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A.L.207, Dec.77

SECTION 3

AIRFRAME

LIST OF CHAPTERS OVERLEAF

SECTION 3

AIRFRAME

LIST OF CHAPTERS

Note:- *A list of contents appears at the beginning of each chapter*

Chapter 1 FUSELAGE

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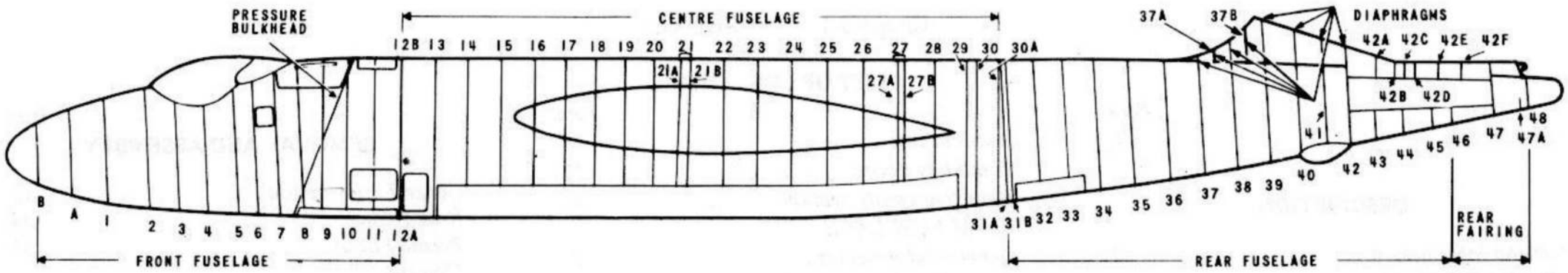

Fig.1. Key diagram

Introduction

1. This chapter gives a general description of the fuselage structure, together with the procedure for dismantling the structure into its main components.

DESCRIPTION

General information

2. The all-metal fuselage is circular in section and of stressed-skin construction throughout. Transport joints at frames 12 and 31 divide the fuselage into three sections, front, centre and rear. Except at the transport joints and elsewhere where reinforcement is necessary, the structure is supported by flanged channel section frames, which are cut away on their outer edges to accommodate the fore-and-aft stringers. Fig.1 illustrates the disposition of the fuselage sections and frames within the structure.

FRONT FUSELAGE

General information

3. The front fuselage comprises a transparent nose-fairing, a pressure cabin, sealed off from the remainder of the fuselage by a pressure bulkhead, a nose undercarriage well, and three compartments positioned between the bulkhead and the transport joint. A horizontal diaphragm, aft of the pressure bulkhead, divides the area between the bulkhead and the transport joint into an upper equipment bay and a lower compartment, the latter being divided by two vertical diaphragms into the nose undercarriage well and flanking compartments. Forward of the bulkhead the structure is cut away and suitably reinforced on the starboard side to accommodate the entrance door, and on the top to allow for the canopy and crew escape hatch, the canopy aperture being reinforced by a circular-section coaming tube. Two 1/8 in. dia. drain holes, one on the port side, and one on the starboard side of the coaming tube at the lowest points facilitate the periodic draining of any water accumulation. They are plugged with self-tapping screws rolled in Bostik, to prevent loss of cabin pressure. A perspex window is provided in the port side of the fuselage at the navigator's station. A folding seat is hinged to the starboard cabin wall between frames 4 and 5. Aft of the pressure bulkhead a suitably reinforced opening in the top surface of the fuselage is provided to accommodate the upper equipment bay hatch door. Similarly reinforced apertures accommodate the hinged doors and hatches of the nose undercarriage bay and lower equipment compartments.

Nose fairing *(fig.8)*

4. The nose fairing consists of inner and outer transparent sheets which form a sandwich, incorporating a flat toughened glass sighting panel slightly offset to starboard. The fairing is secured to the forward end of the structure by retaining ring segments and screws. The pitot head mounting is situated in the centre of the nose.

Cabin floor

5. The main floor of the cabin extends from the pressure bulkhead to frame 1, where an extension ramp into the nose is fitted; a built-up structure at the pilot's station forms the pilot's floor and raises his seat above the level of the main floor.

Cabin pressure bulkhead

6. The cabin pressure bulkhead is inclined aft across the fuselage from between frames 7 and 8 at the bottom to frame 10 at the top; it

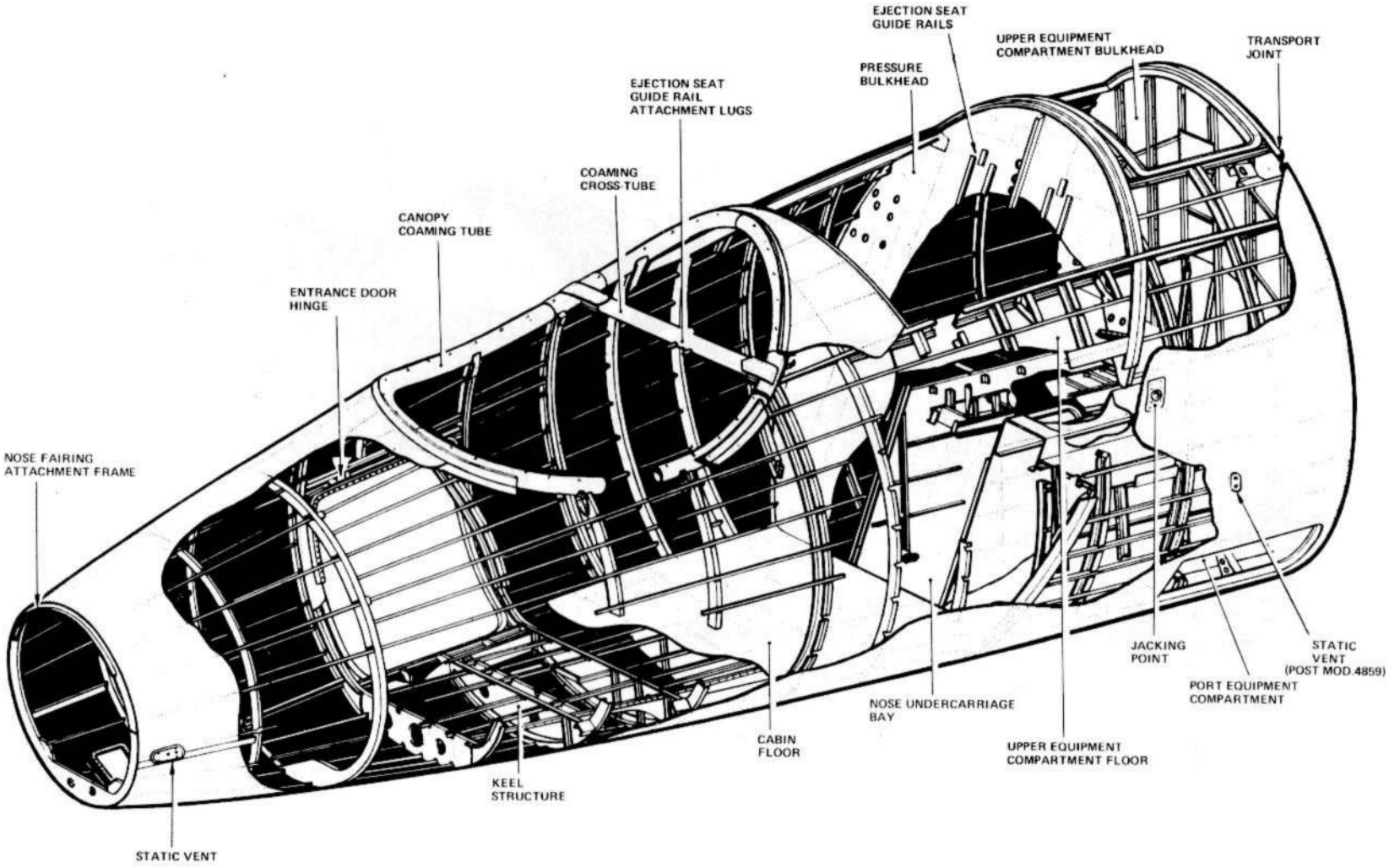

FIG. 2. FRONT FUSELAGE

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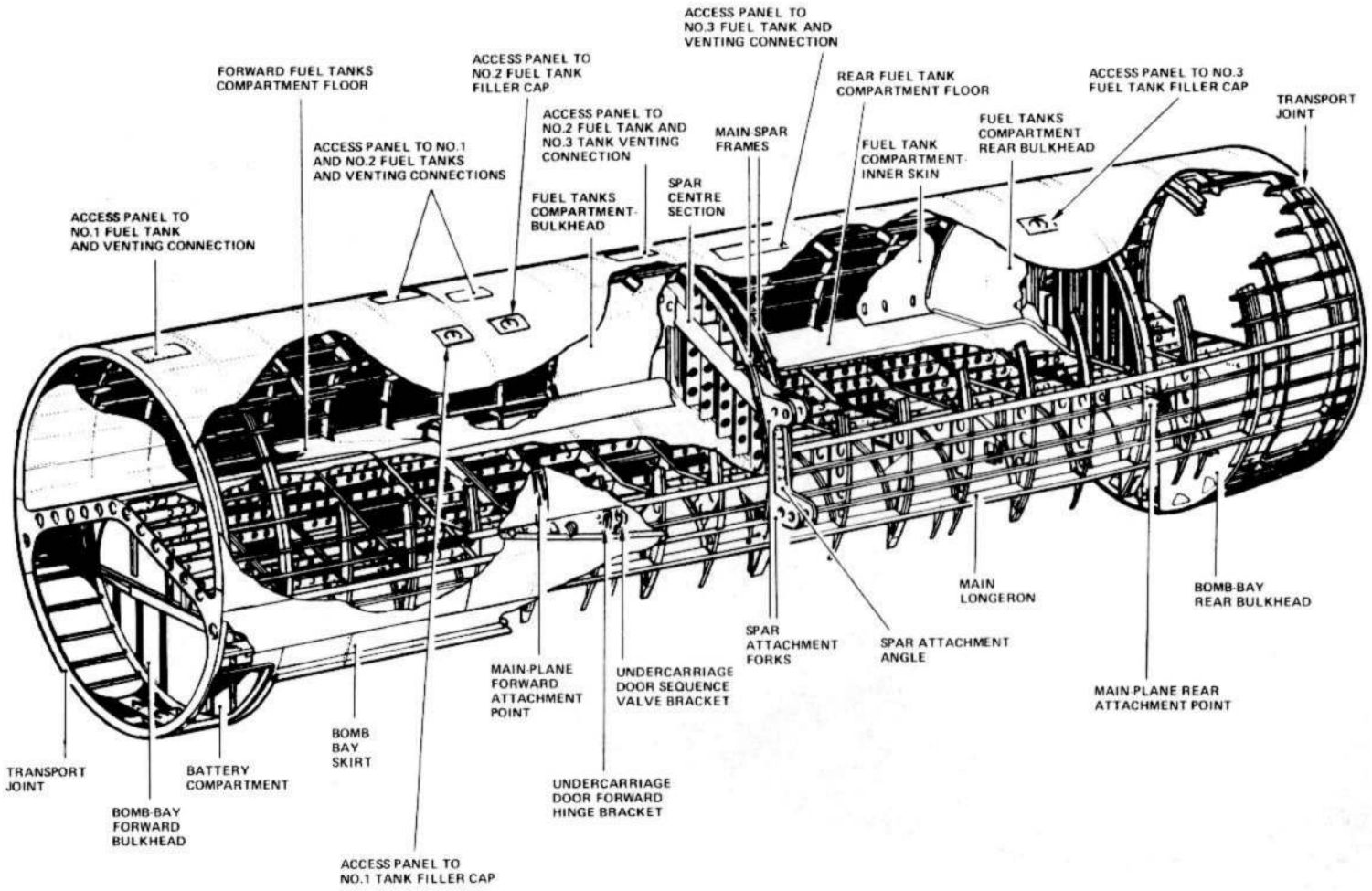


FIG. 3. CENTRE FUSELAGE

◀MOD.1016 NOTE DELETED▶

completely seals off the pressure cabin from the remainder of the fuselage. The bulkhead is reinforced on its rear face by vertical and horizontal channel-section members.

Canopy

7. The canopy consists of two blown transparent plastic sheets forming a sandwich, and separated by an edge spacing-piece. A hinged direct-vision window of laminated glass is fitted to the port forward face. The canopy is secured by 32 explosive attachment bolts to the coaming tube surrounding the fuselage aperture.

Crew escape hatch

8. The crew escape hatch is of metal construction reinforced on the inside by two channel-section cross-members and angle-section stringers, and is secured by 34 explosive bolts to the fuselage cutaway section boundary member. The hatch has two flush-fitting windows and provision is made for the installation of a periscope sextant.

9. Black-out curtains fitted to the hatch windows, are secured by Velcro tape when extended and by straps with Lift-the-Dot fasteners when rolled up.

Equipment compartments

10. Three equipment compartments are located between the cabin pressure bulkhead and the transport joint at frame 12. The upper compartment is above the nose undercarriage well, the well roof forming the compartment floor; access to this compartment is by a removable hatch on the top of the fuselage. The other compartments, one on each side of the nose undercarriage well, are formed by the sides of the well and the fuselage skin, each compartment is fitted with an access door, which is hinged at its lower edge to the fuselage side.

Nose-undercarriage doors

11. The nose-undercarriage doors have a light-gauge inner and outer skin reinforced by ribs interspaced by channel-section members. The doors are attached to the fuselage by piano-type hinges.

Entrance door

12. The entrance door is attached at its top edge to the starboard side of the fuselage by two hinges. It comprises inner and outer skins, between which are reinforcing formers and channel-section bracing members bounded by a channel-section frame to which is attached a pressure-tight seal. The door jettison mechanism is described and illustrated in Chap.11.

Ejection seat guide rails

13. The pilot's ejection seat guide rail is attached to two longitudinal channel-section members on the pilot's floor and to two brackets on the canopy coaming cross-tube. The 1st. and 2nd. navigators' ejection seat guide rails are bolted to the front face of the pressure bulkhead and anchored to angle-section brackets on the cabin floor.

Ballast weights *(fig.6)*

14. To help maintain the C.G. position within the C.G. range *(Sect.2, Chap.3)*, provision is made on the starboard side of the aircraft between frames 1 and 2, to fit adjustable lead ballast up to a maximum weight of 266 lb. Five lead ballast weights are provided (for individual weight values refer to fig.6); these include a base weight, bolted to the floor, surmounted by a box in which the remaining four weights are carried and clamped in position by a metal strap. Wooden blocks of similar form to the ballast weights are provided and must be fitted in position where a ballast weight is not used. Having determined the amount of ballast required for the aircraft role *(Sect.2, Chap.3)*, ballast weights to agree to that weight must be fitted.

Note. . .

Any permutation of ballast weights may be fitted to attain the required amount of ballast. A tolerance of ± 10 lb to the calculated adjustable weight required is permissible.

CENTRE FUSELAGE

General information *(fig.3)*

15. The centre fuselage consists of upper and lower compartments. The upper compartment houses the main fuel tanks, while the lower compartment forms the bomb bay. The effective structure consists of the portion above the floor, which is of double-skinned stressed-skin construction with rolled Z-section stringers stiffening both the outer and inner skins. Transverse channel-section girders, the ends of which form the bomb skirt contour, provide the main support for the arched fuel tank floor, while secondary support is provided by fore-and-aft channel-section members. The battery compartment is situated in the lower compartment of the centre fuselage between the forward transport joint and the bomb bay forward bulkhead; access is through a door on the

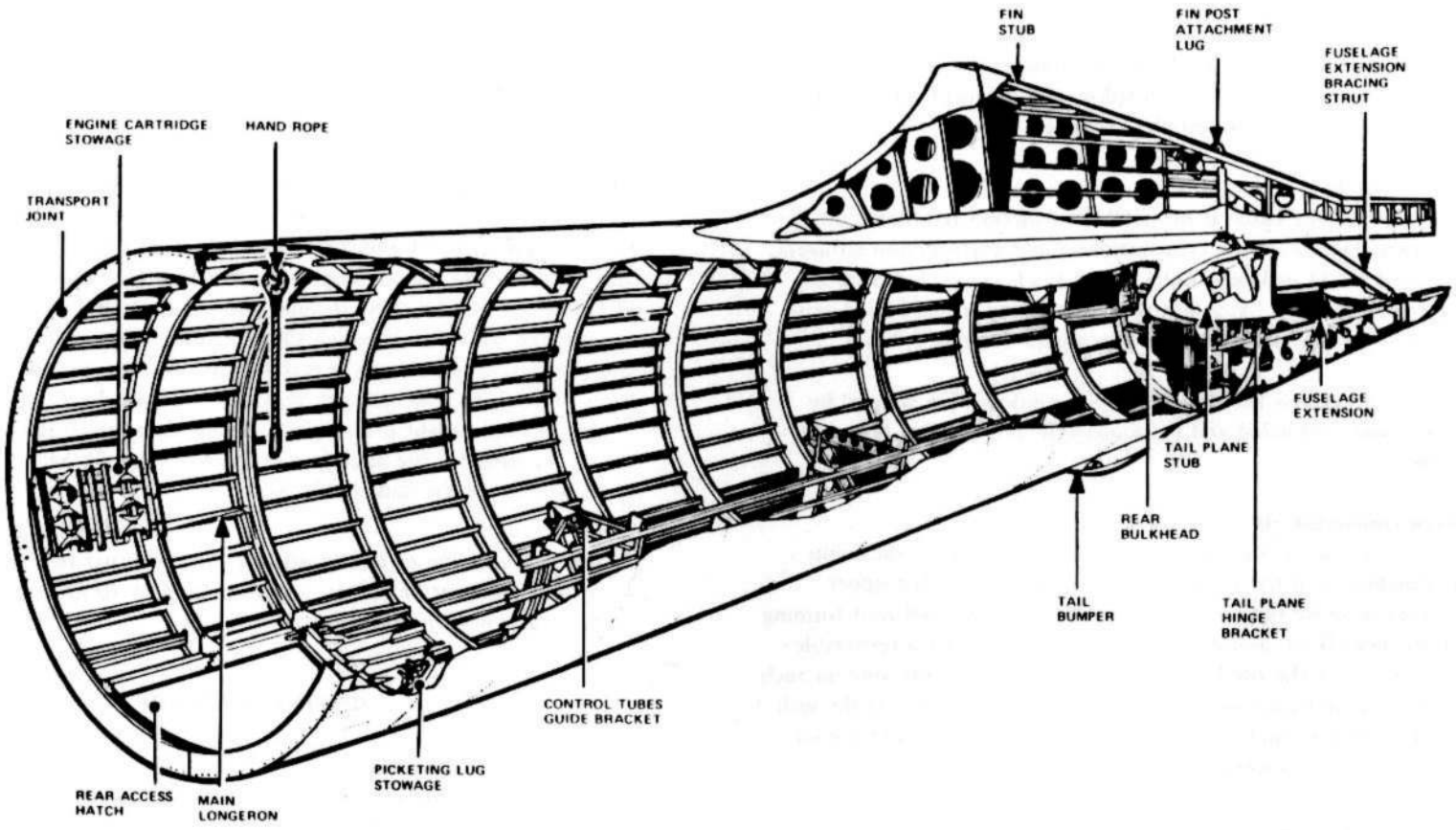


FIG.4. REAR FUSELAGE

◀ port side. Removable panels are provided in the fuselage skin between frames 17 and 18, for inspection of the main plane front spar attachment points.

Fuel tank compartments

16. The fuel tank compartments occupy the upper half of the centre fuselage and extend from frame 12 to frame 29. Divided at the spar frame by a bulkhead, the front compartment houses two rigid self-sealing fuel tanks and the rear a collapsible fuel bag. The floor of the forward compartment is lined to prevent chafing of the fuel tanks against the floor rivets. In the top of the double-skin structure are eight small reinforced cut-away sections, five of which accommodate fuel tank access panels, while the other three house the fuel tank filler caps.

Bomb bay

17. The bomb bay, extending from frame 13 to frame 29 is formed by the lower half of the centre fuselage. Both these frames are of extruded channel section, the lower portion carrying a bulkhead plate reinforced by channel section stiffeners. The transverse girders supporting the fuel tank compartment floor are extended downwards and reinforce the skirt along which the longerons run. The alternate frames 15 to 27 are channelled to accommodate the bomb door rollers. An inspection panel in the bulkhead at frame 29 permits the interior of the bomb bay to be viewed without opening the bomb-bay doors. Provision is made for a camera mounting aft of frame 29 bulkhead, and the lower fuselage skin is cut away to locate a camera window.

Bomb beams

18. A main bomb beam situated between frames 17 and 21 forms part of the aircraft structure. From the main beam, two secondary bomb beams may be fitted in tandem to carry an auxiliary fuel tank *(Sect.4, Chap.2).*

Bomb-bay doors

19. The bomb-bay doors are of light-gauge duralumin construction, each door consisting of an inner and outer skin reinforced by two longitudinal channel-section stringers, internal stringers and ribs. Each door is supported at the ends by forged light-alloy hinge brackets and by rollers operating in the channelled ends of the transverse girders of the fuselage at seven stations along its length.

Main spar centre section

20. Two reinforced frames, interspaced by vertical channel-section members and skinned to form a double plate bulkhead, continue the main spar through the fuselage. They are bounded by extruded angle-section members and carry between them the main spar pick-ups, which have forked ends for the boom attachments and an extruded centre for the attachment of the spar web.

REAR FUSELAGE

General information *(fig.4)*

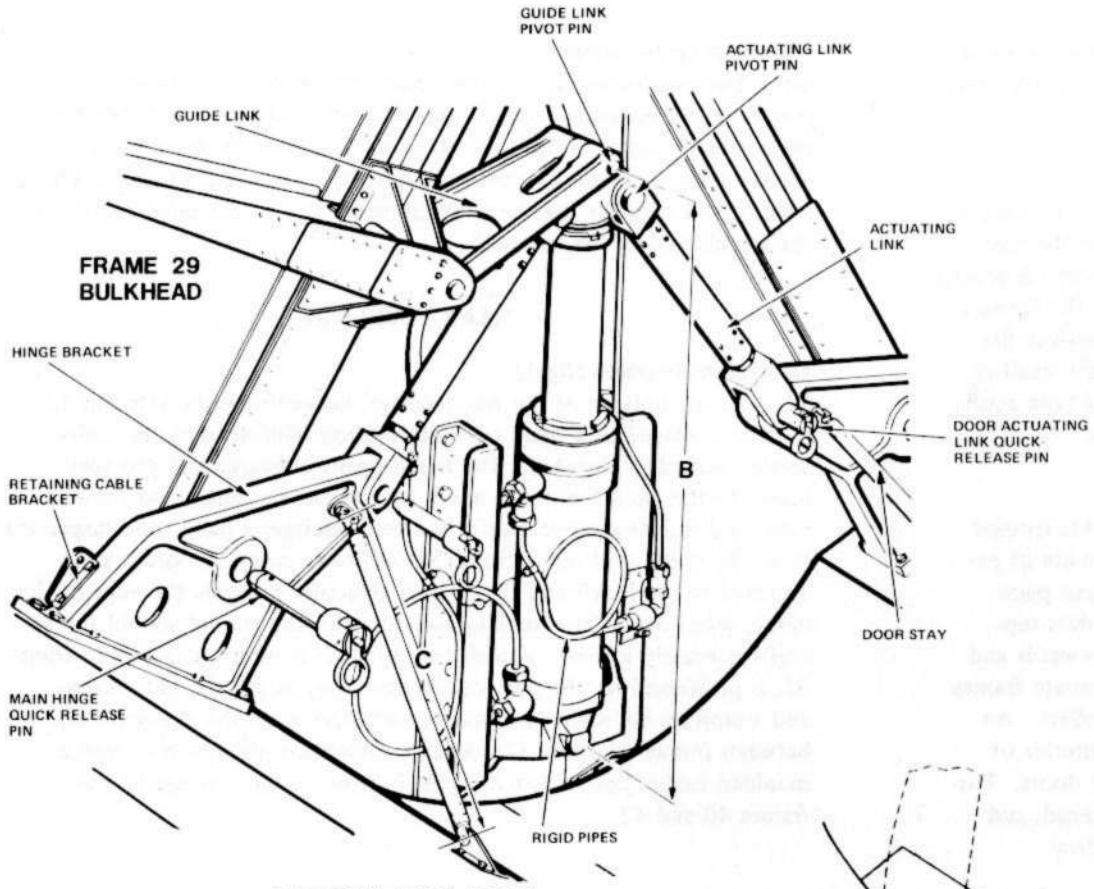
21. At the bottom of the rear fuselage, between frames 31B and 33, a hatch is hinged to a small cut-away section reinforced by an angle-section boundary member. The hatch opens outwards and provides access to the No.3 fuel tank, bomb bay inspection panel, and the elevator and rudder control rods in the rear fuselage; a hand rope suspended ▶ from the upper portion of frame 32 facilitates entry. A safety strap attached to the hatch and the aircraft structure prevents the edge of the hatch, when open, from making contact with the ground should the aircraft be heavily loaded. A picketing eye-bolt stowage, attached to frame 32, is positioned on the port side immediately above the hatch frame, and a stowage for six engine starter cartridges is on the starboard side between frames 31B and 32. A tail bumper, on which is mounted a moulded rubber pad, is fitted to the bottom of the fuselage between frames 40 and 42.

Survival pack stowages

22. Stowage racks for three survival packs are fitted, one between frames 31B and 33, and two between frames 36 and 37. The position of the stowages is indicated on the outer skin of the fuselage.

Tail-plane attachments

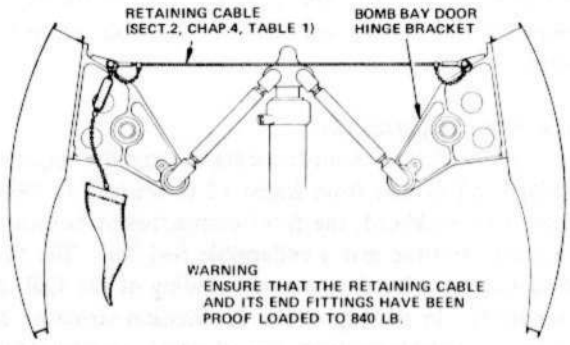
23. An extension to the lower half of the fuselage, aft of frame 42 and extending to frame 46, forms a platform for carrying the variable-incidence tail plane and its electrical actuator, it is braced by a diagonal strut extending from the top of frame 42 to the rear of the extension. Attached to the rear of frame 42 are two brackets which carry the tail plane pivot pins, while on each side of the fuselage, extending forward of frame 42, is a narrow integral tail plane leading edge stub.



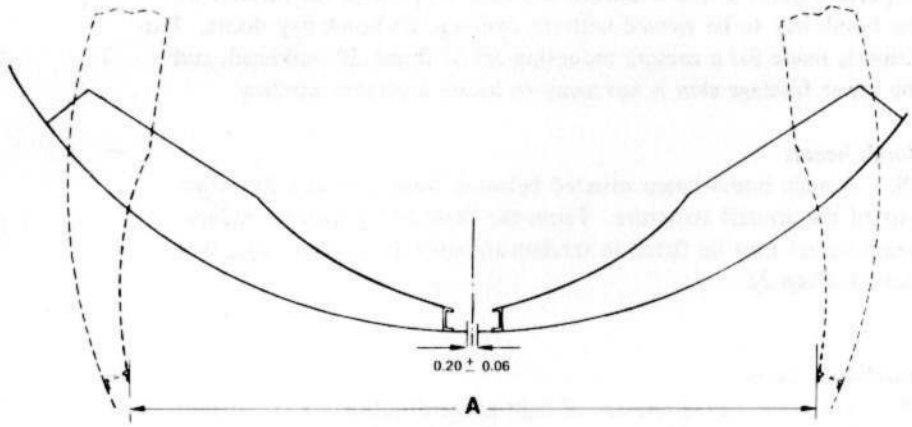
AFT BOMB-BAY DOOR JACK ASSEMBLY SHOWN

A	FORWARD DIMENSION	53.50 ± 0.50
	AFT DIMENSION	45.00 ± 0.50
B	FORWARD JACK	18.625 ± 0.25
	AFT JACK	18.50 ± 0.25
C	FORWARD STAYS	15.035 ± 0.235
	AFT STAYS	15.835 ± 0.215

NOTE . . .
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED



BOMB-BAY RETAINING CABLE



BOMB – BAY DOORS AT FORWARD AND REAR POSITIONS

FIG. 5. BOMB – BAY DOORS ADJUSTMENT

◀ RETAINING CABLE DETAIL ADDED ▶

Fin stub and fin attachments

24. Attached to the top of the fuselage structure, between frames 37 and 42, are eight diaphragms forming the structure of the fin stub, the four diaphragms above frames 39 and 42 being reinforced by longitudinal angle-section members. The diaphragm at frame 42 carries the fin post attachment lug, secondary attachment points for the fin being provided on the diaphragms at frames 39 to 42A.

Rudder stub

25. The top of the fuselage structure is extended aft of frame 42 to form the rudder stub. The extension is formed by six angle-sectioned webbed frames and four longitudinal angle-section members; the resulting box is plated with skinning on each side.

Rear fairing

26. The rear fairing is a detachable structure to which the metal skin covering for the rear fuselage extension is attached. It is built up to form one complete section and is attached to the rear fuselage at frames 42F and 46.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Bomb-bay door jack adjustment *(fig.5)*

Forward jack

27. The distance between the pin centres of the forward jack, measured between the jack attachment lug and the guide link attachment point on the jack piston rod link end, should be 18.625 in. ± 0.25 in. when the jack is fully contracted, this is a manufacturer's setting which should not normally need alteration. If, however, adjustment should be necessary:-

(1) Remove the jack *(para.43)*.

(2) Remove the locking wire from the locknut on the jack piston rod and slacken the locknut.

(3) Adjust as necessary by turning the link end of the piston rod one half turn at a time.

(4) Tighten and wire-lock the locknut on the jack piston rod.

◀ (5) Replace the jack and bleed the circuit *(Chap.6)*. ▶

Aft jack

28. The adjustment of the aft jack is the same as for the forward jack *(para.27)*, except that the distance between the pin centres, measured between the jack attachment lug and the guide link attachment point on the jack piston rod link end, should be 18.50 in. ± 0.25 in.

Bomb-bay door adjustment *(fig.5)*

29. The pin centres of the bomb-bay door actuating links are nominally set at 13.37 in. At this setting the doors, when fully open, should be 53.50 in. ± 0.50 in. apart at the forward end, and 45.00 in. ± 0.50 in. apart at the rear end, measured inside the metal faces of the door edges *(dimension A)*. When the doors are fully closed the hydraulic jacks must be fully extended and there should be a clearance of 0.20 in. ± 0.06 in. between the metal faces of the door edges. To adjust the door actuating links:-

(1) Fully open the doors and fit retaining cables *(Sect.2, Chap.4, Table 1)* to the brackets on the front and rear hinge brackets *(fig.5)*.

(2) Remove the quick-release pin from the door actuating link to be adjusted.

(3) Slacken the locknut on the actuating link and turn the fork-end as required until the pin centres are 13.37 in. ± 0.25 in. apart.

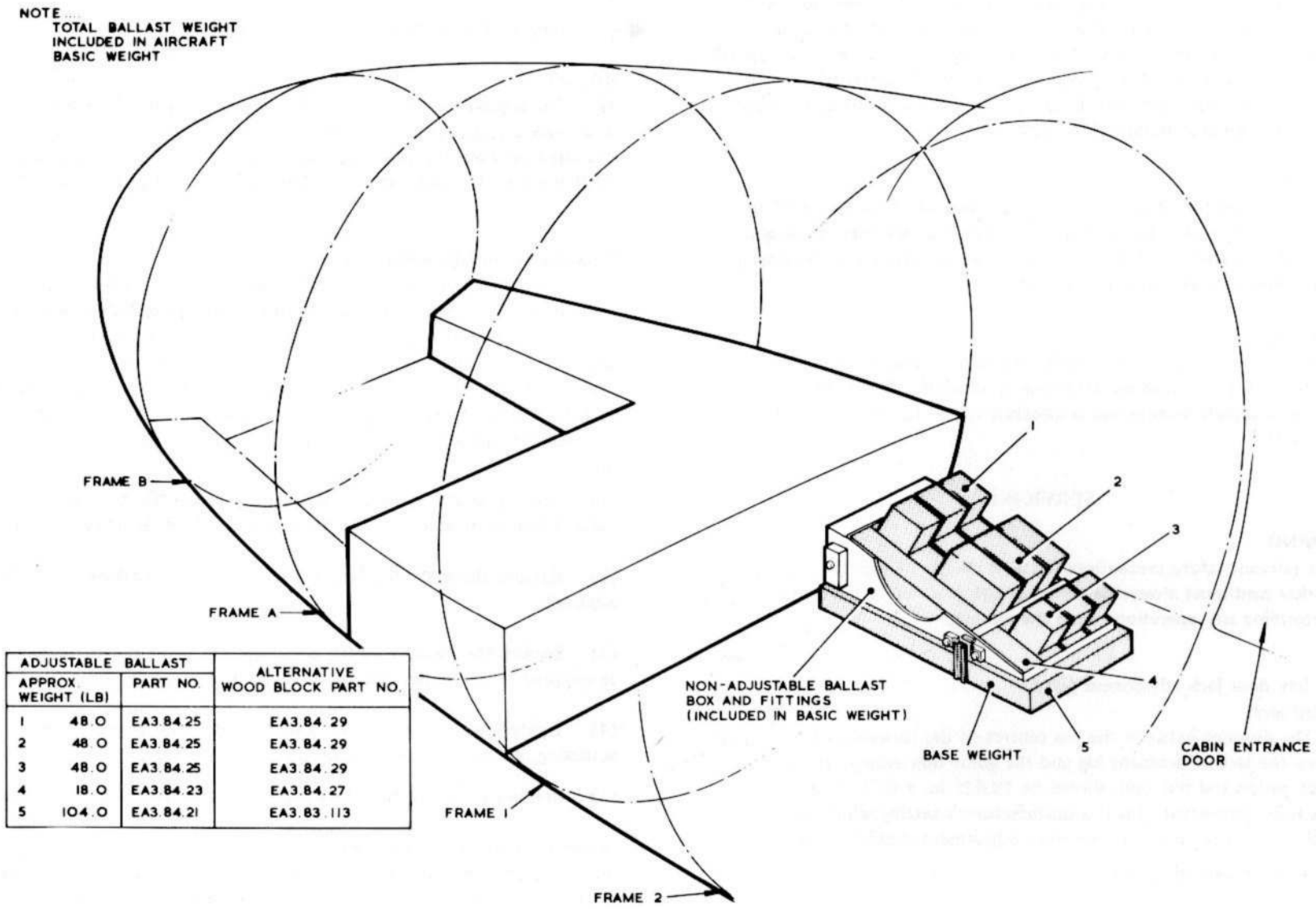
(4) Tighten the locknut on the actuating link and reconnect the actuating link to the hinge bracket by fitting the pip-pin.

(5) Remove the retaining cables and check the operation of the doors.

Bomb-bay door stay adjustment

30. The pin centres of the bomb-bay door forward and aft stays are nominally set at 15.035 in. ± 0.235 in. and 15.835 in. ± 0.215 in. respectively. These are manufacturer's settings which should not normally need alteration. If, however, adjustment should be necessary:-

(1) Fully open the doors and fit retaining cables *(Sect.2, Chap.4, Table 1)* to the brackets on the front and rear hinge brackets *(fig.5)*.



ADJUSTABLE BALLAST			ALTERNATIVE WOOD BLOCK PART NO.
	APPROX. WEIGHT (LB)	PART NO.	
1	48.0	EA3.84.25	EA3.84.29
2	48.0	EA3.84.25	EA3.84.29
3	48.0	EA3.84.25	EA3.84.29
4	18.0	EA3.84.23	EA3.84.27
5	104.0	EA3.84.21	EA3.83.113

FIG. 6. BALLAST WEIGHTS

(2) Disconnect the fork-end of the stay from the eye-bolt on the door hinge bracket.

(3) Slacken the locknut on the stay and turn the fork-end until the nominal pin centre distance is obtained.

(4) Tighten the locknut on the stay and connect the fork-end of the ▶ stay to the eye-bolt on the door hinge bracket. ◀

(5) Remove the retaining cables and check the operation of the doors.

Equipment compartment hatch locking pin settings

31. Instructions for setting the hatch locking pin settings are given in fig.19.

Lubrication

32. Refer to fig.7.

REMOVAL AND ASSEMBLY

General information

33. The following paragraphs contain information on the removal of the fuselage components. Only the removal operations are given in detail since the assembly is generally a reversal of this procedure; where this is not the case the fact is noted.

Nose fairing *(fig.8)*

34. To remove the nose fairing:-

(1) Release the two hose clips from the de-misting pipe slide-on-connection.

(2) Remove the rubber tube from the air-drier connection on the nose fairing.

(3) Disconnect the pressure-head pipe at the connection.

(4) Disconnect the electrical cable from the terminal block.

(5) Remove the 2 B.A. screws attaching the side portions of the retaining ring to the nose and frame B.

(6) With the exception of those at the ends and in the centre, remove the 2 B.A. screws attaching the upper and lower portions of the retaining ring to the nose and to frame B.

(7) With the nose adequately supported, remove the remaining 2 B.A. screws from the upper and lower portions of the retaining ring.

(8) Remove the nose from the fuselage.

Reassembly notes. . .

1. When refitting the nose fairing it is important that the inner sealing strip, the outer sealing strip and the bearing strip are fitted securely.

2. When tightening the attachment screws, the maximum torque must not exceed 25 lb in.

Pressure head

35. To remove the pressure head from the nose fairing:-

(1) Disconnect the union nut securing the pitot piping to the pressure head assembly and blank off the apertures.

(2) Disconnect the electrical leads to the pressure head at the terminal block on frame A.

(3) Remove the locking wire securing the ring nut to the adapter tube and remove the ring nut, washer and rubber sealing ring.

(4) Remove the pressure head from the nose fairing.

Reassembly notes. . .

1. Before replacing the ring nut a thin coating of grease (fig.7) is to be applied to the threads of the ring nut and the pressure head adapter.

2. When finally tightening the ring nut, a torque of 120 lb in. must not be exceeded.

3. To ensure an air-tight joint, Boscoprene 2100 sealant Ref.No.33H/2244271 is to be applied round the periphery of the pressure head adapter at the junction with the front face of the nose fairing. Full instructions for the application of this sealant are given in A.P.1464B, Vol.1, Part 2.

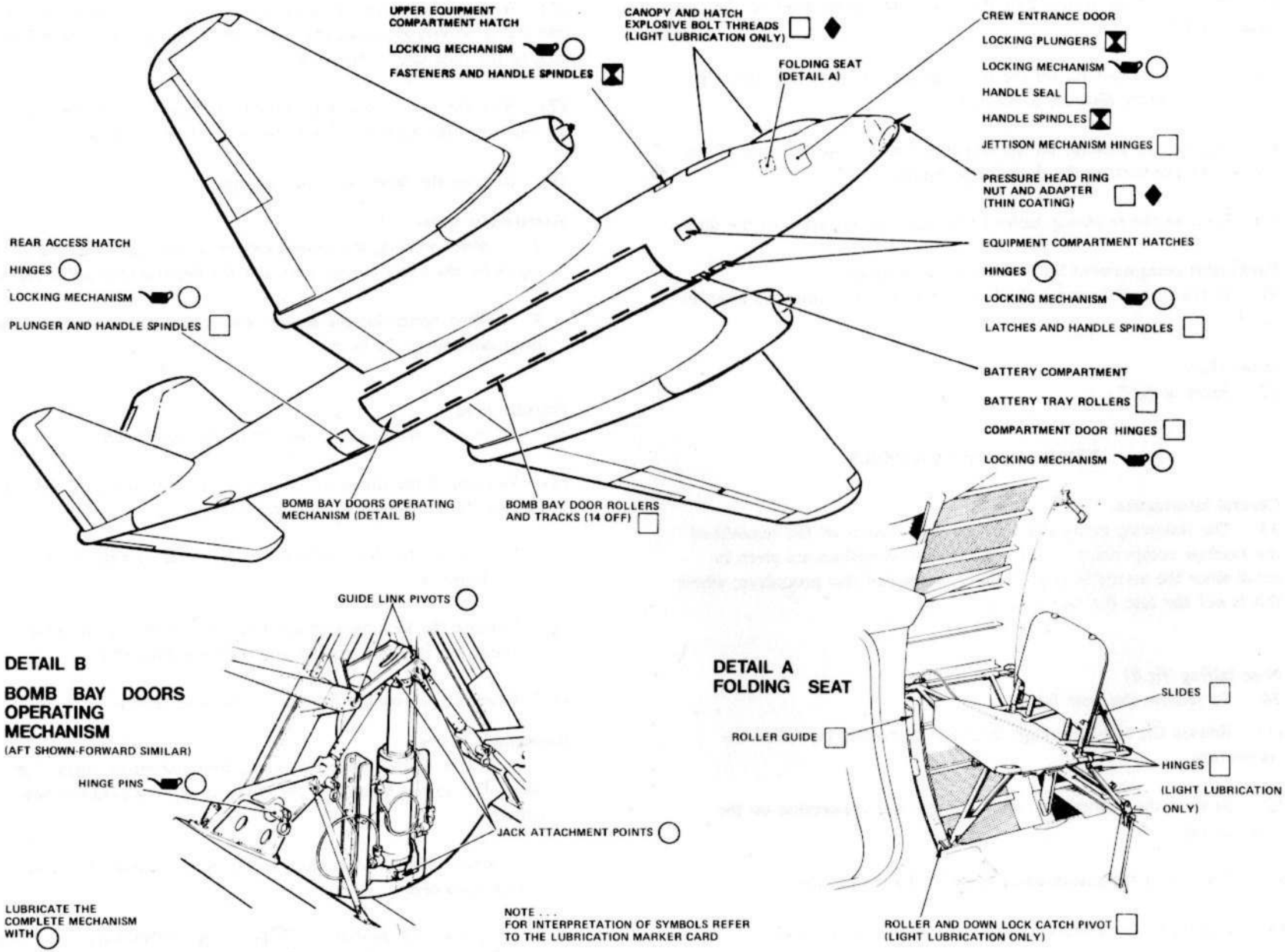


FIG.7. LUBRICATION DIAGRAM

◀ *4. The angular setting of the pressure head must agree with the figure given in Leading Particulars.*

Canopy *(fig.14)*

Removal

36. To remove the canopy:-

WARNING

Before proceeding with the removal of canopy, ensure that the jettison master switch is in the SAFE position. Remove the detonator circuit fuses and disconnect the internal service battery, the emergency battery and and any external electrical supply.

(1) Disconnect the two aerial plugs.

(2) Disconnect the two heater plugs from the D.V. window.

(3) Remove the six 2 B.A. screws securing the canopy fairing and remove the fairing by sliding it clear of the section attached to the crew escape hatch.

(4) Unfasten the cockpit lighting panel, which is secured by self-tapping screws to the coaming tube, and allow it to hang with its weight supported by slings made from soft wire.

(5) Disconnect the hot air diffuser pipe at its control on the port side, unscrew the self-tapping screws and remove the pipe and forward blast shield. Blank off the exposed end of the hot-air pipe.

(6) Disconnect and blank off the three de-misting hoses, and remove the two air-driers.

(7) From the navigator's compartment remove any equipment from the cross-tube that is likely to hinder canopy removal.

(8) Remove the eight blast plates which are secured to the coaming tube.

(9) Remove the detonators from the explosive bolts A.P.110N-0306-1.

(10) Unscrew and remove the 32 explosive bolts.

(11) Raise the forward end of the canopy, lift clear of the rear hinge and remove the canopy from the aircraft.

(12) Remove the seal and all traces of sealant from the coaming tube and around the seating pads. Any white spots approximately 0.25 in. dia. which may be painted on the coaming tube, must not be obliterated.

Assembly

37. To assemble the canopy:-

(1) Fit a new rubber sealing strip *(A.P.101B-0400-6, Part 1, Chap.2).*

Note. . .

Before finally assembling the canopy, the clearance between the canopy edge member and the coaming tube pads must be checked (A.P.101B-0400-6, Part 1, Chap.2).

(2) Offer up the canopy and align it by inserting four locating pins *(Sect.2, Chap.4, Table 1)* in the following positions, forward centre, aft centre, port centre and starboard centre.

Note. . .

No adhesive is to be used between the canopy and the Linatex sealing strip.

(3) When correctly positioned, withdraw each pin in turn and fit slave bolts *(Sect.2, Chap.4, Table 1).* Fit the slave bolts to the remaining 28 bolt holes.

(4) Tighten diametrically opposite bolts in turn, to a torque loading of 150 lb in.

(5) Remove each slave bolt and its diametrical opposite in turn, and fit and tighten the 32 explosive bolts. The torque loading of 150 lb in. must not be exceeded. Check that there is a minimum clearance of 0.20 in. between the end of the explosive bolt and the rebate in the canopy.

Note. . .

1. The threads of the explosive bolts must be lightly lubricated with grease (fig.7) before fitting. ▶

2. Where a white spot approximately 0.25 in. dia. has been painted on the coaming tube, a washer Ref.No.28W/9419478 must be fitted

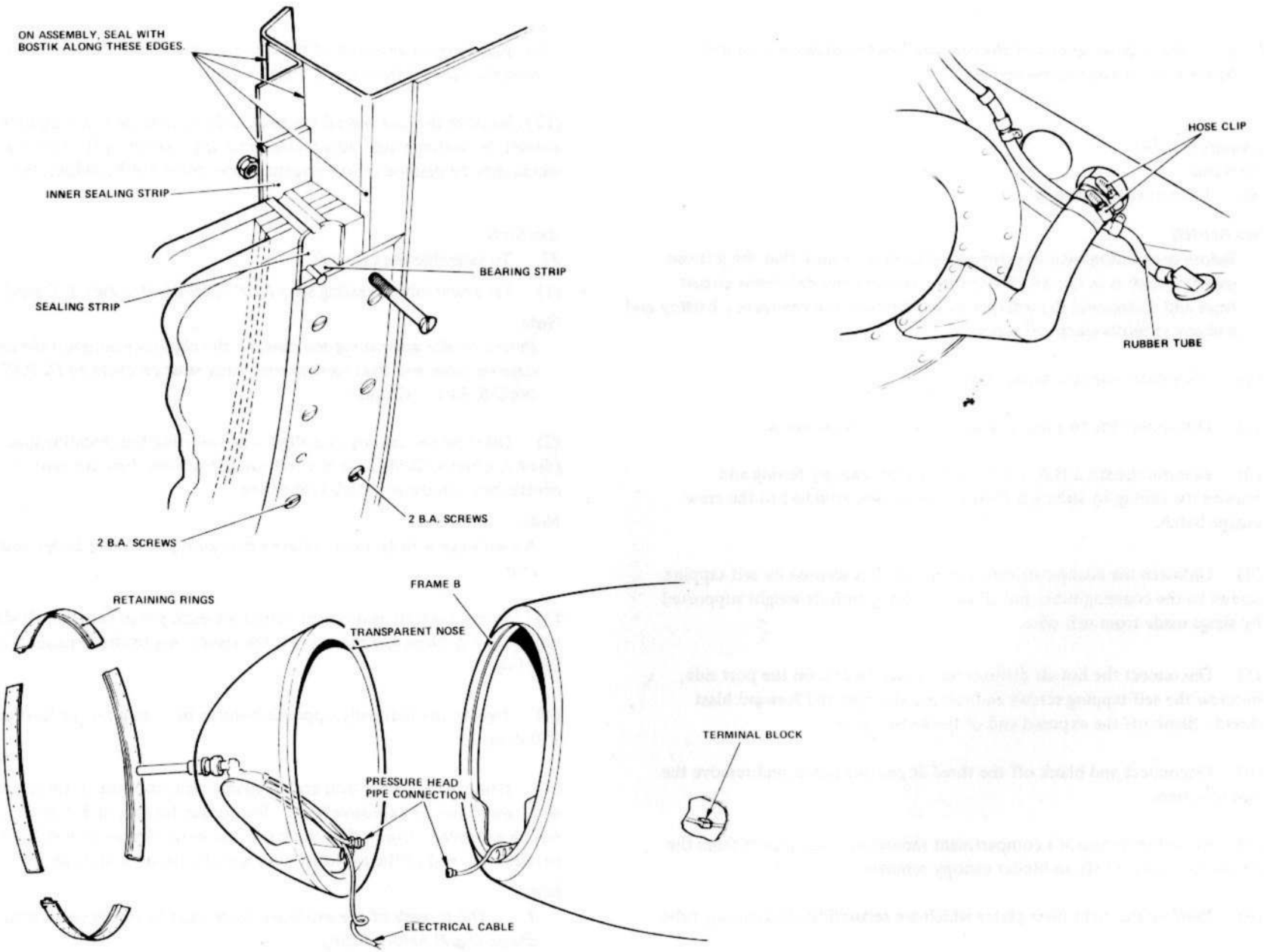


FIG. 8. NOSE FAIRING — REMOVAL AND ASSEMBLY

◀ TITLE AMENDED AND ANNOTATIONS ADDED ▶

between the shoulder of the bolt and the lower bush of the coaming tube.

3. Special-to-type bolts Ref.No.26FZ/1594 are fitted to bolt holes No.2 and 3 from the centre line of the forward port side of the canopy (fig.14).

(6) Place a small piece of plasticine at each end of the canopy fairing angle, refit the canopy fairing and tighten the six 2 B.A. screws. Remove the screws and the canopy fairing, check the thickness of the plasticine, to ascertain the dimension of the gap between the fairing angle and the fuselage skin. If necessary, trim the fairing angle to obtain 0.08 in. gap, apply protective treatment *(A.P.101B-0400-6)*. Refit the canopy fairing, tighten the six 2 B.A. screws and lock by centre punching the edge of the slots.

(7) Refit the eight blast plates.

(8) Refit the two air-driers and connect three de-misting hoses *(Chap.8)*.

(9) Refit the hot-air diffuser and the forward blast shield, and secure by fitting the self-tapping screws.

(10) Connect the diffuser to the hot-air pipe at its control on the port side.

(11) Position the cockpit lighting panel, remove the temporary slings and secure by fitting the self-tapping screws.

(12) Pressure test the cabin *(Chap.8)*.

(13) Fit the detonators into the explosive bolts *(A.P.110N-0306-1)*.

Note. . .

1. It is important that the detonator Ref.No.12G/1278, the distance tube Ref.No.26FZ/1806 for the standard canopy bolt, or Ref.No.26FZ/1808 for the special-to-type canopy bolt and the spring Ref.No.26FZ/1579 be assembled as shown in fig.14. Prior to inserting the spring and screwing the cap home, using a gauge of local manufacture, check the dimension between the distance tube and the end of the bolt; this should be 0.38 in. ± 0.04 in. for the standard bolt and 0.78 in. ± 0.04 in. for the special-to-type bolt.

2. If the position of any detonator lead is disturbed, ensure that at no point is it to run closer than two inches to the run of the V.H.F. aerial connector. At any point where it is necessary for the detonator leads to cross the aerial connector, the cross-over is to be at 90 deg to the run of the connector.

3. Ensure that the detonator leads are not trapped between the bolt retaining nuts and the adjacent structure.

(14) Connect the two heating plugs to the D.V. window.

(15) If the canopy aerials are operational reconnect the two aerial plugs. Where aerials are fitted within the canopy but are non-operational connect the two bonding leads from the aerials to the sockets. Tighten the plugs sufficiently to prevent accidental withdrawal.

(16) Refit the equipment, if any, removed in para.36 (7).

(17) Reconnect the electrical supplies.

Fitting a new canopy

38. The procedure for fitting a new canopy is described in A.P.101B-0400-6, Chap.2.

Fitting a canopy D.V. window

39. When fitting a D.V. window, ensure that the window fits correctly on its seating. This can be ascertained by using a marking medium on the seat, and closing the window. A 100 per cent seating must be obtained. An incorrect seating can be rectified by the addition or subtraction of shims between the hinge bracket and canopy. Pressure test the cabin *(Chap.8)* after any adjustment has been made.

Crew escape hatch *(fig.15)*

Removal

40. The procedure for the removal of the crew hatch is detailed in the following operations. Where the removal is undertaken to fit a new hatch, the removal operations are fully described in A.P.101B-0400-6, Chap.2.

WARNING

Before any work on the crew escape hatch is undertaken, the safety precautions detailed on the LETHAL WARNING marker card must be observed.

(1) Disconnect from the rear of the hatch, the ejection seat secondary firing-cables.

(2) Remove the canopy rear fairing by removing the two ¼ in. dia. countersunk head screws and the twelve 2 B.A. countersunk head bolts, stiffnuts and washers *(view on arrow A).*

(3) Remove the sixty-six ¼ in. dia. attachment bolts securing the hatch to the bolt frame *(Section B-B).*

(4) Remove the hatch by easing it upwards at the forward end to allow the screwed spigots to clear the sockets in the bulkhead; disconnect the butt connector if fitted.

Assembly

41. The procedure for the assembly of the crew escape hatch is detailed in the following operations. When a new hatch is being assembled, the fitting operations are fully described in A.P.101B-0400-6, Chap.2.

(1) Ensure that the sealing strip and pressure seal are secure and in good condition *(Section B-B).*

(2) Place the hatch in position on the bolt frame *(Section B-B)* and, taking care not to trap the seal irregularly, secure the hatch with the sixty-six bolts and two screws (which also attach the canopy rear fairing) in sequence, aft centre, front centre, outwards to the sides of the hatch and finally along the longitudinal edges.

(3) When all screws have been fitted, finally tighten using equal pressure.

(4) Screw the spigots of the hatch down until the shoulder of the spigot butts firmly against the forward face of the pressure bulkhead; do not over-tighten the spigots when tightening the locknuts.

(5) Check and if necessary, adjust and align the periscope mounting butt connector *(fig.15, detail C)* until there is a 12 lb/in^2 pressure between the faces; this can be measured with a spring balance.

(6) Refit the 2 B.A. bolts and nuts etc. to the canopy rear fairing *(view on arrow A).*

(7) Reconnect the secondary firing-cables.

(8) Pressure test the cabin *(Chap.8).*

Note. . .

1. Whenever the explosive bolts have to be replaced, lubricate the threads with a thin coating of grease (fig.7). Ensure that the correct securing nut AGS.2002L/1, Ref.No.28M/10333 is fitted to the explosive bolt and that the appropriate distance tube is used for any position as instructed in A.P.101B-0400-6, Chap.2. The torque applied to tighten the bolts must not exceed 130 lb in.

2. Whenever fitting detonators into the explosive bolts (A.P.110N-0306-1 refers) it is important that the detonator Ref.No.12G/1278, the distance tube Ref.No.26FZ/1807, and the spring Ref.No.26FZ/1579 be assembled as shown in fig.15. Prior to inserting the spring and screwing the cap home, using a gauge of local manufacture check the dimension between the distance tube and the end of the bolt; this must be 0.38 in. ± 0.04 in.

3. Ensure that the detonator leads are not trapped between the bolt retaining nuts and the adjacent structure.

Bomb-bay door *(fig.16)*

42. To remove a bomb-bay door:-

(1) Remove the microswitch from its mounting.

(2) Remove the microswitch actuating plate.

(3) Support the weight of the door and remove the quick-release pins from the hinge brackets and the actuating links.

(4) Remove the door.

Reassembly notes. . .

1. When refitting a bomb-bay door, guide it into the 'OPEN'

position by using a metal shim to protect the bomb-bay skin and sealing strip (fig.16).

2. To ensure that a foul does not occur during the assembly of a new door, the hinged flap covering the door centre hinge roller bearings (fig.16) must be bent inwards to conform with the contour of the bomb door skin.

Bomb-bay door jack *(fig.5)*

43. To remove either of the bomb-bay door jacks:-

(1) Fully open the bomb-bay doors and fit retaining cables *(Sect.2, Chap.4, Table 1)* to the brackets on the front and rear hinge brackets.

(2) Ensure that the hydraulic system is exhausted of all hydraulic pressure *(Chap.6)*, and disconnect the hydraulic pipes from the jack. Blank off the open ends of the pipes and the apertures in the jack.

(3) Remove the split pins and collars from the actuating link pivot pins and remove the pivot pins.

(4) Remove the split pin and collar from the guide link pivot pin and remove the pivot pin.

(5) Remove the split pin and collar from the jack attachment pin, withdraw the attachment pin and remove the jack.

Note. . .

When reassembling the jack it is important that the actuating link pivot pins are inserted with the heads of the pins facing towards the nose of the aircraft. After reassembly, bleed the circuit through the jack bleed screws and check operation of doors (Chap.6).

Bomb beams *(fig.20)*

44. To remove the secondary bomb beams:-

(1) Fully open the bomb-bay doors and fit retaining cables *(Sect.2, Chap.4, Table 1)* to the brackets on the front and rear hinge brackets *(fig.5)*.

(2) Remove the two 5/8 in. dia. bolts, with washers, screwed into the connecting plate, securing the forward beam to the aft beam *(detail C)*.

(3) Remove the split pins from the support pins, at the aft end of the rear beam. Support the aft beam and withdraw the pins from the holes in the face of the transverse beam formed by frame 27 *(detail D)*.

(4) Remove the aft beam.

(5) Remove the split pins from the support pins at the forward end of the forward beam, and withdraw the pins from the bomb bay forward bulkhead *(detail A)*.

(6) Support the beam and withdraw the four quick release pins securing the crutch blocks eye end bolts to the beam lugs *(detail B)*.

(7) Remove the forward beam.

(8) Remove the eye end bolts Ref.No.11A/3827 and 11A/3828 from the crutch blocks.

Reassembly notes. . .

1. Only the forward beam may be fitted independently.

2. Before offering up either beam move the support pins (detail A or D) until their ends are flush with the end of the beam.

3. To facilitate alignment between the forward beam lugs and the eye end bolts, eccentric bushes are fitted to the lugs (detail B).

Fitting a crew entrance door

45. To fit an entrance door:-

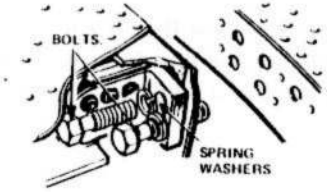
(1) Rotate the door jettison handle to its full extent in a clockwise direction.

(2) Line up the free hinge-pin cups so that their slots are in line with the slots in the hinge-pin cups on the shaft.

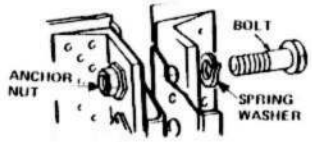
(3) Offer up the door to the fuselage, and insert the hinge pins into the hinge-pin cups.

WARNING

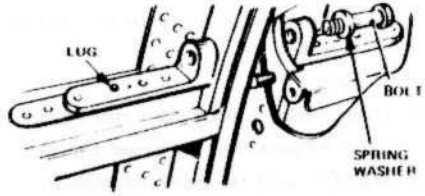
Before securing the entrance door, ensure that the hinge-pin cups are rotated fully to the safe position. The door jettison handle must be



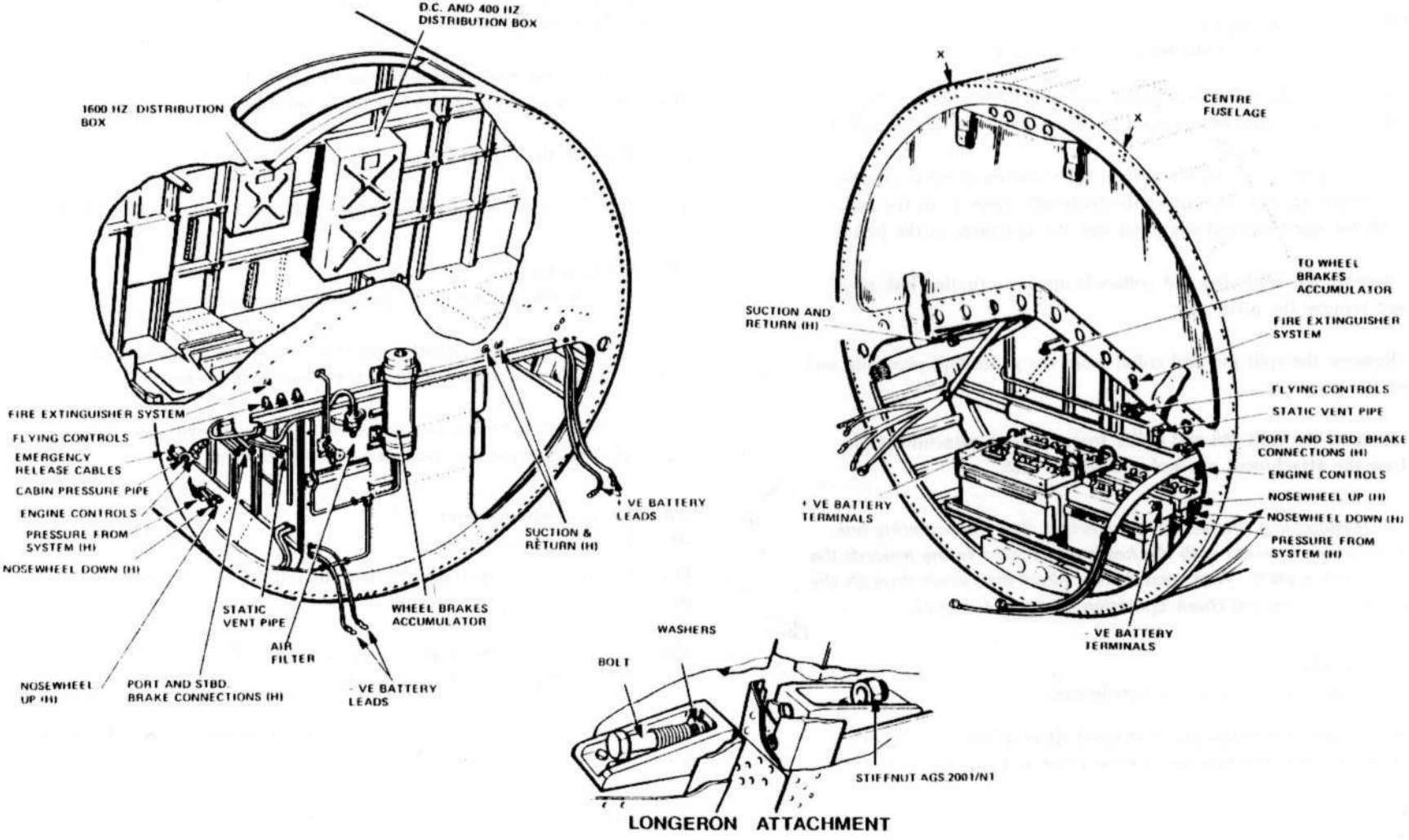
ATTACHMENT AT X



TYPICAL INTERMEDIATE ATTACHMENT



STRINGER TO STRINGER TYPICAL ATTACHMENT



LONGERON ATTACHMENT

FIG 9. FRONT FUSELAGE – REMOVAL

◄ MOD 5339 EMBODIED ►

rotated approximately four complete turns from the jettison to the safe positions.

(4) Rotate the jettison handle in a counter-clockwise direction to its full extent and secure the jettison handle with its securing strap.

46. The procedure for fitting a new crew entrance door is fully described in A.P.101B-0400-6.

Rear fairing

47. Refer to fig.13.

Front fuselage *(fig.9)*

48. To remove the front fuselage from the centre fuselage:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Remove the upper equipment compartment hatch and attach the sling to the front fuselage *(fig.17)*. Take up any slackness in the sling by the hoist.

(3) Disconnect the battery leads and remove the batteries.

(4) Disconnect the detonator circuit fuses.

(5) Disconnect all electrical cables entering the equipment compartment from the centre fuselage.

(6) Disconnect and blank off the following hydraulic system connections:-

(a) Wheel-brakes accumulator.

(b) Port and starboard wheel-brakes connections.

(c) Nose undercarriage ground selector.

(d) Suction and return pipes.

(e) Pressure pipe.

(7) Disconnect and blank off the pressure head and static vent pipes.

(8) Disconnect the connections of the following controls, services and systems:-

(a) Flying control rods.

(b) Engine control tubes.

(c) Fire extinguisher system pipe.

(d) Alighting gear and bomb-bay door emergency release cables.

(e) Cabin pressure pipe.

◄ (f) *deleted* ►

Note. . .

All controls, services and systems are to be disconnected at the points illustrated.

(9) Remove the 31 bolts attaching the end floor member of the centre fuselage to the equipment bay bulkhead *(fig.10)*.

(10) Remove the two bolts from the centre vertical stiffeners on the upper portion of the equipment bay bulkhead *(bolt x, fig.10)*.

(11) Remove the 84 intermediate attachment bolts.

(12) Remove the 84 stringer attachment bolts.

(13) Remove the two attachment bolts from each longeron. The front fuselage is then free and should be slung and placed on the trolley as illustrated in Sect.2, Chap.4. All electrical cables must be neatly coiled.

continued

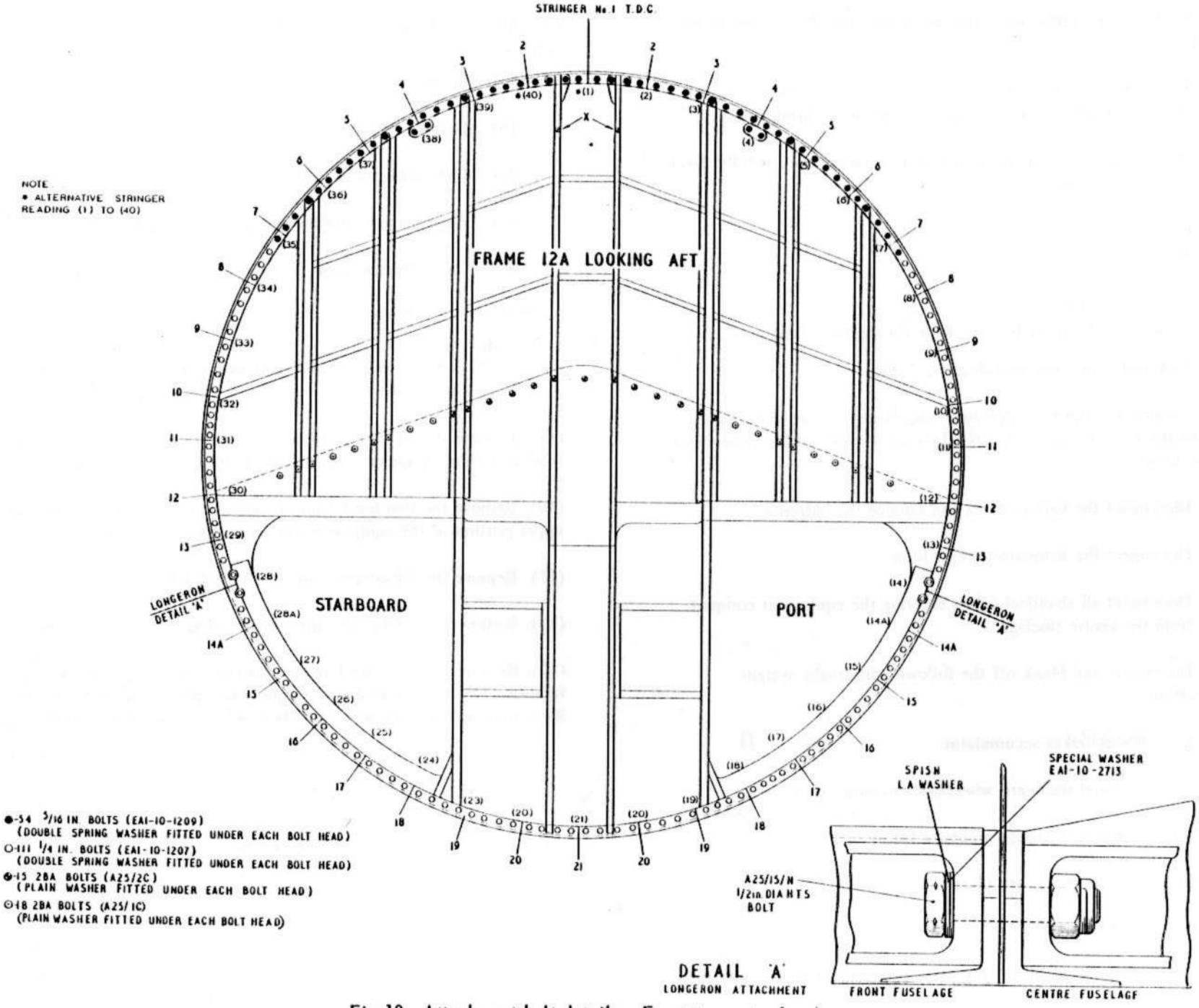


Fig.10. Attachment bolt details – Front to centre fuselage

Reassembly notes. . .

1. Before reassembly, clean the surfaces of the transport joint frames, apply pigmented varnish jointing compound Ref. No. 33H/2202110 between the frames inner edges and the bolt holes, and Bostick glazing compound Ref. No. 33H/9704973 between the frame outer edges and the bolt holes. No jointing or glazing compound must enter the holes.

2. The flying control rods fork-end fittings, are, at the bolt hole in the lug outer faces, machined with a counterbored recess. This recess is designed to accommodate the nut.

3. Engine control rods must be reconnected with the shackle pin heads uppermost. On completion of reconnection, ensure that there is no possibility of a foul occurring between rods, or between rods and fuselage structure ▶

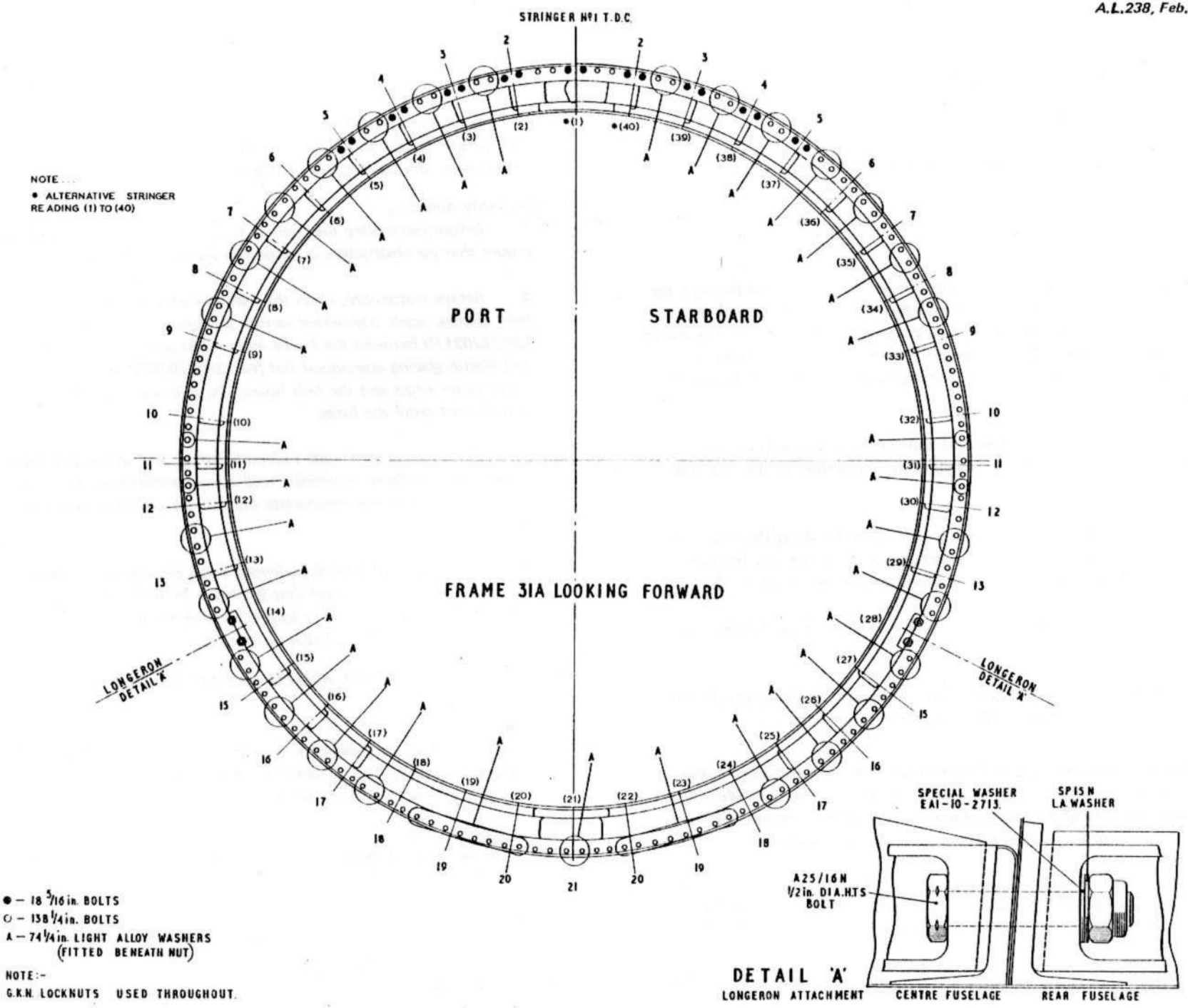


Fig. 11. Attachment bolt details – rear to centre fuselage

Rear fuselage *(fig.12)*

49. To remove the rear fuselage from the centre fuselage:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Attach the sling to the rear fuselage *(fig.18),* take up any slackness on the sling.

(3) Disconnect all electrical supplies.

Note. . .

Access to all connections and attachment bolts is gained through the access hatch in the undersurface of the rear fuselage. Should difficulty be experienced when closing and securing the hatch it is recommended that the hatch be secured by first engaging the fasteners nearest to the hinge line and then working across the fuselage to the hatch outer edge.

(4) Disconnect the electrical cables at the plug and socket connections on the bulkhead at frame 29 and stow them carefully in the rear fuselage.

(5) Disconnect the elevator and rudder control rods at the rear of the centre fuselage and at the first connection point in the rear fuselage. Remove and retain the disconnected portions of the control rods.

(6) Disconnect and blank off the fuel vent pipe on the fuselage, starboard side.

(7) Remove the stiffnuts and washers from the 80 frame-attachment bolts between the stringers. Remove the bolts *(fig.11).*

◀ **Note. . .**

Where a notice referring to Repair Leaflet B4/1 is painted inside the fuselage adjacent to stringer 13, longer bolts, Part No. A25/14E will have been used at the rear transport joint adjacent to stringers 12 and 13. The position of these bolts must be noted on removal. ▶

(8) With the exception of those at stringer 1 and stringers 8 port and starboard, remove the stiffnuts and washers from the remaining 74 frame-attachment bolts on each side of the stringers. Remove the bolts.

(9) Remove the stiffnuts and washers from the frame-attachment bolts on each side of stringer 1 and stringers 8 port and starboard. Remove the bolts.

(10) Remove the stiffnuts and washers from the frame-attachment bolts at each longeron, and withdraw the bolts. The rear fuselage is now free. Lower it on to the trestles *(Sect.2, Chap.4).*

Reassembly notes. . .

1. Before connecting the fuel vent pipes, remove the blanking and ensure that no obstruction is present in either length of pipe.

2. Before reassembly, clean the mating surfaces of the transport joint frames, apply pigmented varnish jointing compound Ref.No. 33H/2202110 between the frame inner edges and the bolt holes, and Bostik glazing compound Ref.No.33H/9704973 between the frame outer edges and the bolt holes. No jointing or glazing compound must enter the holes.

3. The flying control rods fork-end fittings, are, at the bolt hole in the lug outer faces, machined with a counterbored recess. This recess is designed to accommodate the nut, on assembly of the control tubes.

4. Should difficulty be experienced when closing and securing the hatch it is recommended that the hatch be secured by first engaging the fasteners nearest to the hinge line and then working across the fuselage to the hatch outer edge.

◀ *5. Ensure bolts, Part No. A25/14E are refitted at the positions noted in para. 49(7).* ▶

Note. . .

Whenever the rear fuselage is removed and refitted, a flight trim check (Sect.3, Chap.4, App.1) must be made to ensure that the aircraft trim is within the limits laid down.

Slinging

50. The methods of slinging the fuselage sections are illustrated in fig.17 and 18.

Trestling

51. The method of trestling the fuselage sections is illustrated in Sect.2, Chap.4. The Ref.No. and Part No. of these trestles are also given in that chapter.

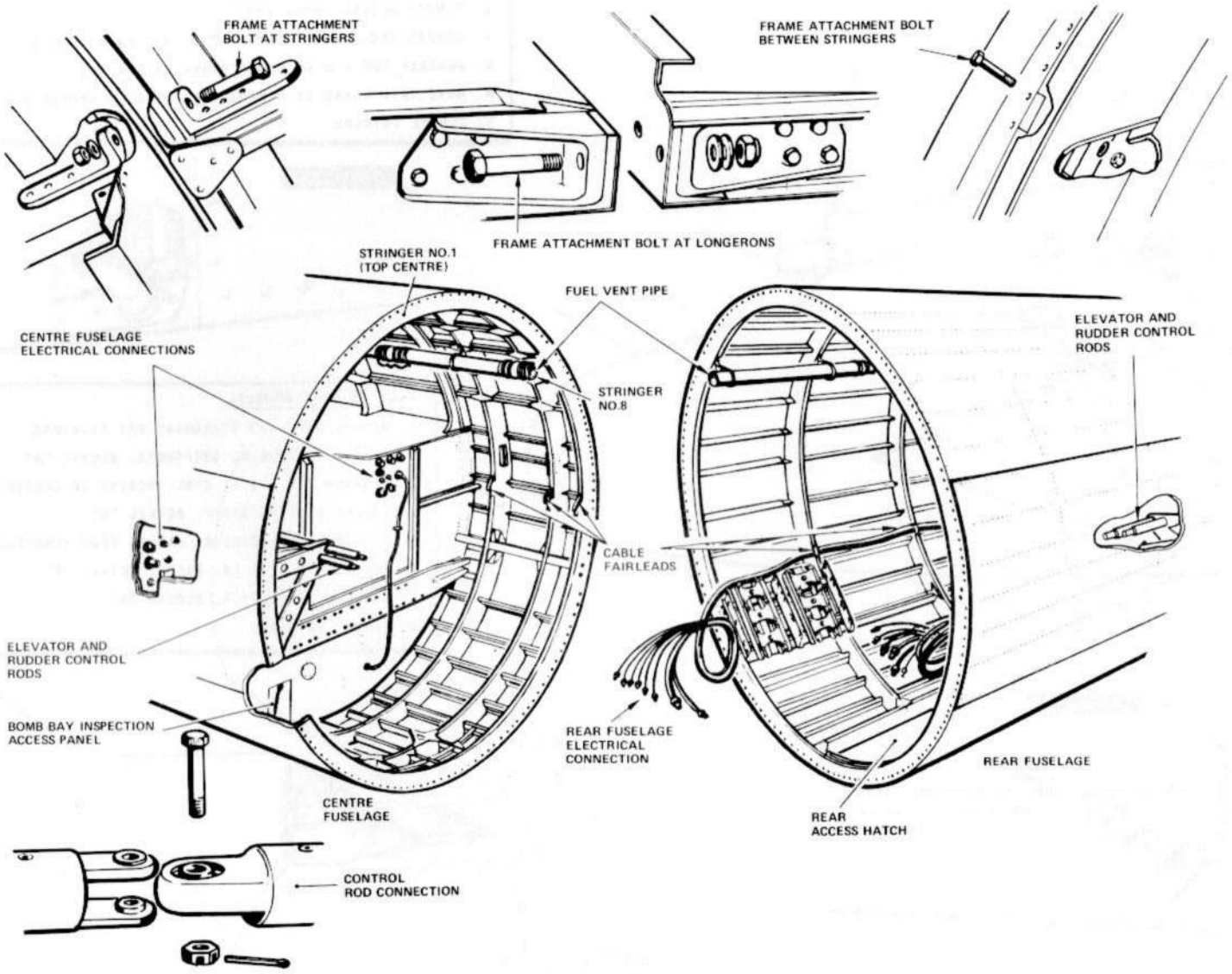
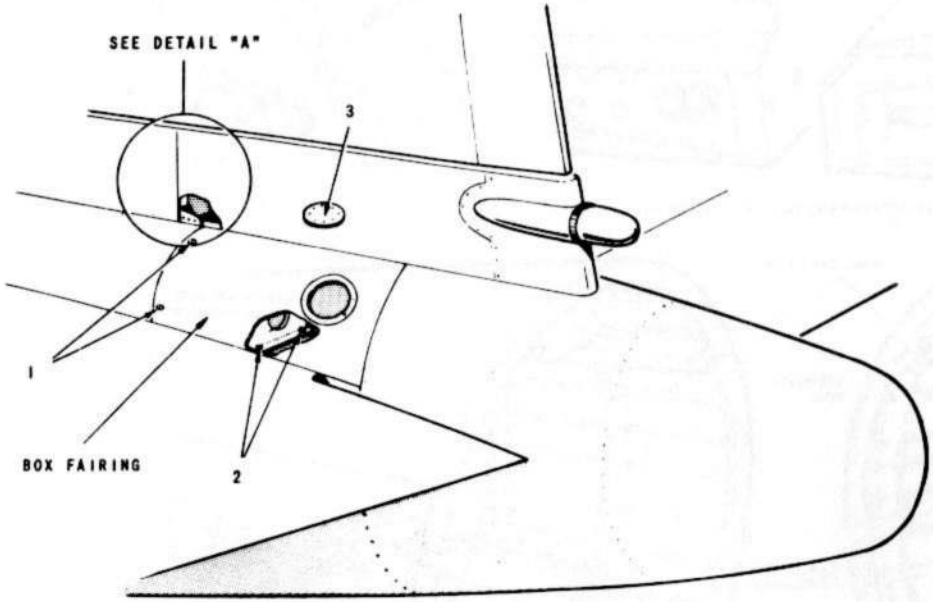


FIG.12. REAR FUSELAGE – REMOVAL

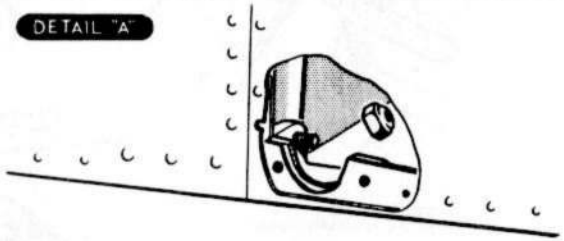
◀MOD.1728 NOTE DELETED▶

BOX FAIRING REMOVAL, PORT & STARBOARD

1. REMOVE ACCESS PANEL (3).
2. REMOVE TWO 2 B.A. BOLTS INSIDE BOX FAIRING (2).
3. UNSCREW TWO 2 B.A. COUNTERSUNK SCREWS (1).
4. MOVE TAIL PLANE TO MINIMUM INCIDENCE & REMOVE 2 B.A. BOLT (4).
5. REMOVE FAIRING.



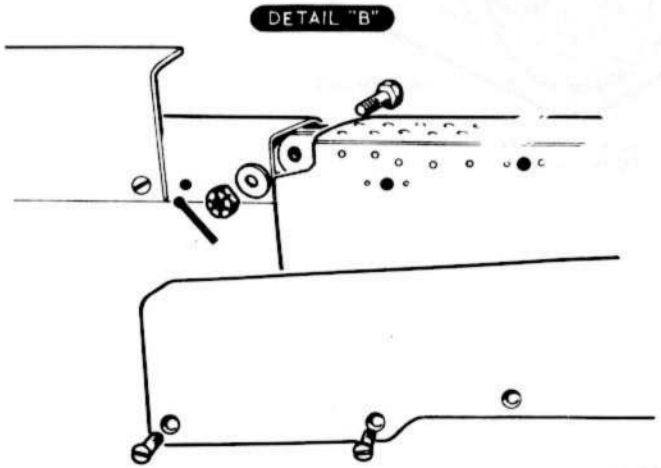
DETAIL "A"



REAR FAIRING REMOVAL

1. REMOVE PORT AND STARBOARD BOX FAIRINGS.
2. REMOVE FOUR 1/4 IN. STIFFNUTS, DETAIL "A"
3. UNSCREW TEN 2 B.A. C'SK. SCREWS ON CLOSING STRIP AND REMOVE CLOSING STRIP, DETAIL "B".
4. DISCONNECT ELECTRICAL CABLES FROM TERMINAL BLOCK (6).
5. REMOVE TWO 5/16 IN. BOLTS, DETAIL "B".
6. UNSCREW FOUR 2 B.A. SCREWS (5).
7. REMOVE FAIRING.

DETAIL "B"



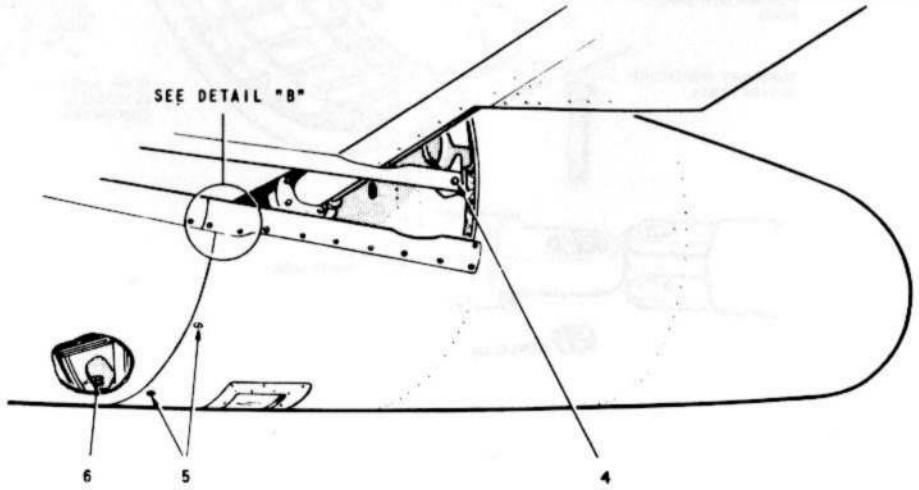


Fig. 13. Rear fairing removal

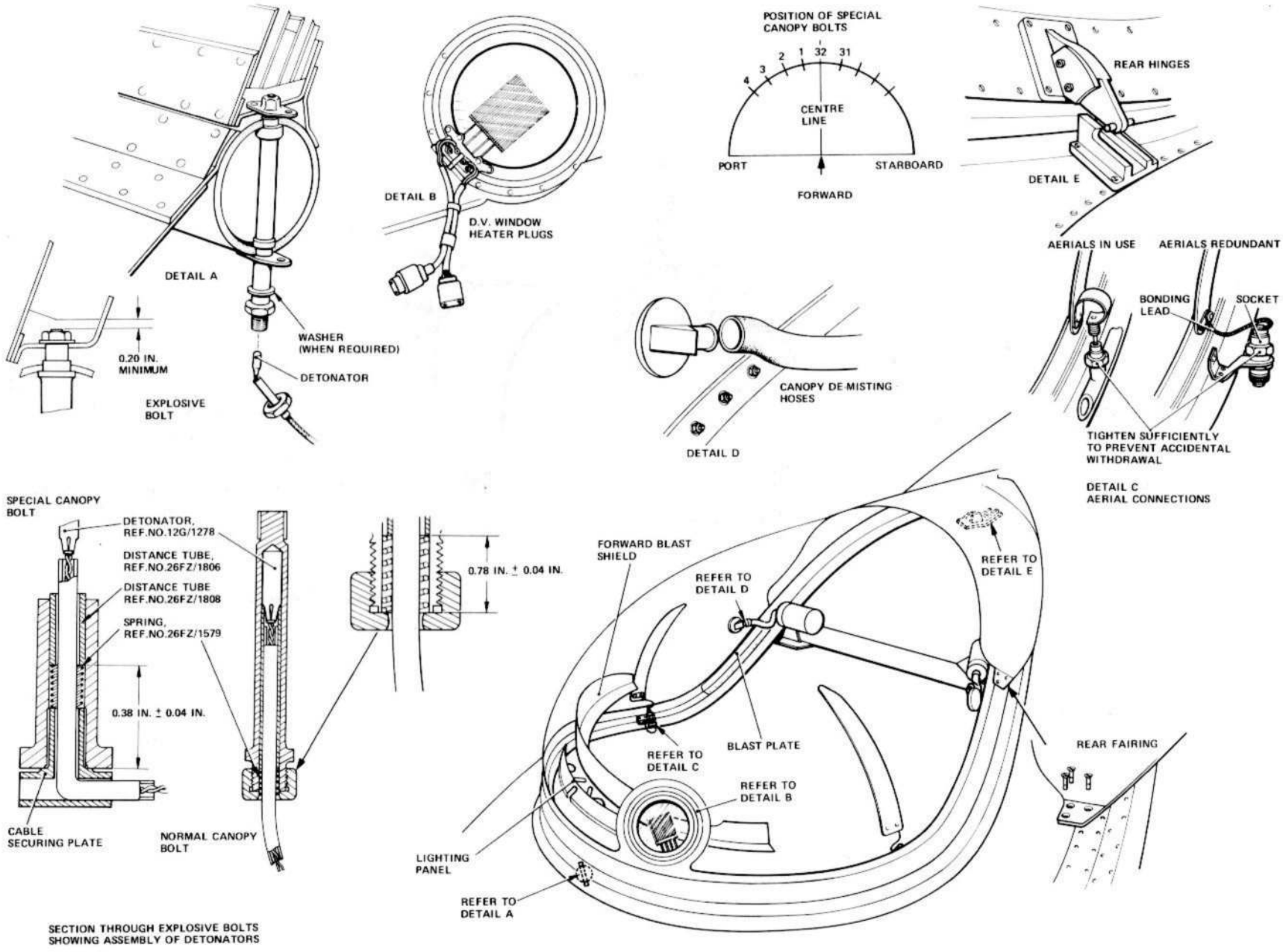


FIG. 14. CANOPY – REMOVAL AND ASSEMBLY

◀ REDRAWN ▶

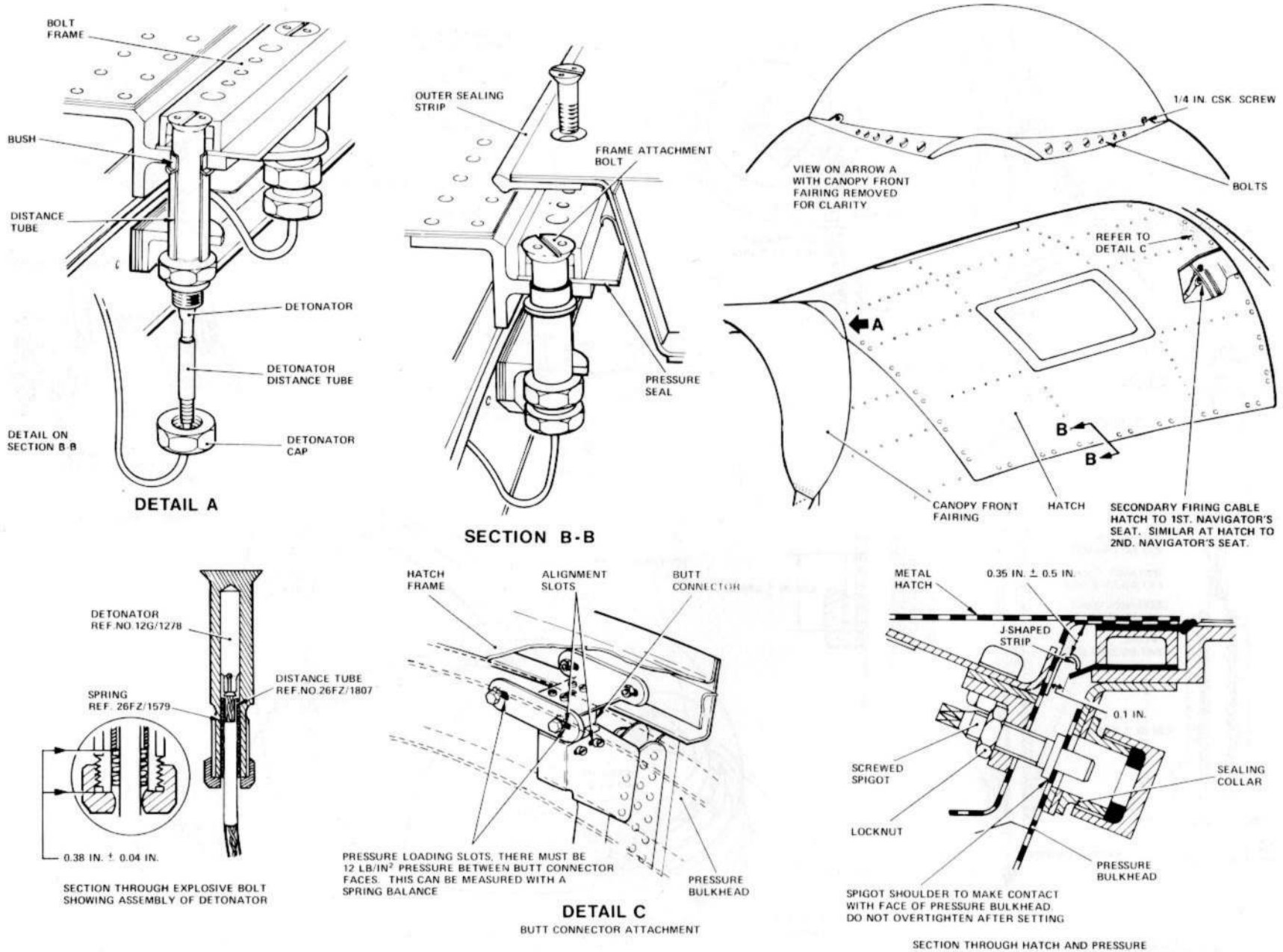
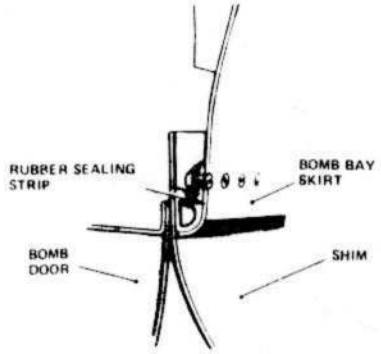
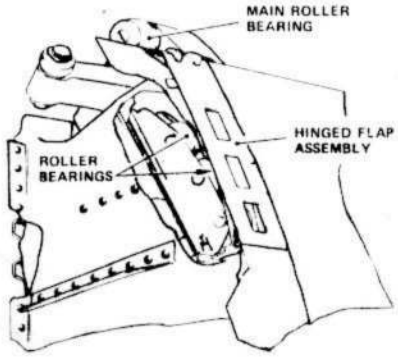


FIG. 15. CREW ESCAPE HATCH – REMOVAL AND ASSEMBLY

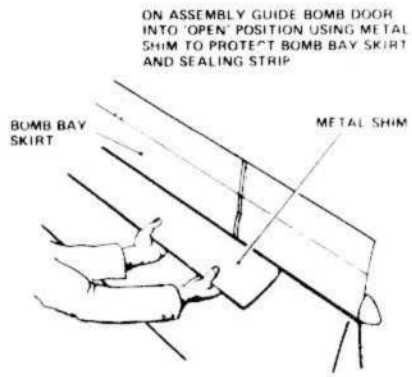
◄ REDRAWN ►



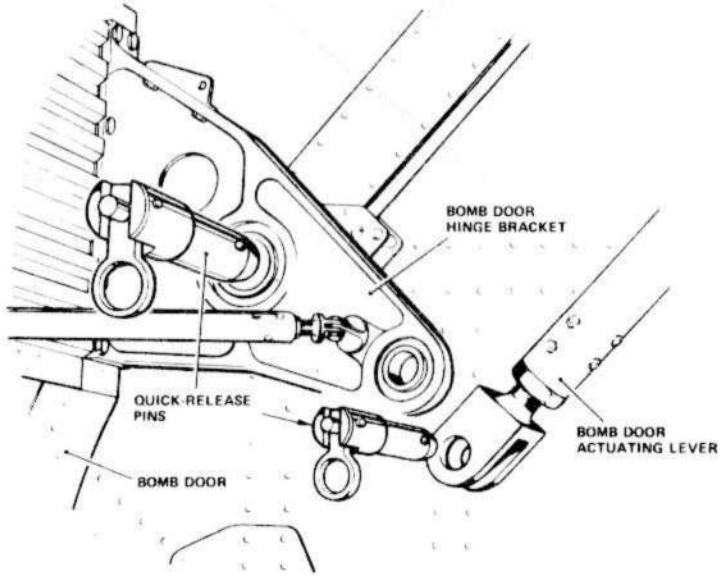
SHIM PROTECTOR FOR BOMB BAY SKIRT



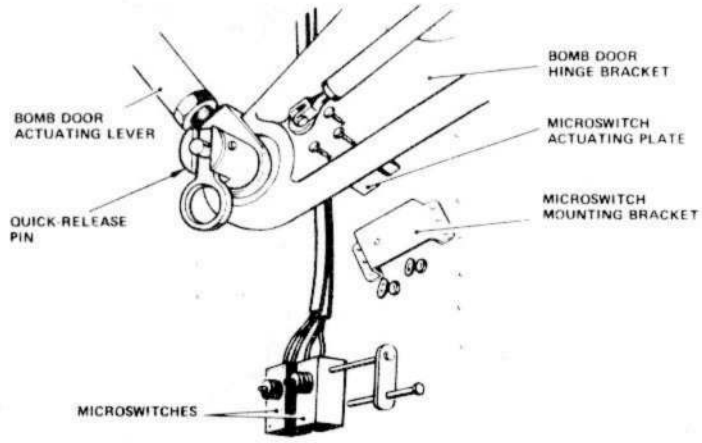
BOMB DOOR CENTRE HINGE



BOMB DOOR INSTALLATION USING SHIM



QUICK - RELEASE PIN REMOVAL, AFT BOMB DOOR HINGE



FORWARD MICROSWITCH REMOVAL

FIG. 16. BOMB-BAY DOORS — REMOVAL AND ASSEMBLY

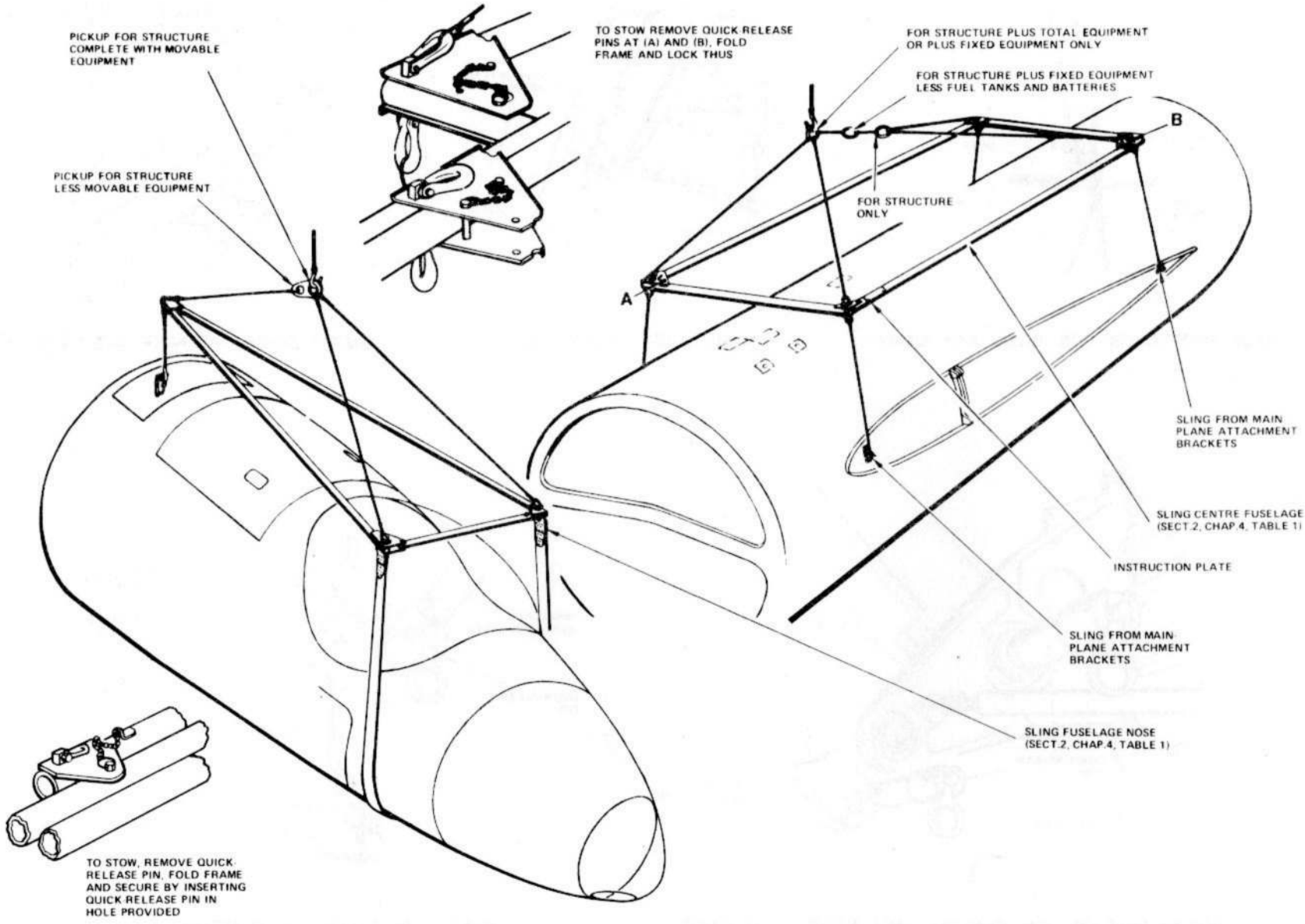


FIG.17. SLINGING – FRONT AND CENTRE FUSELAGE

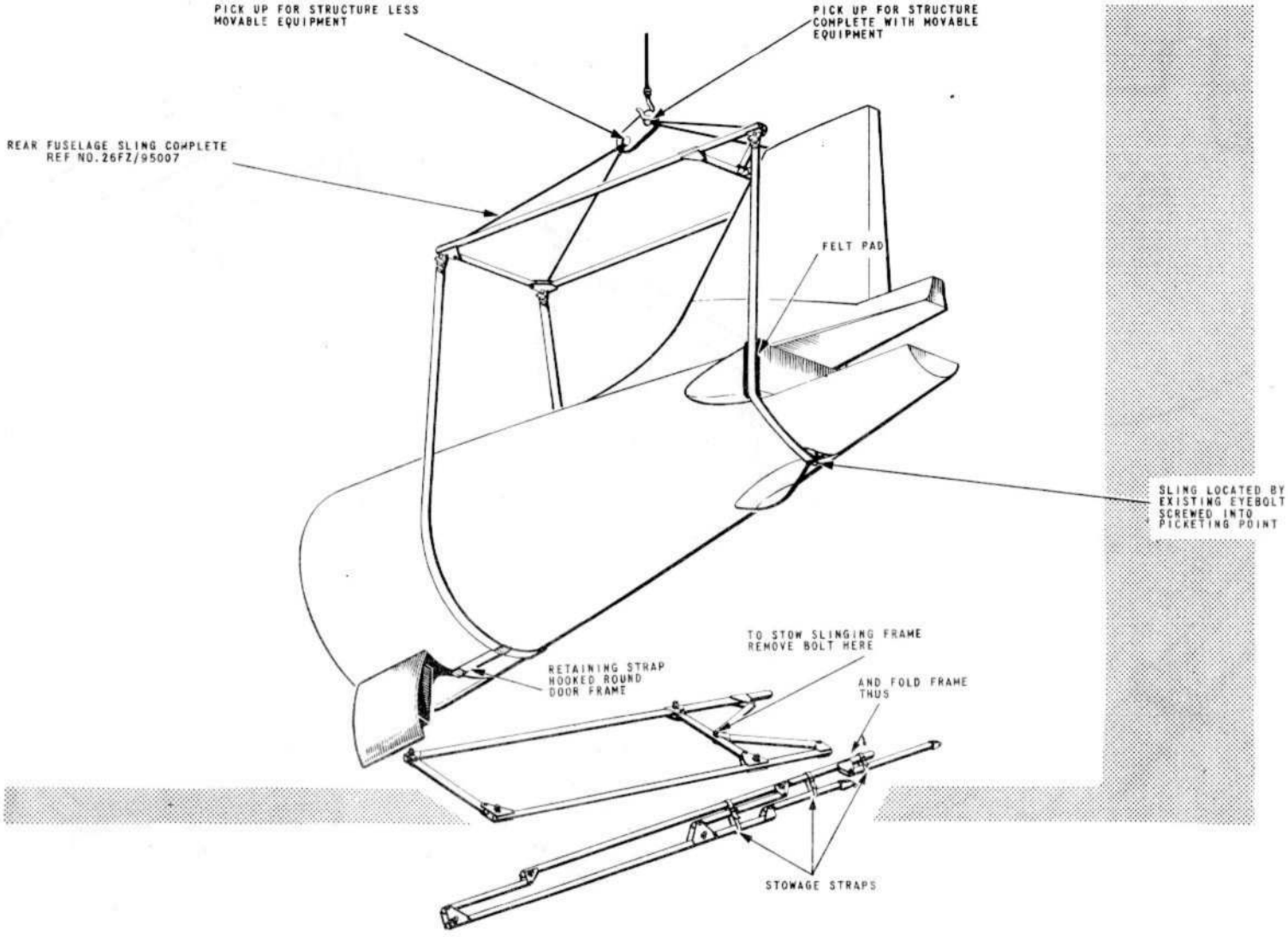


Fig. 18. Slinging – rear fuselage

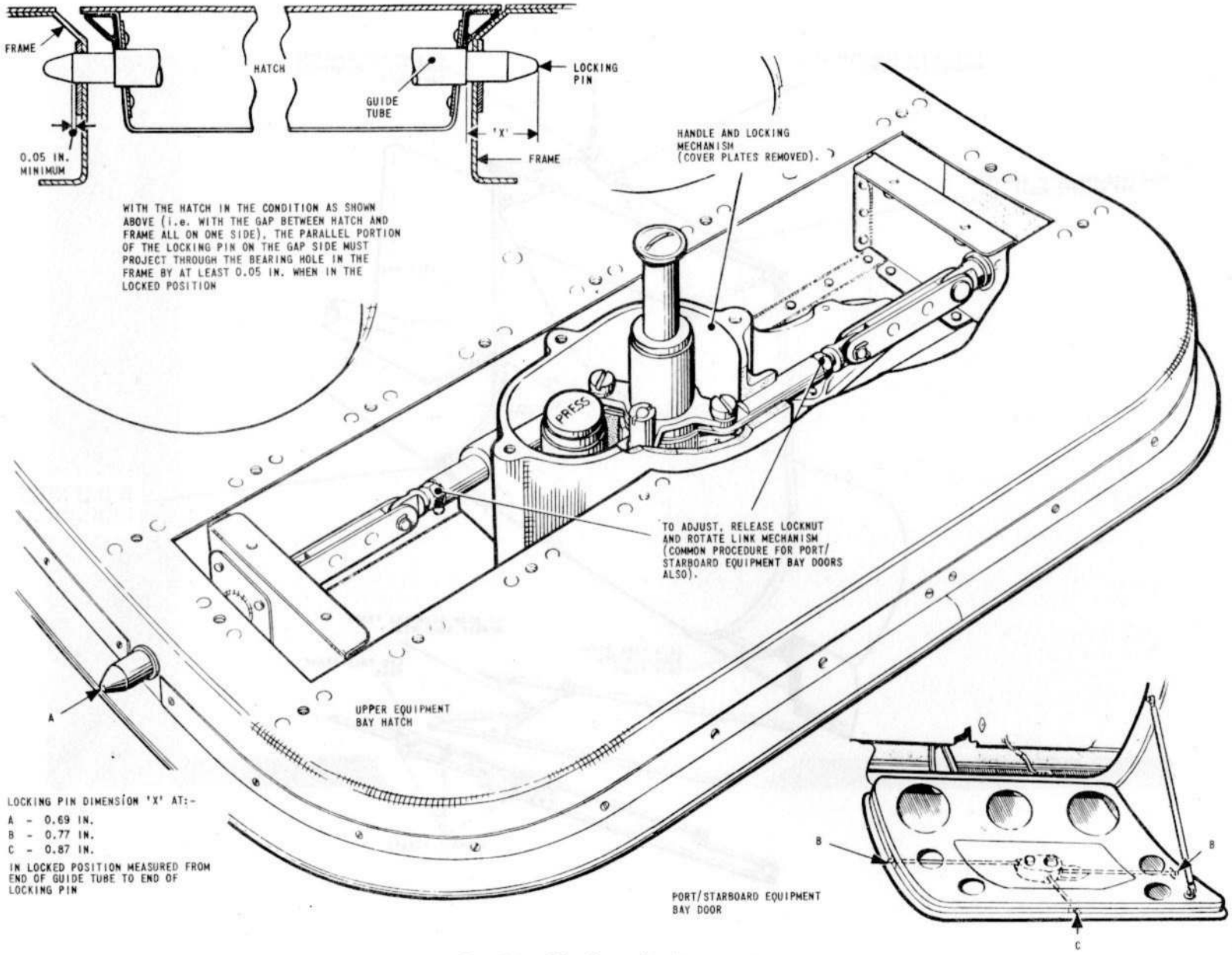


Fig. 19. Hatch pin locking settings

◀ *(New illustration)* ▶

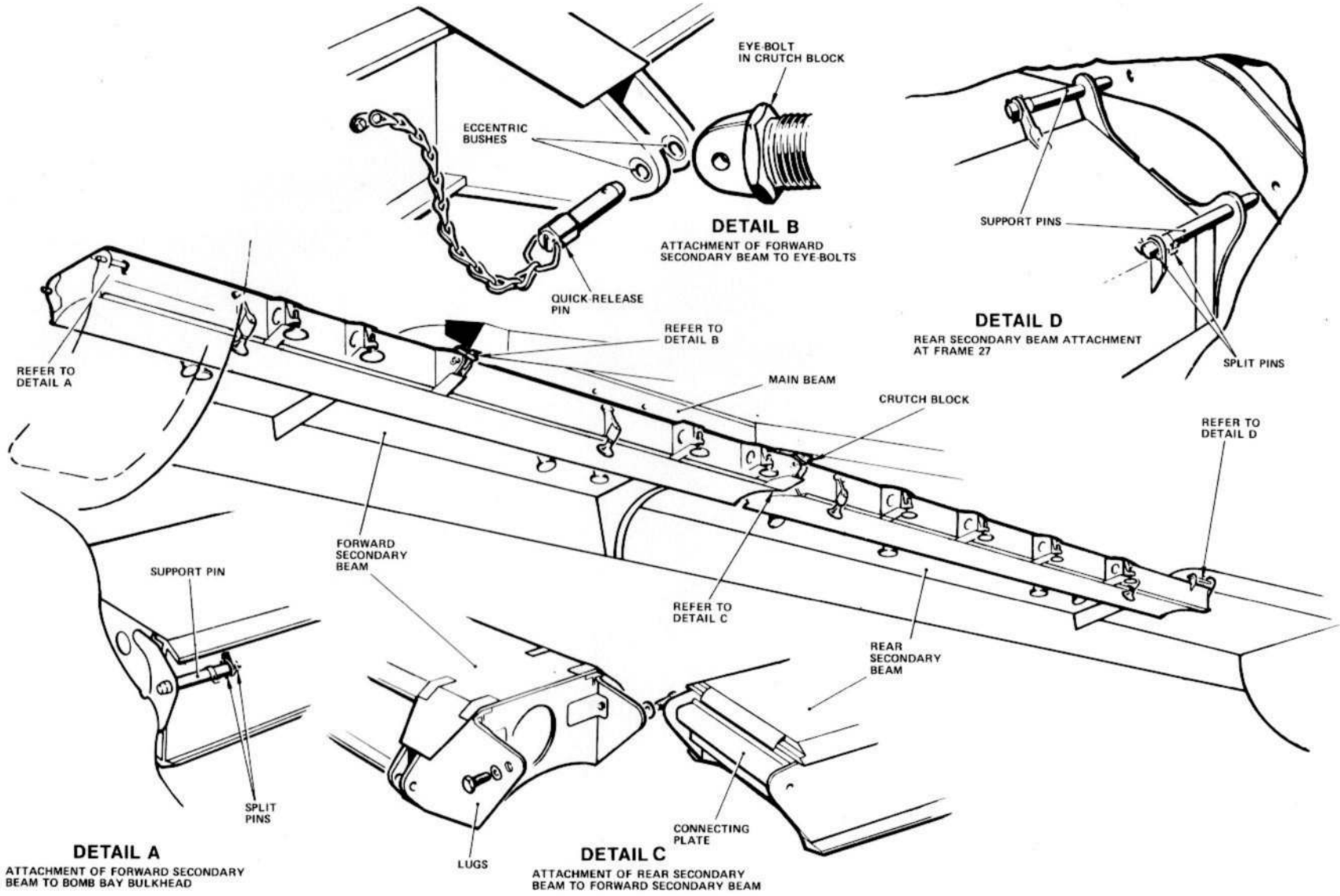


FIG.20. BOMB BEAMS - REMOVAL AND ASSEMBLY

Chapter 2 MAIN PLANE

(completely revised)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

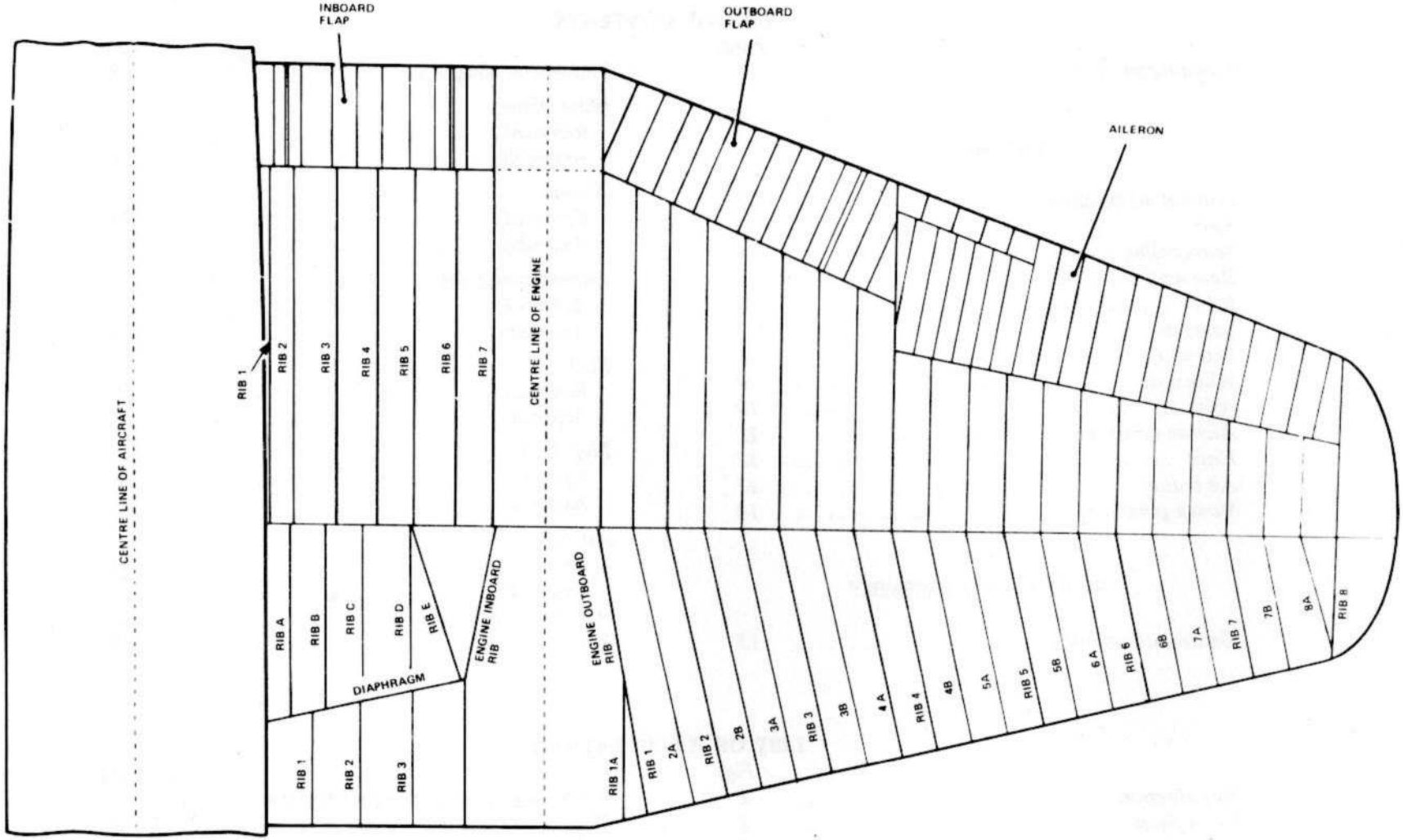


FIG. 1 KEY DIAGRAM

Introduction

1. This chapter gives a general description of the main plane structure and pictorially describes the removal and assembly of certain components. The disposition of the spars and ribs within the structure is illustrated in fig.1.

DESCRIPTION

General information *(fig.2)*

2. The main plane is a single-spar, cantilever structure with a sectional rear wall, and is built in port and starboard units. There is no conventional centre section, the units being mounted direct on the sides of the fuselage with the spar continuation through the fuselage maintained by reinforced spar frames. In plan form the main plane units have a parallel-chord centre portion extending to the outboard side of the engine bay, from which point they taper to the wing tip; the leading and trailing edges are straight. The basic structure consists of a torsion box, formed by the spar and rear wall with the rib and stringer system and between-spar skinning. To this is added the inner and outer leading edge assemblies, the detachable wing tip, the air-brake installation and the aileron and flaps, the latter being carried on hinges mounted on the aft face of the rear wall.

Note. . .

The aileron and aileron spring tab hinges are to be lubricated with grease XG-287. Details of air brakes, flaps and control connection lubrication is given in Sect.3, Chap.4.

Spar

3. The spar is a built-up beam extending from the root to the tip; it has a plate web and machined light-alloy booms, the cross-section of which changes from a complex stepped-T at the root to a plain T at the tip. Lightening holes in the web are reinforced with ring plates, except in the tip portion where they have integral pressed flanges. To accommodate the engine jet pipe, which passes through the spar, the web is cut off square on each side of the aperture, leaving the booms as continuous members, and to the ends of the web so formed are bolted Y-section fittings which form an anchorage for large, forged, light-alloy reinforcing ring-plates bolted to the arms of the Y-section fittings at the front and rear of the spar. A rolled, carbon-steel firewall is fitted to the forward face of the ring-plate at the front of the spar.

Spar cooling

4. An air scoop and associated piping distribute cooling air over the spar in the vicinity of the engines. The air scoop protrudes through the top rear engine cowl and is supported on the upper forward face of the spar. Two diffusers, one above and one below the jet pipe aperture, deliver a supply of cooling air on to the outer side of the heat shroud in the aperture.

Rear wall

5. The rear wall is divided into three sections, an inboard section extending from the root to the inboard side of the jet pipe bay, a centre section extending from the outboard side of the jet pipe bay to the rib at the inboard end of the aileron gap, and an outboard section extending the length of the aileron. The inboard and centre sections are joined by a forged light-alloy I-section ring, through which the jet pipe passes. Each section is built-up of plate webs stiffened by vertical angle-section members and T-section extruded flanges. The web of the outboard section is curved to form the front wall of the aileron pressure-balance box.

Ribs

6. Outboard of the jet pipe bay the spar and the rear wall are joined by a system of main full-depth ribs, flanked on either side by secondary ribs which, instead of being the full depth of the main plane, are made shallow to allow the spanwise stringers to pass outside their flanges. The main ribs have flat, plate webs with flanged lightening holes and extruded T-section booms. Those secondary ribs in the area bounded by the engine ribs and rib 4 have extruded bulb-angle-section booms; those between rib 4 and rib 8 have plain pressed flanges. Forward of the spar is a similar system of main and secondary ribs which match up those aft of the spar but which are at right angles to the leading edge. The secondary ribs do not extend as far forward as the main ribs but

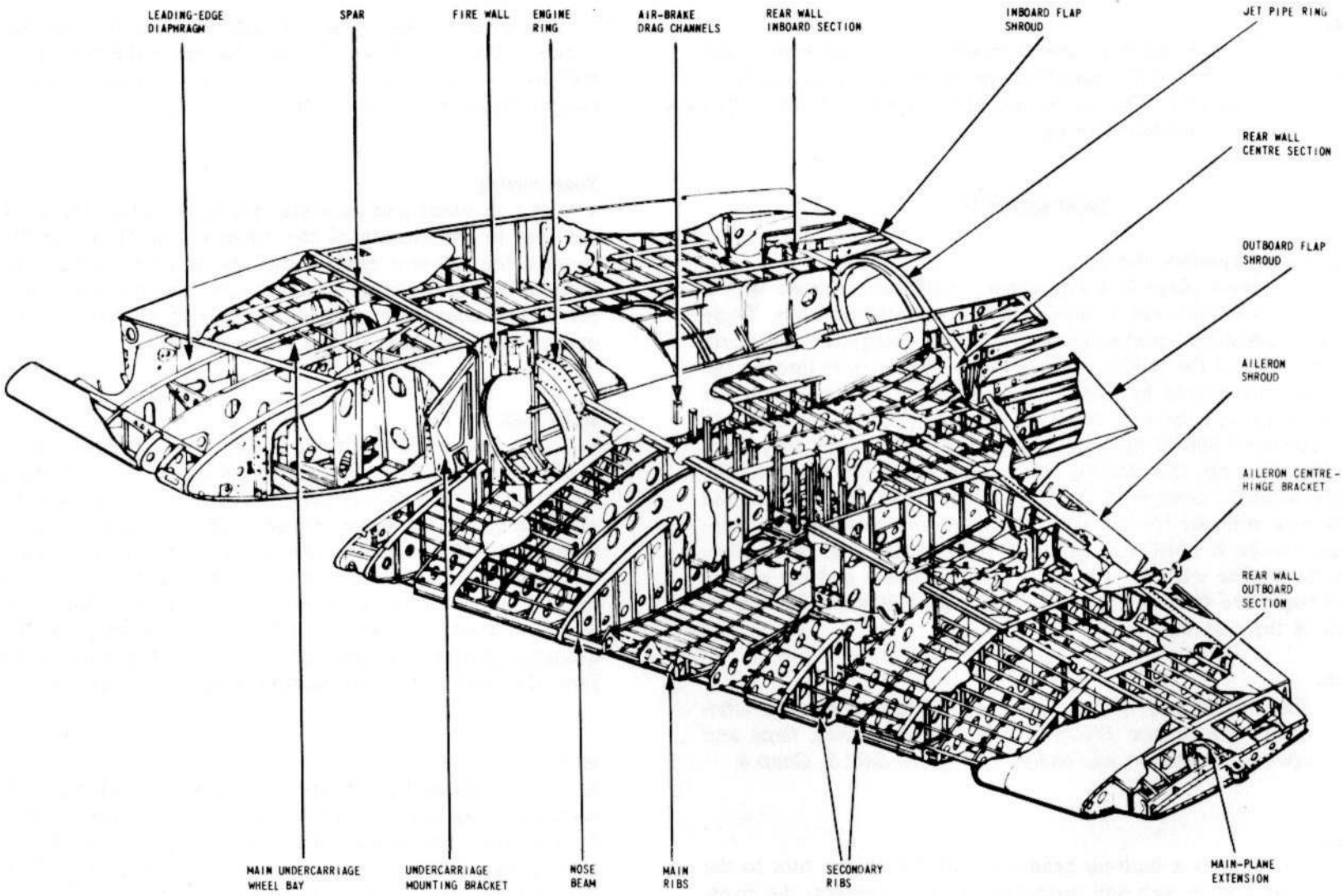


FIG. 2. MAIN PLANE

are cut off some inches short of the leading edge proper. The forward ends of each pair of secondary ribs are joined together and to their main ribs by a nose beam passed through the main rib webs. Inboard of the jet pipe bay, the main ribs aft of the spar are similar to those outboard of the bay, but the pressed-flange secondary ribs are of full main plane depth. Forward of the spar the leading edge houses the main undercarriage unit when retracted; it is divided spanwise by a diaphragm which forms the front wall of the wheel well and extends from the engine bay inboard rib to the fuselage. Forward of the diaphragm, the ribs are constructed with plate webs and angle flanges; aft of the diaphragm the ribs are closed top-hat-section members. On either side of the engine and jet pipe bays special ribs are built up with plate webs and angle-section frames.

Stringers

7. Outboard of the engine and jet pipe bays, the spanwise stringers, of bulb-angle section, lie intercostal with the main ribs but pass outside the secondary ribs. Inboard of these bays the stringers pass through the main and secondary ribs alike.

Skinning

8. The skin plating aft of the spar is in sheets with chordwise butt joints on the centre lines of the main ribs, reinforcing strips being interposed between the rib flanges and the skin. Spanwise joints are made on bulb T-section extrusions running from the outer side of the jet pipe bay to the tip. The leading edge panels are wrapped chordwise round the leading edge.

Wing tips *(fig.3)*

9. A detachable wing tip is carried on an extension to the main plane structure at outboard rib 8. The skin covering is attached to a pressed flanged rib and pressed flanged spanwise ribs, the complete assembly being attached to the leading and trailing edges of outboard rib 8, the spar extension rib and the two spanwise ribs of the main plane extension. Navigation and taxying lamps are installed in the nose of the leading edge, the skin of which is moulded perspex.

Ailerons *(fig.3)*

10. The ailerons are carried on a centre main hinge and on pin-and-socket hinges at their extremities. The skin covering is attached to press ribs which have flanged lightening holes. The ribs are flanged on their lower edge and have a separate angle-section extruded flange on the upper edge. The aileron spar, to which the ribs are attached, has a plate web with flanged lightening holes and carries the D-shaped nose ribs and beaks. Aileron shroud plates, which may be opened to facilitate servicing of the aileron operating mechanism, are mounted on piano-type hinges on the main plane rear wall. Mass balance of the surface is effected by heavy-alloy strips riveted between the beak ribs. Between the inboard end and rib 7 the trailing edge of the aileron is cut away to accommodate the spring tab; the tabs between these points are shortened and carry a curved rear web which forms the front wall of the spring tab pressure-balance box.

Aileron spring tabs *(fig.3)*

11. The aileron spring tabs are hinged to the aileron by a main centre hinge and pin-and-socket hinges at their extremities. The skin covering is attached to pressed flanged ribs and the tubular spar. The spar is reinforced at the centre hinge point by an inner tube and each end of the spar houses a socket in which the hinge pin is secured. Extensions to the upper and lower skins forward of, and riveted to, the spar, form a beak in which triangular wood alignment blocks are inserted at intervals. At the apex of the beak the upper and lower skins are continued forward to form a flat plate extension, terminating in a 60 degree extrusion.

Flaps *(fig.3)*

12. The split trailing-edge flaps are single spar structures of triangular cross section, each carried on two hinges. Pressed, flanged nose, and trailing edge ribs are attached to the spar, the whole structure being covered with a light-alloy skin riveted to the spar and ribs. Flanged lightening holes are cut in the upper skin surfaces.

Air brakes *(fig.10)*

13. The hydraulically-operated air brakes consist of 21 drag channels housed inside each main plane, aft of the main spar. In the out position, nine of the channels protrude through the upper skin surface and twelve through the lower surface; in the in position the ends of all drag channels lie flush with the skin surfaces. The drag

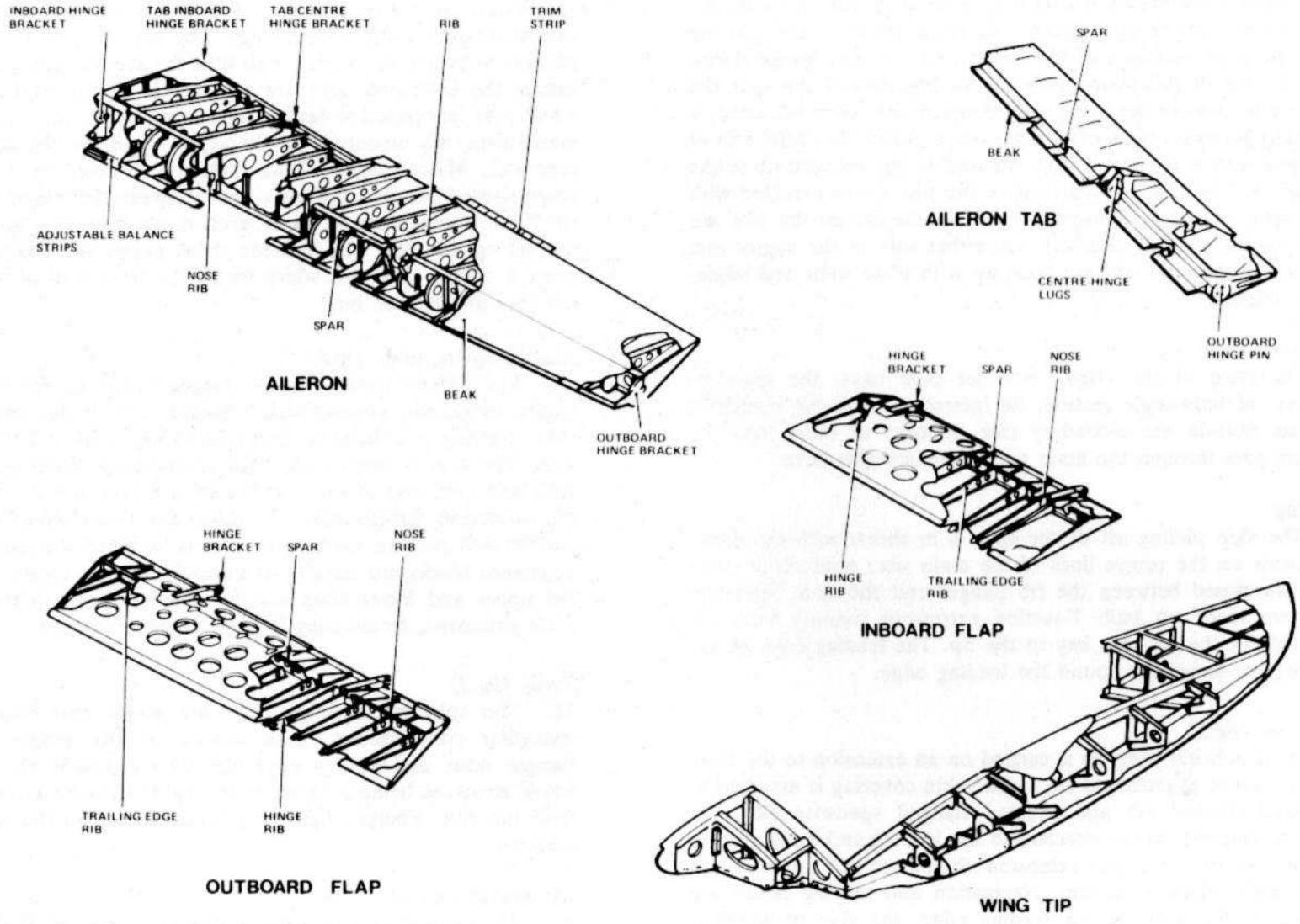


FIG. 3. MAIN PLANE COMPONENT PARTS

channels are attached to the ends of centrally-pivoted rocker arm assemblies, which are attached to a spanwise torque tube constructed in three portions and connected together at outboard ribs 3A and 3B; the tube is carried in bearings at its centre and ends. Annular plates attached to the webs of outboard ribs 2 and 4 accommodate the end bearings; the centre bearing, at rib 3, consists of three rollers, one of which is adjustable to facilitate removal and assembly of the torque tube. A lever in the centre and integral with a rocker arm assembly, is connected to the hydraulic operating jack mounted on the rear of the main spar. Refer to Section 3, Chap.4, for pre and post Mod.272 states.

Vortex generators

14. Vortex generators are fitted to both the wing tips and the wing-tip tanks. The generators, eight in number, are fitted two to the underside of each wing tip forward of the main spar, inboard of rib 8 and inclined 10 deg to the main plane chord line, and two to the inboard face of each wing tip tank.

Note. . .

To obtain the benefit of the vortex generators, both the wing tips and the wing-tip tanks must be modified. Although it is possible to fit an unmodified tank to a modified wing tip and vice versa, no benefit from the modified member will be obtained thereby.

REMOVAL AND ASSEMBLY

Note. . .

After the removal and reassembly of any component which may affect the longitudinal trim of the aircraft, carry out flight trim checks in accordance with Sect.3, Chap.4, App.1.

General information

15. The following paragraphs describe the removal and assembly operations of the main plane and its principal components. Only the removal operations are described, since the assembly is generally the reverse of these operations; where this is not the case, the fact is noted. The recommended sequence of operations is given, although in some cases it will be clear that it is not essential to adhere rigidly to this sequence. The necessary ground equipment is listed in Sect.2, Chap.4.

Main-plane sling *(fig.4)*

16. The main-plane sling, which can only be used when the engine and jet pipe are removed, is a triangular tubular frame, which is attached to the main plane by a beam at the engine rear ◀ mounting brackets (detail B), by a hook at the rear wall connecting ring and by a picketing/slinging ring bolt fitted at the slinging point in the upper surface of the main plane (Sect.2, Chap.4). It is designed to sling both port and starboard main planes and its preparation procedure is detailed in Fig.4. Three rings, for attachment to the crane-hook shackle, are provided in the slinging cables and are used in either one of two conditions, depending on which components are fitted to the main plane during the lifting operation. Both conditions are given in Fig.4. ▶

Note. . .

1. If fitted, the wing tip fuel tank must be drained and removed (Sect.4, Chap.2) before the main plane is slung.

2. During main plane removal, and assembly, great care must be taken to prevent any damage to the upper and lower main spar skin attachment flanges. These flanges, if subjected to excessive loads, are liable to crack and this condition may occur if fouling of the flanges with the main plane attachment lugs takes place. It is therefore essential that the main plane is balanced in the correct attitude, relative to the fuselage, before it is offered up. Although the main plane sling will balance it in approximately the correct position it is imperative that the final adjustments are made by ballasting.

3. It is recommended that whenever possible, the flaps and ailerons are removed for both main plane removal and assembly.

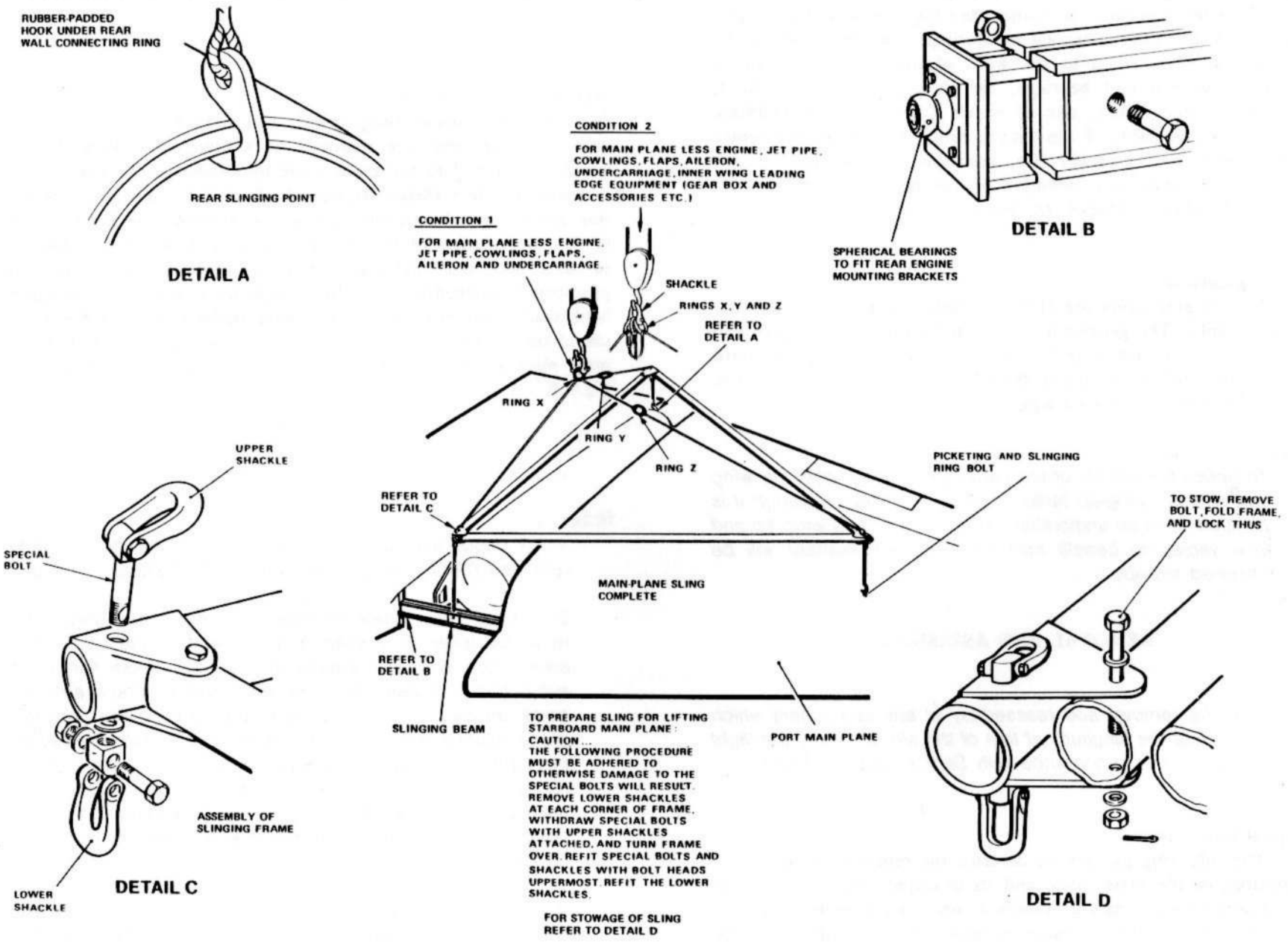
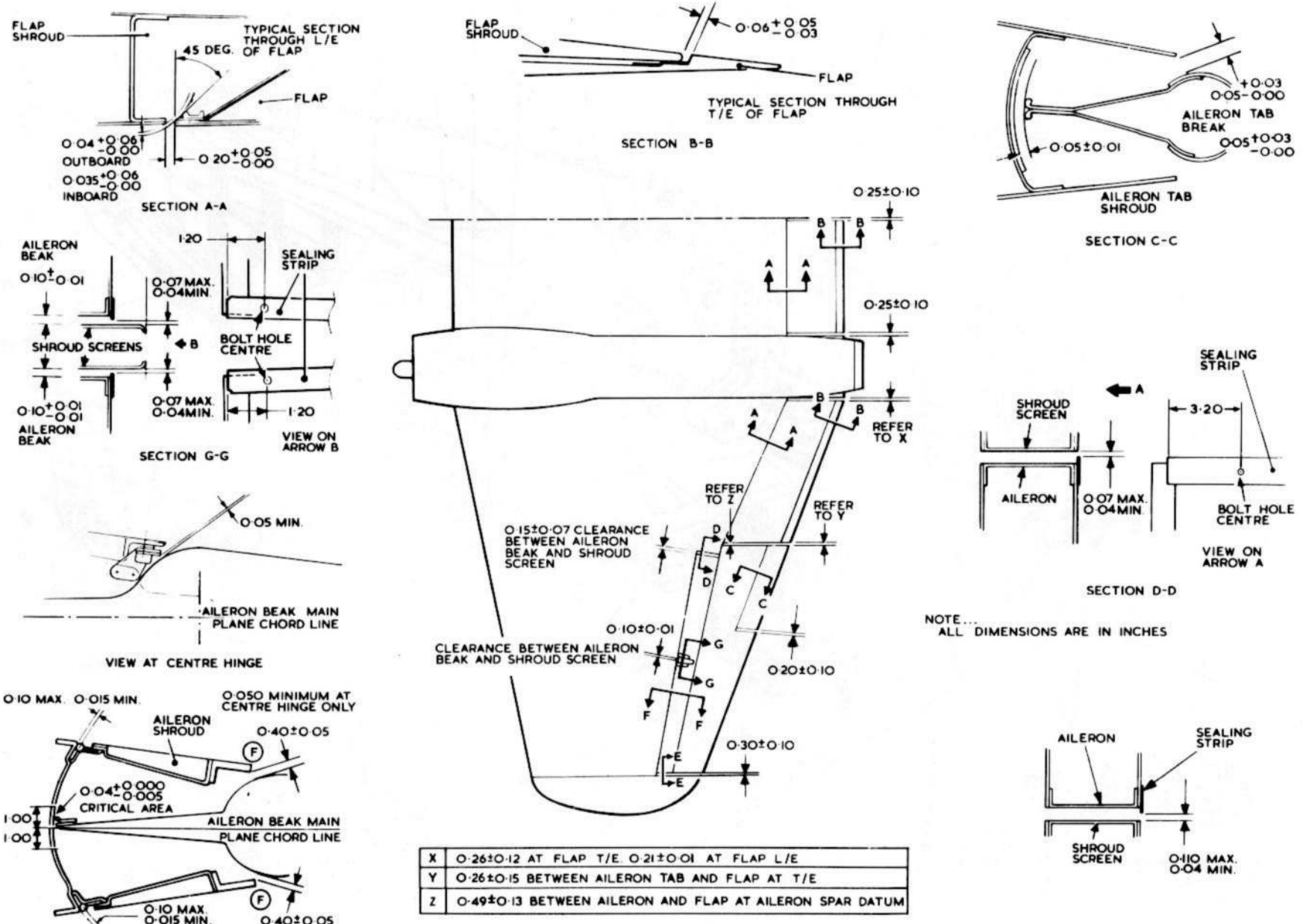


FIG. 4. MAIN PLANE SLINGING

◀ MOD. GE5224 EMBODIED ▶



X	0·26±0·12 AT FLAP T/E. 0·21±0·01 AT FLAP L/E
Y	0·26±0·15 BETWEEN AILERON TAB AND FLAP AT T/E
Z	0·49±0·13 BETWEEN AILERON AND FLAP AT AILERON SPAR DATUM

FIG. 5. MAIN PLANE CLEARANCES

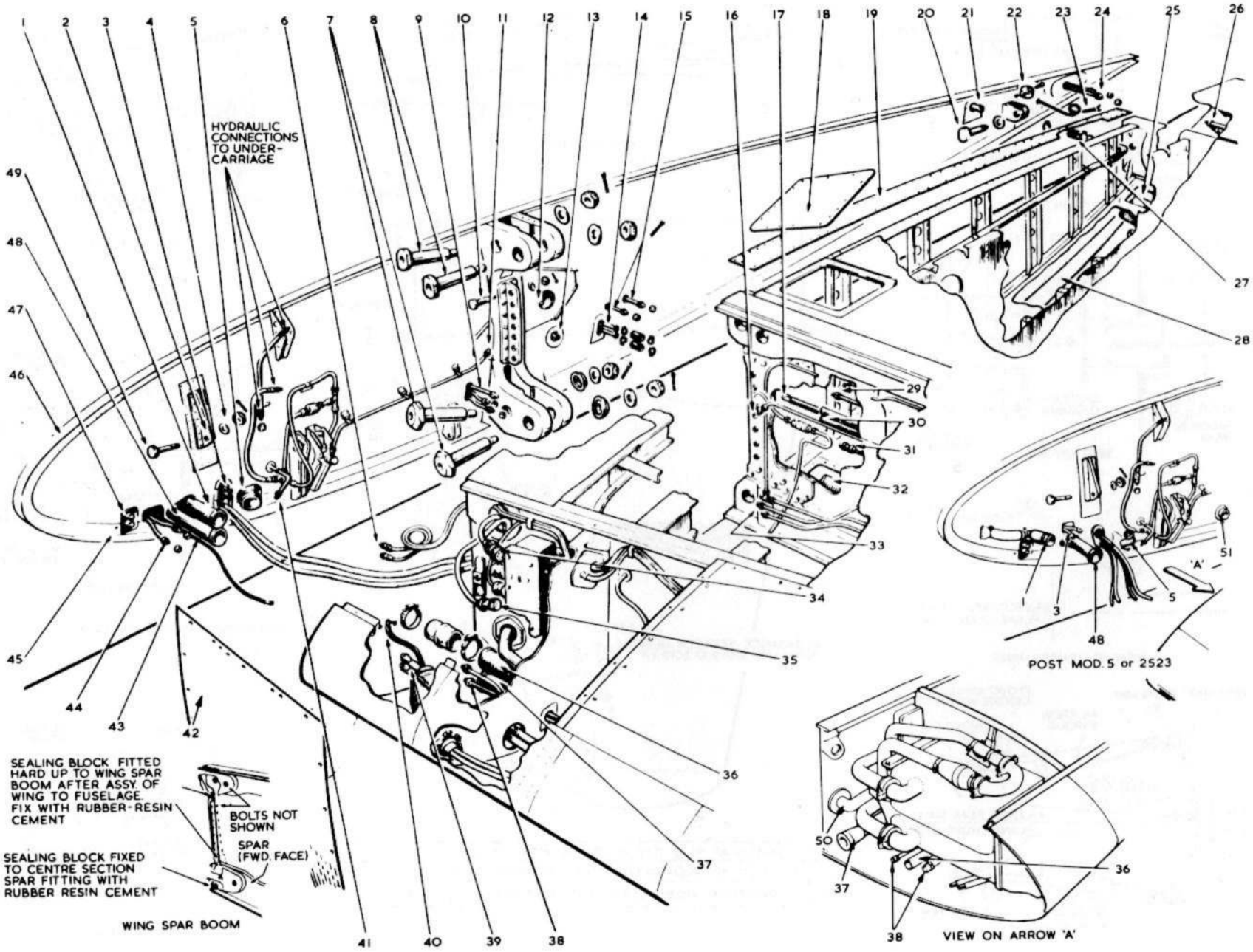


FIG. 6. MAIN PLANE REMOVAL

17. To attach the sling to a main plane:-

(1) Remove the caps from both the engine rear mounting brackets.

(2) Place the slinging beam across the engine bay with the spherical ends of the beam resting in the lower halves of the engine mounting brackets. Refit the caps on the engine mounting brackets.

(3) Insert the eyebolt or picketing ring in the slinging point in the upper surface of the main plane.

(4) Assemble the slinging frame to suit the main plane being lifted and attach the sling to the hoist by the slinging eye, or eyes *(para.16)*.

(5) Adjust the hoist until the cable at the forward apex of the frame can be attached to the centre of the slinging beam, pass the hook on the cable at the rear apex of the frame under the rear wall connecting ring, and the hook on the cable at the outboard apex of the frame through the slinging eye in the main plane.

Main plane *(fig.6)*

Removal

18. To remove a main plane proceed as follows:-

(1) Remove the engine and jet pipe *(Sect.4, Chap.1)*.

(2) Jack and trestle the aircraft *(Sect.2, Chap.4)*, and attach the sling to the main plane *(para.17)*. Take the weight of the main plane on the sling.

(3) Remove the main undercarriage door and undercarriage unit *(Sect.3, Chap.5A)*.

(4) Remove the access panels (18), (25), (32), and (42).

(5) Remove the closing strips (19) and (28).

(6) Remove the screws securing the leading edge skin to the fuselage attachment angle (46).

(7) Disconnect the fuselage/main plane connections of the following controls and services:-

(a) Engine controls push-pull rods (39) from (47).

(b) Hydraulic pipes, main pressure and return (38) from (44).

(c) Air system main hot air duct (1) from (36).

(d) Generator electrical cable (40) from (43). Disconnect at suppressor terminal.

(e) Air system common delivery duct (37) from (48) - port side only.

(f) Pitot and static pipes (3), disconnect at wing root.

(g) Electrical cables (34) and (35) from J.B.7 (J.B.8 starboard main plane).

(h) Fuel delivery pipe (5) from (50).

(j) Hydraulic pipes (9) from (33).

(k) Hydraulic pipes (11) from (16).

(l) Fire protection pipe (41).

(m) Aileron control push-pull tube (12) from (17).

(n) Electrical cables (13) from (31) from fuselage to J.B.7 (J.B.8 starboard). Disconnect two plugs and feed the cables through the aperture in the leading edge diaphragm.

(o) Wing tip fuel tank air pipes (14) from (30).

(p) Hydraulic pipes from air brakes (15) from (29).

(q) Wing-tip tank fuel transfer pipe (21) from (27).

(r) Flaps Desynn transmitter electrical cable (23). Disconnect at transmitter (port only).

(s) Flaps hydraulic pipes (24) from (26).

◄(t) *deleted* ►

(u) Air conditioning system duct, primary cooler to mixing valve (51).

(8) Remove the split pin, nut and washer (4) from the bolt (49) at the forward attachment point (2). Retain any packings and withdraw the bolt.

(9) Remove the locking collar (22) from the rear attachment bolt (20) and withdraw the bolt.

(10) Remove the split pins, nuts and washers, from the seven shear bolts (10) and withdraw the bolts,

(11) Remove the split pins, nuts and washers from the two upper main attachment bolts (8), and the split pins, nuts, pads and washers from the two lower attachment bolts (7). Remove the four bolts using an extractor *(Sect.2, Chap.4, Table 1)*. The main plane is then free and should be lifted clear and placed on trestles *(Sect.2, Chap.4)*.

Assembly

19. Assembly of the main plane to the fuselage is a reversal of the removal procedure with the following additional operations included:-

(1) Before assembling the main plane to the fuselage, ensure that the sealing blocks Part No.EA1.20.2897 (upper) and EA3.20.135 (lower) are securely attached with rubber resin cement Ref. No.33H/2245977 within the forks of the centre section spar fitting, as shown in the detail. Ensure that S.T.I./Can./498A has been satisfied.

(2) Before fitting the spar lower attachment bolts lubricate the bolt threads and the nut faces with grease XG-287 and, when tightening the nuts, apply a torque of 1500 lb in., using a suitable torque wrench. Tighten the nuts alternately.

(3) After assembling the main plane to the fuselage, and before fitting the seven shear bolts (10), attach with rubber resin cement Ref.No.33H/2245977 a sealing block Part No.EA1.20.2899. The block must be hard up to the forward face of the spar lower boom and the fuselage side, as shown in the detail.

(4) At the forward attachment point (2); if the forward attachment bolt (49) is a ½ in.dia. B.S.F. (A25/10N) it is to be torque loaded to 100 lb in.; if a 9/16 in.dia. (A25/10P) bolt is fitted an exact torque loading is not specified.

(5) When securing the main plane skin to the fuselage attachment angle, the sixy-eight 2 B.A. screws securing the leading-edge skin, from the main spar on the upper surface, to the forward edge of the main undercarriage bay, must be fully tightened and then slackened off one quarter of a turn; this ensures freedom of movement between the wing and the fuselage.

(6) When fitting a new main plane refer to A.P.101B-0400-6, Part 1.

Note. . .

Whenever a main plane is refitted, or replaced, a flight trim check must be made in accordance with Sect.3, Chap.4, App.1, to ensure that the aircraft trim is within the specified limits. Should the aircraft trim be outside the specified limits, a new elevator trailing edge strip must be fitted and the flight trim checks and subsequent trailing-edge strip adjustments made.

Aileron *(fig.7)*

Removal

20.

Note. . .

Ailerons must not be removed or refitted while wing tip fuel tanks are fitted to the aircraft.

To remove an aileron with or without the spring tab fitted proceed as follows:-

(1) Open all aileron shrouds by removing the countersunk screws at the extremities of each shroud.

(2) Disconnect the aileron control rod from the lever arm.

(3) Remove the access panel from the underside of the wing tip.

(4) Remove the four 0.25 in.dia. bolts attaching the centre hinge bracket to the aileron and note the number of shims. To facilitate the removal of these bolts, the centre shroud attachment brackets may be removed.

Note. . .

In the event of the centre hinge shroud attachment brackets being removed, note the number and position of shims Ref.No.26FZ/6143. During reassembly, check the shroud and attachment bracket bolt holes for alignment and fit shims as necessary to ensure that no gap exists between the aileron centre hinge and shroud attachment brackets.

(5) Lower the flaps, support the aileron at its extremities, remove the nut and bolt from the inboard hinge pin, and using the extractor *(Sect.2, Chap.4, Table 1)*, withdraw the hinge pin.

(6) Remove the nut and bolt from the outboard hinge pin and using the extractor, withdraw the hinge pin.

(7) Remove the aileron.

Assembly

21. Reassembly of the existing aileron to the main plane is a reversal of the removal procedure plus checking the clearances *(fig.5)*, but if a new aileron is being fitted, before fitting it, check the alignment of the centre hinge bearing and if necessary adjust as follows:-

(1) Offer the aileron to the main plane and engage the inboard and outboard hinge pins.

(2) Check the clearance between the aileron hinge bracket and the forward face of the aileron spar.

(3) Remove the aileron and attach a shim Ref.No.26FZ/5001 (supplied with a new aileron), of the thickness required at operation (2), to the forward face of the aileron spar using the hinge bracket attachment screws; a maximum of two shims (0.10 in.) may be fitted.

(4) With the end holes of the shim as guides, mark out and drill two holes 0.0785 in.dia. in the aileron spar and secure the assembly with P.K. screws Part No.2R3/16 in.

(5) Remove the attachment screws used at operation (3).

22. After fitting a new aileron, check for clearances *(fig.5)* and, if necessary, make the following adjustments:-

(1) To obtain the correct clearances between the aileron beak and the main plane rear wall in the critical area one inch either side of the main plane chord line *(Section F-F)*, it is permissible to have a clearance of 0.015 in. min. to 0.10 in. max. between the beak and wall over the remainder of the travel. Should the aileron beak foul the fabric over the shroud hinges, trim the fabric locally to clear.

(2) To obtain the correct clearance between the two aileron shroud screens and the aileron beak at the centre hinge *(Section G-G)*:-

(a) Open the aileron upper shrouds and remove the sealing strips from the aileron beak. The lower shrouds support the screens and are to be opened only as necessary to obtain the required clearance between the aileron shroud screens and aileron beak.

(b) Sandwich the clearance gauge *(fig.12)* between either of the screens and the beak; hold it in position by applying hand-pressure to the screen and gently close the corresponding upper and lower shrouds. Check that the pegs on the screen enter the holes in the shrouds, if they do not, remove the clearance gauge and carry out a repair in accordance with A.P.101B-0400-6, Part 2.

(c) Remove the clearance gauge and repeat operations (a) and (b) on the other screen.

(d) Reopen the upper shroud at either of the screens. Using the clearance gauge, check that the correct clearance between the beak and screen is maintained and secure the screen in position using the appropriate centre screen locating jig *(fig.12)* by locating the two upper pegs of the screen in the corresponding holes in the jig and bolting the aft end of the jig to the shroud angle attachment bracket. Remove the clearance gauge.

(e) Assemble the sealing strip to the aileron beak, unlock the ailerons and obtain the correct clearance over the full range of aileron movement.

(f) Remove the locating jig and close the aileron shroud.

(g) Repeat operations (a), (b), (c), (d), (e), and (f) at the other screen.

(3) To obtain the correct clearance between the aileron inboard shroud screen and the aileron beak *(Section D-D)*:-

(a) Open the aileron upper inboard shroud, and remove the sealing strip from the aileron beak inboard edge.

(b) Position the inboard shroud locating jig *(fig.12)*, on top of the screen by mating the screen peg with the jig and the point of the jig pointing aft. Mark off and drill a hole in the screen flange using the end hole in the locating jig as a template, and bolt the two items together at this position.

(c) Close the shroud so that the shroud takes on its normal position, and using a pencil, mark the position of the aft point of the locating jig on to the aileron. Reopen the shroud.

(d) Align the aft point of the locating jig with the pencilled mark on the aileron and, while held in this position, bolt the second (moveable) leg of the jig to the shroud angle attachment bracket.

(e) Using a feeler gauge, measure the clearance between the screen and aileron, this should be 0.15 in. ± 0.07 in.; if the clearance is incorrect, carry out a repair in accordance with A.P.101B-0400-6, Part 2.

(f) Assemble the sealing strip to the aileron beak, unlock the ailerons, and obtain the correct clearance over the full range of aileron movement.

(g) Remove the locating jig.

(4) To obtain the correct clearance between the aileron outboard shroud screen and the aileron beak *(Section E-E)*:-

(a) Slacken the sealing strip attachment screws and adjust the strip.

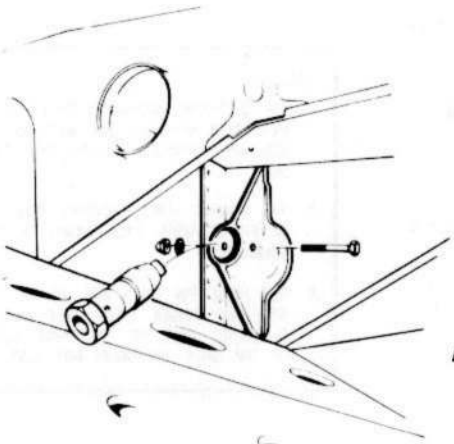
(b) Tighten the attachment screws after adjustment.

(5) Check the alignment of the aileron shrouds *(Section F-F)*; they must be in true alignment with the main plane and aileron contours ± 0.0312 in. measured along the upper and lower surfaces at the trailing edges of the shrouds at F. Adjust their alignment by the shims on the aileron shroud angle brackets at ribs 4, 6 and 8.

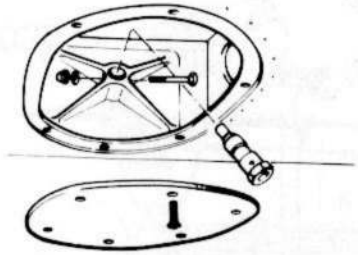
(6) If there is not sufficient clearance between the aileron shrouds and the aileron *(Section F-F)*, file the edges of the shroud, leaving a minimum of 0.025 in. between the rivet heads and the edge of the shroud; do not adjust this clearance by re-shimming the aileron shrouds. Apply protective treatment *(A.P.101B-0400-6)* to filed surfaces.

Note. . .

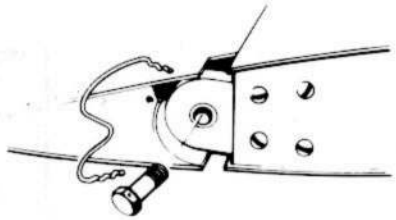
After assembly of the aileron to the main plane, flight trim checks as specified in Sect.3, Chap.4, App.1 must be carried out.



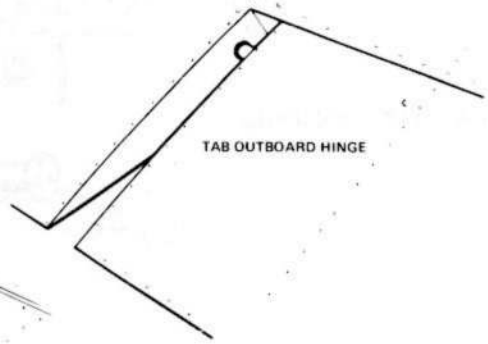
AILERON INBOARD HINGE
(FLAP DOWN)

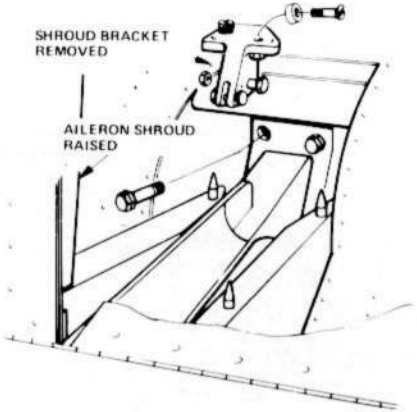


AILERON OUTBOARD HINGE
(IN WING TIP)

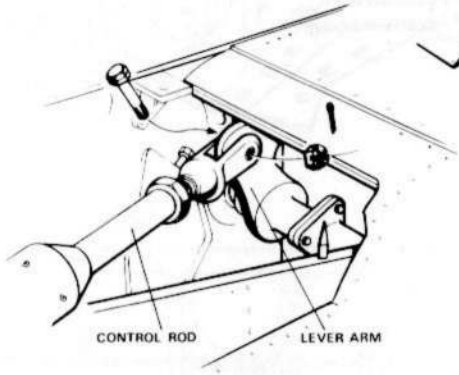


TAB INBOARD HINGE

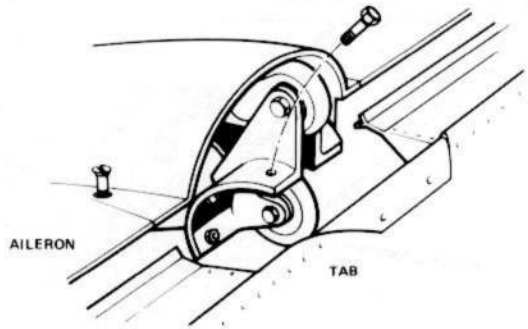




AILERON CENTRE HINGE



CONTROL CONNECTION



TAB CENTRE HINGE

FIG.7. AILERON AND AILERON SPRING TAB REMOVAL

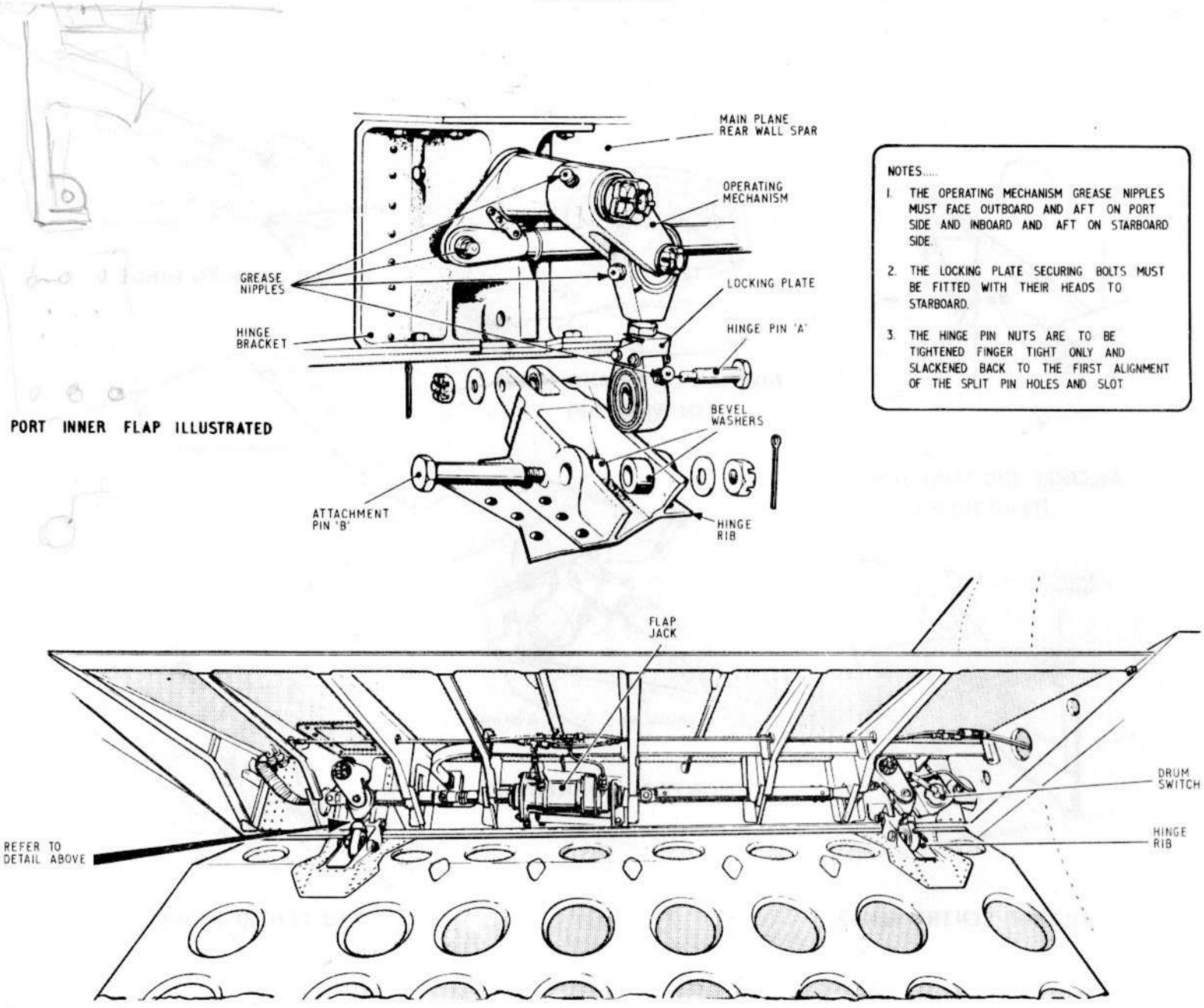


FIG.8. FLAP-REMOVAL AND ASSEMBLY.

Aileron spring tab *(fig.7)*

Removal

23. To remove an aileron spring tab proceed as follows:-

(1) At the centre hinge remove the two countersunk screws attaching the control rod fairing to the aileron and remove the fairing.

(2) Remove the four 2 B.A. bolts and the two countersunk screws attaching the centre hinge bracket to the tab.

(3) Remove the locking wire from the inboard hinge pin and, with the tab adequately supported, remove the hinge pin.

(4) Remove the tab from its outboard hinge pin by drawing the tab inboard.

Assembly

24. Reassembly of the existing aileron spring tab to the aileron is a reversal of the removal procedure plus checking the clearances *(fig.5)* but if a new tab is being fitted, after its fitment, check for correct clearance and if necessary make the following adjustments:-

(1) If the clearance between the tab beak and the rear web of the aileron *(Section C-C)* is incorrect, it may be adjusted by filing the tab beak.

(2) If the clearance between the tab shrouds and the tab *(Section G-G)* is incorrect it may be adjusted by filing the edges of the shrouds.

(3) Apply protective treatment *(A.P.101B-0400-6)* to filed surfaces.

Note. . .

1. Whenever an aileron or aileron tab is removed and replaced or adjusted, a flight trim check must be made in accordance with Sect.3, Chap.4, App.1, to ensure that the aircraft trim is within the specified limits. Should the aircraft trim be outside the specified limits, a new elevator trailing-edge strip must be fitted and the flight trim checks and subsequent trailing-edge strip adjustments made.

2. When refitting bolts and screws removed in para.23(2), check for adequate locking. If locking is unsatisfactory, remove bolts and screws and fit shake-proof washers AGS.2035/6 to the 2 B.A. hexagon bolts, or AGS.2036/C to the 2 B.A. countersunk screws. If AGS.2036/C has been used, check clearance at edge of fairing and head of countersunk screws.

Flaps *(fig.8)*

Removal

25. To remove a flap proceed as follows:-

Note. . .

Removal and assembly procedure is common to all flaps.

(1) Select flaps DOWN and lower the flaps fully.

(2) Support the flap and remove the attachment pin B from both operating mechanisms. Record the position of the bevel washers to assist in reassembly. Retain the attachment pins, bevel washers, plain washer and slotted nut.

(3) With the flap adequately supported at its centre and extremities, remove the hinge pin A from both hinge brackets. Retain the hinge pins, slotted nuts, plain washers and at the datum hinges only, note the position of and retain the semi-spherical washers.

(4) Move the flap aft and downwards and remove it from the main plane.

Assembly

26. Reassembly of the existing flap to the main plane is a reversal of the removal procedure with care being taken to ensure that the bevel and spherical washers, retained during removal of the flap, are refitted correctly in their original positions.

Note. . .

Hinge pin nuts are to be tightened finger tight only, and slackened back to the first alignment of the split pin hole and slot.

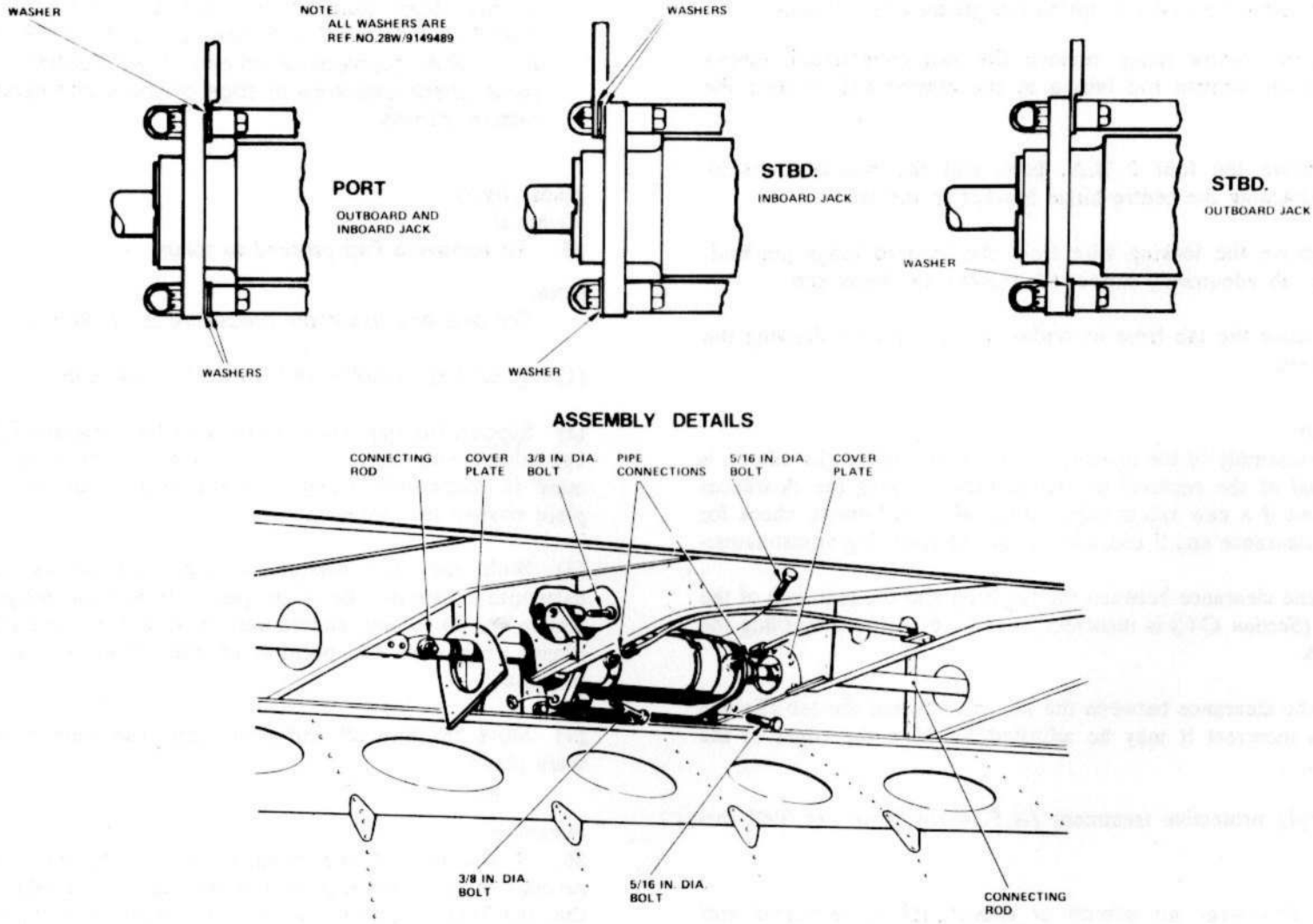


FIG. 9. FLAP JACK – REMOVAL AND ASSEMBLY

27. If a new flap is fitted to the main plane, check for correct clearances *(fig.5)*. If the clearance between the leading edge of the flap and the main plane is incorrect *(Section A-A)*, it may be adjusted by filing the leading edge of the flap. Ensure that the 45 deg chamfer is maintained on the leading edge of the flap. Protective treatment *(A.P.101A-0600-6)* must be applied to all filed surfaces.

Flap jack *(fig.9)*

Removal

28. To remove a flap jack proceed as follows:-

(1) Lower the flaps to their fully down position.

(2) Exhaust the system of hydraulic pressure.

(3) Disconnect the two hydraulic pipes from the jack, and blank off the pipelines and the jack connections.

(4) Remove the split pin and washer from the connecting pin securing the jack connecting rod to the flap mechanism and remove the connecting pins.

(5) Remove the six 2 B.A. bolts and nuts securing each of the two cover plates to the ribs adjacent to the jack body, and remove the cover plates.

(6) Remove the two 3/8 in. N.S.F. nuts and bolts securing the flanged end of the jack to the mounting bracket and the two 5/16 in. bolts securing the ring mounting to the bracket at the opposite end.

(7) Remove the jack from the main plane.

Assembly

29. Assembly of the flap jack to the main plane is the reversal of the removal procedure plus the following operations:-

(1) Ensure that the washers fitted to the mounting bolts at the flanged end of the jack are correctly positioned *(fig.9)*.

(2) Adjust the jack connecting rod fork ends as necessary to enable the connecting pins to connect with the flap mechanism push rods (the fork-ends at the flanged end of the jack first). After making this adjustment, check the dimension between the pin centre and the nearest face of the cylinder flange; this must be 3.13 in. ± 0.25 in. When the final adjustment of the opposite fork end is completed check the dimension between the jack pin centres; this must be 18.30 in. ± 0.25 in. For checking purposes, jack travel is 3.90 in. ± 0.015 in. After adjustment wire-lock both fork-ends, spanner grips and locknuts.

(3) Bleed the jack and pipelines, and test the functioning of the flaps *(Chap.6)*.

Air brakes *(fig.10)*

Removal

30. To remove the air brakes proceed as follows:-

(1) Remove the access panel in the lower surface of the main plane *(Sect.2, Chap.4)*.

(2) Disconnect the hydraulic jack at the lever on the rocker arm assembly.

(3) Remove all drag channels from their rocker arms by unlocking and removing their attachment nuts *(detail D)*.

(4) Remove the nipples and spokes from all rocker arm assemblies and joint tubes *(detail C)*.

(5) Slacken the locknut on the adjustable roller on the bearing on rib 3 and lower the roller to its full extent *(detail A)*.

(6) Remove the nut from the end of the torque tube at rib 2, and the bearing on that rib, after removing the screws securing its annular plate *(detail B)*.

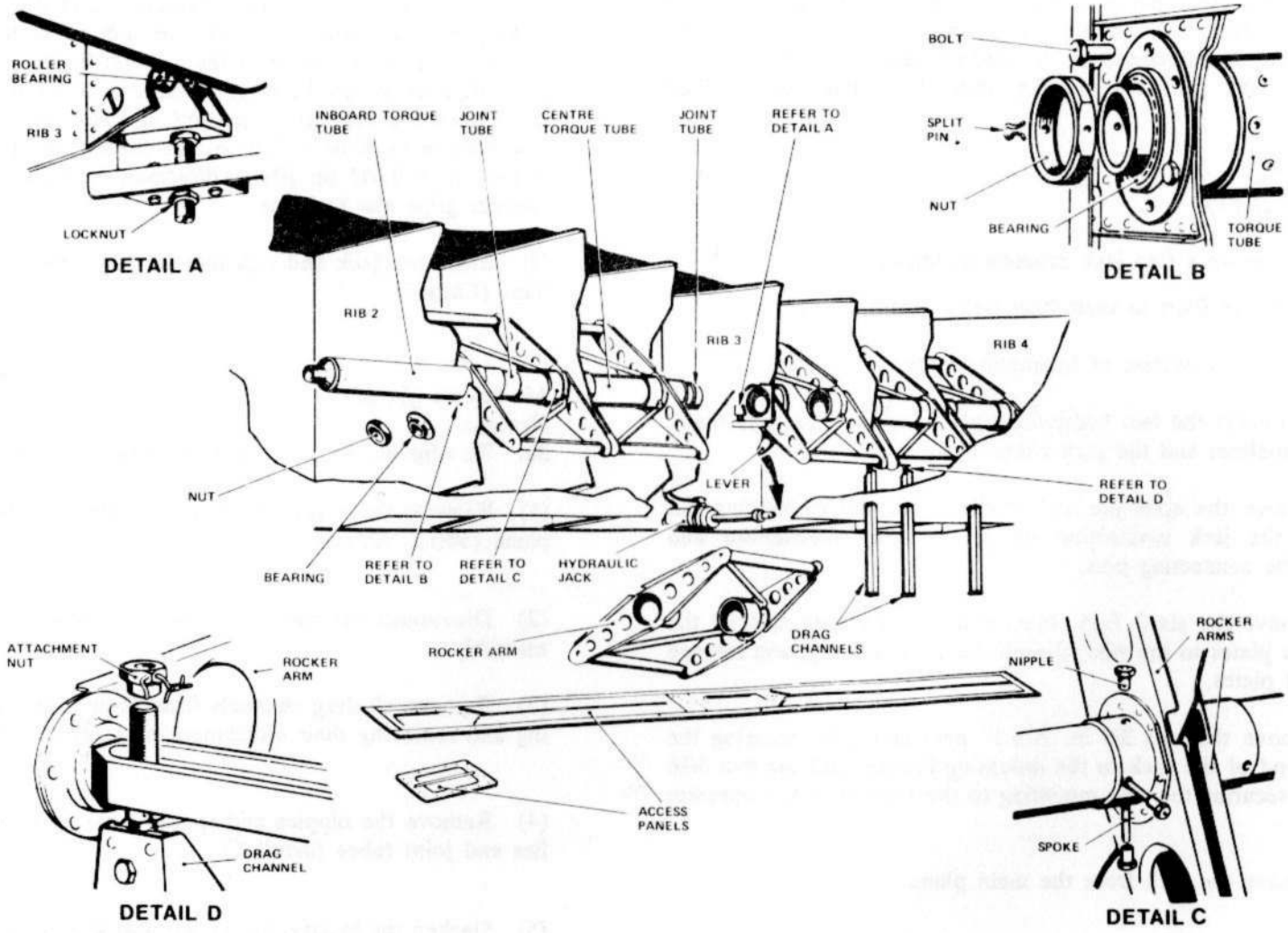


FIG.10. AIR BRAKES – REMOVAL AND ASSEMBLY

(7) Slide the inboard and centre torque tubes towards rib 1, removing the rocker arm assemblies and the joint tube from the main plane as they are released.

(8) Separate the centre and inboard torque tubes, removing the rocker arm assemblies and joint tube as they are released.

(9) Move the centre torque tube to rib 3 and, pivoting it on the adjustable roller, remove it from the main plane.

(10) Move the inner torque tube to rib 3 and remove it from the main plane as for the centre tube.

(11) Remove the outer torque tube in a similar manner, removing the remaining rocker arm assemblies as they are freed.

Assembly

31. After assembling the air brakes into the main plane (removal procedure in reverse) set the mechanism in the manner described in Sect.3, Chap.4.

Air-brakes jack

32. When an air-brakes hydraulic jack is removed and a replacement jack fitted, it is essential that the standard locknut and tab washer are removed from the jack piston rod, and a special locknut, Part No.EA3.73.303 and tab washer, Part No.EA3.73.305 are fitted. After fitting a replacement jack, check that there is a clearance of 0.5 in., minimum, between the coils of the hydraulic pipes.

Wing tip *(fig.11)*

33. To remove a wing tip proceed as follows:-

(1) Remove the access panel in the wing tip bottom skin.

(2) Disconnect the electrical cables from the terminal block in the leading edge.

(3) Remove the bolts securing the wing tip to rib 8 trailing edge.

(4) Remove the countersunk screws securing the wing tip to the main plane extension.

(5) Remove the wing tip.

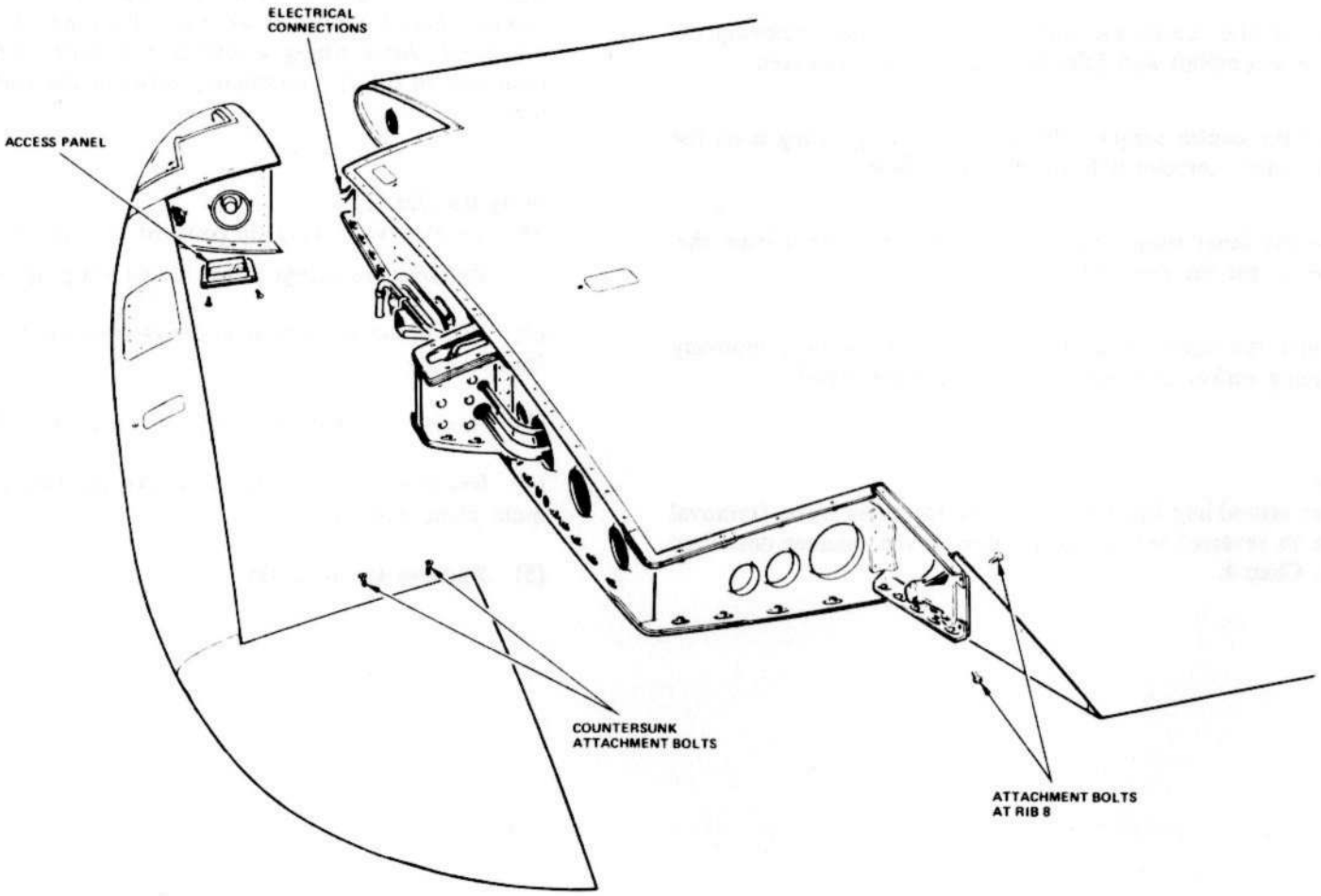
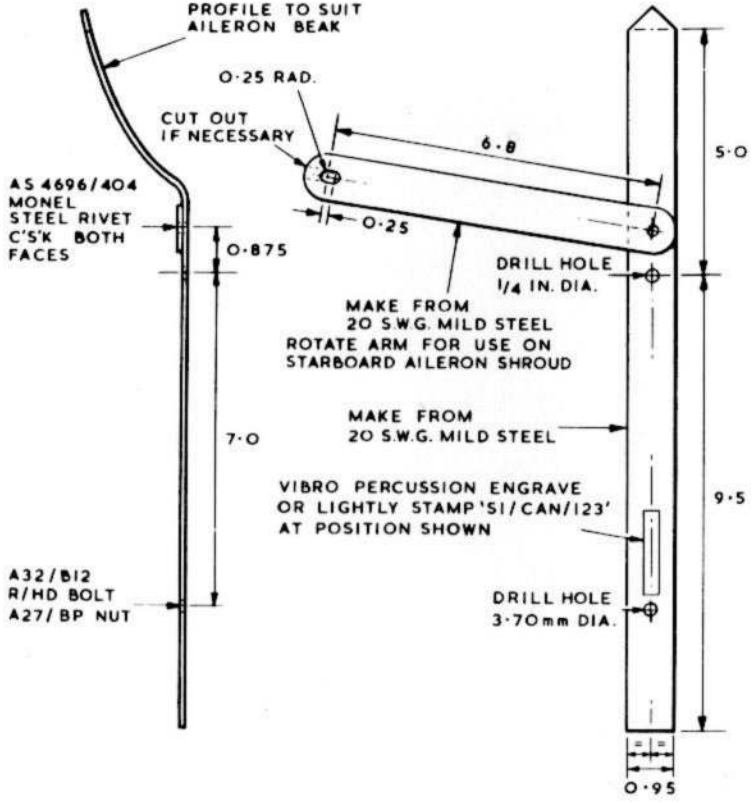
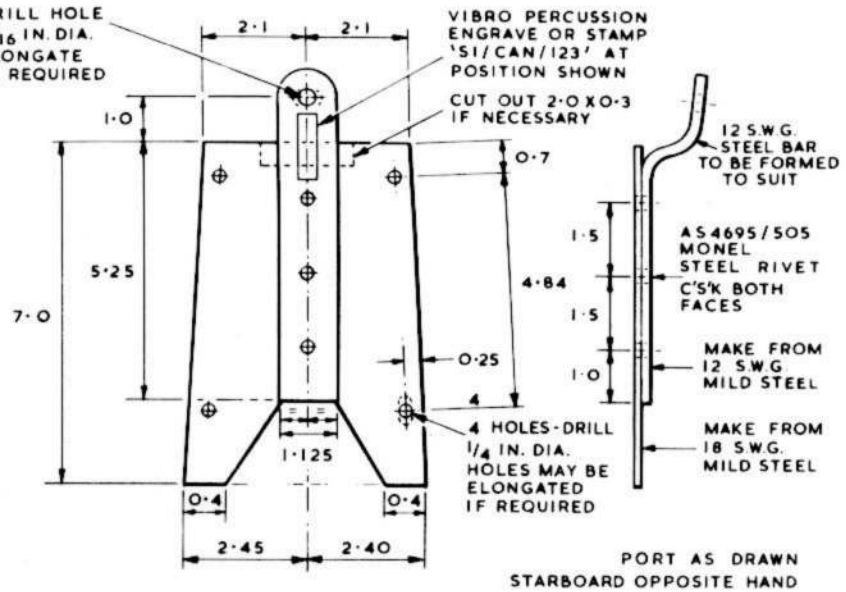


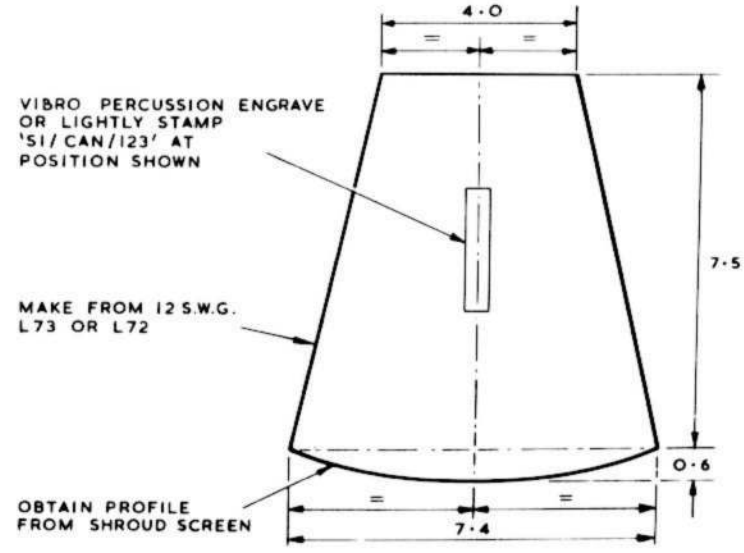
FIG. 11. WING TIP REMOVAL



LOCATING JIG (INBOARD SHROUD)



LOCATING JIG (CENTRE SCREENS)



CLEARANCE GAUGE

NOTE :
ALL DIMENSIONS ARE IN INCHES EXCEPT WHERE OTHERWISE STATED

FIG. 12. AILERON CLEARANCE GAUGES

Chapter 3 TAIL UNIT

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LIST OF ILLUSTRATIONS

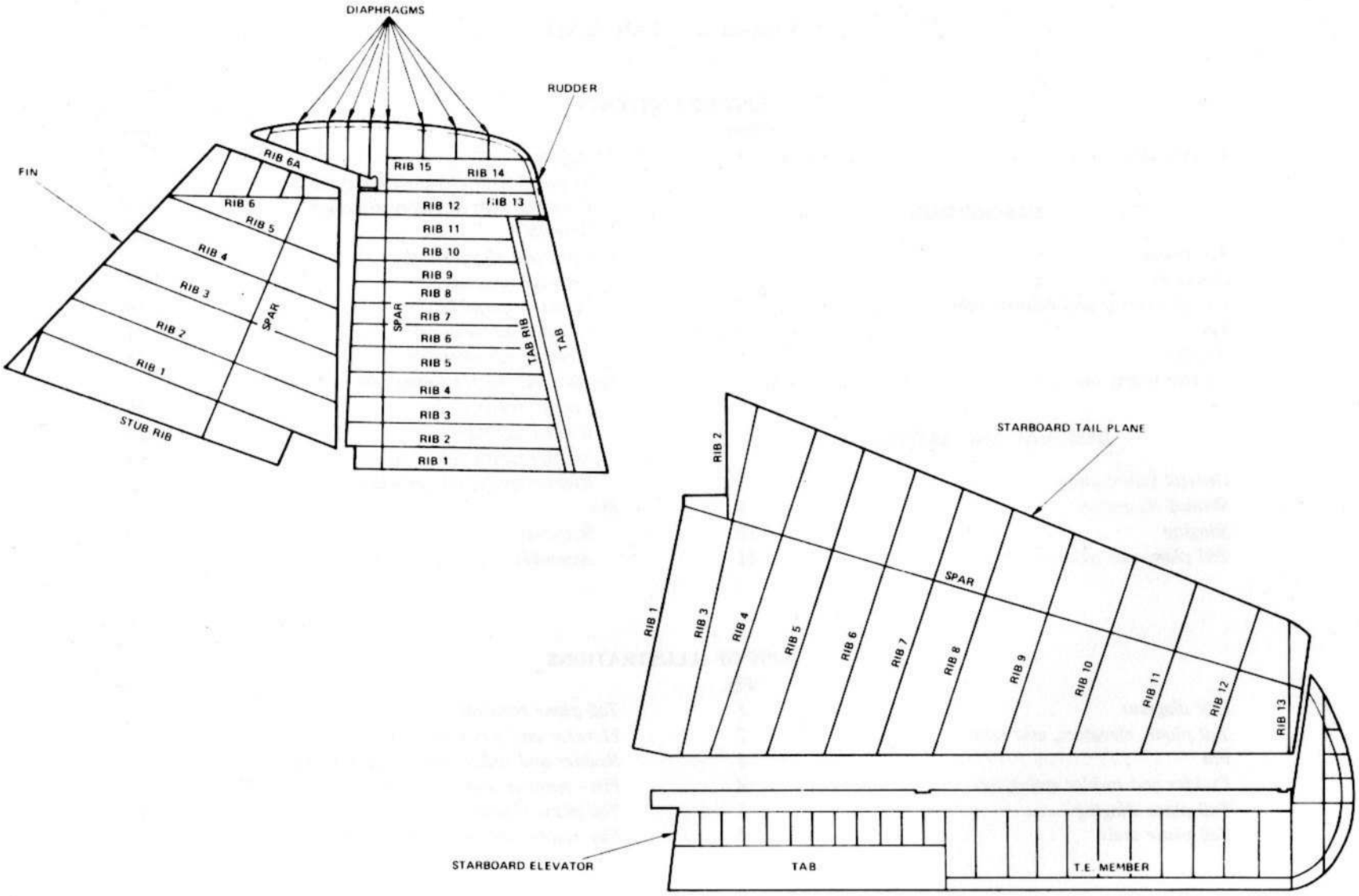


FIG. 1. KEY DIAGRAM

Introduction

1. This chapter gives a general description of the tail unit structure and pictorially describes the removal and assembly operations. The disposition of the spars and ribs within the structure is illustrated in fig.1.

Note . . .

The rudder upper, lower and spring tab hinges, the elevator spring tab hinges and the tail plane hinge pins (gun) are to be greased with XG-287. The elevator hinges and the tail plane actuator attachment points are to be oiled with OX-14. Details of flying control connection lubrication is given in Sect.3, Chap.4.

DESCRIPTION

Tail plane *(fig.2)*

2. The electrically-actuated variable-incidence tail plane is a single-spar structure with a false rear spar, built in port and starboard units, which are connected together at their roots to form a single assembly. The spar has extruded T-section booms, and a plate web stiffened with angle sections; the false rear spar, which carries the elevator hinge attachment brackets, is a flanged plate stiffened with angle sections. Flanged plate ribs, stiffened with angle-section members, join the main and false spars, the ribs being cut away to accommodate bulb angle-section spanwise stringers. The leading-edge ribs are continuations of those aft of the spar and are of similar section, the inboard faces of those at the root being faced with spruce strips. Each unit is covered with a light-alloy skin riveted to the ribs, stringers and spars. A forged light alloy centre section connects the port and starboard units at the spars whilst the false spars are joined directly to each other, the triangular aperture thus formed being plated with top and bottom skins which are supported on three diaphragms and spanwise stringers. The complete tail plane is carried on two brackets on the fuselage at the rear of frame 42 by fork-end brackets on the forward face of the centre section forging, and is supported near the false spar by an electrical actuator. Mod.1277 introduces sealing strips between the tailplane and rear fuselage.

Elevators *(fig.2)*

3. Each elevator, which is hinged to the tail plane at its centre and extremities, has a D-section spar, forming the leading edge, with flanged plate ribs and a light-alloy skin covering behind the spar and over the horn. The inboard ribs are cut away at their trailing edges and are bounded by a plate web to which the tab hinge brackets are attached, the skin being extended beyond the web to form a shroud over the leading edge of the tab. Interconnection of the elevators is effected by vertical torque levers riveted to flanges at the root of each spar, the levers being joined at their ends by a coupling link. The elevators are mass-balanced by bob weights mounted on tubular arms projecting from the leading edge into the interior of the tail plane. On the underside of the elevators, at the centre hinge positions, a panel, secured by rivets, is provided for the examination and replacement of the centre hinge brackets.

Elevator spring and balance tabs *(fig.2)*

4. The elevator spring and balance tabs are hinged to the elevators by end hinges and two intermediate hinge pins, the spring tab being mounted on the port elevator and the balance tab on the starboard elevator. The skin covering is attached to a tubular spar and pressed flanged ribs, the tabs being balanced by spanwise mild steel tubes attached to the spar and protruding into the elevator interior.

Fin *(fig.3)*

5. The fin is a composite structure of wood and metal, built around a single light-alloy spar consisting of T-section booms and a plate web reinforced by angle sections. The leading-edge structure is formed by wooden ribs, with stiffeners, and a laminated spruce leading-edge member, the whole being covered with a plywood skin, which is Reduxed at its aft edge to the outside of the T-section booms forward of the spar web. Aft of the spar the structure is entirely of metal construction, consisting of flanged plate ribs, with angle-section stiffeners, and a curved rear wall forming the rudder shroud. The rudder upper hinge plate is attached to rib 6 at the top of the shroud.

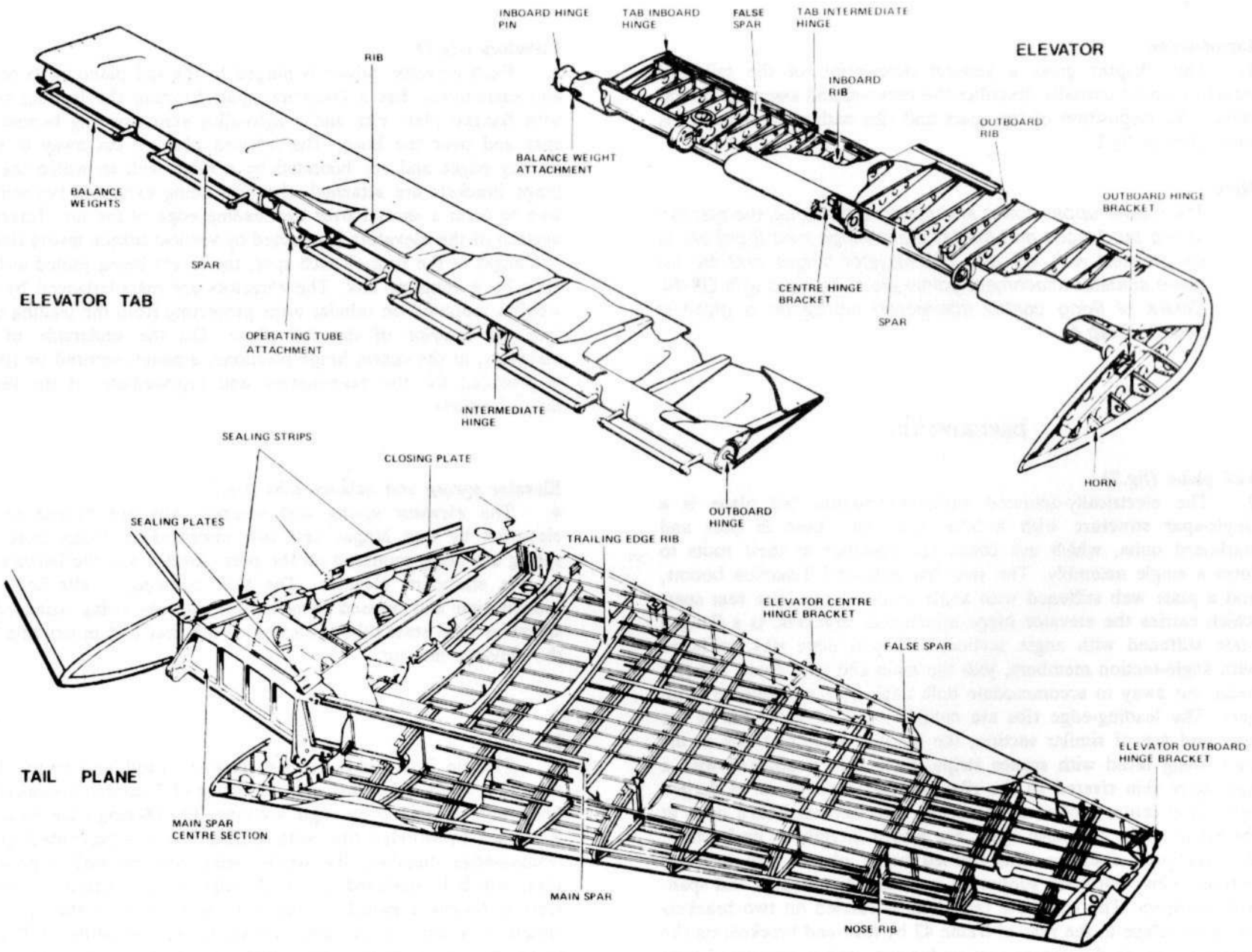


FIG.2. TAIL PLANE ELEVATORS AND TAB

Rudder *(fig.4)*

6. The rudder is of all-metal construction of a built-up spar, flanged plate ribs aft of the spar and D-shaped leading-edge ribs. At the upper end, a horn extends forward of the spar and this together with the upper edge of the rudder, is built up with vertical diaphragms. Ribs 1 to 11 are shortened at their trailing edges and are bounded by a plate web, to which is attached the tab centre hinge bracket; the tab upper hinge socket is mounted on rib 12 and the lower hinge bracket is attached to the underside of rib 1. The whole structure is covered with a light-alloy skin which extends beyond the trailing-edge plate web to form the tab shroud. The rudder is hinged to the fin rear wall at its upper end, and in a bearing in the rudder stub of the rear fuselage at its lower end, and is mass-balanced by two weights, one mounted in the rudder horn and the other attached to an arm at the bottom of the spar.

Rudder spring tab *(fig.4)*

7. The rudder spring tab is similar in construction to the elevator spring and balance tabs *(para.4)*, and is hinged to the rudder by upper and centre hinge pins and a lower hinge bracket. The tab is balanced by weights carried on arms attached to the spar and protruding into the rudder interior.

REMOVAL AND ASSEMBLY

Note . . .

Whenever an aircraft component which affects longitudinal trim is replaced or adjusted, carry out flight trim checks as detailed in Sect.3, Chap.4, App.1.

General information

8. The methods of removing and assembling the components of the tail unit are given in the associated paragraphs. Only the removal operations are given in detail since the assembly is generally a reversal of this detail; where this is not the case the fact is noted.

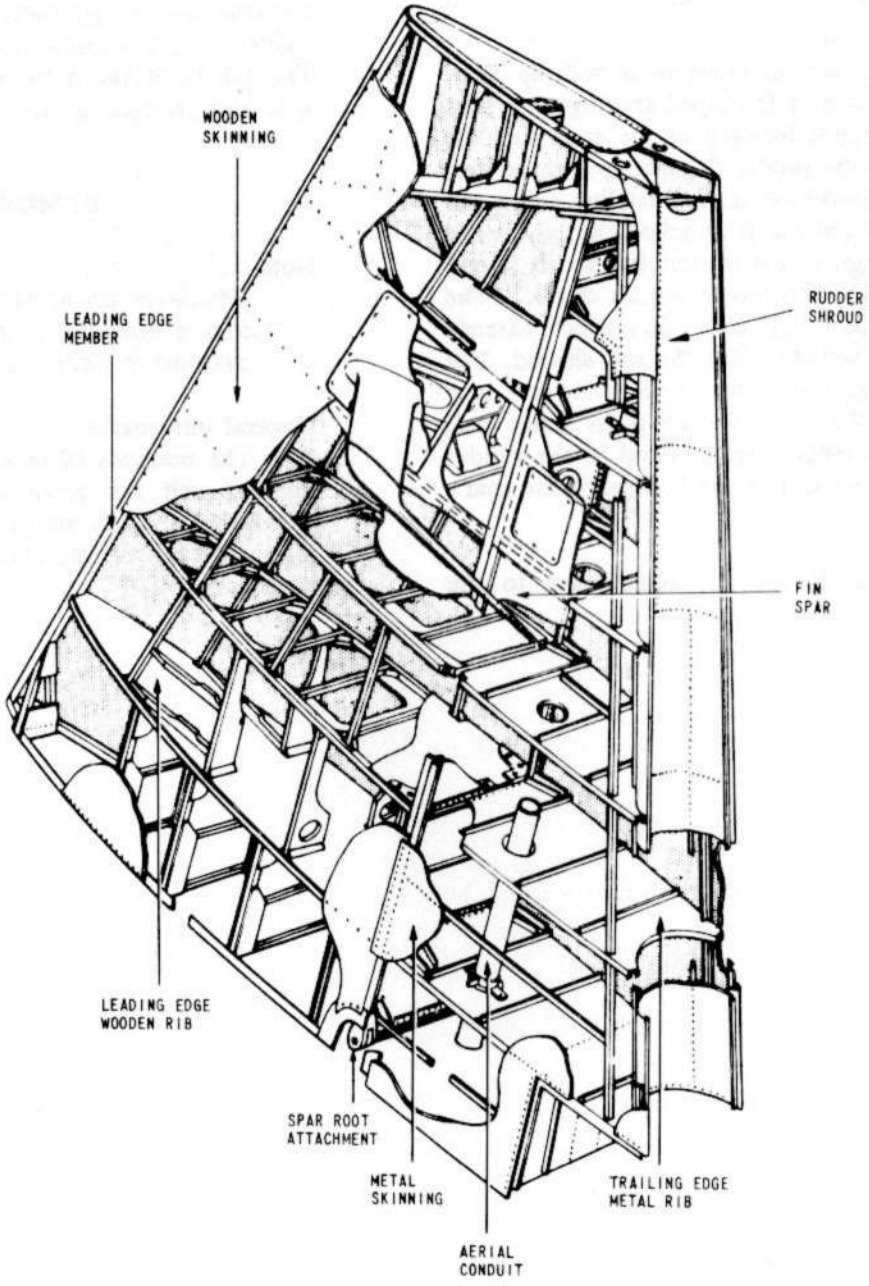
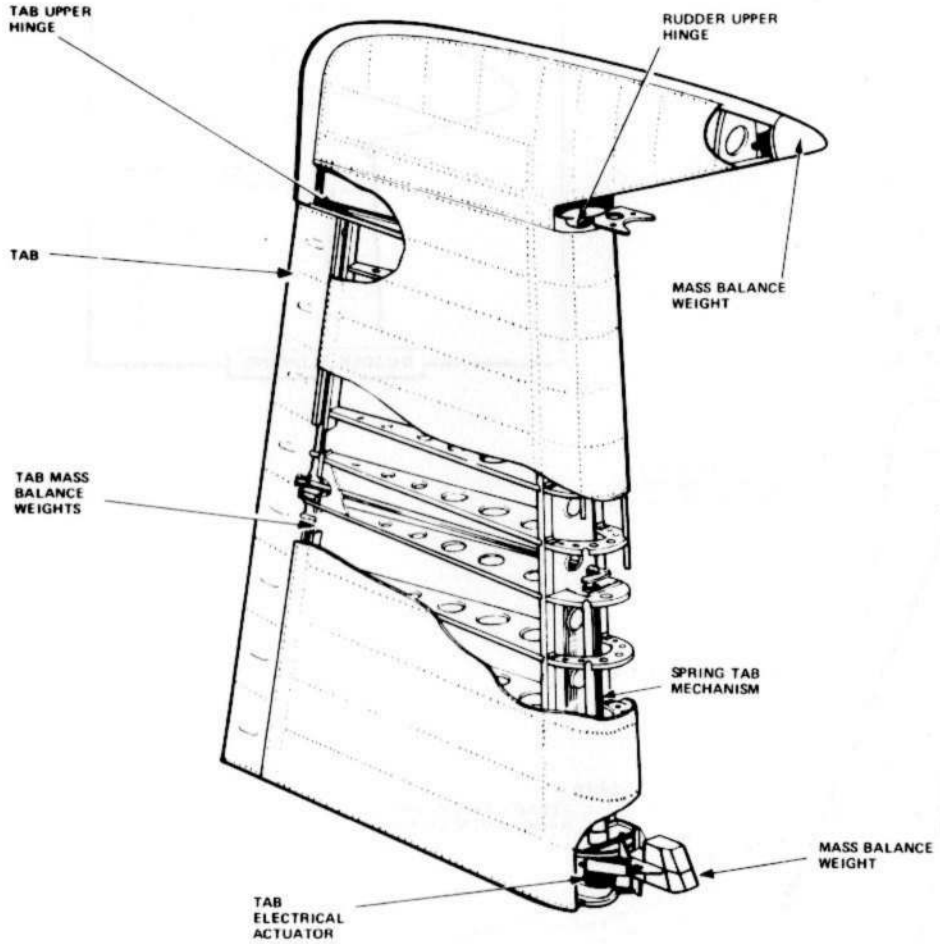
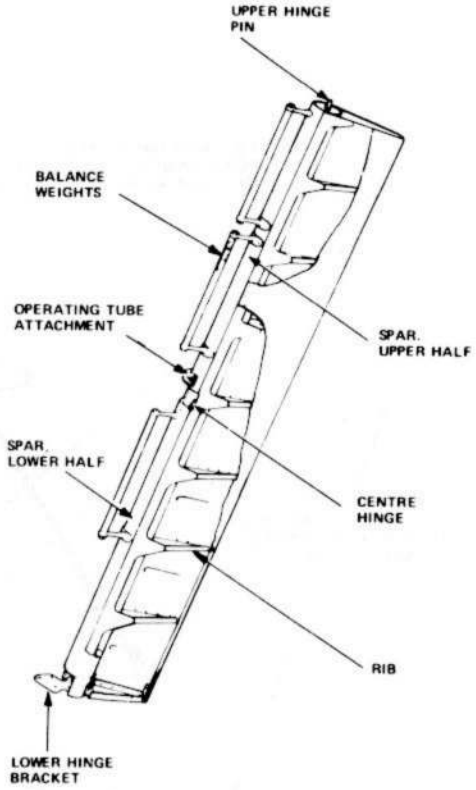

WOODEN SKINNING
LEADING EDGE MEMBER
RUDDER SHROUD
FIN SPAR
LEADING EDGE WOODEN RIB
SPAR ROOT ATTACHMENT
METAL SKINNING
AERIAL CONDUIT
TRAILING EDGE METAL RIB

FIG. 3. FIN

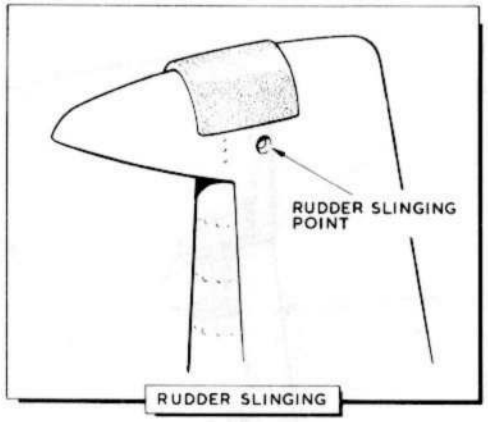




RUDDER TAB

FIG.4. RUDDER AND RUDDER SPRING TAB

WHEN USING TOWING CRANE
TYPE A. REF. NO. 4L/2023,
MAX. HEIGHT OF LIFT IS 6·0 IN.
ABOVE THE INSTALLED POSTITION.



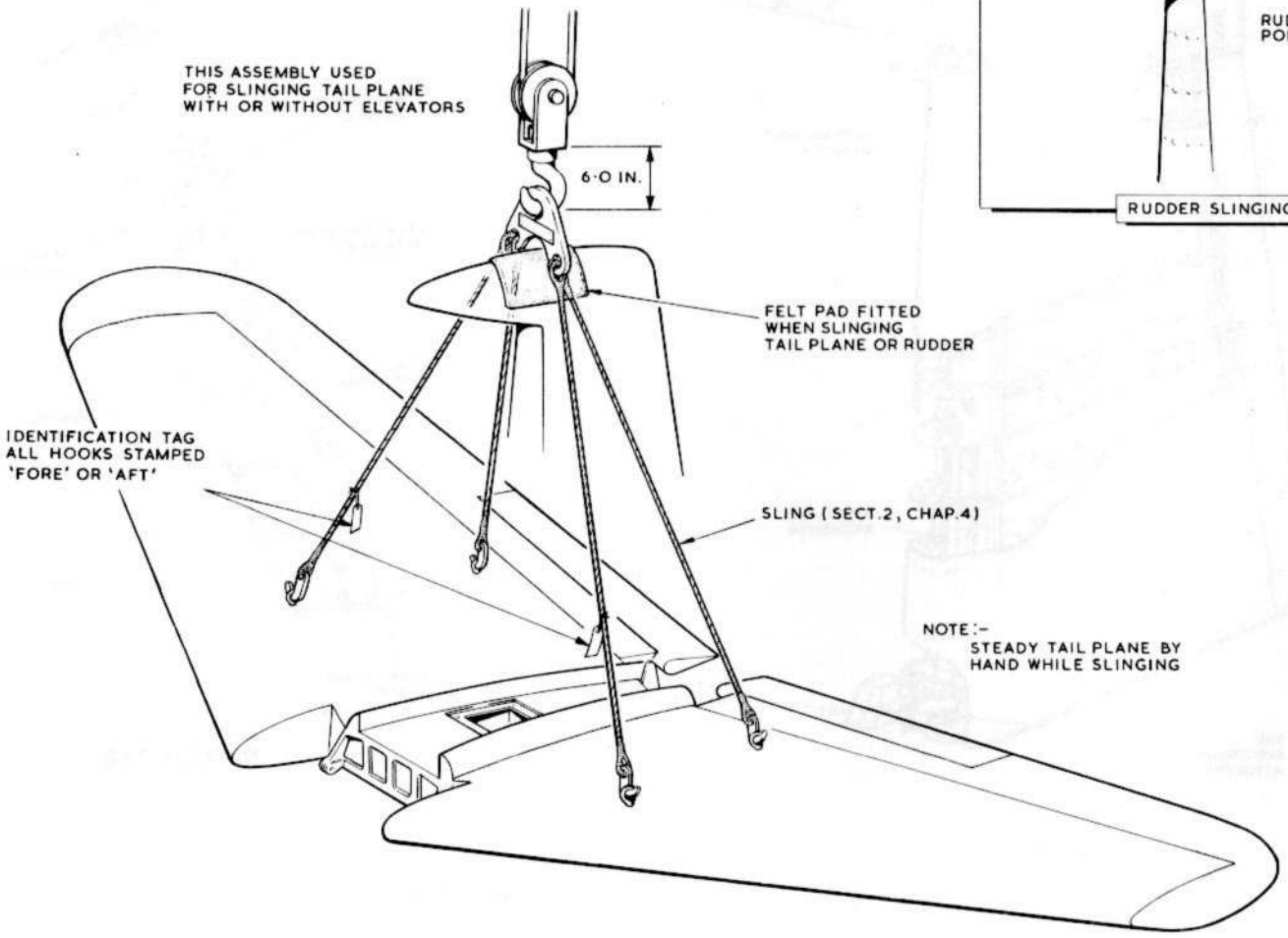


FIG.5. TAIL PLANE SLINGING

◂ SLING HOOKS REVERSED ▸

Shroud clearances *(fig.12)*

9. After fitting a new rudder to the fin, or a tab to either the rudder or elevator, the gap between the shroud and the leading edge of the component must be checked *(details C and B)*. After fitting a new elevator to the tail plane, the gap between the shroud and the leading edge of the elevator must be checked *(detail A)*. If these measurements are not obtained the edges of the shroud may be trimmed by filing. The correct protective treatment as detailed in A.P.101A-0600-6, must be applied to all filed surfaces.

Slinging *(fig.5)*

10. The method of slinging the tail plane is illustrated in fig.5, using the tail plane sling *(Sect.2, Chap.4, Table 1)*. The cables of the sling are identified for the fore or aft positions by tags attached to the cables. It should be noted that only 6 in. lift is permissible above the installed position and care should be taken not to foul the underside of the rudder stub when lifting. The rudder and fin are slung by passing a suitable strap through the holes at the positions indicated in Sect.2, Chap. 4; these holes on the fin are normally covered with fabric patches but on the rudder they are closed by spring-loaded plugs which may be removed by screwing a 4 B.A. bolt into the hole in the plug and pulling outwards.

Tail plane seal adjustment *(fig.6)*

11. The clearance between the tail-plane fairing and the sealing strip is to be adjusted by means of the 10 adjusting screws, five on each side of the tail plane stub. On no account must these screws be fully tightened.

Tail plane *(fig.7)*

Removal with elevators removed

12.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*, and attach the sling to the tail plane. Take up the slackness in the sling.

(2) Remove the tail-plane actuator *(Sect.3, Chap.4)*.

(3) Remove the ten adjusting bolts from the tail-plane stubs (five each side) which secure the sealing plates.

(4) Remove the circular access panel on the port side of the fin stub *(Sect.2, Chap.4)*. This panel gives access to the bracing strut upper attachment.

(5) Refer to detail B; remove the split pin, nut, and washer from the bolt attaching the bracing strut to the lug on the rear of frame 42, and remove the bolt.

(6) Move the tail plane to its minimum incidence by lifting with the sling.

(7) Refer to detail A; remove the split pin, nut, and washer from the bolt attaching the bracing strut to the lug on the rear fuselage.

(8) Refer to detail A; remove the bolt and withdraw the strut.

(9) Remove the split pin, nut, and washer from each hinge pin.

(10) Withdraw the hinge pins from the lugs on the spar centre section and hinge brackets on the rear fuselage. The tail plane is then free to be removed.

Removal with elevators attached

13.

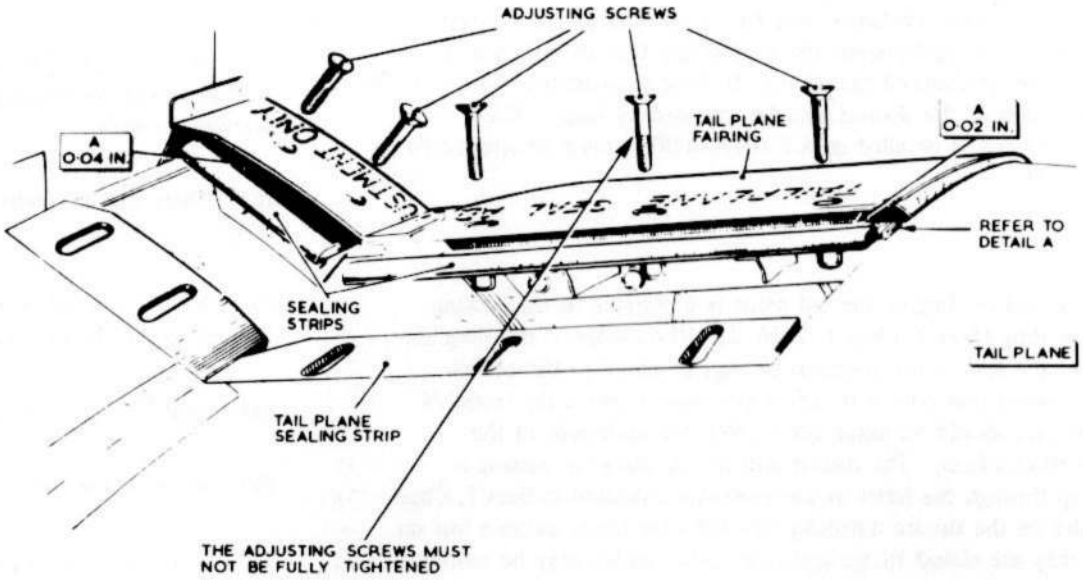
(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*, and attach a sling to the tail plane. Take up the slackness in the sling.

(2) Remove the box fairing and the rear fairing *(Sect.3, Chap.1)*.

(3) Disconnect the control rod from the port elevator lever and at the lever on the bulkhead at fuselage frame 42.

(4) Remove and retain the disconnected section of the control rod.

(5) Proceed as instructed in operations (2) to (10) for the removal of the tail plane with the elevators removed.



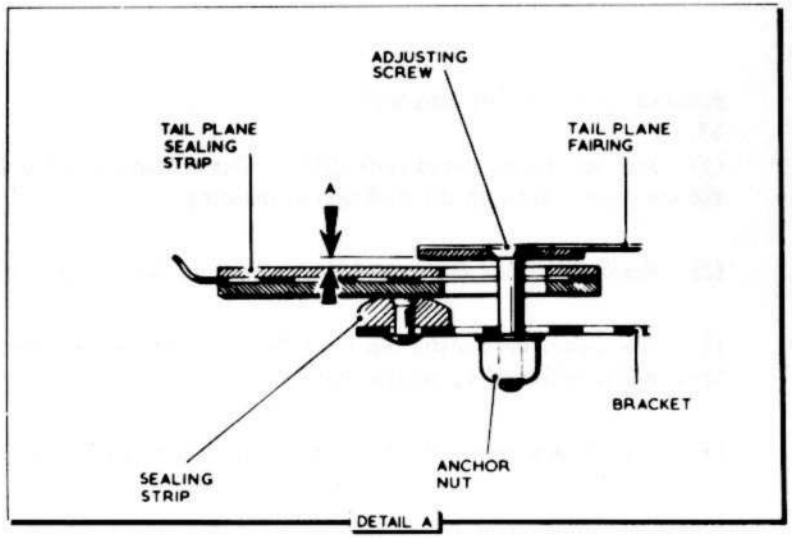


FIG.6. TAIL PLANE SEALS

◀ *Assembly (fig.11)*

14. The following instructions are applicable when fitting a new tail plane:-

Note . . .

All moving contact faces of joints must be generously smeared with XG-276.

(1) Before commencing to fit a tail plane to the rear fuselage, ensure that the lower cover plate, on the port side of the rudder stub, is securely positioned (access to this plate is not possible with the tail plane in position).

(2) Check the clearance between the sealing plate on the underside of the tail plane and the closing strip on the fuselage, before the installation of the tail plane actuator, as follows:-

(a) Ensure that the lower microswitch tappet is screwed back fully.

(b) Set the tail plane to 5 deg 42 min incidence measured at the starboard inboard rigging position - at this incidence the sealing plate and the closing strip are adjacent over practically their whole length, and the clearance can be ascertained.

(c) Check the clearance, which should be lower dimension *(detail B)*.

(3) With the tail-plane actuator installed, set the tail plane to 3 deg 15 min ± 2 min incidence - measured at the starboard inboard rigging position or at the take-off position on the cockpit gauge - and check the following clearances:-

(a) Between the tail plane and the tail-plane stub *(detail A)*. If this dimension is not obtained the clearance may be adjusted by adding extra packing, or facing-off existing packing on the tail plane, as required.

(b) Between the tail plane and the forward face of the rear cone *(position E)*.

(c) Between the tail plane box fairing and the fuselage; *(detail B)* upper dimension.

(4) Set the tail plane in line with tail-plane stub, and adjust the sealing strips to give the following clearances:-

(a) Between the sealing strips (two bolt position) and the tail-plane stub *(detail C)*.

(b) Between the sealing strips (three bolt position) and the tail-plane stub *(detail D)*.

(5) Ensure that there is complete freedom of movement throughout full range of tail-plane travel.

Note . . .

Whenever a tail plane has been replaced or adjusted, a flight trim check must be made as detailed in Sect.3, Chap.4, Appendix 1, to ensure that the aircraft trim is within the limits laid down. Should the aircraft trim be outside the limits specified, a new trailing edge strip should be fitted and the flight trim checks, and subsequent trailing edge strip adjustments carried out.

Elevator and elevator tab *(fig.8)*

Elevator removal

15.

(1) Set the tail plane to its mid-travel position.

(2) Remove the box fairing and the rear fairing as instructed in Sect.3, Chap.1.

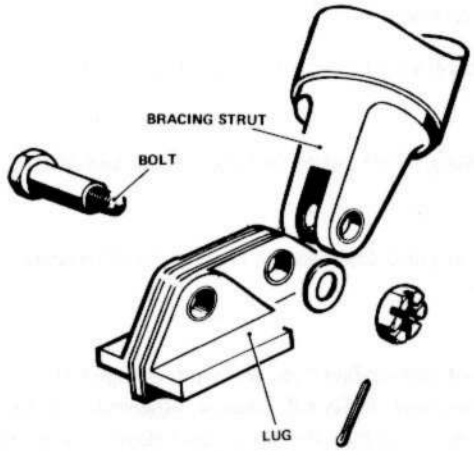
(3) Disconnect the control rod from the lever *(detail A)*.

(4) Remove the access panel from the upper surface of the starboard elevator. This panel gives access to the connecting screw on the operating lever of the starboard tab *(detail B)*.

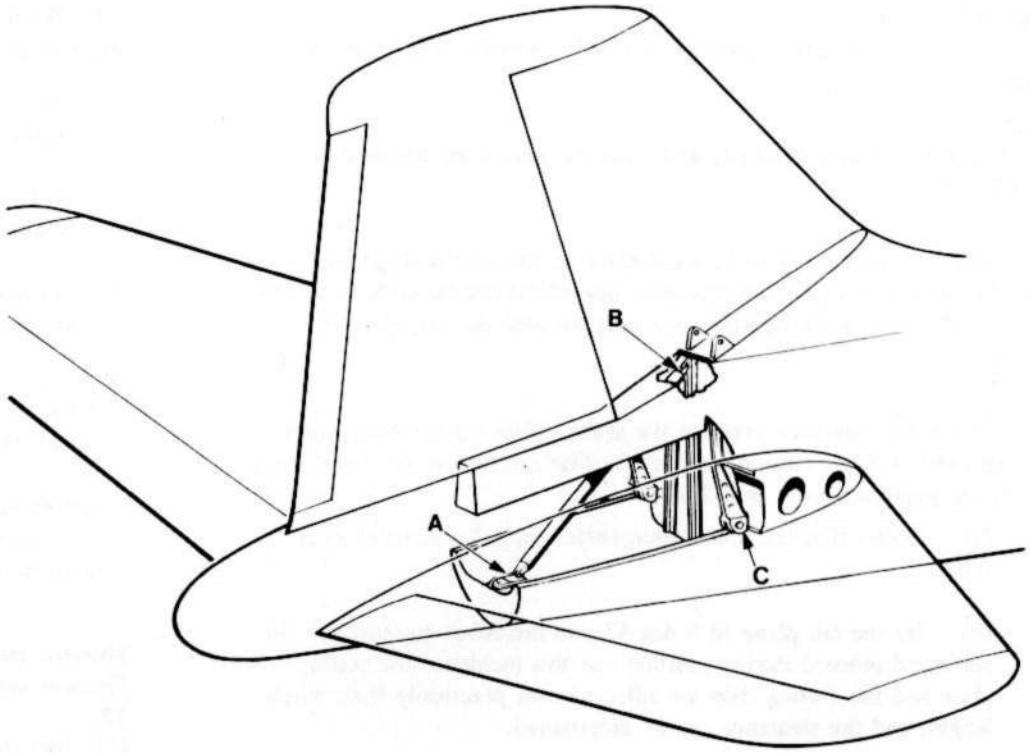
(5) Disconnect the starboard tab-operating lever at the connecting screw.

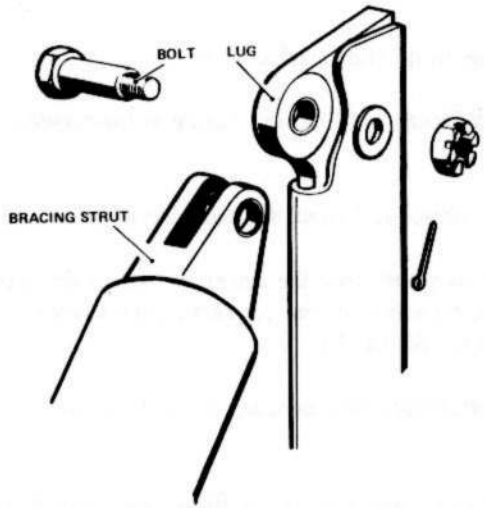
(6) Remove the split pin, nut and washer from each balance weight arm and withdraw the balance weights and arms from the elevator spars *(detail A)*.

(7) Disconnect the coupling link from the starboard elevator. ▶

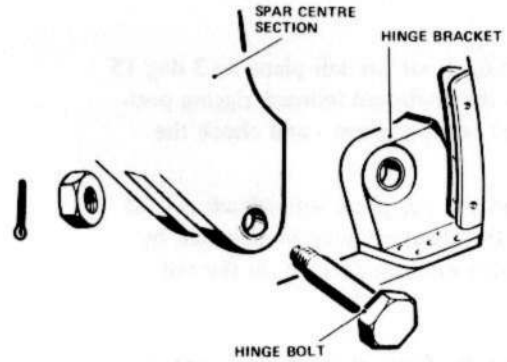


DETAIL A





DETAIL B



DETAIL C

FIG. 7. TAIL PLANE REMOVAL

◄ ANNOTATIONS ADDED ►

◀ (8) Remove the split pin, nut and washer from the inboard hinge pin of the port elevator.

(9) Remove the port elevator from its hinges by moving it outboard, until it is clear of the centre and inboard hinges, and then aft.

(10) Proceed as instructed in operations (8) and (9) with the starboard elevator.

Elevator assembly

16. The assembly of the elevator is the reverse of the removal sequence.

Note . . .

To enable the alignment of the centre and outboard hinges to be checked during reassembly, apertures, closed by spring loaded sealing plugs are provided on the underside of the elevators at these hinge points. To remove, screw a 4 B.A. bolt into the hole in the plug and pull outwards; to replace, remove the bolt, insert the plug in the aperture and press it home. Ensure that the plug is flush with the elevator skin (detail G). The bolt securing the coupling link must, when inserted have its head to port.

Elevator tab removal

17.

(1) Remove the access panels, port and starboard, and, at this point, disconnect the tab operating rod from the lever by removing the connecting screw, in the case of the starboard tab, and by removing the connecting bolt in the case of the port tab *(details B and C).*

(2) Disconnect the tab operating rod from the tab, and move the operating rod clear of the attachment lugs *(details D and E).*

(3) Remove the inboard hinge bracket *(detail H).*

(4) Raise the tab and remove it by moving it inboard until it is clear of the outboard and intermediate hinges, and then aft.

Note . . .

If new tabs are to be fitted it will be necessary to remove the inboard hinge pin. The pin is to be wire-locked on reassembly (detail H).

Elevator tab assembly

18. The assembly of the elevator tab is the reverse of the removal sequence:-

Note . . .

1. Before assembly, inspect the extreme end of the tab operating rod and the surface between the two lugs of the tab hinge fitting. Where a foul has occurred clear it by lightly filing a small flat between the two lugs at the point of contact, so that a minimum clearance of 0.005 in. is obtained. The width of the slot is not to exceed the width of the rod end, and the amount of metal removed should not exceed 0.010 in. in depth.

2. When a new or replacement tab is to be fitted it must be checked for loose balance weights which are rivetted to the inner face of each end rib. Check by tapping the skin and ribs at each end; loose weights will be indicated by a rattling sound. Repair as detailed in S.P.'s for elevator balance tabs.

3. When assembling an elevator tab, ensure that the tab rod is connected to its attachment lugs with bolt Pt.No.EA1.31.65, and that no load is placed on the operating rod attachment lugs when the nut is tightened, by fitting the plain and shim washers as follows;

4. For the port tab (detail E) the thin plain washer Pt.No.S.P.15/C and shim Pt.No.EA1.31.277 must be positioned between the ball race and the outboard bracket, and the plain washer Pt.No.S.P.16/C between the nut and the inboard bracket. For the starboard tab (detail D) the thin plain washer must be positioned between the ball race and the outboard bracket, the shim between the ball race and the inboard bracket and the other plain washer between the nut and the inboard bracket. Lock the nut with a new split pin. It may be necessary to tap the bolt through the ball race in the tab operating rod; the tapping must be as light as possible to avoid any possibility of fracturing the attachment lugs.

5. To ensure correct adjustment of the starboard tab the connecting screw (details B and C) must be screwed into the operating lever and the operating rod simultaneously.

6. After fitting a new elevator, the clearance between the elevator horn and the tail plane must be checked (fig.12).

7. After fitting a new tab to the elevator, the clearance between the outboard end of the tab and the elevator must be checked (fig.12).

Note . . .

A flight trim check must be made whenever an elevator or elevator tab is removed and replaced or adjusted (Sect.3, Chap.4, Appendix 1). ▶

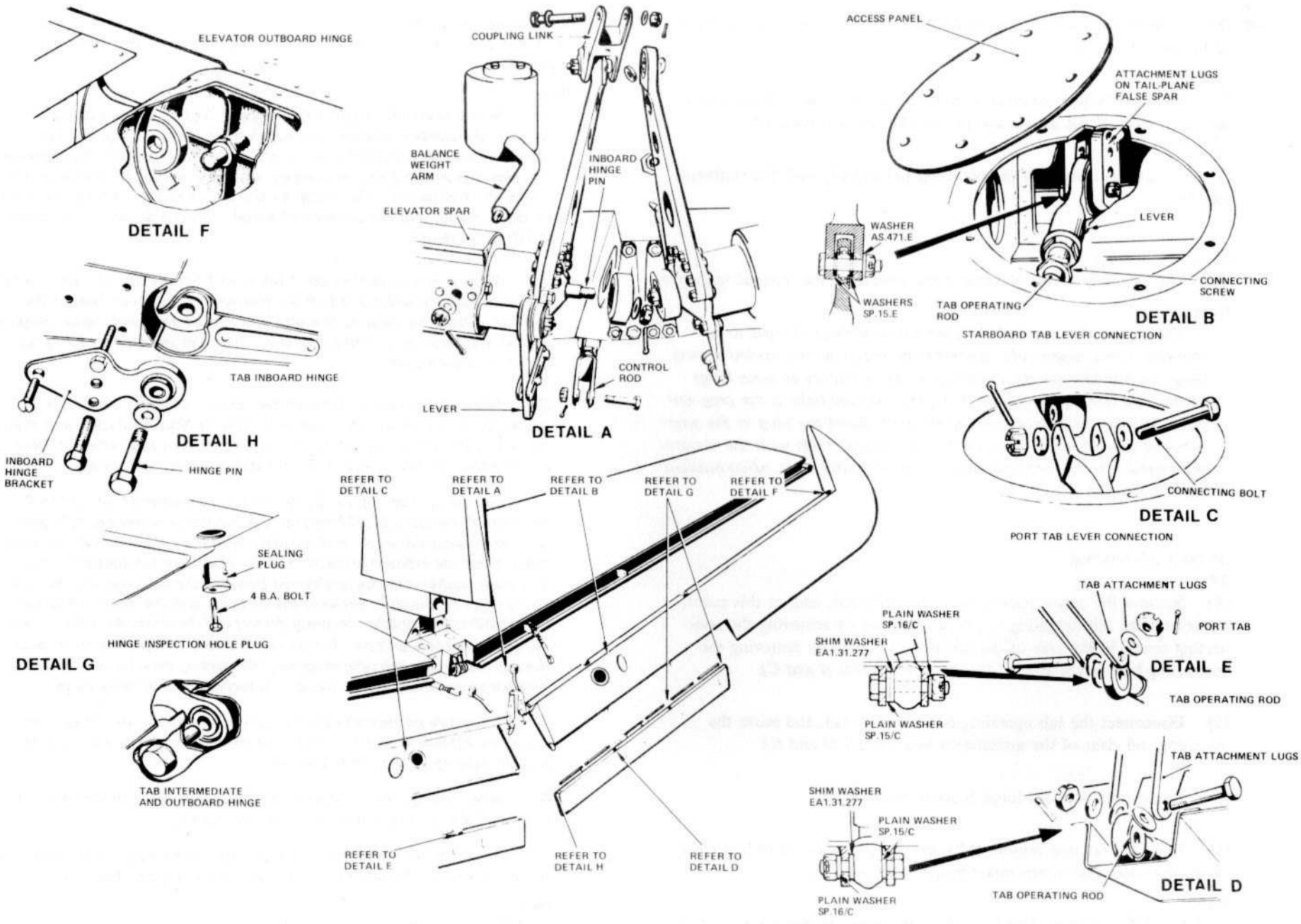


FIG. 8. ELEVATOR AND ELEVATOR TAB REMOVAL

◄ ANNOTATIONS ADDED ►

◀ **Rudder and rudder spring tab** *(fig.9)*

Rudder removal

19.

(1) Remove the two spring loaded plugs, port and starboard, by screwing into each a 4 B.A. bolt and pulling outwards. Attach a rudder sling *(Sect.2, Chap.4, Table 1)* through the rudder at this point.

(2) Remove the cover plates at the base of the rudder, and the access panels at the base of the fin.

(3) Disconnect the control rod from the main operating lever *(detail B)*.

(4) Disconnect the electrical cables from the rudder tab electrical actuator.

(5) Turn the rudder to port and remove the port closing plate.

(6) Turn the rudder to starboard and remove the starboard closing plate.

(7) Remove the circular access panel on the port side of the rudder stub.

(8) Remove the split pin, nut and washer from the lower hinge.

(9) Turn the rudder to port and remove the three bolts from the port side of the upper hinge plate.

(10) Turn the rudder to starboard and remove the three bolts from the starboard side of the upper hinge plate. The rudder is then free to be removed by lifting.

Note . . .

Care must be taken when lifting the rudder to ensure that the lower mass-balance weight does not foul the underside of the fin trailing edge.

Rudder assembly

20. The assembly of the rudder is the reverse of the removal sequence.

Note . . .

Lubricate the lower hinge bracket in the fuselage with grease as detailed in the note following para.1.

After assembling a rudder refer to fig.12 and check the clearances

(1) Between the top of the fin and the rudder horn.

(2) Between the base of the rudder and the rudder stub.

If these clearances are not obtained, remove the shim Part No.EA1.12.201 situated between the rudder lower bearing housing and the stub, and substitute a solid packing of the same overall dimensions and material (L.73) but of a thickness between 17 s.w.g. and 12 s.w.g. as required.

(3) When fitting a new rudder, it is permissible to reduce the 0.50 in. depth of either trailing-edge spoiler to suit the characteristics of the aircraft.

Note . . .

The amount of spoiler strip remaining must not be less than 0.25 in.

Rudder spring tab removal

21.

(1) Remove the rudder tab actuating rod cowl.

(2) Remove the split pin, nut and washer from the bolt attaching the control rod to the lugs on the tab spar, and remove the bolt *(detail A)*.

(3) Remove the three 2 B.A. bolts attaching the rudder hinge bottom bracket to the rudder.

(4) Remove the tab from its hinges by lowering it slightly and moving it outwards.

Note . . .

If a new tab is to be fitted, remove and retain the hinge pin from the hinge bracket. Upon reassembly, the hinge pin is to be wire-locked.

Rudder spring tab assembly

22. The assembly of the rudder tab is the reverse of the removal sequence. After fitting a new rudder tab, refer to fig.12 and check the clearances.

(1) Between the top of the tab and the rudder.

(2) Between the bottom of the tab and the rudder stub.

Note . . .

An additional axial tab movement of 0.02 in. in respect of these dimensions is permissible. ▶

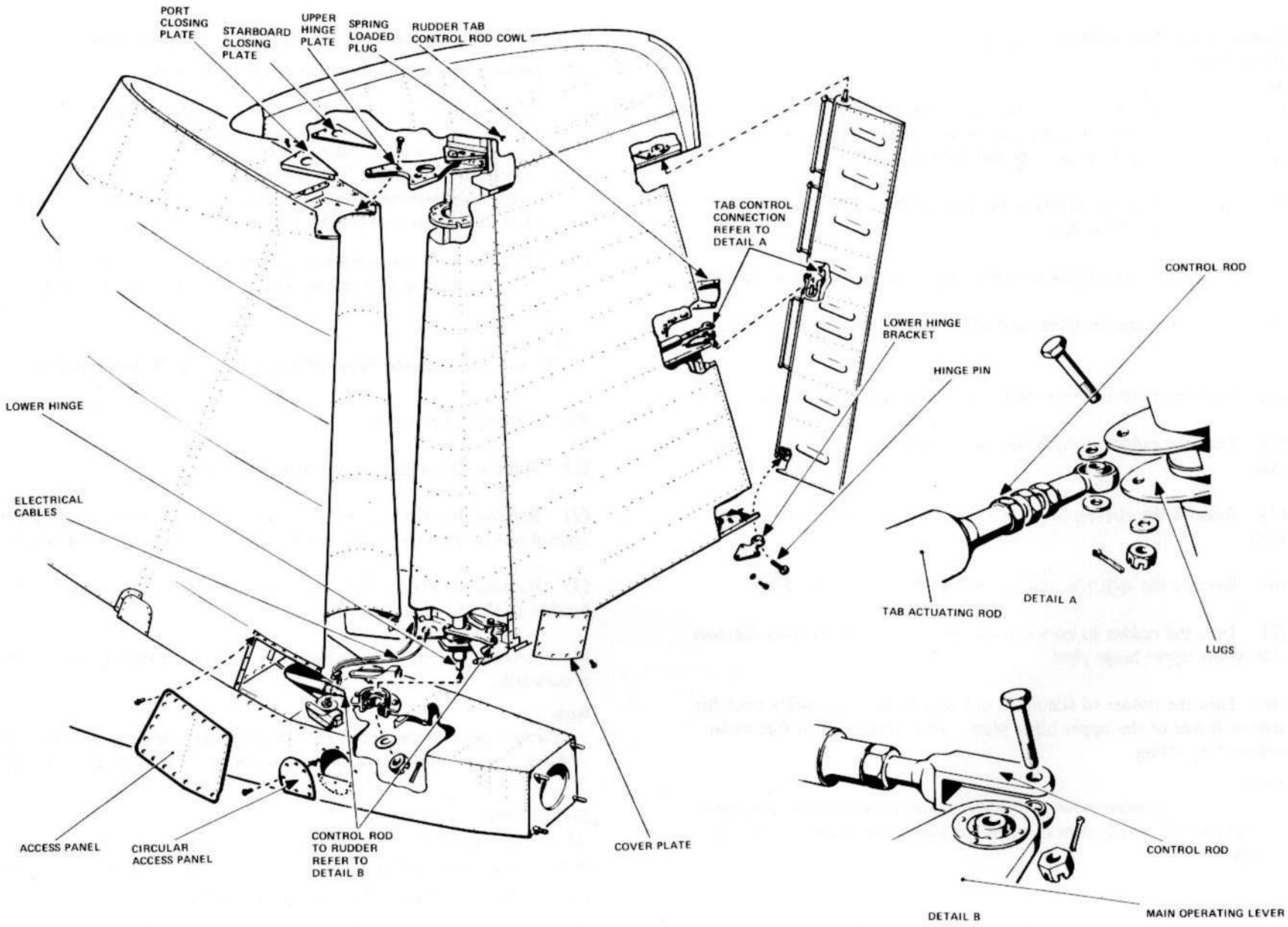


FIG. 9. RUDDER AND RUDDER SPRING TAB REMOVAL

◀ANNOTATIONS ADDED▶

◀ **Fin** *(fig.10)*

Removal

23.

(1) Remove the rudder *(para.19)*.

(2) Disconnect aerial connections where fitted and withdraw cables from fin.

(3) Remove the leading edge cover plate and remove the six 2 B.A. bolts securing the forward attachment former to the stub angle pieces.

(4) Remove the ten 2 B.A. bolts attaching the rear diaphragm to the stub angle piece.

(5) Remove the one-hundred-and-two 2 B.A. countersunk bolts attaching the fin skin to the skin of the fin stub.

(6) Remove the cover plates from each side of the fin.

(7) Remove the port and starboard bolts securing the fin post lugs to the fin attachment lugs.

(8) Remove the fin.

Note . . .

The fin may be slung by removing the fabric patch from each side of the fin and passing a sling through the fin at this point.

Assembly

24.

(1) Offer up the fin and pass the coaxial cable if fitted through the conduit *(fig.3)*. Connect the cable, and other aerials as fitted.

(2) Insert the port and starboard bolts. Do not tighten them.

(3) Secure the forward attachment former to the stub angle piece using the six 2 B.A. bolts.

Note . . .

When fitting a new fin it will be necessary at this stage to mark off and remove the fin for drilling, dimpling and trimming.

(4) Secure the rear diaphragm to the stub angle piece using the ten 2 B.A. bolts.

(5) Secure the fin skin to the skin of the fin stub using the one-hundred-and-two 2 B.A. countersunk bolts.

(6) Screw home the port fin post lug attachment bolt. Do not overtighten.

(7) Screw home the starboard fin post lug attachment bolt to a point where the nut is drawn against the inboard lug of the fin post, and obtain a clearance of 0.0015 in. between the head of the bolt and the lug.

(8) Fit the access panel and cover plate.

(9) Fit the rudder *(para.20)*. ▶

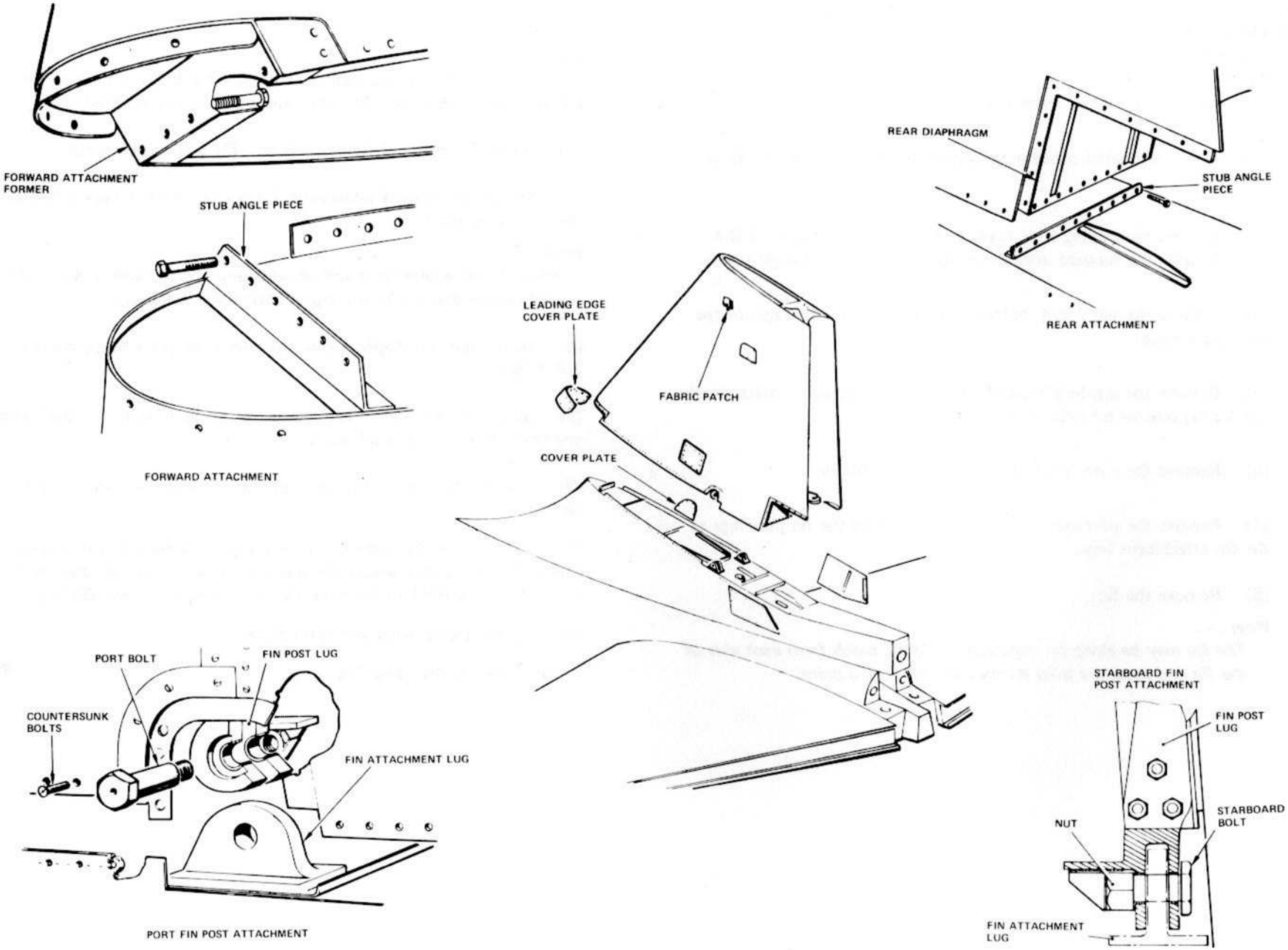


FIG.10. FIN — REMOVAL AND ASSEMBLY

◄DETAIL DELETED AND ANNOTATIONS ADDED►

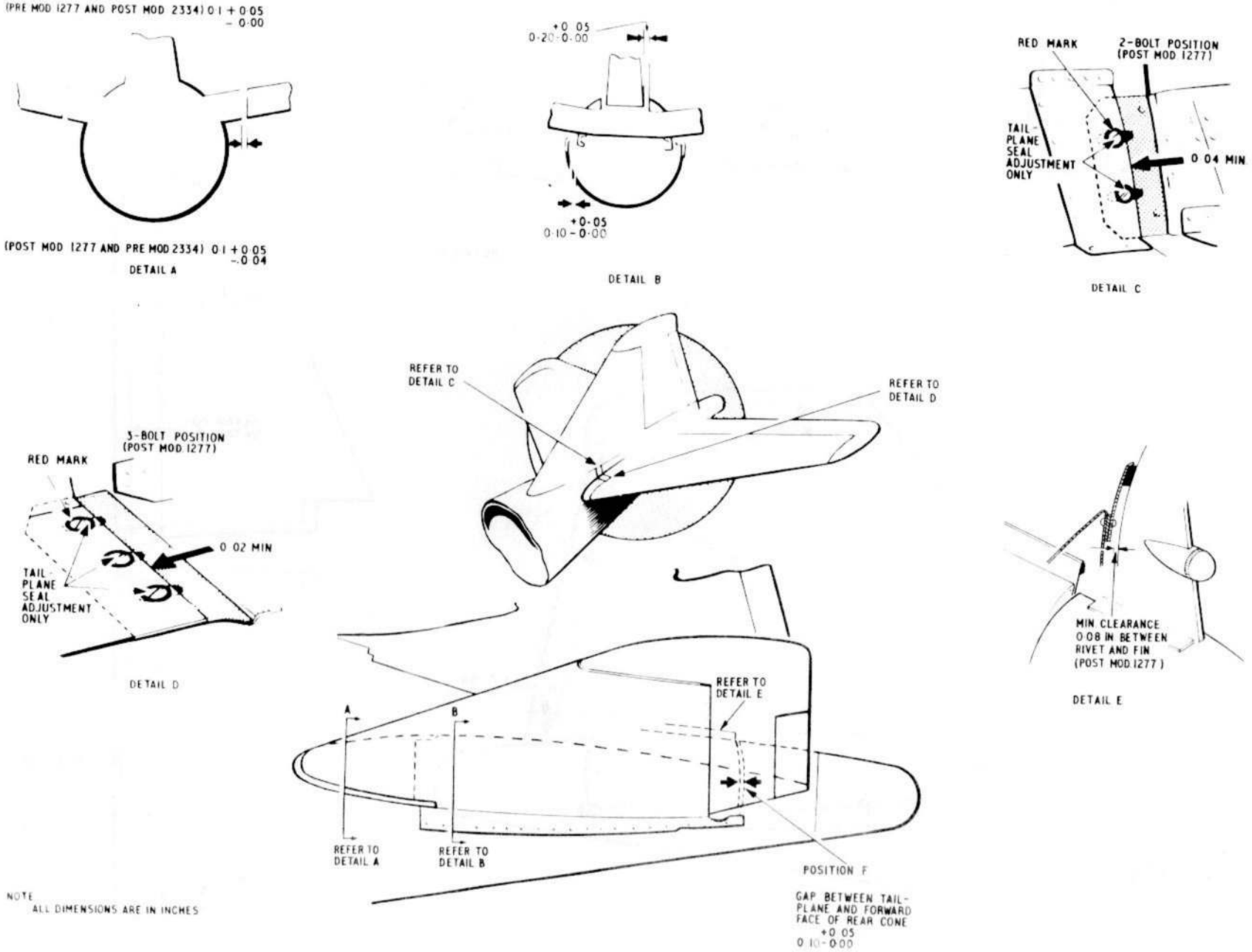


FIG.11. TAIL PLANE CLEARANCES

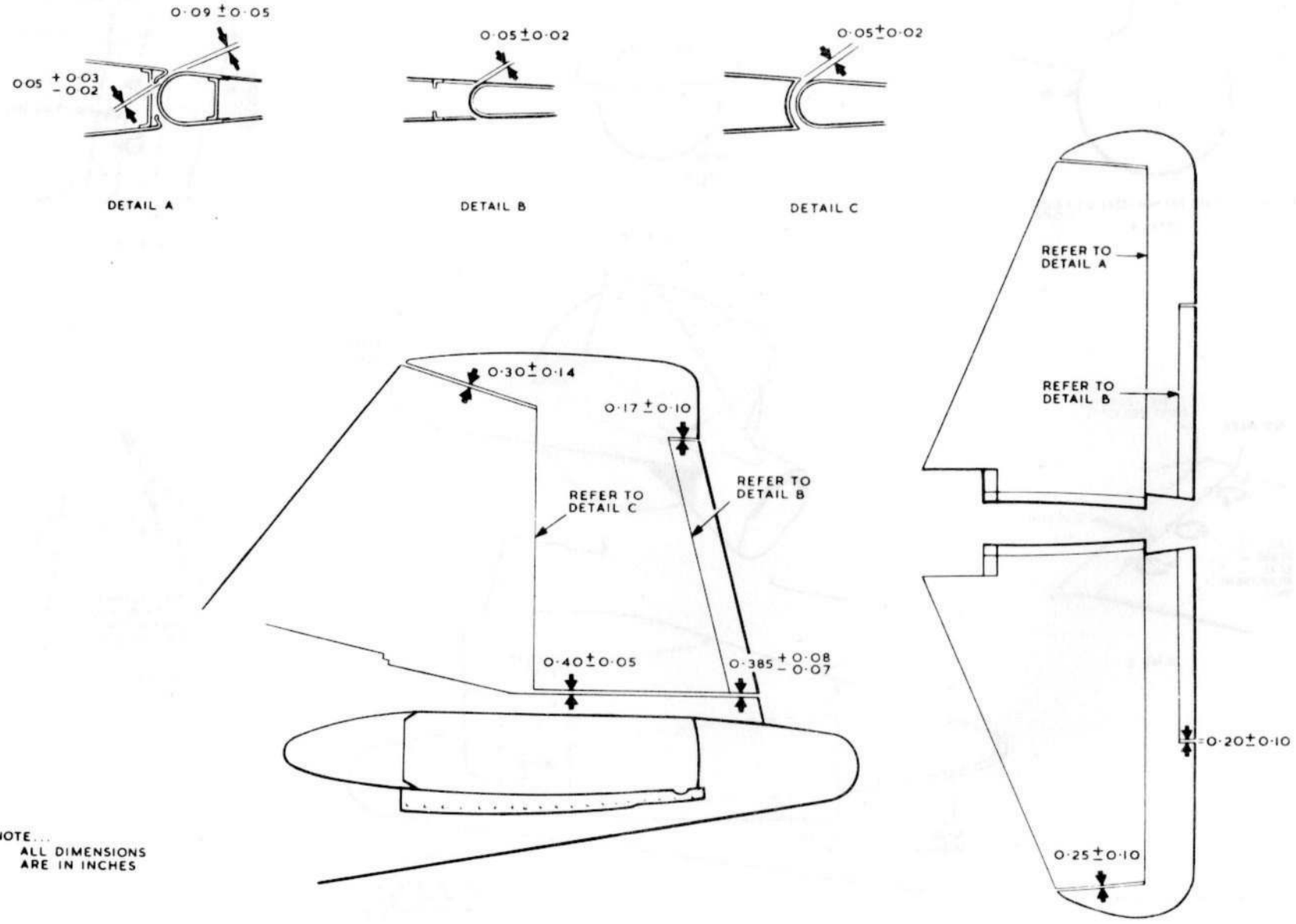


FIG.12. FIN, RUDDER AND ELEVATOR CLEARANCES

Chapter 4 FLYING CONTROLS

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DESCRIPTION

General information

1. The flying controls are conventional in operation, the control runs consisting of push-pull rods and levers, with adjustable ends fitted to the rods on each control run. Tabs in the trailing edges of the ailerons port elevator, and rudder are operated automatically through torque tubes and blow-back rods incorporated in the structure of the control surfaces. The starboard elevator tab operates as a balance tab, and can only be set on the ground. Trim strips are fitted to the trailing edges of the elevators and these are adjusted to the specifications in the Appendix of this chapter. The upper trailing edge of the rudder is fitted with spoilers which may be adjusted if necessary to suit the characteristics of individual aircraft; they are preset by the manufacturer and should not normally require alteration. Each aileron is fitted with a fixed trim strip which can be adjusted on the ground as detailed in para.21. An electrical control permits the rudder tab to be used additionally as a trim tab in flight. Trim tabs are not fitted to the ailerons, but aileron bias is provided which is effected electrically by a bias actuator mounted beneath the pilot's floor. The variable incidence tail plane is electrically actuated and controlled; the flaps and air brakes are also electrically controlled, but are hydraulically operated.

Control column *(fig.1)*

2. The control column, situated on the port side of the cabin centre line, is a tubular member which moves fore-and-aft on its support housing under the cabin floor. At this housing it is coupled with a tubular shaft running laterally outboard to a bracket on the port side; a lever attached to the end of this shaft is connected to the elevator control run. Forward of this lever is a shorter lever connected to the snatch rod of the snatch unit *(Sect.3, Chap.11)*. At its upper end the control column carries a horn-type control wheel, the shaft of which passes into the interior of the column where a bevel gear, integral with the shaft, meshes with a toothed segment at the top of the torque tube contained within the control column. The torque tube is supported in a bearing at the upper end of the column, and terminates at its lower end in a universal joint, which links it with a short shaft carried in the support casting; a lever at the end of this shaft is connected with the aileron control run. Mounted on the control hand-wheel are the wheel brakes operating lever, the air brakes selector switch, and various other switches *(fig.1)*.

Rudder bar

3. The rudder pedals are fitted at each end of a centrally-pivoted horizontal cross-tube, and are fitted with alignment linkage giving them parallel fore-and-aft movement. The cross tube is attached to a short vertical torque tube which protrudes through the pilot's floor, and is linked to an adjusting screw mechanism by which the pedals can be set to suit the pilot's leg reach. Movement of the rudder pedals is transmitted via the torque tube and a horizontal lever at the bottom of the tube, to a push-pull rudder control rod. Attached to this horizontal lever is a connecting rod to the brake relay control valve, which controls differential braking *(Chap.6)*. The movement of the rudder pedals is limited by two adjustable stops in the pressure box on the pressure bulkhead acting on the control lever *(fig.3)*.

Aileron control

4. The movement of the aileron is controlled by the control column hand-wheel, movement of which rotates the inner torque tube of the control column, and the aileron control lever at its lower end converts the rotary movement into a fore-and-aft movement which is transmitted to the ailerons by push-pull rods and levers. Attached by a tension spring to the aileron lever at the control column base is the bias actuator *(para.9)*. From the aileron control lever at the base of the control column the control passes aft along the port side of the cabin to the inboard one of three levers mounted in the pressure box just aft of the pressure bulkhead. The control run continues from this lever through the port equipment compartment and along the bomb bay roof to just aft of the main spar where, via a bell-crank lever, the controls enter the main planes. Here further bell-crank levers connect the control rods to the aileron levers. The control rods are carried along the fuselage by roller guides and are supported in the main planes by the bell-crank and aileron levers. Adjustable stops are provided at the pressure box on the pressure bulkhead in line with the aileron lever, these limit hand-wheel movement, while the control surface movement is limited by stops at the aileron inboard hinges.

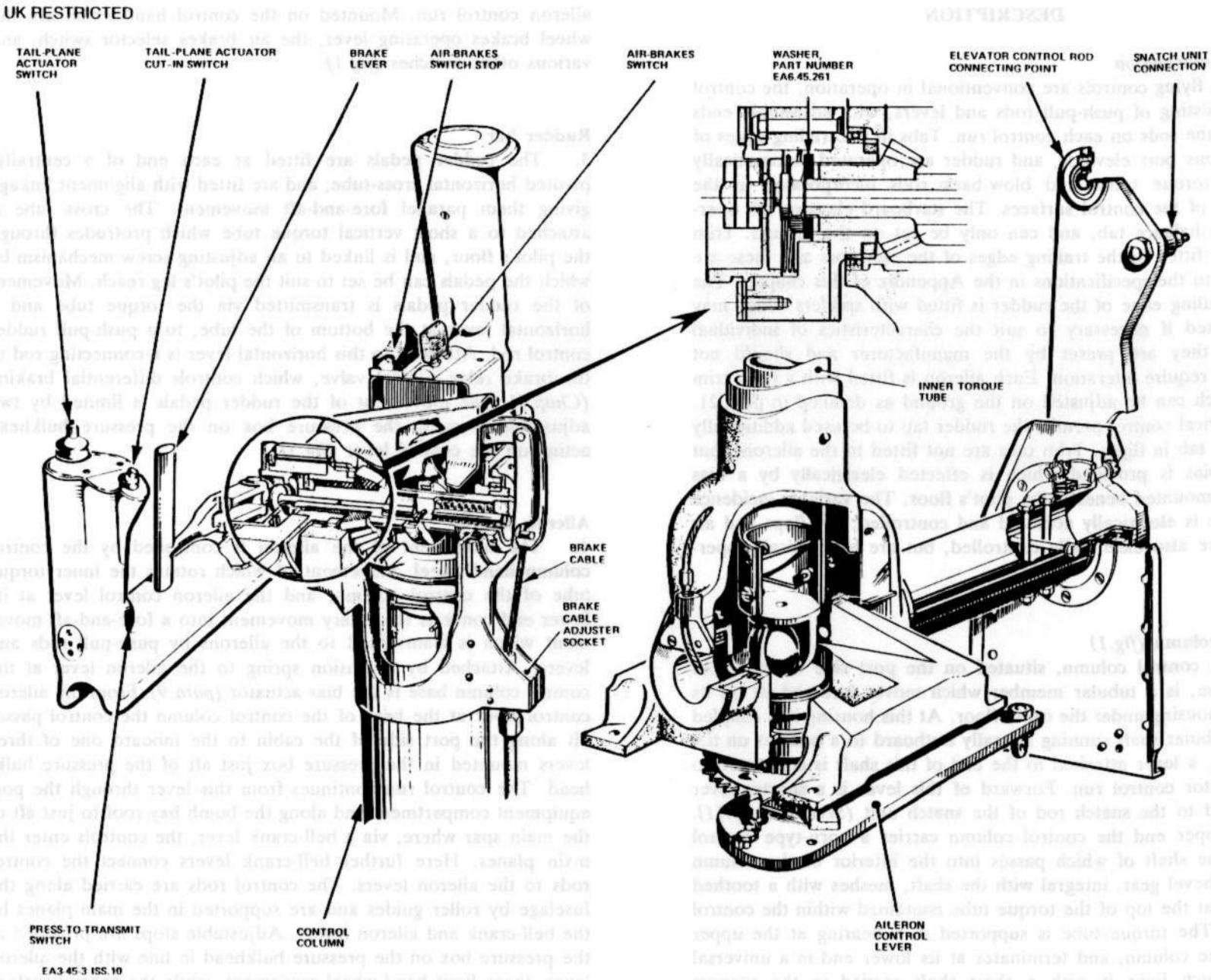

FIG. 1. CONTROL COLUMN

◀ BRAKE CABLE AND SOCKET ANNOTATED ▶

Elevator control

5. The elevators are controlled by a fore-and-aft movement of the control column, this movement being transmitted, by a lever attached to the outboard end of the lateral tube at the bottom of the control column, to the port elevator by push-pull rods and levers. From this control lever, the control rod passes aft, along the port side of the cabin to a lever mounted at frame 6, which reverses its movement, then on to the outboard one of the three levers mounted in the pressure box just aft of the pressure bulkhead. The control continues from this lever through the equipment compartment, along the roof of the bomb bay and through the rear fusleage, to a lever on the bulkhead at frame 42. The port elevator lever is connected to the lever by a further control rod, and the port and starboard elevators are connected together by a coupling link joining the levers on the inboard ends of both elevator spars. The control rods are carried in Fairey roller guides suitably positioned in the fuselage structure, and are provided with couplings at the fuselage transport joint positions. Adjustable stops, located at the pressure box on the pressure bulkhead in line with the elevator lever, limit control column movement, and adjustable control surface limit stops are provided at the starboard elevator link lever.

Rudder control

6. The rudder is controlled by movement of the rudder pedals, this movement being transmitted to the rudder by a horizontal lever at the bottom of the rudder torque shaft, and push-pull rods and levers. From the rudder torque rod lever, the control rod passes aft along the port side of the cabin, to the centre one of the three levers mounted in the pressure box just aft of the pressure bulkhead. The control run continues from the pressure box lever through the equipment compartment, along the roof of the bomb bay and through the rear fuselage to the lower end of a lever on the bulkhead at frame 42. From the opposite end of this lever, a further control rod is connected to a lever at the bottom of the rudder. The control rods are carried in Fairey roller guides, suitably positioned in the aircraft structure, and are provided with couplings at the fuselage transport joint positions. Adjustable stops located at the pressure box on the pressure bulkhead in line with the rudder lever, limit rudder bar movement. The rudder movement is limited by rubber stops at its lower hinge.

Pressure box *(fig.3)*

7. The point at which the flying controls pass through the pressure bulkhead is called the pressure box. The box is of reinforced alloy construction and is bolted, over a rubber pressure seal, to the pressure bulkhead. On entering the pressure box from the cabin the flying control rods connect to the lower attachment points of individual, centrally pivoted levers, which are pressure sealed about their pivot points. The upper portion of the three levers connect to the control rods which continue through the port equipment compartment. Stop bolts, mounted on two channel section members, act on the levers in the pressure box and limit the movement of the pilot's controls: these stops are adjustable, and the correct dimensions and method of setting is given in the relevant control rigging diagram and paragraph.

Tail plane incidence control

8. The variable incidence tail plane is hinged at its main spar centre section on two brackets attached to the rear fuselage at frame 42; at its false spar, near the trailing edge, is connected to the rear fuselage by an electrical actuator. The actuator forms a strut between the tail plane and fuselage, the length of which may be varied in flight under the control of the pilot; extension of the actuator decreases the tail plane incidence. It is controlled by a three-position switch on the right handgrip of the control column hand-wheel *(fig.1)*. A cut-in switch mounted on the same handgrip has first to be depressed before electrical power is supplied to the actuator.

Aileron bias control *(fig.2)*

9. Aileron trim is effected by a bias gear connected to the aileron control lever at the lower end of the control column, there being no independent aileron trim tab. The gear is operated by an electrical actuator which at one end is attached to a floor member, and at the other to a bias actuator lever pivoted on a floor member adjacent to the control column. A bias spring lever, integral with the bias actuator lever, is connected to the aileron control lever at the lower end of the control column by a tension spring. The relationship of the two levers is such that when the actuator is at its mid position, i.e. half extended, the spring is at its minimum tension when the control hand wheel is at neutral, and an equal

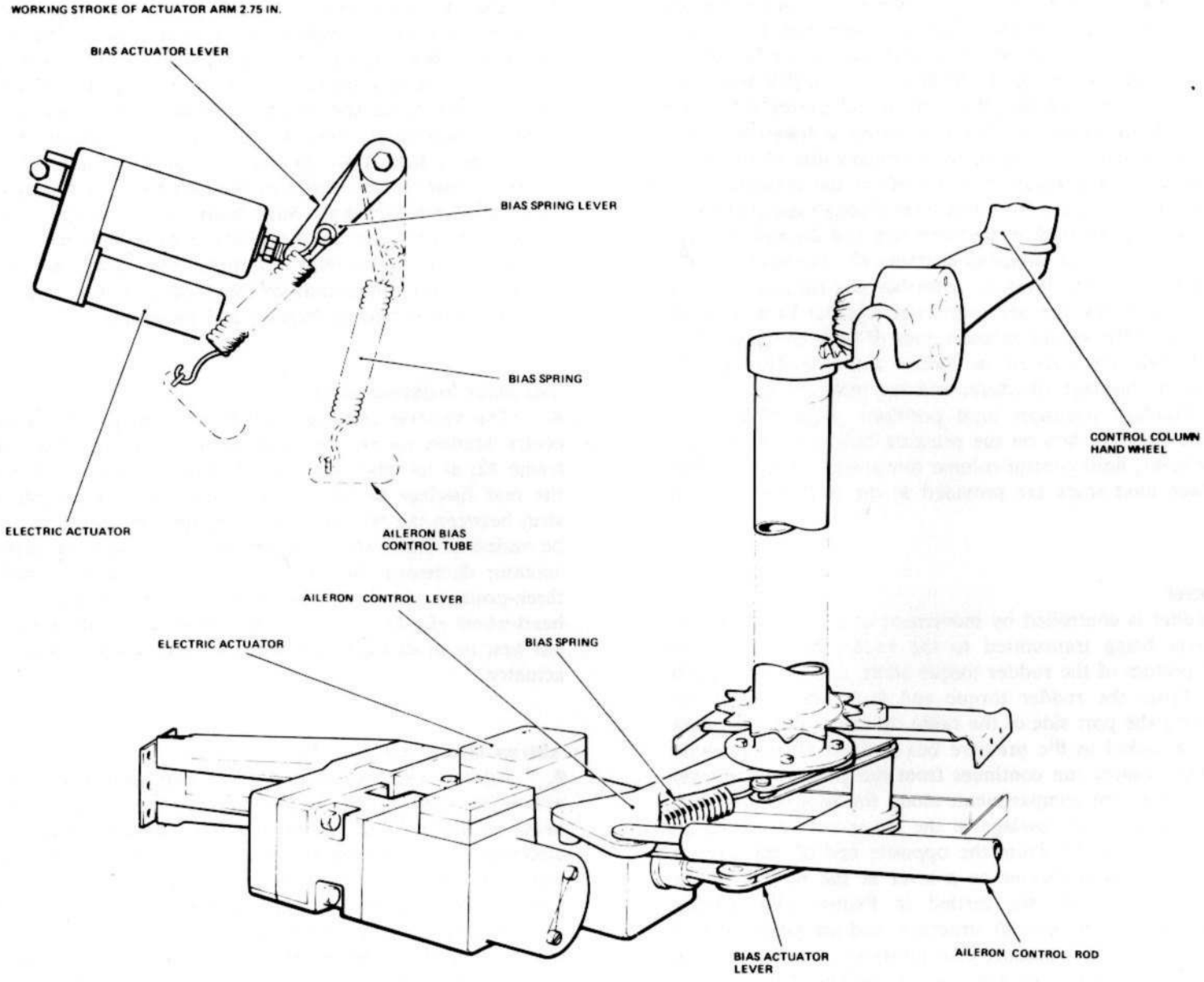

FIG. 2. AILERON BIAS CONTROL

load will be applied to the control when the hand wheel is moved to port or starboard. Operation of the actuator either in or out, will increase the effect of the spring on one direction and decrease it in the other, and bias the control accordingly. The actuator is controlled by a spring-loaded centre-off position switch on the pilot's console, and an aileron trim indicator operated by the movement of the actuator, is mounted on the instrument flying panel.

Spring tab mechanisms

10. The rudder, port elevator, and both ailerons are fitted with spring tabs complete with blow-back rod and torque tube mechanisms, which, in addition to their normal function when operated by the flying controls, have an entirely separate automatic operation. Their normal function is to relieve the pilot of heavy physical loads on the controls, normally occasioned by major changes of direction at high speed; their automatic operation prevents the application of excessive control surface movement. With the exception of the rudder mechanism, which is fitted with two concentric torque tubes and has, in addition, electrical trim actuation, the mechanisms differ only in size. The double torque tubes on the rudder mechanism act as one tube, but as they tend to make it appear slightly more complicated than those fitted for the aileron and elevator tabs, the rudder mechanism will be described in full. The description however, is equally applicable to all three.

Rudder spring tab mechanism *(fig.4)*

11. During normal flight the electrical actuator acts as a strut with fixed centres anchoring the actuator lever to the rudder structure through the mass balance arm. The actuator's function when used as a strut with variable pin centres is described in para.16.

12. Consider a normal turn to starboard. The pilot pushes on the starboard rudder pedal and the control rod moves aft, rotating the rudder control lever in a counter-clockwise direction. The torque applied by the main operating lever is transmitted through the inner and outer torque tubes to the actuator lever which, through the actuator, moves the rudder over to starboard. Assuming that there is no air load on the rudder and that the rudder hinges are frictionless, the actuator lever and consequently the rudder will rotate through the same angle as the main operating lever. During flight, the air load on the rudder resists rudder rotation, and since the torque tubes are torsion springs, they twist under the pilot's effort; consequently the main operating lever moves through a greater angle than the actuator lever and the rudder. The main operating lever has now rotated in a counter-clockwise direction relative to the rudder, as has also the tab-actuating lever, due to the rotation of the blow-back rod which, at its lower end, is attached to the main operating lever. This rotation of the tab-actuating lever is transmitted to the tab by the tab-actuating rod and moves the tab to port; the air load on the tab then moves the rudder to starboard.

13. In addition to its function as a driving shaft between the main operating lever and the tab-actuating lever, the blow-back rod has a safety role. The maximum movements of the rudder and tab, as regulated by their stops, are required for control at low speeds. If it were possible for the pilot to move the rudder through these maximum angles at high speed, prohibitive loads would be imposed on the aircraft structure. In flight, the angle of the rudder is determined by the angle of the tab, so that by restricting the tab movement during high speeds excessive loads on the structure are avoided. This restriction of tab movement is imposed by the blow-back rod, which under the influence of the high air load imposed by the application of large tab angles at high speed, twists in the direction opposite to that applied by the pilot to the main operating lever, with consequent reduction of tab and rudder angles. A stop bolt, attached to the rudder spar, operates in the slot in the conrol lever in order to prevent the pilot applying excessive twist to the torque tubes. In flight, when the main operating lever is moved relative to the rudder and so moves the tab, one end of the slot will momentarily approach the stop bolt but the applied tab will cause the rudder to turn in the same direction as the main operating lever and the bolt will move away from the end of the slot.

Aileron spring tab mechanism *(fig.5)*

14. The spring tab blow-back rod and torque tube mechanism is mounted laterally, forward of the aileron spar. The operation of the mechanism is similar to that for the rudder spring tab *(para.11)*.

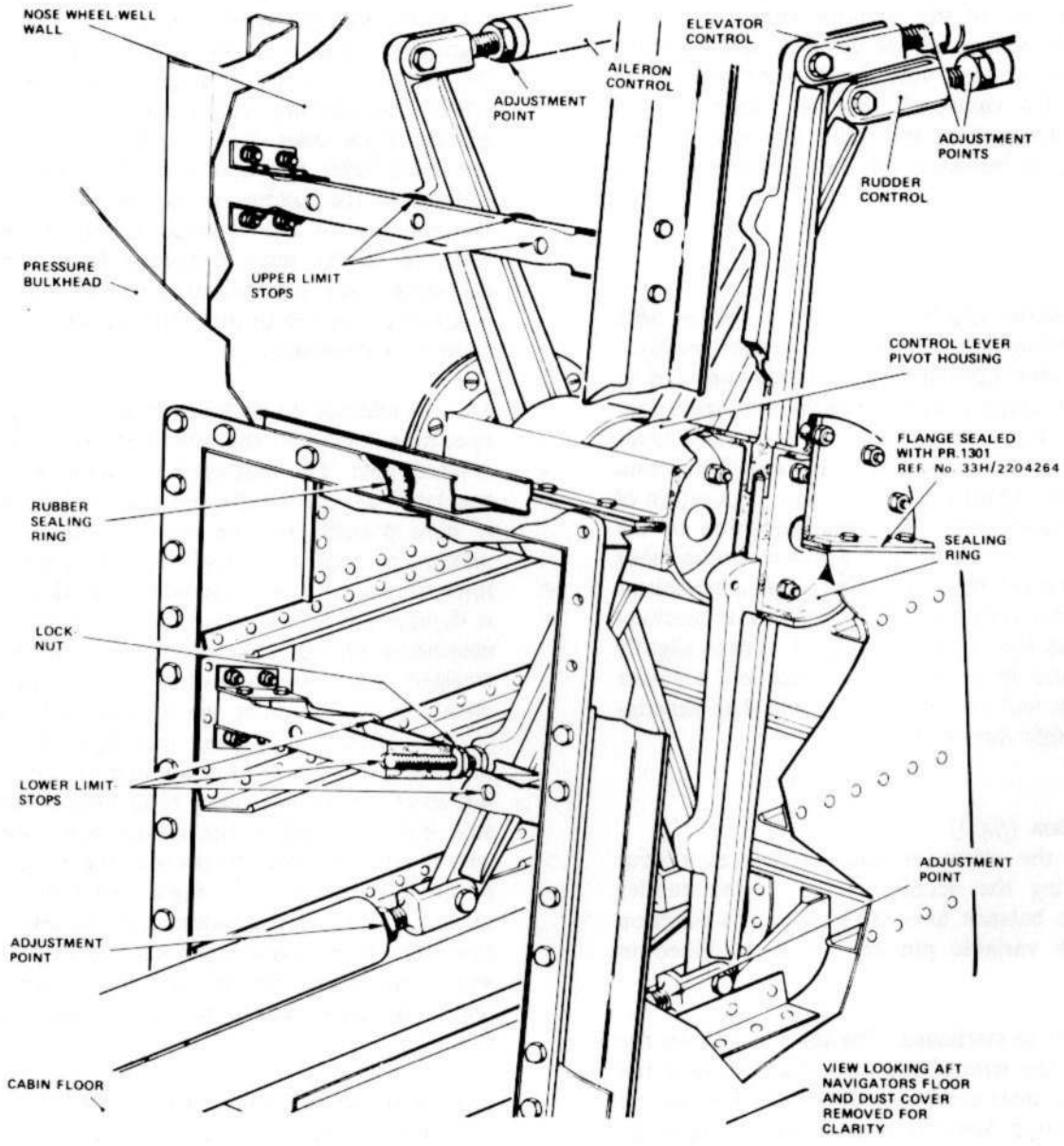

FIG.3. PRESSURE BOX

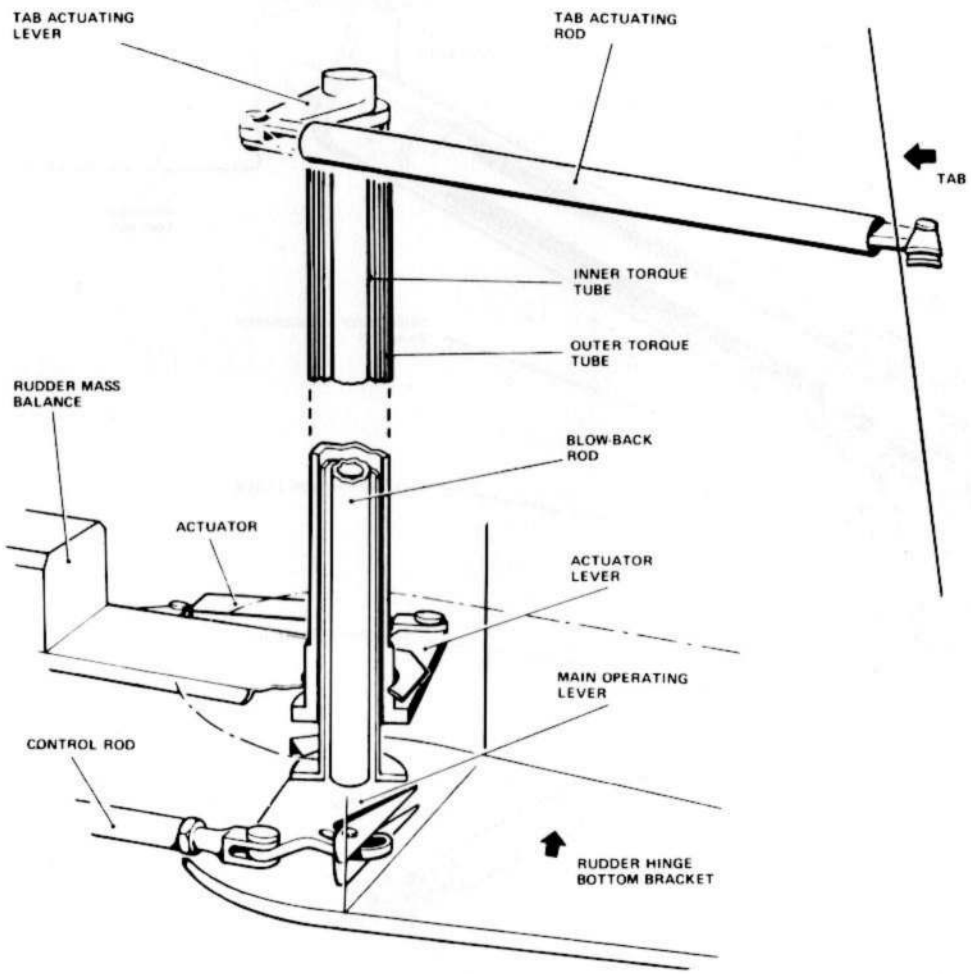

FIG.4. RUDDER SPRING TAB MECHANISM

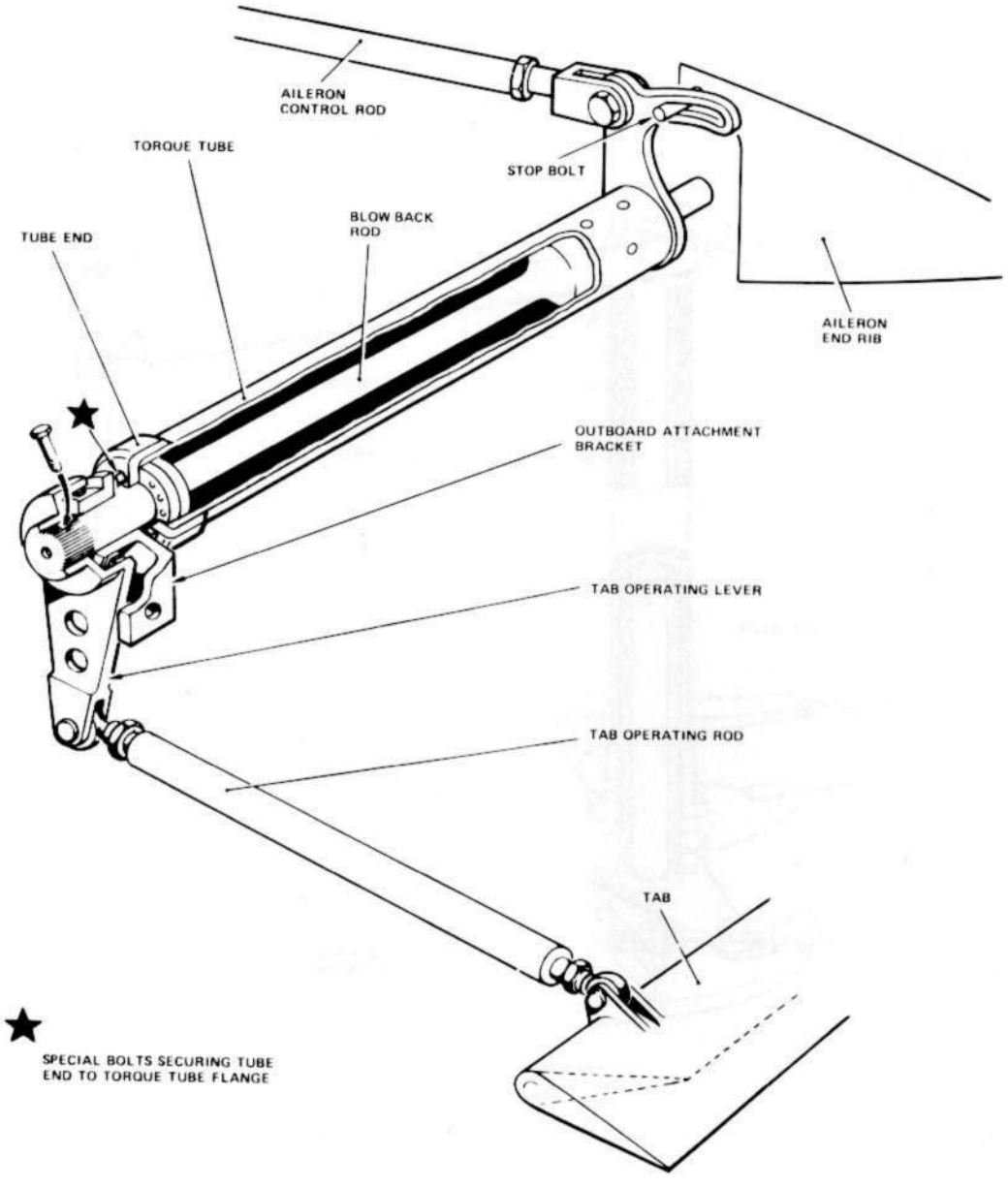

FIG.5. AILERON SPRING TAB MECHANISM

Port elevator spring tab mechanism *(fig.6)*

15. The spring tab blow-back rod and torque tube mechanism is mounted laterally, aft of the port elevator spar. The operation of the mechanism is similar to that for the rudder spring tab *(para.11)*.

Rudder trim actuator

16. The rudder trim tab actuator forms a strut between the outer torque tube of the spring tab mechanism and the mass balance arm at the base of the rudder. Operation of the actuator alters the position of the spring tab mechanism relative to the rudder, and moves the rudder tab to an angle corresponding to the rudder angle required, thus enabling the aircraft to be flown without applying any load at the rudder bar. The RUDDER TRIM L-R actuator switch is located on the pilot's console and a RUDDER TRIM indicator is mounted on the instrument flying panel.

Air brakes control *(fig.7)*

17. Pre Mod.272, two-position air brakes, consisting of 21 finger-type drag channels, are installed in each main plane outboard of the engines and aft of the main spar. In the out position nine of the drag channels protrude through the upper skin surface, and twelve through the lower skin surface of each plane. They are operated by a single hydraulic jack in each main plane and are controlled electrically by a switch on the top of the control column; they have only two positions – IN and OUT. The extent to which the drag channels protrude from the main plane surface is determined by a sleeve fitted to the piston-rod of the operating jack. Aircraft embodying Mod.272 are fitted with three-position air brakes which are similar to the two-position type, except that they have IN, MID and OUT positions, and that the limits of travel are governed by a cam on the starboard jack piston rod and two microswitches attached to the body of the jack, which control a solenoid-operated valve in the circuit. The air brake selector switch incorporates a safety feature to prevent inadvertent selection to the 'full out' position.

Flaps control *(fig.8)*

18. The flaps are operated by four double-ended hydraulic jacks, one jack to each flap. They are controlled electrically by a selector switch mounted on the alighting gear sloping panel.

SERVICING

Controls neutral rigging locks *(fig.9)*

19. Three neutral rigging locks are provided for use when rigging the flying controls. They are:-

(1) *Aileron lock* – The lock is clamped to the control column so that the lock horns contact the underside of the hand wheel.

(2) *Elevator lock* – The lock is clamped to the control column and an adjustable tie-rod terminating in a spade end, passes through the engine starting panel and is locked in position by a quick-release pin.

(3) *Rudder lock* – The lock fits over the rudder bar starwheel spindle and is secured to the pilot's floor by four bolts. The front plate of the lock fits hard against the starwheel, which is prevented from rotating by two bolts protruding through the plate.

Aileron control rigging *(fig.15)*

20. To rig the aileron control:-

(1) Jack and trestle the aircraft laterally and longitudinally level *(Sect.2, Chap.4)*.

(2) Disconnect the aileron control rod *(detail 3, point F)* from the upper end of the lever, and screw back the upper and lower stop screws on the pressure bulkhead. These operations, except for the lower limit stop screw, can be made through the port equipment compartment on the port side of the fuselage. The lower limit stop screw is on the forward face of the pressure bulkhead.

(3) Set the control column hand wheel to its neutral position, i.e. horizontal laterally, using a straight edge and clinometer applied over the top of the hand wheel. Lock the hand wheel in this position *(para.19)*.

Note . . .

Use the same location for the straight edge for all subsequent angular measurements of the hand wheel.

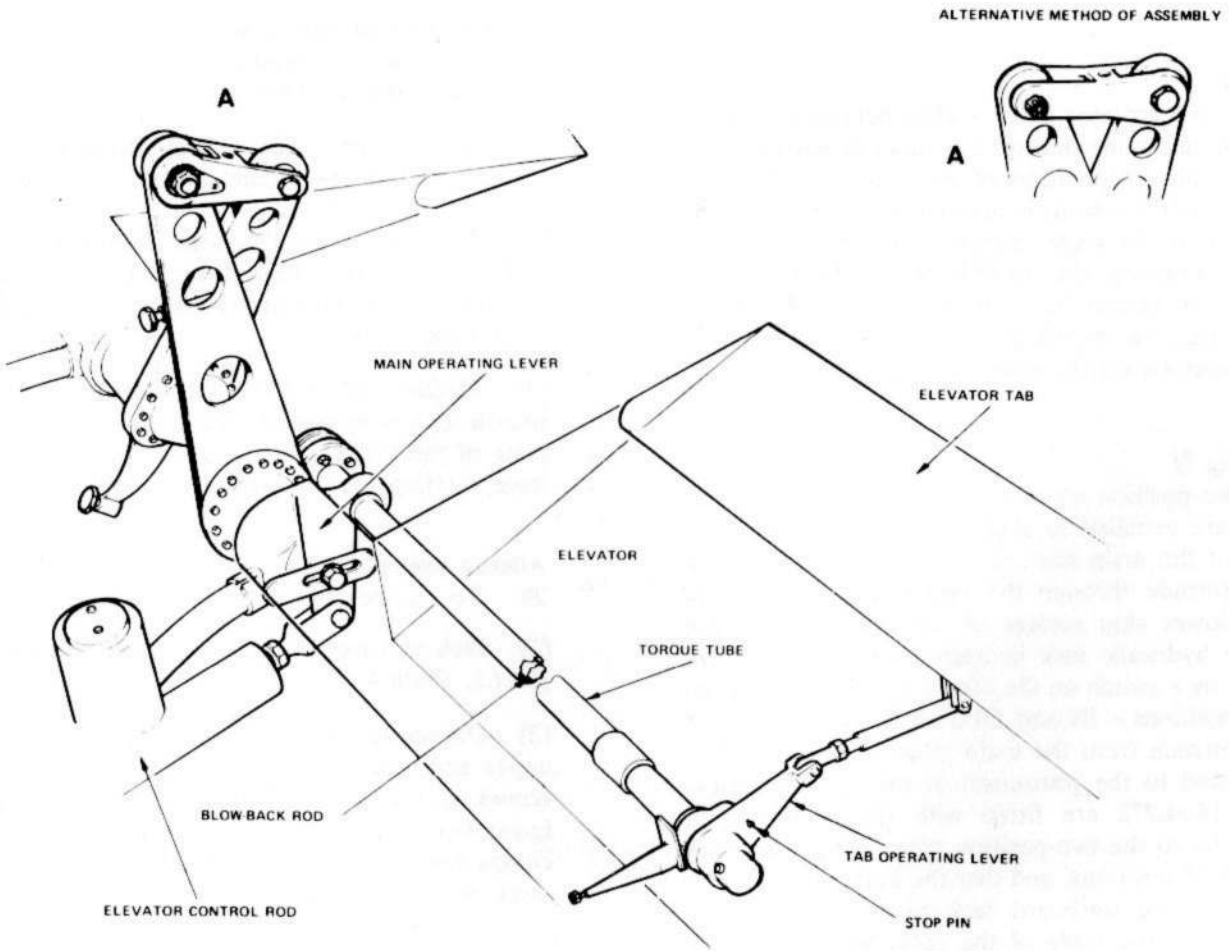

FIG. 6. PORT ELEVATOR SPRING TAB MECHANISM

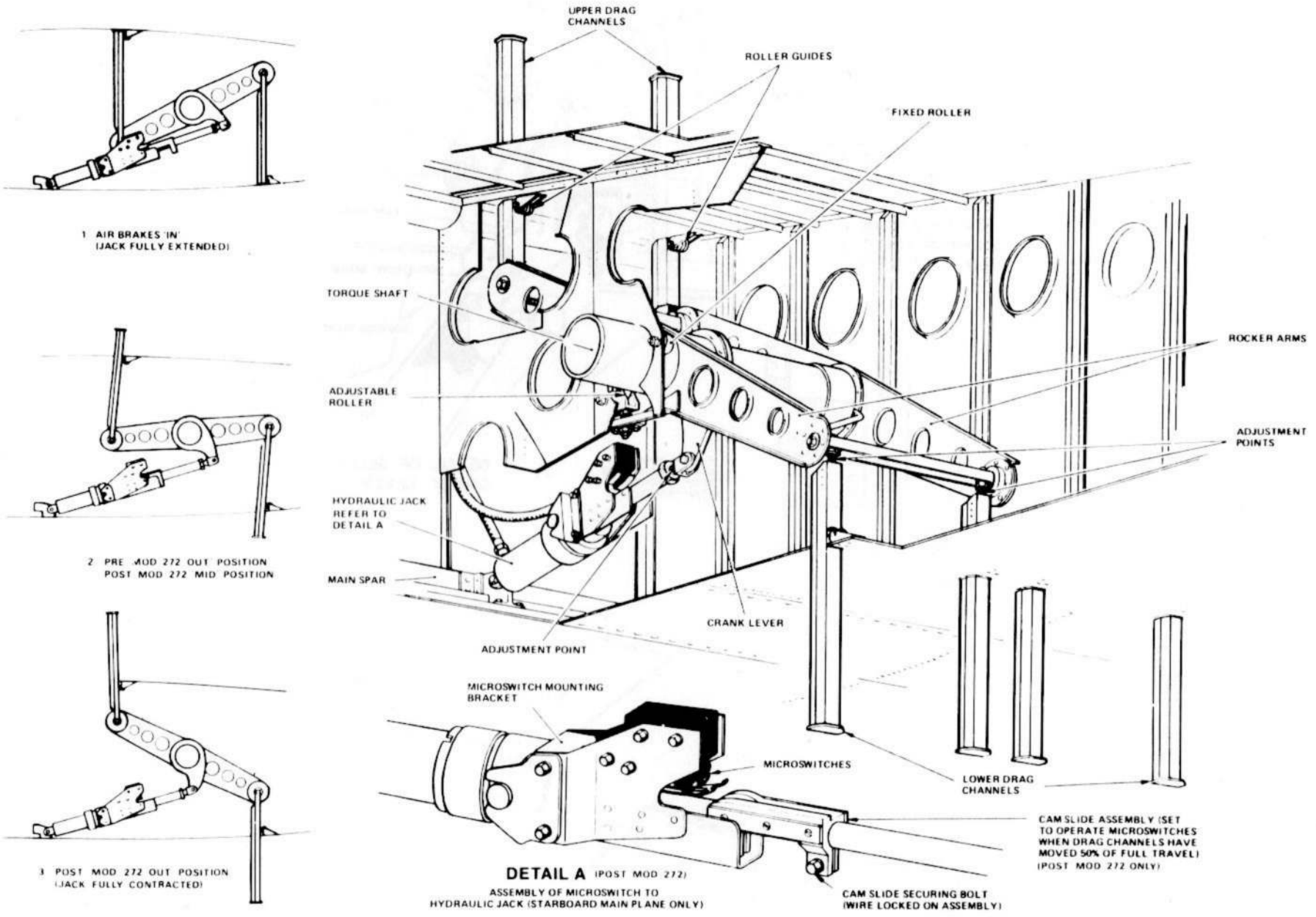

FIG.7. AIR BRAKES CONTROL

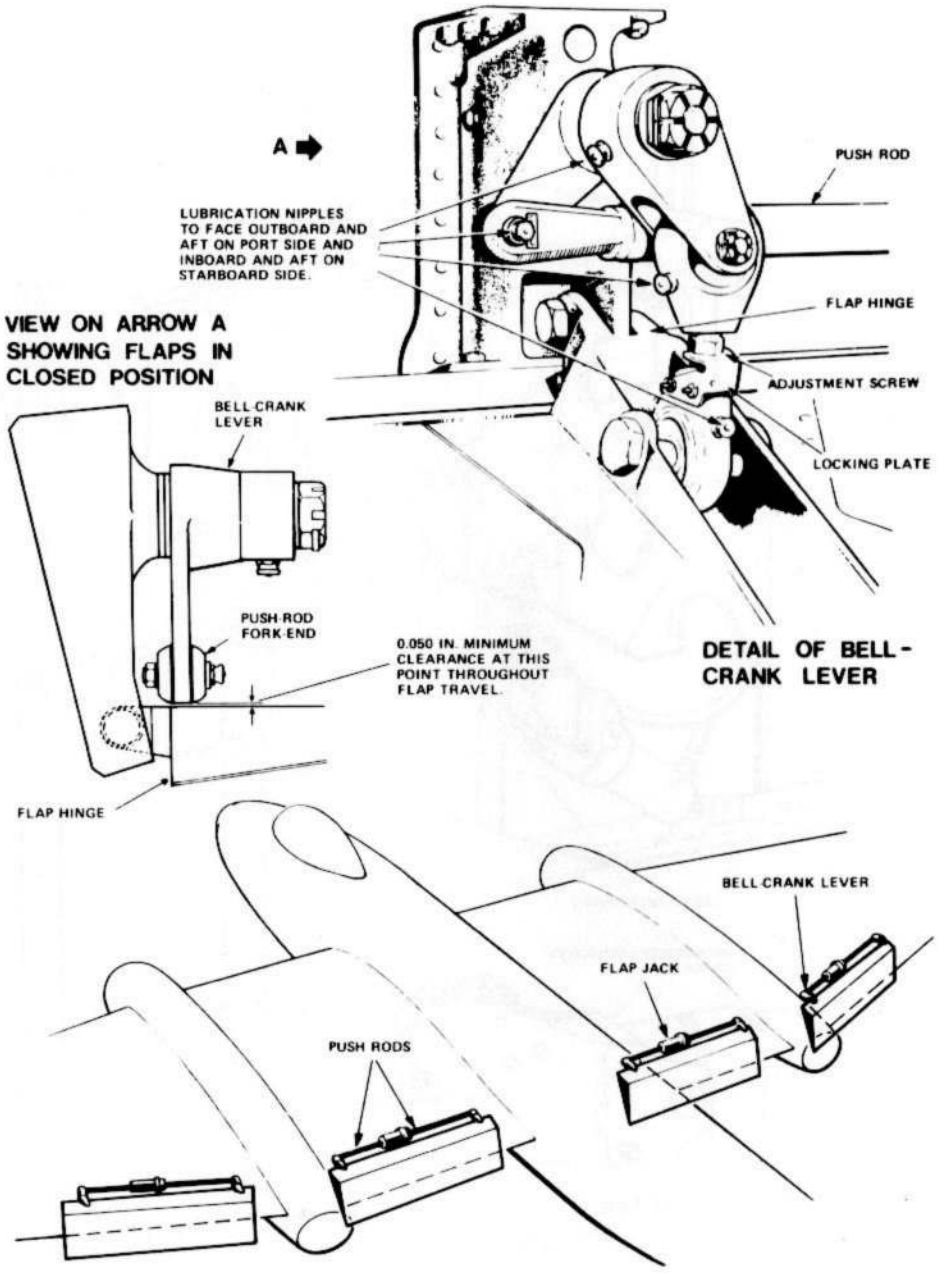

FIG.8. FLAPS CONTROL

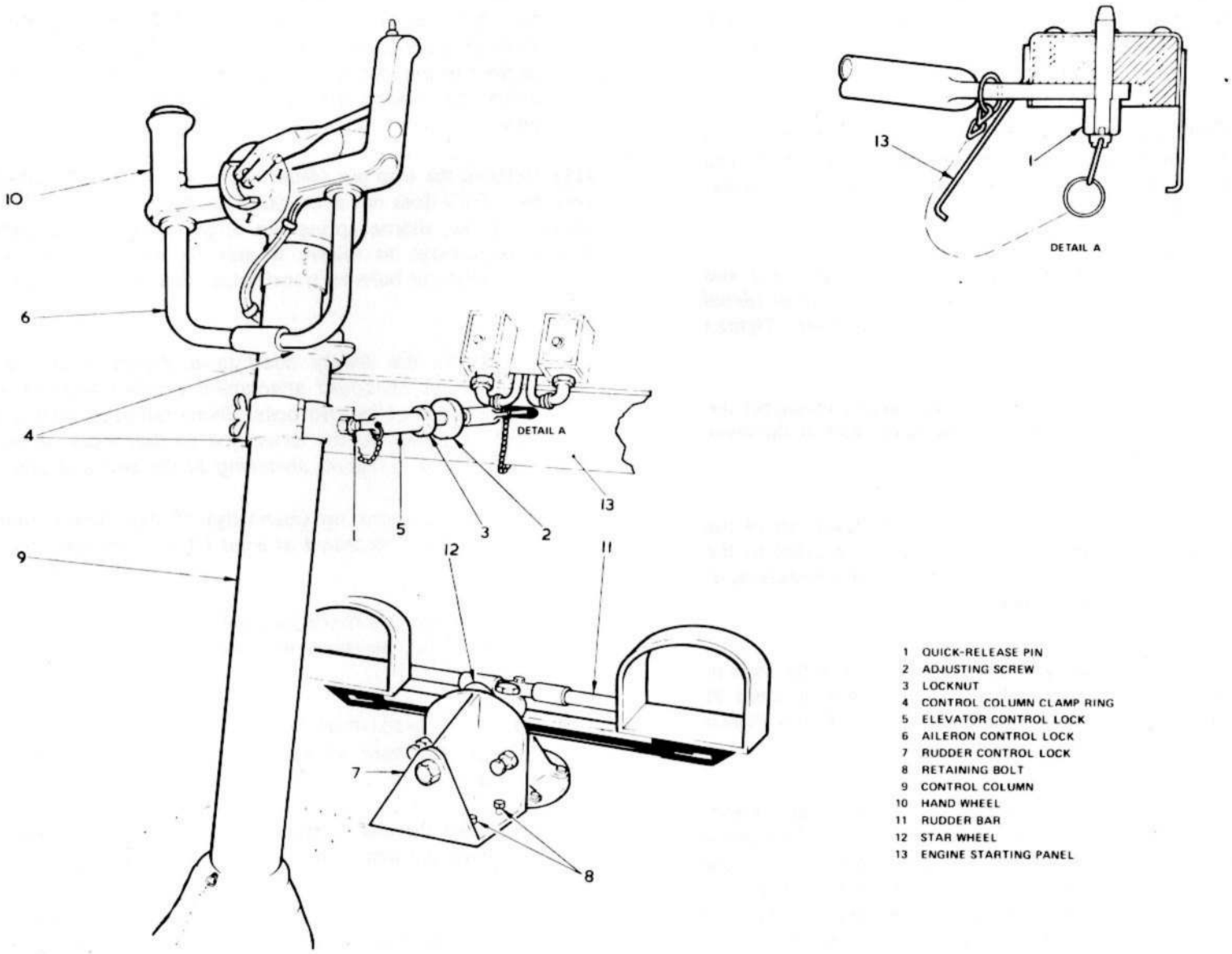

FIG. 9. CONTROL NEUTRAL RIGGING LOCKS

(4) With the hand wheel locked in the neutral position, set the control lever aft of the pressure bulkhead *(fig.22)*, to its neutral position (6.67 in. measured square from the pressure bulkhead to the upper control attachment bolt centre) by adjusting the control rod at point D *(fig.15, detail 3)*.

(5) Unlock the hand wheel, rotate to 92 deg ± 15 min to port and adjust the upper limit stop screw on the pressure bulkhead *(detail 3)* until it contacts the upper arm of the control lever. Tighten the locknut.

(6) Rotate the hand wheel 89 deg ± 15 min to starboard and adjust the lower limit stop-screw on the pressure bulkhead *(detail 3)* until it contacts the lower arm of the control lever. Tighten locking nut.

(7) Lock the hand wheel in its neutral position and reconnect the aileron control rod *(detail 3, point F)* to the upper end of the lever at the pressure bulkhead.

(8) Check that the lower arm of the bell-crank lever, aft of the main spar frame in the roof of the bomb bay, is parallel to the main spar. Adjust, if necessary, at the control rod connections at either end of the control rod *(points F or G)*.

(9) With the stop pins in the ailerons at the aft end of the slots in the control levers, adjust both aileron control rods at point H *(detail 1)* to give the ailerons a droop of 4 deg 54 min *(linear dimension 1.45 in. ± 0.10 in. measured at point C)*.

(10) Disconnect the aileron control rods at the aileron levers and, with the aileron stop pins at the aft end of the slots in the control levers *(detail 1)*, set the tabs with 15 deg droop relative to the aileron datum *(linear dimension 1.38 ± 0.10 in., measured at point A)*. Adjust the tab control rod by removing the control rod fairing *(Sect.3, Chap.2)*, slackening the locknut at the tab end of the control rod, and the locknut at the control rod connection to the tab lever *(detail 2, point B)*, and turning the control rod as necessary.

Note . . .

To adjust the tabs on early aircraft it is necessary to disconnect the tab from the control rod by removing the small brackets connecting the control rod to the tab. Slacken the locknut at the control rod connections at the tab lever, and adjust by rotating the control rod one complete turn at a time.

(11) Remove the stop pin *(detail 1)* and ensure that the tab-setting *(operation (10))* does not alter; this is to check that there is no pre-loading of the aileron spring tab torque tube. If pre-loading is found, adjustment to relieve it may be made on the bearing bracket attachment bolts by transferring shims from one bolt to the other.

Note . . .

The shims are initally fitted to a thickness of 0.040 in. between the outboard attachment bracket and the aileron spar at each of the two bolts. Shims removed from one bolt must be added to the other bolt so that there remains an aggregate of 0.080 in. shimming at the two bolt positions.

(12) Move the ailerons up (manually) 15 deg *(linear dimension 4.58 in. ± 0.20 in., measured at point C)*, and set the upper limit stop *(detail 1)*.

(13) Move the ailerons down (manually) 15 deg *(linear dimensions 4.58 in. ± 0.20 in., measured at point C)*, and set the lower limit stop *(detail 1)*.

Note . . .

Excessive force must not be applied to the ailerons as such action may initiate cracking of the inboard hinge brackets.

(14) Reconnect the aileron control rod to the aileron lever *(detail 1)* and unlock the hand wheel.

Note . . .

The bolt 'J' must be inserted from inboard and the bolt head must locate in the recess in the forked end; to achieve this condition when adjusting the controls it may be necessary to rotate the complete rod assembly through 180 deg so that the recess faces inboard.

(15) Move the hand wheel in both directions until the movement is arrested by the down aileron limit stop. It will be noted that the down aileron reaches its limit stop in advance of the up aileron. Further movement of the hand wheel in both directions will give the ailerons and tabs their respective full movements *(detail 4).*

(16) Ensure that all adjustment points are securely locked and that the control rod couplings do not foul the roller guides during any position of the aileron control movement.

(17) Carry out a flight trim check as detailed in Appendix 1.

Aileron fixed trim strips

21. The neutral position of the aileron fixed trim strip on each aileron is in line with the aileron chord line. These strips are set by the manufacturer and the setting should not normally need alteration. If, however, adjustment is necessary, progressive adjustment to a maximum of 10 deg either up or down from the neutral position may be made on the ground using a setting tool and gauge *(Sect.2, Chap.4, Table 1).*

Note . . .

An adjustment of 3 deg up on one fixed trim strip and 3 deg down on the other is equivalent to five divisions on the aileron trim indicator when the aircraft is flying at 450 knots I.A.S.

Rigging of aileron controls following replacement of control rods and levers

22. The following method of rigging the aileron controls, frame 21 to aileron attachment *(fig.15)* port and starboard is recommended:-

(1) Set the inboard adjustable control rod bell-crank lever to lever arm at rib 4, centre wing, to nominal length (1½ turns in from the safety check hole).

(2) Ensure that the lower arm of the bell-crank lever aft of main spar frame is parallel to the main spar.

(3) Fit control rods as follows:-

(a) Bell-crank lever to lever arm, rib 4, centre wing.

(b) Lever arm to centre lever, engine bay.

(c) Centre lever to lever arm, rib 2, outer wing.

(d) Lever arm to hinge mounting assembly, rib 4, outer wing.

(e) Hinge mounting to aileron. Adjust for correct aileron droop. Check for safety.

Note . . .

Due to the fact that the control rod attachment bolt to aileron, is required to be fitted with the head in the recess in the fork end, and facing inboard, adjustment at this point can only be made in full turns in or out as required. In the event of a half turn adjustment being required, the full turn should be applied, and a half turn adjustment made in the opposite direction at the adjustable end of the bell-crank lever to lever arm control rod at rib 4, centre wing.

◀ **Elevator control rigging** *(fig.16-16A)*▶

23.

WARNING

Before making any adjustments to the elevator stops, ensure that all relevant safety precautions as detailed on the LETHAL WARNING marker card have been observed.

To rig the elevator control:-

(1) Jack and trestle the aircraft laterally and longitudinally level *(Sect.2, Chap.4).*

(2) Disconnect the elevator control rod *(detail 1, point B)* from the upper end of the lever, and screw back the upper and lower

stop screws on the pressure bulkhead. These operations, except for the lower limit stop screw, can be made through the port equipment compartment on the port side of the fuselage. The lower limit stop screw is on the forward face of the pressure bulkhead.

(3) Set the control column to its neutral position (6 deg 30 min forward of the vertical), using a clinometer applied to the rear of the control column. Lock the control in this position.

(4) Set the control lever aft of the pressure bulkhead *(detail 1)*, to its neutral position (6.22 in. measured square from the pressure bulkhead to the upper control attachment bolt centre), by adjusting the control rod at point A or C.

Note . . .

Any adjustments made at the pressure bulkhead may affect the clearances at the snatch unit sear operating lever. Check the dimensions in accordance with Sect.3, Chap.11.

WARNING

Unlock the control column, move it through its full travel in both directions, and ensure that the explosive collar does not foul the adjacent structure. If it is necessary to move the collar (refer to Sect.3, Chap.11), ensure that the red line is repainted on the rod on either side of the collar, and the existing red line is obliterated.

(5) Unlock the control column, and move it 16 deg forward of the vertical, adjust the upper limit stop screw on the pressure bulkhead *(detail 1)* until it contacts the upper arm of the control lever. Tighten the locking nut.

(6) Move the control column 6 deg 30 min aft of the vertical and adjust the lower limit stop screw on the pressure bulkhead *(detail 1)* until it contacts the lower arm of the control lever. Tighten the locking nut.

(7) Reconnect the elevator control rod *(detail 1, point B)* to the upper end of the lever aft of the pressure bulkhead.

(8) Disconnect the elevator control rod at point D *(detail 2)* from the lever on the bulkhead at frame 42; access is through the rear hatch.

(9) Set the tail plane in the take-off position with the incidence gauge at the starboard tail plane inboard position reading 3 deg 15 min ± 2 min, and the tail plane incidence gauge in the cockpit at the take-off position.

(10) Move the elevator down (manually) and adjust the elevator lower limit stop at the starboard elevator link lever to give the elevator horn an upward movement of 15 deg (linear dimension 8.4 in. ± 0.3 in.), measured from the leading edge of the tail plane to the leading edge of the elevator horn *(point F)*.

(11) Move the elevator upwards (manually) and adjust the elevator upper limit stop at the starboard elevator link lever to give the elevator horn a downward movement of 20 deg *(linear dimension 11.16 in. $^{+0.30}_{-0.50}$ in., measured as for operation (10))*.

Note . . .

The measurements given in operations (10) and (11) are obtained with the rubber stop pads removed; with the stop pads in position the measurements will be slightly less.

(12) With the tail plane in the take-off position *(operation (9))*, lock the elevator in its neutral position (in line, with the chord line of the tail plane) by fitting the external control lock to the starboard elevator *(Sect.2, Chap.1)* and a toggle between the port elevator horn and the tail plane.

(13) Adjust the port tab control rod until the tab is 12 deg 30 min up; linear measurement 1.30 in ± 0.10 in., measured between the trailing edges of the tab and the elevator.

(14) Ensure that the stop pin is in the centre of the tab operating arm.

(15) With the tail plane, elevator, and port tab in their neutral positions set the control lever on the bulkhead at frame 42 to its neutral position (6.35 in. ± 0.1 in., measured square from the bulkhead to the control attachment bolt), by adjusting the control rod at point E.

(16) Lock the control column in the neutral position, reconnect the control rod at point D *(detail 2)* to the lever on the bulkhead at frame 42, adjusting the rear end of the main control rod *(point D)* as necessary.

(17) Unlock the control column and elevators, and check the elevator and tab movement. The elevator movements should be those given in operations (10) and (11). The linear dimensions of the starboard tab movement should be that given in para.24. Relock the port elevator and check the movements *(point G)* of the port spring tab which should be:-

Elevator tab up:-	1.70 in. min.
Elevator tab down:-	0.60 in. min.

measured between the trailing edges of the tab and elevator. When the port tab is moved to its fully up position, the relative tab to elevator angle is approximately 21 deg. About this position a foul occurs between the tab mass balance and the elevator skin, this is acceptable providing the minimum dimension is achieved before the foul occurs, as this tab angle never occurs in flight. However, this angle can be reached during ground checks when the control column is moved through its full travel, or when the spring tab is moved by hand to check for defective torque tube blow-back rod assemblies. Unlock the port elevator.

Note . . .

When the elevator tabs are being moved to the extreme travel position the operation is to be performed gently thereby avoiding heavy contact between the balance weights and skin.

(18) Ensure that all adjustment points are securely locked and that the control rod couplings do not foul the roller guides at any point of the control column movement.

(19) Carry out flight trim checks as detailed in Appendix 1.

Rudder control rigging *(fig.17)*

24. To rig the rudder control:-

(1) Disconnect the rudder control rod *(detail 1, point A)* from the upper end of the control lever, and screw back the upper and lower stop-screws on the pressure bulkhead. These operations, except for the lower limit stop screw, can be made through the port equipment compartment on the port side of the fuselage. The lower limit stop screw is on the forward face of the pressure bulkhead.

(2) Turn the adjustment screw on the rudder bar until the pedals are in their neutral position and the two portions of the rubber bat are in line.

(3) Set the rudder bar in its neutral position (at right angles to the centre line of the fuselage) and lock it in this position.

(4) Set the control lever, aft of the pressure bulkhead *(fig.22)* to its neutral position (6.67 in., measured square from the pressure bulkhead to the upper control attachment bolt centre), by adjusting the control rod at point B *(fig.17, detail 1)*.

(5) Unlock the rudder bar and apply port rudder until the port pedal is 28 deg 30 min ± 15 min forward of the neutral position, adjust the lower control limit stop screw on the pressure bulkhead *(detail 1)* until it contacts the lower arm of the lever. Tighten the locking nut.

(6) Apply starboard rudder until the starboard pedal is 26 deg 0 min ± 15 min forward of the neutral position and adjust the upper control limit stop screw on the pressure bulkhead *(detail 1)* until it contacts the upper arm of the lever. Tighten the locking nut.

(7) Reconnect the rudder control rod *(detail 1, point A)* to the upper end of the lever at the pressure bulkhead.

(8) Lock the rudder bar at neutral.

(9) Disconnect the control rod from the rudder lever at point E, and lock the rudder in its neutral position by applying a clamp between the lower edge of the rudder and rudder stub, forward of the spring tab.

(10) Operate the trim tab actuator until its pin centres are set at 8.90 in. ± 0.125 in. and adjust the tab actuating rod on the starboard side of the rudder until the tab is in line with the rudder.

(11) Set the control lever *(detail 2)* on the bulkhead at frame 42 to its neutral position (8.65 in. ± 0.10 in. measured square from the bulkhead to the control attachment bolt centre) by adjusting the control rod at point D.

(12) Reconnect the control rod to the rudder lever at point E, adjusting the fork-end of the control rod at points C or E, as necessary.

(13) Remove the lock from the rudder and unlock the rudder bar.

(14) Apply port rudder until the rudder stop is contacted and ensure that the rudder movement is 25 deg to port (linear dimension 23.10 ± 1.00 in. at point G).

(15) Apply further port rudder until the tab has moved 18 deg 0 min ± 15 min to starboard, (linear dimension measured from the inboard edge of the tab to the centre of the trailing edge of the rudder must be 1.73 in. $^{+0.00}_{-0.10}$ in. as shown in detail 3).

(16) Repeat operations (14) and (15) but with the starboard rudder and check the movement of the rudder and tab; these must be the same as for port rudder.

Note . . .

1. The measurements given in operations (14) and (15) are obtained with the rudder stop-pads removed. With the stop-pads in position and normal force applied to the rudder bar, the linear measurement given in operation (14) must be 21.75 in. ± 1.00 in.

2. If the rudder tab movement, operation (15), is in excess of 18 deg, a new rudder tab operating lever stop plate Ref.No.26FZ/5495 (fig.21) must be fitted, and the stop-faces filed, if necessary, to obtain the desired 18 deg movement. Similarly, if the 18 deg movement is ubobtainable, the existing stop plate must be filed. The correct protective treatment (A.P.101A-0600-6) must be applied to all filed surfaces.

(17) Ensure that all adjustment points are securely locked and that the control rod couplings do not foul the roller guides at any position of the rudder bar.

Aileron bias

25. No adjustment is provided in the aileron bias mechanism. The actuator pin centre distance is set by the manufacturers and does not need further adjustment.

Starboard elevator ground-set tab

26. To adjust the starboard elevator ground-set tab:-

(1) Lock the elevator in its neutral position by clamping the elevator horn to the tail plane.

(2) Remove the elevator tab control access panel on the upper surface of the elevator *(Sect.2, Chap.4)*.

(3) Slacken the locknuts on the adjuster between the tab connecting rod and the end piece.

(4) Operate the adjuster until the tab chord line is 2 deg 21 min up relative to the elevator chord (linear dimension, 0.25 in. ± 0.05 in. between the trailing edges of the elevator and tab, measured at the outboard end of the tab). Relock the adjuster locknuts.

(5) Remove the lock fitted in operation (1) move the elevator through its full travel in both directions and check the tab movement; it should be 17 deg 30 min with the elevator up or down (linear dimension 1.85 in. ± 0.1 in. measured as in operation (4)).

Rudder trim actuator setting

27. The rudder trim actuator electrical stops are set to give a working stroke of 2.72 in. and the pin centres are nominally set at 7.5 in. (fully contracted) against an electrical stop. The mechanical stops are set to give a working stroke of 3 in. and the pin centres are nominally set at 7.425 in. (fully contracted) against a mechanical stop. These are manufacturer's settings and should not require any adjustment; however should it be necessary, the pin-centres may be adjusted ± 0.125 in. as follows:-

(1) Remove the actuator *(para.49)*.

(2) Using a 18-volt electrical supply, extend the actuator until the 1/16 in. dia. hole in the actuator arm is visible.

(3) Slacken the locknut securing the fork-end and screw the fork-end either inwards or outwards to adjust.

(4) After adjustment, insert a piece of 1/16 in. dia. wire into the hole in the actuator arm. If the penetration is greater than 1/16 in. too much outward adjustment has been made and the fork-end must be screwed inward.

(5) Tighten the locknut securing the fork-end.

(6) Using an 18-volt electrical supply, inch the actuators on to the electrical stops and check that the electrical stops operate when the pin-centres are 7.5 in. and 10.22 in.

(7) Refit the actuator.

28. To check the movement of the rudder tab and actuator:-

(1) Connect a ground electrical supply at the ground supply socket.

(2) With the rudder in line with the fin, and the tab in line with the rudder, operate the actuator until the pin centres are 9.42 in., and check that the tab is moved 18 deg to starboard (linear dimension $1.73 \pm^{0.00}_{0.10}$ in. measured, from the inboard trailing edge of the tab to the normal centre line of the rudder).

(3) Retract the actuator to obtain pin centres of 8.37 in., and check that the tab is moved 18 deg to port (linear dimension $1.73 \pm^{0.00}_{0.10}$ in. measured as in operation (2)).

Note . . .

1. The excess of working stroke over the amount required to give full tab movement, is provided to cater for deflection of the torque tube and blow-back rod when an air load is applied to the tab.

2. If the rudder tab movement is in excess of 18 deg, a new rudder tab actuating lever stop plate Ref.No.26FZ/5495 (fig.21) should be fitted, and the stop-faces filed, if necessary, to obtain the desired 18 deg movement. Similarly, if the 18 deg movement is unobtainable, the existing stop plate may be filed. The correct protective treatment (A.P.101A-0600-6) must be applied to all filed surfaces.

Tail plane actuator setting

29. The following instructions for the setting of the tail plane actuator are listed in the sequence in which the setting must be carried out.

Note . . .

All tail plane angles are to be measured on the STARBOARD tail plane at the inboard rigging board position, using the incidence gauge (Sect.2, Chap.4, Table 1) relative to the fuselage horizontal datum. The clinometer should not be disturbed during the rigging operations and readings should be related to its initial setting.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Open the rear hatch and place the lateral leveling gauge *(Sect.2, Chap.4, Table 1)* on the leveling brackets, port and starboard, at frame 31. The port and starboard ends are indicated on the gauge *(fig.10)*.

(3) Level the aircraft laterally (0 deg ± 0 min).

Note . . .

It is most important that the aircraft is rigged to this degree of accuracy - both laterally and longitudinally - otherwise any deviation will have to be allowed for in the subsequent tail plane settings.

(4) With the lateral gauge in position, place the longitudinal gauge *(Sect.2, Chap.4, Table 1)* on the leveling bracket on the starboard side of the frame 29 bulkhead, and on the datum pad on the lateral gauge *(fig.10)*.

(5) Level the aircraft longitudinally (0 deg ± 0 min).

(6) Ensure that the microswitch tappets are screwed fully home, and that the upper and lower microswitches are set to give the minimum distance between the switches and tappets *(fig.12)*.

(7) Retract the actuator on to its mechanical down stop and check that the tail plane up travel limit - tail plane leading edge up - is 4 deg 7 min ± 4 min relative to the fuselage datum *(fig.11)*.

Note . . .

As a precaution against damaging the actuator when running it on to its down stop, it is advisable to operate the motor in that direction at a reduced voltage. This is achieved by disconnecting the cable core T33L-1 (circuit C21) from the terminal A1 on the low-speed motor reversing relay in the rear fuselage, and then connecting a resistor of approximately 2.2 ohms resistance and 200 watt rating between the cable terminal and the relay terminal A1. A suitable resistor would be a Painton Type 5007, of approximately 2.2 ohms resistance, and 'B' termination.

(8) Insert a 1/16 in. dia. pin in the actuator ram safety hole and check that it does not penetrate to a depth exceeding 3/16 in., thus ensuring that a sufficient amount of thread is in engagement with the ball nut.

(9) Check and record the angle found in operation (7).

(10) Reduce the angle recorded in (9) by 8 min $\pm^{1}_{0}$ min. This will give the angle at which the lower microswitch must be tripped *(fig.11)*.

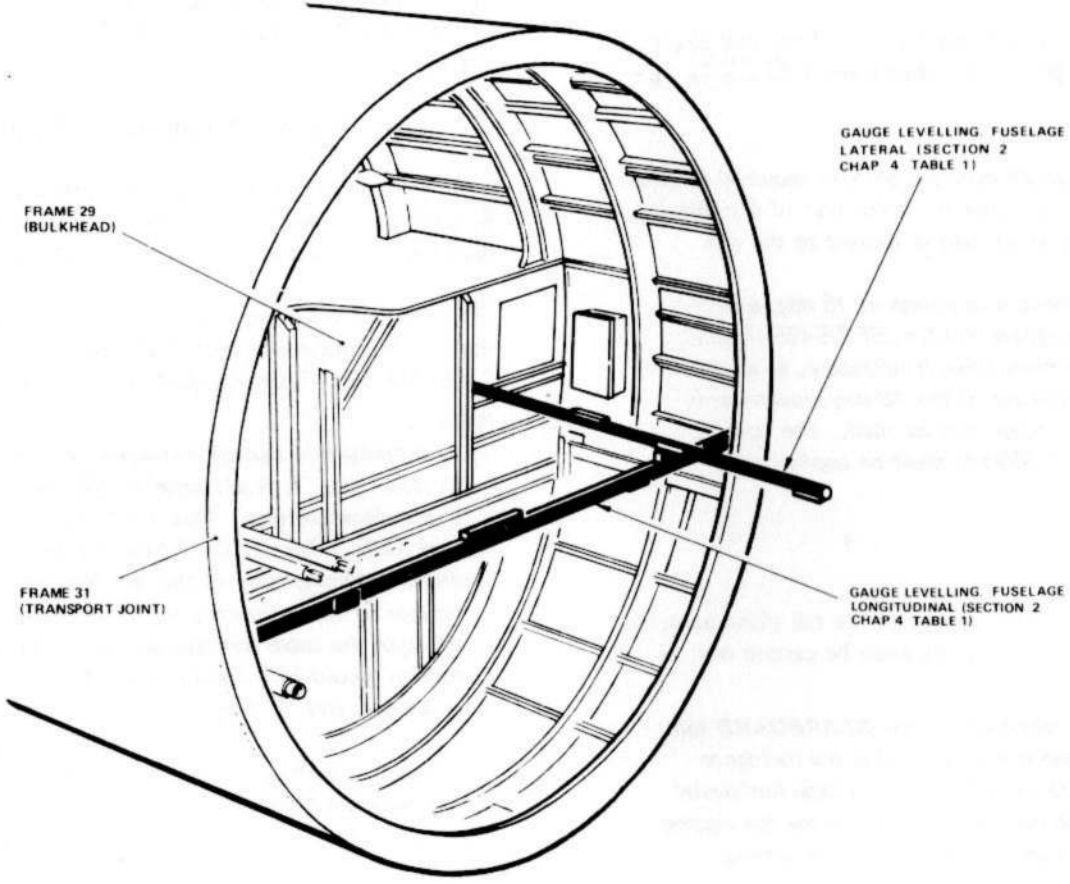

FIG. 10. FUSELAGE LEVELING – FOR TAIL PLANE ACTUATOR SETTING

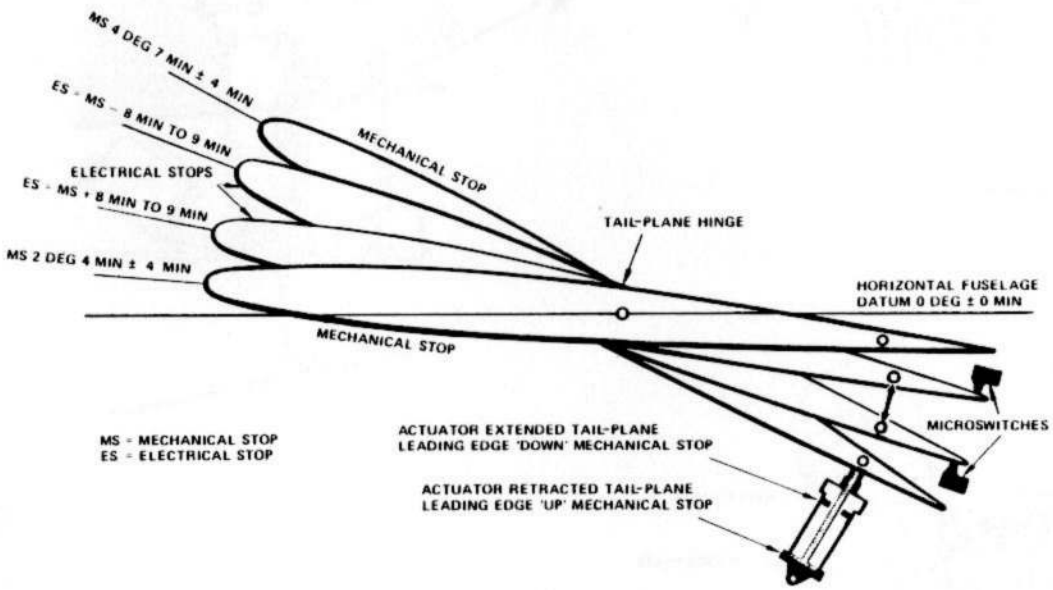

FIG.11. TAIL PLANE ACTUATOR SETTINGS

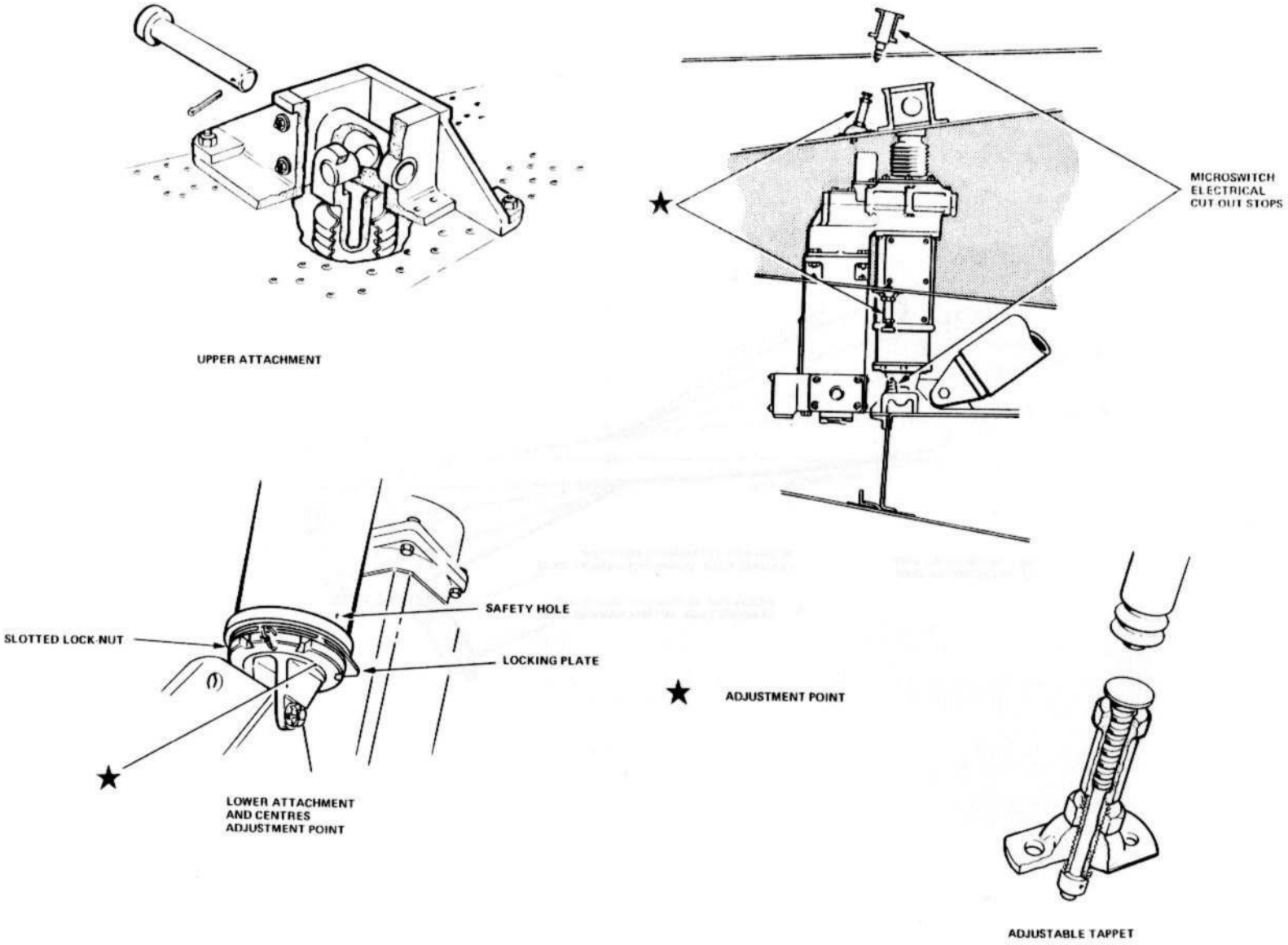

FIG. 12. TAIL PLANE ACTUATOR

◀ REDRAWN AND CLARIFIED ▶

(11) Adjust the lower tappet to operate the lower microswitch at the angle found in (10).

(12) Extend the actuator on to its mechanical stop and check that the tail plane down travel limit - tail plane leading edge down - is 2 deg 4 min ± 4 min relative to the fuselage horizontal datum *(fig.11)*.

(13) Check and record the correct angle found in operation (12).

(14) Increase the angle recorded in (13) by 8 min $\pm \frac{1}{0}$ min. This will give the angle at which the upper microswitch must be tripped *(fig.11)*.

(15) Adjust the upper tappet to operate the upper microswitch at the angle found in (14).

(16) Recheck the operational angles of incidence at both upper and lower actuator positions, moving the actuator slowly when approaching the microswitches, and check that the tail-plane indicator in the cockpit registers the take-off position when the incidence is 3 deg 15 min ± 2 min.

(17) Finally, carry out flight trim checks as specified in Appendix 1.

Air brakes setting (pre Mod.272)

30. To set the air brake mechanism, proceed as follows on both mechanisms:-

(1) Slacken off all drag channels at their attachment points to the rocker arms and ensure that the end plates of the drag channels do not bear on the main plane skin when the jacks are fully extended.

(2) With the jack fully extended, check the distance between the pin centres of the jack body and piston-rod; it should be 24.92 in. Adjustment may be effected by unlocking and rotating the eye-end of the jack piston-rod.

(3) Adjust individual drag channels at their attachments to the rocker arms until the end plates of the drag channels bear firmly on the main-plane skin.

(4) Retract the jack to extend the drag channels and ensure that they function correctly.

(5) Lock all adjustment points.

(6) Fit the access panels; ensure that access panel bolts are all of the same length and diameter (if 14 x 5/16 in. dia. B.S.F. bolts are fitted their overall length must be 0.70 in. if 26 x 2 B.A. bolts are fitted their overall length must be 0.60 in.).

Air brakes setting (post Mod.272) *(fig.13)*

31. To set the air brake mechanism:-

(1) Remove the panels giving access to the air brake mechanism *(Sect. 2, Chap.4)* from the underside of each main plane.

(2) Set the air brakes and flaps ground selector to GROUND and, using the aircraft hand pump, fully extend the jacks.

(3) Check the dimension between the pin centres of the piston-rod and jack body; this should be 24.92 in. Adjustment is effected by unlocking and rotating the eye-end of the jack piston-rod.

(4) Check that all drag-channel end plates are flush with the main-plane skin.

(5) Disconnect the hydraulic pipelines from the starboard jack and blank off. Connect an external hand pump test rig.

(6) Slacken the securing bolts of the cam slide assembly on the jack piston-rod and move the slide a short distance along the piston-rod towards the eye-end of the rod.

(7) Retract the jack to extend the drag channels to the MID position in accordance with the dimension given in fig.13.

(8) Adjust the position of the cam slide on the piston rod to operate the microswitches at this point; tighten and wire-lock the securing bolts.

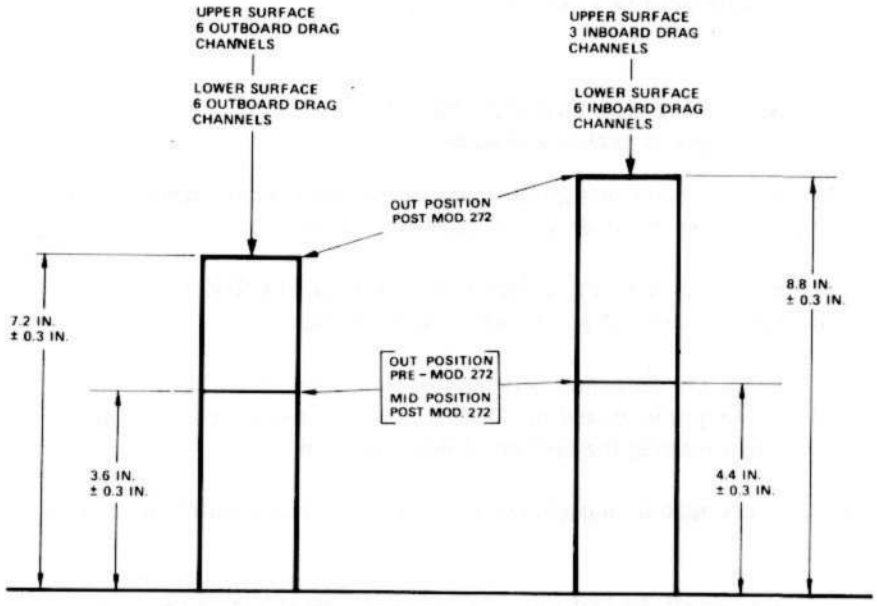

FIG. 13. AIR BRAKES SETTING (PRE AND POST MOD. 272)

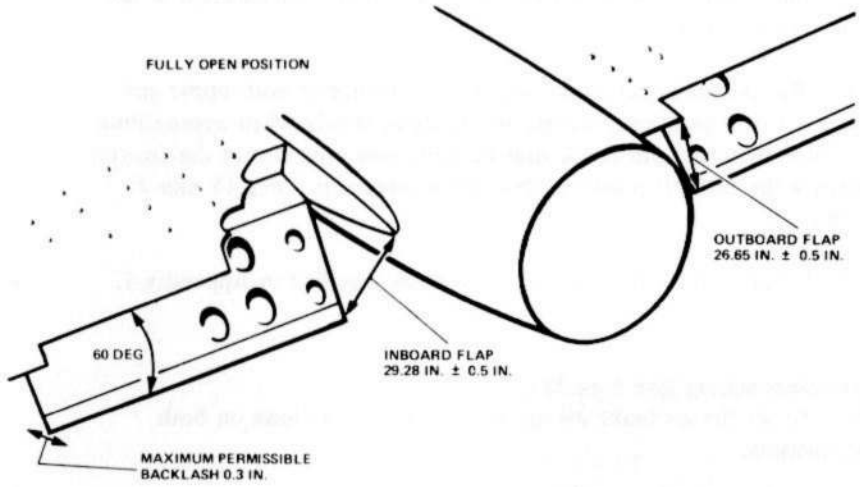

FIG. 14. FLAP MOVEMENT

(9) Disconnect the external test rig from the starboard jack, reconnect the pipelines and bleed the air brake system,

(10) Fully extend the jacks, select MID and OUT, and check that the drag channel protrusion in each position agrees with the dimensions given in fig.13.

Note . . .

In the MID position the inboard or outboard drag channel extensions must not differ by more than 0.5 in. between each main plane.

(11) Select IN, extend the jacks, lock all adjustment points and replace the access panels. Ensure that the access panel bolts are all of the same length and diameter; (if 14 x 5/16 in. dia. B.S.F. bolts are fitted their overall length must be 0.70 in. if 26 x 2 B.A. bolts are fitted their overall length must be 0.60 in.).

(12) Set the air brakes and flap ground selector to FLIGHT and wire-lock.

Flaps setting

32. To set the flap mechanism, proceed as follows for all flaps, using the hydraulic hand pump to operate them:-

(1) Check the distance between the pin centres of the flap jack piston-rods *(Chap.2)*.

(2) With the flaps down, remove the locking plates from the links connecting the flaps to their operating levers, and slightly slacken all link adjustment screws *(fig.8)*.

(3) Raise the flaps, moving them slowly when approaching the fully up position, and check that they do not bear on the underside of the main plane when the jacks are bottoming.

(4) Lower th e flaps sufficiently to give access to the link adjustment screws and adjust at these points until, when the jacks are bottoming, they bear without undue pressure on the underside of the main plane.

(5) The movement of the flaps from the fully up to the fully-down position is 29.28 in. ± 0.50 in. (inboard flap) and 26.65 in. ± 0.50 in. (outboard flap). This movement is to be measured from the trailing edge of the wing, at the outboard end of the inboard flap and at the inboard end of the outboard flap. Maximum permissible backlash in the new condition is 0.30 in. to allow for adverse tolerances in bolts and bores in the total linkage from jack to flap *(fig.14)*. Where backlash exceeds 0.60 in. refer to A.P.101B-0400-6.

(6) When the correct flap settings have been obtained check that there is a minimum clearance of 0.050 in. between the pushrod fork-ends and the flap hinge brackets throughout the full flap travel *(fig.8)*. Ensure that all of the 'free' lift in the flap at the hinges has been taken up when this check is made. If this clearance cannot be obtained, it is permissible to file, and remove locally, up to 0.10 in. maximum from the flap hinge bracket to clear the foul; blend out the rebate and restore the local finish *(A.P.101A-0600-6)*.

(7) When refitting the locking plates ensure that the bolts are fitted with their heads to starboard as illustrated on Fig.8.

Static friction loads

33. The maximum acceptable values for the static friction loads of the control runs are as follows:-

Aileron	4 lb
Elevator	6½ lb
Rudder	6½ lb

The loads are to be measured with a spring balance *(Sect.2, Chap.4, Table 2)* connected to the control at the point of application of the pilot's effort. The readings of the rudder and aileron runs are to be taken when the control commences to move. Due to the out-of-balance moment of the elevator control run, it is necessary to pull the control column forward by means of the spring balance, and take the maximum reading. Hold the control column in this position and zero the spring balance, then allow the control column to move back, with the spring balance held, and again take the reading. Half the difference of the two readings will be the static friction load.

Lubrication

34. Refer to fig.18. 18A and 18B.

Note . . .

No grease or oil is to be applied to the roller guides of the flying control push-pull tubes.

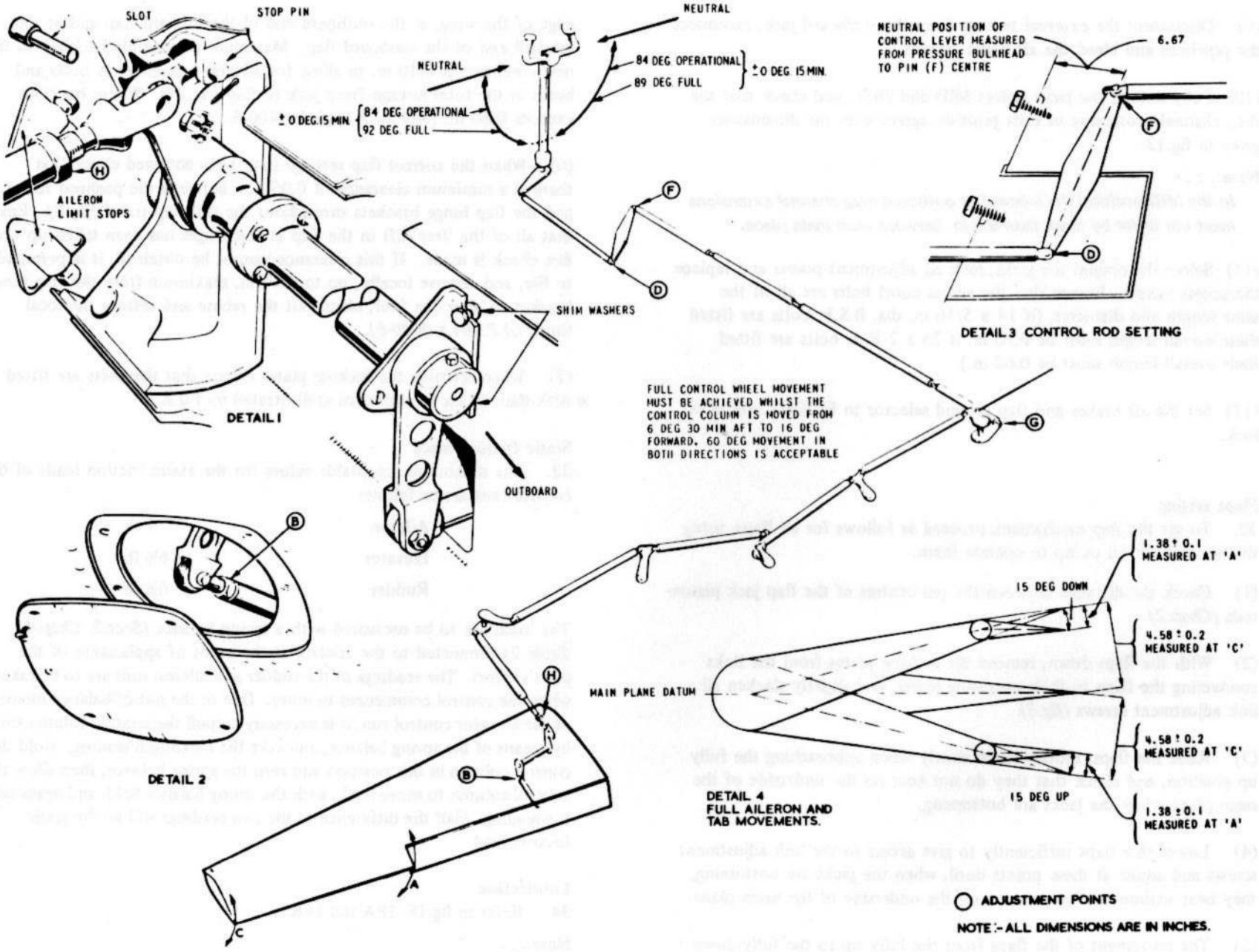

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FIG. 15. AILERON CONTROL RIGGING

101B-0402-1A/250/B233608/12-83/BAe/1307

REMOVAL AND ASSEMBLY

General information

35. The following paragraphs contain information on the removal and assembly of certain components of the flying controls. Only the removal operations are described, since the assembly is generally the reverse of these operations.where this is not the case, the fact is noted. The recommended sequence of operations is given, although in some cases it will be clear that it is not essential to adhere rigidly to this sequence. The necessary ground equipment is listed in Sect.2, Chap.4, Tables 1 and 2.

Control column

36. To remove the control column:-

WARNING

1. Ensure that all relevant safety precautions as detailed on the LETHAL WARNING marker card, have been observed.

2. To prevent ingress of swarf and/or scoring of the inner torque tube where the control column is fitted with a vertical conduit channel, the channel must not be removed whilst the control column is in situ, nor may the channel attachment rivets be replaced by self-tapping screws.

(1) Disconnect all electrical supplies.

(2) Remove the pilot's seat bucket.

(3) Remove the screws securing the port foot ramp to the floor of the cockpit and remove the foot ramp.

(4) Remove the two leather dust covers from the base of the control column.

(5) Remove the two sealing cover plates, one at each side of the base of the control column.

(6) Remove the cover plate in the floor of the cockpit, forward of the control column, and the cover plate in the floor to port of the control column.

(7) Remove the access panels on the inboard face of the pilot's console *(forward end)*.

(8) Disconnect the aileron control rod from the lever at the bottom of the control column, and the elevator control rod and snatch unit from within the pilot's console *(Sect.3, Chap.11)*.

(9) Disconnect the wheel-brakes Bowden cable at the top of the control column, and remove the cable adjusters and the clips retaining the Bowden cable to the control column. Remove the cable.

◀ **Note . . .**

Check the conduit socket EA1-45-123 which retains the brake cable at the top of the control column for security of the rivets before replacing the cable (Fig.1). ▶

(10) Disconnect the electrical cables from the terminal block beneath the cockpit floor, forward of the control column.

(11) Remove the eight 2 B.A. bolts securing the elevator torque tube bearing retaining plate to the inner face of the console.

(12) Remove the four ¼in. bolts from the control column support casting.

(13) Partly lift the control column, release the bias spring from its attachment on the aileron control lever, move the control column slightly to starboard and remove it from the cockpit floor.

Rudder bar

37. To remove the rudder bar:-

(1) Disconnect the control rod from the rudder main operating lever at the bottom of the rudder bar torque tube.

(2) Disconnect the brake control valve lever from the rudder main operating lever.

(3) Remove the four ¼ in. nipples from the two spokes retaining the rudder main operating lever to the rudder bar torque tube and withdraw the spokes.

(4) Remove the rudder main operating lever.

(5) Remove the eight ¼ in. bolts securing the rudder bar pedestal to the cockpit floor, and remove the rudder bar.

Note . . .

Close-tolerance 5/16 in. bolts may be fitted in lieu of the spokes (A.P.101B-0400-6, Repair Leaflet B.2/27).

UK RESTRICTED

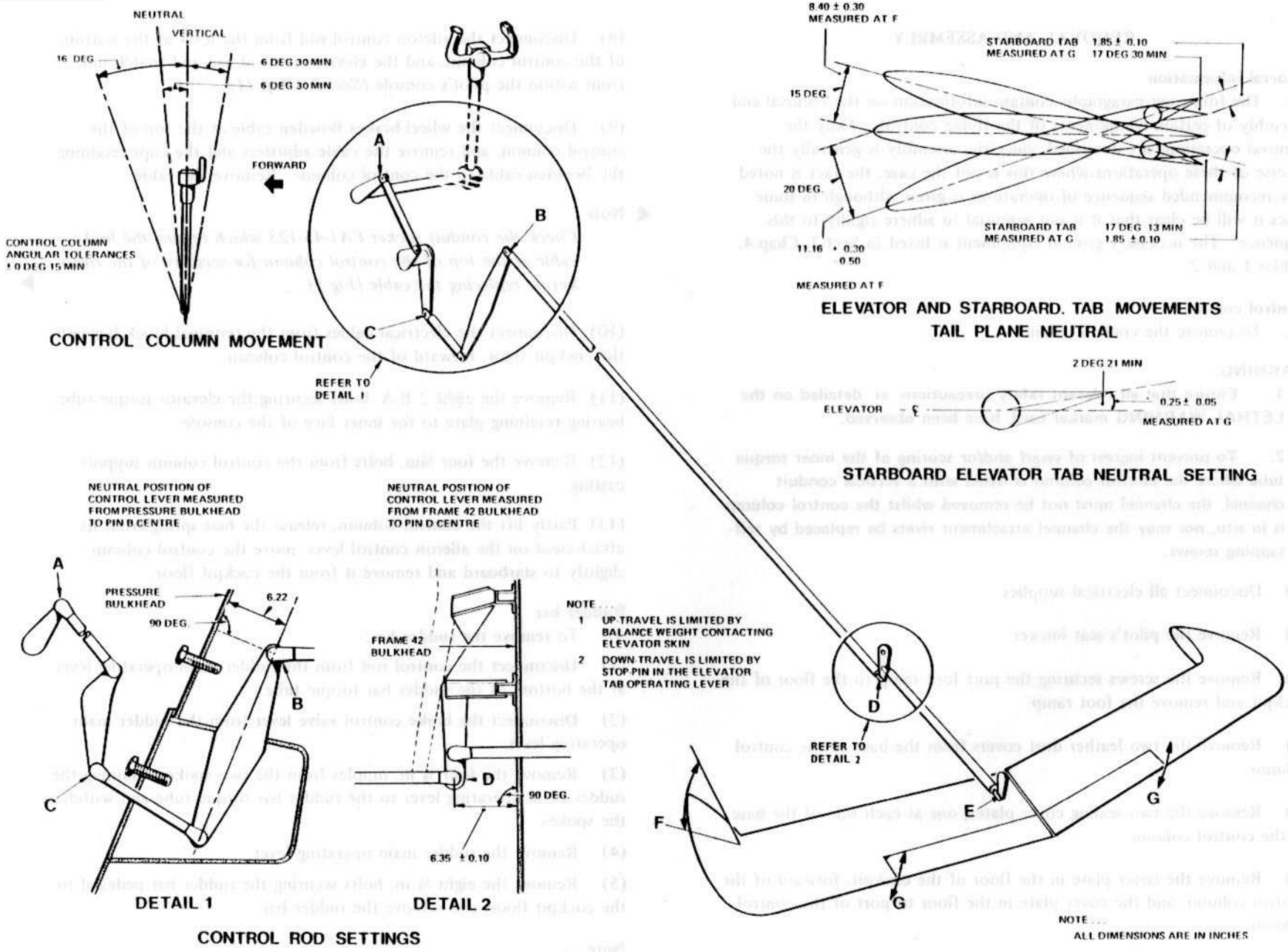
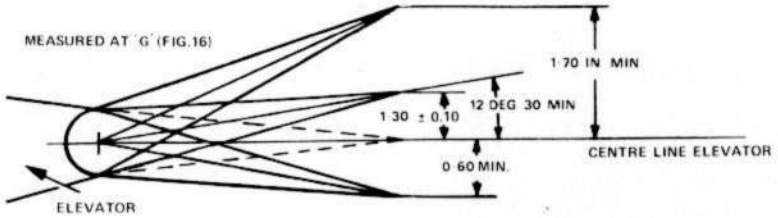


FIG.16. ELEVATOR CONTROL RIGGING (1)

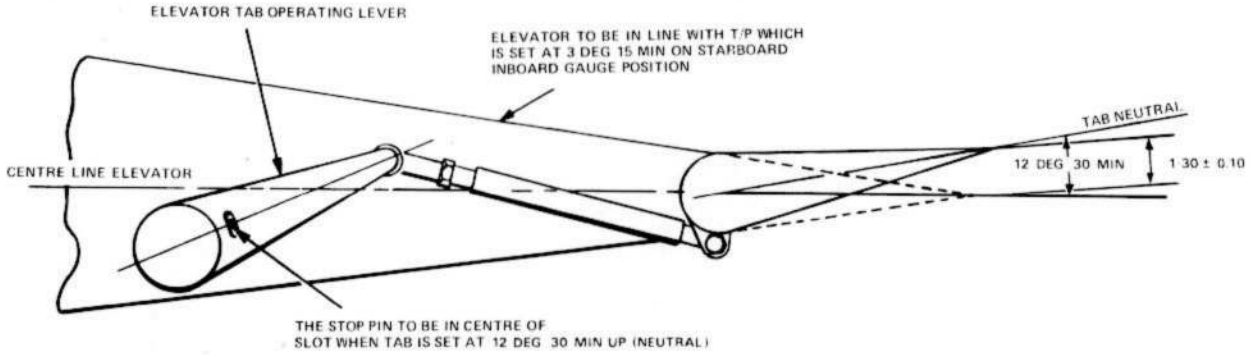
DETAIL A

NOTE . . .

UP-TRAVEL AND DOWN-TRAVEL IS LIMITED BY STOP-PIN IN ELEVATOR TAB-OPERATING LEVER



PORT TAB MOVEMENT – ELEVATOR LOCKED NEUTRAL



PORT ELEVATOR TAB RIGGING

NOTE. . .
ALL DIMENSIONS ARE IN INCHES, UNLESS OTHERWISE STATED

FIG. 16A ELEVATOR CONTROL RIGGING (2)

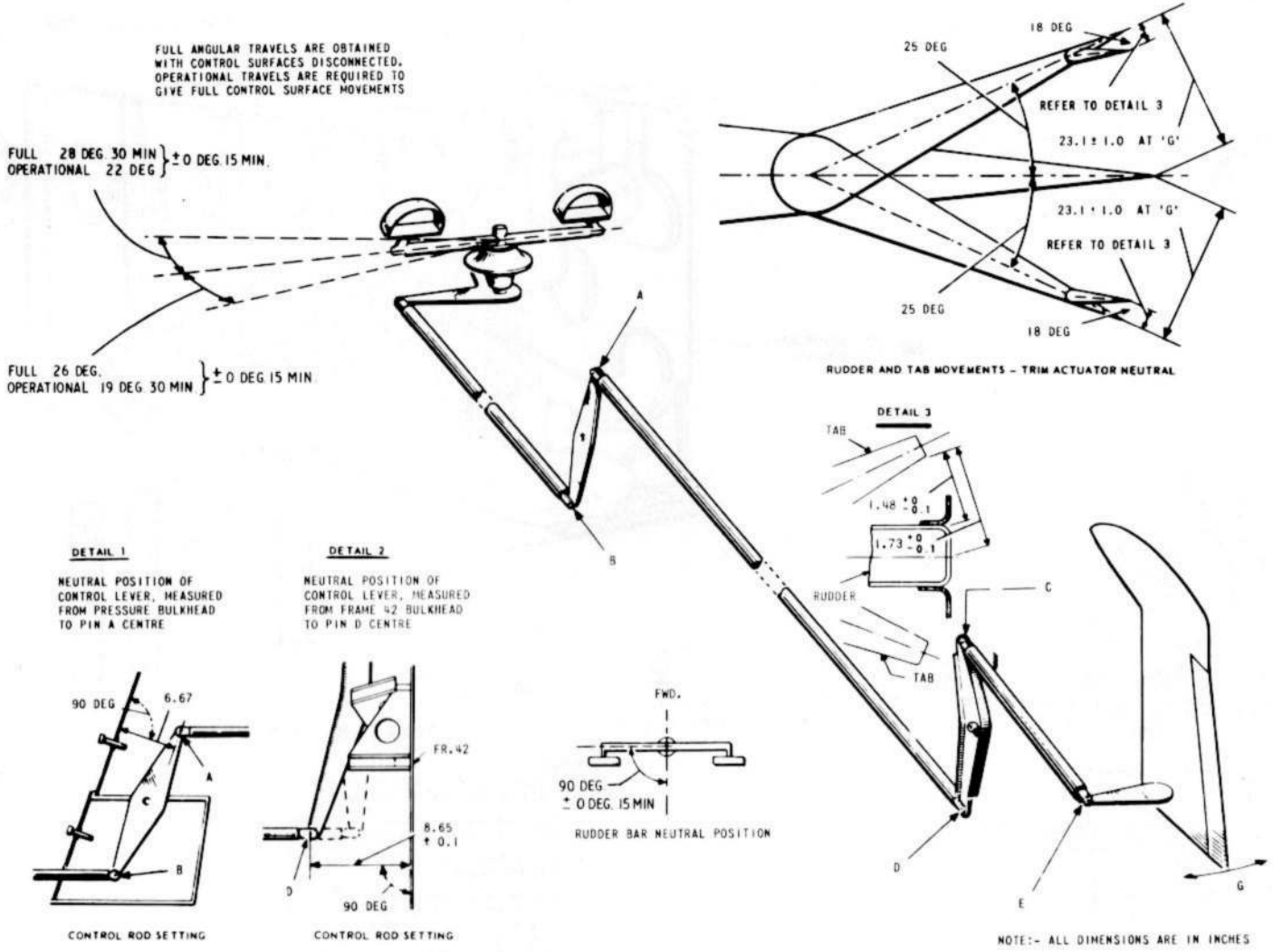
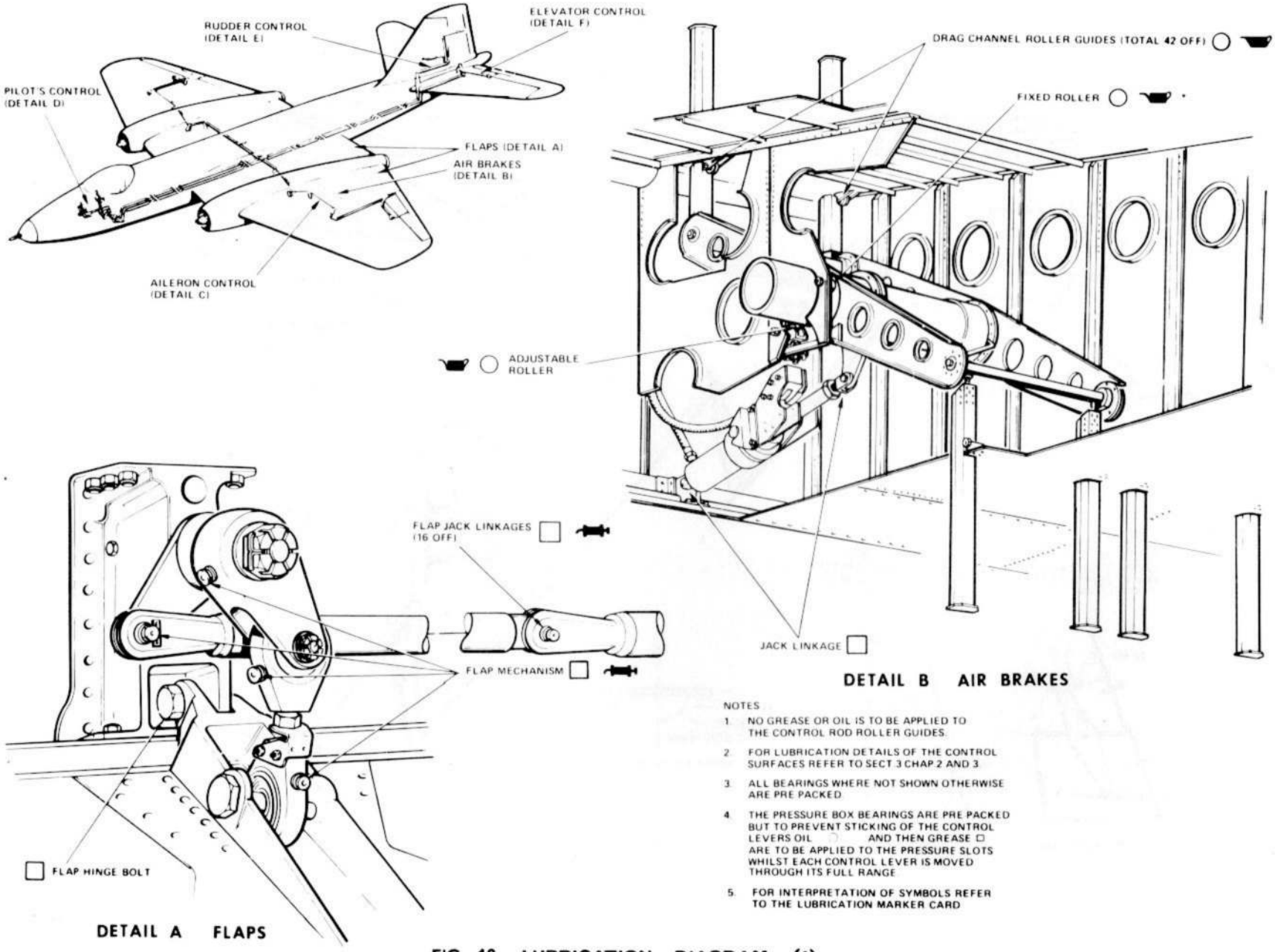


FIG.17. RUDDER CONTROL RIGGING



NOTES

1. NO GREASE OR OIL IS TO BE APPLIED TO THE CONTROL ROD ROLLER GUIDES.
2. FOR LUBRICATION DETAILS OF THE CONTROL SURFACES REFER TO SECT 3 CHAP 2 AND 3.
3. ALL BEARINGS WHERE NOT SHOWN OTHERWISE ARE PRE PACKED.
4. THE PRESSURE BOX BEARINGS ARE PRE PACKED BUT TO PREVENT STICKING OF THE CONTROL LEVERS OIL ○ AND THEN GREASE □ ARE TO BE APPLIED TO THE PRESSURE SLOTS WHILST EACH CONTROL LEVER IS MOVED THROUGH ITS FULL RANGE.
5. FOR INTERPRETATION OF SYMBOLS REFER TO THE LUBRICATION MARKER CARD

FIG. 18. LUBRICATION DIAGRAM (1)

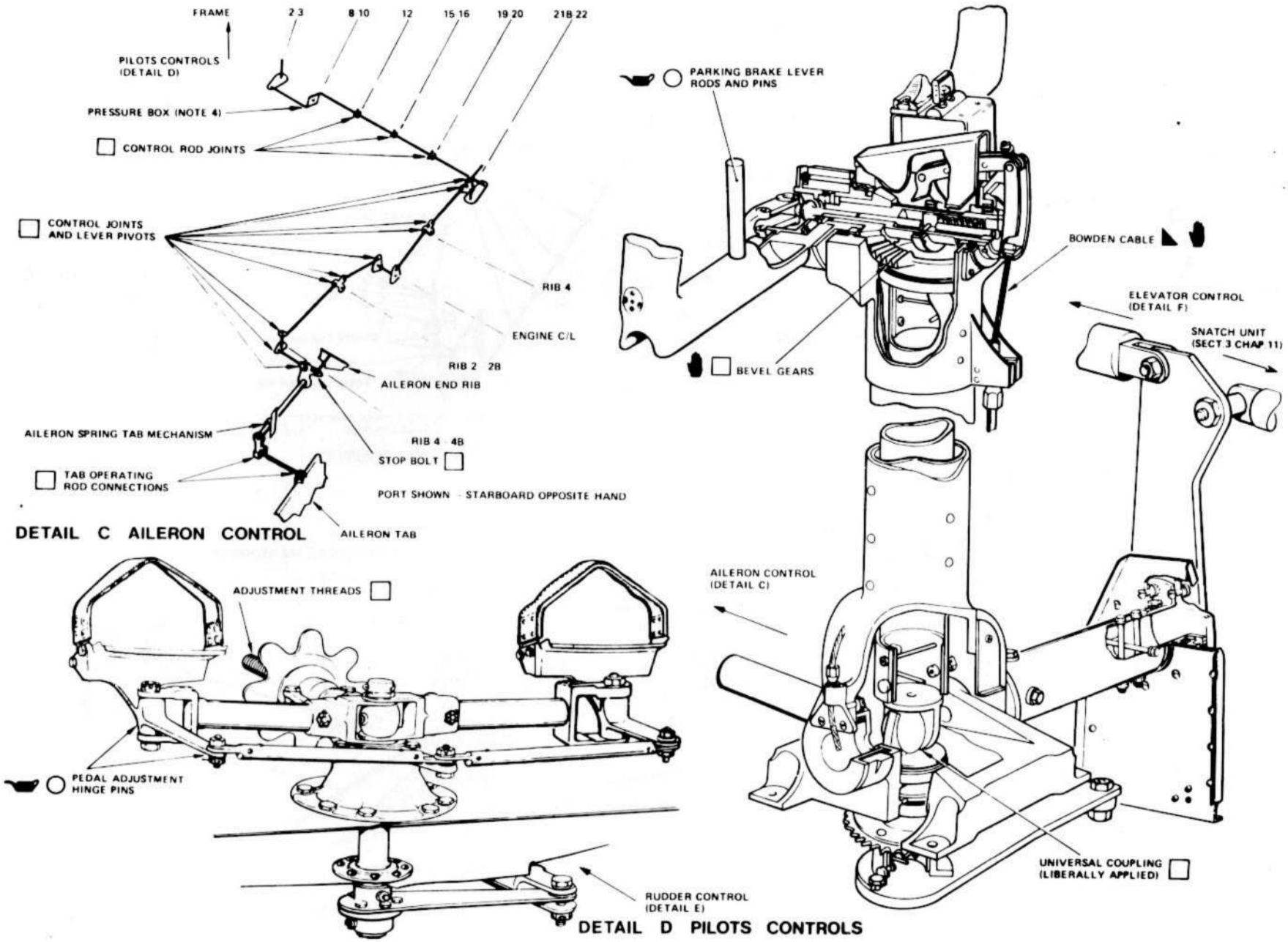


FIG. 18A. LUBRICATION DIAGRAM (2)

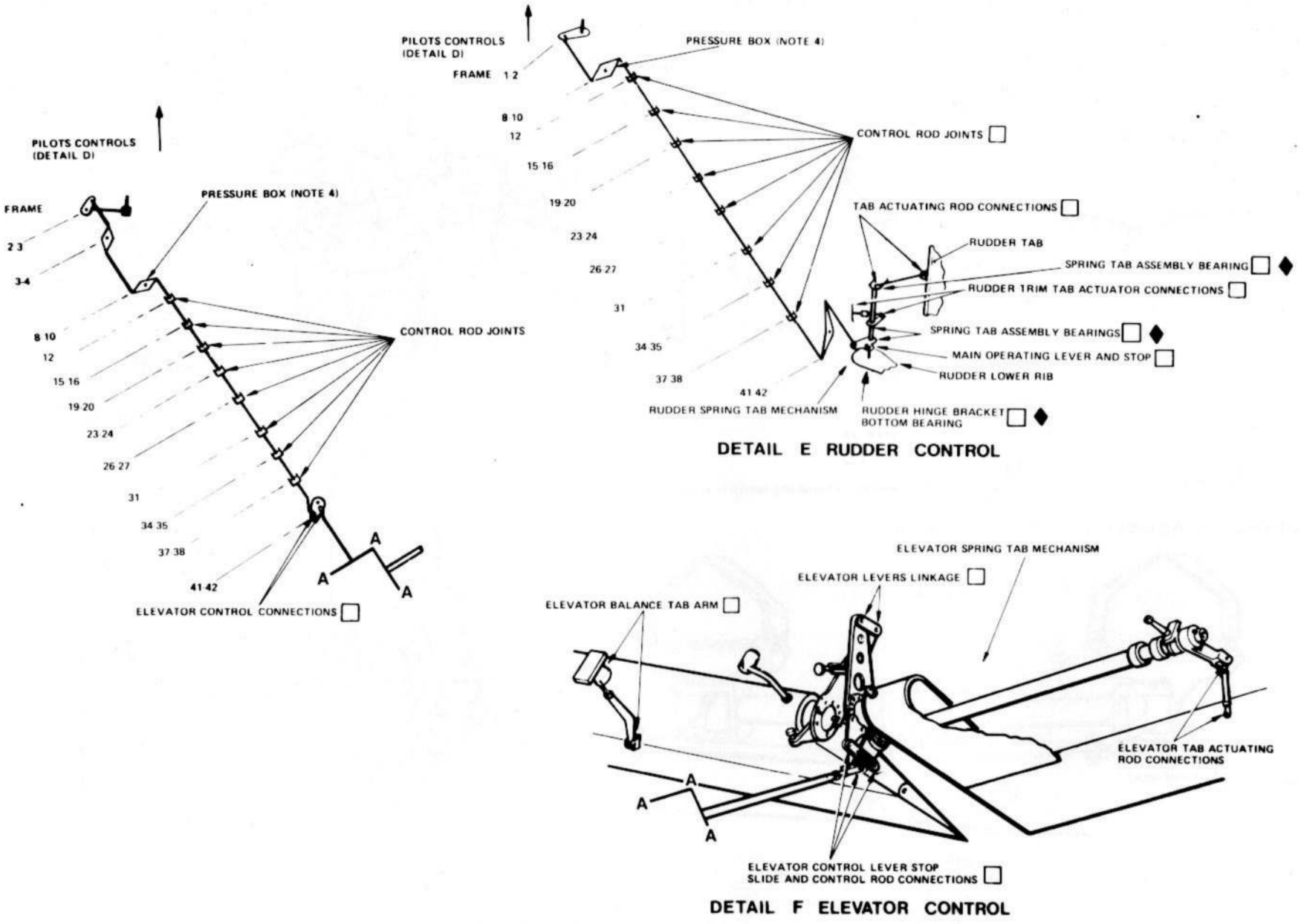


FIG. 18B. LUBRICATION DIAGRAM (3)

Pressure box *(fig.3)*

38. Whenever a pressure box assembly has been removed and replaced a cabin pressure test must be made in accordance with the instructions given in Chap.8. Each control must be moved over its full range at least three times when the pressure test is in progress. Refer to the relevant rigging diagram and reset the lever limit stops.

Note . . .

It may be found on re-assembly that a new rubber seal, Ref.No. 26FZ/12173, is required between the bulkhead and pressure box.

Aileron spring tab mechanism *(fig.19)*

Removal

39. To remove an aileron spring tab mechanism:-

(1) Remove the aileron *(Sect.3, Chap.2).*

(2) Remove the access panels from the leading edge of the aileron *(Sect.2, Chap.4).*

(3) Disconnect the tab operating rod from the tab operating lever *(detail A).*

(4) Remove the stop bolt with the lever arm bush from the aileron hinge bracket through the lever arm *(detail B).*

(5) Remove the split pin and nut securing the bolt passing through the blow-back rod and the tab operating lever. Withdraw the bolt and retain the saddle washers *(detail A).*

(6) Using an extractor *(Sect.2, Chap.4, Table 1),* withdraw the tab operating lever from the splines of the blow-back rod *(detail A).*

(7) Remove the two bolts securing the attachment bracket to the aileron spar *(detail A).* Retain the shim washers as fitted, noting the position from which they were removed.

(8) Ease the blow-back rod inboard end spigot from the blow-back rod bearing *(detail B),* withdraw the mechanism from the aileron.

Assembly

40. The assembly sequence for refitting the existing spring tab mechanism is the reverse of that given for the removal.

Note . . .

Between the attachment bracket and the aileron spar, shim washers are fitted to adjust the spring tab mechanism (detail A). It is important that these shim washers are refitted in their original positions as failure to do this may subject the torque tube assembly to undue strain.

Assembly of a new spring tab mechanism

41. Assemble a new spring tab mechanism as follows:-

(1) Separate the attachment bracket from the original mechanism by removing the nuts and washers from the three countersunk bolts *(detail A).*

(2) Assemble the original attachment bracket to the new mechanism, with the flange of the bracket positioned approximately parallel to the bolt hole in the blow-back rod splined end.

(3) Ease the blow back rod inboard end spigot into the blow-back rod bearing *(detail B).*

(4) Fit a plain washer beneath each attachment bolt head, and bolt the attachment bracket to the spar, fitting between the bracket and the spar 0.040 in. thickness of shim washers at each bolt *(detail A).*

(5) Assemble the stop bolt and lever arm bush through the lever arm slot, into the aileron hinge bracket *(detail B).*

(6) Assemble the tab operating lever to the splined end of the blow-back rod. Fit the bolt, saddle washers, nut and split pin *(detail A).*

(7) Connect the tab operating rod to the tab operating lever.

(8) Check that with the stop bolt at the aft end of the lever arm slot no pre-loading exists in the torque tube. If pre-loading is found

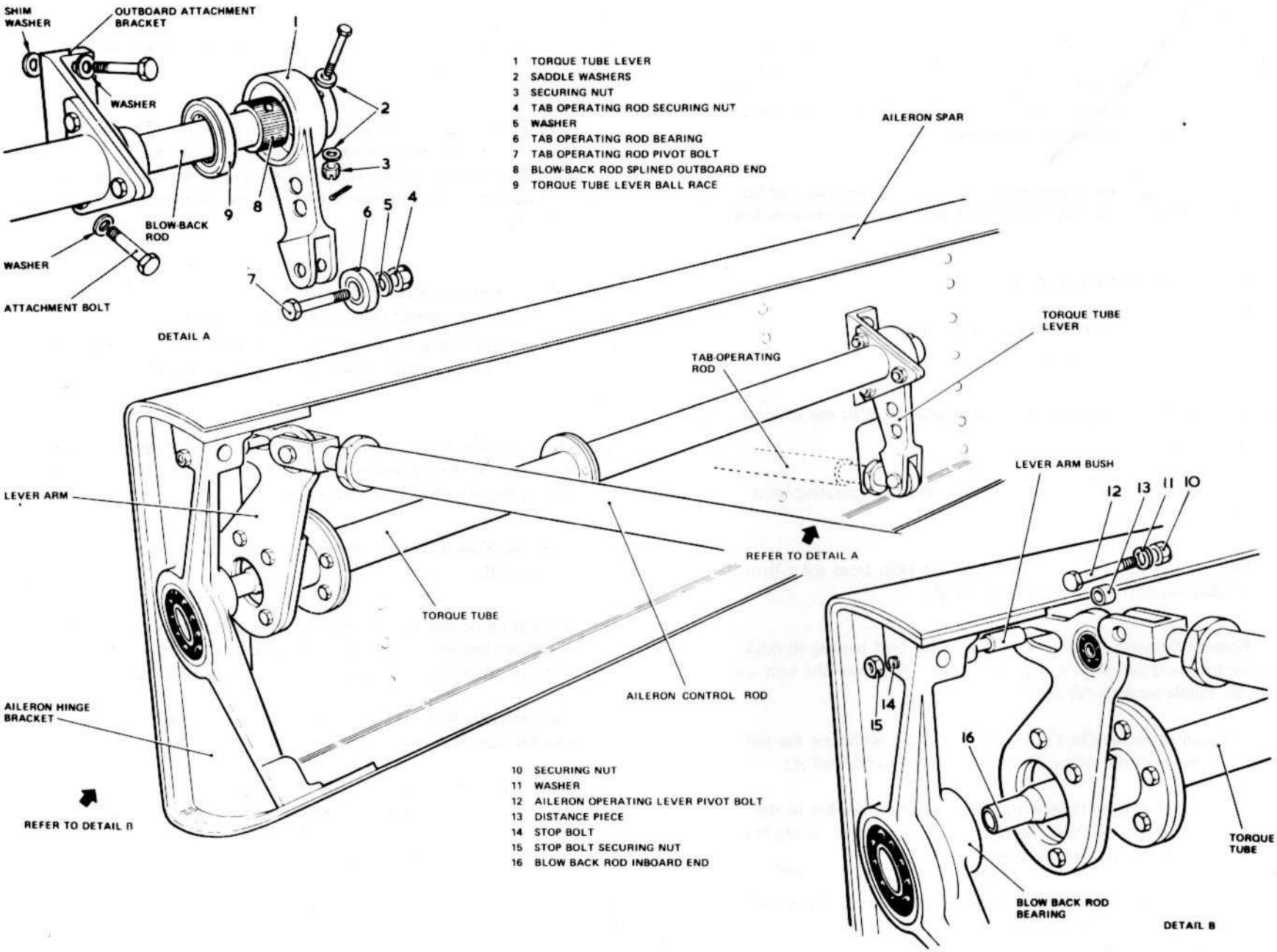


FIG.19. AILERON SPRING TAB MECHANISM REMOVAL

adjustment to relieve it must be made by transferring shim washers between the bolts securing the attachment bracket to the spar.

Note . . .

1. The shims are initially fitted to a thickness of 0.040 in. between the attachment bracket and the aileron spar at each of the two bolts. Shims removed from one bolt must be added to the other bolt so that there remains an aggregate of 0.080 in. shimming at the two bolt positions.

2. Each shim lamination is 0.003 in. thick.

3. To ensure security of mounting of the attachment bracket bolts A25/6/E may be fitted in lieu of A15Y/5E.

(9) Adjust the tab operating rod to give the tab a 15 deg droop.

(10) Refit the aileron to the aircraft *(Sect.3, Chap.2).*

(11) Rig the aileron controls *(para.20).*

(12) Carry out a flight trim check as detailed in Appendix 1.

Port elevator spring tab mechanism *(fig.20)*

Removal

42. Remove the port elevator spring tab mechanism as follows:-

(1) Remove the port elevator *(Sect.3, Chap.3).*

(2) Remove the access panel in the upper surface of the elevator *(Sect. 2, Chap.4),* giving access to the tab operating gear assembly.

(3) Remove the nut and withdraw the tab-operating lever securing bolt. Remove the tab-operating lever from the splined end of the blow-back rod.

(4) Remove the split pin and withdraw the shackle pin and washers from the slots in the links. Allow the links to swing clear of the main operating lever.

(5) Remove the two nuts and inboard bearing bracket securing bolts.

(6) Remove the locking wire and slacken the torque tube clamp nut securing the outboard end of the assembly to the outboard bearing bracket.

(7) Ease the torque tube assembly inboard through the ball race, attached to the elevator main spar, and withdraw through the inboard end of the elevator.

Assembly

43. Assemble the port elevator spring tab mechanism as follows:-

(1) Offer up the torque tube assembly (torque tube, blow-back rod, inboard bearing bracket and the main operating lever), through the inboard end of the elevator.

(2) Ease the torque tube assembly through the ball race, and the torque tube clamp nut.

(3) Fit the tab operating lever to the splined end of the blow-back rod and fit the tab operating lever securing bolt and nut.

(4) Attach the inboard bearing bracket using the two securing bolts with nuts.

(5) Tighten the torque tube clamp nut, and check that the gap between the outboard bearing bracket and the tab-operating lever does not exceed 0.25 in. (view on arrow A).

Note . . .

If this dimension is not obtained, or when fitting a new blow-back rod, refer to A.P.101B-0400-6.

(6) Lift the links and insert the shackle pin through the slots and the main operating lever. Fit the washers and split pin.

Note . . .

With the top surface of the elevator uppermost, the centres of the shackle pins must be 3.12 in. apart.

(7) If a new blow-back rod, torque tube, and main operating lever are being fitted, or if the assembly is being fitted in another aileron; set the tab in its neutral position (12 deg 30 min up) and with the pin central in the tab operating lever slot (view on arrow A), clamp together the main operating lever and the flanges of the torque tube and blow-back rod.

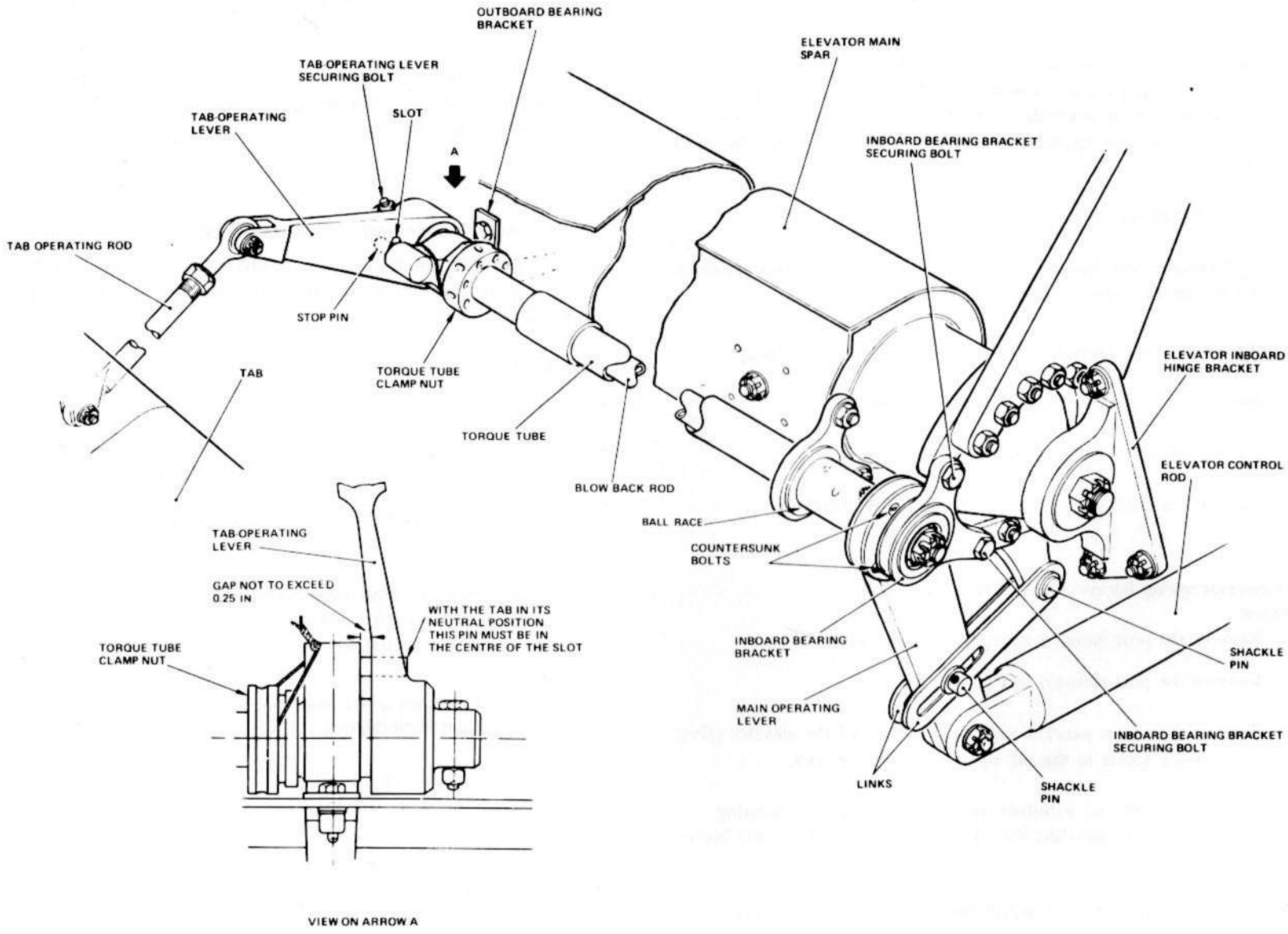


FIG. 20. PORT ELEVATOR SPRING TAB MECHANISM REMOVAL

(8) Check the tab movements.

(9) From the 5/32 in. dia. pilot holes in the flange of the blow-back rod, drill and ream (0.185 in. dia.), if necessary, the main operating lever and the flange of the torque tube. Secure the assembly with four countersunk bolts, and remove the clamps if fitted in (7).

(10) Wire-lock the torque tube clamp nut.

(11) Refit the access panel.

(12) Refit the elevator to the aircraft *(Sect.3, Chap.3).*

(13) Rig the elevator controls *(para.23).*

(14) Carry out a flight trim check as detailed in Appendix 1.

Rudder spring tab mechanism

Removal (fig.21)

44. Remove the rudder spring tab mechanism as follows:-

(1) Remove the rudder from the aircraft *(Sect.3, Chap.3).*

(2) Remove the two access panels from the base of the rudder nose *(Sect.2, Chap.4).*

(3) Disconnect the tab actuator and remove it from the rudder.

(4) Remove the two 2 B.A. bolts securing the stop bracket to the rudder hinge bottom bracket.

(5) Remove the two ¼in. dia. B.S.F. bolts securing the rudder hinge bottom bracket to nose rib 2 behind the rudder spar.

(6) Remove the thirty-one 2 B.A. bolts which secure the rudder hinge bottom bracket to the rudder.

Note . . .

Ensure the rudder hinge bottom bracket is completely free from the rudder.

(7) Remove the access panel at rib 6 from the rudder nose.

(8) Unfasten the nut and withdraw the bolt that secures the tab actuating lever to the splined end of the blow-back rod.

(9) Remove the two diametrically opposite bolts which secure the upper bearing housing to rib 6, and fit the special extractor *(Sect.2, Chap.4, Table 1).*

(10) By operating the extractor, force out the torque tube assembly complete with the rudder bottom hinge bracket and stop bracket, taking care to keep the main operating lever kidney slot clear from the rudder spar.

Note . . .

In some cases the spring-tab mechanism may be extremely difficult to remove; this is generally caused by the upper and outer torque tube bearings binding in their bearing housings. If all the above operations have been correctly followed and the rudder hinge bottom bracket is free, it may be advantageous to remove the main operating lever and although this will not actually assist in the mechanism removal, a greater twisting movement can be applied to the tab-actuator lever, and this action, together with the downward force of the extractor (operation (10)) will free the mechanism from the rudder.

Dismantling

45. Remove the two self-tapping screws which fasten the sealing plate over the bearings at the base of the tab mechanism. Remove the sealing plate. Separate the rudder bottom hinge bracket from the tab mechanism at the bottom bearing using a separating tool *(Sect.2, Chap.4, Table 1).*

Assembly

46. The sequence of assembly for a removal rudder spring tab mechanism is the reverse of the removal procedure.

Note . . .

In preparation ensure that the bearing between the inner and outer torque tubes (upper bearing), also the outer torque tube bearing are packed with grease (fig.18B).

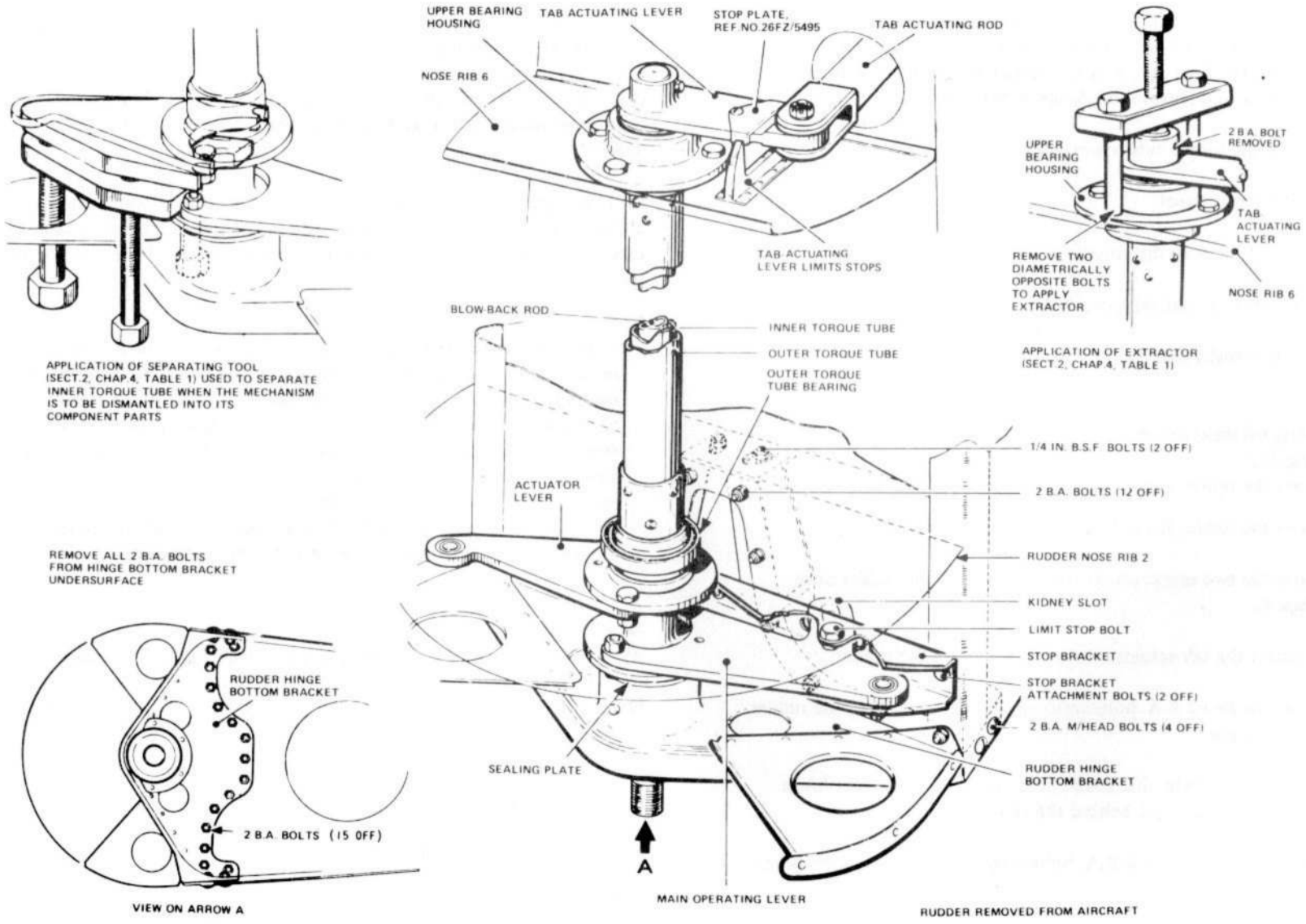


FIG. 21. RUDDER SPRING TAB MECHANISM REMOVAL

Assembly of a new spring tab mechanism

47. Assemble a new spring tab mechanism as follows:-

Note . . .

In preparation ensure that the bearing between the inner and outer torque tubes (upper bearing), also the outer torque tube bearing are packed with grease (fig.18B). Ensure that the rudder lower hinge bearing is lubricated as detailed in Chap.3.

(1) Assemble the rudder bottom hinge bracket to the new spring tab mechanism, and fit the spigot and bearings into the bottom hinge bearing housings.

(2) Secure the sealing plate over the bearing housing using two self-tapping screws and jointing compound Ref.No.33H/2202110.

(3) At the access panel at rib 6 on the rudder nose, remove the two remaining bolts which secure the upper bearing bracket to the rib, and disconnect the tab-control lever from the tab actuating rod. Remove the tab-actuating lever and bearing housing complete.

(4) Offer up the assembly to the rudder and fit the bolts which secure the rudder bottom hinge bracket and stop bracket.

(5) Manufacture a block to fit to each side of the stop bolt, thus centralizing it in the kidney slot. With the actuator in mid position, refit it to the rudder and connect the tab actuator lever to the ram, adjusting ram as required. Remove blocks from slot on completion of rigging.

(6) Locate the tab-actuating lever and upper bearing housings on to the splined end of the blow-back rod, and position it with the lever mid-way between its stops.

(7) With the tab set in its neutral position, reconnect the tab-actuating rod to the tab-actuating lever. Refit the four bolts which secure the upper bearing housing.

(8) Operate the tab, and check that the maximum travels quoted in fig.17 are obtained, and that the stops of the tab-actuating lever are reached before the limit stop reaches the ends of the kidney slot.

(9) Ensure that no foul occurs between the sealing plate and the bolts which secure the main operating lever, when the lever is moved through its complete travel.

(10) Through existing holes in the tab-actuating lever drill a 3/16 in. dia. hole in the splined end of the blow-back rod.

(11) Secure the tab-actuating lever by using a new 2 B.A. nut and bolt, and the two existing saddle washers. Centre punch to lock.

(12) Refit the access panels.

(13) Refit the rudder to the aircraft *(Sect.3, Chap.3).*

(14) Rig the rudder controls *(para.24).*

Note . . .

1. If the rudder tab movement is in excess of 18 deg, a new rudder tab actuating lever stop plate, Ref.No.26FZ/5495, must be fitted, and the stop faces filed, if necessary to obtain the desired 18 deg movement. Similarly, if the 18 deg movement is unobtainable, the existing stop plate must be filed. The correct protective treatment (A.P.101A-0600-6) must be applied to all filed surfaces.

2. The sequence of assembly for a reconditioned rudder spring tab mechanism, Ref.No.26FZ/2102, is similar to the above except that the drilling detailed in operation (10) will already have been done when the blow-back rod was fitted to its original rudder. Should it be necessary to misalign this hole relative to the hole in the tab actuating lever to obtain a no foul condition, the misalignment must be corrected by drilling through with a ¼ in. dia. drill, and fitting a larger bolt at operation (11).

(15) Carry out a flight trim check as detailed in Appendix 1.

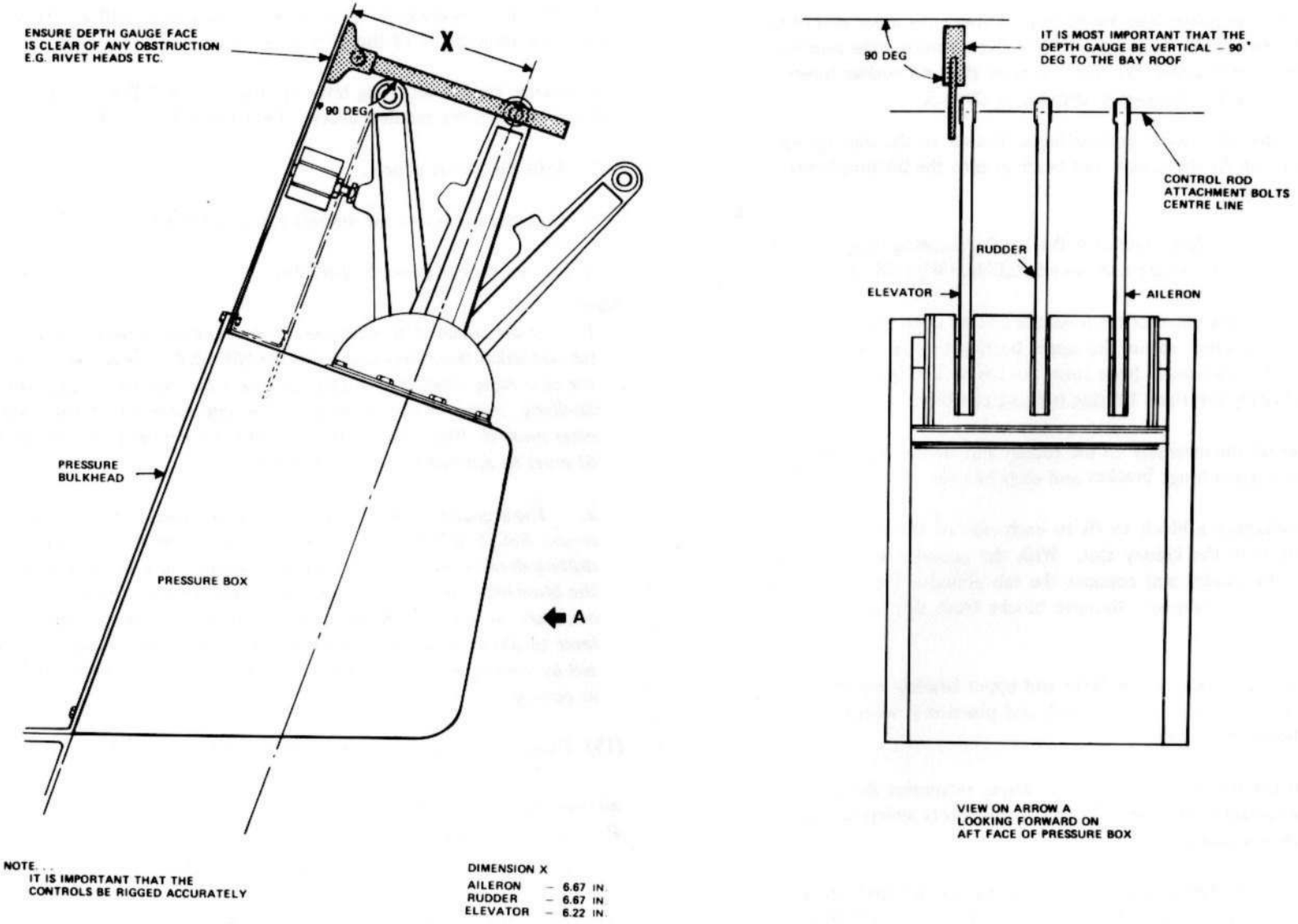
Aileron bias actuator *(fig.2)*

48. To remove the aileron bias actuator:-

(1) Remove the floor cover plate forward of the control column.

(2) Disconnect the electrical cables from the actuator.

(3) Turn the control column hand wheel fully to starboard; this will give greater ease of access to the aileron bias lever.



NOTE...
IT IS IMPORTANT THAT THE CONTROLS BE RIGGED ACCURATELY

DIMENSION X

AILERON	– 6.67 IN.
RUDDER	– 6.67 IN.
ELEVATOR	– 6.22 IN.

FIG. 22. CONTROL LEVER RIGGING

(4) Remove the split pin, nut and bolt securing the actuator ram to the actuator lever.

(5) Remove the split pin, nut and shouldered bolt securing the actuator to the floor beam, and remove the actuator.

Rudder trim actuator

49. To remove the rudder trim actuator:-

(1) Remove the actuator access panel on the starboard side of the fin.

(2) Disconnect the electrical cables from the actuator.

(3) Remove the split pin and nut from the bolt connecting the actuator ram to the actuator lever and remove the bolt.

(4) Remove the split pin from the shouldered bolt attaching the actuator to the mass balance lever and remove the bolt.

(5) Remove the actuator.

Tail plane actuator

Removal

50. To remove the tail plane actuator:-

(1) Set the tail plane to its mid-travel position.

(2) Remove the fuselage rear cone fairing and the rear fuselage fairing below the rudder *(Sect.3, Chap.1).*

(3) Disconnect the electrical cables from the actuator.

(4) Remove the five seal adjustment bolts from each side of the tail plane if Mod.1277 is embodied.

(5) Attach a sling *(Sect.2, Chap.4, Table 1)* to the tail plane *(Sect.3, Chap.3).*

(6) Remove the split pin and nut from the bolt attaching the actuator to the reinforcement piece on frame 46 of the fuselage.

(7) Raise the sling until it takes the weight of the tail plane off the actuator, and withdraw the actuator attachment bolt.

(8) Remove the locking pin from the bolt connecting the actuator ram to the tail plane, and withdraw the bolt.

(9) Withdraw the actuator from the underside of the tail plane.

Note . . .

When the actuator has been removed a tail plane jury strut (Sect.2, Chap.4, Table 1) must be fitted before detaching the tail plane sling.

Assembly

51. Assemble the tail plane actuator to the aircraft in the reverse order to that given in para.50 and carry out the following checks:-

Note . . .

Ensure that the actuator cable T33L has a free length of 17 to 19 in. between the cable clamp at frame 46 and the tail plane actuator socket.

(1) On aircraft embodying Mod.1277 the tail plane must be set to the neutral position, i.e. 3 deg 56 min incidence measured at the starboard rigging position, and the sealing strips adjusted to give the following clearances:-

(a) Between the sealing strips (2-bolt position) and the tail plane stub fairing 0.04 in. minimum.

(b) Between the sealing strips (3-bolt position) and the tail plane stub fairing, 0.02 in. minimum.

(2) Ensure complete freedom of movement throughout the full range of tail plane travel.

(3) Whenever a tail plane actuator has been replaced or adjusted, a flight trim check as detailed in Appendix 1 must be made to ensure that the aircraft trim is within the permitted limits. Should the aircraft trim be outside these limits, a new trailing edge strip should be fitted and the flight trim checks repeated until a satisfactory result is obtained.

Flying control rod assemblies

52. The fork-end fittings of flying control rods are machined with a counter-bored recess on the outer face of one of the lugs concentric with the bolt hole. This recess is provided to accommodate the nut, when the rods are connected. Should the bolt be reversed on assembly, i.e. with the bolt head in the recess, fouling with the airframe may occur at frame 12. An exception is at the connection of the control rods to the aileron levers at which point the bolt must be inserted from inboard and the head must locate in the recess in the forked end *(fig. 15, 'J').*

Limits on Fairey roller guides

53. During assembly of the control rods, the following procedure should be adopted to obtain the correct clearance between the control rods and the roller guides:-

(1) Assemble the control rods through the fairleads.

(2) Release the locking screw in each adjustable roller guide assembly and, at the point of maximum diameter, adjust until the three rollers in each assembly are in contact with the control rods.

(3) Tighten the locking screws and recheck the adjustment.

(4) Move the control rods to the slackest position of travel, at which point the following clearances between the rod and any one roller must not exceed 0.006 in. at the fairlead nearest to any lever motion and 0.012 in. at any other fairlead.

Appendix 1 FLIGHT TRIM CHECKS

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

IMPORTANT

Whenever an aircraft component which affects longitudinal trim is replaced or adjusted, the flight trim checks as specified in this Appendix should be repeated. Should the aircraft trim be outside the limits specified, a new trailing-edge strip should be fitted, and the flight trim checks and subsequent trailing-edge strip adjustments carried out. Components likely to affect the longitudinal trimming, are:- Wing(s), rear fuselage, tail plane, tail-plane actuator, ailerons, elevators, and aileron and elevator tabs.

Introduction

1. This appendix details the flight trim checks, and the subsequent trimming of the elevator trailing-edge strips necessary to ensure that the aircraft trim is within the limits laid down, thus enabling the pilot to maintain control of the aircraft under any flight condition within service limits, should the tail-plane actuator have run away to the maximum aircraft 'nose-down' position, i.e. the actuator on its mechanical stop.

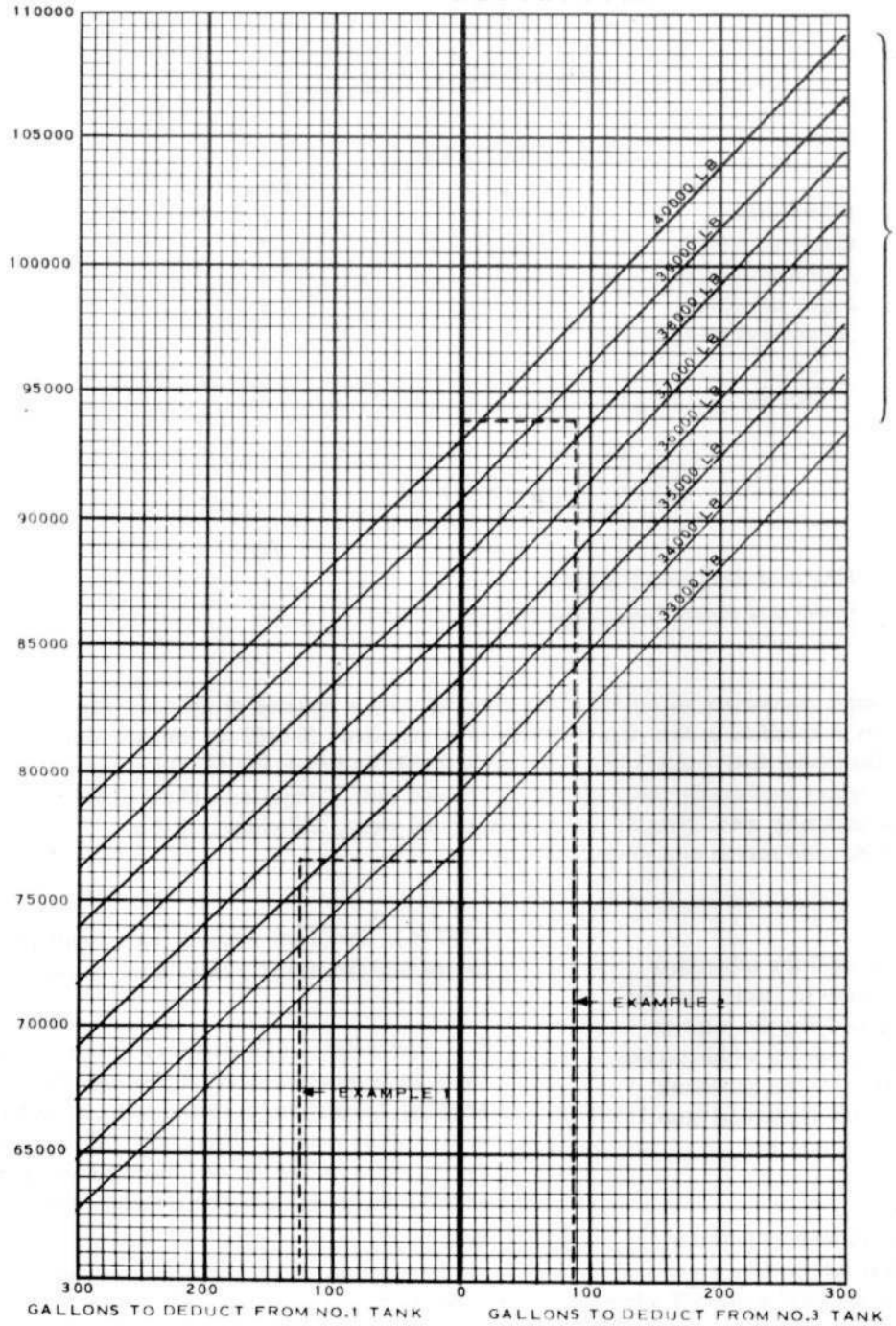
Centre of gravity

2. During flight tests, the centre of gravity is to be maintained at 2.285 ft. ± 0.15 ft. aft of the c.g. datum. This is achieved by a pre-determined distribution of the fuel load at engine 'start-up' which will allow for fuel consumed in taxying, take-off, and climb to test altitude (up to 6000 ft.). Two crew members only (pilot and navigator) are to be carried and the wing-tip tanks must be removed.

3. The weight and moment of the aircraft, with undercarriage down, are to be determined with full fuselage fuel load and two crew, by weighing, calculation, or reference to the current Form 4908. These values will be used in conjunction with the graph *(fig.1)* to determine the reduction of the full fuel load at start-up in tanks 1 or 3 to ensure a correct c.g. position at the commencement of the test run.

Note . . .

The weight and moment of the navigator at his normal station should be used.



EXAMPLE 1
MOMENT 76500 LB FT
A.U.W. 35500 LB
FUEL TO DEDUCT FROM
NO.1 TANK 125 GALLONS

EXAMPLE 2
MOMENT 94000 LB FT
A.U.W. 38250 LB
FUEL TO DEDUCT FROM
NO.3 TANK 90 GALLONS

FIG.1. FUEL LOAD DETERMINATION GRAPH

Fuel load determination *(fig.1)*

4. The appropriate value of the aircraft moment is read off from the vertical axis of the graph and a horizontal line is extended from this value to intersect the aircraft weight value on, or between the weight lines. A vertical line is then dropped from this intersection to the horizontal axis of the graph to indicate the amount of fuel to be removed from the relevant tank to give the correct trim at 'start-up'.

Example 1 (fig.1)

Aircraft moment . . . . . 76500 lb/ft
All-up weight . . . . . 35500 lb
Amount of fuel to be deducted from No.1 tank . . . . . 125 gal
No.3 tank . . . . . .Full

Example 2 (fig.1)

Aircraft moment . . . . . 94000 lb/ft
All-up weight . . . . . 38250 lb
Amount of fuel to be deducted from No.3 tank . . . . . 90 gal
No.1 tank . . . . . .Full

Note . . .

No.2 tank is maintained with a full fuel load.

5. The test run should commence immediately on reaching test altitude. The warm-up, taxi, take-off and climb to test altitude should be made using fuel from No.1, 2 and 3 tanks, thereafter fuel from No.2 tank only should be used until completion of the test run.

Flight procedure

Note . . .

1. All speeds quoted are I.A.S.

2. Before the first flight test, the elevator trailing-edge strips Part No.EA1.31.677 should be examined and, if they are bent, kinked, or damaged, should be removed and new strips fitted. Bowing where the strip follows the line of the elevator edge is acceptable.

3. It is better to remove too little trailing-edge strip since, if the aircraft trim is over-adjusted, a new strip will have to be fitted and the tests re-commenced.

4. Take-off and climb should be normal on all three tanks, but the actual trim checks should be carried out on No.2 tank only, with No.1, and 3 tanks switched off.

5. Tests are to be carried out in calm air and good visibility.

◀ *6. When fitting a new trailing-edge strip, care must be taken to ensure that the new strip is correctly aligned in the position vacated by the old strip.* ▶

6. Operate the fuel system as instructed in Note 4, and climb to test altitude (1013 millibars setting), and increase speed slowly until:

(1) *Case 1* – The aircraft can just be trimmed 'hands-off' in level flight with speed steady using full NOSE–DOWN trim. Record the speed. Increase the speed slowly beyond this point to ensure that a push force develops on the control column.

OR

(2) *Case 2* – If 450 knots is reached before the condition described in Case 1 is obtained, trim the aircraft 'hands-off' at 450 knots and, without further adjustment of the tail trimmer reduce speed slowly using elevator and throttle, and land the aircraft.

Note . . .

Care should be exercised when reducing speed since an aircraft 'nose-down' change of trim will generally occur as speed is reduced. The stick force to hold this change of trim may increase initially as speed is reduced, but will diminish below 350 knots. Lower the under-carriage at 190 knots, and the flaps at 160 knots. The pull force on the control column should be greatly reduced and may become a small push force when the flaps are lowered.

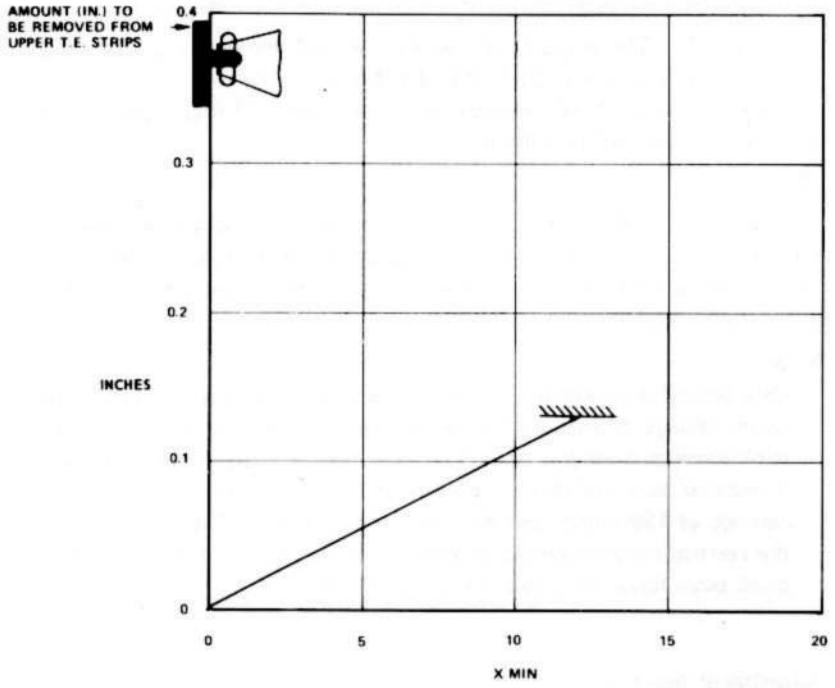
Adjustment procedure

7. *Case 1* – Refer to fig.2 (lower);

(1) Read off the amount of metal to be removed from the elevator strips according to the speed reached, and remove this amount from the depth of the lower strips on both elevators, along the whole length of the strips.

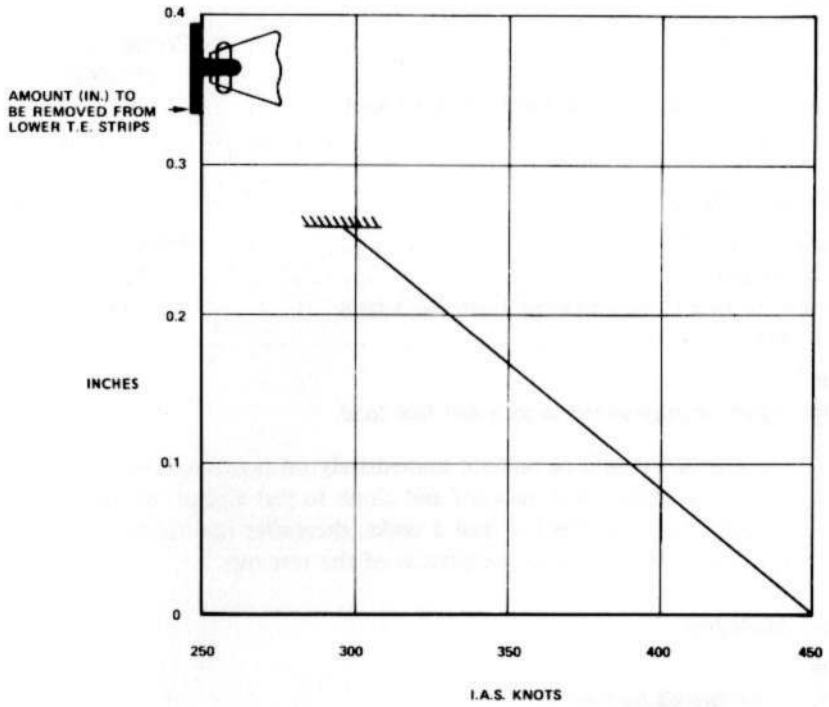
(2) Refuel the aircraft *(para.4)*, repeat the flight trim check *(para.6(1))*, and trailing-edge strip adjustment (1) as necessary until the following trim conditions are achieved:

The aircraft can be flown 'hands-off' at a speed between 425 and 450 knots with full NOSE–DOWN trim applied.



X = T/P ANGLE ON ELECTRICAL STOPS MINUS T/P ANGLE REQUIRED TO TRIM AIRCRAFT 'HANDS OFF' AT 450 KNOTS (ANGLES TO BE MEASURED BY INCIDENCE BOARD)

UPPER



MAXIMUM I.A.S. AT WHICH AIRCRAFT CAN BE TRIMMED 'HANDS OFF' USING FULL AIRCRAFT 'NOSE DOWN' TRIM

LOWER

FIG. 2. UPPER AND LOWER TRAILING EDGE STRIP ADJUSTMENT

Typical example – Consider an aircraft which, on its first flight check, can be flown 'hands-off' at 355 knots with full aircraft NOSE–DOWN trim.

◀ Reference to the curve *(fig.2 lower)* will show that 0.16 in. must be removed from the depth of the lower strips. After the second flight, and assuming that the aircraft is now in trim at 390 knots, a further 0.1 in. should be removed from the lower strips. If on the third flight, the 'hands-off' trim speed with full aircraft NOSE–DOWN trim applied, lies between 425 and 450 knots, the trailing-edge strip adjustment is satisfactory.

Note . . .

1. There is no restriction on the amount of lower strip which may be removed; the whole of the lower strip may be removed if necessary.

2. If, due to over-adjustment, the aircraft becomes 'Case 2', this condition is satisfactory providing the tail plane setting at 450 knots is not more than 3 minutes from the tail plane leading-edge UP electrical stop (refer to para.6(2) and 8(1) and (2) for the procedure in this case). If excessive over-adjustment has occurred, and the tail plane setting at 450 knots is greater than 3 minutes from the tail plane plane leading-edge UP electrical stop, the trailing-edge strip must be renewed and the tests re-commenced. It is not permissible to remove metal from both the upper and lower strips.

3. When fitting a new trailing edge strip, care must be taken to ensure that the new strip is correctly aligned in the position vacated by the old strip,

8. *Case 2* – Refer to fig.2 (upper);

(1) Place the aircraft on a level standing and support the fuselage with a trestle. Without disturbing the tail trim setting measure the tail plane incidence (this was the angle found necessary to trim 'hands-off' at 450 knots).

(2) Without removing the clinometer run the actuator on to its leading edge UP electrical stop. Record the difference in angle between the 'hands-off' at 450 knots trim position, and the electrical stop.

(3) Read off the amount of metal to be removed from the upper strips corresponding to the difference found in operation (2). Remove the required amount of metal from both elevators along the whole length of the strips.

(4) Refuel the aircraft *(para.4)* and repeat the flight check *(para.6(2))* and trailing-edge strip adjustment (3) as necessary until the following trim condition is achieved:

The aircraft can be flown 'hands-off' at a speed of 450 knots with the tail plane setting not more than 3 minutes from the leading-edge UP electrical stop.

Typical example – Consider an aircraft on which the tail plane angle required to fly 'hands-off' at 450 knots was 3 deg 52 min and the electrical stop is found to be set at 4 deg giving a difference of 0 deg 8 min.

Reference to the curve *(fig.2 upper)* will show that 0.080 in. must be removed from the depth of the upper strips. Assuming that the 450 knots tail plane setting is 4 minutes from the electrical stop on the 2nd flight, a further 0.040 in. must be removed from the upper strips. If, on the 3rd flight, the aircraft will fly 'hands-off' at 450 knots with the tail plane set at not more than 3 minutes from the leading-edge UP electrical stop, the trailing-edge strip adjustment is satisfactory.

Note . . .

1. The amount of metal that can be removed from the upper strips is restricted to half the depth of the strips.

2. If, due to over-adjustment, the aircraft becomes 'Case 1', this condition is satisfactory providing that the aircraft can be flown 'hands-off' using full aircraft NOSE–DOWN trim at a speed of not less than 425 knots. If excessive over-adjustment has occured resulting in a 'hands-off' trim speed of less than 425 knots using full aircraft NOSE–DOWN trim, the trailing-edge strips must be renewed, and the tests re-commenced.

3. When fitting a new trailing edge strip care must be taken to ensure that the new strip is correctly aligned in the position vacated by the old strip. ▶

Chapter 5 ALIGHTING GEAR

LIST OF CONTENTS

Note. . . *A detailed list of contents will be found at the beginning of each chapter.*

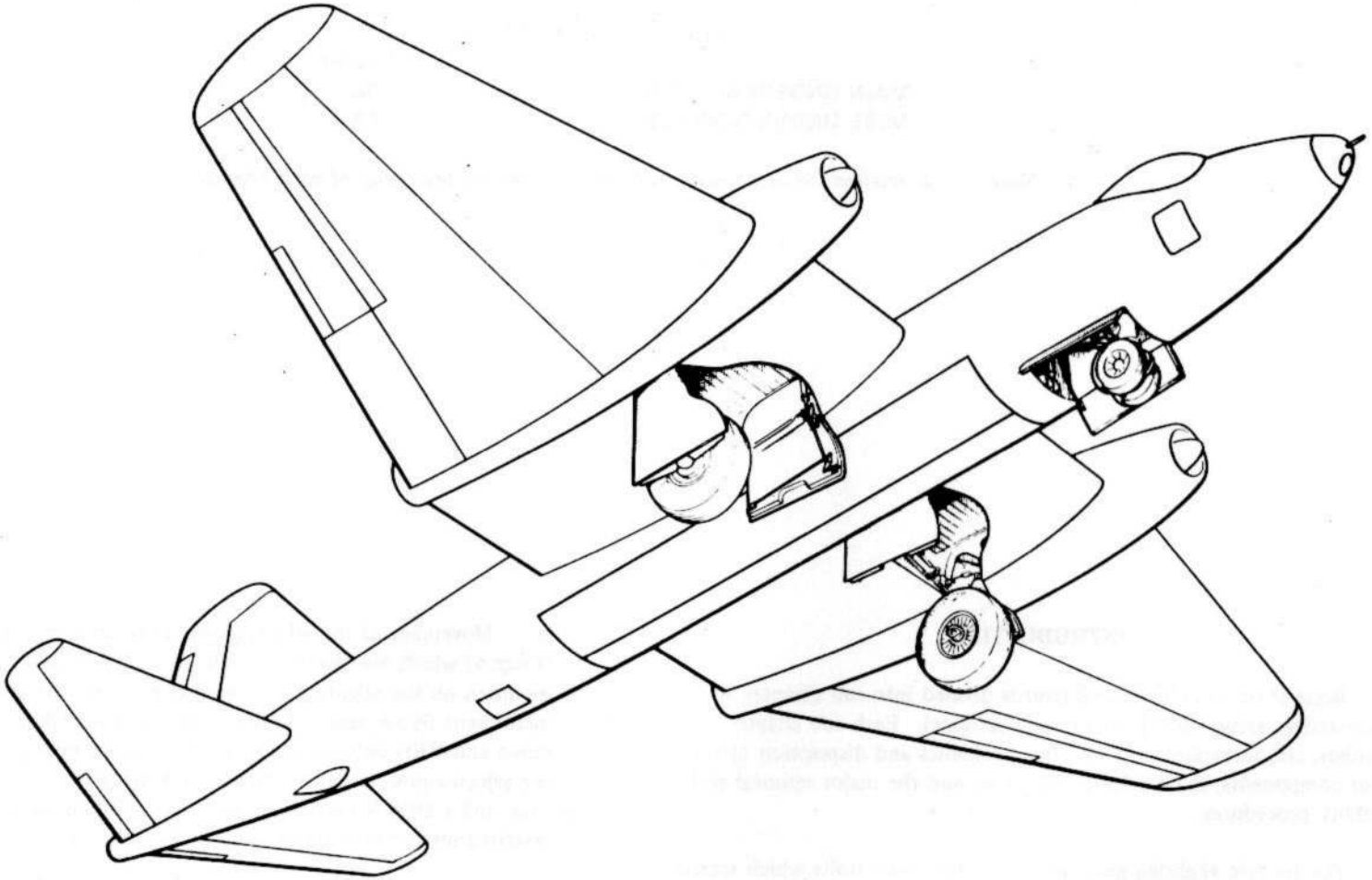
INTRODUCTION

1. Because of its bulk, this chapter is divided into sub Chapter A (main undercarriage) and B (nose undercarriage). Each sub chapter describes, and illustrates in detail, the mechanics and disposition of the major components, the servicing operations and the major removal and assembly procedures.

2. The tricycle alighting gear consists of two main units which retract inward into bays in the main planes and a single nose unit which retracts rearward into a bay in the nose fuselage aft of the pressure bulkhead. Each main undercarriage has a single wheel mounted on an inward-facing stub axle incorporating Dunlop hydraulic copper plate type brake units fitted to each wheel. To reduce shimmy, the nose undercarriage is fitted with twin wheels; these are smaller in diameter than the main wheels and are mounted on a common axle. Mud guards, fitted over both wheels, protect the interior of the nose-wheel bay.

3. Movement of the alighting gear is effected by hydraulic jacks *(Chap.6)* which are electrically controlled by selector push-buttons mounted on the alighting gear sloping panel on the port side of the instrument flying panel. Indicator lights, which show GREEN locked down and RED unlocked are mounted on the same panel adjacent to the selector push-buttons. Provision is made for an override UP selection and a DOWN emergency selection. The operational controls and resetting instructions are detailed in Sect.3, Chap.11.

4. The apertures into which the alighting gear retracts are sealed upon completion of retraction by flush-fitting doors operated by hydraulic jacks. Correct retraction and lowering sequence is ensured by the incorporation of sequence valves in the hydraulic circuit, details of which are given in Chapter 6.



ALIGHTING GEAR

◀ MAIN UNDERCARRIAGE DOOR MECHANISM AMENDED ▶

Chapter 5A MAIN UNDERCARRIAGE

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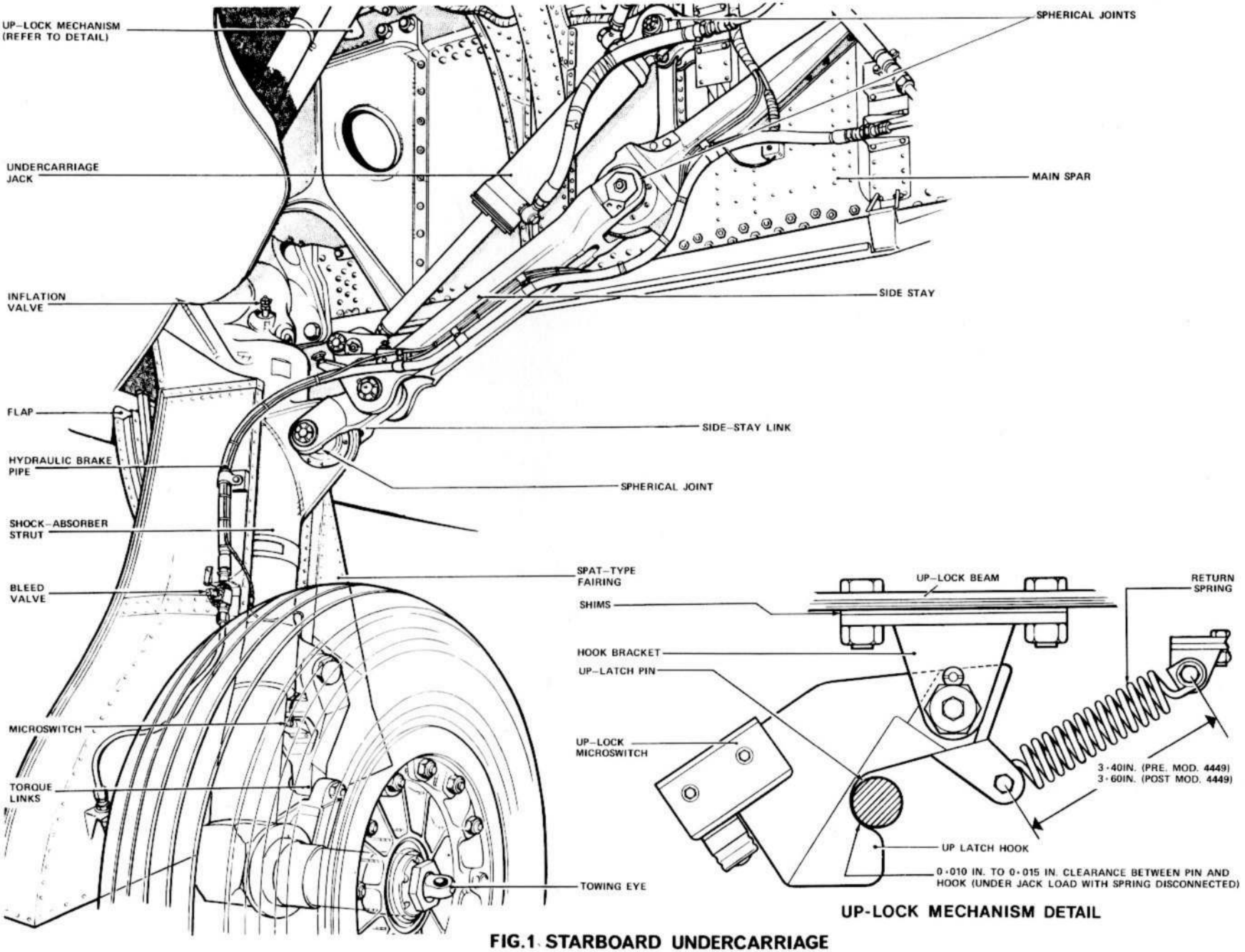

FIG.1 STARBOARD UNDERCARRIAGE

DESCRIPTION

General information *(fig.1)*

1. Each main undercarriage consists of a cantilever shock-absorber strut of the oleo pneumatic type, carrying a single wheel and retracting inwards into the main plane. In the down position the shock absorber is braced against side loads by a knuckle-jointed side stay *(para.3)* which incorporates the down-lock mechanism. The undercarriage jack is attached by a spherical joint to the main plane structure and to the lock lever assembly on the side-stay assembly down-lock mechanism *(fig.6)*. Spat-type fairings are attached to the shock absorber struts to fair off the housing when the undercarriage is retracted. The unit is fully described in A.P.104B-1401-1.

Shock-absorber struts

2. Each shock-absorber strut is suspended by its main pivot from large bearing bracket lugs on the front face of the main plane main spar, one on each side of the engine inboard rib. The struts consist of two cylinders sliding one within the other, two pistons operating one within each cylinder, and an axle which is formed at the base of the inner cylinder or sliding tube. Torque links hinged to lugs on both inner and outer cylinders form a scissors connection between the two cylinders and transmit the torque loads from the wheel to the outer cylinder, thus preventing rotation of the sliding tube. An adapter, fitted with an oil level tube and an inflation valve, is fitted into the head of the outer cylinder.

Side stay *(fig.6)*

3. The side stay assembly consists of a side stay, a side-stay link, and the down-lock mechanism. The stay and stay link are hinged together and the hinge bolt is offset below the centre-line of the assembly; this ensures that the loading on the side stay will tend to fold it downwards, though this is resisted by a stop bolt fitted on the stay which butts against a buttress formed on the upper face of the stay link. The upper end of the side stay is attached by a spherical joint on a bracket to the front face of the main spar, and the lower end, which is the side stay link fork, is attached to the spherical bearing lug on the shock-absorber strut. The side stay carries the pick-up point for the hydraulic jack piston rod, the down lock lever and rollers, the down-lock microswitch, up latch pin, and an adjustable tappet for operating the door jack sequence valve.

Up-lock mechanism *(fig.3)*

4. The up-lock hook is mounted on the main-plane structure in the roof of the wheel well and is held in the engaged position by a coil spring. The undersurface of the hook is so shaped that when the up-latch pin in the side stay contacts it during retraction, the hook pivots to permit the pin to pass and then, under the influence of its spring, snaps back to its original position, engages the pin and retains the undercarriage in the retacted position. The UP indicator lights are actuated by the upper surface of the side stay fork which contacts a microswitch mounted on the up-lock hook.

5. When DOWN is selected the initial movement of the jack releases the lock. The pivot pin connecting the eye end of the jack piston rod to the side stay is fitted in slotted holes and moves across the holes as the jack extends. The eye end of the jack contacts the end of the hook and, by a protrusion above the centre-line of the eye, pushes the hook out of engagement. The undercarriage falls under gravity for the first part of its travel during which time the jack pivot is returned to its former position. As the undercarriage approaches the down position, hydraulic pressure in the jack straightens the side-stay assembly and pushes the down-lock lever into engagement with the stay link lip *(fig.6)*.

Down-lock mechanism *(fig.3 and 6)*

6. The down-lock mechanism consists of a lever, pivoted on the up-latch pin in the side stay, which is moved into position against the lip on the end of the stay link by the action of the undercarriage jack; it is retained in position by spring-loaded stop in the side stay. A flanged plate lever is attached to the up-latch pin and the jack pivot pin so that it moves with the lock levers and depresses the plunger of a microswitch which operates the DOWN indicator lights. When UP is selected, the initial movement of the jack moves the down-lock lever out of engagement with the lip of the stay link and unlocks the unit.

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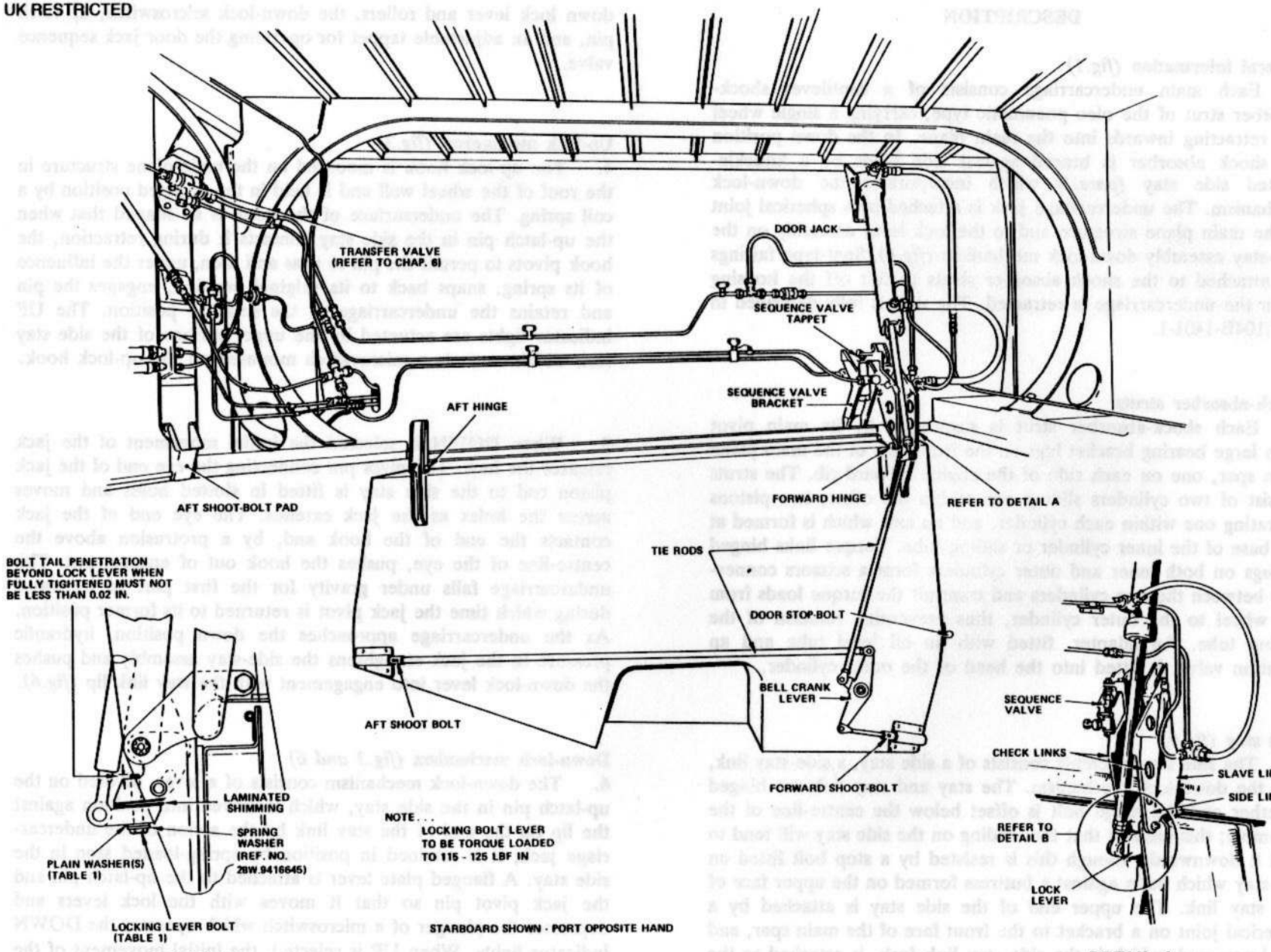


DETAIL B

DETAIL A

FIG. 2. MAIN UNDERCARRIAGE DOOR-OPERATING MECHANISM

◂TORQUE LOADING NOTE ADDED TO LOCKING LEVER BOLT▸

Door-operating mechanism *(fig.2 and 4)*

7. The main doors open downwards and inboard on two hinges attached to the fuselage side. Jointed check links, which abut when the doors are fully open, are attached to the lugs of the forward hinge; the upper check link carries a trip lever with an adjustable tappet which operates the down sequence valve. This valve is positioned so that the door must be fully down and open before the trip lever tappet strikes it and allows hydraulic pressure to the down side to the main undercarriage jack. In the event of a mechanical failure of the check links the sequence valve is operated by an inboard movement of the undercarriage door in the airstream beyond its normal fully-open position; this further movement is transmitted to the sequence valve by a slave link mechanism attached to the door and the upper check link. The door jack is mounted vertically downwards between brackets on the fuselage skin with its piston rod attached to a lock lever between the door forward hinge bracket lugs. On contraction of the jack the door is first retracted and, when fully up, the lock lever rotates through a small arc and operates a tie-rod, the movement of which is redirected through a bell-crank lever to two further tie rods which operate the door shoot bolts. When DOWN is selected the jack operates the lock lever and the shoot bolts are withdrawn as the first operation.

Engine cowl flap

8. A small flap, the movement of which is restricted by a check cable, is situated in the engine lower cowling and is mechanically connected to the undercarriage main pivot by an adjustable tie rod. The flap allows the main strut, when lowered, to move outboard into a recess in the skin of the engine cowling and, on retraction, fits in the recess and fairs off the cowling.

Transfer valves

9. A transfer valve installed in each main undercarriage hydraulic circuit, allows fluid expelled from the up side of the hydraulic jack during lowering of the undercarriage to be diverted to the down side, thus reducing the lowering time. The additional supply of fluid assists the pump to meet the immediate demands of the undercarriage circuit, ensuring a smooth continuous lowering and preventing cavitation in the main jacks. This transfer is especially effective when an emergency lowering has to be made as the extra fluid provided for the jack down stroke reduces the number of strokes required on the aircraft hand pump. When the undercarriage is retracted the transfer valves close, ensuring that the pump supply is confined to the up side of the jack only. Each valve incorporates a thermal relief valve which, in abnormal temperatures and pressures, will relieve from the up line to the down line when the sequence valve is open. Full details and servicing of the transfer valves are given in A.P.105B-0003-1.

Principle of operation *(fig.3)*

Raising

10. When the alighting gear is selected UP, hydraulic pressure is felt simultaneously on the up side of both the undercarriage and undercarriage door jacks, but, as the door jack sequence valve is closed, preventing a return flow of fluid from the door jack, only the undercarriage jack operates. The initial movement pulls the jack pivot pin back along the slot in the end of the side stay and moves the down-lock lever out of enagagement with the lip of the stay link. Continued retraction raises the unit and at the same time closes the mechanically-operated flap in the engine cowling *(para.8)*. Final contraction of the main jack engages the up-latch pin with the up-latch hook in the roof of the wheel well and brings the door jack sequence valve adjustable tappet on the side stay into contact with the plunger of the door jack sequence valve. The door jack sequence valve is now open allowing hydraulic pressure on the up side of the jack to raise the door. During its retraction the jack folds the check links *(fig.4)*, closes the undercarriage main jack sequence valve, and finally locks the door in its closed position by operating the shoot-bolts.

Lowering

11. Upon application of hydraulic power to lower the undercarriage, pressure is applied to both the undercarriage and undercarriage door jacks, but since the undercarriage jack sequence valve is closed, preventing the flow of fluid from the undercarriage jack, only the door jack is operated. Initial extension of the door jack disengages the door shoot bolts against the action of their springs and continued movement of the jack

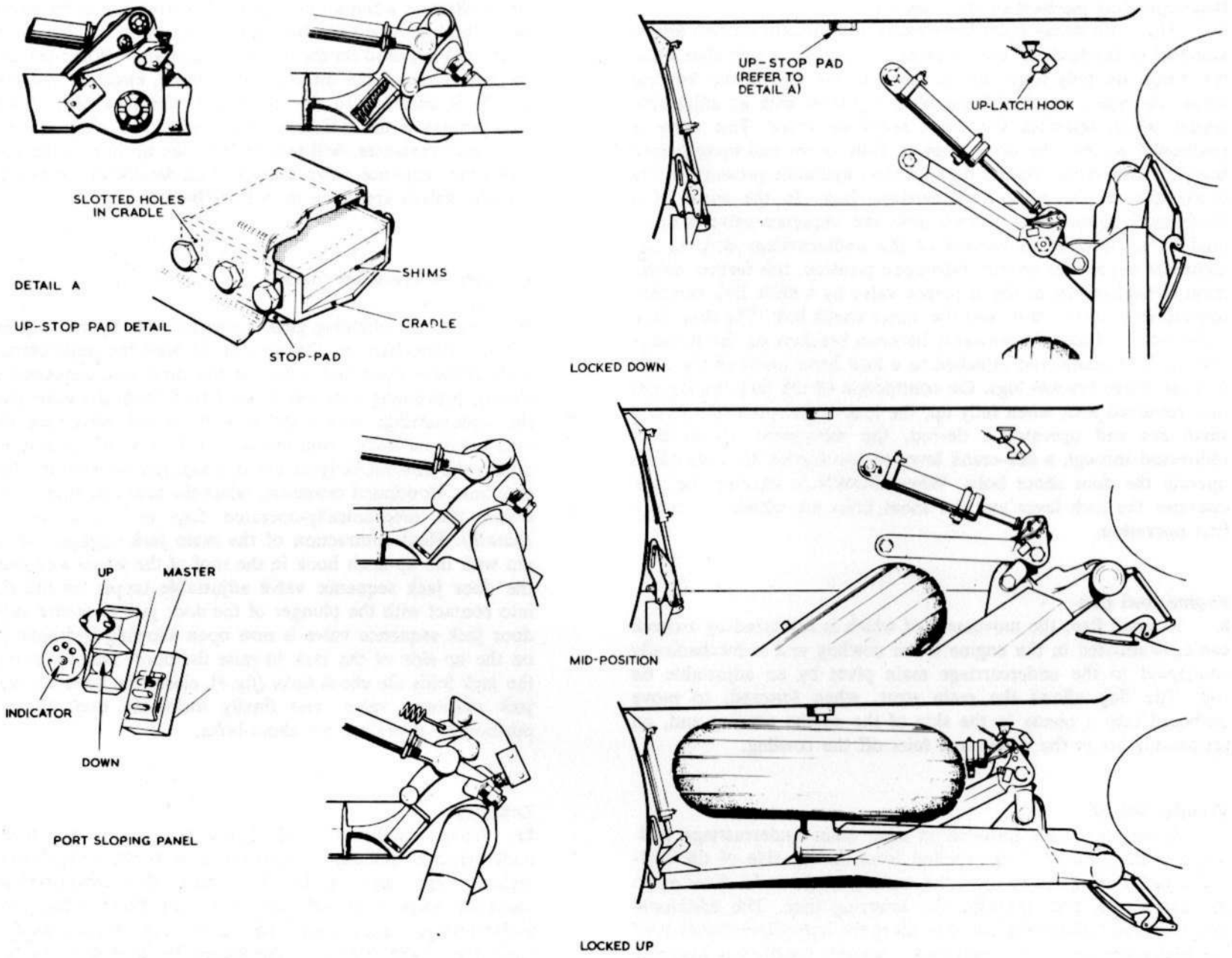


FIG.3. MAIN UNDERCARRIAGE DOOR-OPERATION

piston rod opens the door and finally brings the sequence valve adjustable tappet on the door check links into contact with the undercarriage sequence valve plunger.

12. With the sequence valve open, hydraulic power can now operate the undercarriage jack, and its initial movement releases the unit from the up-latch hook and closes the door sequence valve, locking the door jack in its extended position. For the first part of its travel the undercarriage falls under gravity, overrunning the hydraulic pressure but, as it approaches the down position, hydraulic pressure builds up, straightens the side stay and link, and pushes the down-lock lever into position against the lip on the end of the stay link, locking the undercarriage down.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General information

13. The following paragraphs provide information on checking and correcting the shock-absorber struts oil level and air pressure.

Checking and correcting oil level

14. An inflation adapter fitted with a pressure gauge *(Sect.2, Chap.4, Table 2)* is used when checking and correcting the oil level. The following procedure must be adopted:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Ensure that the adapter air-release valve is closed by turning the knurled knob as far as it will go in a clockwise direction.

(3) Carefully turn the gauge counter-clockwise until the stop is reached; do not strain against the stop.

(4) Tighten the cap at the adapter inflation point to prevent air escaping.

(5) Remove the cap from the inflation valve at the top of the shock-absorber strut and screw on the adapter assembly, taking care not to disturb the position of the gauge.

(6) Bleed off the air pressure to zero through the air-release valve in the adapter.

(7) With the release valve still open, compress the strut fully, using a 15-ton pillar jack, Mk.27 adapter head and jacking bracket *(Sect.2, Chap.4, Tables 1 & 2)*.

(8) Close the inflation valve by rotating the gauge in a counter-clockwise direction, and close the adapter air-release valve.

(9) Remove the cap from the adapter inflation point, and connect an oleo charging pump *(Sect.2, Chap.4, Table 2)* to the inflation point.

(10) Open the undercarriage inflation valve and pump in hydraulic fluid OM-15, allowing the shock-absorber strut to extend by gradually lowering the pillar jack until the sliding tube of the shock-absorber strut is exposed to the extent of between one and two inches. Close the undercarriage inflation valve, disconnect the oleo charging pump and refit the cap on the inflation point.

(11) Open the undercarriage inflation valve and expel the excess fluid, compressing the shock-absorber strut by slowly raising the pillar jack. Close the inflation valve.

(12) If no fluid is expelled, repeat operations (7) to (11).

(13) Carry out operations detailed in para.15. The correct inflation pressures for varying all-up weights are given in Sect.2, Chap.2.

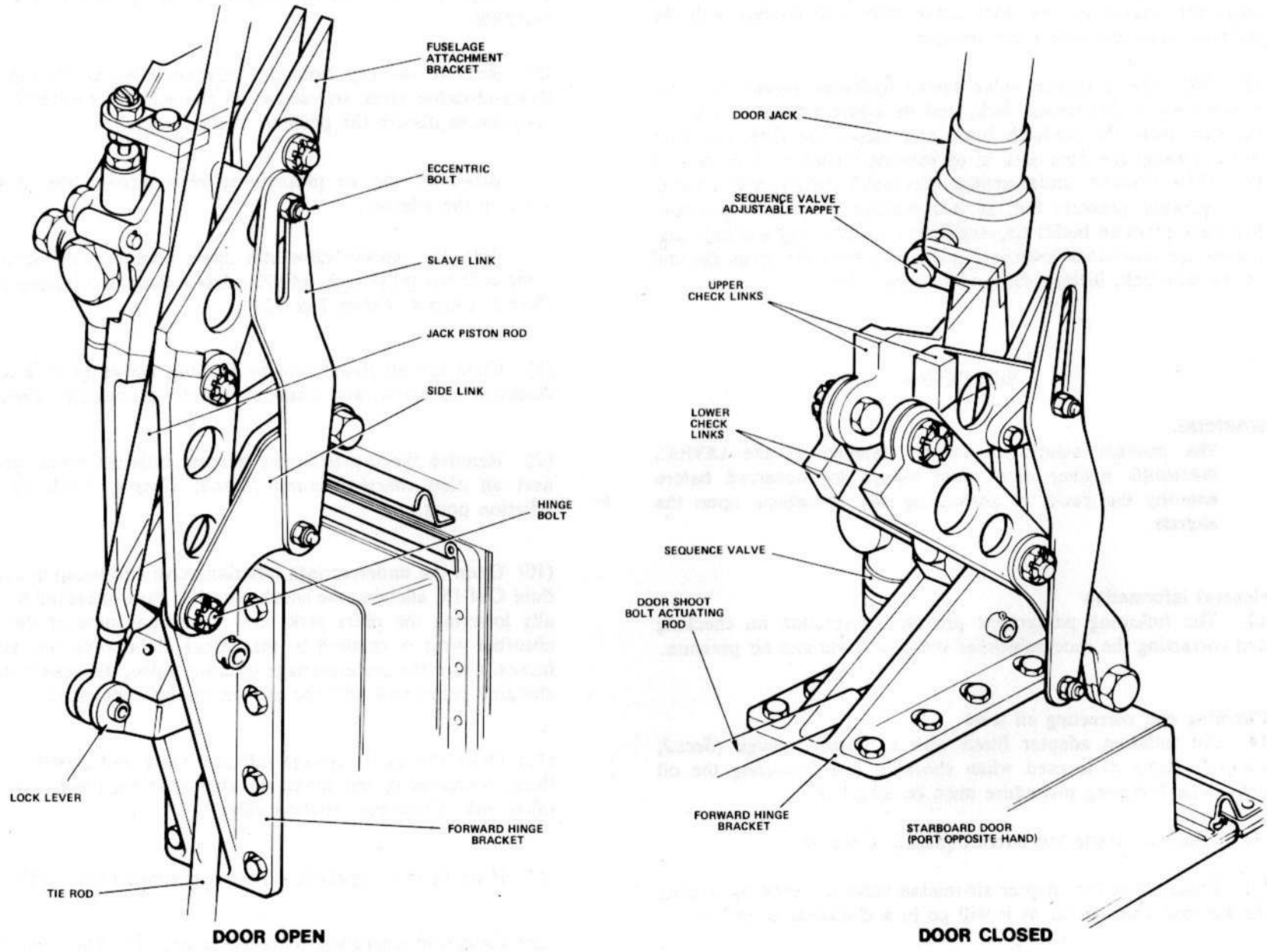


FIG.4. UNDERCARRIAGE DOOR-OPERATING MECHANISM

Checking and correcting air pressure

15. The inflation adapter and pressure gauge *(para.14)* is used when checking and correcting the shock-absorber strut inflation pressure. A full description of the inflation adapter, and general instructions for use are given in A.P.119F-1500 series. Before checking the air pressure, note the following:-

(1) Correct air pressure is dependent upon a correct oil level *(para.14).*

(2) The shock-absorber strut must be fully extended.

(3) The strut inflation valve is the non-return type, therefore a reading will be obtained on the adapter gauge without slackening the valve.

To check and correct the air pressure:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Ensure that the adapter air release valve is closed by turning the knurled knob clockwise as far as it will go.

(3) Carefully turn the gauge counter-clockwise until the stop is reached; do not strain against the stop.

(4) Tighten the cap at the adapter inflation point.

(5) Remove the cap from the inflation valve at the top of the shock-absorber strut and screw on the adapter assembly, taking care not to disturb the position of the page.

(6) Turn the gauge clockwise until the stop is reached and a reading obtained. For related inflation pressure/all-up-weight figures refer to Sect.2, Chap.2.

(7) Should the gauge indicate more than the required pressure, release air through the air release valve until the correct pressure is indicated.

When air pressure is low:-

(8) Turn the gauge in a counter-clockwise direction until the stop is reached.

(9) Connect a high-pressure air charging trolley *(Sect.2, Chap.4, Table 2)* to the inflation point of the adapter.

(10) Turn the pressure gauge clockwise until the stop is reached.

(11) Introduce air into the strut until the required pressure is indicated on the gauge.

(12) Shut off the air supply.

(13) Turn the gauge counter-clockwise until the stop is reached.

(14) Disconnect the air supply connection from the adapter inflation point.

(15) Remove the inflation adapter from the inflation valve and refit the blanking cap.

(16) Lower the aircraft to the ground and remove the jacks and trestles.

Lubrication

16. Refer to fig.5.

ADJUSTMENTS

General information

17. The following paragraphs describe the procedure to be adopted when settings have to be checked and adjustments made. These occasions arise during both servicing and assembly operations. After any adjustments have been made the alighting gear must be function tested.

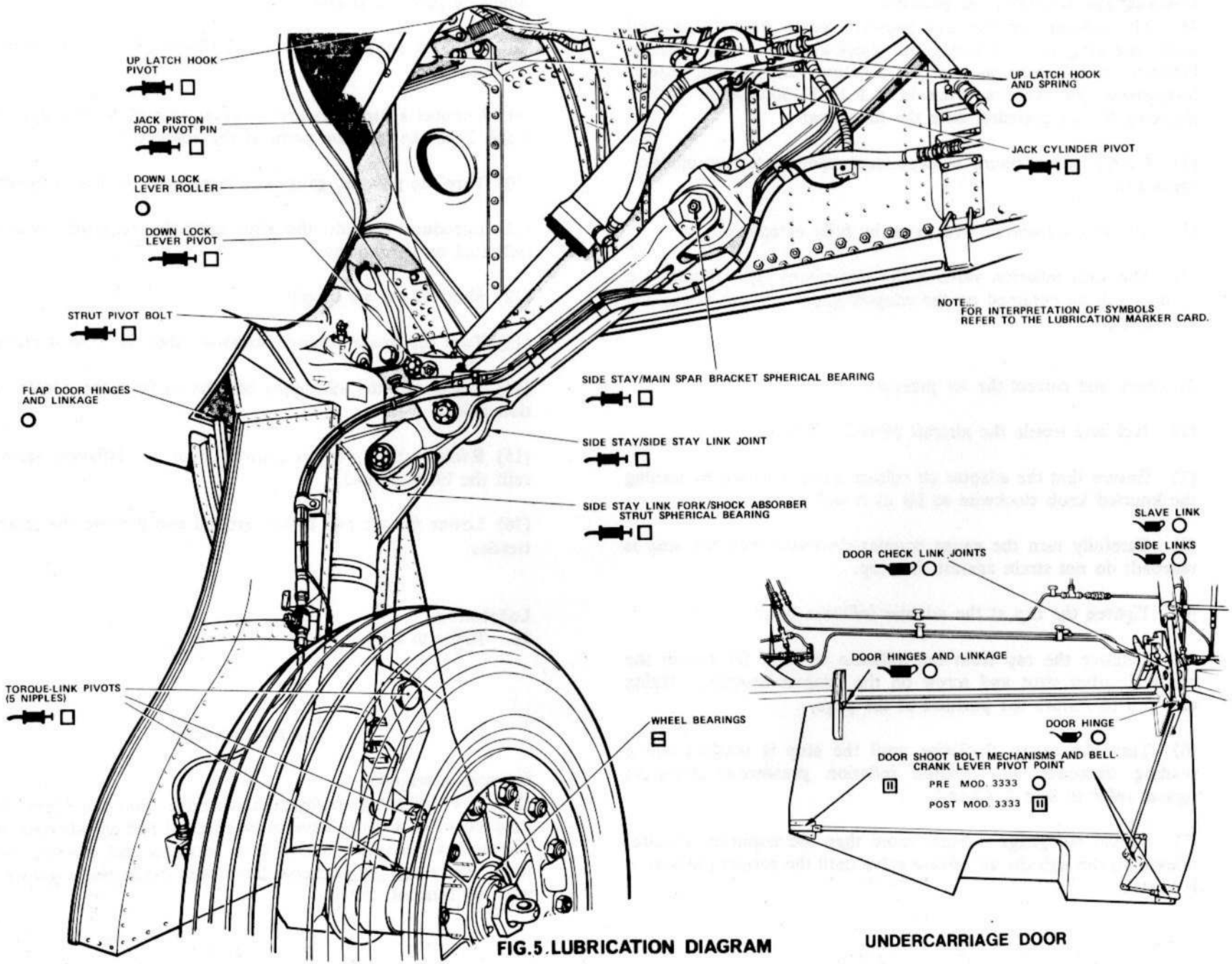


FIG.5 LUBRICATION DIAGRAM

UNDERCARRIAGE DOOR

Side-stay and side-stay link alignment *(fig.6)*

18. The side stay and stay link are correctly aligned when the hinge bolt is offset downwards approximately 0.30 in. measured from a straight line between the side stay pin centre and the stay link spherical joint centre. The offset is adjusted during initial assembly by setting the clearance between the down-lock lever roller and the stay link lip at 0.004 in. Should it be found necessary to adjust the offset:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Remove the pivot pin attaching the jack piston rod to the down-lock lever and retract the jack.

(3) Apply an upward force to the underside of the side stay until the roller on the down lock lever is bearing hard against the stay link lip. Adjust the stop bolt until the clearance between the stop bolt and its buttress measures 0.004 in. Tighten and wire-lock the stop-bolt locknut.

(4) Release the force applied to the underside of the side stay when it will be noted that the 0.004 in. clearance now exists between the roller on the lock lever and the stay link lip. This can be checked by depressing the spring-loaded stop in the side stay and inserting a 0.004 in. feeler gauge between the lock-lever roller and the stay link lip.

(5) Extend the jack until the pick up centres coincide, then secure the piston rod end to the down lock lever pin. Lock the slotted nut with a split pin.

Jack settings

Main jack

19. The distance between the pin centres of the main jack when fully closed must not exceed 20.63 in. ± 0.25 in., the jack piston rod travel is 11.22 in. ± 0.045 in. The exact pin-centre dimension is governed by the pick-up points on the aircraft structure and side stay down lock lever. The centres must be checked following renewal, replacement, or after any servicing which may be affected its setting. The length of the jack is adjusted in the following manner:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Remove the pivot pin attaching the jack piston rod to the down-lock lever.

(3) Check the alignment of the side-stay and stay-link *(para.18),* and adjust as necessary.

(4) Ensure that all hydraulic pressure is exhausted *(Chap.6).* Disconnect the hydraulic pipes and connect the jack to a hydraulic test rig.

(5) Pump the jack into the fully extended position.

(6) Loosen the locknut on the piston rod and adjust the length of the fully extended jack until the distance between the jack pin centres exceeds the pick-up centres on the aircraft structure and side stay down-lock lever by 0.15 in. $^{+0.00}_{-0.05}$ in.

(7) Check that the piston rod eye end is in safety and tighten the locknut against the spanner grip. Wire-lock the locknut and the spanner grip together.

(8) Close the jack until the jack pin centre is in alignment with the pick-up centre of the down-lock lever and fit the jack pivot pin.

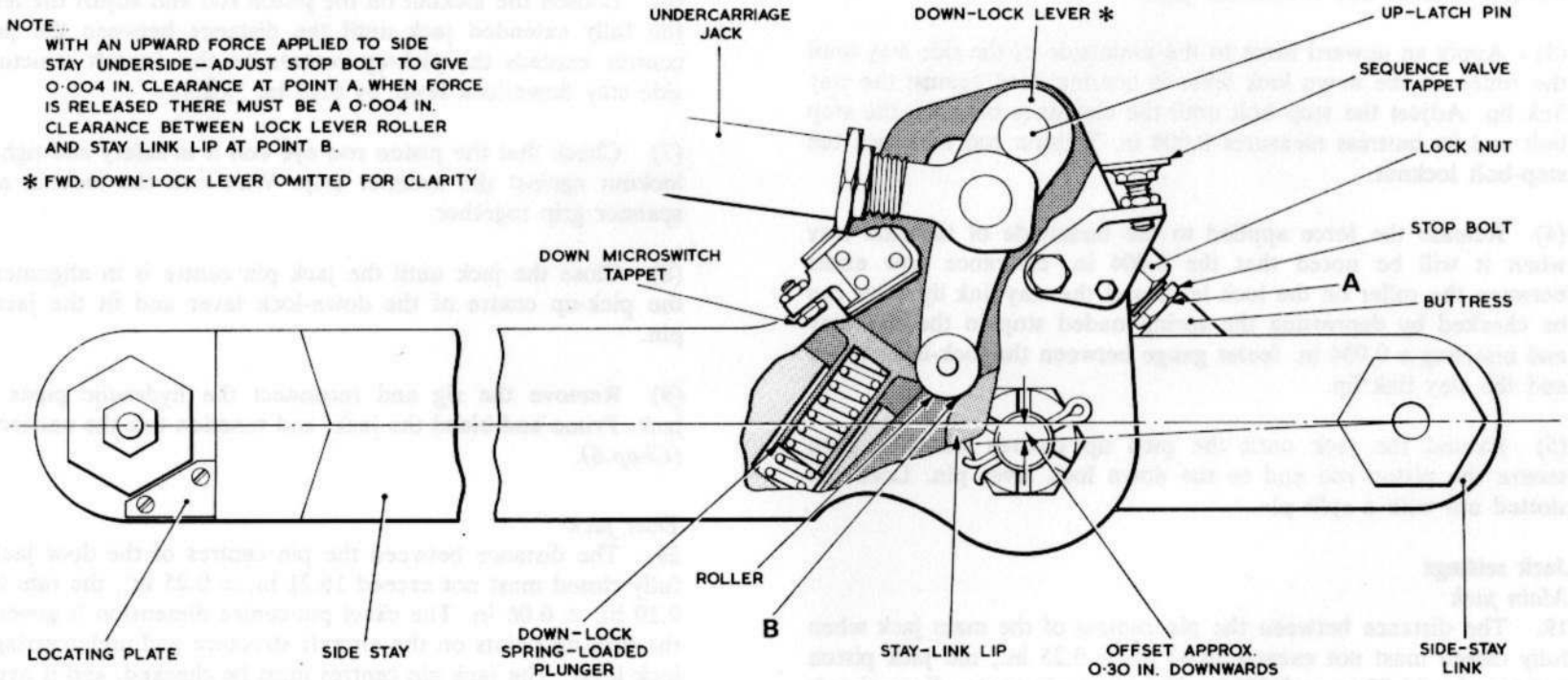
(9) Remove the rig and reconnect the hydraulic pipes to the jack. Prime and bleed the jack, and function test the undercarriage *(Chap.6).*

Door jack

20. The distance between the pin centres of the door jack when fully closed must not exceed 16.21 in. ± 0.25 in., the ram travel is 9.19 in. ± 0.06 in. The exact pin-centre dimension is governed by the pick-up points on the aircraft structure and undercarriage door lock lever. The jack pin centres must be checked, and if necessary, adjusted in the following manner following replacement, or after any servicing which may have affected its setting:-

(1) Ensure that all hydraulic pressure is exhausted from the system *(Chap.6).*

(2) Remove the pin attaching the lower end of the door jack piston rod to the door lock lever.



VIEW ON FORWARD FACE, PORT SIDE

FIG. 6. SIDE-STAY AND SIDE-STAY LINK ALIGNMENT

◀REDRAWN▶

MISSING

MISSING

(4) Manually close the door, disconnect the tie rod between the lock lever and the bell-crank lever at the bell-crank lever end, slacken the tie-rod locknut and adjust by turning the fork end one half-turn at a time, and connecting the tie rod to the bell-crank lever between adjustments, until the front shoot bolt has a minimum engagement of 0.50 in. when locked. Repeat this adjustment for the rear shoot bolt by adjusting the tie rod between the rear shoot bolt and bell-crank lever, with the door unlocked there should be a clearance of 0.11 in. between the end of the shoot bolts and the pads with which they engage.

Note . . .

The dimension 0.11 in. is for the linkage in an as new condition. A relaxation of this dimension to 0.060 in. is permitted due to subsequent cumulative wear in the linkage. (Refer to A.P.101B-0400-6, Part 1, Chap.3 for maximum wear limits.)

(5) When the correct adjustments have been made, tighten the locknut(s) on the tie rod(s) and reconnect the tie rod(s) to the bell-crank lever.

(6) Manually close the door and fully lock the shoot bolts, checking that the two shoot bolts contact their engagement pads either simultaneously or with the forward shoot bolt slightly in advance of the rear shoot bolt. Check also that the pins attaching the shoot bolts to the tie rods do not foul the shoot-bolt housings when the shoot bolts are fully locked.

(7) Check that there is a 0.04 in. clearance between the flats of the shoot bolts and their brackets *(para.22)*.

(8) Reconnect the door jack piston rod to the lock lever.

(9) Manually operate the door jack sequence valve and operate the hydraulic hand pump to test the operation of the door; recheck the adjustments.

Door setting *(fig.7 and 13)*

22. An adjustable stop bolt is provided on the leading edge of the door to ensure that the door, when closed, is in its correct position relative to the wing contour. The stop bolt is adjusted to permit the leading edge of the door to move 0.08 in. max. inside the wing contour; the door hinge shimming may also require adjustment to obtain this figure *(para.35)*. With the door in its correct position the clearance between the door shoot-bolt flats and their brackets must be 0.04 in. This clearance can be obtained by adjustment of the shimming between the shoot-bolt housings and the door *(fig.13)*.

Note . . .

It is not essential that the shoot bolts and brackets are parallel across their flats; an additional 0.02 in. is permissible along one edge providing that it does not affect the clearance of 0.04 in. at the other.

Sequence valve setting *(fig.8)*

23. To adjust the sequence-valve tappet slacken the locknut and screw the tappet until a 0.10 in. ± 0.05 in. clearance is obtained between the striking face of the tappet and the body of the sequence valve when the valve plunger is depressed *(fig.8)*. After adjustment, check the operation of the sequence valve *(Chap.6)* and tighten the locknut.

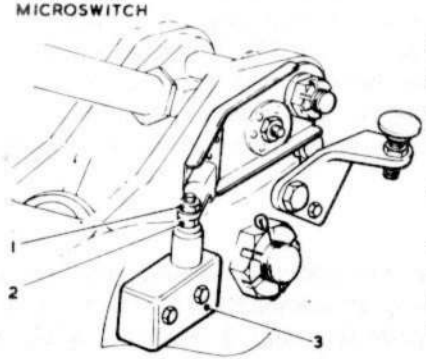
Up-latch hook setting *(fig.1)*

24. The up-latch hook is set by the manufacturers and should not normally require alteration, the clearance between the hook and up-latch pin being obtainable by adjustment of the up-stop pad *(para.25)*. If, after renewal of the hook or undercarriage unit, it is found necessary to adjust the hook bracket, the shimming between the bracket and up-lock beam may be varied accordingly, care being taken to ensure that the attitude of the hook is not altered when doing so. To adjust the hook bracket:-

(1) Disconnect the return spring from the up-latch hook and remove the hook from the bracket, ensuring no damage is done to the microswitch or its connections.

(2) Remove and discard the attachment bolts and remove the bracket from the up-lock beam.

DOWN LOCK MICROSWITCH



DOWN LOCK MICROSWITCH ADJUSTMENT

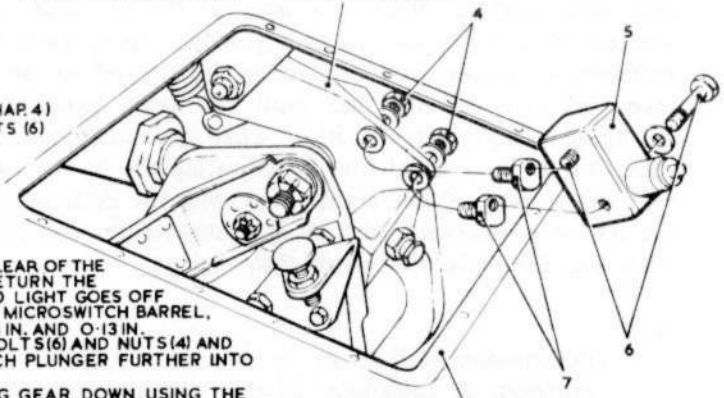
1 CONNECT A 24-VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET
2 SLACKEN LOCKNUT (1)
3 SCREW STRIKER BOLT (2) AWAY FROM MICROSWITCH (3) (GREEN LIGHT OFF)
4 SCREW STRIKER BOLT (2) TOWARDS MICROSWITCH (3) UNTIL A DEFINITE CLICK IS HEARD (GREEN LIGHT ON) AND THEN GIVE A FURTHER TWO COMPLETE TURNS
5 TIGHTEN LOCKNUT (1) AND ENSURE THAT SOME PLUNGER MOVEMENT REMAINS

UP LOCK MICROSWITCH ADJUSTMENT: U/C IN THE UP POSITION ON FULL HYDRAULIC PRESSURE

1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT. 2, CHAP. 4)
2 CONNECT A 24-VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET, GREEN LIGHT ON
3 REMOVE THE APPROPRIATE ACCESS PANEL FROM THE UPPER SURFACE OF THE MAIN PLANE INNER WING (SECT. 2, CHAP. 4)
4 SLACKEN THE NUTS (4) AND MICROSWITCH ATTACHMENT BOLTS (6)
5 TURN THE HEADS OF THE ECCENTRIC BOLTS (7) SO THAT THE MICROSWITCH ATTACHMENT TAPPED HOLES ARE AT THE FURTHEST POINT OF ADJUSTMENT AWAY FROM THE HOOK: TIGHTEN THE ATTACHMENT BOLTS (6) AND NUTS (4)
6 RETRACT THE ALIGHTING GEAR, USING THE HAND PUMP, APPLYING FULL JACK PRESSURE. CHECK THAT THE RED LIGHT COMES ON DURING OPERATION, AND GOES OFF WHEN THE UP-LATCH HOOK IS FULLY ENGAGED
7 THROUGH THE ACCESS PANEL, LIFT THE UP-LATCH HOOK CLEAR OF THE LATCH PIN, AND ENSURE THAT THE RED LIGHT COMES ON. RETURN THE UP-LATCH HOOK TO THE ENGAGED POSITION AND ENSURE RED LIGHT GOES OFF
8 USING FEELER GAUGES, CHECK THAT THE GAP BETWEEN THE MICROSWITCH BARREL, AND OPERATING FACE OF THE SIDE STAY IS BETWEEN 0·08 IN. AND 0·13 IN.
9 IF THE GAP IS IN EXCESS OF 0·13 IN., SLACKEN ATTACHING BOLTS (6) AND NUTS (4) AND ROTATE ECCENTRIC BOLT (7) TO DEPRESS THE MICROSWITCH PLUNGER FURTHER INTO OVERTRAVEL
10 EXHAUST THE JACK PRESSURE AND SELECT THE ALIGHTING GEAR DOWN, USING THE HAND PUMP. SLOWLY LOWER THE ALIGHTING GEAR UNTIL THE D-DOOR UNLOCKS. PULL THE DOOR OPEN AND OPERATE THE DOWN SEQUENCE VALVE. THE RED LIGHT MUST NOT COME ON. IF THE RED LIGHT DOES COME ON REPEAT OPERATION 9
11 SELECT THE ALIGHTING GEAR UP, FULLY RETRACT THE ALIGHTING GEAR USING THE HAND PUMP, AND RECHECK THE PLUNGER GAP AS IN OPERATION 8

UP LOCK MICROSWITCH

UP-LATCH HOOK



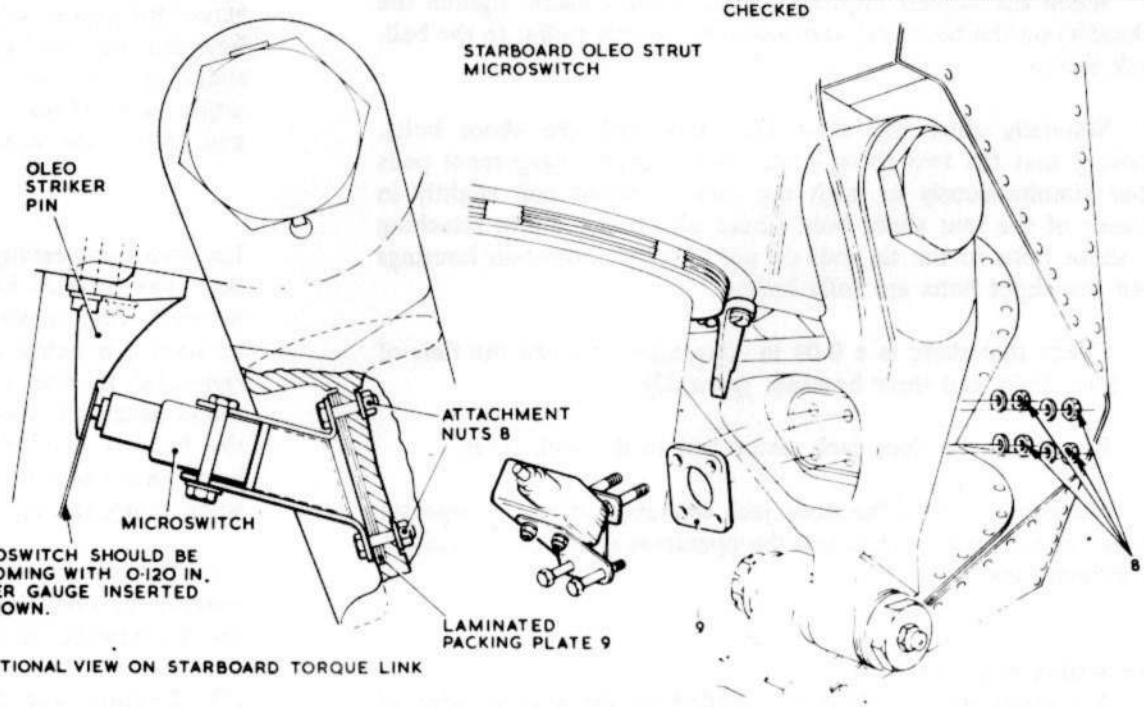
ACCESS IN UPPER SURFACE OF INNER WING

NOTE....
AFTER ADJUSTMENT OF THE UP OR DOWN LOCK MICROSWITCHES AN ALIGHTING GEAR RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED

STARBOARD OLEO STRUT MICROSWITCH ADJUSTMENT

1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT. 2, CHAP. 4)
2 INSERT A 0·120 IN. FEELER GAUGE BETWEEN THE MICROSWITCH PLUNGER AND THE OLEO STRIKER PIN. THE PLUNGER SHOULD JUST BE BOTTOMING
3 IF THE ADJUSTMENT (OPERATION 2) IS INCORRECT PROCEED AS FOLLOWS:-
(A) REMOVE THE MICROSWITCH ATTACHMENT NUTS (8) AND WASHERS, AND WITHDRAW THE MICROSWITCH TOGETHER WITH LAMINATED PACKING PLATE (9)
(B) BY PEELING A NEW LAMINATED PACKING PLATE REF. No. 26FZ/706 ADJUST THE MICROSWITCH TO OBTAIN THE CONDITION DESCRIBED IN OPERATION 2
4 RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY REFITTED THE MICROSWITCH AND TIGHTENED THE SECURING NUTS

STARBOARD OLEO STRUT MICROSWITCH



SECTIONAL VIEW ON STARBOARD TORQUE LINK

FIG. 9. MICROSWITCH ADJUSTMENT - (POST MOD. 4449)

(3) Adjust the shimming as necessary and ensure that it will not affect the original attitude of the hook.

(4) Refit the bracket to the up lock beam using new bolts. When the hook is correctly set *(para.25)*, peen over the bolts to lock.

(5) Refit the up-latch hook and connect the return spring.

Note . . .

When a new hook is fitted the up microswitch must be adjusted (fig.9 or 10).

Up-stop pad setting *(fig.3)*

25. A rubber or Tufnol pad in the roof of the wheel well receives the impact made by the wheel axle towing eye when the undercarriage is retracted. The pad is adjusted to obtain the correct clearance (0.010 in. to 0.015 in.) between the up-latch hook and up-latch pin *(para.24)*. Tufnol pads are to be filed and trimmed to suit, rubber pads are to be reduced if too large or packed with light-alloy strips if too small to obtain the required clearance. Access to the up-latch hook when the undercarriage is raised is gained through a panel in the main-plane upper surface *(Sect.2, Chap.4)*.

Torque-link tolerance and adjustment

26. The centre pivot pin of the torque links should be examined for wear during servicing operations on the undercarriage. The correct clearance at this point is 0.001 in. to 0.004 in. but a maximum clearance of 0.010 in. is permissible. If the clearance exceeds 0.010 in. a new washer, Ref.No.26FZ/715 is to be fitted to regain the original clearance.

Microswitch settings

27. After any servicing or component replacement which may have affected the microswitch settings, a thorough check, and if necessary resetting, must be made as detailed in fig.9 or 10.

Strut fairing alignment

28. The undercarriage strut spat type fairing is adjusted to the main-plane contours by varying the shims fitted between the fairing and the four attachment bosses on the strut. When all the undecarriage adjustments are correct, the undercarriage raised and resting in the up-latch hook, adjust the shims until the leading edge of the fairing is 0.05 in. inside the main-plane contour and the trailing edge is flush. When a new fairing is fitted file off the trim allowance to give 0.05 in. to 0.08 in. clearance around the spat perimeter.

Note . . .

Protective treatment (A.P.101A-0600-6, Scheme 9.1.2) must be applied to all filed surfaces.

New engine cowl flap fitting and adjustment

29. The flap is adjusted by means of the tie rod which connects it to the top of the shock-absorber strut. Adjustment is made until the flap is flush with the engine cowl skin when the undercarriage is fully retracted. When fitting a new flap the following procedure must be adopted:-

(1) Attach the flap to the engine cowl and connect the tie rod and check cable.

(2) Remove the rubber or Tufnol stop pads *(fig.3)*.

(3) With the engine lower rear cowl fitted and the undercarriage retracted, file the trim allowance of the flap to ensure a butt fit on the cowl skin with the flap 'out-of-airflow' and apply protective treatment in accordance with A.P.101A-0600-6, Scheme 9.1.2.

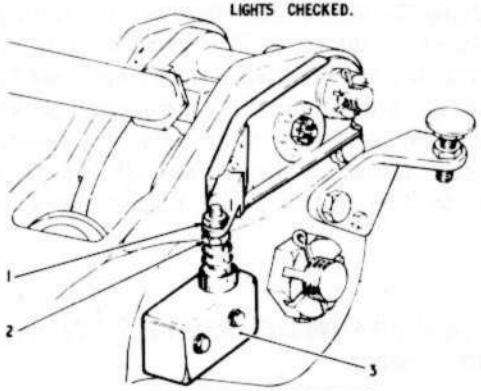
(4) Remove the engine top cowl, connect the tie rod to the shock-absorber strut bracket, and adjust the tie rod until the flap is closed.

(5) Fully slacken the check cable tension rod.

(6) Lower the undercarriage.

DOWN MICROSWITCH

NOTE... AFTER ANY ADJUSTMENT OF THE UP OR DOWN MICROSWITCHES AN UNDERCARRIAGE RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED.

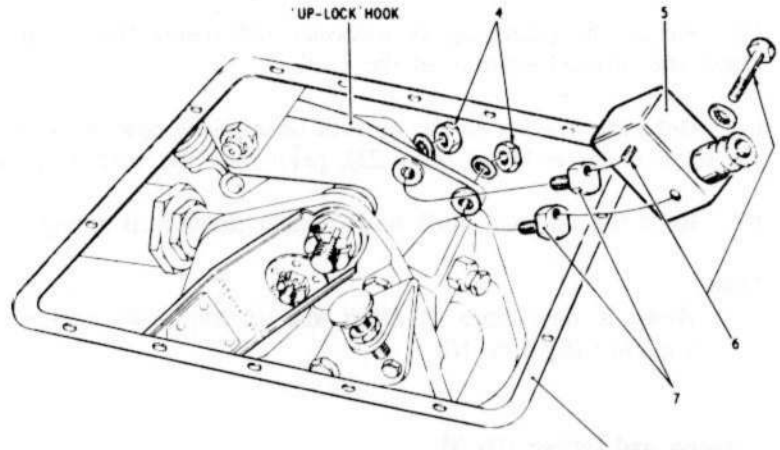


DOWN MICROSWITCH ADJUSTMENT

1 CONNECT A 24 VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET.
2 SLACKEN LOCKNUT (1)
3 SCREW STRIKER BOLT (2) AWAY FROM MICRO-SWITCH (3) (GREEN LIGHT OFF).
4 SCREW STRIKER BOLT (2) TOWARDS MICROSWITCH (3) UNTIL A DEFINITE CLICK IS HEARD (GREEN LIGHT ON) AND GIVE ANOTHER COMPLETE TURN.
5 TIGHTEN LOCKNUT (1) AND ENSURE THAT SOME PLUNGER MOVEMENT REMAINS.

UP MICROSWITCH ADJUSTMENT

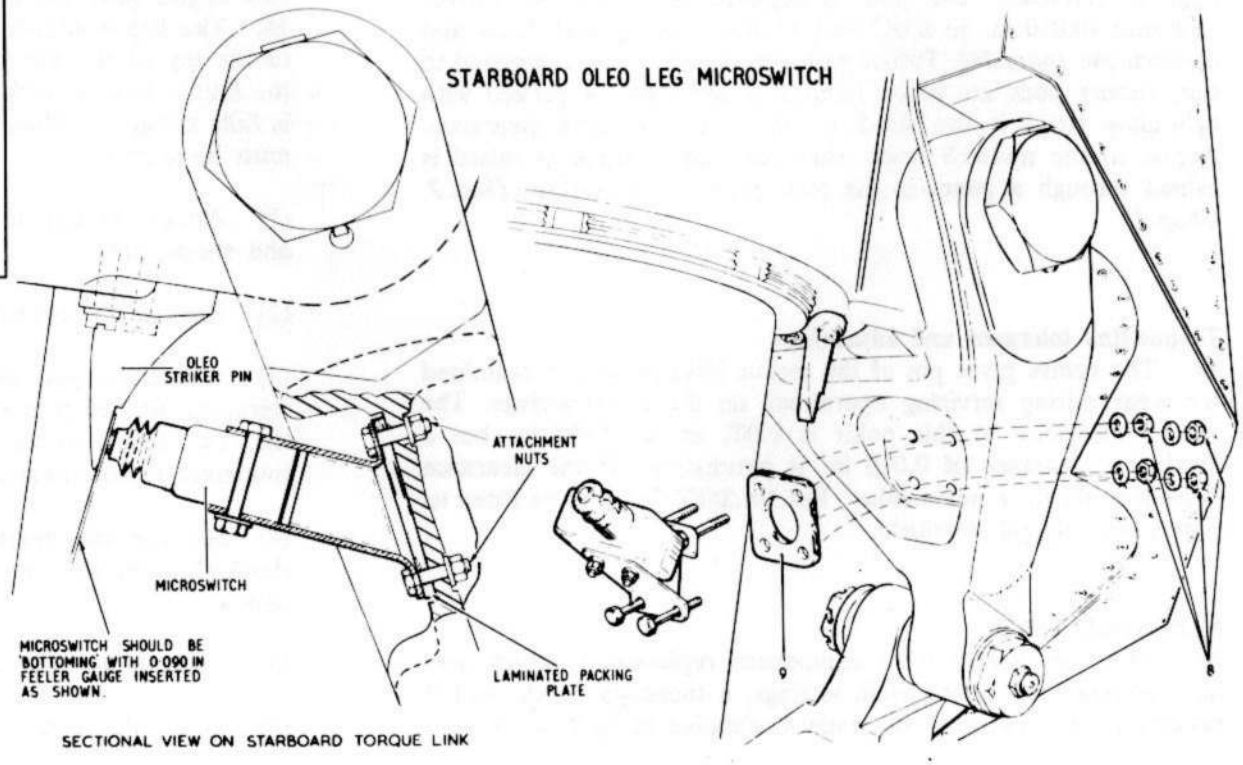
1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT.2, CHAP.4).
2 CONNECT A 24 VOLT POWER SUPPLY TO THE EXTERNAL SUPPLY SOCKET.
3 REMOVE THE APPROPRIATE ACCESS PANEL FROM THE UPPER SURFACE OF THE MAINPLANE INNER WING (SECT.2, CHAP.4).
4 RAISE THE ALIGHTING GEAR (SECT.3, CHAP.6).
5 SLACKEN THE NUTS (4) AND MICROSWITCH ATTACHMENT BOLTS (6).
6 TURN THE HEADS OF THE ECCENTRIC BOLTS (7) TOGETHER IN AN ANTI-CLOCKWISE DIRECTION (RED LIGHT WILL COME ON).
7 TURN THE HEADS OF THE ECCENTRIC BOLTS IN THE OPPOSITE DIRECTION UNTIL A DEFINITE CLICK IS HEARD (RED LIGHT OFF).
8 DO NOT ALLOW THE MICROSWITCH TO MOVE AND TIGHTEN ITS ATTACHMENT BOLTS (6) AND NUTS (4)
9 ENSURE THAT SOME PLUNGER MOVEMENT STILL REMAINS.



UP MICROSWITCH

STARBOARD OLEO LEG MICROSWITCH ADJUSTMENT

1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT.2, CHAP.4)
2 INSERT A 0·090 IN. FEELER GAUGE BETWEEN THE MICROSWITCH PLUNGER AND THE OLEO STRIKER PIN THE PLUNGER SHOULD JUST BE 'BOTTOMING'
3 IF THE ADJUSTMENT (OP 2) IS INCORRECT PROCEED AS FOLLOWS:
(a) REMOVE THE MICROSWITCH ATTACHMENT NUTS (8) AND WASHERS AND WITHDRAW THE MICROSWITCH TOGETHER WITH LAMINATED PACKING PLATE (9)
(b) BY PEELING A NEW LAMINATED PACKING PLATE (PT.No. EAI-40-335) ADJUST THE MICROSWITCH TO OBTAIN THE CONDITION DESCRIBED IN OP 2
4 RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY RE-FITTED THE MICROSWITCH AND TIGHTENED THE SECURING NUTS



SECTIONAL VIEW ON STARBOARD TORQUE LINK

FIG.10. MICROSWITCH ADJUSTMENT (PRE MOD.4449)

(7) Partially retract the undercarriage and fit the rubber or Tufnol stop pads.

Note . . .

Tufnol pads are to be filed and trimmed to suit. Rubber pads are to be reduced if too large and packed by light-alloy strip if too small.

(8) With the flap in the open position, adjust the check cable tension rod until it is finger-tight and then slacken it one turn. Lock the tension rod.

(9) Tighten the nut and peen over the bolt attaching the check cable to the flap arm

REMOVAL AND ASSEMBLY

General information

30. The following paragraphs detail the removal and assembly operations for the undercarriage and its main components. Items which do not require special instructions for removal or assembly are not included. The sequence of operations for assembling the undercarriage and door must be adhered to. Checks and subsequent adjustments referred to are to be made at the stated operations.

Undercarriage *(fig.12).*

Removal

31. To remove the undercarriage and its main components:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Exhaust all hydraulic pressure from both the main and brake hydraulic systems *(Chap.6).*

Note . . .

Unless the brake unit is life expired or damaged, it need be removed only if a replacement strut is to be fitted. Care must be taken when handling a shock-absorber strut when the brake unit has not been removed.

(3) Remove the wheel and if necessary the brake unit *(fig.14)* from the wheel axle. Blank off exposed hydraulic pipes and apertures.

(4) Remove the bolt from the shock-absorber strut end of the flap door actuating link *(detail B).*

(5) Remove the engine bottom rear cowl *(Sect.4, Chap.1).*

(6) Disconnect the wheel brake flexible hydraulic pipes from the connection at the bleed valve bracket on the spat fairing *(fig.11).* Blank off exposed pipe ends.

(7) Unclip the flexible hydraulic pipe from the top of the fairing.

(8) Disconnect the flexible hydraulic pipes from the bracket at the bottom of the fairing. Blank off exposed pipe ends.

(9) Disconnect the electrical cables from the microswitch on the upper torque link, and unclip and release the cable from the fairing (starboard undercarriage only).

(10) Remove the four fairing attachment bolts from the brackets of the shock-absorber strut, remove the fairing and retain the shimming *(fig.11).*

Note . . .

If the fairing or strut is to be replaced the four brackets must be removed from the bosses on the strut. Retain the shimming.

(11) Disconnect both flexible hydraulic pipes from the main jack *(detail C).* Blank off exposed pipes and apertures.

(12) Remove the split pin and nut from the jack piston rod pivot pin *(detail A),*and remove the pin.

(13) Remove the split pin and nut from the jack pivot pin *(detail C),* and remove the jack from the aircraft.

(14) Disconnect the electrical cables from the down-lock microswitch *(detail A).*

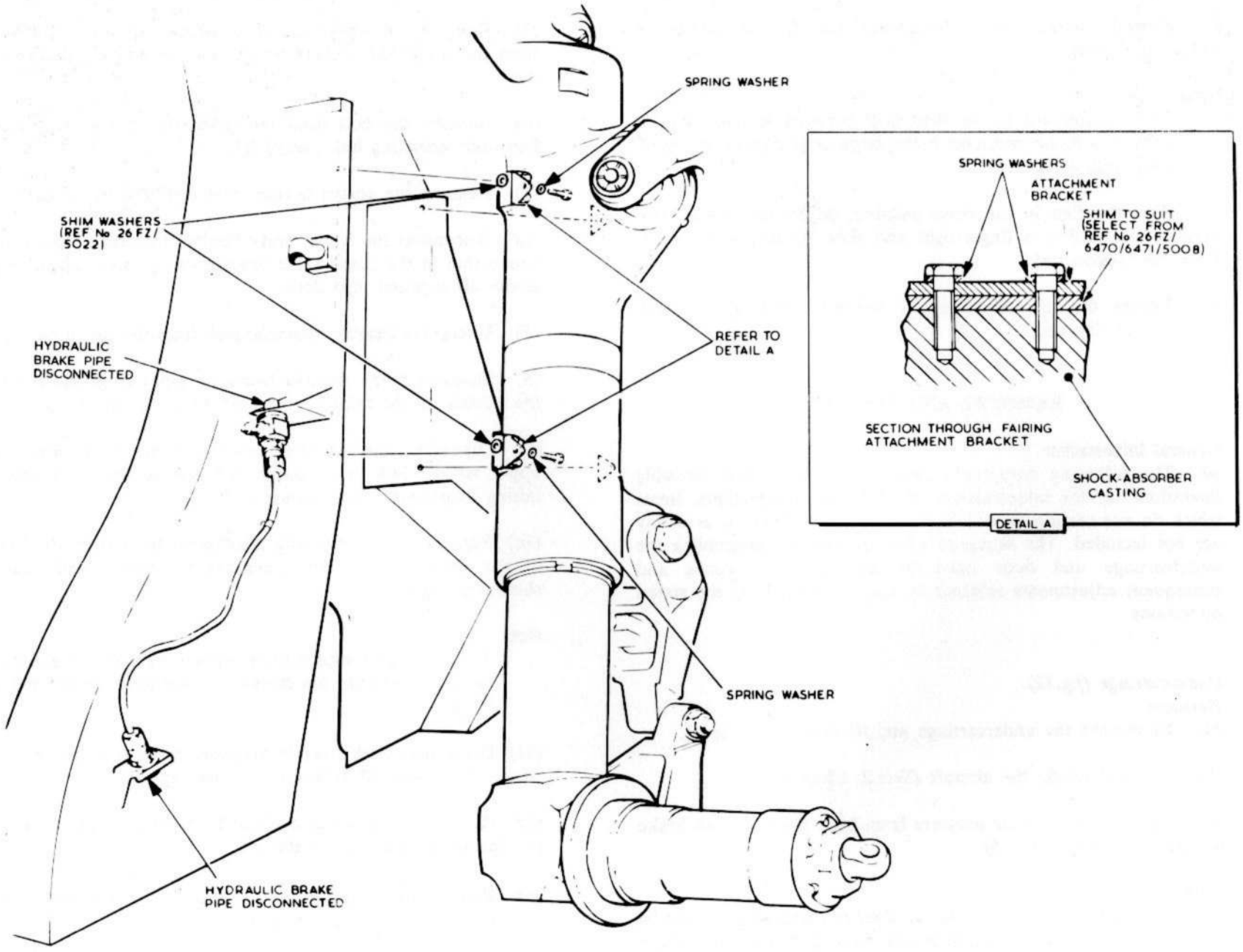


FIG.11. STRUT FAIRING - REMOVAL AND ASSEMBLY

(15) Unclip the hydraulic pipe and electrical cables from the side stay. Coil and stow the electrical cables.

(16) Disconnect the flexible hydraulic brake pipe from the bracket at rib B on the main spar bulkhead, and remove the pipe from the aircraft. Blank off exposed pipe ends.

(17) Remove the split nut from the side stay link bolt at the spherical joint on the shock-absorber strut casting, and withdraw the bolt *(detail A)*.

(18) Support the side stay and link and remove the locating plate from the side stay spherical pivot bolt *(detail D)*.

(19) Withdraw the side stay pivot bolt and remove the side stay and link from the aircraft.

(20) Remove the split pin from the slotted nut on the shock-absorber strut main pivot bolt and, using a spanner *(Sect.2, Chap.4, Table 1)*, remove the nut. With the nut removed, withdraw the locking plate *(detail B)*.

Note . . .

1. Access to the head of the main pivot bolt can be gained through a panel in the main-plane undersurface (Sect.2, Chap.4).

2. Should difficulty be encountered when removing the main pivot bolt, it may be found advantageous to screw the inserter (Sect.2, Chap.4, Table 1 and fig.11, detail B) on to the thread of the pivot bolt and give the end of the inserter a sharp knock with a hide-faced mallet.

(21) Support the strut and, using the spanner *(Sect.2, Chap.4, Table 1)*, withdraw the main pivot bolt *(detail B)*. Remove the shock-absorber strut from the aircraft.

Assembly (fig.12)

32. To assemble the undercarriage and its components:-

(1) With the inserter *(Sect.2, Chap.4, Table 1)* screwed on to the threads of the main pivot pin, assemble the shock-absorber strut, less wheel and spat type fairing to the main plane pick-up point.

(2) Remove the inserter and fit the pivot locking plate, slotted nut and split pin to secure the pivot pin.

(3) Check that the red line *(detail B)* is still visible, and that the locking plate dowel holes are aligned. If necessary, rotate the pivot bolt to enable the plate to be pushed home by hand; the dowels must not be forced home by tightening the nut. A red line painted on the end of the main pivot bolt in the same relative position as the line on the pivot bracket will enable a check to be made, before tightening the nut, to ensure that the pivot bolt and locking plate are in line.

(4) Fit a dummy sleeve and weight, Part No.EA1.88.371, to the wheel axle to make up the width of the wheel hub against which the towing eye abuts. The towing eye forms the undercarriage up-stops.

(5) Assemble the side stay and link in the reverse order of removal *(para.31)*, fitting split-pins to lock the slotted nuts of both pivot bolts. Secure the locating plate at the side stay pivot bolt head and wire-lock the pivot bolt grease nipple stud to the locating plate *(detail D)*.

(6) Fit the undercarriage jack at its main spar pivot attachment and lock the slotted nut with a split pin.

(7) Connect a hydraulic test rig *(Sect.2, Chap.4, Table 2)* to the jack and ensure that the jack is fully extended. Adjust its length by screwing the piston rod eye end either in or out to obtain the correct override past the jack pivot pin centres on the stay link lock lever *(para.19)*. Wire-lock the piston-rod locknut.

(8) Close the jack until the pick-up centres coincide, and secure the piston rod end to the down-lock lever bolt. Lock the slotted nut with a split pin.

(9) Uncouple the up-latch hook return spring.

(10) With the hydraulic test rig connected to the main jack, raise the undercarriage (2750 lb/in^2) and, whilst under jack load, check the clearance between the up-latch hook and up-latch pin *(fig.1)*. If

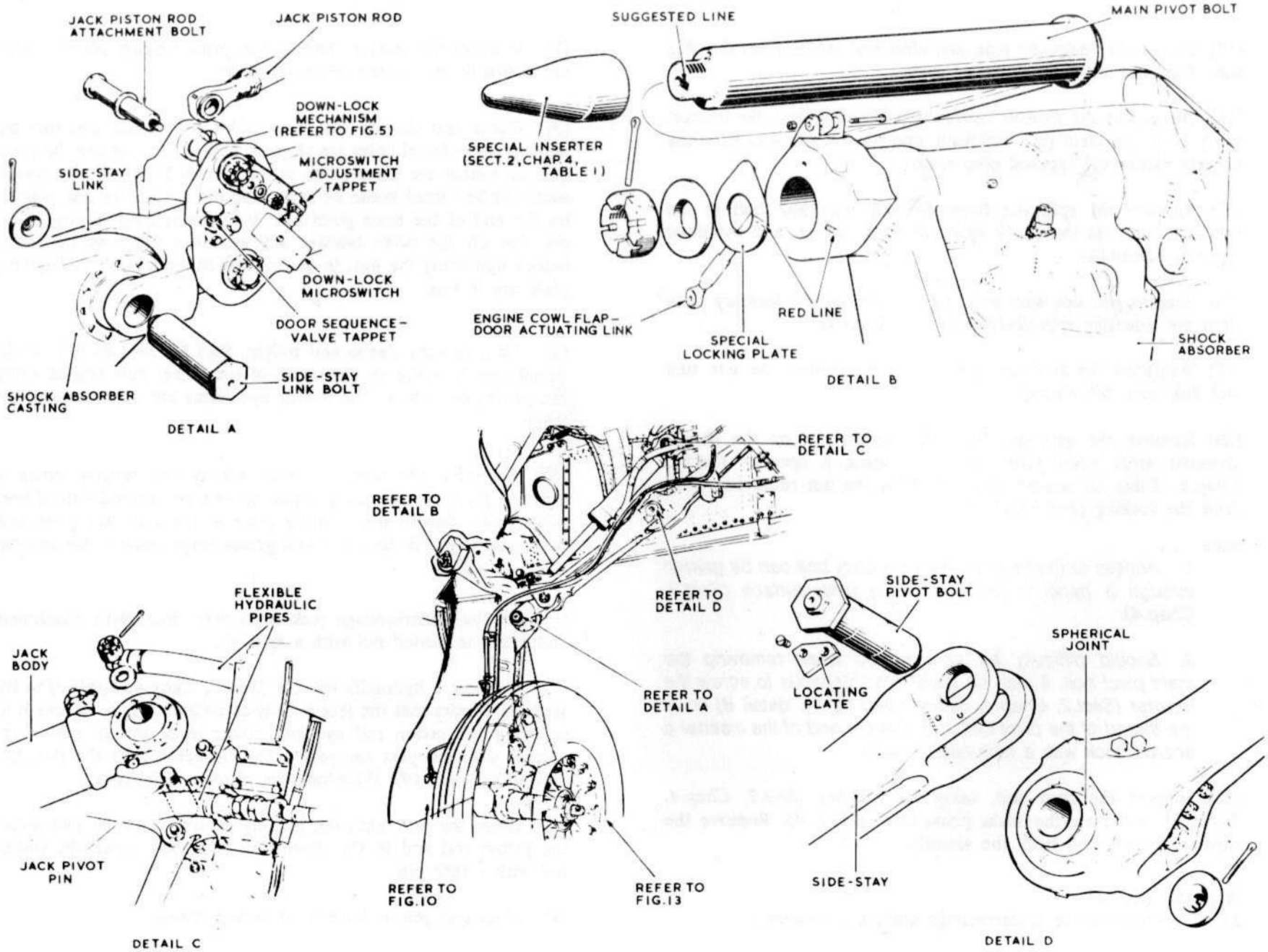


FIG.12. UNDERCARRIAGE — REMOVAL AND ASSEMBLY

adjustment is required, vary the shim thickness beneath the upstop pad in the wheel-well roof (para.24).

Note...

1. It may be necessary to adjust the up-latch hook (para.24); ensure that the hook attitude is not altered.

2. Access to the up-latch hook, when the undercarriage is retracted, is gained through a panel in the upper surface of the inner main plane (Sect.2, Chap.4)

(11) Lower the undercarriage and reconnect the up-latch hook return spring.

(12) Release the locknut of the door jack sequence-valve tappet on the side stay knuckle joint, and screw the tappet as far as possible into the casting.

(13) Raise the undercarriage and adjust the tappet so that the sequence-valve plunger is depressed to the dimensions given in fig.8. Tighten the locknut.

Note...

Access to the sequence-valve tappet when the undercarriage is raised is gained through the same panel as for the up-latch hook (operation (10), Note 2).

(14) Check the up microswitch setting and adjust if necessary (fig.9 or 10).

(15) Partly raise the undercarriage and attach the spat-type fairing to the shock-absorber strut in the reverse order of its removal (para.31).

(16) With the undercarriage resting in the up-latch hook, check the skin contour dimensions around the fairing perimeter; they must be as given in para.28. If adjustment is required, vary the shims beneath the fairing attachment brackets on the four bosses of the shock-absorber strut (fig.12)

(17) Lower the undercarriage, remove the dummy sleeve from the wheel axle and fit the wheel (fig.14).

(18) Reconnect and clip the brake hydraulic pipes to the side-stay and strut fairing, leaving the clips partly tightened. Wire-lock the unions.

(19) Reconnect and clip the microswitch cables to the sidestay and hydraulic pipes as shown in figs. 12A and 12B. Leave the clips partly tightened.

(20) Check the settings of the down-lock micro-switch and, on the starboard undercarriage, the shock-absorber strut switch; if necessary, adjust (fig.9 or 10).

(21) Fit the rear half of the engine lower cowling, connect the flap-operating link and, if necessary, adjust to give the flap a flush fit with the cowl (para.29) when the undercarriage is raised.

(22) Using the hydraulic test rig, raise and lower the undercarriage to check no setting has been disturbed.

◀(23) Disconnect the test rig and connect the hydraulic pipes to the undercarriage jack as shown in Fig. 12C. Wirelock the unions. ▶

(24) Upon completion of the wiring and piping installation and before final tightening of the securing clips, using the hand pump, fully retract and lower the undercarriage (Sect.3, Chap.6).

(25) Check that, at all points of travel (with the undercarriage locked up and down), all pipes and cables are safely routed (figs. 1, 12A and 12B), do not chafe and are not trapped or stretched.

(26) Tighten all securing clips and tape the hydraulic pipes (fig.1).

(27) Prime and bleed the jack and brakes.

(28) Test the functioning of the alighting gear and brakes (chap.6).

(29) Ensure that all bolts, nuts, pins and unions are correctly locked.

Note...

If after fitting a replacement shock-absorber strut, slight oil leakage occurs from the gland area, further flights may be made to allow the seals to bed-in before rejecting the strut as unserviceable.

Fitting a replacement undercarriage unit

33. The following operations, additional to para. 32, are applicable whenever a main undercarriage unit is changed.

(1) Fit the up-stop cradle and pad (fig.3) together with the special shim packing, Ref. No. 26FZ/9184.

(2) Fit undercarriage up-latch bracket, with hook attached and spring connected, and the special shim, Ref.No.26FZ/18513, interposed between structure and bracket.

(3) Wrap a 0.010 in. to 0.015 in. lamination around the up-latch pin and raise the undercarriage by hand pump or hydraulic rig applying full hydraulic pressure.

(4) Check that the up-latch hook is moved only by the up-latch pin. To ensure correct alignment between the up-latch hook and the up-latch pin, adjustment may be made by tapering the shim.

Note...

1. If the towing eye on the undercarriage main wheel hits the stop pad and the door-jack sequence valve is operated before the up-latch hook engages correctly, further shimming, Ref. No. 26FZ/5055, may be added to the up-latch hook bracket with a corresponding reduction of shimming under the stop pad.

2. Any additional laminations required at either position must be halved and the equivalent amount removed from the other, e.g. if 0.050 in. is required under the up-latch hook bracket fit 0.025 in. and remove 0.025 in. from under the stop pad. Additional shims to the basic 10 s.w.g. L.72 packing under the stop pad may be made by adding laminations from laminated aluminium shim, Ref. No. 26FZ/6166.

(5) Check, after adjusting shims, that the initial movement of the up-latch hook is made by contact with the up-latch pin and not the lever on the side stay and that a gap of 0.010 in. to 0.015 in. between the up-latch pin and the up-latch hook (fig. 1) is present on full retraction.

(6) Fit and adjust the microswitch (fig.9 or 10).

(7) Repeat the undercarriage retraction and check alignment and relevant settings.

(8) Finally, check that on retraction the undercarriage fixed fairing is correctly aligned (para. 28) by adjustment of the shim packings fitted between the shock-absorber strut and the fixed fairing.

Undercarriage door (fig.13)

Removal

34. To remove an undercarriage door:-

(1) Fully open the door.

(2) Remove the pin connecting the door jack piston rod to the lock lever between the lugs of the forward hinge bracket.

(3) Remove the bolt about which the lock lever, side links and lower check links pivot.

(4) Remove the hinge bolt from the front and rear door hinges, and remove the door.

Assembly

35. To assemble the undercarriage door:-

Note...

Refer to A.P.101B-0400-6, Part 1, Chap.3 for fitment of a new undercarriage door.

(1) Jack and trestle the aircraft (Sect.2, Chap.4).

(2) Attach the door to its hinges and fit the slave link mechanism (para.36).

Note...

The front hinge bolt acts as a pivot for the side links at their inboard end.

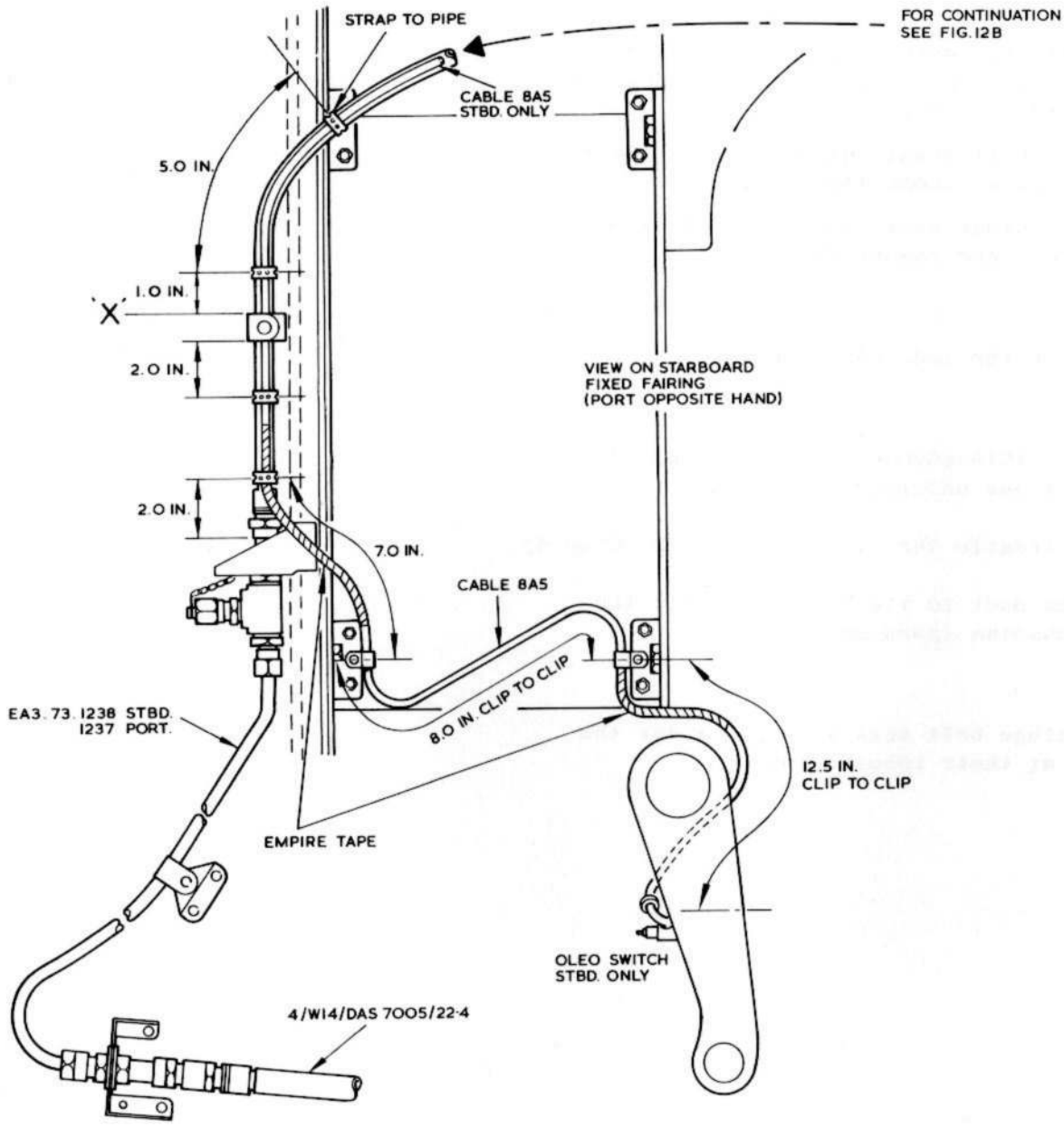


FIG.12A. UNDERCARRIAGE – PIPING AND WIRING INSTALLATION

◄ NEW ILLUSTRATION ►

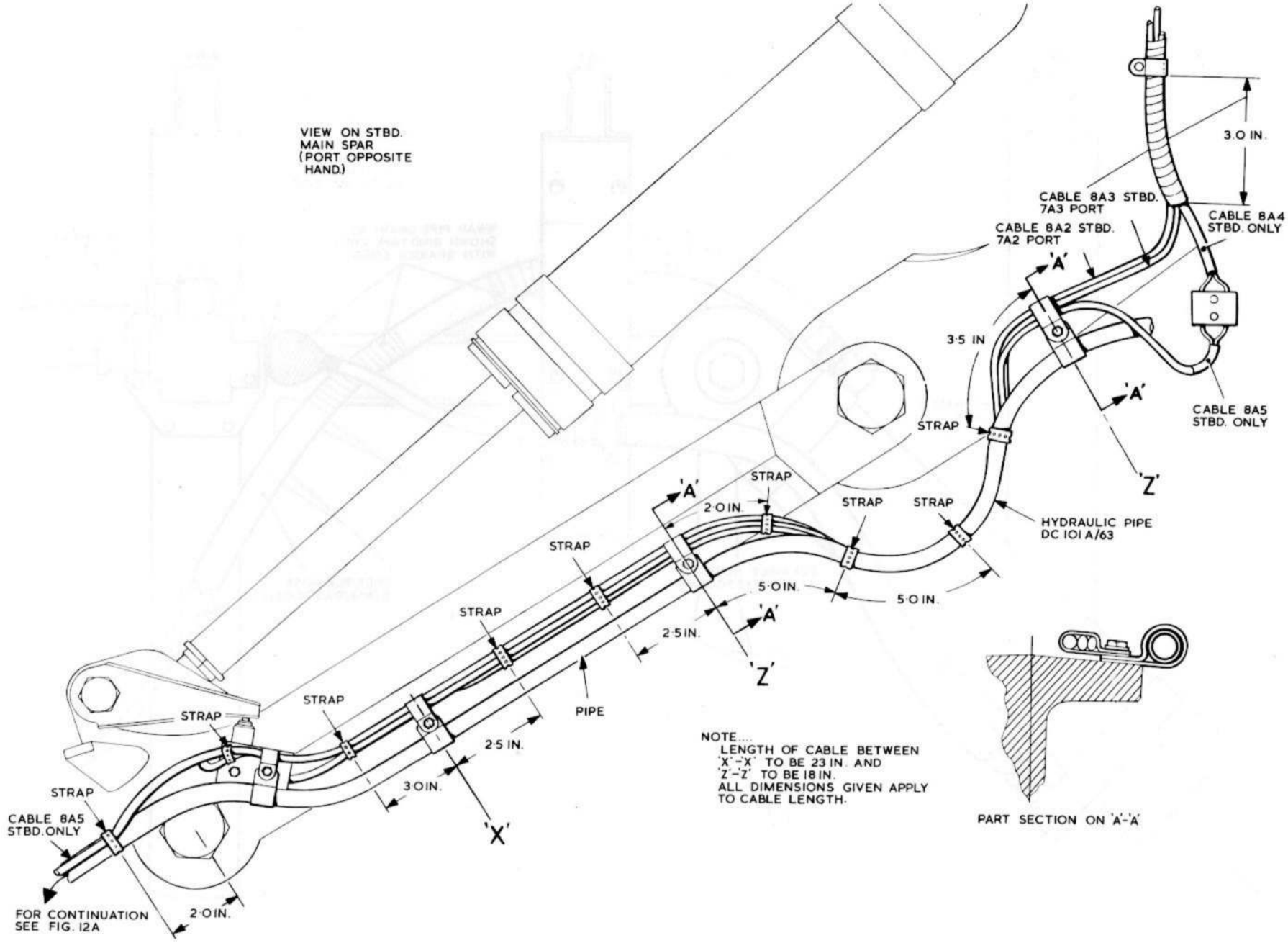


FIG.12B. UNDERCARRIAGE – PIPING AND WIRING INSTALLATION

◄ NEW ILLUSTRATION ►

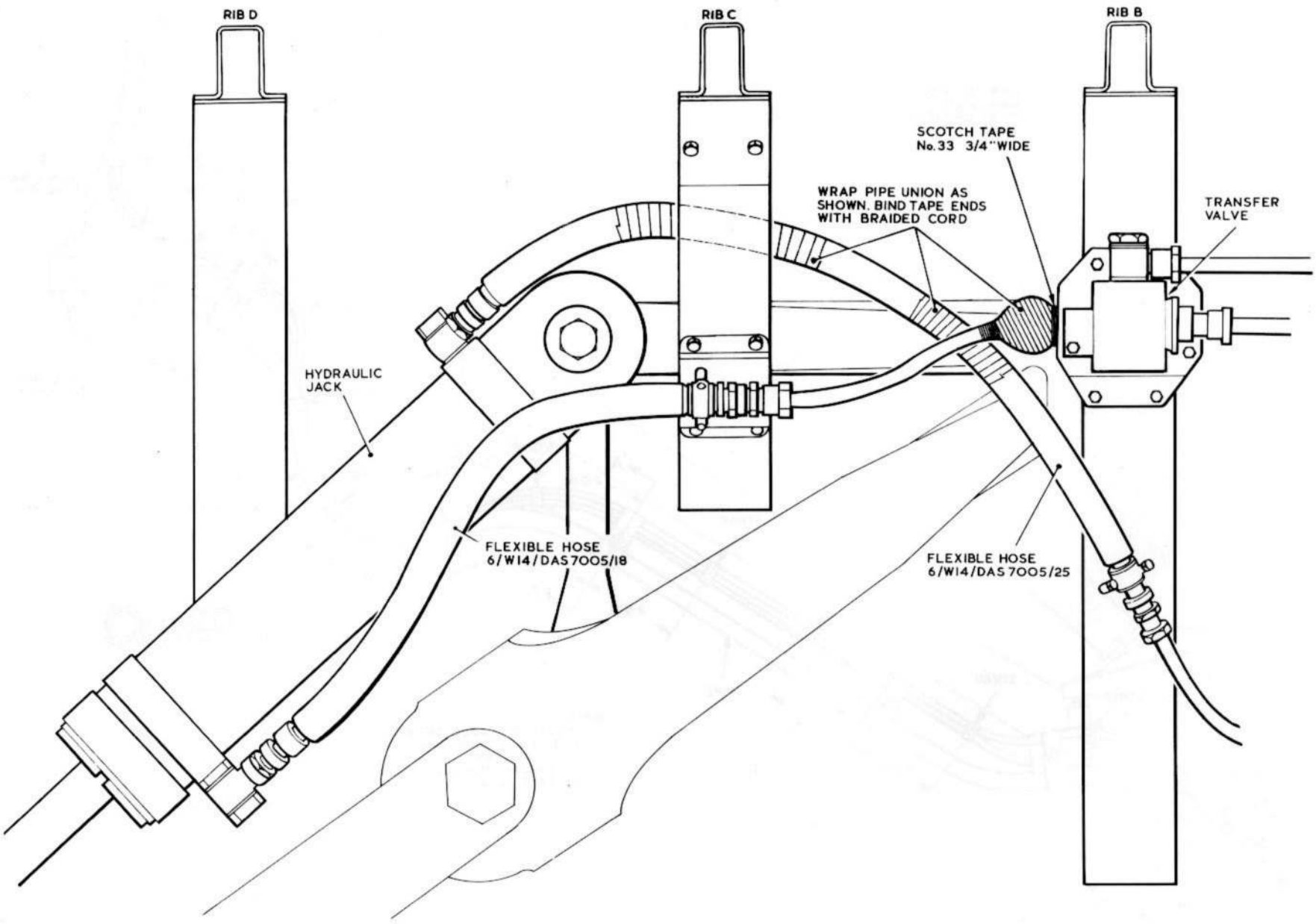


FIG. 12C. UNDERCARRIAGE – HOSE INSTALLATION

◄NEW ILLUSTRATION►

101B-0402-1A/226/8233453/371/8-81/BAe/1307

(3) Close the door manually and ensure that a 0.08 in maximum skin gap existing at the door leading edge. File the leading edge if necessary, then apply protective treatment in accordance with A.P.101A-0600-6, Scheme 9.1.2.

(4) Adjust the door stop bolt *(para.22)* until the door leading edge is 0.08 in. inside the wing contour out-of-airflow. If necessary, adjust the shimming between the door forward hinge bracket and door *(para.37)*.

(5) The trailing edge of the door must be flush with the skin contour. If necessary, adjust the shimming between the door rear hinge bracket and door *(para.37)*.

(6) Fit the bolt about which the lock lever, side links and lower check links pivot.

(7) Ensure that all pressure is exhausted from the hydraulic system *(Chap.6)*. Disconnect the flexible pipes from the door jack and connect a hydraulic test rig to the jack. Blank off the pipes.

(8) Check, and if necessary, adjust the door jack overrides *(para.20)*.

(9) Connect the door jack piston rod to the operating mechanism.

(10) After adjustment of the shimming between the two parts of the lock lever, check the shim thickness and, in accordance with ◀Table 1, fit the correct bolt and number of plain washers. Torque load to 115-125 lbf in. Ensure that the bolt tail, when fully tightened, protrudes 0.02 in. minimum.▶

(11) Check that the lock lever countersunk locating screw has been locked by centre-popping.

(12) Check the operating of the door shoot bolts and adjust if necessary *(para.21)*.

(13) Check the sequence valve tappet setting and if necessary adjust *(para.23)*.

(14) Disconnect the hydraulic test rig and recouple the flexible pipes to the door jack. Bleed the jack *(Chap.6)*

(15) Functionally test the undercarriage and door *(Chap.6)*

(16) Ensure that there is a good even fit between the door and undercarriage spat-type fairing.

(17) Check that the door shoot bolts engage properly and in correct sequence *(para.21)*.

(18) Ensure that all bolts, nuts, pins and unions are correctly locked.

TABLE 1

Door locking lever bolt and shim details

Shim thickness (In.)	Bolt Pt. No.	No. of plain washers
0.000 – 0.050	A59 – 10G	3
0.051 – 0.098	A59 – 10G	2
0.099 – 0.146	A59 – 10G	1
0.147 – 0.202	A59 – 10G	0
0.203 – 0.250	A59 – 12G	3
0.251 – 0.298	A59 – 12G	2
0.299 – 0.350	A59 – 12G	1

Note . . .

1. Also fit, in each case, one spring washer Ref. No.28W/9416645.

2. Bolt A59 – 10G is Ref.No.28D/1213610, bolt A59 – 12G is Ref.No.28D/1213611 and the plain washers are Ref.No.28W/9419403.

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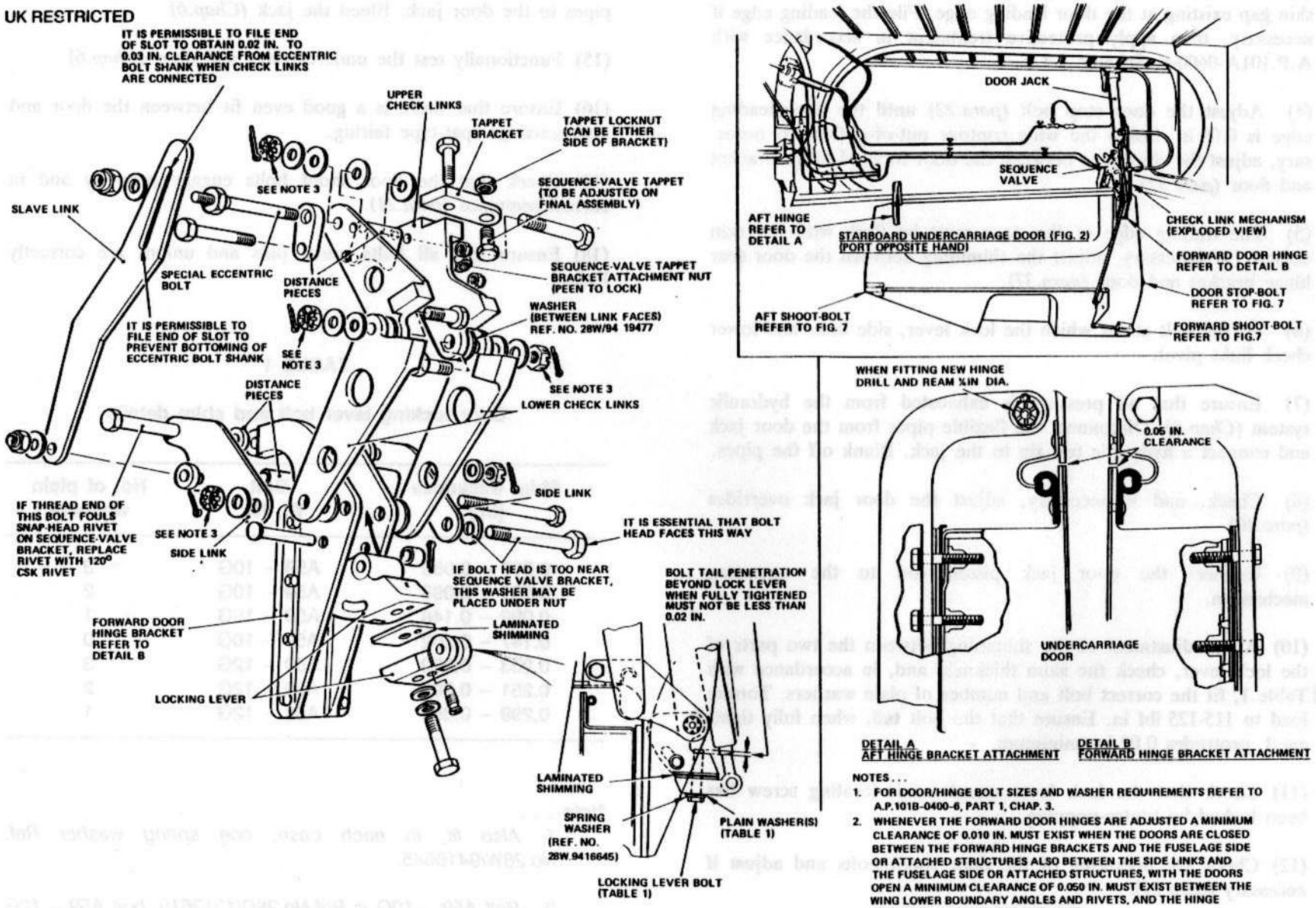

CHECK-LINK MECHANISM ASSEMBLY

NOTES...

1. FOR DOOR/HINGE BOLT SIZES AND WASHER REQUIREMENTS REFER TO A.P.101B-0400-6, PART 1, CHAP. 3.
2. WHENEVER THE FORWARD DOOR HINGES ARE ADJUSTED A MINIMUM CLEARANCE OF 0.010 IN. MUST EXIST WHEN THE DOORS ARE CLOSED BETWEEN THE FORWARD HINGE BRACKETS AND THE FUSELAGE SIDE OR ATTACHED STRUCTURES ALSO BETWEEN THE SIDE LINKS AND THE FUSELAGE SIDE OR ATTACHED STRUCTURES, WITH THE DOORS OPEN A MINIMUM CLEARANCE OF 0.050 IN. MUST EXIST BETWEEN THE WING LOWER BOUNDARY ANGLES AND RIVETS, AND THE HINGE BRACKETS, AND ALSO THE SIDE LINKS.
3. TO ENSURE UNRESTRICTED MOVEMENT OF CHECK LINKS ABOUT FULCRUM AND PIVOT POINTS THE FOUR SLOTTED NUTS MUST BE FULLY TIGHTENED AND TURNED BACK ONE QUARTER OF A TURN BEFORE DRILLING HOLE IN BOLT FOR SPLIT PIN.
4. THE LOCKING LEVER BOLT IS TO BE TORQUE LOADED TO 115-125 LBF IN.

FIG.13. CHECK-LINK MECHANISM AND DOOR — REMOVAL AND ASSEMBLY

◂ANNOTATIONS ALTERED,NOTE 3 INCLUDED, NOTE 4 ADDED▸

Door checks links *(fig.13)*

36. The door check link mechanism should not normally require any attention apart from normal periodic lubrication *(fig.5)*. If, however, it is found necessary to remove and replace parts of, or the whole of, the mechanism, the following assembly points must be noted and functioning checks made. The removal of the mechanism is straightforward and requires no explanation.

Assembly notes and functioning checks

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)* and remove the main undercarriage jack piston rod pivot pin *(para.31)*.

(2) Assemble the side links, but not the slave link. Set the check links and sequence valve and ensure that the sequence valve plunger is not bottoming *(para.23)*.

Note . . .

1. A foul may occur between the bolt Ref.No.26FZ/21079, about which the lock lever, side links and lower check links pivot, and the flange of the adjacent sequence valve bracket. This bolt must be fitted with its head facing aft and, if the foul still exists the washer under the head of the bolt must be fitted under the nut.

2. When assembling the check links ensure that the two 3/8 in. dia. fulcrum bolts Ref.No.26FZ/21081 are positioned with their heads on the inner faces of the links with the spacing washer between the hinge and the check links (refer to Note 3) and a plain washer fitted under each nut. After fully tightening these nuts and the nuts on the check links upper and lower attachment bolts, screw them back one quarter of a turn before drilling the split-pin hole; this allows for free movement of the links.

3. It is permissible to fit both spacing washers on either the forward or the aft side in order to provide a safer working clearance between the jack ram and the heads of the fulcrum bolts.

(3) Fit the slave link and adjust to the dimension given in fig.13.

(4) With the door jack disconnected at the lock lever, manually close the door and check that the slave link is free throughout its movement and does not foul the door-sealing strip or check-link pins. Observe the clearance at the top of the slot and ensure the slot does not bottom during the whole movement, there must also be adequate clearance at the bottom of the slot when the door is fully up.

(5) Remove the two 3/8 in. dia. bolts from the fulcrum of the check links and ensure that the slave mechanism operates the sequence-valve plunger with the door pushed to the fully open position.

(6) Reconnect the door jack to the lock lever and pump the jack fully down. Check that the slave mechanism still operates the sequence-valve plunger.

(7) Ensure that with the check link fulcrum bolts removed, there is no clearance between the top of the slave link slot and the eccentric bolt shank when the door is in the down position.

(8) Pull the door in an outboard direction and ensure that the mechanism is firm and that the sequence-valve plunger is still depressed.

(9) Refit the bolts in the check links fulcrum points *(operation (2) Note 2)* and, observing the quarter turn back of the nuts, fit the split pins.

(10) Finally check that with the door fully down there is still a clearance between the top of the slave-link slot and the eccentric-bolt shank.

(11) Refit the main undercarriage jack piston rod pivot pin *(para.32)*.

(12) Function test the alighting gear *(Chap.6)*.

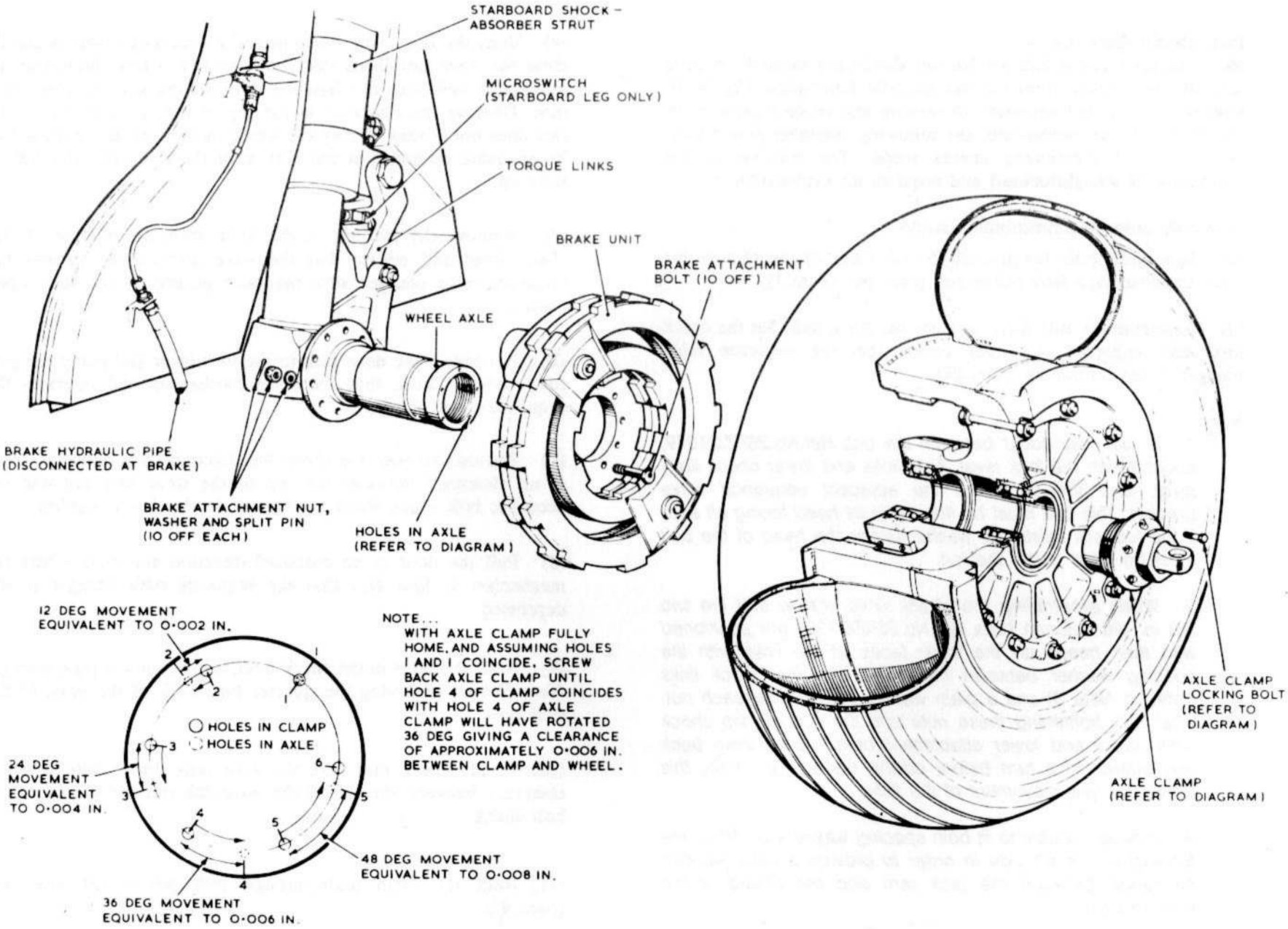

FIG.14. WHEEL AND BRAKE — REMOVAL AND ASSEMBLY

Door hinges *(fig.13)*

37. The amount of thread of a hinge bracket attachment bolt which passes into its anchor nut is critical. It is, therefore, important that, during assembly of the hinge brackets one of the following procedures is carefully observed, dependent on the type of bolt fitted.

(1) *Bolt A25*

Measure the amount of the existing packing and fit the appropriate length of bolt and/or washers selected from the following table:-

PACKING	FASTENING
FWD. HINGE	
Nil	bolt A.25/3C
less than 0.05 in.	bolt A.25/4C and washer SP.15/C
0.05 in. to 0.10 in.	bolt A.25/4C
0.10 in. to 0.13 in.	bolt A.25/5C and washer SP.15/C
AFT HINGE (top bolt)	
Nil	bolt A.25/2C
less than 0.03 in.	bolt A.25/3C and washer SP.15/C
0.03 in. to 0.08 in.	bolt A.25/3C
0.08 in. to 0.13 in.	bolt A.25/4C and washer SP.15/C
AFT HINGE (remaining bolts)	
less than 0.07 in.	bolt A.25/3C and washer
0.07 in. to 0.13 in.	bolt A.25/3C

or

(2) *Bolt EA3-20-2045*

Assemble the main undercarriage door to the forward and aft hinges using 1.05 in. long bolts Part No.EA3-20-2045 adjusting the amount of each bolt plain shank engagement with an appropriate amount of washers (S.P.15/C) beneath each bolt head to obtain a combined thickness of packings, shims and washers as follows:-

Forward hinge	0.15 to 0.20 in.
Aft hinge	0.20 to 0.25 in.

Note . . .

Procedure (1) was introduced by STI/CAN/148. Procedure (2) is required on the current issue of the relevant drawings and has the advantage of constant bolt length.

Wheel *(fig.14)*

Removal

38.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Ensure that the aircraft parking brake is off *(Chap.6).*

(3) Unlock the brake piston rods by removing the retaining springs and locking plates. Screw the piston rods in tight.

(4) Remove the locking wire and unscrew and remove the locking bolt from the axle clamp.

(5) Unscrew and remove the axle clamp.

(6) Using wheel extractor *(Sect.2, Chap.4, Table 1)* remove the wheel from the axle.

Assembly

39. When reassembling the wheel it is important that the wheel bearing and brake clearances are correctly adjusted. To obtain these clearances the following sequence of operations must be observed:

(1) Ensure that the wheel bearings are lubricated with grease *(fig.5).*

(2) Slide the wheel on to the axle until it is fully engaged with the brake tenons. Release the brake by unscrewing each piston rod about two turns. The wheel should now be free to rotate.

(3) Whilst rotating the wheel, screw on the axle clamp until the taper bearings are fully home and the clearance is taken up. Do not overtighten the axle clamp during this operation.

(4) When the axle clamp is fully home and the clearance taken up, unscrew the axle clamp to obtain a clearance of 0.005 in. $^{+0.005}_{-0.000}$ in. between the clamp and the wheel.

Note . . .

Six locating holes for the locking bolts are provided in the axle clamp and five in the axle, therefore only one of the axle clamp holes will coincide with a hole in the axle at any one time (fig.13). This coincidence will occur at different holes at 12 deg intervals as the axle clamp is rotated. The axle clamp is threaded 16 t.p.i., thus one complete turn of the clamp will give a clearance of 0.0625 in. A movement of 12 deg from one hole coincidence to the next would, therefore, give a clearance of 12/360 of 1/16 = 0.002 in. approximately. To obtain the minimum defined clearance the axle clamp must be unscrewed through the coincidence of three holes which will give the correct clearance of 0.006 in.

(5) Insert the locking bolt into the coinciding holes; tighten and wire-lock.

(6) Adjust the brake clearance by screwing in the piston rods until resistance to rotation is felt, indicating that the brake clearance is taken up. Slacken each piston rod one complete turn, plus the amount required to re-engage the end of the piston rod with the locking plate. Position the locking plates on the cylinders and retain with the springs *(A.P.104J-1039-1)*.

(7) Function test the operation of the brakes *(Chap.6)*.

Brake unit *(fig.14)*

Removal

40.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Ensure that all hydraulic pressure is exhausted *(Chap.6)*.

(3) Remove the wheel *(para.38)*.

(4) Disconnect the flexible hydraulic pipes from the brake unit and blank off the pipes.

(5) Remove the split pins from the ten slotted nuts which secure the brake unit to the axle.

(6) Remove the brake unit.

Assembly

41.

(1) Assemble the brake unit to the stub axle and secure with the slotted nuts and new split pins.

(2) Remove the blanks, bleed and reconnect the hydraulic pipes to the brake unit.

(3) Refit the wheel and adjust the brake piston rods *(para.39)*.

(4) Function test the operation of the brakes *(Chap.6)*.

Chapter 5B NOSE UNDERCARRIAGE

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LIST OF ILLUSTRATIONS

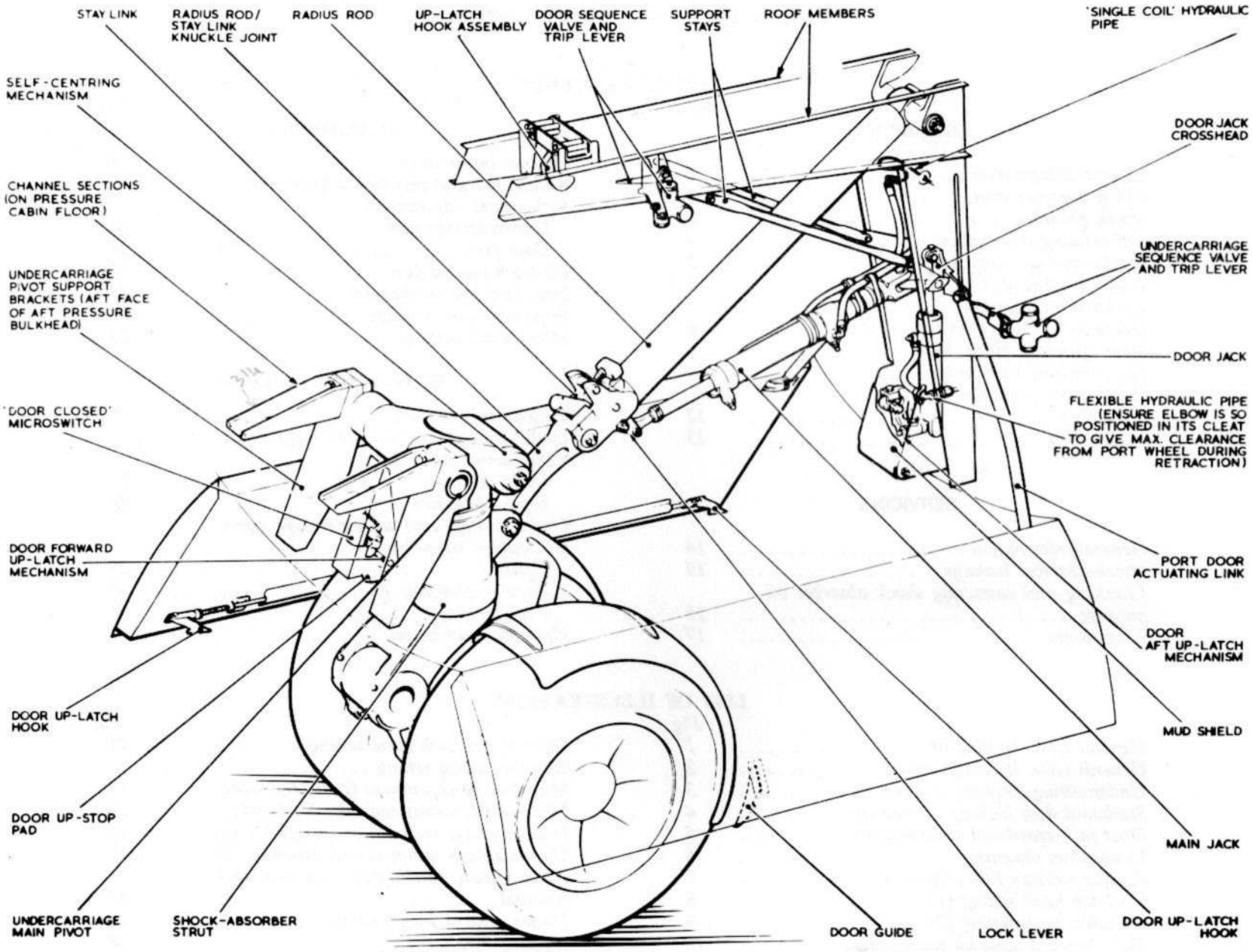


FIG. I. GENERAL VIEW LOOKING AFT

◀ *Part numbers deleted* ▶

DESCRIPTION

General information *(fig.1 and 2)*

1. The nose undercarriage is a twin wheel, lever suspension type, fitted with a liquid spring shock-absorber and a spring-loaded self-centring device *(A.P.1803E, Vol.1, Sect.6)*. The unit pivots about support brackets mounted on the aft face of the pressure bulkhead and, on retraction, a hydraulic jack moves it rearwards and upwards into the nose-wheel well *(Chap.1)*. After retraction, the nose wheel well is faired-off flush with the aircraft skin by two doors actuated by another hydraulic jack mounted on the aft bulkhead of the well. A mudguard, attached to the bearing bracket on the axle is provided for each wheel. A radius rod and stay link, spanned between the aircraft structure and the shock-absorber, incorporates a down-lock mechanism in its knuckle joint; the undercarriage is held locked in the retracted position by an up-latch hook situated in the roof of the wheel well. Sequence valves, interposed in the hydraulic jacks circuits, ensure correctly sequenced opening and closing of the doors in relation to the undercarriage operation *(Chap.6)*.

Shock-absorber strut

2. The strut consists of a main fitting, which houses the main pivot shaft and self-centring mechanism, a pivot fork and link fitting, a twin-stub axle beam, and a liquid-spring shock absorber. Two bearing brackets of the aft face of the pressure bulkhead provide a suspension and pivoting point for the strut main pivot shaft, while lugs on the rear of the strut outer sleeve form attachment points for the stay link which connects the strut to the retracting mechanism *(para.5)*. The wheels are carried on the stub axle beam pivoted to the lower end of the inner sleeve, with the lower end of the shock-absorber strut pin-jointed to the beam between the axle and pivot pin.

Shock absorber

3. The shock absorber is a liquid-spring unit housed within the strut outer sleeve and retained in the strut by a pip-pin. It consists of a cylinder, housing a piston assembly, and is described in A.P.1803E, Vol.1, Sect.6.

Self-centring mechanism

4. The spring-loaded self-centring mechanism is an integral part of the strut outer sleeve. It is housed in a dashpot at the top of the sleeve and acts as a damper to any shimmying effect which might occur during taxying. The unit is fully castering, controlled within a range of 25 deg on each side of the trailing position.

Radius rod and stay link

5. The radius rod pivots at its upper end in a block mounted between two heavy support beams on the underside of the undercarriage well roof, and is pin-jointed at its lower end to the stay link which connects it to the strut outer sleeve. Where the radius rod joins the stay link a knuckle joint is formed which folds during undercarriage retraction. Incorporated in this knuckle joint is the down-lock mechanism and a pin which engages the up-latch hook when the undercarriage is fully retracted. Two microswitches, which when operated, illuminate the undercarriage indicator lights at the pilot's station, are mounted on the knuckle joint.

Undercarriage jack

6. The jack is situated below the radius rod, and at its body end is pivoted between the two channel stiffeners on the aft bulkhead of the undercarriage well. At its forward end the jack piston rod is attached through the down-lock lever to the knuckle joint of the radius rod. The jack is extended when the undercarriage is retracted.

Up-latch mechanism *(fig.8)*

7. The up-latch hook assembly is mounted between the two support beams on the underside of the wheel-well roof. The hook is retained in its normal locking position by a spring, one end of which is attached to an extension of the hook, while the other is attached to the support beam. When the undercarriage is fully retracted, the hook, under the action of its spring, engages the up-latch pin on the end of the radius rod; when the jack retracts to lower the undercarriage, the initial movement rotates the down-lock lever and a roller on the end of the lever disengages the up-latch hook from the up-latch pin to release the undercarriage. An adjustable pedestal is mounted on each side of the up-latch hook

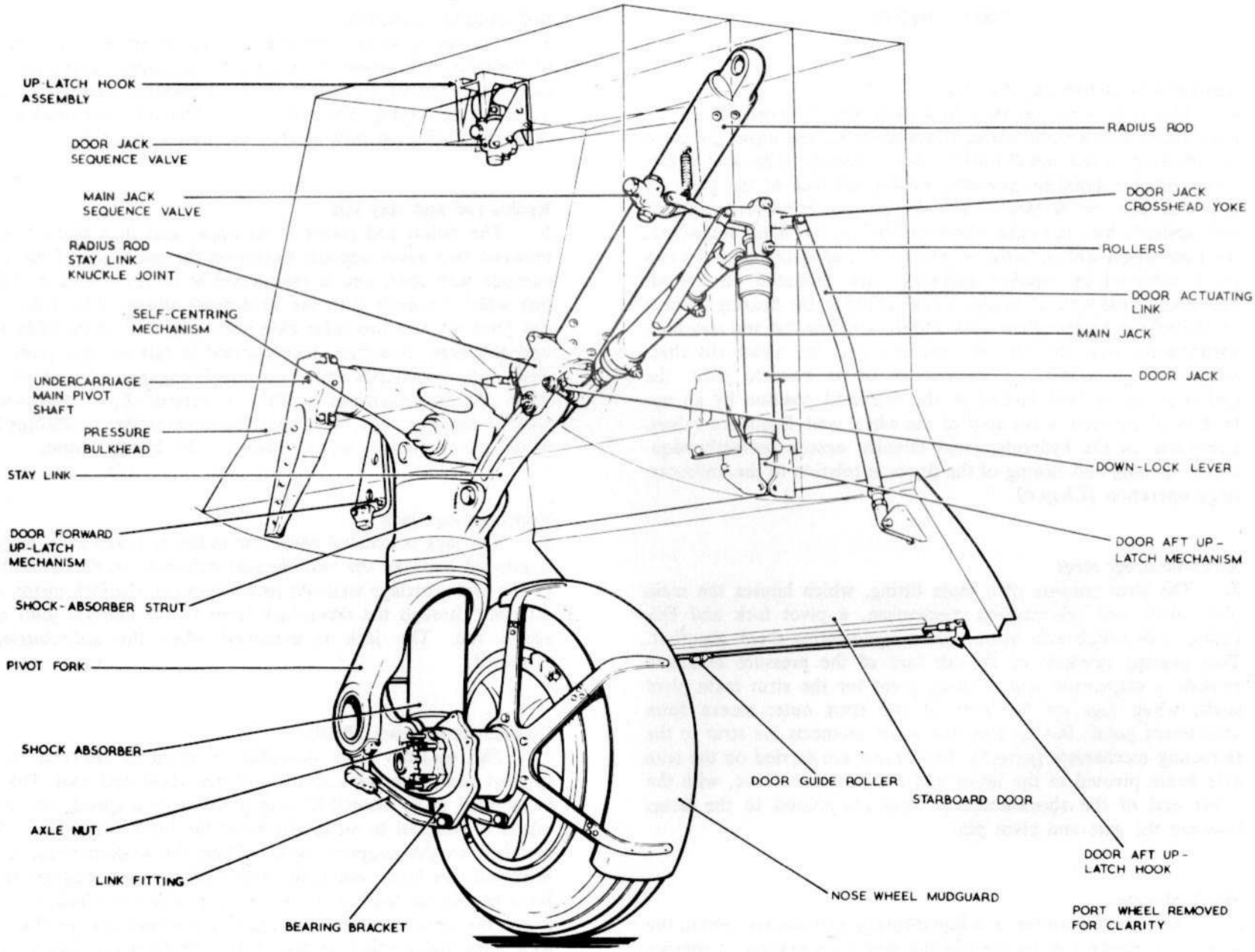


FIG. 2. GENERAL VIEW LOOKING FORWARD

◀ *Redrawn* ▶

to limit the upward movement of the radius rod. The door sequence valve and trip lever is mounted just aft of the up-latch hook assembly on the port longitudinal well roof beam; the lever is operated, during undercarriage retraction, by the upper face of the radius rod.

Down-lock mechanism *(fig.3 and 7)*

8. The down-lock mechanism is carried in the forked end of the radius rod in which the stay link is hinged. It consists of a lever, mounted on a pivot bolt, carrying two rollers on its upper end; the lower end of the lever is connected to the end of the jack piston rod. When in the down position, the lower of the two rollers on the lever rests on the profiled end of the stay link, in which position it is locked by a spring-loaded latch pin.

Door-operating mechanism *(fig.5)*

9. The two doors are hinged to the under-surface of the fuselage, one on either side of the undercarriage well, and open downward and outward. The doors are operated by a jack mounted vertically on the rear bulkhead of the undercarriage well, the upper end of the jack piston rod being connected to a crosshead yoke which is connected to the rear of both doors by actuating links; the lower end of the jack is connected to the door up-latch hook release lever *(fig.4 and 11)*. A trip screw on the port arm of the crosshead operates, through a lever, the undercarriage jack sequence valve when the doors are opened.

Door-latching mechanism *(fig.4)*

10. The doors are secured in their closed position by two latches, one at each end of the starboard door, which hook over the two up-latch bolts suitably positioned on the forward and aft walls of the undercarriage well. The port door is held in the closed position by two bevelled abutment faces *(fig.8 and 9)*, fitted to the edge of the starboard door, which mate with corresponding inverted abutment faces on the edge of the port door. The two door up-latch hooks are connected by an adjustable rod, and are loaded in the locked position by a latch return spring. Up stops are provided for both doors, one at the front and two at the rear of the undercarriage well; the rear stop packings are on the doors, and all three are adjustable by shimming to ensure a correct fit of the doors to the fuselage. The doors are shaped in such a manner that the forward ends close first.

11. The doors are opened when the latches are operated by a hook release lever mounted at the rear end of the undercarriage well; the lever is pivoted about its centre, and its upper end carries a striker roller so positioned that downward movement will cause it to contact the upper face of the aft latch. The lever carries the door jack lower pick-up point, and forward swing limit stops are fitted to the lever bracket to contact the lever and ensure a positive operating point for the jack when closing the doors. Initial retraction of the jack gives an upward movement to its lower pick-up point and a forward and downward movement to the hook release lever, which causes the striker roller to contact and move the aft latch out of engagement with its latch bolt. Movement of the aft latch is transmitted by the connecting rod to the front latch which is simultaneously released; further movement of the jack opens the doors. When the doors are being closed, the final movement of the jack brings the upper edges of the latch hooks into contact with the latch bolts and, due to their bevelled shape, the latches are moved rearwards until the doors are fully closed then, under the action of the latch return spring, they move forward and lock the doors.

Principle of operation

Raising

12. Upon selecting alighting gear UP, hydraulic pressure is first felt at both the undercarriage and door jacks but, since the door jack sequence valve is closed, preventing a flow of fluid from the door jack, only the undercarriage jack is operated. Initial extension of the jack piston rod overrides the spring-loaded lock lever plunger and withdraws the lower roller of the lock lever from the profiled end of the stay link *(fig.3)*, further movement breaks the stay link/radius rod knuckle joint, raises the radius rod and retracts the undercarriage. As the undercarriage approaches the end of its movement, the up-latch bolt is engaged by the up-latch hook, and the radius rod trips the door sequence valve operating lever, permitting a flow of fluid from the door jack. Initial extension of the door jack piston rod closes the undercarriage jack sequence valve, and continued movement of the door jack closes the doors *(para.11)*.

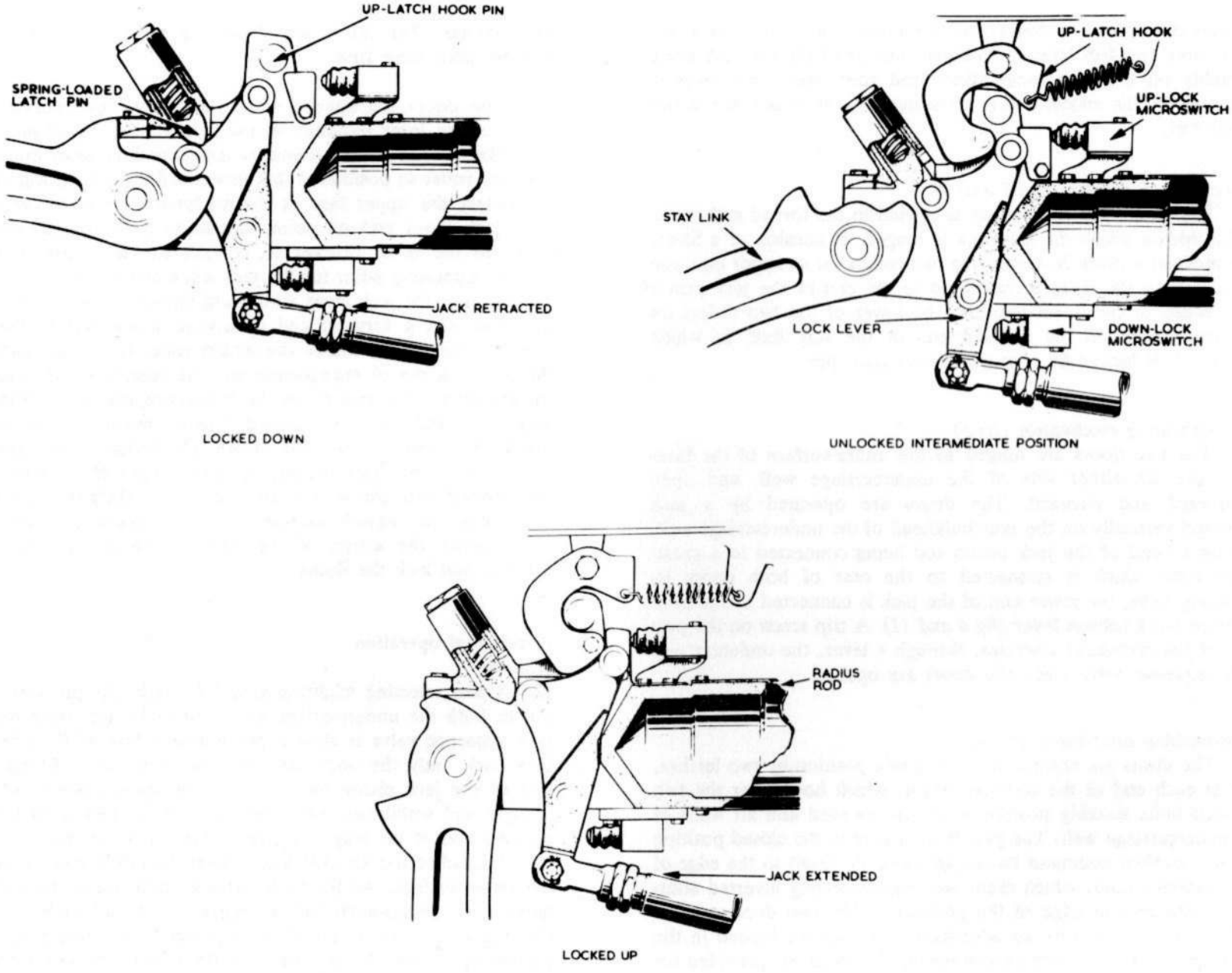


FIG. 3. UNDERCARRIAGE LOCKING MECHANISM

◀ *Redrawn* ▶

Lowering

13. When the alighting gear is selected DOWN, hydraulic pressure is first felt at both the undercarriage and door jacks but, since the undercarriage sequence valve is closed, preventing a flow of fluid from the undercarriage jack, only the door jack is operated. Initial retraction of the door jack piston rod operates the door latches *(para.11)* and continued retraction opens the doors which finally operate the undercarriage jack sequence valve, allowing fluid to flow from the undercarriage jack. Initial movement of the undercarriage jack causes the lock lever to pivot and disengage the up-latch hook, the radius rod falls and closes the door jack sequence valve and further movement of the jack lowers the undercarriage. The undercarriage is finally locked down by the engagement of the lower roller of the lock lever in the lip on the end of the stay link and the operation of the spring-loaded lock lever plunger *(fig.3)*.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

General information

14. The following paragraphs provide information on the routine servicing of component parts.

Shock-absorber leakage

15. External leakage from the shock absorber is an indication of a defective sealing ring or gland washer. In these cases the unit must be considered unserviceable and a replacement fitted. If leakage occurs past the bleed plug it may be caused by slackness of the plug or grit under the ball; if cleaning and tightening proves ineffective the unit must be replaced.

Checking and correcting shock-absorber oil pressure

16. If the shock-absorber strut extension does not conform to the dimensions given in Sect.2, Chap.2 when the undercarriage is in the normal static-loaded condition and the shock absorber shows no signs of leakage, the unit must be topped up as follows:-

(1) Jack the aircraft nose *(Sect.2, Chap.4)* to remove the load from the shock absorber.

(2) Connect a flexible charging adapter to a universal lubricating gun *(Sect.2, Chap.4, Table 2)* and prime the charging adapter using hydraulic fluid OM-15.

(3) Remove the cap from the shock absorber charging valve and connect the primed charging adapter and gun to the valve.

(4) Charge the shock absorber to a pressure of 1500 ± 0.00 lb/in^2. Release the pressure in the charging adapter bleed screw. Remove the adapter and gun; refit the valve cap and lower the aircraft to the ground.

(5) Recheck the strut extension dimension *(Sect.2, Chap.2)*.

Lubrication

17. Refer to fig.6.

ADJUSTMENTS

General information

18. The paragraphs in this section describe the procedure to be adopted when settings have to be checked and adjustments made. The occasions arise during both servicing and assembly operations and have for that reason been incorporated in this separate section, with relevant cross references made as necessary from other sections. After any adjustments have been made the nose undercarriage must be function tested *(Chap.6)*.

Note . . .

1. Operation of the nose undercarriage UP/FLIGHT selector valve to UP isolates and prevents main undercarriage retraction (Chap.6).

2. When raising the nose undercarriage with the door-actuating links disconnected from the doors, an assistant must hold and guide the links to prevent damage to the adjacent hydraulic piping.

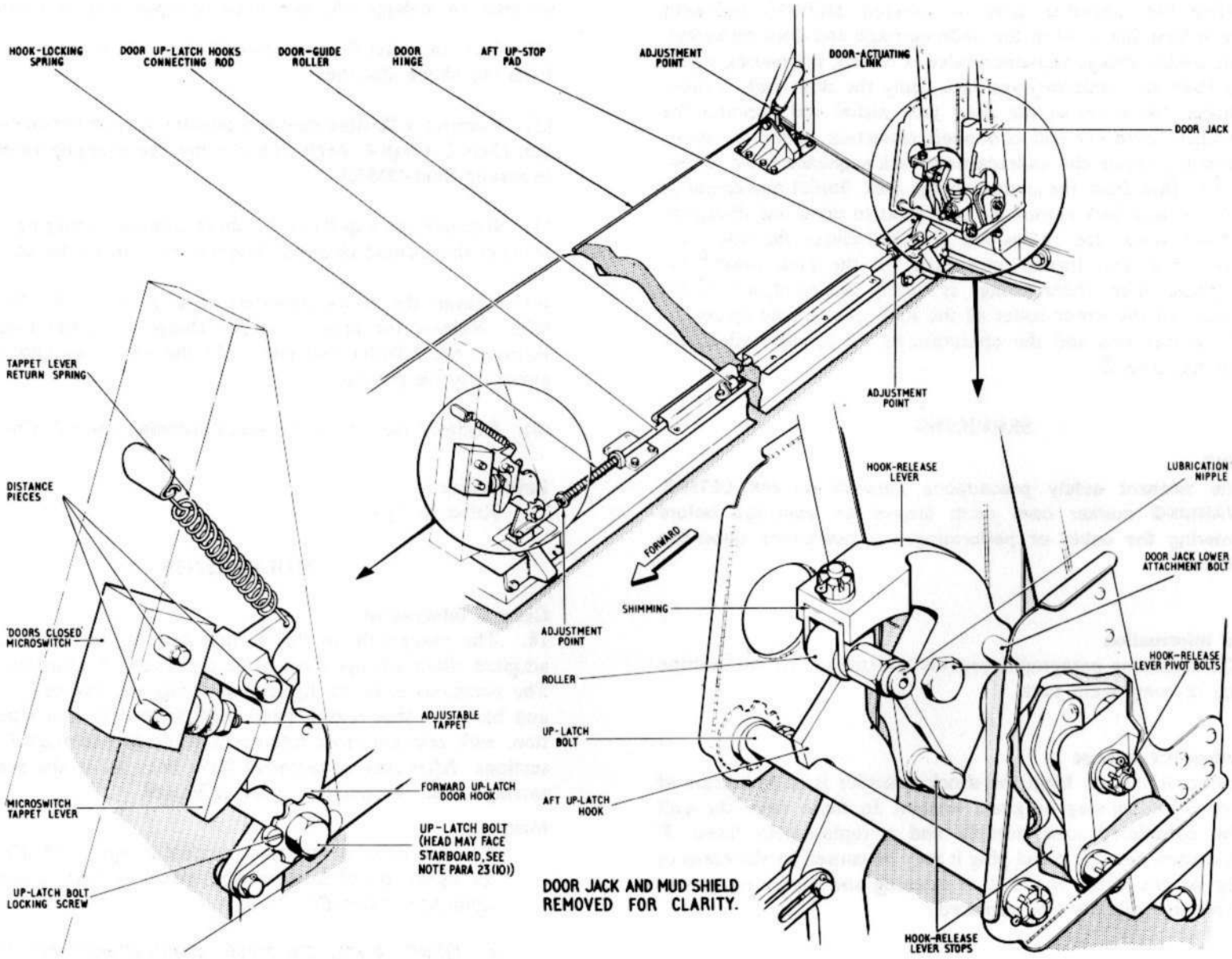


FIG. 4. STARBOARD DOOR LOCKING MECHANISM

◂ STI/CAN/199 INCORPORATED ▸

Radius-rod and stay-link adjustment *(fig.7)*

19. The radius rod and stay link are in correct alignment when their joint pivot pin is offset 0.25 in. downwards from a straight line between the radius rod pin centre and the stay link pin centre. The dimension can be measured with either the jack connected and under hydraulic pressure or by applying strong upward manual pressure to the radius rod. With hydraulic pressure released, there must be a 0.004 in. clearance between the upper lip of the side stay and the radius rod stop plate *(fig.7)*. Should adjustment be necessary, either add to, or subtract from, the shimming Ref.No.26FZ/6146 (total pack 0.0625 in. in laminations of 0.002 in.) provided behind the stop plate, in the following manner:-

(1) With the aircraft jacked and trestled *(Sect.2, Chap.4)*, select UP on the UP/FLIGHT selector valve and partly raise the undercarriage by operating the aircraft hand pump.

(2) Remove the stop plate by unscrewing the securing bolts and adjust the shimming *(para.19)* as necessary. Refit the stop plate.

(3) Select FLIGHT on the UP/FLIGHT selector and fully lower the undercarriage by operating the aircraft hand pump.

(4) Release the hydraulic pressure and check that the 0.004 in. clearance has been obtained.

Jack travel adjustments

Undercarriage jack

20. The distance between the pin centres of the undercarriage jack when fully closed is 24.61 in. ± 0.25 in.; the jack piston rod travel is 9.09 in. ± 0.06 in. The exact pin-centre dimension is governed by the pick-up points on the aircraft structure and the radius rod lock lever. The jack length must be checked upon renewal and after any servicing which may have affected its setting. To adjust the length:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Disconnect the jack piston rod from the lock lever by removing the attachment bolt *(para.27)*.

(3) Disconnect the stay link and radius rod assembly from the shock absorber strut by removing the stay link lower pivot bolt *(para.27)*.

(4) Ensure that the radius rod assembly does not fall below its normal operating position whilst disconnected at its lower end, or its underside will foul and damage the rigid single-coil hydraulic pipe situated on the aft bulkhead immediately below the radius rod upper pivot attachment *(fig.1)*.

(5) Unlock the nose undercarriage UP/FLIGHT hydraulic selector valve *(Chap.6)*, select UP, and fully extend the jack by operating the aircraft hand pump.

(6) Loosen the locknut on the jack piston rod eye end.

(7) Manually lift the radius rod assembly hard against the up-lock pedestal stops and adjust the length of the jack by screwing the piston rod eye end either in or out, until the distance between the jack pin centres exceeds the distance between the centre of the piston rod attachment hole in the lock lever and the centre of the jack attachment bolt in the aircraft structure by 0.18 in. ± 0.02 in. Do not reconnect the jack piston rod to the lock lever at this stage.

(8) Reconnect the radius rod and stay-link assembly to the shock absorber strut in the down position. Check the radius rod and stay link for correct alignment *(para.19)*.

(9) Ensure that the undercarriage jack hydraulic pipes are so positioned and secured that, during all operations of the jack, they will not foul either the undercarriage door jack crosshead or any part of the structure. The method of positioning and securing the pipes is described and illustrated in fig.18.

(10) Select FLIGHT on the nose undercarriage UP/FLIGHT selector valve, and operate the hand pump to fully close the jack.

(11) With the radius-rod assembly locked down and the jack fully closed, check that the distance between the centre of the jack piston rod attachment hole in the lock lever and the centre of the

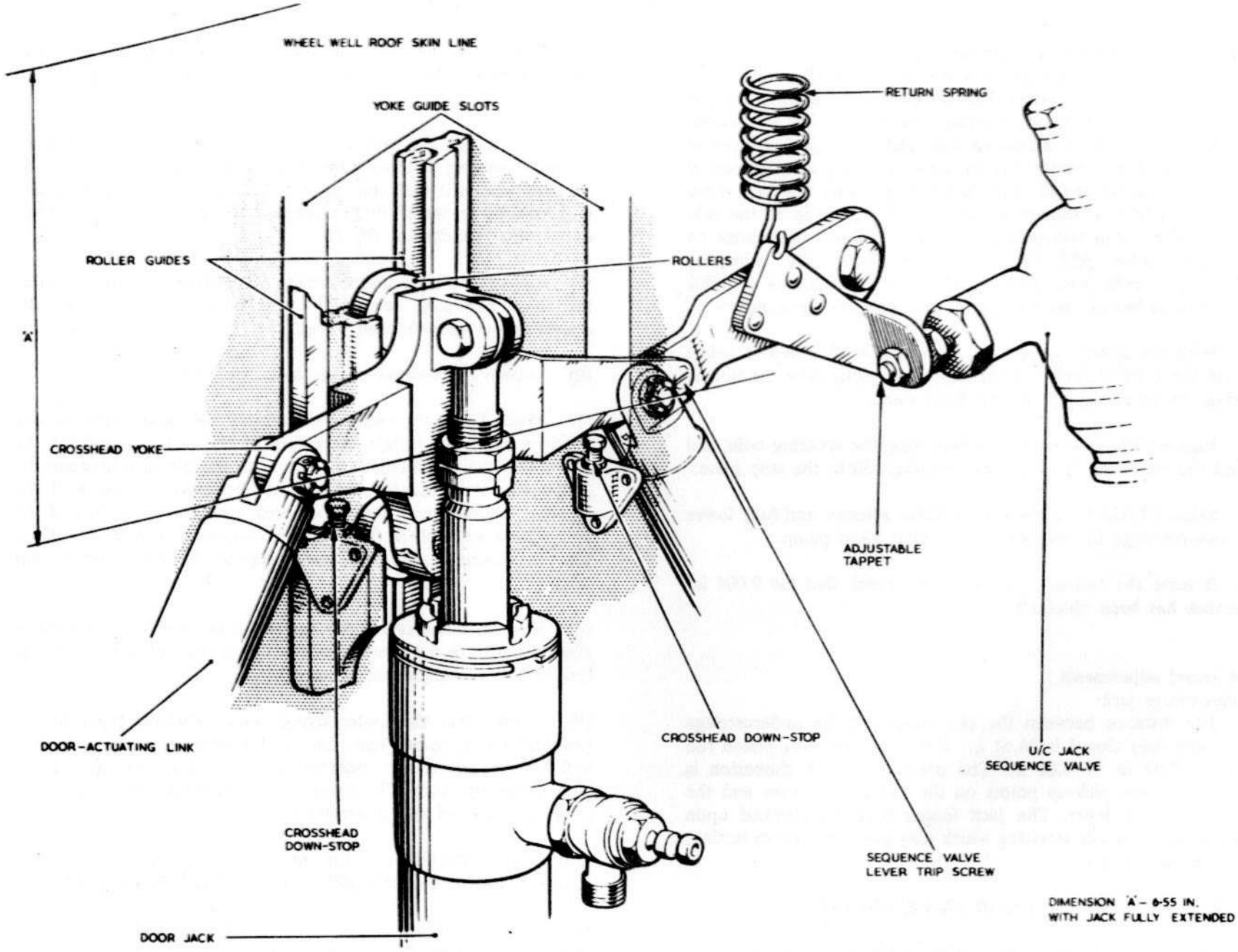


FIG. 5. DOOR JACK CROSSHEAD ARRANGEMENT

◀ *Redrawn* ▶

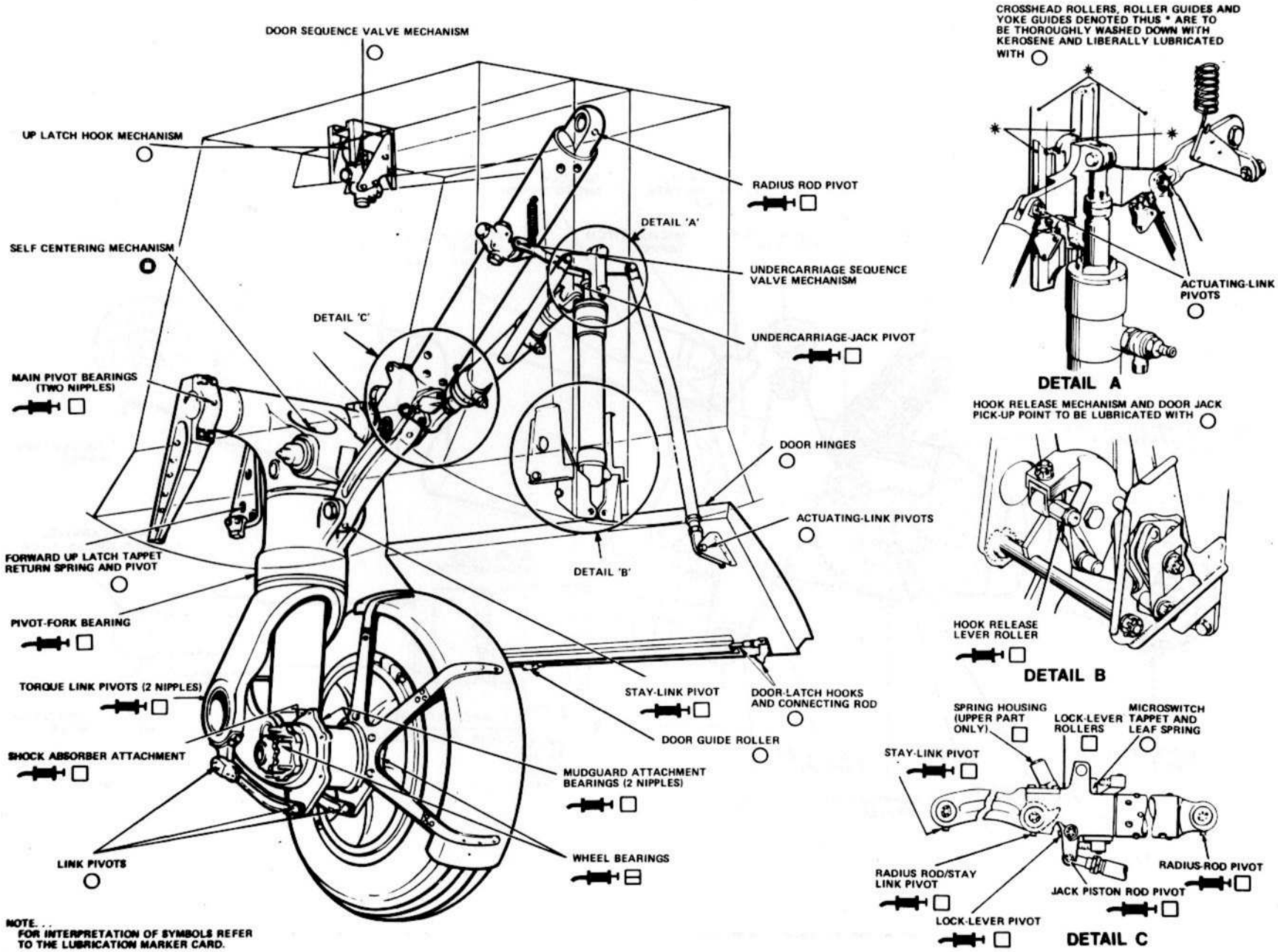


FIG. 6. LUBRICATION DIAGRAM

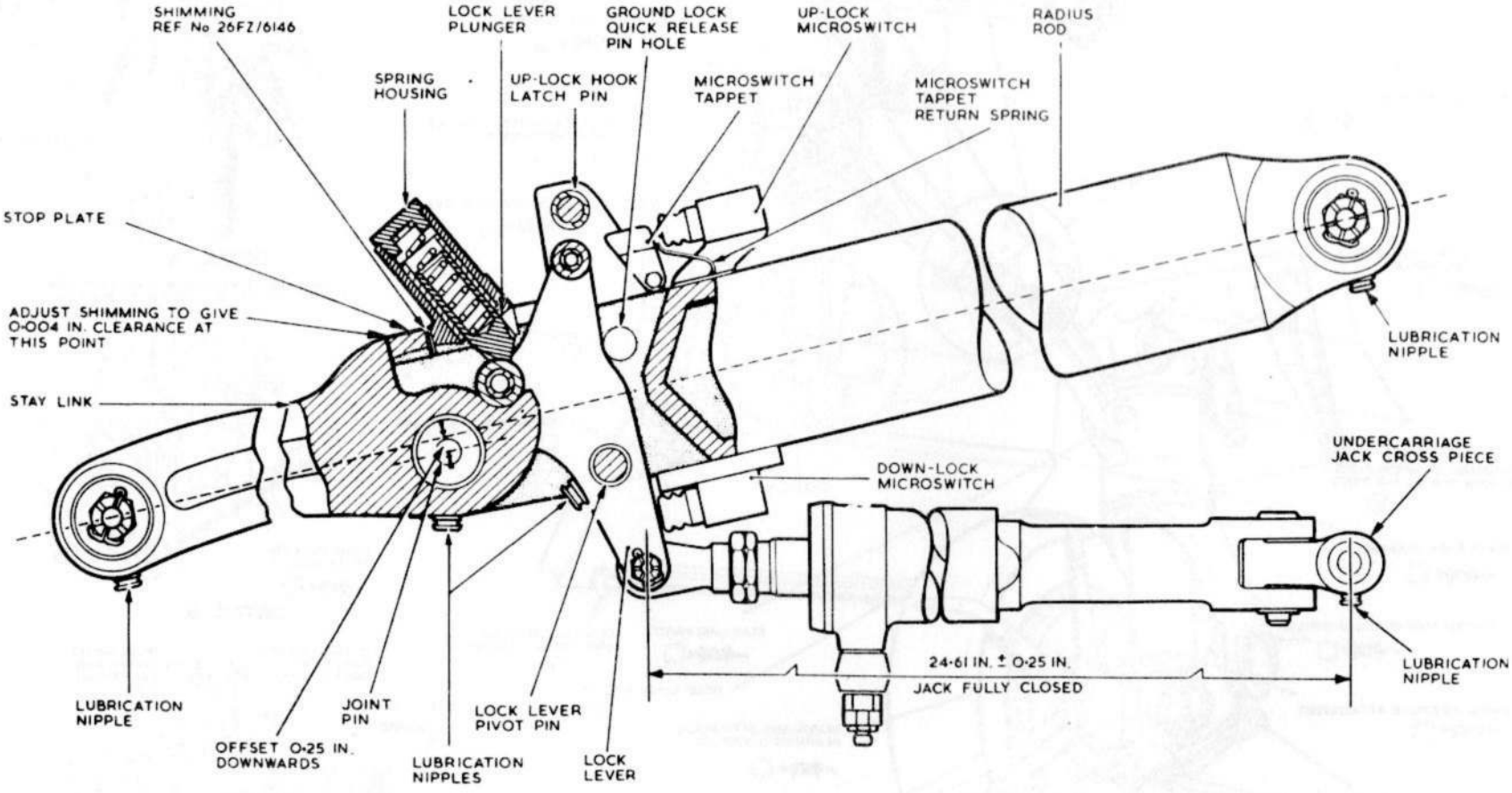


FIG. 7. RADIUS ROD/STAY LINK ALIGNMENT

◀ *Redrawn* ▶

jack attachment bolt in the aircraft structure exceeds the jack pin centres by 0.22 in. $^{+0.04}_{-0.05}$ in.

Note . . .

Ensure that the lock lever is correctly positioned by inserting the ground lock quick-release pin (Sect.2, Chap.4, Table 1); remove the pin before continuing with the adjustment.

(12) Select UP on the nose undercarriage UP/FLIGHT selector valve and, using the aircraft hand pump, extend the jack until its piston rod eye end and the holes in the lock lever coincide. Fit and lock the attachment bolt *(para.31).*

(13) Tighten and wire-lock the jack piston rod locknut.

(14) Reselect the UP/FLIGHT selector valve to FLIGHT and wire-lock. Fully close the jack. Check that the clearance between the radius rod stop plate and the lip of the side stay is 0.004 in. *(fig.7).* Should adjustment be necessary refer to para.19.

Door jack

21. The distance between the pin centres of the door jack when fully closed must not exceed 16.21 in. ± 0.25 in. the jack piston rod travel is 9.19 in. ± 0.06 in. The exact pin centres dimension is obtained by measuring from the undercarriage well roof to the door actuating link pin centres on the jack crosshead; this dimension is 6.55 in. when the jack is fully extended *(fig.5, dimension A).* The jack closed position is governed by the setting of the crosshead stops. On replacement of the jack or after any servicing which may have affected its setting, the jack length must be checked, and, if necessary, adjusted in the following manner:-

(1) Disconnect the undercarriage jack from the radius rod lock lever and the aircraft structure and remove the jack *(para.27).* Disconnect the door actuating links from the doors *(para.28).*

(2) Unlock and select UP on the nose undercarriage UP/FLIGHT selector valve, and fully extend the door jack.

(3) Release the jack piston rod locknut and remove the piston rod eye end connecting bolt from the crosshead.

(4) Adjust the jack length by turning the eye end one half turn at a time, reinserting the connecting bolt, but not locking it and, with a straight edge placed across the pin centres of the two door actuating link attachment bolts on the crosshead, measure a vertical dimension to the skin of the well roof. Adjust until a vertical dimension of 6.55 in. is obtained *(fig.5, dimension A).*

(5) Tighten and wire-lock the piston rod locknut.

(6) Lock the slotted nut to the jack piston rod connecting bolt with a split pin.

(7) Reconnect the door actuating links.

(8) Adjust the crosshead stops until the doors are at their fully open position; 54.50 in. ± 0.50 in. measured between the outer edges of their outer skins.

(9) Refit the undercarriage jack to the aircraft *(para.31).*

(10) Check that the flexible hydraulic pipe which runs to the top of the door jack, is positioned in its cleat on the mud shield so as to give the maximum possible clearance between its elbow union and the port wheel tyre during nose undercarriage retraction.

Up-latch mechanism *(fig.8)*

22. The following information covers the installation of a replacement up-latch hook and/or bracket assembly. It will be evident that the whole procedure is not necessary for a normal check of the hook setting, but the additional information relating to the initial hook setting has been incorporated to cover cases of extreme maladjustment, when the complete procedure must be adopted. To assemble the up-latch mechanism:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Remove the mudguards and wheels *(para.27).*

(3) Disconnect the door-actuating links from the doors.

(4) Disconnect the jack piston rod from the radius rod lock lever *(para.27).*

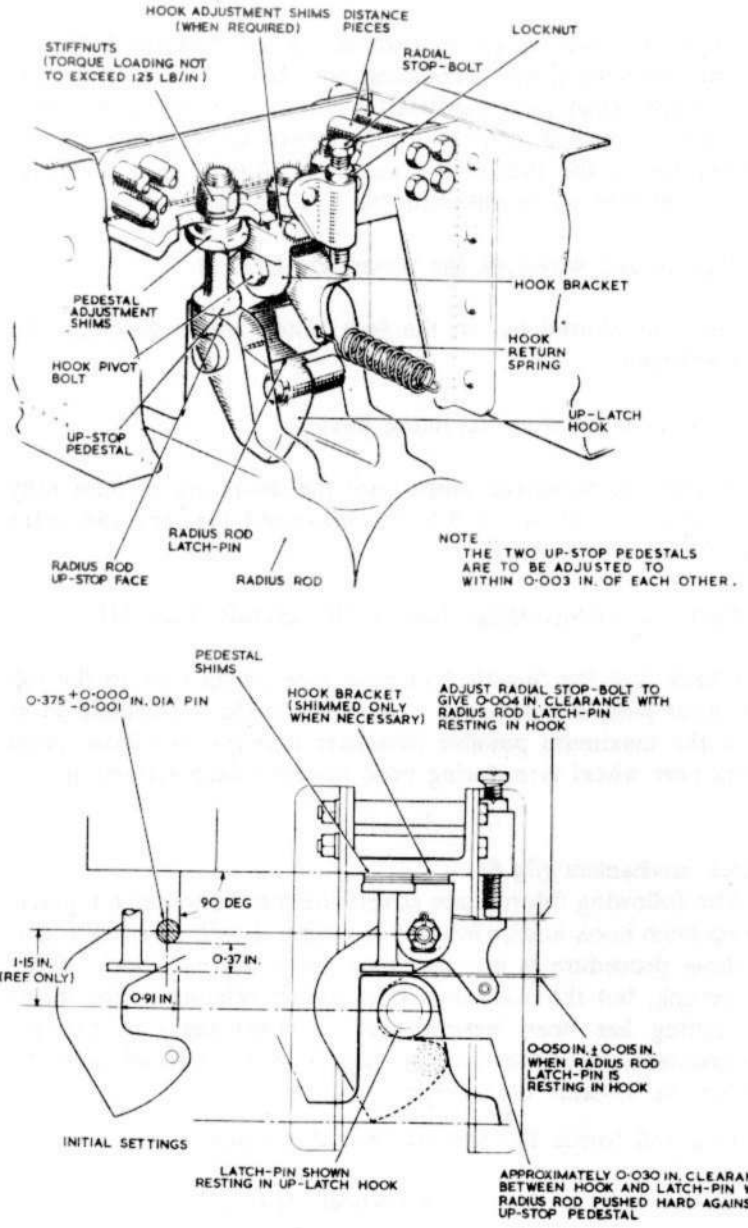
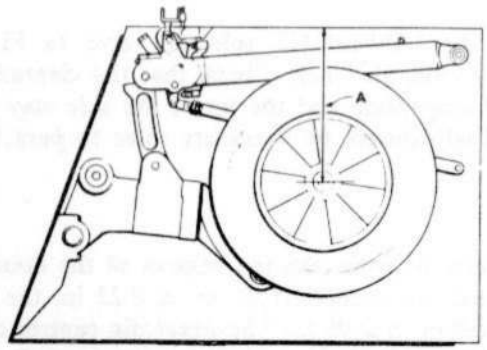


FIG. 8. UP-LATCH HOOK SETTING (1)



DIMENSION 'A' VERTICAL MEASUREMENT FROM WHEEL WELL ROOF TO WHEEL AXLE

FIG. 9 UP-LATCH HOOK SETTING (2)

(5) Do not allow the radius rod assembly to fall below its normal operating position whilst disconnected at its lower end or its underside will foul and damage the rigid single-coil hydraulic pipe situated on the aft bulkhead immediately below the radius rod upper pivot attachment *(fig.1)*.

(6) Remove the pivot bolt attaching the radius rod stay link to the undercarriage strut *(para.27)*.

(7) Remove the cover plate of the up-latch mechanism from the floor of the upper equipment compartment; holes in the cover plate provide access when carrying out adjustments and security checks. Remove the hook and bracket assembly and the up-stop pedestals and discard the unserviceable item. Retain the shims and fastenings, less split pins.

(8) Assemble the hook bracket, less shims, to the well roof structure and secure with a stiffnut. Do not exceed a torque loading of 125 lb in.

(9) Assemble the up-stop pedestals, complete with shims, and secure with stiffnuts. Do not exceed a torque loading of 125 lb in.

(10) Refer to fig.8 and with a 0.375 in. $^{+0.000}_{-0.001}$ in. dia. pin inserted in the hook pivot bracket, set the hook and pedestals to the dimensions given in the illustration. Attach the hook and connect the hook spring.

(11) Manually raise the radius rod until the latch pin rests in the hook.

(12) Adjust the radial stop-bolt to give a clearance of 0.004 in. between the end face of the radial stop bolt and the hook flat. Tighten the radial stop-bolt locknut.

(13) With the latch-pin still resting in the hook, adjust the up-stop pedestals to give a clearance of 0.050 in. ± 0.015 in. between the pedestals and the radius rod stop faces.

Note . . .

1. If the 0.050 in. clearance cannot be attained after the removal of all the shims from beneath the up-stop pedestals, shims must be inserted beneath the hook bracket and, if necessary, further adjustment obtained by reshimming the up-stop pedestals.

2. The two up-stop pedestals are to be adjusted to within 0.003 in. of each other.

(14) Manually push the radius rod hard up against the up-stop pedestals and support it in that position.

(15) Check, and if necessary adjust, the jack override *(para.20)*. Connect the jack to the radius rod lock lever *(para.31)*.

(16) Select the UP/FLIGHT selector valve to FLIGHT and, by using the aircraft hand pump, force the radius rod against the up-stop pedestals and adjust the sequence valve *(para.24)*.

(17) Disconnect the jack from the lock lever, lift the radius rod clear of the hook and lower by hand to reconnect the stay link to the undercarriage strut *(para.31)*. Check that the radius rod lock lever is engaged.

(18) Select the UP/FLIGHT selector valve to UP and fully close the jack under pressure. Check its closed override *(para.20)* and connect the jack to the lock lever *(para.31)*.

(19) With the wheels or an equivalent weight fitted to the undercarriage stub axles, raise the undercarriage under hydraulic pressure.

(20) Take and record a vertical measurement from a point in the roof of the wheel well to the undercarriage stub axle *(fig.9, dimension A)*.

(21) Place a jack or trestle beneath the strut allowing a clearance of approximately 1 in. between the strut and the jack or trestle.

(22) Using the aircraft hand pump, lower the door jack until its crosshead trips the undercarriage sequence valve. An audible click will be heard when the radius rod latch-pin drops into the well of the up-latch hook. When this occurs, stop pumping immediately, leaving the undercarriage suspended by the up-latch hook.

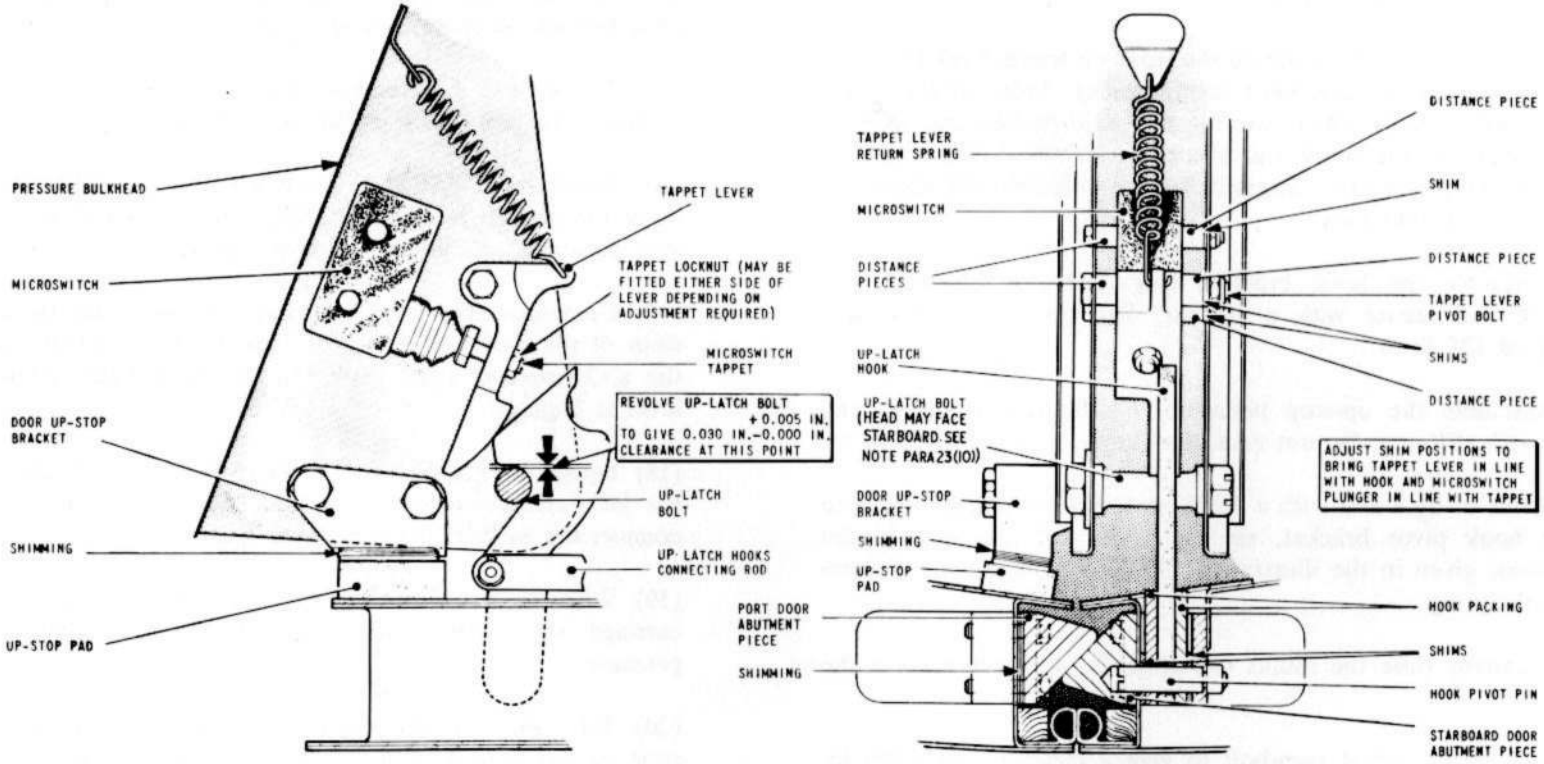


FIG. 10. DOOR FORWARD UP-LATCH HOOK SETTING

◂ STI/CAN/199 INCORPORATED ▸

(23) Take a second measurement from the same point in the roof, to the nosewheel axle *(fig.9, dimension A)*; this dimension should exceed that obtained in operation (19) by 0.20 in. ± 0.050 in. If this dimensional difference is incorrect, it can be corrected by adjusting the shimming beneath the up-stop pedestals.

Note . . .

The 0.20 in. ± 0.050 in. dimension ensures that, with the radius rod hard up against the up-stop pedestals, a gap of approximately 0.030 in. exists between the latch pin and the hook.

(24) Function test the nose undercarriage and ensure that the hook engages correctly with the latch pin. Recheck the sequence-valve setting and the jack overrides.

(25) Refit the box cover over the up-latch mechanism in the upper equipment compartment.

(26) Reconnect the door-actuating links and ensure all nuts, pins and unions are correctly locked. Ensure also, that the UP/FLIGHT selector valve is locked in the FLIGHT position.

Door-latching mechanism *(fig.10 and 11)*

23. The correct setting of the doors in the up position depends upon the critical setting of several adjustable items, namely; the forward and aft door up-latch hooks and connecting rod, the door up-stop pads, abutment faces, and the door actuating links. Any item which is maladjusted can affect the setting of each of the other items; for this reason the following procedure must be adopted, as the sequence in which the settings are made is as important as the setting themselves. To set the nose undercarriage doors:-

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Remove, and mark for reidentification, both door actuating links.

(3) For ease of access remove the landing wheels and mud-guards.

(4) Fully retract the undercarriage.

(5) Remove and retain the packing and shimming from the up-stop on the forward up-latch bolt attachment bracket.

(6) Manually close the starboard door and align its trailing edge flush with the fuselage contour by adding or subtracting shims at the aft up-stop pad *(fig.11)*. Hold the door firmly in the closed position and obtain a 0.030 in. 'out-of-airflow' step at the door leading-edge by inserting a Paxalin wedge (of local manufacture) between the door inner skin and the starboard lower edge of the forward-up-latch bolt mounting bracket. The door is designed to close at its forward end first.

(7) Adjust the up-latch hooks connecting rod on the starboard door so that the hooks will fully engage over the up-latch bolts. Remove the Paxalin wedge.

(8) Support the front edge of the door in the up position and check that the forward hook is in line with the microswitch tappet lever, and that the tappet is in line with the microswitch plunger.

(9) Should it be necessary to align the tappet and/or the microswitch, lateral adjustment can be gained on both items by repositioning the shims fitted on the attachment bolts between the distance pieces and the brackets *(fig.10)*.

Note . . .

It is permissible to fit the shims equally on each side of the distance pieces, or both at one side, depending upon the adjustment required. In cases of extreme maladjustment a similar arrangement is permissible with the hook pivot pins shims (fig.10).

(10) Check the clearance between the forward up-latch hook and the up-latch bolt; this is to be 0.03 in. $^{+0.005}_{-0.000}$ in. *(fig.10)*. If adjustment is required, remove the locating screw *(fig.4)* from the scalloped head of the up-latch bolt and rotate the bolt until the correct clearance is obtained. Refit the locating screw. Check that the up-latch bolt is fitted with its head at the port side of the forward up-latch door hooks as shown in fig.4.

Note . . .

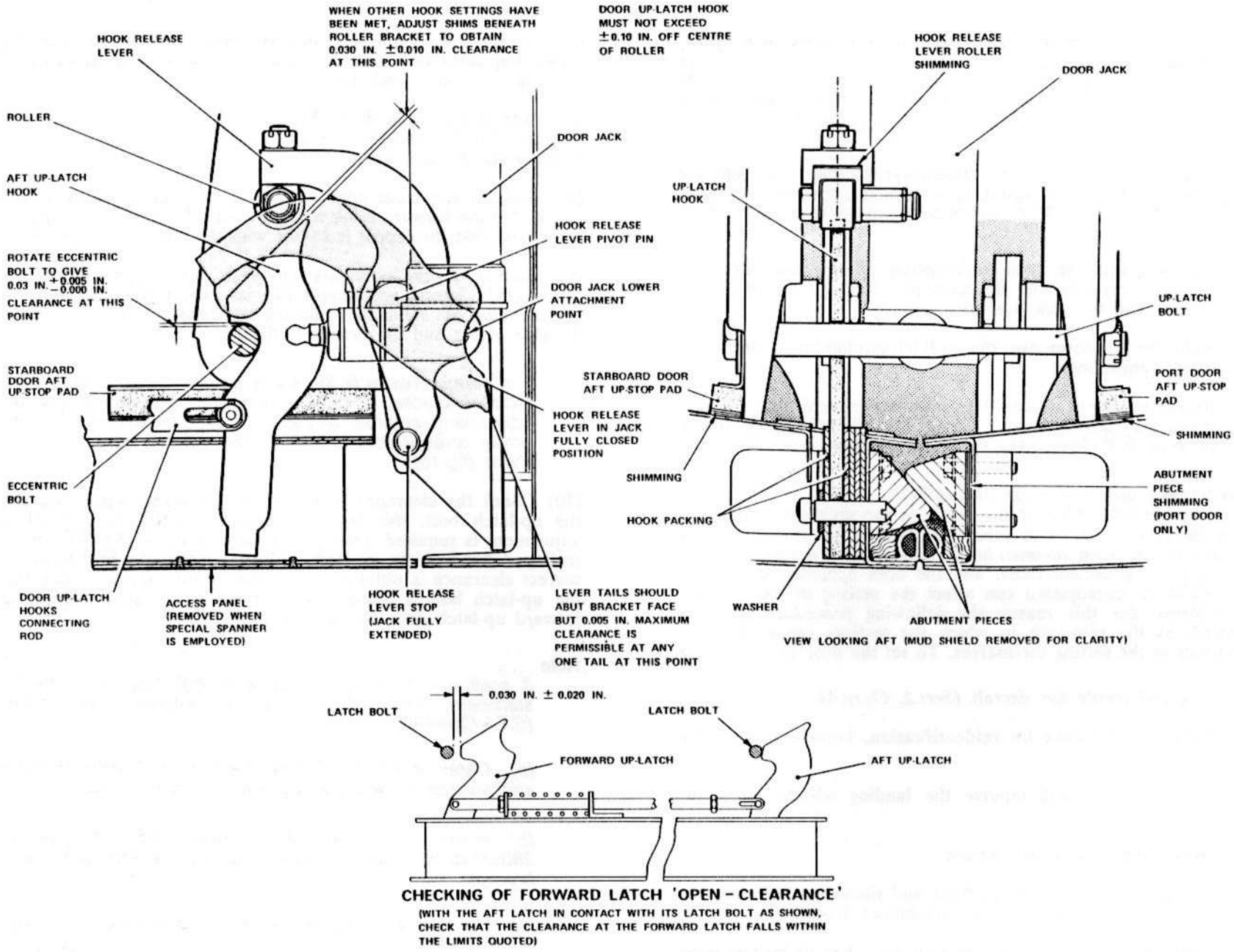
If scalloped head of the up-latch bolt has been fitted to starboard, then it should be secured as follows (S.T.I./Can/199):-

(a) Obtain a 4 B.A. thick washer (SP 16/B, 28W/9419486) and enlarge its hole using a 4.8 mm (3/16 in.) drill.

(b) Insert a 2 B.A. round head bolt (AS1246/1/C, 28D/3140202) with its head inboard of starboard latch bracket.

(c) Fit the 4 B.A. thick washer over the bolt so that it seats in the scallop.

(d) Secure, using a spring washer (SP 47/C, 28W/9416643) and nut (A 27-CT, 28M/1006473).



CHECKING OF FORWARD LATCH 'OPEN - CLEARANCE'

(WITH THE AFT LATCH IN CONTACT WITH ITS LATCH BOLT AS SHOWN, CHECK THAT THE CLEARANCE AT THE FORWARD LATCH FALLS WITHIN THE LIMITS QUOTED)

FIG. 11. DOOR AFT UP-LATCH HOOK SETTING

◀ LATCH BOLT CLEARANCE DETAIL ADDED ▶

(11) Check, and if necessary, adjust the forward up-latch micros-witch tappet *(fig.13)*.

(12) With the starboard door still closed, check the clearances of the aft up-latch mechanism:-

(a) The hook should be in line with the centre of the hook release lever roller to within 0.10 in.

(b) If, after renewal of a starboard door, hook, or hook release lever mechanism, it is found necessary to make adjustments to obtain this alignment:-

(i) Remove the abutment piece and the hook assembly from the door, retain the washer *(fig.11)*.

(ii) Drill out the five rivets attaching the packing to the hook.

(iii) Reassemble the packing to the hook to suit the alignment of the hook and hook release lever roller.

(iv) Rivet the packing to the hook and reassemble the hook assembly to the door, fitting the washer removed in operation (i). Refit the abutment piece.

Note . . .

The washer Ref.No.28W/9419476 may be filed to give free fore-and-aft movement of the hook, without allowing any side play (fig.11).

(c) Check the clearance between the aft up-latch hook and the up-latch bolt *(fig.11)*. If adjustment is required, remove the locating screw from the scalloped head of the up-latch bolt and rotate the bolt until the correct clearance is obtained. Refit the locating screw.

(d) When all other aft latch mechanism settings have been met, check the clearance between the flat portion of the hook lip, (the tip has a radius of 0.05 in.) and the hook release lever roller *(fig.11)*. If adjustment is required, remove the slotted nut which secures the roller housing to the hook release lever, and add or subtract shims Part No.EA3.10.3339 as necessary to a maximum shim thickness of 0.20 in. (nominal thickness 0.080 in.).

Note . . .

If, after adjusting the hook release lever roller, the roller attachment nut fouls the adjacent vertical stiffener when the lever is moved aft, the stiffener may be filed locally to clear (max. depth 0.20 in.). Protective treatment (A.P.101A-0600-6, Scheme 9.1.2) must be applied to all filed surfaces.

(e) Wedge the sequence valve on the bulkhead in the open position i.e. tappet away from plunger, and remove the sequence valve lever trip screw from the port arm of the jack crosshead. THIS IS IMPORTANT.

(f) Ensure that the crosshead down-stops are correctly set *(para.21)* and fully close the jack. The two tails of the hook release lever should abut the lever bracket, but a maximum gap of 0.005 in. is allowed at any one tail *(fig.11)*.

◀ (13) Slightly open the starboard door and check the 'open-clearance' of the forward up-latch hook (fig.11). Manually raise the port door and adjust the up-stop pad at the aft end until the door leading edge is 0.030 in. inside the fuselage contour, 'out-of-wind'. With the aft up--stop' correctly set, refit the forward up-stop packing removed in operation (5) and shim to suit the 0.030 in. condition. ▶

(14) Close both doors and, with pressure applied to the starboard door, check that the doors fit flush with each other and that their leading edges are 0.030 in. inside the fuselage contour 'out-of-airflow'. If the doors do not fit flush with each other, adjust the shims beneath the port door abutment pieces *(fig.10 and 11)*.

Note . . .

The door up-latch hooks can be released when the doors are locked up by removing the small access panel from below the aft hook in the door skin, and operating the hook tail with the appropriate spanner (Sect.2, Chap.4, Table 1).

(15) Ensure the door jack is fully extended and fit the starboard door-actuating link; adjust the link if necessary by turning the link eye end until, with the port door closed manually, the doors fit as in operation (14). Tighten the link locknut and remove the link.

(16) Fit the port door-actuating link and adjust the link if necessary as in operation (15), until the condition described in operation (14) is obtained. Tighten the actuating link locknut and split pin the attachment bolts.

(17) Close the door jack and refit and lock the starboard door actuating link.

(18) Support the undercarriage and remove the wedge from the sequence valve on the bulkhead. Refit the sequence valve lever trip screw to the port arm of the door jack crosshead.

(19) Hydraulically lower the undercarriage *(Chap.6).*

(20) Refit the landing wheels and mudguards.

(21) Hydraulically raise the undercarriage and check that the doors fit correctly and that the 0.030 in. 'out-of-airflow' condition is maintained.

(22) Check that the door microswitch functions correctly *(fig.13 or 14).*

(23) Check all skin gaps around both doors *(A.P.101B-0400-6, Part 1).*

(24) Function test the undercarriage *(Chap.6).*

Sequence-valve settings *(fig.12)*

24. The sequence valve lever tappets are adjusted to a 0.15 in. dimension measured from the striking face of the tappet and the body of the valve when the lever is in its fully operated position. After any adjustments to the sequence-valve setting a functional check of the undercarriage must be made *(Chap.6).*

Microswitch settings

25. Following any servicing or component replacement which may have affected the microswitch settings, a thorough check and, if necessary, resetting must be made as detailed in fig.13 or 14.

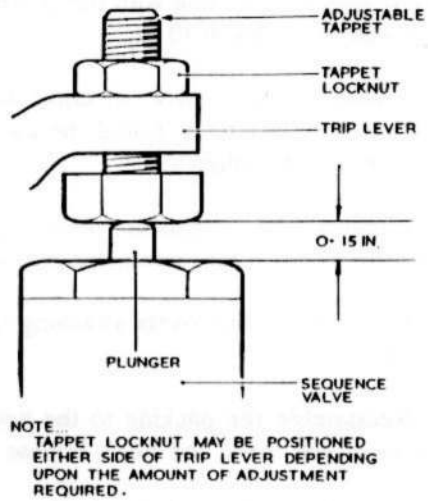


Fig.12. Sequence-valve setting

REMOVAL AND ASSEMBLY

General information

26. The following paragraphs detail the removal and assembly operations for the nose undercarriage and its main components. Items which do not require special instructions for removal or assembly are not included. The sequence of operations for assembling the undercarriage must be adhered to, and checks and subsequent adjustments are to be made at the stated operation.

Undercarriage and undercarriage doors mechanism removal *(fig.15, 16 and 17)*

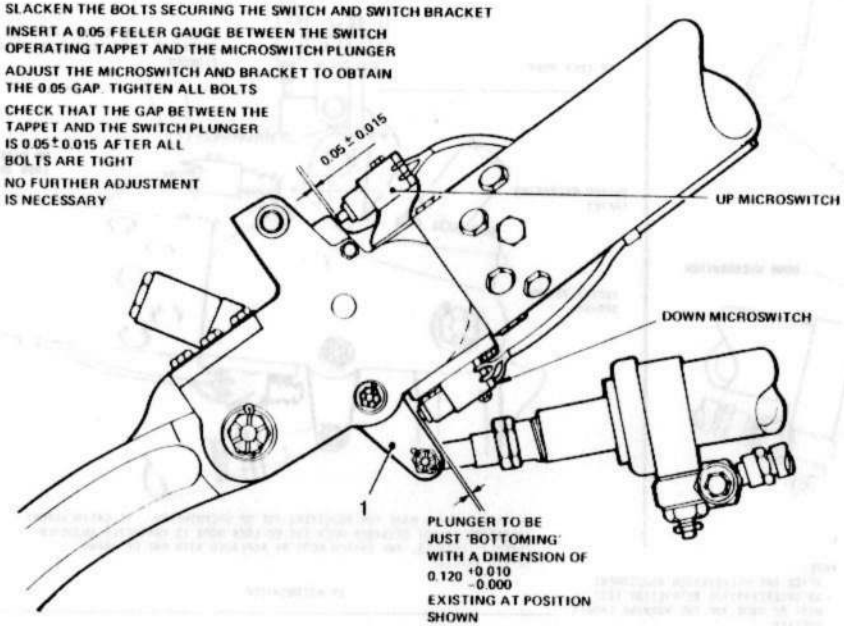
Note . . .

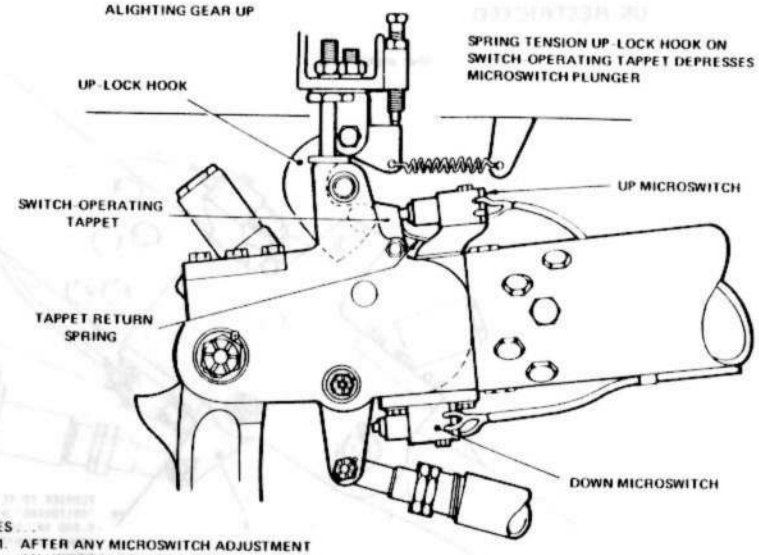
The undercarriage and doors mechanism can be removed independently of each other.

UK RESTRICTED

UP MICROSWITCH ADJUSTMENT WITH U/C IN THE DOWN POSITION

1. SLACKEN THE BOLTS SECURING THE SWITCH AND SWITCH BRACKET
2. INSERT A 0.05 FEELER GAUGE BETWEEN THE SWITCH OPERATING TAPPET AND THE MICROSWITCH PLUNGER
3. ADJUST THE MICROSWITCH AND BRACKET TO OBTAIN THE 0.05 GAP. TIGHTEN ALL BOLTS
4. CHECK THAT THE GAP BETWEEN THE TAPPET AND THE SWITCH PLUNGER IS 0.05 ± 0.015 AFTER ALL BOLTS ARE TIGHT
5. NO FURTHER ADJUSTMENT IS NECESSARY



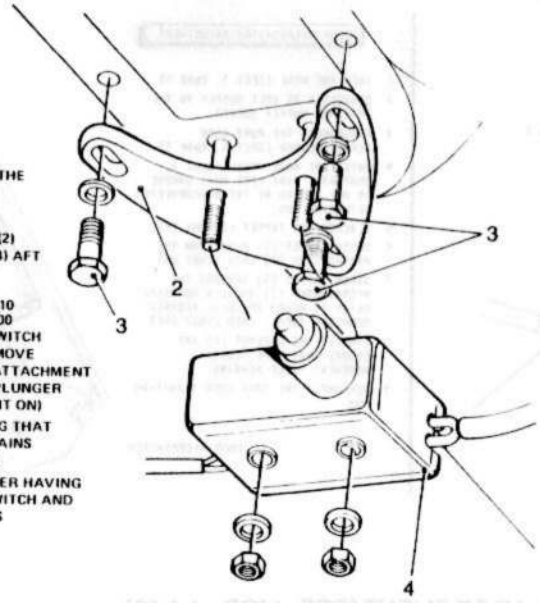


NOTES

1. AFTER ANY MICROSWITCH ADJUSTMENT AN UNDERCARRIAGE RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED
2. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED

DOWN MICROSWITCH ADJUSTMENT
U/C IN DOWN POSITION

1. CONNECT A 24 VOLT SUPPLY TO THE EXTERNAL SUPPLY SOCKET
2. SLACKEN THE BOLTS (3)
3. MOVE THE ATTACHMENT PLATE (2) COMPLETE WITH MICROSWITCH (4) AFT TO THE LIMIT OF ITS TRAVEL (GREEN LIGHT OFF)
4. WITH A DIMENSION OF 0.120 +0.010 -0.000 EXISTING BETWEEN THE MICROSWITCH PLUNGER AND LOCK LEVER (1). MOVE THE MICROSWITCH (4) AND THE ATTACHMENT PLATE (2) FORWARD UNTIL THE PLUNGER IS JUST BOTTOMING (GREEN LIGHT ON)
5. TIGHTEN THE BOLTS (3) ENSURING THAT SOME PLUNGER MOVE MENT REMAINS WHEN ADJUSTMENT IS FINALISED
6. RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY REFITTED THE MICROSWITCH AND TIGHTENED THE SECURING BOLTS



DOOR MICROSWITCH ADJUSTMENT

1. JACK THE NOSE (SECT.2, CHAP.4)
2. CONNECT A 24 VOLT SUPPLY TO THE EXTERNAL SUPPLY SOCKET
3. DISCONNECT THE PORT DOOR ACTUATING LINK (FIG.1) AT IT'S LOWER END
4. UNLOCK AND SELECT THE NOSE UNDERCARRIAGE UP/FLIGHT SELECTOR TO UP. USING THE HAND PUMP, FULLY RAISE THE NOSE WHEEL, ENSURING THAT THE DISCONNECTED LINK IS HELD CLEAR
5. SLACKEN THE TAPPET LOCKNUT (6)
6. SCREW TAPPET (6) AWAY FROM THE MICROSWITCH (7) (RED LIGHT ON)
7. SCREW TAPPET (5) TOWARDS THE MICROSWITCH (7) UNTIL A DEFINITE CLICK IS HEARD (RED LIGHT OFF) AND GIVE A FURTHER TWO COMPLETE TURNS
8. TIGHTEN THE LOCKNUT (6) AND ENSURE THAT SOME PLUNGER MOVEMENT STILL REMAINS
9. SELECT THE NOSE UNDERCARRIAGE UP/FLIGHT SELECTOR TO FLIGHT. USING THE HAND PUMP, FULLY LOWER THE NOSE WHEEL, ENSURING THAT THE DISCONNECTED DOOR LINK IS HELD CLEAR. WIRE LOCK THE UP/FLIGHT SELECTOR IN THE FLIGHT POSITION
10. RECONNECT THE PORT DOOR ACTUATING LINK

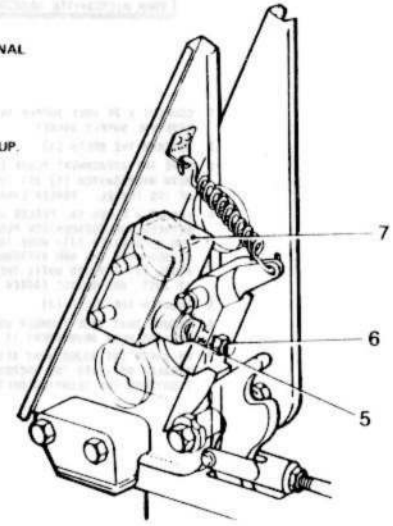


FIG.13 MICROSWITCH ADJUSTMENT - POST MOD.4449

◀ 'DOWN' MICROSWITCH SETTING DIMENSION AMENDED ▶

UK RESTRICTED

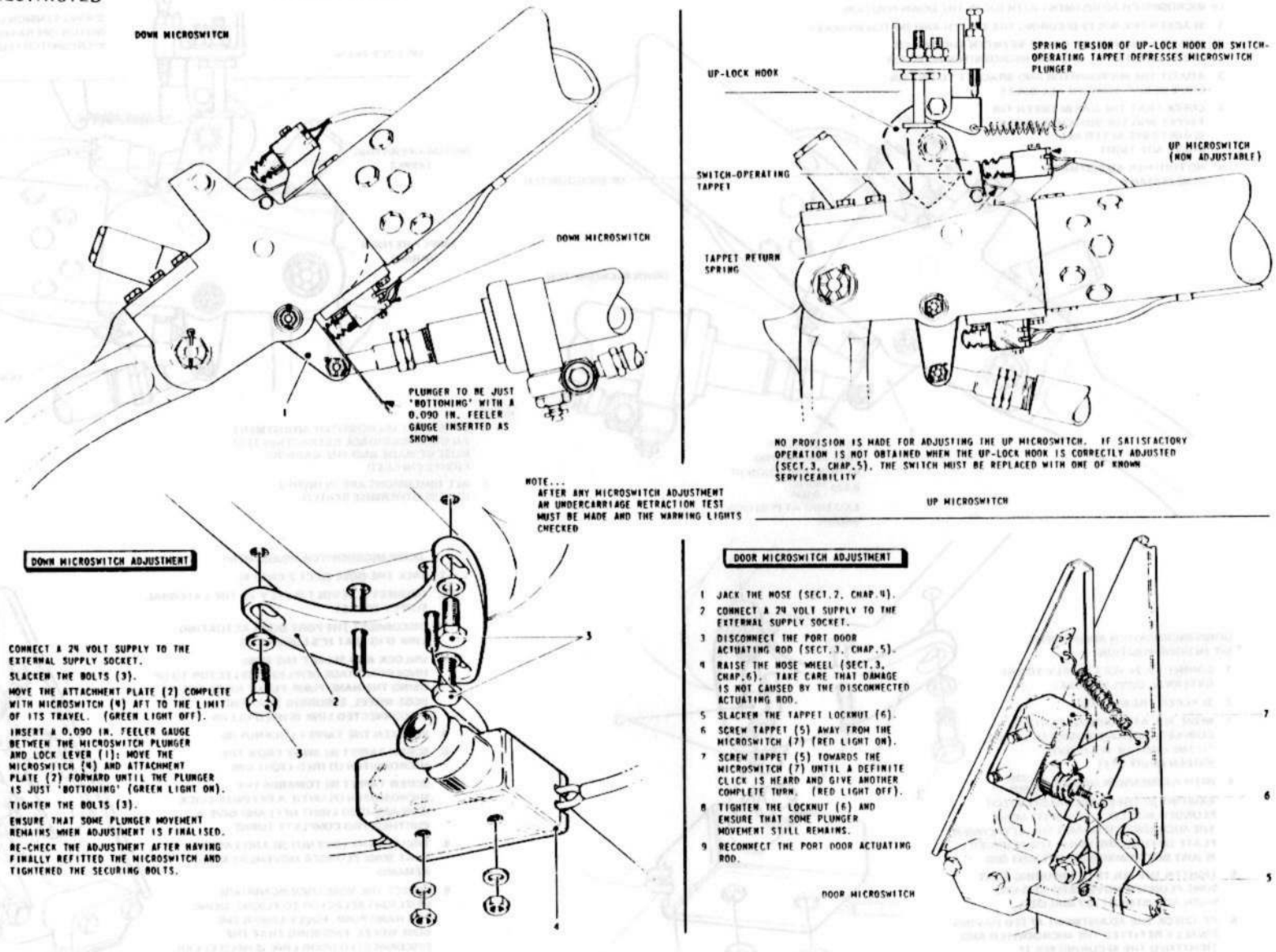


FIG. 14. MICROSWITCH ADJUSTMENT (PRE MOD. 4449)

UK RESTRICTED

Undercarriage

27.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Exhaust all hydraulic pressure *(Chap.6).*

(3) Remove the three bolts and washers securing each mudguard to its bearing bracket and remove the mudguards.

(4) Remove the six stiffnuts and washers securing each landing wheel to its axle and remove the wheels.

(5) Disconnect the hydraulic fluid pipes from the undercarriage jack and blank off the pipe ends and jack apertures *(Chap.6).*

(6) Remove the clamps and blocks from the jack body *(fig.18)* and release the hydraulic fluid pipes.

(7) Remove the split pin and slotted nut from the jack piston rod pivot bolt and withdraw the pivot bolt *(fig.16, detail C).*

(8) Remove the split pin, slotted nut and washer, from the jack crosspiece pivot between the two channel members on the aft bulkhead, and withdraw the pivot bolt *(fig.16, detail E).* Remove also and retain the two plain washers Ref.No.28W/9419467 fitted one at each side of the jack pivot between the jack crosspiece and the vertical channel members.

Note . . .

Some aircraft have flanged bushes riveted to the vertical channel members. These are fitted by the manufacturers to rectify oversize rivet holes and each is equivalent in thickness to washer Ref.No.28W/9419467.

(9) Remove the jack.

(10) Disconnect the electrical cables from the two microswitches on the radius rod knuckle joint *(A.P.101B-0402-1B, Sect.5, Chap.1, Group G)* remove the three cable clips from the radius rod tube, and coil and stow the cables in the roof of the wheel well.

(11) Remove the split pin, slotted nut and special washer from the stay link pivot bolt on the shock-absorber strut *(fig.16, detail D).*

(12) Remove the locating grub screw from the head of the stay link pivot bolt and, using an extractor, withdraw the pivot bolt. Support the radius rod assembly.

(13) Do not allow the radius rod assembly to fall below its normal operating position or its underside will foul and damage the single coil-shaped rigid hydraulic pipe situated on the aft bulkhead immediately below the radius rod upper pivot attachment *(fig.1).*

(14) Remove the split pin, slotted nut and special washer from the radius rod upper pivot bolt. The head of the pivot bolt is a plain nut which is, and must remain, peened *(fig.15, detail A).*

(15) Slacken the bearing pin retaining grub screw on the starboard shoulder of the radius rod pivot bracket casting *(fig.14, detail A)* and, taking the weight of the assembly from the pivot, withdraw the pivot bolt, special washer, and bearing pin. Carefully lower and remove the radius rod/stay-link assembly.

(16) Support the undercarriage and remove the split pins, slotted nuts and washers from the four bolts attaching each saddle clamp at the undercarriage main pivot *(fig.16, detail B).* The heads of the four upper attachment bolts are accessible from inside the pressure cabin.

(17) Withdraw the lower bolts and remove the saddle clamps. Remove the undercarriage.

Door mechanism

28.

(1) Remove the split pins, slotted nuts and special bolts from both ends of each door actuating link and remove the links. Tie the doors in the fully open position.

(2) Remove the four 2 B.A. bolts attaching the mud shield to the hook release lever mechanism box section.

▶ ◀

(3) Disconnect and remove the flexible hydraulic pipes from the door jack. Blank off the exposed pipe ends and jack apertures.

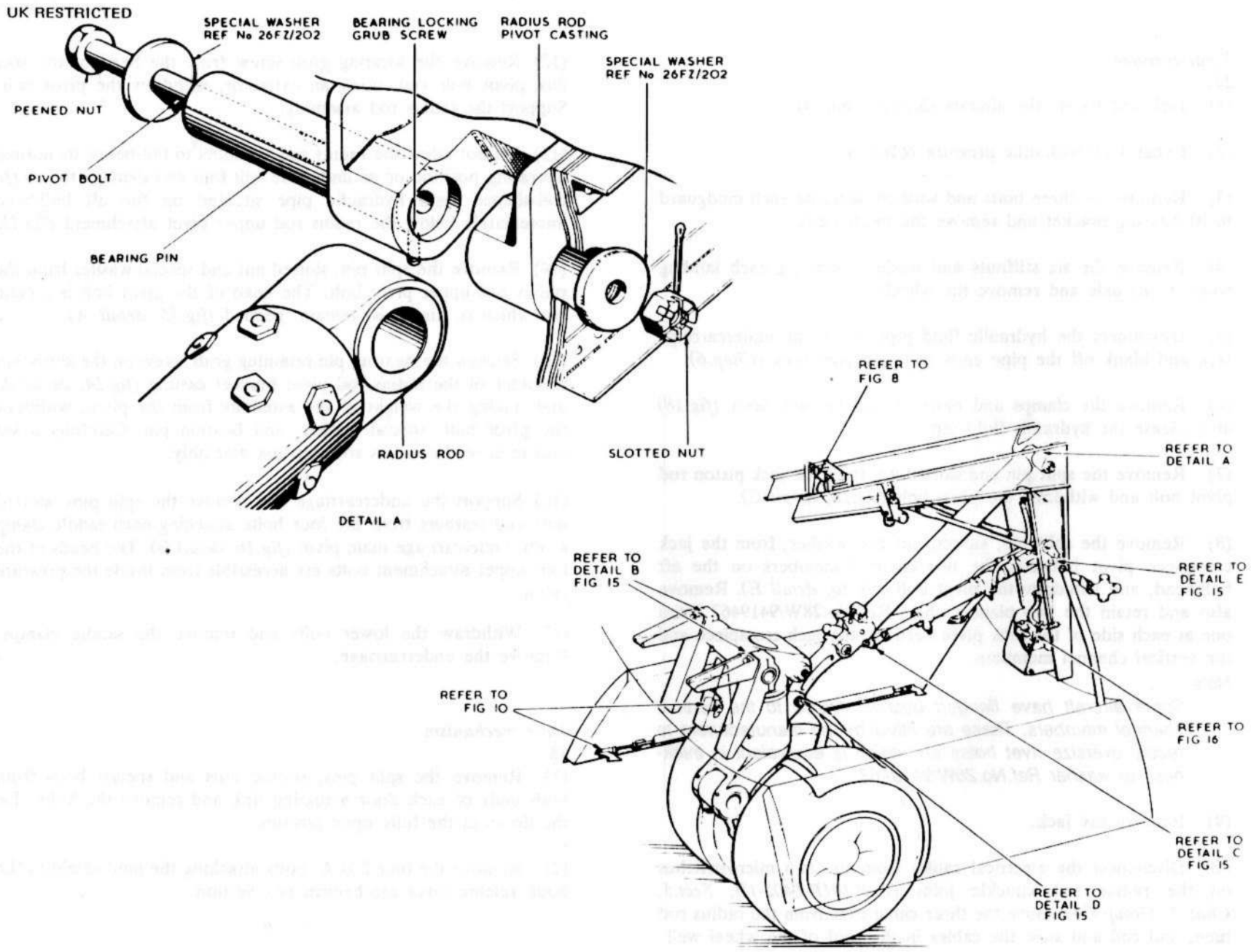


FIG. 15. UNDERCARRIAGE REMOVAL AND ASSEMBLY (1)

(4) Remove the split pin, slotted nut and special bolt attaching the door jack piston rod to the crosshead. To do this it is necessary to remove the undercarriage jack from its aft pivot *(para.27)* to gain access to the door jack piston rod attachment bolt.

◀ (5) Remove the countersunk headed screws attaching the capping strip to the fuselage skin on the lower forward face of the wheel well aft bulkhead *(fig.17)*.

(6) Remove the split pin, slotted nut and washer from the up-latch bolt. Remove the bolt, taking note of the position of the scalloped head in relation to the locating screw *(fig.17)*.

(7) Remove the two 1/4 in. dia. countersunk bolts attaching the bottom of each release lever bracket to the aft bulkhead *(fig.17)*. ▶

Note . . .

The heads of these four bolts are accessible from within the forward camera bay.

(8) Break the wire-locking and remove the two 2 B.A. bolts securing each release lever bracket to the vertical channel stiffeners.

(9) Remove the door jack and release lever mechanism by sliding the complete assembly upwards and out through the top of the vertical channel stiffeners.

Note . . .

When this operation is made with the undercarriage jack still in situ and disconnected from its aft pivot (para.27), the jack must be strapped clear from the top of the channel stiffeners.

(10) Disconnect the door jack from the hook release lever mechanism by removing the split pin, slotted nut, pivot bolt, washer and distance pieces *(fig.17)*.

(11) Dismantle the hook release levers from their brackets by removing the split pin, slotted nut, washer, Part No.EA1.10.1407 and bolt Part No.EA1.10.3219 from each lever *(fig.17)*.

(12) Remove the thirty-eight 2 B.A. bolts, washers and stiffnuts securing the crosshead roller guides to the aft bulkhead, and remove the guides.

(13) Withdraw the jack crosshead from the slots in the vertical channel stiffeners.

Undercarriage and undercarriage doors mechanism assembly
◀ *(fig.15, 16 and 17)*

General

29. Consideration has been given in the following sequence of operations, to the additional work entailed in fitting replacement components. It will be obvious which operations are necessary when reassembling original items. Instructions for fitting new undercarriage doors are given in A.P.101B-0400-6, Part 1. To reassemble the undercarriage and undercarriage door mechanism:-

Door mechanism

30.

(1) Refit the door jack crosshead between the vertical channel stiffeners on the aft bulkhead, and fit the roller guides over the crosshead rollers using the thirty-eight 2 B.A. bolts, washers and stiffnuts.

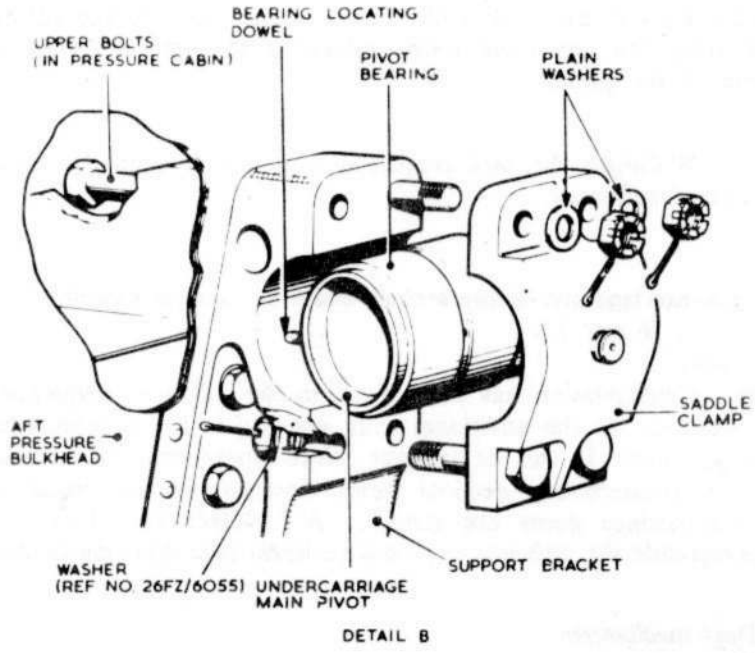
(2) Assemble each hook release lever to its bracket using the special-to-type bolt and washer, plain washer, slotted nut and split pin *(fig.17)*.

Note . . .

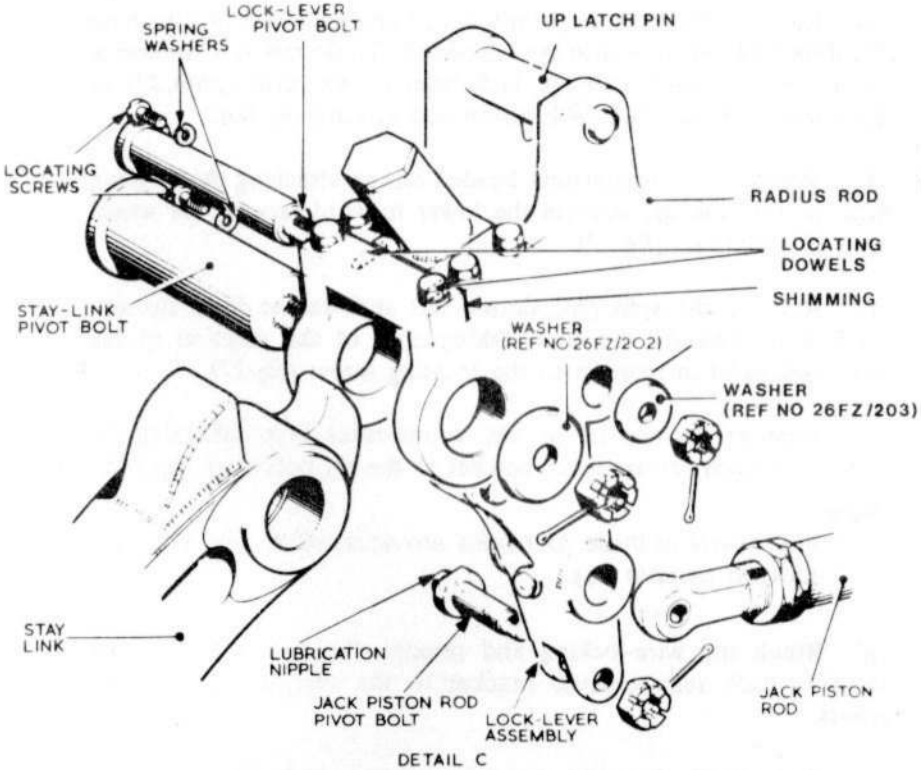
The washer Part No.EA1.10.1407 fitted between each lever and bracket may be filed on assembly to obtain free movement of the lever. Protective treatment (A.P.101A-0600-6, Scheme 9.1.2), must be applied to filed surfaces.

(3) Fit the door jack lower pick-up point to the hook release lever mechanism, using the pivot bolt, distance pieces, washer, slotted nut and split pin *(fig.17)*. ▶

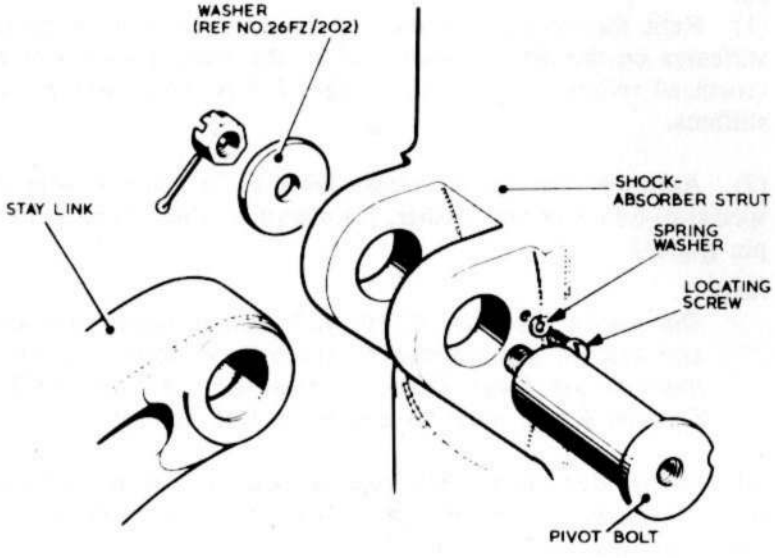
(4) Refit the complete jack and release lever mechanism assembly.



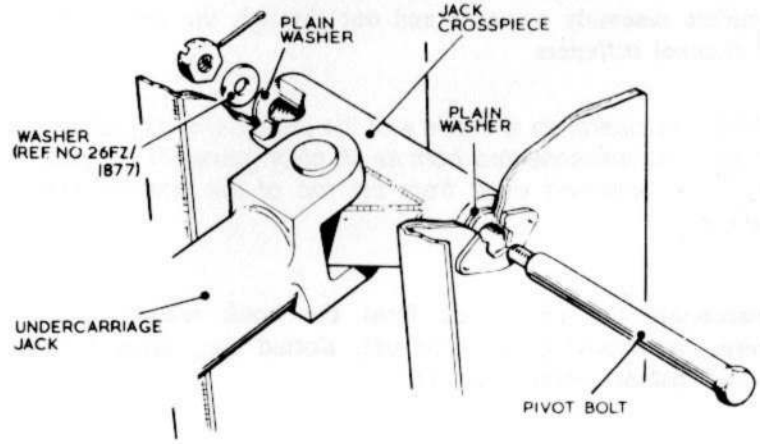
DETAIL B



DETAIL C



DETAIL D



DETAIL E

FIG.16. UNDERCARRIAGE REMOVAL AND ASSEMBLY (2)

◀ *Redrawn* ▶

(5) Connect the door jack piston rod eye end to the crosshead, using the bolt, slotted nut and split pin.

(6) Bolt the hook release lever brackets to the aft bulkhead using the four 1/4 in. bolts and spring washers *(fig.17)*.

(7) Fit the two 2 B.A. bolts to secure each release lever support bracket to the vertical channel stiffeners *(fig.17)*. Tighten and wire-lock the bolt heads together.

(8) Refit the up-latch bolt, ensuring the scalloped head is returned to its original position. Fit the washer, slotted nut and split pin *(fig.17)*.

(9) Refit the capping strip to the lower lip of the aft bulkhead using the countersunk screws and stiffnuts *(fig.17)*.

(10) Reconnect the flexible hydraulic fluid pipes to the door jack. Prime and bleed the door jack hydraulic circuit *(Chap.6)*. Wire-lock the pipe unions.

(11) Refit the mud shield over the hook release lever mechanism box section using the four 2 B.A. screws. Replace the packing washers, if any, *(para.28(2))* in their original positions.

(12) Check the hydraulic fluid pipe, which runs to the top of the door jack, is positioned in its cleat on the mud shield so as to give the maximum possible clearance between its elbow union and the port wheel tyre during undercarriage reaction.

(13) Reconnect the door-actuating links to the doors using the bolts, slotted nuts and split pins.

(14) Check the door-operating and latching mechanism adjustment *(para.23)*.

Undercarriage

31.

(1) For ease of access, remove the door actuating links and tie back the doors.

(2) Assemble the undercarriage to its main pivot support brackets, taking care to ensure that the pivot shaft bush is properly located by its spigot on both the port and starboard saddle clamp faces *(fig.16, detail B)*. Fit the four bolts, washers, slotted nuts and split pins which secure the removable half of each saddle clamp. The heads of the four upper saddle clamp bolts are accessible from inside the pressure cabin.

(3) Refit the radius rod to its upper pivot point by inserting the bearing pin. Slide the pivot bolt, with a washer, through the bearing pin and secure with another washer and slotted nut and split pin *(fig.15, detail A)*. Tighten the bearing pin locking grub screw.

(4) Do not allow the radius rod assembly to fall below its normal operating position or its underside will foul and damage the single-coil-shaped rigid hydraulic pipe situated on the aft bulkhead immediately below the radius rod upper pivot attachment *(fig.1)*.

(5) Reconnect the stay link to the lugs on the undercarriage strut, using the pivot bolt and washer, slotted nut and split pin. Refit and tighten the locating grub screw at the head of the pivot bolt *(fig.16, detail D)*.

(6) Reconnect the electrical cables to the two microswitches on the radius rod/stay link knuckle joint. Reclip the cables to the radius rod tube *(A.P.101B-0402-1B, Sect.5, Chap.1, Group G)* and ensure they will not foul when the undercarriage is retracted.

(7) Position the undercarriage jack crosspiece between the aft bulkhead vertical flanged stiffeners. If flanged bushes are not fitted to the channel stiffeners *(para.27)* ensure that a washer, Ref.No.28W/9419467 is inserted at each side of the jack pivot, between the jack crosspiece and the channel stiffeners. Insert the pivot bolt from the port side, ensuring that its head seats into the locking plate on the port channel stiffener *(fig.16, detail E)*.

(8) Secure the pivot bolt using the washer and slotted nut. Measure the gap at each end of the crosspiece; the washers (if fitted) must be pressed against the channel stiffeners. Where the

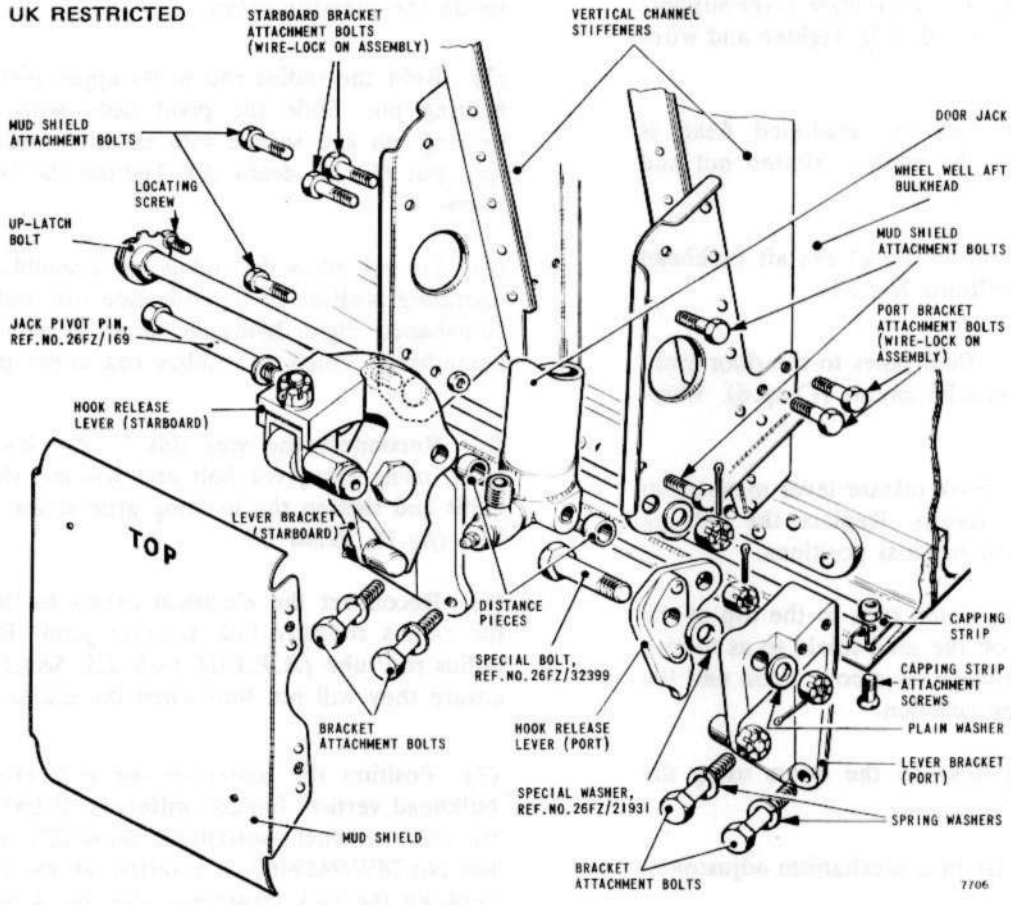


FIG.17. HOOK RELEASE MECHANISM AND DOOR JACK REMOVAL

◀ WASHERS FOR MUD SHIELD ATTACHMENT BOLTS DELETED ▶

total of the two gaps does not exceed 0.015 in. lubricate the assembly and fit the split pin to the pivot bolt slotted nut.

Note . . .

Should the total gap exceed 0.015 in. standard washers, Ref.No.28W/9419467 and/or locally manufactured washers are to be fitted to equalize the gaps and give a total gap of between 0.005 in. and 0.010 in. Locally manufactured washers are to be made from the appropriate s.w.g. steel sheet Spec.S.520 or S.521. No washer is to be less than 30 s.w.g. (0.012 in.).

(9) Connect the flexible hydraulic fluid pipes to the jack and fit the blocks and clamps to the jack body *(fig.18).*

(10) Check that the hydraulic pipes are so positioned and secured in their blocks that, during the operation of the jack, they will not foul either the door jack crosshead or any other part of the structure *(fig.18).*

(11) Prime and bleed the jack and pipelines *(Chap.6)* and fully close the jack, using the aircraft hand pump.

(12) Check, and if necessary adjust, the jack overrides *(para.20).*

Note . . .

When hydraulic pressure is first applied, the door jack will move and trip the undercarriage sequence valve, allowing pressure to be transmitted to the undercarriage jack.

(13) Connect the jack piston rod to the radius rod lock lever using the pivot bolt, slotted nut and split pin *(fig.16, detail C).*

(14) Raise the undercarriage fully and adjust the door jack sequence valve *(para.24).*

Note . . .

When raising the undercarriage door jack with the actuating links disconnected from the doors, an assistant must hold and guide the links to prevent damage to the adjacent hydraulic fluid piping and aircraft structure.

(15) Check, and if necessary adjust, the up-stop pedestals *(para.22).*

(16) Ensure that the up-latch hook is engaging the radius rod latch pin. Adjust if necessary *(para.22).*

(17) Lower the undercarriage and fit the landing wheels and mudguards.

(18) Fit the starboard door-actuating link *(para.30)* and raise the undercarriage. Ensure that the undercarriage and undercarriage door mechanism is operating correctly.

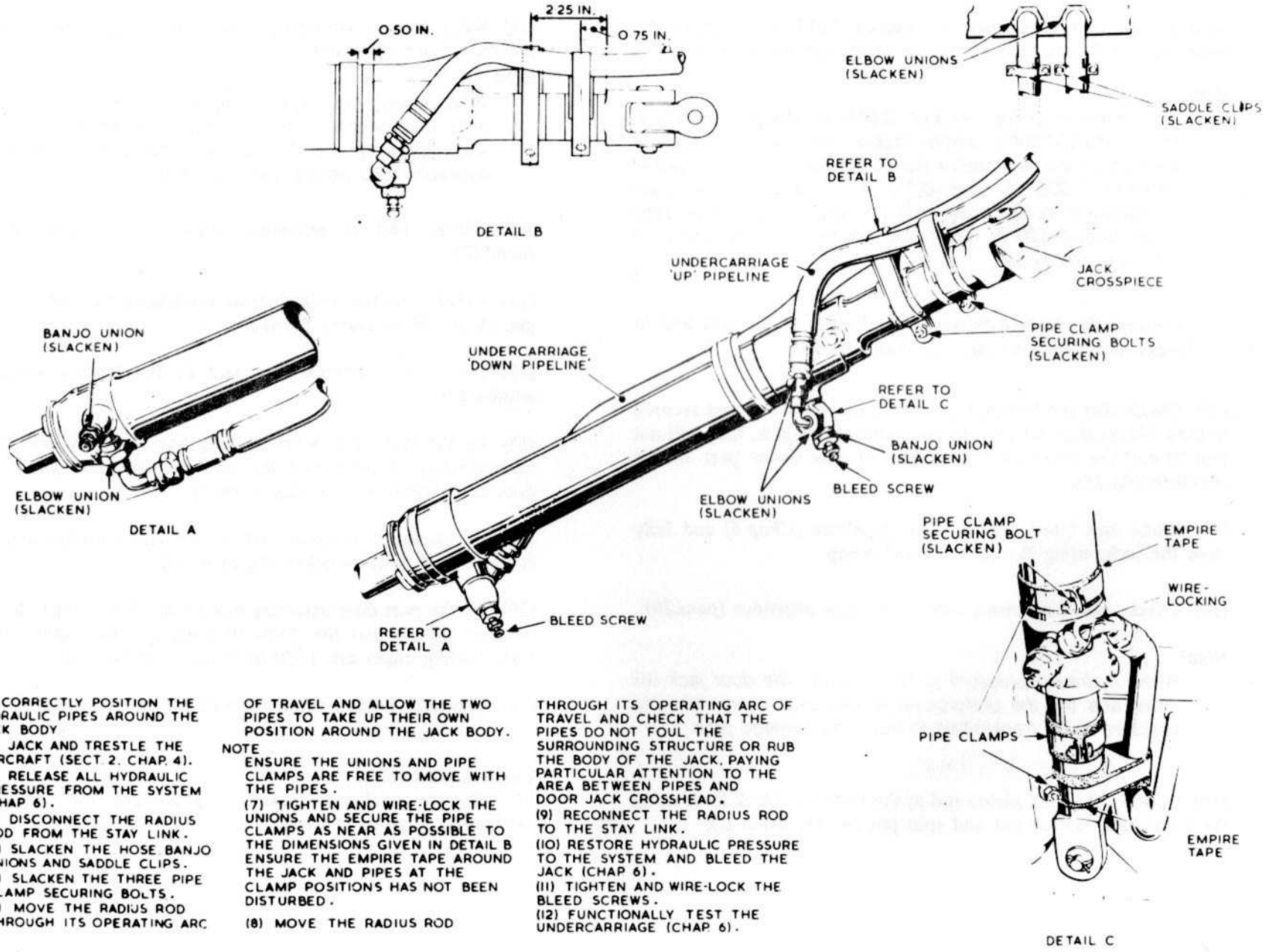
(19) Check, and if necessary adjust, the undercarriage and undercarriage door microswitches *(fig.13 or 14).*

(20) Fit the port door-actuating link *(para.30)* and raise the undercarriage. Check that the doors fit flush with each other and that their leading edges are 0.030 in. 'out-of-airflow' *(para.23).*

(21) Function check the operation of the undercarriage *(Chap.6).*

Up-latch mechanism

32. The removal and assembly procedure for the up-latch mechanism is given in para.22.



TO CORRECTLY POSITION THE HYDRAULIC PIPES AROUND THE JACK BODY

(1) JACK AND TRESTLE THE AIRCRAFT (SECT 2, CHAP 4).

(2) RELEASE ALL HYDRAULIC PRESSURE FROM THE SYSTEM (CHAP 6).

(3) DISCONNECT THE RADIUS ROD FROM THE STAY LINK.

(4) SLACKEN THE HOSE BANJO UNIONS AND SADDLE CLIPS.

(5) SLACKEN THE THREE PIPE CLAMP SECURING BOLTS.

(6) MOVE THE RADIUS ROD THROUGH ITS OPERATING ARC OF TRAVEL AND ALLOW THE TWO PIPES TO TAKE UP THEIR OWN POSITION AROUND THE JACK BODY.

NOTE

ENSURE THE UNIONS AND PIPE CLAMPS ARE FREE TO MOVE WITH THE PIPES.

(7) TIGHTEN AND WIRE-LOCK THE UNIONS AND SECURE THE PIPE CLAMPS AS NEAR AS POSSIBLE TO THE DIMENSIONS GIVEN IN DETAIL B ENSURE THE EMPIRE TAPE AROUND THE JACK AND PIPES AT THE CLAMP POSITIONS HAS NOT BEEN DISTURBED.

(8) MOVE THE RADIUS ROD THROUGH ITS OPERATING ARC OF TRAVEL AND CHECK THAT THE PIPES DO NOT FOUL THE SURROUNDING STRUCTURE OR RUB THE BODY OF THE JACK, PAYING PARTICULAR ATTENTION TO THE AREA BETWEEN PIPES AND DOOR JACK CROSSHEAD.

(9) RECONNECT THE RADIUS ROD TO THE STAY LINK.

(10) RESTORE HYDRAULIC PRESSURE TO THE SYSTEM AND BLEED THE JACK (CHAP 6).

(11) TIGHTEN AND WIRE-LOCK THE BLEED SCREWS.

(12) FUNCTIONALLY TEST THE UNDERCARRIAGE (CHAP 6).

FIG. 18. UNDERCARRIAGE JACK HYDRAULIC PIPES CLIPPING

◀ *Redrawn* ▶

Chapter 6 HYDRAULIC SYSTEM

(completely revised)

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continued. . .

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LIST OF ILLUSTRATIONS

Introduction

1. This chapter describes and illustrates the hydraulic system, gives details of the servicing operations and recommends method for the removal and assmbly of certain components. The system provides power for the operation of the alighting gear, flaps, bomb doors, air brakes and wheel brakes.

2. The location of the hydraulic units in the fuselage and main planes is illustrated in fig.3 and 4 respectively and the system is illustrated diagrammatically in fig.2.

DESCRIPTION

Hydraulic fluid reservoir

3. The reservoir is mounted just to the rear of the pressure bulkhead, against the upper starboard fuselage skin. It is oval in shape and is inclined at an angle of approximately 45 deg. The filler neck is on the side and is accessible through a Dzus fastened panel in the fuselage skin. The engine-driven pump suction pipeline is taken from a stack pipe in the bottom of the reservoir, thus providing a reserve of fluid for the hand pump. The suction pipe for the hand pump is taken from a point slightly higher up, although, due to the reservoir being inclined, this is its lowest point. A pipeline from the pressure bulkhead ducts cabin pressure to the reservoir, and a non-return valve in this pipeline maintains a maximum pressure difference of ½ lb/in^2 between the cabin and reservoir pressures when the cabin pressure system is in operation. A pressure relief valve, situated in a pipeline connecting with the tank above fluid level, blows off at 12 to 17 lb/in^2, reseating itself when the pressure falls to 8 lb/in^2, this blow-off line is led to atmosphere through the bottom of the fuselage.

Power circuit

4. Power is supplied by two continuously-running hydraulic pumps, one mounted on each engine accessories gearbox. The pumps draw fluid from the reservoir, through a filter located on the forward face of frame 13 bulkhead, and deliver it under pressure to the four rotary control valves and the brake relay control valve. A non-return valve is fitted in the pipeline on the pressure side of each pump and the flexible pipes from each pump are fitted with self-sealing couplings. (These couplings may be broken to enable hydraulic servicing trolleys to be connected into the circuit for ground testing purposes). An automatic cut-out valve, located in the starboard main plane leading-edge, is fitted in the pressure line and connects to the return line, providing an idling circuit and diverting the pump delivery back to the reservoir between operational demands; it is set to cut out when the accumulator pressure reaches $2500 \pm {}^{0}_{100}$ lb/in^2 and cuts in at a minimum pressure of 2000 lb/in^2. A gauge mounted on the starboard instrument panel gives indication of the pressure in the power circuit.

Note . . .

This pressure gauge must not be used for circuit testing.

Accumulators

5. The main hydraulic accumulator is mounted inboard of rib 1 in the starboard main plane leading edge, and is connected to the power circuit by a branch pipe; it maintains a reservoir of power, prevents hammering of the cut-out, and provides initial power for the movement of the jacks when a service is selected. The charging valve and pressure gauge for the main accumulator is situated on the forward diaphragm of the starboard wheel well. A second hydraulic accumulator, located on the aft face of frame 12 bulkhead, is connected to the pressure line of the wheel brakes circuit to facilitate smooth braking and maintain an independent reserve of power for application of the brakes. The brakes accumulator pressure gauge and charging valve is positioned in the bomb bay on the aft of the forward bulkhead.

Relief valves

6. Thermal relief valves, suitably positioned in the circuits, open when, due to temperature variation, pressure in the line of a service increases to 3350 to 3500 lb/in^2; these valves reseat when the pressure falls to 3100 lb/in^2 (min.). Mod.3749 introduces an additional thermal relief valve which is interposed between the sequence valve and the transfer valve of each main undercarriage circuit; to avoid premature pressure relief of the system and to ensure satisfactory functioning of this valve, a modified brake relay control valve(Mod.3962) incorporating a pressure relief valve relieving at a pressure of 3500 ± 100 lb/in^2 is installed in the wheel brakes system.

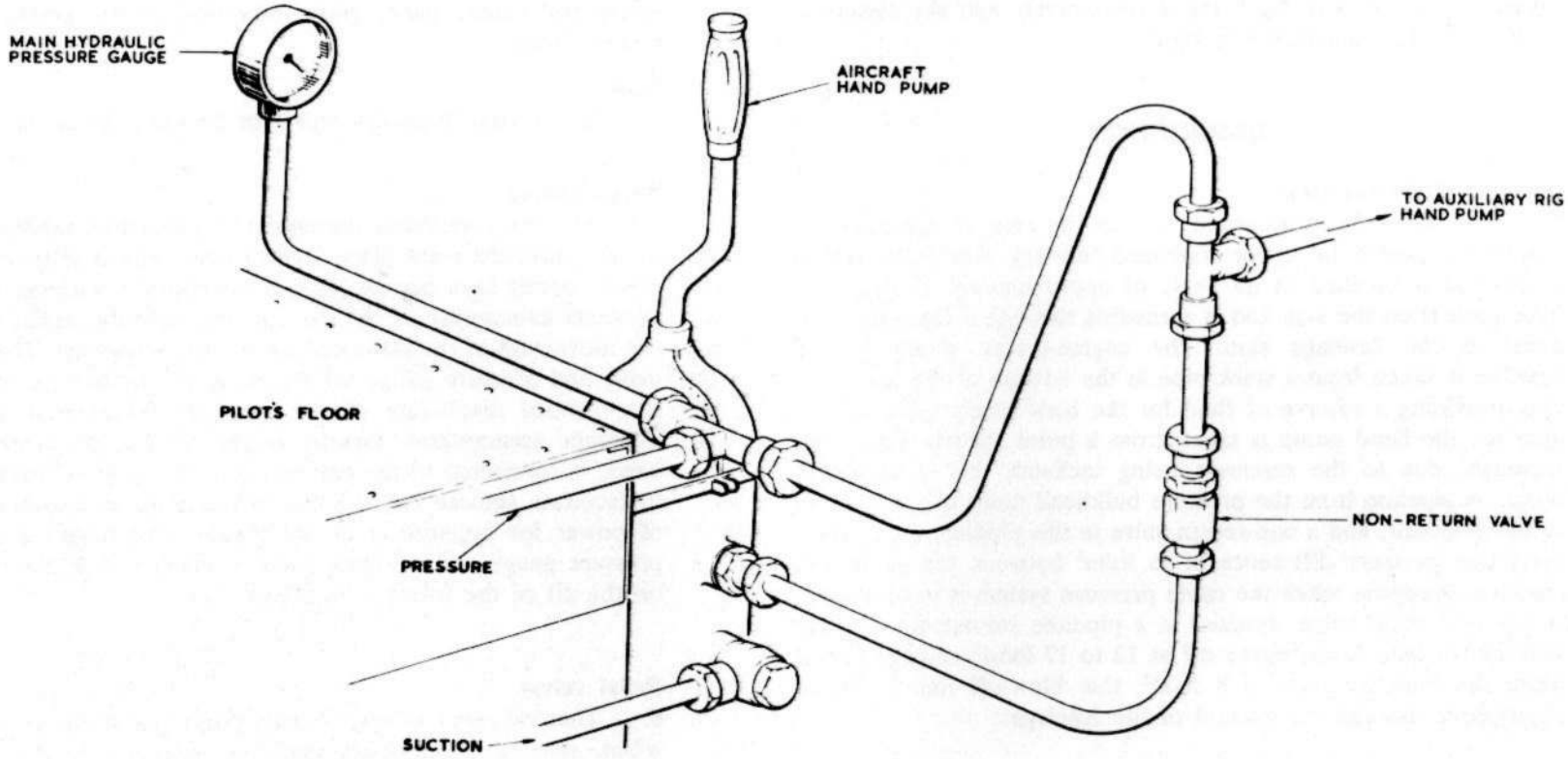

FIG. I. AUXILIARY HAND PUMP CIRCUIT

Hand pump circuit

7. The hand pump, situated at the starboard side of the pilot's seat, will operate the alighting gear, bomb doors and wheel brakes after the appropriate selection has been made. A ground selector and non-return valve in the pressure line normally isolates the air brakes and flaps from the hand pump circuit, but provision is made for operating these services by the hand pump during ground servicing operations. The hand pump draws fluid from the reservoir through a filter mounted on the aft face of frame 12 bulkhead, and delivers it under pressure to the service selected. In the event of hydraulic failure due to loss of fluid in the system, sufficient fluid is retained in the reservoir *(para.3)* to operate the bomb doors and alighting gear using the hand pump. A non-return valve, fitted between the transfer valve and door jack operated sequence valve of each main undercarriage, prevents the flow of fluid from the down line to the up-line. This eliminates any loss of the reserve fluid via a failed up-line pipe during lowering of the alighting gear.

Alighting gear circuit

8. Operation of the alighting gear is controlled by two push-buttons marked UP and DOWN, which are mounted on the sloping panel on the port side of the instrument flying panel. Provision is made on the UP selector button for an override UP selection, this is accomplished by rotating the knobbed ring which encircles the UP button clockwise through 60 deg (or 90 deg according to type) and then depressing the UP button in the normal manner. If an UP selection is made in this way the mechanical lock within the switch will remain inoperative until reset as described in Sect.3, Chap.11.

WARNING:

Under no circumstances must the knobbed ring be turned past the 60 deg or 90 deg stop as such action will damage the switch and may result in inadvertent retraction of the alighting gear.

Undercarriage DOWN emergency selection is made by pulling the black-and-yellow painted handle protruding above the alighting gear sloping panel *(para.15)*. When a push-button is depressed, the selector valve, located in the roof of the bomb bay, is operated by an electrical actuator, and fluid is delivered to the jacks operating the alighting gear and alighting-gear doors. Fluid already in the nose undercarriage and door jacks is returned via the selector valve and return line to the reservoir. Fluid in the main undercarriage jack down circuits, is similarly returned to the reservoir, but return flow in the jack up circuits is passed through transfer valves and sequence valves to the down side of the jacks. The transfer valves, therefore, by supplementing the delivery of fluid to the down side of the jacks, assist in reducing the time required to complete the lowering. This transfer is especially effective where an emergency lowering has to be carried out as the extra fluid provided reduces the number of strokes required on the hand pump. If 'out-of-sequence' retraction occurs due to a defective valve the hydraulic lock so caused can be overcome by the relieving of the thermal relief valve fitted between the sequence valve and the transfer valve (post Mod.3739)*(para.6)*, thus ensuring that the undercarriage can still be lowered in an emergency. Incorporated in each transfer valve is a thermal relief valve which will, under abnormal temperature or pressure changes, relieve from the 'up' to the 'down' line; the transfer valves are full described in A.P.105B-0003-1, Sect.9. The main undercarriage units are raised and their doors closed by the retraction of the operating jacks, whilst the nose-wheel unit is raised and its doors closed by the extension of the operating jacks. Sequence valves incorporated in the circuits ensure that the door and wheel unit circuits operate in their proper sequence, and restrictor valves in these circuits give smooth operation to all movements. An UP/FLIGHT selector *(para.16)* is connected into the nose-wheel circuits to enable nose-wheel retraction for ground servicing.

Flaps circuit

9. The flaps are operated by a two position selector switch mounted on the alighting gear sloping panel and marked UP and DOWN. A guard on either side of the switch is provided with holes, into which the flap safety quick-release pin *(Sect.2, Chap.1)* can be inserted. The switch controls the electrically-actuated selector valve which directs fluid, under pressure, to either end of the double-ended jacks. Fluid displaced by the movement of the jacks is returned, via the selector valve and return line, to the reservoir. To ensure progressively equal movement of both the port and starboard flaps, a two-way restrictor is incorporated in the down line of the circuit.

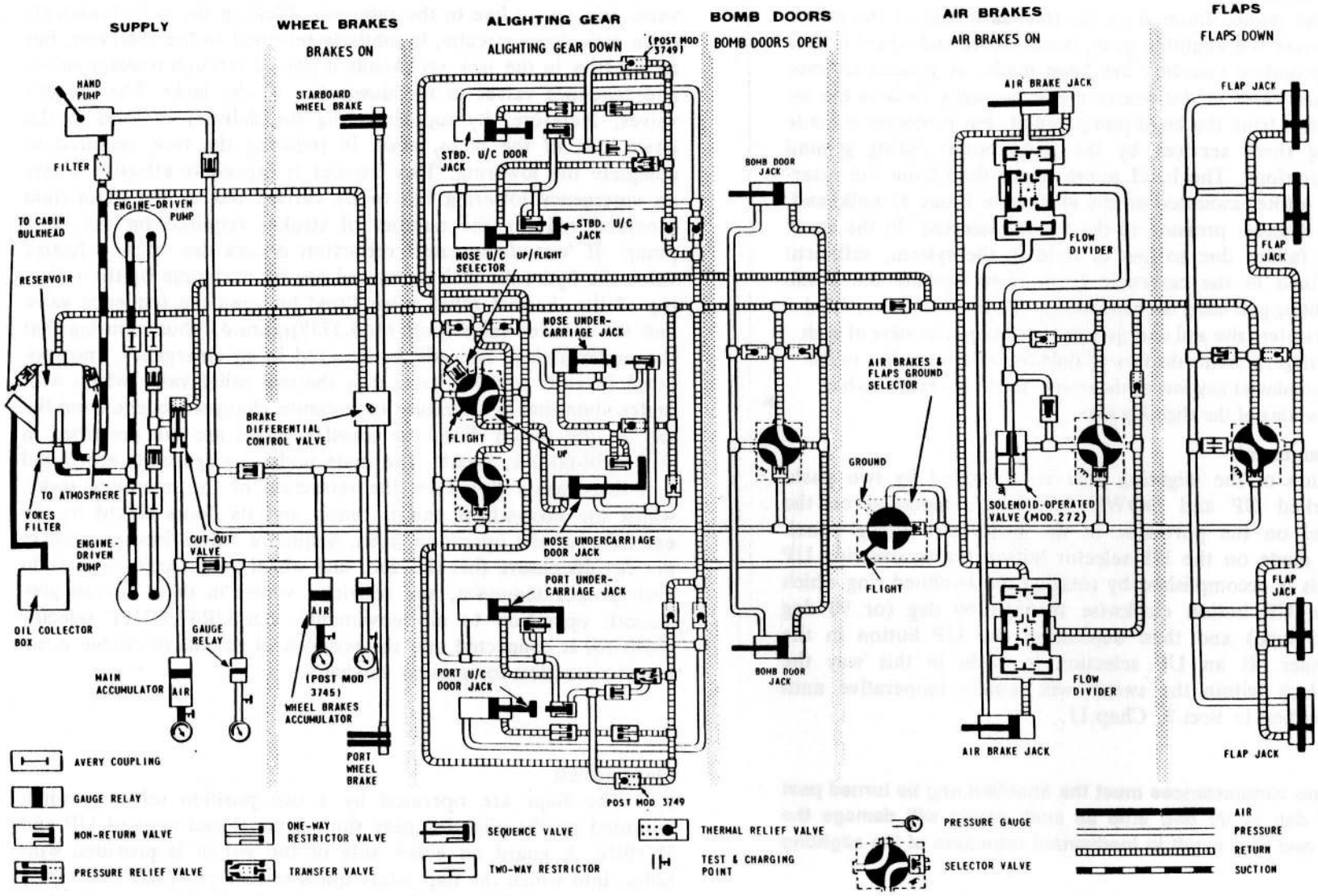

FIG. 2. HYDRAULIC SYSTEM DIAGRAM

◂MOD. 5118 EMBODIED▸

Air brakes circuit

10. This circuit is controlled by a selector switch mounted on the top of the control column; the selector valve being operated by an electrical actuator. Fluid under pressure is delivered through the selector valve to the jacks operating the air brakes, and fluid displaced by the movement of the jacks is returned, via the selector valve, to the reservoir. Flow dividers are incorporated in both lines of the circuit to ensure synchronization of the two operating jacks.

Pre Mod.272

11. Pre Mod.272 aircraft are fitted with two-position air brakes, IN and OUT. The selector switch on the top of the control column directly operates the selector valve, which is installed in the roof of the bomb bay. Fluid displaced by the movement of the jacks is returned, via the selector valve and return line, to the reservoir.

Post Mod.272

12. Post Mod.272 aircraft fitted with three-position air brakes, have a solenoid-operated valve located in the OUT pressure-line. Two microswitches, mounted on a bracket attached to the body of the starboard jack and operating in conjunction with the selector switch and the solenoid valve, provide a MID position, in addition to the normal IN and OUT positions; these positions are indicated on the selector switch. Movement of the switch from IN to MID operates the selector valve as for OUT and the air brake drag channels are moved outwards until the MID position is reached. At this point, a cam, mounted on the jack piston-rod, operates the microswitch and closes the solenoid valve; at the same time, by operating a relay, the selector valve is reversed and pressure is directed to the piston end of the jack; the solenoid-operated valve, being closed, prevents the flow of fluid from the opposite end, and thus forms a hydraulic lock. Movement of the selector switch from MID to OUT causes the selector valve to be reversed again and the solenoid valve to open, permitting the jack to be fully retracted and the drag channels to travel to their fully OUT position. On selection of MID from OUT the selector valve is reversed, and the jack extends until the MID position is reached; the solenoid valve, then closes, preventing the flow of fluid from the jack, thereby retaining the drag channels at the MID position. When IN is selected from MID the solenoid valve opens and permits the flow of fluid from the jack, which extends to the outward limit, fully withdrawing the drag channels. Selection of OUT from IN, or IN from OUT isolates the microswitch circuit and permits a normal flow of fluid through the system.

Wheel brakes circuit

13. The wheel brakes are applied by movement of the hand lever, mounted on the control column and connected by a Bowden cable to a relay control valve situated beneath the pilot's raised floor-structure. From the relay control valve, pressure, proportionate to the movement of the brake lever, is supplied to the brake units. To enable the pressure actuating each brake to be varied when taxying or towing the aircraft, the relay valve is mechanically linked to the rudder pedals. The brake relay control valve reduces the system pressure of 2700 lb/in^2 to $1500 \pm^{150}_{0}$ lb/in^2 for braking purposes. A branch pipe from the pressure pipeline is connected through a gauge relay to a pressure gauge on the pilot's starboard instrument panel, and to a charging valve mounted on the forward face of frame 1 (post Mod.3745) *(para.18).*

Bomb doors circuit

14. A two-position selector switch on the pilot's console, marked 'OPEN' and 'CLOSED', operates the selector valve through the medium of an electrical actuator. Fluid under pressure is delivered through the selector valve to the two jacks operating the bomb doors, and fluid displaced by the movement of the jacks is returned, via the selector valve and return line, to the reservoir.

Mechanical emergency selectors

15. Mechanical emergency selectors are provided for operating the alighting gear and bomb door circuits in the event of an electrical fault rendering the actuators inoperative *(Sect.3, Chap.11).* The alighting gear control is situated above the pilot's alighting gear control panel, and the bomb doors control lever is mounted on the port wall of the cabin. Both controls are linked, by cable, directly to levers on their respective selectors and, when operated, mechanically move the selectors to the alighting gear DOWN and bomb doors OPEN positions, enabling the movement to be completed either by the engine-driven pumps, if the system is otherwise serviceable or, alternatively, by the hand pump.

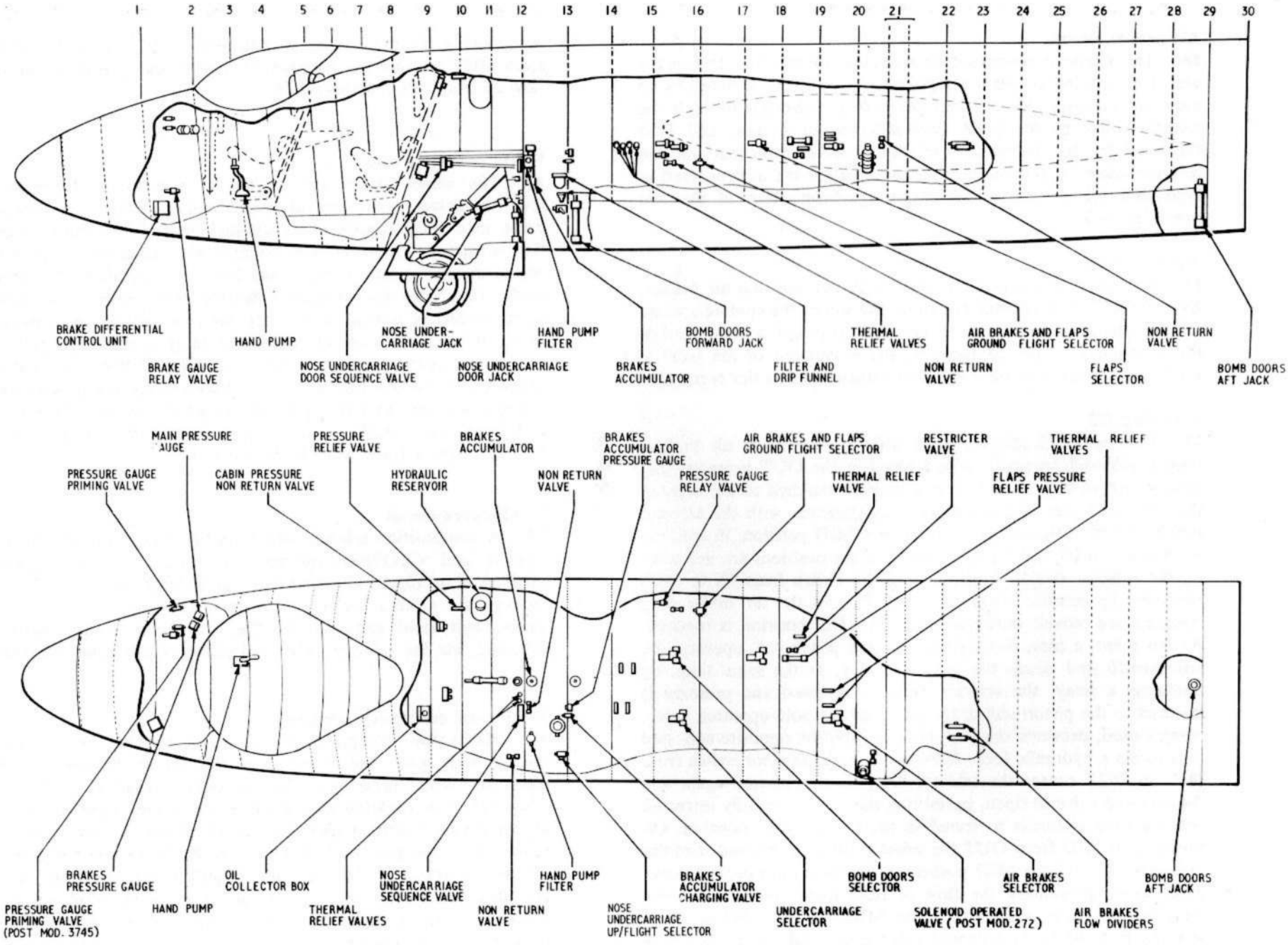

FIG. 3. LOCATION OF HYDRAULIC COMPONENTS IN FUSELAGE.

Nose undercarriage UP/FLIGHT selector

16. A manually operated UP/FLIGHT selector valve is mounted on the forward face of frame 13 bulkhead on the port side of the battery bay, it is positioned in the up and down lines of the nose undercarriage circuit and has an independent connection to the hand pump delivery pipeline. The selector has two positions, UP and FLIGHT; it is normally wire-locked in the FLIGHT position. When in the UP position it enables the nose undercarriage unit to be retracted, by operating of the hand pump, independently of the main undercarriage.

Air brakes and flaps GROUND/FLIGHT selector

17. To enable the air brakes and flaps to be operated by the hand pump during servicing operations, a non-return valve and manual selector, operable only when the aircraft is on the ground, are positioned in the main delivery line, to which the hand pump is connected. The selector, mounted in the roof of the bomb bay, has two positions, FLIGHT and GROUND; it is normally wire-locked in the FLIGHT position. In this position the air brakes and flaps circuits are isolated from the hand pump by a non-return valve; movement of the selector to GROUND opens a line which by-passes the non-return valve and permits the air brakes and flaps to be operated by the hand pump after the appropriate selection has been made.

Charging valves

18. Six A.58 Gyp inflation valves are installed in the system for three different purposes; two valves, situated adjacent to each accumulator *(para.5)*, are provided for charging the accumulators with air pressure; two more, one on each main undercarriage leg fairing, are provided as test points for wheel brake pressure testing, when a Turner adapter is employed *(para.31)*. A further valve is installed in the main pressure gauge pipeline and is mounted on the forward face of frame 1 in the pressure cabin; this valve is used for priming the pressure gauge and its pipeline *(para.27)*. The wheel brakes pressure gauge also has on the introduction of Mod.3745 a valve installed in its pipeline to serve a similar purpose; it is situated adjacent to the main gauge valve on frame 1.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Note . . .

1. After the removal of any components, or if the system has been drained or partly drained, the engine-driven pumps must be primed (para.45) and the complete system bled (para.24).

2. During the reassembly of system components, new bonded seals, AGS.1186, are to be fitted to all banjo connections. Care must be taken not to over-tighten banjo bolts (A.P. 1803A, Vol.1, Sect.2, Chap.1, Table 1).

General information

19. Scrupulous cleanliness is essential during all servicing operations on hydraulic mechanisms. When dismantling a component, which should be done, when possible, in a dust-free atmosphere, the parts removed should be laid out in a suitable drip tray.

Note . . .

Hydraulic fluid has a deleterious effect on paint, rubber, electric cables, etc., and care must be taken to avoid spilling it on such parts.

20. Because the presence of a foreign body, no matter how minute, in a component, might not only shorten the life of the equipment, but might also result in a serious failure, benches, tools and test rigs should be kept spotlessly clean. All pipe ends and unions exposed during servicing operations should be blanked off to prevent the entry of dirt. Containers used for holding fluid or for the reception of drained fluid should be kept perfectly clean; after a container has been cleaned it should be rinsed with a small quantity of fluid which should then be discarded. Always work with clean hands, clean tools and on a clean bench.

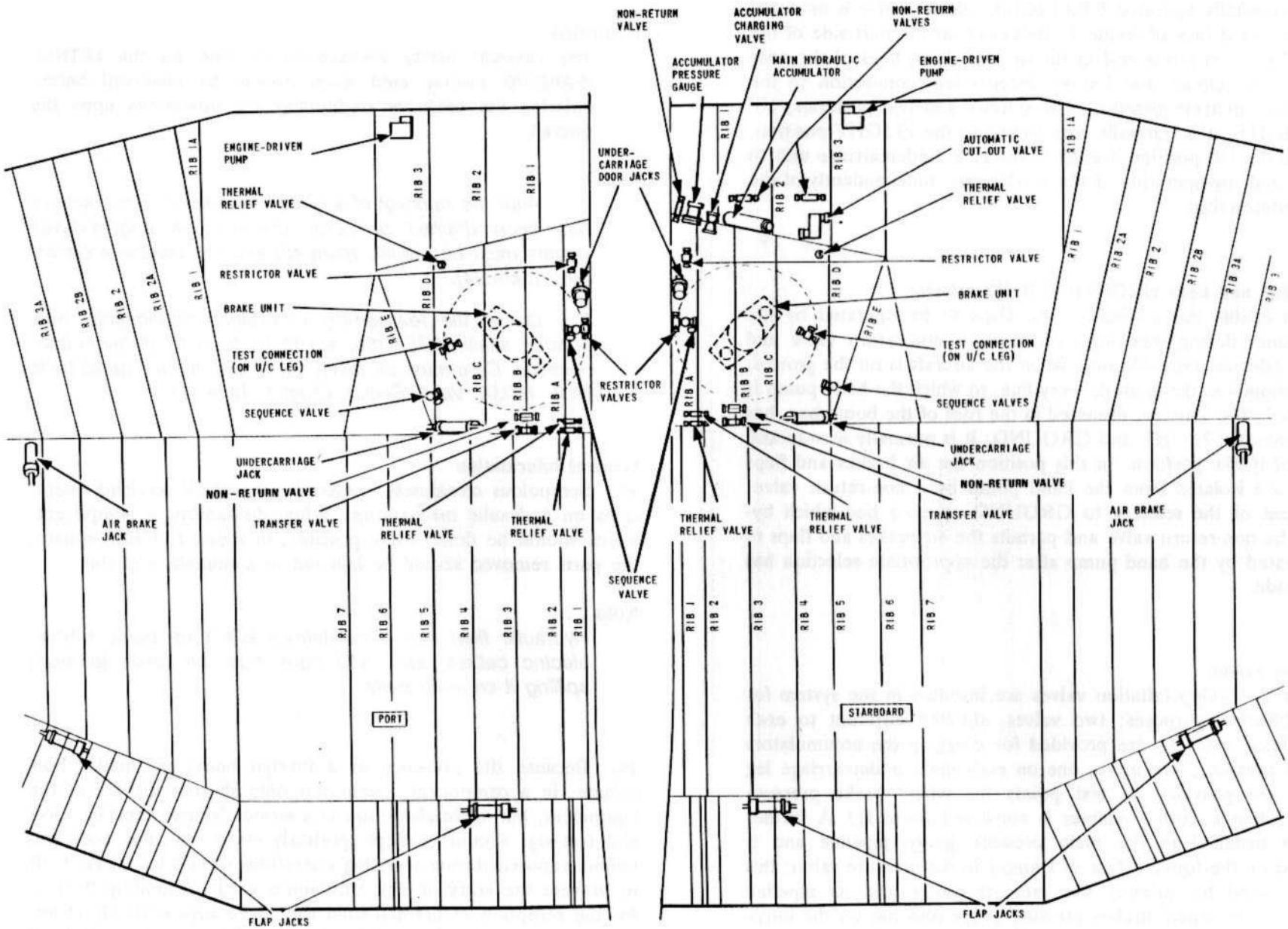

FIG.4. LOCATION OF HYDRAULIC COMPONENTS IN MAIN PLANES

◂MOD 5118 EMBODIED▸

Topping up the reservoir

21. The reservoir should be topped up with the alighting gear selected DOWN, the bomb doors OPEN and with the accumulator hydraulic pressures exhausted. The fluid in the main accumulator may be exhausted by operating either the flaps selector switch or the bomb doors selector switch until no further movement can be obtained on the flaps or bomb doors. Operate the wheel brakes to exhaust the brakes accumulator pressure. The reservoir must be topped up to the maximum possible level with fluid, OM-15; a drainpipe is provided for fluid spilt through overfilling.

22. Before topping up the reservoir, check the air pressure in the accumulators; the gauges are situated one in the starboard undercarriage well (main) and the other on the aft face of the bomb bay forward bulkhead (brakes); the pressure should be as given in the Leading Particulars when the accumulators are exhausted of fluid pressure. If the pressure is high it is an indication that fluid is still contained in the accumulator, and if low the accumulator should be examined and, if it is undamaged and showing no signs of leakage, charged up to the correct pressure. The accumulator charging valves are adjacent to the accumulator pressure gauges.

Draining the reservoir

23. The reservoir should be drained with the alighting gear and flaps DOWN, the air brakes IN, and the bomb doors OPEN.

(1) Connect an external electrical supply *(Sect.5, Chap.1.*

(2) Exhaust the hydraulic pressure as detailed in para.21.

(3) Select bomb doors CLOSED to exhaust any residual pressure.

(4) Select bomb doors OPEN. THIS IS IMPORTANT.

(5) Remove the hand pump suction line banjo connection at the reservoir, and drain the reservoir at this point.

Note . . .

Overtightening of the banjo bolt may result in stripping the threads. A leak at this point is to be rectified by fitting washers AGS.1186C, not by increasing the troque loading on the banjo bolt.

Filling the system

24. To fill the system:

(1) Jack and trestle the aircraft *(Sect.2, Chap.4).*

(2) Examine the gauze filter in the neck of the reservoir; clean it if necessary. Fill the reservoir to the maximum possible level with fluid OM-15 *(para.21)*; a drainpipe is provided for fluid spilt through overfilling.

(3) Break the locking wire and move the air brakes and flaps, GROUND/FLIGHT selector *(para.17)*, to GROUND.

(4) Using the hand pump, operate each hydraulic service several times in the following order; air brakes, flaps, alighting gear, and bomb doors, bleeding air through the respective jack bleed screws and topping up the reservoir until the system is full.

Draining the system

25. The bulk of the fluid can be drained from the system by uncoupling unions or connections at the lowest point of individual pipe runs, depending upon the attitude of the aircraft. Providing the aircraft is suitably trestled or jacked with the wheels clear of the ground, draining may be facilitated by operation of the jacks using the hand pump.

Charging the accumulators

26. The main accumulator charging valve is located in the starboard undercarriage well and the wheel brakes accumulator charging valve on the aft face of the bomb bay forward bulkhead; the pressure gauges, recording the accumulator pressures, are adjacent to the charging valves. The accumulators are to be inflated to the pressures given in the Leading Particulars, with all hydraulic pressure exhausted *(para.21).*

Filling the pressure gauge pipelines

27. The pipelines to the main and wheel brakes pressure gauges are to be filled with fluid OM-15. A Gyp Type A.58 inflation valve, located on the forward face of frame 1 starboard side, is

provided to fill the main pressure gauge line, and a similar inflation valve, introduced by Mod.3745 and located adjacent to the main gauge inflation valve, provides the wheel brakes pressure gauge line with the same facility. On aircraft not embodying Mod.3745 the wheel brakes gauge line is filled at the gauge pipe union. The following items of equipment are required:

(1) Portable hydraulic hand pump rig with a 0-3500 lb/in^2 pressure gauge *(Sect.2, Chap.4).*

(2) Charging valve adapter *(Sect.2, Chap.4).*

(3) Gauge pipe union adapter (local manufacturer) (for brake pressure gauge line pre Mod.3745).

Before commencing this operation the main and wheel brake accumulators are to be exhausted of hydraulic pressure as instructed in para.21. To fill the gauge pipelines with fluid:-

Main pressure gauge pipeline, and wheel brakes pressure gauge pipeline (post Mod.3745).

(1) The following operations apply to both the main and the wheel brakes pressure gauge pipelines:-

(a) Remove the locking wire, and slacken the priming plug of the gauge relay: located between frames 15 and 16 on the port wall of the bomb bay for the main pressure gauge, and between frames 1 and 2 beneath the nose ramp, for the wheel brakes pressure gauge.

(b) Remove the screwed cap of the charging valve at frame 1 and attach the flexible pipe, with adapter, from the hand pump rig to which the pressure gauge is fitted.

(c) Commence to pump slowly to fill the pipeline and continue until the oil flows from the gauge relay priming point clearly and free from air. Tighten and wire-lock the gauge relay priming plug.

(d) Slacken the pipe union at the aircraft pressure gauge. Operate the pump until clear fluid flows from the pipe union, and tighten the union.

(e) Build up a pressure of 2500 lb/in^2 and note that the aircraft and rig pressure gauges each register this pressure.

(f) Gradually slacken the pipe union at the aircraft pressure gauge and allow the pressure to fall to zero. Tighten and wire-lock the pipe union.

(g) Remove the adapter from the charging valve, and replace the screwed cap.

Brake pressure gauge line (pre Mod.3745)

(2) The following operations are applicable only to aircraft not embodying Mod.3745:

(a) Remove the pipe union from the wheel brake pressure gauge and attach the flexible pipe, with adapter, from the hand pump rig to the gauge pipeline.

(b) Remove the locking wire from the priming plug on the gauge relay located in the pipeline between frames 1 and 2.

(c) Build up a pressure of 2500 lb/in^2 and slacken the relay priming plug. Continue to pump until fluid flows from the priming point clearly and free from air. Tighten and wire-lock the gauge relay priming plug.

(d) Remove the adapter from the pipe union, and reconnect and wire-lock the union to the pressure gauge.

Pressure settings and component adjustments

28. Pressure settings of all pressure relief and thermal relief valves are given in Leading Particulars: the adjustment of all the hydraulic components is described in the appropriate Air Publication, listed in para.2.

Automatic cut-out valve setting

29. The cut-out valve (Lockheed AIR.41158) is to be set to cut out at $2500 \pm {}^{0}_{100}$ lb/in^2. Final adjustment may be carried out with the valve fitted in the aircraft but prior to installation preliminary

setting and testing is necessary. Using a static test rig *(Sect.2, Chap.4)*, with hydraulic fluid, OM-15, adjust the cut-out and cut-in pressures as follows:-

Preliminary adjustment

(1) Blank off the system connection of the valve and couple the pump connection to the test rig.

(2) Build up pressure gradually with a smooth action of the hand pump and note the pressure at which fluid commences to escape from the reservoir connection; this is the cut-out pressure.

(3) Remove the blank from the system connection to allow the fluid trapped behind the non-return valve to escape, then replace the blank.

(4) Adjust the pressure setting by turning the adjusting screw clockwise to increase, or counter-clockwise to reduce the pressure. Test and adjust alternately until $2500 \pm^{0}_{100}$ lb/in^2 is obtained.

Leakage test

(1) Disconnect the test rig from the pump connection and couple to the system connection of the valve.

(2) Apply a pressure of 2500 lb/in^2, seepage from either pump or reservoir connections must not exceed 10 cc per minute.

(3) Disconnect the coupling from the system connection and couple to the pump connection.

(4) Apply a pressure of 2200 lb/in^2, seepage from the reservoir connection must not exceed 10 cc per minutes.

(5) Disconnect the coupling from the pump connection and couple to the reservoir connection.

(6) Blank off the pump and system connections and apply a pressure of 250 lb/in^2, there must be no leakage.

Final adjustments in the aircraft

(1) Install the valve and couple to the aircraft system.

(2) Trestle the aircraft *(Sect.2, Chap.4)* and couple a hydraulic servicing trolley fitted with a Lockheed Mk.9 hydraulic pump to the system.

(3) Fill the system *(para.24)* and inflate the accumulators to the correct pressure *(para.26)*.

(4) Start the servicing trolley, and note that when the valve cuts out, the main accumulator pressure gauge registers $2500 \pm^{0}_{100}$ lb/in^2. If the cut-out pressure is incorrect, turn the adjusting screw in the appropriate direction until the correct setting is obtained.

(5) Operate the flaps to discharge the accumulator and cause the valve to cut-in. Note that the cut-in pressure is at or above the minimum of 2000 lb/in^2. If not, the valve must be considered unserviceable.

(6) When the correct settings are obtained wire-lock the connections and repeat the test several times to ensure that the settings remain constant.

Pressure test of the system

30. To pressure test the hydraulic system:-

Note . . .

The reservoir must be kept topped-up to the correct level during all bleeding operations. The aircraft hand pump must be used for operation and bleeding of the jacks and wheel brakes. The hand pump of the auxiliary rig must be used only for building up pressure.

(1) Jack and trestle the aircraft *(Sect.2, Chap.4)*.

(2) Connect an external electrical supply *(Sect.5, Chap.1)*.

(3) Uncouple the hand pump pressure pipe at the hand pump and connect an auxiliary hand pump circuit into the pipe the hand pump union *(fig.1)*.

(4) Uncouple the delivery pipe at the flap pressure relief valve, adjacent to the flap selector in the roof of the bomb bay, and blank off the pipe and the valve.

(5) Charge the main and wheel brakes accumulators *(para.26)*.

(6) Move the air brakes and flaps GROUND/FLIGHT selector *(para.17)* to GROUND.

(7) Fill the reservoir with hydraulic fluid OM-15.

(8) Prime and bleed the aircraft hand pump.

(9) With the alighting gear selected DOWN, the nose undercarriage UP/FLIGHT selector at FLIGHT, the bomb doors selector at OPEN, the flaps selector at DOWN, the air brakes selector at IN and the wheel brakes parked, use the aircraft hand pump to fill the system and jacks with fluid until pressure commences to build up.

(10) Check the lengths of the bomb door jacks *(Chap.1)*, the air brakes and flap jacks *(Chap.4)*, and the alighting gear jacks and sequence valve settings *(Chap.5)*.

(11) Top up the reservoir and replace the tank cap.

IMPORTANT

The tank cap must be fitted during all the following tests; on no account must it be removed with the alighting gear UP.

(12) Without altering any system selection (9), bleed all jack pipelines and brake units at the bleed valves or suitable connections on individual jacks.

(13) Build up a preliminary test pressure of 2000 to 2500 lb/in^2 with the auxiliary hand pump and check the pressure lines for leaks and security. Hold this pressure for a few minutes and then release.

(14) Remove the nose undercarriage door actuating links and tie back the doors in the open position.

(15) Select alighting gear UP and, using the aircraft hand pump, retract the alighting gear as far as is possible to leave the jack bleed valves accessible. Bleed the main and nose undercarriage jacks.

(16) Using the aircraft hand pump fully retract the alighting gear, disconnecting the main undercarriage door jacks from the doors as soon as they commence to retract.

(17) Retract the main undercarriage door jacks and extend the nose undercarriage door jack and bleed all three jacks when they have completed the 'doors-closed' stroke.

(18) Select bomb doors CLOSED, and using the aircraft hand pump, partially close the bomb doors. Bleed both bomb door jacks.

(19) Fully close the bomb doors. Ensure, by checking that there is a 0.2 in $\pm$ 0.06 in clearance between the metal faces of the edges of the doors, and that the jacks are fully at the end of their stroke and are not straining the bomb doors. The method of adjusting the bomb doors is given in Chap.1.

(20) Select flaps UP and, using the aircraft hand pump, partially raise the flaps and bleed the jacks. If the flaps are not assembled to the mechanism, operate the jacks to the end of their stroke before bleeding.

(21) Fully raise the flaps and ensure that they are not under any strain when bearing against the main plane trailing edges *(Chap.4)*.

(22) Select the air brakes OUT and, using the aircraft hand pump, operate the air brake jacks to the end of their stroke and bleed the jacks.

(23) Test the brake relay control unitl:-

(a) *Pre Mod.3962* – Discount the brake control unit and, using the anciliary hand pump, apply a test pressure of 2900 lb/in^2. Retain this pressure and check the pressure drop; it must not exceed 150 lb/in^2 during the first 15 minutes. Hold the pressure for a further 15 minutes and then release. Reconnect the brake control unit and repeat the test at a pressure of 2480 lb/in^2.

(b) *Post Mod.3962* – Using the auxiliary hand pump apply a test pressure of 2900 lb/in^2. Retain this pressure and check the pressure drop; it must not exceed 150 lb/in^2 during the first 15 minutes. Hold the pressure for a further 15 minutes and release. The brake differential unit is not to be disturbed.

(24) Lower the flaps, select air brakes IN, open the bomb doors, and lower the alighting gear, recoupling the main undercarriage door jacks before the jacks are fully extended *(Chap.5)*. Reconnect the nose undercarriage door actuating links.

(25) Repeat the pressure test (23).

(26) Disconnect the auxiliary hand pump circuit and recouple the hand pump pressure pipe to the hand pump, and the delivery pipe to the flap pressure relief valve.

(27) Move the air brakes and flaps GROUND/FLIGHT selector to FLIGHT, and wire-lock.

(28) Disconnect the external electrical supply.

Functioning tests of the services

31. With the aircraft jacked and trestled *(Sect.2, Chap.4)*, and using two Mk.2A or 2B, or 2C hydraulic servicing trolleys fitted with Lockheed Mk.9 engine-drive pumps, connected to the Avery couplings in the suction and delivery lines of the aircraft engine-driven pumps, test the functioning of the services as follows:-

Note . . .

The air brakes and flaps GROUND FLIGHT selector in the roof of the bomb bay must be in the FLIGHT position for all power tests.

(1) Connect an external electrical supply *(Sect.5, Chap.1)*.

(2) Test the power circuit using both servicing trolleys, and check the operation of the automatic cut-out valve by operating the bomb doors, air brakes and flaps. The automatic cut-out valve should cut-in at 2000 lb/in^2 and cut-out when the system pressure has built up to $2500 \pm^{0}_{100}$ lb/in^2.

(3) *Alighting gear*

(a) Using both servicing trolleys, retract and lower the alighting gear five times, checking that the mechanical down locks, door locks *(Chap.5)* and indicating lights *(Sect.5)* function correctly. The time taken to raise and lower the alighting gear must not exceed 14 and eight seconds respectively.

IMPORTANT

To prevent oscillations when lowering the alighting gear by the hand pump, station a man at each alighting gear door with instructions to hold the doors fully open to ensure that the sequence valves controlling the lowering of the alighting gear remain open for returning fluid.

(b) Stop both servicing trolleys, release all hydraulic pressure and select the alighting gear to emergency UP. Using the aircraft hand pump retract the alighting gear, ensuring that the nose door rear hook engages centrally on its rollers. Reset the alighting gear UP button.

(c) Operate the alighting gear emergency control and lower the gear using the aircraft hand pump.

(d) Reset the selector actuator and emergency control *(Chap.11)*.

(e) Using the aircraft hand pump, retract the nose undercarriage with the UP/FLIGHT selector set to UP and then lower the nose undercarriage with the UP/FLIGHT selector set to FLIGHT. On satisfactory completion of this check wire-lock the UP/FLIGHT selector in the FLIGHT position.

(f) Using the port servicing trolley only, retract and lower the alighting gear once.

(g) Repeat operation (e) using the starboard servicing trolley only.

(h) Using both servicing trolleys retract and lower the alighting gear three times.

(j) On aircraft embodying Mod.3749, test each main undercarriage individually as follows:-

(i) Remove the door jack attachment bolt at the piston end *(Chap.5).*

(ii) Remove the bolt which connects the door check links to the door *(Chap.5).*

(iii) Using both servicing trolleys retract the main undercarriage ensuring that the door jack piston-rod is clear of surrounding mechanisms and structure.

(iv) Fold the check links back to remove the pressure from the sequence valve plunger.

(v) With the servicing trolleys still running, select alighting gear DOWN and pump vigorously on the aircraft hand pump until the undercarriage is locked down.

(vi) Partially retract the undercarriage and reconnect the door check links and door jack *(Chap.5).*

(vii) Using both servicing trolleys retract and lower the alighting gear.

(4) *Bomb doors*

(a) Using both servicing trolleys close and open the bomb doors and check that the warning lamp on the pilot's console is on when the doors are open. The time for the bomb doors to close and open must not exceed six and five seconds respectively.

(b) Using each servicing trolley independently, close and open the bomb doors.

(c) Stop the servicing trolleys, release the pressure and, using the aircraft hand pump, close the bomb doors. Operate the bomb doors emergency control and open the bomb doors using the aircraft hand pump.

(d) Reset the bomb doors selector actuator and emergency control *(Chap.11).* Using both servicing trolleys, close and open the bomb doors.

(5) *Flaps*

(a) Using both servicing trolleys raise and lower the flaps four times. Check the operation of the flaps position indicator and check the synchronization of the port and starboard flaps. The time taken to either raise or lower the flaps must be between 15 and 19 seconds.

(b) Using each servicing trolley independently, raise and lower the flaps.

(6) *Air brakes*

(a) Using both servicing trolleys operate the air brakes OUT, MID (post Mod.272) and IN three times, checking the synchronization of the port and starboard brakes. The time taken to either extend or retract the air brakes must be between a half and two-and-a-half seconds.

Note . . .

In the MID position the inboard or outboard drag channel extensions must not differ by more than 0.5 in between each mainplane.

(b) Using each servicing trolley independently, operate the air brakes as in operation (a).

(7) *Wheel brakes*

(a) Stop the servicing trolleys and attach a Turner adapter with a pressure gauge *(Sect.2, Chap.4, Table 2)* to the wheel brake test connections in the hydraulic pipes to the brakes.

(b) Start the servicing trolleys and, with the wheel brakes off, check that the wheels are free to rotate.

(c) Apply the brakes progressively and, with the rudder bars central, check that at intermediate positions the pressures at each brake do not vary considerably from each other and that when the brakes are fully applied there is a steady pressure of $1500 \pm^{150}_{0}$ lb/in^2 at each brake.

Note . . .

For all pressures from zero to 1000 lb/in^2 the pressure gauge readings must be within 100 lb/in^2 of each other and for pressures from 1000 lb/in^2 to 1500 lb/in^2, the readings must be within 150 lb/in^2 of each other.

(d) Apply full port rudder and check that the pressure in the port brake remains at $1500 \pm^{150}_{0}$ lb/in^2 and the pressure in the starboard brake falls to zero.

(e) Apply full starboard rudder and check that the pressure in the starboard brake returns to $1500 \pm^{150}_{0}$ lb/in^2 and the pressure in the port brake falls to zero. Release the brakes.

(f) Repeat operation (c).

(g) Release the brake lever and check that the pressure at both brakes falls to zero.

(h) Stop the servicing trolleys and remove the Turner adapter and pressure gauge from both wheel brake test connections.

(j) Fully apply the brake lever and operate the parking lever; this should operate easily with one hand.

(8) *Air brakes and flaps GROUND FLIGHT SELECTOR*

(a) Place the selector in the GROUND position and ensure that all hydraulic services can be operated by the aircraft hand pump.

(b) Move the selector back to FLIGHT and check that the air brakes and flaps cannot be operated by the hand pump. Wire-lock the selector valve at FLIGHT.

(9) *Nose undercarriage UP FLIGHT selector*

(a) Place the selector in the UP position and ensure only the nosewheel retracts when the hand pump is operated.

(b) Move the selector to FLIGHT, operate the hand pump and ensure that the nose and main undercarriages will not retract until the alighting gear is selected UP. On satisfactory completion of tests, wire-lock the selector in the FLIGHT position.

Procedure after functioning tests

32. After the functioning tests are satisfactorily completed the following operations must be carried out:-

(1) Disconnect the external electrical supply.

(2) Disconnect the servicing trolleys and connect the aircraft engine-driven pumps at the Avery couplings.

(3) Bleed the pumps and top-up the reservoir as instructed in para.21.

(4) Reseal the emergency release cables as instructed in Chap.8.

(5) Ensure that the air brakes and flaps and the nose undercarriage, ground selectors are wire-locked in the FLIGHT position with new wire.

(6) Relock and seal the undercarriage and bomb door emergency release handles as instructed in Chap.11.

Faults and remedies

33. The more common hydraulic faults and their remedies are listed in Table 2; faults in individual components are covered in the appropriate A.P.104B/105B series.

REMOVAL AND ASSEMBLY

General information

34. Methods of removing certain items from the system are given in the following paragraphs. Generally, the assembly sequence is the reverse of removal, but where there are special reassembly features they are specifically mentioned.

Note . . .

1. After removal of any component, or if the system has been drained or partly drained, the engine-driven pumps must be primed (para.45) and the complete system bled (para.24).

2. When reassembling hydraulic pipes Pt.No.EA3.73.799 and EA3.73.803 to the transfer valve in the port wheel bay, ensure that they are not crossed. The two pipes should run parallel throughout their length.

3. During the reassembly of system components new bonded seals, AGS.1186, are to be fitted to all banjo connections. Care must be taken not to overtighten banjo bolts (A.P.1803A, Vol.1, Sect.2, Chap.1, Table 1).

Reservoir

35. To remove the reservoir:-

(1) Remove the equipment bay hatch *(Sect.2, Chap.4).*

(2) Drain the reservoir *(para.23).*

(3) Disconnect all the remaining pipes from the reservoir, and blank off all exposed pipe ends and apertures.

(4) Remove the locking wire from the trunnion tension rods and unscrew the tension rods. This operation will release the straps retaining the reservoir in position. Remove the reservoir.

Note . . .

1. When assembling the reservoir, it is important that pieces of hard felt, ¾ in × ⅛ in × 26 in long, are attached to the reservoir with rubber-resin cement at the retaining strap position.

2. Care must be taken not to overtighten the hand pump suction pipe banjo when reassembling. Leakage at this point should be rectified by fitting washers AGS.1186C, not by increasing the torque loading on the banjo bolt.

Main accumulator

36. To remove the main accumulator:-

(1) Exhaust all hydraulic pressure from the system *(para.21).*

(2) Remove the inboard access panel from the upper surface of the starboard main plane leading edge *(Sect.2, Chap.4).*

(3) Release the air pressure by depressing the Schrader unit in the charging valve.

(4) Disconnect and blank off the air charging pipeline and the hydraulic pipeline at the accumulator.

(5) Remove the bolts on the two retaining straps and remove the accumulator.

Note . . .

When assembling the accumulator it is important that pieces of hard felt, ¾ in × ⅜ in × 10 in long, are attached to the accumulator with rubber-resin cement at the retaining strap positions.

Wheel brakes accumulator

37. Removal and assembly operations for this accumulator are the same as for the main accumulator *(para.36)* except that it is removed through the battery compartment door on the port side of the fuselage.

Automatic cut-out valve

38. To remove the automatic cut-out valve:-

(1) Exhaust the system of hydraulic pressure *(para.21).*

(2) Remove the inboard access panel from the upper surface of the starboard main plane leading edge *(Sect.2, Chap.4).*

(3) Disconnect and blank off the pressure pipelines and the return to reservoir pipeline.

(4) Remove the three retaining bolts and remove the cut-out valve.

Filter

39. To remove the filter:-

(1) Exhaust the system of hydraulic pressure *(para.21).*

(2) Drain the reservoir *(para.23).*

(3) Disconnect and blank off the inlet and outlet pipes.

(4) Remove the two retaining bolts attaching the filter to the channel-section on the forward face of frame 13 bulkhead.

(5) Lift the filter out of the retaining ring and remove the filter.

Hand pump

40. To remove the hand pump:-

(1) Exhaust the system of hydraulic pressure *(para.21).*

(2) Disconnect and blank off the pressure and suction pipes.

(3) Remove the three attachment bolts in the side of the pump and remove the pump.

Brake relay control valve

Removal

41. To remove the brake relay valve:-

(1) Exhaust the system of hydraulic pressure *(para.21).*

(2) Drain the system *(para.25).*

(3) Remove the access panels from the cabin floor.

(4) Disconnect the four pipelines at the control unit.

(5) Disconnect the Bowden cable.

(6) Disconnect the operating lever from the rudder lever.

(7) Remove the bolts securing the control unit to the cabin floor, and remove the unit.

CAUTION

Prior to reassembly of the Bowden cable to the control valve, check the cable for damage to the strands and for kinking. If either are evident the cable must be replaced.

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Assembly

42. Before fitting the brake relay control valve to the aircraft, blow out the pipelines.

(1) Bolt the control valve to the cabin floor, and connect the four pipelines and the Bowden cable to their respective points on the control valve

(2) With the rudder bar central, connect the operating rod to the control valve and adjust the rod until the pointer on the control valve is central.

(3) Fit Turner inflation adapters and gauges to the connections in the hydraulic pipes to the brakes *(para.31 (7)).*

(4) Ensure that the main hydraulic pressure is 2500 lbf in^2.

(5) With the aircraft jacked and trestled *(Sect.2, Chap.4),* and the rudder bar central, apply the hand brake lever and adjust the Bowden cable to give a brake pressure of $1500 \pm^{150}_{0}$ lbf in^2 on the Turner gauges. Release the brakes and ensure that the pressure falls to zero and that the wheels are free to turn.

(6) Apply full port rudder and check the pressures registered on the Turner gauges; they should be:-

Port – $1500 \, ^{+150}_{-0}$ lbf in^2

Starboard – Zero, with the wheel free to turn.

(7) Apply full starboard rudder and repeat the check in operation (6), the pressures should be:-

Starboard – $1500 \, ^{+150}_{-0}$ lbf in^2

Port – Zero, with the wheel free to turn.

(8) Check the pressures at various brake lever settings with the rudder bar central. For partly applied brakes at pressures up to 1000 lbf in^2 there should not be more than 100 lbf in^2 difference between port and starboard gauge readings. For partly applied brakes at pressures exceeding 1000 lbf in^2 there should not be more than 150 lbf in^2 difference between gauge readings.

Note . . .

The brake lever must not be snatched on, as high and incorrect readings may result.

(9) Remove the Turner inflation adapters and gauges.

Note . . .

Should any fluctuation in the pressures occur at the Turner gauges it is an indication that there is a leak past the relay control valve and the valve is unserviceable.

Engine-driven pump

Removal

43.

(1) Exhaust the system of hydraulic pressure *(para.21)*.

(2) Remove the appropriate access panels *(Sect.2, Chap.4)*.

(3) Drain the hydraulic fluid from the pump.

(4) Disconnect and blank off the hydraulic pipes to the pump, and blank off the pump apertures.

(5) Disconnect the pump drainpipe.

(6) Remove the six nuts and spring washers securing the pump to the accessories gearbox, and remove the pump.

(7) Remove the driving quill from the gearbox driveshaft, attach it to the blanking cover, and blank off the gearbox aperture.

Assembly

44. To assemble the pump to the accessories gearbox:

(1) Remove the blanking cover from the gearbox aperture, and retain the gasket.

(2) Lightly smear the pump driving quill with grease XG-277 and insert into the gearbox driveshaft.

Note . . .

Driving quills are supplied with the accessories gearbox.

(3) Fit the gasket to the pump seating flange on the gearbox.

(4) Prime the pump with hydraulic fluid OM-15.

(5) Offer up the pump to the gearbox, line up the splines and fit the pump over the securing studs on the gearbox flange, ensuring that the bleed screw is at the top of the pump.

(6) Fit and tighten the six nuts and spring washers.

(7) Remove the blanks from the hydraulic pipes and pump apertures, and fit the pipes. Wire-lock the unions.

(8) Connect the drainpipe to the pump, and wire-lock the union.

(9) Bleed the pump *(para.45)*.

Priming and bleeding

45. (1) Top up the reservoir with hydraulic fluid OM-15.

(2) Slacken the bleed screw on the pump.

(3) Build up a pressure of 1 to 2 lb/in^2 in the reservoir.

Note . . .

To pressurize the reservoir, a cap of local manufacture incorporating a Schrader valve and 0-5 lb/in^2 pressure gauge, may be used. Pressure should be built up slowly to 1 or 2 lb/in^2.

(4) Allow fluid to flow from the bleed vent until it flows freely and free from air.

(5) Tighten and wire-lock the bleed screw.

TABLE 1

List of hydraulic components

Component	Description	A.P.	No. off per A/C
Engine-driven pump	Lockheed Mk.9	105B-0108-13A	2
Hand pump	Turner, 77C/1275	105B-0217-1	1
Accumulator	Lockheed, AIR40016	1083B	2
Brake relay control valve	Dunlop, AC61762	105 Series	1
Brake units,			
port	Dunlop, AH9597	104J-1039-1	1
starboard	Dunlop, AH9598	104J-1039-1	1
Gyp inflation valve	High Pressure Components Ltd. A58	105B-07225-1	6
Automatic cut-out valve	Lockheed, AIR41158	105 B Series	1
Filter, Vokes	30L/1/7915 or 30L/1/22537	1803P	1
Hand pump oil filter unit	Dowty, C2254Y	105B-0483-1	1
Flow dividers	British Messier, 8076/52	1803T	2
Gauge relay	Electro Hydraulics, 7391	1803F	2
Jacks:			
Air brakes	Dowty, 1.03036.001 or 1.03035.001	105B-0986-16C	2
Bomb doors			
Forward	Dowty, 1.00522.001	105B-0004-1	1
Aft	Dowty, 1.00523.001	105B-0004-1	1
Flaps	Dowty, 07016Y.C.O.1	105B-0004-1	4
Main undercarriage	Dowty, 07017Y.C.O.1	105B-0004-1	2
Nose undercarriage	Dowty, 08214Y.C.O.1	105B-0004-1	1
Main and nose undercarriage doors	Dowty, 08246Y.C.O.1	105B-0004-1	3
Non-return valve	U.M.C.704, 1/4 in. B.S.P.	105B-07398-1	2
◀ Non-return valve	U.M.C.706, 3/8 in. B.S.P.	105B-07398-1	6 ▶
Non-return valve (pressurization)	British Messier, 8557	1803T	1
Non-return valve	Dowty, 5240Y	105B-05113-1	1
Pressure-relief valves:			
Flaps	Dowty, C1034Y, Mk.Q	105B-07221-1	1
Reservoir	Dowty, D2568Y	105B-07390-1	1
Restrictor valves:			
Flaps	Dowty, D657Y	105B-0003-1	1
Main undercarriage doors	Dowty, 033717.B.O.6 and Dowty, 062097.B.O.1	105B-07389-1 1803D	2 2
Selector valves:			
Air brakes and flaps	Dowty, 408Y, Mk.BL	105B-05117-1	2
Alighting gear	Dowty, 408Y, Mk.BQ	1803D	1
Bomb doors	Dowty, 408Y, Mk.BR	105B-05117-1	1
Ground/flight selector valves:			
Nose undercarriage	Dowty, 01183Y, Mk.B02	105B-05119-1	1
Air brakes and flaps	Dowty, 408Y, Mk.BN	105B-05118-1	1
Sequence valves:			
Main undercarriage, port	Dowty, D401Y, Mk.L	105B-0003-1	1
Main undercarriage, starboard	Dowty, D401Y, Mk.M	105B-0003-1	1
Main undercarriage door, port	Dowty, D401Y, Mk.K	105B-0003-1	1
Main undercarriage door, starboard	Dowty, D401Y, Mk.J	105B-0003-1	1
Nose undercarriage	Dowty, D401Y, Mk.G	105B-0003-1	1
Nose undercarriage doors	Dowty, D401Y, Mk.H	105B-0003-1	1
Thermal relief valve	Dowty, C4603Y, Mk.E	105B-0738-16	13
Thermal relief valve	Dowty, C8697Y, Mk.A	105B-0738-16	2
Transfer valve	Dowty, C6790Y, Mk.A	105B-0003-1	2
Solenoid-operated valve (air brakes)	British Messier, 6330	1803T	1
Pressure gauge	Mk.14LL	112G-0400-1	4

TABLE 2

Faults and remedies

Fault	Possible Cause	Remedy
(1) Engine-driven pump and hand pump fail to operate the system	No fluid in the system	Refill the system
	Leakage in the system	Correct the leak and refill the system
(2) Engine-driven pump drive shears	Pump dry	Change the engine-driven pump ▶
	Excessive pressure due to foreign matter in system	Drain the system and replenish with clean fluid
	Hammering of the automatic cut-out	Renew the automatic cut-out
(3) All services inoperative by engine-driven pumps but services can be operated by the hand pump	Engine-driven pump drives sheared	(Refer to (2))
	Foreign matter in the filter	Remove the filter and clean it
	By-pass valve in the automatic cut-out leaking	Renew the automatic cut-out (refer to (2))
(4) Spongy action on hand pump	Air in particular service	Bleed the affected service and test
	Faulty non-return valves	Renew the affected non-return valves
(5) All services inoperative by hand pump	Hand pump worn or damaged	Renew the hand pump
(6) Flaps droop, or spring back from the lowered position	Jack piston-rod glands leaking	Renew the jack
	Non-return valve in rotary control valve leaking	Renew the rotary control valve
	Air in system	Bleed the system and test
(7) Flaps return to original position after moving	Jack piston-rod glands leaking	Renew the jack (refer to (6))
	Leaking rotary control valve	Renew the rotary control valve (refer to (6))
	Leaking thermal relief valve	Renew the thermal relief valve
(8) No movement of flaps upon selection, accumulator pressure correct	Actuator fuse blown	Renew relevant fuse (Sect.5, Chap.1)
(9) Flaps on one side move in advance of those on the other side	Foreign matter in restrictor valve and pressure relief valve	Remove the restrictor valve and pressure relief valve, and clean them
	Air in system	Bleed the system and test

continued . . .

TABLE 2 Faults and remedies – *continued*

Fault	Possible Cause	Remedy
(10) Bomb doors droop	Jack piston rod glands leaking	Renew the jack
	Non-return valve in rotary control valve leaking	Renew the rotary control valve
	Air in system	Bleed the system and test
(11) No movement of bomb doors upon selection, with accumulator pressure correct	Actuator fuse blown	Renew relevant fuse (Sect.5, Chap.1)
(12) Alighting gear doors droop	Door jack piston rod glands leaking	Renew the affected jack (Dowty, 08246Y, C.O.2)
	Non-return valve in rotary control valve leaking	Renew the rotary control valve
	Air in system	Bleed the system and test
	Incorrect setting of door jack sequence valves	Reset affected sequence valve
(13) No movement of alighting gear upon selection, with accumulator pressure correct	Actuator fuse blown	Renew relevant fuse (Sect.5, Chap.1)
(14) Wheel brakes inoperative, with accumulator pressure correct	Broken Bowden cable	Renew the Bowden cable
	Slack Bowden cable	Release the cable and adjust
(15) Wheel brakes remain on after brake lever is released	Tight Bowden cable	Release the Bowden cable and adjust
	Frayed Bowden cable	Renew the Bowden cable
(16) Air brakes inoperative upon selection, with accumulator pressure correct	Actuator fuse blown	Renew relevant fuse (Sect.5, Chap.1)
(17) Air brake drag channels protrude from main plane surfaces	Jack piston rod glands leaking	Renew the jack
	Non-return valve in rotary control valve leaking	Renew the rotary control valve
	Air in system	Bleed the system and test
(18) Hammering of the automatic cut-out	Air in the system	Bleed the system and test
	Leaking non-return valve	Renew the non-return valve or automatic cut-out
	Broken secondary spring	Renew the automatic cut-out (see (2))
	Leaking rotary control valve	Renew the affected rotary control valve
	Restriction in pressure line	Flush the pressure line – renew if damaged
(19) Slow movement of services	Insufficient air pressure in the appropriate accumulator due to leakage at inflation point	Stop the leak, re-inflate and test
(20) Sluggish movement of a particular service with correct accumulator pressure	Air in system	Bleed the system and test

Note...

Fault (20) may be apparent only in flight, or with one engine at idling rev/min, and not when using the servicing trolleys.

Chapter 8

AIR CONDITIONING, AIR VENTILATED SUIT (POST MOD.2717) AND DE-MISTING SYSTEMS

LIST OF CONTENTS

Note . . .

A detailed list of contents will be found at the beginning of each chapter.

Introduction

This chapter is divided into three separate parts, A, B and C, describing individually the three systems which supply conditioned and controlled air to the pressure cabin, crew and transparent panel interspaces. The air conditioning system is either to pre Mod.5 or 2523, or post Mod.5 or 2523 standard, the versions of which are described in Chapter 8A. Chapter 8B deals with the air ventilated suit system (post Mod.2717), fitted to aircraft post Mod.5 or 2523, and Chapter 8C with the cabin transparent panel interspace de-misting.

Chapter 8A AIR CONDITIONING SYSTEM

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Introduction

1. This chapter describes and illustrates both the pre and post Mod.5 or 2523 air conditioning system, it gives details of servicing operations, and recommends methods for the removal and assembly of certain components in the air conditioning system. The air ventilated suit system (post Mod.2717) and the de-misting systems are described and illustrated separately in Chapters 8B and 8C respectively.

List of principal components

2. Details of the principal components used in both the pre and post Mod.5 or 2523 systems, together with their Air Publication references, where applicable are given in Table 1 and Table 2.

DESCRIPTION

General information

3. Air for pressurizing and conditioning the cabin is supplied from a tapping on both engine compressors. The cabin pressure is controlled by a combined-valve unit and pressure controller, and the temperature by an electrically actuated mixing valve governed by a switch mounted on the pilot's miscellaneous instrument panel. The pressure controller, in conjunction with the combined valve unit, controls the cabin pressure at altitudes above 10,000 ft; cabin pressure and atmospheric pressure below this altitude are approximately the same. The efficiency of the air conditioning system is improved by the insulation of the cabin with fibreglass blanketing which is affixed to the interior of the cabin skin.

Supply (pre Mod.5 or 2523) *(fig.2)*

4. Hot air from each engine compressor casing passes through non-return valves adjacent to the engine tapping, then on into a common duct running laterally across the aircraft. From the main hot air delivery duct a tapping is taken, passing first through a constant-flow valve then into the cabin temperature control mixing valve. The mixing valve is controlled by a CABIN AIR HOT /COLD switch on the pilot's miscellaneous instrument panel and is operated by an electrical actuator; it can be selected to deliver hot, cooled or cold air to the cabin. The valve receives its cold air supply from an external ram air intake duct mounted in the leading-edge of the port main plane; at certain settings unrequired hot air is spilled to atmosphere through a duct from the valve into the port engine bay. Depending upon the pilot's selection air can either flow direct to the cabin from the mixing valve or can be diverted through a cooler which lines the inside of the main plane leading-edge outer skin. In each case the air flows through a common duct running along the port side of the fuselage to a non-return valve positioned in the duct, just aft of the pressure bulkhead; this valve prevents loss of cabin pressure back through the system in the event of a system failure. In the cabin the main duct branches into smaller ducts to supply the pilot's 1st and 2nd navigators' diffusers and louvres *(para. 9 and 10)*, and the inner surface de-misting diffusers *(Chap.8C)*.

Supply (post Mod.5 or 2523) *(fig.4)*

5. From a tapping in each engine compressor casing hot air passes through a non-return valve and an electrically actuated gate valve into the main hot air delivery duct which runs laterally through the main planes and fuselage. Two T-piece tappings along the length of this duct supply the air for the system. In the port inner wing a pipe branches from the main duct to the hot air side of the mixing valve, and a similar branch pipe in the starboard wing is fed into the inlet side of the primary cooler. A test point connection is provided at each end of the main hot air delivery duct downstream of the gate valve.

Cabin temperature control (post Mod.5 or 2523)

6. The temperature of the delivery to the cabin is governed by a mixing valve, electrically controlled by a CABIN AIR HOT /COLD switch on the pilot's miscellaneous instrument panel. By suitable operation of this switch air is delivered hot, cooled, or cold. Movement of the switch to HOT directs hot air from the engine compressors through the mixing valve along the common delivery duct to the cabin, the air passing through a constant-flow valve, water extractor and non-return valve. By moving the switch to COLD the hot air from the engine compressors is directed through the primary cooler in the starboard main plane leading edge to the mixing valve in the port main plane leading edge, the cold side of which allows the partly-cooled air to pass to the

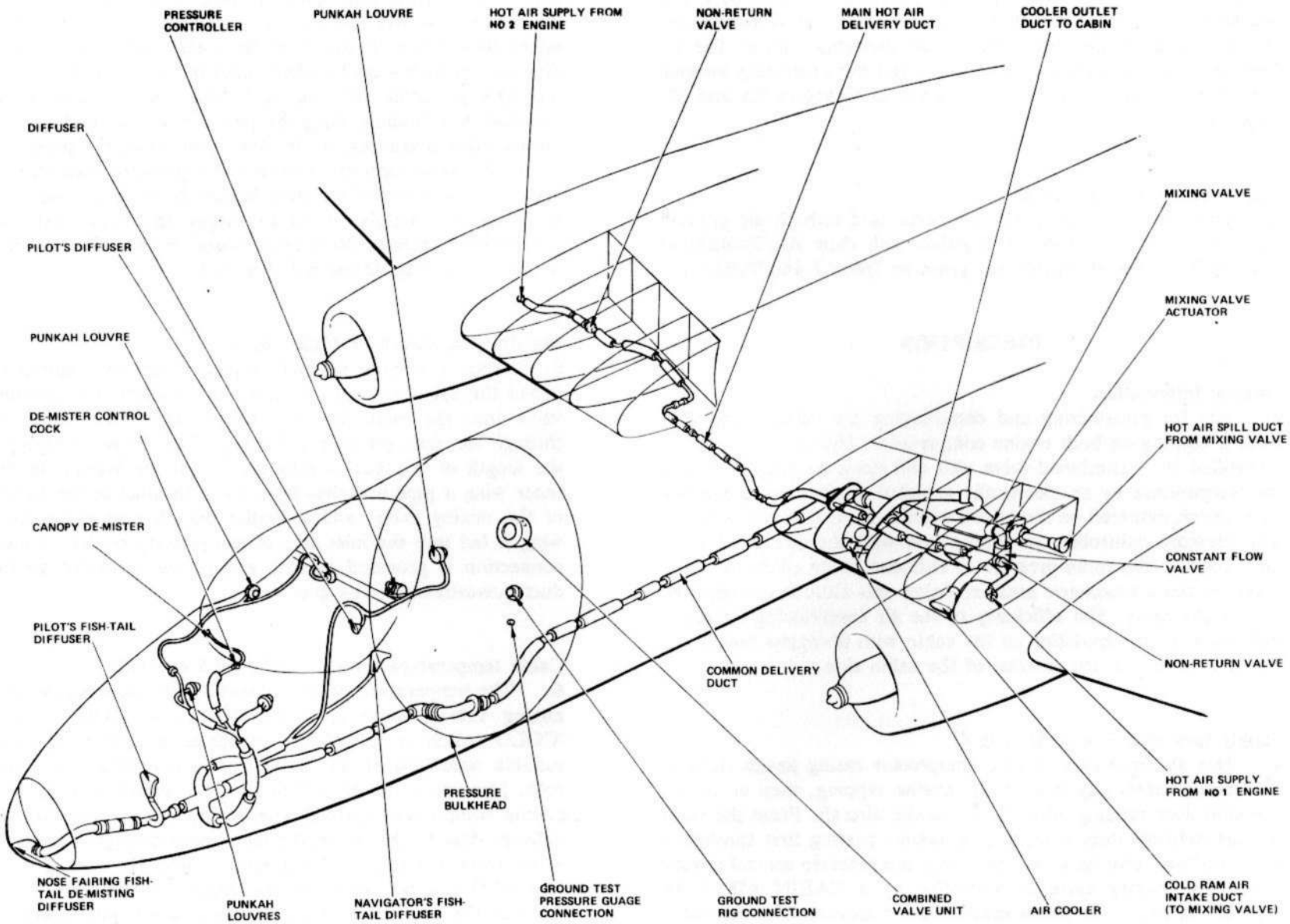


FIG.1. AIR CONDITIONING SYSTEM (PRE MOD. 5 OR 2523)

◀ *Annotations amended* ▶

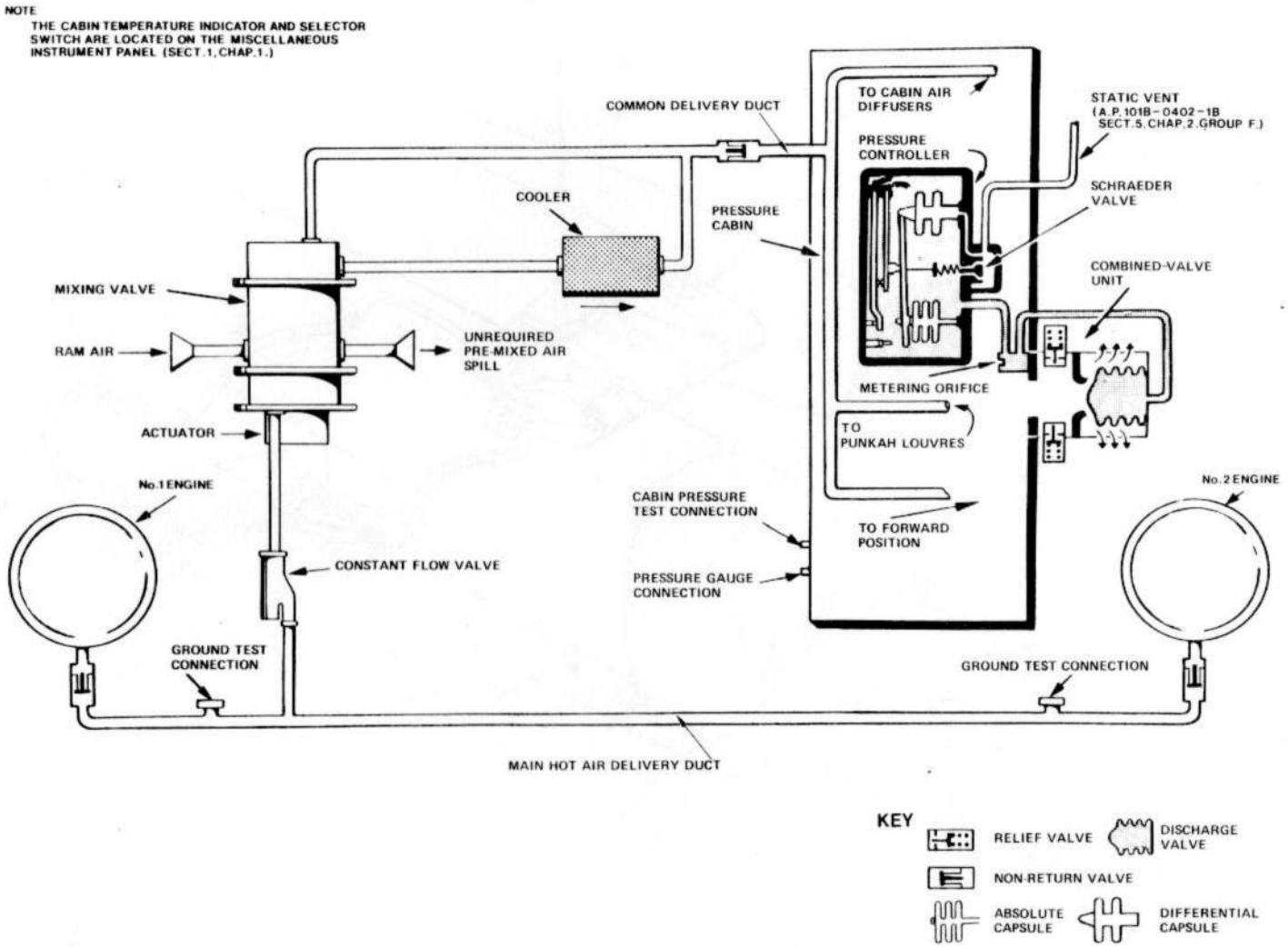


FIG. 2. AIR CONDITIONING SYSTEM DIAGRAM (PRE MOD. 5 OR 2523)

◀ *Detail removed and annotations amended* ▶

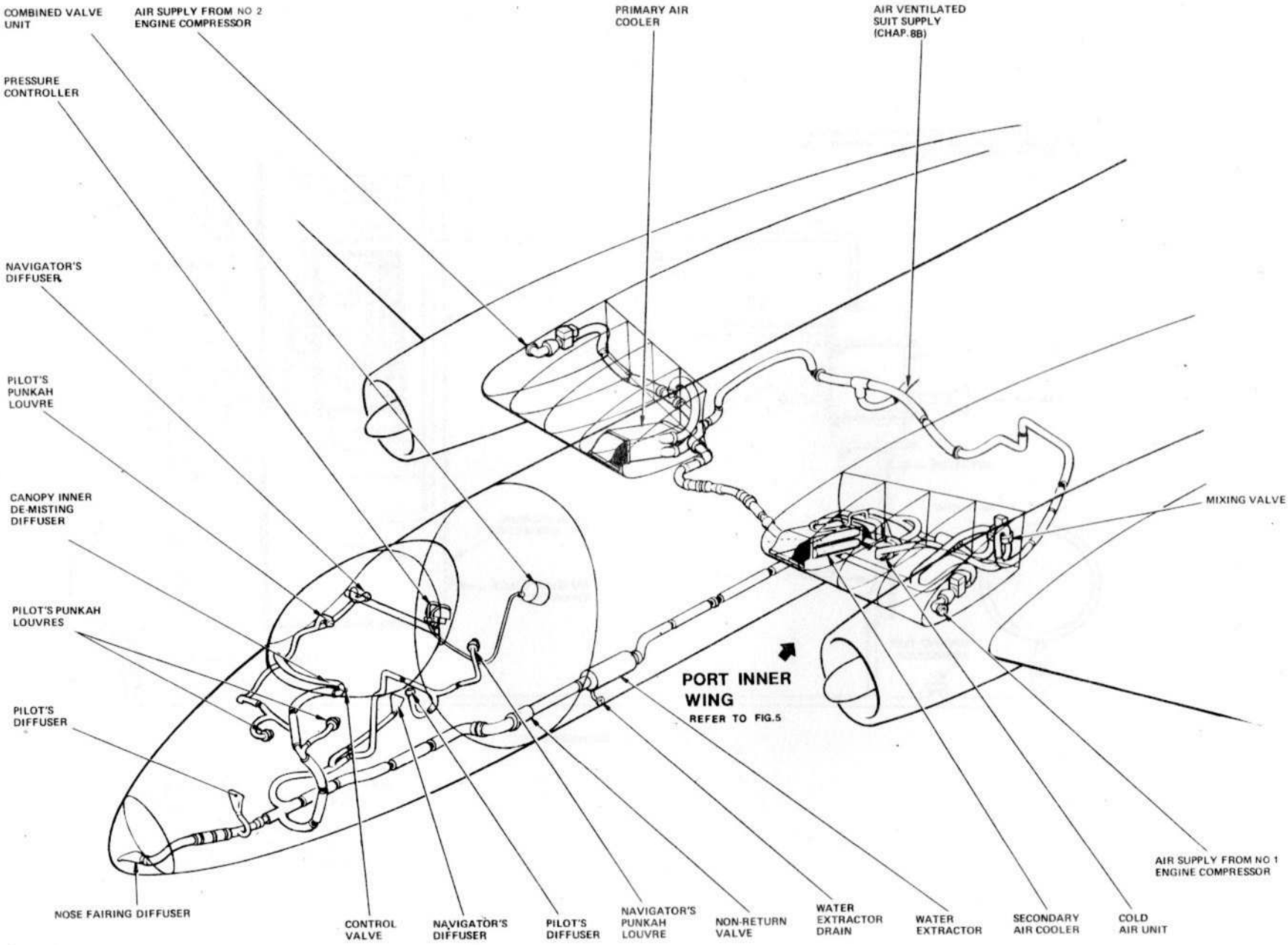


FIG. 3. AIR CONDITIONING SYSTEM (POST MOD. 5 OR 2523)

◀ *Annotations amended* ▶

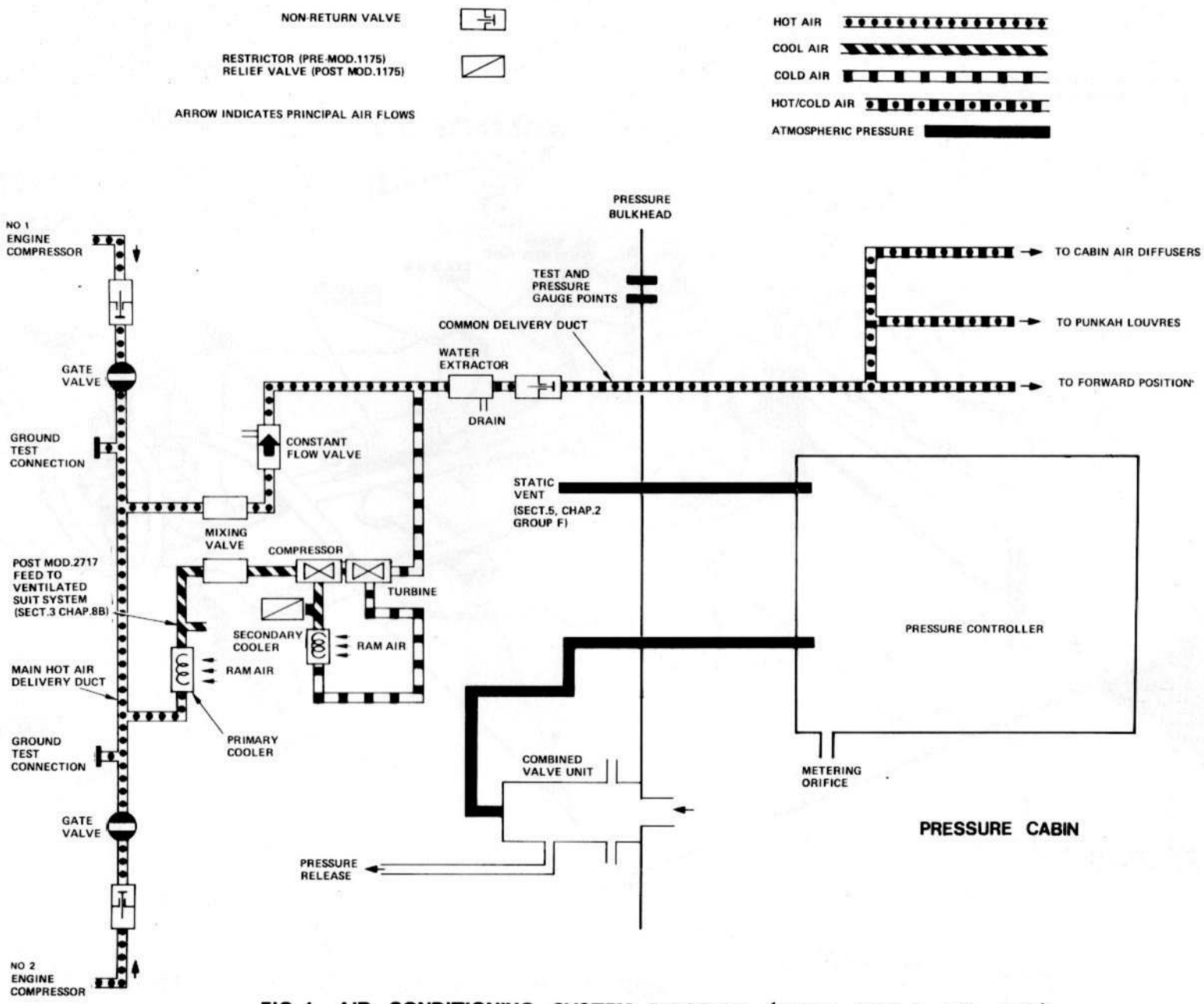


FIG. 4. AIR CONDITIONING SYSTEM DIAGRAM (POST MOD. 5 OR 2523)

◀ *Annotations amended* ▶

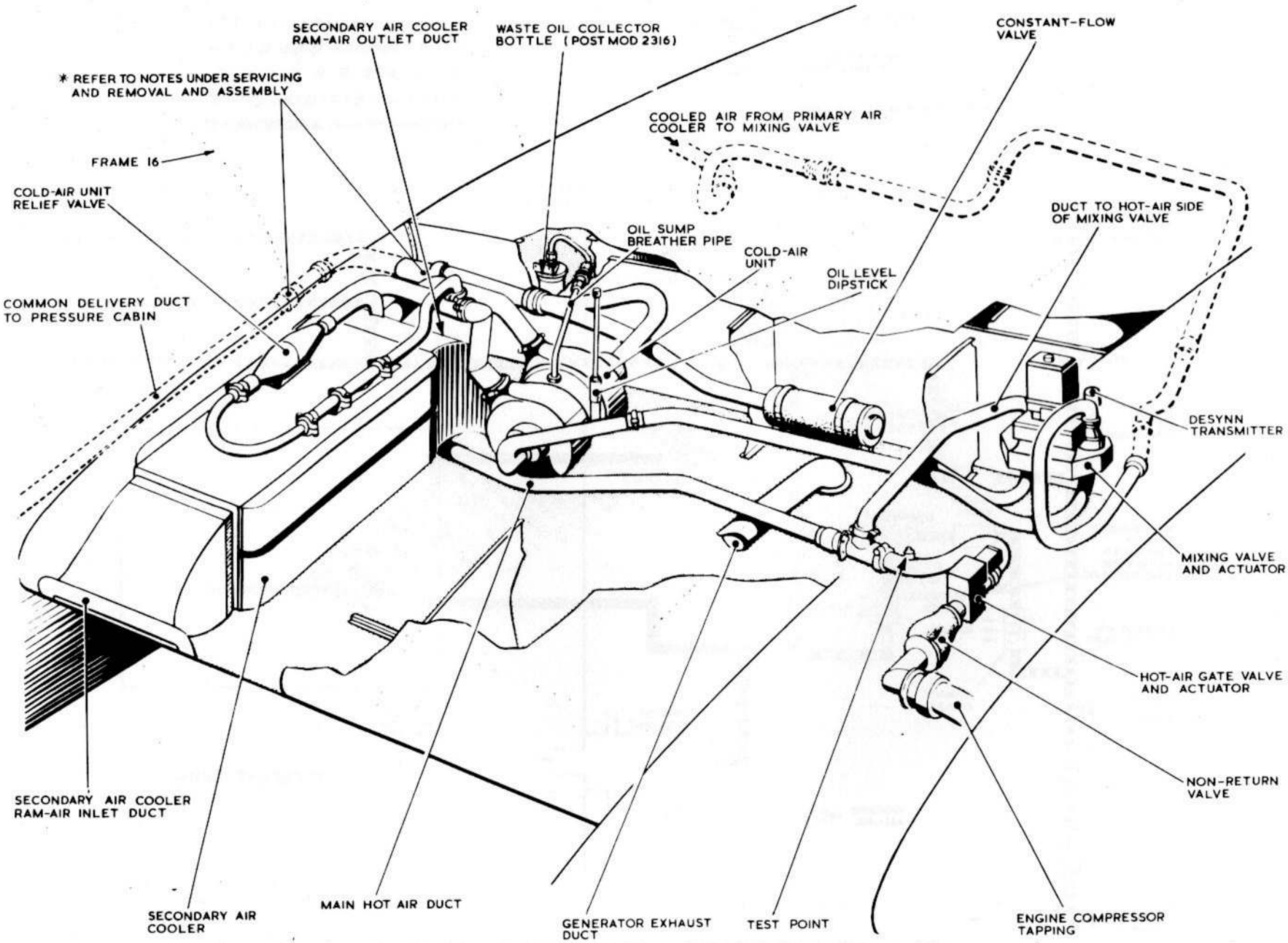


FIG.5. AIR CONDITIONING SYSTEM-PORT INNER-WING, LEADING EDGE (POST MOD. 5. OR 2523)

◀ *Annotations amended* ▶

compressor side of the cold-air unit (C.A.U.). On leaving the compressor side of the C.A.U. the air passes through the secondary cooler to the turbine stage of the C.A.U. and then, very cold, through the common delivery duct to the cabin. Pre Mod.1175 a restrictor valve, and post Mod.1175 a relief valve is fitted between the compressor and the secondary cooler. The relief valve output combines with the cooler ram air output, both valves being mounted on the duct, and prevent build up of pressure in the C.A.U. The cabin heat control switch can be operated to give any desired temperature; it has a spring return centre off position and, when in use, should be held to the HOT or COLD position, whichever is desired, until the required temperature is obtained and then allowed to return to off. The position of the mixing valve is registered on the CABIN AIR indicator mounted adjacent to the control switch on the miscellaneous instrument panel.

Note . . .

1. No air will be supplied unless one or both of the ENGINE AIR TO CABIN switches controlling the gate valves are set to ON.

2. In the event of a fault developing in the supply from an engine, or if an engine fails or is shut-off, the gate-valve switch of that engine should be set to OFF.

7. From the constant-flow valve in the port main plane leading edge the common delivery duct passes into the fuselage and then forward to the water extractor at frame 11, and on through the non-return valve at the pressure bulkhead. In the pressure cabin, the duct branches into smaller ducts to supply the pilot's, 1st and 2nd navigator's diffusers and louvres *(para.9 and 10)*, and the inner surface de-misting diffusers *(Chap.8C)*.

Cabin air distribution

General

8. From the common delivery duct running along the port wall of the pressure cabin, conditioned air is ducted through branch pipes to louvres and diffusers positioned at various points about the cabin. In addition to providing conditioned air to selected areas, the combined mass of air from the louvres and diffusers also maintains the cabin pressure at a pre-determined level at all altitudes. Internal transparency de-misting diffusers are detailed in Chap.8C.

Note . . .

As the cold air supply (pre Mod.5 or 2523) is only at ram pressure, full pressurizing will not be obtained whilst the mixing valve is admitting cold air.

Punkah louvres

9. Conditioned air is delivered to various parts of the cabin through pipes branching from the common delivery duct, some of which terminate in punkah louvres; these are controlled by the crew members and may be shut off when not required for use. The pilot's station has three punkah louvres which are located one on the rudder pedal guard, one on the alighting gear control panel and one on the coaming tube above the entrance door. A further punkah louvre on the inboard side of the alighting gear sloping panel controls the pilot's supply of cold-air from outside *(para.11)*. The navigator's, station is provided with one punkah louvre mounted on the port side of the cabin above the chart table.

Note . . .

The louvre on the coaming tube, above the entrance door must be fitted with attachment bolts with their heads outboard to prevent fouling of the canopy detonator cable at frame 4.

Diffusers

10. Air conditioning diffusers are fitted in four locations and are of two types; either controllable head, or fish tail. The controllable head diffusers are located; one on the cockpit port wall, and one on the far right of the navigator's coaming panel. The fish tail diffusers are each different, a single outlet type is fitted forward of the pilot's feet and a double outlet type is fitted between the navigators, forward of their feet. The fish tail diffusers cannot be individually controlled.

Pilot's cold-air supply *(fig.6)*

11. A supply of cold air to the pilot is provided by a small air-

scoop, located on the front fuselage outside skin immediately forward of the canopy, which directs ram air along a duct to a punkah louvre mounted on the inboard side of the alighting gear sloping panel. A simple non-return valve in the duct prevents cabin pressurizing air blowing back through the system and any moisture which may collect in the duct is drained through a small pipe leading to a drain hole in the fuselage skin. The supply can be controlled by the pilot by movement of the punkah louvre.

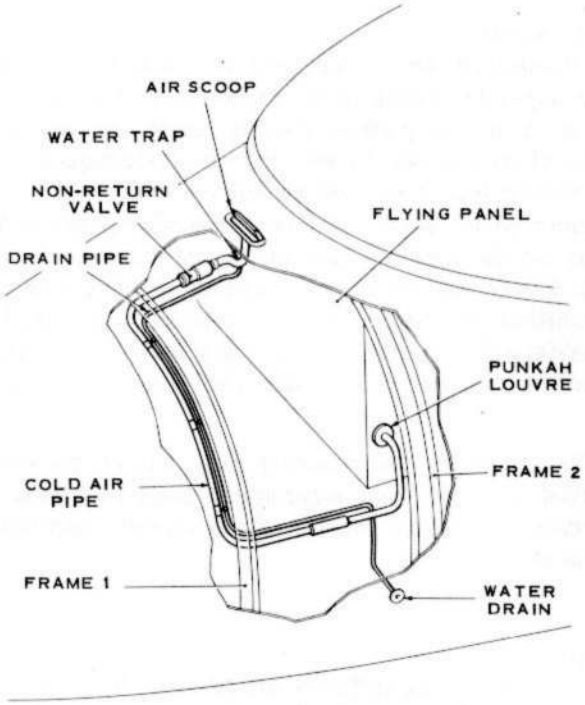


Fig.6. Pilot's cold air supply

Hot-air (gate) valves (post Mod.5 or 2523)

12. On the post Mod.5 or 2523 system, an electrically-actuated gate-valve is mounted on the inboard face of each engine rib in the air supply duct from the engine compressors. Operation of the gate valve actuator to ON lifts a carbon slide clear of the air flow and allows air to pass into the system. The gate-valves can be operated independently by two toggle switches annotated ENGINE AIR TO CABIN NO.1–ON/NO.2–ON mounted on the the pilot's miscellaneous instrument panel; their purpose is to shut off air from either engine should a fault occur or if an engine fails.

Constant-flow valve *(fig.9)*

13. A constant flow valve, incorporating a removeable filter, provides the required constant flow of air from the engine compressors to the cabin for a predetermined altitude and temperature, irrespective of engine speed. Air entering the valve passes through the filter and into the open end of the support tube, and then between the flow controller and the support tube, leaving the valve at its outlet to continue along the ducting.

Mixing valve (pre Mod.5 or 2523) *(fig.7)*

14. The mixing valve in the pre Mod.5 or 2523 system consists of a magnesium body housing a barrel valve of similar material. The coincidence of the ports in the barrel valve and the body allows varying proportions of hot and cold air to be either delivered direct to the cabin or passed through the cooler before delivery; it also caters for the spilling of unrequired hot air to atmosphere. These conditions are selected by the rotation of the valve by an electrical actuator which, by allowing infinite variation of the angular setting of the valve, permits fine adjustment of cabin temperature, ranging from hot air direct from the compressors to ram air passed through the cooler. The actuator is controlled by the CABIN AIR HOT-/COLD switch on the pilot's miscellaneous instrument panel, and the valve setting is indicated to the pilot by a Desynn transmitter on the valve and the CABIN AIR indicator adjacent to the control switch.

Mixing valve (post Mod.5 or 2523) *(fig.8)*

15. This system's mixing valve which is also installed in the port main plane leading edge equipment compartment, consists of a light-alloy body housing two carbon slide valves with an inlet port and both discharging through separate outlets. The valves are operated simultaneously by two crankshafts geared together, and are so arranged that when one slide is open, the other is fully closed, both valves being half-way open at the mid-position of the unit. The movement of each slide valve from open to closed is

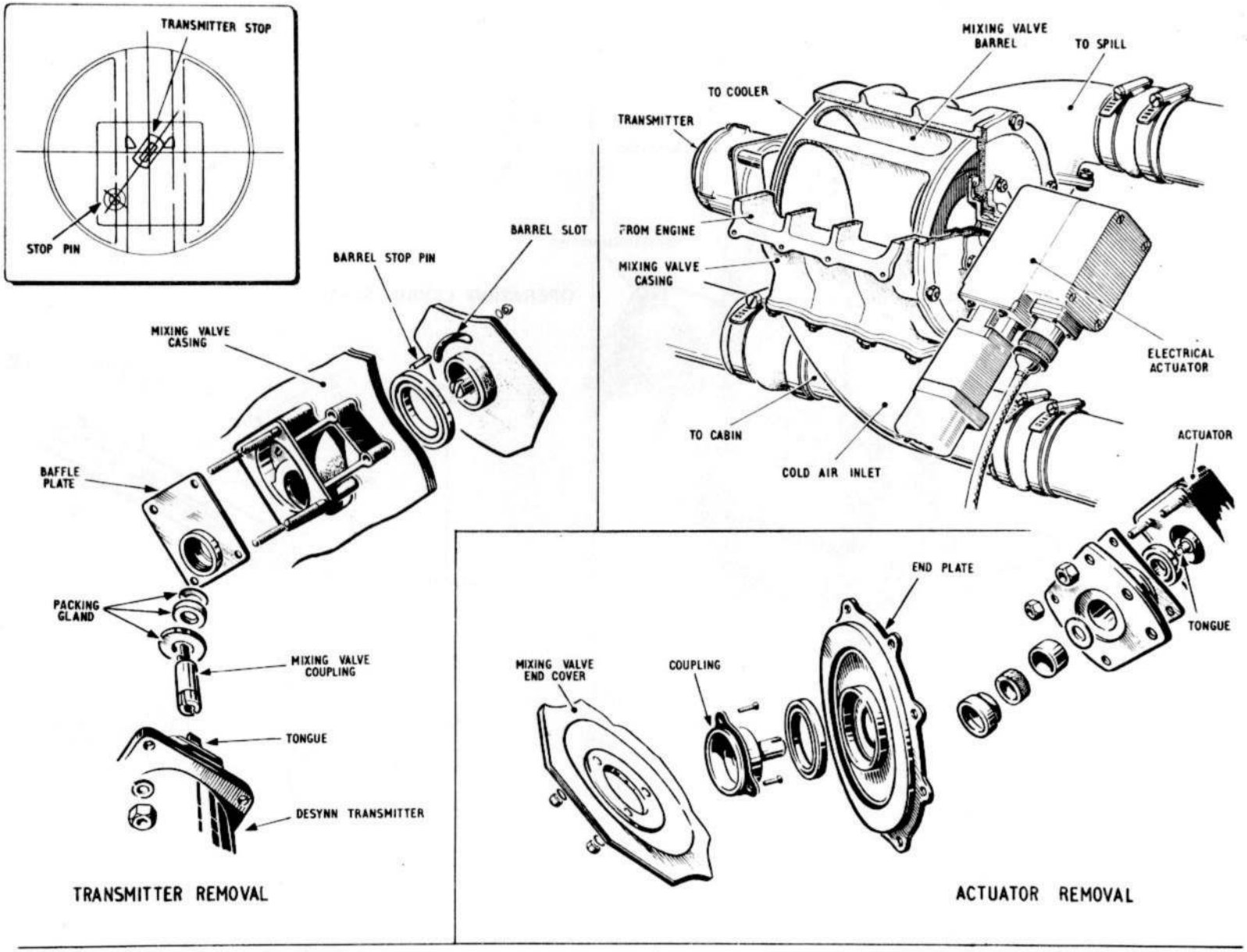


FIG. 7. MIXING VALVE (PRE MOD. 5 OR 2523)

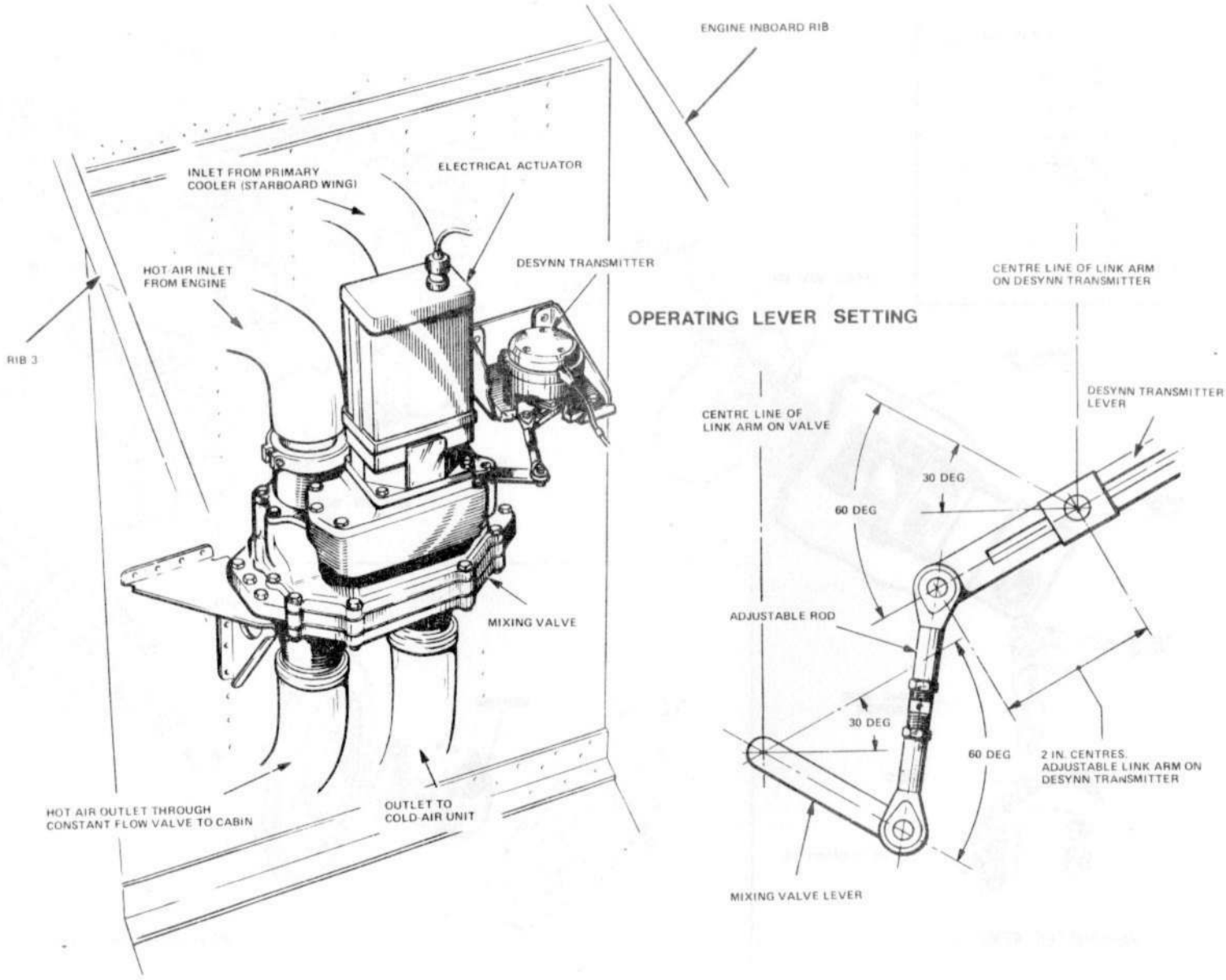


FIG.8. MIXING VALVE (POST MOD. 5. OR 2523)

◀ *Illustration amended* ▶

effected by 180 deg rotation of its crankshaft. Hot air is led to one inlet port and cooled air to the other, the two air streams being entirely separate within the valve. The hot-air stream is directed to the cabin duct without any cooling, and the cooled-air stream from the primary cooler *(para.17)* is further cooled in the cold-air unit *(para.18)*, and the secondary cooler *(para.17)*. Mixing occurs downstream of the cold-air unit, and temperature control is effected by varying the air flow through the cooling system and the cooling system by-pass. The valve is operated by an electrical actuator controlled by the CABIN AIR switch mounted on the pilot's miscellaneous instrument panel; the switch is spring-loaded to the off position, and must be held to COLD or HOT until the desired position of the mixing valve is attained. The valve setting is indicated to the pilot by a Desynn transmitter connected to the valve by an adjustable tie-rod, and registering on the CABIN AIR indicator adjacent to the control switch.

Air cooler (pre Mod.5 or 2523)

16. The air cooler is part of the port main plane inner wing leading edge undersurface skinning between ribs 1 and 2. It has a corrugated inner skin following the contour of the outer skin, and air entering at its upper end is cooled as it passes over the large area of outer skin which is exposed on its outside to the cold ambient temperature.

Air coolers (post Mod.5 or 2523)

17. The post Mod.5 or 2523 system has two air coolers, a primary and a secondary, installed in the leading edges of the starboard and port main planes respectively, between the fuselage and rib 1. Cold ram air enters through the intakes in the main plane leading edges, cools the system air passing through the radiator-type units, and exhausts to atmosphere beneath the main planes.

Cold-air unit (post Mod.5 or 2523)

18. The cold-air unit, installed in the leading edge of the port main plane, consists of a turbine driving a centrifugal compressor, both being mounted on a common shaft and operating in separate chambers. The motive power for the unit is supplied by air passing through the mixing valve from the engine compressors. The unit is inoperative when the mixing valve is in the full HOT position. The cold air unit oil sump breather pipe is routed from the generator exhaust duct to a waste oil collector bottle mounted on the aft face of the wheel-well forward diaphragm.

Relief valve (post Mod.5 or 2523 and 1175)

19. Mod.1175 introduces, to post Mod.5 or 2523 systems, a relief valve incorporated in the duct between the compressor stage of the cold-air unit and the secondary cooler. It is mounted on top of, and vents into, the secondary cooler outlet duct, operating to relieve undue pressure at the cold-air unit.

Non-return valves

20. Two non-return valves are fitted in the main supply duct adjacent to the engine compressor tappings. They safegaurd against system pressure loss back through the engine in the event of a single engine failure. A non-return valve is also positioned in the main cabin supply duct just aft of the pressure cabin; this prevents loss of cabin pressure should there be a leak or failure in the system.

Water extractor (post Mod.5 or 2523)

21. To prevent the formation of condensation in the pressure cabin, post Mod.5 or 2523 systems have a water extractor positioned in the main cabin supply duct just aft of the pressure bulkhead. The extractor is mounted on the nose wheel-well wall in the port equipment compartment and is drained through a small pipe leading to an outlet in the underside of the fuselage skin.

Cabin pressure control unit

22. The pressure controller, mounted on the lower starboard side of the pressure bulkhead, maintains, in conjunction with the combined valve unit, a cabin pressure greater than atmospheric at all altitudes above 10,000 ft, the difference between these two pressures being termed the differential pressure. The unit regulates the pressure in the cabin by adjusting the opening of the discharge valve in the combined-valve unit, thus regulating the discharge of

air from the cabin. The controller is designed to initiate cabin pressurizing at approximately 10,000 ft and to build up and maintain a maximum differential pressure of 3.5 lb/in^2 at 25,000 ft and above. Below 10,000 ft cabin pressure and atmospheric pressure are approximately the same. The vent plates for the static pipeline from the controller, are positioned on either side of the nose fuselage just aft of the perspex nose fairing *(A.P.101B-0402-1B, Sect.5, Chap.2, Group F)*. A warning horn is operated by the pressure controller in the event of a serious drop in cabin pressure.

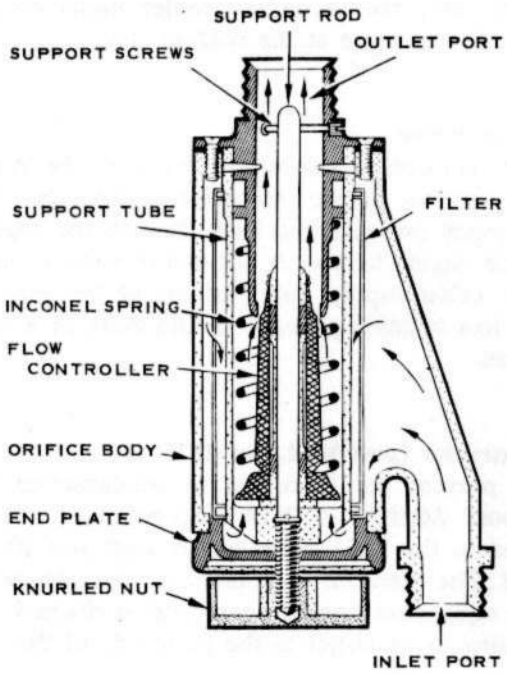


Fig.9. Constant-flow valve

Combined-valve unit

23. The combined-valve unit, mounted on the aft face of the pressure bulkhead, regulates the cabin pressure, in conjunction with the cabin pressure control unit *(para.22)*, by controlling the rate at which air is allowed to escape from the cabin. Two safety valves are incorporated in the unit and should the cabin pressure rise to more than 4.2 lb/in^2, both valves will open allowing the excess pressure to vent to atmosphere. An inwards relief valve limits to a safe value the amount of negative differential pressure which may occur in certain circumstances, such as rapid aircraft descent following engine failure.

Pressure warning system

24. An electrical warning horn is mounted on the starboard side of the pressure cabin just aft of the entrance door. It is operated by the cabin pressure control unit and gives audible warning when the cabin pressure falls to a dangerous level. Pre Mod.4939 a guarded CABIN PRESS WARN HORN ON/OFF switch permits the isolation of the horn. Post Mod.4939 an unguarded switch is fitted with an additional TEST position. Either switch is mounted on the pilot's miscellaneous instrument panel.

Pressure cabin sealing *(fig.10)*

25. The entrance door, pilot's canopy, crew escape hatch, and the joint between the perspex nose and the fuselage are sealed by rubber sealing strips and bushes. All electrical connections, controls, etc., passing through the pressure bulkhead are also sealed, typical examples of which are given in fig.11. The sealing of the joints in the cabin structure is made with Peratol and Bostik sealing compounds.

SERVICING

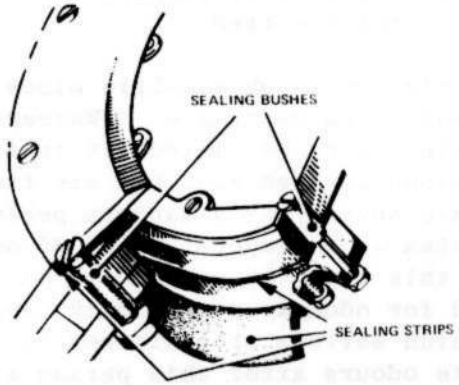
WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft.

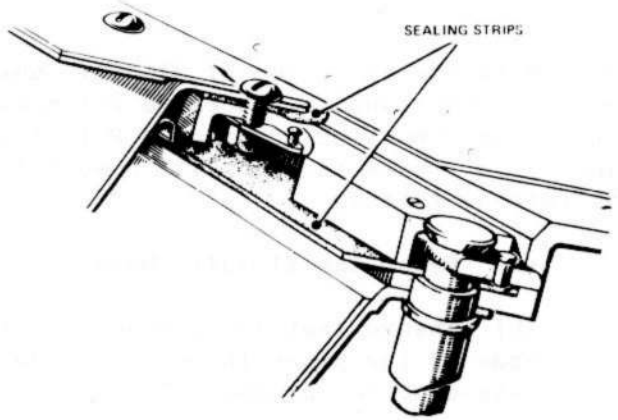
General information

26. Both the pre and post Mod.5 or 2523 systems have their pipelines pressure and flow tested in a similar manner; where particular operations are peculiar to either pre or post Mod. condition the fact is stated. The method of pressure testing the pressure cabin is identical for both Modification states. The follow-

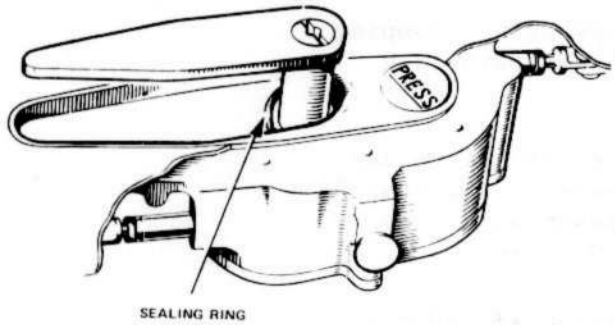
DIRECT – VISION WINDOW



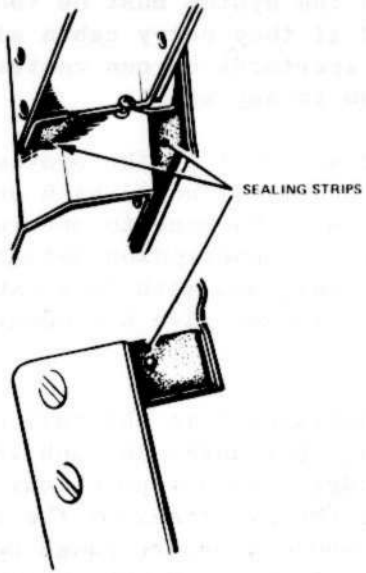
NAVIGATOR'S ESCAPE HATCH



MAIN ENTRANCE DOOR



ENTRANCE DOOR INSPECTION PAN



CANOPY TO COAMING TUBE

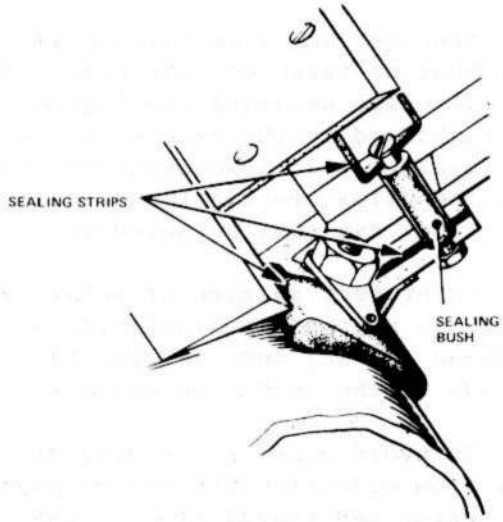


FIG.10. PRESSURE CABIN SEALING

ing notes must be observed when recoupling pipes and reassembling lagging.

Notes...

1. With the exception of SILASTIC hose joints, the standard procedure for remaking hose joints must be adopted (A.P.101A-0300-1A). To remake the SILASTIC hose joints, proceed as follows:-

(a) Renew the SILASTIC hose.

(b) Ensure that the gap between the ends of the pipes to be connected is between 0.10 in. and 0.50 in.

(c) Fit the hose clips using clamping rings Pt.No.EEAS.66/14 beneath each clip.

(d) Fully tighten the hose clips and ensure that the gap between the ends of the clamping ring beneath each clip is between 0.05 in. and 0.07 in.

2. Whenever box type lagging is removed, care must be taken on reassembly that the Jubilee clips securing the lagging are not overtightened to the extent of collapsing the lagging. It is considered satisfactory that the clips are tightened to the stage where they can just be moved by hand.

3. To prevent seizure of metal-to-metal couplings molybdenum disulphide anti-seize compound (ZX-38) must be applied to the threads of the unions on reassembly.

◄ 4. To avoid distress or discomfort to the crew from objectionable odours generated in the system and transmitted to the cabin, the following precautions are to be taken:-

(a) When pipes or ducts are disconnected they are to be blanked off to exclude foreign matter.

(b) Replacement non-metallic pipes must bear a red rectangle. Whenever a new pipe is to be fitted, it is first to be blown through with hot air from a non-toxic heater for a minimum period of 30 minutes at a temperature of 85 deg C. During this time the pipe is to be checked for odours and rigidity, any pipe which softens or continues to generate odours after this period is to be rejected and reported defective.

(c) New components and metallic pipes fitted to the system must be thoroughly degreased if they carry cabin air through ducts or apertures or can contaminate the system in any way.

(d) When any part of the system has been disturbed, a check, with engines running, is to be made to ensure that the system is functioning satisfactorily, does not leak, and with full cabin heat selected does not give off odours. ►

Test points

27. A test point, positioned in the main hot air duct from the engine, is located in each inner main plane leading edge; either point may be used for pressure testing the pipelines of the system. A third test point, and a pressure gauge connection is fitted on the rear face of the pressure bulkhead and is accessible from the nose undercarriage well; these are used when pressure testing the cabin (para.31).

Pressure and flow test of pipelines (pre Mod.5 or 2523)

28. To pressure and flow test the pre Mod.5 or 2523 system pipelines:-

(1) Disconnect and securely blank off the following pipe connections:-

(a) Mixing valve outlet connection to cabin (not to cooler) at mixing valve — or main cabin air duct at inner wing rib 1 port.

(b) Both engine compressor delivery pipes at engine. (Blank engine compressor outlet ducts to prevent ingress of foreign matter).

(2) Connect an electrical supply to the external supply socket (Sect.2, Chap.2), and set the mixing valve to fully HOT. THIS IS IMPORTANT.

(3) Connect a test rig incorporating a 0-100 lb/in² pressure gauge to the test point in either the port or starboard leading edge equipment bay.

(4) Start the test rig and raise the pressure in the system to 80 lb/in².

(5) Stop the test rig and check the time taken for the pressure to drop to 30 lb/in². This must not be less than ten minutes.

(6) Check all joints and pipelines for leaks using a soap solution.

(7) Release the pressure and remove all traces of the soap solution.

(8) Remove the blanks and reconnect the pipelines disconnected in operation (1a). Wire-lock reconnected pipe unions.

(9) Build up a flow of 80 lb/in² on the test rig and check that air flows from all louvres and diffusers in the pressure cabin.

(10) Select the mixing valve to the mid-way position, disconnect the outlet pipe from the cooler in the port inner wing, and ensure

continued

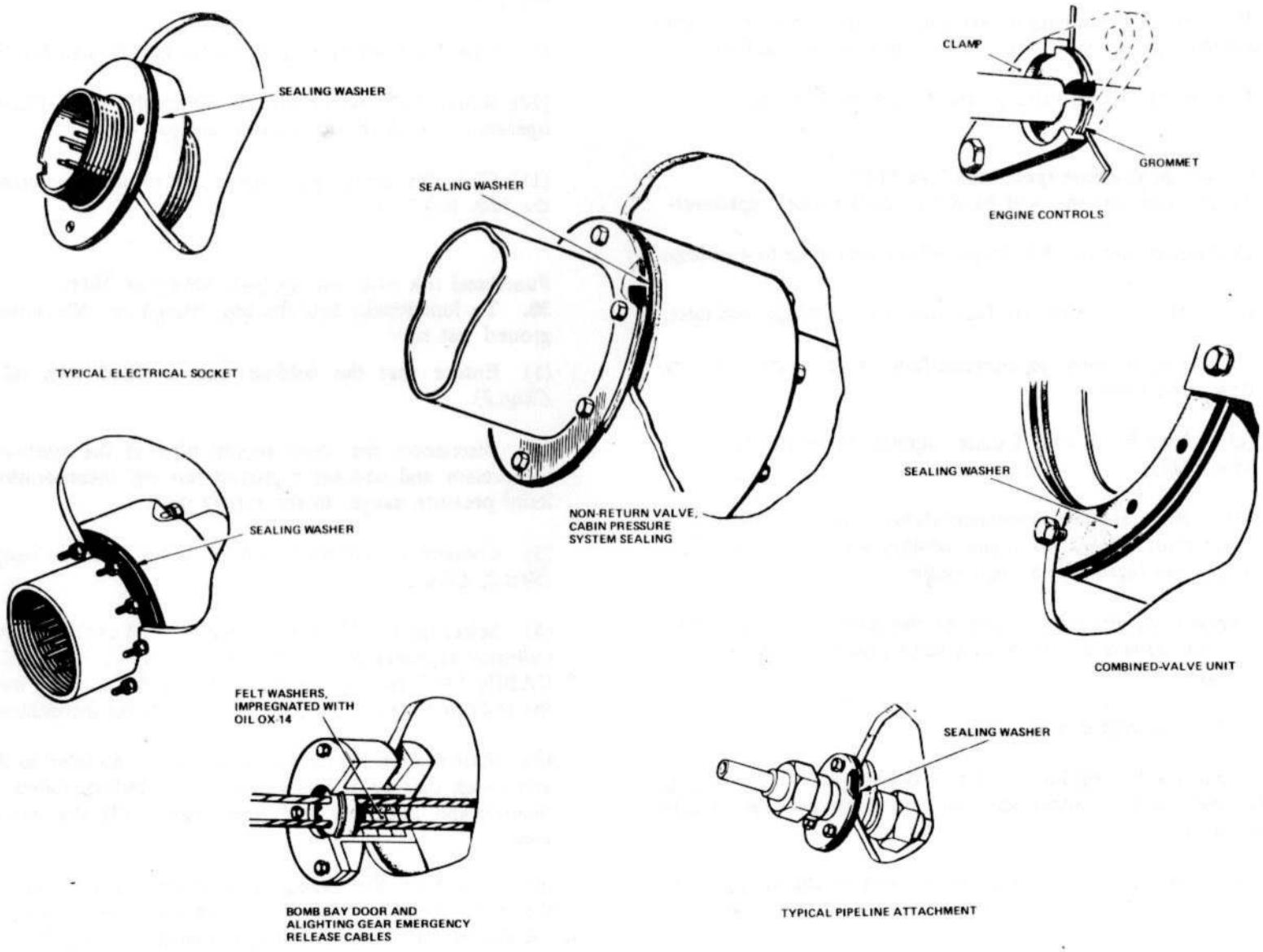


FIG. 11. PRESSURE BULKHEAD SEALING

◀ *Annotations amended* ▶

air is flowing through the cooler.

(11) Disconnect the test rig and refit the blank to the test point.

(12) Remove the remaining blanks and reconnect the supply pipes to the engine compressor casings. Wire-lock all pipe unions.

(13) Return the mixing valve to the fully COLD position.

Pressure test of pipelines (post Mod.5 or 2523)

29. To pressure test the post Mod.5 or 2523 system pipelines:-

(1) Disconnect and securely blank off the following pipe connections:-

(a) Mixing valve to cold-air unit at the cold-air unit inlet.

(b) Mixing valve to constant-flow valve at the constant-flow valve inlet.

(c) Ventilated suit T-piece tapping in bomb bay (post Mod.2717).

(d) Both engine compressor delivery pipes at the engine compressor. (Blank off engine compressor casing outlet ducts to prevent ingress of foreign matter).

(2) Connect an electrical supply to the external supply socket *(Sect.2, Chap.2)* and set the mixing valve mid-way between HOT and COLD.

(3) Open both engine gate valves.

(4) Connect a test rig incoporating a 0–100 lb/in^2 pressure gauge to the test point in either the port or starboard leading-edge equipment bay.

(5) Start the test rig and raise the pressure in the system to 80 lb/in^2.

(6) Stop the test rig and check the time taken for the pressure to drop to 30 lb/in^2. This must not be less than 10 min.

▶ (7) Check all joints and pipelines for leaks using a soap solution. ◀

(8) Release the pressure and remove all traces of the soap solution.

(9) Disconnect the test rig and refit the blank to the test point.

(10) Remove all blanks, and reconnect the pipes disconnected in operation (1). Wire-lock all pipe unions.

(11) Close the engine gate valves and return the mixing valve to the fully HOT position.

Functional test with test rig (post Mod.5 or 2523)

30. To functionally test the post Mod.5 or 2523 system using a ground test rig:-

(1) Ensure that the cold-air unit is filled with oil *(Sect.2, Chap.2).*

(2) Disconnect the main supply pipe at the starboard engine compressor and connect a ground test rig, incorporating a 0–100 lb/in^2 pressure gauge, to the supply pipe.

(3) Connect an electrical supply to the external supply socket *(Sect.2, Chap.2).*

(4) Select the CABIN AIR switch to HOT until the CABIN AIR indicator registers fully HOT, and select the ENGINE AIR TO CABIN NO.2 (stbd.) switch to ON. Both the above switches and the indicator are on the pilot's miscellaneous instrument panel.

(5) Start the test rig to give a pressure of 80 lb/in^2 to the system, and check that air is flowing at all distribution outlets, i.e. cabin louvres and diffusers, and (post Mod.2717) the ventilated suit cocks.

(6) Disconnect the mixing valve to cold-air unit pipe, and check that there is no air flow. (Should there be an air flow, check that ◀ the mixing valve actuator is performing correctly *A.P.101B-0402-1B, Sect.5, Chap.1)*, if it is, the mixing valve is at fault and should ▶ be replaced).

(7) Reconnect the mixing valve to cold-air unit pipe.

(8) Remove the test rig, reconnect the supply pipe to the engine compressor, and connect the test rig to the delivery pipe at the No.1 engine compressor.

(9) Select the CABIN AIR switch to COLD until the CABIN AIR indicator registers fully COLD, select the ENGINE AIR TO CABIN NO.2 (stbd.) switch off, and the NO.1 (port) switch to ON.

(10) Start the test rig and flow test *(operation (5))*.

(11) Visually check that the cold-air unit is running by disconnecting the pipe from the cold-air unit outlet. Reconnect the pipe.

(12) Remove the test rig, and reconnect the delivery pipe at the port engine compressor.

(13) Select the CABIN AIR switch to HOT until the CABIN AIR indicator registers fully HOT, and select the ENGINE AIR TO CABIN NO.1 (port) switch off.

(14) Disconnect the external electrical supply.

Cabin pressure tests

General

31. The following cabin pressure tests apply except where noted, to both pre and post Mod.5 or 2523 conditions:

WARNING

1. Pressure must not exceed 3.5 lb/in² with personnel inside the cabin.

2. Only personnel certified by the Station or Unit Medical Officer as fit for Servicing duties inside pressure cabins, are permitted inside the pressurized portion of an aircraft during tests at ground level. Personnel with colds must have further medical approval.

3. At no time is the cabin pressure to exceed 4.7 lb/in².

4. On completion of a pressure test, the cabin entrance door must not be opened until the pressure gauge reads zero and two minutes have elapsed to allow any residual pressure to escape.

Note . . .

During pressure tests, each control passing through the pressure bulkhead must be operated very slowly, at least three times, over its entire range.

With test trolley

32. Test the pressure cabin in the following manner using a Mk.1C pressure cabin testing trolley *(Sect.2, Chap.4, Table 2)* operating instructions are given in A.P.119F-1508-126A.

(1) Ensure that the canopy de-misting system units are installed and connected *(Chap.8C)*.

◄ (2) Remove all static vent plugs, fit static vent blanks (6C/1059239) to cabin pressure system. ►

(3) Remove the blanking cap from the pressure gauge connection situated on the rear face of the pressure bulkhead, accessible from inside the nose undercarriage well, and fit a 0 to 10 lb/in² pressure gauge to the connection.

(4) Ensure that the air supply adapter *(Sect.2, Chap.4, Table 2)* is fitted to the delivery hose of the ground testing trolley, and connect the hose to the ground test connection situated on the rear face of the pressure bulkhead; access is also from inside the nose undercarriage well.

◄ (5) With the entrance door and direct vision window closed, pressurize the cabin and record the pressure at which the safety valve 'cracks' open. This pressure is to be $4.2 \pm^{0}_{0.25}$ lb/in², with an airflow of 5 lb/min.

(6) Check cabin structure for any signs of permanent distortion and, using a soap and water solution, check for leaks. ►

◄ (7) Stop the trestling trolley and, with a stop watch, not the time taken for the pressure to drop from 3.5 to 1.75 lb/in^2. This must not be less than 35 seconds.

Note . . .

If the time taken is less than 35 seconds rectify the leaks noted in operation (6), repeat the pressure test.

(8) Remove the delivery hose and pressure gauge from the pressure bulkhead ground test connection and refit the blanking caps.

(9) Test the operation of the warning horn; pre Mod.4939 by carrying out the electrical test detailed in A.P.101B-0402-1B, Sect.5, Chap.1, Group H and post Mod.4939 by selecting the CABIN PRESS WARN HORN switch to its spring loaded TEST position.

(10) Remove static vent blanks (6C/1059239), refit all static vent plugs. ►

With engines

33.

WARNING

When post Mod.5 or 2523 aircraft are stationary, there is no cooling air flow through the primary and secondary coolers. Prolonged ground running with COLD selected is therefore to be avoided, and, with the engines running (speed not to exceed 5000 rev/min continuously), the cold air unit must not be operated for longer than ten minutes during any one period. It is permissible, however, to use the cold-air unit whilst taxying.

(1) Ensure that the canopy and nose demisting systems units are installed and connected up *(Chap.8C).*

(2) Remove the static vent plugs.

(3) Post Mod.5 or 2523 top up the oil level in the cold-air unit *(Sect.2, Chap.2).*

(4) Disconnect the pipe, which connects the combined valve unit to the pressure controller, at the combined valve unit, and blank off the pipe only, using a blanking plug *(Sect.2, Chap.4, Table 1).*

(5) Before starting the engines, operate the CABIN AIR switch to allow the CABIN AIR indicator to fully traverse. The time taken to traverse in each direction should be approximately three seconds. Select the indicator, pre Mod.5 or 2523 to the mid-way position, or post Mod.5 or 2523 to the fully COLD position.

(6) Start the engines, and with the No.1 engine-running at 5500 rev/min the port (No.1) gate valve (post Mod.5 or 2523) open and the No.2 engine idling, check that air enters the cabin. Operate the CABIN AIR control switch and check the time taken for the mixing valve to move from one extreme of travel to the other. The maximum time for this operation in each direction is five seconds.

(7) With the No.2 engine running at 5500 rev/min and the No.1 engine idling, post Mod.5 or 2523 the port (No.1) gate valve open and the starboard (No.2) gate valve closed, repeat operation (6).

(8) Close the entrance door and with both engines running at 5500/6000 rev/min, and using a hand pressure (boost) gauge, make the following tests:-

(a) With the mixing valve selected to fully HOT on the cabin temperature control switch, check the time of pressure rise to 3.5 lb/in^2; this must not exceed 60 seconds.

(b) Post Mod.5 or 2523 select the mixing valve to fully COLD and check the time of pressure rise to 3.5 lb/in^2; this must not exceed 60 seconds.

(c) When the CABIN AIR control switch is operated, check that the temperature of the air entering the cabin agrees with that indicated on the temperature gauge adjacent to the control switch.

Note . . .

When fully COLD is selected (pre Mod.5 or 2523) only air at ram pressure is supplied.

(d) Post Mod.5 or 2523 with the No.1 engine idling and the No.2 engine running at 5500 rev/min, check that the cabin pressure can be maintained for at least three minutes. Repeat the test with the No.2 engine idling and the No.1 engine running at 5500 rev/min.

(e) Pre Mod.5 or 2523 close down both engines, or post Mod.5 or 2523 select both ENGINE AIR TO CABIN switches to off and check the time of pressure to fall from 3.5 lb/in^2 to 1.75 lb/in^2. This must not be less than 35 seconds. Check also that there is no air entering cabin through any louvre diffuser or (post Mod.2717) ventilated suit cocks.

(9) When all the cabin pressure has been released remove the blanking plug from the pressure controller pipe and reconnect the pipe to the combined valve unit.

(10) Close all doors and apertures, select, (post Mod.5 or 2523) both ENGINE AIR TO CABIN switches ON and select fully HOT on the CABIN AIR control switch. Run both engines at 5500 rev/min and check the cabin pressure does not exceed 1.0 lb/in^2.

Note . . .

Post Mod.5 or 2523 the hot and cold pressurizing are to be regarded as two independent systems. Times and pressures are to be recorded under both headings.

Test to be undertaken after a major repair

34. The cabin must be pressure tested whenever the canopy, hatch or any other major component affecting cabin pressure, has been renewed or repaired.

Sealing

Structural

35. Two alternative types of sealant, Bostik and Peratol, were used for sealing the pressure cabin during manufacture, but on repair or pressure leak rectification, Bostick only is to be used. Full particulars of Bostik sealing compound for repairing damaged sealing are given in A.P.1464B, Vol.1, Part 2, Sect.4, Chap.7, and details of the method of application are given in A.P.101B-0400-6, Part 1, Chap.2.

Emergency release cables

36. The barrel on the pressure bulkhead through which the alighting gear and bomb doors emergency release cables pass, houses seven felt washers, which are impregnated on assembly with anti-freeze oil. If either emergency control has been operated, remove the circlip on the front of the barrel and fully impregnate the sealing washers with oil, OX-14. Replace the circlip.

Constant-flow valve

37. This valve is set by the manufacturers and the only servicing permitted is the removal of the filter for cleaning. This is accessible when the knurled end cap has been unscrewed and the end plate, together with its asbestos washer, removed.

Pressure controller and combined-valve unit

38. Refer to the relevant Air Publications as detailed in Table 1 or 2.

WARNING

Particular care must be taken to ensure that the gauze inlet filter of the combined valve unit is kept clean. Failure to do so may result in serious damage to the pressure cabin and the mechanism of the combined valve unit.

Cold-air unit (post Mod.5 or 2523)

39. Instructions for filling and topping up the oil level are given in Sect.2, Chap.2. For further information refer to the relevant Air Publication as detailed in Table 2.

Mixing valve

40. Refer to the relevant Air Publication as detailed in Table 1 or 2.

REMOVAL AND ASSEMBLY

General information

41. The following paragraphs detail the recommended methods of removing certain components from the pre and post Mod.5 or 2523 systems. Generally the assembly sequence is the reverse of the removal, but where there are special assembly features they are specifically mentioned. Items which are not common to both the pre and post Mod.5 or 2523 systems are given separate paragraphs. The following notes must be observed when recoupling pipes and reassembling lagging:-

Notes...

1. With the exception of SILASTIC hose joints, the standard procedure for remaking hose joints must be adopted (A.P.101A-0300-1A). To remake the SILASTIC hose joints, proceed as follows:-

(a) Renew the SILASTIC hose.

(b) Ensure that the gap between the ends of the pipes to be connected is between 0.10 in. and 0.50 in.

(c) Fit the hose clips using clamping rings (Pt.No.EEAS.66/14) beneath each clip.

(d) Fully tighten the hose clips and ensure that the gap between the ends of the clamping ring beneath each clip is between 0.05 in. and 0.07 in.

2. Whenever box type lagging is removed, care must be taken on reassembly that the jubilee clips securing the lagging are not overtightened to the extent of collapsing the lagging. It is considered satisfactory that the clips are tightened to the stage where they can just be moved by hand.

3. To prevent seizure of metal-to-metal couplings molybdenum disulphide anti-seize compound (ZX-38) must be applied to the threads of the unions on reassembly.

◄ 4. To avoid distress or discomfort to the crew from objectionable odours generated in the system and transmitted to the cabin, the following precautions are to be taken:-

(a) When pipes or ducts are disconnected they are to be blanked off to exclude foreign matter.

(b) Replacement non-metallic pipes must bear a red rectangle. Whenever a new pipe is to be fitted, it is first to be blown through with hot air from a non-toxic heater for a minimum period of 30 minutes at a temperature of 85 deg C. During this time the pipe is to be checked for odours and rigidity, any pipe which softens or continues to generate odours after this period is to be rejected and reported defective.

(c) New components and metallic pipes fitted to the system must be thoroughly degreased if they carry cabin air through ducts or apertures or can contaminate the system in any way.

(d) When any part of the system has been disturbed, a check, with engines running, is to be made to ensure that the system is functioning satisfactorily, does not leak, and with full cabin heat selected does not give off odours. ►

Constant-flow valve
Pre Mod.5 or 2523

42.

(1) Remove the outboard access panel from the upper surface of the port main plane inner wing leading edge (Sect.2, Chap.4).

(2) Slacken the jubilee clips around the rubber jointing piece connecting the valve to the inlet of the mixing valve.

(3) Disconnect the supply pipe at the inlet port of the valve.

(4) Remove the 2 B.A. bolts attaching the upper mounting bracket to rib.3.

(5) Remove the 2 B.A. bolts securing the semi-circular retaining clip at the lower part of the valve body, and remove the clip. Remove both valve and mounting bracket together.

(6) Remove the bolts attaching the valve to the bracket and remove the bracket.

Post Mod.5 or 2523

43.

(1) Remove the access panels from the upper surface of the port main plane inner wing leading-edge (Sect.2, Chap.4).

(2) Disconnect the clamping ring on the outlet pipe inboard of rib 2.

(3) Disconnect the supply pipe at the inlet port of the valve.

(4) Release the two jubilee clips securing the valve to the mounting bracket and remove the valve.

Mixing valve actuator
Removal (pre and post Mod.5 or 2523)

44.

(1) Remove the outboard access panel from the upper surface of the port main plane inner wing leading-edge (Sect.2, Chap.4).

continued

(2) Disconnect any electrical supply.

(3) Remove the Plessey plug from the actuator socket.

(4) Remove the nuts and spring washers from the attachment studs on the mixing valve and remove the actuator.

Assembly (pre Mod.5 or 2523) (fig.7)
45.
(1) Turn the mixing valve to either the fully HOT or fully COLD position.

(2) Offer up the actuator to the mixing valve ensuring that the drive shaft engages correctly with the slot in the mounting flange.

(3) Fit and tighten the 2 B.A. nuts and spring washers.

(4) Test the operation of the assembly *(para.33).*

◀ *Assembly (post Mod.5 or 2523) (fig.8)* ▶
46.
(1) Turn the actuator shaft to the full extent of its travel in an anti-clockwise direction, when viewed looking into the actuator from the drive end.

(2) Turn the mixing valve drive shaft clockwise so that the master slot on the drive shaft attains a position relative to the master slot in the actuator drive shaft.

(3) Offer up the actuator to the mixing valve ensuring that the master spline engages with the master slot.

Note . . .
It may be necessary to operate the follower lever slightly to achieve engagement.

(4) Fit and tighten the four 2 B.A. nuts, plain and spring washers, securing the actuator to the attachment studs on the mixing valve.

(5) Test the operation of the assembly *(para.33).*

Mixing valve (pre Mod.5 or 2523)
Removal
47.
(1) Remove the access panels from the upper surface of the port main plane inner wing leading-edge *(Sect.2, Chap.4).*

(2) Remove the actuator *(para.44).*

(3) Slacken the Jubilee clips around the rubber hose joints at each of the following connections:-

(a) Mixing valve to cooler.

(b) Mixing valve to spill duct.

(c) Mixing valve to cold-air inlet.

(d) Mixing valve to constant-flow valve.

(e) Mixing valve to cabin air supply duct.

(4) Disconnect the electrical cables from the Desynn transmitter.

(5) Remove the nuts and washers from the four studs attaching the mixing valve to the mounting bracket on the forward face of the wheel well diaphragm.

(6) Remove the nuts and washers from the studs attaching the mixing valve to the mounting bracket on rib 2, and remove the valve.

(7) Securely blank off all pipe opening and valve apertures.

Assembly
48.
(1) Remove all blanking caps.

(2) Fit the mixing valve to the mounting bracket attachment studs on rib 2, fit and tighten the washers and nuts.

(3) Fit and tighten the four washers and nuts to the attachment studs on the mounting bracket on the forward face of the wheel well diaphragm.

(4) Slide over the rubber hose joints and tighten the Jubilee clips at the following ports:-

(a) Valve to cabin air supply duct.

(b) Valve to constant-flow valve.

(c) Valve to cold air inlet duct.

(d) Valve to spill duct.

(e) Valve to cooler.

(5) Refit the actuator *(para.45).*

(6) Reconnect the electrical cables to the Desynn transmitter.

(7) Test the operation of the assembly *(para.33).*

Mixing valve (post Mod.5 or 2523)

Removal

49.

(1) Remove the access panels from the upper surface of the port inner wing leading-edge *(Sect.2, Chap.4).*

(2) Remove the actuator *(para.44).*

(3) Remove the split pin, steel pin and washer connecting the link arm to the Desynn transmitter.

(4) Slacken the clamping rings at each of the following connections:-

(a) Mixing valve to primary cooler.

(b) Mixing valve to engine compressors.

(c) Mixing valve to cold-air unit.

(d) Mixing valve to constant-flow valve.

(5) Remove the six 2 B.A. nuts and bolts attaching the mixing valve to the mounting bracket on the forward face of the undercarriage well diaphragm, and remove the valve.

(6) Securely blank off all pipe ends and valve apertures.

Assembly

50.

(1) Remove all blanking caps.

(2) Fit the valve to the mounting bracket on the forward face of the undercarriage well diaphragm, and fit and tighten the six 2 B.A. nuts, bolts, plain and spring washers.

(3) Fit and tighten the clamping rings connecting the pipes to the valve at the following ports:-

(a) Valve to primary cooler.

(b) Valve to engine compressors.

(c) Valve to cold-air unit.

(d) Valve to constant-flow valve.

(4) Fit the actuator *(para.46).*

(5) Set the mixing valve follower lever at its mid-position (i.e. 30 deg from either end of full travel).

(6) Set the adjustable Desynn transmitter lever at its mid-position (i.e. 30 deg from either end of full travel).

Note . . .

The lever should initially be set at 2.0 in. from the centre of the shaft to the connecting pin centre.

(7) Connect the two levers without disturbing the setting, by fitting the adjustable tie-rod. If adjustment is necessary to fit the tie-rod, ensure that both the mixing valve follower lever and the Desynn transmitter operating lever have full 60 deg travel, i.e. 30 deg either side of the mid-position after adjustment has been made.

(8) Fit the steel pins, washers and split pins, and lock all adjustment points.

(9) Test the operation of the assembly *(para.33).*

Desynn transmitter (pre Mod.5 or 2523)

Removal

51.

(1) Disconnect the electrical cables from the transmitter.

(2) Remove the four nuts and washers securing the transmitter to the mixing valve and remove the transmitter.

Assembly (fig.7)

Note . . .

When assembling a new Desynn transmitter, remove the nut and adjustable link from the driving shaft and fit the stop Pt. No.EA1.75.245.

52.

(1) Turn the mixing valve until the barrel stop pin is at the end of its slot.

(2) Turn the transmitter until its slot is in line with the barrel stop.

(3) Fit the transmitter over its attachment studs on the mixing valve, and engage the tongue of the transmitter shaft in the slot of the mixing valve.

(4) Fit and tighten the four securing washers and nuts.

(5) Test the assembly manually for correct operation.

(6) Reconnect the electrical leads to the transmitter and functionally test *(para.33).*

Desynn transmitter (post Mod.5 or 2523)

Removal

53.

(1) Disconnect the electrical cables from the transmitter.

(2) Remove the pin and disconnect the adjustable tie-rod from the transmitter lever.

(3) Remove the four bolts attaching the transmitter to its bracket and remove the transmitter.

Assembly

54.

(1) Fit the transmitter to its mounting bracket and tighten the four attachment bolts.

(2) Reconnect the transmitter lever to the adjustable tie-rod and set and adjust the levers as described in para.50.

(3) Reconnect the electrical cables to the transmitter.

(4) Functionally test the assembly *(para.33).*

Air cooler (pre Mod.5 or 2523)

55.

(1) Remove the two access panels from the upper surface of the port main plane inner wing leading edge *(Sect.2, Chap.4).*

(2) Slacken the Jubilee clips from around the rubber hose joints on the inlet and outlet elbows of the cooler.

(3) Remove the 2B.A. countersunk screws attaching the cooler to the main plane leading edge.

(4) Remove the cooler.

Air coolers (post Mod.5 or 2523)

Primary air cooler

56.

(1) Remove the inboard access panel from the upper surface of the starboard main plane leading edge *(Sect.2, Chap.4).*

(2) Disconnect the supply pipes at the inlet and outlet ports of the cooler.

(3) Disconnect and remove the clamping rings at the inlet and outlet ducts of the cooler.

(4) Remove the bolt attaching the cooler to the top support bracket and remove the air cooler, by lifting clear of the two bottom locating brackets.

(5) Blank off pipe ends and component apertures.

Secondary air cooler

57.

(1) Remove the inboard access panel from upper surface of the port main plane leading edge *(Sect.2, Chap.4).*

(2) Disconnect the restrictor (pre Mod.1175) or the relief valve (post Mod.1175) at the junction on the compressor to cooler pipe.

(3) Disconnect the relief valve (post Mod.1175) to outlet duct clamp.

(4) Disconnect the supply pipes at the inlet and outlet ports of the cooler.

(5) Disconnect and remove the clamping rings at the inlet and outlet ducts of the cooler.

(6) Remove the bolt attaching the cooler to the top support bracket, and remove the cooler by lifting clear of the bottom support bracket.

(7) Blank off pipe ends and component apertures.

Cold-air unit (post Mod.5 or 2523)

Removal

58.

(1) Remove the access panels from the upper surface of the port main plane leading-edge *(Sect.2, Chap.4).*

(2) Remove the clamping rings at each of the following connections to the unit:-

(a) Unit to mixing valve.

(b) Unit to cabin delivery duct.

(c) Unit compressor to secondary cooler.

(d) Unit turbine to secondary cooler.

(3) Disconnect the oil breather pipe from the unit.

(4) Remove the 16 bolts, light alloy washers and double spring washers securing the unit to the mounting brackets and remove the unit.

(5) Securely blank off all pipe ends and unit apertures.

Oil priming and testing

59. To oil prime the cold-air unit, and test for oil leaks before installation:-

(1) Stand the unit on a bench with the rotor shaft horizontal, and the vent plug uppermost.

(2) Ensure that the dipstick is secure, then remove the breather and its washer from the top of the centre casing.

(3) Slowly pour approximately 85 cc of oil OEP.71 through the tapped hole in the centre casing from which the breather has been removed. Spin the turbine wheel in the normal direction of rotation.

Note . . .

Ensure that both the oil and oil container used are scrupulously clean.

(4) Allow the unit to stand for one hour with the rotor shaft horizontal, then examine the oil level dipstick and filler assembly banjo connection. If oil leakage has occurred, remake the banjo connection and repeat this test.

(5) After ascertaining that no oil leakage has occurred, drain the oil from the centre casing.

(6) Refit the breather, using a new joint washer, to the top of the centre casing. Wire-lock the banjo bolt and the breather.

Installation

60.

(1) Remove all blanking caps.

(2) Position the unit in the aircraft and fit and tighten the 16 bolts, light alloy washers Part No.SP.16/C, and double spring washers Part No.AGS.586/C.

(3) Make the connections between the unit and the following ducts:-

(a) Unit to mixing valve.

(b) Unit to cabin delivery duct.

(c) Unit compressor to secondary cooler.

(d) Unit turbine to secondary cooler.

(4) Ensure that each split clamp is tightened to give an equal gap on each side between the halves of the clamp.

(5) Reconnect the oil breather pipe to the unit and wire-lock.

(6) After installation, fill the unit with oil *(Sect.2, Chap.2).*

Note . . .

1. Owing to the speed at which the cold-air unit operates, gyroscopic forces are high, and the alignment of the unit in the aircraft is critical. It is essential that when the unit is refitted or replaced, the packings, if any, are replaced exactly as found on the original installation, and the unit is securely fitted.

2. When fitting a replacement unit it is essential that new banjo bolts and washers are fitted, or internal leakage of oil may ensue.

Pressure controller

61.

(1) Disconnect the pipe to the combined valve unit at the base of the unit.

(2) Disconnect the static pipe at the base of the unit.

◀ (3) Disconnect electrical cables from the unit *(A.P.101B-0402-1B, Sect.5, Chap.1, Group H).* ▶

(4) Remove the nuts and washers from the two bolts securing the unit to the aircraft structure.

(5) Blank off pipe ends and the unit apertures.

Assembly note . . .

When the assembly of the pressure controller is complete test the operation of the warning horn; pre Mod.4939 by carrying out the electrical test detailed in Sect.5, Chap.1, Group H, or post Mod.4939 by selecting the CABIN PRESS WARN HORN switch to its spring loaded TEST position.

Combined-valve unit

Removal

62.

(1) Remove the inlet grid of the unit on the forward face of the pressure bulkhead by turning it counter-clockwise and lifting it clear of the three special to-type bolts.

(2) Disconnect the pipe to the pressure controller at the banjo union, and remove the union by unscrewing the bolt.

(3) Remove the three special to-type bolts, and the eight ¼ in. B.S.F. bolts and washers securing the unit, and remove from the rear face of the pressure bulkhead.

Assembly

63.

(1) Remove the inlet grid from the valve unit by rotating it counter-clockwise, and lifting it clear of the three special-to-type bolts.

(2) Remove the three special to-type bolts and the banjo connection bolt containing the metering orifice, noting their respective positions.

(3) Offer up the combined-valve unit to the rear face of the pressure bulkhead, ensuring that the rubber sealing ring is fitted between the bulkhead and the valve unit, and that the metering orifice housing is in the 7 o'clock position when viewed from the cabin.

(4) Secure the unit to the bulkhead by fitting the three special to-type bolts, eight ¼ in. B.S.F. bolts, and the metering orifice banjo bolt, fitting both plain and spring washers. Ensure that the three bolts are in their correct positions as noted in Operation (2), and that the two washers are in their correct positions on the banjo bolt.

(5) Connect the pipe from the pressure controller to the banjo union and wire-lock the union. Check that all bolts are tight. Refit the inlet grid to the three special to-type bolts, by rotating the grid frame clockwise to the fullest extent of the keyhole slots.

(6) Test the pressure controller *(A.P.107B-1407-16).*

(7) Pressure test the cabin *(para.31).*

Relief valve (post Mod.5 or 2523 and 1175)

64.

(1) Remove the inboard access panel from the upper surface of the port main plane leading-edge *(Sect.2, Chap.4).*

(2) Remove the clamp from the forward end of the valve, and the Jubilee clip from the rear.

(3) Remove the two bolts securing the valve to the secondary cooler and remove the valve.

TABLE 1

List of principal components in the air conditioning system (pre Mod.5 or 2523)

Ref. No.	Component	Manufacturer and Part No.	A.P.	Sect.	Chapter
26FZ/2130	Mixing valve	B.A.C EA3.75.359	–	–	–
5W/52	Actuator	B.A.C. Type 203, Mk.3	4343D	16	13
26FZ/4623	Cooler	B.A.C EA1.75.7	–	–	–
27KD/5	Constant-flow valve	Normalair-Garrett 502090	107B-0911-16		
27KD/3	Pressure controller, Type A	Normalair-Garrett 500326	107B-1407-1		
27KD/2836	Combined-valve unit	Normalair-Garrett 527060	107B-1415-1		
6A/2133	Desynn transmitter		112G-0501-16		

TABLE 2

List of principal components in the air conditioning system (post Mod.5 or 2523)

Ref. No.	Component	Manufacturer and Part No.	A.P.	Sect.	Chapter
27UA/555	Water extractor	Godfrey, Type W.E.30, Mk.2B	107B-0522-1	–	
27KD/3	Pressure controller, Type A	Normalair-Garrett 500326	107B-1407-1		
27KD/2836	Combined-valve unit	Normalair-Garrett 527060	107B-1415-1		
27KD/7	Non-return valve	Normalair-Garrett 500457	107B-0905-16AD		
27UA/492	Primary cooler	Marston D106/8A	107B-0614-1		
27UA/491	Secondary cooler	Marston D106/6A	107B-0614-1		
27UA/4060	Cold-air unit	Godfrey A.C.R.E.9 Mk.10EX	107B-0142-1		
27V/4282	Hot-air (gate) valve	Teddington FKH/A/16	4303E	2	11
5W/4002	Hot-air (gate) valve actuator	B.A.C. Type 234	113E-0249-1		
27KD/5	Constant-flow valve	Normalair-Garrett 502090	107B-0911-16		
27V/4281	Mixing valve	Teddington FKH/A/15	4303E	2	11
5W/409	Actuator, mixing valve	B.A.C. Type 233	113E-0249-1		
6A/2133	Desynn transmitter	32 FL	112G-0501-16		
26FZ/12902	Pressure relief valve (post Mod.1175)	B.A.C. EB6.75.729	101B-0402-1		

Chapter 8B AIR VENTILATED SUIT SYSTEM (POST MOD.2717)

(completely revised)

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Introduction

1. Provision is made for air-ventilated suits at all three crew positions. This chapter describes and illustrates the system, gives details of servicing operations and recommends methods for the removal and assembly of certain components.

DESCRIPTION

General information

2. The air supply for the ventilated-suit system is taken from the air conditioning system pipeline between the primary air cooler and the two-way mixing valve *(Sect.3, Chap.8A)*. Additional air cooling takes place in the centre fuselage where the air cooling pipe is routed aft to the rear of the bomb bay, then forward along the port wall to the water extractor. Forward of the water extractor, the pipe is fed across the fuselage at frame 13 to the pressure reducing valve which is controlled by the ambient pressure in the lower equipment bay. The system air, at reduced pressure, passes through two non-return valves and the pressure bulkhead to serve each individually controlled crew member's station. A relief valve is located between the pressure reducing valve and the first non-return valve. The air-conditioning supply is only available if one or both engines are running. To enable the ventilated-suit system to be used while the aircraft is at rest, an external breakaway charging connection for a ground supply is provided between frames 12 and 13, entering the system between the non-return valves.

Water extractor

3. A water extractor, located between frames 19 and 20, ensures that the ventilated suits delivery air is free from moisture. The separated moisture is drained to atmosphere through a vent pipe. The water extractor is fully described in A.P.107B-0515-16.

Pressure-reducing valve

4. The pressure-reducing valve receives the system air at approximately 90 lb/in^2 and maintains a delivery pressure of 12 lb/in^2 at all cabin pressures and altitudes. The valve is controlled by the ambient pressure in the lower equipment bay.

Relief valve

5. A relief valve in the pipeline between the pressure reducing valve and the non-return valves prevents excessive pressure when air is supplied from the air-conditioning system. The valve opens at pressures in excess of 8 lb/in^2 resulting from all three crew control valves being closed or failure of the pressure reducing valve.

Non-return valves

6. A non-return valve is fitted between the relief valve and the T-union for the breakaway charging connection and ensures, when a ground supply is attached, that the air is fed directly to the crew stations. A second non-return valve is fitted between the T-union and the pressure bulkhead connection to ensure that the cabin pressure is not lost when the suits are not in use and the control valves are ON.

Air supply

External

7. A breakaway charging connector is fitted on the starboard fuselage between frames 12 and 13 and provides for ground supply air to be fed to the crew control valves when the engines are not running. The connection is sealed when the ground supply pipe is disconnected. Ground supply cooling air may be fed from either:-

(1) Air-compressor trolley, Type L, Ref.No.4F/4229212.

(2) One or more 15,000 litre air bottles charged to 3500 lb/in^2 with dry air. The air is to be fed through a suitable arrangement of reducing valves to reduce the pressure to 8 lb/in^2.

Note. . .

The flexible hose connecting the external air supply to the aircraft must be fitted with a Normalair connector, Pt.No.512080.

Internal

8. With the ground supply disconnected and one or both engines running, cooling air is controlled by fully selecting COLD on the cabin heat control switch *(Sect.3, Chap.8A)*. When taxying the cooling effect attains its maximum efficiency with one or both engines running at 5000 rev/min. When stationary the engine(s) must not exceed 5000 rev/min with the COLD selection, made for a maximum period of 10 minutes.

Control valves

9. Three control valves are fitted in the pressure cabin, one adjacent to each crew member's seat. Each valve gives independent control of cool air to the respective suit.

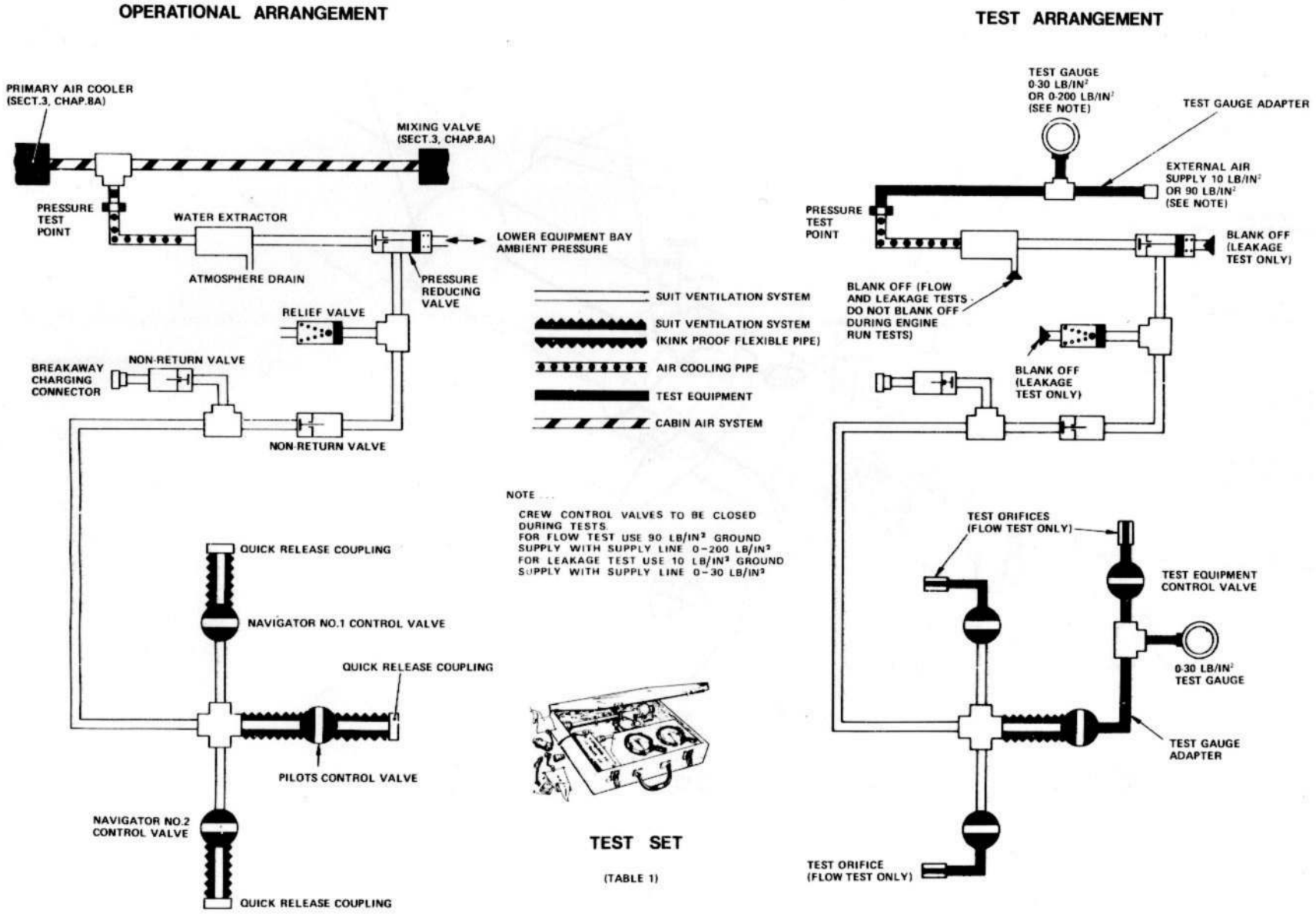

FIG. 1. VENTILATED SUIT SYSTEM

◀ *(Note Amended)* ▶

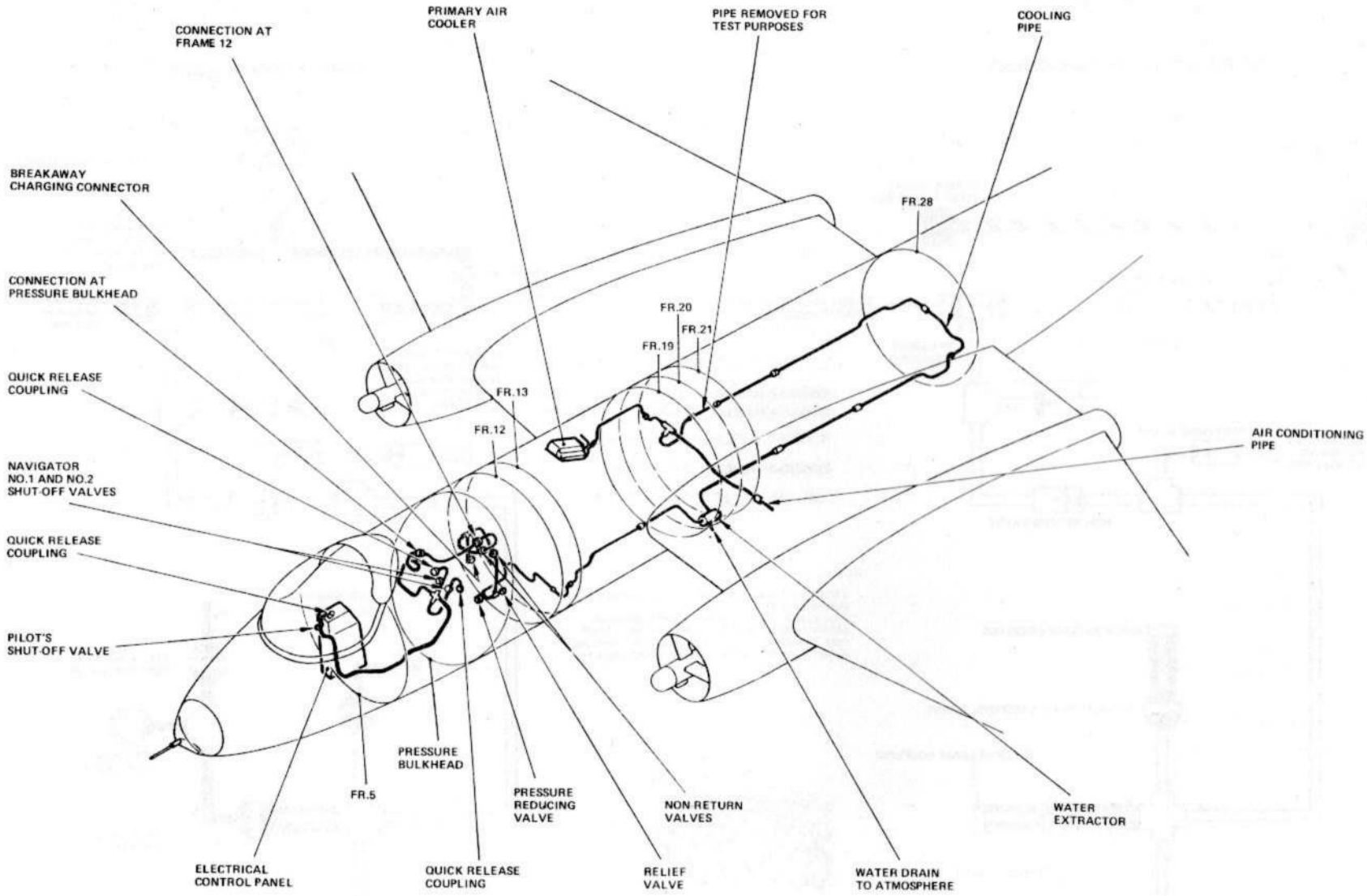

FIG. 2. VENTILATED SUIT SYSTEM - LOCATION OF COMPONENTS

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations on the aircraft.

Test set *(fig.1)*

10. A test set *(Sect.2, Chap.4, Table 1)* contains in its case the items detailed in Table 1 which are used to carry out the leakage and flow tests.

Leakage test

11. Prepare and test the ventilated-suit system for leaks as follows:-

Note. . .

The test equipment required is contained in the test set (Table 1), and the arrangement is functionally shown in fig.1.

(1) Disconnect and remove part of the air cooling pipe from the T-union with the air-conditioning system, in the bomb bay aft of frame 20, to the pressure test point.

(2) Connect the test gauge adapter Pt.No.EA3.88.5069, and the 0-30 lb/in^2 test gauge to the pressure test point.

(3) Connect a source of clean dry air, capable of supplying 10 lb/in^2, to the test adapter.

(4) Blank off the water extractor drain using blanking plug assembly Pt.No.EA3.88.5061.

(5) Remove the reducing valve vent filter in the lower equipment bay pressure line and blank off the vent using blanking plug assembly, Pt.No. EA3.88.5059.

(6) Blank off the relief valve outlet using blanking plug assembly Pt.No. EA3.88.5063.

(7) Ensure the three crew control valves are closed.

(8) Pressurize the system to 8 lb/in^2 and turn off the air supply.

CAUTION

Care must be taken to restrict the supply pressure to 8 lb/in^2, as high pressure will damage the 0-30 lb/in^2 test gauge.

TABLE 1

Test set components (fig.1)

Item No.	Pt. No.	Description	No. off	Application
1	EA3.88.5057	Test orifice	3	
2	EA3.88.5059	Blanking plug assembly	1	Pressure reducing valve
3	EA3.88.5061	Blanking plug assembly	1	Water extractor
4	EA3.88.5063	Blanking plug assembly	1	Pressure relief valve
5	EA3.88.5069	Test gauge adapter	1	
6	EA3.88.5077	Test gauge adapter	1	
7	–	Test gauge, 0-30 lb/in^2	1	
8	–	Test gauge, 0-200 lb/in^2	1	

◀ (9) Check all pipelines and components for leaks using a soap solution (A.P.105C-0001-5F).

Note. . .

If a leak is found it is generally caused by dirt on the nipple or branch mating face; this is remedied by cleaning and degreasing the faulty fitting. If the leak persists renew the fitting.

(10) Upon satisfactory completion of (9) all traces of the soap solution are to be removed.

(11) Repeat (8); over five minutes the maximum permissible pressure drop is 5 lb/in^2. ▶

(12) Release pressure via a control valve. Remove the blanking plug assemblies from the water extractor drain, the relief valve outlet and the reducing valve vent; refit the reducing valve vent filter.

(13) Remove the test gauge and adapter. Refit the removed portion of the air cooling pipe. Return the test equipment to the carrying case.

Flow tests

External air

12. Flow test the ventilated-suit system with an external air supply as follows:-

Note. . .

The test equipment required is contained in the test set (Table 1), and the arrangement is functionally shown in fig.1.

(1) Disconnect and remove part of the air cooling pipe from the T-union with the air-conditioning system in the bomb bay aft of frame 20, to the pressure test point.

(2) Connect the test gauge adapter, Pt.No.EA3.88.5069, and the 0-200 lb/in^2 test gauge to the pressure test point.

(3) Connect a source of clean dry air, capable of supplying 90 lb/in^2, to the test adapter.

(4) Blank off the water extractor drain using blanking plug assembly, Pt.No.EA3.88.5061.

(5) Remove the pilot's flexible pipe from the control valve.

(6) Connect the test gauge adapter, Pt.No.EA3.88.5077, and the 0-30 lb/in^2 test gauge to the pilot's control valve.

(7) Ensure the three crew control valves are closed.

(8) Pressurize the system to 90 lb/in^2 registered on the 0-200 lb/in^2 test gauge.

(9) Ensure that all joints and pipelines up to the pressure reducing valve are leak tight.

(10) Open the pilot's control valve and the test equipment control valve.

(11) Ensure that, with the pressure reducing valve datum pressure outlet suddenly blanked off, the pressure shown on the 0-30 lb/in^2 test gauge does not exceed 8 lb/in^2. If a greater pressure than 8 lb/in^2 is reached, the relief valve is suspect.

(12) Shut off the ground air supply and disconnect from the test gauge adapter. Remove the test gauge and adapter from the system supply line. Refit the removed portion of the air cooling pipe.

(13) Remove the blanking plug assembly from the water extractor drain.

(14) Remove the test gauge adapter and test gauge from the pilot's control valve, refit the pilot's flexible pipe.

(15) Close the pilot's control valve. Return the test equipment to the carrying case.

Internal air

13. Flow test the ventilated-suit system, with one or both engines running, as follows:-

Note. . .

1. *The test equipment required is contained in the test set (Table 1), and the arrangement is functionally shown in fig.1.*

2. *Do not blank off the water extractor drain.*

(1) Ensure the three crew control valves are closed.

(2) Remove the 1st and 2nd navigator's flexible pipes. Fit a test orifice, Pt.No.EA3.88.5057, to the 1st navigator's control valve. Set up test equipment at the pilot's control valve as 12(5) and (6). Fit a test orifice to the test equipment control valve.

(3) Open the 1st navigator's, the pilot's and the test equipment control valves. Ensure that the pressure shown on the 0-30 lb/in^2 test gauge does not fall below the following:-

(a) 2.0 lb/in^2 with the engine(s) running at 5500 rev/min.

(b) 2.5 lb/in^2 with the engine(s) running at 7400 rev/min.

(4) Close the 1st navigator's control valve and ensure that the test gauge pressure does not rise above 5.5 lb/in^2.

(5) Close the pilot's and the test equipment control valves. Transfer the test equipment to the 1st navigator's control valve, and the test orifice to the pilot's control valve.

(6) Repeat (3).

(7) Close the pilot's control valve and ensure that the test gauge pressure does not rise above 5.5 lb/in^2.

(8) Close the 1st navigator's and the test equipment control valves. Transfer the test equipment to the 2nd navigator's control valve.

(9) Open the 2nd navigator's, the pilot's and the test equipment control valves. Proceed as (3) but leave the 1st navigator's control valve closed.

(10) Repeat (7).

(11) Close the 2nd navigator's and the test equipment control valves. Return the test equipment to the carrying case. Refit the three flexible pipes.

CAUTION

Ensure that no test orifices are left in the test positions, the three orifices provided must be in the stowage, in the test set.

Note. . .

The results of the proceeding tests must be the same with or without the cabin pressurized.

REMOVAL AND ASSEMBLY

General information

14. In the following paragraphs only the removal sequence is detailed since assembly is a reversal of the removal sequence. Any special assembly instructions are noted.

Water extractor and vent pipe

15. Remove the water extractor and vent pipe as follows:-

(1) Open and lock the bomb bay doors *(Sect.3, Chap.1)*.

(2) Disconnect the air feed and outlet pipes by slackening off their respective outer sleeves. Retain the inner nipples.

(3) Disconnect the vent pipe by slackening off the outer sleeve attaching the pipe to the vent connection in the fuselage skin.

(4) Release the body of the extractor by removing the bolts securing the retaining strap to the bracket, the bolts screw into anchor nuts.

(5) Blank off the exposed pipe ends.

Breakaway charging connection

16. Remove the charging connection as follows:-

(1) Open the access door in the lower starboard side of the fuselage between frames 12 and 13.

(2) Disconnect the pipe from the body of the connection and from the T-union in the supply line. Retain the inner nipple.

(3) Remove the four 2 B.A. screws adjacent to the connection aperture in the fuselage skin.

(4) Remove the charging connection from the aircraft. Retain the packing from between the fuselage skin and the connection.

Pressure-reducing valve

17. Remove the pressure-reducing valve as follows:-

(1) Open the access door in the lower starboard side of the fuselage between frames 12 and 13.

(2) Disconnect the two pressure pipes from the valve body by releasing their respective outer sleeves. Retain the inner nipples.

(3) Remove the 2 B.A. stiffnuts, washers and bolts securing the fairlead to frame 12B flange. Retain the fairlead.

(4) Blank off the exposed pipe ends.

(5) Remove the valve and both halves of the fairlead from the aircraft.

Pressure-relief valve

18. Remove the pressure-relief valve as follows:-

(1) Open the access door in the lower starboard fuselage between frames 12 and 13.

(2) Disconnect the two pressure pipes from the mounting block by releasing their respective outer sleeves. Retain the inner nipples.

(3) Remove the 2 B.A. bolts and washers securing the mounting block to the bracket. These bolts screw into anchor nuts.

(4) Blank off the exposed pipe ends.

(5) Remove the mounting block and relief valve from the aircraft.

(6) Remove the relief valve from the mounting block.

Note. . .

When the relief valve and mounting block are fitted into the aircraft, a minimum clearance of 0.05 in. must be maintained between the head of the relief valve and frame 13.

TABLE 2

Equipment details

Ref. No.	Component	Description	Qty.	A.P. Reference
27KD/969	Charging connector	Normalair 512070	1	107B-1111-16
27VA/6330	Socket - quick release	Dunlop ACO.23654	3	108F-0503-1
27KD/989	Control valve	Normalair 513390	3	107B-1027-16
27FR/30869	Non-return valve	Flight refuelling 9811125/H	2	◄ 106D-100A-1 ►
27UB/5761	Pressure relief valve	Hymatic RAV.158/002	1	105C-05148-1
27UB/5732	Reducing valve	Hymatic PAS.148-094	1	105C-0546-16
27UA/1952	Water extractor	Godfrey Type W.E.5	1	107B-0523-1

Chapter 8C DE-MISTING SYSTEM

(completely revised)

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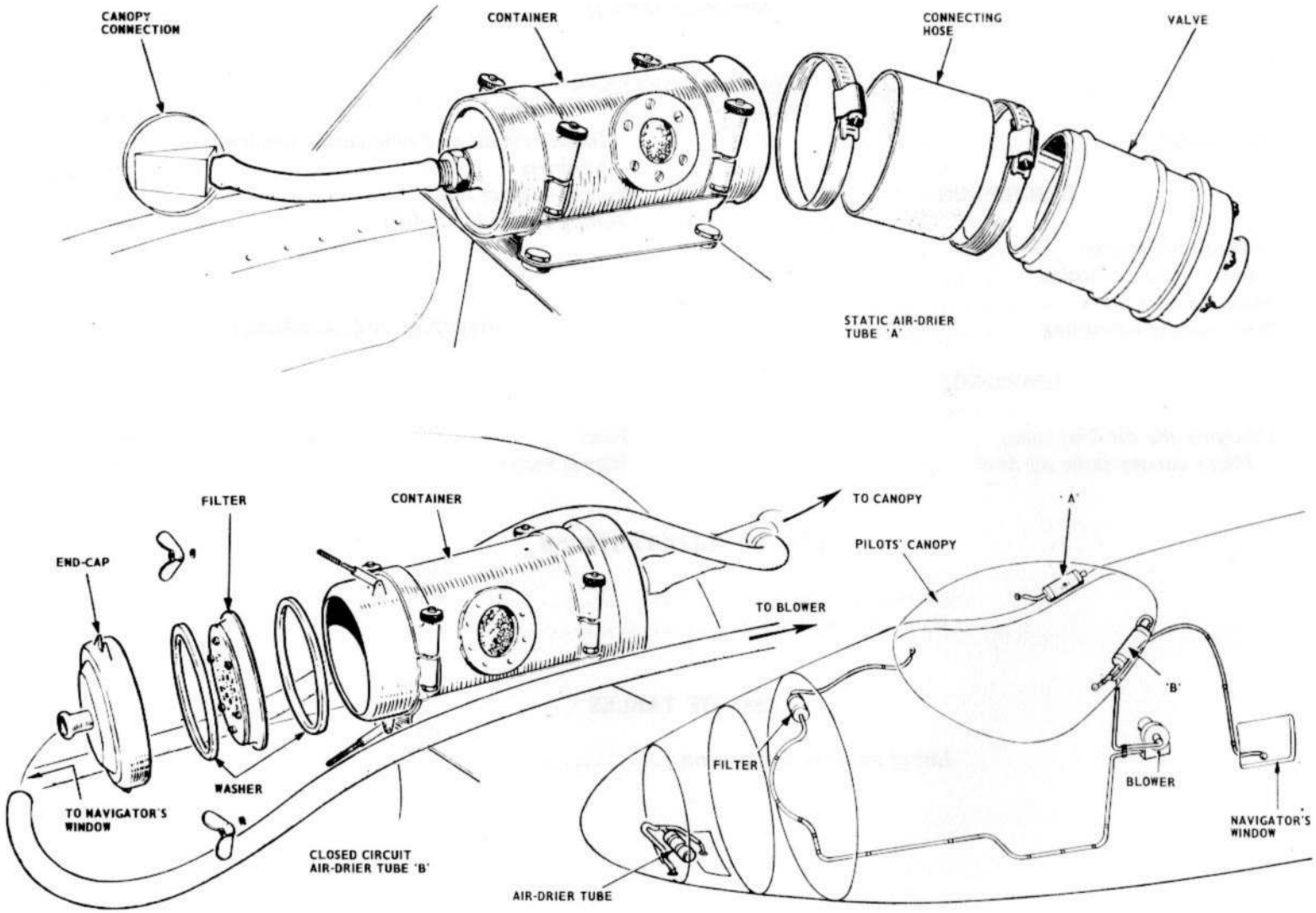

FIG.1. DE-MISTING SYSTEM

Introduction

1. The purpose of the de-misting system is to prevent the formation of condensation within the interspaces of the transparent fairings. This chapter describes and illustrates the system, gives details of servicing operations, and recommends methods for the removal and assembly of certain components. The location of the de-misting units is illustrated in fig.1.

2. Details of the de-misting system components are given in Table 1.

TABLE 1

List of principal components

Ref.No.	Description	System
5UD/3310	Blower unit	Canopy
26FZ/2146	Closed circuit air-drier	Canopy
26FZ/1815	Filter	Canopy
26FZ/2841	Static air-drier	Canopy
26FZ/1374	Closed circuit air-drier	Nose
◀DTD818L3	Silicone rubber hose	Canopy▶

DESCRIPTION

General information *(fig.1)*

3. The pilot's canopy, the transparent nose fairing, the observation window and the navigator's window are all provided with dry-air de-misting. Three air-driers are utilized, one of which is connected in a system providing for an initial circulation of air through the pilot's canopy; this air-drier is also connected to the navigator's window, but since there is no feed back to this window, its role in this respect is purely static. Of the two remaining driers, one is connected to the pilot's canopy, in addition to that in the circulatory system, and the other is connected to the nose fairing and nose observation window, the role of these two tubes is static.

Closed circuit de-misting

4. The air-drier tube for the circulatory system is connected to the inner sheet of the canopy, on the port side, by a rubber tube with a slip-on connection. It is part of a system forming a closed circuit which ensures that the air initially contained in the canopy cavity is extracted, dried and returned to the canopy. This is accomplished by a small electrically driven blower which draws air from the canopy, through the air-drier tube and returns it through a filter and slip-on rubber tube to a connection on the inner sheet of the canopy, at the centre front. The navigator's window is connected to the suction side of the system but there is no feedback when the blower is running. The drier tube is mounted on the canopy coaming and is charged with silica-gel. The blower is mounted on a bracket at the front of the navigator's table and is controlled by the canopy de-misting switch on the pilot's console; the filter is mounted in the roof of the nose on fuselage frame 1.

Static air-drier tubes

5. The static air-drier tube connected to the canopy is fitted with inlet and outlet valves and its drying medium is silica gel. It is mounted on the canopy coaming cross-tube and connected to the inner sheet of the canopy on the starboard side. The air-drier tube for the nose fairing is not fitted with valves, and it is mounted just aft of the nose fairing, the drying medium in this tube is also silica gel. Both tubes are connected to their respective windows by rubber tubes, that at the canopy being a slip-on connection permitting the joint to be broken when the canopy is jettisoned; at all ◀other points the connections are clipped.▶

Inner surface de-misting

6. To prevent misting of the nose fairing and canopy inner surfaces, conditioning air is ducted from the cabin air system and delivered to these surfaces through diffusers *(Chap.8A)*. The canopy diffuser has a control valve located on the frame to port of the alighting gear control panel; the diffuser for the nose fairing is not controllable but delivers conditioned air to the inner surface simultaneously with the cabin air supply.

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Charging the air-drier tubes

Pilot's canopy static air-drier

7. The drier tube is fitted with a window through which the contents may be inspected; the contents should be changed, when they turn pink. To recharge:-

(1) Remove the blanking cap from the stowage on the canopy coaming, adjacent to the air-drier.

(2) Remove the air-drier connection tube at the canopy and seal the canopy connection by fitting the blanking cap.

(3) Release the mounting clips and remove the air-drier from the aircraft.

(4) Slacken the Jubilee clips securing the hose connecting the container to the valve body and withdraw the container.

(5) Empty the container and refill it with silica gel, Ref. No.33C/790.

(6) Refit the valve to the container and tighten the Jubilee clips around the connecting hose.

(7) Refit the air-drier into the aircraft and tighten the securing clips.

(8) Remove the blanking cap from the canopy connection and connect the air-drier to the canopy by sliding the rubber tube on to ◀the connection on the canopy; this connection is not clipped. ▶

(9) Refit the blanking cap on its stowage.

Blower circuit and observation window air-driers

8. These air-driers are each fitted with a tell-tale compartment incorporating a window through which the contents may be inspected. The tell-tale compartment and the main compartments are filled with silica gel. The contents of both the tell-tale and main compartments should be changed when the crystals visible through the inspection window, become pink coloured. To re-charge:-

(1) Pinch the rubber connecting tube with a clip to prevent air entering the cavity in the canopy or window, and in the case of the canopy air-drier, pinch also the tubes to the blower and navigator's window.

◀(2) Remove the clips securing the rubber tubes to the air-drier▶ and remove the tubes from the air-drier.

(3) Release the air-drier mounting clips and remove the air-drier from the aircraft.

(4) Remove the end cap, filter and sealing ring from the air-drier (the end cap is secured by wing nuts) and empty the main and tell-tale compartments.

(5) Fill the tell-tale and main compartment with silica gel, Ref.No.33C/790.

(6) Refit the filter, sealing ring and end cap to the air-drier body.

(7) Replace the air-drier into the aircraft and tighten the securing clips.

◀(8) Fit the rubber tubes to the air-drier and clip them securely.▶

(9) Remove the clips from the rubber connection tubes.

Note . . .

When refilling the air-driers a minimum amount of time should be taken in packing the crystals, as moisture from the air is absorbed by the crystals, so reducing the efficiency and life span of the component.

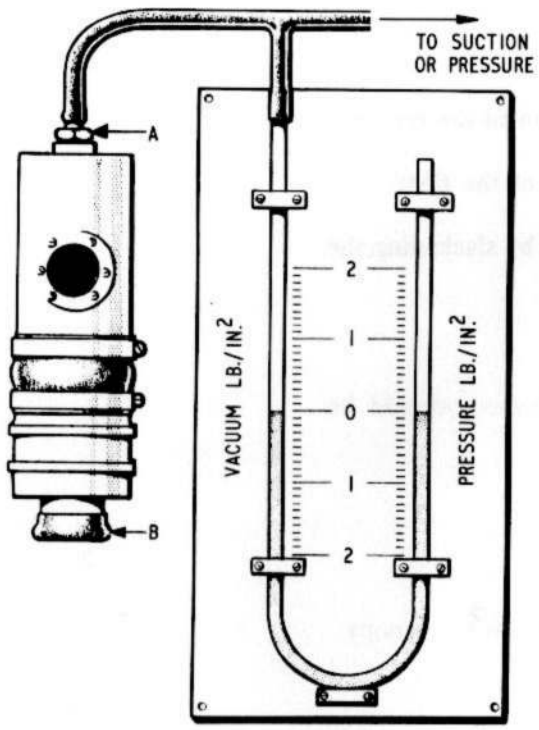

Fig.2. Static air-drier test rig

System leakage rate

9. With all system components assembled and connected together, a pressure drop from ½ lb/in², to ¼ lb/in² must not take less than 50 seconds.

Note . . .

The air supply used for this test must be clean and free from moisture.

Testing the static air-drier

10. The following equipment is required for testing the pilot's canopy static air-drier:-

(1) A test rig capable of applying an air pressure of 2 lb/in² and a suction of 0.6 lb/in².

(2) A 12 in. mercury U-tube.

11. Before testing the air-drier, it must be removed from the aircraft *(para.7, operation (1) to (3))*, then proceed as follows:

(1) Connect the air pressure pipe from the test rig to the canopy end (A) of the drier with the mercury tube interposed *(fig.2)*. Blank off the aperture (B) at the opposite end of the drier.

(2) Apply a pressure of 2 lb/in² and check that the complete assembly is airtight.

(3) Release the pressure and remove the blank from the end of the drier.

(4) Apply pressure and check that the outlet valve opens at 0.6 lb/in² but that it is airtight below 0.3 lb/in².

(5) Remove the pressure pipe and connect the suction pipe in its place.

(6) Apply suction and check that the inlet valve opens at 0.6 lb/in² but that it is airtight at 0.3 lb/in².

(7) Disconnect the test rig and refit the drier tube into the aircraft.

REMOVAL AND ASSEMBLY

Filter

12. To remove the element from the filter:-

(1) Pinch the rubber tube at the inlet connection to the canopy.

(2) Disconnect the rubber hose from the base of the filter.

(3) Release the filter base from the outer case by slackening the wing nut.

(4) Remove the filter element.

13. Before assembly, the ends of the filter element should be lightly greased with lanolin.

Blower motor

14. To remove the blower motor:-

(1) Pinch the rubber tube at the inlet connection to the canopy.

(2) Disconnect the electrical cable at the motor.

(3) Remove the four 6 B.A. bolts attaching the outlet connection to the blower and remove the outlet connection.

(4) Remove the 2 B.A. stiffnuts from the two studs holding the inlet connection and remove the inlet connection.

(5) Remove the 2 B.A. stiffnuts from the four bolts securing the attachment clip.

(6) Remove the attachment clip and the motor.

15. Before assembling the inlet and outlet connections to the blower, apply rubber-resin cement, Ref.No.33H/2245977, to their faces.

Chapter 10 OXYGEN SYSTEM

(completely revised)

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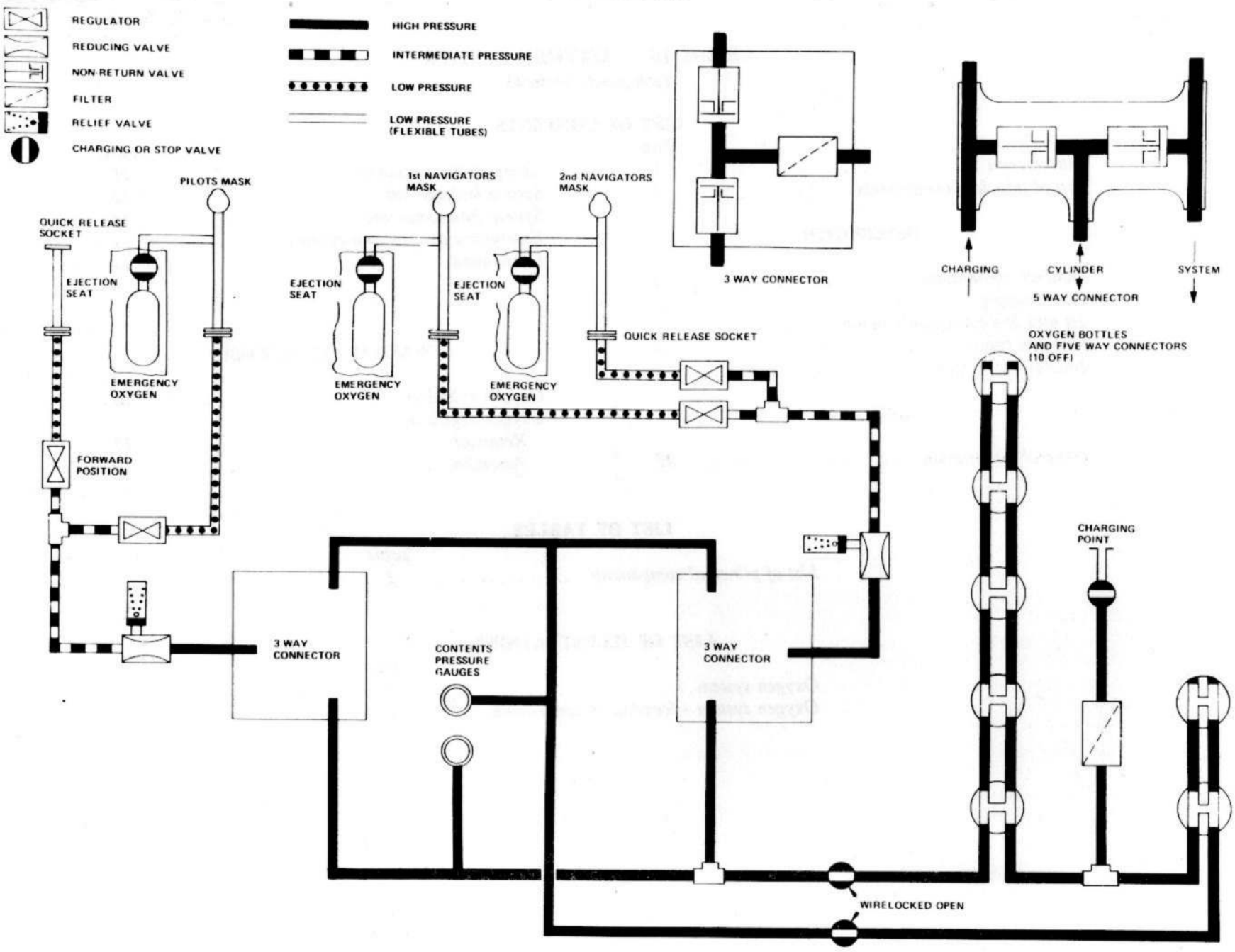

FIG. 1. OXYGEN SYSTEM

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WARNING

Oxygen and oil or grease unite explosively. When handling any equipment used in high pressure oxygen systems, keep all oil and grease from contact with the equipment. Failure to do this may result in loss of life and equipment.

Introduction

1. This chapter contains a description together with the servicing procedure and the method of removal and assembly of certain components of the oxygen system. The electrical services associated with the oxygen regulators are described in A.P.101B-0402-1B, Sect.5, Chap.1, Group W, and brief details of the regulators and pressure gauges are given in A.P.101B-0402-1B, Sect.5, Chap.2, Group D. A full description of the system components, the procedure for servicing them and the method of charging the cylinders are given in A.P.107D and 108F series.

List of principal components

2. A list of the principal components used in the system is given in Table 1.

DESCRIPTION

General information

3. Oxygen is carried in seven cylinders, two 2250 litres and five 750 litres, mounted in the compartment aft of the pressure bulkhead. Each cylinder is fitted with a five-way connection incorporating two non-return valves. In order to reduce vulnerability and as a safeguard against total loss of oxygen in the event of fracture of the supply lines the cylinders are grouped into two banks, isolated from each other and the high-pressure system is duplicated. A charging valve, with a filter in the charging line, is connected to all the cylinders enabling them to be charged in situ. The charging valve is located on the aft face of frame 12.

4. High pressure supply lines, one to each bank of cylinders, pass forward through the pressure bulkhead on the port and starboard sides, respectively, to stop valves located, one on the port wall of the navigator's station, and one on the forward face of the pressure bulkhead on the starboard side. From the stop valves the high pressure supply lines pass along the walls of the pressure cabin to a point forward of the pilot's instrument panels, where the port supply line passes across the cabin to join the starboard line. The supply lines are joined by a three-way connector housing a non-return valve in each of the connections to the supply lines, the third being connected to a pipe leading to a Mk.1 pressure-reducing valve, and housing a filter in the pipeline connection. Two pressure gauges, located above the entrance door, are connected into the supply lines, to register the pressure in each bank of oxygen cylinders. From the pressure reducing valve, which reduces the pressure to 400 lb/in^2, an intermediate-pressure supply line is connected to the pilot's pressure regulator mounted on the port wall of the cabin above the console and, through a three-way connection in the pipeline, to a pressure regulator on the starboard side of the 2nd navigator's forward station in the nose of the aircraft.

5. A pipeline passing across the cabin at the navigator's stations, joins the two supply lines on the port and starboard walls, respectively. At the 1st navigator's position, a three-way connector, housing two non-return valves and a filter, joins a pipeline to a Mk.1 reducing valve which, through intermediate pressure branch pipelines, supplies both navigator's oxygen regulators, mounted on the canopy coaming cross-tube and on the starboard wall of the cabin respectively.

◀ **Note. . .**

A label is fitted adjacent to the navigator's stop valve, stating that the valve must be left open. ▶

Pilot's supply

6. From the pilot's oxygen-regulator a low pressure pipe, terminating in a flanged connector, takes the supply to an attachment point on the starboard side of the ejection seat. The flexible tube from the pilot's face mask connects to a break point on the connector so that it will disengage when the seat is ejected.

1st and 2nd navigator's supply

7. From the navigator's oxygen regulators, the low pressure oxygen is fed to quick-release sockets which will disengage when the seats are ejected.

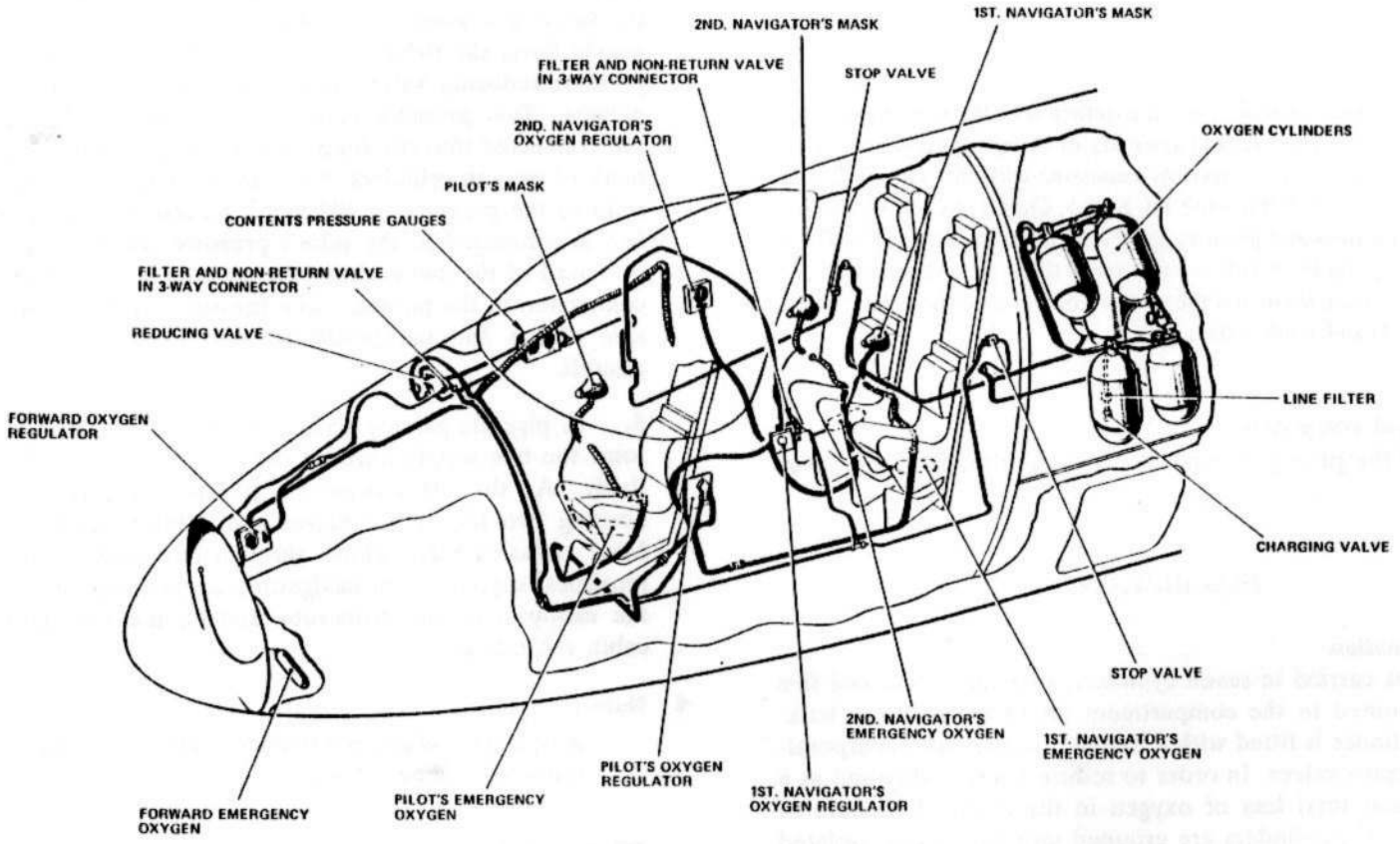

FIG. 2 OXYGEN SYSTEM - LOCATION OF COMPONENTS

Forward supply

8. From the oxygen regulator on the starboard side of the forward station a low-pressure line connects to a flexible tube, terminating in a quick-release socket. The tube passes aft and is stowed in a clip on the starboard side of the 2nd navigator's normal station. The arrangement of this and the normal supply enables the 2nd navigator to change over when preparing to move to his forward station, by disengaging the face mask flexible tube at the quick-release connection and connecting it to the alternative supply tube, which is of sufficient length to enable him to move freely to his forward station.

Emergency oxygen

9. Each crew member is provided with an emergency oxygen supply, from a cylinder attached to the starboard side of his ejection seat, for use when ejecting from the aircraft. This emergency supply may also be used in the event of failure of the main supply as instructed in Sect.1, Chap.3. At the forward station an emergency oxygen cylinder is provided to which the 2nd navigator may connect directly if required.

SERVICING

WARNING

Oxygen and oil or grease unite explosively. When handling any equipment used in high pressure oxygen systems, keep all oil and grease from contact with the equipment. Failure to do this may result in loss of life and equipment.

General information

10. The servicing necessary to maintain the system in an efficient working condition consists of keeping the installation free from oil, grease and moisture, checking that the cylinders are always fully charged, and testing for leaks at all joints. An examination of the system should also be made for signs of damage, and to ensure that components are securely mounted. Check that the flexible tubes are fitted securely and, at the pilot's station, check that the flexible tube is fully down to the flange at the ejector seat break-point. The standard serviceability and operational test of the components are fully described in A.P.107D-0201-1.

Charging the cylinders

11. Scrupulous cleanliness of all connections must be observed during charging operations. To charge the cylinders:—

(1) Remove the blanking cap from the oxygen charging valve on the aft face of frame 12 bulkhead.

(2) Connect a high pressure oxygen supply from an oxygen charging trolley and charge the cylinders to 1800 lb/in^2 in accordance with A.P.107D-0001-1.

Note. . .

Charge the cylinders to 2000 lb/in^2, on cooling the pressure will be approximately 1800 lb/in^2.

(3) When charging is completed, disconnect the charging trolley and replace the blanking cap on the charging valve.

System leakage test

12. To test the system for leaks:-

(1) Remove the wire-locking and switch the four oxygen regulators ON/OFF valves to OFF.

(2) Ensure there is between 1700 lb/in^2 and 1800 lb/in^2 pressure in the oxygen cylinders.

(3) Check that the stop valves on the pressure bulkhead are OPEN.

(4) Check all pipelines (3/16 in. copper and 5/16 in. L.A. piping) and components from the charging valve to the regulators for leaks, using a solution as instructed in A.P.107D-0001-1.

Note. . .

If a leak is found it is generally caused by dirt on the nipple or branch mating face; this is remedied by cleaning and degreasing the faulty fitting. If the leak persists, the fitting should be renewed.

(5) On completion of the tests all traces of the solution must be removed.

(6) Return the four regulators ON/OFF valves to ON and wire-lock using 28 s.w.g. copper enamelled wire, Ref.No.5E/9102399.

System functional test

13. To test the functioning of the system and system components:-

(1) Ensure there is between 1700 lb/in^2 and 1800 lb/in^2 pressure in the oxygen cylinders.

(2) Close both stop valves on the pressure bulkhead.

(3) Exhaust the cabin side of the system by depressing the valve in the free end of the pilot's flexible hose connection and operating the regulator EMERGENCY – PRESS TO TEST MASK switch.

(4) Open the stop valve on the port side of the pressure bulkhead. Pressure should read rapidly on rear contents gauge.

Note. . .

The forward contents gauge will record slowly due to leak past non-return valve in the starboard supply line.

(5) Close the stop valve on the port side of the pressure bulkhead.

(6) Exhaust cabin side of system as at operation (3).

(7) Open the stop valve on the starboard side of the pressure bulkhead. Pressure should read rapidly on the forward contents gauge.

Note. . .

The rear contents gauge will record slowly due to leak past the non-return valve in the port supply line.

(8) Open the stop valve on the port side of the pressure bulkhead.

(9) Ensure that the flexible hose is down to the flange at the ejection seat break-point.

Make the following checks at all four oxygen regulators.

(10) *Pressure reducing valve check.* Check that each regulator pressure gauge reads between 200 lb/in^2 and 400 lb/in^2.

Note. . .

If the pressure at the regulator is greater or less, the pressure reducing valve is suspect and should be tested as detailed in A.P.107D-0201-1.

(11) Test the oxygen regulator for internal leakage by removing the wire-locking and switching the ON/OFF valve to OFF and ensure that the pressure drop shown on the regulator gauge does not exceed 25 lb/in^2 in 60 seconds. Switch the regulator ON.

(12) Test the integrity of the low pressure pipe by setting the air inlet shutter to NORMAL, insert rubber stopper in mask socket connection, switch emergency toggle to left or right and switch the ON/OFF valve to OFF. Check time taken for the regulator pressure to drop to zero; this must not be less than 60 seconds.

(13) Ensure that the air inlet shutter is functioning correctly by selecting 100% OXYGEN with the ON/OFF valve set to OFF, suck gently through face mask. There should should be a considerable resistance to suction. Whilst still sucking move air inlet shutter to NORMAL; there should be no resistance to suction.

(14) Using a face mask make the following checks:-

(a) Switch the regulator ON/OFF valve to ON and the air inlet shutter to NORMAL, breathe normally, and ensure that with each inhalation the blinker indicator on the regulator face operates.

(b) Deflect the EMERGENCY toggle switch to the left and to the right and check that there is a continuous flow of oxygen. With the toggle switch in the central position, push the toggle switch downwards and verify that there is a continuous flow of oxygen at a much increased pressure. Insert a rubber stopper in the mask socket connection and with the toggle switch in each position (i.e. left, right and centre), check that the flow ceases and the blinker indicator returns to normal.

(15) On satisfactory completion of these tests wire-lock the stop valves on the pressure bulkhead in the fully OPEN position. Wire lock the regulator's ON/OFF valves ON using 28 s.w.g. copper enamelled wire Ref.No.5E/9102399.

Emergency oxygen control lever

14. The pull off load for the emergency oxygen control lever must not exceed 30 lb.

Lubrication

15. Refer to the WARNING preceding para.10. The authorized lubricant for use on the screw threads of the oxygen equipment is graphited lubricating fluid (ZX-32). No other lubricant may be used. Instructions for lubrication will be found in A.P.107D-0001-1.

REMOVAL AND ASSEMBLY

Oxygen cylinders

16. To remove an oxygen cylinder:-

(1) Remove the appropriate access panel *(Sect.2, Chap.4).*

(2) Remove the locking wire from the high-pressure stop valve in the supply line from the appropriate bank of cylinders, and fully close the valve.

(3) Unscrew the stop valve forward union, slowly open the stop valve, and allow the oxygen to escape.

(4) Disconnect the cylinder pipelines and blank off the exposed pipe-ends.

(5) Release the two cylinder retaining straps by unscrewing the two turnbuckles.

(6) Remove the cylinder from the compartment.

Oxygen regulator

Removal

17.

(1) Disconnect all electrical supplies.

(2) Disconnect the electrical plug from its socket at the rear of the unit.

(3) Uncouple, remove and blank off the oxygen supply and delivery pipes.

(4) Remove the four 2 B.A. securing screws and remove the regulator.

◄ **Note . . .**

After removal of the post mod. 3225 oxygen regulator, the protective guard must be removed and attached to the replacement regulator, prior to its installation. ►

Assembly

18.

(1) Position the regulator in its bracket and secure with the four 2 B.A. screws.

(2) Reconnect the oxygen supply and delivery pipes.

(3) Reconnect the electrical plug and socket.

(4) Functionally test the regulator and system *(para.13).*

(5) Reconnect the electrical supplies.

(6) Functionally test the regulator and system *(para.13 and A.P.107D-0201-1).*

(7) Carry out the electrical test *(A.P.101B-0402-1B, Sect.5, Chap.1, Grp.W)*

TABLE 1

List of Principal components

Ref. No.	Description	No. off per A/C	A.P. Reference
6D/9429900	Oxygen cylinder, 2250 litres	2	107D-0001-1
6D/9429896	Oxygen cylinder, 750 litres	5	
6D/2344	Pressure reducing valve, Mk. 1A	2	107D-0503-1
6D/1650	Flanged connector	3	107D-0400C-1
6D/2237	Oxygen contents gauge, Mk.4	2	107D-0305-1
6D/427	Non-return valve, Mk.1	4	107D-0001-1
6D/1652	Quick-release socket, Mk.9	3	107D-0400C-1
6D/1817	Quick-release socket, Mk.10A	1	
6D/2671	Oxygen regulator, Mk.17F	4	107D-0201-1
6D/574	Filter unit, Mk.1	1	
6D/575	Connection, 2	5	107D-0001-1
6D/603	Connection, 3 way	7	
6D/1698	Aerolex clip, Type D	3	
6D/1580	Flexible tubing, 6 ft	1	107D-0400A-1
6D/1579	Flexible tubing, 4 ft	3	
6D/1497	Union blank, Mk.3	5	107D-0001-1
6D/1644	Emergency oxygen set, Mk.2A	1	107D-1002-1
6D/2678	Emergency oxygen set, Mk.7J	3	
6D/2244774	Charging valve, Mk.1	1	
6D/2244775	Stop valve, Mk.1	2	

Chapter 11 EMERGENCY EQUIPMENT

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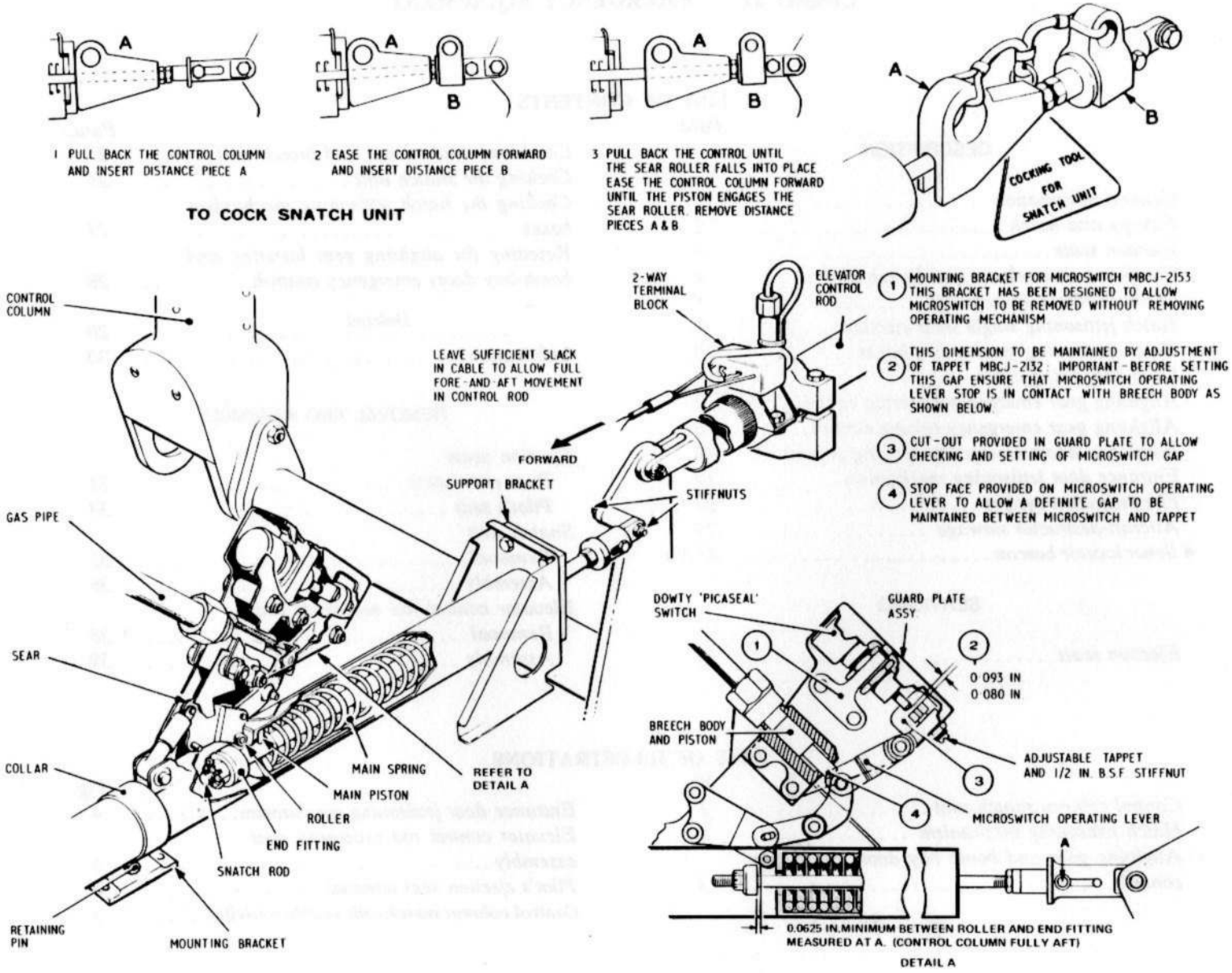


FIG. 1. CONTROL COLUMN SNATCH UNIT

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

DESCRIPTION

General information

1. The emergency equipment comprises: Martin Baker ejection seats, with 'single lever' facilities, for the pilot and rear crew, provision for emergency lowering and raising of the alighting gear, fire detection and extinguishing systems, an aircraft destructor and provisions for jettisoning the entrance door, canopy and rear crew hatch. Operating instructions are given in Sect.1, Chap.3.

Canopy and hatch

2. The pilot's canopy and the rear crew escape hatch are attached to the fuselage by bolts containing detonators; both are jettisonable by operation of the associated jettison switches.

Ejection seats

3. Type 2CA1 Mk.2 pilot, and Type 2CA2 Mk.4 rear crew, ejection seats are fitted. The seats are described in A.P.109B-0107-1.

Combined time-release and breech unit

4. This unit provides the power to operate the snatch unit and incorporates a time-delay mechanism which withdraws the sear from the seat ejection-gun approximately one second after the snatch unit gun has been fired. The snatch unit gun and the time-delay mechanism are contained in separate compartments within a casing bolted to the rear of the guide rail. At the base of the snatch unit gun is a threaded union which, together with a soft metal washer, forms a gas-tight connection with a pipe which communicates with the chamber of the piston valve assembly on the top of the snatch unit. For a description of the combined time-release and breech unit Pt.No.MBSJ/159 refer to A.P.109C-0201-1.

Control column snatch unit *(fig.1)*

5. This unit is located within the pilot's console on the port side of the cockpit and is connected to the elevator control lever. Its purpose is to move the control column forward and hold it against the instrument panel to provide an unobstructed exit for the pilot in his ejection seat when abandoning the aircraft. An explosive severance-unit, fitted around the elevator control rod aft of the control lever and fired prior to the operation of the snatch unit, severs the elevator control rod which nullifies the effect that movement of the control column, due to the action of the snatch unit, would otherwise have upon the flying attitude of the aircraft.

6. The unit consists of a tubular casing supported at the rear end by a bracket and attached at the forward end to the aircraft structure by a collar secured to a mounting bracket by a retaining pin and split pin. The tubular casing houses a hollow piston which, when the unit is cocked, holds the mainspring under compression against the closed rear end of the casing. The piston is retained in the cocked position by a sear, the roller of which projects through the wall of the tubular casing; the sear is spring-loaded in its cocked position by the sear return spring. A snatch rod passes through the rear-end casing, inside the mainspring and through the drilled head of the hollow piston, to terminate in a shouldered end-fitting carrying a rubber cushion. The other end of the rod is screwed into a slotted attachment fitting and locked by a locknut; the length of the snatch rod can be adjusted at this point. The end of the slotted attachment fitting is drilled and bushed to fit on to a shouldered stud fitted to the elevator control lever; the bush is radiused at one end and it is essential that this end faces the shouldered stud. The slot allows free movement of the snatch rod, and the rod, which is of sufficient length to allow full fore-and-aft movement of the control column, moves freely within the piston.

7. The snatch unit and the elevator control rod severance-unit detonator switch (which is mounted on a bracket secured to the snatch unit) are controlled by the ejection seat face-screen, or seat-pan firing handle. When either handle is operated a cartridge is fired in the combined time-release and breech unit *(para.4)* from which the resultant gas pressure is directed through a pipe to a

COCKING OF HATCH JETTISONING MECHANISM

1 INSERT COCKING LEVER INTO COCKING LINK APERTURE

2 MOVE COCKING LEVER TO STARBOARD AND ENGAGE ON LOCKING PEG.

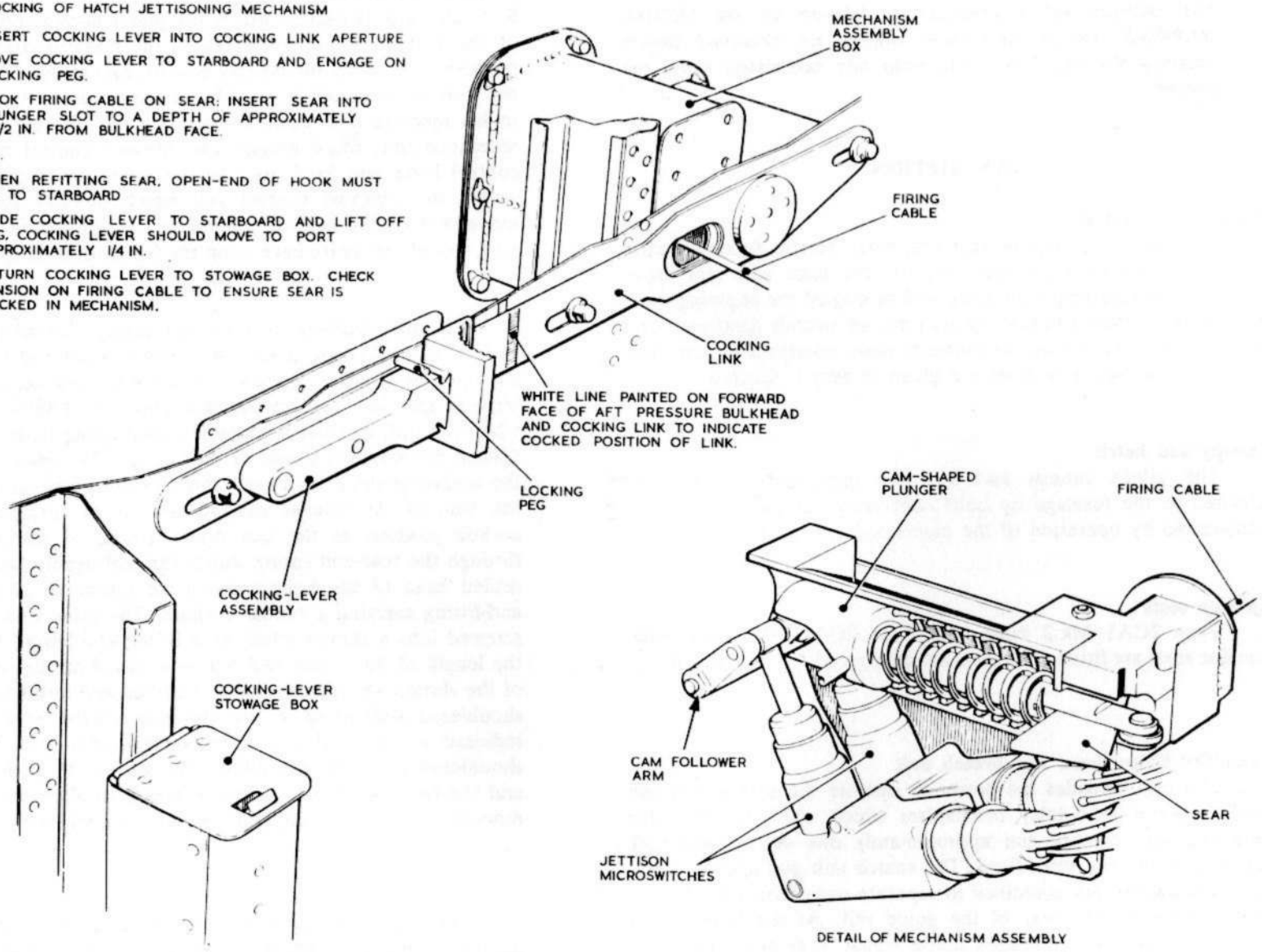
3 HOOK FIRING CABLE ON SEAR: INSERT SEAR INTO PLUNGER SLOT TO A DEPTH OF APPROXIMATELY 2 1/2 IN. FROM BULKHEAD FACE.

NOTE....

WHEN REFITTING SEAR, OPEN-END OF HOOK MUST BE TO STARBOARD

4 SLIDE COCKING LEVER TO STARBOARD AND LIFT OFF PEG, COCKING LEVER SHOULD MOVE TO PORT APPROXIMATELY 1/4 IN.

5 RETURN COCKING LEVER TO STOWAGE BOX. CHECK TENSION ON FIRING CABLE TO ENSURE SEAR IS LOCKED IN MECHANISM.



DETAIL OF MECHANISM ASSEMBLY

FIG. 2. HATCH JETTISONING MECHANISM

valve piston assembly mounted on the top of the snatch unit. The valve piston engages a boss at the interconnection of the sear operating lever and the microswitch operating lever. The sear operating lever is pivoted at its centre on the snatch unit and is inter-linked at its lower end to the sear; the microswitch operating lever, which is pivoted on the mounting plate, has an adjustable tappet at its switch end and a stop face at the other end, which bears against the breech casing of the valve piston assembly. The gas pressure forces the piston against the boss and rotates both levers, the sear operating lever withdraws the sear and the microswitch operating lever operates the microswitch, the severance unit charge being exploded before the snatch unit operates. Operation of the firing handle also trips the release of the combined time release and breech unit which, after a delay of one second withdraws the ejection-gun sear, to initiate seat ejection.

8. The action of releasing the sear frees the hollow piston which, under the force of the mainspring, is propelled along the interior of the casing and contacts the end fitting of the snatch rod; further extension of the spring moves the snatch rod forward and, through the elevator control lever, rotates the elevator torque shaft and moves the control column forward against the instrument panel.

Hatch jettisoning single lever ejection

9. The single-lever ejection system for the crew members comprise Type 2CA2, Mk.4 ejection seats and two hatch-jettisoning mechanism which are secured to the rear face of the pressure bulkhead. The ejection guns of these seats have breech-type time-delayed firing units fitted with a restrictor and safety-catch *(A.P.109C—0200-1)*, the latter being connected to the hatch by a secondary firing cable. The seat-firing cable is bifurcated, one leg being connected to the ejection gun sear and the other to the sear of the hatch jettisoning mechanism.

Hatch jettisoning mechanism boxes *(fig.2)*

10. These units are mounted on the aft face of the pressure bulkhead and are positioned behind each crew ejection seat; their purpose is to initiate automatic jettisoning of the hatch prior to ejection of either crew seat. The boxes are sealed to the bulkhead to prevent pressurized air from the cabin escaping to atmosphere via the sear and cocking-lever apertures.

11. Each box houses two microswitches, which when operated complete the circuit to the hatch detonators, and a tubular casing containing a spring-loaded plunger which is campshaped at one end. The plunger, when cocked, holds the mainspring in compression against the closed end of the casing and is retained in this position by a sear which is attached to the seat-firing cable. A cam-follower assembly, comprising three rollers mounted on a pivoted arm, transmits the contours of the cam to the microswitches.

12. When either firing handle of the associated ejection seat is operated one leg of the bifurcated firing cable withdraws the sear from the breech-type time-delayed firing unit. Withdrawal of the sear causes the firing pin to rise slightly and its roller is immediately trapped by the restrictor pawl; a safety catch positioned in the restrictor jaws prevents the release of the firing pin. Simultaneously, the other leg of the bifurcated firing cable withdraws the sear from the hatch-jettisoning mechanism and, under the influence of its spring, the cam-face of the plunger forces the cam-follower to operate the microswitches. This completes the circuit to the hatch detonators and the hatch is blown off. As the hatch leaves the aircraft the secondary firing cable withdraws the safety catch from the restrictor of the firing unit and the firing pin is thereby released to fire the ejection gun, which it does after a delay of approximately one second.

Secondary firing cable

13. The upper end of the cable is connected to the hatch by a steel shackle pin and secured by a washer and split pin; the lower end is similarly connected to the safety catch in the breech-type time-delayed firing unit. The purpose of the cable is to withdraw the safety catch from the ejection-gun firing unit as the hatch leaves the aircraft, thereby ensuring correct sequencing of hatch jettisoning and seat ejection.

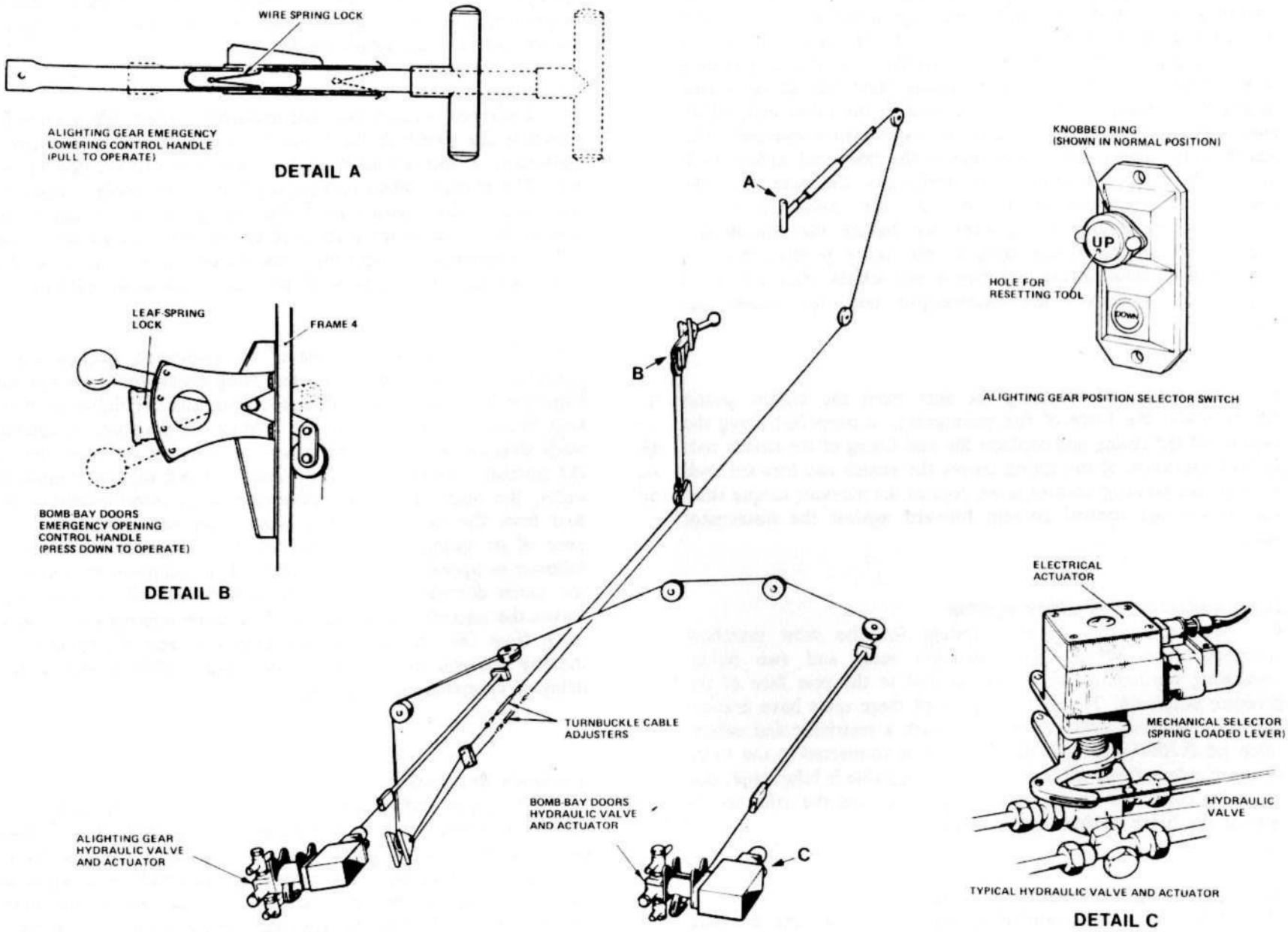


FIG.3. ALIGHTING GEAR AND BOMB BAY DOORS EMERGENCY CONTROLS

Alighting gear emergency lowering control *(fig.3)*

14. The emergency control for lowering the alighting gear is a black-and-yellow striped T-shaped handle situated to port of the instrument flying panel; it is connected by cable to a spring-loaded lever on the alighting-gear selector in the bomb bay. The control is locked in the operated position by a wire spring, contained in the shaft of the handle, which hooks over the end of the control housing when the handle is fully extended. For resetting instructions refer to para.28.

15. The control cable passes over pulleys behind the instrument panel, aft down the port side of the fuselage, through the pressure bulkhead and equipment compartment, and into the bomb bay where it is connected to the lever on the alighting-gear selector. The lever is spring-loaded to the off position.

Alighting gear emergency raising control

◀ **16.** The UP mechanical lock can be overriden in an emergency, or if required during servicing, by turning the knobbed ring which encircles the UP button, clockwise through 60 deg. (or 90 deg. according to type) and then depressing the button in the normal manner. If an UP selection is made this way, the mechanical lock will remain inoperative until reset. To reset, lightly depress the DOWN selector button and hold depressed. Insert into the small hole in the face of the selector button a resetting tool (see Section 2, Chapter 4, Table 2). Exert a steady pressure on the reset tool to overcome internal spring tension until the UP button rises and the knobbed ring rotates counter-clockwise to its normal position (the knob horizontal to the switch body) under its own internal spring pressure. Ensure that the UP button cannot be depressed using normal finger pressure.

WARNING

Under no circumstances must the knobbed ring be turned past the 60 deg. (or 90 deg.) stop as such action will damage the switch, and may result in inadvertent retraction of the alighting gear. Similarly it is important that returning the UP selector button to normal mode be carried out as detailed. Any attempt to reset it by any other method, or by using a different tool will cause damage to the switch mechanism. ▶

Bomb bay doors emergency opening control *(fig.3)*

17. The emergency control for opening the bomb bay doors is a black-and-yellow striped lever situated on the port side of the cabin; it is connected by a cable to a spring-loaded lever on the bomb bay doors selector in the bomb bay. The control is locked in its operated position by a leaf-spring lock incorporated in the lever bracket. For resetting instructions refer to para.28.

18. The control cable is anchored to a bracket on the port side of the fuselage and passes upward over a pulley on the end of the control lever, then down and along the port side of the fuselage, parallel with the cable for the alighting gear emergency lowering control, into the bomb bay. Within the bomb bay the cable passes over to the starboard side where it again passes aft to the lever on the bomb bay doors selector. The lever is spring-loaded to its off position.

Entrance door jettisoning mechanism *(fig.4)*

19. This is contained within the frame of the door aperture at its upper side. A horizontal shaft carries a hinge-pin bearer cup at each end; a wormwheel, pinned to the centre of the shaft, is meshed with a worm on the shaft of the door-jettisoning handle. The horizontal shaft is carried in three bearings, one at either end and one, a double bearing, in the centre; the centre bearing, in addition to locating the wormwheel, also forms the bearing for the shaft of the jettisoning handle. The aft collar of the shaft is designed to stop the shaft at the extremes of rotation (i.e. door safe or unsafe) by abutting integral lugs on the aft bearing housing.

20. The door carries two hinge brackets on its upper frame, each bracket having a freely rotating hinge-pin which extends outward on either side. The hinge-pins are accommodated in the hinge-pin cups, which, in the safe condition, are rotated so that their slots are facing inboard, thereby forming sockets in which the hinge-pins are retained. The position of the hinge-pins relative to the cups is adjusted during initial assembly by guide bolts which project through the inboard face of the bearings and bear on the inner face of the door hinge brackets.

21. When the door is assembled to the fuselage and the mechanism is in the safe condition, the slots in the hinge-pin cups are facing inboard and the door is retained in the door aperture; in this condition the jettisoning handle has been rotated in a counter-clockwise direction. To jettison the door, the handle is rotated in a

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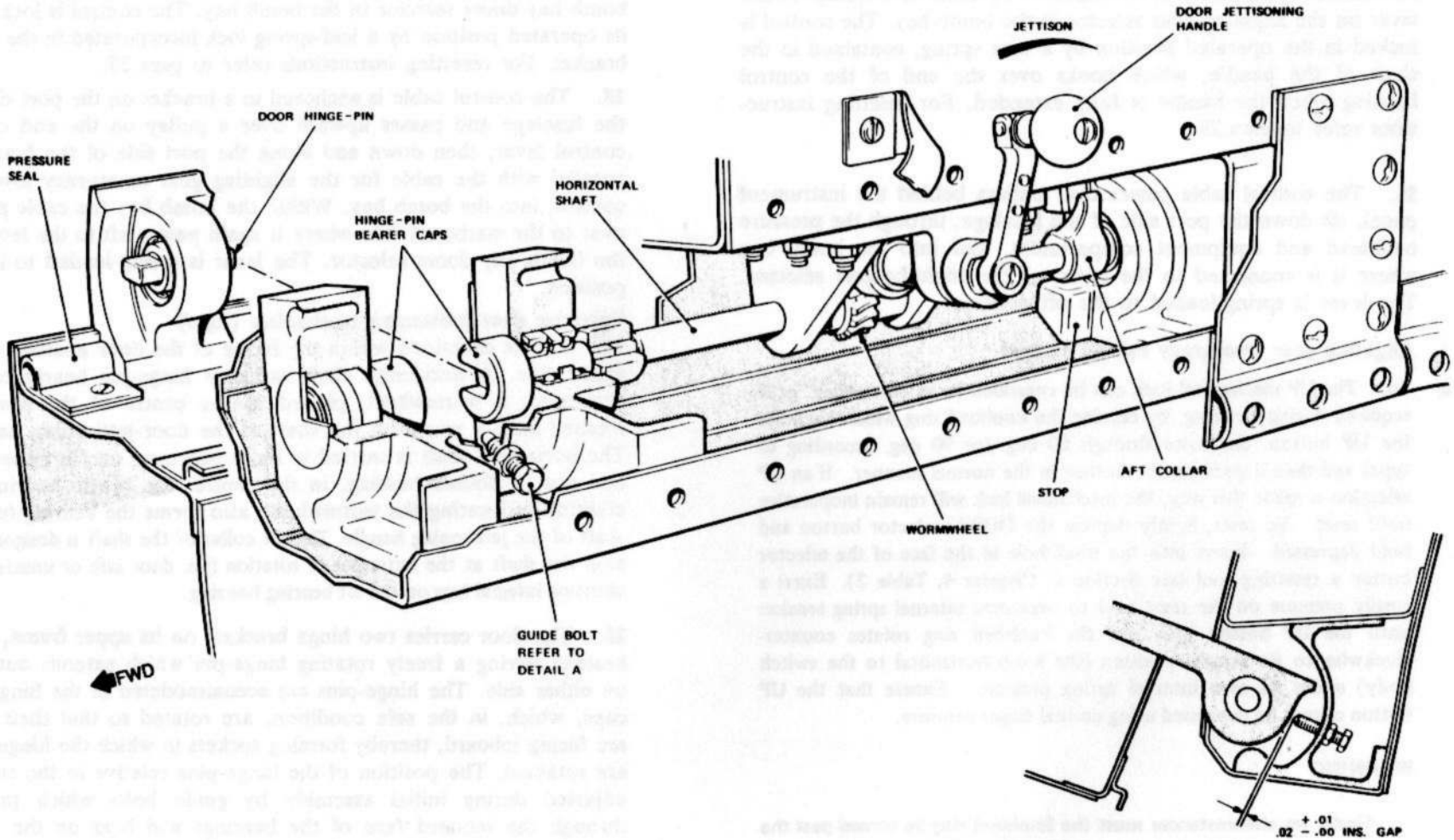


FIG.4. ENTRANCE DOOR JETTISONING MECHANISM

clockwise direction, thereby revolving the horizontal shaft and hinge-pin cups until their slots face outboard and permit the door to fall away from the aircraft. To facilitate ground servicing the door may be removed by this means.

Fire protection system

22. Refer to Sect.4, Chap.5.

Aircraft-destructor stowage.

23. This is attached to the inner surface of the starboard equipment bay door.

◄ **Sonar locator beacon**

23A. The Sonar locator beacon is located in the port wheel well, attached to the diaphram, outboard of the wheel well rib. For operation refer to Sect.1, Chap.3. ►

SERVICING

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Ejection seats

24. Refer to para.3 and A.P.109B-0107-5F.

Combined time-release and breech unit

25. Refer to para.4 and A.P.109C-0201-5F

Cocking the snatch unit

26. Refer to para.5 and fig.1.

Cocking the hatch jettisoning mechanism boxes

27. Refer to para.10 and fig.2.

Resetting the alighting gear lowering and bomb-bay doors emergency controls

Note. . .

Ensure that the aircraft is raised on jacks (Sect.2, Chap.4) before resetting the alighting gear emergency lowering control.

28. Exhaust hydraulic pressure and electrically select the alighting gear actuator to UP or the bomb bay doors actuator to CLOSED before resetting the emergency control. Both procedures are similar. In the case of the alighting-gear control, press in the ends of the spring lock in the shaft and push the handle into its housing, in that of the bomb bay doors control, move the leaf-spring outboard and return the handle to the UP position. After resetting the controls, lock the handles in position with 20 s.w.g. aluminium wire joined at the ends by a lead seal; check that the levers on the respective selectors have been returned to the off position and that they are bearing on their stops, repack the sealing washers where the cables pass through the pressure bulkhead *(Sect.3, Chap.8)*. Carry out a functional test of the normal system for correct operation.

29. Deleted

ASSEMBLY NOTES

NOTE

1. LOCATE THE TERMINAL BLOCK AND CLAMP ASSEMBLY AS ILLUSTRATED AND SECURE IN THE VERTICAL POSITION. (THE VERTICAL POSITION IS DETERMINED BY ROCKING THE ELEVATOR CONTROL TUBE ABOUT ITS LONGITUDINAL AXIS AND SETTING IT IN THE MID POSITION).

2. PAINT THE RED BAND ADJACENT TO THE CLAMP ASSEMBLY.

3. LOCATE THE EXPLOSIVE COLLAR IN THE VERTICAL POSITION HARD UP AGAINST THE TERMINAL BLOCK, TIGHTEN THE SECURING NUTS UNTIL THE RUBBER SPACERS BULGE AND THE EXPLOSIVE COLLAR IS SECURE AGAINST MANUAL ROTATION.

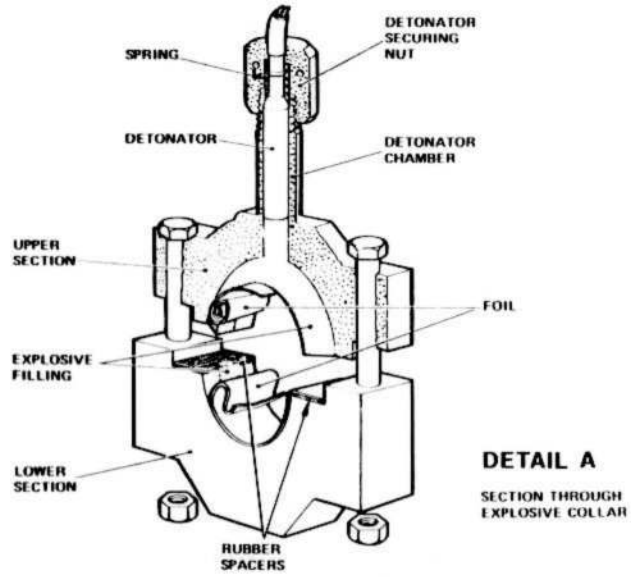
4. AFTER CONNECTING THE DETONATOR CABLE SECURE ACCESS CABLE AS ILLUSTRATED (USE TYTON STRAPPING 5E/1147500 AND STUDS 5E/1147501).

5. WHEN CONNECTING THE INPUT CABLE ALLOW SUFFICIENT SLACK FOR FULL FORE AND AFT TRAVEL OF THE CONTROL ROD.

WARNING:

(1) GREAT CARE IS TO BE EXERCISED DURING ALL EXPLOSIVE COLLAR FITTING, REMOVAL AND LOCATING OPERATIONS TO PREVENT DAMAGE TO THE FOIL COVERING THE EXPLOSIVE FILLING ON THE INNER PERIPHERY OF THE COLLAR.

(2) TIGHTEN DOWN THE DETONATOR SECURING NUT FINGER TIGHT ONLY. EXCESSIVE FORCE WILL CAUSE BULGING OF THE FOIL ON THE COLLAR.



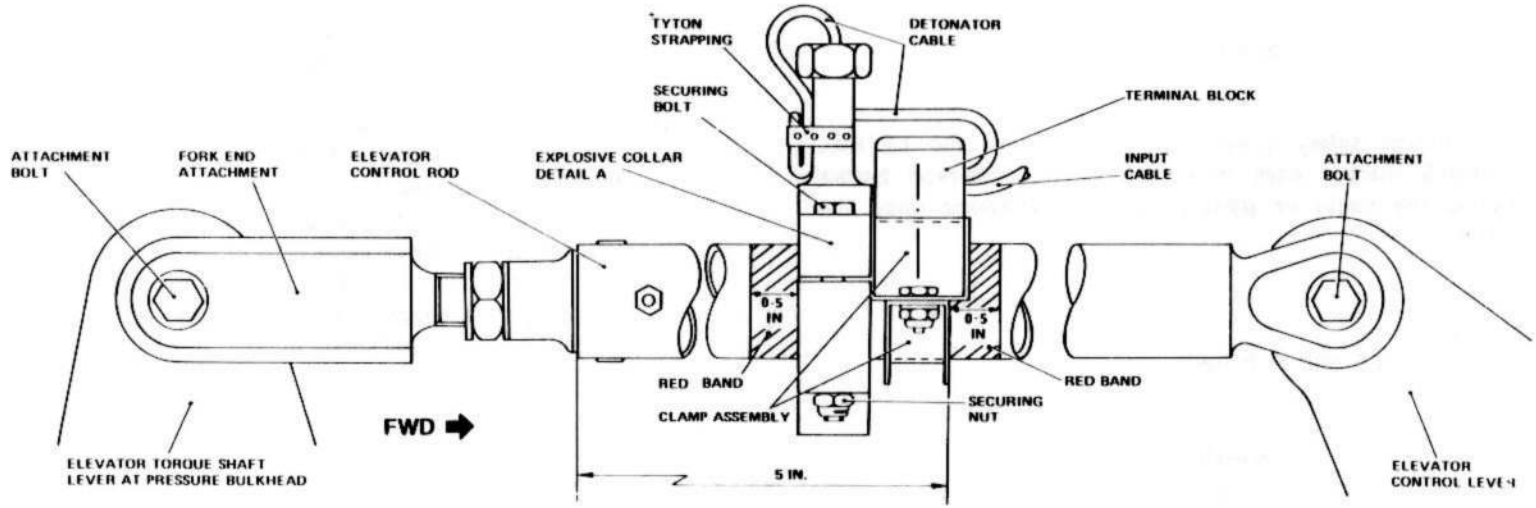


FIG. 5. ELEVATOR CONTROL ROD SEVERENCE UNIT ASSEMBLY

Lubrication

30. Controls of emergency equipment are lubricated on assembly and, except where detailed in appropriate chapters of this volume and in A.P.101B-0400-5 series require no further lubrication.

REMOVAL AND ASSEMBLY

WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cabin or performing any operations upon the aircraft.

Ejection seats

Rear crew seats

31. Remove a rear crew seat as follows:-

(1) Remove the rear crew hatch *(Sect.3, Chap.1).*

(2) Remove the cartridges from the ejection and drogue guns *(A.P.109A-0001-1).*

(3) Disconnect the leg-restraining straps by withdrawing the quick-release pins.

(4) Disconnect the emergency oxygen cable at the anchor hook.

(5) Remove the bolts securing the mic/tel socket.

(6) Disconnect the air ventilated suit hose (if fitted) at the shut-off valve.

(7) Disconnect the demand oxygen hose at the flanged connector.

(8) Disengage the top stops with tool Pt.No.MBEU 13935/A to release the seat from the rail, then slide the seat out through the escape hatch aperture.

32. Assembly of a rear crew seat is a reversal of the removal operations.

Pilot's seat (fig.6)

33. The seat is removed complete with guide rail. Refer to A.P.109B-0107-1 and proceed as follows:-

(1) Remove the cartridges from the ejection gun, drogue gun and the time-release and breech unit *(A.P.109A-0001-1).*

(2) Disconnect the leg restraining straps by withdrawing the quick-release pins.

(3) Disconnect the seat pan firing handle from the bracket, then remove the seat pan in accordance with A.P.109B-0107-1.

(4) Disconnect the gas pipe from the time release and breech unit.

(5) Remove the top two bolts securing the guide rail to the adjacent structure.

(6) Disconnect the emergency oxygen cable at the anchor hook.

(7) Disconnect the demand oxygen hose from the flanged connection.

(8) Remove the two bolts securing the mic/tel socket to the bracket on the guide rail.

(9) Disconnect the air ventilated suit hose (if fitted) at the shut-off valve.

(10) Secure all loose items.

(11) Remove the bottom two bolts securing the guide rail to the adjacent structure.

(12) Withdraw the seat and guide rail through the cabin entrance door aperture.

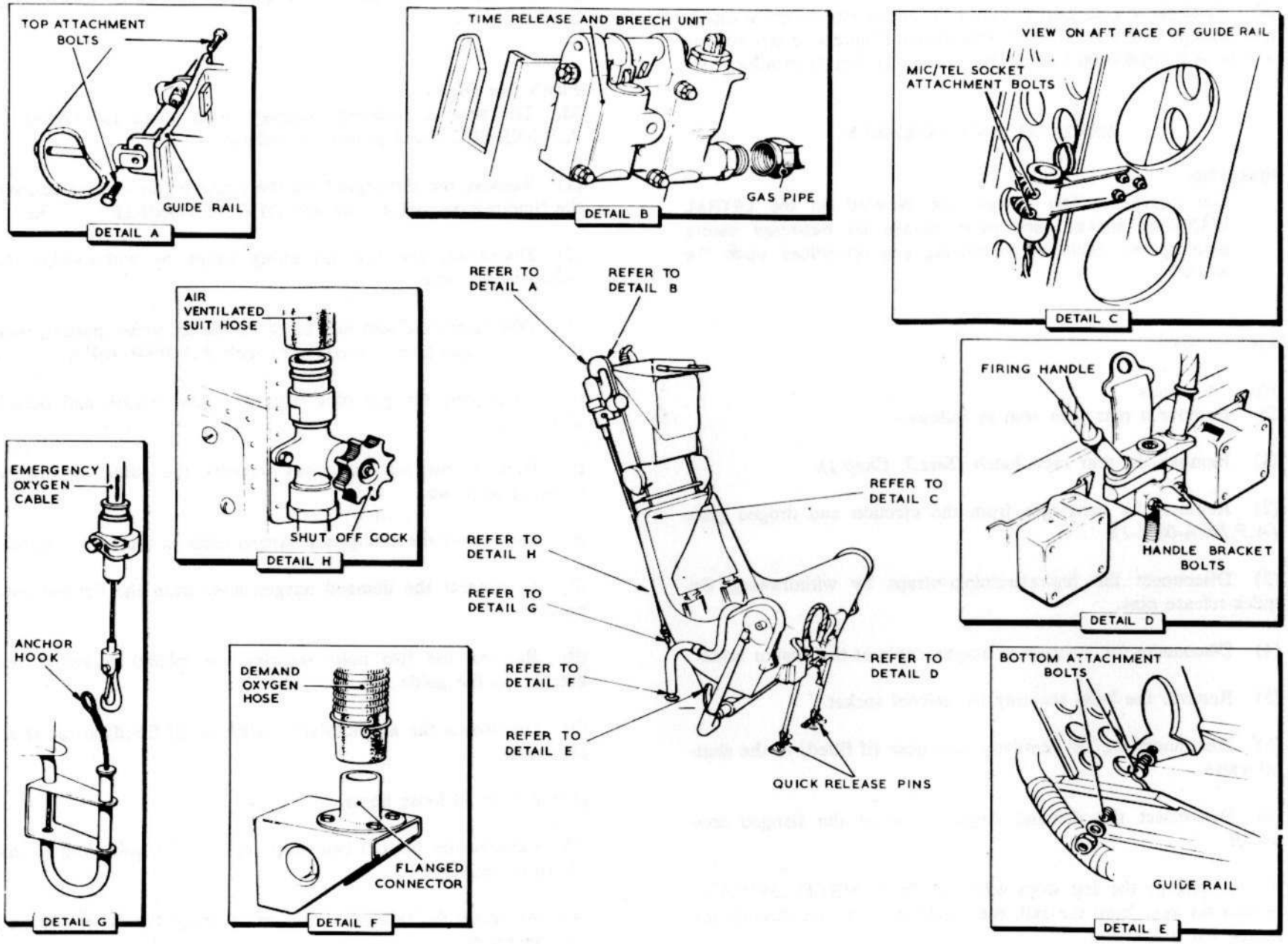


FIG.6.PILOT'S EJECTION SEAT REMOVAL

34. Assembly of the pilot's seat is a reversal of the removal procedure.

Snatch unit

◀ **WARNING**

Some Control Column Snatch Units have been fitted with a shortened snatch rod to overcome rigging problems. Whenever a CCSU is removed or refitted the ADD Log of the aircraft concerned is to be consulted to ensure that an EA approved concession has been granted and recorded. Under no circumstances is a standard rod to be fitted in lieu of a shortened rod or vice versa. ▶

Removal

35. Procedure:-

(1) Disconnect all normal, emergency and ground electrical supplies.

(2) Remove the time-release and breech unit cartridge *(A.P.109C-0201-1).*

(3) Remove the forward inboard side panel from the pilot's console.

(4) Remove the elevator severance unit detonator *(para.38)*

(5) Disconnect the microswitch electrical leads at the six-way terminal block.

(6) Remove the locking wire and disconnect the gas pipe from the valve piston chamber.

(7) Remove the stiffnut and washer and disconnect the snatch rod from the elevator control lever.

(8) Remove the split pin from the tubular casing forward retaining pin and withdraw the retaining pin from the mounting bracket.

Assembly

36. This is the reverse of the removal procedure but the following points should be noted:-

(1) The microswitch clearance is to be as shown in fig. 1 and cables routed as in fig. 7.

(2) After assembly make electrical checks *(A.P.101B-0402-1B, Sect.5, Chap.1, Group W).*

(3) The snatch unit is to be tested as detailed in the relevant Servicing Procedure detailed in A.P.101B-0400-5A3.

37. Upon completion of the instructions detailed in the previous paragraph, and whenever the elevator control circuit is readjusted or the snatch unit is test fired and reset:-

(1) Move the control column aft until the elevator bulkhead stop is contacted. At the same time closely observe the sear return spring and the sear operating lever on the snatch unit for movement.

(2) Movement indicates that the snatch rod is fouling the sear which may result in premature operation of the snatch unit. Where movement is found, check, and if necessary adjust, the setting of the elevator bulkhead stops *(Chap.4).*

(3) Check, by applying hand pressure to the snatch-unit rod, that, with the control on the bulkhead stop, it is capable of a minimum of 0.0625 in. free travel between contacting the end of the slot in its attachment fitting at the elevators control lever, and contacting the sear. If necessary adjust the length of the snatch rod *(para.6).*

Elevator control rod severance unit *(fig.5)*

Removal

38. Procedure:-

(1) Disconnect the normal, emergency and ground electrical supplies.

(2) Remove the centre access panel from the inboard side of the pilot's console.

(3) Disconnect the detonator and input cables at the terminal block mounted on the control rod.

WARNING

Before handling detonators refer to the LETHAL WARNING marker card at the beginning of this book.

(4) Unscrew the detonator securing nut and remove the detonator from the detonator chamber.

(5) Ensure that red bands have been painted in the correct position on the control rod on either side of the severance unit assembly. Renew paint if necessary.

(6) Supporting the lower section of the explosive collar, remove the securing nuts and bolts and remove the two sections of the explosive collar from the control rod.

Assembly

39. This is a reversal of the removal procedure *(para.38)* but great care must be taken to ensure that fig.5 dimensions and instructions are strictly adhered to and the following points noted:-

(1) When tightening the explosive collar securing nuts, care must be taken to pull the nuts up evenly to prevent damage to the foil covering the explosive filling.

(2) Ensure that the detonator rests on the explosive filling before tightening the detonator securing nut. For information on the assembly of the detonator refer to A.P.110N-0306-1.

(3) After refitting the access panel removed in para.38(2), move the control column through its full fore-and-aft travel to ensure that the severance unit assembly does not foul the access panel or surrounding structure.

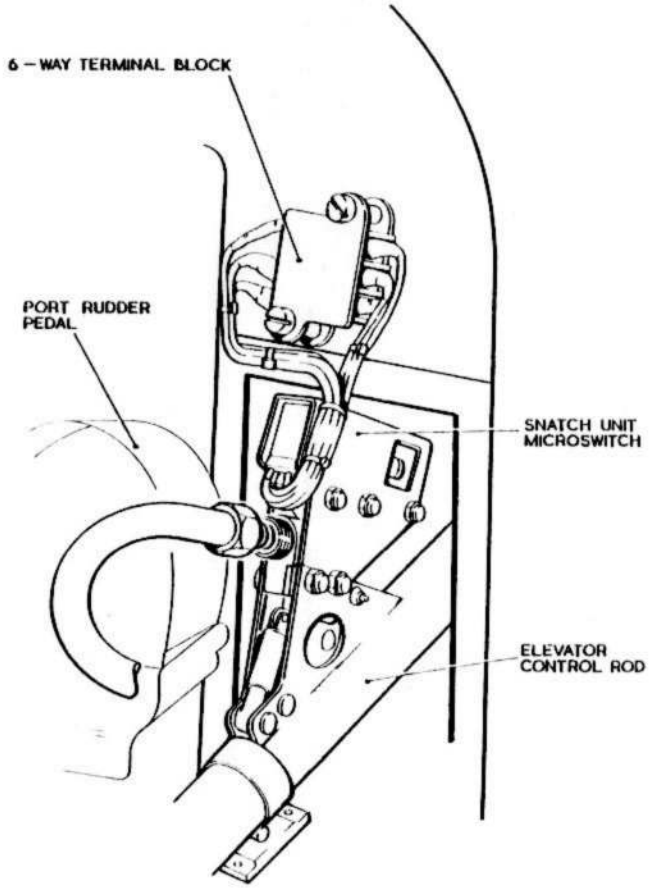
ASSEMBLY NOTES

WHEN CONNECTING A SNATCH UNIT MICROSWITCH AND/OR ELEVATOR DETONATOR TO THE 6-WAY TERMINAL BLOCK PROCEED AS FOLLOWS:-

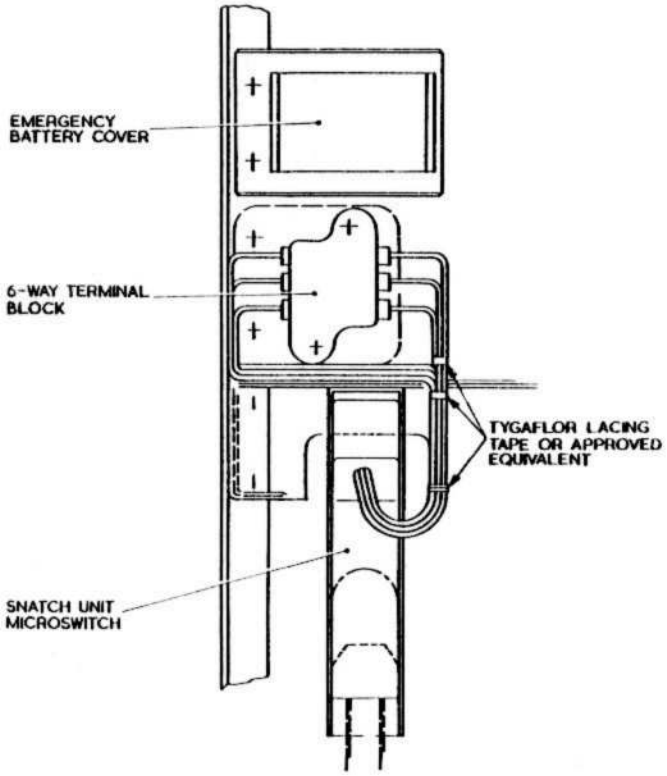
1. ROUTE CABLES OUTBOARD FROM THE MICROSWITCH TO THE TERMINAL BLOCK AS SHOWN.
2. CABLES ARE TO BE CUT TO THE MINIMUM LENGTH REQUIRED TO REACH THE TERMINAL BLOCK.
3. BIND CABLES TOGETHER AND WHERE POSSIBLE BIND TO ANY ADJACENT CABLES TO KEEP IN POSITION.
4. WHERE NECESSARY CRIMP NEW 4BA TAGS, HELLERMANN REF. HE.294 TO RELEVANT CABLES.

WARNING

ENSURE THAT THE CABLES ARE ROUTED AND SECURED SO THAT THEY CANNOT PROTRUDE INTO THE PILOT'S FOOTWELL BEYOND THE EMERGENCY BATTERY ACCESS PANEL.



ELEVATOR SNATCH UNIT MICROSWITCH WIRING
VIEW LOOKING AFT PORT SIDE



ROUTEING OF CABLES

FIG. 7 CONTROL COLUMN SNATCH UNIT - CABLE ROUTEING

◄ NEW ILLUSTRATION ►