

SECTION 3**AIRFRAME****LIST OF CHAPTERS**

Note.— A list of contents appears at the beginning of each chapter

- 1 Fuselage**
- 2 Main plane**
- 3 Tail unit**
- 4 Flying controls**
- 5 Alighting gear**
- 6 Hydraulic systems**
- 7 *(Not applicable to this aircraft)***
- 8 Air systems**
- 9 *(Not applicable to this aircraft)***
- 10 Oxygen system**
- 11 Emergency equipment**

Chapter 1 FUSELAGE

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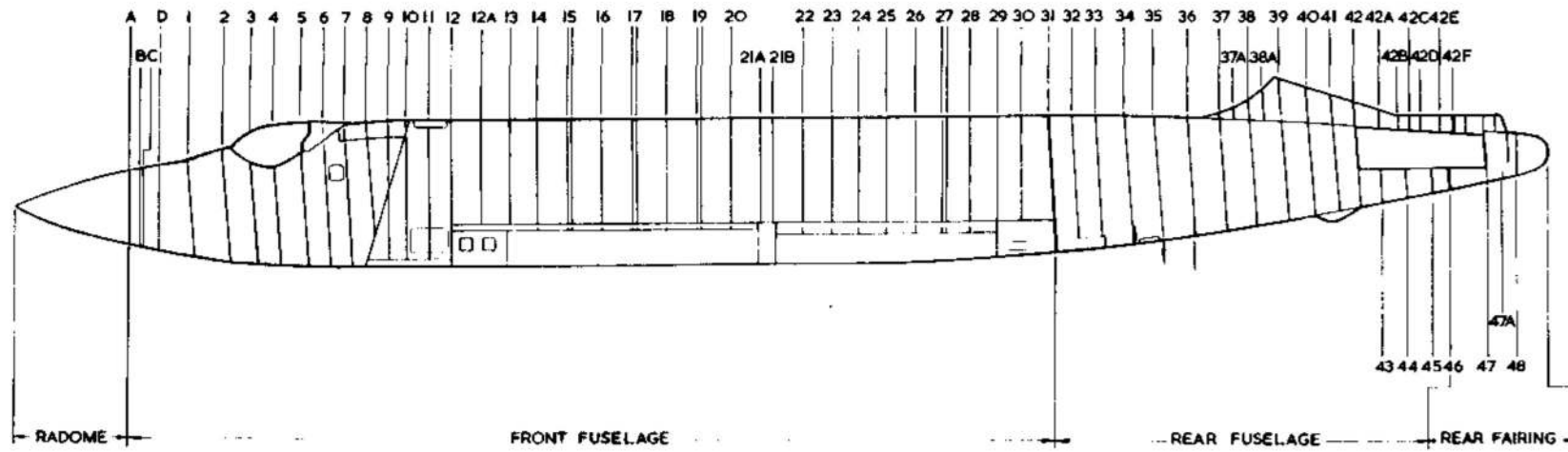


FIG. I. KEY DIAGRAM

Introduction

1. This chapter gives a general description of the fuselage structure, together with the procedure for removing and assembling the main components.

DESCRIPTION**General information**

2. The all-metal fuselage is circular in section and of stressed skin construction throughout. A transport joint at frame 31 divides the fuselage into front and rear sections. Except at the transport joint 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 (fig. 2)**

3. The front fuselage comprises a nose radome, a pressure cabin, a nose undercarriage well, three equipment compartments, two camera bays, fuel compartments and a flare bay. The flare bay is not used for the carriage or discharge of flares.

4. The effective structure consists of the portion above the floor of the main fuel compartment which is of double-skinned stressed skin construction with rolled Z-section stringers stiffening both the inner and outer skins. Transverse channel-section girders, the ends of which follow the contour of the fuselage, provide the main support for the floor of the main fuel tank compartments; aft of the main spar frame, secondary support is provided by fore-and-aft channel-section members.

Nose radome and structure

5. A glassfibre radome forms the nose of the aircraft and accommodates a radar scanner. The

radome is located by dowels and is secured to magnesium alloy rings in the nose structure at frame A by King toggle fasteners housed within channel members inset flush with the outer skin. The structure between frame A and the forward face of frame 1 is a conventional light-alloy fabrication within which is mounted the A.R.I.5930 radar equipment.

Cabin and bulkheads

6. Frame 1 forms the forward pressure bulkhead of the cabin; the rear pressure bulkhead slopes rearward from its base between frames 7 and 8 to its apex at frame 10. The bulkheads completely seal off the cabin from the remainder of the fuselage. Both bulkheads are reinforced, the forward bulkhead on its forward face and the rear bulkhead on its rear face by vertical and horizontal channel section members. The main floor of the cabin extends between the two bulkheads; a built-up structure at the pilot's station forms the pilot's floor and raises his seat above the main floor level. The cabin structure is cut away on the starboard side to accommodate the entrance door and, on the top, to allow for the canopy and navigator's escape hatch. The canopy aperture is reinforced by a circular section coaming tube. An 0.125 in. dia. drain hole is drilled in each side of the coaming tube at its lowest points. These holes, which facilitate the periodical draining of any water accumulation, are plugged with self-tapping screws. The screws are dipped in sealing compound immediately before they are inserted, to prevent loss of cabin pressure. In the underside of the cabin skin, forward of the nose-wheel well, a screwed pressure-seal plug is provided for draining the pressure cabin. A window is provided in the port side at the navigator's station. A folding seat is hinged to the starboard cabin wall between frames 4 and 5 static vent plates.

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 forward face, offset slightly to port. The canopy is secured by 32 explosive attachment bolts to the coaming tube surrounding the aperture.

Navigator's escape hatch

8. The navigator's escape hatch is of metal construction reinforced on the inside by two channel-section cross-members and angle section stringers. Two flush-fitted transparent plastic windows are installed and provision is made for mounting a periscope sextant. Black-out curtains are fitted and are secured by Velcro tape when extended and by straps with Lift the Dot fasteners when rolled up. The hatch is secured to the boundary member of the fuselage cut-away section by 34 explosive attachment bolts.

Seat guide rails

9. 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 navigator's ejection seat guide rail is bolted to the front face of the cabin rear bulkhead and anchored to angle-section brackets on the cabin floor.

Equipment compartments

10. Aft of the rear pressure bulkhead a horizontal diaphragm divides the area between the rear pressure bulkhead and the forward bulkhead of the forward camera bay into an upper equipment bay and a lower compartment. The latter is divided by two vertical diaphragms into the nose undercarriage well and two flanking equipment compartments. The structure is cut away and reinforced to accommodate the upper

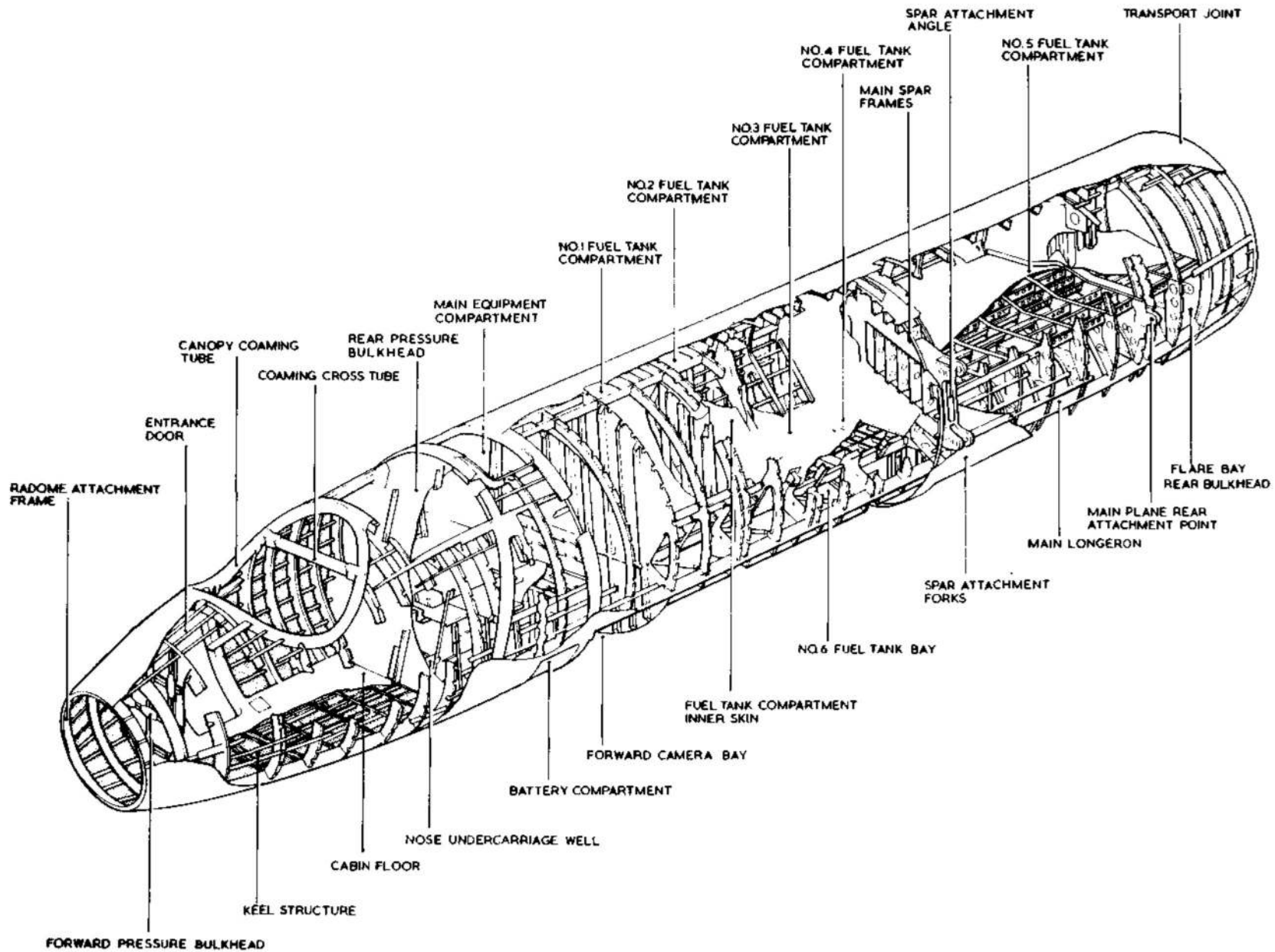


FIG. 2. FRONT FUSELAGE

equipment bay hatch on the top and the nose undercarriage doors on the bottom. Access doors are fitted to the equipment compartments located port and starboard of the nose undercarriage well; these, and the nose undercarriage doors, are hinged to the structure.

Forward camera bay

11. The forward camera bay is located between the bulkheads at frame 12 and 13. Between these two bulkheads, the skinning beneath the main longerons is cut away to accommodate port and starboard flanking fairings to which four hydraulically-operated camera doors are fitted. A removable panel on the underside of the fuselage between the two fairings provides access to the bay. Redundant camera windows are obscured by bolted-on blanking plates.

Fuel tank compartments

12. Aft of the forward camera bay the fuselage is divided into upper and lower compartments; the upper compartment houses the main fuel tanks while the lower compartment which is further divided by a bulkhead at the spar frame, houses No. 6 fuel tank at the front and forms the flare bay at the rear.

13. The fuel tank compartment in the upper half of the fuselage extends from frame 13 to frame 29 and is divided at the spar frame by a bulkhead. The forward portion is further divided by false bulkheads into four compartments each of which houses a crashproof, collapsible, fuel bag. The floor of each compartment comprises a removable panel reinforced on the underside by channel-section intercostals. The rear portion houses a crash-proof, collapsible, fuel bag. In the top of the double-skin structure are ten, small, reinforced, cut-away sections, five of which accommodate access panels; the other five house the fuel tank filler caps.

No. 6 fuel tank bay

14. The No. 6 fuel tank bay in the lower half of the fuselage extends from frame 13 to frame 21. Between these frames, both of which carry bulkheads reinforced by channel-section stiffeners, the skinning on the underside beneath the main longerons is cut away to accommodate an all-metal fuel tank which in shape conforms to the contour of the fuselage. The tank is slung on metal straps attached to trunnions on the underside of each longeron at frames 15 and 19. Access to each trunnion is provided by an adjacent skin panel; at the rear of the tank on the undersurface, a removable fairing, reinforced on the inside by Z-section members and attached to the main longerons by four quick-release toggle fasteners, provides access to the tank collector box.

Flare bay

15. The flare bay, extending from frame 21 to frame 29, is formed by the lower half of the centre fuselage aft of the No. 6 tank, the lower portion of these two frames carrying bulkhead plates reinforced by channel-section stiffeners. The transverse girders supporting the rear portion of the fuel tank compartment floor are extended downwards and reinforce the skirt along which the longerons run. The transverse girders at frames 21 and 29 provide support for a longitudinal flare beam; those at frames 23, 25 and 27 are channelled at the ends to accommodate the rollers of the flare-bay doors. An access door on the bulkhead at frame 29 provides for visual inspection of the flare bay without opening the flare bay doors. A master reference gyroscope (M.R.G.) is installed in the flare bay.

Flare-bay doors

16. The flare-bay doors are of light-gauge duralumin construction, each door consisting of

an inner and outer skin reinforced by 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 fuselage transverse floor girders at three stations along its length.

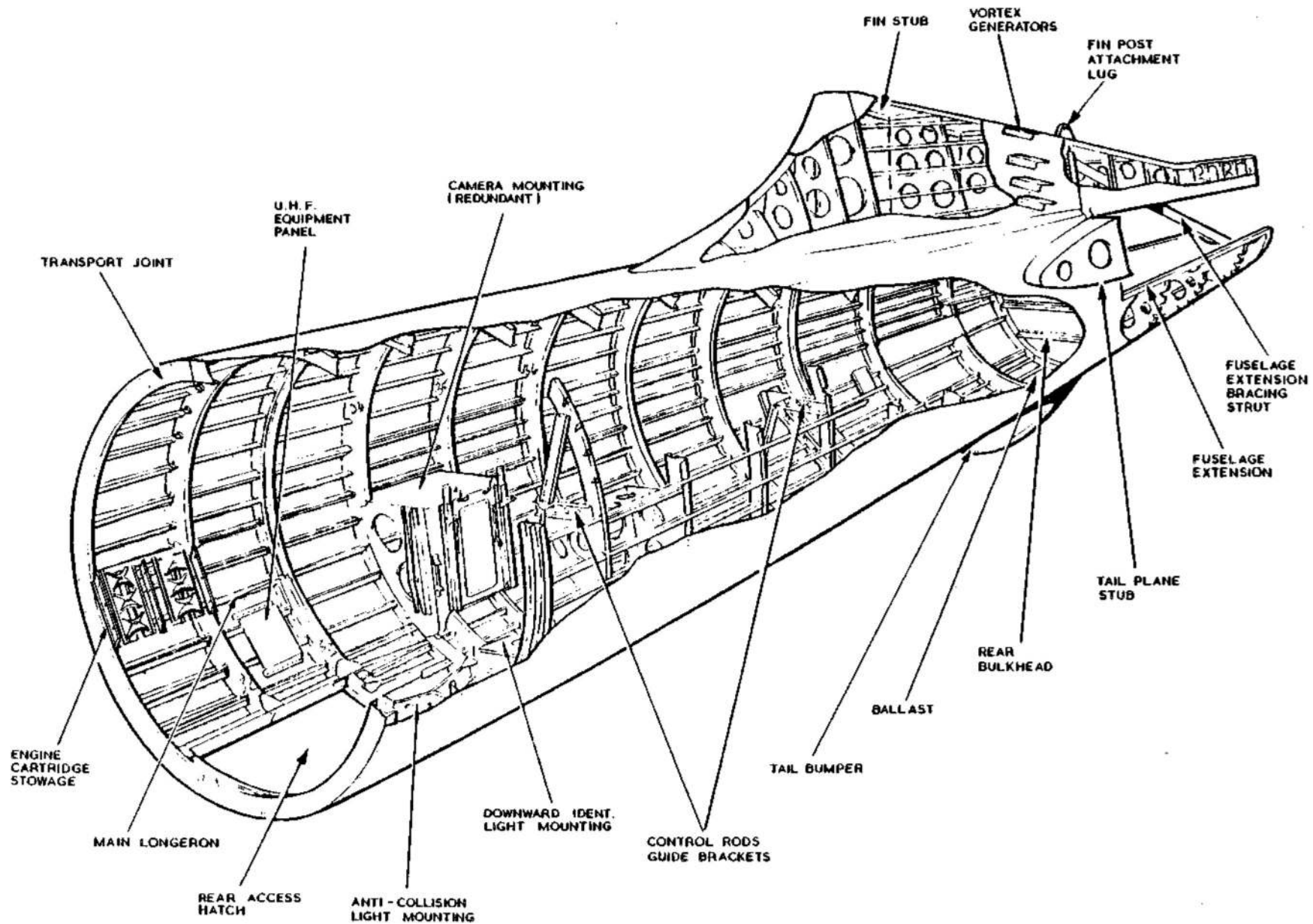
Main spar centre-section

17. 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 camera bay (fig. 4)

18. The rear camera bay is located between frames 29 and 31 and at this point two circular apertures are cut in the underside of the fuselage skin, which is reinforced by angle-section members. The apertures are each covered by diaphragms attached to the skin inside the fuselage and are fitted with circular glass camera windows. The port camera window is obscured by a bolted-on blanking plate. The sliding camera-doors are of light gauge aluminium alloy construction, each door consisting of an inner and outer skin reinforced by channel-section stiffeners. The doors, which are fitted with ball-bearing rollers and roller guide pins, move in channel-section tracks which pass beneath the diaphragms housing the camera windows and are attached along their length to the inside of the fuselage skin and at their outer ends to the longerons. Each door is linked by a connecting-rod to a centrally-mounted operating lever between the doors, and the doors are operated by a single hydraulic jack mounted forward of the starboard door tracks and connected to one end of the door operating arm.

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FIG.3. REAR FUSELAGE

◀ENGINE STARTER CARTRIDGE STOWAGE ADDED▶

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REAR FUSELAGE

General information (fig. 3)

19. On the underside of the rear fuselage between frames 31 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 rear of No. 5 fuel tank, the rear camera bay, the flare bay inspection panel in the flare bay rear bulkhead, and the elevator and rudder control runs 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 ring-bolts 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 31 and 32. A tail bumper, on which is mounted a moulded rudder pad, is attached to the underside of the rear fuselage between frames 40 and 42.

Ballast weights (fig. 5)

20. To help maintain the C.G. position within the C.G. range (Sect. 2, Chap. 3) ballast is fitted at frame 48. The ballast is fixed and is included in the basic weight. To cater for possible future ballast requirements, a ballast tray is fitted to frames 41 and 42. The tray is a permanent fixture and is included in the basic weight. The tray can carry up to nine ballast weights to a total of 81 lb. The weights are secured by three bolts. Wooden blocks of similar form to the ballast weights are provided and must be fitted in position on the tray when ballast weights are not used. The ballast weights, (if fitted in part or whole) are not included in the basic weight and

must be added to the aircraft all-up weight summary.

Survival pack stowages

21. Two survival pack stowages are situated one on the port side and the other on the starboard side of the rear fuselage. The position of the stowages is indicated on the outer skin of the rear fuselage.

Minilift hoist and walkway

22. To facilitate the assembly and removal of the radio and radar equipments in the rear fuselage and the camera in the rear camera bay, provision is made for the installation of a Minilift hoist. The hoist consists of a hand-operated winch, attached to two small trolleys free to run in one of three rail assemblies secured to the roof structure of the fuselage. Each trolley is fitted with four rollers which run within the two channels forming each rail assembly (fig. 12). The Minilift hoist is attached to two suspension hooks on the front, and a single suspension hook on the rear trolley. The ends of the rails are cut away to enable the trolleys to be removed from the rails, and stop blocks are fitted at each end of the rails to prevent the trolleys running out of the channels. A walkway is fitted between frames 37 and 39 which also facilitates servicing equipment in the rear end 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; on each side of the fuselage, extending forward of

frame 42 is a narrow, integral tail plane leading-edge stub.

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 to 42 being reinforced by longitudinal angle-section members. Eight vortex generators, four on each side, are secured to the fin stub. The diaphragm at frame 42 carries the fin post attachment lugs, secondary attachment points for the fin being provided on the diaphragms at frames 39 and 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 (fig. 16)

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. Ballast weights are permanently fixed to frame 48.

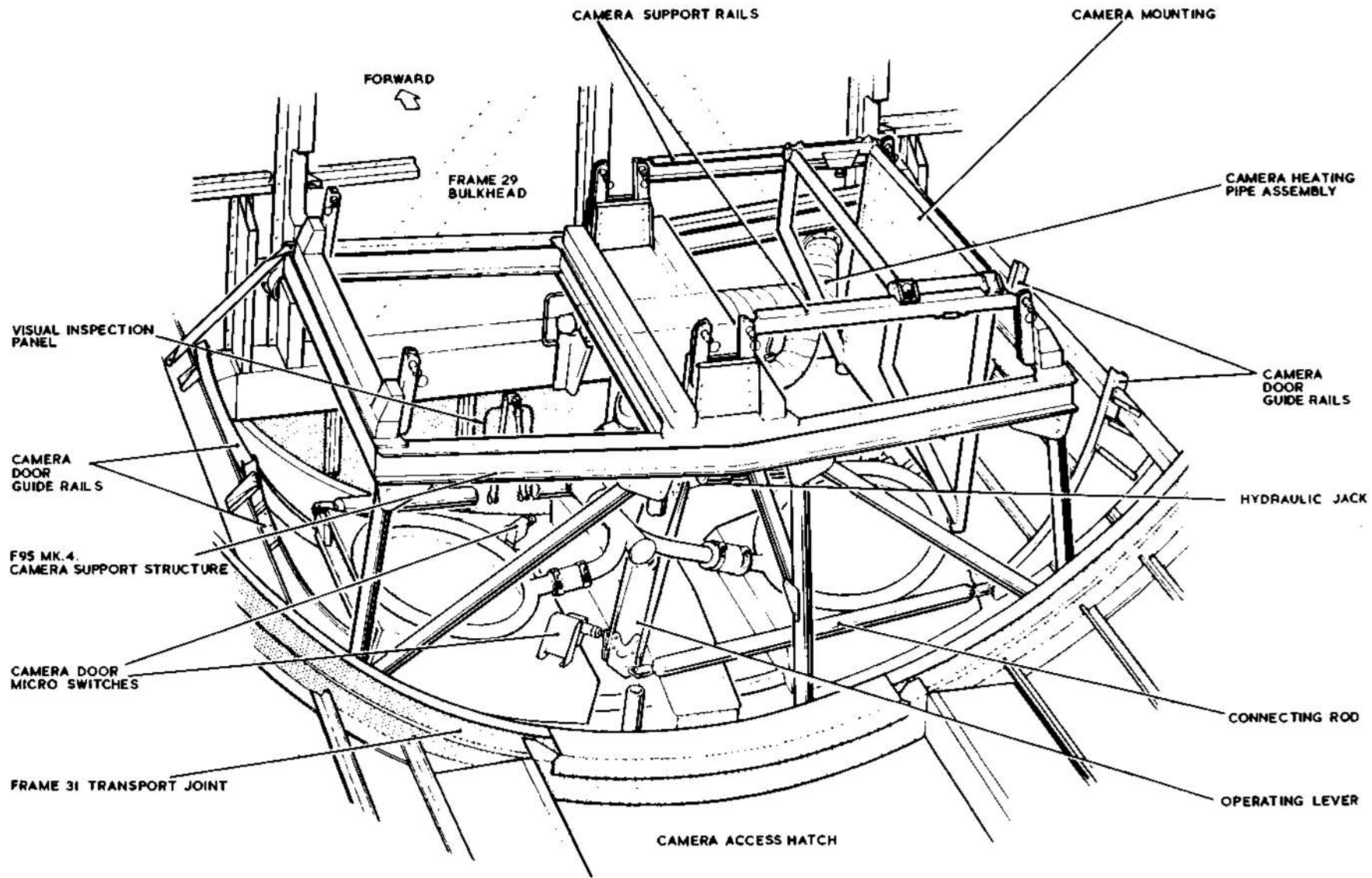
SERVICING

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.

Forward camera bay door jack adjustment (fig. 10)

27. The pin centres of the port and starboard



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FIG. 4. REAR CAMERA BAY

jacks are nominally set at 15.80 in. \pm 0.1875 in. when the jacks are fully contracted; this is a manufacturer's setting which should not normally need alteration after assembly. If adjustment is necessary:—

- (1) Remove the jack cover.
- (2) Disconnect the jack piston rod from the bridge-piece on the camera doors.
- (3) Remove the locking wire from the locknut at the fork-end of the jack piston rod and slacken off the locknut.
- (4) Adjust as necessary by turning the fork-end of the piston rod one-half turn at a time.
- (5) Tighten the locknut on the jack piston rod and relock with new locking wire.
- (6) Reconnect the jack piston rod to the bridge-piece on the camera doors.

Flare bay door jack adjustment (fig. 6)

28. The pin centres of the door jacks are nominally set at 18.625 in. \pm 0.25 in. This dimension is measured between the jack attachment lug and the uppermost hole in the link-end when the jacks are fully contracted (dimension B). This is a manufacturer's setting which should not normally require alteration after assembly. If adjustment is necessary: -

- (1) Remove the jack (para. 46).
- (2) Remove the locking wire from the locknut at the link-end of the piston rod and slacken off the locknut.
- (3) Adjust as necessary by turning the link-end one-half of a complete revolution at a time.

(4) Tighten the locknut on the jack piston rod and relock with new locking wire.

(5) Refit the jack.

Flare bay door adjustment (fig. 6)

29. The pin centres of the flare bay door actuating links are nominally set at 11.975 in. \pm 0.25 in. At this setting the flare-bay doors, when fully open should be 49.70 in. \pm 0.50 in. apart at the forward end and 42.50 in. \pm 0.50 in. apart at the rear end measured inside the metal faces of the door edges. When the doors are fully closed the hydraulic jacks must be fully extended, and there should be a clearance of 0.20 in. between the metal faces of the door edges. To adjust the actuating links:

- (1) Fully open the flare-bay doors.
- (2) Remove the split pin and collar from the pin attaching the fork-end of the actuating link to the hinge bracket, and withdraw the attachment pin.
- (3) Slacken the locknut at the fork-end of the actuating link, and turn the fork-end of the actuating link as required.
- (4) Tighten the lock-nut on the actuating link.
- (5) Reconnect the actuating link to the hinge bracket.
- (6) Check the operation of the doors.

Flare bay door stay adjustment (fig. 6)

30. The pin centres of the flare bay door forward and aft stays are nominally set at 10.70 in. \pm 0.15 in. and 16.70 in. \pm 0.15 in. respectively. These are manufacturer's settings which

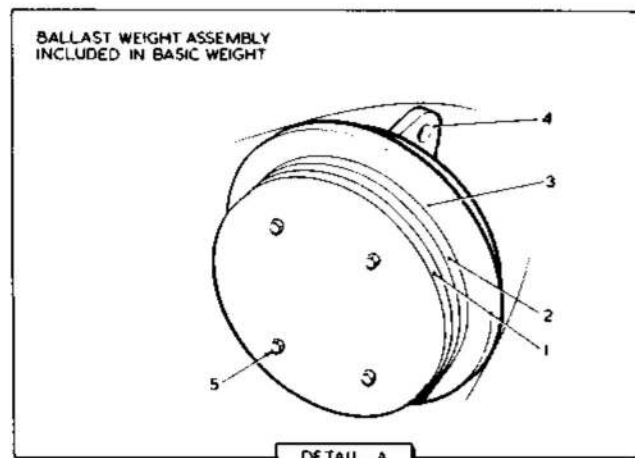
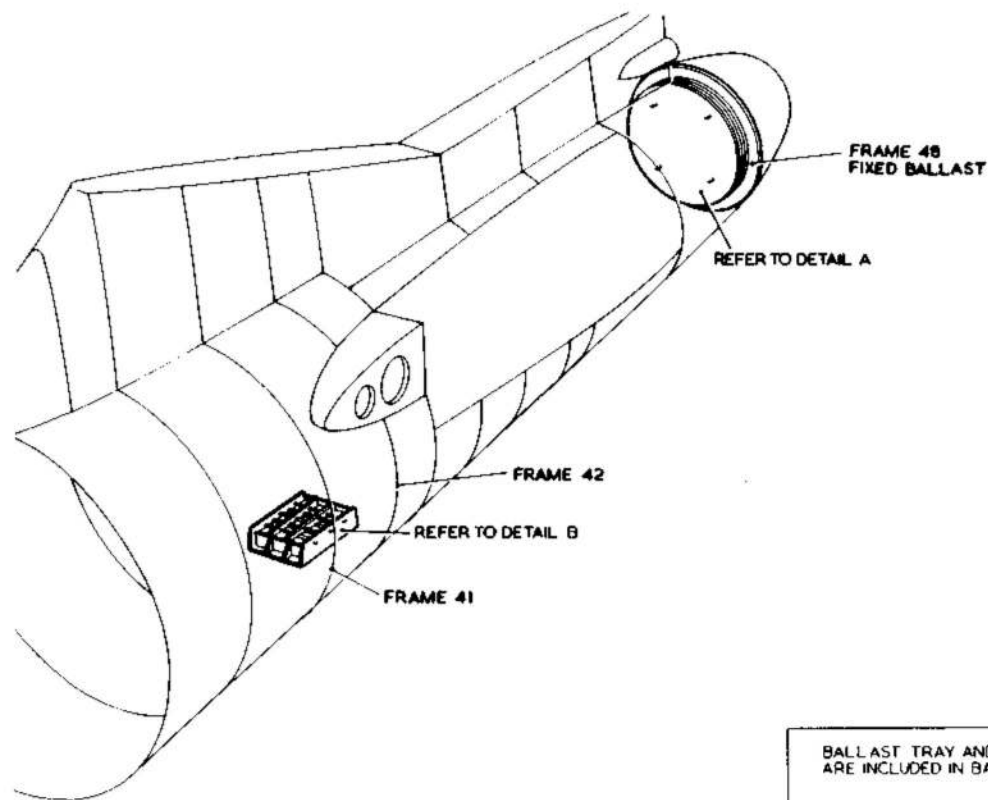
should not normally require alteration. If adjustment is necessary:

- (1) Fully open the flare-bay doors.
- (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 to the eye-bolt on the door hinge bracket.
- (5) Check the operation of the doors.

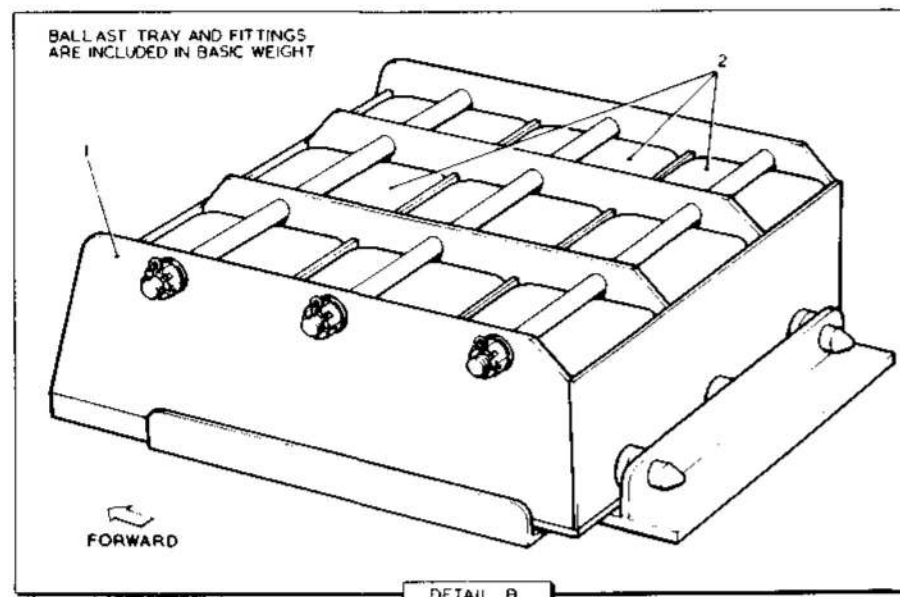
Rear camera bay door jack adjustment (fig. 4)

31. The pin centres of the rear camera-bay door jack are nominally set at 15.80 in. \pm 0.1875 in. when the jack is fully contracted; this is a manufacturer's setting which should not normally require alteration after assembly. If adjustment is necessary:

- (1) Remove the jack cover.
- (2) Disconnect the fork-end of the jack piston rod from the pivot arm.
- (3) Remove the locking wire from the locknut on the jack piston rod and slacken off the locknut.
- (4) Adjust as necessary by turning the fork-end one-half turn at a time.
- (5) Tighten the locknut on the jack piston rod and relock with new locking wire.
- (6) Reconnect the fork-end of the jack piston rod to the pivot arm.



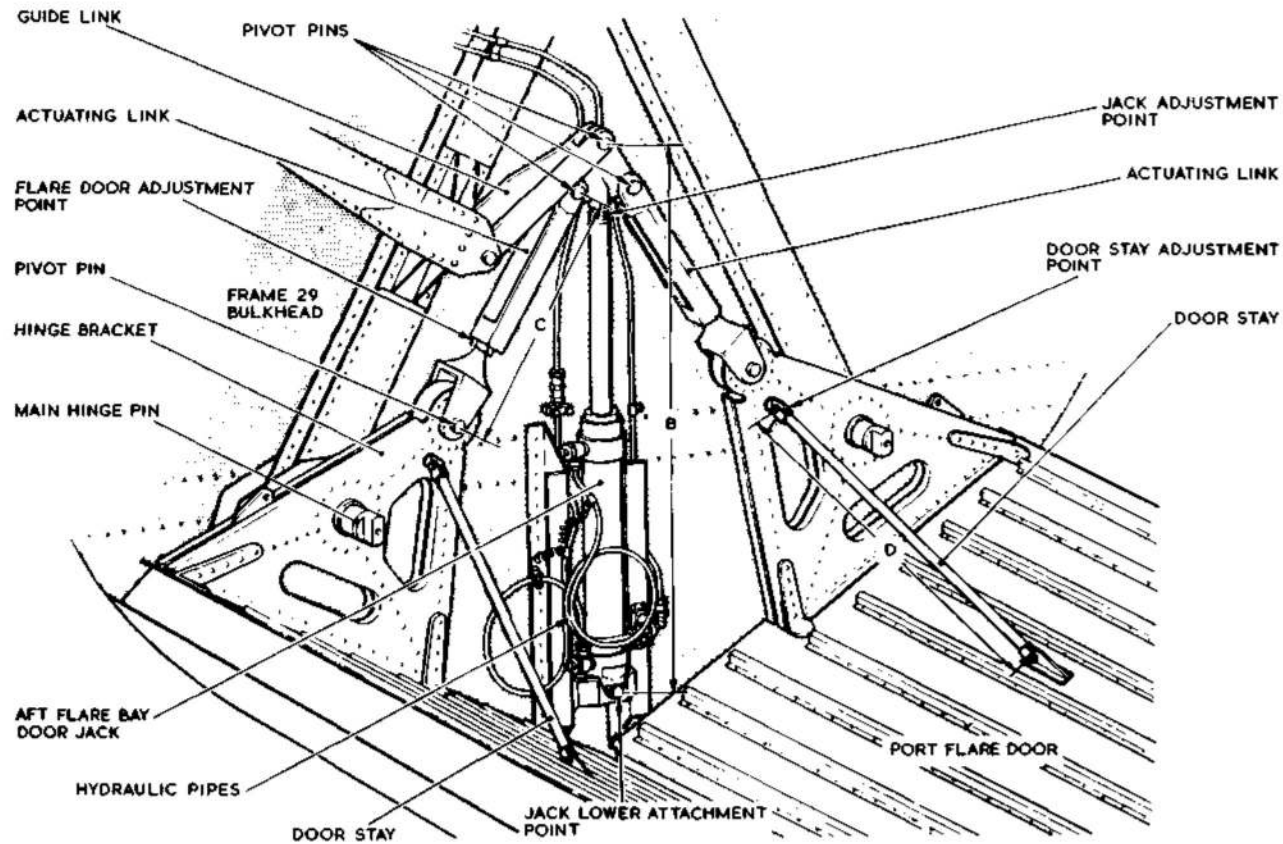
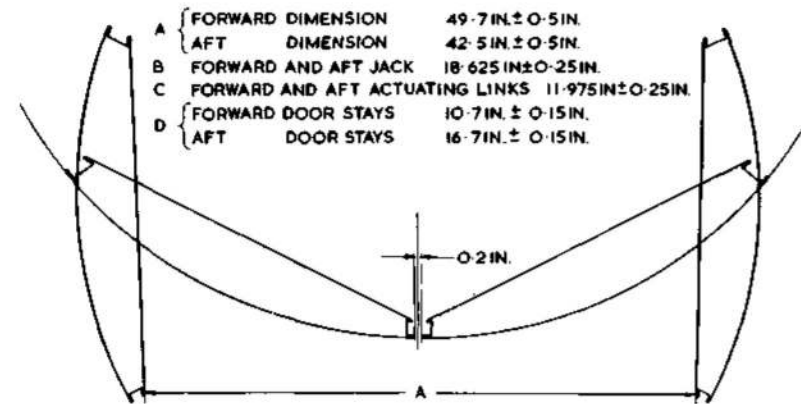
NO	ITEM	APPROX WEIGHT (LB)	PART NO	QTY
1	BALLAST WEIGHT	9.0	EKS 84 9	5
2	BALLAST WEIGHT	7.0	EKS 84 27	2
3	CARRIER PLATE	7.5	EKS 84 7	1
4	LIFTING WEIGHT ASSEMBLY	9.5	EKS 84 11	1
5	FITTINGS	0.5		4



NO	ITEM	APPROX WEIGHT (LB)	PART NO	QTY	ALTERNATIVE WOOD BLOCK NO.	QTY
1	TRAY ASSEMBLY	12.0	EKS 84 15	1		
2	BALLAST WEIGHT	9.0	EKS 84 19	9	EKS 84 23	9

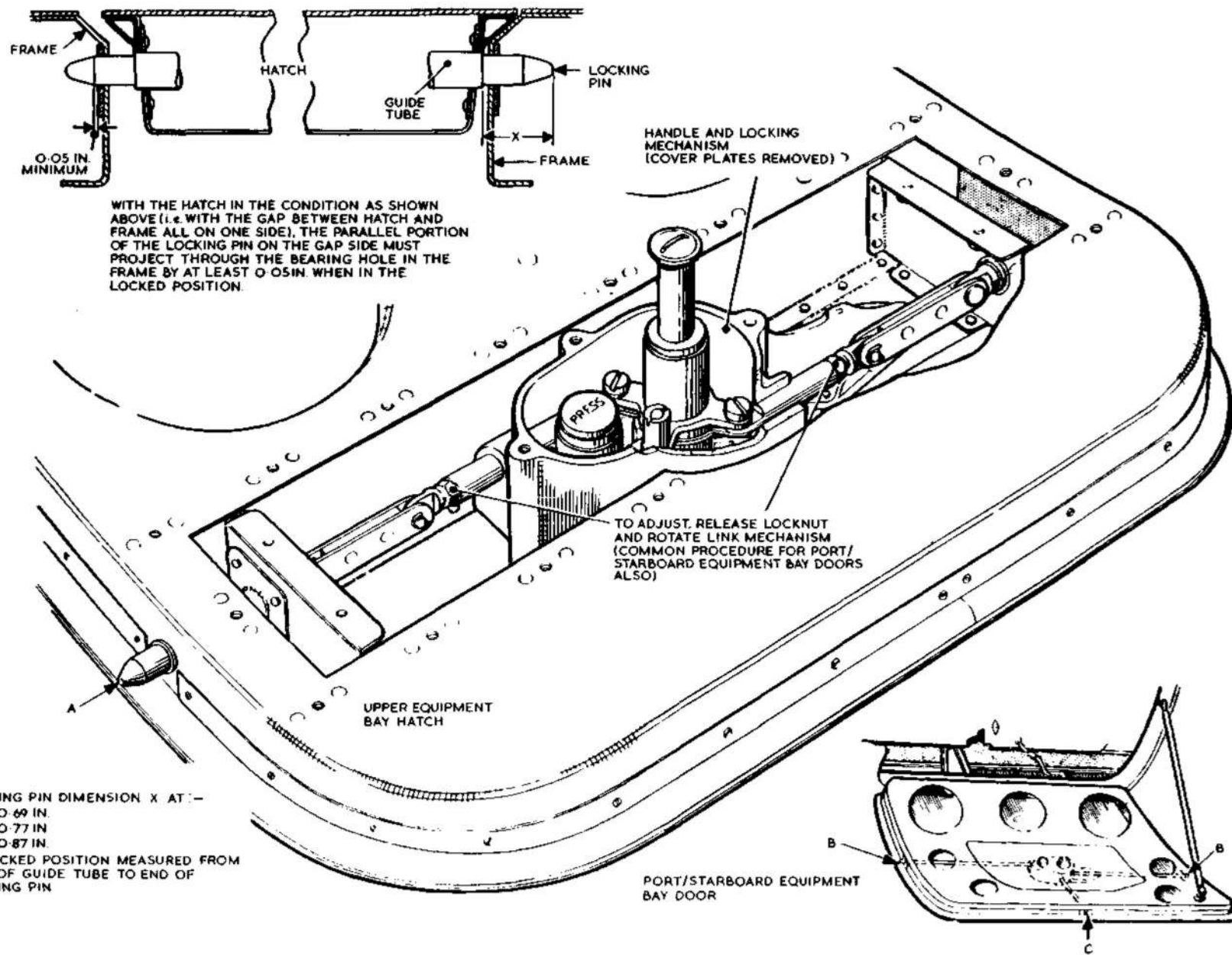
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FIG. 5. BALLAST WEIGHTS



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EA2-11-1311 155 6A

FIG. 6. FLARE BAY DOORS ADJUSTMENT



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FIG. 7. HATCH LOCKING PIN SETTINGS

- (7) Replace the jack cover.

Lubrication

32. Refer to fig.7A.

REMOVAL AND ASSEMBLY

General information

33. The following paragraphs describe the removal and assembly operations of the fuselage and its principal components. Only the removal operations are described, since assembly is generally a reversal 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.

Slinging

34. The methods of slinging the fuselage sections are illustrated in fig. 14 and 15.

Trestling

35. 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.

Nose radome

CAUTION . . .

The nose radome must be depressurized before any removal operation is started.

Depress the manually operated valve located on the underside of the fuselage, forward of frame 1 on the port side, until air ceases to escape.

36. To remove the radome proceed as follows:—

- (1) Depressurize the radome.
- (2) Support the radome in its trolley, release the ten King toggle fasteners and remove the radome.

37. When fitting a new or replacement radome proceed as follows:—

- (1) Remove the seal from the sealing ring on frame A.
- (2) Lightly chalk the bearing face of the mounting ring on the radome assembly.
- (3) Assemble the radome to the dowels on frame A and engage all fasteners.
- (4) Remove the radome from frame A and check for full contact of mounting ring bearing face against the sealing ring; adjust fasteners to obtain full contact. Remove the radome.
- (5) Clean both bearing faces, insert seal into the sealing ring.
- (6) Assemble the radome to frame A; pressurize radome (Sect. 3, Chap. 8) and check for leaks.

Canopy (fig. 8)

WARNING . . .

Before proceeding with the removal of the canopy, ensure that the jettison master switch is in the safe position. Remove the detonator

circuit fuses and disconnect the internal service batteries, the emergency batteries, and any external electrical supply.

Removal

38. To remove the canopy:—

- (1) Disconnect the two clear-vision window heating plugs.
- (2) Remove the six 2 B.A. screws securing the canopy fairing, and remove the fairing by sliding clear of the section attached to the navigator's escape hatch.
- (3) Unfasten the coaming panel and allow it to hang with its weight supported by slings made from soft wire.
- (4) Disconnect the hot air diffuser pipe at its control on the port side, unscrew the P.K. screws and remove the pipe and forward blast shield. Blank off the exposed end of the hot air pipe.
- (5) Disconnect and blank off the three de-misting hoses, and remove the two air-driers (Sect. 3, Chap. 8).
- (6) Remove the eight blast plates which are secured to the coaming tube.
- (7) Remove the detonators from the explosive bolts (A.P.110N-0312-1).
- (8) Unscrew and remove the 32 explosive bolts.
- (9) Raise the forward end of the canopy, lift clear of the rear hinge and remove the canopy from the aircraft.
- (10) Remove the seal and all traces of sealant

RESTRICTED

- FORWARD CAMERA BAY DOORS (4 OFF)
- JACK PIVOT POINTS
- DOOR ROLLERS
- GUIDE RAILS
- OPERATING MECHANISM

- STARBOARD EQUIPMENT COMPARTMENT DOOR
- HINGES
- LOCKING MECHANISM
- LATCHES AND HANDLE SPINDLE

- UPPER EQUIPMENT COMPARTMENT HATCH
- LOCKING MECHANISM
- FASTENERS AND HANDLE SPINDLES

- FOLDING SEAT PIVOTS AND SLIDES (LIGHT LUBRICATION ONLY)

- CANOPY AND HATCH EXPLOSIVE BOLT THREADS (LIGHT LUBRICATION ONLY)

- CREW ENTRANCE DOOR;
- LOCKING PLUNGERS
- LOCKING MECHANISM
- HANDLE SEAL (LIGHT LUBRICATION ONLY)
- HANDLE SPINDLES
- JETTISON MECHANISM HINGES

- BATTERY COMPARTMENT;
- BATTERY TRAY ROLLERS
- DOOR:
- HINGES
- LOCKING MECHANISM
- LATCHES AND HANDLE SPINDLE

- REAR ACCESS HATCH
- HINGES
- LOCKING MECHANISM
- PLUNGER AND HANDLE SPINDLES

- FLARE BAY DOOR ROLLERS AND TRACKS (6 OFF)

- FLARE BAY DOORS OPERATING MECHANISM (DETAIL A)

- REAR CAMERA BAY DOORS.
- JACK PIVOT POINTS
- OPERATING LEVER PIVOT
- CONNECTING ROD BEARINGS
- DOOR ROLLERS
- GUIDE RAILS

- ROLLER GUIDE

DETAIL B
FOLDING SEAT

LUBRICATE THE COMPLETE OPERATING MECHANISM WITH

- SLIDES
- HINGES (LIGHT LUBRICATION ONLY)

- ROLLER AND DOWN LOCK CATCH PIVOT (LIGHT LUBRICATION ONLY)

- GUIDE LINK PIVOTS

- JACK ATTACHMENT POINTS
- PIVOT PIN

DETAIL A
FLARE BAY DOORS OPERATING MECHANISM
(LEFT SHOWN FORWARD SIMILAR)

NOTE
FOR INTERPRETATION OF SYMBOLS REFER
TO THE LUBRICATION MARKER CARD

FIG. 7A LUBRICATION DIAGRAM

◀ FOLDING SEAT ADDED ▶
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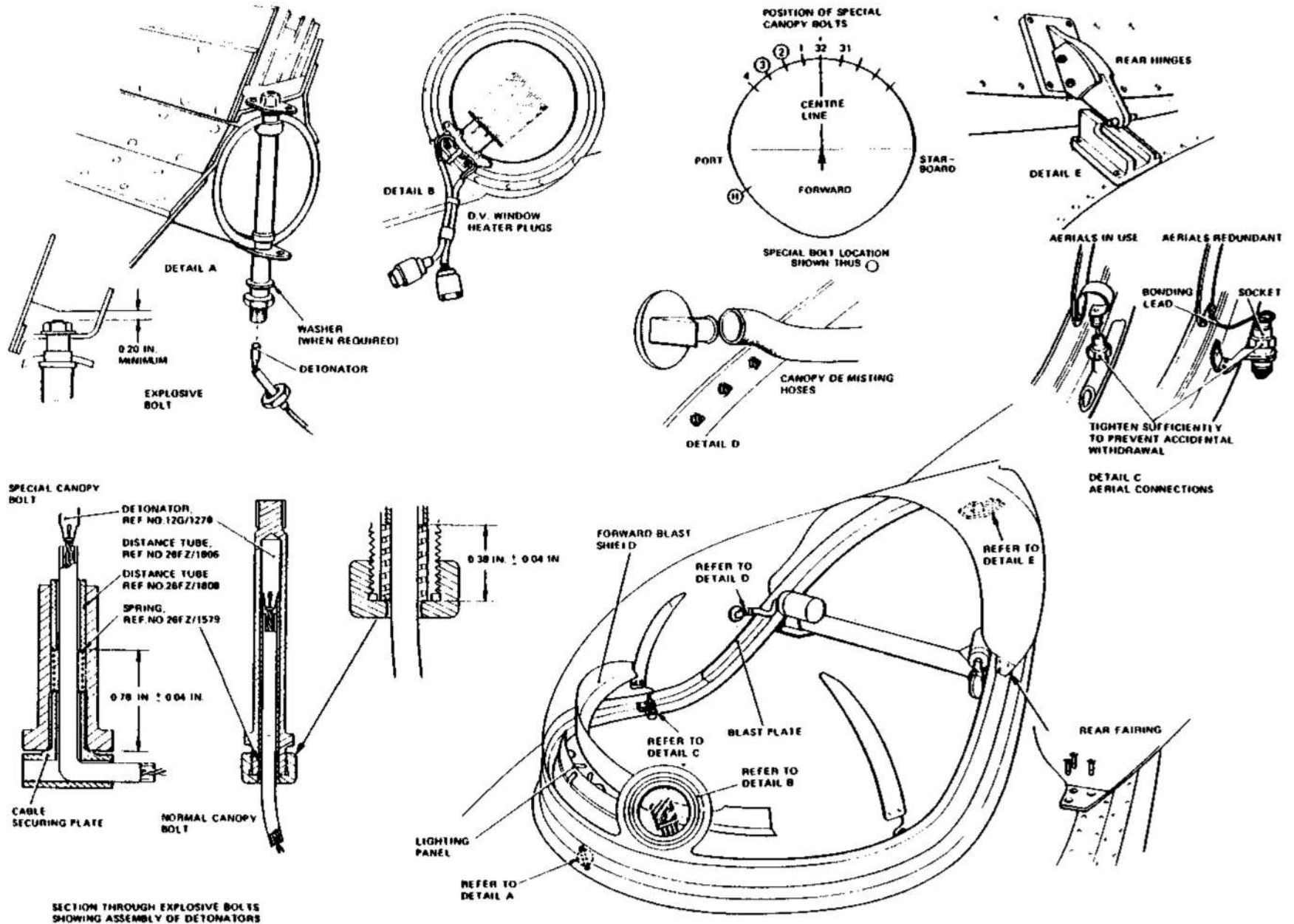


FIG. 8. CANOPY-REMOVAL AND ASSEMBLY

◀ THIRD SPECIAL CANOPY BOLT AND AERIAL DETAILS ADDED ▶

from the coaming tube and from 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

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, Chap. 2)

39. To assemble the canopy:-

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

(2) Offer up the canopy and align it by inserting four locating pins (Sect. 2, Chap. 4) 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). Fit 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.

Note . . .

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

2. Where a white spot approximately 0.25 in. dia. has been painted on the coaming tube, a washer Ref. No. 28W/12442 must be fitted between the shoulder of the bolt and the lower bush of the coaming tube.

3. Special bolts Ref. No. 26FZ/1594, are fitted to bolt holes No. 2, 3 and 11 from the centre line on the forward, port, side of the canopy (fig.8). Do not count that bolt hole which is on the centre line of the canopy.

(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 the three de-misting hoses (Sect. 3, Chap. 8).

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

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

(11) Position the coaming panel, remove the temporary slings, and secure the panel to the tube.

(12) Pressure test the cabin (Sect. 3, Chap. 8).

(13) Fit the detonators into the explosive bolts (A.P.110N-0312-1).

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 bolt and the spring Ref. No. 26FZ/1579 be assembled

as shown in fig. 8. 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. \pm 0.04 in. for the standard bolt and 0.78 in. \pm 0.04 in. for the special bolt.

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

(14) Connect the two clear-vision window heating plugs.

(15) Reconnect the electrical supplies.

Fitting a new canopy

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

Fitting a canopy D.V. window

41. 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 marking 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 (Sect. 3, Chap. 8) after any adjustment has been made.

Navigator's escape hatch (fig. 9)

Removal

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

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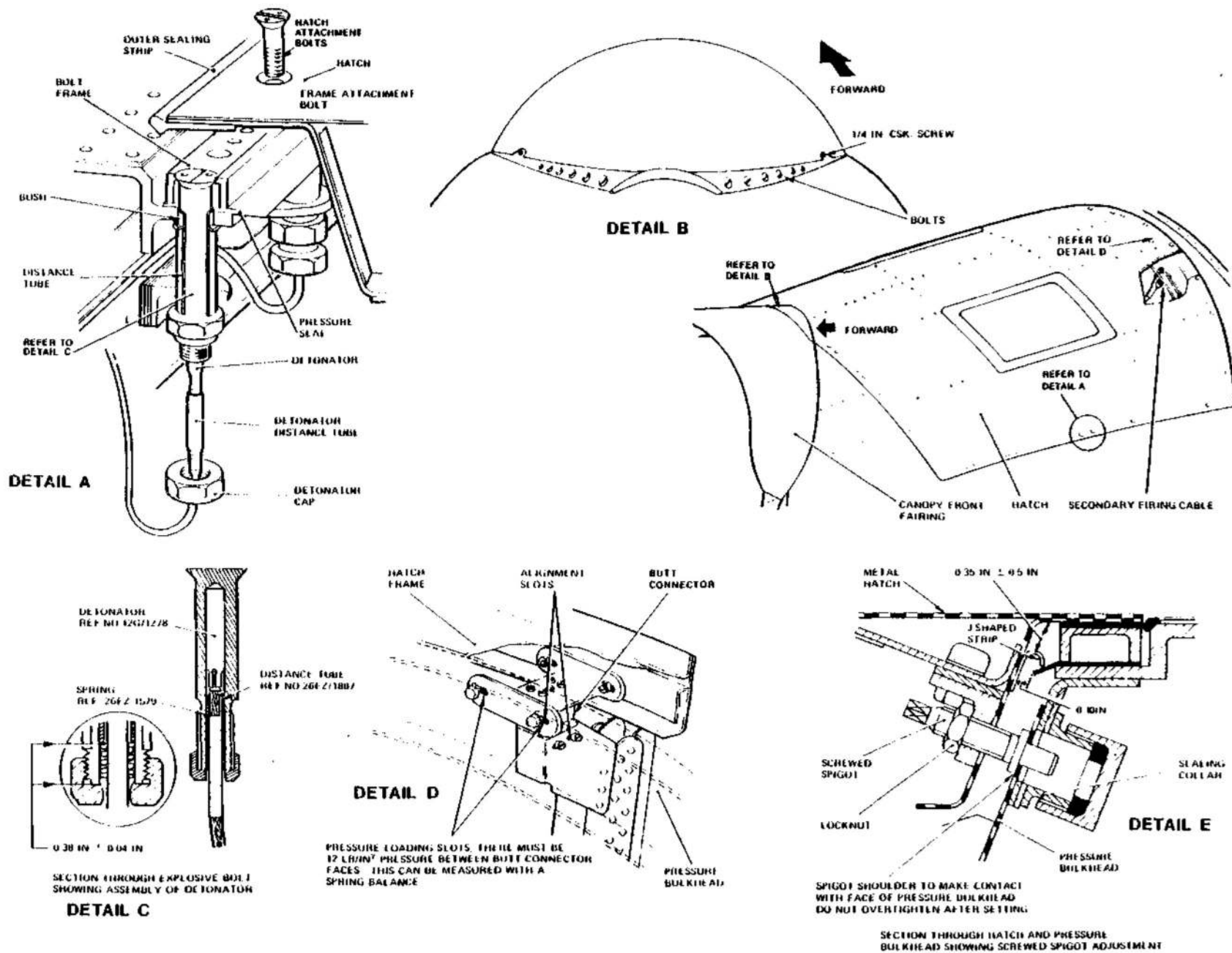


FIG. 9. NAVIGATOR'S HATCH REMOVAL

<DISTANCE TUBE REF. NO. AT DETAIL C AMENDED>

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WARNING . . .

Before any work on the crew 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 cable.
- (2) Remove the canopy aft fairing (*detail B*).
- (3) Remove the 68 - ¼ in. dia. attachment screws securing the hatch to the bolt frame (*detail A*).
- (4) Remove the hatch by easing it upwards at its forward end to allow the screwed spigots to clear the sockets in the bulkhead.

Assembly

43. The procedure for the assembly of the navigator's hatch is detailed in the following operations. When a new navigator's 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 (*detail A*).
- (2) Place the hatch in position on the bolt frame (*detail A*) and, taking care not to trap the seal irregularly, secure the hatch with the 68 screws 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 overtighten spigots when tightening locknuts.

- (5) Check and if necessary, adjust and align the periscope mounting butt connector (*fig. 9, detail D*) until there is a 12 lb/in² pressure between the faces; this can be measured with a spring balance.
- (6) Refit the canopy aft fairing (*detail B*).
- (7) Reconnect the secondary firing-cable to the hatch.
- (8) Pressure test the cabin (*Sect. 3, Chap. 8*).

Note . . .

1. Whenever the explosive bolts have to be replaced, lubricate the threads with a thin coating of grease (*fig.7A*). Ensure that the correct securing nut, Part No. AGS.2002/1/1, is fitted to the explosive bolt and that the appropriate distance tubes are used for any given 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-0312-1) 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. 9*. 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 surrounding structure.

Forward camera bay doors (*fig. 10*)

44. To remove the forward camera bay sliding doors:—

- (1) Remove the nuts and washers from the three 2 B.A. bolts attaching each door to the bridge-piece.
- (2) List the bridge-piece clear and slide the door upwards out of its guide rails.

Forward camera bay door jacks (*fig. 10*)

45. To remove either of the forward camera bay door jacks:—

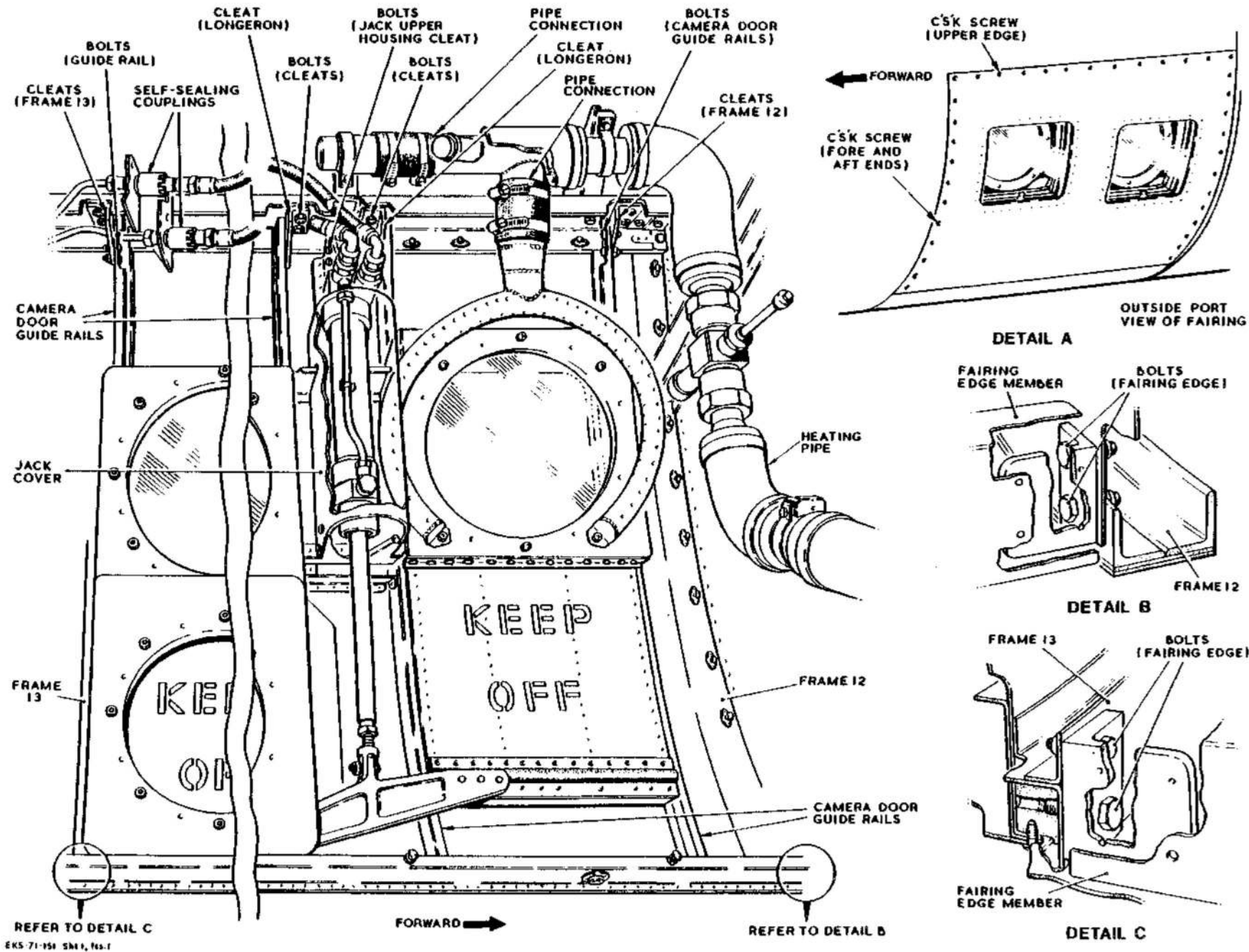
- (1) Remove the jack cover.
- (2) Disconnect the hydraulic pipes at the self-sealing couplings.
- (3) Disconnect the jack piston rod from the bridge-piece.
- (4) Disconnect the jack from the jack attachment-bracket and remove the jack.

Flare bay door jacks (*fig. 6*)

46. To remove either of the flare bay door jacks:—

- (1) Fully open the flare-bay doors.
- (2) Ensure that the hydraulic system is exhausted of all hydraulic pressure (*Sect. 3, Chap. 6*), and disconnect the hydraulic pipes from the jack.
- (3) Remove the split pins and collars from the actuating-link pivot-pins.
- (4) Withdraw the pivot-pins and, at the same time, move the actuating links away from the end-fitting of the jack and remove the spherical washers from the bush.

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REFER TO DETAIL C
EKS-71-150 SH1, FIG. 1

REFER TO DETAIL B

FIG. 10. FORWARD CAMERA BAY FAIRING REMOVAL

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(5) Remove the split pin and collar from the guide link pivot-pin and withdraw the pivot-pin.

(6) 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 from the bulkhead side of the links. After reassembly, bleed the circuit through the jack bleed screws (Sect. 3, Chap. 6).

Flare-bay doors (fig. 11)

47. To remove the flare-bay doors: -

- (1) Fully open the flare-bay doors.
- (2) Ensure all electrical services are switched OFF.
- (3) Remove the lower microswitch from its mounting bracket.
- (4) Support the flare-bay door.
- (5) Remove the No. 6 fuel tank rear fairing (Sect. 4, Chap. 2).
- (6) Remove the split pins and nuts from the hinge bracket pivot pins on the forward face of frame 21B and aft face of frame 29.
- (7) Remove the pivot pins from the actuating links.
- (8) Remove the pivot pins from the hinge brackets.
- (9) Remove the doors.

Note . . .

On assembly, guide the flare-bay doors into their open position using a metal shim to protect the flare-bay skirt and sealing strip.

Rear camera bay door jack (fig. 4)

48. To remove the rear camera bay door jack:-

- (1) Remove the jack cover (if fitted).
- (2) Ensure that the hydraulic system is exhausted of all hydraulic pressure (Sect. 3, Chap. 6), then disconnect and blank off the hydraulic pipes from the jack.
- (3) Disconnect the fork-end of the jack piston-rod from the operating lever.
- (4) Disconnect the jack from the jack attachment-bracket and remove the jack.

Rear camera bay doors (fig. 4)

49. To remove the rear camera bay sliding doors: -

- (1) Fully retract the door jack.
- (2) Disconnect the connecting-rod from the door to be removed.
- (3) Lift the connecting-rod clear of the door and slide the door upwards out of its guide rails.

Fitting a crew entrance door

50. To remove the crew entrance door, operate the door jettison mechanism (Sect. 3, Chap. 11). To fit an entrance door proceed as follows: -

- (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; an assistant stationed outside the aircraft should maintain pressure on the door to ensure that the hinge pins remain correctly located.

CAUTION . . .

Before securing the jettison handle ensure that the hinge-pin cups are rotated fully to the safe position. The door jettison handle must be rotated approximately four complete revolutions from the jettison to the safe position.

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

Note . . .

When a new door is to be fitted refer to A.P.101B-0400-6, Part 1, Chap. 2.

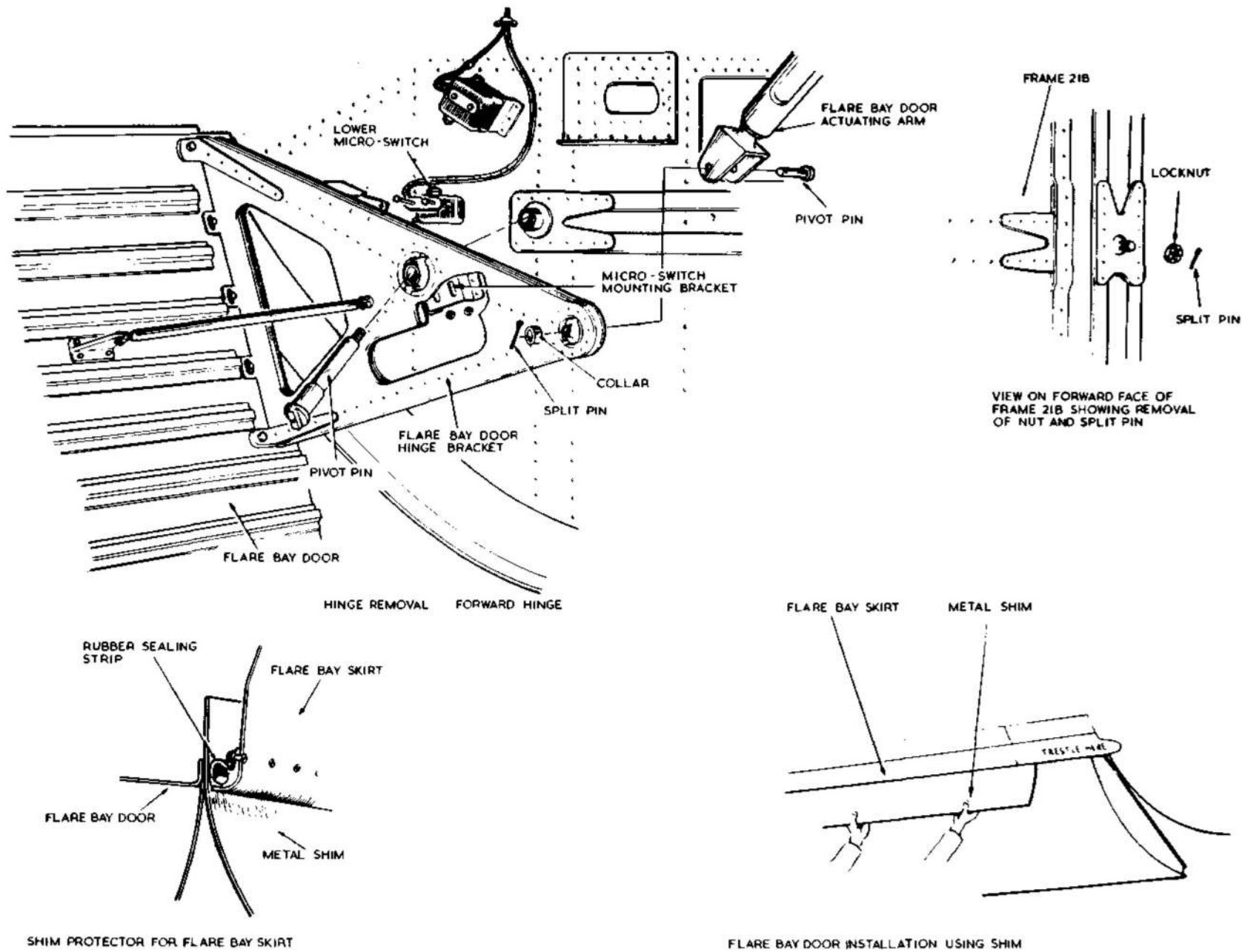
Rear fuselage removal (fig. 12)

51. To remove the rear fuselage from the front fuselage:-

- (1) Jack and trestle the aircraft (Sect. 2, Chap. 4).
- (2) Attach the sling to the rear fuselage (fig. 15); take up the slackness on the sling.
- (3) Disconnect all electrical supplies.

Note . . .

Access to all connections and attachment bolts is gained through the camera access hatch in the undersurface of the rear fuselage. Should difficulty be experienced when closing and securing the camera hatch, it is recommended that the hatch be secured by



HINGE REMOVAL FORWARD HINGE

FIG. II. FLARE BAY DOOR REMOVAL

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 electrical cable 6112 from the lighting box on the starboard side of the rear fuselage and carefully stow it in the front fuselage.

(6) Disconnect the elevator and rudder control tubes on the port side of the fuselage.

(7) Disconnect and blank off the fuel vent pipe on the starboard side of the fuselage.

(8) Dismantle the Minilift hoist rails from the roof of the fuselage. The eight 2 B.A. bolts attaching the guide rail brackets to the transport joint must also be removed.

◀ **Note...**

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

(9) Refer to fig.12 and remove the stiff-nuts and washers from the 80 frame-attachment bolts between the stringers and remove the bolts.

(10) 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, then remove the bolts.

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

(12) Remove the stiffnuts and washers from the frame-attachment bolts at each longeron, and withdraw the bolts. The rear fuselage is then free, and should be placed on trestles (Sect. 2, Chap. 4).

Note ...

1. Before reassembly, apply pigmented varnish jointing compound (Ref. No. 33H/2202110) to the faces of the transport joint between the inner edge of the frame and the bolt holes, and Bostik glazing compound (Ref. No. 33H/9704973) between the outer edge of the frame and the bolt holes. No jointing compound or Bostik must enter the bolt holes.

2. The fork end fittings of flying control rods are machined with a counterbored recess, on the outer face of the lugs, at the bolt hole. This recess is designed to take the nut when the control rods are assembled.

3. A flight trim check must be made, as detailed in Sect. 3, Chap. 4, Appendix 1, whenever the rear fuselage is refitted or replaced, to ensure that the aircraft trim is within the limits laid down. Should the aircraft trim be outside the limits specified, a new elevator trailing-edge strip should be fitted and the flight trim checks and subsequent trailing-edge strip adjustments made.

◀ 4. Ensure bolts Pt. No. A25/14E are refitted at the positions noted in para. 51 (8). ▶

Rear fairing removal (fig. 16)

52. To remove the rear fairing from the rear fuselage:—

(1) Remove the box fairings from both sides of the fuselage as follows:—

(a) Remove the access panels.

(b) Remove the two 2 B.A. bolts from inside the box fairing.

(c) Remove the two 2 B.A. countersunk screws from the forward edge of each box fairing.

(d) Move the tail plane to its minimum incidence, then remove the 2 B.A., bolt from each side of the rear end of each box fairing.

(e) Remove the box fairings.

(2) Support the tail fairing; remove the four ¼ in. dia. stiffnuts (detail A).

(3) Remove the ten 2 B.A. countersunk screws from each closing strip and remove the closing strips.

(4) Disconnect the electrical cables from the terminal block in the rear fuselage.

(5) Remove the 5/16 in. dia. bolts (detail B).

(6) Unscrew the four countersunk 2 B.A. screws from the forward edge of the tail fairing.

(7) Remove the tail fairing.

Forward camera bay fairing removal (fig. 10)

53. To remove a forward camera-bay fairing:—



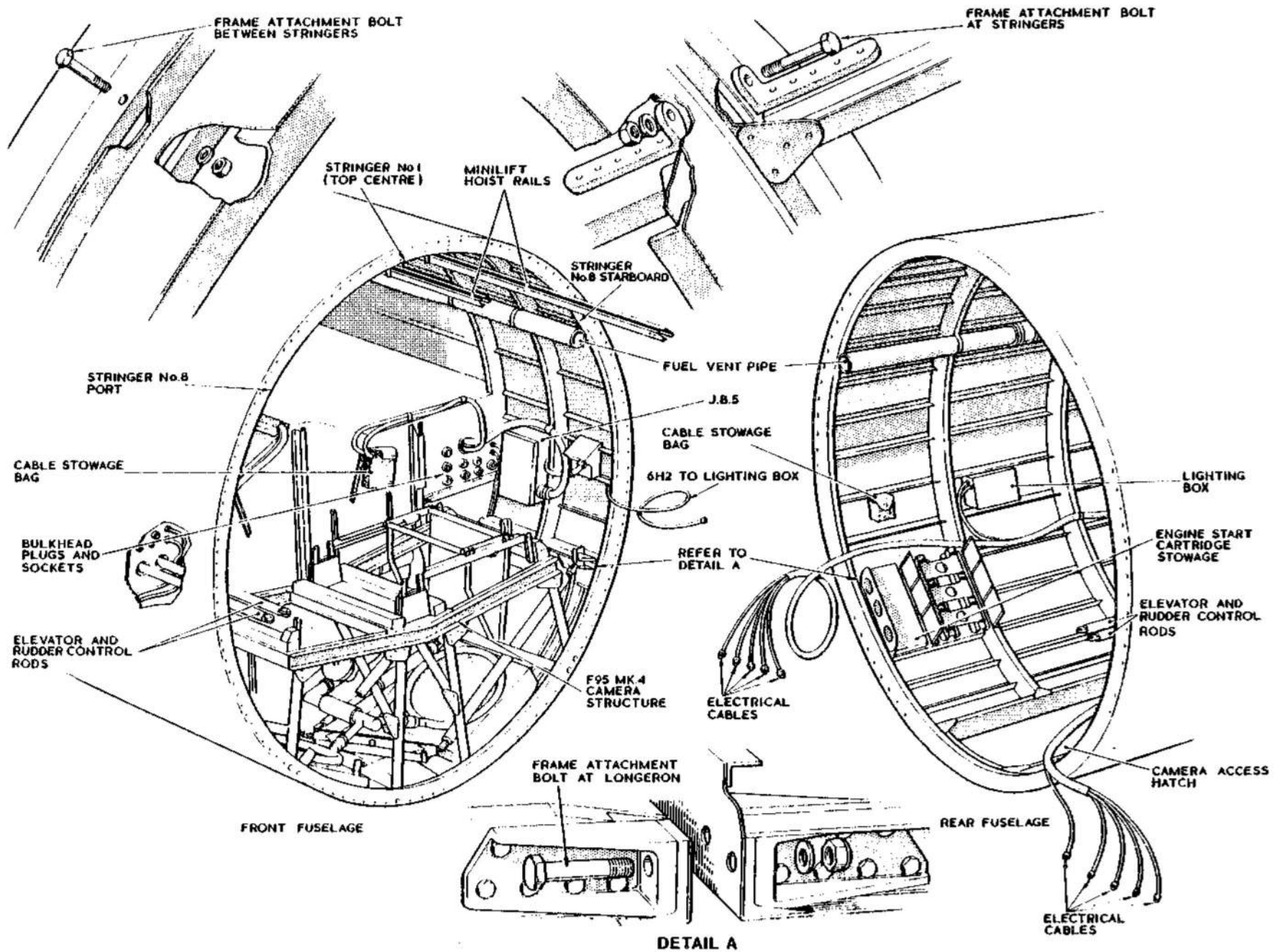


FIG.12. REAR FUSELAGE REMOVAL

- ◀ (1) Remove the camera-bay access panel (*Sect. 2, Chap. 4*).
- (2) Remove the lagging and slacken off the clips securing the heating pipes slide-on connections and slide the connections clear of the joints.
- (3) Disconnect the hydraulic pipes at the self-sealing couplings.
- (4) Remove the bolts attaching the camera-door guide rails to the cleats adjacent to frames 12 and 13. ▶
- (5) Remove the bolts attaching the cleats of

the camera-door guide rails to the longeron.

- (6) Remove the two bolts from the cleat attaching the jack upper housing to the longeron.
- (7) Remove the two bolts attaching the fairing edge-member to frame 12 (*detail B*).
- (8) Remove the two bolts attaching the fairing edge-member to frame 13 (*detail C*).
- (9) With the fairing's weight suitably supported, remove the countersunk screws attaching the fore and aft ends of the fairing to frames 12 and 13 (*detail A*).

(10) Remove the countersunk screws attaching the fairing upper edge to the longeron (*detail A*), and remove the fairing.

(11) Blank-off all exposed pipe ends and adequately protect the camera window glasses.

Note . . .

Care must be taken when re-assembling the box-type lagging to the camera heating pipes. The jubilee clips attaching the lagging, should not be overtightened to the extent of collapsing it. It is considered satisfactory to tighten the clips to the stage where they can just be moved by hand.

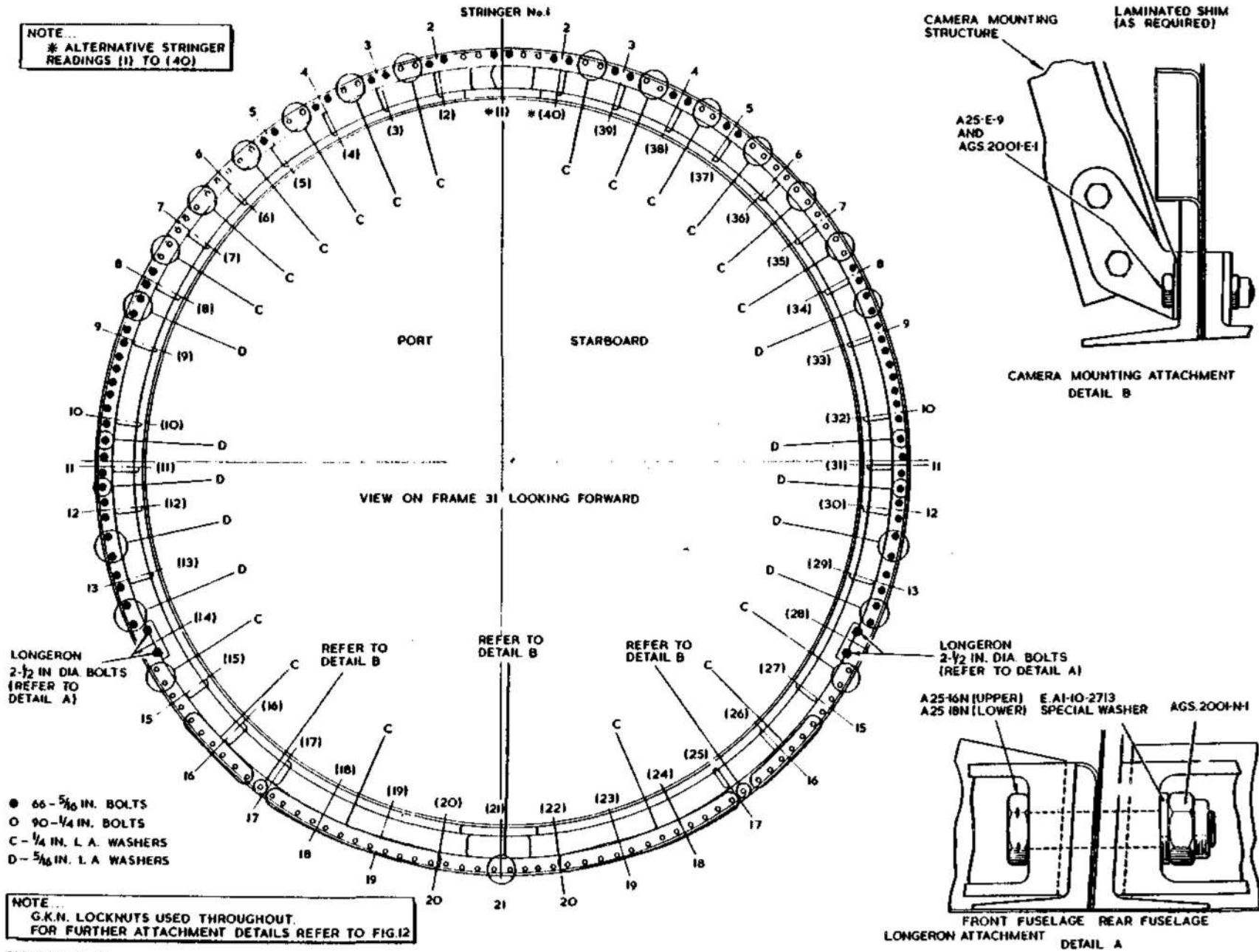


FIG.13. ATTACHMENT BOLT DETAILS - FRONT TO REAR FUSELAGE

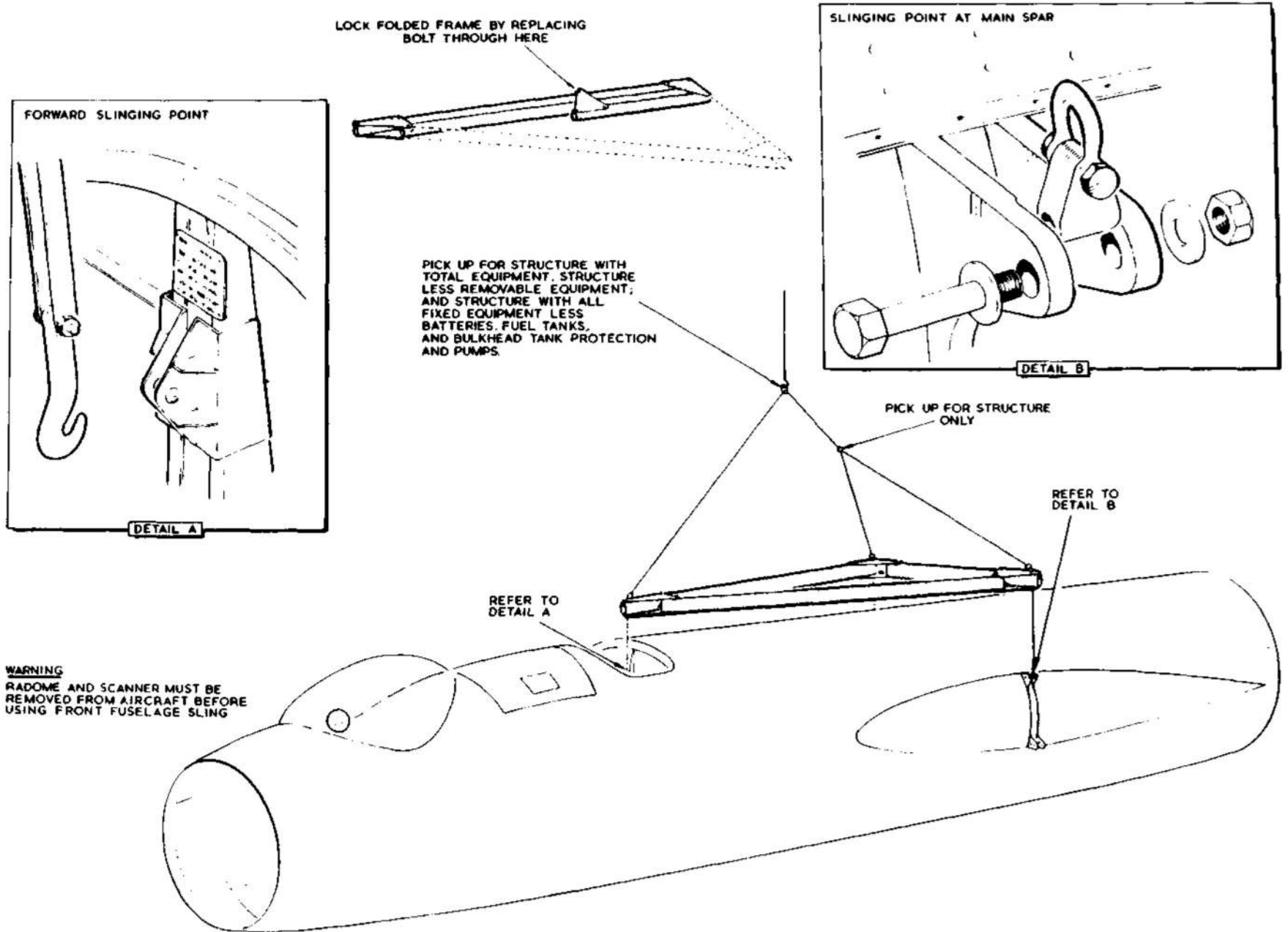


FIG.14. FRONT FUSELAGE SLINGING

◀ WARNING ADDED ▶

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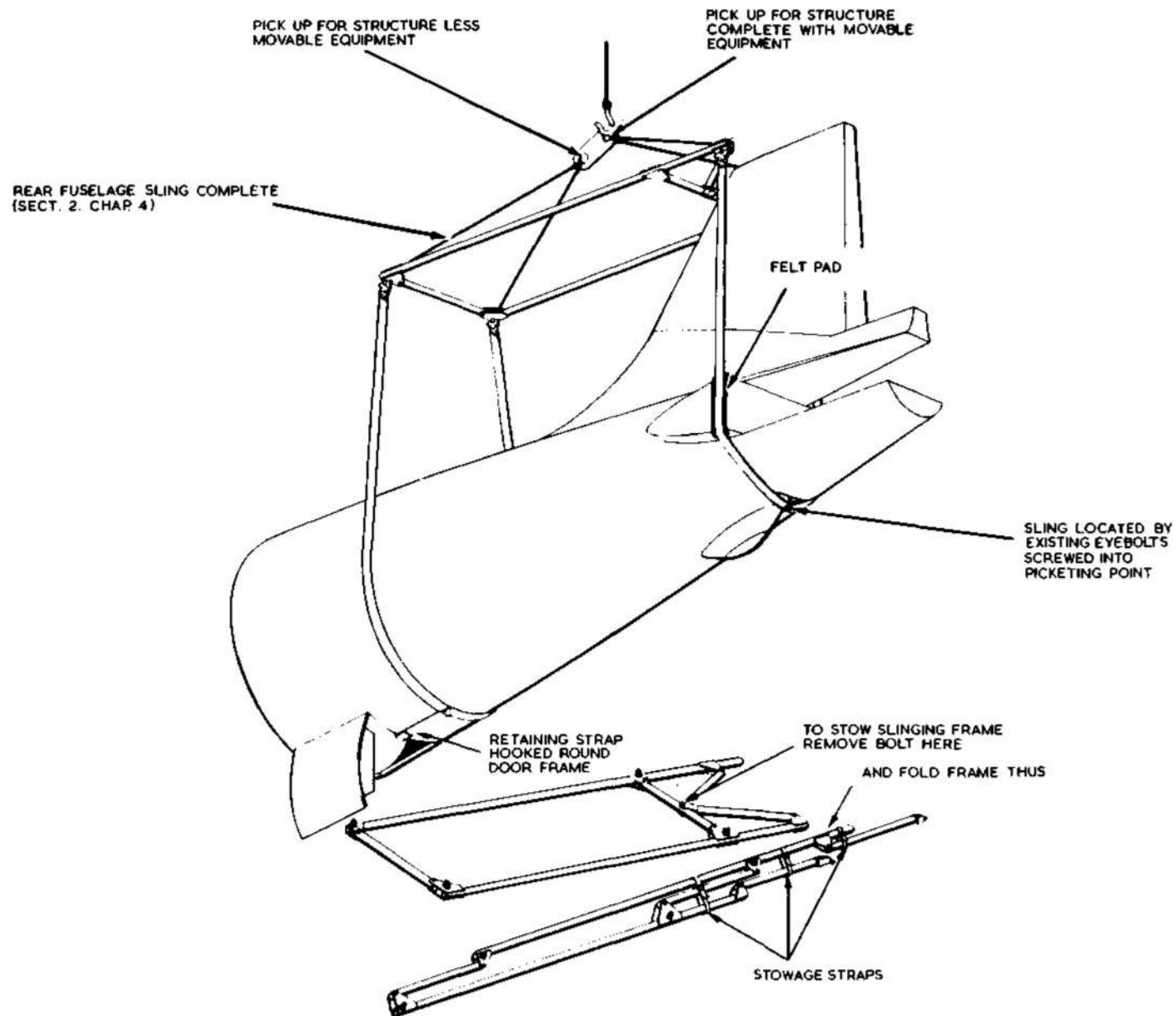
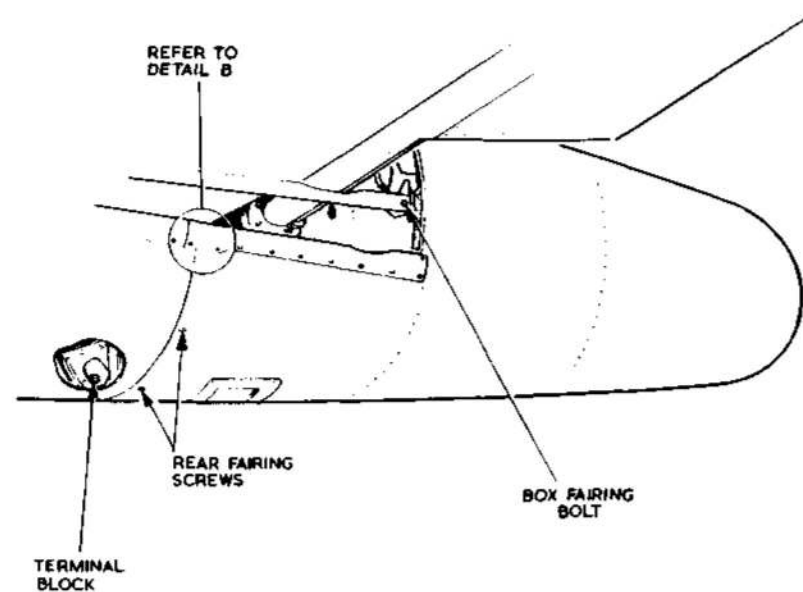
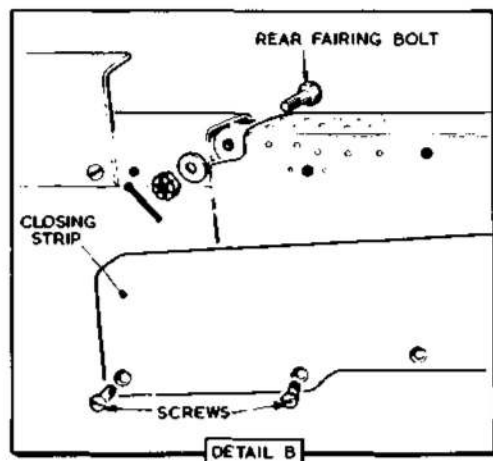
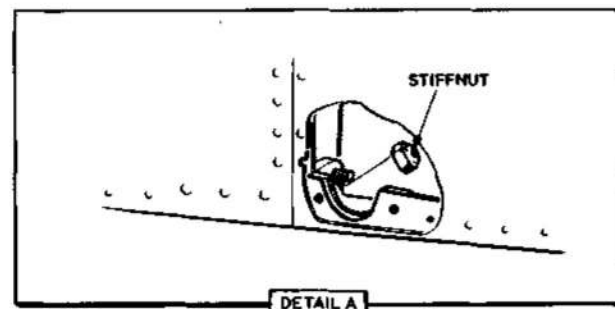
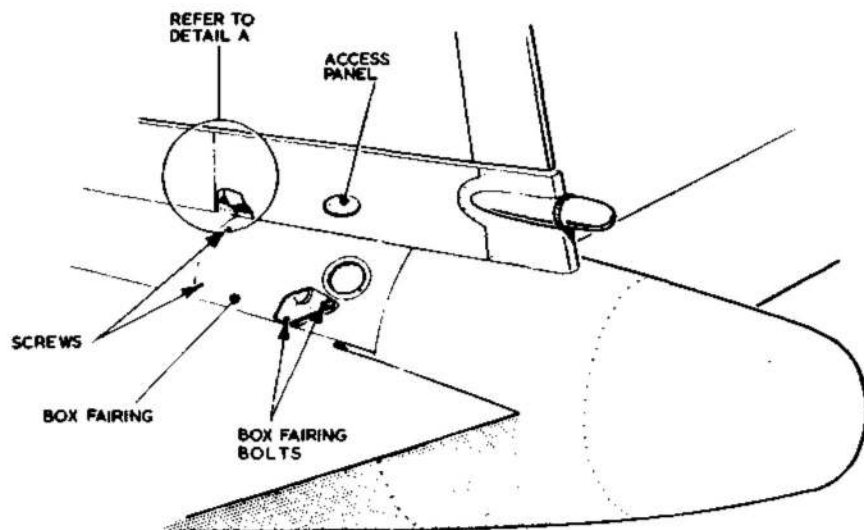


FIG.15. REAR FUSELAGE SLINGING

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FIG.16. REAR FAIRING REMOVAL

Chapter 2 MAIN PLANE

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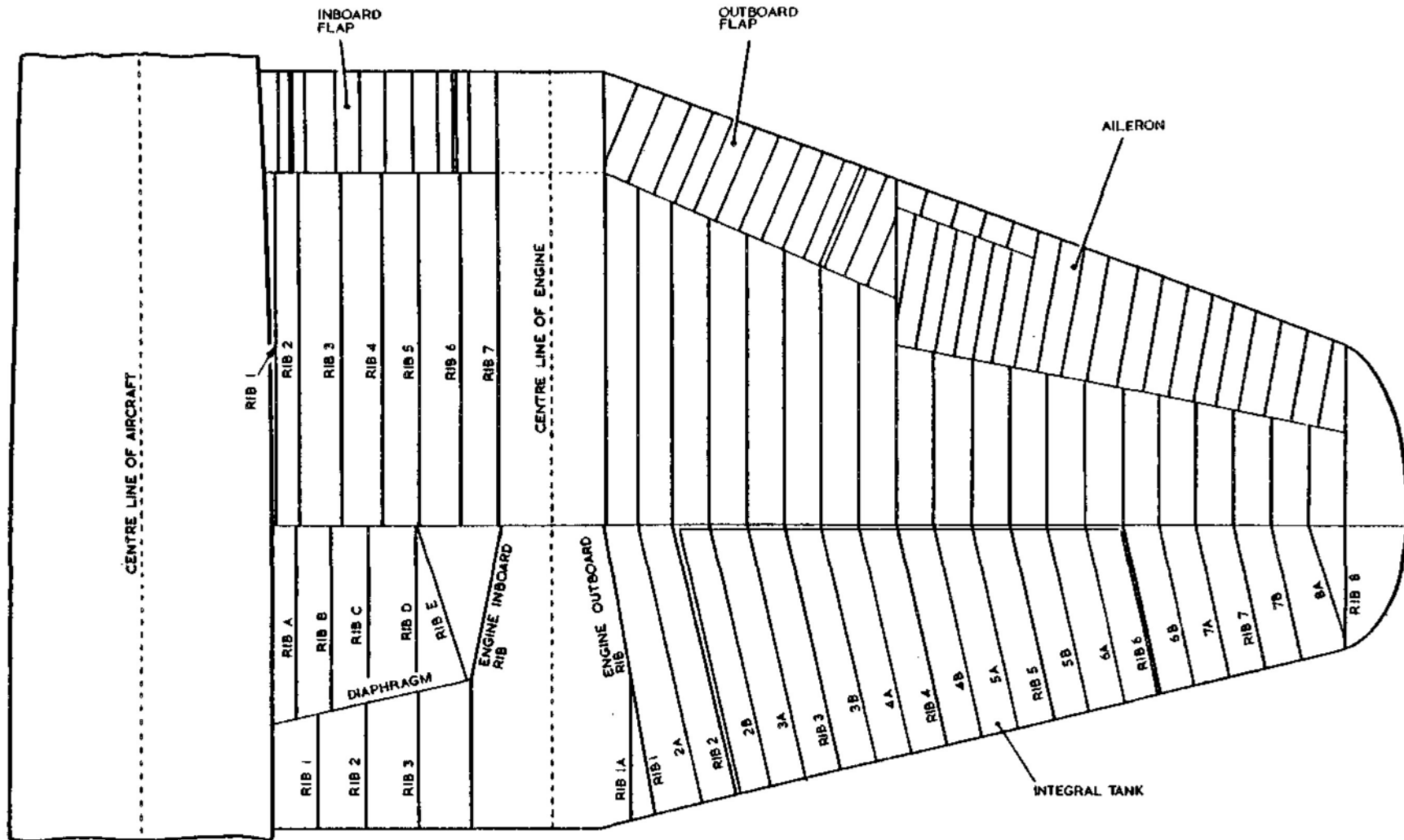


FIG.1. KEY DIAGRAM

Introduction

1. This chapter gives a general description of the main plane structure and 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 inner 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 main 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 flap shrouds, the air brake installation and the aileron and flaps, the latter being carried on hinges mounted on the aft face of the rear wall. The outer leading-edge assemblies embody the integral fuel tanks, located between ribs 2 and 6.

Note . . .

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

Main spar

3. The main 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. Lightning 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.

Rear wall

4. 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

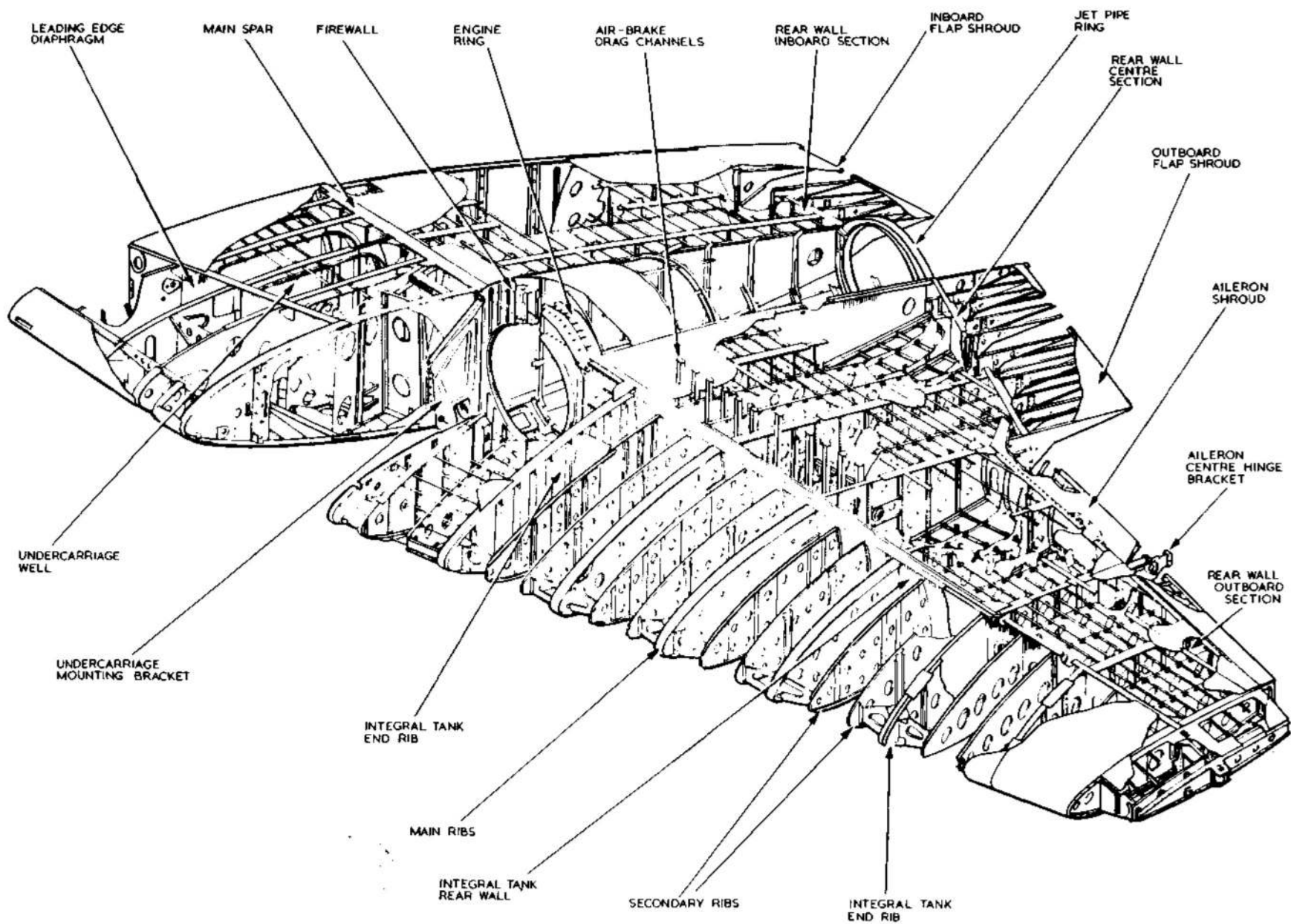
5. Outboard of the jet-pipe bay the main spar and the rear wall are joined by a system of main full-depth ribs, flanked on either side by secondary ribs which, instead of being the full depth of the main plane, are made shallow to allow the spanwise stringers to pass outside their flanges. The main ribs have flat, plate webs with flanged lightning 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.

6. Forward of the main 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 main plane leading edge. The secondary ribs do not extend as far forward as do the main ribs, but 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. From rib 2 to rib 6, forward of the main spar, the main and secondary ribs and the stringers are covered on the top, around the leading edge and on the underside by a one-piece sheet-metal skin which, with the rear, the outboard and the inboard tank walls, form a fuel tank within the main plane structure. The tank section is located by spigots on the web of the main spar and is secured to the top and bottom flange sections of the spar boom, around the outboard flange of the rib 2 and the inboard flange of rib 6 by countersunk bolts. The tank section may be removed without removing the main plane.

7. 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, while aft of the diaphragm the ribs are closed top-hat-section members. On either side of jet-pipe and engine bays, special ribs are built up with plate webs and angle-section frames.

Stringers

8. Outboard of the engine and jet-pipe bays, the spanwise stringers, of bulb-angle-section, lie intercostal with the main ribs but pass outside



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FIG.2. MAIN PLANE

the secondary ribs. Inboard of these bays the stringers pass through the main and secondary ribs alike.

Skinning

9. 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 chord-wise round the leading edge.

Wing tips (fig. 3)

10. 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 taxiing lamps are installed in the nose of the leading edge, the skin of which is moulded transparent perspex sheeting. A pitot/static pressure head is attached to the port leading edge.

Ailerons (fig. 3)

11. The ailerons are carried on a centre main hinge and on pin-and-socket hinges at their extremities. The skin covering is attached to pressed 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 aileron beaks. Upper and lower 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 ribs 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)

12. 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)

13. The split trailing-edge flaps are single-spar structures of triangular cross-section, 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 surface.

Air brakes (fig. 11)

14. 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; when in their IN position, the ends of all the drag channels lie flush with the main plane

skin surfaces. The drag 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 hydraulically operated jack mounted on the rear of the main spar.

Vortex generators

15. Two vortex generators are fitted 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.

REMOVAL AND ASSEMBLY

Note . . .

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

General information

16. 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 a reversal 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.

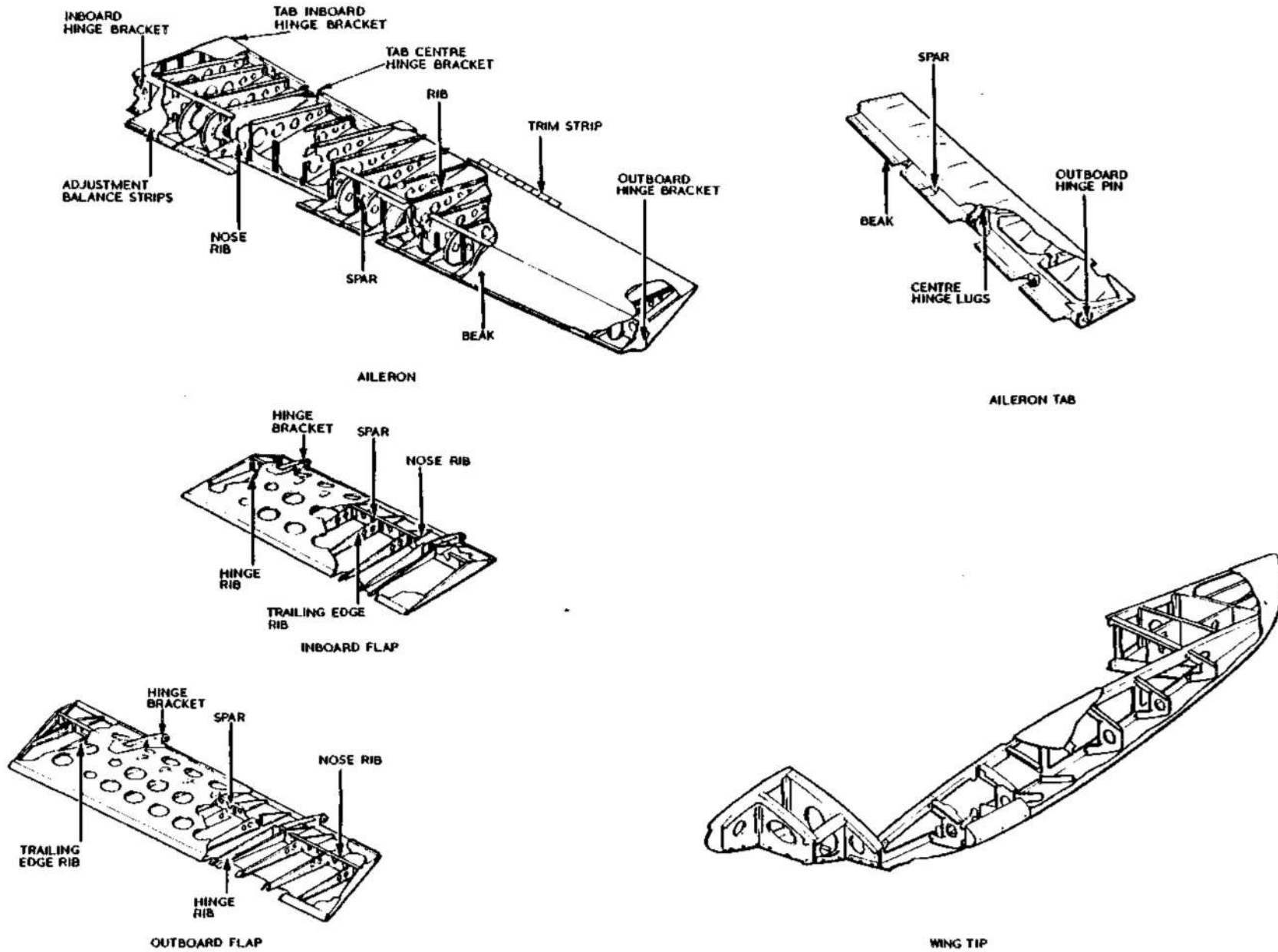


FIG.3. MAIN PLANE COMPONENT PARTS

◀ Main plane sling (fig.4)

17. The main plane sling, which can only be used when the engine and jet-pipe are removed, is a triangular frame, which is attached to the main plane by a beam at the engine rear mounting bracket (detail B), by a hook at the rear wall connecting ring, and a 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. *Integral tank fuel must be drained (Sect.4, Chap.2) before a main plane is slung.*
2. *During main plane removal, and more particularly during 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 final adjustments are made by ballasting.*
3. *It is recommended that, whenever possible, the flaps and ailerons are removed both for main plane removal and replacement.*

18. 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) Fit the ring bolt in the slinging point on the upper surface of the main plane (Sect. 2, Chap. 4).
- (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. 17).
- (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 ring bolt in the main plane.

Main plane (fig. 6)

Removal

19. To remove a main plane proceed as follows:—

- (1) Remove the engine (Sect. 4, Chap. 1).
- (2) Jack and trestle the aircraft (Sect. 2, Chap. 4) and attach the sling to the main plane (para. 18). Take the weight of the main plane on the sling.
- (3) Remove the main undercarriage door and main undercarriage unit (Sect. 3, Chap. 5).
- (4) Remove the access panels.

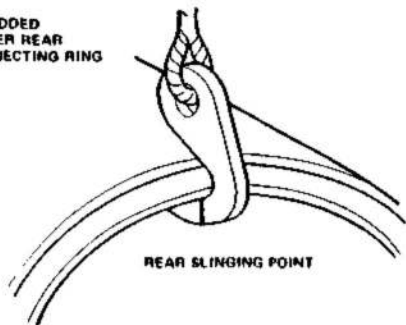
(5) Remove the closing strips.

(6) Remove the screws securing the leading edge of the main plane skin to the fuselage attachment angle.

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

- (a) Engine controls
- (b) Hydraulic pipes, suction and delivery
- (c) Hot-air delivery pipe to camera bays
- (d) Cabin air delivery pipe (port side only).
- (e) Pitot and static pipes to the A.M.U. (port side only).
- (f) Fuel delivery pipe
- (g) Fire protection pipe
- (h) Hydraulic pipes
- (i) Oxygen pipes
- (j) Aileron control tube
- (k) Pitot and static pipes to the pressure head (port side only).
- (l) Air brakes hydraulic pipes
- (m) Radio compass (port side only)
- (n) Flaps hydraulic pipes
- (o) Cabin air delivery pipe, primary cooler to mixing valve

RUBBER-PADDED
HOOK UNDER REAR
WALL CONNECTING RING

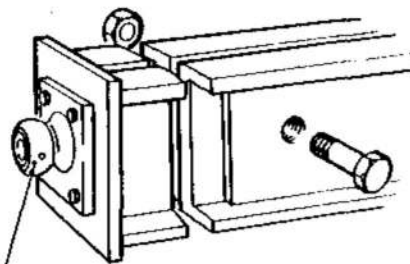


REAR SLINGING POINT

DETAIL A

CONDITION 2

FOR MAIN PLANE LESS ENGINE, JET PIPE,
COWLINGS, FLAPS, AILERON,
UNDERCARRIAGE, INNER WING LEADING
EDGE EQUIPMENT (GEAR BOX AND
ACCESSORIES ETC.)

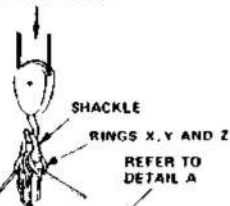


DETAIL B

SPHERICAL BEARINGS
TO FIT REAR ENGINE
MOUNTING BRACKETS

CONDITION 1

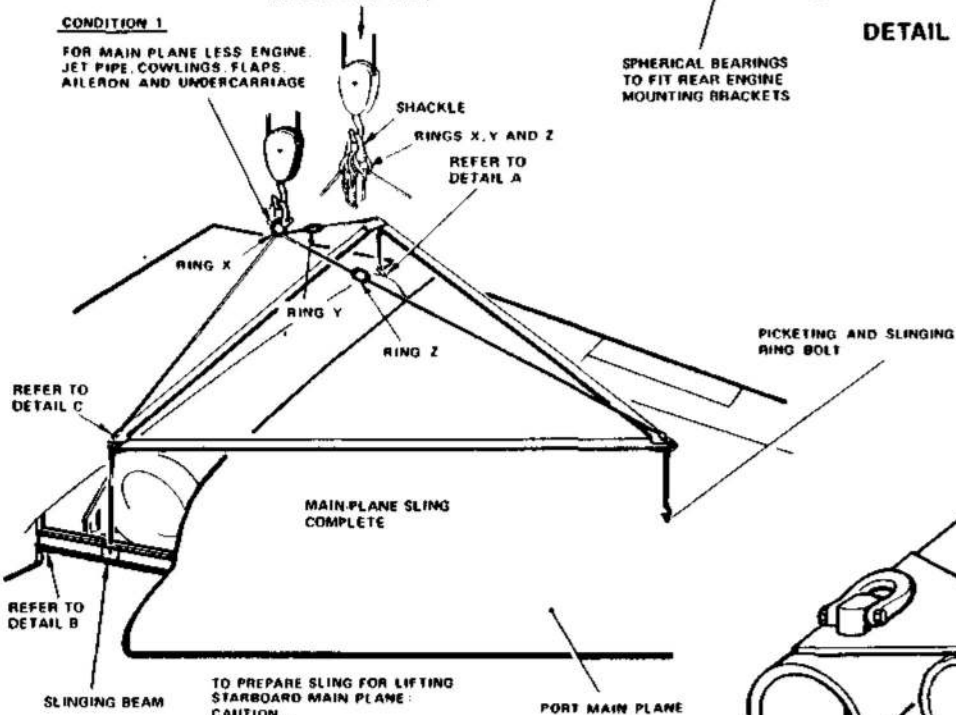
FOR MAIN PLANE LESS ENGINE,
JET PIPE, COWLINGS, FLAPS,
AILERON AND UNDERCARRIAGE



SHACKLE

RINGS X, Y AND Z

REFER TO
DETAIL A



REFER TO
DETAIL C

PICKETING AND SLINGING
RING BOLT

MAIN PLANE SLING
COMPLETE

REFER TO
DETAIL B

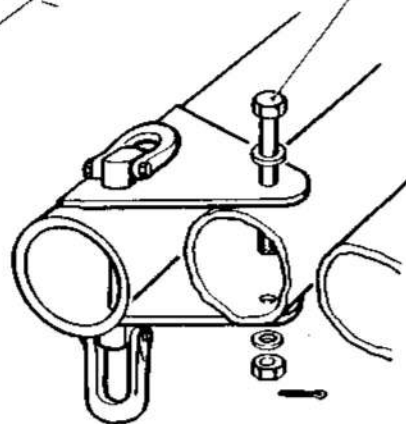
SLINGING BEAM

PORT MAIN PLANE

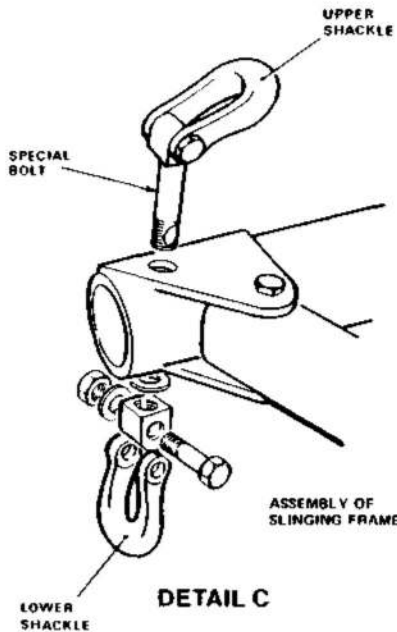
TO PREPARE SLING FOR LIFTING
STARBOARD MAIN PLANE:
CAUTION.
THE FOLLOWING PROCEDURE
MUST BE ADHERED TO
OTHERWISE DAMAGE TO THE
SPECIAL BOLTS WILL RESULT.
REMOVE LOWER SHACKLES
AT EACH CORNER OF FRAME.
WITHDRAW SPECIAL BOLTS
WITH UPPER SHACKLES
ATTACHED, AND TURN FRAME
OVER. REFIT SPECIAL BOLTS AND
SHACKLES WITH BOLT HEADS
UPPERMOST REFIT THE LOWER
SHACKLES

FOR STOWAGE OF SLING
REFER TO DETAIL D

TO STOW, REMOVE
BOLT, FOLD FRAME,
AND LOCK THUS



DETAIL D



ASSEMBLY OF
SLINGING FRAME

DETAIL C

LOWER
SHACKLE

FIG. 4. MAIN PLANE SLINGING

- (p) I.L.S. aerial connection (stbd. side only)
- (8) Ensure that all electrical, radio and radar connections have been disconnected (Sect. 5, and 6).
- (9) Remove the split pin, nut and washer from the bolt at the forward attachment point and withdraw the bolt.
- (10) Remove the locking collar from the rear attachment bolt and withdraw the bolt.
- (11) Remove the split pins, nuts and washers from the seven shear bolts and withdraw the bolts.
- (12) Remove the split pins, nuts and washers from the four main attachment bolts and, using an extractor (Sect. 2, Chap. 4) remove the bolts. The main plane is then freed and should be lifted clear and placed on trestles (Sect. 2, Chap. 4).

Assembly

20. Assembly of the main plane 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.3311/2245977 within the forks of the centre section spar fitting, as shown in the detail.
- (2) Ensure that STI/Can/498 has been carried out.
- (3) Before fitting the spar lower attachment bolts lubricate the bolt threads and the nut faces and, when tightening the nuts, apply a torque of 1500 lb in., using a suitable torque wrench. Tighten the nuts alternately.

(4) After assembling the main plane to the fuselage, and before fitting the seven shear bolts, attach with rubber resin cement Ref.No.3311/2245977 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.

(5) When securing the main plane skin to the fuselage attachment angle, the sixty-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.

Note . . .

Whenever a main plane is removed and 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)

- ◀ 21. To remove an aileron, with or without the spring tab fitted:-
- (1) Open all aileron shrouds by removing the countersunk screws at the extremities of each shroud.
- (2) Disconnect the aileron control tube from the aileron lever (detail E).
- (3) Remove the access panel from the underside of the wing tip (detail B).
- (4) Remove the four 0.25 in. dia. bolts

attaching the centre hinge bracket to the aileron (detail D) and note the number of shims. To facilitate the removal of these bolts, the centre shroud attachment brackets may be removed (detail D).

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) withdraw the hinge pin (detail A).
- (6) Remove the nut and bolt from the outboard hinge pin and using the extractor, (Sect. 2, Chap. 4) withdraw the hinge pin (detail B).
- (7) Remove the aileron.

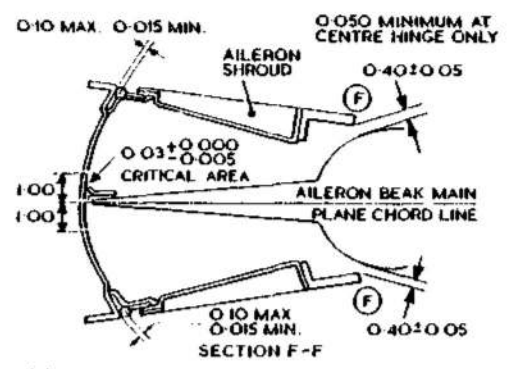
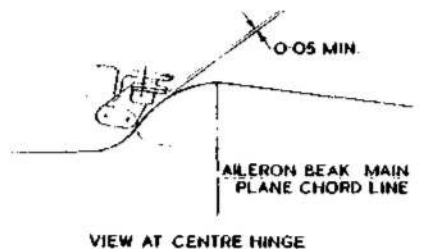
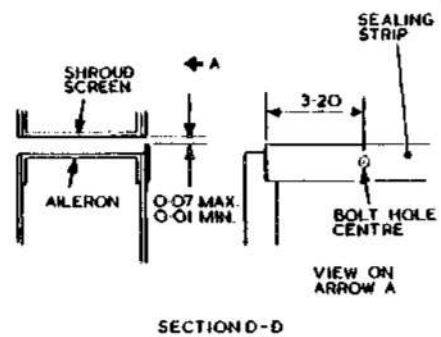
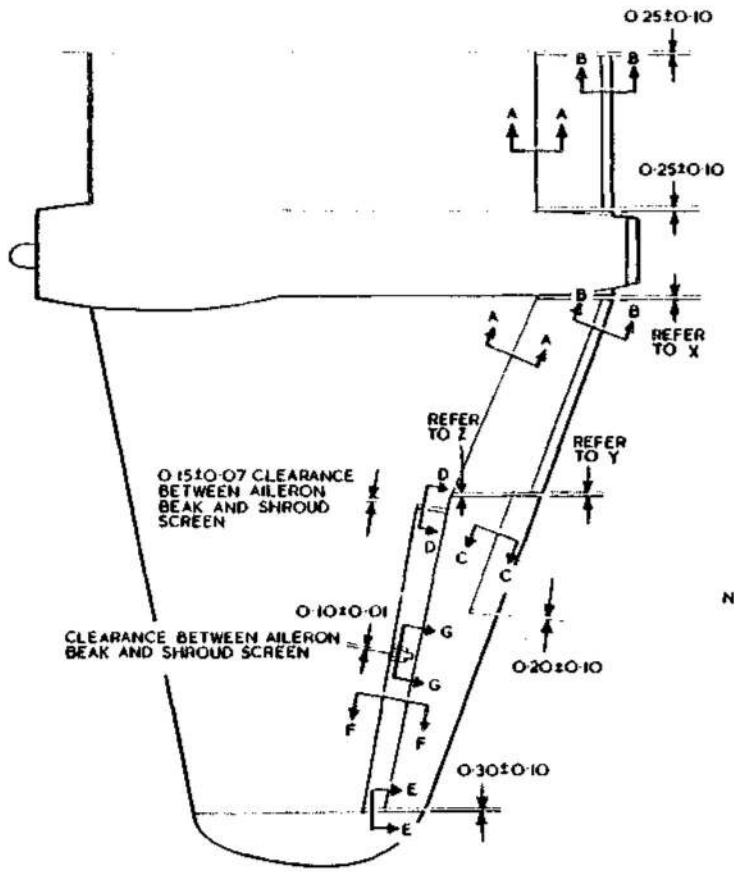
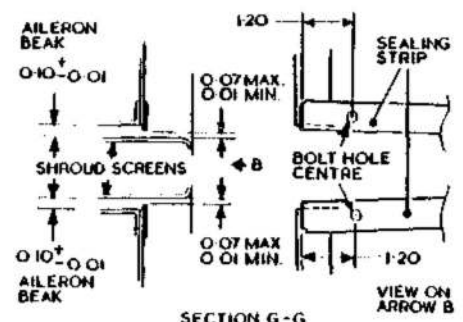
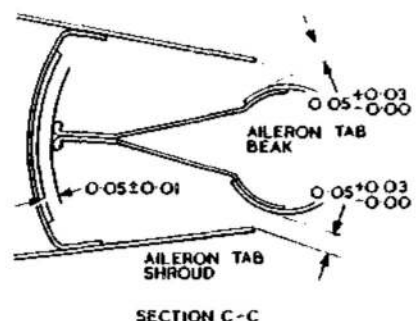
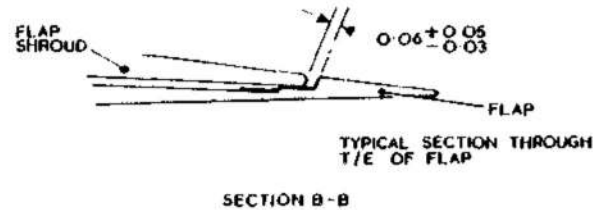
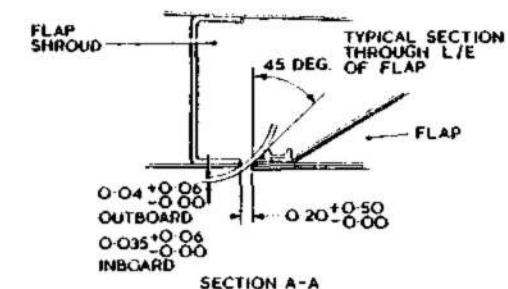
Assembly

◀ Note... ▶

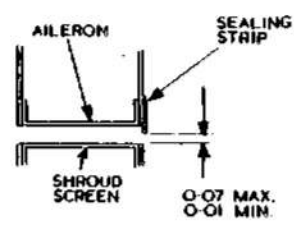
Before fitting an aileron, lubricate the hinge points with grease XG-287

22. 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 lunge bracket and the forward face of the aileron spar.

RESTRICTED



NOTE... ALL DIMENSIONS ARE IN INCHES



X	0.26 ± 0.12 AT FLAP T/E	0.21 ± 0.01 AT FLAP L/E
Y	0.46 ± 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

REFERENCE TO W DELETED AND X, Y DETAILS AMENDED

RESTRICTED

EK5.00.71
EAT.00.71
EK5.00.1112

(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. S971.

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

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

(1) To obtain the correct clearance 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. 8*) 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, Leaflet C.3/32.

(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. 8*) 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. 8*), 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. \pm 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.

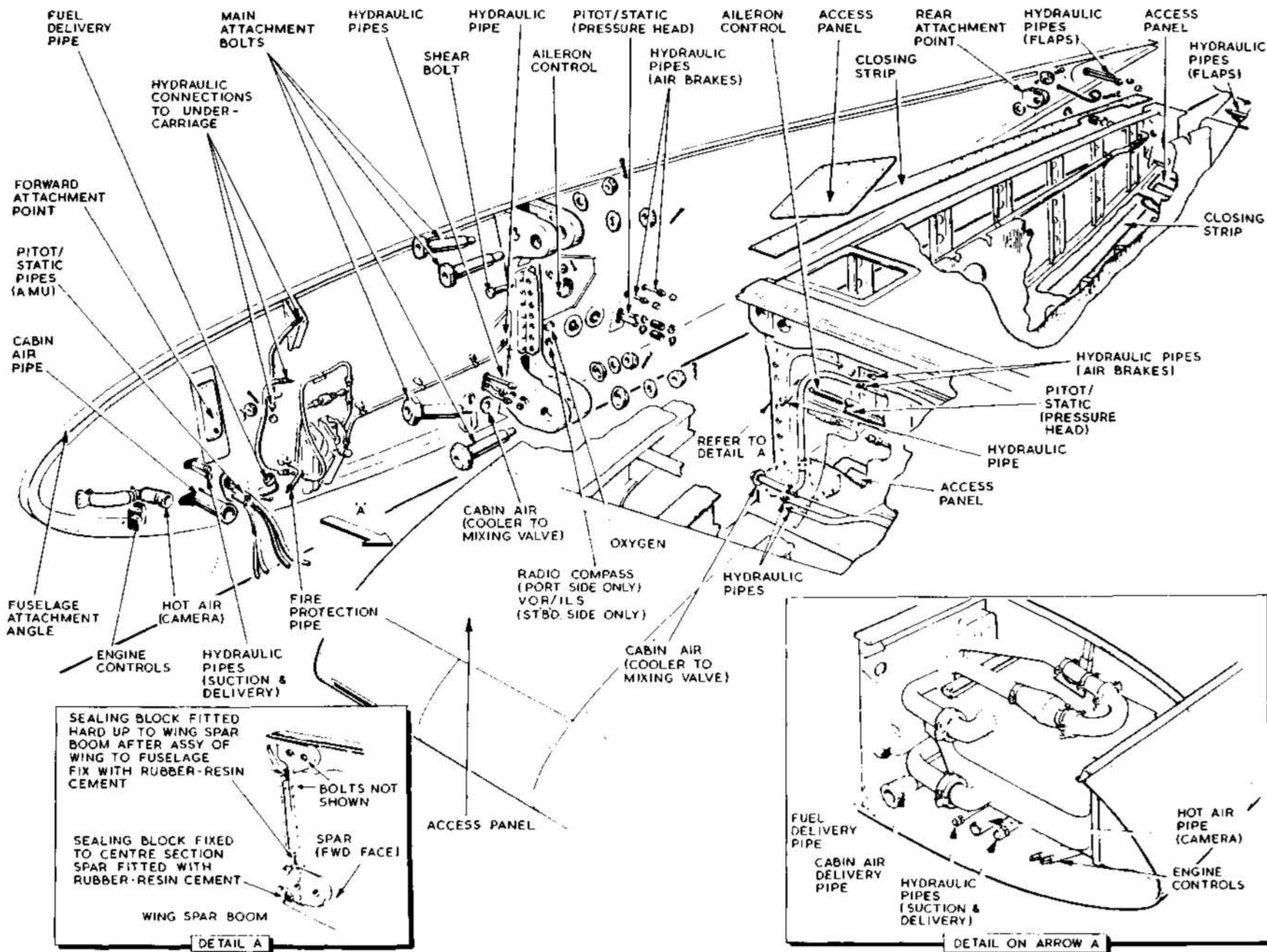


FIG. 6. MAIN PLANE REMOVAL

EAI 45 13/14
 ERA 71 5/6
 EKS 57 17/10
 EKS 73 7/8
 EKS 81 9/10
 EKS 82 9/10

(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 reshimming the aileron shrouds. Apply protective treatment (*A.P.119A-0509-1*) 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 spring tab (fig. 7)

Removal

24. To remove an aileron spring tab:-

- (1) Remove the two countersunk screws attaching the control rod fairing to the aileron and remove the fairing (*detail G*).
- (2) Remove the four 2 B.A. bolts and the two countersunk screws attaching the centre hinge bracket to the tab (*detail G*).
- (3) Remove the locking wire from the inboard hinge pin and, with the tab adequately supported, remove the hinge pin (*detail C*).
- (4) Remove the tab from its outboard hinge pin by drawing the tab inboard (*detail F*).

Assembly

Note...

Before fitting a spring tab, lubricate the hinge points with grease XG-287.

25. Reassembly of the existing 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.119A-0509-1*) to filed surfaces. ▶

Note...

Whenever an aileron or aileron tab is refitted, 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.

Flaps (fig. 9)

Removal

26. To remove a flap proceed as follows:-

Note...

Removal and assembly procedure is common for all flaps.

- (1) Select flaps DOWN and lower the flaps fully.
- (2) Support the flap and remove the attachment bolts from both operating mechanisms. Record the position of the bevel washers to assist in reassembly. Retain the attachment bolts, bevel washers, plain washer and slotted nut.
- (3) With the flap adequately supported at its centre and extremities, remove the hinge bolts from both hinge brackets. Retain the hinge bolts, 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.

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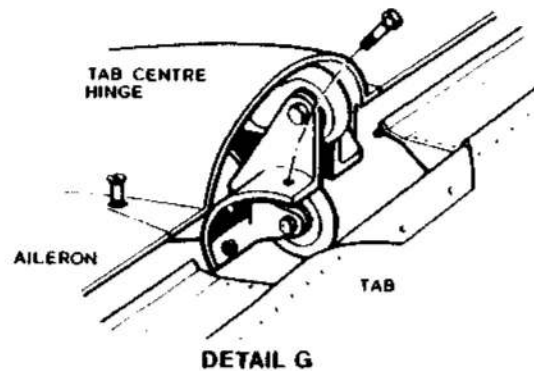
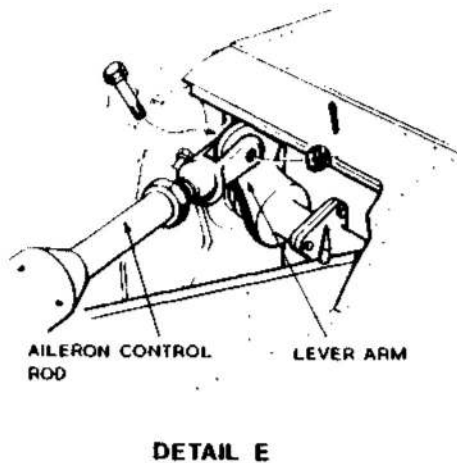
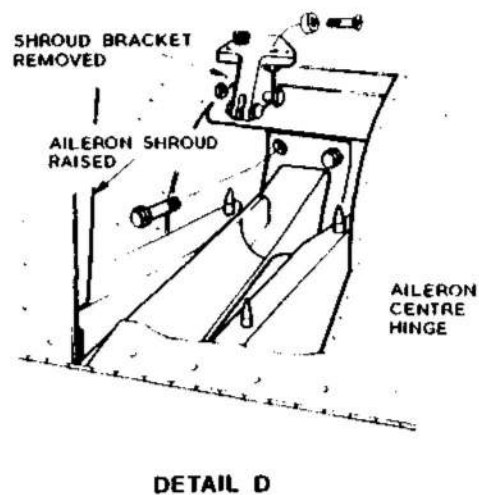
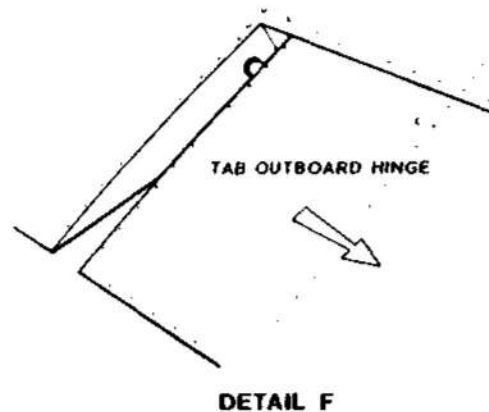
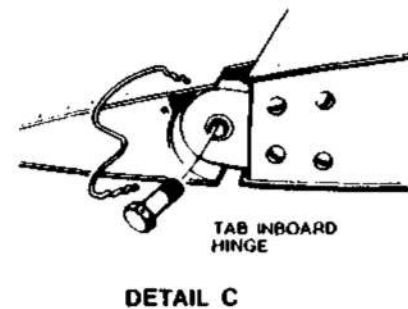
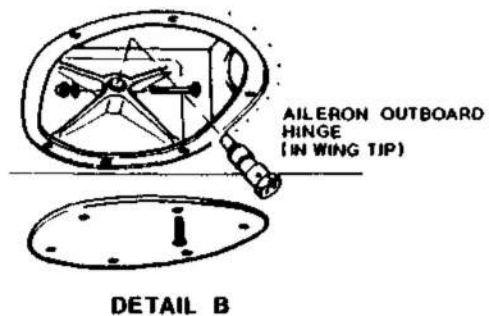
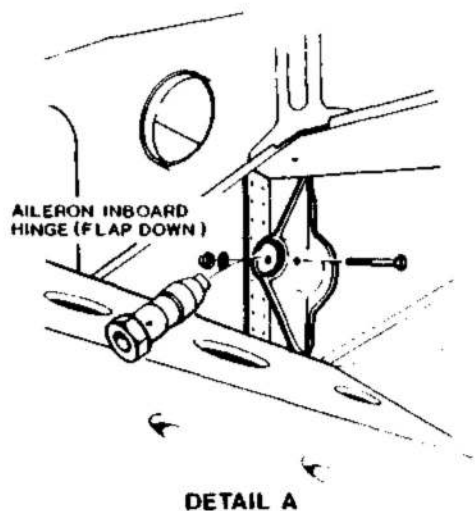


FIG. 7. AILERON AND AILERON SPRING TAB-REMOVAL AND ASSEMBLY

Assembly (fig.9)**Note...**

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

27. 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 washers retained during removal of the flap are refitted correctly in their original positions. The semi-spherical washers, removed in para.26 operation (3) must be refitted in their original positions.

28. 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.119A-0509-1*) must be applied to all filed surfaces.

Flap jack (fig.10)**Removal**

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

- (1) Lower the flaps to their fully down position.
- (2) Exhaust the system of hydraulic pressure (*Chap.6*).
- (3) Disconnect the two hydraulic pipes from the jack, and blank off 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. BSF 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

30. Assembly of the flap jack to the main plane is a 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. 10).

(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-end 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. \pm 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. \pm 0.25 in. For checking purposes, jack travel is 3.90 in. \pm 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. 11)

Removal

31. 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).

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

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

(9) Move the centre ▶◀ 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 portion.

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

Assembly

32. 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

33. 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.

34. After fitting a replacement jack, check that there is a clearance of 0.5 in., minimum, between the coils of the hydraulic pipes.

Wing tips (fig. 12)

Removal

35. 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.

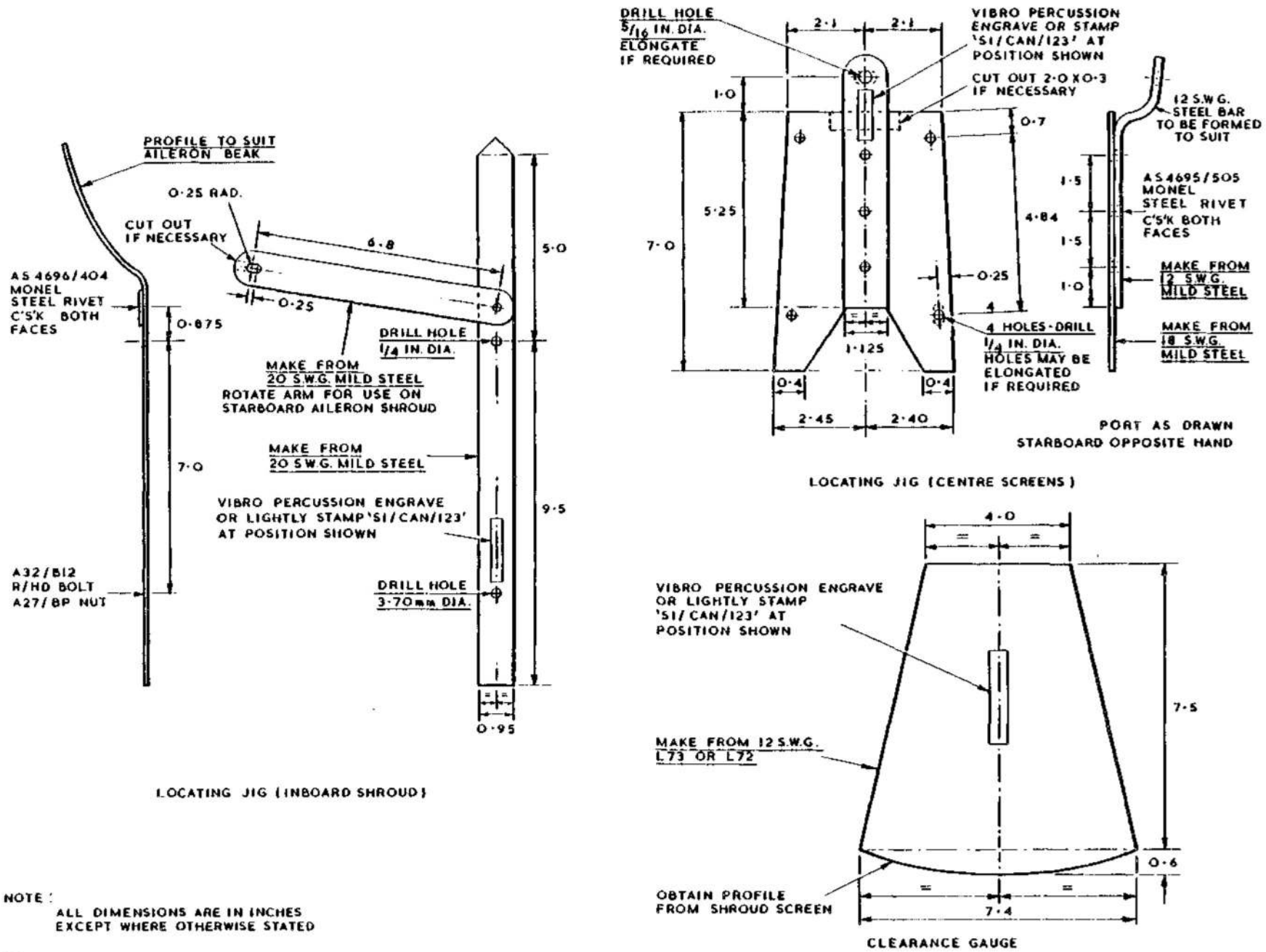


FIG. 8. AILERON CLEARANCE GAUGES

NOTE :
ALL DIMENSIONS ARE IN INCHES
EXCEPT WHERE OTHERWISE STATED

S1/CAN/123

(3) Remove the rubber seal (port side only) from around the pitot boom at the wing tip perspex window, and remove the countersunk screws securing the window to the wing tip. Remove the window.

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

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

(6) Remove the wing tip.

Pitot boom (fig. 12)

Removal

36. To remove a pitot boom proceed as follows:--

(1) Remove the access panel from the port main plane extension lower surface.

(2) Remove the perspex window and rubber seal from the wing tip (*para. 35*).

(3) Disconnect the pressure head electrical leads from the terminal block at rib 8.

(4) Disconnect the pitot and static pipes at the rear of the pressure head. Blank off the pipe ends.

(5) Remove the 2 B.A. nut, bolts, and washer securing the pitot boom to the rear mounting bracket at rib 8. Slacken the four 1/4 in. B.S.F. bolts at the front and rear mounting brackets and withdraw the boom from the main plane.

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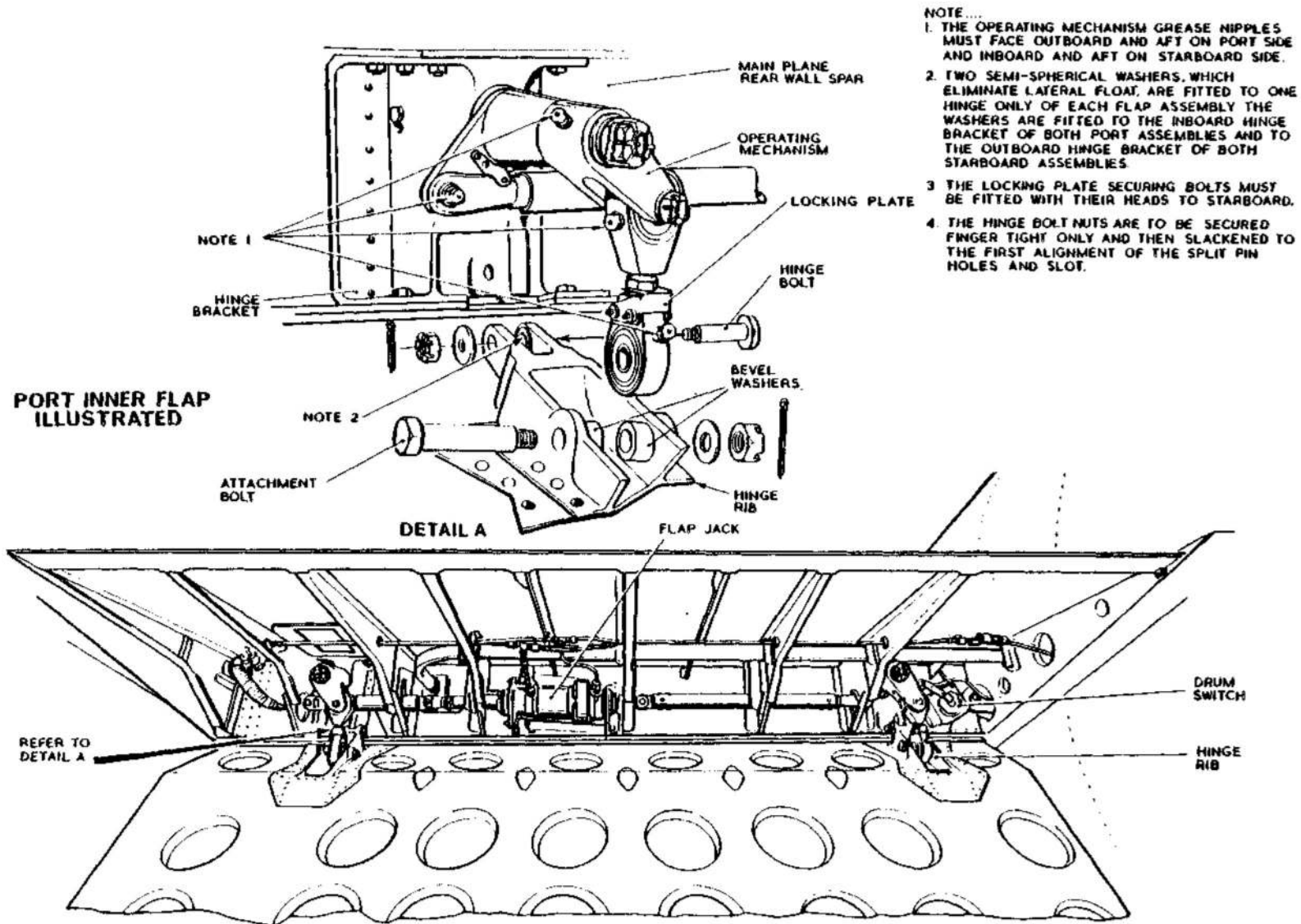


FIG. 9. FLAP-REMOVAL AND ASSEMBLY

• LOCKING PLATE DETAILS AND NOTES ADDED •

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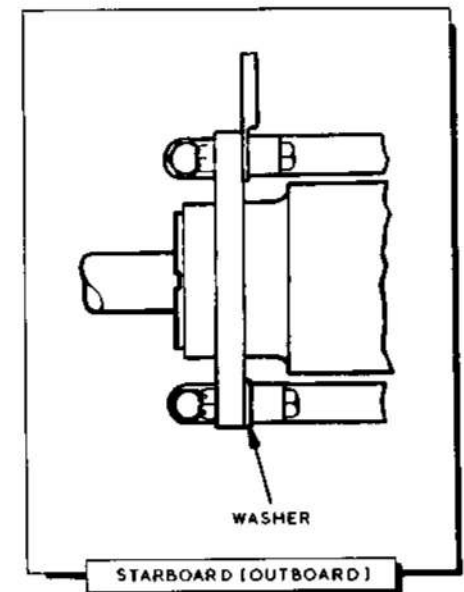
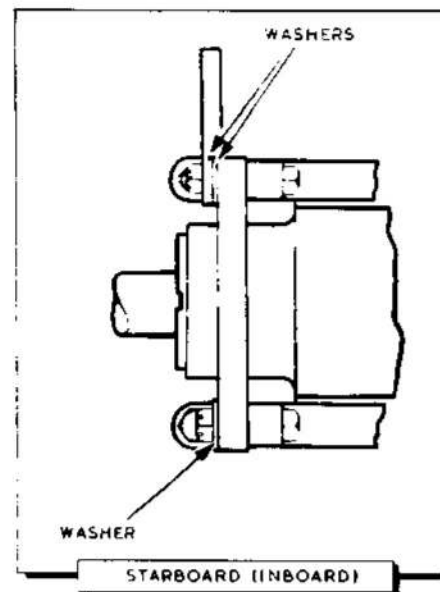
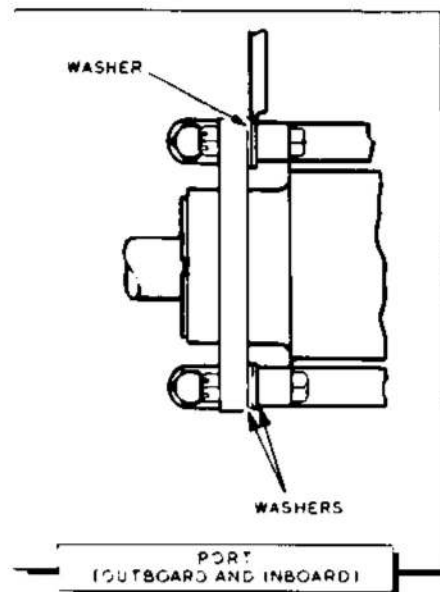
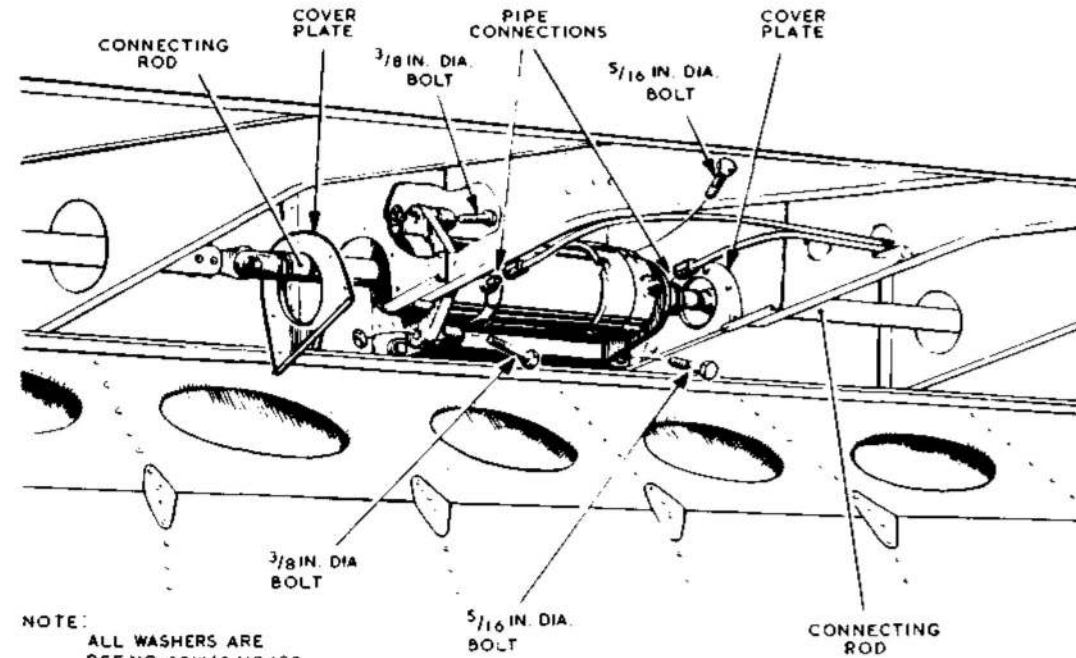
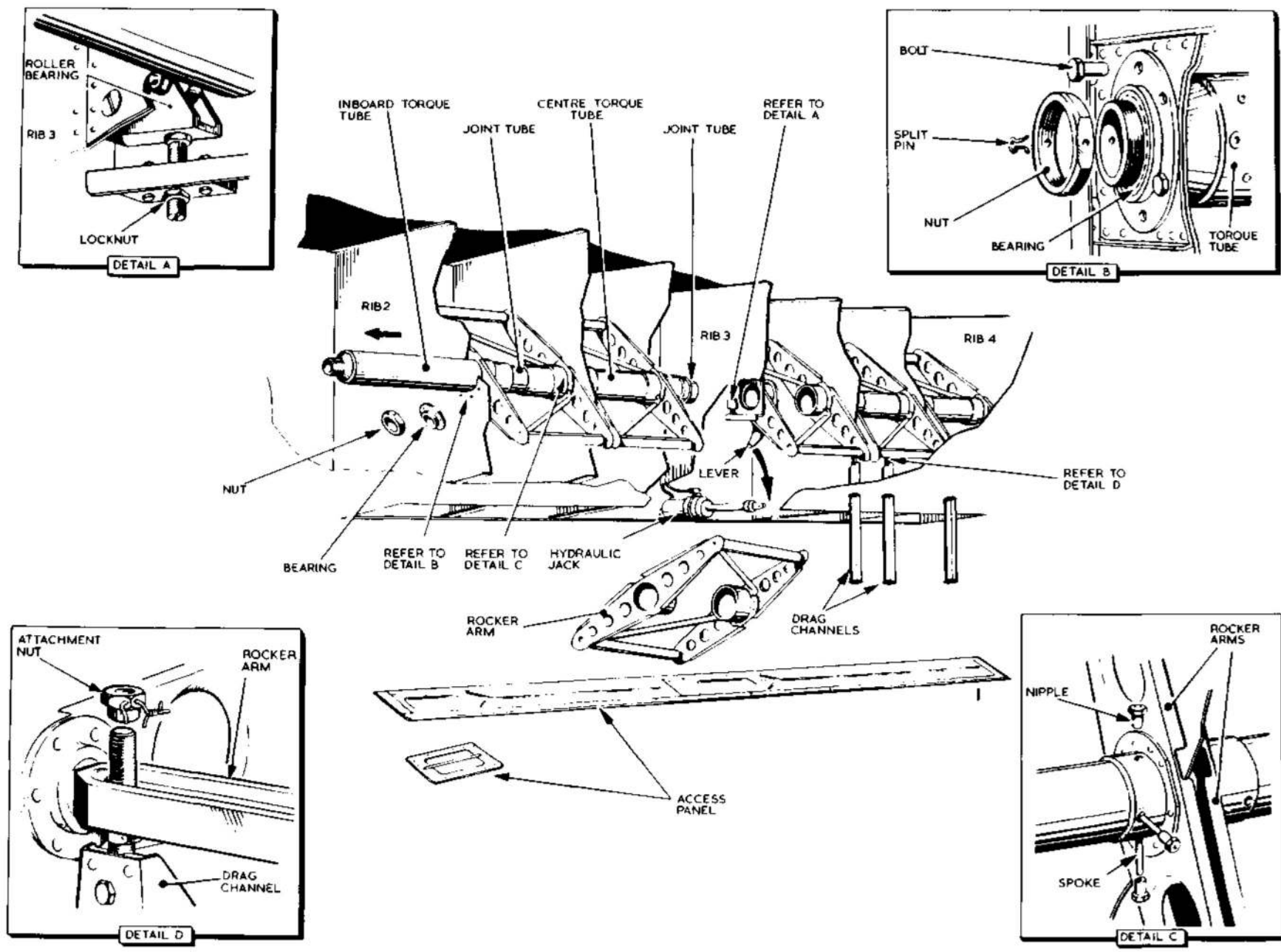
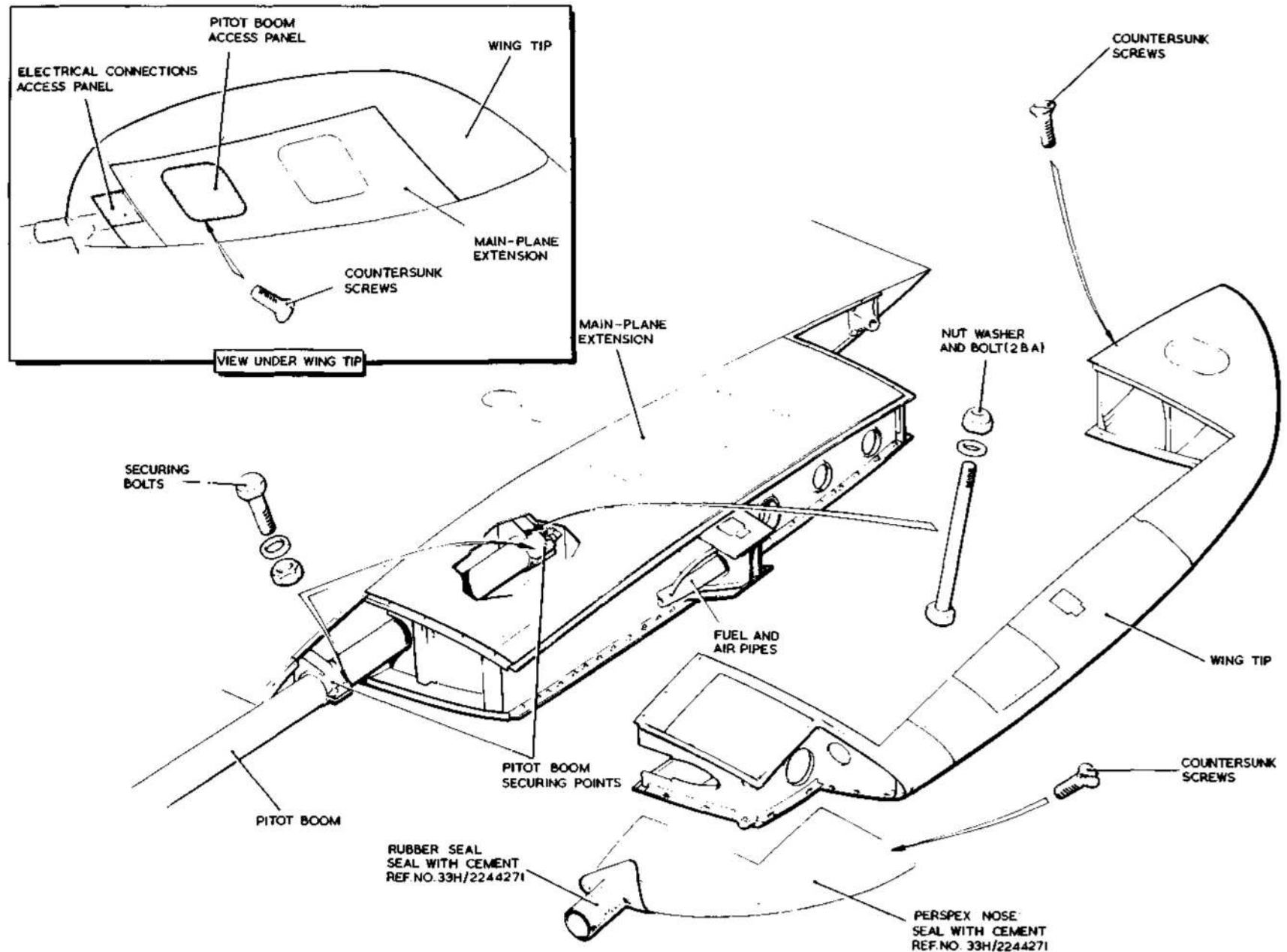


FIG. 10. FLAP JACK - REMOVAL AND ASSEMBLY



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FIG.II. AIR BRAKES-REMOVAL AND ASSEMBLY



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FIG.12. WING TIP/PITOT BOOM-REMOVAL AND ASSEMBLY

Chapter 3 TAIL UNIT

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◀ <i>Rudder and rudder spring tab</i>	4	▶ <i>Elevator and elevator tab removal</i>	8	<i>Fin, rudder and elevator clearances</i>	12

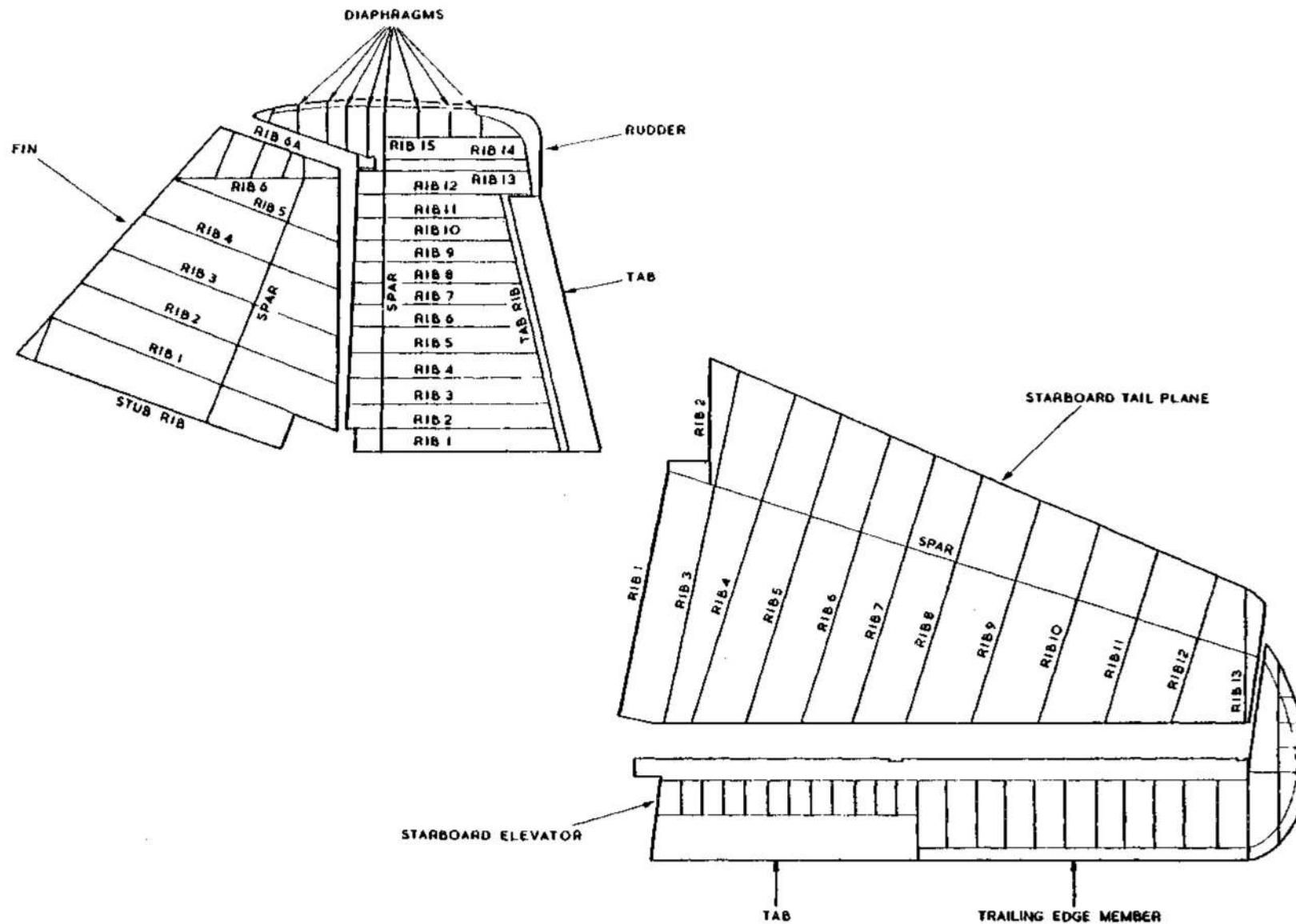


FIG. I. KEY DIAGRAM

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.

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. Sealing strips are fitted between the tail plane and the 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. An access panel, secured by rivets, is fitted on the underside of the elevators, at the centre hinge positions, for 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

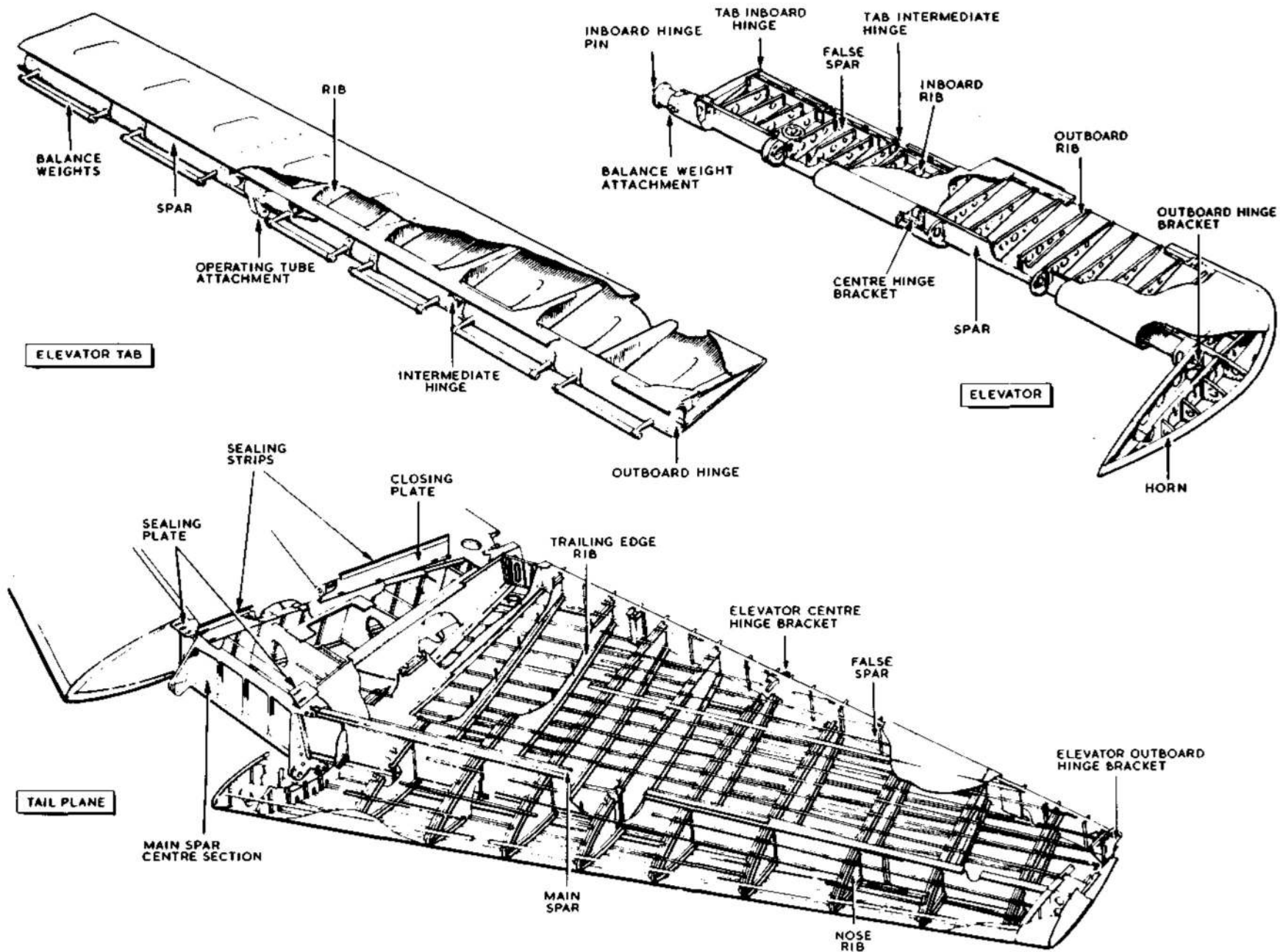
member, the whole being covered with a plywood skin, which is Reduxed at its aft edge to the outside of the T-section booms forward of the spar web. Aft of the spar the structure is entirely of metal construction, consisting of flanged plate ribs, with angle-section stiffeners, and a curved rear wall forming the rudder shroud. The rudder upper hinge plate is attached to rib 6 at the top of the shroud.

Rudder (fig. 4)

6. The rudder is of all-metal construction consisting 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 to two weights, one mounted in the rudder horn and the other attached to an arm at the bottom of the spar.

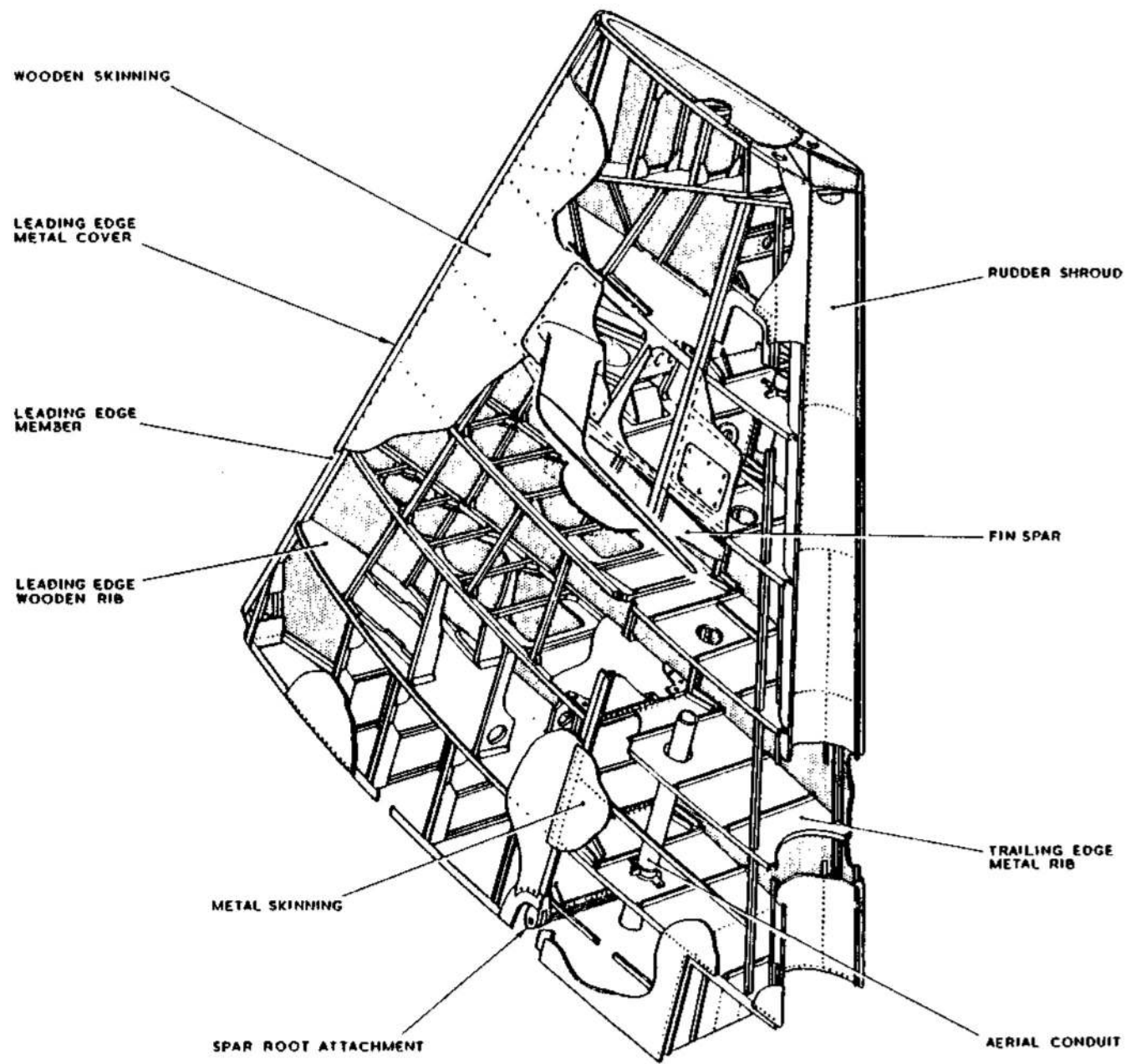
Rudder spring tab (fig. 4)

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.



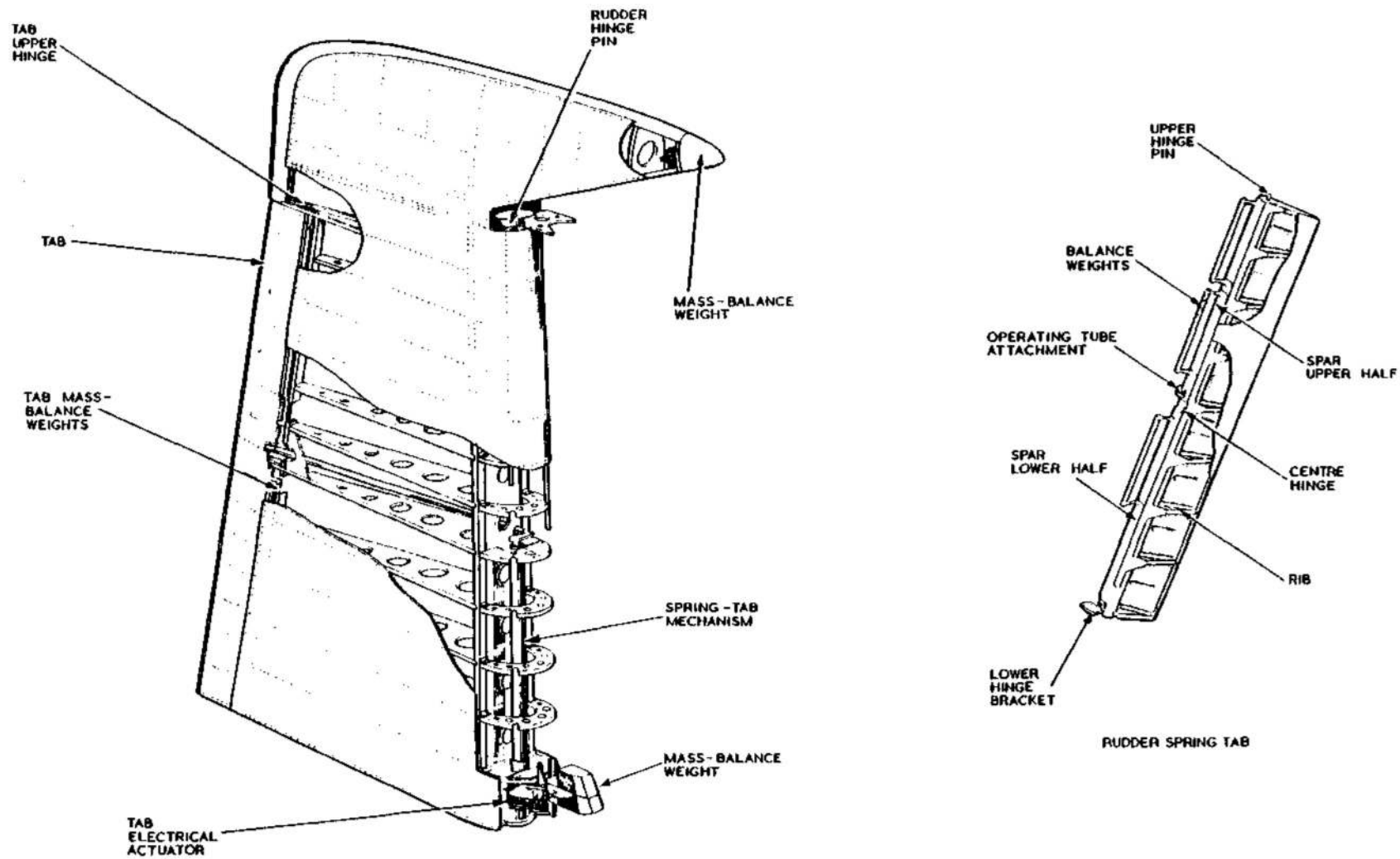
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FIG.2. TAIL PLANE, ELEVATORS AND TABS



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FIG.3. FIN



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FIG. 4. RUDDER AND RUDDER SPRING TAB

◀ TITLE AMENDED ▶

SERVICING

General

7A. The only servicing normally required on the tail unit is the lubrication of hinges and hinge bearings. Details of flying control connection lubrication is given in Chap.4. The following require periodic lubrication:-

- (a) The rudder upper, lower and tab hinge bearings, and the elevator tab hinges; to be greased with XG-287.
- (b) The tail plane hinge pins; one nipple on each pin to be greased with XG-287.
- (c) The elevator hinges and the tail plane actuator attachment points; to be oiled with OX-14.

REMOVAL AND ASSEMBLY

Note . . .

Following replacement, reassembly or adjustment of any component which may affect the longitudinal trim of the aircraft, carry out flight trim checks as detailed in Sect.3, Chap.4, App.1.

General

8. The removal procedure for each component is given in a recommended sequence, rigid adherence to which is not essential. The assembly procedure is the reverse of that for removal unless otherwise stated. All disturbed bonding and locking must be renewed even though not mentioned in the relevant operations.

Shroud clearances (fig.12)

9. After fitting a new rudder to the fin, or tab

to either the rudder or an elevator, the gap between the shroud and the leading edge of the component must be checked; the respective dimensions are given in details B and C. After fitting a new elevator to the tail plane the gap between the shroud and the leading edge of the elevator must be checked; the respective dimensions are given in detail A. If these measurements are not obtained, the edges of the shroud may be trimmed by filing. The correct protective treatment, must be applied to all filed surfaces; refer to A.P.119A-0509-1.

Slinging

10. The method of slinging the tail plane is illustrated in fig.5, using the tail-plane sling (Sect. 2, Chap.4), the cables of which are identified for the fore or aft positions by tags attached to each cable. 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 removal (fig.7)

12. The tail plane may be removed with or without the elevators fitted.

With elevators removed

13.

(1) Jack and trestle the aircraft (Sect.2, Chap.4) and attach the sling to the tail plane (fig.5). 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) 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 (detail B).

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

(7) Remove the split pin, nut and washer from the bolt attaching the lower end of the bracing strut to the lug on the rear fuselage (detail A). Remove the bolt and withdraw the strut.

(8) Remove the split pin and nut from each hinge pin (detail C).

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

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

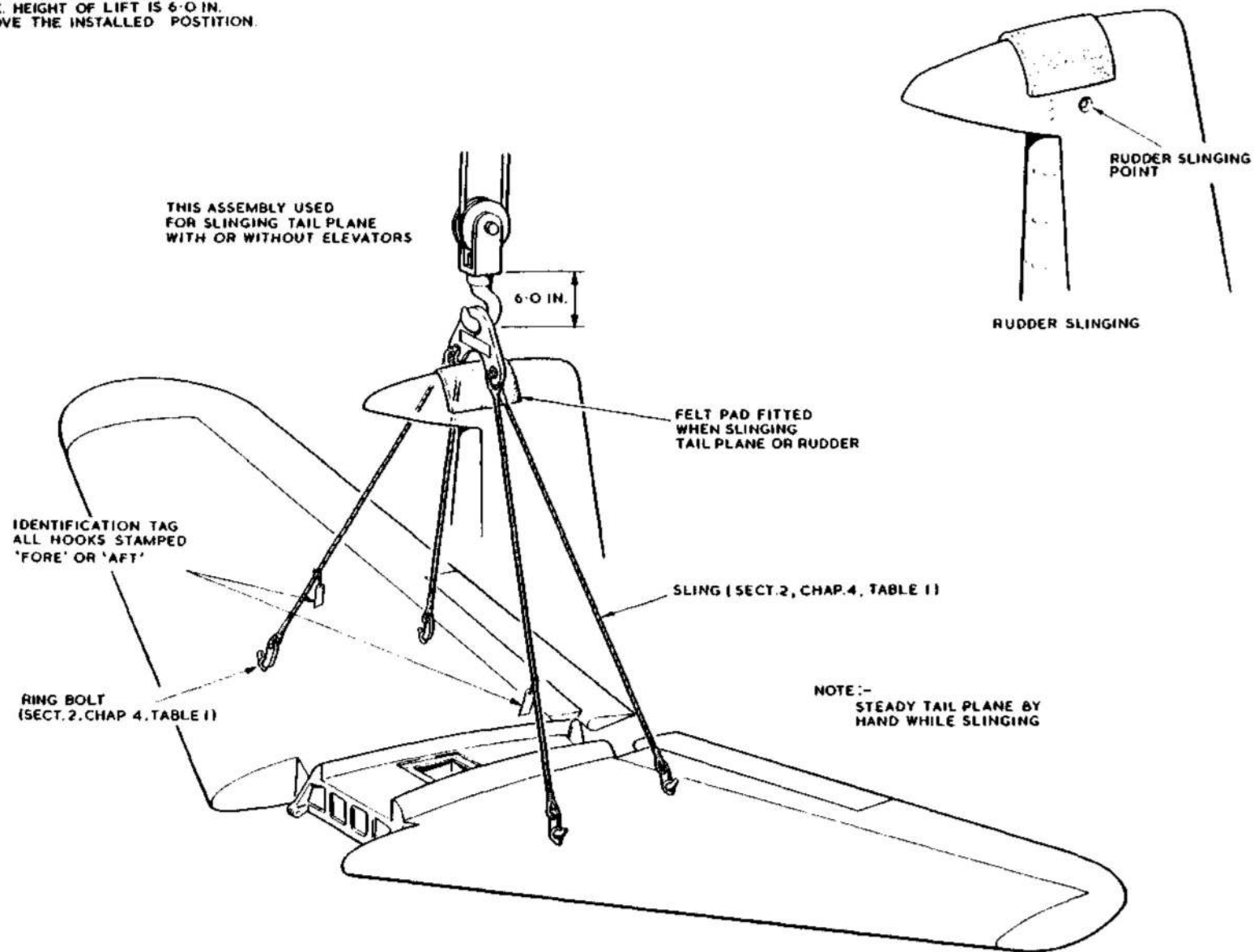


FIG.5. TAIL PLANE SLINGING

With elevators attached

14.

(1) Jack and trestle the aircraft (*Sect.2, Chap. 4*), and attach a sling to the tail plane (*fig.5*). 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. ▶

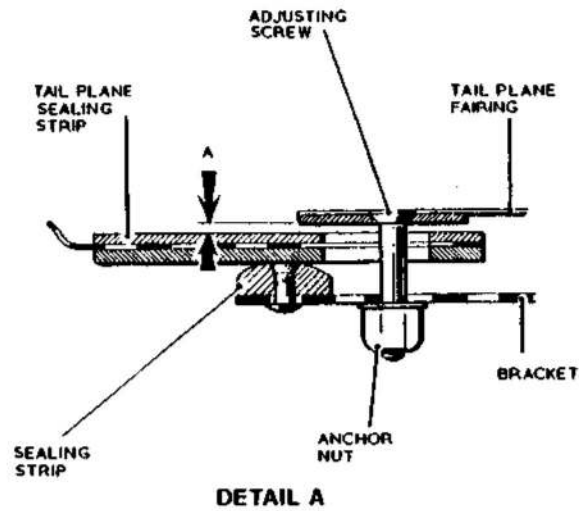
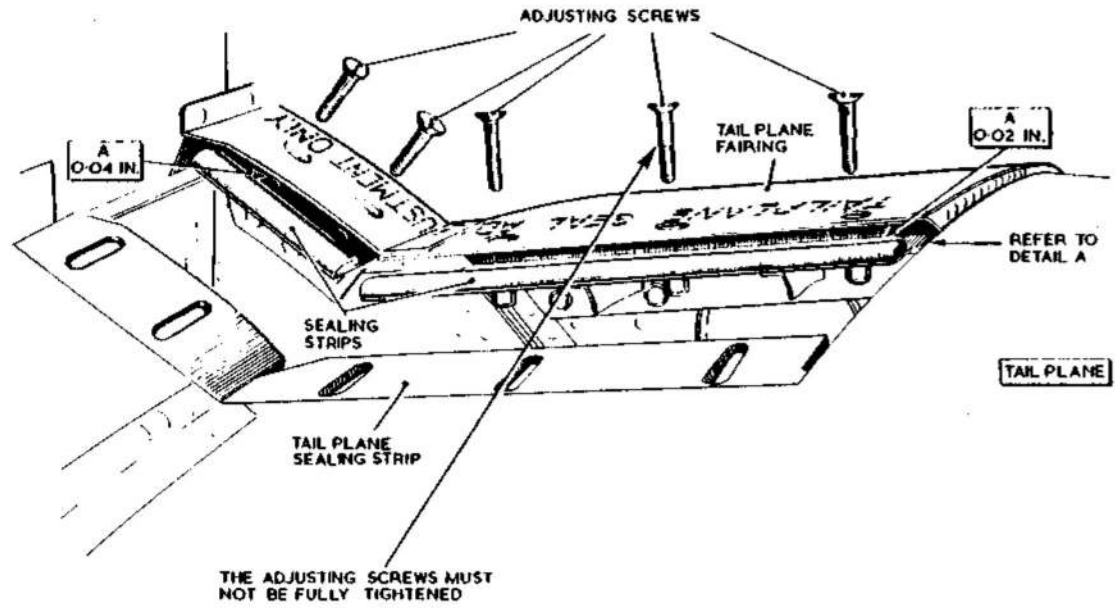
◀ (4) Remove and retain the disconnected section of the control rod. ▶

(5) Proceed as instructed in para.13(2) to (9) for the removal of the tail plane with the elevators removed.

Tail plane assembly details (fig.11)

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

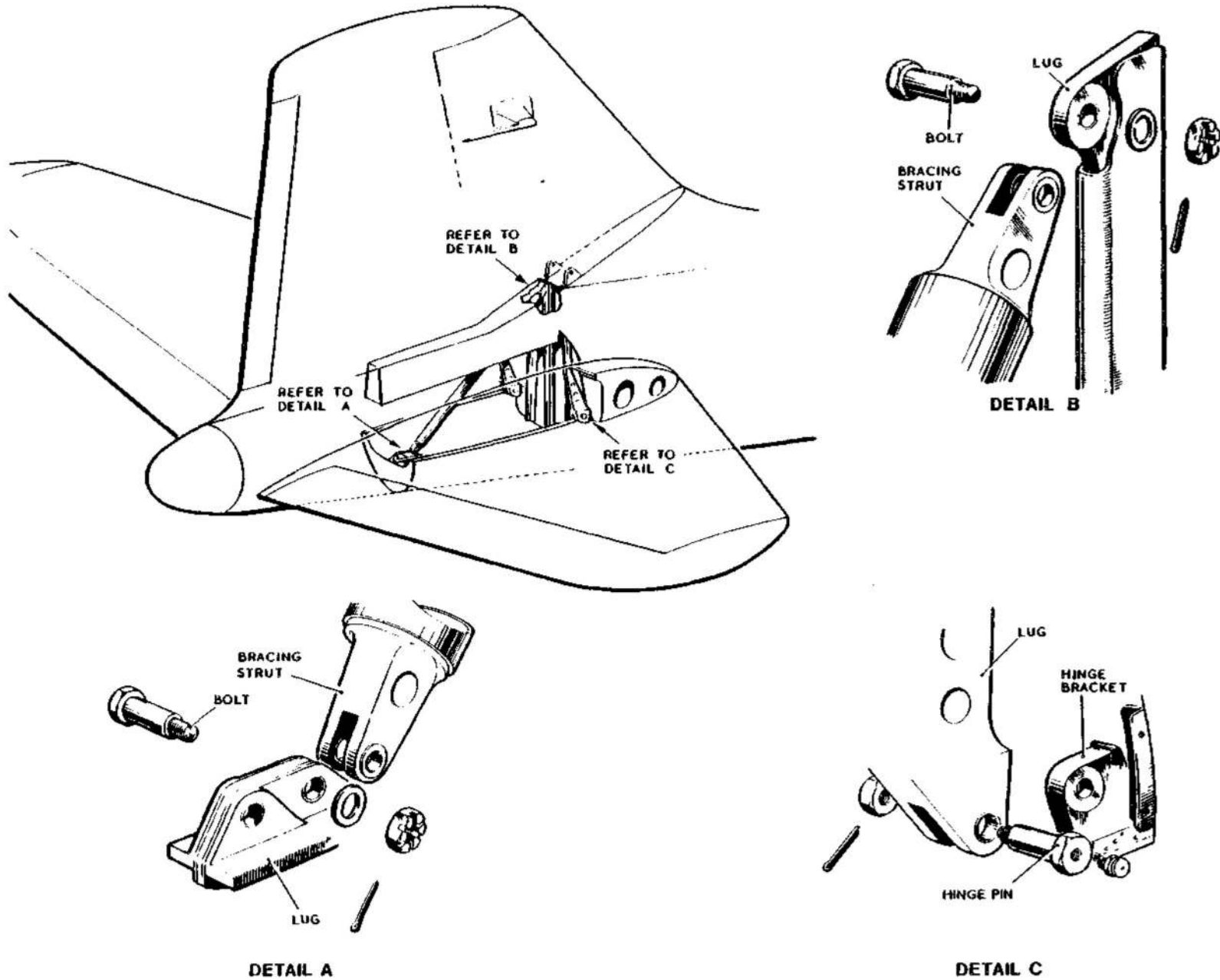
(1) Before commencing to fit a tail plane to the rear fuselage, ensure that the lower cover plate,



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FIG.6.TAIL PLANE SEALS

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FIG. 7. TAIL PLANE REMOVAL

◀SPLIT PIN ADDED AT DETAIL C▶

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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) Ensure that all contact faces of moving parts of the lugs on the spar centre section (fig.7) and hinge brackets on the rear fuselage, are coated generously with grease XG-276.

(3) 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; the relative dimension (B-B) is given in detail B.

(4) With the tail-plane actuator installed set the tail plane to 3 deg 15 min incidence - measured at the starboard inboard rigging position, (take-off position on the cockpit gauge) and, again referring to fig.11 check the following clearances:-

(a) Between the tail plane and the tail-plane stub (A-A); the dimension is given in 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; the dimension is given at position E.

(c) Between the tail plane box fairing and the fuselage; the dimension is given in detail B.

Note . . .

The minimum gap at this point, between the tail-plane seal rivets and the fin, is 0.080 in. (fig.11, detail B).

(5) Set the tail plane in line with the tail-plane stub (3 deg 56 min measured at the starboard inboard rigging position) and adjust the sealing strips to give the following clearances (fig.11).

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

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

Note . . .

These clearances are obtained by adjustment of the ten screws, five on each side of the tail-plane stub (fig.6). On no account must these screws be fully tightened. Ensure that there is complete freedom of movement throughout the full range of tail plane travel.

Refitting the original tail plane

16. The fitting details are the reverse of those given for the removal of the tail plane with the addition of para.15(1), (2), (4) and (5) operations.

Note . . .

Whenever a tail plane has been replaced or adjusted, a flight trim check must be carried out in accordance with Sect.3, Chap.4 App. 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 tabs removal/assembly (fig. 8)

Removal of elevators

17. To remove the elevators:-

(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.

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

(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.

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

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

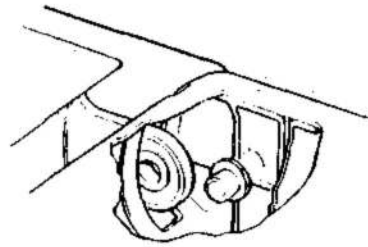
(9) Remove the port elevator from its hinges by moving it outboard, until it is clear of the centre and inboard hinges, and then aft.

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

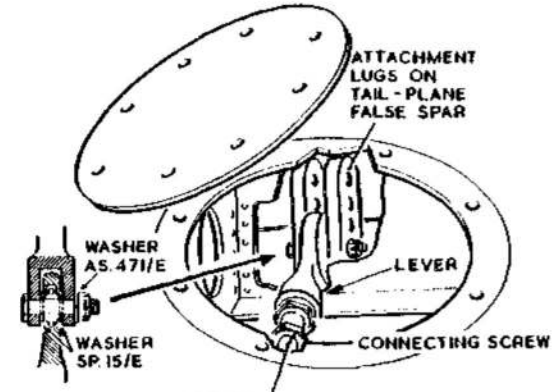
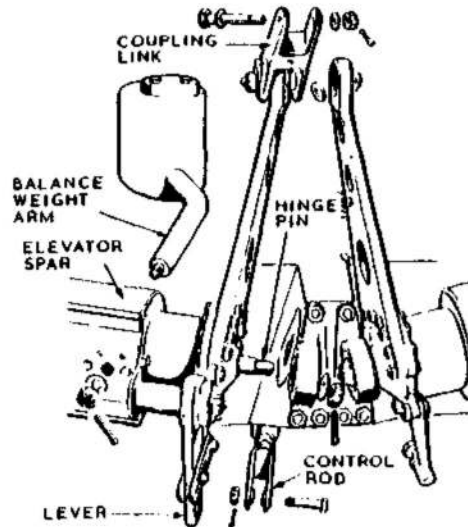
Elevator assembly details

18. To enable the alignment of the centre and outboard hinges to be checked during reassembly, apertures, closed by spring-loaded sealing

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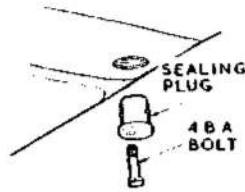
ELEVATOR OUTBOARD HINGE



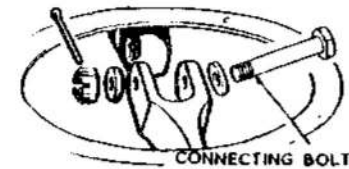
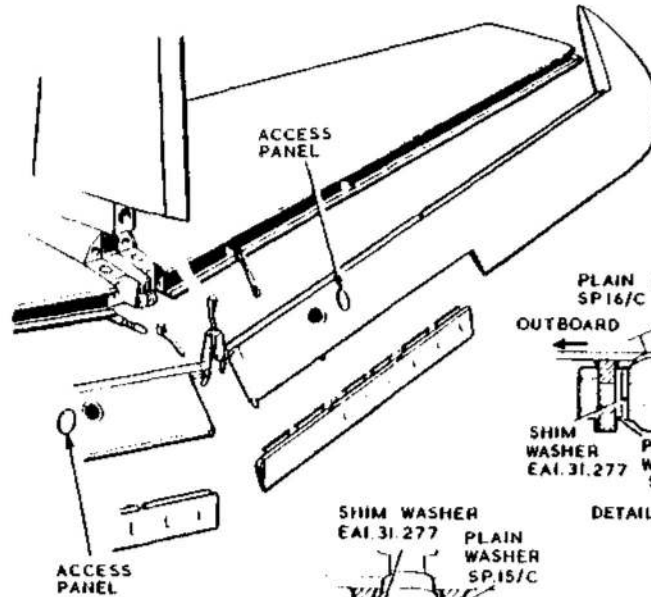
TAB OPERATING ROD
STARBOARD TAB LEVER CONNECTION



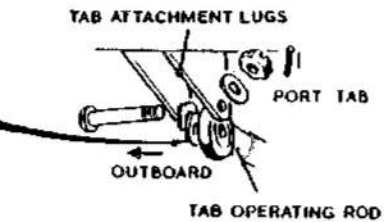
TAB INTERMEDIATE
AND OUTBOARD HINGE



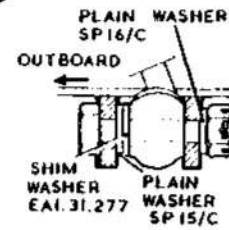
HINGE INSPECTION
HOLE PLUG
4BA BOLT



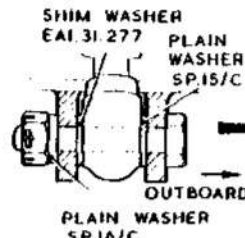
PORT TAB LEVER CONNECTION



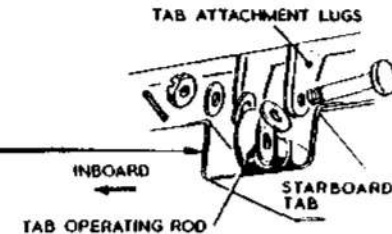
TAB ATTACHMENT LUGS
PORT TAB
TAB OPERATING ROD
OUTBOARD



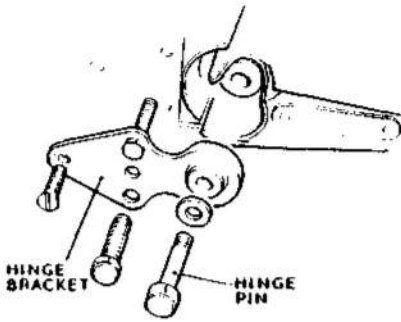
DETAIL A



DETAIL B



TAB ATTACHMENT LUGS
STARBOARD TAB
TAB OPERATING ROD
INBOARD



TAB INBOARD HINGE

FIG. 8. ELEVATOR AND ELEVATOR TAB REMOVAL

«STARBOARD TAB CONNECTION TO LUGS ON FALSE SPAR AMENDED»

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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.

Removal of elevator tabs

19. To remove an elevator tab:—

- ◀ (1) Remove the access panel, 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. ▶
- ◀ (2) Disconnect the tab operating-rod from the tab, and move the operating-rod clear of the attachment lugs. ▶
- (3) Remove the inboard hinge bracket.
- (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.

Assembly of elevator tabs

20. Assembly notes:—

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 assembling an elevator tab, ensure that the tab operating-rod is connected to its attachment lugs with bolt Part 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:—

For the port tab (detail A) the thin plain washer Part No. SP.15/C, and shim Part No. EA1.31.277, must be positioned between the ball race and the outboard bracket, and the plain washer Part No. SP.16/C, between the nut and the inboard bracket. For the starboard (detail B) 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 connecting-rod; the tapping must be as light as possible to avoid any possibility of fracturing the attachment lugs.

3. To ensure correct adjustment of the starboard tab the connecting screw must be screwed into the operating lever and the operating-rod simultaneously.

4. After fitting a new elevator, the clearance between the elevator horn and the tail plane must be checked; the clearance is given in fig. 12.

5. After fitting a new tab to the elevator, the clearance between the outboard end of the tab and the elevator must be checked; the clearance is given in fig. 12.

Note . . .

A flight trim check must be made whenever

an elevator, or the elevator tab, is refitted, replaced or adjusted (Sect. 3, Chap. 4, App. 1).

Rudder and rudder tab removal/assembly (fig. 9) Removal of rudder

21. To remove the rudder:—

- (1) Screw a 4 B.A. bolt into the spring-loaded plugs on the port and starboard sides of the rudder and remove the plugs by pulling the bolts outwards. Removal of these plugs permits a sling (Sect. 2, Chap. 4) to be passed 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 cable 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.

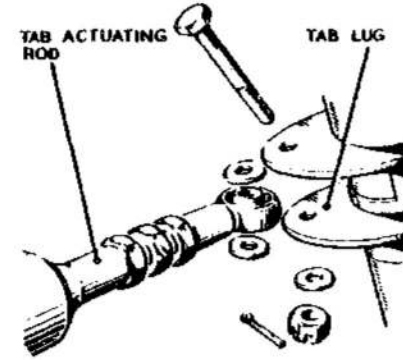
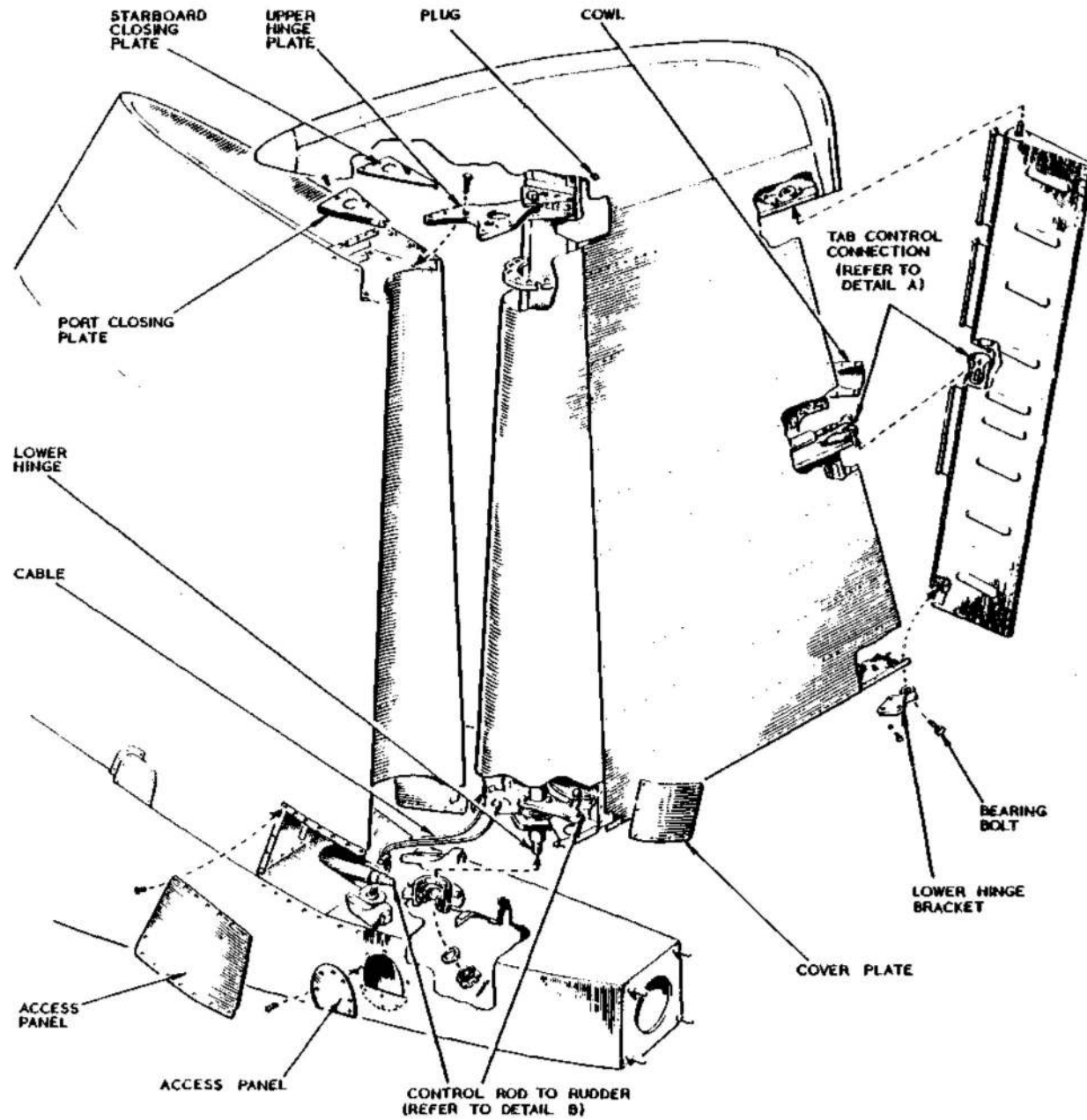
- (7) Remove the circular access panel on the port side of the rudder stub.

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

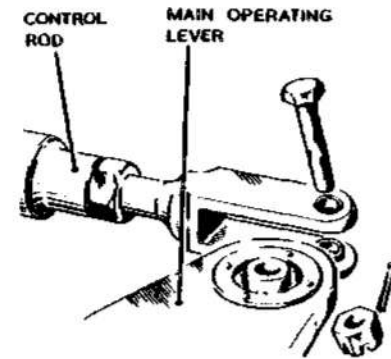
- (9) Turn the rudder to port and remove the three bolts from the port side of the upper hinge plate.

- (10) Turn the rudder to starboard and remove

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DETAIL A



DETAIL B

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FIG. 9. RUDDER AND RUDDER SPRING TAB REMOVAL

◀ TITLE AND ANNOTATIONS AT DETAILS AMENDED ▶

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the three bolts from the starboard side of the upper hinge plate (3). 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 details

Note . . .

Before assembling a rudder, ensure that the rudder lower hinge bearing, (in the fuselage) is packed generously with grease (para.7A).

22. 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.

Note . . .

If these clearances are not obtained remove the shim Part No.EAI.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.

Removal of rudder tab

23. To remove the rudder tab:-

- ◀ (1) Remove the 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. ▶
- (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 locked with wire.

Assembly of rudder tab

24. 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.

Fin removal (fig.10)

25. To remove the fin:-

- (1) Remove the rudder (para.21).
- (2) Remove the access panel and disconnect the coaxial cable to the VOR/ILS aerial. Withdraw the cable from the aerial conduit.

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

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

(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.

Fin assembly (fig.10)

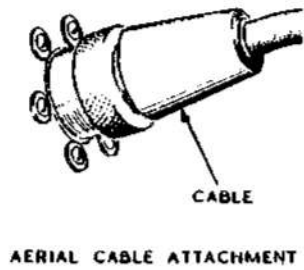
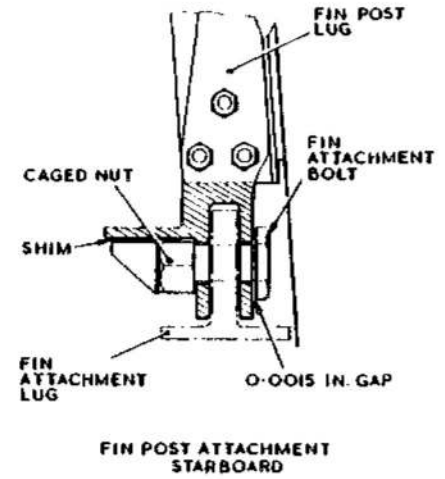
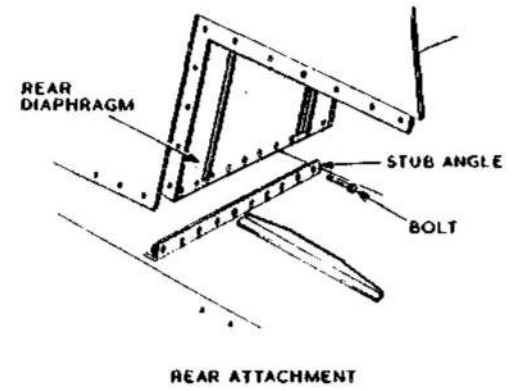
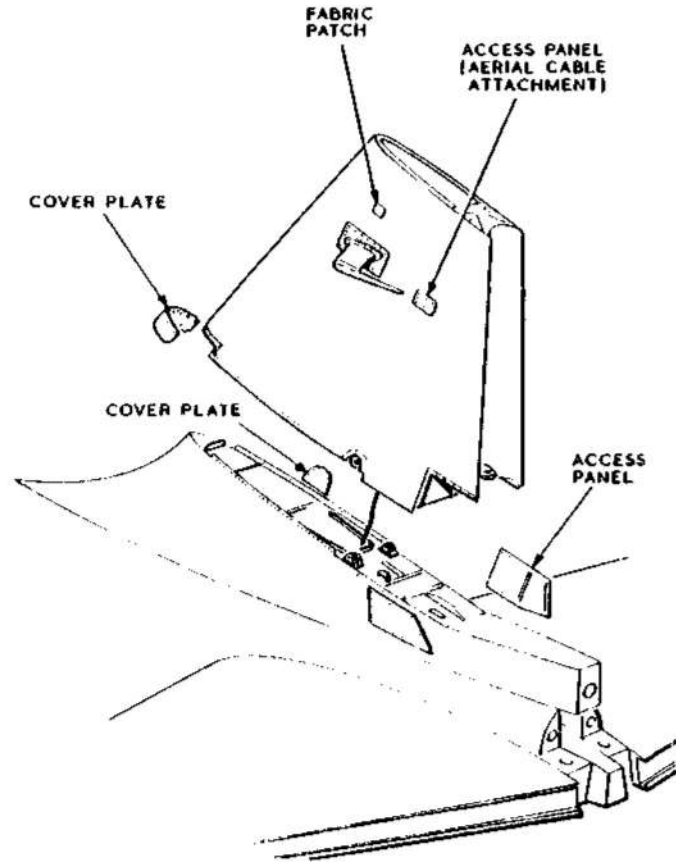
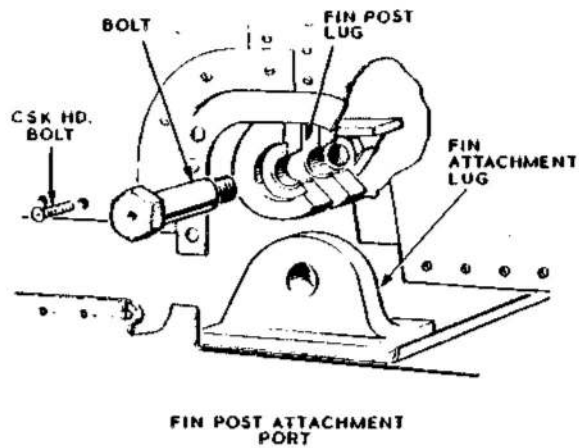
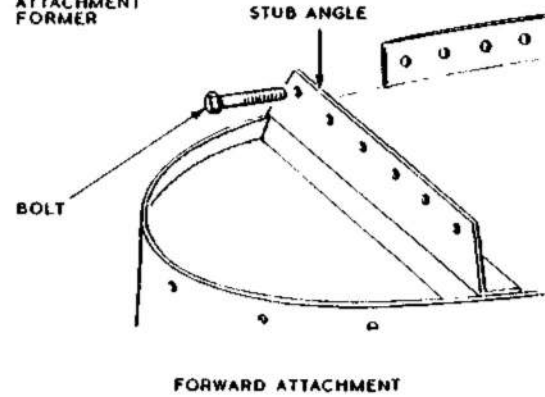
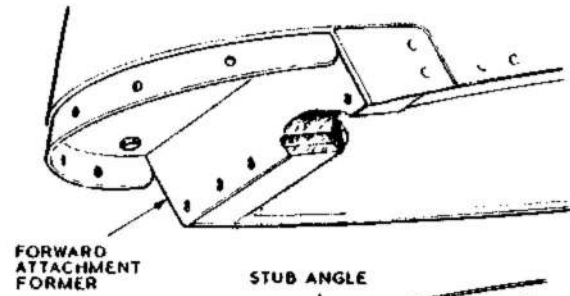
26. To assemble a fin:-

- (1) Offer up the fin and insert the VOR/ILS aerial coaxial cable through the conduit. Connect the cable.
- (2) Insert the port and starboard bolts. Do not tighten them.
- (3) Secure the forward attachment former to the stub angle 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.

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FIG. 10. FIN REMOVAL

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(4) Secure the rear diaphragm to the stub angle 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.

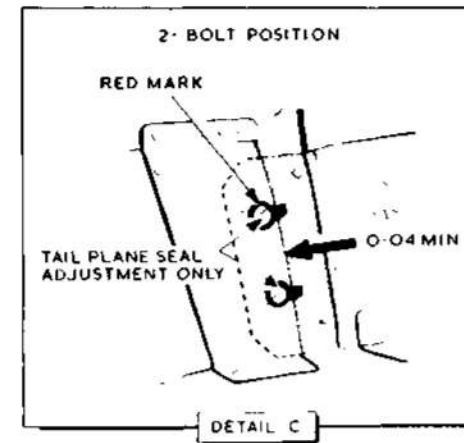
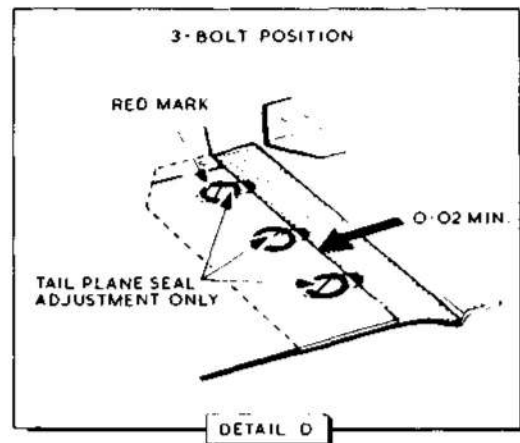
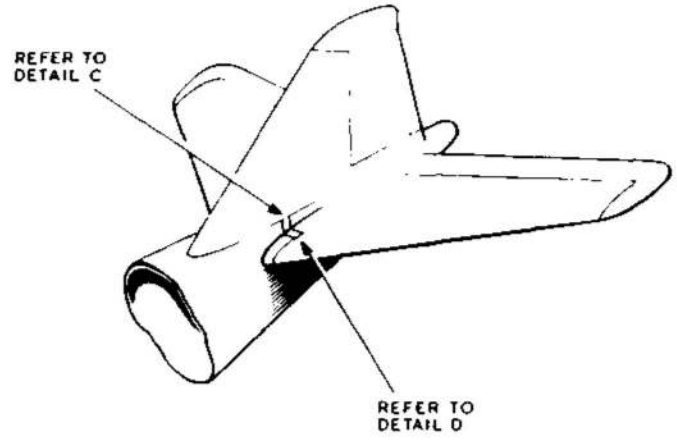
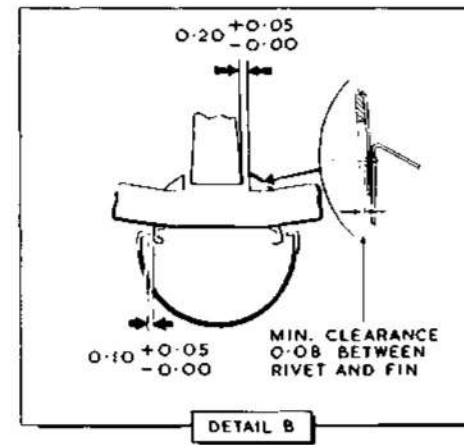
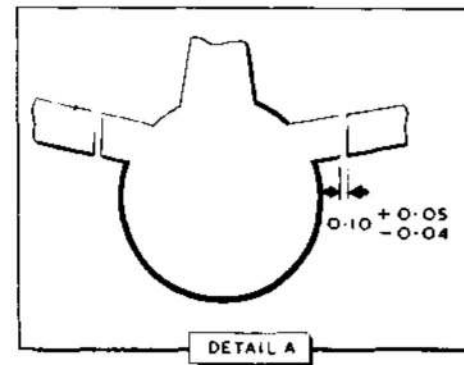
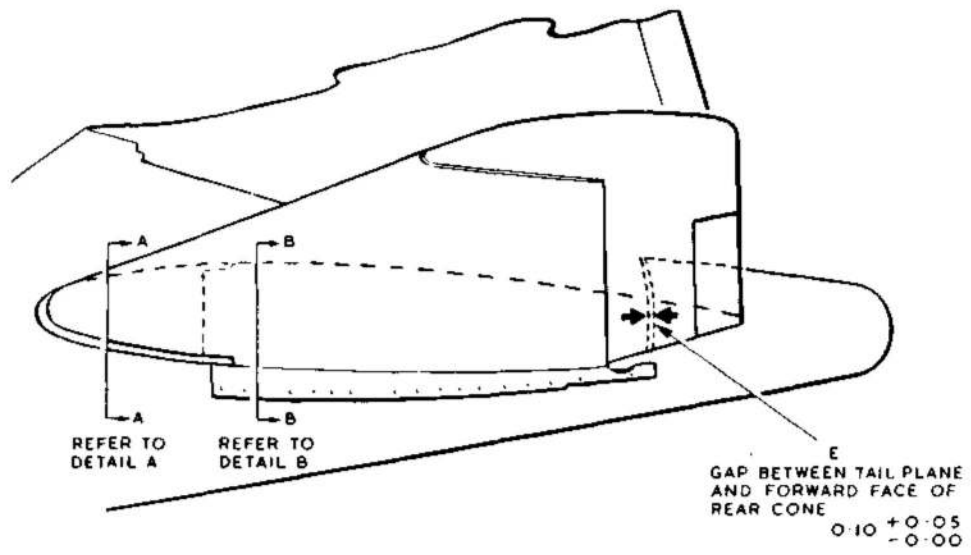
(6) Screw home the port fin post lug attachment bolt. Do not over-tighten.

(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.

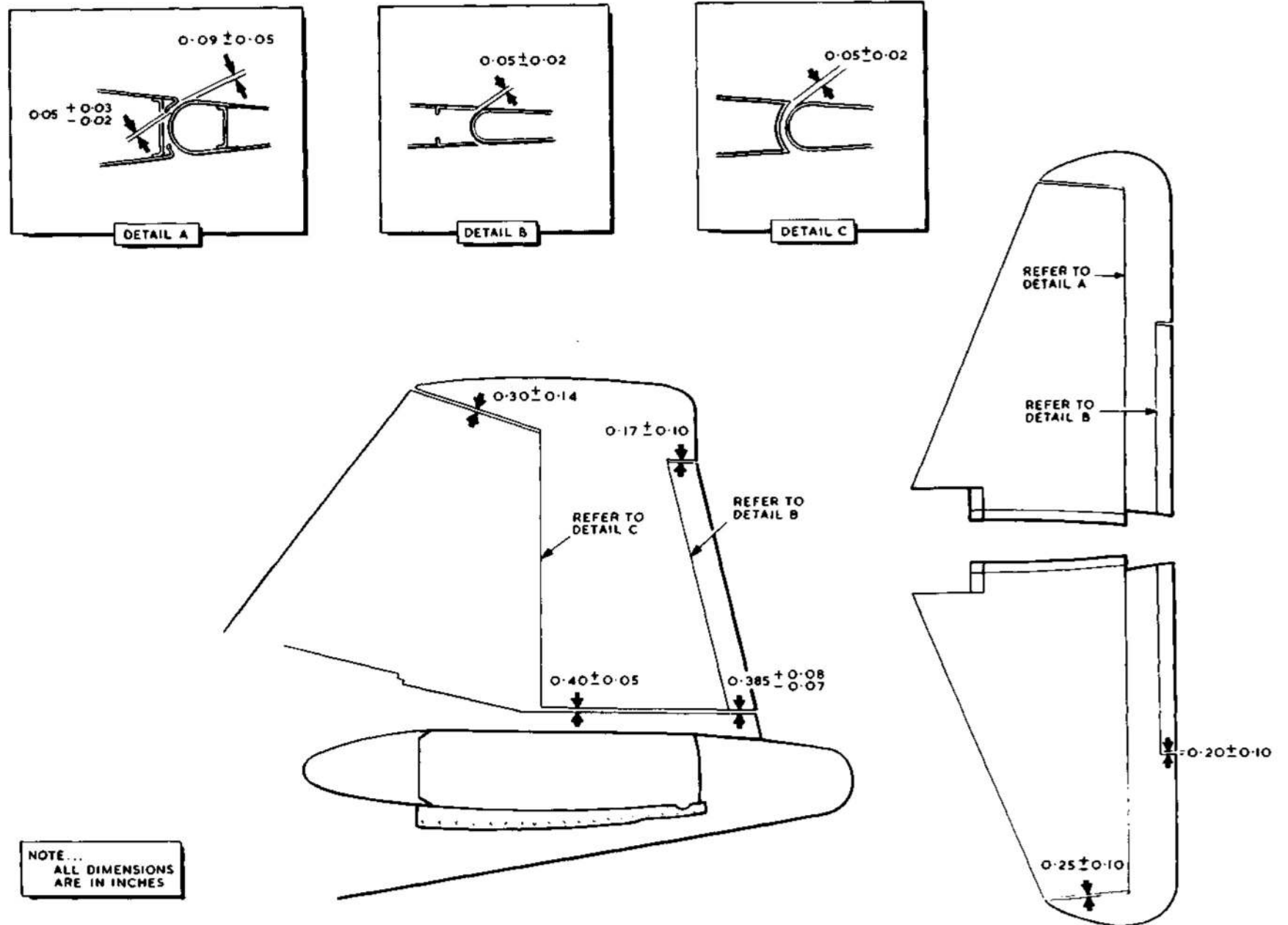
(8) Fit the access panel and cover plates.

(9) Fit the rudder (*para. 21 and 22*).



NOTE...
ALL DIMENSIONS
ARE IN INCHES

FIG.II. TAIL PLANE CLEARANCES



NOTE...
ALL DIMENSIONS
ARE IN INCHES

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FIG.12. FIN, RUDDER AND ELEVATOR CLEARANCES

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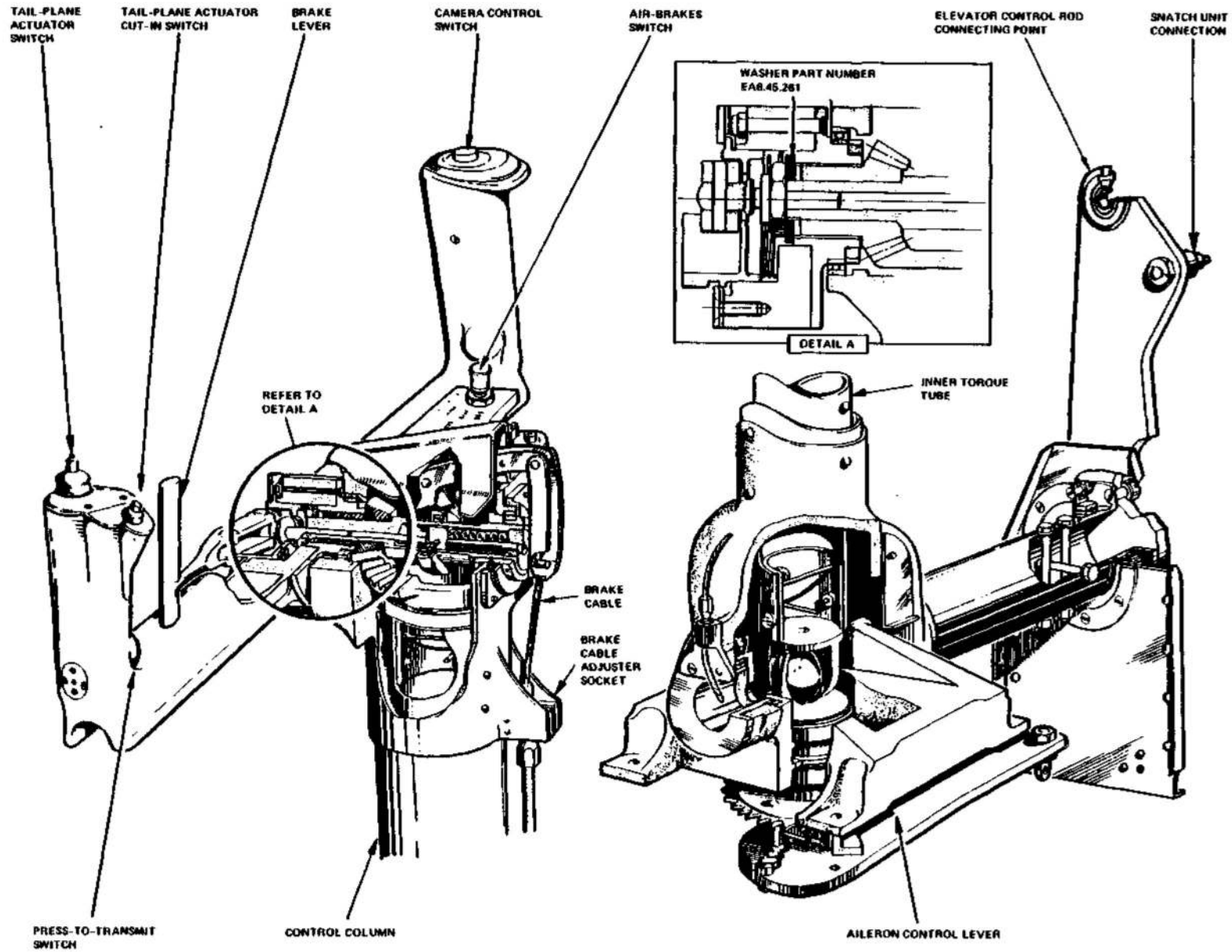


FIG.1. CONTROL COLUMN

◀ BRAKE CABLE AND ADJUSTER SOCKET ANNOTATED ▶

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 when the aircraft is on the ground. Adjustable trim strips are fitted to the upper and lower trailing edges of the elevators and are set in accordance with the information laid down in Appendix 1. 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. 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. 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 pilot's 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, and on the same shaft, 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 brakes relay control valve, which controls differential braking. The movement of the rudder pedals is limited by two adjustable stops on the aft pressure bulkhead acting on the main operating lever.

Aileron control

4. The movement of the aileron is controlled by the control column handwheel, 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. From

the aileron control lever the control passes aft along the port side of the cabin to the inboard one of three levers mounted in a pressure box at the rear of the aft pressure bulkhead. The control run continues from this lever through the battery bay, the forward camera bay, fuel tank bay, and the roof of the flare bay, 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 the aileron levers. Adjustable stops are provided at the pressure box 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.

Elevator control

5. The elevators are controlled by a fore-and-aft movement of the control column, this movement being transmitted to the port elevator by a lever attached to the outboard end of the lateral tube at the bottom of the control column, and by push-pull rods and levers. From this control lever, the control rods pass aft along the port side of the cabin to the outboard one of the three levers mounted in the pressure box. The control run continues from this lever, through the battery bay, the fuel tank bay, along the flare bay roof and through the rear fuselage, to a lever on the rear bulkhead at frame 42. The port elevator lever is connected to this bulkhead 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 (fig.6). The control rods are carried in roller guides suitably positioned in the fuselage structure, and are provided with a coupling at the fuselage transport joint position. Adjustable stops,

located at the pressure box in line with the elevator lever, limit control column movement, and 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 by push-pull rods and levers. From the rudder torque tube 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. The control run continues from this lever through the battery bay, the forward camera bay, fuel tank bay, along the flare-bay roof 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 roller guides, suitably positioned in the aircraft structure, and are provided with a coupling at the fuselage transport joint position. Adjustable stops located at the pressure box 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.2)

7. The point at which the flying controls pass through the aft pressure bulkhead is 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.

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; and its false spar, near the trailing edge, is connected to the rear fuselage by a two-speed electrical actuator. In this installation only the slow speed motor of the actuator is used. The actuator, the length of which may be varied in flight under the control of the pilot, forms a strut between the tail plane and fuselage; 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. 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.3)

9. As there are no independent aileron trim tabs, aileron trim is effected by a bias gear connected to the aileron control lever at the lower end of the control column. 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 bias 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 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 in 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 main instrument panel.

Spring tab mechanism

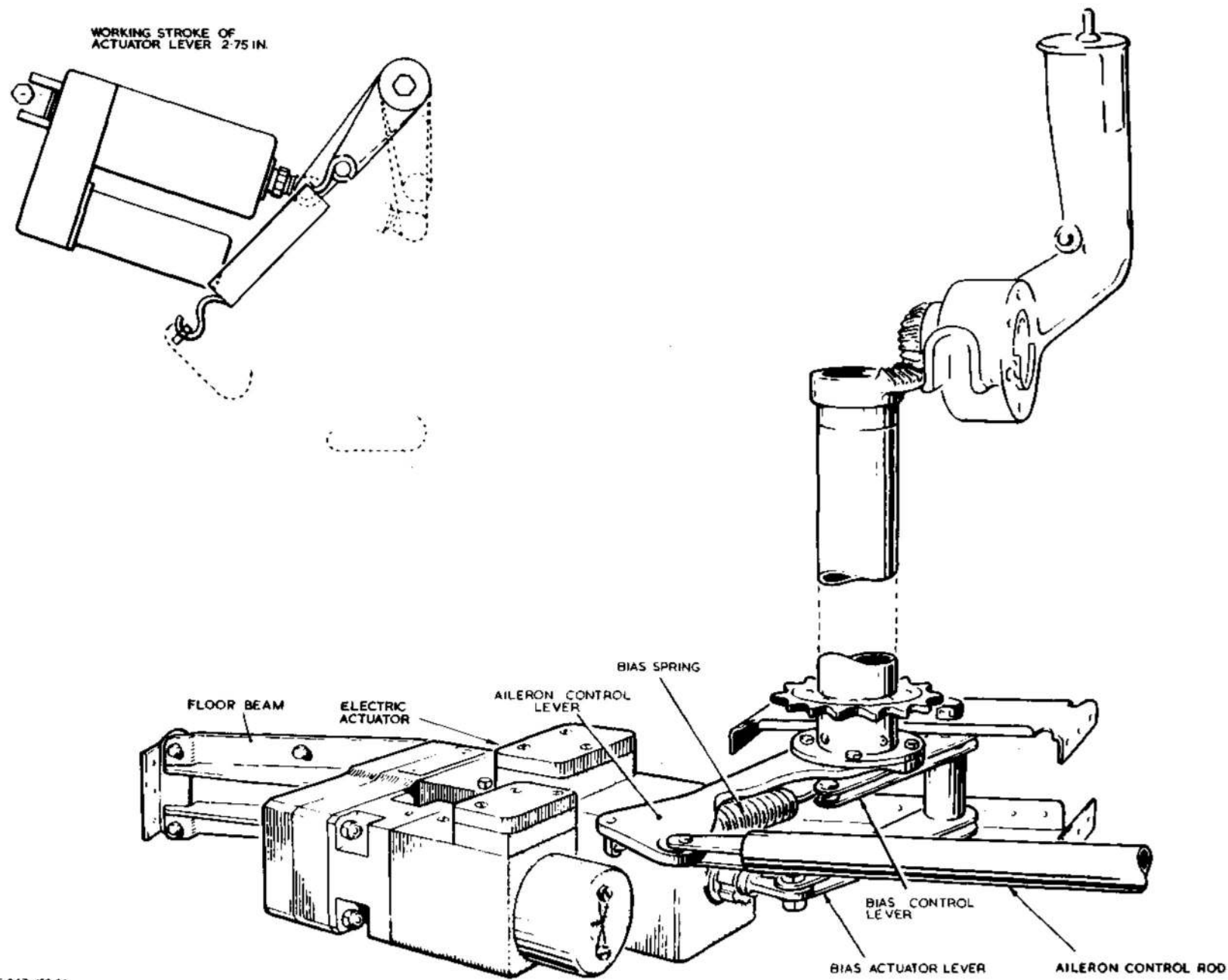
10. The rudder, port elevator, and both ailerons are fitted with spring tabs complete with blow-back rod and torque tube mechanisms, which, in addition to their normal function when operated by the flying controls, have an entirely separate automatic operation. Their normal function is to relieve the 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

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FIG. 3. AILERON BIAS CONTROL
◀ANNOTATIONS AMENDED▶

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pilot pushes on the starboard rudder pedal and the control rod moves aft, rotating the rudder main operating lever in a counter-clockwise direction. The torque applied by the control lever is transmitted through the inner and outer torque tubes to the actuator lever which, through the actuator, moves the rudder over the 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 the 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 a slot in the main operating 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 movement 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 of the rudder spring tab (para.11).

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 of 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 actuator switch is located on the pilot's console and a rudder trim indicator is mounted on the main instrument panel.

Air brakes control (fig.7)

17. The air brakes have three positions, and consist of 21 finger-type drag channels installed in each main plane, situated outboard of the engines and just 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 main plane. They are operated by a single hydraulic jack in each main plane, and are controlled electrically by a switch mounted on top of the control column marked IN MID OUT. The three-way switch has a centre lock; a slide stop, adjacent to the switch, prevents inadvertent selection to the full OUT position. The air brake mechanism is described in Sect.3, Chap.2, and the hydraulic circuit in Sect.3, Chap.6.

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

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.

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

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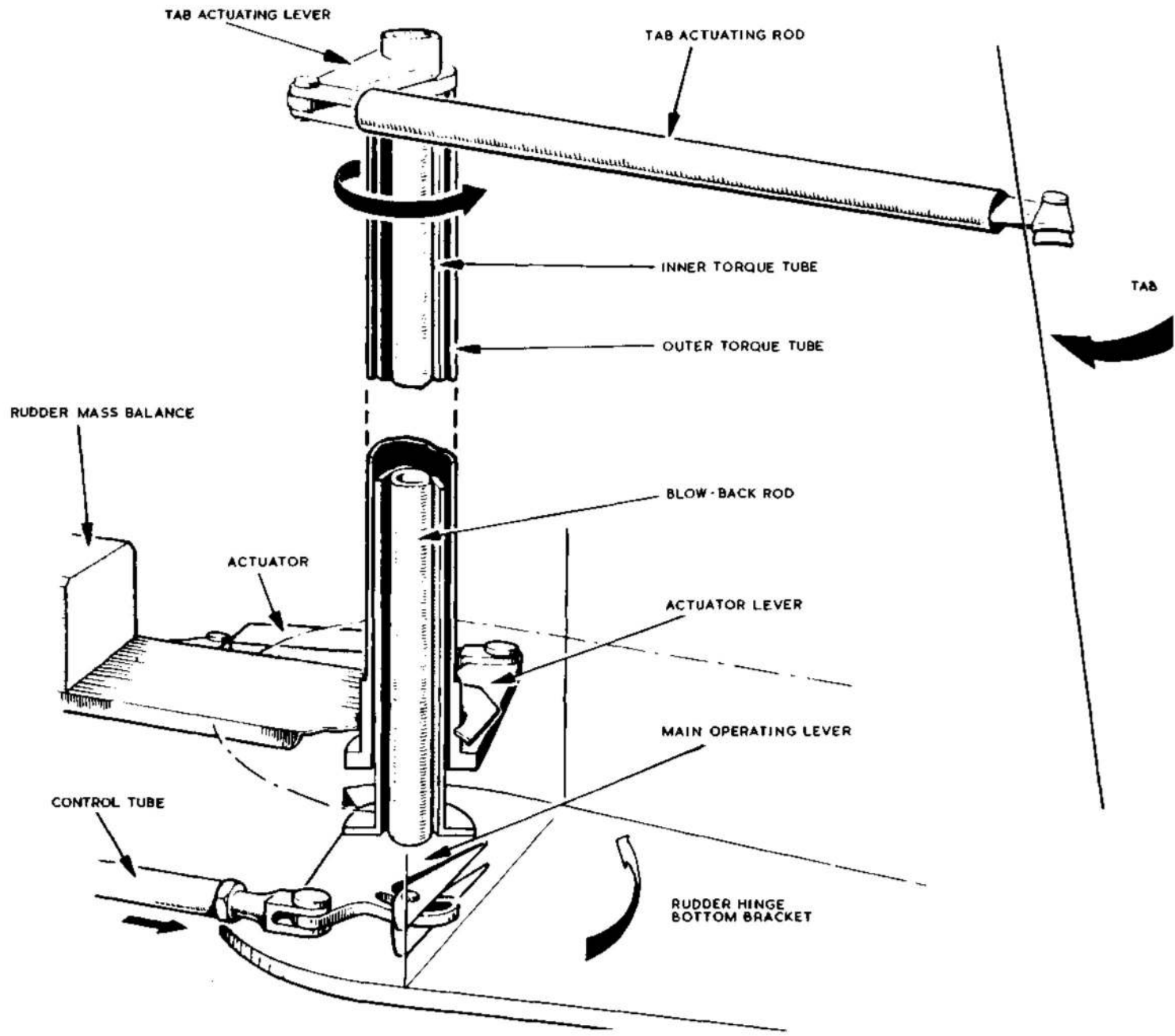


FIG. 4. RUDDER SPRING TAB MECHANISM
◀ ANNOTATIONS AMENDED ▶

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engine starting panel and is locked in position by a quick-release pin.

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

Control rigging

Aileron (fig. 12)

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 C, point 3) from the upper end of the lever, and screw back the upper and lower stop-screws on the aft pressure bulkhead. These operations, except for the lower limit stop-screw, can be made through the battery compartment on the port side of the fuselage. The lower limit stop-screw is on the forward face of the aft 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.

(4) With the hand wheel locked in the neutral position, set the control lever, aft of the aft pressure bulkhead (fig. 11), to its neutral position (7.15 in., measured square from the

pressure bulkhead to the upper control attachment bolt centre) by adjusting the control rod at point 2 (fig. 12, detail C).

(5) Unlock the hand wheel, rotate to 96 deg to port and adjust the upper limit stop-screw on the aft pressure bulkhead (detail C) until it contacts the upper arm of the control lever. Tighten locking nut.

Note . . .

To prevent the possibility of a foul occurring between the wheel-brake lever and the air-brake switch, the wheel-brake lever must be locked in the parked position during handwheel rigging operations.

(6) Rotate the hand wheel 80 deg to starboard and adjust the lower limit stop-screw on the pressure bulkhead (detail C) 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 C, point 3) to the upper end of the lever at the aft pressure bulkhead.

(8) Check that the lower arm of the bell-crank lever, aft of the main spar frame in the roof of the flare bay, is parallel to the main spar. Adjust, if necessary, at the control rod connections at either end of the control rod (points 3 or 4).

(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 5 (detail A) to give the ailerons a droop of 4 deg 54 min (linear dimension 1.45 in. \pm 0.10 in., measured at point 8).

(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 A), set the tabs with 15 deg droop relative to the aileron datum (linear dimension 1.38 in. \pm 0.10 in., measured at point 7). 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 B, point 6), and turning the control rod as necessary.

(11) Remove the stop pin (detail A) 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 torque tube bracket attachment bolts by transferring shims from one bolt to the other.

Note . . .

- ◀ 1. Shims are initially fitted to a thickness of 0.040 in. between the inboard 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. Excessive force must not be applied to the ailerons as such action may initiate cracking of the inboard hinge brackets. ▶

(12) Move the ailerons up (manually) 15 deg (linear dimensions 4.58 in. \pm 0.20 in. measured at point 8), and set the upper limit stop (detail A).

(13) Move the ailerons down (manually) 15 deg (linear dimensions 4.58 in. \pm 0.20 in.), measured at point 8, and set the lower limit stop (detail A).

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

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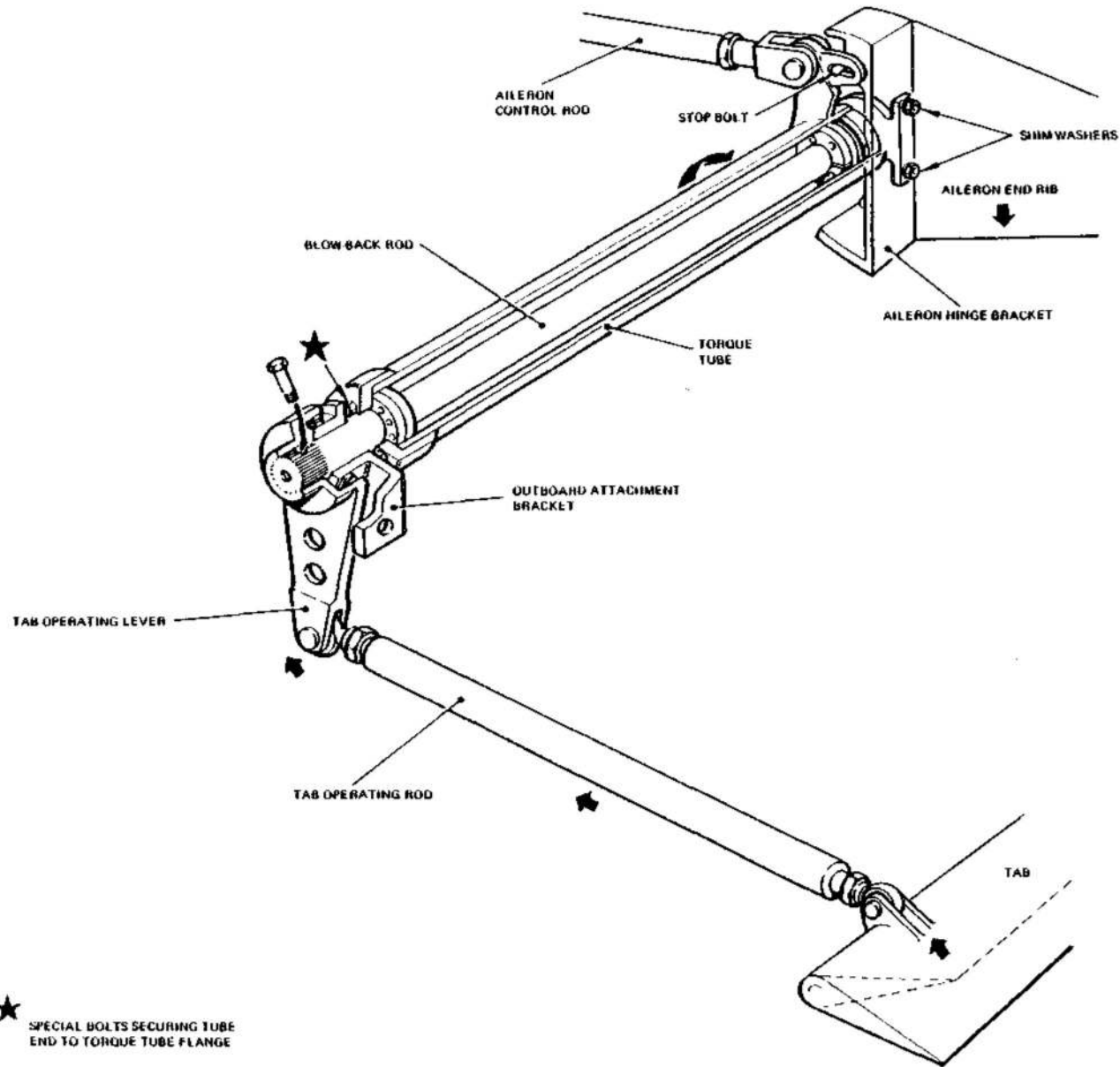


FIG.5. AILERON SPRING TAB MECHANISM

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Note . . .

The bolt (detail A) 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 D).

(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 flight trim checks 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 setting tool and gauge (Sect. 2, Chap. 4).

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 following control tube replacement

22. Following the replacement of control rods and levers between frame 21 and the aileron connection, the following method of rigging the aileron controls, port and starboard is recommended:—

- (1) Set 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 (fig.13 and 13A)**

23. To rig the elevator controls proceed as follows:—

WARNING . . .

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

- (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 aft pressure bulkhead. These operations, except for the lower limit stop-screw, can be made through the battery compartment on the port side of the fuselage. The lower limit stop-screw is on the forward face of the aft 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 (para. 19).
- (4) Set the control lever aft of the pressure bulkhead (fig. 11), to its neutral position (7.25 in. measured square from the pressure bulkhead to the upper control attachment bolt centre), by adjusting the control rod at point A or C (fig. 13, detail 1).

Note . . .

1. Any adjustments made at the aft

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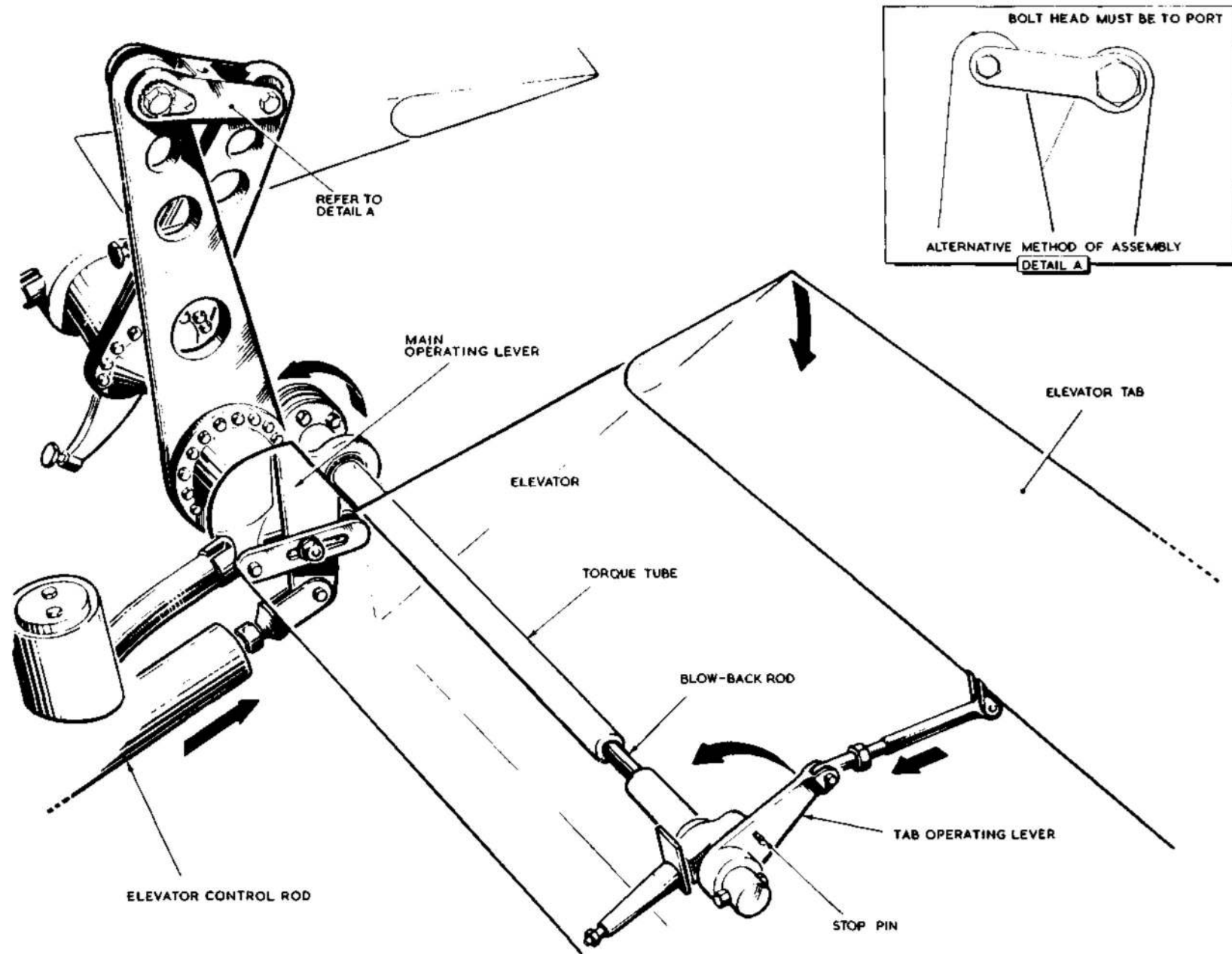


FIG. 6. PORT ELEVATOR SPRING TAB MECHANISM
ANNOTATIONS AMENDED

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pressure bulkhead may affect the clearances at the snatch unit sear operating lever. Check the dimensions in accordance with Chap.11, fig. 1.

2. 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, ensure that the red line is repainted on the rod on either side of the collar, and that the original red line is obliterated.

(5) Move the control column 16 deg forward of the vertical and 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 camera 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 \pm 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 8.40 in. \pm 0.30 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. $\begin{matrix} +0.30 \\ -0.50 \end{matrix}$ 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, and a toggle between the port elevator horn and the tail plane.

(13) Adjust the port tab control rod until the tab is 9 deg up; linear measurement 0.95 in. \pm 0.10 in. measured between the trailing edges of the tab and the elevator (point G).

(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. \pm 0.10 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 (para. 19) and reconnect the control tube 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 those given in para. 26. Relock the port elevator and check the movements (point G) of the port spring tab which should be:

Port elevator tab up: 2.35 in. min.

Port elevator tab down: 1.00 in. min.

The dimensions are measured between the trailing edges of the tab and elevator. When the port tab is moved to its fully up 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.

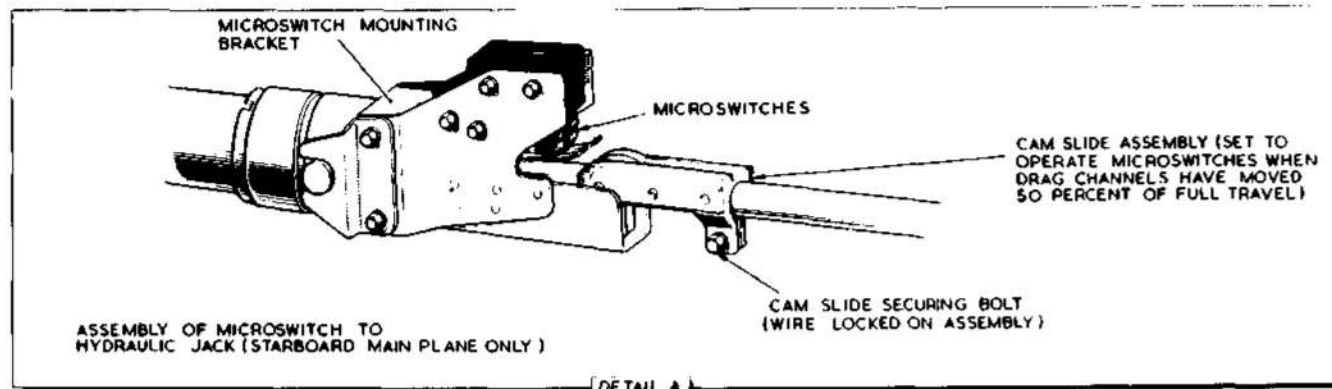
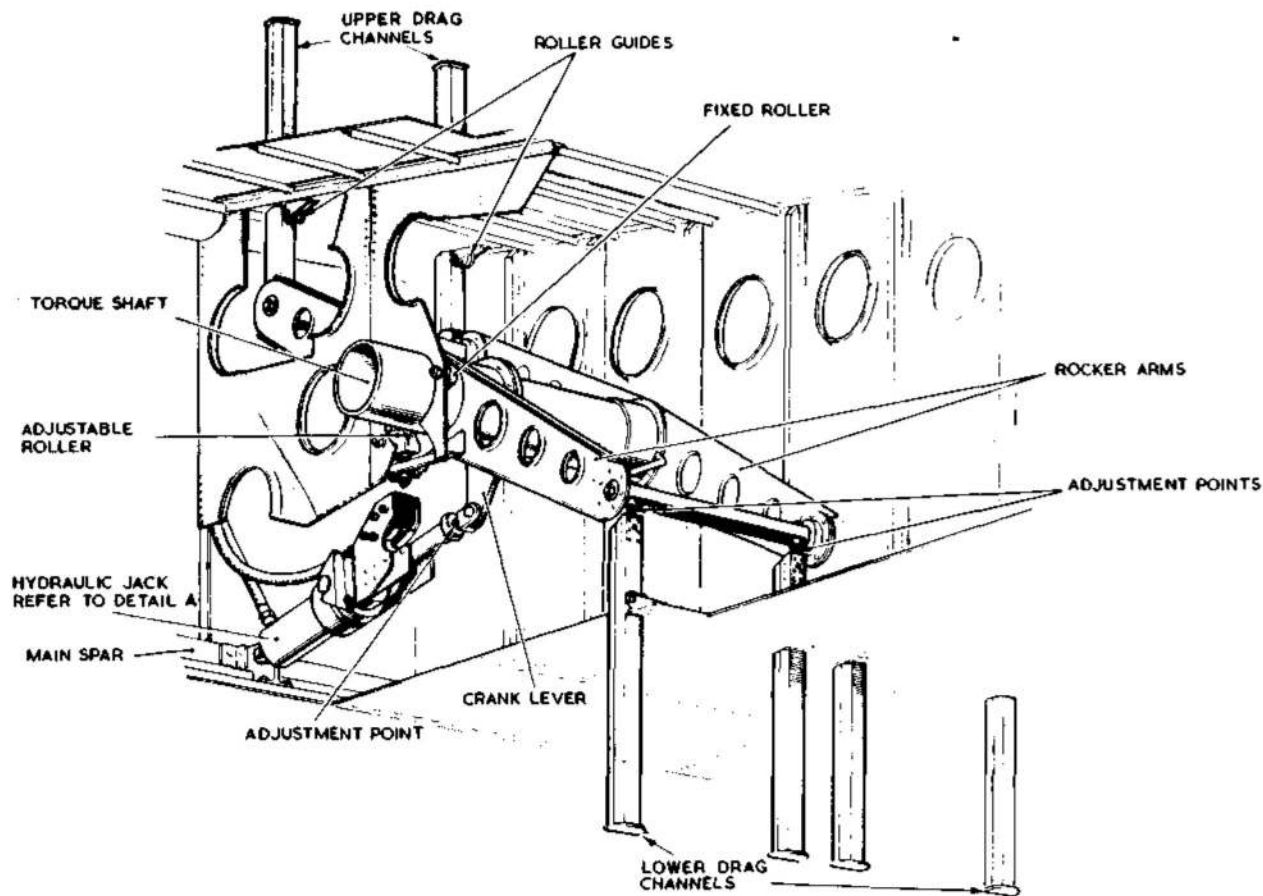
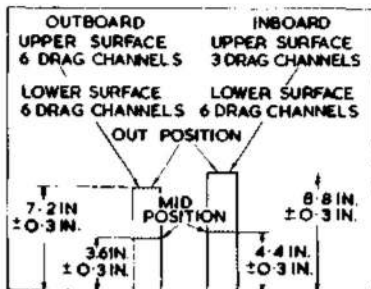
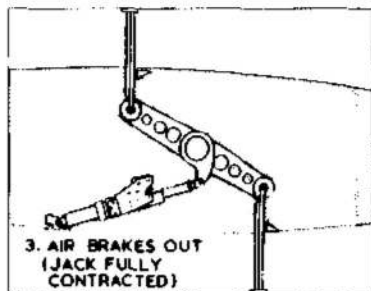
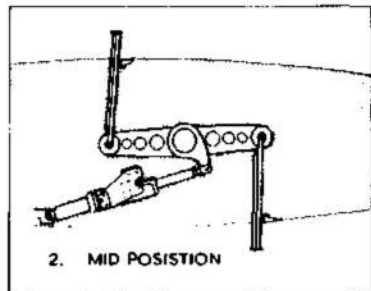
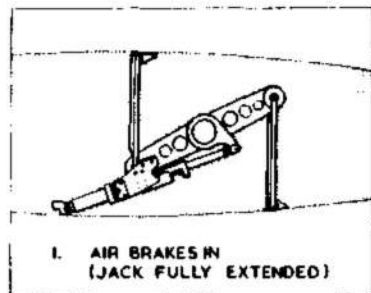


FIG.7. AIR BRAKES CONTROL AND SETTING

(19) Carry out flight trim checks as specified in Appendix I.

(20) Following completion of adjustments, check the operation of the control column snatch unit (*Chap. 11*).

Rudder (*fig. 14*)

24. To rig the rudder controls proceed as follows: -

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

(3) Set the rudder bar in its neutral position (port pedal forward, two degrees, making an angle of 92 deg to the centre line of the fuselage) and lock it in this position, (*para. 19*).

(4) Set the control lever, aft of the aft pressure bulkhead (*fig. 11*), to its neutral position (7.4 in. measured square from the pressure bulkhead to the upper control attachment bolt centre) by adjusting the control rod at point 2 (*fig. 14, detail A*).

(5) Unlock the rudder bar and apply port rudder until the port pedal is 27 deg forward of the neutral position. Adjust the lower control limit stop-screw on the pressure bulkhead (*detail*

A) until it contacts the lower arm of the lever. Tighten the locking nut.

(6) Apply starboard rudder until the starboard pedal is 25 deg forward of the neutral position and adjust the upper control limit stop-screw on the pressure bulkhead (*detail A*) until it contacts the upper arm of the lever. Tighten the locking nut.

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

(8) Lock the rudder bar at neutral (*para. 19*).

(9) Disconnect the control rod from the rudder lever at point 5, 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. \pm 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 B*) on the bulkhead at frame 42 to its neutral position (8.65 in. \pm 0.10 in., measured square from the bulkhead to the control attachment bolt centre) by adjusting the control rod at point 4.

(12) Reconnect the control rod to the rudder lever at point 5, adjusting the fork-end of the control rod at points 3 or 5, 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 check the rudder movement; it

should be 25 deg to port (linear dimension 23.10 in. \pm 1.00 in. at point 7).

(15) Apply further port rudder until the tab has moved 18 deg to starboard (linear dimension measured from the inboard edge of the tab to the centre of the trailing edge of the rudder should be 1.73 in. $\begin{matrix} +0.00 \\ -0.10 \end{matrix}$ as shown in detail D, point 6.

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

Note . . .

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

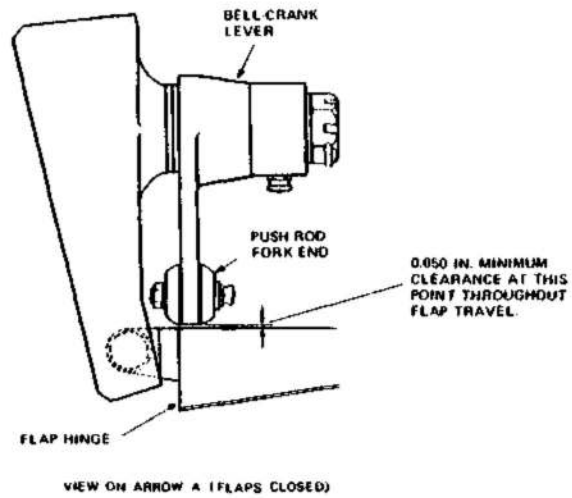
2. If the rudder tab movement, operation (15), is in excess of 18 deg, a new rudder tab operating lever stop plate (*fig. 19*) should be fitted, and the stop-faces filed, if necessary, to obtain the desired 18 deg movement. Similarly, if the 18 deg movement is unobtainable, the existing stop plate may be filed. The correct protective treatment (A.P.119A-0509-1) 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

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NOTE
ALL DIMENSIONS
ARE IN INCHES

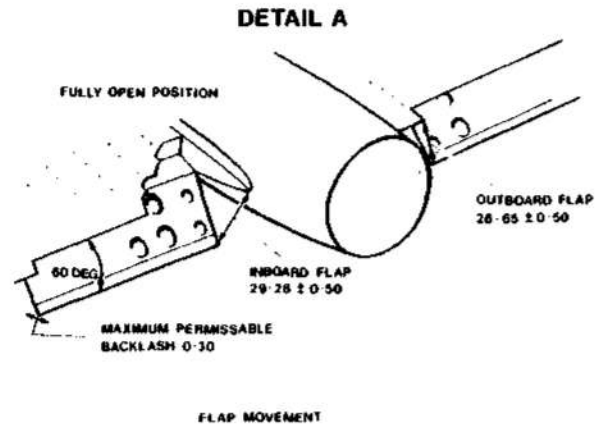
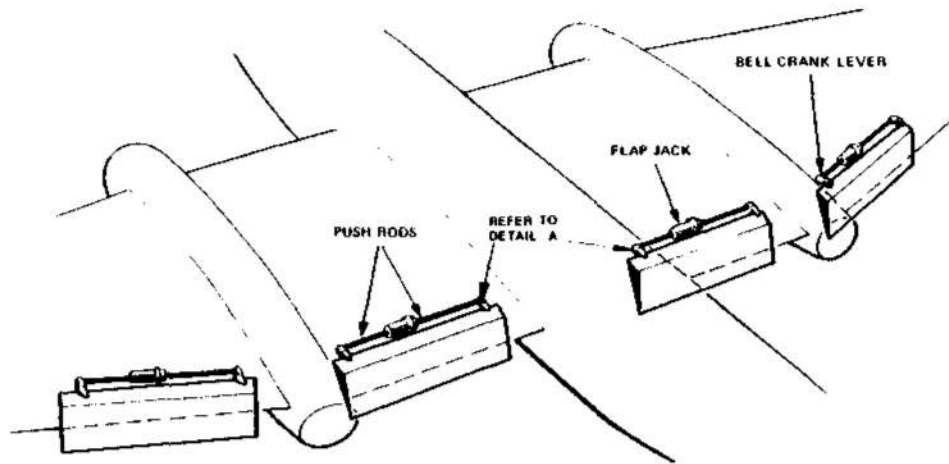
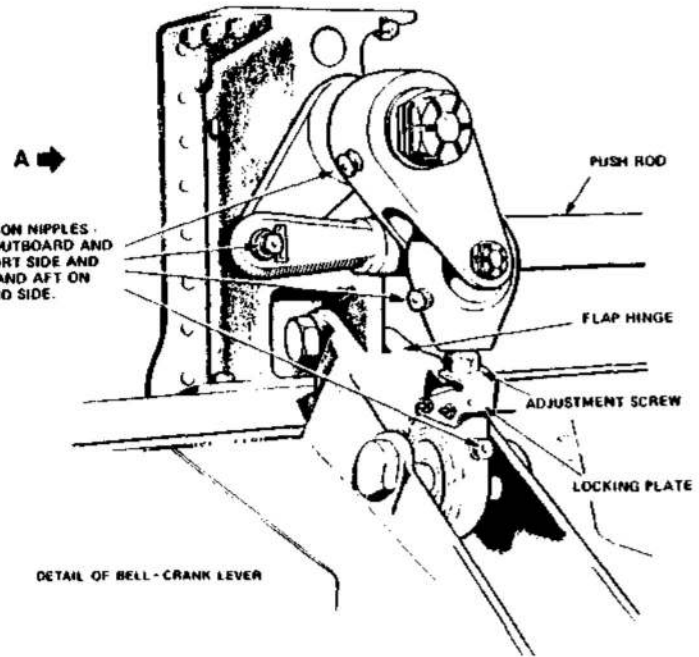


FIG.8. FLAPS CONTROL AND MOVEMENT

is set by the manufacturers and will not need further adjustment.

Starboard elevator ground-set tab

26. To adjust the starboard elevator ground-set tab proceed as follows:—

- (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.
- (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. \pm 0.05 in.) between the trailing edges of the elevator and tab, measured at the outboard end of the tab (fig. 13). 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 1.85 in. \pm 0.10 in., up or down, 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 7.50 in. (fully contracted) against an electrical stop. The mechanical stops are set to give a working stroke of 3.00 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 \pm 0.125 in. as follows:

- (1) Remove the actuator (para. 46).
- (2) Using an 18V d.c. 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 18V d.c. supply, check that the electrical stops operate when the pin-centres are 7.50 in. and 10.22 in.
- (7) Replace the actuator in the reverse order of removal.

28. To check the movement of the rudder tab and actuator proceed as follows:—

- (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 $\begin{smallmatrix} +0.00 \\ -0.10 \end{smallmatrix}$ in. measured from the inboard trailing edge of the tab to the normal centre line of the rudder (fig. 14)).
- (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 $\begin{smallmatrix} +0.00 \\ -0.10 \end{smallmatrix}$ 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 (fig. 19) 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.119A-0509-1) must be applied to all filed surfaces.

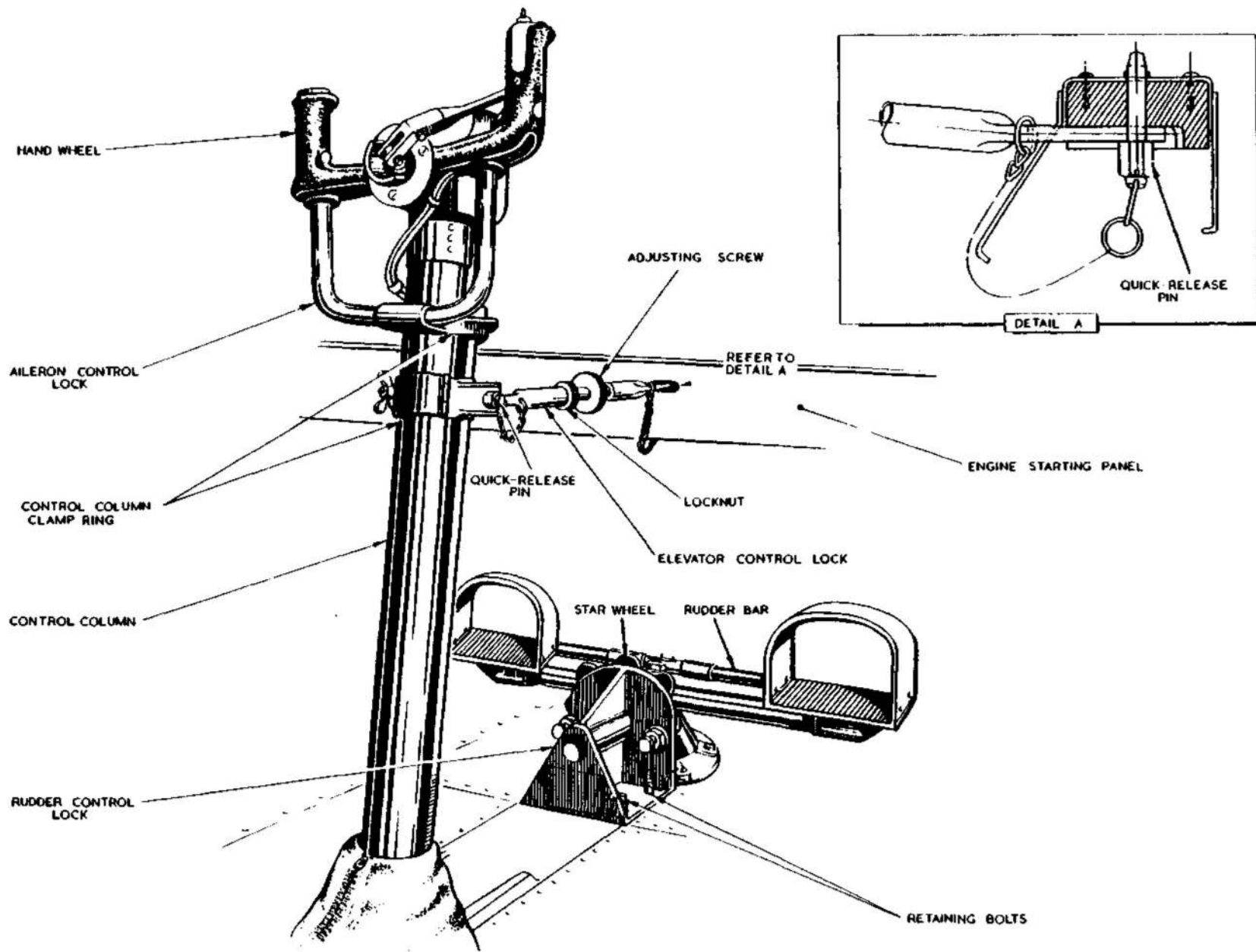
Tail plane actuator setting (fig. 10)

29. The following instructions for the setting of the Type 4022, Mk. 1 tail plane actuator are listed in the sequence in which the setting must be carried out: no adjustment is possible on the actuator itself. For detailed information on the actuator refer to A.P.4343D, Vol. 1, Book 3, Sect. 14, Chap. 89.

Note . . .

All tail plane angles are to be measured on the STARBOARD tail plane at the inboard rigging board position, using incidence gauge (Sect. 2, Chap. 4) 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).



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FIG. 9. CONTROLS NEUTRAL RIGGING LOCKS

(2) Open the camera access hatch and place the lateral leveling gauge (Sect.2, Chap.4) 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 \pm 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) on the leveling bracket on the starboard side of frame 29 bulkhead, and on the datum pad on the lateral gauge (fig. 10).

(5) Level the aircraft longitudinally (0 deg \pm 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. 15).

(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 \pm 13 min relative to the fuselage datum (fig. 10).

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 dis-connecting 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 cable. A suitable resistor would be a Painton Type 5007, of approximately 2.2 ohms resistance, and 'B' termination.

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

(9) Reduce the angle recorded in (8) by 8 min. $\begin{matrix} +1.00 \\ -0.00 \end{matrix}$ min, this will give the angle at which the lower microswitch must be tripped (fig. 10).

(10) Adjust the lower tappet to operate the lower microswitch at the angle found in (9).

(11) 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 \pm 13 min relative to the fuselage horizontal datum (fig. 10).

(12) Check and record the correct angle obtained in operation (11).

(13) Increase the angle recorded in (12) by 8 min $\begin{matrix} +1.00 \\ -0.00 \end{matrix}$ min, this will give the angle at which the upper microswitch must be tripped (fig. 10).

(14) Adjust the upper tappet to operate the upper microswitch at the angle obtained in (13).

(15) 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 \pm 2 min.

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

Air brakes setting (fig. 7)

30. To set the air brake mechanism proceed as follows:–

(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. 7.

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

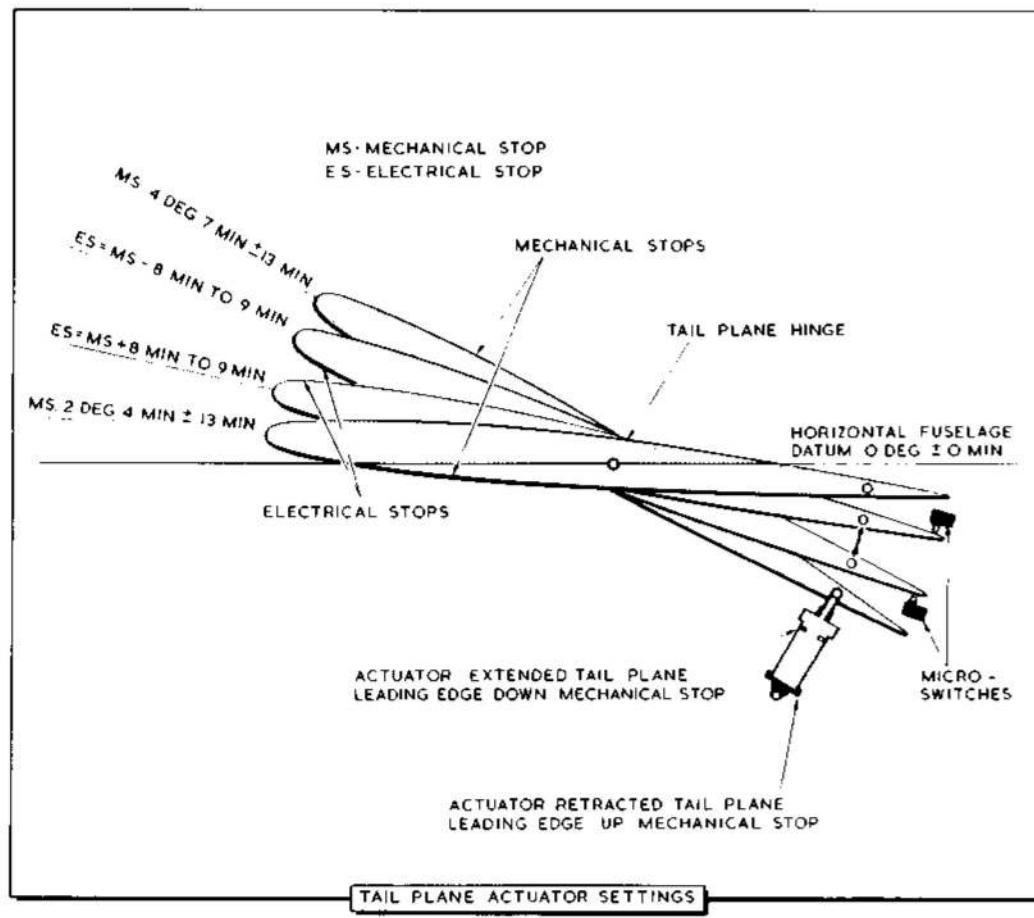
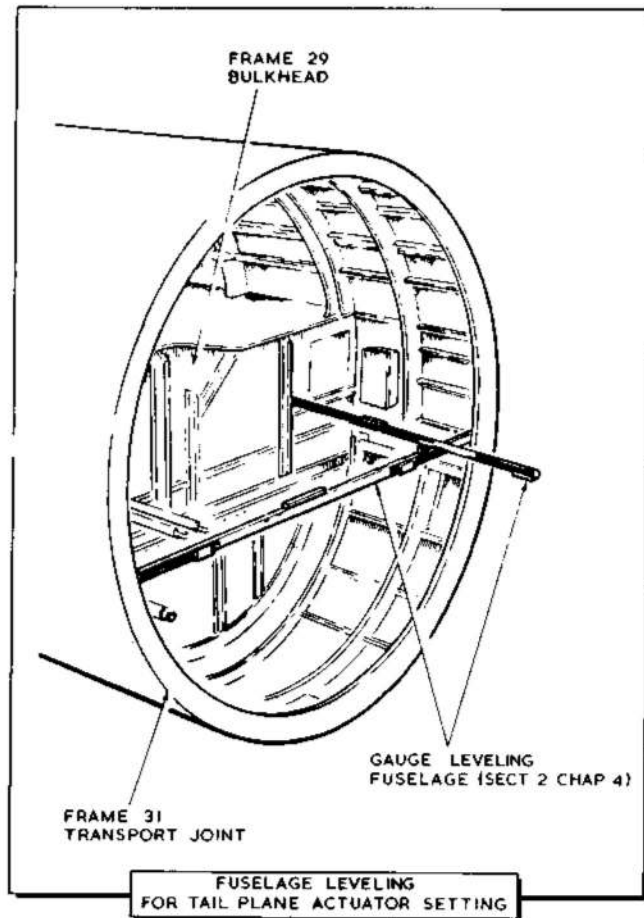


FIG. 10. FUSELAGE LEVELING AND TAIL PLANE SETTING

(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.7. In the MID positions, the inboard and outboard drag channel extensions on one main plane must not differ by more than 0.50 in. to the extensions of the corresponding sets of channels on the opposite 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 0.7 in., if 26 x 2 B.A. bolts are fitted their overall length must be 0.6 in.).

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

Flaps setting

31. 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, Flap jack assembly*).

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

(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 the 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. \pm 0.50 in. (inboard flap) and 26.65 in. \pm 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 is 0.30 in. (*fig. 8*).

Note . . .

The dimension 0.30 in. is for the linkage in an as new condition. A relaxation of this dimension to 0.60 in. is permitted due to subsequent cumulative wear in the linkage. Refer to A.P.101B-0400-6 for maximum wear limits.

(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.

(7) When refitting the locking plates, ensure that the bolts securing the plates are fitted with their heads to starboard.

Note . . .

◀ *The correct protective treatment (A.P.119A-0509-1) must be applied to all filed surfaces.* ▶

Static friction loads

32. The maximum acceptable values for the

static friction loads of the control runs are as follows:

Aileron	4 lb
Elevator	6.5 lb
Rudder	6.5 lb

The loads are to be measured with a spring balance (*Sect. 2, Chap. 4*) 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

33. For lubrication details of the flying control system refer to fig.16, 16A and 16B.

Note . . .

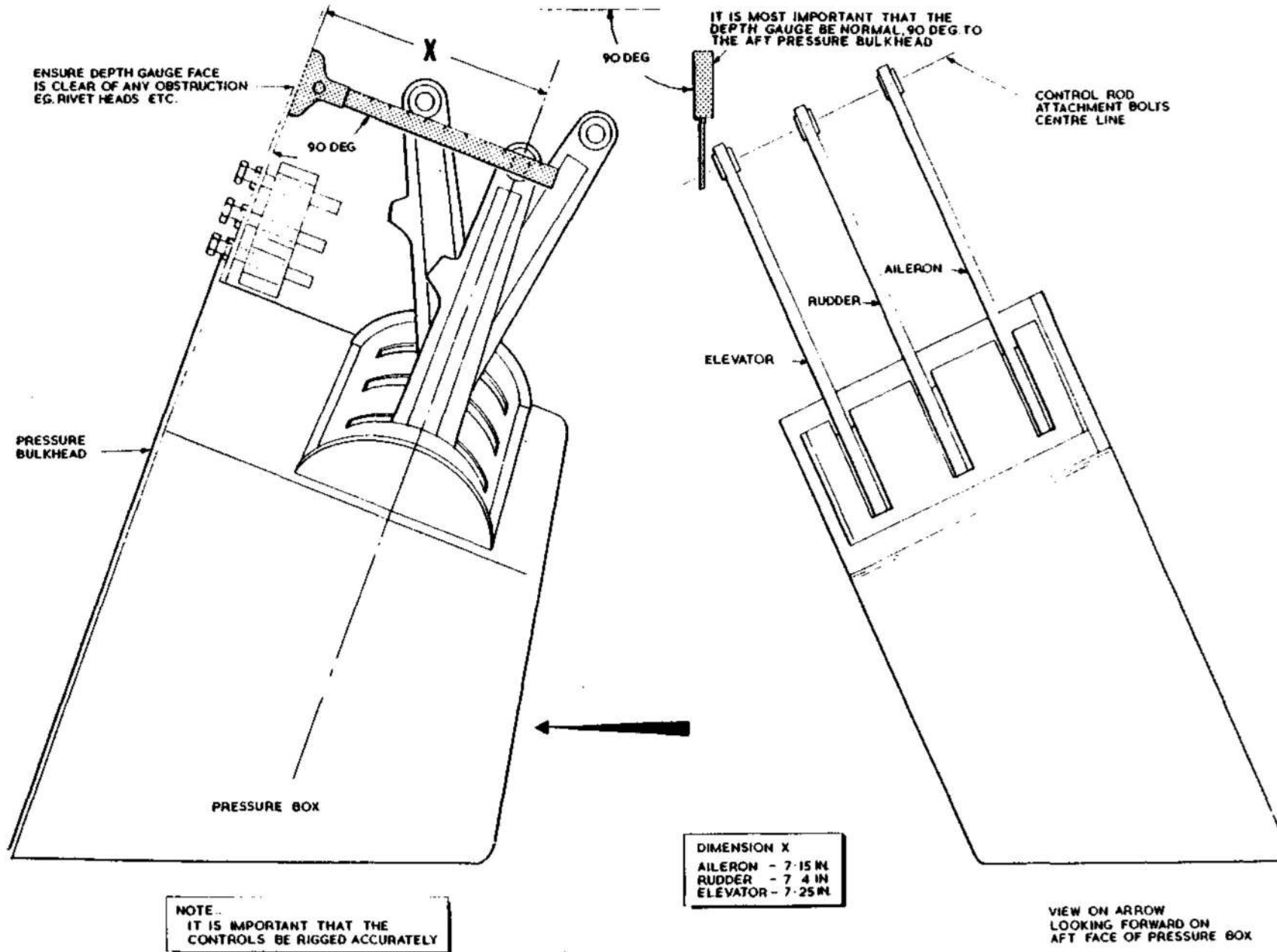
No grease or oil is to be applied to the roller guides of the flying control push-pull rods.

REMOVAL AND ASSEMBLY

General information

34. 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

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FIG.II. CONTROL LEVER RIGGING

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.

Control column

35. To remove the control column proceed as follows:-

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 (Sect.3, Chap.11).
- (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, situated one 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, also 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, then remove the cable adjusters and the clips retaining the Bowden cable to the control column. Remove the cable.

Note . . .

Check the conduit socket EA 1-45-123 which retains the brake cable at the top of the control column for security of the rivets before replacing the cable.

- (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 ¼ in. dia. 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.

◀ 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. When a new cable is to be fitted, the nipple end may require dressing to suit the control valve. Extreme care must be used during this process to ensure the cable is not kinked or its strands damaged. ▶

Rudder bar

36. To remove the rudder bar proceed as follows:-

- (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.

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).

- (4) Remove the rudder main operating lever.
- (5) Remove the eight ¼ in. dia. bolts securing the rudder bar pedestal to the cockpit floor, and remove the rudder bar.

Spring-tab mechanisms

Aileron (fig.17)

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

- (1) Remove the aileron (Sect.3, Chap.2).
- (2) Remove the access panel from the leading edge of the aileron and disconnect the tab-operating rod from the torque-tube lever.
- (3) Remove the stop bolt and bush from the slot in the aileron-operating lever at the inboard end of the tab operating gear assembly (detail B).
- (4) Remove the bolt securing the tab-operating lever to the blow-back rod at the outboard end of the assembly (detail A).
- (5) Using an extractor (Sect.2, Chap.4) withdraw the tab-operating lever from the splines of the blow-back rod (detail A).
- (6) Remove the bolts attaching both the inboard and outboard mounting brackets to the aileron spar. Withdraw the operating gear from the aileron.

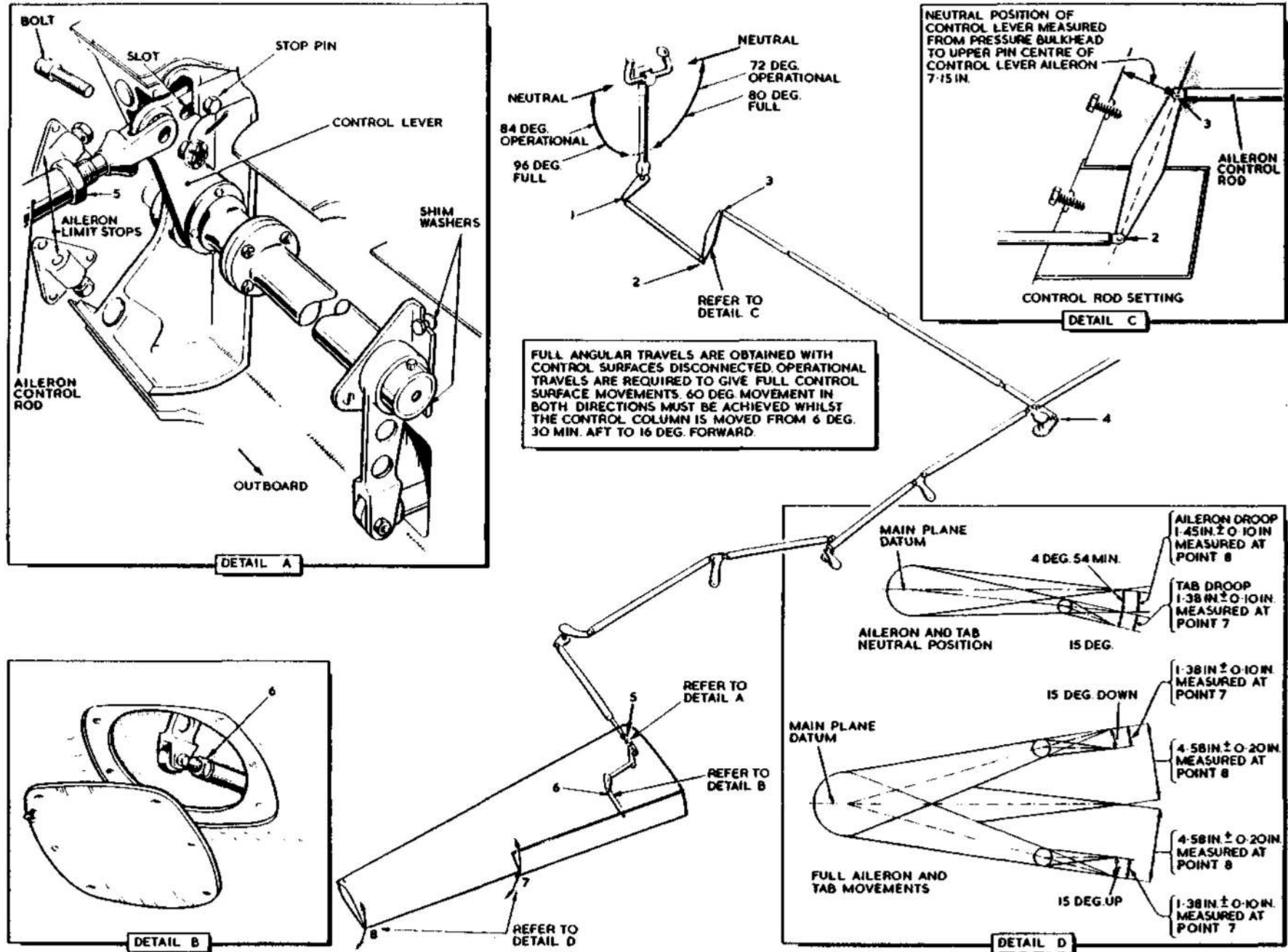


FIG. 12. AILERON CONTROL RIGGING

Note . . .

Shims are fitted between the inboard mounting bracket and the aileron spar and are used to adjust the spring-tab mechanism (detail A). It is important that these shims are refitted in their original positions as neglecting to do this may subject the torque tube assembly to undue strain.

38. *Sequence of assembly.* - The assembly sequence for refitting the existing spring-tab mechanism is the reverse of that given for the removal.

39. *Assembly of a new spring tab mechanism.* -

(1) Separate the outboard mounting bracket from the original tab operating mechanism.

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

(3) Assemble the mechanism into the aileron and temporarily bolt the mounting brackets to the aileron spar, fitting between the inboard mounting bracket and the spar, a shim washer at both bolt positions.

Note . . .

If difficulty is experienced when fitting the new inboard mounting bracket, the inboard edge of the bracket may be filed locally to obtain a satisfactory fit. The correct protective treatment (A.P.119A-0509-1) must be applied to all filed surfaces.

(4) Assemble the stop bolt and bush through the slot in the aileron-operating lever at the inboard end of the tab-operating gear (detail B).

(5) Assemble the torque-tube lever to the

splined end of the blow-back rod, and fit the bolt, nut, saddle washers and split pin (detail A).

(6) Fit the tab-operating rod.

(7) Check that with the stop bolt at the aft end of the slot in the aileron-operating lever there is no pre-loading in the torque tube. If pre-loading is found, adjustment to relieve it may be made on the mounting bracket attachment bolts by transferring shims from one bolt to the other.

Note . . .

The shims are initially fitted to a thickness of 0.040 in. between the inboard 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.

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

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

(10) Rig the aileron control (para. 20).

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

Port elevator (fig. 18)

40. To remove the port elevator spring tab mechanism proceed as follows: -

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

(2) Obtain access to the outboard end of the tab operating gear assembly by removing the panel in the top surface of the elevator.

(3) Unfasten the nut and withdraw the bolt that secures the tab-operating lever to the extreme outboard end of the tab operating gear assembly.

(4) Remove the split pin from the shackle pin, and withdraw the shackle pin from the slots in the links at the inboard end of the tab-operating gear, and allow the links to swing downwards clear of the main operating lever.

(5) Remove the two nuts and withdraw the bolts securing the bearing bracket to the elevator main spar at the extreme inboard end of the torque tube assembly.

(6) Break the locking wire and slacken the torque tube clamp nut which secures the outboard end of the assembly to the outboard bearing bracket; the complete torque tube assembly can then be withdrawn through the inboard end of the elevator.

41. *Sequence of assembly.* -

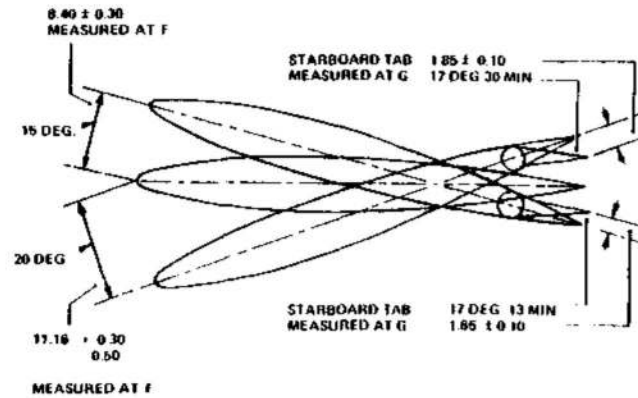
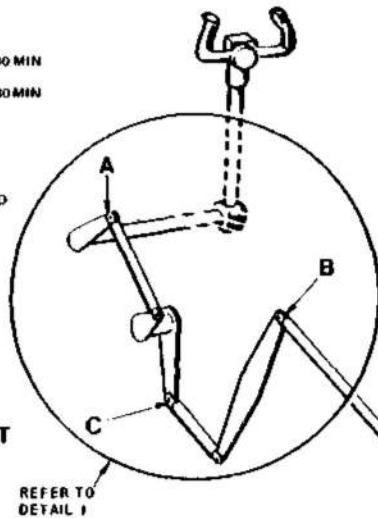
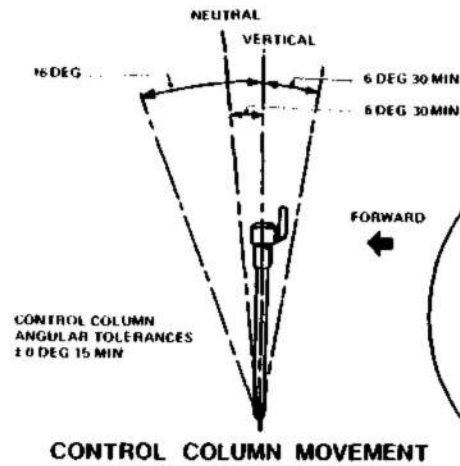
(1) Offer up the torque tube, the inboard bearing bracket, the blow-back rod, and the main operating lever, to the elevator.

(2) Pass the splined end of the torque tube through the clamp nut into the tab-operating lever, and fit and tighten the tab-operating lever securing bolt.

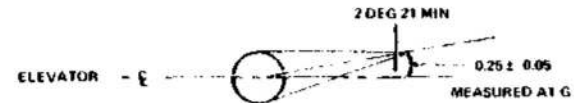
(3) Fit the two bolts which attach the inboard bearing bracket to the elevator main spar.

(4) Tighten the torque-tube clamp nut, and ensure that the gap between the outboard bearing bracket and the tab-operating lever does not exceed 0.25 in. (detail A). If this dimension cannot be obtained, or when fitting a new rod, refer to A.P.101B-0400-6, Book 2, leaflet D.4/2.

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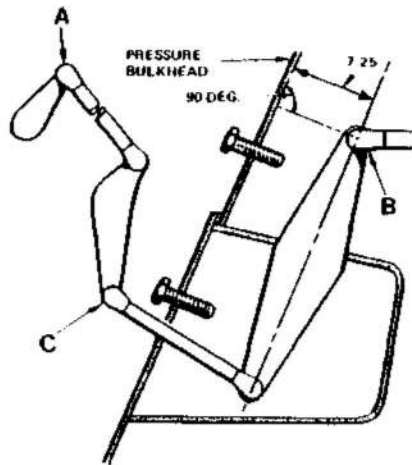
ELEVATOR AND STARBOARD TAB MOVEMENTS
TAIL PLANE NEUTRAL



STARBOARD ELEVATOR TAB NEUTRAL SETTING

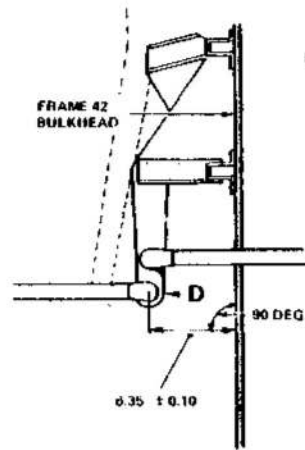
NEUTRAL POSITION OF
CONTROL LEVER MEASURED
FROM PRESSURE BULKHEAD
TO PIN B CENTRE

NEUTRAL POSITION OF
CONTROL LEVER MEASURED
FROM FRAME 42 BULKHEAD
TO PIN D CENTRE



DETAIL 1

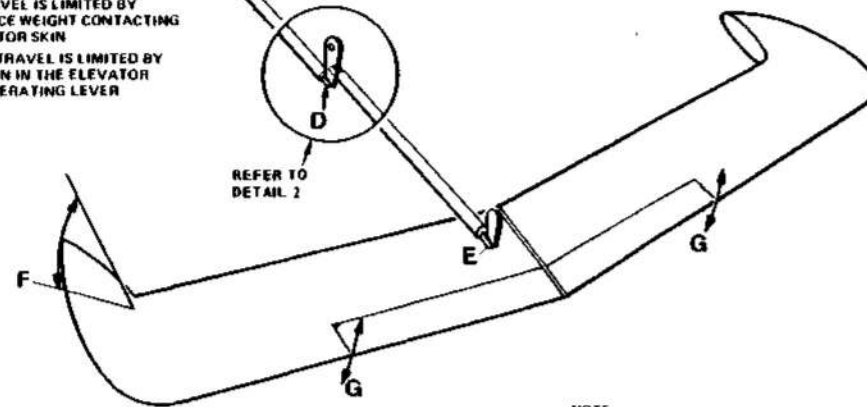
CONTROL ROD SETTINGS



DETAIL 2

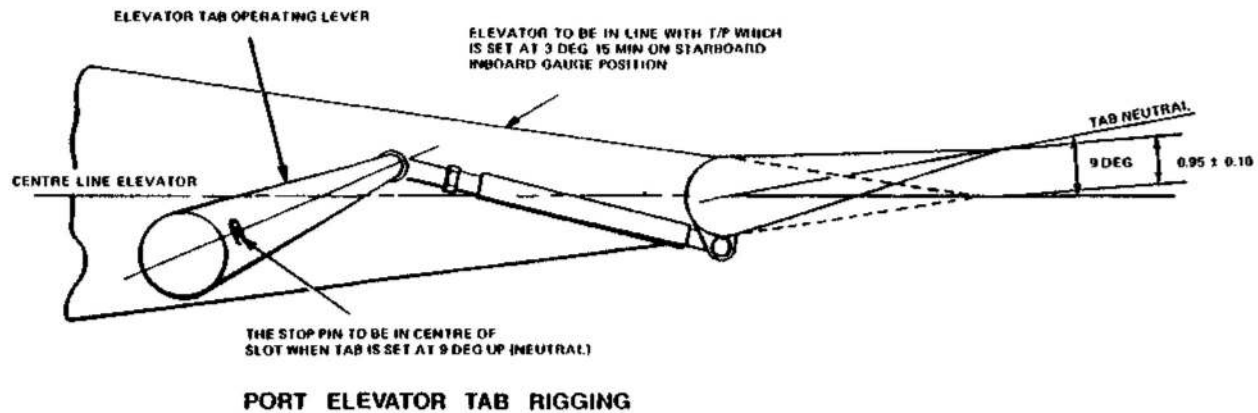
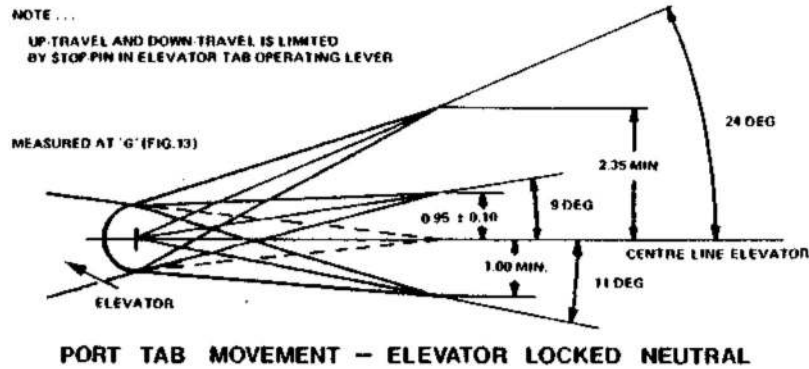
NOTE

- 1 UP TRAVEL IS LIMITED BY
BALANCE WEIGHT CONTACTING
ELEVATOR SKIN
- 2 DOWN TRAVEL IS LIMITED BY
STOP-PIN IN THE ELEVATOR
TAB OPERATING LEVER



NOTE
ALL DIMENSIONS ARE IN INCHES

FIG.13. ELEVATOR CONTROL RIGGING (1)



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

FIG. 13A ELEVATOR CONTROL RIGGING (2)

← REFERENCE TO POINT 'G' AMENDED TO READ FIG.13 →

(5) Secure the links to the main operating lever by fitting the shackle pin together with its associated washers and split pin.

(6) With the top surface of the elevator uppermost, the centre of the shackle pins must be 3.12 in. apart. With the stop pin in the centre of the slot of the tab-operating lever (*detail A*), and the tab in its neutral position 9 deg up, (linear dimension 0.95 ± 0.10 in.), clamp together the main operating lever and the flanges of the torque tube and blow-back rod.

(7) Check the tab movements.

(8) From the 5/32 in. dia. pilot holes in the flange of the blow-back rod, drill and ream (0.185 in. dia.) the main operating lever and the flange of the torque tube. Secure the assembly with four countersunk bolts, and remove the clamps fitted in operation (6).

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

(10) Fit the access panel to the top surface of the elevator.

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

(12) Rig the elevator control (*para.23*).

(13) Carry out flight trim checks as detailed in Appendix I.

Note . . .

The above instructions are for fitting a new blow-back rod, torque tube, and main operating lever. If the torque tube and blow-back rod assembly is being refitted in the same elevator from which it was removed, the fitting of the clamps, drilling and reaming, will not be necessary.

Rudder (fig.19)

42. To remove the spring tab mechanism proceed as follows:-

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

(2) Remove the two access panels from the base of the rudder nose.

(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 ¼ in. 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 securing 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 two diametrically opposite bolts which secure the upper bearing housing to rib 6, and fit the special extractor (*Sect.2, Chap.4 (detail A)*).

(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 assist in the mechanism removal, a greater twisting movement can be applied to the tab-actuating lever, and this action, together with the downward force of the extractor (*op.(10)*) will free the mechanism from the rudder.*

43. Dismantling procedure:-

(1) 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 the extractor (*Sect.2, Chap.4 (detail A)*).

44. Sequence of fitting a new rudder spring-tab mechanism.-

(1) Preparation. Ensure that the bearing between inner and outer torque tube, also the outer torque tube bearing, are packed with grease (*fig.16B*).

(2) Assemble the rudder bottom hinge bracket to the new spring-tab mechanism, and fit the spigot and bearings into the bottom hinge bearing housing. Ensure that the bearing housing is packed with grease (*Chap.3*).

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

(4) 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

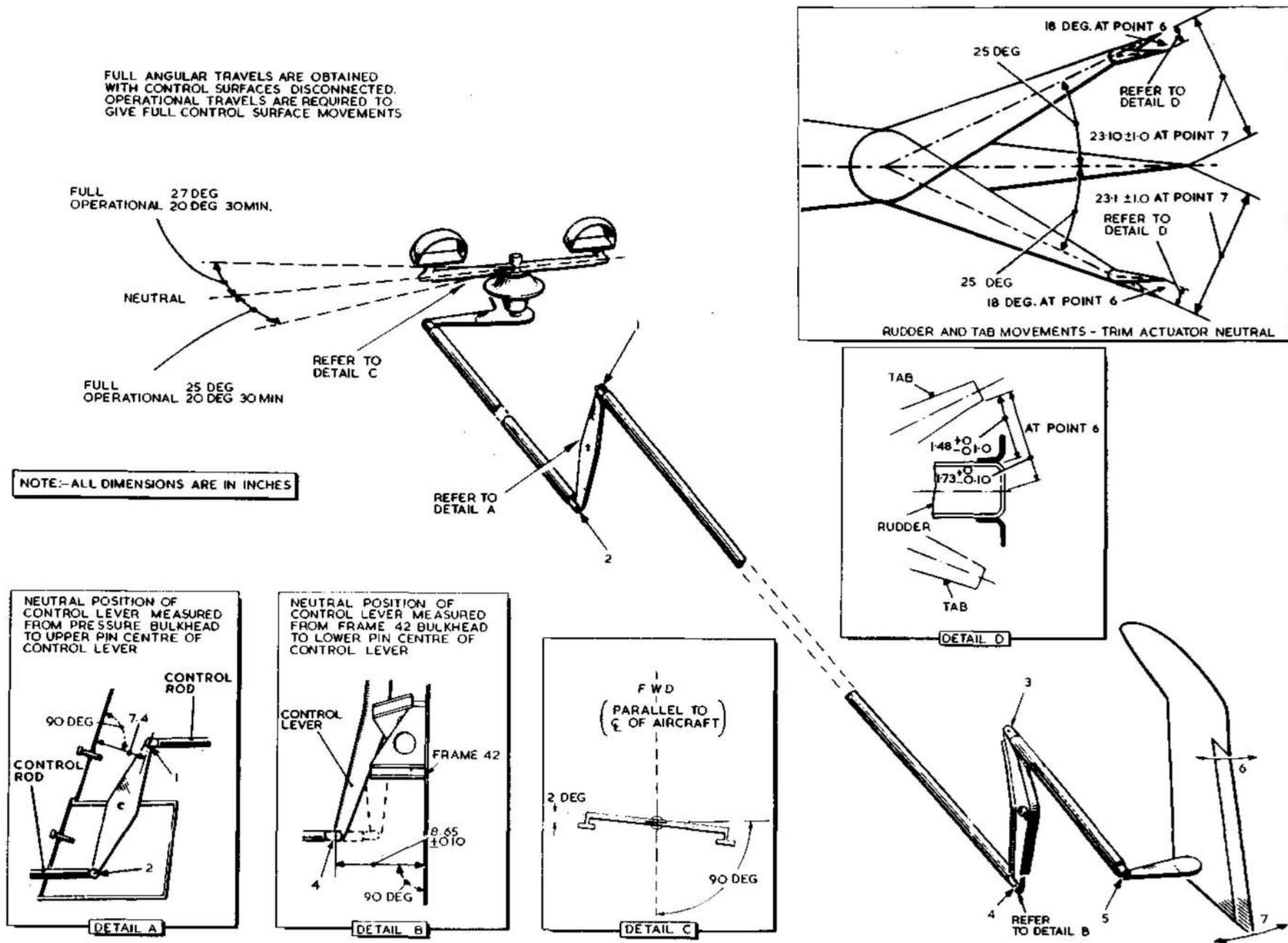


FIG. 14. RUDDER CONTROL RIGGING
ANNOTATIONS AMENDED

disconnect the tab-control lever from the tab-actuating rod. Remove the tab-actuating lever and bearing housing complete. Pack the upper bearing with grease (fig.16B).

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

◀ (6) Manufacture a block to fit each side of the stop bolt, thus centralizing it in the kidney slot. With the actuator in the mid position, refit it to the rudder and connect the tab actuator lever to the ram, adjusting the ram as required. This ensures that lever and tab mechanisms are located in the neutral position. Remove the blocks from kidney slot on completion of rigging. ▶

(7) Locate the tab-actuating lever and upper bearing housing on to the splined end of the blow-back rod, and position it with the lever midway between its stops.

(8) 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.

(9) Operate the tab, and check that the maximum travels quoted in fig.14 are obtained, and that the stops of the tab-actuating lever are reached before the limit stop reaches the ends of the kidney slot.

(10) 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.

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

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

(13) Replace the access panels.

Note . . .

To obtain satisfactory locking, ensure that the screws, securing the access panel at rib 6 on the rudder nose, are of correct length (thread length 0.4 in.).

(14) Refit the rudder to the aircraft (Chap.3).

(15) 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 (fig.19) 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 may be filed. The correct protective treatment (A.P.119A-0509-1) must be applied ▶ to all filed surfaces.*

2. *The sequence for fitting a reconditioned rudder spring-tab mechanism 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 condition of 'no foul', then the misalignment must be corrected by drilling through with a 1/4 in. dia. drill, and fitting a larger bolt at operation (11).*

Aileron-bias actuator (fig.3)

45. To remove the aileron - bias actuator proceed as follows:-

(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.

(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, then remove the actuator.

Rudder-trim actuator (fig.4)

46. To remove the rudder - trim actuator proceed as follows:-

(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 (fig.15)

Removal

47. To remove the tail-plane actuator proceed as follows:-

(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).

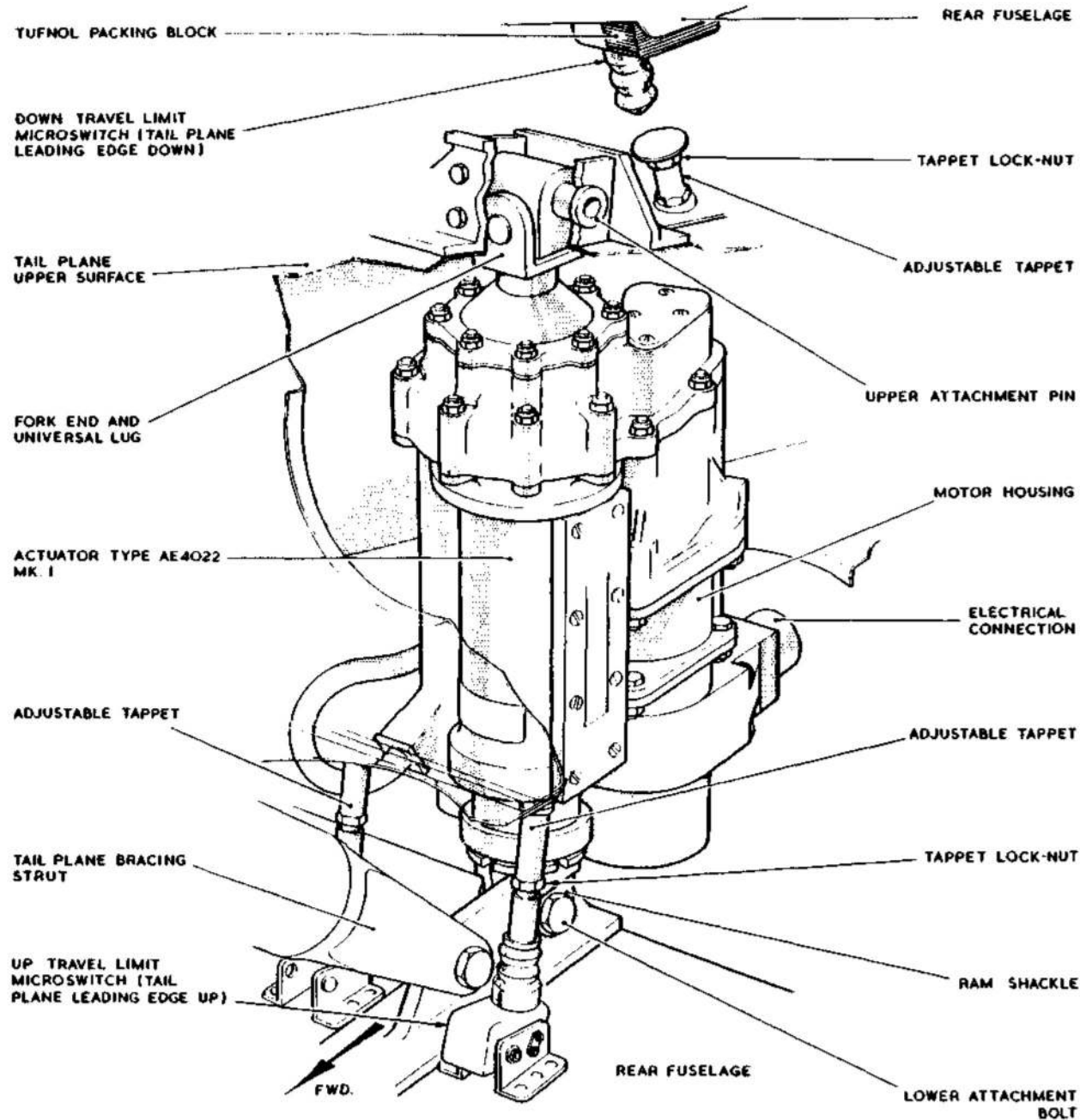


FIG.15. TAIL PLANE ACTUATOR

(3) Disconnect the electrical cables from the actuator.

(4) Remove the five seal-adjustment bolts from each side of the tail plane.

(5) Attach a sling (Sect. 2, Chap. 4) 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, then withdraw the actuator attachment bolt.

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

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

Note . . .

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

Assembly

Note . . .

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

48. Assemble the tail-plane actuator to the aircraft in the reverse order to that given in para. 47. Check the clearances as detailed in Sect. 3, Chap. 3 and:—

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

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

Flying control rod assemblies

49. 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., fitted with the bolt head in the recess, it may foul the airframe 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. 12, detail A).

Limits on Fairey roller guides

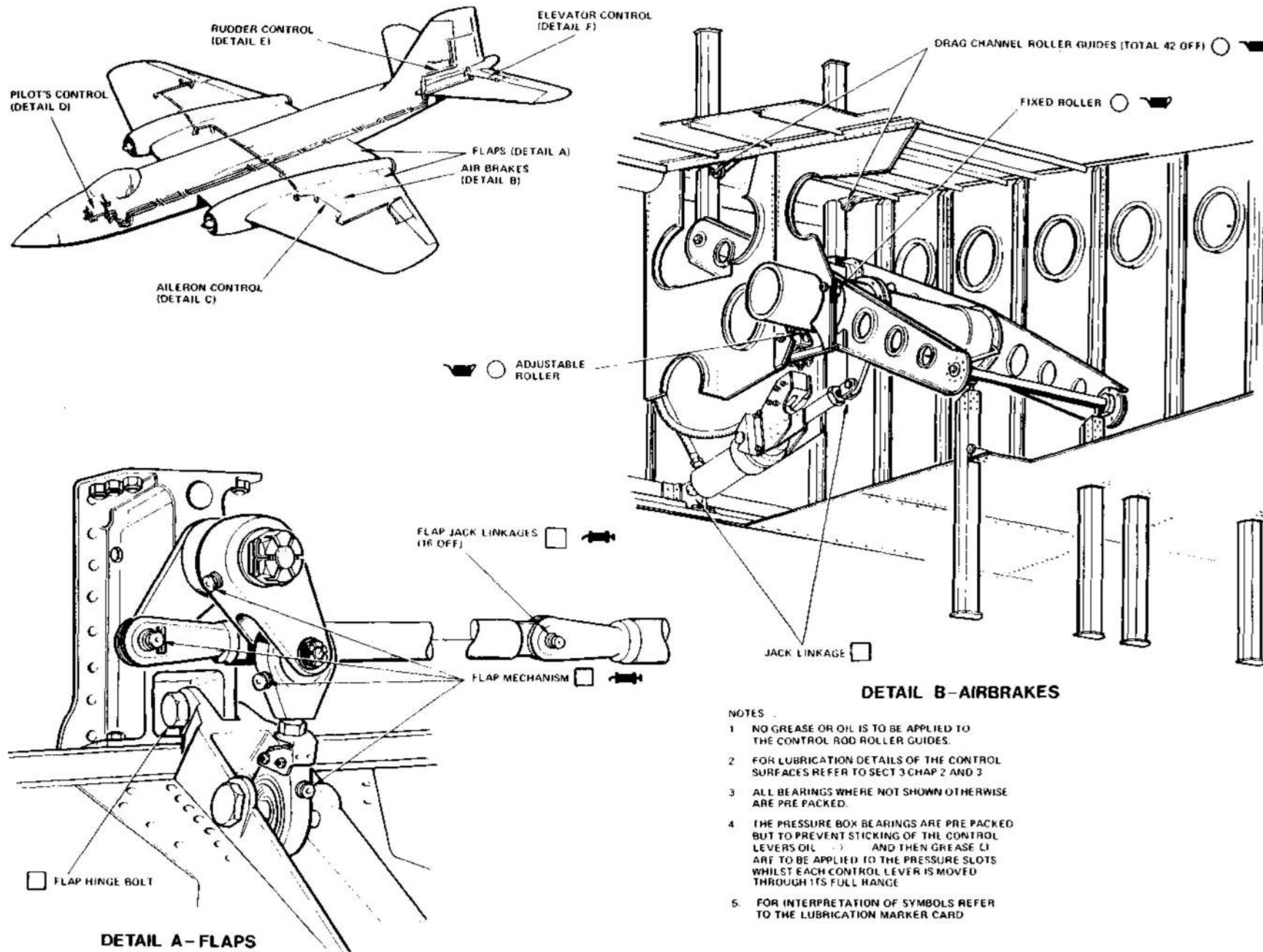
50. During assembly of the control rods, the following procedure should be adopted to obtain the correct clearance between the control rods and the roller guides:

(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, recheck the adjustment, and ensure that there is no backlash.

(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.



DETAIL B - AIRBRAKES

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. 16 LUBRICATION DIAGRAM (1)

◀ REDRAWN ▶

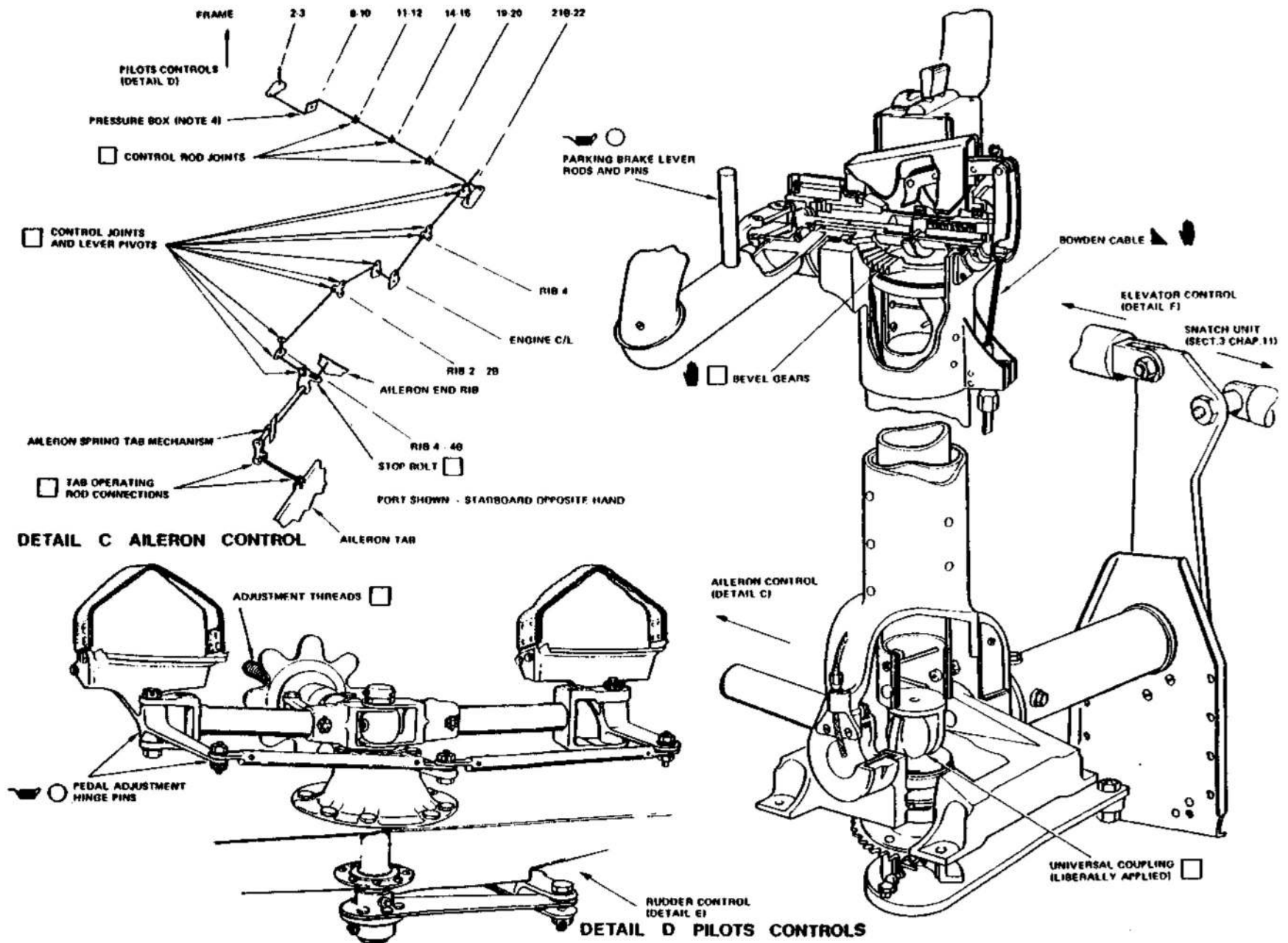


FIG.16A. LUBRICATION DIAGRAM (2)

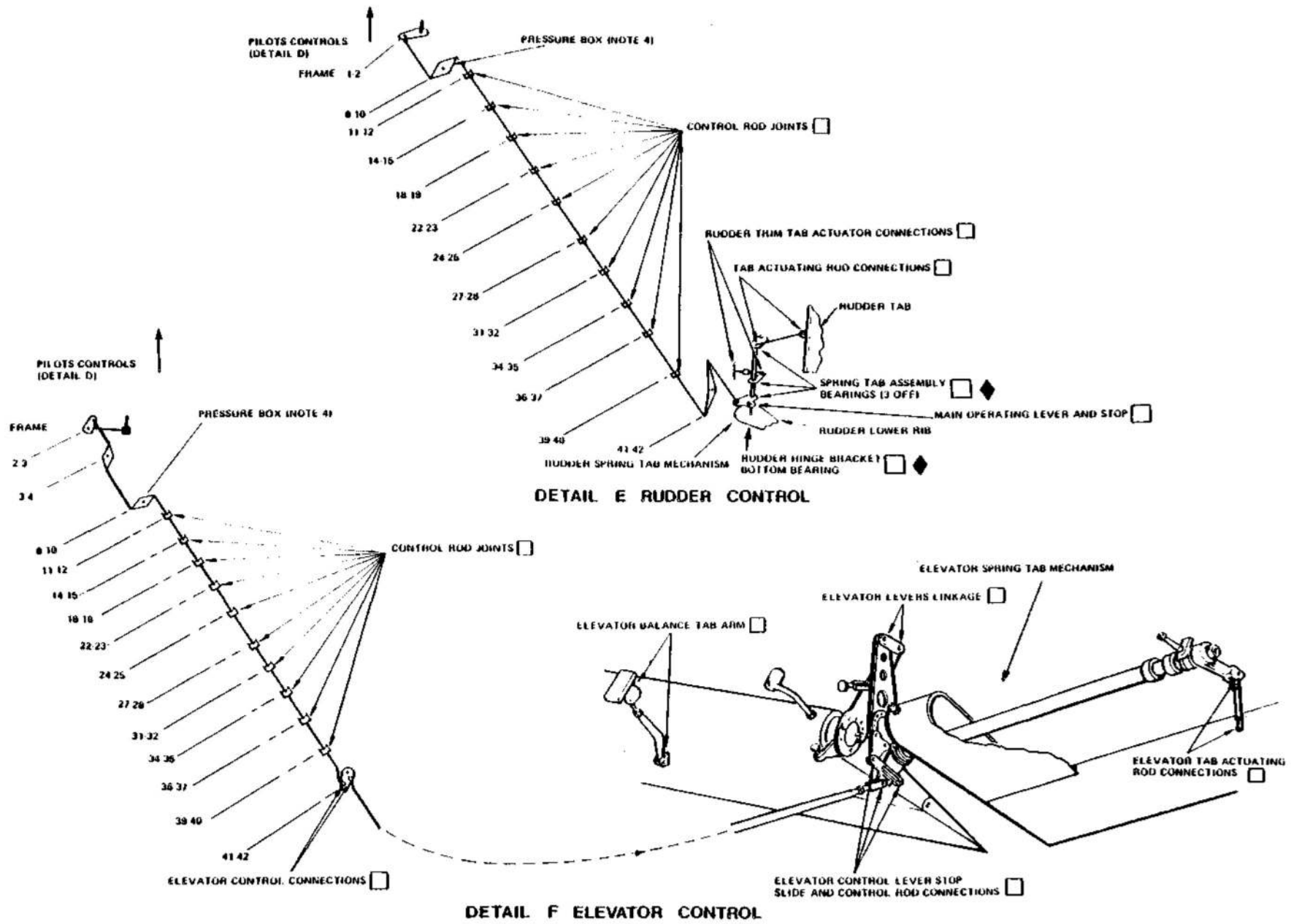


FIG. 16B. LUBRICATION DIAGRAM (3)

«DETAIL F AMENDED»

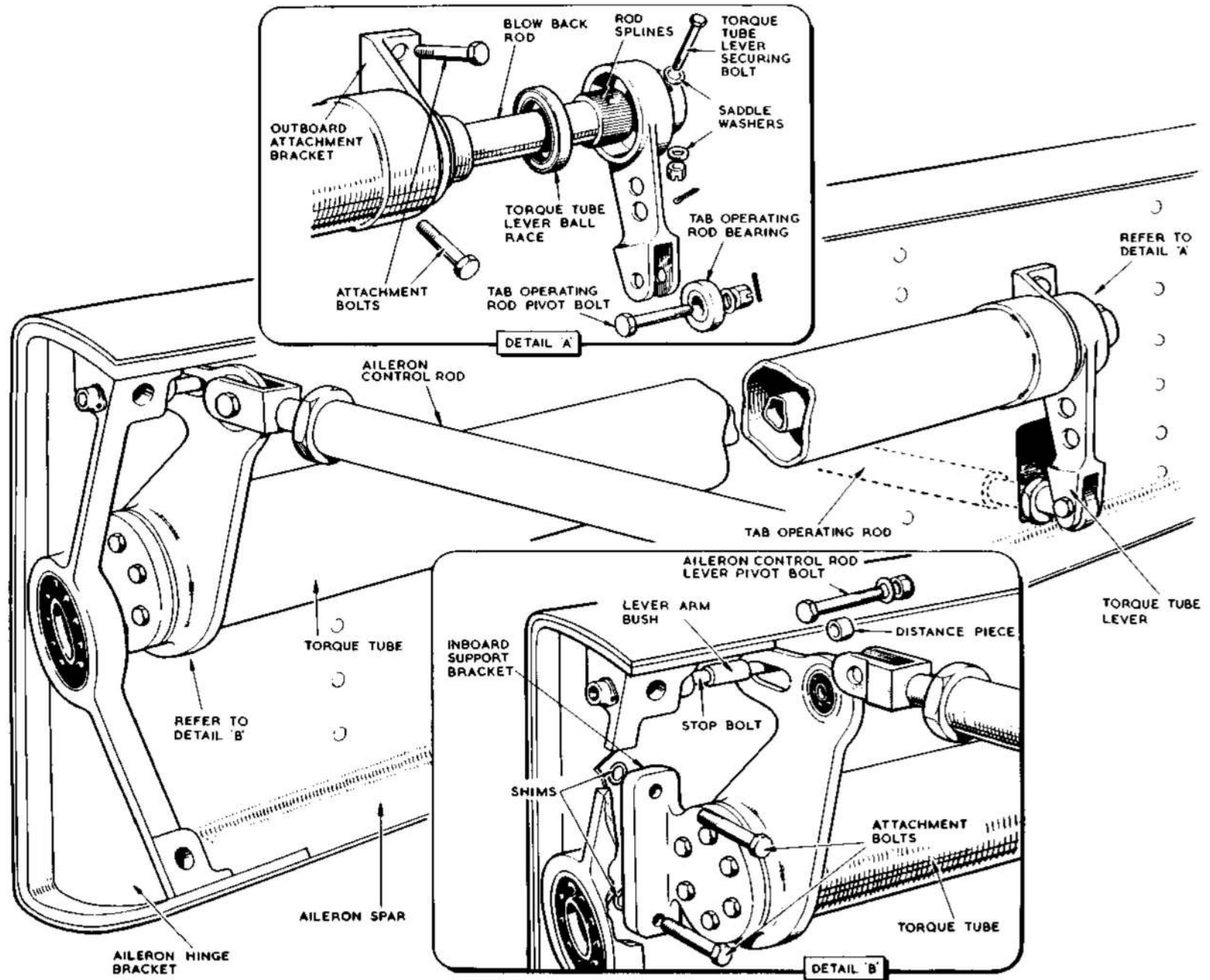


FIG.17. AILERON SPRING TAB MECHANISM REMOVAL
◀ ANNOTATIONS AMENDED ▶

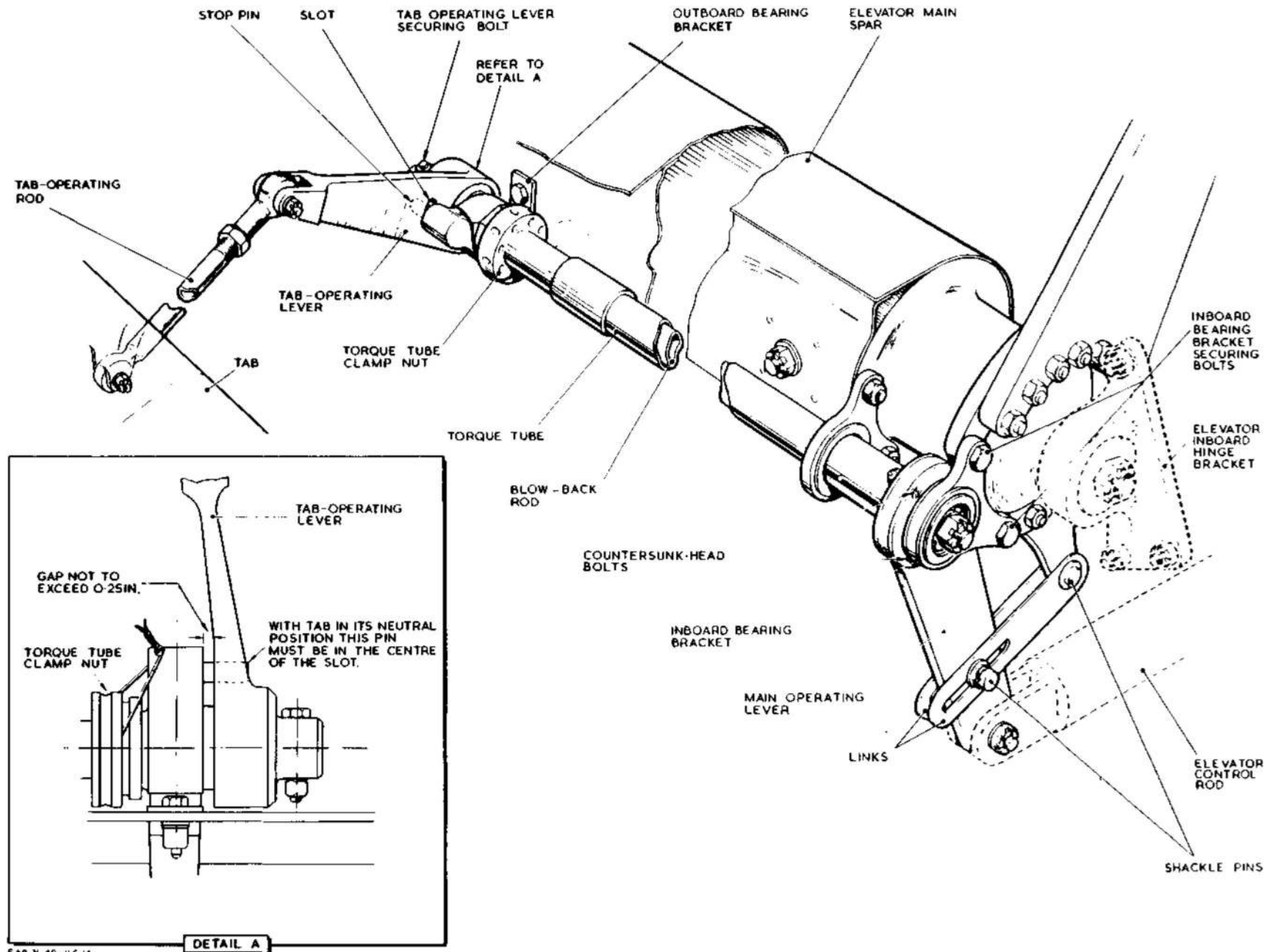


FIG. 18. PORT ELEVATOR SPRING TAB MECHANISM REMOVAL

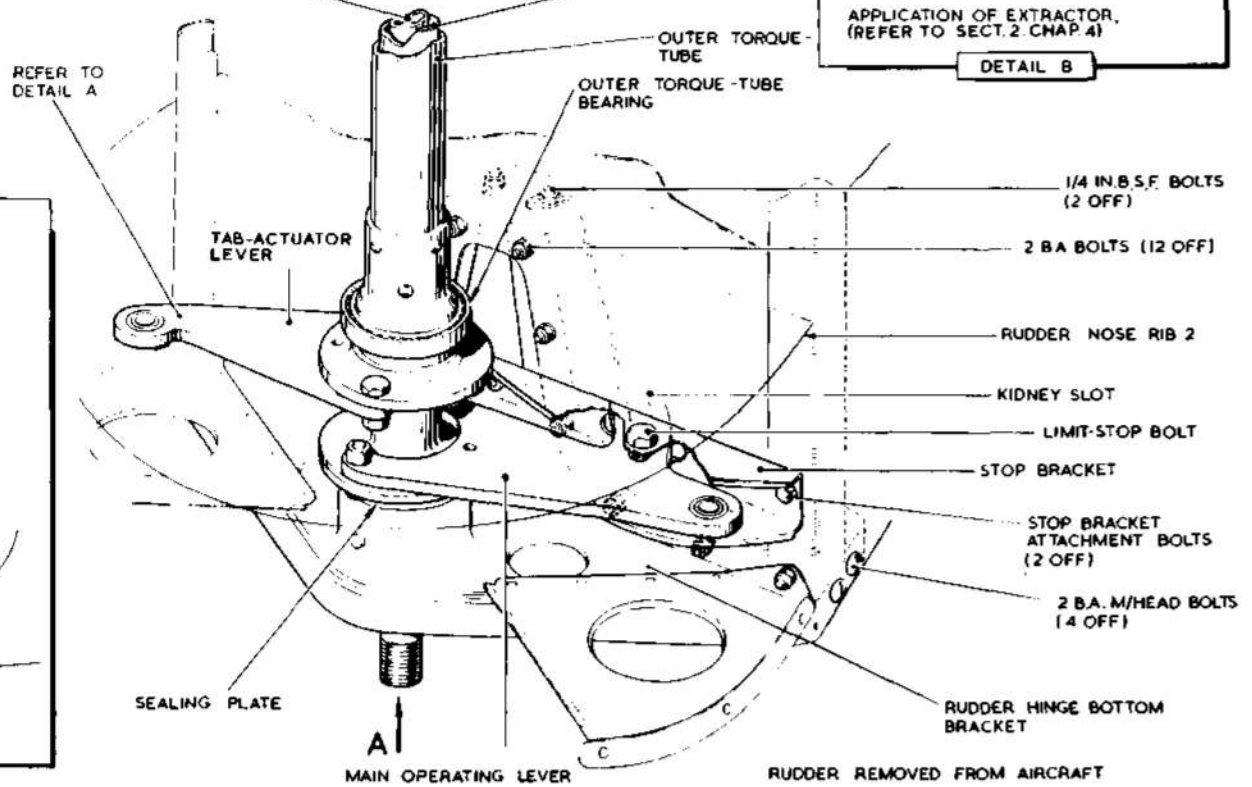
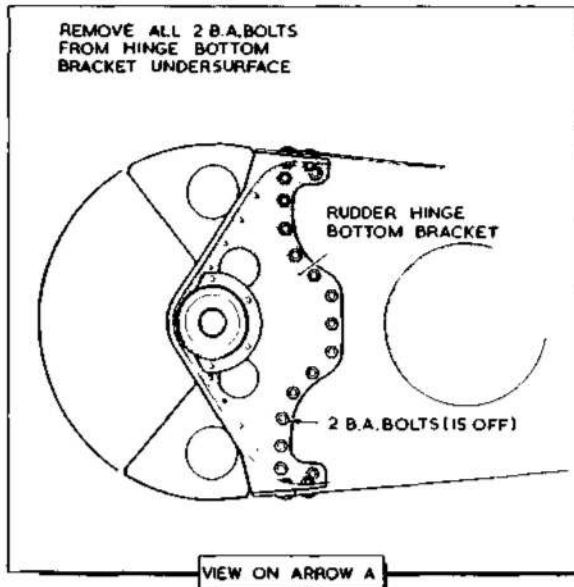
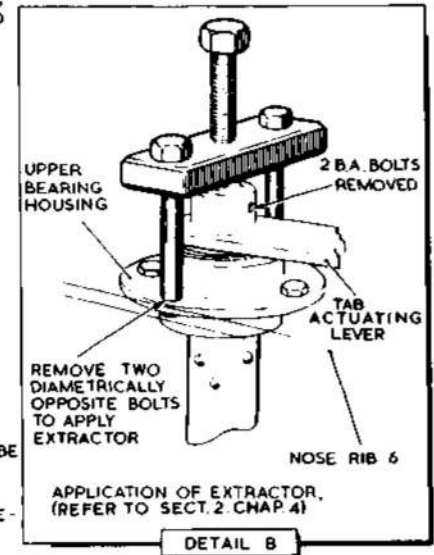
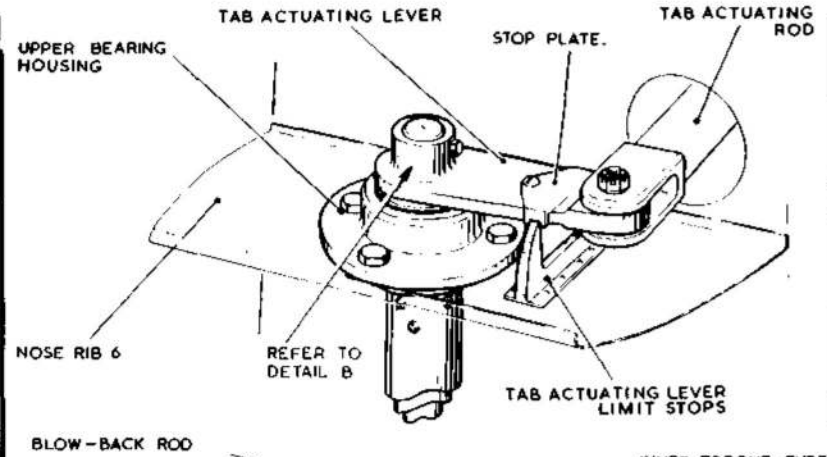
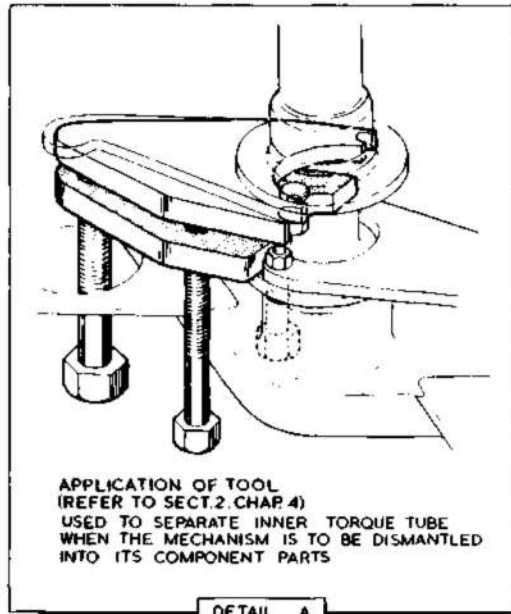


FIG.19. RUDDER SPRING TAB MECHANISM REMOVAL
◀ANNOTATIONS AMENDED▶

Appendix 1 FLIGHT TRIM CHECKS

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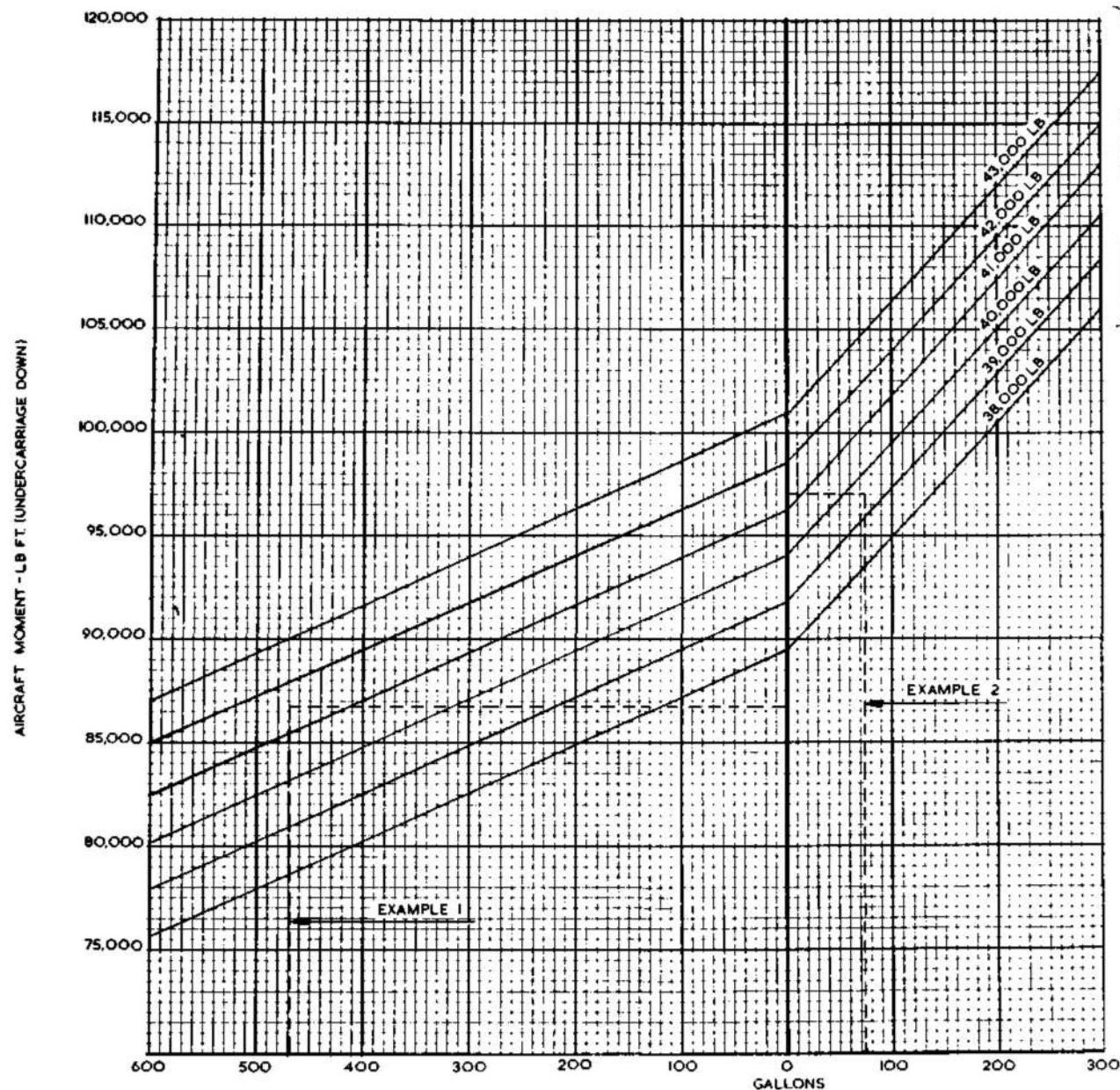
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WARNING

Whenever an aircraft component which affects longitudinal trim is removed, replaced or adjusted, the flight trim checks specified in this Appendix must be repeated. Should the aircraft trim be outside the limits specified, a new elevator trailing-edge strip must be fitted, and the flight trim checks and subsequent elevator 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.



WEIGHED OR CALCULATED AUW WITH FULL FUEL AND CREW

EXAMPLE 1
 AIRCRAFT MOMENT 86750 LB. FT.
 ALL UP WEIGHT 41500 LB.
 AMOUNT OF FUEL TO BE DEDUCTED FROM No. 1,2,3 & 4 TANKS 470 GALLONS.
 No. 5 TANK FULL

EXAMPLE 2
 AIRCRAFT MOMENT 97000 LB. FT.
 ALL UP WEIGHT 39500 LB.
 AMOUNT OF FUEL TO BE DEDUCTED FROM No. 5 TANK 75 GALLONS. No. 1,2,3 & 4 TANKS FULL

NOTE...
 No. 6 (BELLY) TANK MAINTAINED WITH A FULL FUEL LOAD

DEDUCT FROM No's 1,2,3 & 4 TANKS, TOP (MEAN ARM - 0.584 FT. FOR TOP TANKS) EQUAL AMOUNTS TO BE DEDUCTED FROM EACH TANK.

DEDUCT FROM No 5 TANK

FIG. I. FUEL LOAD DETERMINATION GRAPH

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. \pm 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 taxiing, take-off, and climb to test altitude (up to 6000 ft.). Two crew members only (pilot and navigator) are to be carried; and the integral wing tanks drained.

3. The weight and moment of the aircraft with undercarriage down, are to be determined with full fuselage fuel load and two crew but no stores, 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, 2, 3 and 4, or tank 5 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 must be used.

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	86750 lb/ft.
All-up weight	41500 lb.
Amount of fuel to be deducted from	
No. 1, 2, 3 and 4 tanks	470 gal (total)
No. 5 tank	Full

Example 2 (fig. 1)

Aircraft moment	97000 lb/ft.
All-up weight	39500 lb.
Amount of fuel to be deducted from	
No. 5 tank	75 gal
No. 1, 2, 3 and 4 tanks	Full

Note ...

No. 6 (belly) tank is maintained with a full fuel load.

5. The test run should commence immediately on reaching test altitude, using fuel from No. 1, 2, 3, 4 and 5 tanks, thereafter fuel from No. 1, 2, 3, 4 and 5 tanks should be used until completion of the test run.

Flight procedure**Note ...**

- All speeds quoted are I.A.S.*
- Before the first flight test, the elevator trailing-edge strips (Part No. EAL.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.*
- 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, and the actual trim checks, should be carried out on all fuselage tanks.*

5. *Tests are to be carried out in calm air and good visibility.*

6. *When fitting a new trailing edge strip, 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:

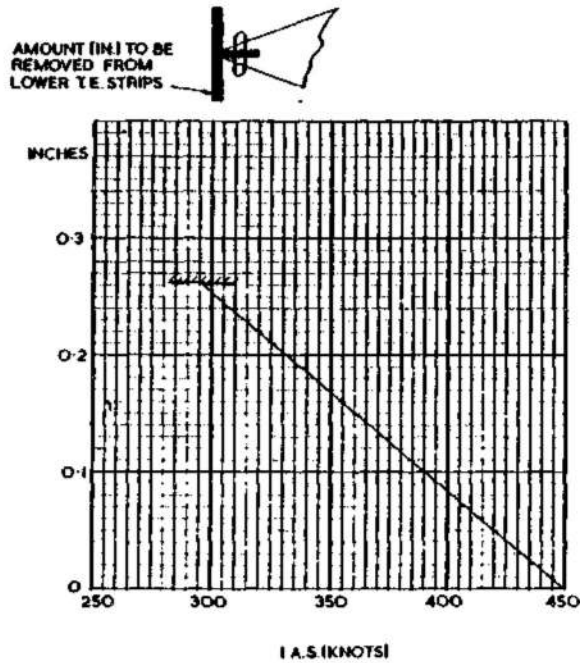
(1) *Case 1* – The aircraft can just be trimmed 'hands-off' in level flight with speed steady using full NOSE-DOWN trim. Record the speed. Increase the speed slowly beyond this point to ensure that a push force develops on the control column.

OR

(2) *Case 2* – If 450 knots is reached before the condition described in Case 1, 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.

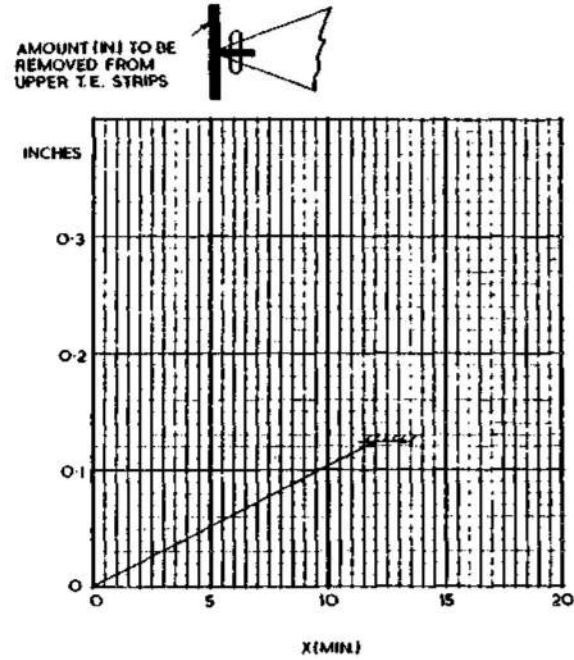
Note ...

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 undercarriage 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.



MAXIMUM I.A.S. AT WHICH AIRCRAFT CAN BE TRIMMED HANDS OFF USING FULL AIRCRAFT NOSE DOWN TRIM

LOWER TRAILING EDGE STRIP ADJUSTMENT



X-T/P ANGLE ON ELECTRICAL STOP MINUS T/P ANGLE REQUIRED TO TRIM AIRCRAFT "HANDS OFF" AT 450 KNOTS. (ANGLES TO BE MEASURED BY INCLINOMETER)

UPPER TRAILING EDGE STRIP ADJUSTMENT

FIG.2. TRAILING EDGE STRIP ADJUSTMENT

Adjustment procedure*Case 1.*

7. Refer to fig. 2.

(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:

- (a) The aircraft can be flown 'hands-off' at a speed between 425 and 450 knots with full NOSE-DOWN trim applied.

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*) will show that 0.16 inch 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 inch 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 (see *para. 6 (2)*), and *para. 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 leading-edge UP electrical stop, the trailing-edge strip must be renewed and the tests recommenced. It is not permissible to remove metal from both the upper and lower elevator strips.

Case 2

8. Refer to fig. 3.

(1) Place the aircraft on a level standing and support the fuselage with a trestle, without disturbing the tail trim setting, and 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 conditions are achieved:

- (a) 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. 3*) will show that 0.08 inch 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 inch 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.

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 not less than 425 knots. If excessive over-adjustment has occurred 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 recommenced.

3. When fitting a new trailing edge strip, ensure that the new strip is correctly aligned in the position vacated by the old strip.

Chapter 5 ALIGHTING GEAR
(completely revised)

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	Chapter
MAIN UNDERCARRIAGE	5A
NOSE UNDERCARRIAGE	5B

Note... A detailed list of contents will be found at the beginning of each chapter.

INTRODUCTION

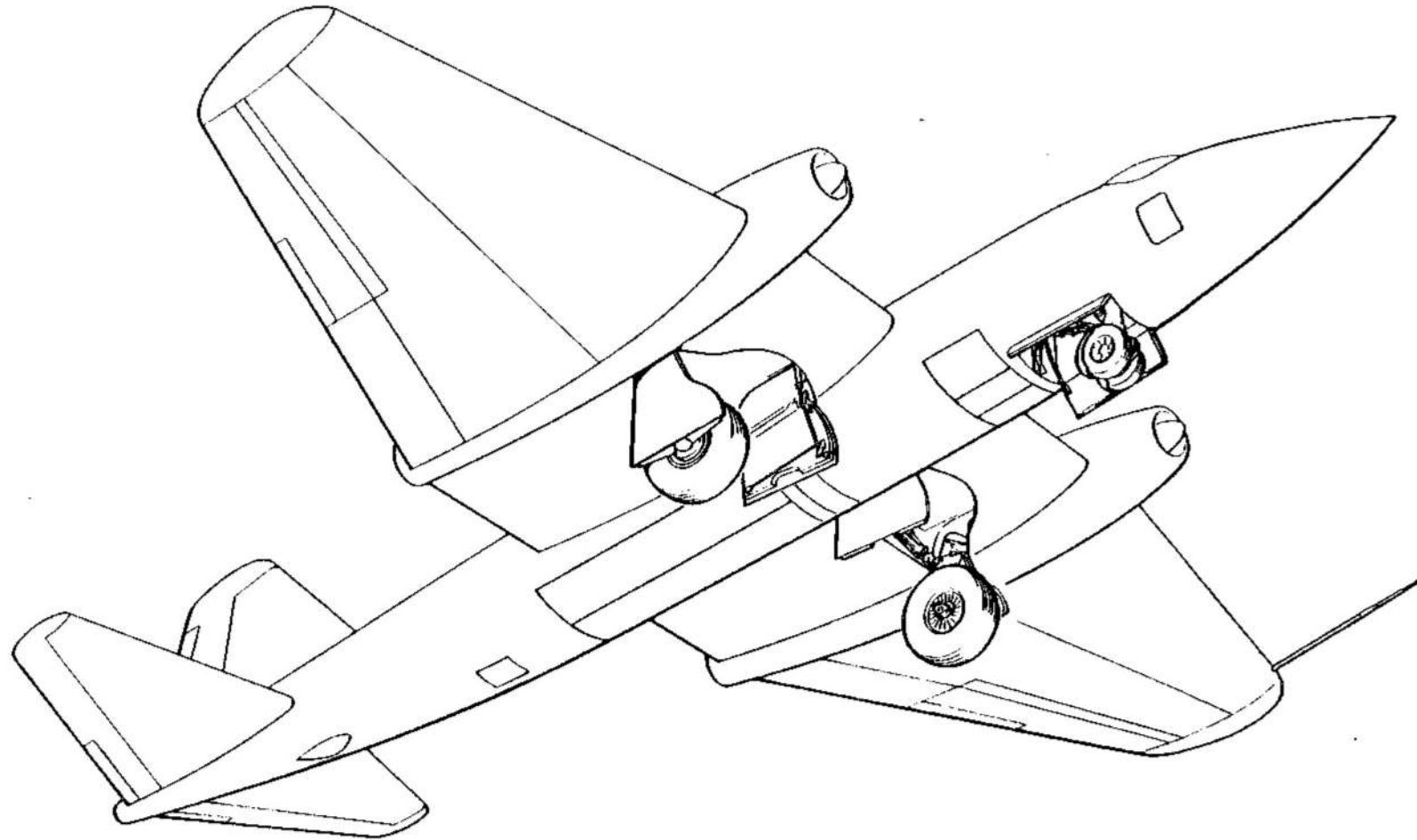
1. Because of its bulk, this chapter is divided into sub-chapter A (main undercarriage) and B (nose undercarriage). Each sub-chapter describes, and illustrates in detail, the mechanics and disposition of the major components, the servicing operations and the major removal and assembly procedures.

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 main instrument 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; this is accomplished by turning the knobbed ring clockwise through 60 deg (or 90 deg according to type) followed by depression of the button. Alighting gear DOWN emergency selection is made by pulling the black-and-yellow painted handle protruding above the alighting gear sloping panel. Operation and resetting of the emergency controls are detailed in Chapter 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.

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ALIGHTING GEAR

◀ MAIN UNDERCARRIAGE DOOR MECHANISM AMENDED ▶

RESTRICTED

Chapter 5A MAIN UNDERCARRIAGE

◀ (completely revised) ▶

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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 is hinged at its lower end to the side-stay link, with the hinge bolt 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 bolted to a spherical joint located in a bracket mounted on the front face of the main spar, while the forked end of the stay-link 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 retracted 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

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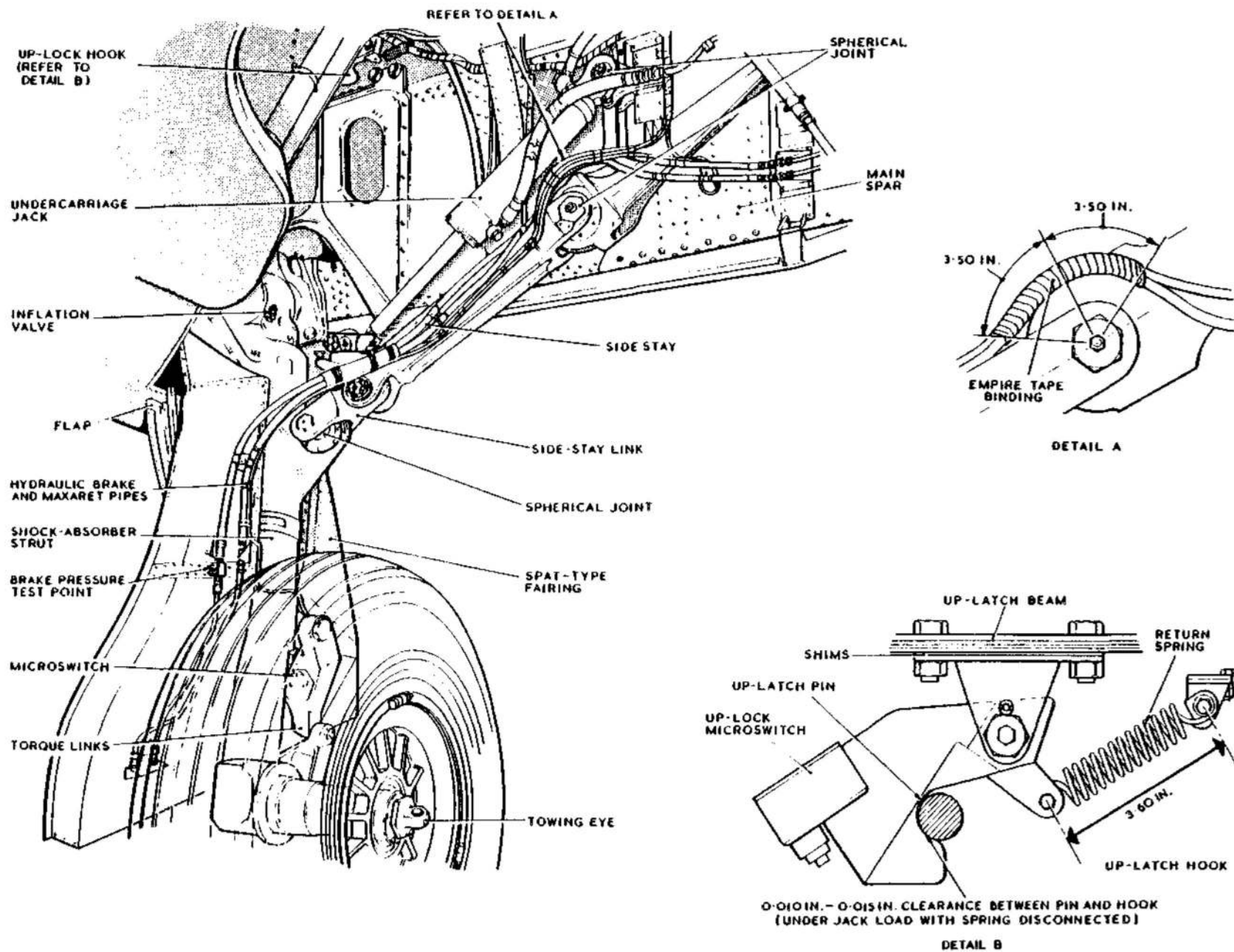


FIG. STARBOARD UNDERCARRIAGE

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its travel during which time the jack pivot pin returns 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 a 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.

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 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 bellcrank 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

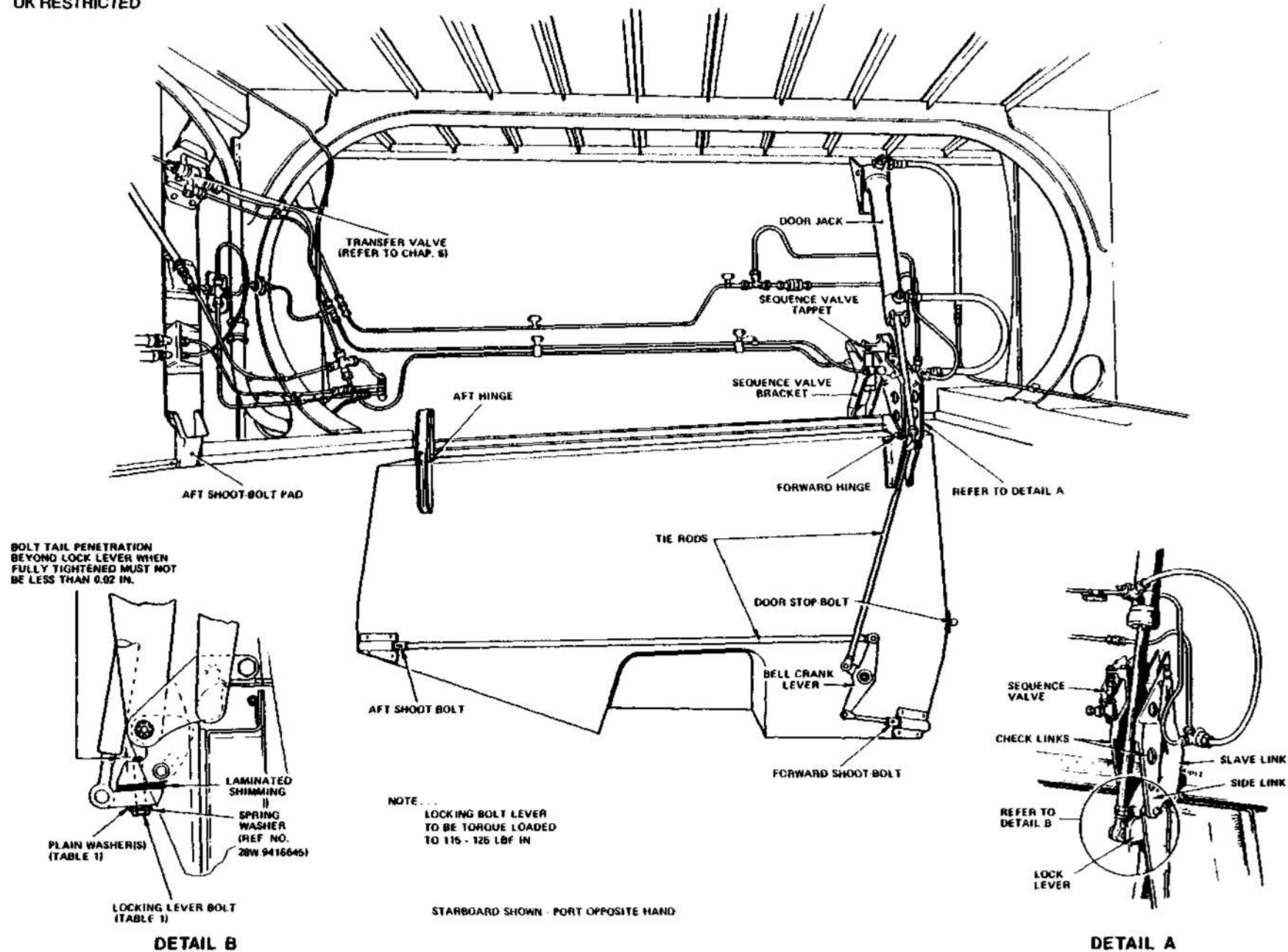


FIG.2. MAIN UNDERCARRIAGE DOOR-OPERATING MECHANISM

< TORQUE LOADING NOTE ADDED TO LOCKING LEVER BOLT >

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 engagement 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-lock 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 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. 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.

Maxaret units

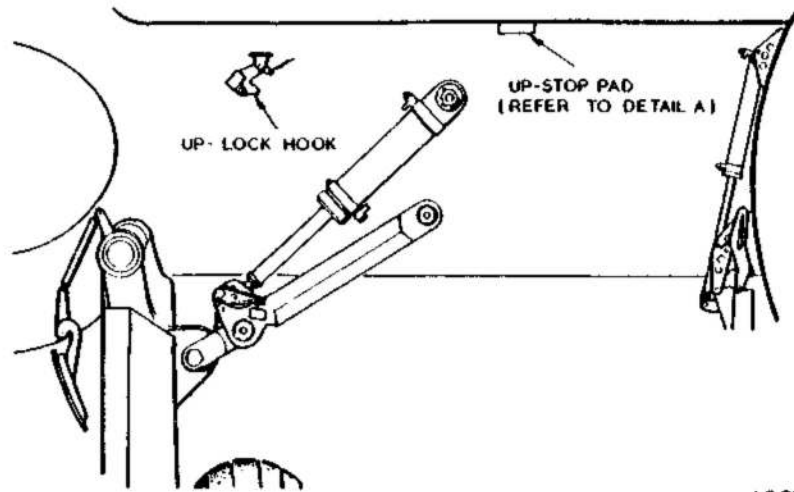
12. The Maxaret anti-skid units permit maximum braking effort to be applied under any conditions without locking the wheels. The units, which are entirely self-contained, are interposed in the hydraulic brake circuit and consist of a valve arrangement regulated by a fly-wheel housed in a rubber-tyred shell which is rotated by direct contact with a track on the outboard side of each main wheel. Full details and servicing of the Maxaret units are given in A.P.1803S, Vol.1, Book 2, Sect.8, Chap.5.

SERVICING

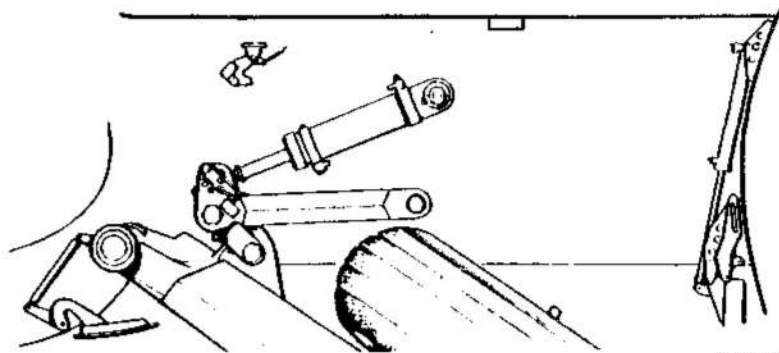
WARNING

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

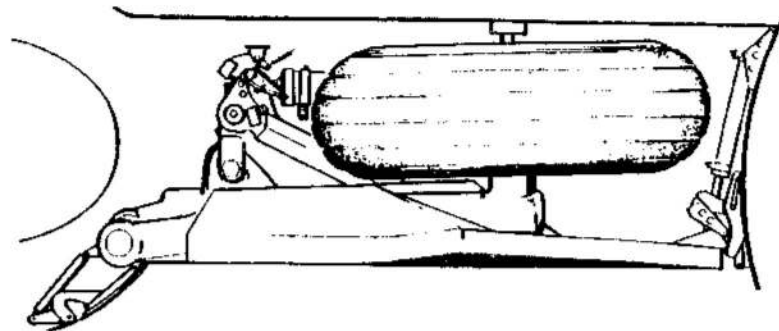
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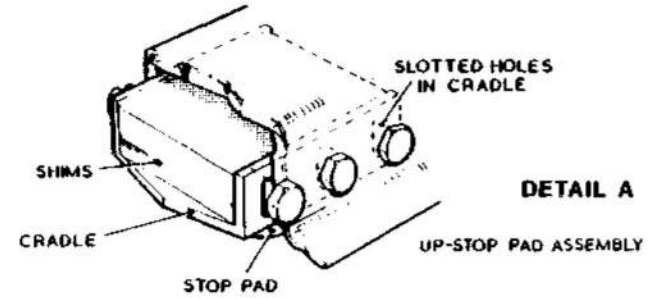
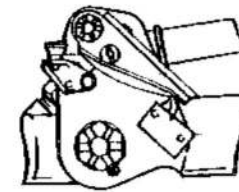
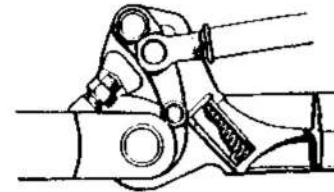
LOCKED DOWN



MID-POSITION



LOCKED UP



DETAIL A

NOTE
ALIGHTING GEAR SELECTORS
AND POSITION INDICATOR ON
ALIGHTING GEAR, PANEL, ARE
SHOWN IN SECT. I, CHAR I, FIG. 3

FIG 3. MAIN UNDERCARRIAGE OPERATION

RESTRICTED

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, Table2) 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-weights are given in Sect.2, Chap.2.

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-1519-1. 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.

RESTRICTED

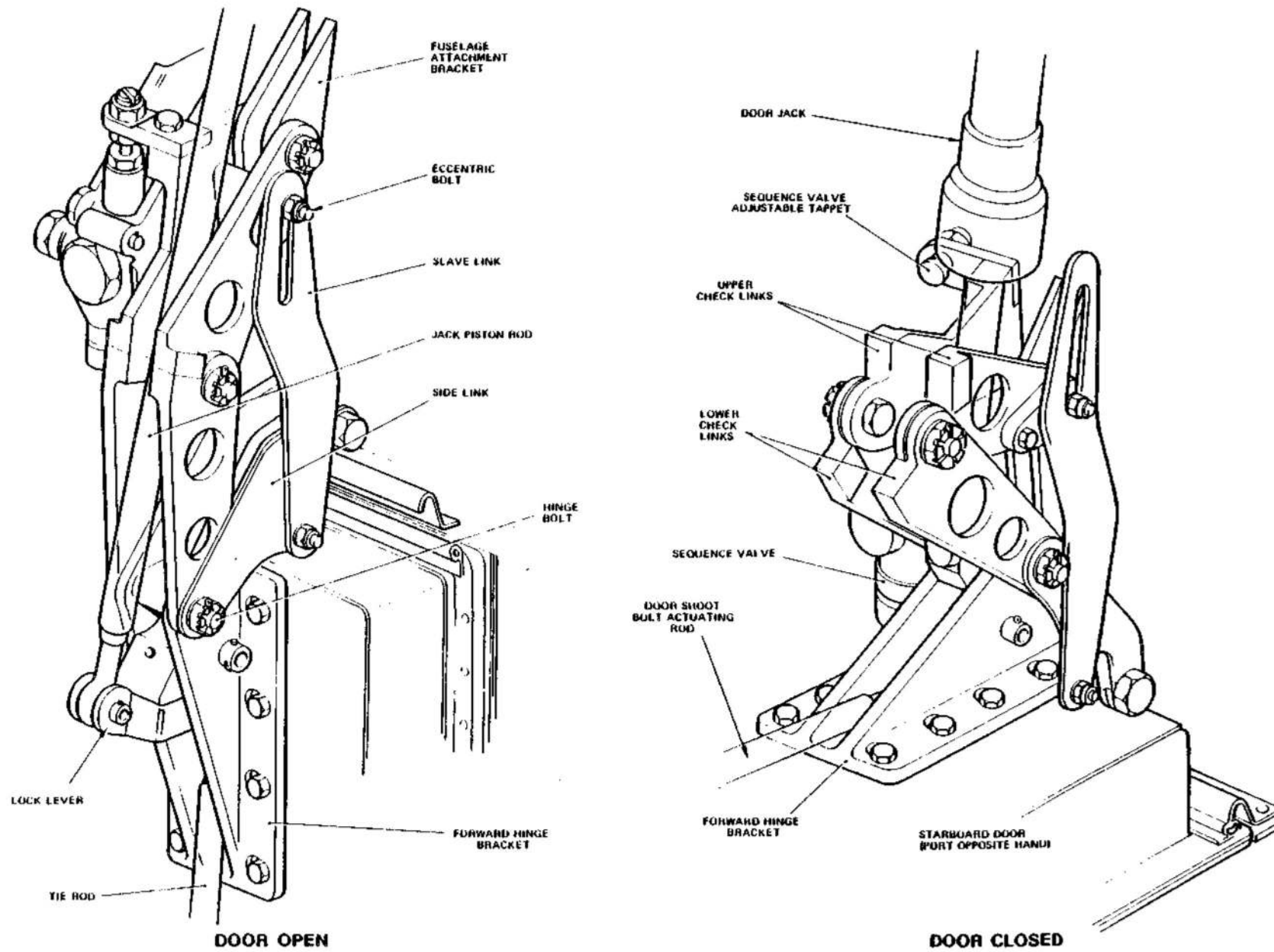


FIG. 4 UNDERCARRIAGE DOOR - OPERATING MECHANISM

RESTRICTED

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 gauge.
- (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.

Side-stay and side-stay link alignment (fig.6)

18. The side stay and side-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

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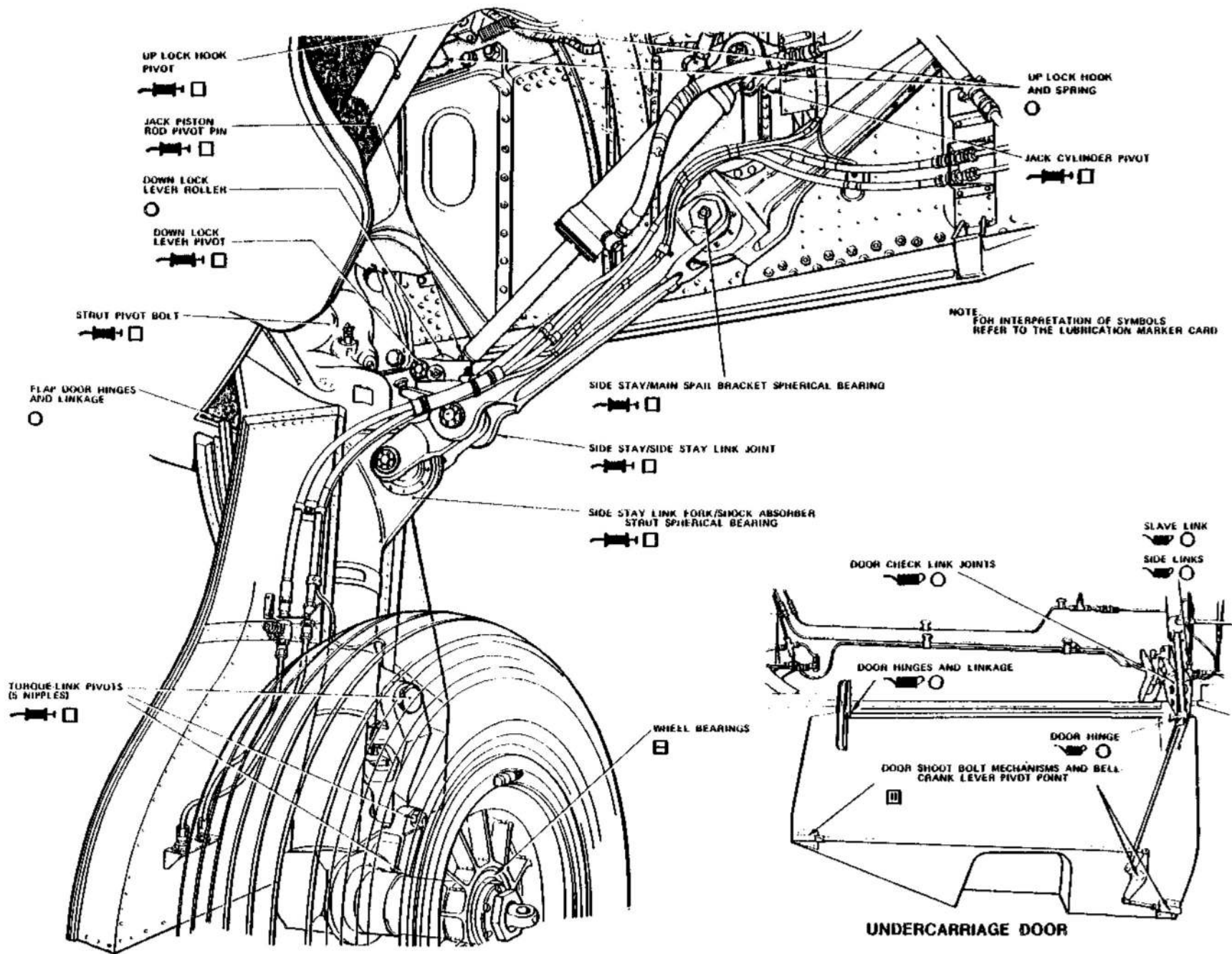


FIG.5 LUBRICATION DIAGRAM

RESTRICTED

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 hard against the side-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 side-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. \pm 0.25 in., the jack piston rod travel is 11.22 in. \pm 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 affect the settings. 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 side 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 \pm $\frac{0.00}{0.05}$ 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

RESTRICTED

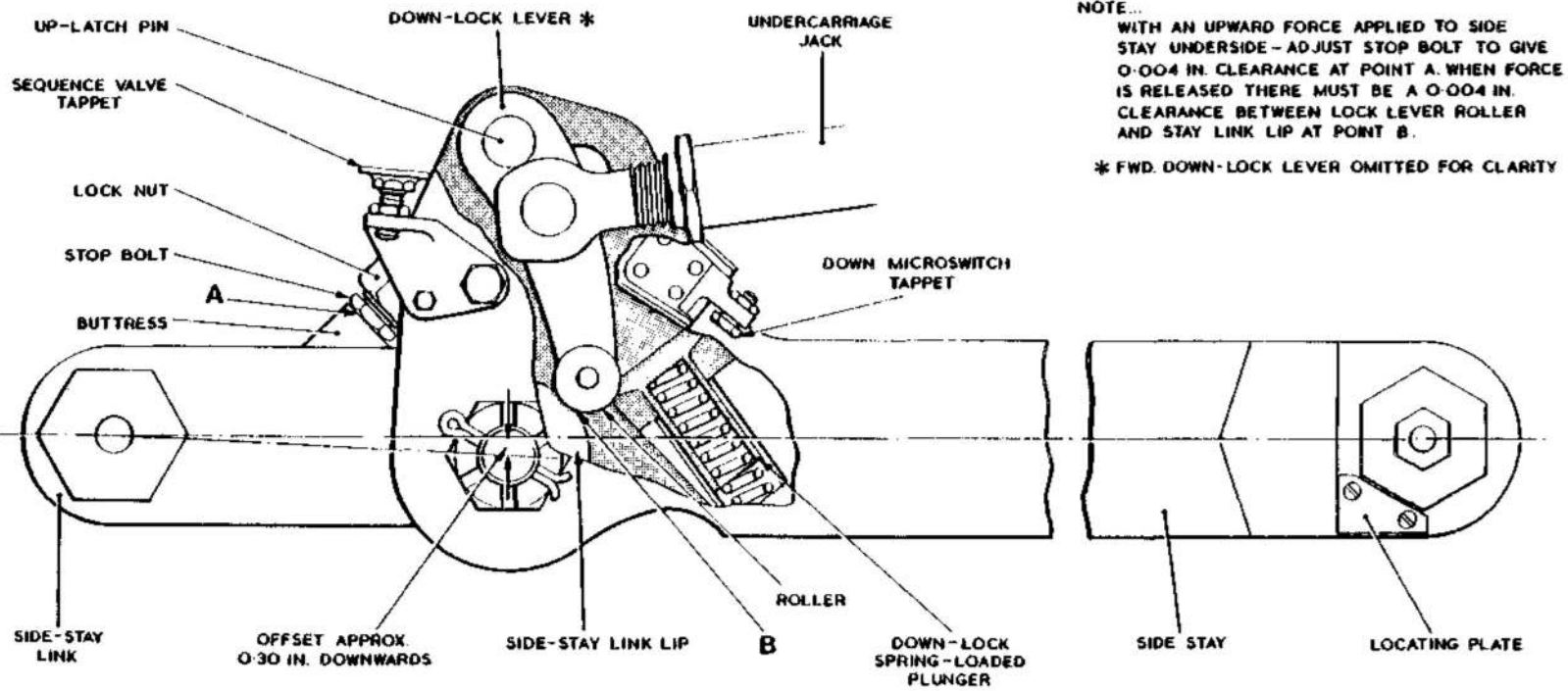


FIG. 6. SIDE-STAY AND SIDE-STAY LINK ALIGNMENT

RESTRICTED

16.21 in. \pm 0.25 in., the ram travel is 9.19 in \pm 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.
- (3) Check the movement of the slave link (fig. 12) to ensure that 0.02 in. minimum to 0.03 in. maximum clearance exists between the top of the slot and the eccentric bolt shank when the door is fully down. Check the sequence valve to ensure that the plunger is depressed only to within the limits given in para.23. If the necessary clearance does not exist at the top of the slave-link slot, it can be obtained by adjustment to the eccentric bolt; adjust the sequence-valve tappet as detailed in para.23.

Note...

There must be adequate clearance between the bottom of the slave-link slot and the eccentric bolt when the door is fully up, and the link must not foul anywhere throughout its travel.

- (4) Disconnect the hydraulic pipes at the door jack and connect a hydraulic test rig to the jack.
- (5) Remove the locking-wire from the locknut and the splined nut at the end of the jack piston rod and slacken the locknut.

(6) Disconnect the lower rear check link from the upper link.

(7) Close the door by hand and pull the lock lever up to move the shoot-bolts into the fully locked position.

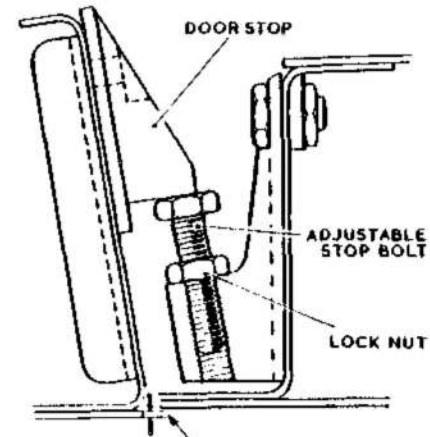
(8) Pump the jack into the fully-retracted position, and check whether a minimum override of 0.125 in. exists by positioning the eye end of the piston rod between the forks of the lock lever and noting the alignment of the attachment-pin hole in both components. If the override is less than the minimum required, increase it by turning the eye end of the piston rod one half-turn at a time until the necessary dimension is obtained.

(9) Open the door, tighten the locknut on the jack piston rod, and wire-lock in position.

(10) Connect the lower rear check link to the upper link.

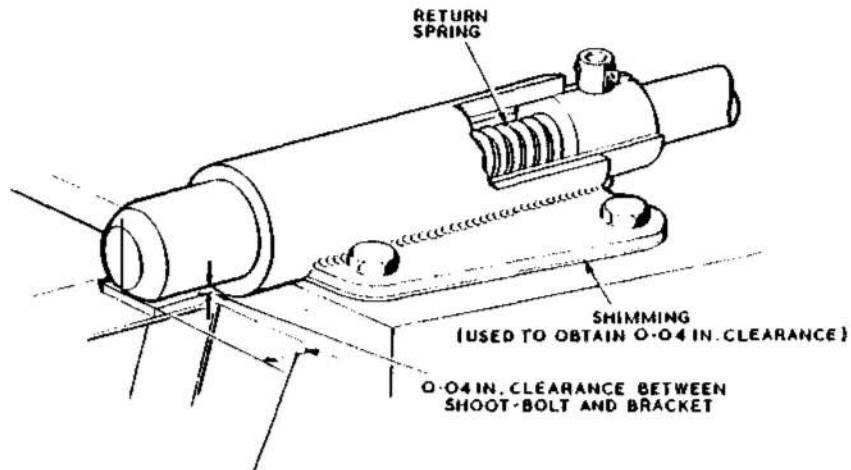
(11) Pump the jack into the fully extended position and, with the door held open but not sprung, check the alignment of the attachment-pin hole through the lock lever and piston rod eye end; there should be a maximum override of 0.02 in. If the override is greater or appreciably less, adjust it by varying the amount of shimming between the two parts of the lock lever; the packing is made up of 0.003 in. laminations (fig. 12 and para.35).

(12) After adjustment of the shimming between the two parts of the lock lever, check that the thread of the bolt which secures the two parts of the lock lever together, protrudes by 0.02 in. minimum - when fully tightened. If necessary, up to three washers in addition to the spring washer, may be fitted beneath the head of the bolt to prevent thread binding (fig.12).



ADJUST TO OBTAIN A 0.080 IN. CLEARANCE BETWEEN LEADING EDGE OF DOOR AND MAIN PLANE UNDERSURFACE

DOOR STOP-BOLT ADJUSTMENT

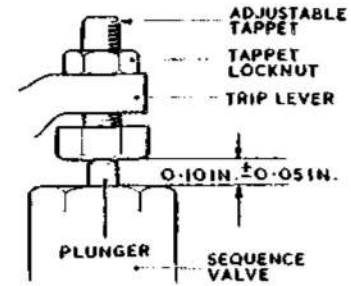


0.04 IN. CLEARANCE BETWEEN SHOOT-BOLT AND BRACKET

THIS DIMENSION TO BE AT LEAST 0.50 IN. WHEN DOOR IS UP AND SHOOT-BOLTS ARE IN LOCKED POSITION

DOOR SHOOT-BOLT ADJUSTMENT

FIG.7. DOOR ADJUSTMENT POINTS



NOTE... TAPPET LOCKNUT MAY BE POSITIONED EITHER SIDE OF TRIP LEVER DEPENDING UPON THE AMOUNT OF ADJUSTMENT REQUIRED

FIG.8. SEQUENCE-VALVE SETTING

(13) Ensure that the lock lever countersunk screw has been locked by centre popping.

(14) Retract the jack slightly and align the attachment pin holes in the lock lever and the end of the piston rod by moving the door. Insert the attachment pin and fully extend the jack.

(15) With the door fully open, check again that the maximum override (operation (11)) is present by applying hand pressure to the lower inside edge of the door; it should be possible to rotate the pin securing the lock lever.

(16) Disconnect the test rig, and reconnect the pipes to the jack. Prime and bleed the jack, and test the functioning of the undercarriage and door (Chap.6).

Door shoot-bolt setting (fig.7)

21. The operation and setting of the door shoot bolts must be checked after servicing. Should adjustment be necessary proceed as follows:-

- (1) Before any adjustments are made, check the door hinges for excessive wear (A.P.101B-0400-6, Part 1, Chap.3).
- (2) Disconnect the door jack by removing the pin attaching the lower end of the door jack piston rod to the lock lever.
- (3) Disconnect the rear shoot-bolt tie-rod and adjust to its minimum length, reconnect the tie rod, leaving the locknut slack.
- (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 the 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.

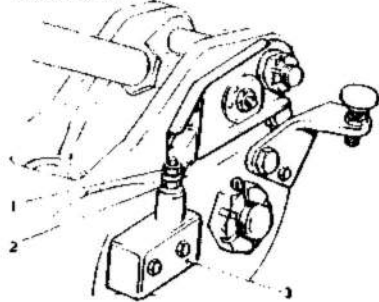
(6) Manually close the door and fully lock the shoot bolts, checking that the two shoot bolts contact their engagement pads either simultaneously or with the forward shoot bolt slightly in advance of the rear shoot bolt. Check also that the pins attaching the shoot bolts to the tie rods do not foul the shoot-bolt housings when the shoot bolts are fully locked.

(7) Check that there is a 0.04 in. clearance between the flats of 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.

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

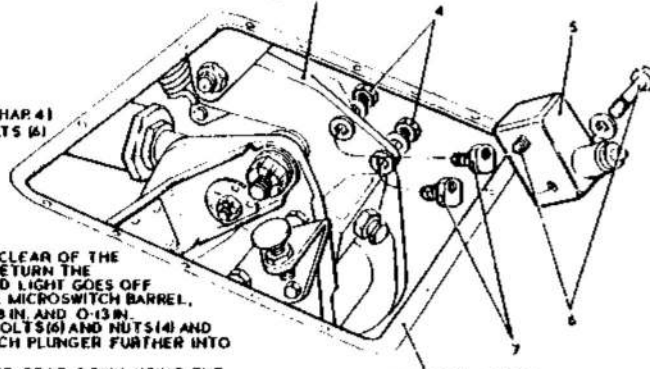
STARBOARD OLEO LEG MICROSWITCH ADJUSTMENT

- 1 JACK AND TRESTLE THE AIRCRAFT WITH THE WHEELS CLEAR OF THE GROUND (SECT. 2, CHAP. 4)
- 2 INSERT A 0.120 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

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 (14) 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 (14)
- 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-LOCK HOOK IS FULLY ENGAGED
- 7 THROUGH THE ACCESS PANEL, LIFT THE UP-LOCK HOOK CLEAR OF THE LATCH PIN AND ENSURE THAT THE RED LIGHT COMES ON. RETURN THE UP-LOCK 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 (14) 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-LOCK HOOK

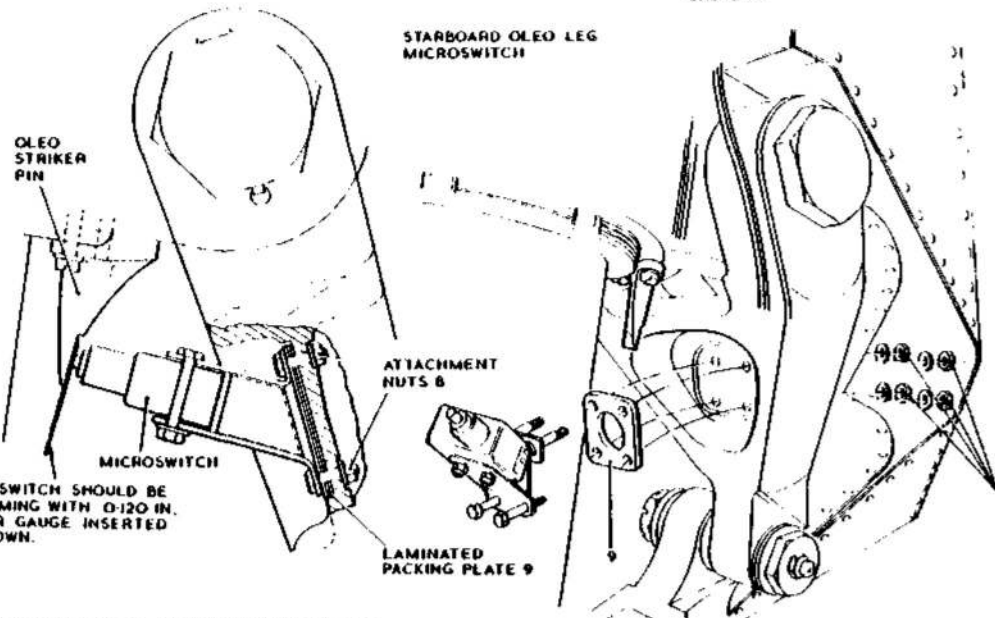


ACCESS IN UPPER SURFACE OF INNER WING

NOTE

AFTER ADJUSTMENT OF THE UP OR DOWN LOCK MICROSWITCH AN ALIGHTING GEAR RETRACTION TEST MUST BE MADE AND THE WARNING LIGHTS CHECKED

STARBOARD OLEO LEG MICROSWITCH



MICROSWITCH SHOULD BE BOTTOMING WITH 0.120 IN. FEELER GAUGE INSERTED AS SHOWN.

SECTIONAL VIEW ON STARBOARD TORQUE LINK

FIG. 9 MICROSWITCH ADJUSTMENT

Door setting (fig.7 and 12)

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.12).

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. \pm 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-lock hook setting (fig.1)

24. The up-lock 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-lock 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.
- (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-lock hook and connect the return spring.

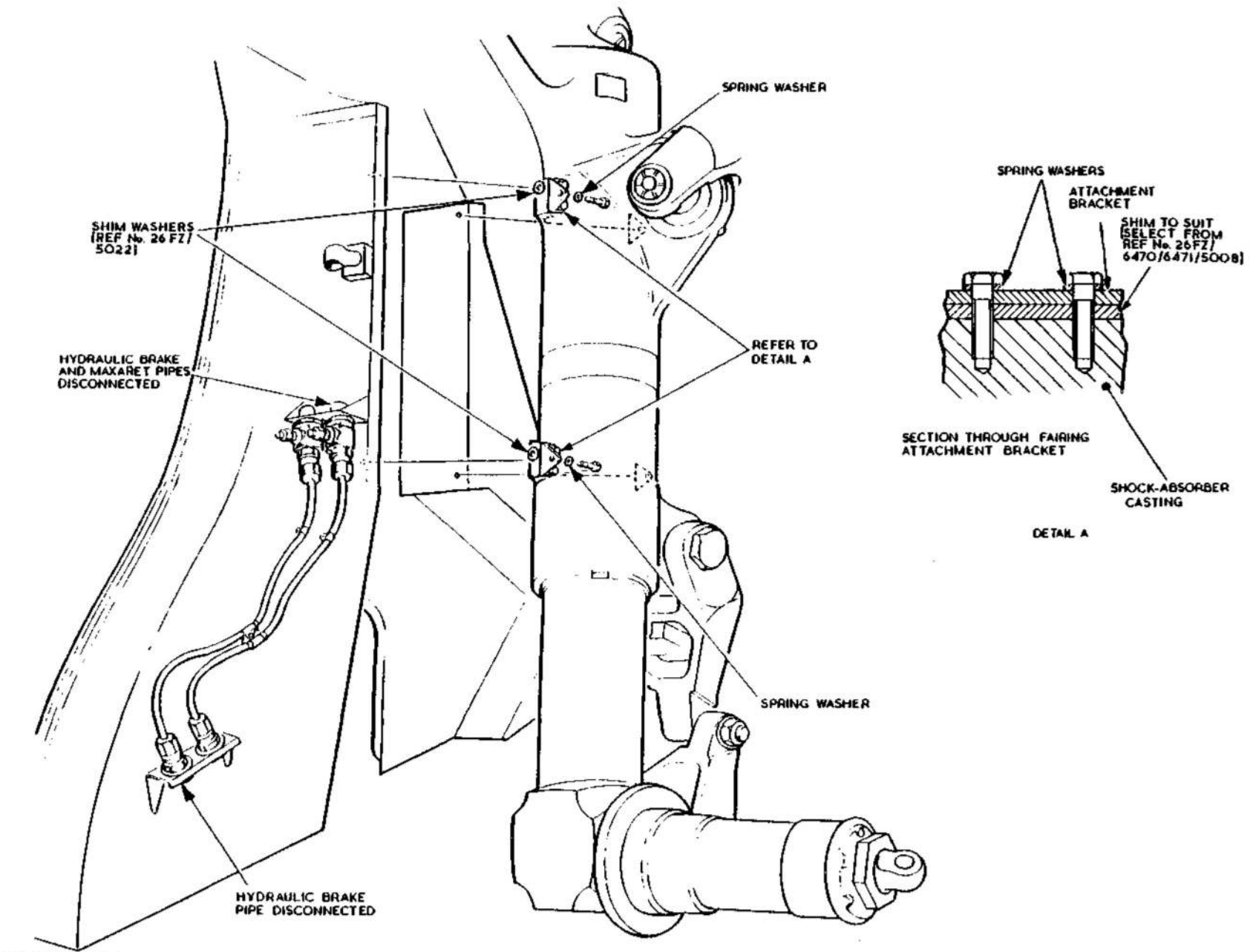
Note...

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-lock 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-lock hook when the undercarriage is raised is gained through a panel in the main-plane upper surface (Sect.2, Chap.4).

RESTRICTED



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FIG.10. LEG-FAIRING REMOVAL AND ASSEMBLY

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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.

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 undercarriage 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.119A-0509-1) 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.119A-0509-1. ▶

(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.

(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.

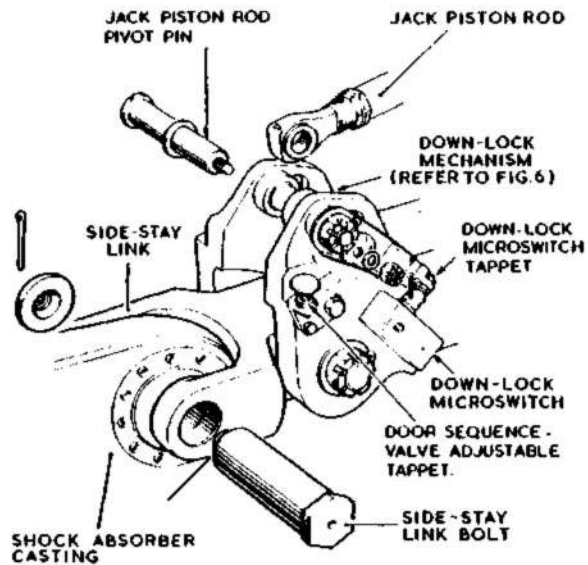
(8) With the flap in the open position, adjust the check cable tension rod until it is finger-tight and then slacken it one turn. Lock the tension rod.

(9) Tighten the nut and peen over the bolt attaching the check cable to the flap arm.

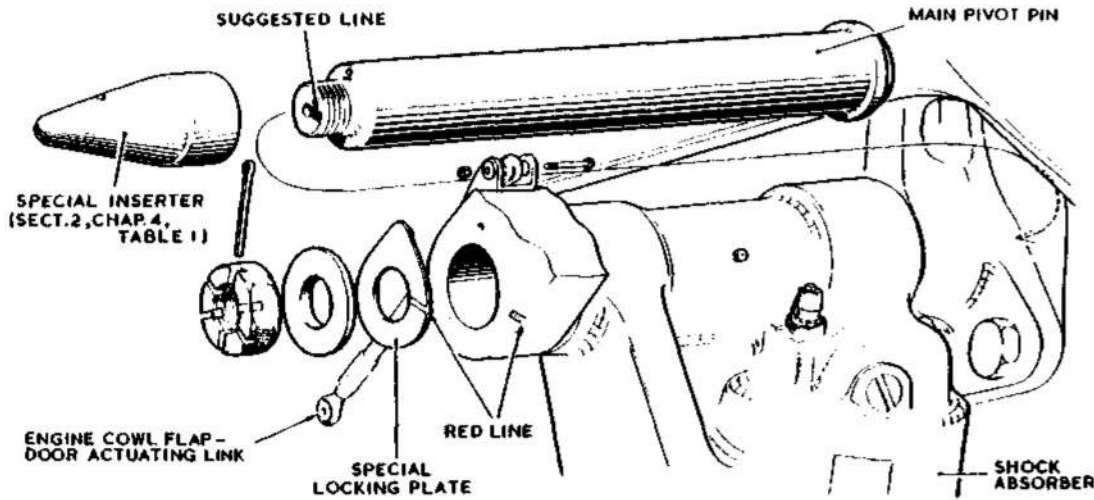
REMOVAL AND ASSEMBLY**General information**

30. The following paragraphs detail the removal

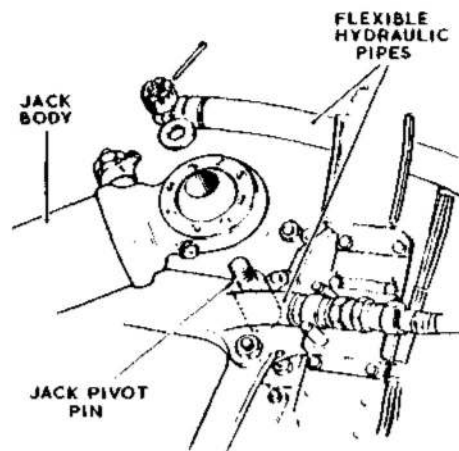
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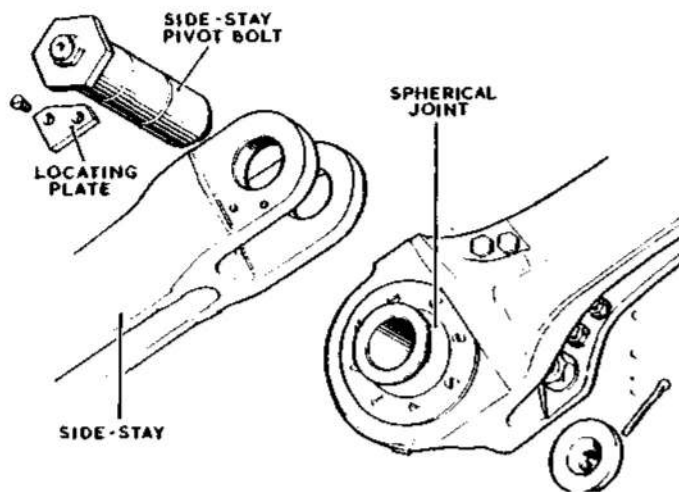
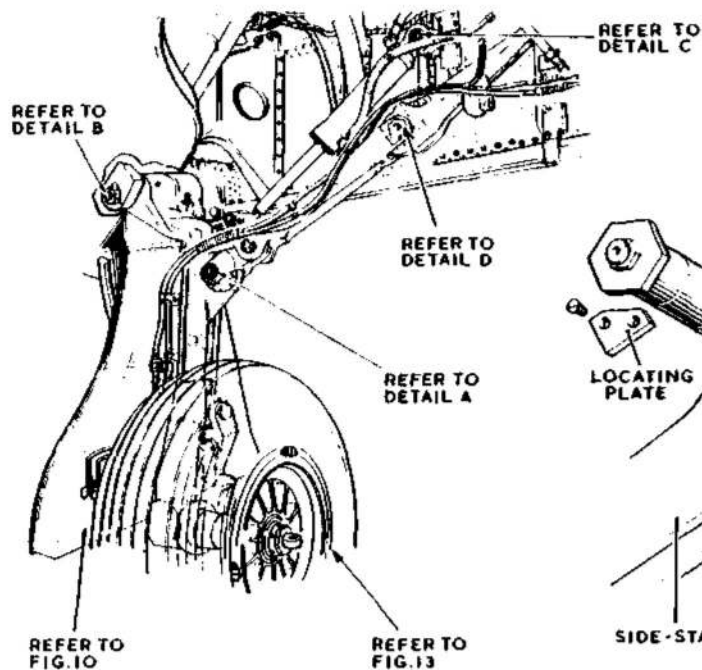
DETAIL A



DETAIL B



DETAIL C



DETAIL D

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FIG. II. UNDERCARRIAGE REMOVAL AND ASSEMBLY

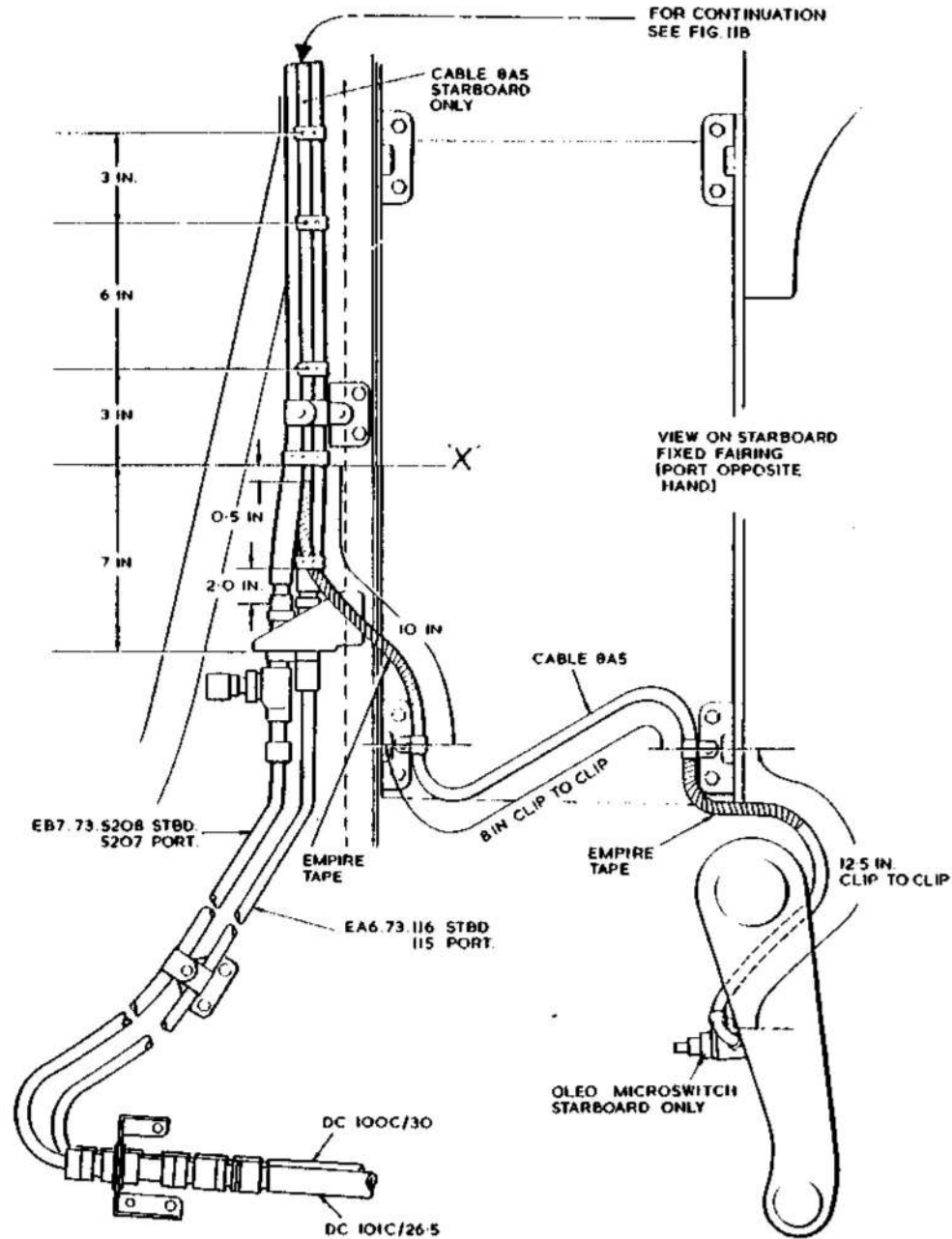


FIG. IIA. UNDERCARRIAGE - PIPING AND WIRING INSTALLATION

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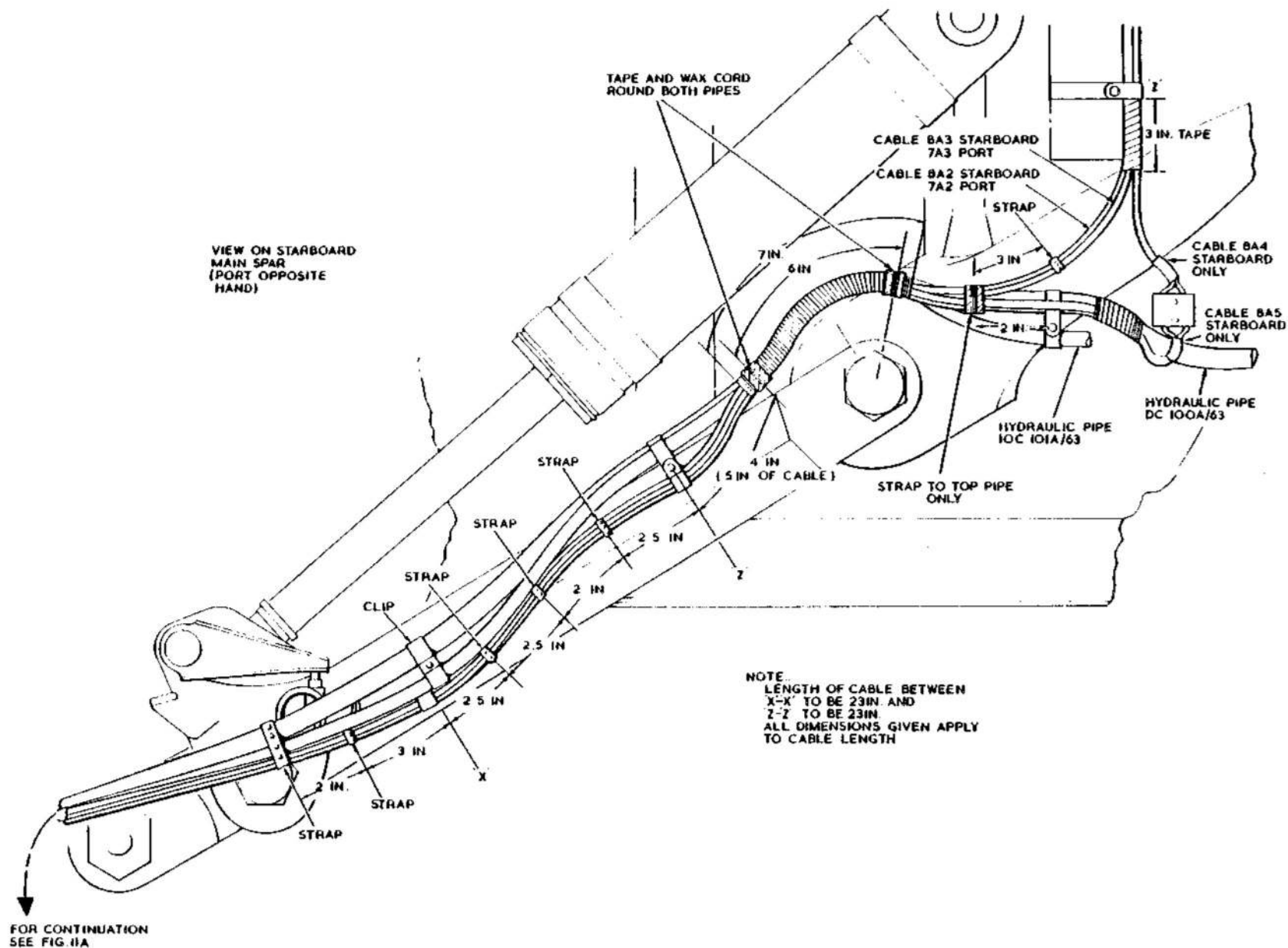


FIG. IIB. UNDERCARRIAGE - PIPING AND WIRING INSTALLATION

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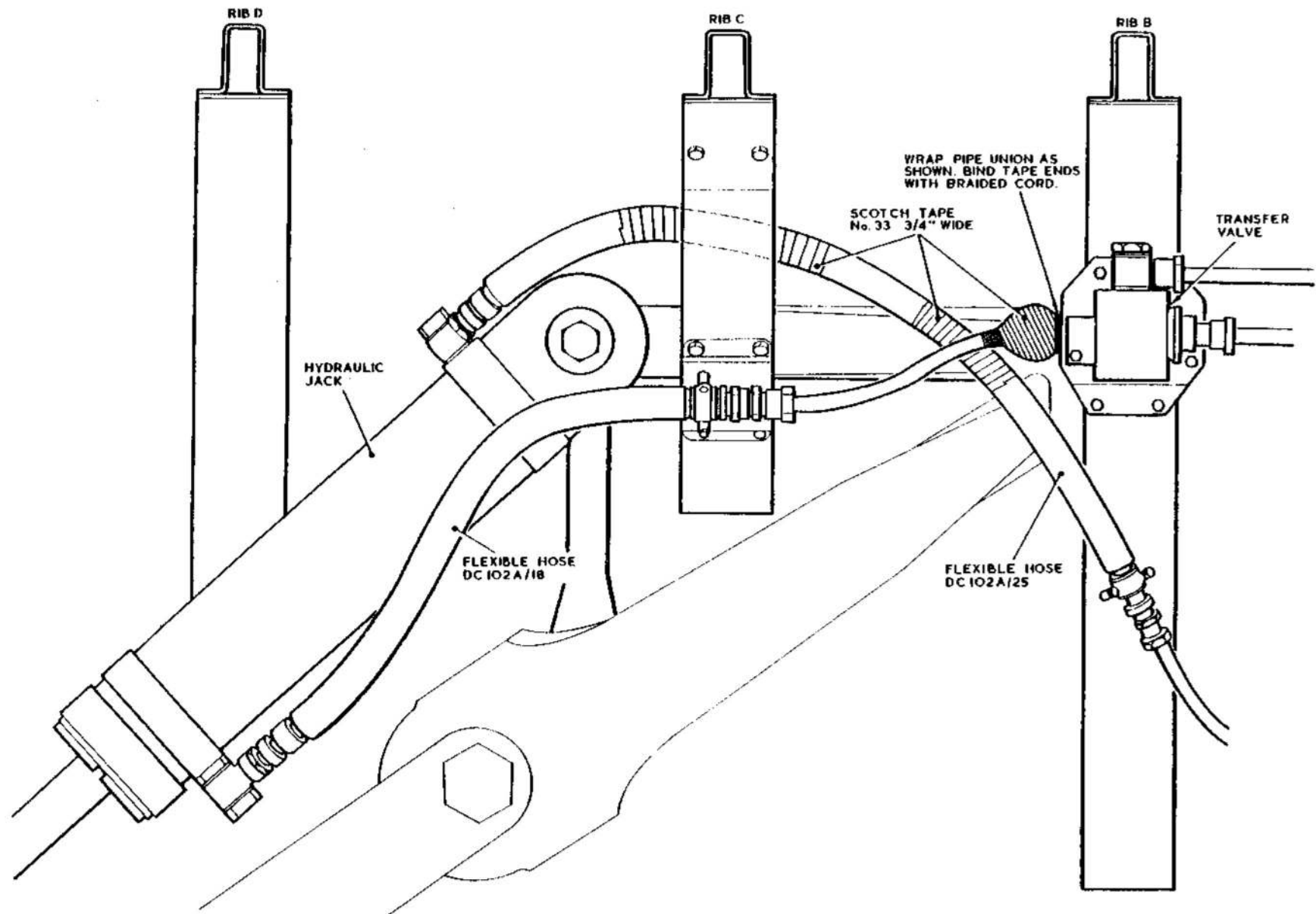


FIG. IIC. UNDERCARRIAGE - HOSE INSTALLATION

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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.11)

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.13) 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.10). 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.10).

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.

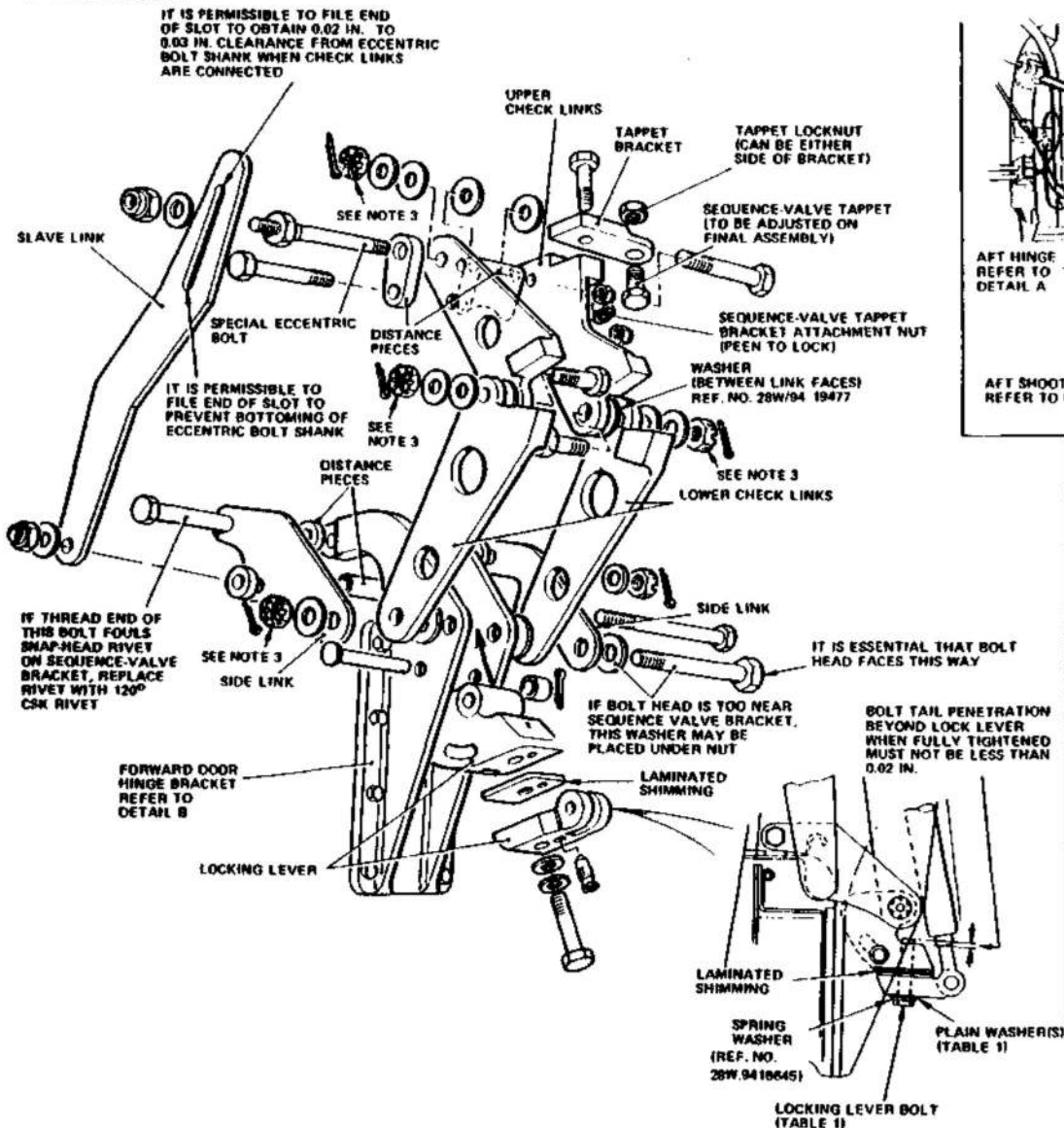
(12) Remove the split pin and nut from the jack piston rod pivot pin (detail A), and remove the pin.

(13) Remove the split pin and nut from the jack pivot pin (detail C), and remove the jack from the aircraft.

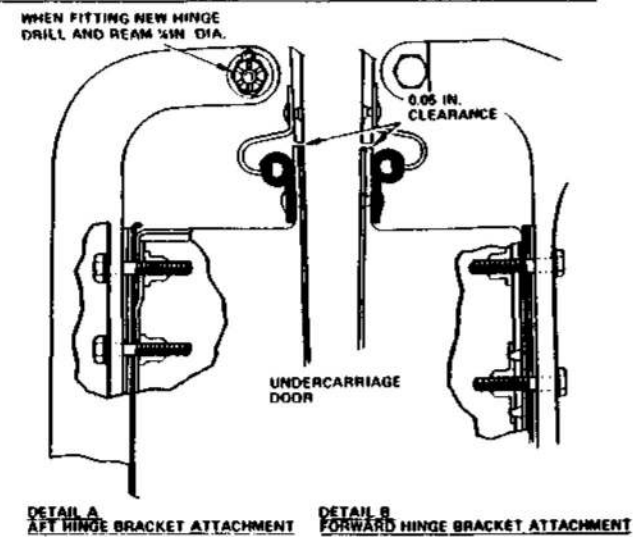
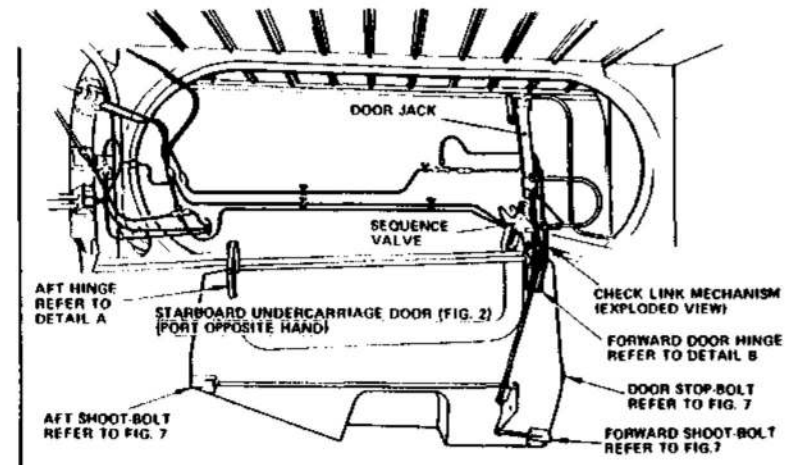
(14) Disconnect the electrical cables from the down-lock microswitch (detail A).

(15) Unclip the hydraulic pipes and electrical cables from the side stay. Coil and stow the electrical cables.

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CHECK-LINK MECHANISM ASSEMBLY



- NOTES...
- FOR DOOR/HINGE BOLT SIZES AND WASHER REQUIREMENTS REFER TO A.P.1018-0400-8, PART 1, CHAP. 3.
 - 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.
 - 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.
 - THE LOCKING LEVER BOLT IS TO BE TORQUE LOADED TO 115-125 LBF IN.

FIG.12. CHECK-LINK MECHANISM AND DOOR — REMOVAL AND ASSEMBLY.

4ANNOTATIONS ALTERED,NOTE 3 INCLUDED, NOTE 4 ADDED

(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 pin 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 pin 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 pin can be gained through a panel in the main-plane under-surface (Sect.2, Chap.4).*

2. *Should difficulty be encountered when removing the main pivot pin, 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 pin 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.11)

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 and insert the pivot pin.

(2) Remove the inserter and fit the pivot pin locking plate, washer, 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 pin 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 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 pin 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 side-stay link in 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.

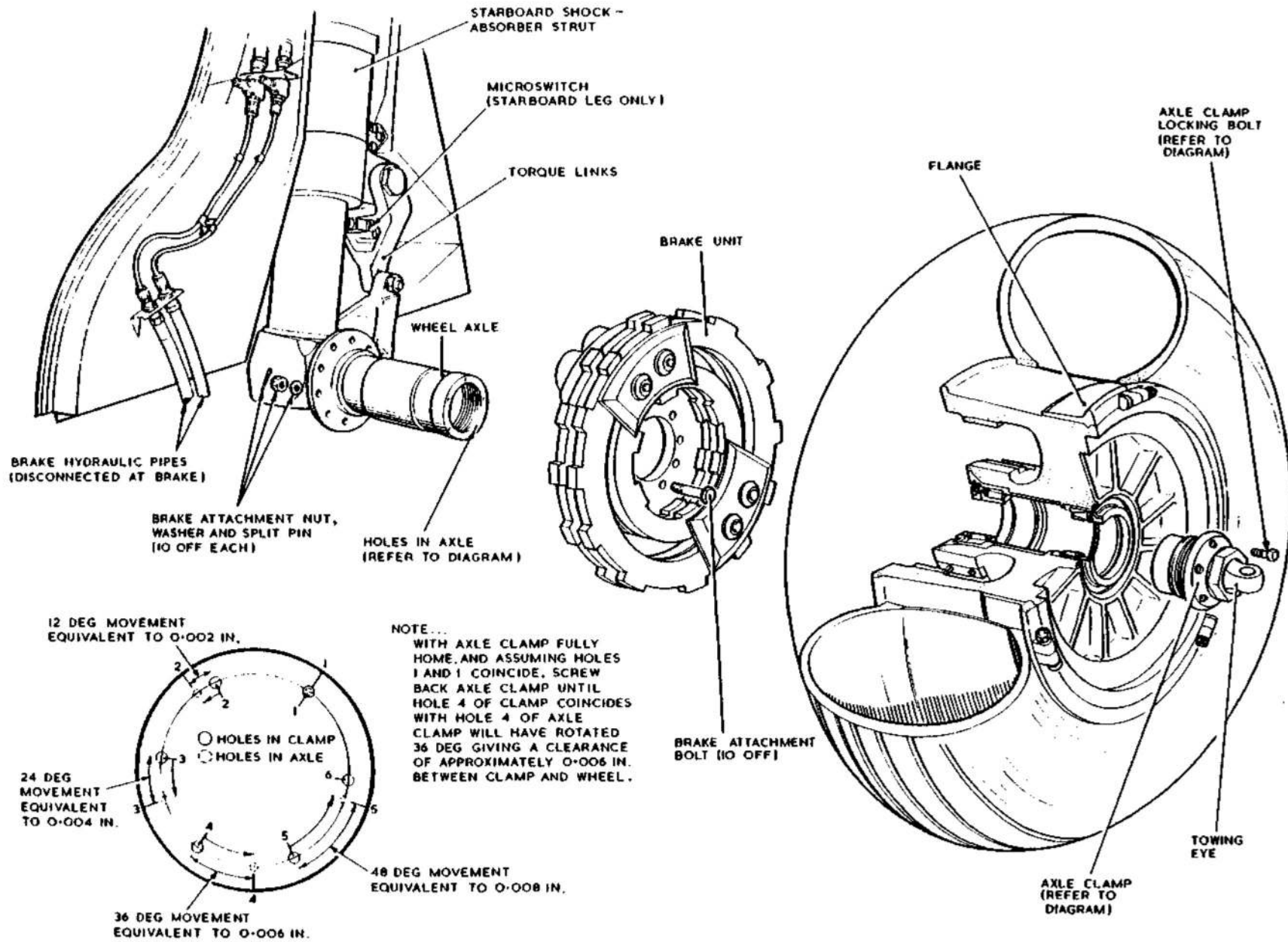


DIAGRAM SHOWING RELATIONSHIP BETWEEN HOLES IN AXLE CLAMP AND AXLE

FIG.13. WHEEL AND BRAKE REMOVAL AND ASSEMBLY

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(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 with the pivot pin and slotted nut. Lock the 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/in²) and, whilst under jack load, check the clearance between the up-lock hook and up-latch pin (fig.1). If adjustment is required, vary the shim thickness beneath the up-stop pad in the wheel-well roof (para.25).

Note...

1. It may be necessary to adjust the up-hook (para.24); ensure that the hook attitude is not altered.

2. Access to the up-lock 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-lock 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-lock hook (operation (10), Note 2).

(14) Check the up microswitch setting and adjust if necessary (fig. 9).

(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-lock 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.10).

(17) Lower the undercarriage, remove the dummy sleeve from the wheel axle and fit the wheel (fig.13).

(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 side stay and hydraulic pipes as shown in figs. 11A and 11B. Leave the clips partly tightened.

- (20) Check the setting of the down-lock micro-switch and, on the starboard undercarriage, the shock-absorber strut switch; if necessary, adjust (fig.9).
- (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.11C. 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 (and with the undercarriage locked up and down), all pipes and cables are safely routed (fig.11A and 11B), 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-lock 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-lock pin and raise the undercarriage by hand pump or hydraulic rig applying full hydraulic pressure.
- (4) Check that the up-lock hook is moved only by the up-lock pin. To ensure correct alignment between the up-lock hook and the up-lock 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-lock hook engages correctly, further shimming, Ref. No. 26FZ/5055, may be added to the up-lock hook bracket with a corresponding reduction of shimming under the stop pad.

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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-lock 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-lock 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-lock hook (fig.1) is present on full retraction.

(6) Fit and adjust the microswitch (fig.9).

(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.12)

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 checks 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.

(3) Close the door manually and ensure that a 0.08 in. maximum skin gap exists at the door leading edge. File the leading edge if necessary, then apply protective treatment in accordance with ◀A.P.119A-0509-1. ▶

(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 operation 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.

Door check links (fig.12)

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.12.

(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 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*).

Door hinges (*fig.12*)

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 SP.15/C
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.13*)

Removal

38.

- (1) Jack and trestle the aircraft (*Sect.2, Chap.4*).
- (2) Ensure that the aircraft wheel brakes lever is in the off position. (*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. It is important that the wheel bearing and brake clearances are correctly adjusted, and that shock loads are not transmitted to the Maxaret unit. 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 over-tighten 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. $\begin{matrix} +0.005 \\ -0.000 \end{matrix}$ 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 (AP 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 and Maxaret units. 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 and Maxaret units.

(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

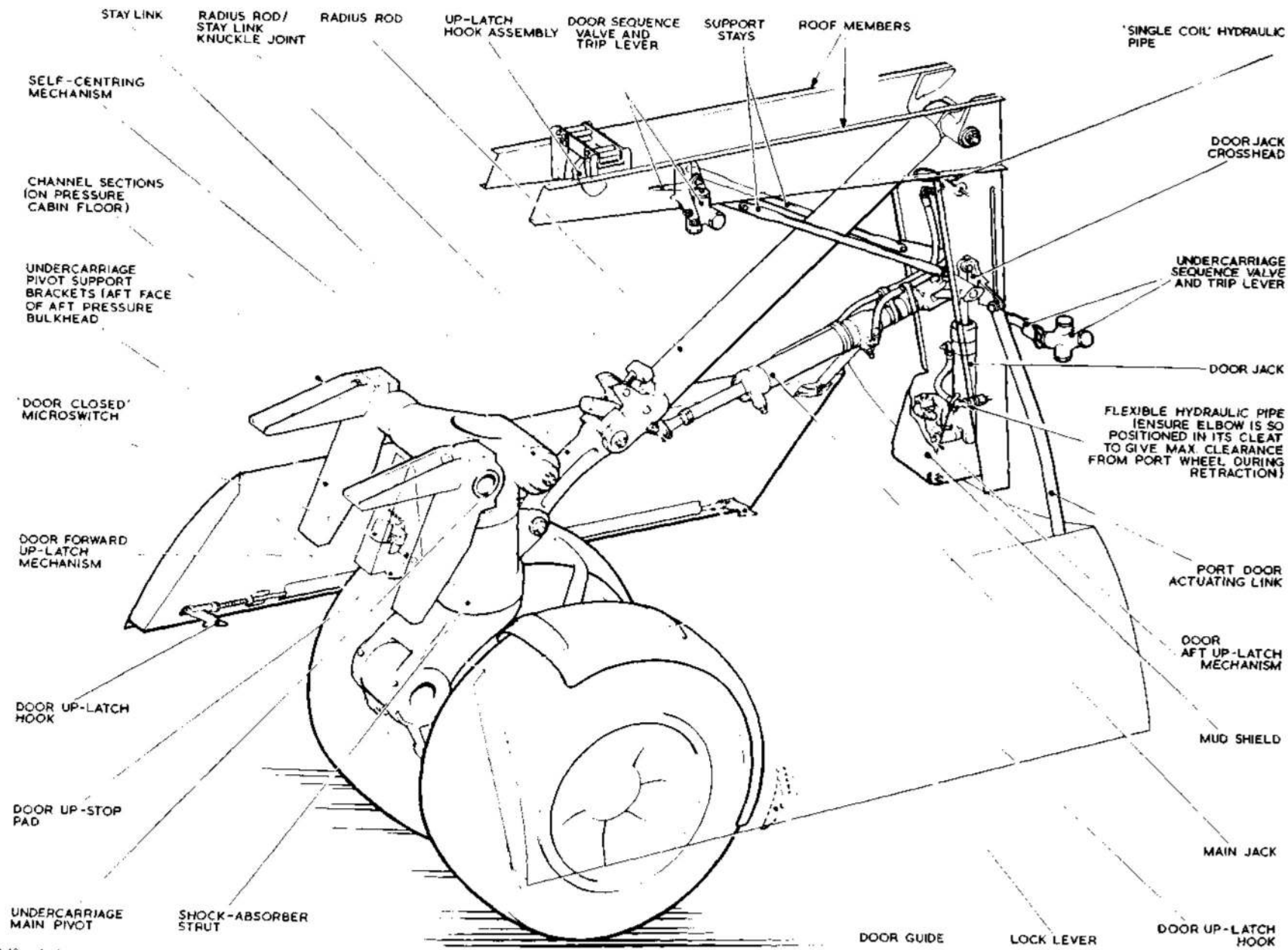
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FIG. I. GENERAL VIEW, LOOKING AFT

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DESCRIPTION

General information (fig. 1 and 2)

1. The nose undercarriage is the 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 aft 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 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-timed 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 on the aft face of the aft 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 taxiing. 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 micro-switches, 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)

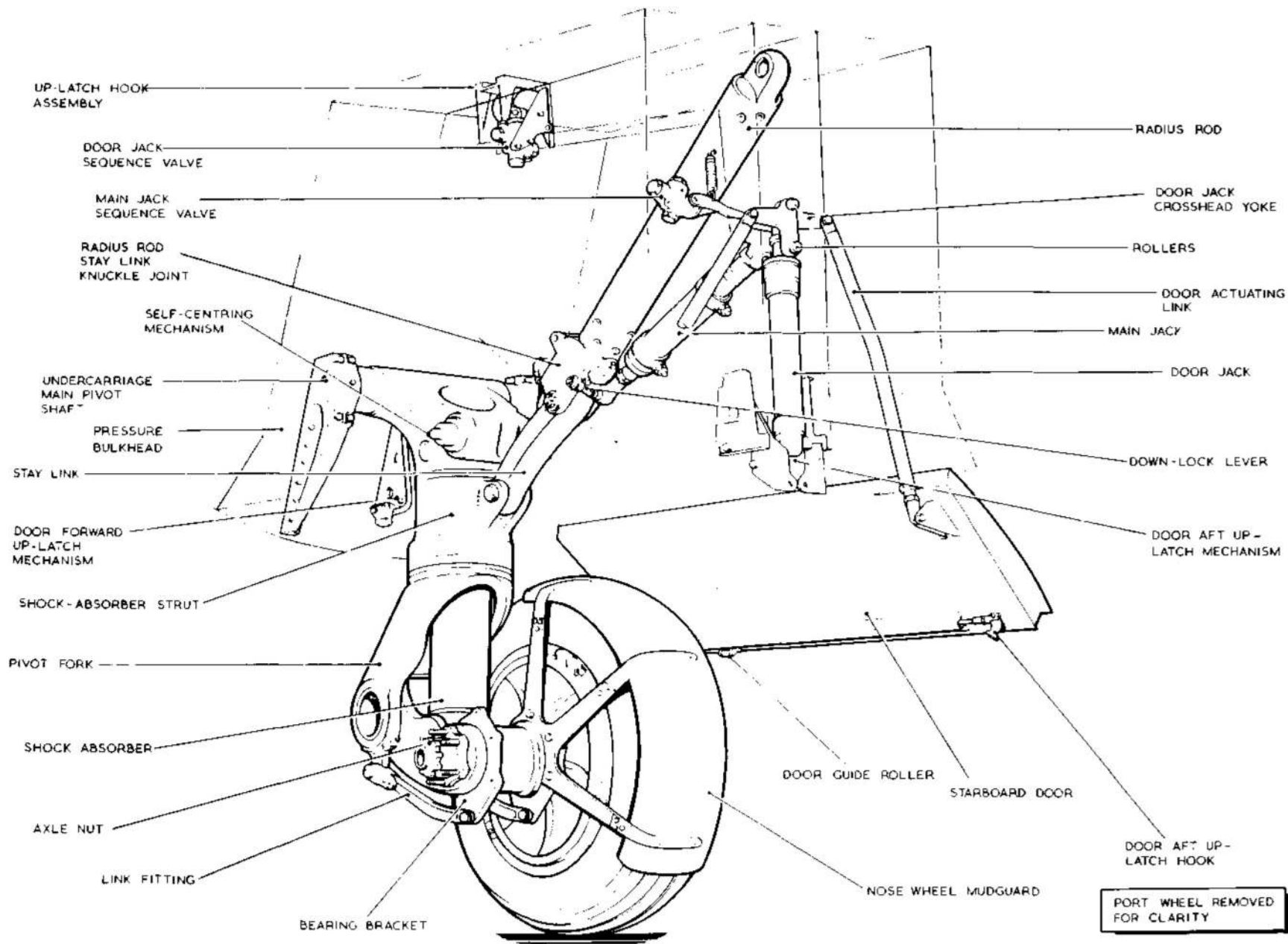
7. The up-latch hook assembly is mounted between the two support beams on the underside of the wheel-well roof. The hook is retained in its normal locking position by a spring, one end of which is attached to an extension of the hook, while the other is attached to the support beam. When the undercarriage 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 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



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FIG.2 GENERAL VIEW LOOKING FORWARD

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 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. 10 and 11), 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).

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 new one fitted. If leakage occurs past the bleed plug it may be caused by slackness of the plug or grit under the

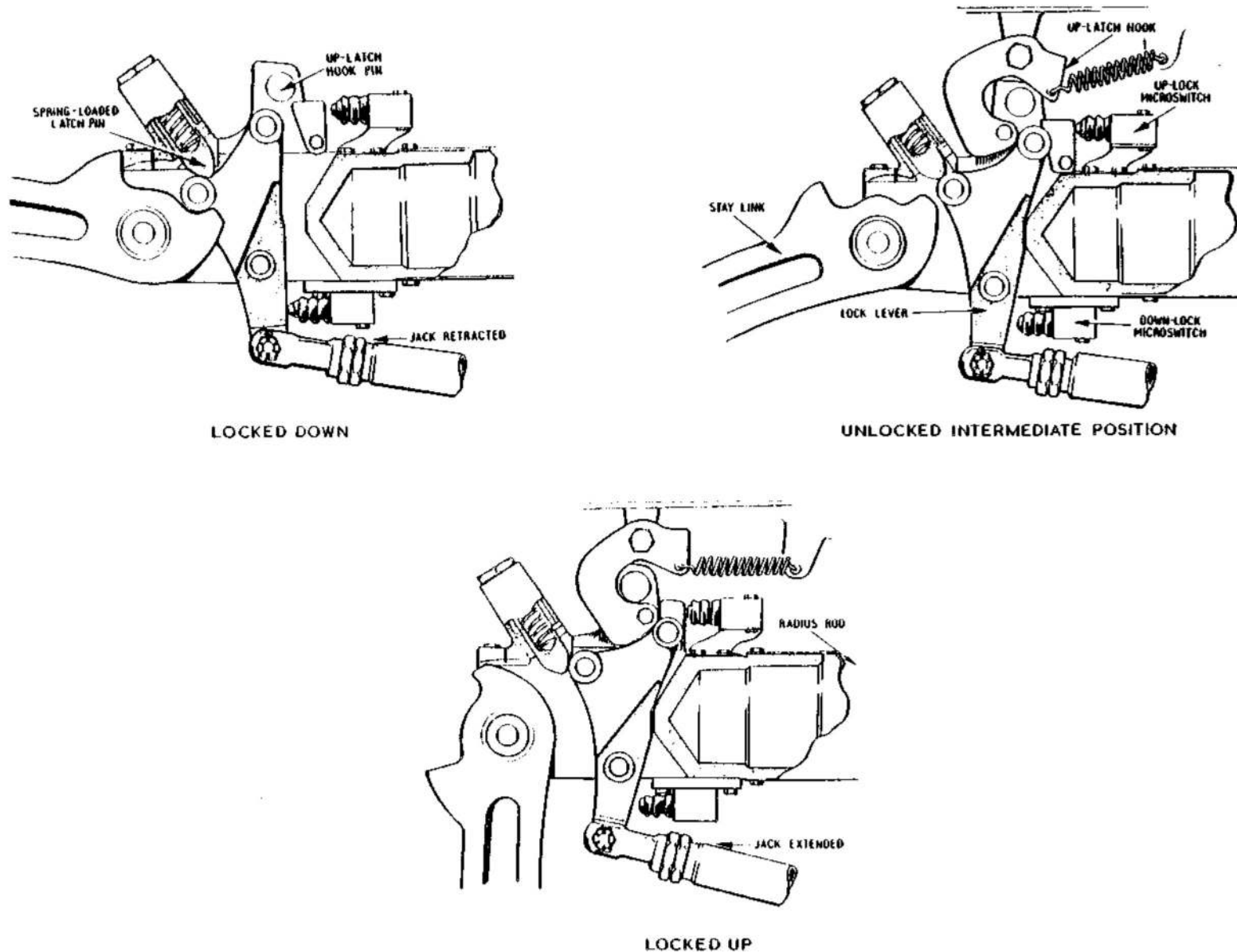


FIG.3. UNDERCARRIAGE LOCKING MECHANISM

ball; if cleaning and tightening proves ineffective the unit must be renewed.

Checking and correcting shock-absorber oil pressure

16. If the shock-absorber leg 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/in². Release the pressure in the charging adapter by slackening the adapter bleed screw. Remove the adapter and gun; refit the valve cap and lower the aircraft to the ground.

(5) Recheck the leg 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.

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. This 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. \pm 0.25 in.; the jack piston rod travel is 9.09 in. \pm 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).

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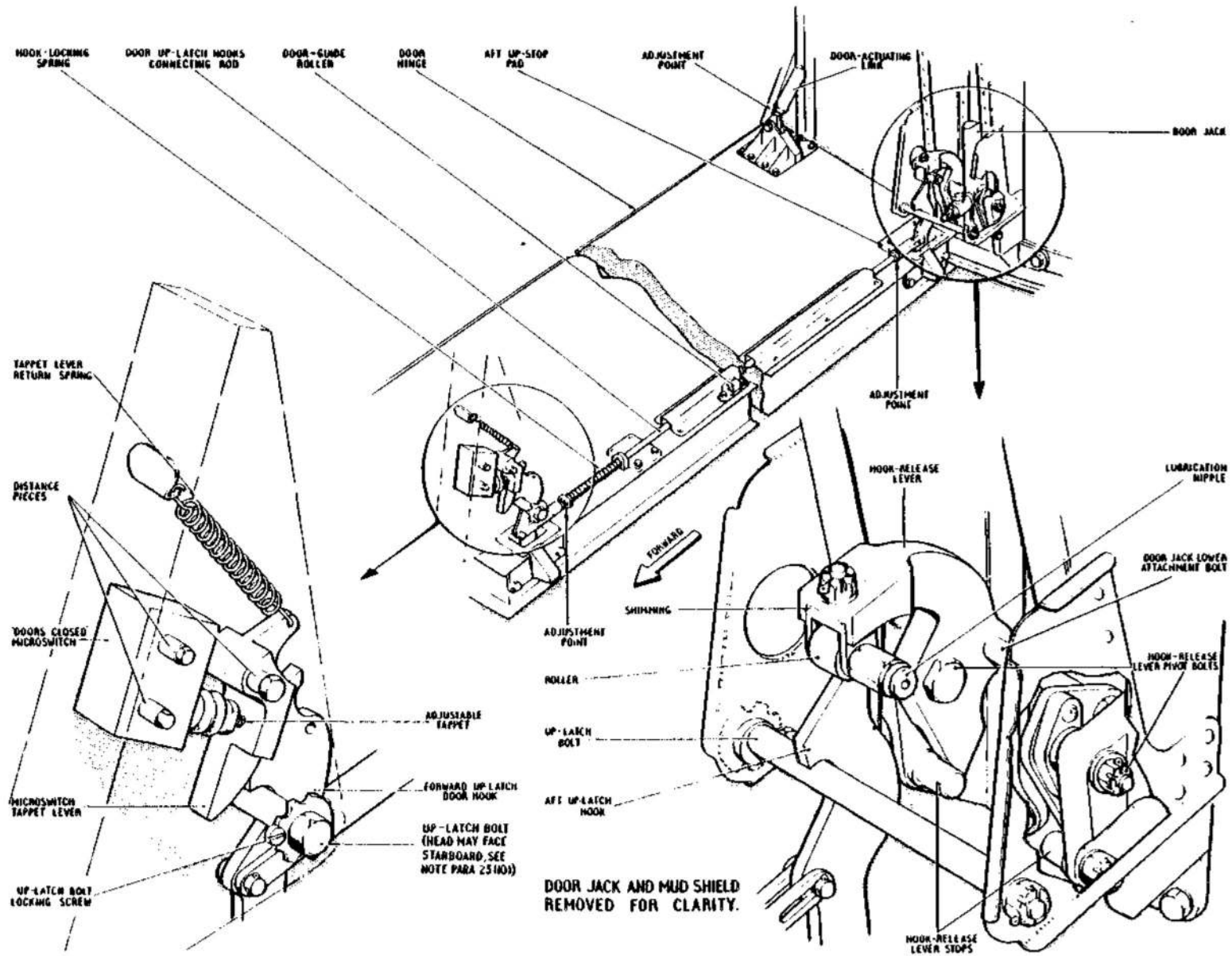
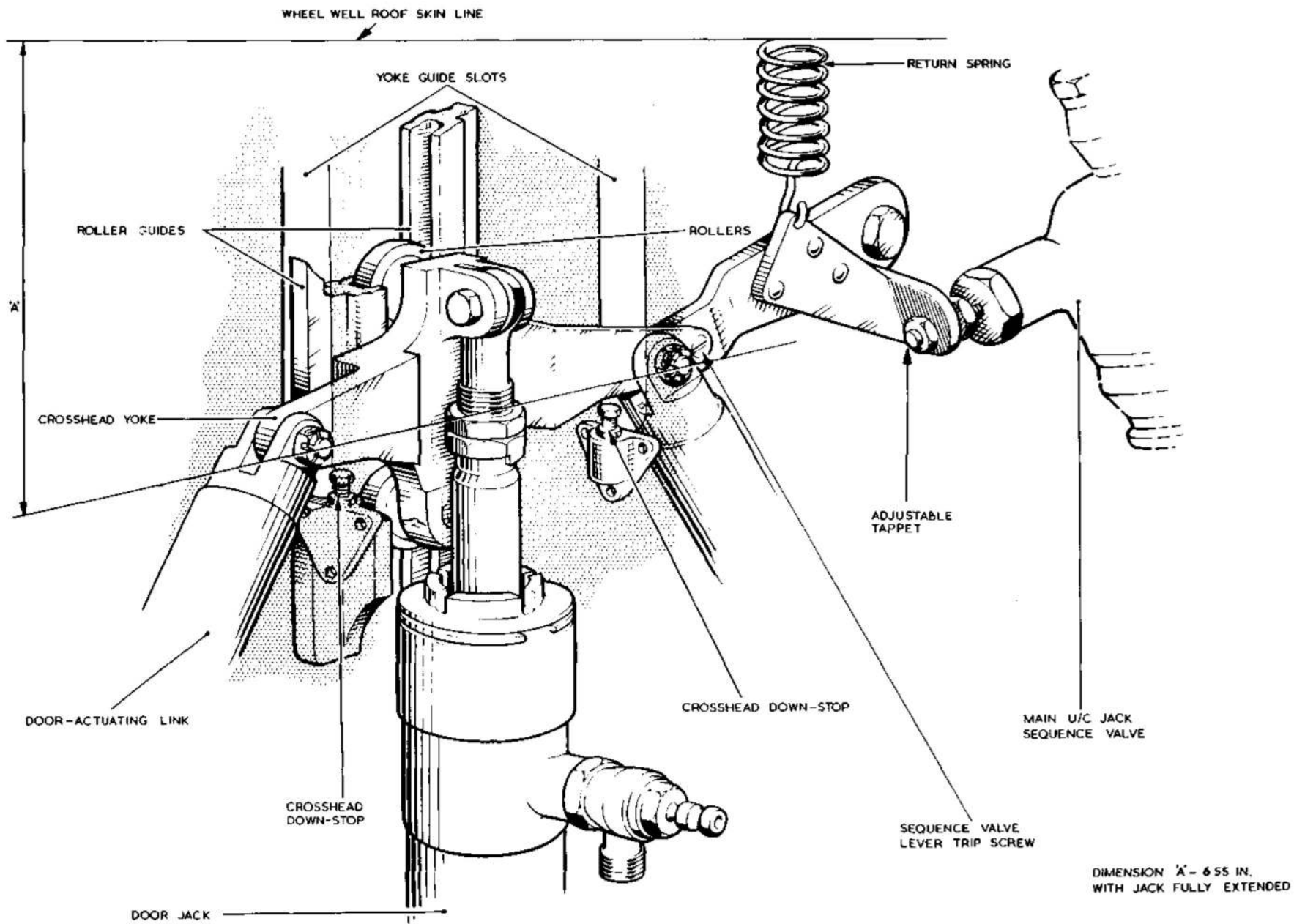


FIG. 4. STARBOARD DOOR LOCKING MECHANISM

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FIG. 5. DOOR JACK CROSSHEAD ARRANGEMENT

◀ (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. \pm 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. 17.

(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 jack attachment bolt in the aircraft

structure exceeds the jack pin centres by 0.22 in. $+0.04$ in.
 -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. \pm 0.25 in.; the jack piston rod travel is 9.19 in. \pm 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 door (*para. 28*).

(2) 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, re-inserting 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. \pm 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

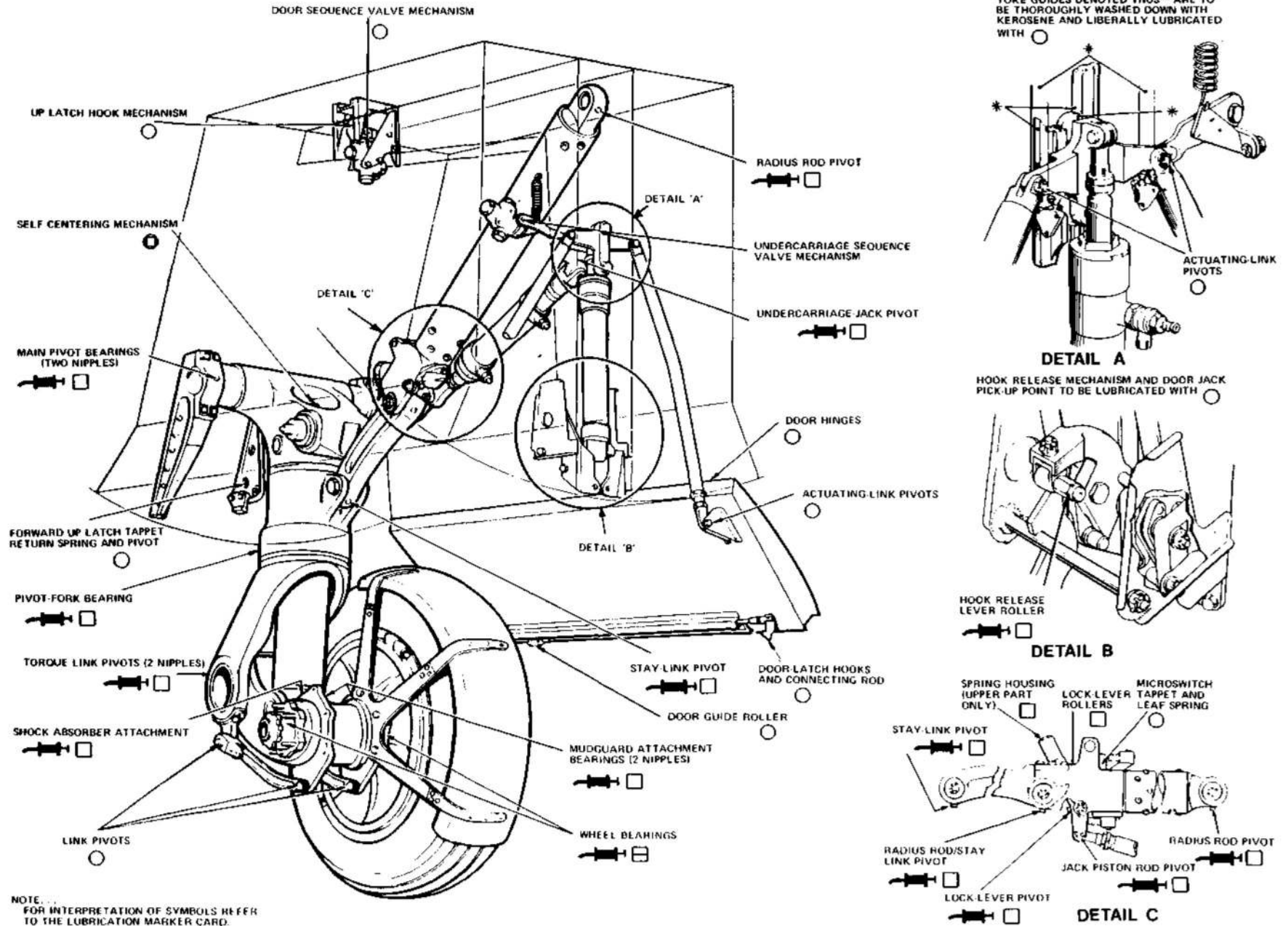


FIG. 6 LUBRICATION DIAGRAM

← DRAWN →

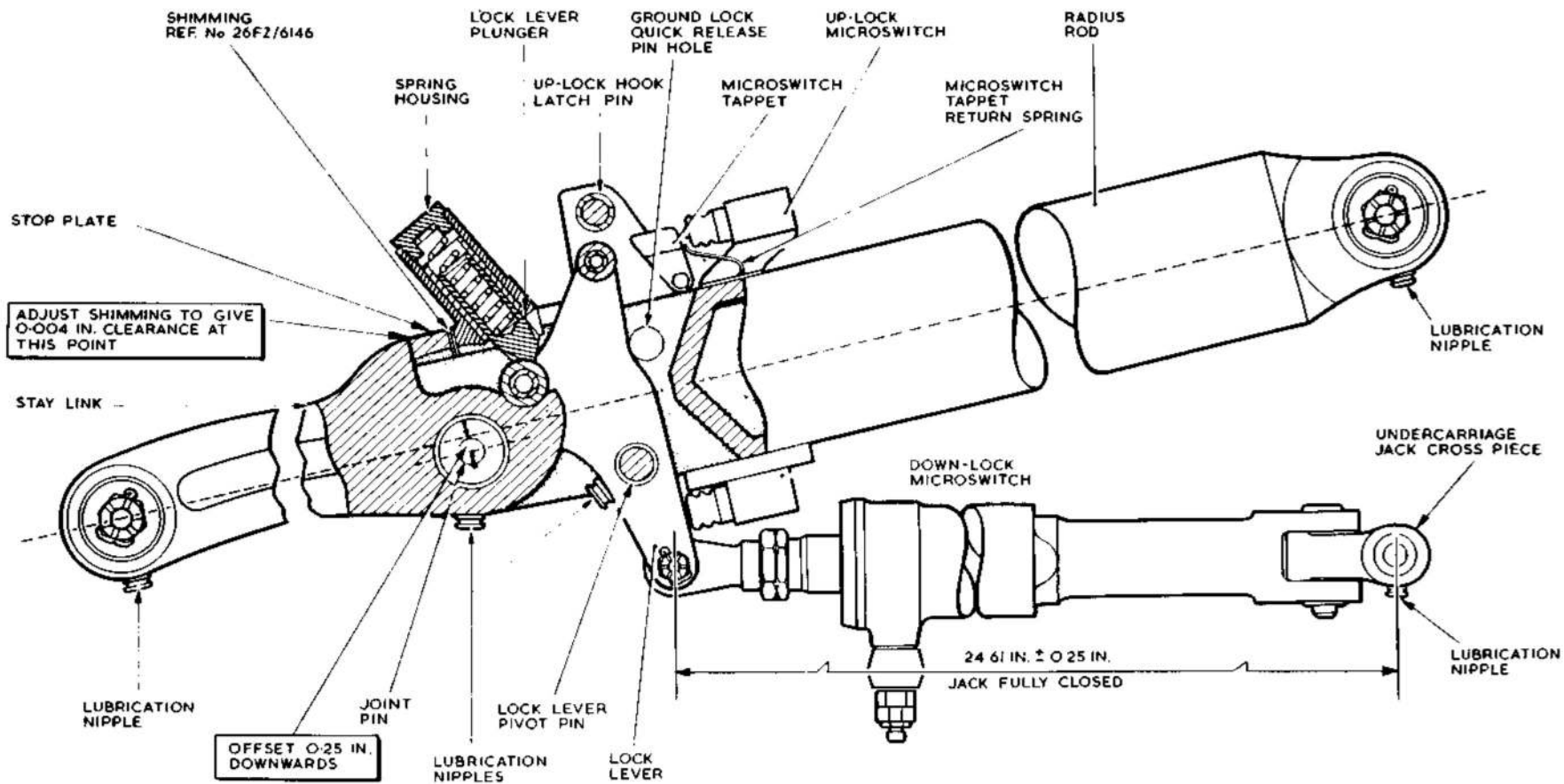
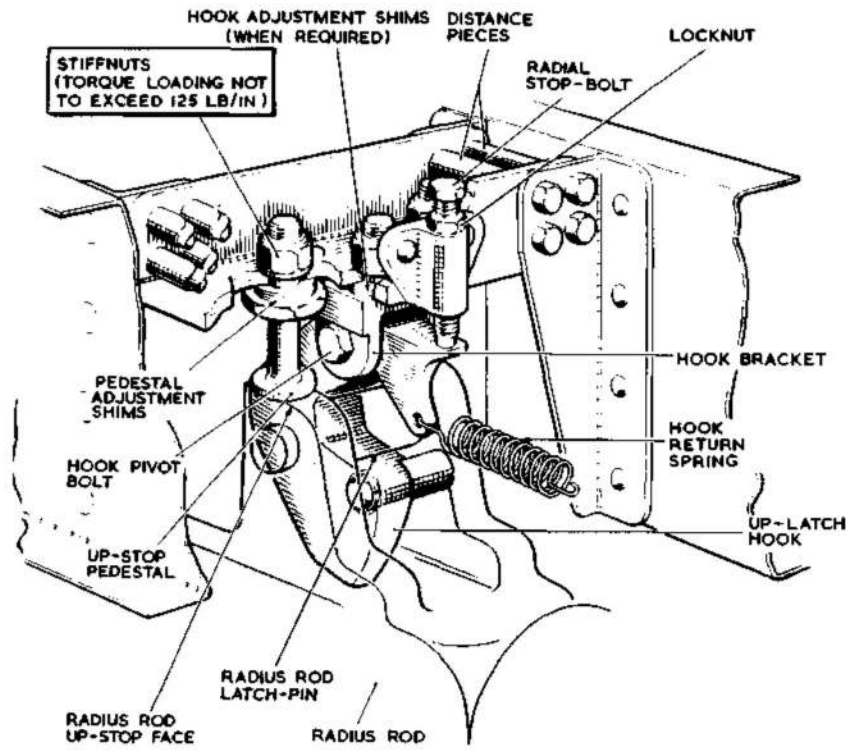


FIG. 7. RADIUS ROD/STAY LINK ALIGNMENT



NOTE...
THE TWO UP-STOP PEDESTALS
ARE TO BE ADJUSTED TO
WITHIN 0.003 IN. OF EACH OTHER

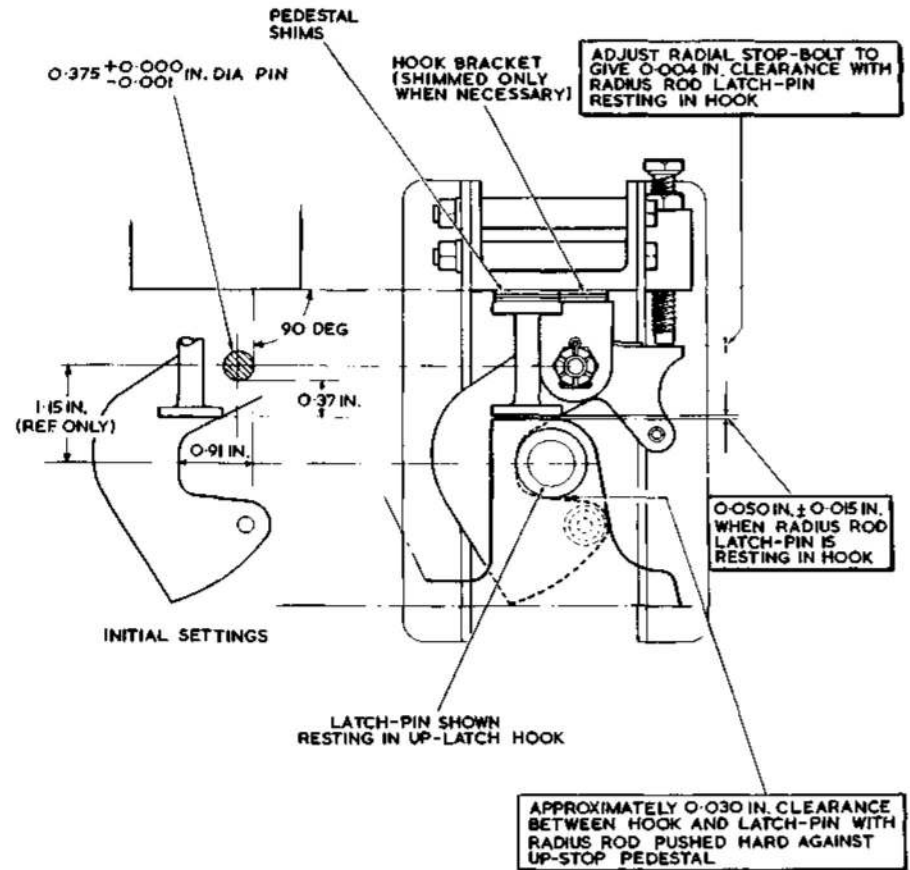


FIG. 8. UP-LATCH HOOK SETTING (I)

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).
- (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 box of the up-latch mechanism from the floor of the upper equipment compartment. 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. \pm 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. \pm 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 UP and, by using the aircraft hand pump, force the radius rod against the up-stop pedestals and adjust the sequence valve (para.24). ▶

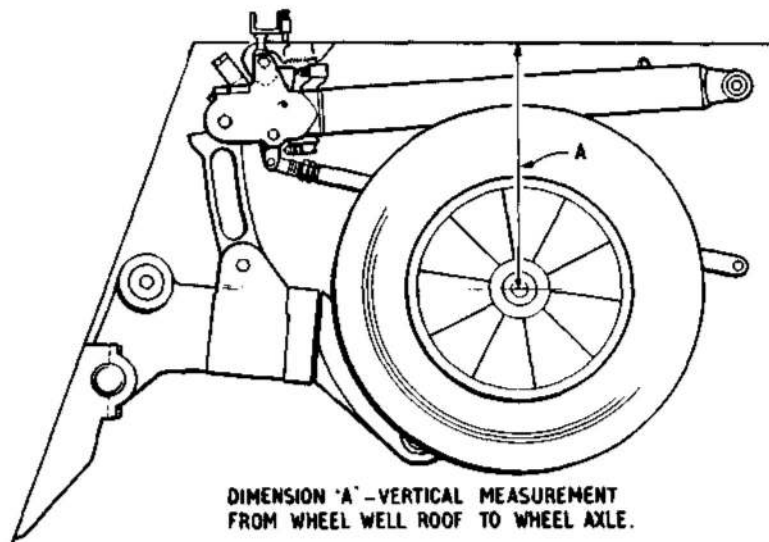


Fig.9. Up-latch hook setting (2)

(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 ◀ FLIGHT 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.

(23) Take a second measurement from the same point in the roof, to the nose-wheel 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. \pm 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.

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 mal-adjusted 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 settings themselves. To set the nose undercarriage doors:-

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

(2) Remove, and mark for re-identification, both door-actuating links.

(3) For ease of access remove the landing wheels and mudguards.

(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-wind' 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 pin shims (fig.10).

(10) Check the clearance between the forward up-latch hook and the up-latch bolt; this is to be 0.30 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 hook 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 (S.P.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 (S.P.47/C, 28W/9416643) and nut (A 27-CT, 28M/1006473).

(11) Check, and if necessary, adjust the forward up-latch microswitch tappet (fig.13).

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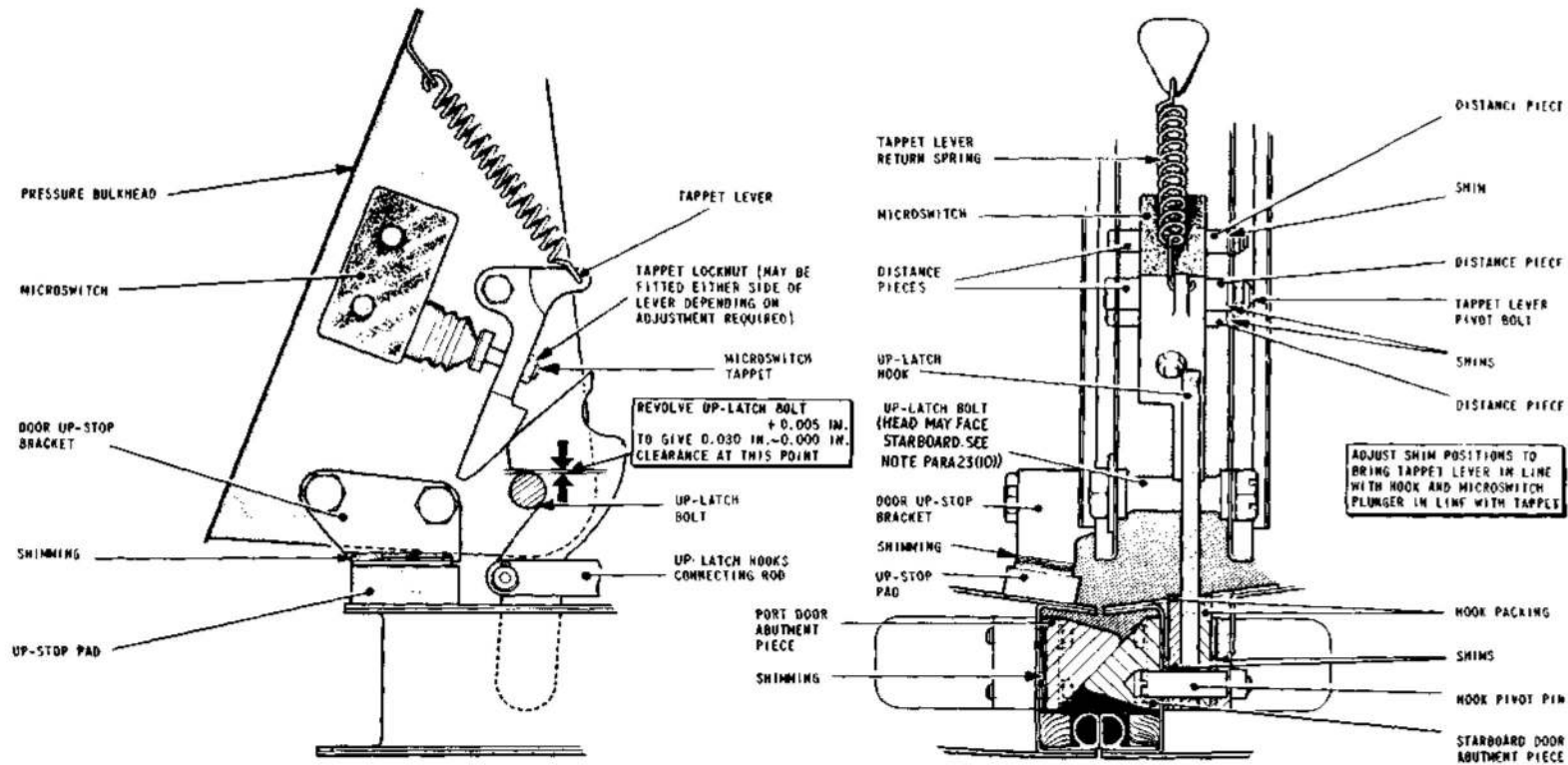


FIG. 10. DOOR FORWARD UP-LATCH HOOK SETTING

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(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.119A-0509-1) 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-wind'. If the doors do not fit flush with each other adjust the shims beneath the port door abutment pieces (fig.10 and 11).

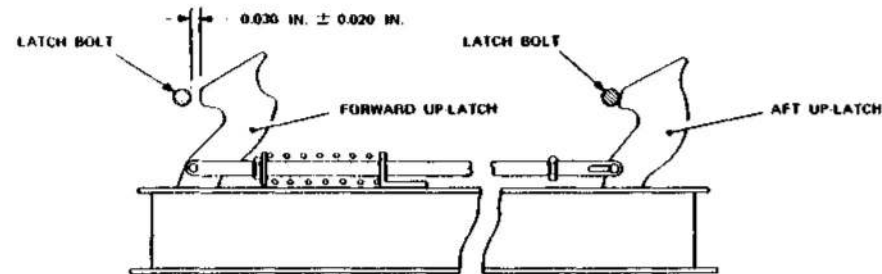
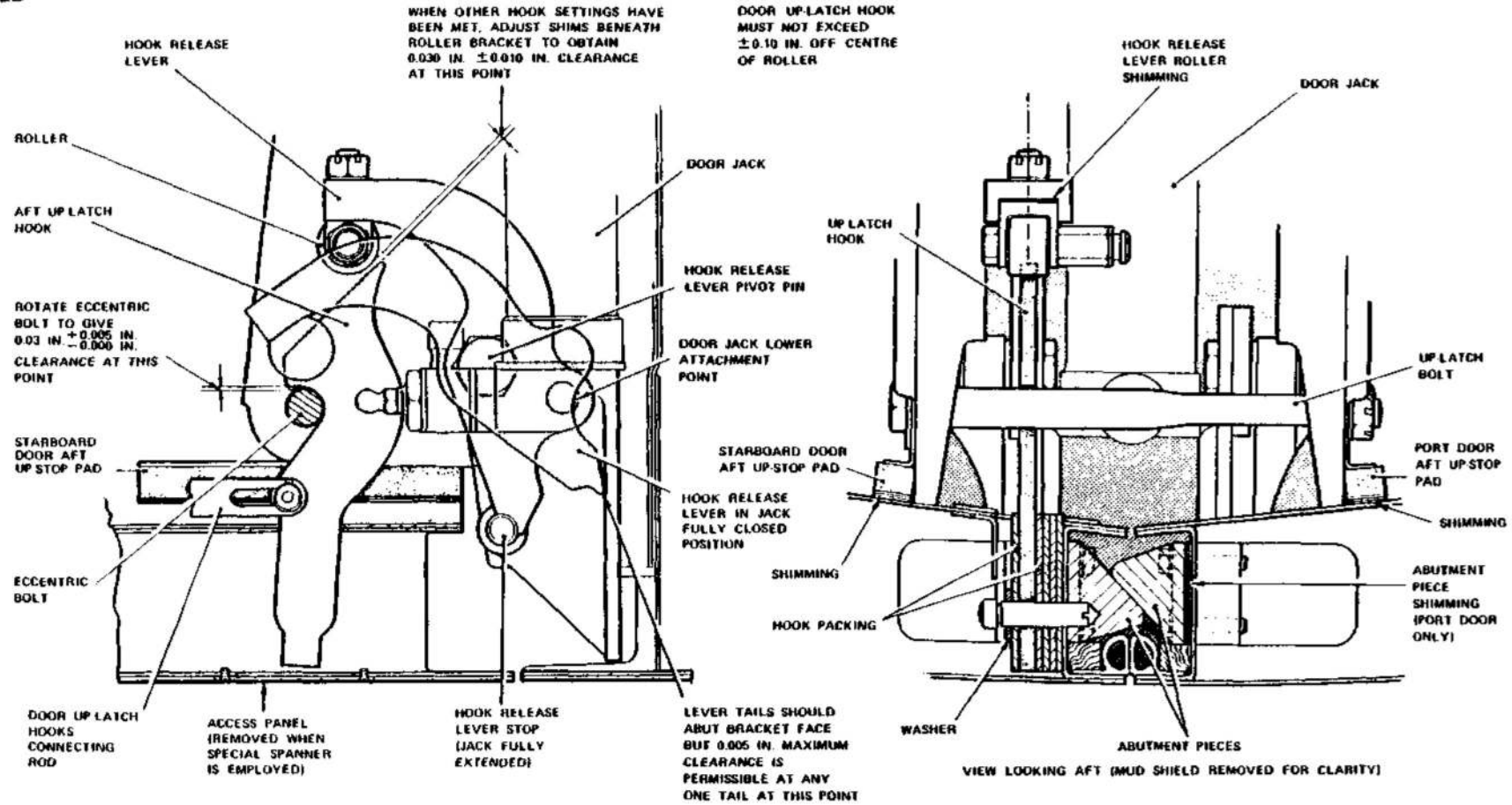
Note . . .

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-wind' condition is maintained.
- (22) Check that the door microswitch functions correctly (fig.13).
- (23) Check all skin gaps around both doors (A.P.101B-0400-6, Part 1).
- (24) Function-test the undercarriage (Chap.6).

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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

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).

Note . . .

The tappet locknut may be fitted on either side of the tappet bracket depending upon the amount of adjustment required.

Microswitch settings (fig. 13)

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.

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. 14, 15 and 16)**Note . . .**

The undercarriage and doors mechanism can be removed independently of each other.

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. 17) 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. 15, 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. 15, 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 were 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 (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. 15, 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

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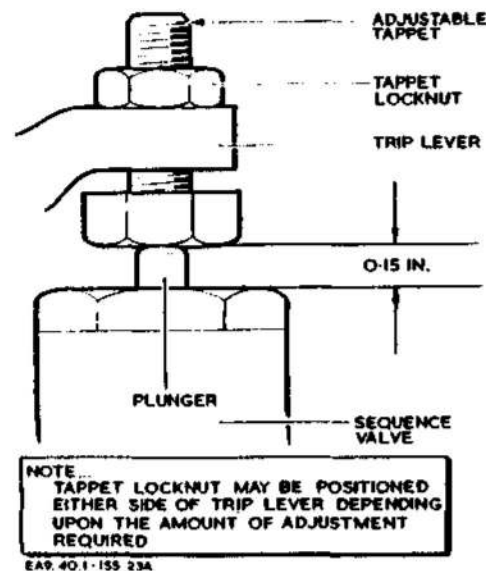
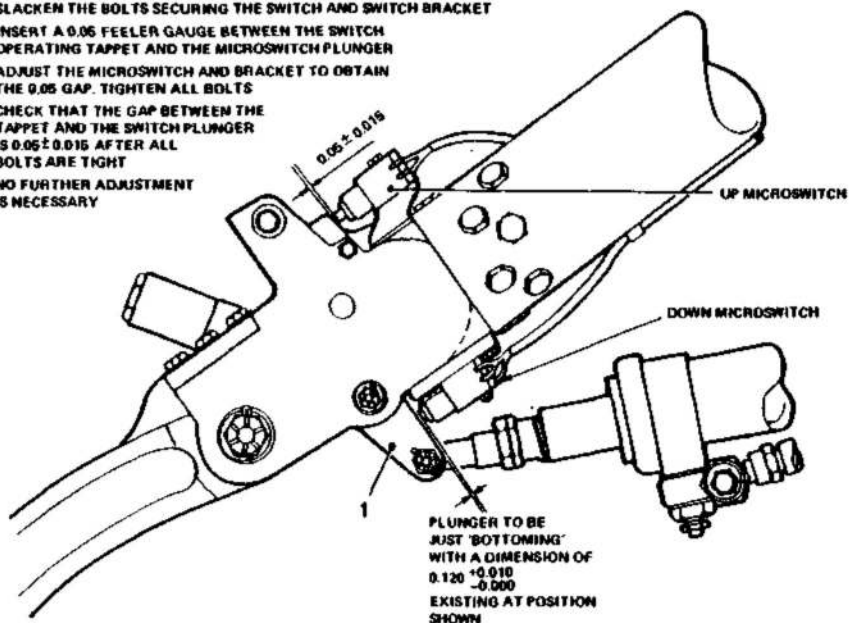


Fig.12. Sequence valve setting

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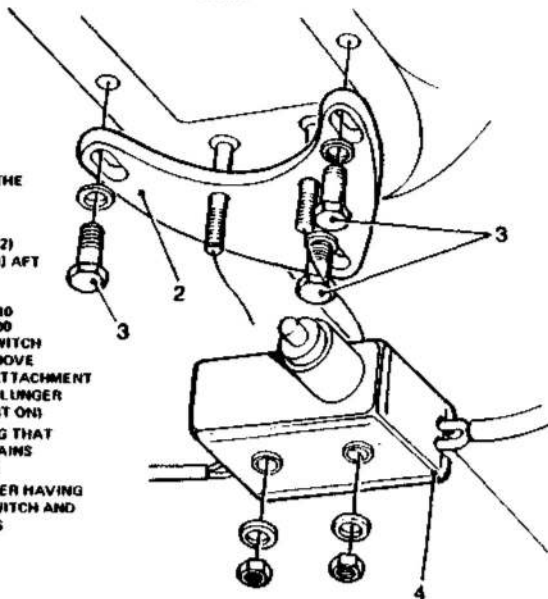
UP MICROSWITCH ADJUSTMENT WITH U/C IN THE DOWN POSITION

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

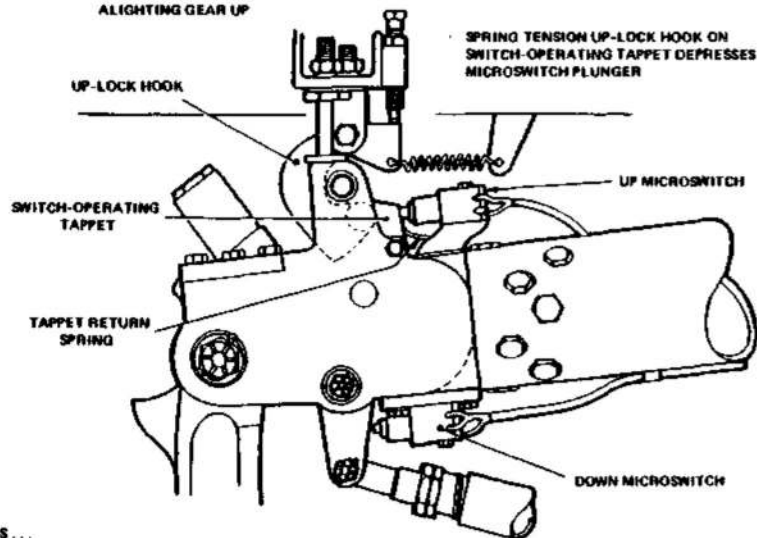


DOWN MICROSWITCH ADJUSTMENT U/C IN DOWN POSITION

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 $0.120 \pm 0.010 - 0.000$ 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 MOVEMENT REMAINS WHEN ADJUSTMENT IS FINALISED
6. RE-CHECK THE ADJUSTMENT AFTER HAVING FINALLY REFITTED THE MICROSWITCH AND TIGHTENED THE SECURING BOLTS



ALIGHTING GEAR UP

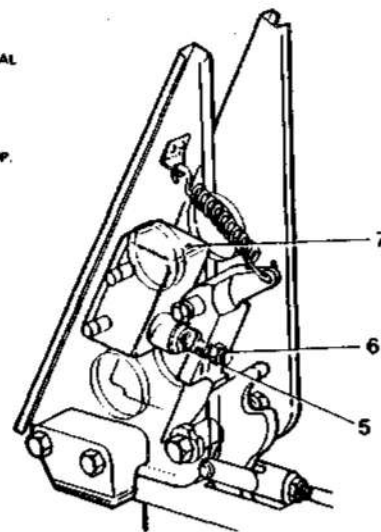


NOTES...

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

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 (5) 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 - NOSE UNDERCARRIAGE ▶
'DOWN' MICROSWITCH SETTING DIMENSION AMENDED

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. 14, 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. 15, 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.

(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 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. 16).

(6) Remove the two 1/4 in. dia. countersunk bolts attaching the bottom of each release lever bracket to the aft bulkhead (fig. 16).

Note . . .

The heads of these four bolts are accessible from within the forward camera bay.

(7) Break the wire-locking and remove the two 2 B.A. bolts securing each release lever bracket to the vertical channel stiffeners.

(8) Remove the door jack and release lever mechanism complete by lifting over the frame channel (fig. 16).

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.

(9) Disconnect the door jack from the hook release lever mechanism by removing the split pin, slotted nut, pivot bolt, washer and distance pieces (fig. 16).

(10) Dismantle the hook release levers from their brackets by removing the split pin, slotted nut, washer, Part No. EA1.10.1407 and special bolt from each lever (fig. 16).

(11) Remove the thirty-eight 2 B.A. bolts, washers and stiffnuts securing the cross-head roller guides to the aft bulkhead, and remove the guides.

(12) Withdraw the jack crosshead from the slots in the vertical channel stiffeners.

Undercarriage and undercarriage doors mechanism assembly (fig. 14, 15 and 16)

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 not 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.

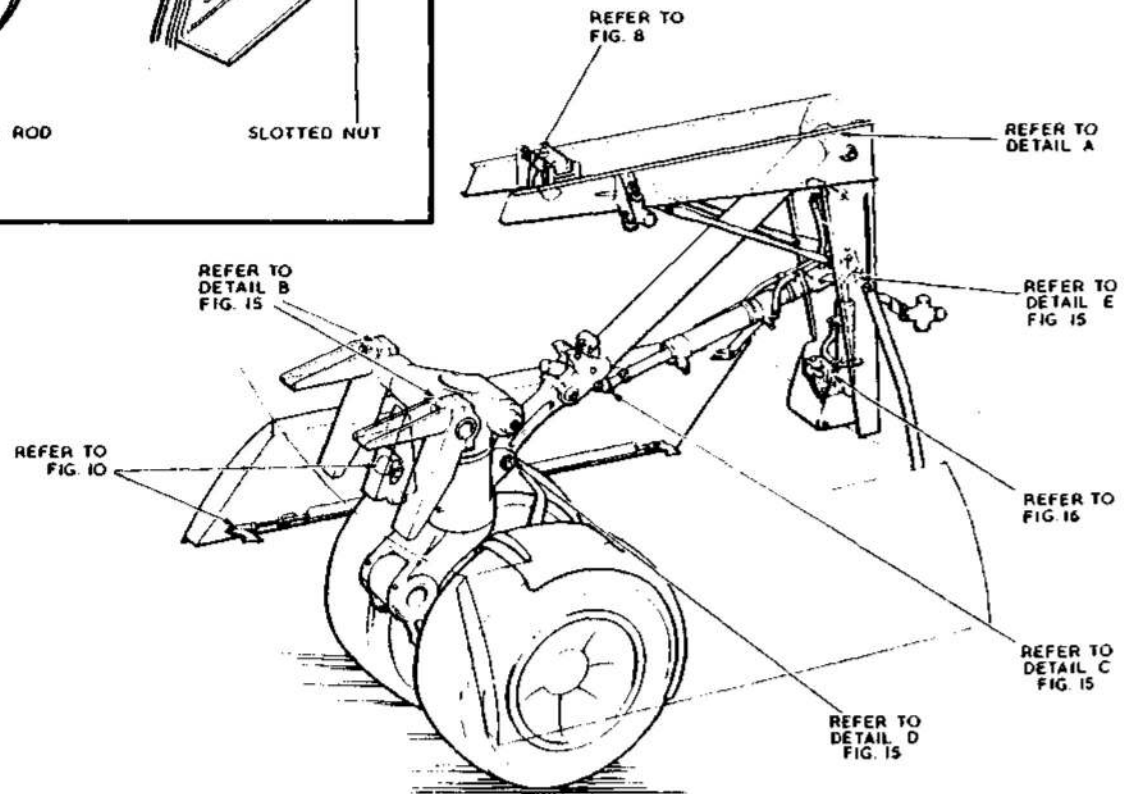
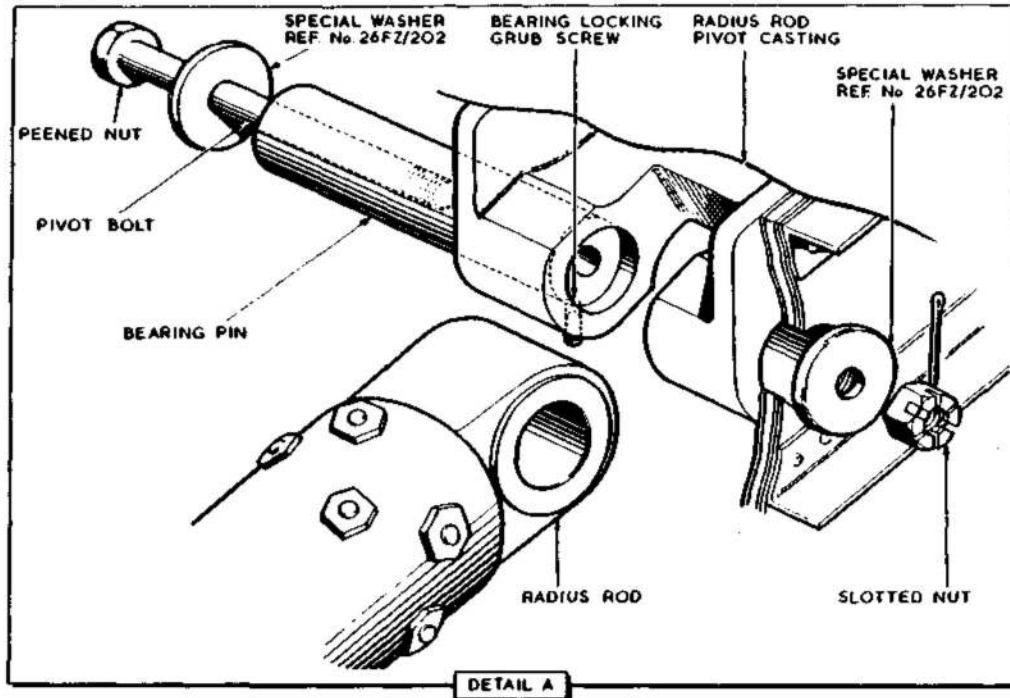
(1) Refit the door jack crosshead between the vertical channel stiffeners on the aft bulkhead, and fit the roller guides over the crosshead rollers using the thirty-eight 2 B.A. bolts, washers and stiffnuts.

(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. 16).

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

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FIG. 14. UNDERCARRIAGE REMOVAL AND ASSEMBLY (I)

◀ lever. Protective treatment (A.P.119A-0509-1), 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. 16).
- (4) Refit the complete jack and release lever mechanism assembly.
- (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. countersunk bolts. Peen the nuts (fig. 16).
- (7) Fit the two 2 B.A. bolts to secure each release lever support bracket to the vertical channel stiffeners (fig. 16). 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. 16).
- (9)

▶◀
- (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 that 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 retraction.

(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. 15, 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. 14, 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 pin and washer, slotted nut and split pin. Refit and tighten the locating grub screw at the head of the pivot pin (fig. 15, 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 (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 pin from the port side, ensuring that its head seats into the locking plate on the port channel stiffener (fig.15, detail E).

(8) Secure the pivot pin 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 total of the two gaps does not exceed 0.015 in. lubricate the assembly and fit the split pin to the pivot pin 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.S520 or S.521. No washer is to be less than 30 s.w.g. (0.012 in.).

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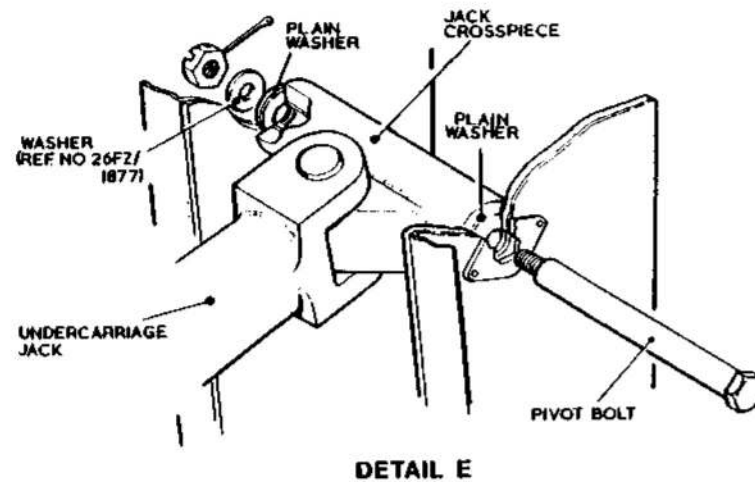
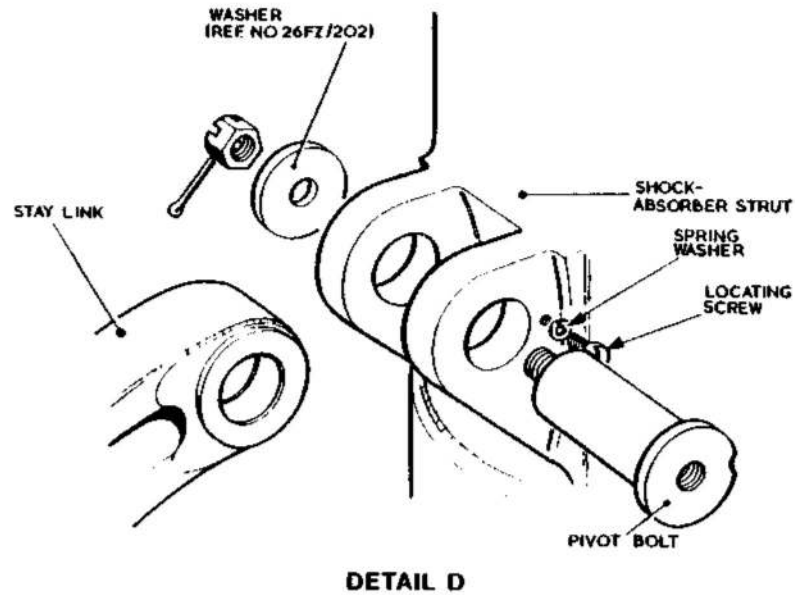
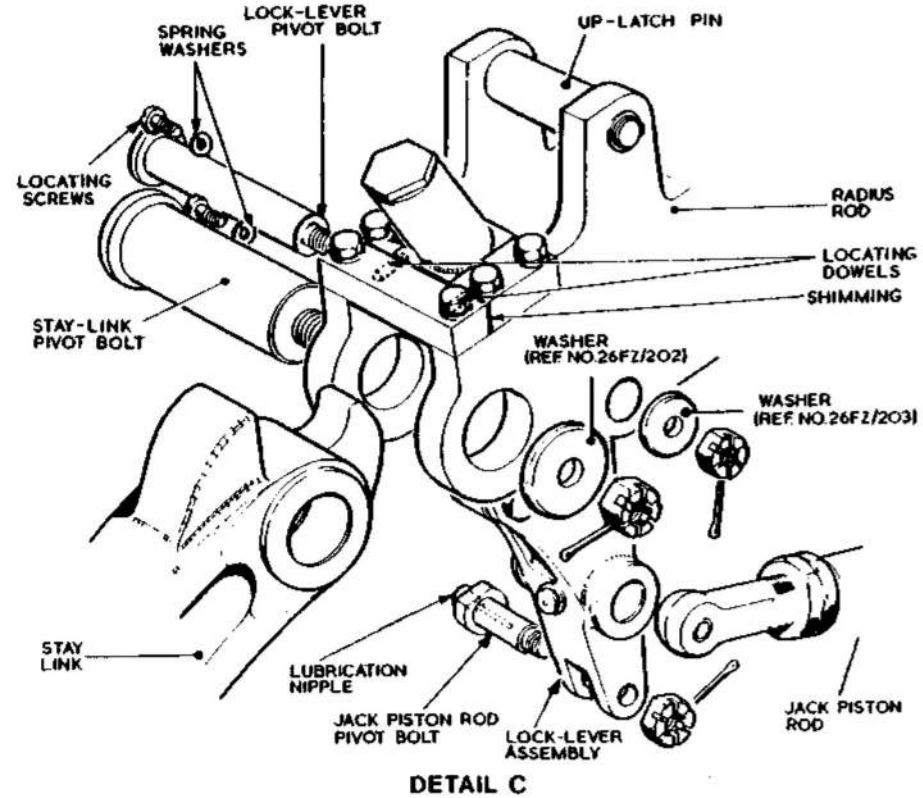
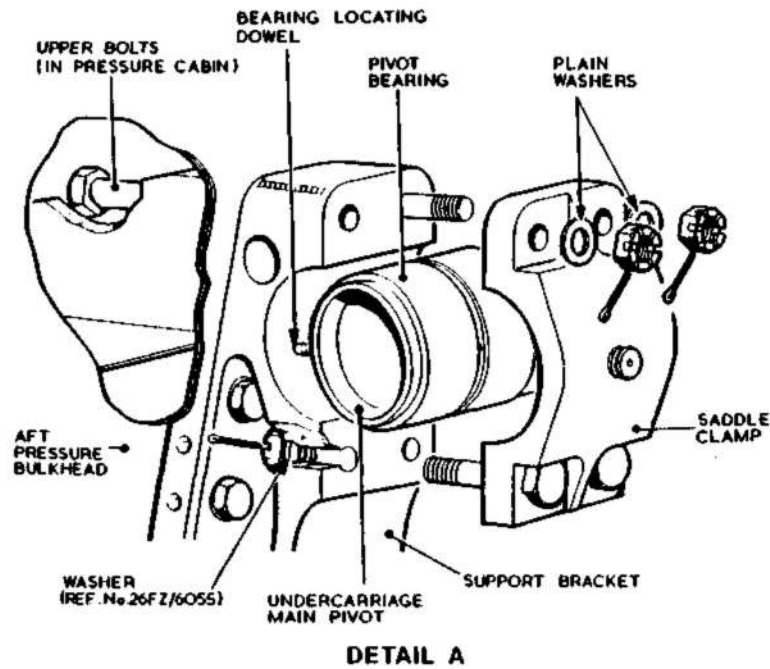


FIG. 15. UNDERCARRIAGE REMOVAL AND ASSEMBLY (2)

(9) Connect the flexible hydraulic fluid pipes to the jack and fit the blocks and clamps to the jack body (fig. 17).

(10) Check that the hydraulic fluid 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. 17).

(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. 15, 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 micro-switches (fig. 13).

(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-wind' (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.

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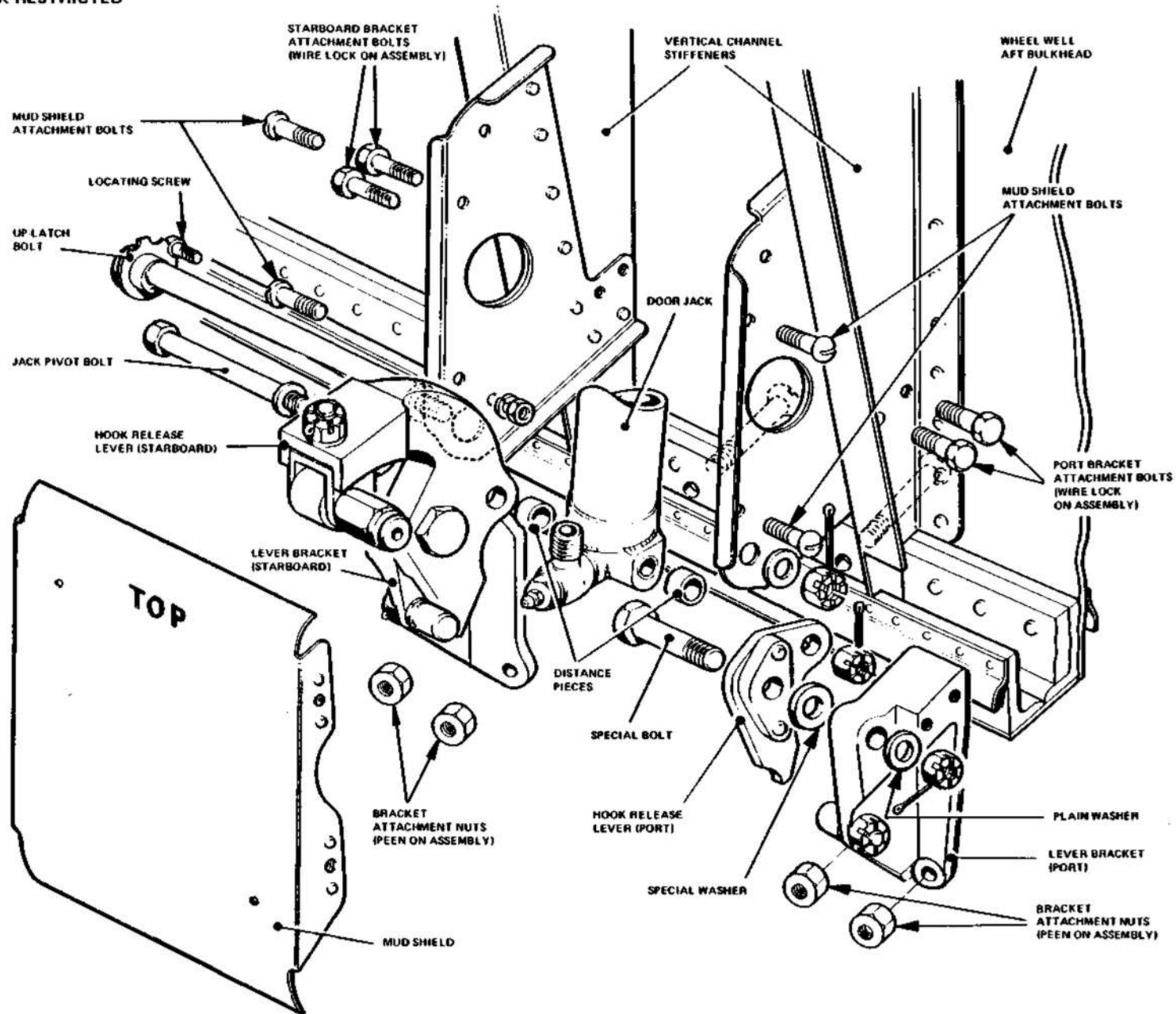
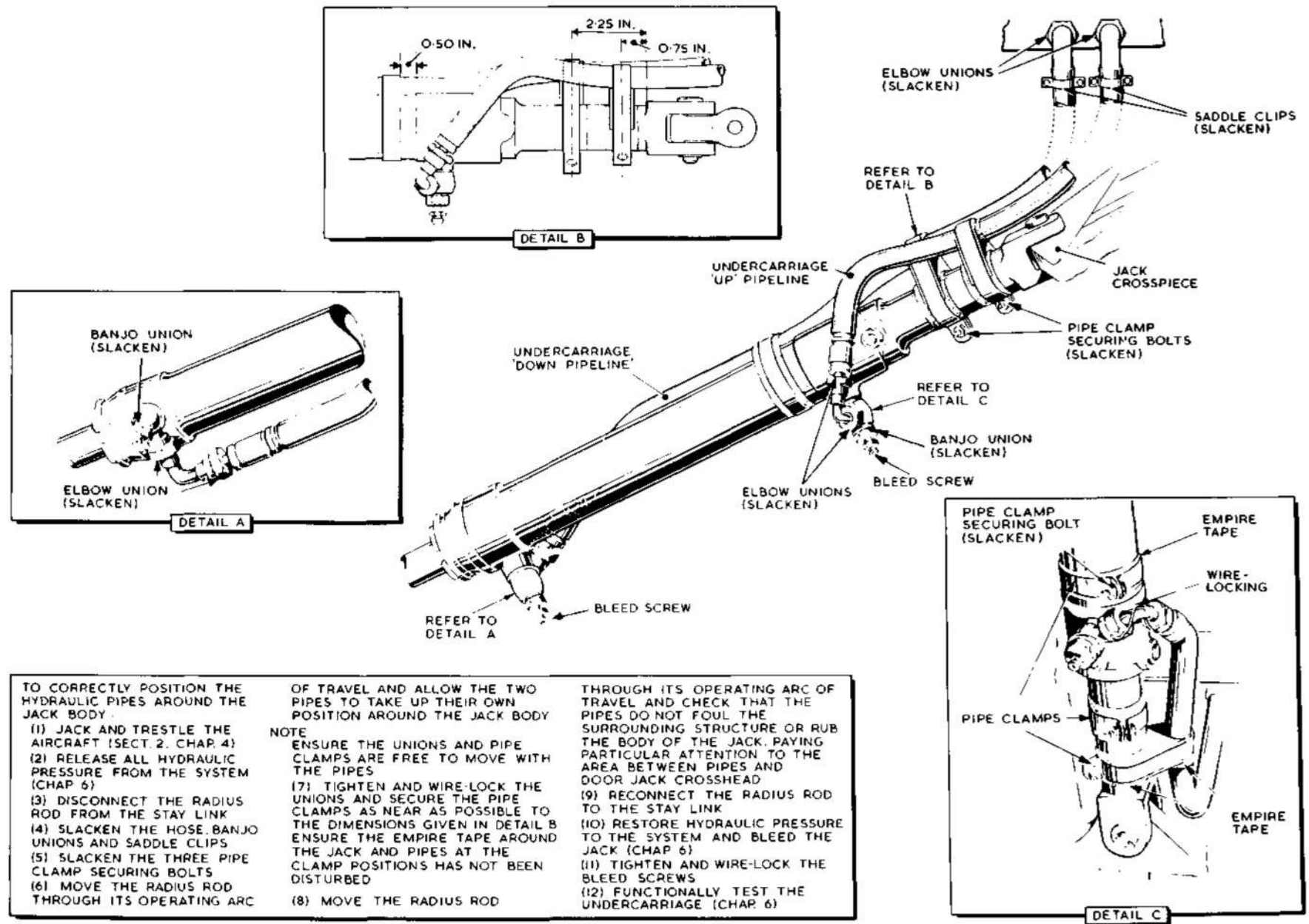


FIG. 16. HOOK RELEASE MECHANISM & DOOR JACK REMOVAL

◀ WASHERS FOR MUD SHIELD ATTACHMENT BOLTS DELETED ▶



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

- (7) TIGHTEN AND WIRE-LOCK THE UNIONS AND SECURE THE PIPE CLAMPS AS NEAR AS POSSIBLE TO THE DIMENSIONS GIVEN IN DETAIL B
- (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. 17. UNDERCARRIAGE JACK HYDRAULIC PIPES CLIPPING

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<i>brakes and alighting gear</i>	1	<i>Location of hydraulic units in main</i>	
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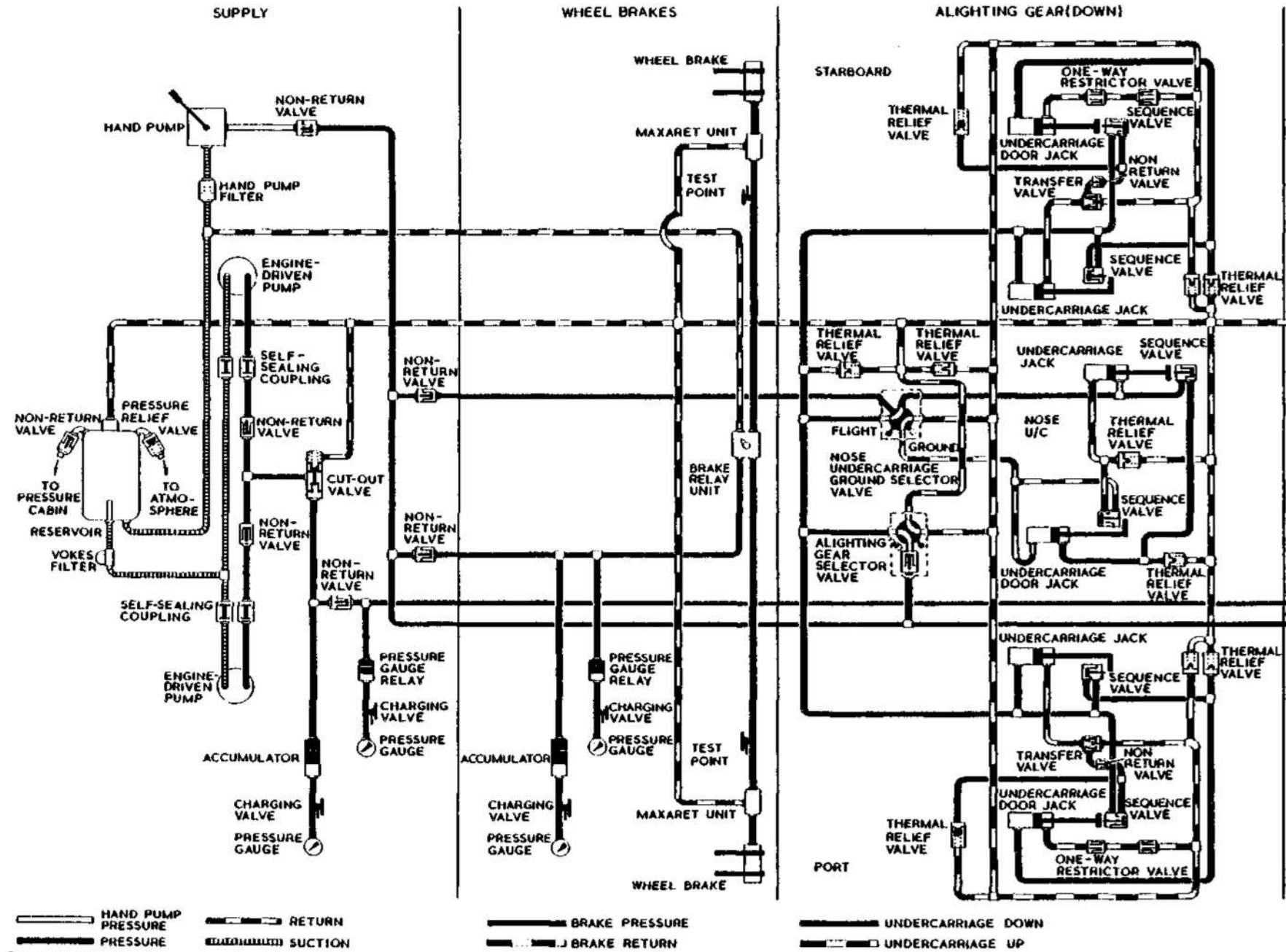


FIG.1. HYDRAULIC SYSTEM DIAGRAM SUPPLY, WHEEL BRAKES AND ALIGHTING GEAR

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Introduction

1. This chapter describes and illustrates the hydraulic system, gives details of the servicing operations and recommends methods for the removal and assembly of principal components. The system provides power for the operation of the alighting-gear, flaps, flare and camera bay-doors, air brakes and wheel brakes.

2. The location of the hydraulic units in the fuselage and main planes is illustrated in fig. 2 and 3 respectively and the system is illustrated diagrammatically in fig. 1. A list of system components, together with the relevant Air Publications, is given in Table 2 at the end of this chapter.

DESCRIPTION

Hydraulic fluid reservoir

3. The reservoir is mounted immediately aft of the rear 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 aft pressure bulkhead ducts cabin pressure to the reservoir, and a non-return valve in this pipeline maintains a maximum pressure difference of $\frac{1}{2}$ lb/in² 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/in², resealing itself when the pressure falls to 8 lb/in²; this blow-off line is led

to a four-way pipe coupling on the fuselage starboard side above floor level. A drip tray is secured to the reservoir and drainpipes from the tray and the filler neck are also connected to the four-way pipe coupling. The fourth connection on the coupling is connected, via a pipe, to a vented fluid collecting box located in the nose wheel bay.

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 starboard wall of the forward camera bay, and deliver it under pressure to the five 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. 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 2700 ± 50 lb/in² and cuts in at a minimum pressure of 2200 lb/in². A gauge mounted on the miscellaneous 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 outboard of rib 1 in the starboard main plane leading edge, and is connected to the power circuit by a branch pipe; it maintains a reserve 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 bulkhead of the starboard wheel well. A second hydraulic accumu-

lator, located on the port side of the forward face of the forward camera bay rear bulkhead, is connected to the pressure line of the 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 just below the accumulator.

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 $\leftarrow 3550$ lb/in²; these valves reseal when the pressure falls to 3100 lb/in² (min). An additional thermal \blacktriangleright relief valve 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, the brake relay control valve, installed in the wheel brake system has a pressure relief valve installed which relieves at 3500 ± 100 lb/in².

Hand pump circuit

7. The hand pump situated at the starboard side of the pilot's seat, will operate the alighting gear, flare bay doors and wheel brakes after the appropriate selection has been made. A non-return valve in the pressure line normally isolates the air brakes, flaps and camera bay doors 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 in the forward camera bay, 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

to operate the flare bay doors and 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 upright panel on the port side of the pilot's instrument flying panel. When a push-button is depressed, the selector valve, located in the roof of the flare bay, is operated by an electrical actuator, and fluid is delivered to the jacks operating the alighting gear and 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 fluid in the jack up circuits is passed through transfer valves and sequence valves to the down side of the jacks. This increases the rate of lowering of the main undercarriage and is especially effective when the hand pump is used to make an emergency lowering. The main undercarriage units are raised, and their doors closed, by retraction of the jack operating rams; the nose undercarriage is raised and its doors closed by the extension of the operating jack rams. Sequence valves incorporated in the circuits ensure that the door and undercarriage unit circuits operate in their proper sequence. A ground-operated selector is fitted in the nose undercarriage circuit to enable it to be retracted independent of the main undercarriage whilst the aircraft is on the ground.

Flaps circuit

9. The flaps are operated by a two-position selector switch marked UP and DOWN, mounted on the port side of the pilot's instrument panel. The switch controls an electrical actuator which operates the flap selector valve mounted in the roof of the flare bay; the selector valve directs

fluid to either end of the double-ended flap jacks. Fluid displaced by the movement of the jacks is returned, via the selector valve and return line, to the reservoir. There is no mechanical linkage between the jacks in the opposite main planes, and to ensure a gradual movement of the flaps, a two-way restrictor valve is incorporated in the down line of the circuit.

Air brakes circuit

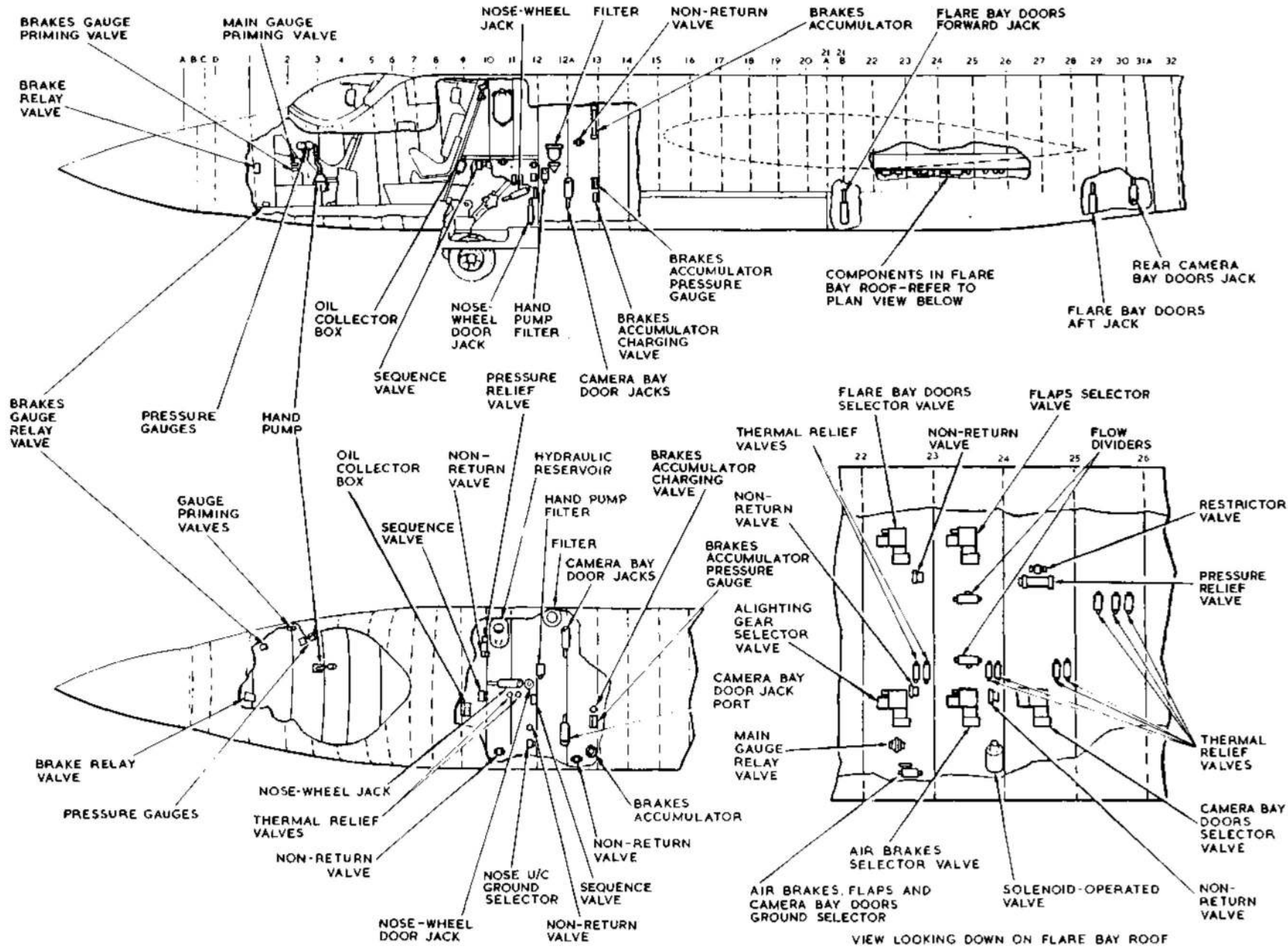
10. This circuit is controlled by a three-position selector switch mounted on the top of the control column; the selector valve is operated by an electric actuator both of which are mounted in the roof of the flare bay. Fluid under pressure is delivered through the selector valve to the jacks operating 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.

11. Three positions, IN, OUT and MID, may be selected for the drag channels, these positions being indicated on the selector switch. The first two positions are obtained by the selector valve directing the fluid to the appropriate end of the jacks, the displaced fluid returning to the reservoir. To obtain the MID position, two microswitches, mounted on a bracket attached to the body of the starboard jack, an electrical relay, and a solenoid-operated valve, located in the OUT pressure line, are employed; the microswitches are operated by cams mounted on the piston-rod of the starboard jack. When MID position is selected from IN, the selector valve is operated as for OUT, and fluid is directed to the piston-rod end of the jack, causing it to retract and extend the drag channels out of the main plane. When half-travel position has been reached, the cams on the piston-rod engage the

microswitches, which complete an electrical circuit and cause the solenoid-operated valve to close and the selector valve to be reversed, directing pressure fluid to the piston end of the jack. The solenoid-operated valve, being closed, prevents displacement of the fluid from the piston-rod end of the jack and so forms a hydraulic lock. Movement of the selector switch to OUT from MID reverses the selector valve and opens the solenoid-operated valve, permitting the jack to retract fully and further extend the drag channels out of the main plane. Selection of MID from OUT operates the selector valve to extend the jacks, and withdraws the drag channels to the half-travel position when, as for outward travel, completion of the electrical circuit causes the solenoid-operated valve to close, and prevent, by the hydraulic lock so formed, further movement. When IN is selected from MID, the solenoid-operated valve opens and permits the flow of displaced fluid from the jack, which extends to the outward limit, withdrawing the drag channels into the main plane. Selection of IN from OUT or vice versa, isolates the microswitch circuit and permits a normal flow of fluid through the system.

Wheel brakes circuit

12. The wheel brakes are applied by a lever on the control column, connected by a Bowden cable to a brake relay control valve on the forward pressure bulkhead, from which pressure proportionate to the movement of the brake lever, is supplied to the brake units. The rudder bar is mechanically connected to the relay control valve to give differential braking when taxiing or when towing the aircraft; by this means the pressure actuating either brake unit is varied by the position of the rudder bar. The brake relay control valve reduces the system pressure of 2700 lb/in² to 1500 $\frac{+150}{0}$ lb/in² for braking purposes. In the event of excessive



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FIG.3. LOCATION OF HYDRAULIC UNITS IN FUSELAGE

deceleration of the aircraft on landing, automatic Maxaret control units, mounted on the brake torque plates, release the pressure in the brakes and close the brake pressure supply until the wheels regain speed. If after landing, bouncing occurs after the brakes have been applied, the brake pressure is released in a similar manner for a maximum period of 3.5 seconds. A branch pipe from the pressure pipe-line is connected to a pressure gauge located on the miscellaneous instrument panel.

Flare bay doors circuit

13. A two-position selector switch on the electrical control panel, marked OPEN and CLOSED, operates an electrical actuator which controls the selector valve mounted in the roof of the flare bay. Fluid is delivered through the selector valve to the two jacks operating the flare bay doors, and fluid displaced by the movement of the jacks is returned, via the selector and return line, to the reservoir.

Camera bay doors circuit

14. The camera bay door jacks are controlled by a two-position switch, mounted on the pilot's console, marked OPEN; the switch controls an electrical actuator which operates the camera bay doors selector valve in the roof of the flare bay. Fluid is delivered through the selector valve to each camera bay door jack, and fluid displaced by 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 flare door circuits in the event of an electrical fault rendering the actuators inoperative. The alighting gear control is situated on the sloping panel to port of the instrument panel, and the flare doors control on the port wall of the pilot's

station (Sect. 3, Chap. 11). Both controls are linked by cable directly to levers on their respective selector valves and when operated, positively move them to the alighting gear down and flare bay doors open positions, and enable the movement to be completed either by the engine-driven pumps, if the system is otherwise serviceable or, alternatively, by the hand pump.

Nose undercarriage ground selector

16. A manually operated ground selector is mounted on the forward face of the rear bulkhead in 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 operation of the hand pump, independently of the main undercarriage.

Air brakes, flaps and camera bay doors ground selector

17. To enable the air brakes, flaps, and camera bay doors 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 flare bay, has two positions, FLIGHT and GROUND; it is normally wire-locked in the FLIGHT position. In this position the air brakes, flaps, and camera bay doors circuits are isolated from the hand pump by a non-return valve; movement of the selector to GROUND opens a line which bypasses the non-return valve and permits the air brakes, flaps, and camera bay doors to be operated by the hand pump, after the appropriate selection has been made.

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 component, or if the system has been drained or partly drained, the engine-driven pumps must be primed and bled (para.48) and the complete system bled (para. 23).

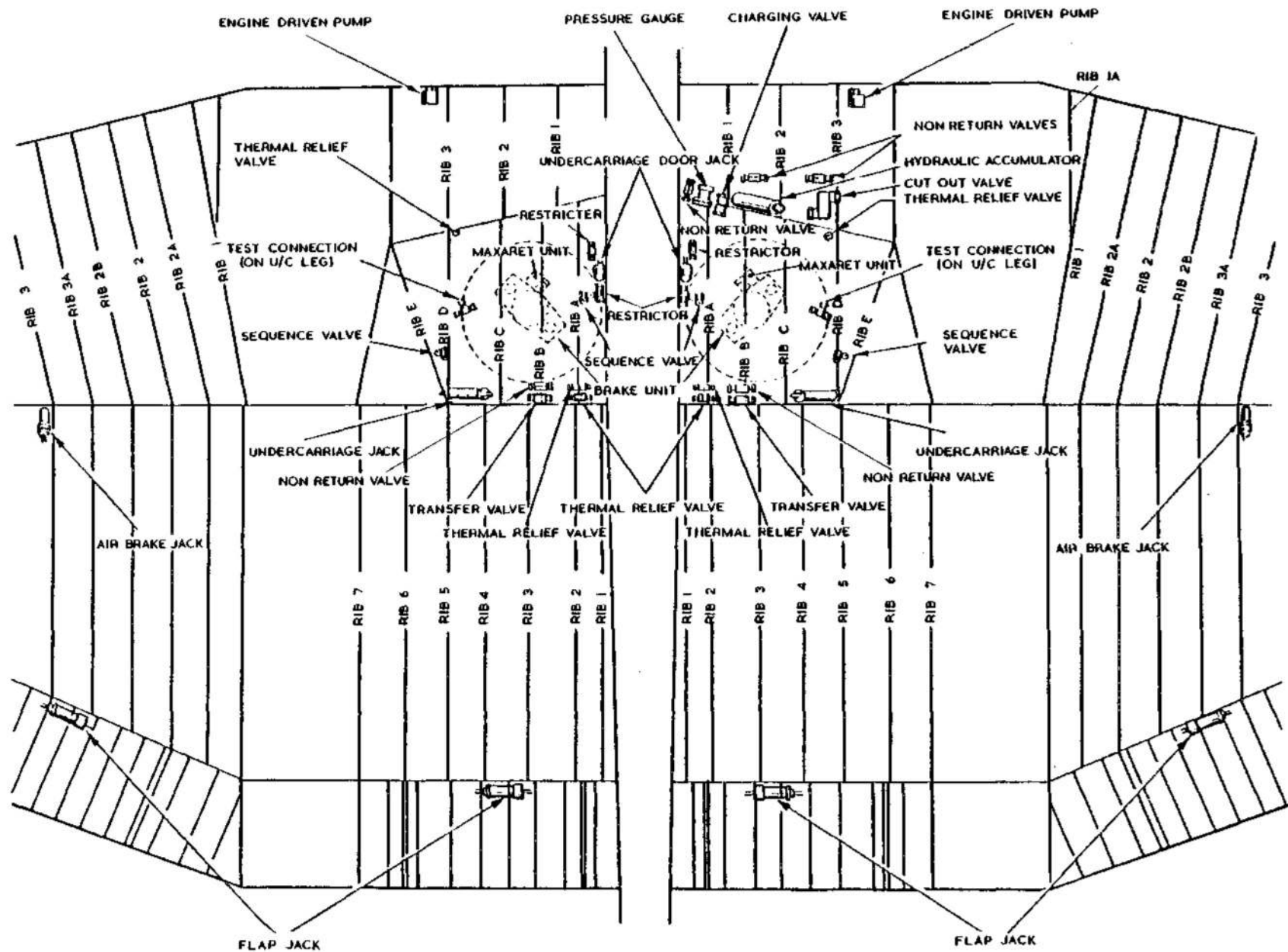
2. During the reassembly of system components, new bonded seals, AGS.1186 are to be fitted to all banjo connections. Care must be taken not to overtighten banjo bolts. (A.P.1803A, Vol. 1, Sect. 2, Chap. 1, Table 1).

General information

18. 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. Hydraulic fluid has a deleterious effect on paint, rubber, electric cables, etc., and care must be taken to avoid spilling it on such parts.

19. 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

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FIG. 4. LOCATION OF HYDRAULIC UNITS IN MAIN PLANES

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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.

Topping up the reservoir

20. The reservoir should be topped up with the alighting gear down, the flare bay doors open, and with the accumulator hydraulic pressures exhausted. Pressure in the main accumulator may be exhausted by operating either the flaps selector switch or the flare bay doors selector switch until no further movement can be obtained on the flaps or flare bay 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 drain pipe is provided for fluid spilt through overfilling.

21. 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 forward face of the forward camera bay rear 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.

Draining the reservoir

22. The reservoir should be drained with the alighting gear and flaps DOWN, the air brakes OFF, and the flare bay doors OPEN.

- (1) Connect an external electrical supply.

- (2) Exhaust the hydraulic pressure as detailed in para. 20.

- (3) Select flare bay doors CLOSED, to exhaust any residual pressure.

- (4) Select flare bay 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 torque loading on the bolt.

Filling the system

23. To fill the system:-

- (1) Jack the aircraft with the wheels clear of the ground (Sect. 2, Chap. 4).

- (2) Examine the gauze filter in the neck of the reservoir, and clean it if necessary. Fill the reservoir to the maximum possible level with fluid OM-15; a drain pipe is provided for fluid spilt through overfilling.

- (3) Break the locking wire and move the air brakes, flaps, and camera bay doors ground 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, camera and flare bay doors, bleeding air through the respective jack bleed screws and topping up the reservoir until the system is full.

Draining the system

24. 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 by the hand pump.

Charging the accumulators

25. The main accumulator charging valve is located in the starboard undercarriage well, and the wheel brakes accumulator is on the face of the forward camera bay rear bulkhead; the pressure gauges, recording the accumulator pressures, are adjacent to the charging valves. The accumulators are to be inflated, with all hydraulic pressure exhausted (para. 20), to the pressures given in the Leading Particulars.

Filling the pressure gauge lines

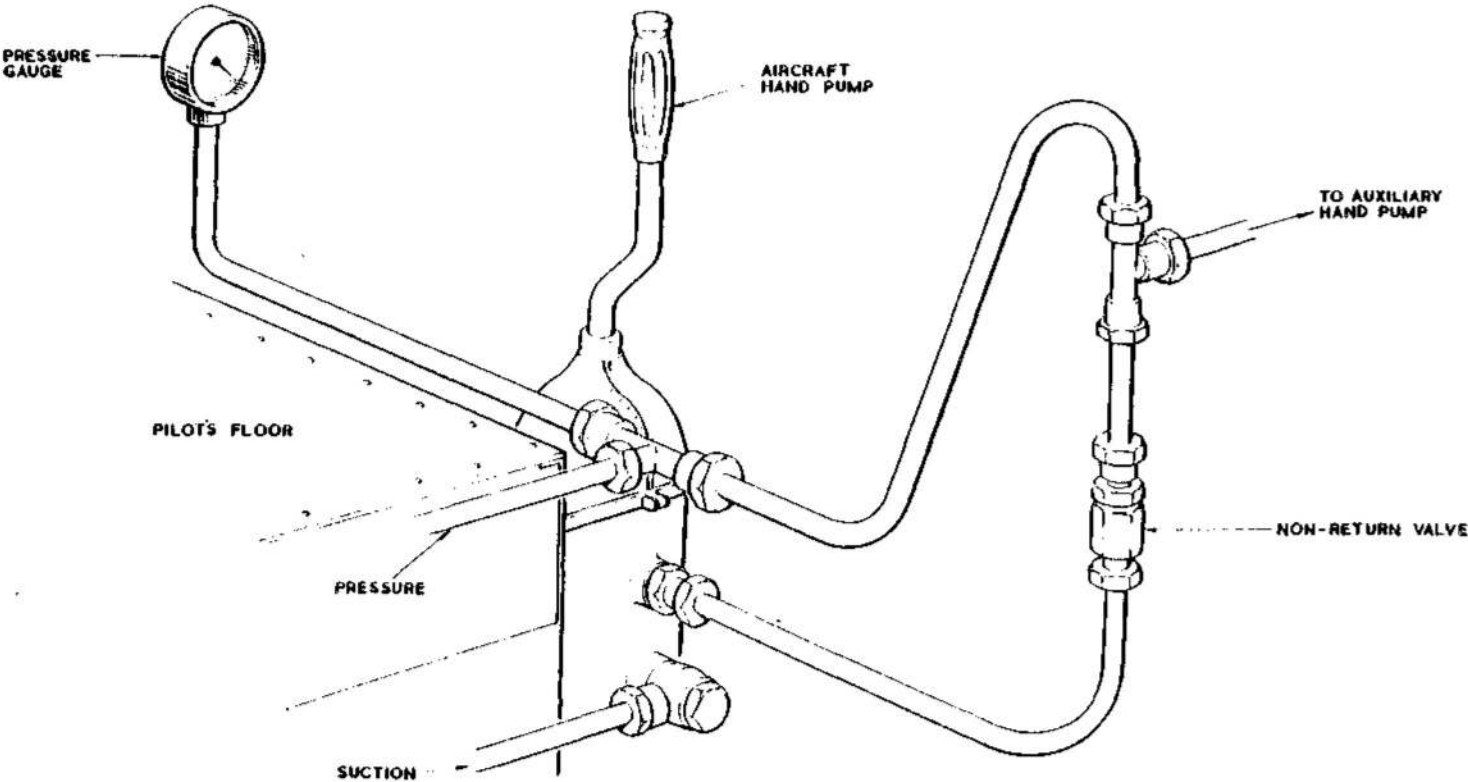
26. The pipelines to the main and wheelbrakes pressure gauges are to be filled with fluid OM-15. A Gyp Type A58 inflation valve, located on the aft face of frame 2 starboard side, is provided to fill the main pressure gauge line, and a similar inflation valve, located adjacent to the main gauge inflation valve, provides the wheel-brakes pressure gauge line with the same facility. The following equipment (Sect.2, Chap.4) is required:-

- (1) Portable hydraulic hand pump rig with a ◀ 0-3500 lb/in² pressure gauge Ref. No.4G/4420034 ▶

- (2) Charging valve adapter Ref. No. 4G/6246.

27. The following operations apply to both the main and the wheel brakes pressure gauge pipelines. To fill the gauge pipelines with fluid:-

- (1) Exhaust the hydraulic pressure from the



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FIG.5. AUXILIARY HAND PUMP CIRCUIT

main and the wheel-brake accumulators, as instructed in para. 20.

(2) Remove the locking wire, and slacken the priming plug of the gauge relay; located between frames 22 and 23 on the port wall of the flare bay for the main pressure gauge, and between frames 1 and 2 beneath the nose ramp, for the wheel brakes pressure gauge.

(3) Remove the screwed cap of the charging valve at frame 2 and attach the flexible pipe, with adapter, from the hand pump rig, to which the pressure gauge is fitted.

(4) 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 priming plug.

(5) Slacken the pipe union at the aircraft pressure gauge. Operate the pump until clear fluid flows from the pipe union, and tighten the union.

(6) Build up a pressure of 2500 lb/in² and note that the aircraft and rig pressure gauges each register this pressure.

(7) Gradually slacken the pipe union at the aircraft pressure gauge and allow the pressure to fall to zero. Tighten the pipe union.

(8) Remove the adapter from the charging valve, and replace the screwed cap.

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 Vol. 1, listed in Table 1.

Automatic cut-out valve setting

29. The cut-out valve (Lockheed AIR 43634) is to be set to cut out at $2700 \begin{smallmatrix} +50 \\ -0 \end{smallmatrix}$ lb/in². 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. To adjust the cut-out and cut-in pressures.

Preliminary adjustment

30.

(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 $2700 \begin{smallmatrix} +50 \\ -0 \end{smallmatrix}$ lb/in² is obtained.

Leakage test

31.

(1) Disconnect the test rig from the pump connection and couple to the system connection of the valve.

(2) Apply a pressure of 2700 lb/in²; 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/in²; seepage from the reservoir connection must not exceed 10 cc per minute.

(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/in²; there must be no leakage.

Final adjustment in the aircraft

32.

(1) Install the valve and couple to the aircraft system.

(2) Trestle the aircraft (Sect. 2, Chap. 4) and couple a hydraulic servicing trolley (Sect. 2, Chap. 4) fitted with a Lockheed Mk. 7 or 9 hydraulic pump, to the system.

(3) Fill the system (para. 23) and inflate the accumulators to the correct pressure (para. 25).

(4) Start the servicing trolley, and note that when the valve cuts out, the main accumulator pressure gauge registers $2700 \begin{smallmatrix} +50 \\ -0 \end{smallmatrix}$ lb/in². 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 2200 lb/in². 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.

Important . . .

It is essential that replacement valves are adjusted in accordance with the fore-going instructions before final installation.

Pressure test of the system

33. To pressure test the 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 the operation and bleeding of the jacks. The hand pump of the auxiliary rig must be used only for building up pressure.

- (1) Jack the aircraft with the wheels clear of the ground (*Sect. 2, Chap. 4*).
- (2) Connect an electrical supply to the external supply socket (*Sect. 2, Chap. 2*).
- (3) Uncouple the hand pump pressure pipe at the hand pump and connect an auxiliary hand pump circuit (*fig. 5*).
- (4) Uncouple the delivery pipe at the flap relief valve, adjacent to the flap selector valve in the roof of the flare bay, and blank off the pipe.
- (5) Charge the main accumulator (*para. 25*).
- (6) Charge the wheel brakes accumulator (*para. 25*).
- (7) Move the air brakes, flaps and camera bay doors ground selector (*para. 17*) to GROUND.

(8) Fill the reservoir with hydraulic fluid, OM-15.

(9) Prime and bleed the aircraft hand pump.

(10) With the alighting gear selected DOWN the ground-operated nose wheel selector at FLIGHT, the flare bay doors selector at OPEN, the flaps selector at DOWN, the air brakes selector at OFF, the camera bay doors selector at OPEN, and the wheel brakes parked, use the aircraft hand pump to fill the system and jacks with fluid until pressure commences to build up. Check jack and sequence valve settings.

(11) Top up the reservoir and replace its cap.

Note . . .

The tank cap must be fitted during all the following tests and must not be removed with the alighting gear UP.

(12) Bleed all jack pipe-lines and wheel units at the respective bleed valves or suitable connections on individual jacks.

(13) Build up a preliminary test pressure of 2200 to 2500 lb/in² 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 doors actuating links at the doors 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 possible, but leaving 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) Fully retract the alighting gear door jacks and bleed them.

(18) Select flare bay doors CLOSED and partially close the doors. Bleed the jacks.

(19) Fully close the flare bay doors. Ensure that the jacks are at the end of their strokes and are not straining the doors by checking that there is 0.20 in. clearance between the metal faces of the edges of the doors. The method of adjusting the flare bay doors is given in Sect. 3, Chap. 1.

(20) Select flaps UP, 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. Ensure that they are not strained when in the fully up position (*Sect. 3, Chap. 4*).

(22) Select air brakes OUT, operate the air brakes fully on and bleed the jacks.

(23) Select camera bay doors CLOSED and partially close the doors; bleed the jacks.

(24) Using the auxiliary hand pump, apply a test pressure of 2900 lb/in², or as near as possible to the thermal relief valve operating pressure. Retain this pressure and check the pressure drop; it must not exceed 150 lb/in², during the first 15 minutes. Hold the pressure for a total of 30 minutes and then release.

(25) Lower the flaps, close the air brakes, open

the flare bay doors and lower the alighting gear, recoupling the alighting gear door jacks to the doors before the jacks are fully extended. Reconnect the nose undercarriage door actuating links.

(26) Repeat operation (24).

(27) Disconnect the auxiliary hand pump circuit and connect the hand pump pressure pipe, and also the delivery pipe to the flap pressure-relief valve.

(28) Move the air brakes, flaps, and camera bay doors ground selector to FLIGHT, and wire-lock.

Functioning tests of services

34. With the aircraft jacked and trestled with the wheels clear of the ground (Sect. 2, Chap. 4), and using two Mk. 2A, or 2B, or 2C hydraulic servicing trolleys fitted with Lockheed Mk. 6 engine-driven 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, flaps and camera bay doors GROUND/FLIGHT selector in the roof of the flare bay must be in the FLIGHT position for all power tests.

◀ (1) Connect an external electrical supply (A.P.101B-0422-1B, 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 flare bay doors, camera bay doors, air brakes and flaps. The cut-out valve should cut-in at 2,200 lb/in² (min.) and cut-out when the system pressure has built up to 2700 $\begin{matrix} + 50 \\ - 0 \end{matrix}$ lb/in².

(3) Using both servicing trolleys, retract and lower the alighting gear five times, and check that the mechanical down locks, door locks and indicating lights function correctly (Sect. 3, Chap. 5). The time taken to retract and lower the alighting gear must not exceed fourteen and eight seconds respectively.

(4) Stop the servicing trolleys, release all hydraulic pressure and raise the alighting gear using the aircraft hand pump.

(5) Operate the alighting gear emergency control and lower the alighting gear using the aircraft hand pump. Ensure that the nose undercarriage door hooks engage centrally and check the operation of the main doors and shoot bolts (Sect. 3, Chap. 5A)

Note . . .

To prevent oscillation when lowering the alighting gear by 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 the returning fluid.

◀ (6) Reset the selector actuator and the emergency control (Chap.11). Set the nose undercarriage UP/FLIGHT selector to UP and retract nose undercarriage using the aircraft hand pump. Set the selector to FLIGHT, and using the aircraft hand pump lower the nose undercarriage. Wire-lock the UP/FLIGHT selector in the FLIGHT position. ▶

(7) Using the port servicing trolley only, retract and lower the alighting gear once.

(8) Repeat operation (7) using the starboard servicing trolley only.

(9) Using both servicing trolleys, retract and lower the alighting gear three times.

◀ (10) Check that the alighting gear indicating lights function correctly (A.P.101B-0422-1B, Sect.5, Chap. 1, Group G). ▶

(11) Remove the door jack attachment bolt at the piston end (Sect. 3, Chap. 5A).

(12) Remove the bolt which connects the door check links to the door.

(13) Using both servicing trolleys retract the main undercarriage ensuring that the door jack ram is clear of surrounding mechanisms and structure.

(14) Fold the check links back to remove the pressure from the sequence valve plunger.

(15) With the servicing trolleys still running, select alighting gear DOWN and operate the aircraft hand pump until the undercarriage is locked down.

(16) Partially retract the undercarriage and reconnect the door check links and door jack (Sect. 3, Chap. 5).

(17) Using both servicing trolleys, retract and lower the alighting gear.

(18) Using both servicing trolleys, close and open the flare bay doors and check that the warning lamp is illuminated when the doors are open. The time taken to close and open the doors must not exceed six and five seconds respectively.

(19) Using the port servicing trolley only, close and open the flare bay doors.

(20) Repeat operation (19) using the starboard servicing trolley only.

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(21) Close the flare bay doors and stop the servicing trolleys. Operate the doors emergency control and open the doors by the hand pump.

(22) Reset the flare bay doors emergency control (Sect.3, Chap.11), and using both servicing trolleys close and open the doors.

(23) Using both servicing trolleys, raise and lower the flaps, checking the operation of the position indicator and the synchronization of the port and starboard flaps. The time taken to either raise or lower the flaps should be between fifteen and nineteen seconds.

(24) Using the port servicing trolley only, raise and lower the flaps.

(25) Repeat operation (24) using the starboard servicing trolley only.

(26) Stop the servicing trolleys and release the pressure. Place the air brakes, flaps and camera bay doors ground selector in the flare bay to the GROUND position and, using the aircraft hand pump, raise and lower the flaps once.

(27) Return the ground selector to FLIGHT and wire-lock. Check that the flaps cannot be operated by the hand pump.

(28) Using both servicing trolleys, operate the air brakes OUT and IN, checking the synchronization of the port and starboard brakes. In the MID positions, the inboard and outboard drag channel extensions on one main plane, must not differ by more than 0.50 in. to the extensions of the corresponding sets of channels on the opposite main plane. The time taken to either extend or retract the air brake drag channels should be between 0.5 and 2.5 seconds.

(29) Using each servicing trolley independently, operate the air brakes OUT and IN.

(30) Using both servicing trolleys, select camera bay doors OPEN and CLOSED. The time taken to

either open or close the doors must be 5 seconds for the forward camera bay and 3 seconds for the rear camera bay.

(31) Using each servicing trolley independently, open and close the camera bay doors.

(32) Stop the servicing trolleys and release the pressure. Attach a Turner inflation adapter with associated pressure gauge (Sect.2, Chap.4) to the wheel brake test connections in the hydraulic pipes to the brakes.

(33) Start the servicing trolleys and, with the wheel brakes off and the rudder bar central, check that the wheels are free to rotate.

(34) Using the brake lever, apply the brakes progressively and, with rudder bar central, check that at intermediate positions the pressures at each brake do not vary considerably from each other and that when the brakes are full on there is a steady pressure of 1500 ± 50 lb/in² at each brake.

Note . . .

For all pressures from zero to 1000 lb/in² the pressure gauge readings must be within 100 lb/in² of each other; for all pressures from 1000 to 1500 lb/in² the readings must be within 150 lb/in² of each other.

(35) Apply full port rudder and check that the pressure at the port brake remains at 1500 ± 50 lb/in² and the pressure at the starboard brake falls to zero.

(36) Apply full starboard rudder and check that the pressure at the port brake falls to zero and the pressure at the starboard brake returns to 1500 ± 50 lb/in².

(37) Repeat operation (34).

(38) Release the brake lever, remove both main wheels and with the rudder bar central, use the

brake lever to apply the brakes. Spin each Maxaret wheel by hand quickly in the direction of the arrow, check that the brake pistons operate and that the brake discs come 'on'. Stop each Maxaret wheel abruptly and check that the brakes come 'off' immediately and that the indicator rods pop out. Refit the main wheels.

(39) Remove the Turner inflation adapter and pressure gauge from both wheel brake test connections.

(40) Place the air brakes, flaps, and camera bay doors ground selector in the flare bay to the GROUND position, and check that all services can be operated by the hand pump.

(41) Move the air brakes, flaps, and camera bay doors ground selector to the FLIGHT position and check that the air brakes, flaps and camera bay doors cannot be operated by the hand pump.

35. After the functioning tests are satisfactorily completed the following operation must be carried out:-

(1) Disconnect the external electrical supply.

(2) Disconnect the servicing trolleys and connect the aircraft engine-driven pumps at the self-sealing couplings.

(3) Bleed the pumps (para.28) and top up the reservoir (para.20).

(4) Reseal the emergency release cables at the aft pressure bulkhead (Sect.3, Chap.8A).

(5) Wire-lock the air brakes, flaps, and camera bay doors ground selector, and the nose under-carriage ground selector, in the FLIGHT position.

(6) Refock and seal the alighting gear and flare bay door emergency release handles (Sect.3, Chap.11).

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TABLE I

Faults and Remedies

◀ The more common faults and their remedies are listed in this table, faults in individual components are covered in the appropriate publication listed in Table 2 ▶

Fault	Possible Cause	Remedy
(1) Engine-driven pump and hand pump fail to operate the system	No fluid in the system Leakage in the system	Refill the system Correct the leak and refill the system
(2) Engine-driven pump drive shears	Pump dry Excessive pressure due to foreign matter in system Hammering of the automatic cut-out	Change the engine-driven pump (Table 2) Drain the system and replenish with clean fluid Renew the automatic cut-out (Table 2)
(3) All services inoperative by engine-driven pumps but services can be operated by the hand pump	Engine-driven pump drives sheared Foreign matter in the filter By-pass valve in the automatic cut-out leaking	Refer to (2) Remove the filter and clean it Renew the automatic cut-out (Refer to (2))
(4) Spongy action on hand pump	Air in particular service Faulty non-return valves	Bleed the affected service and test Renew the affected non-return valves
(5) All services inoperative by hand pump	Hand pump worn or damaged	Renew the hand pump (Table 2)
(6) Flaps droop, or spring back from the lowered position	Jack piston rod glands leaking Non-return valve in rotary control valve leaking Air in system	Renew the jack (Table 2) Renew the rotary control valve Bleed the system and test
(7) Flaps return to original position after moving	Jack piston rod glands leaking Leaking rotary control valve Leaking thermal relief valve	Renew the jack (Refer to (6)) Renew the rotary control valve (Refer to (6)) Renew the thermal relief valve (Table 2)
(8) No movement of flaps upon selection, accumulator pressure correct	Actuator fuse blown	◀ Renew the relevant fuse (A.P.101B-0422-1B, 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 Air in system	Remove the restrictor valve and pressure relief valve, and clean them Bleed the system and test
(10) Flare bay doors droop	Jack piston rod glands leaking Non-return valve in rotary control valve leaking Air in system	Renew the jack (Table 2) Renew the rotary control valve (Table 2) Bleed the system and test

TABLE 1 Faults and Remedies - continued

Fault	Possible Cause	Remedy
(11) No movement of flare bay doors upon selection, with accumulator pressure correct	Actuator fuse blown	◀ Renew the relevant fuse (A.P.101B-0422-1B, Sect.5, Chap.1) ▶
(12) Alighting gear doors droop	Door jack piston rod glands leaking Non-return valve in rotary control valve leaking Air in system Incorrect setting of door jack sequence valve	Renew the affected jack (Table 2) Renew the rotary control valve (Table 2) Bleed the system and test Reset affected sequence valve
(13) No movement of alighting gear upon selection, with accumulator pressure correct	Actuator fuse blown	◀ Renew the relevant fuse (A.P.101B-0422-1B, Sect.5, Chap.1) ▶
(14) Wheel brakes inoperative, with accumulator pressure correct	Broken Bowden cable Slack Bowden cable	Renew the Bowden cable Release the cable and adjust
(15) Wheel brakes remain on after brake lever is released	Tight Bowden cable Frayed Bowden cable	Release the Bowden cable and adjust Renew the Bowden cable
(16) Air brakes inoperative upon selection, with accumulator pressure correct	Actuator fuse blown	◀ Renew the relevant fuse (A.P.101B-0422-1B, Sect.5, Chap.1) ▶
(17) Air brake drag channels protrude from mainplane surfaces	Jack piston rod glands leaking Non-return valve in rotary control valve leaking Air in system	Renew the jack (Table 2) Renew the rotary control valve (Table 2) Bleed the system and test
(18) No movement of camera bay doors upon selection, with accumulator pressure correct	Actuator fuse blown	◀ Renew the relevant fuse (A.P.101B-0422-1B, Sect.5, Chap.1) ▶
(19) Incomplete movement of camera bay doors upon selection	Door jack piston rod glands leaking Non-return valve in selector valve leaking Air in system	Renew the affected jack (Table 2) Renew the selector valve (Table 2) Bleed the system and test
(20) Hammering of the automatic cut-out	Air in the system Leaking non-return valve Broken secondary spring Leaking rotary control valve Restriction in pressure line	Bleed the system and test Renew the automatic cut-out Renew the affected rotary control valve Flush the pressure line - renew if damaged

TABLE I Faults and Remedies – continued

Fault	Possible Cause	Remedy
(21) Slow movement of services	Insufficient air pressure in the appropriate accumulator due to leakage at inflation point	Stop the leak, re-inflate and test
(22) Sluggish movement of a particular service with correct accumulator pressure	Air in system	Bleed the system and test

Note . . .
Fault (22) may be apparent only in flight, or with one engine at idling rev/min, and not when using the servicing trolleys.

REMOVAL AND ASSEMBLY

General information

36. 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. The removal, assembly and adjustment of the flare and camera bay door jacks is given in Chap. 1, the air brakes and flap jacks in Chap. 2 and the alighting gear jacks in Chap. 5.

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. 48) and the complete system bled.

2. When reassembling hydraulic pipes Part 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

37. To remove the reservoir:—

(1) Drain the reservoir (para. 22).

(2) Disconnect all the remaining pipes from the reservoir, and blank off all exposed pipe ends and apertures.

(3) 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, 3/4 in. x 1/8 in. x 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 bolt 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

38. To remove the main accumulator:--

- (1) Exhaust all hydraulic pressure from the system (para.20).
- (2) Release the air pressure by depressing the Schrader unit in the charging valve.
- (3) Disconnect and blank off the air charging pipeline and the hydraulic pipeline at the accumulator.
- (4) 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, 3/4 in. x 3/8 in. x 10 in. long, are attached to the accumulator with rubber-resin cement at the retaining strap positions.

Wheel brakes accumulator

39. Removal and assembly operations for this accumulator are the same as for the main accumulator (para.38).

Automatic cut-out valve

40. To remove the automatic cut-out valve:--

- (1) Exhaust the system of hydraulic pressure (para.20).
- (2) Disconnect and blank off the pressure pipelines and the return to reservoir pipeline.
- (3) Remove the three retaining bolts and remove the cut-out valve.

Filter

41. To remove the filter:--

- (1) Exhaust the system of hydraulic pressure (para.20).
- (2) Drain the reservoir (para.22).
- (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 starboard side of the forward camera bay.
- (5) Lift the filter out of the retaining ring and remove the filter.

Hand pump

42. To remove the hand pump:--

- (1) Exhaust the system of hydraulic pressure (para.20).
- (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

43. To remove the brake relay control valve:--

- (1) Exhaust the system of hydraulic pressure (para.20).
- (2) Drain the system (para.24).
- (3) Disconnect the four pipe lines at the control unit.
- (4) Disconnect the Bowden cable.
- (5) Disconnect the operating lever from the rudder lever.
- (6) Remove the bolts securing the control unit to the mounting bracket on the aft face of the forward pressure bulkhead; 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. When a new cable is to be fitted the nipple end may require dressing to suit the control valve. Extreme care must be used during this process to ensure the cable is not kinked or its strands damaged.

Assembly

44. Before fitting the brake relay control valve to the aircraft, blow out the pipe-lines to the brake units, then:--

- (1) Bolt the control valve to the mounting bracket on the forward pressure bulkhead and connect the four pipe-lines 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.
- (4) Ensure that the main hydraulic pressure is 2700 lb/in².
- (5) With the aircraft wheels jacked clear of the ground (Sect. 2, Chap.4), and with the rudder bar central, apply the hand brake lever and adjust the Bowden cable to give a brake pressure of 1500 \pm 150 $\frac{0}{0}$ lb/in² on the Turner gauges. Release the brakes and ensure that the pressure falls to zero and that the wheels are free to rotate.
- (6) Apply full port rudder and check the

pressures registered on the Turner gauges; they should be:—

Port — $1500 \pm \frac{150}{0}$ lb/in².

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 — $1500 \pm \frac{150}{0}$ lb/in².

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 lb/in² there should not be more than 100 lb/in² between port and starboard gauge readings. For partly applied brakes at pressures exceeding 1000 lb/in² there should not be more than 150 lb/in² 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.

45. 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

46.

(1) Exhaust the system of hydraulic pressure (*para. 20*).

(2) Remove the appropriate access panel (*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 drain pipe.

(6) Remove the six nuts and spring washers securing the pump to the accessory gearbox, and remove the pump.

(7) Remove the driving quill from the gearbox driveshaft, attach to the blanking cover, and blank off the gearbox aperture.

Assembly

47. To assemble the pump to the accessory gearbox:—

(1) Remove the blanking cover from the gearbox aperture, and retain the gasket.

(2) Lightly smear the pump driving quill with grease XG-271 and insert into the gearbox driveshaft.

Note . . .

Driving quills are supplied with each 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 to the pump. Wire-lock the unions.

(8) Connect the drain pipe to the pump, and wire-lock the union.

(9) Bleed the pump (*para. 48*).

Priming and bleeding

48.

(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/in² in the reservoir.

Note . . .

To pressurize the reservoir, a cap of local manufacture incorporating a Schrader valve and 0-5 lb/in² pressure gauge, may be used. Pressure should be built up slowly to 1 or 2 lb/in².

(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.

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TABLE 2
List of principal components

Component	Description	No. off per A/C	A.P.	Sect.	Chap.
Accumulator	Lockheed, Air 40016	2	1803B	5	1
Maxaret anti-skid unit, port	Dunlop, AC11516	1	◀ 105B-0700-1		
starboard	Dunlop, AC11514	1	105B-0700-1		
Brake relay control valve	Dunlop, AC61762	1	1803S	7	2
Brake unit, port	Dunlop, AH9780	1	104J-1023-1		
starboard	Dunlop, AH9781	1	104J-1023-1		
Gyp inflation valve	High Pressure Components Ltd. A58	6	105B-07225-1		
Cut-out valve	Lockheed, AIR43634	1	105B-07134-1		
Engine-driven pump	Lockheed, Mk.9	2	105B-0110-1		
Filter	Vokes, E 30L/1 in/7915 or Vokes, E 30L/1 in/22537	1	105B-0419-1		
Flow divider	British Messier, 8076/052	2	105B-07468-1		
Gauge relay	Electro Hydraulics, 7391	2	1803F		1
Hand pump	Turner, 77C/1275	1	105B-0217-1		
Jacks					
Air brakes	Dowty, I.03035.001 or I.03036.001	2	105B-0986-16C		
Flare bay doors	Dowty, I.00522.001	2	105B-09261-16		
Flaps	Dowty, 07016Y.C.O.1	4	105B-09266-16		
Main undercarriage	Dowty, 07017Y.C.O.1	2	105B-09264-16		
Main and nose under- carriage doors	Dowty, 08246Y.C.O.1	3	105B-09260-16		
Nose undercarriage	Dowty, 08214Y.C.O.1	1	105B-09263-16		
Camera bay doors, Forward	Dowty, C82447	2	105B-09259-16		
Rear bay	Dowty, C82447	2	105B-09259-16		
Non-return valve	UMC, 703, 704 and 706	6	105B-05113-1		
Non-return valve (pressurisation)	Dowty Rotol 8557	1	105B-07433-16C		
Non-return valve (return line)	Dowty, 5240Y	2	105B-05113-1		
Oil filter unit	Dowty, 2254Y	1	105B-0483-1		

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TABLE 2 List of principal components - continued

Component	Description	No. off per A/C	A.P.
Pressure gauge	6A/2237916	4	◀ 112G-0400-1
Pressure-relief valve:			
Flaps	Dowty, 1034Y, Mk.Q	1	105B-07221-1
Reservoir	Dowty, 2568Y	1	105B-07390-1
Restrictor valve			
Flaps	Dowty, 657Y	1	105B-0003-1
Main undercarriage doors	Dowty, 0337Y. B.O.6	2	105B-07389-1
	Dowty, 06209Y. B.O.1	2	105B-07389-1
Rotary selector valve:			
Air brakes, flaps and camera doors	Dowty, 408Y-BL	3	105B-05117-1
Alighting gear	Dowty, 408Y-BQ	1	105B-05117-1
Flare bay doors	Dowty, 408Y-BR	1	105B-05117-1
Up/flight rotary selector valve:			
Nose undercarriage	Dowty, 01183Y. B.O.2	1	105B-05119-1
Ground/flight rotary selector valve:			
Air brakes, flaps and camera doors	Dowty, 408Y-BN	1	105B-05118-1
Sequence valve:			
Main undercarriage, port	Dowty, 401Y, Mk.L	1	105B-0003-1
Main undercarriage, starboard	Dowty, 401Y, Mk.M	1	105B-0003-1
Main undercarriage door, port	Dowty, 401Y, Mk.K	1	105B-0003-1
Main undercarriage door, starboard	Dowty, 401Y, Mk.J	1	105B-0003-1
Nose undercarriage	Dowty, 401Y, Mk.G	1	105B-0003-1
Nose undercarriage doors	Dowty, 401Y, Mk.H	1	105B-0003-1
Solenoid-operated valve	Dowty Rotol, 6330	1	105B-06112-1
Thermal relief valve	Dowty, 4603Y, Mk.E	13	105B-0738-16 (App.3)
Thermal relief valve	Dowty, C8697Y, Mk.A	2	105B-0738-16 (App.7)
Transfer valve	Dowty, 6790Y, Mk.A	2	105B-0003-1 ▶

Chapter 8 AIR SYSTEMS

	<i>Chapter</i>
CABIN AIR CONDITIONING AND PRESSURIZATION SYSTEM	8A
DE-MISTING SYSTEM	8B

Note . . .

A detailed list of contents will be found at the beginning of each chapter.

Chapter 8A CABIN AIR CONDITIONING AND PRESSURIZATION SYSTEM

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Introduction

1. This chapter describes and illustrates the air conditioning and pressurization systems, gives details of servicing operations and recommends methods of removal and assembly of certain components from the aircraft. The systems provide air for pressurizing and heating the cabin, for pressurizing and cooling the nose radome and for heating the camera windows in the forward and rear camera bays. A diagrammatic layout of the systems is shown in fig. 1; locations of system components are shown in fig. 2 to fig. 6.

2. Details of major components, together with the respective Air Publication references, where applicable, are listed in Table 1 at the end of this chapter.

DESCRIPTION**General information**

3. Air supply for the pressurizing, conditioning and heating is derived from both engine compressors. Cabin pressure is controlled by a pressure controller and combined valve unit, and the temperature by a two-way mixing valve. The pressure controller, in combination with the combined valve unit, control the cabin pressure above 10,000 ft; cabin pressure and atmospheric pressure below this height are approximately the same. Cabin temperature is controlled by a cabin heat control switch mounted on the pilot's starboard instrument panel. The pressure and temperature of the air for heating the camera windows are not controllable by the pilot, the temperature being governed by temperature control valves situated in the vicinity of the cameras. The cabin is insulated by a fibreglass blanket affixed to the inner surface of the fuselage skin.

Air supply*Cabin air conditioning and pressurization*

4. Hot air from the engine compressors passes

into a common duct routed across the fuselage at frame 21, the initial supply from each compressor being controlled by an electrically-operated gate valve installed close to the inboard engine rib in the leading edge of each main plane. A non-return valve is fitted between each gate valve and engine compressor.

5. The temperature of the air delivered to the cabin is governed by a mixing valve electrically controlled by the cabin heat control switch located on the starboard instrument panel; by suitable operation of this switch, air is delivered hot, cooled or cold. Movement of the switch to HOT directs the hot air from the engine compressors through the mixing valve 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, the cold side of which allows the partly cooled air to pass to the compressor side of the cold-air unit. On leaving the compressor stage, the air passes through the secondary cooler installed in the port main plane leading edge, to the turbine stage of the cold-air unit and then, now very cold, through the common delivery duct to the cabin. A relief valve with an outlet to the secondary cooler outlet duct to atmosphere, is incorporated in the line to prevent build up of pressure.

6. The cabin heat control switch can be operated to give any desired temperature, it has a central 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 returned to OFF. The position of the mixing valve is registered on the cabin heat control indicator situated on the miscellaneous instrument panel.

Note . . .

1. No air will be supplied to the cabin unless the gate-valve switches 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. Within the cabin, the common delivery duct passes along the port side to just forward of the pilot's floor, from where branch pipes supply conditioned air through louvres and diffusers to various parts of the pressure cabin.

Radome pressurization**WARNING . . .**

Before removal of the radome (Sect.3, Chap.1) all pressure must be exhausted to avoid injury to personnel and damage to radome fasteners.

8. The radome is constantly pressurized and can only be depressurized by manually operating a pressure relief valve on the port side of the fuselage nose, until all pressure is exhausted. Air for radome pressurizing (fig.4) is taken from a tapping off the cabin supply on the delivery side of the primary cooler. The air is routed to the starboard wheel bay where it passes through a non-return valve, a filter, a pressure reducing valve and an air-drier. From three-way connections between the non-return valve and the air-drier, branch lines lead to a pressure relief valve, an inward vent valve and a ground test connection.

◀ 9. From the air-drier the air passes through a non-return valve and is delivered through the cabin to a four-way connection, located in front of the forward pressure bulkhead (frame 1), and then on to the radome. Branch lines from the four-way connections lead to a bursting disc ▶

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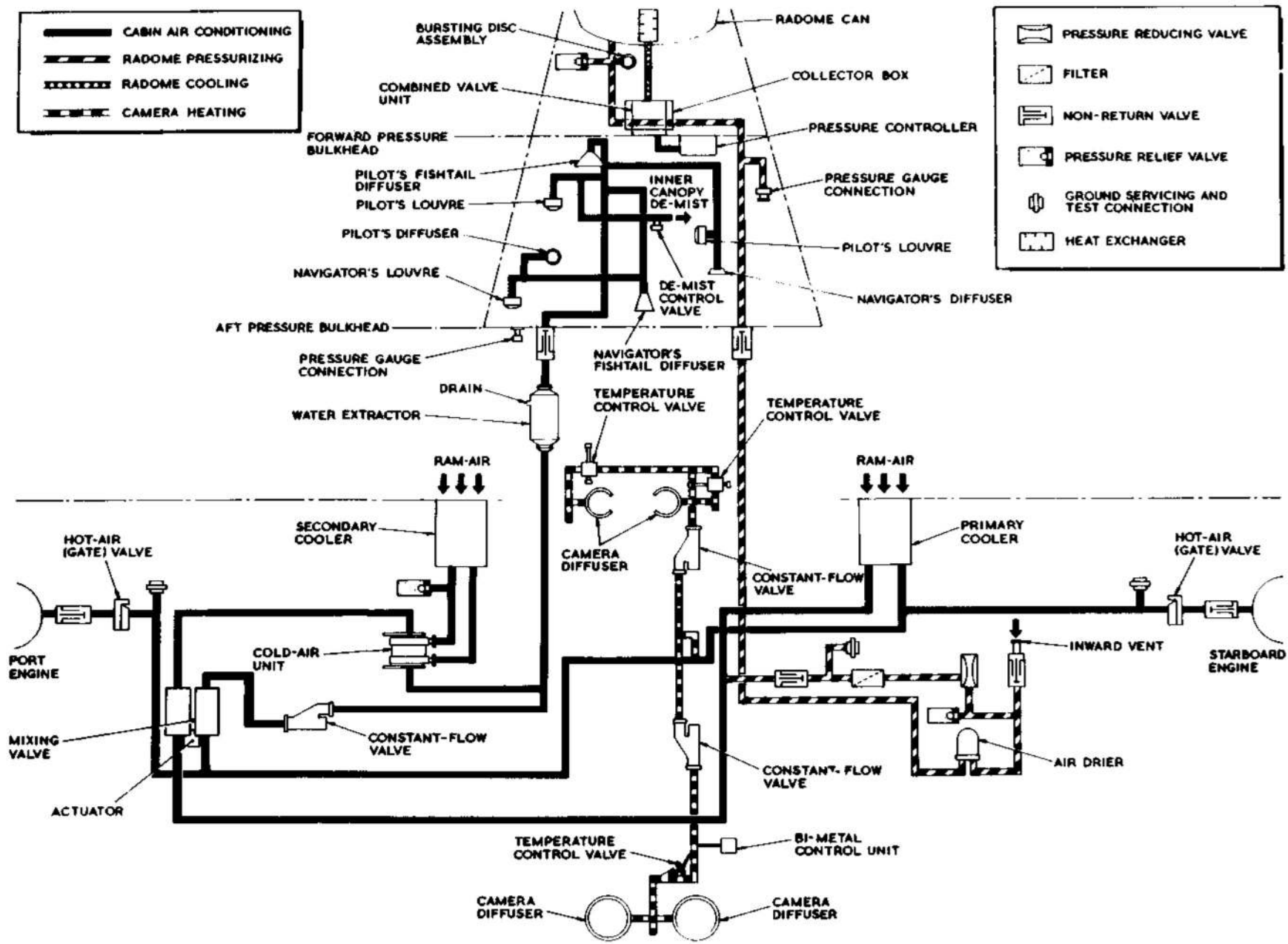


FIG. I. AIR SYSTEM DIAGRAM

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assembly and a manually operated, pressure relief valve.

Radome cooling

10. During flight, the discharge air from the cabin, exhausted through the combined valve unit, is used as cooling air (*fig. 4*) for the radar equipment in the radome. The air is ducted, via a collector box to a heat exchanger located in the top aft end of the radar can.

11. After passing through the matrix of the heat exchanger, cooling air is exhausted from the top of the radar can into the unpressurized air space, between frame A and the forward pressure bulkhead, and vented to atmosphere through vent panels in the port and starboard skins.

Camera heating

12. Hot air for the camera bays is ducted directly from the gate valves at each inboard engine rib; the main air conditioning supply to the cabin is taken from this duct at a tee junction in the port main plane equipment bay. From each main plane the camera heating ducts join a common duct which runs forward, through a constant-flow valve, to the forward camera bay and aft, also through a constant-flow valve, to the rear camera bay. Lagging, secured to the ducts by clips, reduces heat transfer.

13. *Forward camera bay.*— Refer to *fig. 5*. After passing through the constant flow valve, located forward of frame 13, hot air is ducted forward to supply, via piston-type temperature control valves (*fig. 8*) camera window diffuser rings (one each side of the bay), located between frames 12 and 12A. Exposed ends of ducts are sealed with blanking plugs.

14. Should the temperature on either side of the bay rise above a predetermined limit, the thrustat part of the valve expands causing a

piston in the valve body to shut off the supply of hot air to the respective camera diffuser. The contraction of the thrustat, due to a drop in temperature, allows a spring to move the piston in the other direction so that hot air can again flow through the valve to the diffuser.

15. *Rear camera bay.*— Refer to *fig. 6*. Hot air to the rear bay is ducted aft along the starboard side of the fuselage, via a constant flow valve at frame 20, and routed inboard on the aft face of the bulkhead at frame 29, where a branch pipe serves the rear camera bay. The exposed end of the main duct is sealed with a blanking plug. The branch pipe terminates at two diffuser rings, and the bay temperature is governed by a bi-metal thermostat, mounted on the underside of the camera mounting, and an associated spring-loaded shut-off valve. A filter restrictor is fitted in the by-pass line.

16. When the temperature in the camera bay exceeds $8 \text{ deg C} \pm 2 \text{ deg C}$, the bi-metal thermostat seals off the shut-off valve's by-pass pipeline. This results in a build-up of pressure on the diaphragm of the shut-off valve which eventually closes the valve and prevents air supply to the diffusers. Should the bay temperature fall below $8 \text{ deg C} \pm 2 \text{ deg C}$, the bi-metal thermostat will operate and open the by-pass pipeline, resulting in a loss of pressure on the diaphragm of the shut-off valve. The valve now opens under spring action and permits hot air to pass to the diffusers.

Constant-flow valves

17. Three constant-flow valves, each incorporating a removable filter, provide the required constant flow of air from the engine compressors to the cabin and camera bays, for a predetermined altitude and temperature irrespective of engine speed. Air is ducted through the valve filter and into the open end. Inside the support tube it passes between the flow controller and

the orifice body, leaving the valve at the outlet port along the ducting.

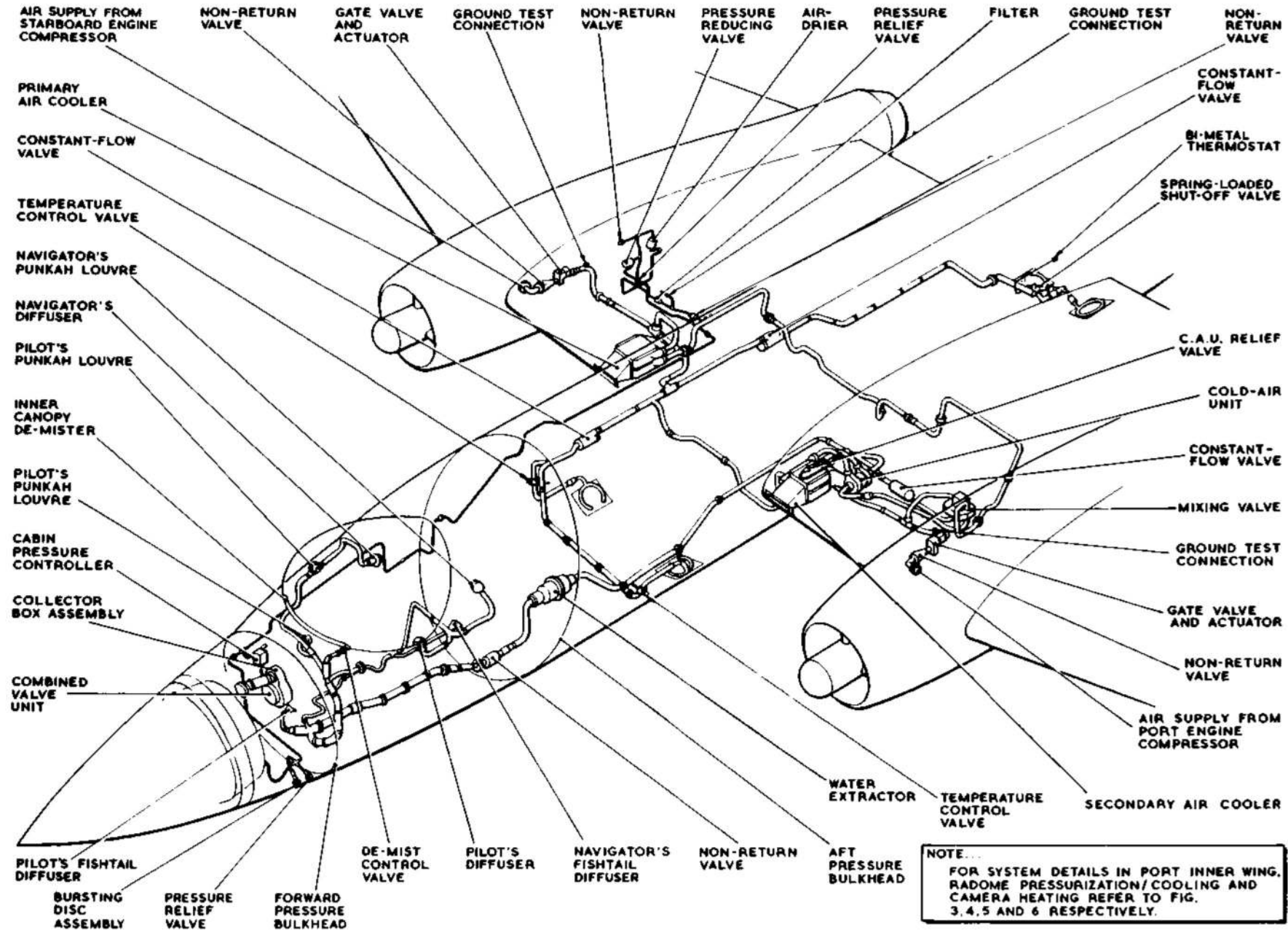
Mixing valve (fig. 7)

18. The mixing valve, installed in the leading edge of the port main plane, consists of a light-alloy body housing two carbon slide valves, each with an inlet port and an outlet port. 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-open at the mild position of the unit. The movement of each slide valve from open to closed is 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 is further cooled in the cold-air unit and the secondary cooler. Mixing occurs down-stream 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 heat switch mounted on the starboard 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, and a cabin heat indicator adjacent to the valve control switch.

Air coolers

19. The primary and secondary air coolers are installed in the starboard and port main planes respectively between the fuselage and rib 1. Ram air enters through the intakes in the leading edge skinning, cools the air passing through the units, and exhausts to atmosphere beneath the main planes.

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FIG. 2. AIR SYSTEM LAY-OUT

◀C.V.U. POSITION CORRECTED▶

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Cold-air unit

20. 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 system from the engine compressors when the cabin heat control switch is at COLD; the unit is inoperative when the hot delivery line is in use.

Pressure controller

21. The pressure controller mounted on the aft face of the forward pressure bulkhead, maintains, in conjunction with the combined valve unit, a cabin pressure greater than atmospheric pressure at 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 on the combined valve unit, thus regulating the discharge of air from the cabin. The unit 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/in² at 25,000 ft and above. Below 10,000 ft cabin pressure and atmospheric pressure are approximately the same. A warning horn is operated by the controller in the event of a serious drop in pressure.

Combined valve unit

22. The combined valve unit, mounted on the front face of the forward pressure bulkhead, regulates the cabin pressure 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/in² both valves will open automatically allowing the excess pressure to vent into the collector box (para.10). 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 relief valve

23. A pressure relief valve, discharging air to atmosphere via the secondary cooler outlet duct, is incorporated in the line between the compressor stage of the cold air unit and the secondary cooler. It is mounted on top of the secondary cooler and operates to prevent pressure build-up of the cold air unit.

Non-return valves

24. A spring loaded non-return valve is incorporated in the system aft of the pressure bulkhead to prevent any back-flow of air through the supply duct in the event of failure of the compressors, cold-air unit, or a leak in the ducting. A non-return valve is also fitted between each gate valve and engine, to prevent back-flow in the event of a single engine failure.

Water extractor

25. A water extractor is installed in the supply duct, aft of the pressure bulkhead, to prevent condensation in the cabin. A drain from the extractor has an outlet in the port side of the fuselage.

Cabin pressure warning system

26. A warning horn, operated by the pressure controller and mounted on the starboard side of the cabin aft of the entrance door, gives audible warning if the cabin pressure should fall to a dangerous level. A warning horn override switch is located on the starboard instrument panel.

Cabin sealing (fig. 11 and 12)

27. The entrance door, pilot's canopy, crew escape hatch, and the joint between the plastic nose and the fuselage are sealed by rubber sealing

strips and bushes (fig. 11). All electrical connections, controls, etc., passing through the pressure bulkhead are also sealed, typical examples of which are given in fig. 12. The sealing of the joints in the cabin structure is made with Peratol and Bostik sealing compounds.

Pilot's cold-air supply (fig. 9)

28. A supply of cold air to the pilot is provided via a small air-scoop on the front fuselage, immediately forward of the canopy, to a punkah louvre at the side of the instrument-flying panel. A simple non-return valve in the ducting prevents air from the pressurized cabin blowing back through the system; the supply may be cut off at the punkah louvre. Any moisture that accumulates in the system is drained away, via a water trap, through a drain hole in the fuselage side.

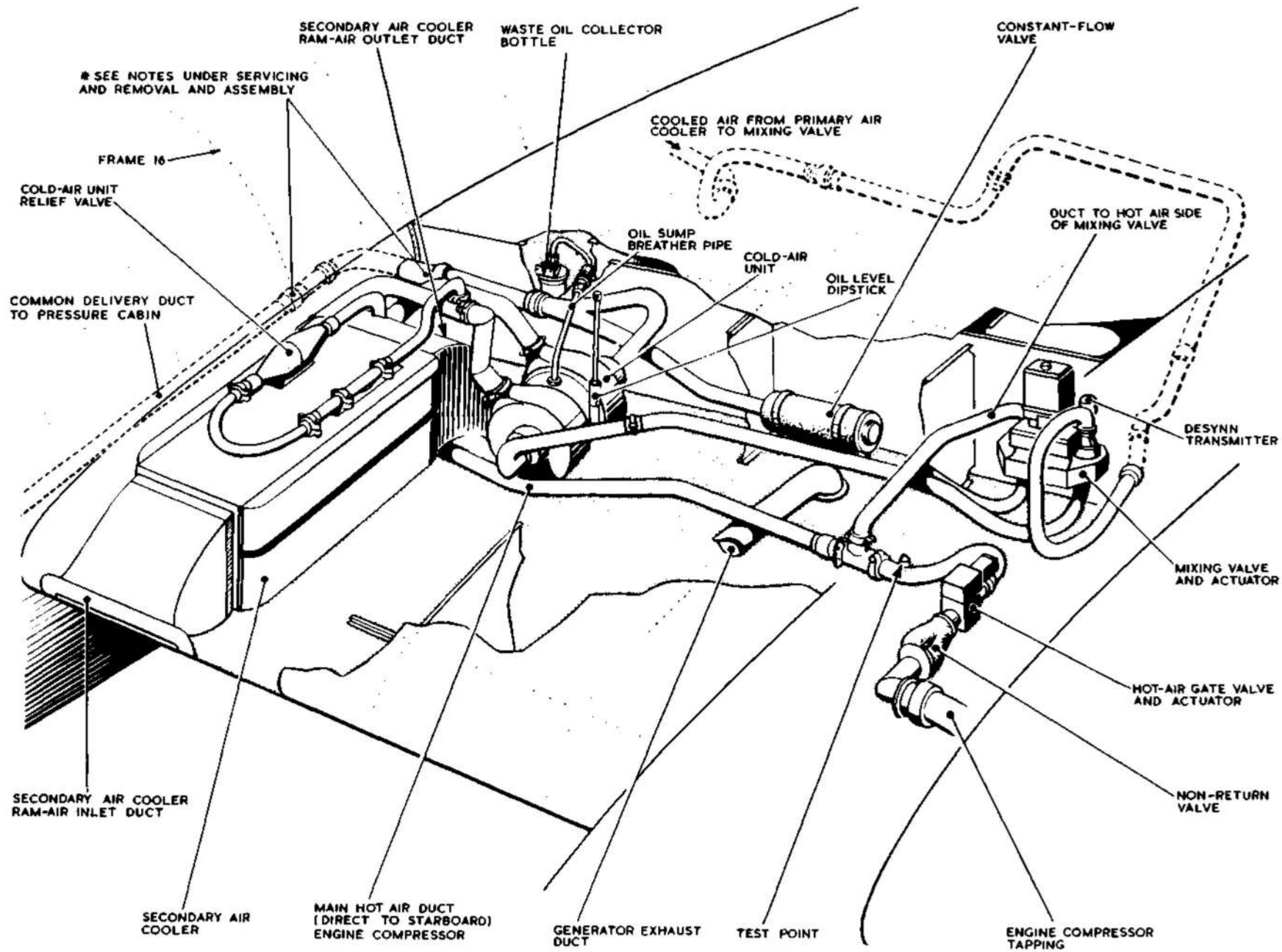
Punkah louvres

29. From the common delivery duct within the cabin, conditioned air is delivered to various parts of the cabin through branch pipes (para. 7) 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 on the rudder pedal guard, the alighting gear control panel and the coaming tube above the entrance door, the navigator's station has one on the port side of the cabin above the chart table.

Diffusers

30. The pilot's and the navigator's stations are each provided with a fish-tail shaped diffuser, located forward of the respective crew member's feet, and a diffuser is fitted to the coaming tube to port of the pilot and also to the inboard edge of the navigator's instrument panel. These latter diffusers may be controlled to deliver either a jet or a diffused flow of air into the cabin by

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FIG.3. AIR CONDITIONING SYSTEM-PORT INNER-WING, LEADING EDGE

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rotation of the diffuser top, they cannot be shut off.

Non-return valve

31. A non-return valve, located in the starboard wheel bay, is fitted in the radome pressure line which is tapped off the main air supply from the primary cooler in the starboard wing. Its purpose is to prevent any back flow to the cabin pressure system during ground testing of the radome pressure system.

Filter

32. A filter, located in the starboard wheel bay, is fitted in the radome pressure line upstream of the non-return valve (*para. 31*). It provides filtered air to a pressure reducing valve (*para. 33*).

Pressure reducing valve

33. This valve is mounted on the outboard structure of the starboard wheel bay. The valve is set to deliver air at $20 \pm 0.50 \text{ lb/in}^2$ absolute (the pressure required for the radome).

Note . . .

The absolute pressure includes normal atmospheric pressure at sea level (14.7 lb/in^2).

Pressure relief valve

34. A pressure relief valve, positioned adjacent to the pressure reducing valve (*para.33*) will, in the event of reducing valve failure, operate to relieve pressures in excess of 19 lb/in^2 gauge, and protect the radome from over pressurization. The relief valve is fitted in the end of a branch line from a three-way connection upstream of the reducing valve.

Air-drier

35. The air-drier (*fig. 10*) secured to mounting brackets on the outboard structure of the

starboard wheel bay, has a circular light-alloy base, drilled to accept inlet and outlet unions. The inlet drilling, which is centrally disposed in the base, carries a hollow stem having drilled holes extending half-way down its length. A cylindrical pack, comprising a transparent casing containing a chemical drying agent and upper and lower filters, completes the assembly. The pack fits over the stem in the air-drier and is retained by a wing nut.

Inward vent

36. An inward vent line, incorporating a non-return valve, is connected to the pressure line between the air drier and the pressure reducing valve. A filter, secured by a Jubilee clip, is fitted to the inlet end of the line. The non-return valve operates to allow air inflow should a pressure differential occur as a result of rapid aircraft descent.

Radome ground test connection

37. A connection for radome ground testing equipment is connected to a three-way connection in the pressure line, between the non-return valve (*para. 31*) and the filter (*para. 32*).

Bursting disc assembly

38. A bursting disc assembly is fitted to the port skin of the fuselage between frame D and the forward pressure bulkhead (*frame 1*) and is connected to the four-way connection in the pressure line. The assembly comprises a frangible disc and retaining washer contained in a body and secured with a hollow nut. A gasket is interposed between the body and disc.

39. Should over-pressurizing occur through malfunction of other components in the system, the disc will burst and relieve the pressure to atmos-

phere, thereby preventing damage to the radome. The disc will burst at $37 \text{ lb/in}^2 \pm 10$ per cent at minus 40 deg C , falling to $27 \text{ lb/in}^2 \pm 10$ per cent at plus 100 deg C .

Manually-operated pressure relief valve

40. To provide for de-pressurization of the radome on the ground, a manually-operated valve, fitted adjacent the bursting disc, is also connected to the four-way connection in the pressure line. The assembly comprises a spring housing, a flanged body, a compression spring and a valve. Within the housing, the spring retains the tapered head of the valve on a seating in the body; the valve stem extends, through a drilling in the body, to the external surface of the fuselage skin.

41. When the valve stem is pressed, the tapered head is lifted from its seating, allowing the pressurized air to escape through the housing and body to atmosphere.

Radome pressure test gauge connection

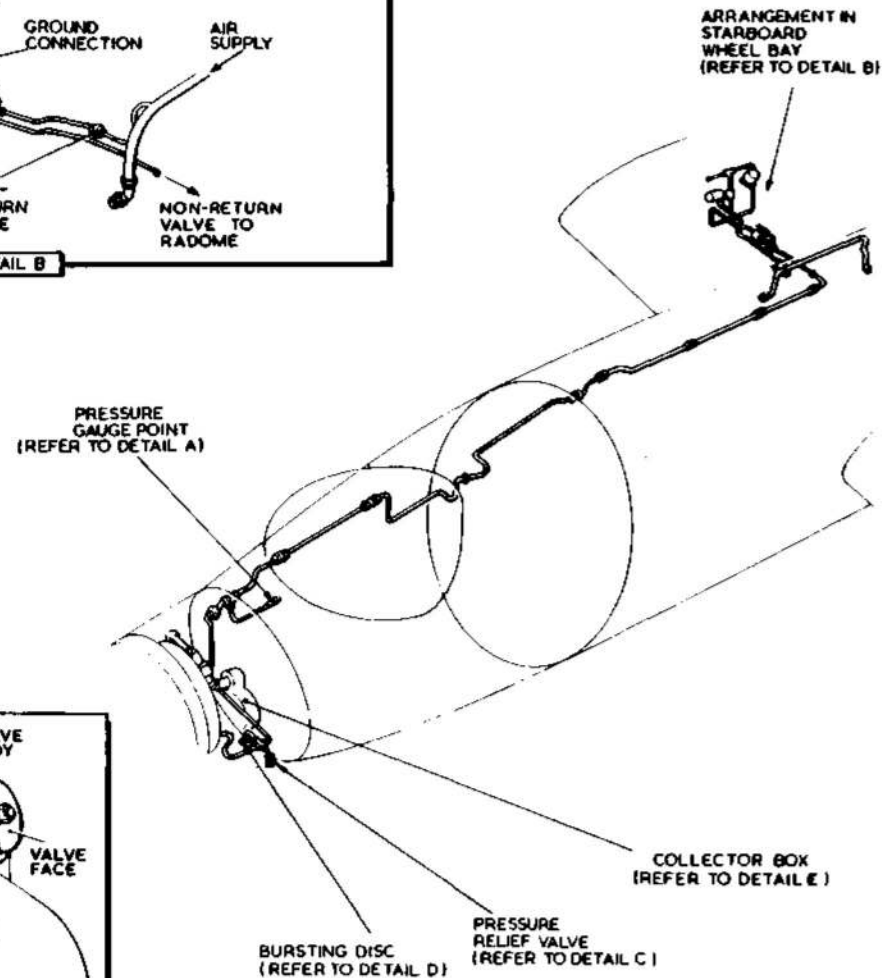
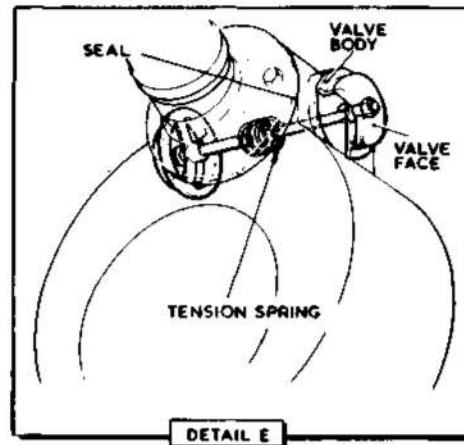
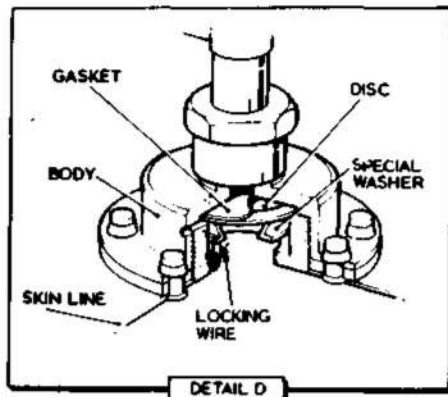
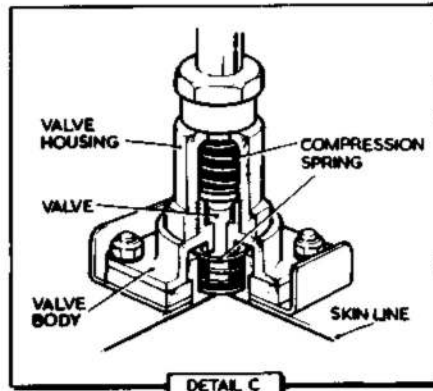
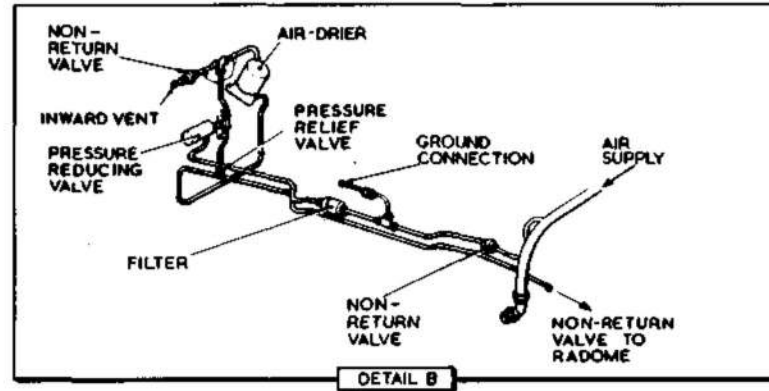
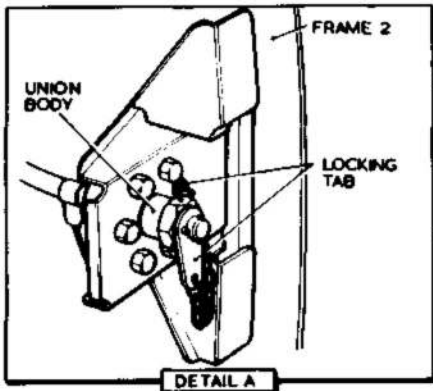
42. A radome pressure test gauge connection is mounted on the starboard side of frame 2. When not in use, a blanking cap is fitted with a chain-anchored locking tag retained by a split pin.

Collector box

43. During flight the collector box is the inlet for the radome cooling system, accepting discharged air from the combined valve unit. The box is mounted over the combined valve unit and bolted to the front face of the forward pressure bulkhead.

44. To prevent malfunction of the combined valve unit, a pressure relief unit is fitted in

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FIG. 4. RADOME PRESSURIZATION AND COOLING

◀ FLAP VALVE REMOVED, COLLECTOR BOX POSITION REVERSED ▶

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the upper part of the box. The unit comprises two diametrically-opposite valve assemblies and a tension spring. Each valve assembly consists of a circular face and a shouldered stem, the stem being retained by nut and split pin. The tension spring is anchored to the end of each valve stem and retains the valve faces in contact with integral seatings on the box. A pressure build-up within the box will overcome the retaining action of the spring and force each valve off its seating, allowing the air to flow from the box through apertures in each seating.

45. Deleted.

46. Deleted.

Heat exchanger

47. This unit is located in the upper part of the radar can and is connected to the air supply duct at a flanged joint in the aft skin of the radar can. The air passes through a matrix in the heat exchanger and is exhausted through twin outlets secured to the structure between frames A and B.

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.

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 pipe ends 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; ensure that the gap between the ends of the clamping ring beneath each clip is between 0.50 in. and 0.70 in.

2. When assembling box-type lagging, ensure that the Jubilee securing clips are not over-tightened which may result in the lagging collapsing. To avoid this, tighten the clips to the stage where they can just be moved by hand.

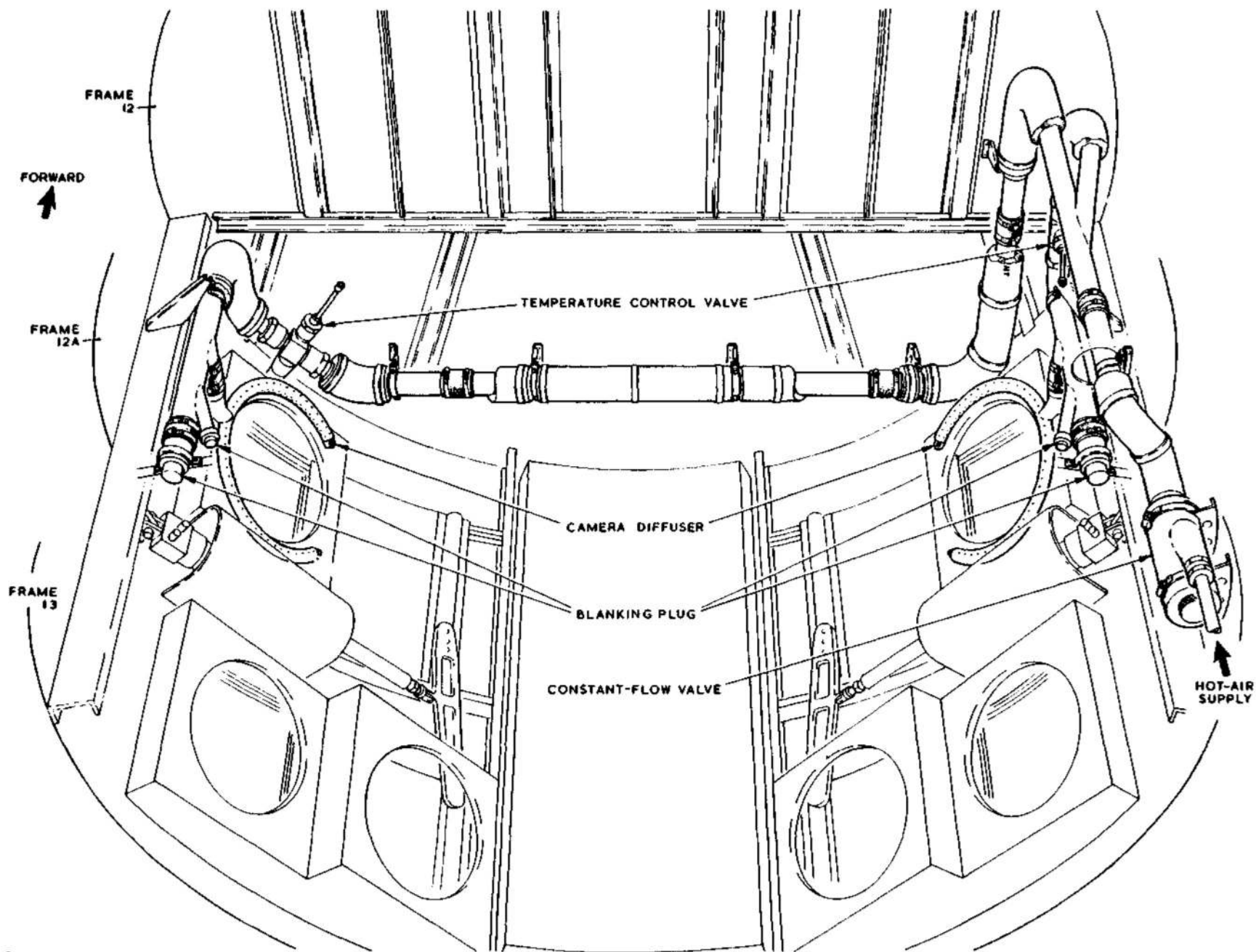
3. To prevent seizure of metal-to-metal couplings molybdenum disulphide anti-seize compound (ZX-38) must be applied to the threads of the unions on reassembly.

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

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FIG.5. AIR CONDITIONING SYSTEM - FORWARD CAMERA BAY

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4 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

48. A test point, positioned in the main supply pipe from the engine, is located in each inner main-plane leading edge, either point may be used for pressure testing the pipe lines of the system. A third test point, and a pressure-gauge connection, fitted on the rear face of the pressure bulkhead and accessible from the nose undercarriage well, are used when pressure testing the cabin.

49. For radome system pressure testing, a test point is positioned in the pressure line, between the non-return valve and filter, in the starboard wheel bay. The connection for an associated pressure gauge is positioned on the starboard side of frame 2 (para.42).

Pressure test of cabin system piping

50. To pressure test the system piping:-

(1) Disconnect the pipes from the mixing valve to the cold-air unit, and the mixing valve to the constant flow-valve, and the delivery pipe at the constant flow valves in the forward camera bay and No.6 tank bay. Disconnect the radome supply pipe from the main supply connection in the starboard wheel bay. Blank off the connection.

(2) Disconnect the delivery pipes from each engine, and blank off the engine apertures.

(3) Securely blank off the disconnected pipe lines.

(4) Connect a test rig incorporating a 0-100 lb/in² pressure gauge to either port or starboard delivery pipe, and open the engine gate valves. Blank off delivery pipe not in use.

Note...

The pressure gauge can be connected to either port or starboard test point.

- (5) Set the mixing valve to the cold position.
- (6) Switch on the test rig, and raise the pressure to 80 lb/in².
- (7) Switch off the test rig, and check the time taken for the pressure to drop to 30 lb/in². This should be not less than 10 min.
- (8) Using an approved soap solution, check all joints and pipelines for leaks.
- (9) Release the pressure, and remove all traces of the soap solution.
- (10) Disconnect the test rig, and reconnect both delivery pipes to the engines.
- (11) Remove the blanks, and reconnect the pipes disconnected in operation (1).
- (12) Close the engine gate valves.
- (13) Return the mixing valve to HOT.

Functional test with test rig

51. To carry out the functional testing of the cabin system:

- ◀ (1) Ensure that the cold-air unit is filled with oil (Sect.2, Chap.2). ▶
- (2) Disconnect the supply pipe at the engine inboard rib in the starboard inner wing leading edge and connect a test rig incorporating a 0-100 lb/in² pressure gauge.
- (3) Disconnect the radome supply pipe from the main supply connection in the starboard wheel bay. Blank off the connection.

- (4) Connect an electrical supply to the external supply socket (Sect. 2, Chap. 2).
- (5) Select fully HOT at the cabin heat control switch, and move the starboard engine gate valve switch to ON. Both these switches are situated on the starboard instrument panel.
- (6) Switch on the test rig to give a pressure of 80 lb/in² to the system, and check that air is flowing into the cabin at all distribution outlets.
- (7) Disconnect the mixing valve to cold-air unit pipe, and check that there is no air flow.
- (8) reconnect the mixing valve to cold-air unit pipe.
- (9) Remove the test rig, reconnect the pipe to the engine delivery pipe, and connect the test rig to the delivery pipe at the port engine inboard rib.
- (10) Select fully COLD at the cabin heat control switch, and switch the port engine gate valve switch ON.
- (11) Switch on the test rig and carry out the flow test (5).
- (12) Visually check that the cold-air unit is running by disconnecting the pipe from the cold-air unit to the water extractor. Reconnect the pipe.
- (13) Remove the test rig, and reconnect the delivery pipe at the port engine inboard rib.
- (14) Select fully HOT at the cabin heat control switch, and move both engine gate valve switches to OFF.
- (15) Disconnect the external electrical supply.

- (16) Reconnect the radome supply pipe.

Preparation for cabin pressure tests

52. Prepare the aircraft for ground cabin pressure tests in the following manner:-

- (1) Check the operation of the warning horn. (As this does not function on the ground the electrical test should be made as detailed in Sect. 5, Chap. 1, Group H).
- (2) Ensure that the canopy, observation panel, and navigator's window air driers are fitted and that vent plugs are removed.
- (3) Remove the blanking cap from the pressure gauge connection on the rear face of the pressure bulkhead, accessible from the nose undercarriage well, and fit a 0 to 10 lb/in² pressure gauge to the connection.

Cabin pressure tests

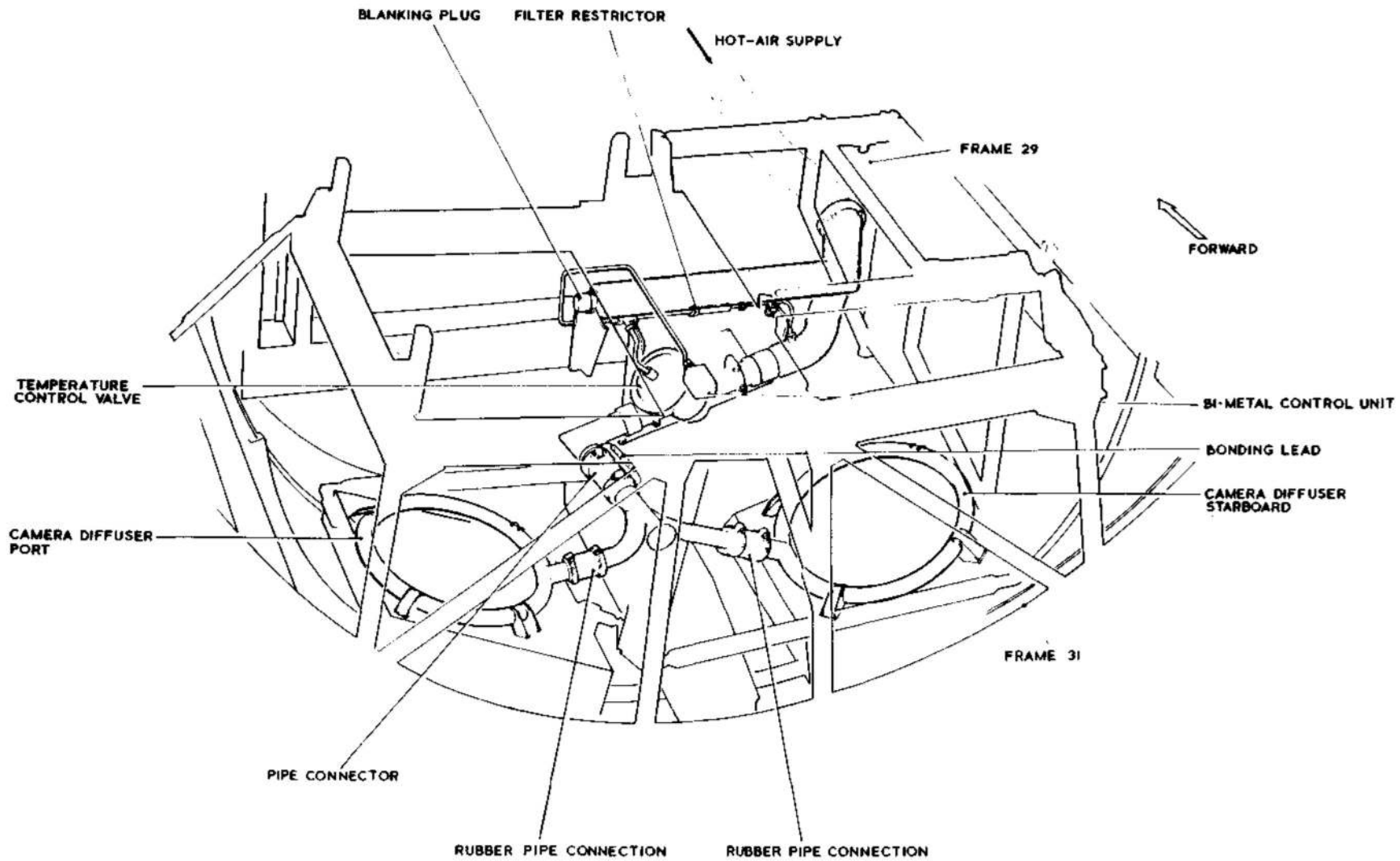
WARNING

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.

Note . . .

During pressure tests, each control passing through the pressure bulkhead must be operated very slowly, at least three times, over its entire range.

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FIG. 6. AIR CONDITIONING SYSTEM-REAR CAMERA BAY

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With test rig

53. The pressure cabin should be tested in the following manner, using the pressure cabin testing trolley (*Sect. 2, Chap. 4*), instructions for the operation of which are given in A.P.2306G, Vol. 1. This test must always be carried out whenever hatches, windows, etc. have been removed and replaced.

- (1) Check that para. 52 has been observed.
- ◀ (2) Remove all static vent plugs, fit static vent blanks (6C/1059239) to cabin pressure system. ▶
- (3) Ensure that the air supply adapter (*Sect. 2, Chap. 4*) is fitted to the delivery hose of the ground testing trolley, and connect the hose to the ground test connection on the rear face of the pressure bulkhead; access is through the nose undercarriage well.
- (4) With all doors and hatches closed, pressurize cabin and record the pressure at which the safety valve cracks open. This pressure is to be 4.4 ± 0.25 lb/in², with an airflow of 5 lb/min.
- (5) Check cabin structure for any signs of permanent distortion and note any leaks.
- (6) Stop the testing trolley and, with a stop watch, note the time taken for the pressure to drop from 3.5 to 1.75 lb/in². This must not be less than 35 seconds.
- (7) Remove the pressure gauge and replace the blanking cap.
- ◀ (8) Remove static vent blanks (6C/1059239), refit all static vent plugs. ▶

*With engines***WARNING**

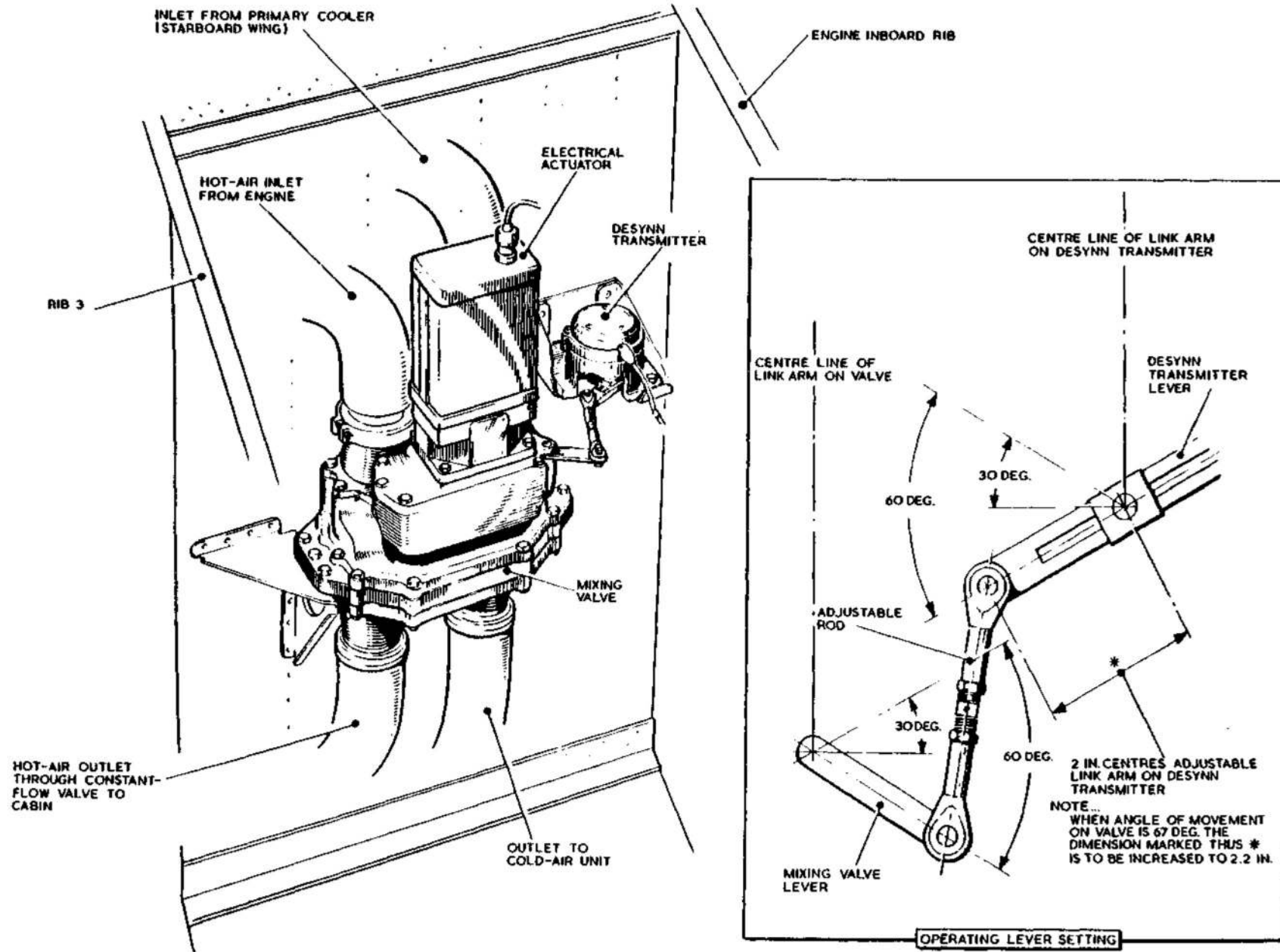
When the aircraft is stationary there is no cooling air flow through the primary and secondary coolers. Prolonged ground running is therefore to be avoided, and, with the engines running (maximum speed 5000 rev/min), the cold-air unit must not be operated for longer than five minutes during any one period. It is permissible, however, to use the cold-air unit whilst taxiing.

54.
 - (1) Check that para. 52 has been observed.
 - (2) Ensure that the cold-air unit is filled with oil (*Sect. 2, Chap. 2*).
 - (3) 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 special plug (*para. 53 (2)*).
 - (4) Before starting the engines, operate the cabin heat control switch to secure full travel of the mixing valve and note the time taken for this operation; the time of operation in each direction should be approximately three seconds. Switch the mixing valve to the cold position.
 - (5) Start the engines, and with the port engine running at 5,500 rev/min and the starboard engine idling, check that air enters the cabin. Operate the cabin heat 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.
 - (6) With the starboard engine running at 5,500

rev/min and the port engine idling, repeat operation (5).

- (7) Close all doors and hatches, and with both engines running at 5,500/6,000 rev/min, carry out the following test:—
 - (a) With temperature at fully HOT check the time of pressure rise to 3.5 lb/in²; this is to be within 60 seconds.
 - (b) With temperature at fully COLD check the time of pressure rise to 3.5 lb/in²; this is to be within 60 seconds.
 - (c) With the port engine idling and starboard engine running at 5,500 rev/min, check that the cabin pressure can be maintained for at least three minutes. Repeat test with starboard engine idling and port engine running at 5,500 rev/min.
 - (d) Switch off the engine gate valves, and with both engines idling check the time of pressure drop from 3.5 lb/in² to 1.75 lb/in²; this must not be less than 35 seconds.
 - (e) At the change of the selector from HOT to COLD, check that there is a change of air temperature entering the cabin. Check that the air is entering at all louvres, diffusers and fishtails.
 - (f) Check that air ceases to enter the cabin when the engine gate-valves are switches off.
- (8) Ensure all pressure inside the cabin has been released, and remove the blanking plug from the pressure controller pipe and reconnect the pipe to the combined-valve unit.
- (9) Close all doors and hatches, select fully

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FIG.7. MIXING VALVE

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HOT, and with both engines running at 5,500 rev/min, check that the cabin pressure does not exceed 1.0 lb/in².

Note . . .

The hot and cold pressurizing are to be regarded as two independent systems. Times and pressures are to be recorded under both headings.

(10) Remove the pressure gauge from the rear face of the pressure bulkhead, and refit blanking cap to the bulkhead connection.

Test after major repair

55. The following tests must be completed whenever replacements of, or repairs to, components affecting the pressure sealing of the cabin have been made. The pressure cabin testing trolley (*para. 53*), fitted with the air supply adapter (*para. 53(3)*) is required.

(1) Check that the operations detailed in *para. 52* have been observed.

(2) Disconnect the pipe which connects the pressure controller to the combined valve unit, at the combined valve unit, and blank off the pipe only using the special plug (*para. 53(2)*).

(3) Connect the delivery hose, fitted with air supply adapter, to the cabin pressure test connection on the rear face of the pressure bulkhead in the nose undercarriage bay.

(4) Close the cabin door and clear vision window, and start the testing trolley.

(5) Pressurize the cabin with an air flow of 5 lb/min. to a maximum pressure of 4.2 lb/in² at which pressure the combined valve unit safety valves should open. Turn off the air supply to the

cabin, check for air leaks and allow the pressure to drop to 3 lb/in².

(6) Check the cabin structure for signs of permanent distortion.

(7) Pressurize the cabin to 3.5 lb/in² and using a stop watch, note the time taken for the pressure to fall to 1.75 lb/in². This should be not less than 35 seconds.

(8) Remove the delivery hose from the ground test connection and refit the blanking cap.

(9) Remove the blanking plug from the pressure controller pipe, and reconnect the pipe to the combined valve unit.

(10) Remove the pressure gauge and replace the blanking cap.

Radome pressure test

Note . . .

The following test must always be carried out whenever the system has been broken down.

56. With the system complete:--

(1) Blow clean, dry air through all pipe lines to ensure removal of any foreign matter.

(2) Disconnect and blank-off the pipe from the bursting disc assembly.

(3) Connect the testing trolley (*para. 53*) to the ground test connection in the starboard wheel bay.

(4) Remove the blanking cap and fit a pressure gauge (*Sect.2, Chap.4*) to the test connection on starboard side of frame 2 in the cabin.

(5) Slowly pressurize the system to 25 lb/in²g and note the reading on the cabin gauge; this should be between 4.5 and 6.0 lb/in².

(6) Slowly increase the supply pressure to 50 lb/in²g and note the reading on the cabin gauge; this should be between 4.5 and 6.0 lb/in².

(7) Slowly increase the supply pressure to 80 lb/in²g and note the reading on the cabin gauge; this should be between 4.5 and 6.0 lb/in².

Note . . .

Operation (5), (6) and (7) are to check for satisfactory operation of the pressure reducing valve.

(8) Stop the testing trolley and, with a stop watch, note the time taken for the pressure to drop from 80 to 30 lb/in²g; this must not be less than 10 min.

(9) Using an approved soap solution, check all joints and pipelines for leaks.

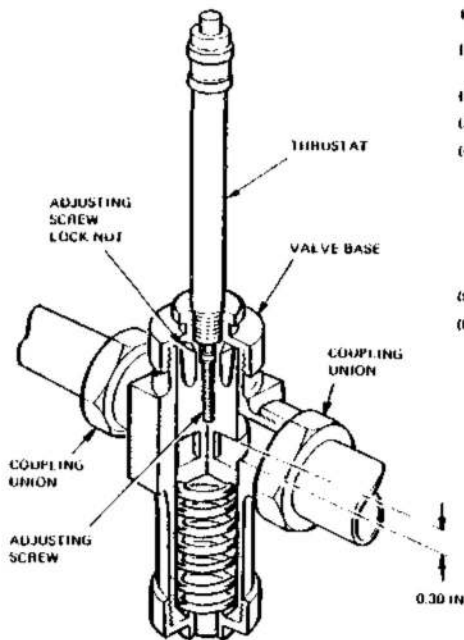
(10) Press the button of the pressure relief valve, forward of frame 1, to ensure that the radome is depressurised.

(11) Remove the pressure gauges (4) and refit blanking cap to test connection at starboard side of frame 2 in the cabin.

(12) Remove the blank fitted at (2) and reconnect the pipe to the bursting disc assembly.

(13) Disconnect the testing trolley from the ground test connection in the starboard wheel bay.

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TO ADJUST THE VALVE PORT OPENING:

- (1) REMOVE THE VALVE FROM THE AIRCRAFT BY UNSCREWING THE TWO COUPLING UNIONS
- (2) UNLOCK AND REMOVE THE VALVE BASE CONTAINING THE THRUSTAT.
- (3) SLACKEN THE ADJUSTING SCREW LOCK NUT.
- (4) TURN THE ADJUSTING SCREW UNTIL THE VALVE PORT OPENING IS 0.30 IN.

NOTE..

IT WILL BE NECESSARY TO REFIT THE VALVE BASE AND THRUSTAT AFTER EACH ADJUSTMENT UNTIL THE CORRECT PORT OPENING IS OBTAINED

- (5) LOCK THE ADJUSTING SCREW.
- (6) REFIT AND WIRE LOCK THE VALVE BASE AND THRUSTAT

TO TEST THE VALVE OPERATION:

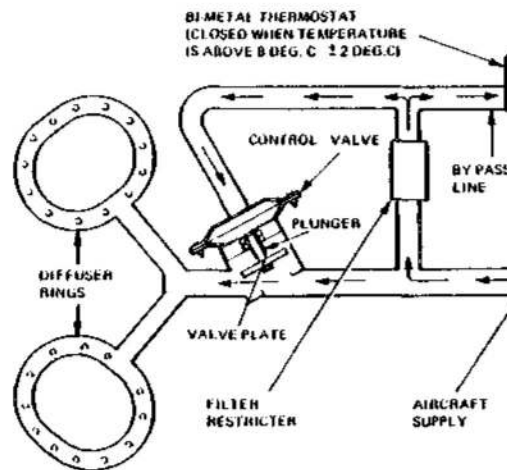
- (1) FULLY IMMERSE THE THRUSTAT INTO WATER AT A TEMPERATURE OF 60 DEG. C \pm 1 DEG. C.
- (2) CHECK THAT THE VALVE CLOSES FULLY IN NOT MORE THAN 90 SECONDS.
- (3) REMOVE THE VALVE FROM THE WATER AND CHECK THAT THE PISTON RETURNS TO THE FULLY OPEN POSITION. THE CHECK MAY BE EXPEDITED BY SUBJECTING THE VALVE TO A CURRENT OF COLD AIR, OR IMMERSING THE THRUSTAT IN COLD WATER.

NOTE..

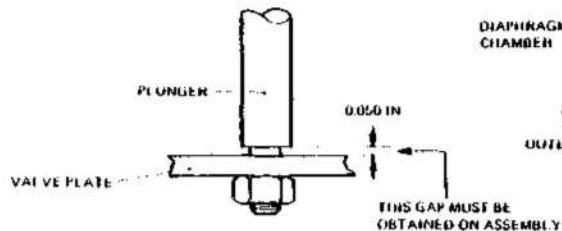
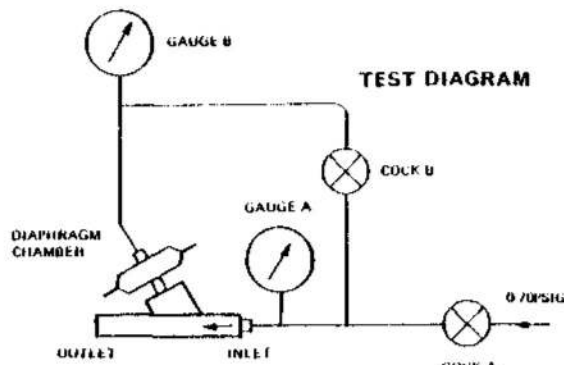
THE THRUSTAT MUST NOT BE ALLOWED TO COME INTO CONTACT WITH A NAKED FLAME.

- (4) REFIT THE VALVE IN THE AIRCRAFT AND LOCK THE COUPLING UNIONS

FORWARD CAMERA BAY



TEST DIAGRAM



REAR CAMERA BAY

TO PRESSURE TEST THE VALVE.

- (1) CONNECT VALVE TO TEST RIG AS SHOWN IN TEST DIAGRAM.
- (2) WITH COCK B CLOSED AND COCK A OPEN, AIR FROM THE RIG SHOULD PASS FREELY THROUGH THE VALVE OUTLET THUS PROVING THAT THE VALVE IS OPEN.
- (3) APPLY PRESSURE TO THE DIAPHRAGM CHAMBER BY OPENING COCK B AND ENSURE THAT VALVE CLOSES AT A DIAPHRAGM PRESSURE (INDICATED ON GAUGE B) NOT EXCEEDING 60% OF LINE PRESSURE (INDICATED ON GAUGE A)
- (4) WITH VALVE CLOSED, PRESSURE TEST TO 70 PSIG.

FIG. 8. TEMPERATURE CONTROL VALVES

◀ PRESSURE TEST PROCEDURE ADDED ▶

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57. Deleted.

Sealing (fig. 12)

Pressure cabin

58. Two alternative types of sealant, Bostik and Peratol, were used for sealing the pressure cabin during manufacture, but on repair, Bostik only should 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.

Emergency release cables

59. The barrel on the pressure bulkhead through which the alighting gear and flare doors emergency release cables pass, houses seven felt washers, which are impregnated on assembly with anti-freezing 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 after repacking with oil.

Constant-flow valves

60. The constant-flow valves are 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

61. Refer to Table 1 for relevant Air Publication.

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

62. 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 1.

Mixing valve

63. Refer to Table 1 for relevant Air Publication.

Temperature control valves

64. Instructions for adjusting and testing the piston-type control valves are given in fig. 8. The spring-loaded shut-off valves and associated bi-metal thermostats (fig. 8) can be checked as follows:

(1) The bi-metal thermostats are adjusted to seal off the shut-off valves by-pass pipeline when the ambient air temperature is above 8 deg C \pm 2 deg C. This is a manufacturer's setting and should not need subsequent adjustment. If a

check is necessary, the thermostat should be removed and cold tested in an instrument bay.

(2) The operation of the spring-loaded shut-off valves can be checked in situ. To do this:-

(a) Disconnect the shut-off valve by-pass pipeline from the bi-metal thermostat.

(b) Apply an air pressure of 5 lb/in² to the inlet side of the shut-off valve and check that air is expelled from the camera diffuser rings on the outlet side of the valve.

(c) Place a finger over the open end of the valve by-pass pipeline; the valve should close and, consequently, seal off the air supply to the camera diffuser rings.

Air-drier

65. When the desiccant in the air-drier changes in colour from blue to pink it is an indication that the desiccant crystals are saturated and require changing. To change the crystals: -

(1) Remove the air-drier pack from the air-drier body by unscrewing the wing nut.

(2) Remove the circlip retaining the bottom filter of the pack, and remove the filter.

(3) Retaining the top filter by finger pressure on its centre tube, empty out the saturated crystals.

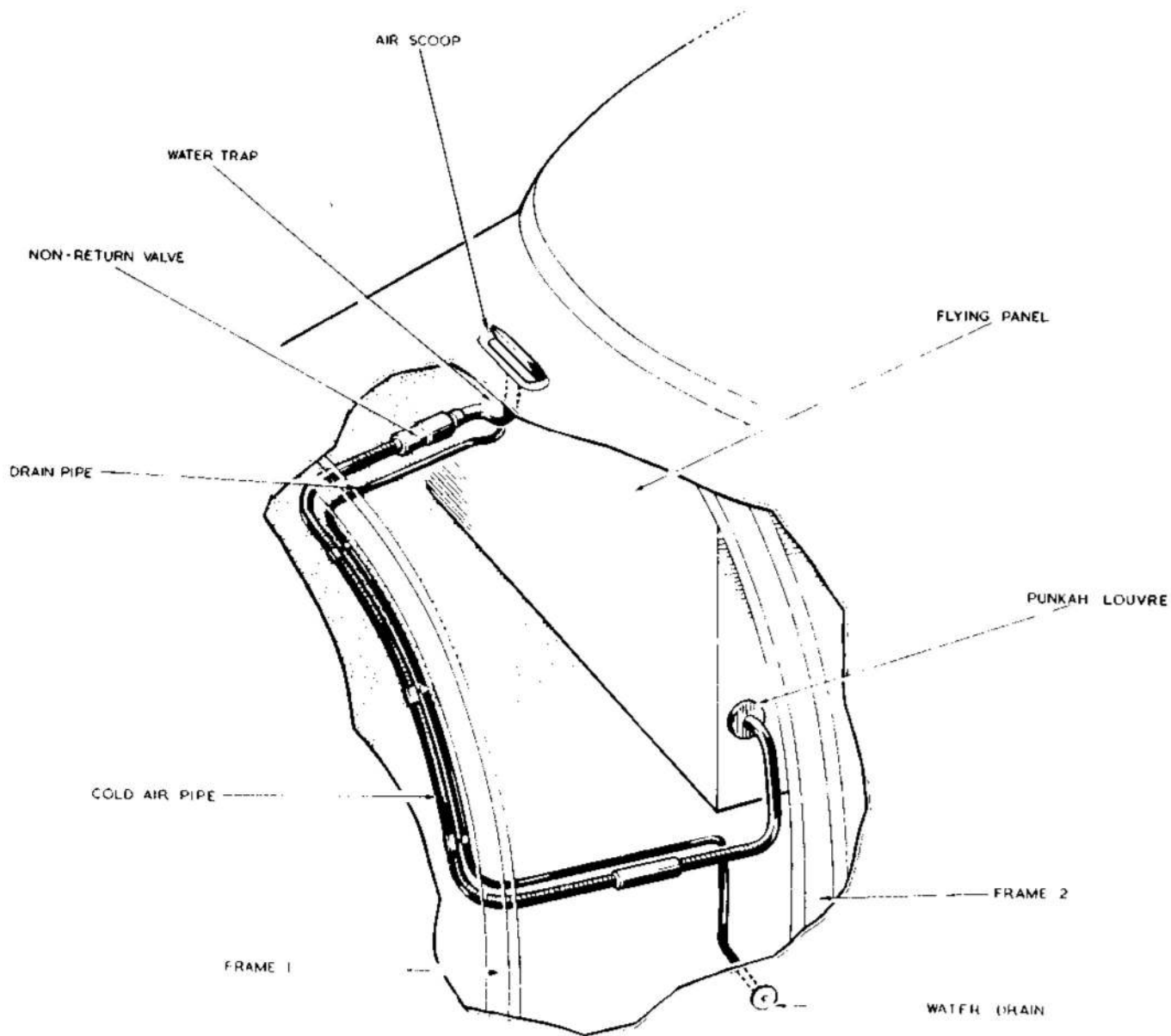
(4) Check that the pack is free of moisture.

(5) Fill the pack with silica-gel crystals Ref. No. 33C/790.

Note . . .

Be careful not to shatter the crystals.

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FIG. 9. PILOT'S COLD AIR SUPPLY

RESTRICTED

(6) Refit the bottom filter and circlip.

(7) Reassemble the pack to the air-drier body.

REMOVAL AND ASSEMBLY

Note...

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 Part 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 0.50 in. and 0.07 in.

2. Whenever box type lagging is removed from the air conditioning pipes, care must be taken, on reassembly, to ensure that the Jubilee clips securing the lagging are not overtightened to the extent of crushing the lagging. It is considered satisfactory that the clips are tightened to the stage where they can just be removed by hand.

3. 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 the pipes or ducts are disconnected they are to be blanked off to exclude foreign matter.

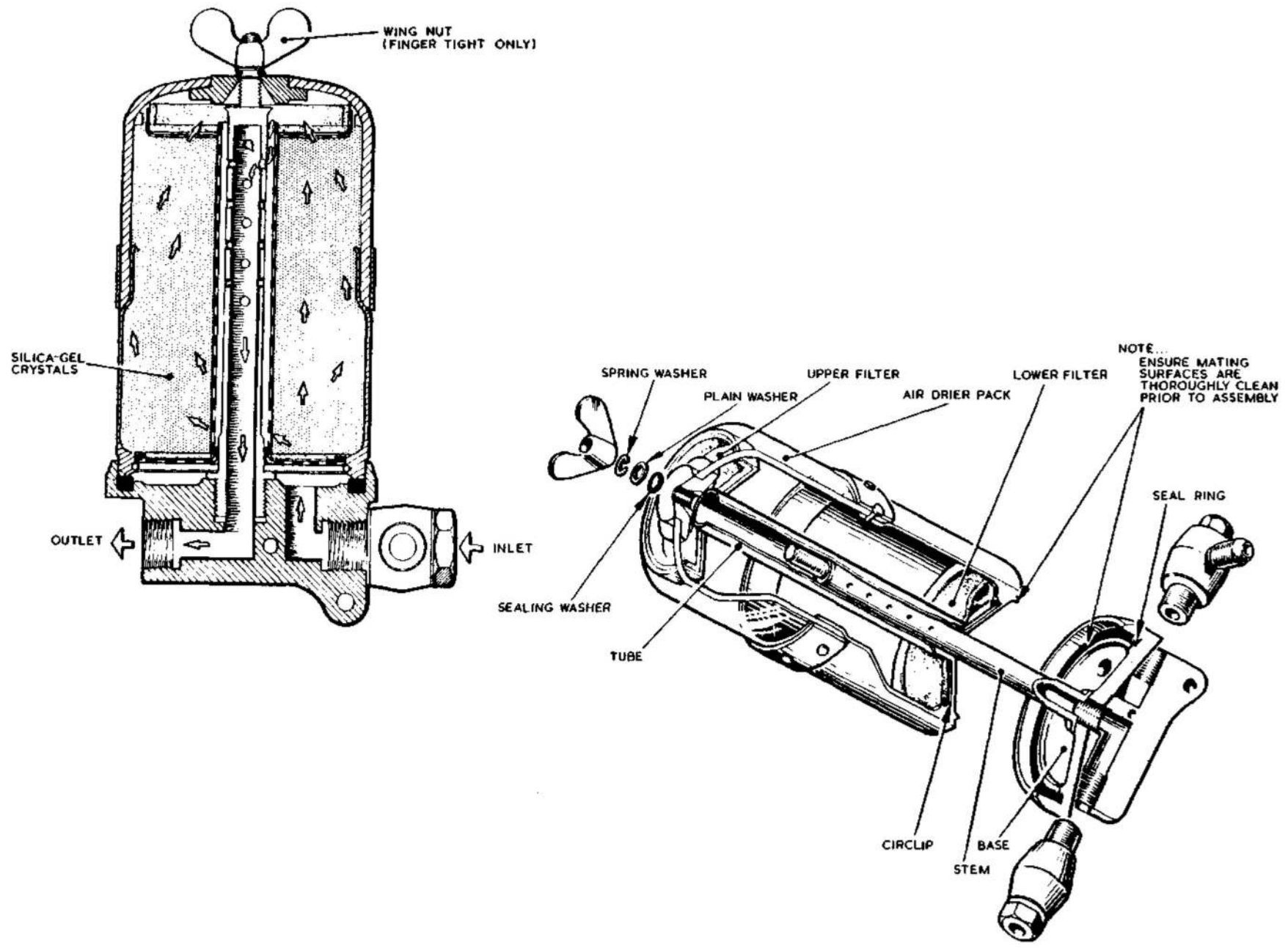
(b) Replacement non-metallic pipes must bear a red rectangle. Whenever a new pipe is to be fitted, it is first to be blown through with hot air from a non-toxic heater for a minimum period of 30 minutes at a temperature of 85 deg C. During this time the pipe is to be checked for odours and rigidity, 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. ▶

General information

66. The following paragraphs detail the recommended methods of removing certain components from the system. Generally the assembly sequence is the reverse of the removal, but where there are special assembly features they are specifically mentioned.



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FIG.10. AIR-DRIER

Note...

1. A pipeline pressure test must be carried out in accordance with para. 50 or whenever a system component is removed or replaced.

2. To obviate seizure, treat the threads of all metal couplings, upon assembly, with anti-seize compound ZX-38.

Constant-flow valves

Port main plane

67. To remove the constant-flow valve:-

(1) Remove the access panels from the upper surface of the port main plane 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 or the valve.

(4) Release the two Jubilee clips securing the valve to its mounting, and remove the valve.

Forward camera bay

68. To remove the constant-flow valve:-

(1) Unscrew the inlet pipe adapter and disconnect the inlet pipe from the valve.

(2) Remove the six 2 B.A. bolts and washers attaching the outlet pipe to the valve.

(3) Release the two Jubilee clips attaching the valve to its mounting, and remove the valve.

No. 6 fuel tank bay

69. To remove the constant-flow valve:-

(1) Remove No.6 tank (Sect. 4, Chap. 2).

(2) Proceed as instructed in para. 68 for the valve in the forward camera bay.

Mixing-valve actuator

Removal

70. To remove the mixing-valve actuator:-

(1) Disconnect the electrical supply.

(2) Remove the outboard access panel from the upper surface of the port main plane leading edge (Sect. 2, Chap. 4).

(3) Remove the Plessey plug from the actuator socket.

(4) Remove the four 2 B.A. nuts from the studs on the mixing valve and remove the actuator.

Assembly

71. To assemble the actuator to the mixing valve:-

(1) Turn the actuator shaft to the full extent of its travel in a counter-clockwise direction, when viewed looking into the gearbox from the drive end.

(2) Turn the mixing valve drive shaft clockwise, so that the master spline on the drive shaft attains a position relative to the master slot in the actuator drive.

(3) Offer up the actuator to the mixing valve ensuring that the master spline engages with the

master slot in the actuator drive shaft.

(4) Fit and tighten the four 2 B.A. nuts, and

Note...

It may be necessary to operate the follower lever slightly to achieve actuator engagement.

continued

plain and spring washers securing the actuator to the mixing valve.

(5) Test the operation of the assembly (*para. 54*).

Mixing valve (*fig. 7*)

Removal

72. To remove the mixing valve:—

(1) Remove the outboard access panel from the upper surface of the port main plane leading edge (*Sect. 2, Chap. 4*).

(2) Remove the actuator (*para. 70*).

(3) Remove the split pin, steel pin and washer connecting the link arm to the Desynn transmitter.

(4) Remove 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

73. To assemble the mixing valve:—

(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. bolts, nuts, plain and spring washers.

(3) Fit and tighten the clamping rings connecting the pipes to the valve at the following ports:—

- (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.

(4) Assemble the actuator (*para. 71*).

(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 adjusting 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. 54*).

Air coolers

Primary air-cooler

74. To remove the primary air-cooler:—

(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.

Secondary air cooler

75. To remove the secondary air cooler:—

(1) Remove the inboard access panel from the upper surface of the port main plane leading edge (*Sect. 2, Chap. 4*).

(2) Disconnect the relief valve pipe at the junction on the compressor to cooler pipe.

(3) Disconnect the relief valve 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

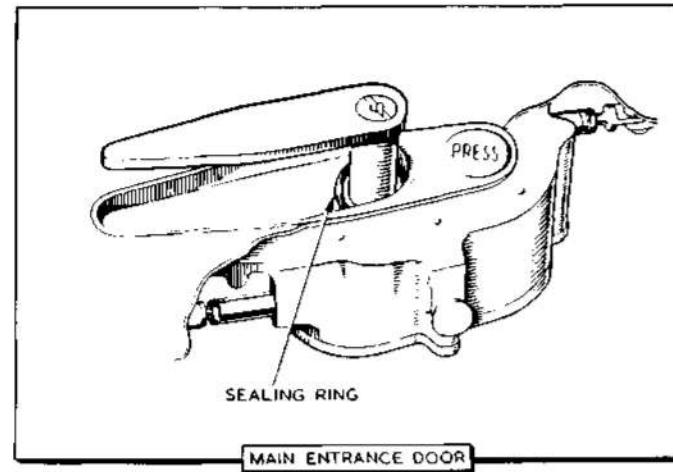
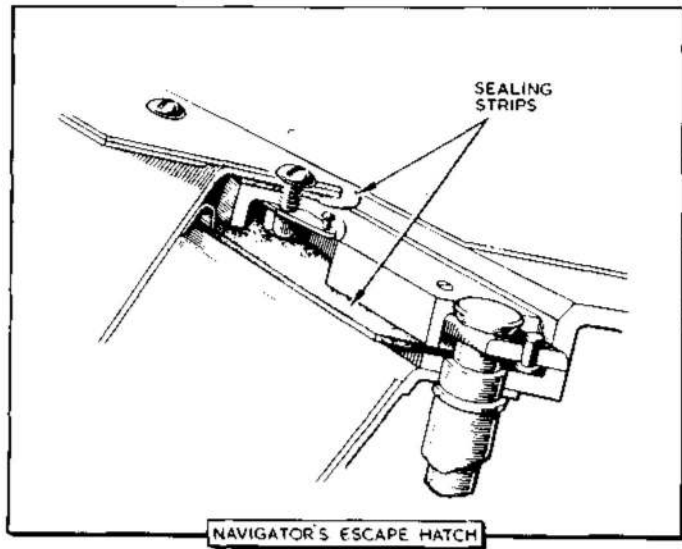
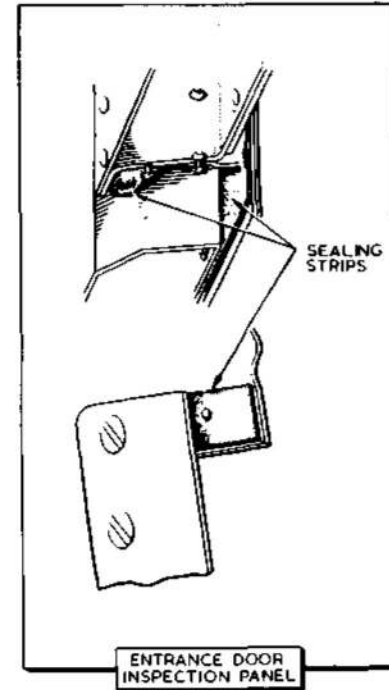
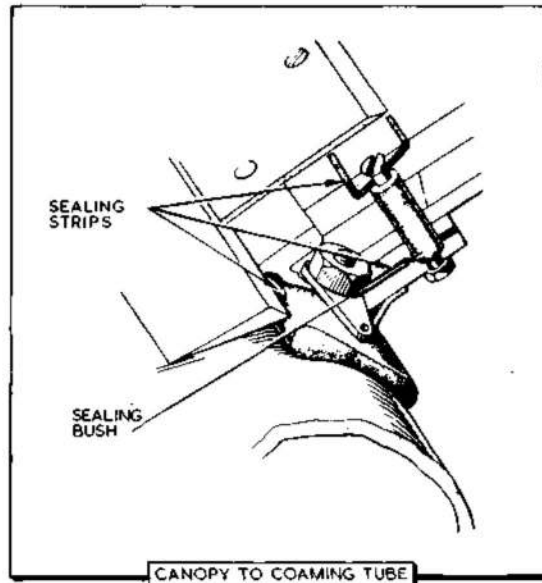
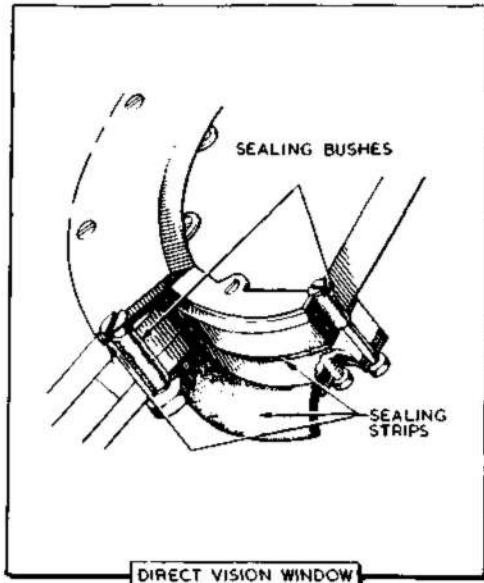


FIG. II. PRESSURE CABIN SEALING

the top support bracket, and remove the cooler by lifting clear of the bottom support bracket.

(7) Blank off pipe ends.

Cold-air unit

Removal

76. To remove the cold-air unit:-

(1) Remove the inboard access panel from 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 breather pipe from the unit.

(4) Remove the 16 bolts, light alloy 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

77. 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 c.c. 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.

Note . . .

The unit is to be drained and refilled every 200 airframe hours.

Installation

78. To install the cold-air unit:-

(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 pressure 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) Re-connect the breather pipe to the unit.

(6) After installation, remove the filler cap, and fill the unit with oil (Sect.2, Chap.2).

(7) Refit the filler cap.

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 if the unit be removed 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.*

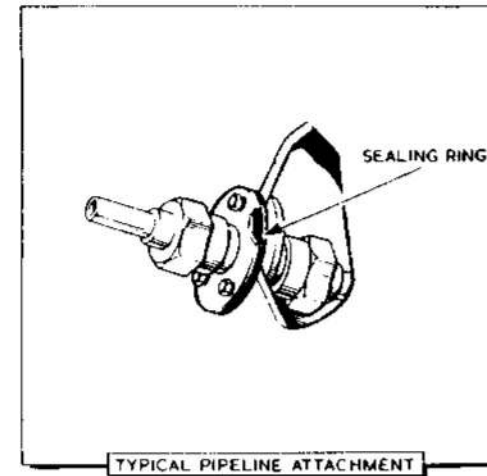
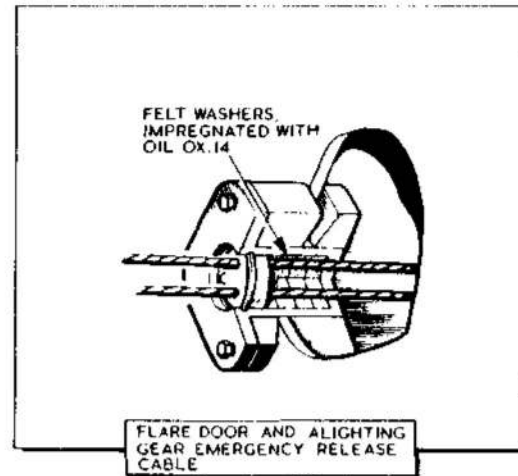
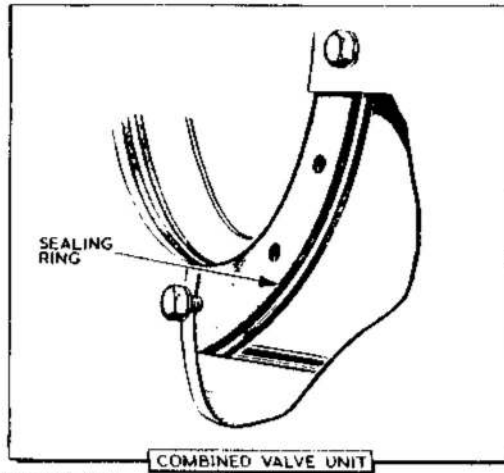
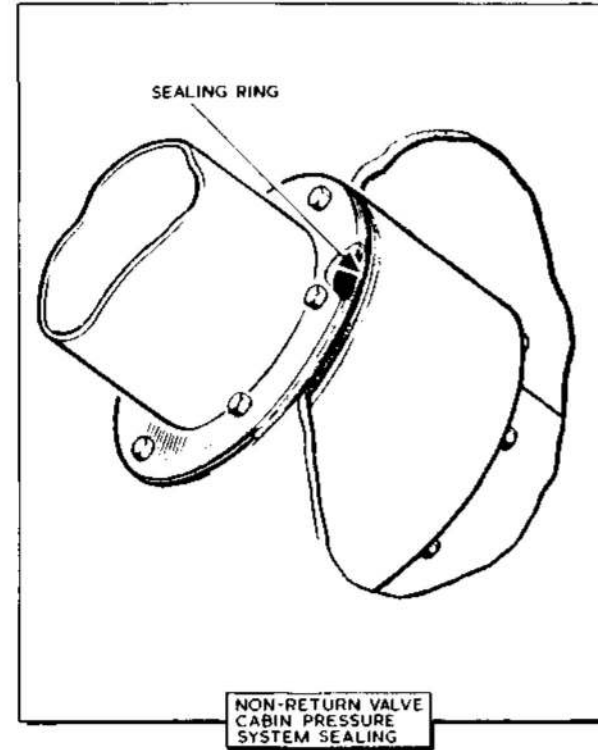
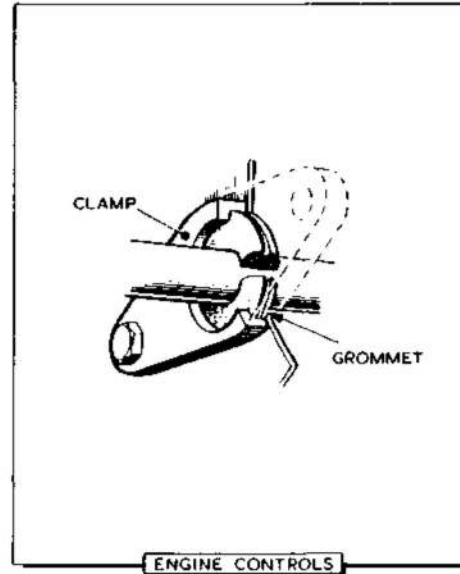
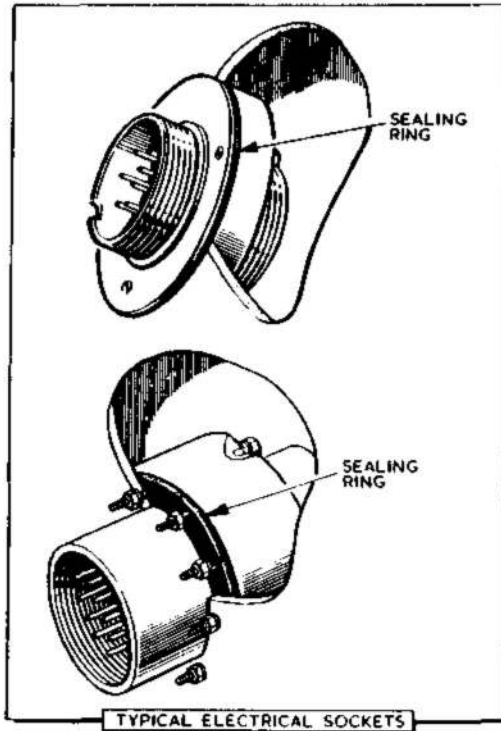
Pressure controller

79. To remove the pressure controller:

(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) Remove the three bolts and washers, securing the unit to the mounting bracket on the



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FIG.12. SEALING AT PRESSURE BULKHEADS

forward pressure bulkhead, and lift the unit through the access aperture forward of frame 1.

- (4) Blank off pipe ends and unit apertures.

Combined valve unit

Removal

80. To remove the combined valve unit:—

- (1) Remove the collector box (*para. 85*).
- (2) 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.
- (3) Remove the locking wire; disconnect the pipe to the pressure controller at the banjo union, and remove the union by unscrewing the bolt.
- (4) Remove the locking wire and remove the three special to-type bolts, the stud nut and the seven bolts, together with the associated spring and plain washers, securing the unit to the front face of the forward pressure bulkhead. Lift the unit through the access aperture forward of frame 1.

Assembly

81. To assemble the combined valve unit:—

- (1) Remove the inlet grid from the valve unit by rotating it counter-clockwise, and lifting it clear of the three special 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 front 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, stud nut, seven 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. Relock with 20 s.w.g. locking wire Ref. No. 30A/9140209. 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; refer to Table 1 for relevant Air Publication.

(7) Pressure test the cabin (*para. 53*).

Relief valve

82. To remove the relief valve:—

- (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.

Temperature control valves

83. The piston-type temperature control valves are removed by disconnecting the two coupling unions, one on either side of the valve body. The spring-loaded shut-off valve is removed in a similar manner, though the small union on the valve dome also requires disconnecting. The bi-metal strip valve is removed by disconnecting the union nut, and withdrawing the bolts which attach it to the structure.

Air-drier

84. To remove the air drier:—

- (1) Disconnect the inlet and outlet pipes at the banjo connections in the base of the air-drier.
- (2) Remove the two bolts, washers and stiffnuts, securing the air-drier to the mounting bracket on the starboard wheel bay structure.
- (3) Blank off the pipes.

Note . . .

After reassembly, carry out the radome pressure test (para. 56).

Collector box

85. To remove the collector box:—

- (1) Slacken the hose clips and remove the sleeve connecting the collector box to the radome canister.
- (2) Remove the fifteen stiffnuts, washers and bolts securing the two halves of the collector box together and remove the lower half.
- (3) Remove the two stiffnuts, washers and bolts securing the upper half to the bulkhead and remove the upper half of the box.

86. Deleted.

TABLE I

List of principal components

Component	Type or Part No.	Qty.	A.P. Reference		
			A.P.	Sect.	Chap.
◀ Cabin air conditioning					
Actuator (gate valve)	BAe Type 234	2	113E-0249-1		
Actuator (mixing valve)	BAe Type 233	1			
Cold air unit	Godfrey A.C.R.E. 9, Mk. 10E	1	107B-0142-1		
Combined valve unit	Normalair 527060	1	107B-1415-1		
Constant flow valve	Normalair 502090	1	107B-0911-16		
Desynn transmitter	Type C 132 FL	1	112G-0501-16		
Hot air (gate) valve	Teddington FKH/A/16	2	107B-10112-1		
Primary cooler	Marston D.106/8A	1	107B-0614-1		
Mixing valve	Teddington FKH/A/15	1	107B-10109-1		
Non-return valve (in fuselage)	Normalair 500457	1	107B-0905-123A6AD		
Non-return valve (in main planes)	Normalair 501670	2	107B-0905-123A6AD		
Pressure controller	Normalair 500326	1	107B-1407-1		
Pressure relief valve	BAe EB6-75-729	1	101B-0422-1A	3	8A
Secondary cooler	Marston D.106/6A	1	107B-0614-1		
Water extractor	Godfrey WE30, Mk. 2B	1	107B-0522-1		
Camera heating					
Constant-flow valve	Normalair 502090	2	107B-0911-16		
Filter restrictor	W.97303	1			
Temperature control valve (piston type)	BAe EA2-75-669	2	101B-0422-1A	3	8A
Thermostat (bi-metal)	B.P.A. MS.51/67	1			
Temperature control valve	BAe EB7-75-1041 (post mod. 5245) MS51/30 (pre mod. 5245)	1	101B-0422-1A	3	8A
Radome pressurization					
Air-drier	BAe EB3-75-1135	1	101B-0422-1A	3	8A
Bursting disc assembly	BAe EK5-75-71	1	101B-0422-1A	3	8A

continued ▶

TABLE 1 List of principal components - continued

Component	Type or Part No.	Qty.	A.P. Reference		
			A.P.	Sect.	Chap.
◀ Radome pressurization (cont.)					
Filter	Hymatic	LF.7/4	1	105C-0112-1	
Ground connection	BAe	EB2-75-3087	1	101B-0422-1A	3 8A
Non-return valve (inward vent)	Hymatic	NAR.109-020	1	105C-0592-1	
Non-return valve (pressure)			1		
Pressure reducing valve			1		
Pressure release valve	Hymatic	PS.60/26	1	105C-0596-1	
Pressure relief valve	BAe	EK5-75-63	1	101B-0422-1A	3 8A
	Hymatic	RAV.150-003	1	105C-05113-1	
Radome cooling					
Collector box	BAe	EK5-75-37	1	101B-0422-1A	3 8A
Heat exchanger	BAe	YB3-82-678	1		
Miscellaneous					
Non-return valve	BAe	EA3-74-23	1	101B-0422-1A	3 8A
Punkah louvre			1		
Water trap			1		
Diffuser			2		
Punkah louvre (Navigator's)			1		
Valve (canopy internal de-misting)	BAe	(Modified to EB7-75-55) EA3-76-223	1		



Chapter 8B DE-MISTING SYSTEM

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DESCRIPTION		SERVICING		REMOVAL AND ASSEMBLY	
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<i>Closed circuit de-misting</i>	3	<i>Pilot's canopy static air-drier</i>	6	<i>Blower motor</i>	13
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<i>Air-drier installations</i>	2
<i>Static air-drier test rig</i>	3

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.

DESCRIPTION

General information (fig. 1)

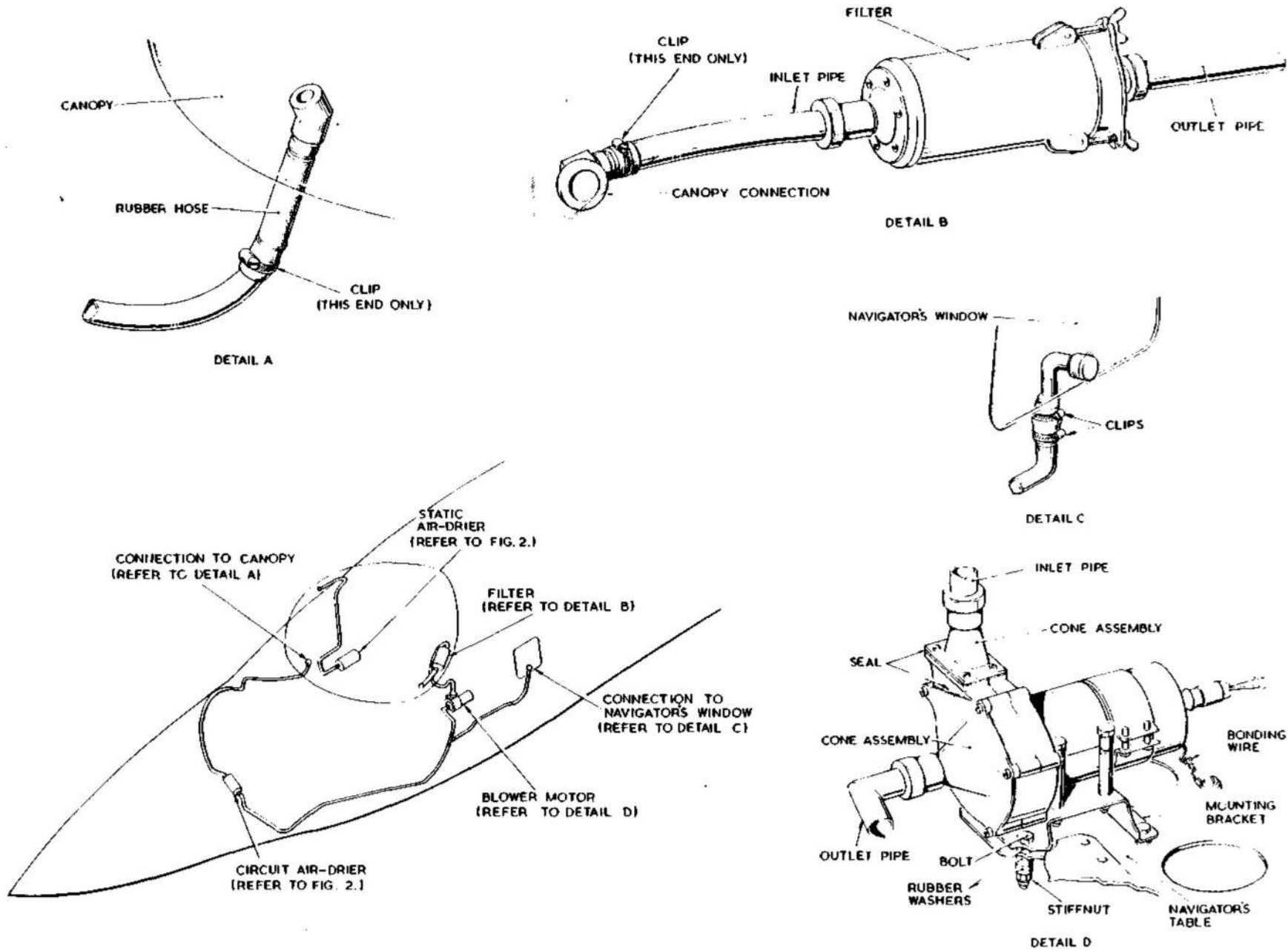
2. The pilot's canopy and navigator's window are provided with dry-air de-misting. Two air-driers are utilized, one being incorporated in a system providing air circulation through the pilot's canopy with a branch pipe leading to the navigator's window for suction purposes only.

The second air-drier is connected to the pilot's canopy independent of the system and is static.

Closed circuit de-misting

3. The air-drier for the circulatory system is connected to the inner sheet of the canopy, at the centre front, by a rubber hose with a slip-on connection. It is part of a system forming a closed circuit which ensures that the air initially

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FIG. I. DE-MISTING SYSTEM

◀ MOD. 5238 EMBODIED ▶

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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 an air filter and returns it through the air-drier and the slip-on rubber hose 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 feed back when the blower is running. The drier tube is mounted on the aft face of the forward pressure bulkhead and is charged with silica-gel. The blower is mounted on a bracket at the port front of the navigator's table and is controlled by the canopy de-misting switch on the pilot's take-off panel; the filter is mounted on the canopy coaming.

Static air-drier tube (fig. 2)

4. 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 starboard side of the cabin, between frames 4 and 5, and connected, via a rubber hose slip-on connection, to the inner sheet of the canopy (starboard side).

Note...

The slip-on connections (para.3 and 4) permit the respective joints to be broken on canopy jettisoning. At all other points the connections are secured with clips. ▶

Inner surface de-misting

5. To prevent misting of the canopy inner surfaces, conditioned 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.

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

6. The drier tube is fitted with a window through which the contents may be inspected; the contents are to be changed, when they turn pink. To recharge:—

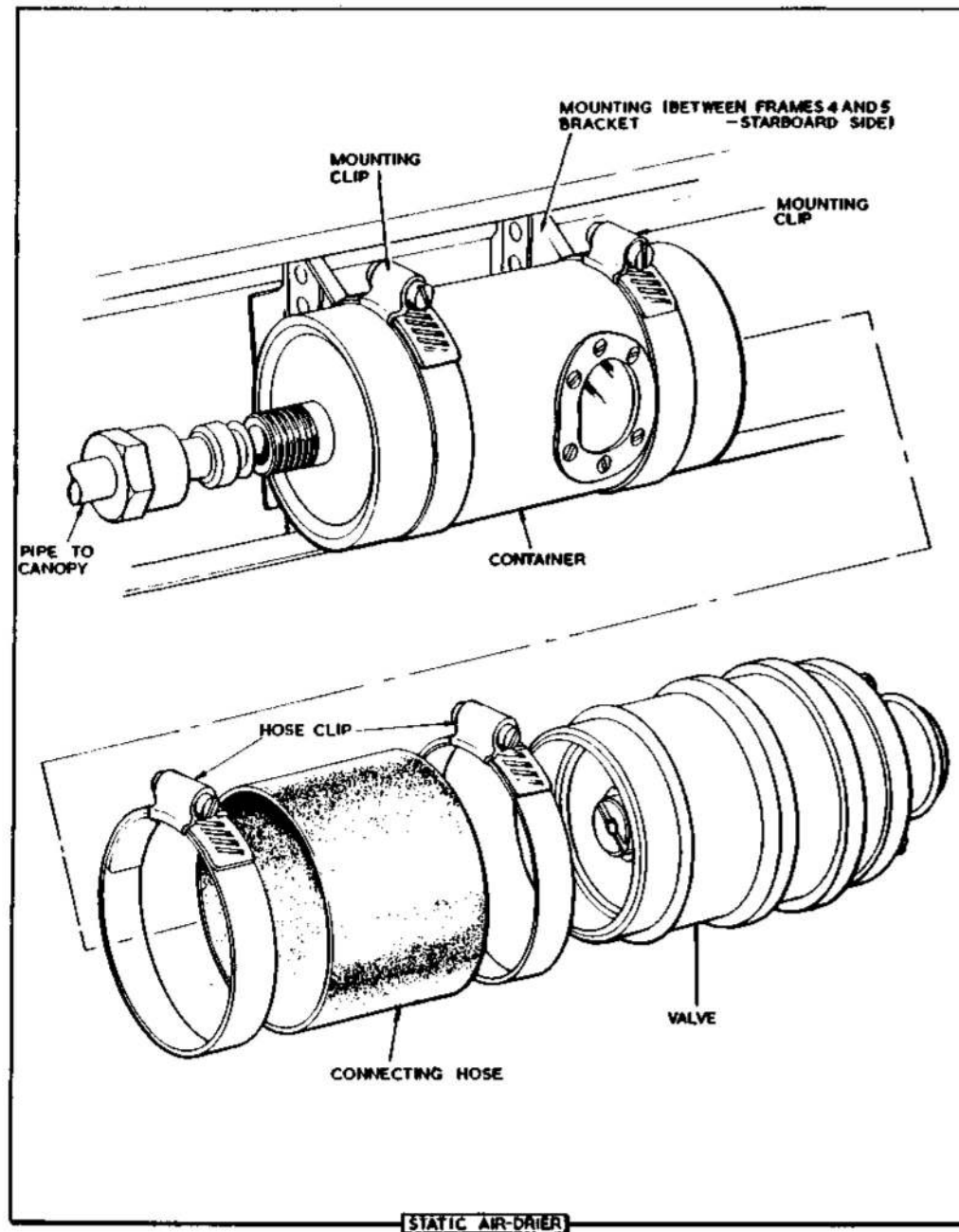
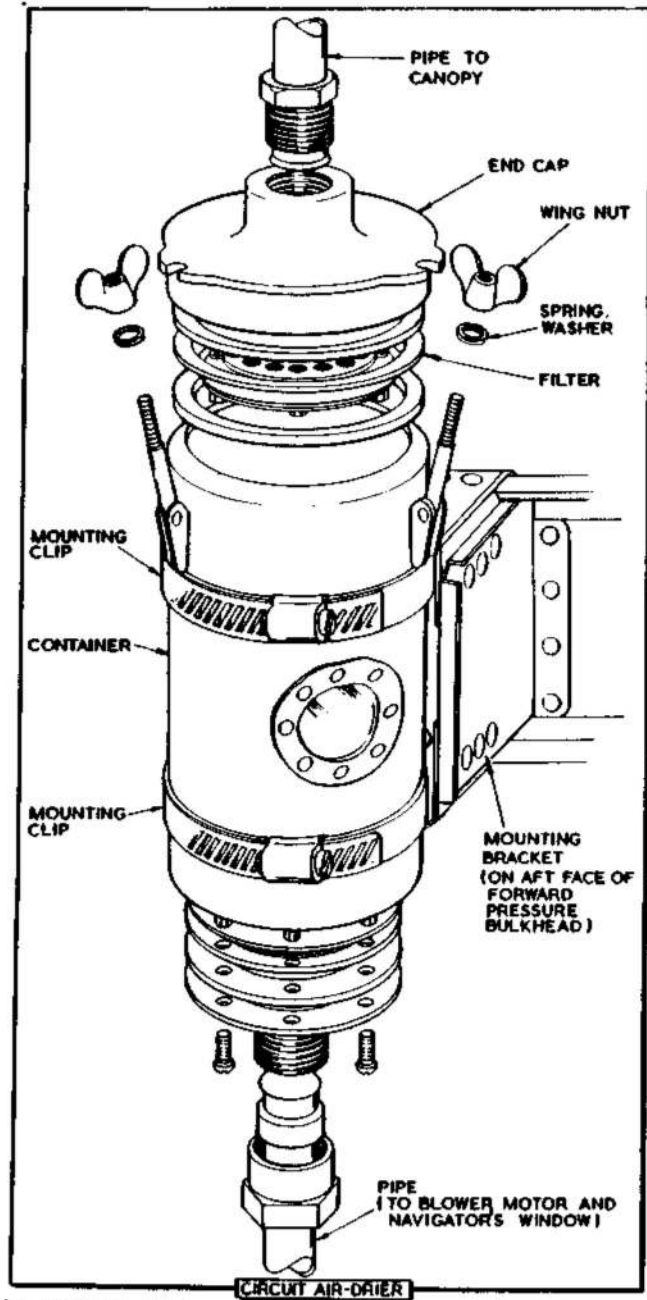
- (1) Disconnect the pipe from the respective end of the air-drier by unscrewing the pipe outer sleeve.
- (2) Release the mounting clips and remove the air-drier from the aircraft.
- (3) Remove the blanking cap from the stowage on the canopy coaming and fit it to the exposed end of the pipe.
- (4) Slacken the Jubilee clips securing the hose connecting the container to the valve body and withdraw the container.
- (5) Empty the container and re-fill 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 end of the pipe and refit it on its stowage.

- (9) Reconnect the pipe to the air-drier, ensuring that the associated nipple is correctly positioned in the end of the pipe.

Blower circuit air-drier

7. The blower circuit air-drier is 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 are to be changed when the crystals visible through the inspection window, become pink coloured. To re-charge:—

- (1) Disconnect the pipes from the ends of the air-drier.
- (2) Release the air-drier mounting clips and remove the air-drier from the aircraft.
- (3) Remove the blanking caps from their stowage and fit them to the exposed ends of the pipes.
- (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) Refit the air-drier into the aircraft and tighten the securing clips.
- (8) Remove the blanking caps from the pipes and refit the pipes to the air-drier.
- (9) Refit the blanking caps on their stowage.



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FIG.2. AIR-DRIER INSTALLATIONS

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Note . . .

When re-filling 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.

System leakage test

8. To test the canopy de-misting system for leaks:—

- (1) Remove the static air-drier (para. 6) and fit the blanking cap to the exposed end of the pipe.
- (2) Remove the blower assembly and fit a bridge pipe incorporating a connection for an external air supply.
- (3) Apply air pressure at $\frac{1}{2}$ lb/in².
- (4) With all system components assembled and connected together, a pressure drop from $\frac{1}{2}$ lb/in² to $\frac{1}{4}$ lb/in² must not take less than 2 minutes.

Testing the static air-drier**Note . . .**

The air supply used for this test must be clean and free from moisture.

9. 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.
10. Before testing the air-drier, it must be removed from the aircraft (para. 6, 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. 3). 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 air-drier into the aircraft.

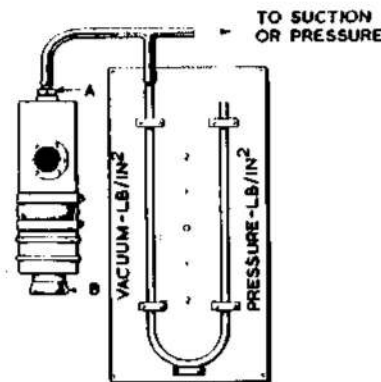


Fig.3. Static air-drier test rig

REMOVAL AND ASSEMBLY**Filter**

11. To remove the element from the filter:—

- (1) Pinch the rubber tube at the inlet connection to the canopy and also the tube to the blower.
- (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.

12. Before assembly, the ends of the filter element should be lightly greased with lanolin.

Blower motor

13. To remove the blower motor:—

- (1) Disconnect the electrical cable at the motor.
- (2) Remove the screw, washer and stiff nut, securing the bonding cable to the navigator's table.
- (3) Disconnect the inlet and outlet pipes from the cone connections on the motor. Blank off the exposed ends of the pipes and the cone connections.
- (4) Remove the four bolts, washers and stiffnuts, and the twelve rubber washers, securing the motor mounting bracket to the navigator's table.
- (5) Remove the motor, complete with the mounting bracket.

TABLE 1
List of principal components

Ref. No.	Component	Part or Type No.	A.P. Reference
5UD/3310	Blower unit	Type 710	A.P.113E-0385-1
26FZ/12521	Air-drier, canopy, starboard, assembly	EA9.76.75	Fig.2 (Static air-drier)
26FZ/12522	Air-drier, canopy forward, assembly	EG9.76.237	Fig. 2 (Closed Circuit air-drier)
26FZ/12524	Air filter assembly, complete	EA9.76.239	Fig.1
26FZ/-	De-mister assembly, inner canopy	EG9.76.63	Chap.8A
	◀ Silicon rubber hose, canopy	DTD 818L3▶	

Chapter 10 OXYGEN SYSTEM

◀ (completely revised) ▶

LIST OF CONTENTS

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<i>General information</i>	<i>2</i>	<i>Emergency oxygen control lever</i>	<i>12</i>
<i>Pilot's supply</i>	<i>4</i>	<i>Lubrication</i>	<i>13</i>
<i>Navigator's supply</i>	<i>5</i>	REMOVAL AND ASSEMBLY	
<i>Occasional seat station supply</i>	<i>6</i>	<i>Oxygen cylinders</i>	<i>14</i>
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<i>Charging the cylinders</i>	<i>9</i>		

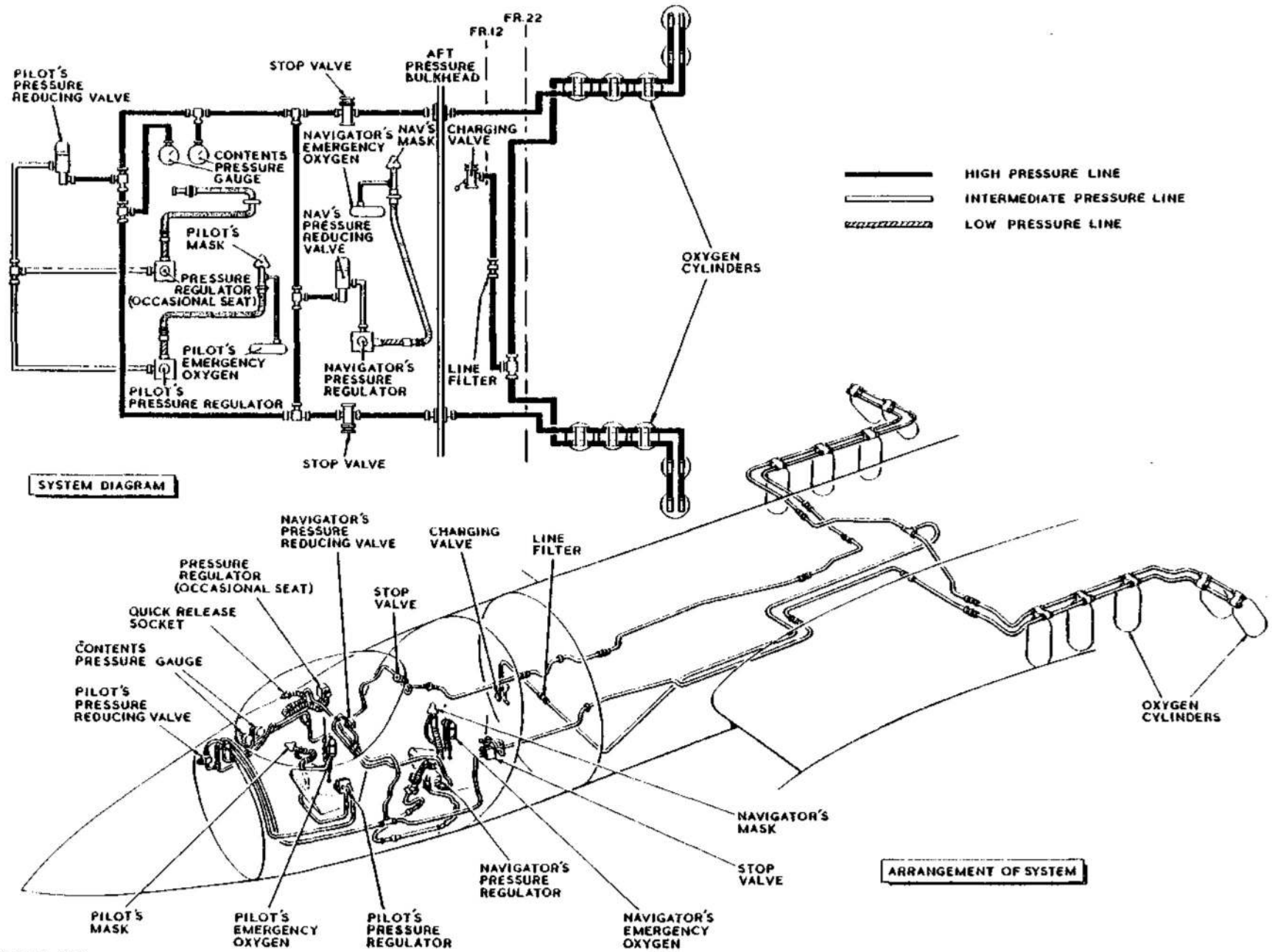
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LIST OF ILLUSTRATIONS

	<i>Fig.</i>
<i>Oxygen system</i>	<i>1</i>

RESTRICTED



SYSTEM DIAGRAM

ARRANGEMENT OF SYSTEM

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FIG.1. OXYGEN SYSTEM

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WARNING

Oxygen and 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 of the oxygen system and also the procedure for the removal and assembly of certain components. The procedure for servicing the components of the system, and the method of charging the cylinders, is given in A.P.107D-0001-1 and the relevant publication listed in Table 1.

DESCRIPTION**General information (fig. 1)**

2. Oxygen is carried in ten 750 litre cylinders mounted five in each inner wing, aft of the main spar, between ribs 3 and 6. Each cylinder is fitted with a five-way connection incorporating two non-return valves. In order to reduce vulnerability and to prevent the total loss of oxygen through fracture of a supply pipe, the cylinders are divided into two banks, isolated from each other by non-return valves and the high-pressure system is duplicated. A charging valve, in the starboard equipment compartment, is connected through a filter to all cylinders, enabling them to be charged in situ.

3. The cylinders are connected by two high-pressure supply pipes, which pass through the port and starboard sides of the pressure bulkhead, to two stop valves, located on the port wall of the navigator's station and the forward face of the bulkhead respectively. 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 pressure-reducing valve, and housing a filter in the pipe-line connection. From the pressure reducing valve, which lowers the pressure to 400 lb/in², an intermediate-pressure supply line is connected to the pilot's Mk. 17F pressure regulator mounted on the port wall of the cabin above the console and, through a three-way connection in the pipeline, to a Mk. 17F pressure regulator on the starboard side of the cabin, between frames 5 and 6. The navigator's station is supplied by a pipe leading inboard from each high-pressure supply pipe, along the canopy coaming cross-tube to a three-way connector, and a high-pressure pipe from the connector carries the supply to an adjacent

pressure-reducing valve, non-return valves in the connector prevent interflow between the two supplies. An intermediate-pressure pipe from the reducing valve conveys the supply to the navigator's pressure regulator on the port side of the cabin, between frames 6 and 7. Two oxygen contents pressure gauges, fitted on the miscellaneous instrument panel, are connected into the high pressure supply lines to give an indication of the amount of oxygen available from each bank of cylinders.

Note . . .

A label is fitted adjacent to the navigator's stop valve, stating that the valve must be left open.

Pilot's supply

4. From the Mk. 17F pressure regulator on the port wall of the cabin at the pilot's station, 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 is connected to a Mk. 9 quick-release socket. From the socket, the flexible tube connects to a break point on the flanged connector so that it will disengage when the seat is ejected.

Navigator's supply

5. From the Mk. 17F pressure regulator on the port side of the cabin the supply is conveyed by a low-pressure pipe, terminating in a flanged connector on the forward face of the pressure bulkhead. The flexible tube from the navigator's face mask connects to a Mk. 9 quick-release socket, from the socket, the flexible tube connects to a break point on the flanged connector so that it will disengage when the seat is ejected.

Occasional seat station supply

6. A low-pressure pipe from the Mk. 17F pressure regulator on the starboard side of the cabin conveys the supply into a flexible tube terminating in a Mk. 10A quick-release socket. When not in use, the tube is retained by a clip stowage mounted above the coaming tube and adjacent to the pressure regulator. The associated plug should be inserted into the socket when the flexible tube to the face mask is disconnected.

Emergency oxygen

7. An emergency oxygen cylinder is mounted on the starboard side of the Mk. 2CA.1 and 2CA.2 ejection seats; these may be used in the event of failure of the main supply as instructed in Sect. 1, Chap.3.

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

8. 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 servicing and operational test of the components are fully described in the relevant publication listed in Table 1.

Charging the cylinders

9. 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 in the starboard equipment compartment.
- (2) Observing the precautions given in A.P.107D-0001-1, connect a high pressure oxygen supply from an oxygen charging trolley and charge the cylinders to 2000 lb/in². On cooling, the pressure will be approximately 1800 lb/in².
- (3) When charging is completed, disconnect the charging trolley and replace the blanking cap on the charging valve.

System leakage test

10. To test the system for leaks :-

- (1) Remove the wire-locking and switch all three oxygen regulator ON/OFF valves to OFF.
- (2) Ensure there is between 1700 lb/in² and 1800 lb/in² pressure in the oxygen cylinders.

(3) Check that the stop valves, on the pressure bulkhead and the navigator's station port wall, 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 soap solution; refer to 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 test all traces of the soap solution must be removed.

(6) Return the regulator ON/OFF valves to ON and wire-lock them in this position, using 28 s.w.g. enamelled copper wire (5E/9102399).

System functional test

11. To test the functioning of the system and system components:-

- (1) Ensure there is between 1700 lb/in² and 1800 lb/in² pressure in the oxygen cylinders.
- (2) Close both stop valves (*Para. 10 (3)*).
- (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 MASK TEST switch.
- (4) Open the stop valve on the port wall at the navigator's station. Pressure should read rapidly on forward contents gauge.

Note...

The rear 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 wall at the navigator's station.
- (6) Exhaust cabin side of the system as at operation (3).

(7) Open the stop valve on the starboard side of the pressure bulkhead. Pressure should read rapidly on the rear contents gauge.

Note...

The forward 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 wall at the navigator's station.

(9) Ensure that the flexible hose is down to the flange at the ejection seat break-point, and that the oxygen hose will pull off with a force of between 1 lbf and 3 lbf.

Make the following checks at all three oxygen regulators.

(10) *Pressure reducing valve check.* - Check that each regulator pressure gauge reads between 200 lb/in² and 400 lb/in²

Note...

If the pressure at the regulator is greater or less, the pressure reducing valve is suspect and should be tested as detailed in the relevant publication.

(11) *Regulator internal leakage check.* - Switch the regulator ON/OFF valve to OFF and check the pressure drop on the regulator gauge. This must not exceed 25 lb/in² in 60 seconds. Switch the regulator ON.

(12) *Low pressure pipe check.* - Set air inlet shutter to NORMAL, insert rubber stopper in mask socket connection, switch emergency toggle to left or right and turn off the regulator ON/OFF valve. Check time taken for the regulator pressure to drop to zero; this must not be less than 60 seconds.

(13) *Air inlet shutter check.* - Switch the air inlet shutter on the oxygen regulator to 100% OXYGEN and, with the regulator ON/OFF valve OFF, suck gently through face mask. There 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) Breathing normally with the regulator switch ON and the air inlet shutter at NORMAL, check 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 the associated plug into 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 in the fully OPEN position using 22 s.w.g. nickel chrome wire. Wire-lock the regulators ON/OFF valves ON in the fully ON position using 28 s.w.g. enamelled copper wire (5E/9102399).

Emergency oxygen control lever

12. The pull off load for the emergency oxygen control lever must not exceed 30 lb.

Lubrication

13. Refer to the WARNING preceding para. 8. 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, Chap.1.

REMOVAL AND ASSEMBLY

Oxygen cylinders

14. 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 turn-buckles.
- (6) Remove the cylinder from the aircraft.

Regulator

Removal

15.

- (1) Disconnect all electrical supplies
- (2) Disconnect the electrical plug from its socket.
- (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

16.

- (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 10*).
- (5) Reconnect the electrical supplies.
- (6) Functionally test the regulator and system.
- (7) Carry out the electrical test (*A.P.101B-0422-1B, Sect.5, Chap.1, Group W*).

TABLE I

List of principal components

Ref. No.	Description	No. off per A/C	A.P. Ref.
6D/9429896	Cylinder, Mk.5D, 750 litres	10	107D-0001-1
6D/1650	Connector, flanged, L.P. tube	2	107D-0400C-12
6D/574	Filter, Mk.1, pipeline, H.P.	1	107D-0111-1
6D/2237	Gauge, Mk.4, contents	2	107D-0305-12
6D/2671	Regulator, Mk.17F, pressure	3	107D-0201-123A
6D/1652	Socket, Mk.9, quick-release	2	107D-0400B-1
6D/1817	Socket, Mk.10A, quick-release	1	107D-0400B-1
6D/2204340	Valve, Mk.1 non-return	4	107D-0500A-12
6D/2344	Valve, Mk.1A, pressure reducing	2	107D-0512-12
6D/2244774	Valve, Type 1 charging	1	107D-0507-12
6D/2678	Emergency oxygen set, Mk. 7J	2	107D-1002-123A
6D/2244775	Valve stop	2	107D-0500A-12

Chapter 11 EMERGENCY EQUIPMENT

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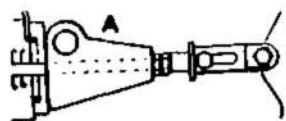
DESCRIPTION	Para.	DESCRIPTION	Para.	REMOVAL AND ASSEMBLY	Para.
<i>General information</i>	1	<i>Fire protection system</i>	22	<i>Ejection seats</i>	
<i>Canopy and hatch</i>	2	<i>Aircraft-destroyer stowage</i>	23	<i>Navigator's seat</i>	
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<i>Combined time-release and breech unit</i> ...	4	<i>Ejection seats</i>	24	<i>Assembly</i>	30
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<i>Entrance door jettisoning mechanism</i>	19			<i>Removal</i>	36
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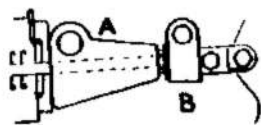
	Fig.		Fig.
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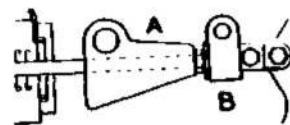
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1 PULL BACK THE CONTROL COLUMN AND INSERT DISTANCE PIECE A



2 EASE THE CONTROL COLUMN FORWARD AND INSERT DISTANCE PIECE B



3 PULL BACK THE CONTROL UNTIL THE SEAR ROLLER FALLS INTO PLACE EASE THE CONTROL COLUMN FORWARD UNTIL THE PISTON ENGAGES THE SEAR ROLLER. REMOVE DISTANCE PIECES A & B.

TO COCK SNATCH UNIT

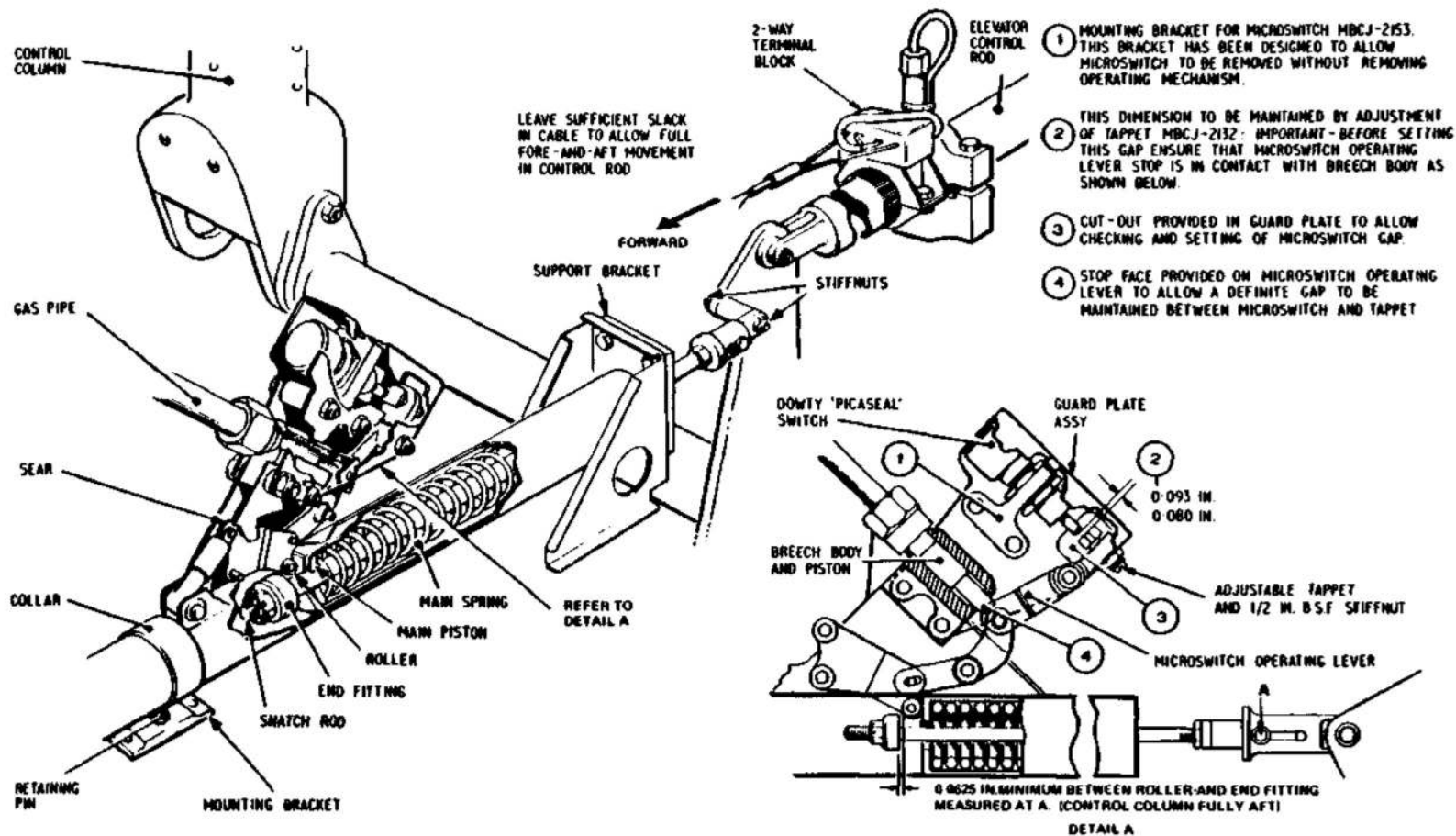
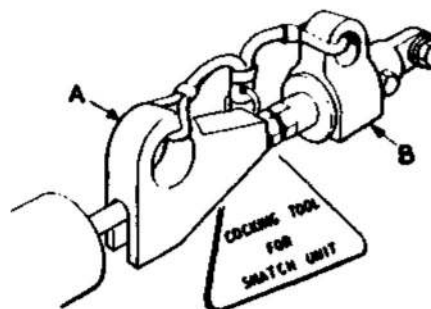


FIG. 1. CONTROL COLUMN SNATCH UNIT

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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 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 crew hatch. Operating instructions are given in Sect. 1, Chap. 3.

Canopy and hatch

2. The pilot's canopy and the crew's 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 and Type 2CA2, Mk. 4 ejection seats are fitted; the seats are described in A.P.109B-0107-1.

Combined time-release and breech unit

4. The time-release and breech 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)

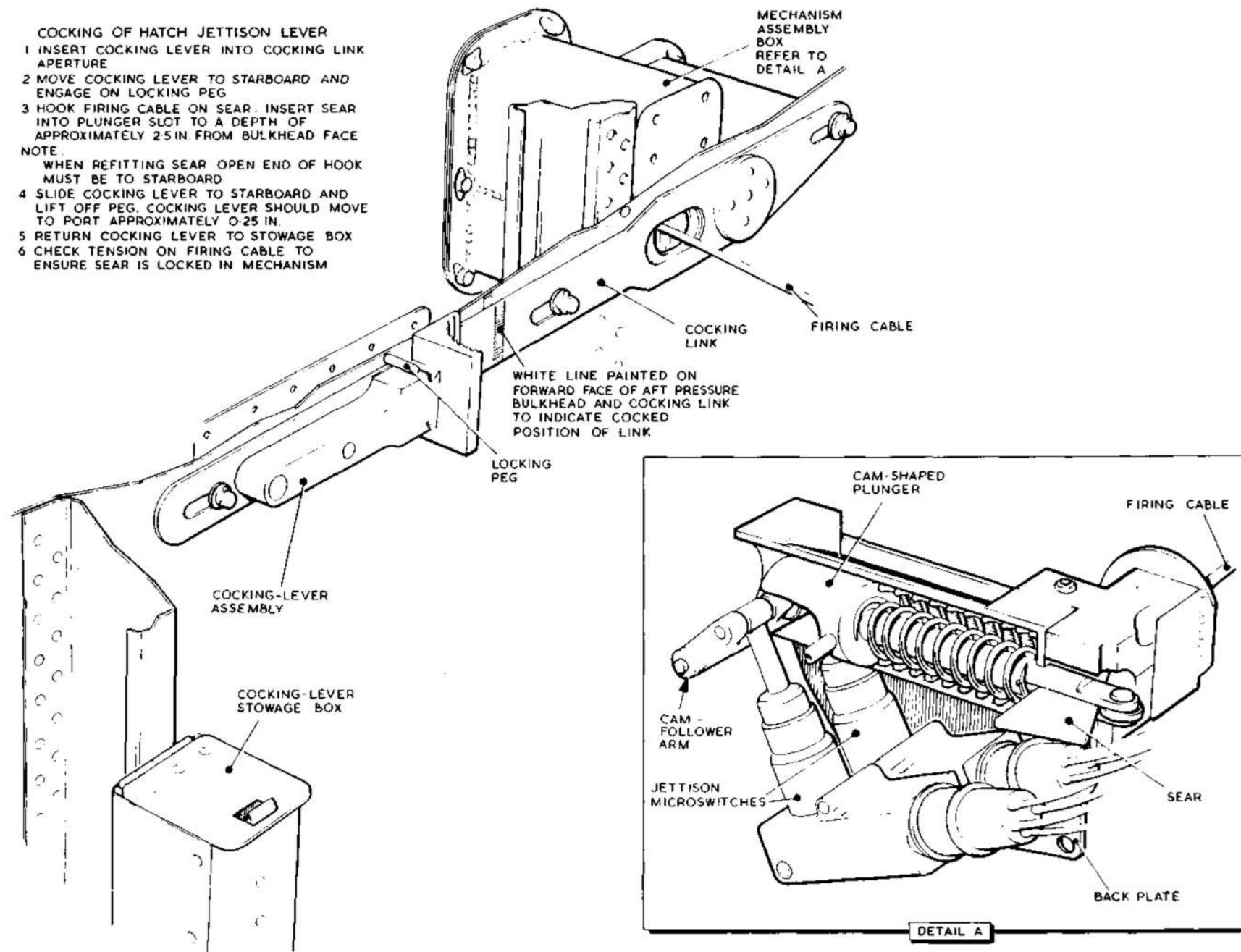
5. The control column snatch unit, located within the pilot's console on the port side of the cockpit, is connected to the elevator control-lever. Its purpose is to move the control column forward and hold it against the instrument panel to provide an unobstructed exit for the pilot in his ejection seat when abandoning the aircraft. An explosive severance-unit, fitted around the elevator control-tube aft of the control lever and fired prior to the operation of the snatch unit, severs the elevator control-tube 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 snatch 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 main-spring 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-tube 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 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 micro-switch, the charge in the severance unit 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 withdraws the ejection-gun sear, after a delay of one second, to initiate seat ejection.

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FIG. 2. HATCH-JETTISONING MECHANISM

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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 member comprises a Type 2 CA2, Mk.4 ejection seat and a hatch-jettisoning mechanism which is secured to the rear face of the aft pressure bulkhead. The ejection gun of this seat has a breech-type time-delayed firing unit fitted with a restrictor and safety catch (A.P.109C-0206-1), 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 box (fig.2)

10. The hatch-jettison mechanism box is mounted on the rear face of the aft pressure bulkhead behind the navigator's seat: its purpose is to initiate automatic jettisoning of the hatch prior to ejection of the navigator's seat. The box is sealed to the bulkhead to prevent pressurized air from the cabin escaping to atmosphere via the sear and cocking-lever apertures.

11. The 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 cam-shaped at one end. The plunger, when cocked, holds the mainspring in compression against the closed end of the casing and is retained in that 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 the firing handle of the navigator's 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 seat gun, which it does after a delay of approximately one second.

Secondary firing cable

13. The upper end of the secondary firing 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 seat gun firing unit as the hatch leaves the aircraft, thereby ensuring correct sequencing of hatch jettisoning and seat ejection.

Alighting gear emergency lowering control

(fig.3)

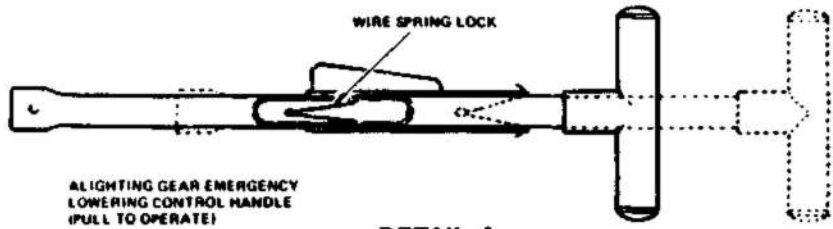
14. The emergency control for lowering the alighting gear is a black-and-yellow striped T-shaped handle situated to port of the instrument-flying panel; it is connected by cable to a spring-loaded lever on the alighting-gear selector in the flare bay. The control is locked in the operated position by 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 along the port side of the fuselage, through the aft pressure bulkhead, equipment compartment and into the flare bay where it is connected to the lever on the alighting gear selector. The lever is spring-loaded to the off position.

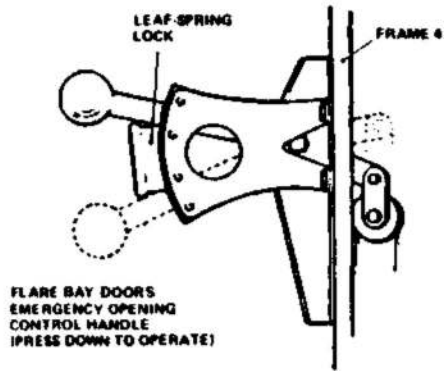
Alighting gear emergency raising control

◀ 16. The UP mechanical lock can be overridden 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 ▶

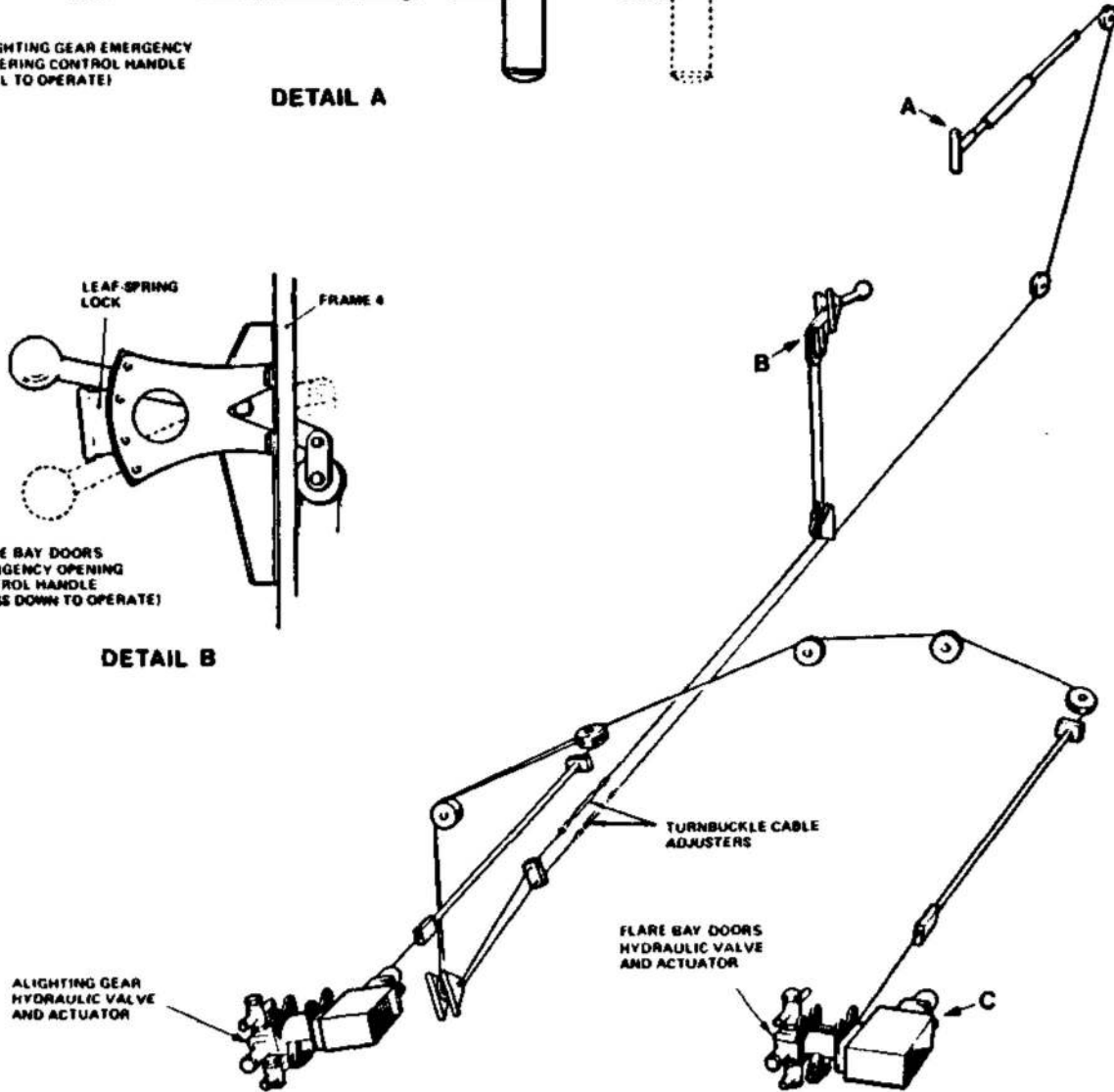
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DETAIL A



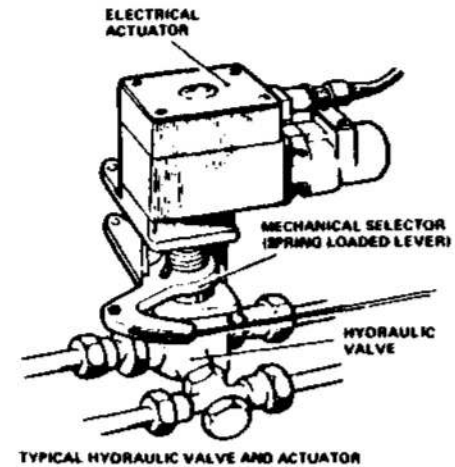
DETAIL B



KNOBBED RING (FOR EMERGENCY UP SELECTION - SHOWN IN NORMAL POSITION)

HOLE FOR RESETTING TOOL

ALIGHTING GEAR POSITION SELECTOR SWITCH



DETAIL C

FIG.3 ALIGHTING GEAR AND FLARE BAY DOORS EMERGENCY CONTROLS

◀ 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. ▶

Flare-bay doors emergency opening control

(fig.3)

17. The emergency control for opening the flare-bay doors is a black-and-yellow striped lever situated on the port side of the cabin; it is connected by cable to a spring-loaded lever on the flare-bay doors selector in the flare 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

continued

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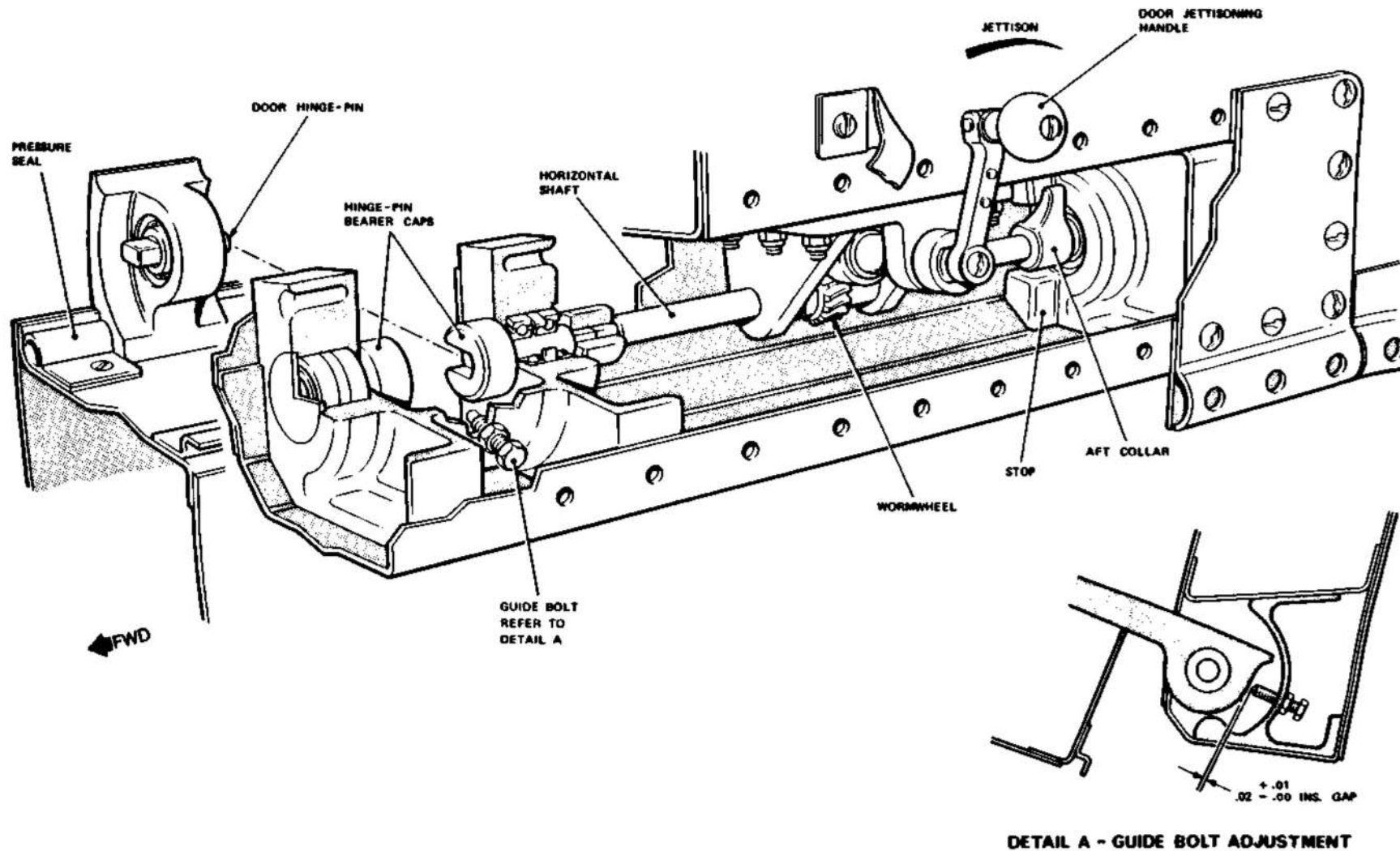


FIG.4. ENTRANCE DOOR JETTISONING MECHANISM

lever, then down and along the port side of the fuselage, parallel with the cable for the alighting gear control, into the flare bay. Within the flare bay the cable passes over to the starboard side where it again passes aft to the lever on the flare-bay doors selector. The lever is spring-loaded to its off position.

Entrance door jettisoning mechanism (fig. 4)

19. The entrance door jettisoning mechanism 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 each 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 of 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 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-destroyer stowage

23. The aircraft destroyer stowage is attached to the inner surface of the starboard equipment bay door.

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.109B-0201-5F.

Cocking the snatch unit

26. Refer to para. 5 and fig. 1.

Cocking the hatch jettisoning mechanism box

27. Refer to para. 10 and fig. 2.

Resetting the alighting gear lowering and flare-bay doors emergency controls

Note . . .

Ensure that the aircraft is raised on jacks (Sect. 2, Chap. 4) before resetting the alighting gear emergency control.

28. Exhaust hydraulic pressure and electrically select the alighting gear actuator to UP or the

flare-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 flare-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, and 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 aft pressure bulkhead (Chap. 8A). Carry out a functional test of the normal system for correct operation.

Lubrication

28A. Following operation of the alighting gear lowering or flare bay emergency controls, impregnate the sealing washers where the cables pass through the aft pressure bulkhead as detailed in Chap. 8A. Grease with XG-287 the operating cables and handle mechanisms. For lubrication details of the entrance door and flying controls refer to Chap. 1 and 4 respectively.

◀ 28B. Deleted ▶

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

Navigator's seat

29. *Removal.*— To remove the navigator's seat, remove the hatch in accordance with Sect.3, Chap.1, then remove the seat in accordance with A.P.109B-0107-1.

30. *Assembly.*— Assembly of the navigator's seat is the reversal of the removal operations.

Pilot's seat

31. *Removal.*— To remove the pilot's seat complete with guide rail, refer to fig.6 and A.P.109B-0107-1, and proceed as follows:-

- (1) Remove the ejection gun, drogue gun and the time-release and breech unit cartridges in accordance with 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-0101-1.
- (4) Disconnect the gas pipe from the time-relay and breech unit.
- (5) Remove the two top 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) Secure all loose items.
 - (10) Remove the two bottom bolts securing the guide rail to the adjacent structure.
 - (11) Withdraw the seat and guide rail through the cabin entrance doorway.
32. *Assembly.*— Assembly of the pilot's seat is the reversal of the removal operations.

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

33. To remove the snatch unit:-

- (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 elevator severance unit detonator (para.36(1) - (4)).

- (4) Remove the forward inboard side panel from the pilot's console.
- (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

34. Assembly of the snatch unit is a reversal of the removal procedure but the following points should be noted and carried out:-

- (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-0422-1B, Sect.5, Chap.1, Group W)
 - (3) The snatch unit may be tested as detailed in the relevant Servicing Procedure detailed in A.P.101B-0400-5A3.
35. 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, carry out the following:-
- (1) Move the control column aft until the elevator bulkhead stop is contacted. At the same time closely observe the sear return spring and

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ASSEMBLY NOTES

NOTE

1. LOCATE THE TERMINAL BLOCK AND CLAMP ASSEMBLY HARD UP AGAINST THE NIPPLE, AS INDICATED BY ARROW A, AND SECURE IN THE VERTICAL POSITION AS ILLUSTRATED. (THE VERTICAL POSITION IS DETERMINED BY ROCKING THE ELEVATOR CONTROL ROD 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 EXCESS CABLE AS ILLUSTRATED. (USE TYTON STRAPPING SE/1147500 AND STUOS SE/1147501).

5. WHEN CONNECTING THE INPUT CABLE ALLOW SUFFICIENT SLACK FOR FULL FORE-AND-AFT TRAVEL OF THE CONTROL ROD. THIS LENGTH IS NOT TO EXCEED 9 IN. BETWEEN THE LAST 'P' CLIP AND THE CENTRE OF THE TERMINAL BLOCK.

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.

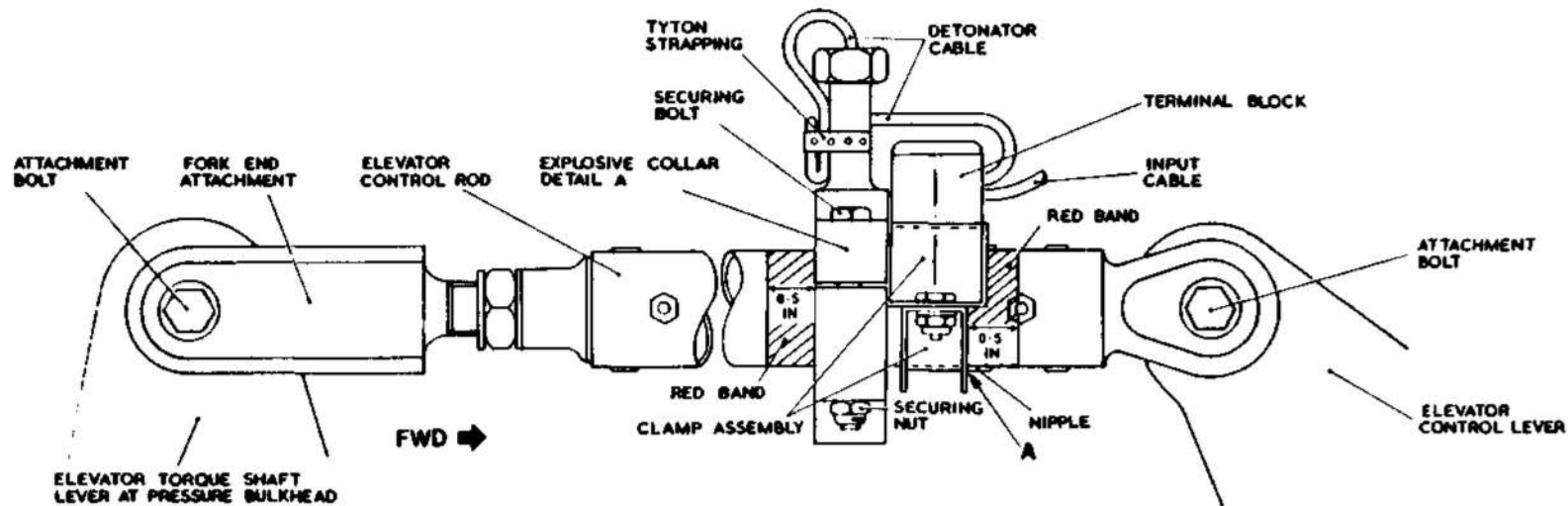
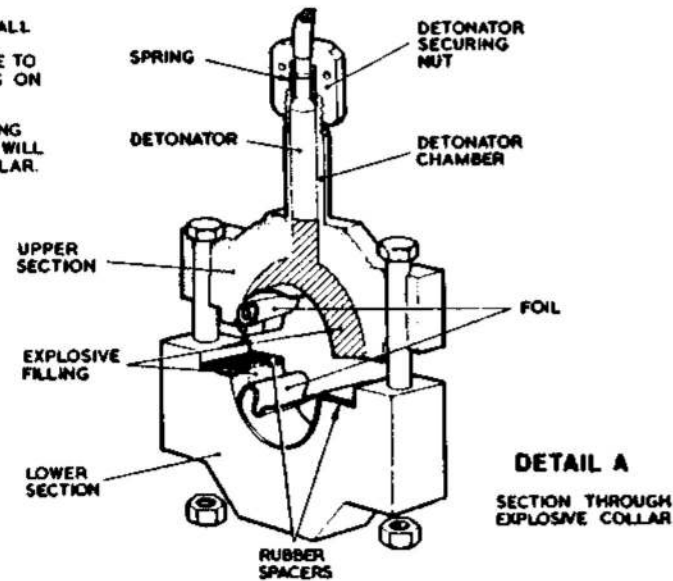


FIG.5. ELEVATOR CONTROL ROD SEVERANCE UNIT ASSEMBLY

◀ 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

36. To remove the assembly:-

- (1) Disconnect the normal, emergency and ground electrical supplies (*A.P.101B-0422-1B, Sect.5, Chap.1, Group P*).
- (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 card at the beginning of this book. Reference must also be made to A.P.110N-0306-1 for detonator information.

- (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 positions 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.

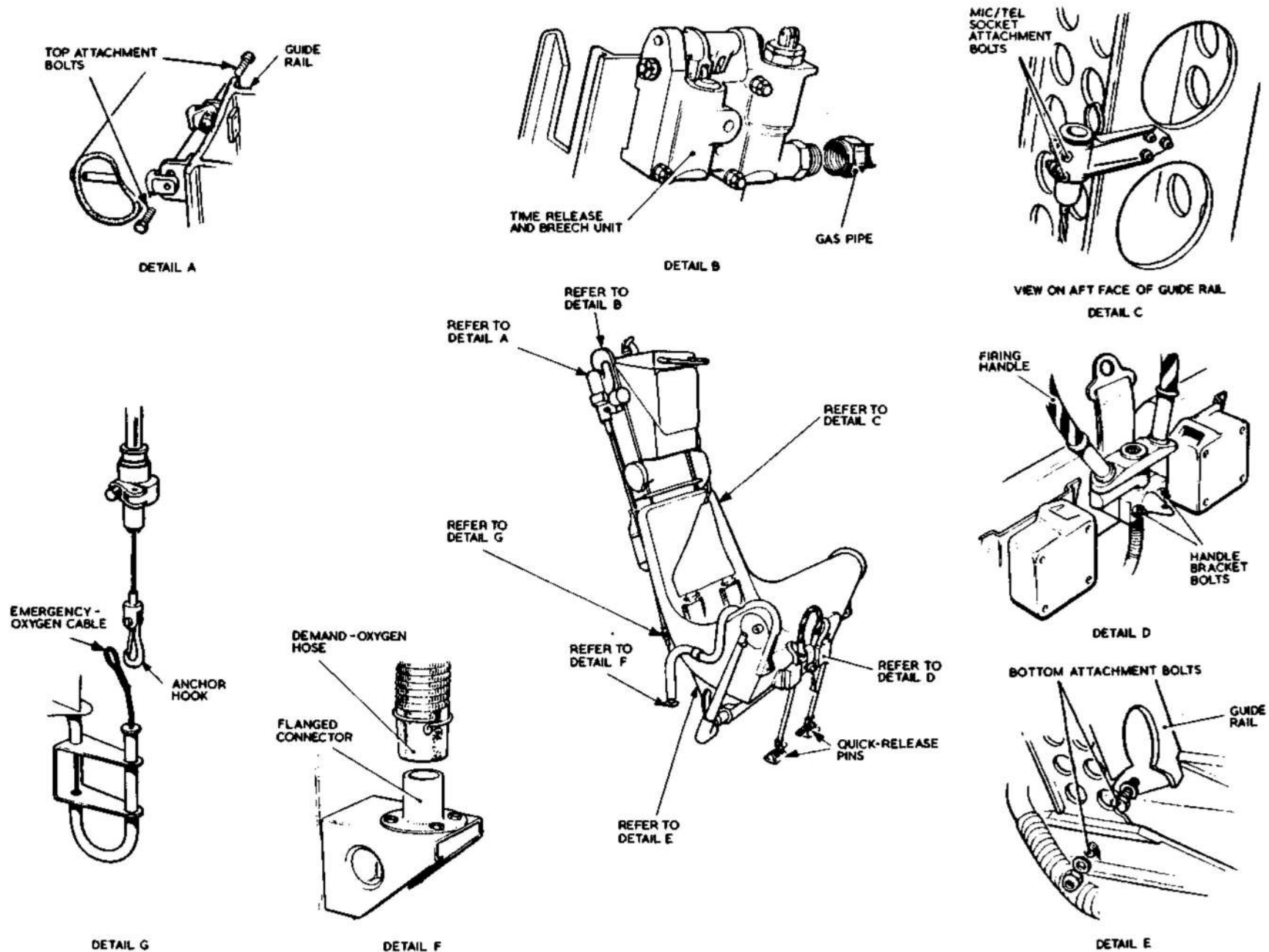
Assembly

WARNING

Before handling detonators, refer to the LETHAL WARNING card at the beginning of this book. Reference must also be made to A.P.110N-0306-1 for detonator information.

37. Assembly is as follows:-

- (1) Locate the terminal block and clamp assembly hard up against the nipple, as indicated by arrow A, and secure in the vertical position as illustrated. (The vertical position is determined by rocking the elevator control rod about its longitudinal axis and setting 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 evenly, to prevent damage to the foil, until the rubber spacers bulge and the explosive collar is secure against manual rotation.
- (4) Locate the detonator, ensuring that it rests on the explosive fitting and tighten the securing nut finger tight only.
- (5) After connecting the detonator cable secure excess cable as illustrated (use tyton strapping 5F/1147500 and studs 5F/1147501).
- (6) Connect the input cable, allowing sufficient slack for full fore-and-aft travel of the control rod. This length is not to exceed 9 in. between the last 'P' clip and the centre of the terminal block.
- (7) Move the elevator control rod through the full range of movement and check that the terminal block, explosive collar and cables do not foul the adjacent structure. Ensure also, that sufficient clearance will remain after refitment of the access panel.
- (8) Refit the access panel.



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FIG. 6. PILOT'S EJECTION SEAT REMOVAL

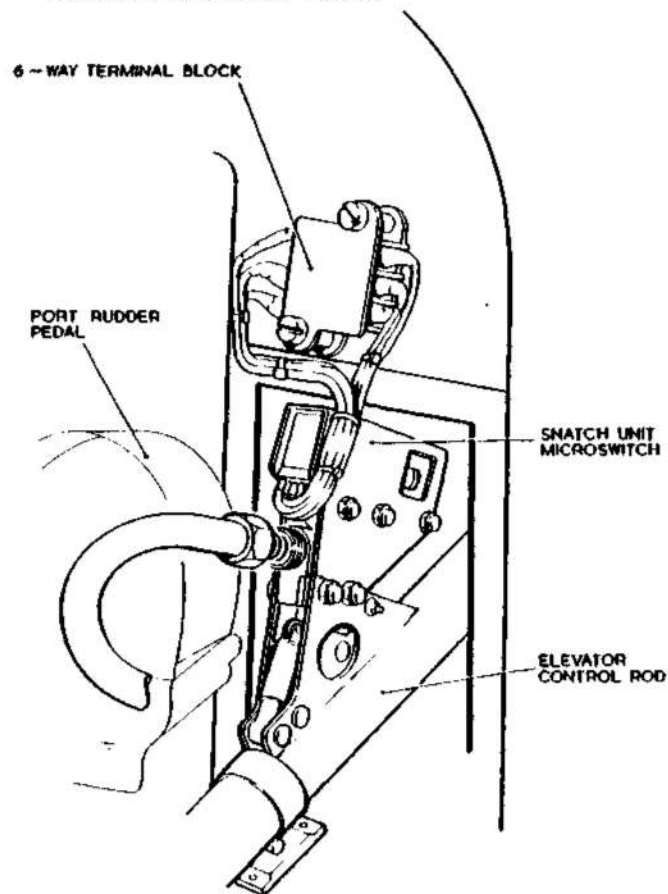
ASSEMBLY NOTES

WHEN CONNECTING A SNATCH UNIT MICROSWITCH AND/OR ELEVATOR DETONATOR TO THE 6-WAY TERMINAL BLOCK PROCEED AS FOLLOWS:-

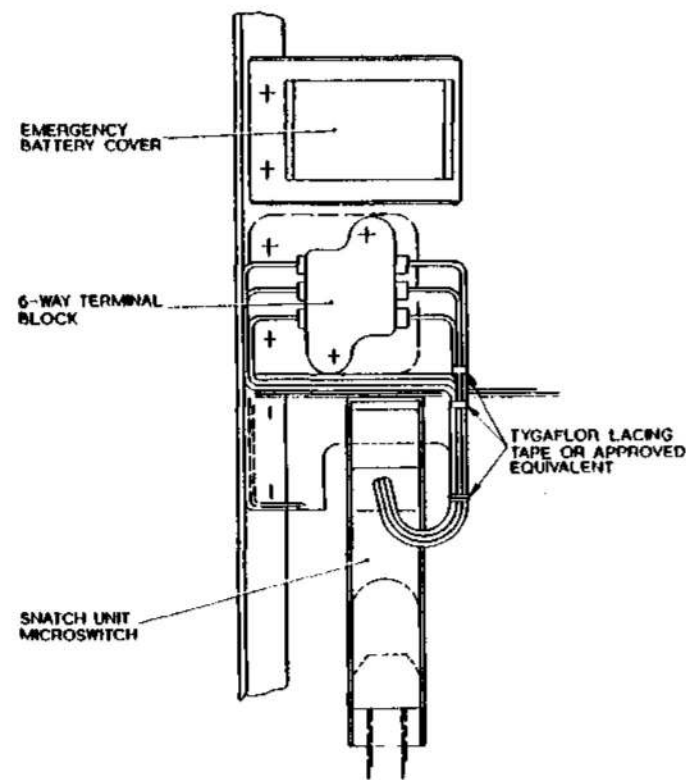
1. ROUTE CABLES OUTBOARD FROM THE MICROSWITCH TO THE TERMINAL BLOCK AS SHOWN.
2. CABLES ARE TO BE CUT TO THE MINIMUM LENGTH REQUIRED TO REACH THE TERMINAL BLOCK.
3. BIND CABLES TOGETHER AND WHERE POSSIBLE BIND TO ANY ADJACENT CABLES TO KEEP IN POSITION.
4. WHERE NECESSARY CRIMP NEW 48A TAGS, HELLERMANN 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



ROUTING OF CABLES

FIG. 7 CONTROL COLUMN SNATCH UNIT - CABLE ROUTING

◀ NEW ILLUSTRATION ▶

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