

## Chapter 2                      MAIN PLANES

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#### Introduction

1. This Chapter contains a general description of the main plane structure, together with the lubrication and servicing information necessary to maintain it in an efficient condition. Illustrations showing the method of slinging and dismantling the structure into its major components, are also included.

#### DESCRIPTION

##### General

2. The main plane is built in three sections, the stub wing, which is integral with the centre fuselage and the port and starboard outer wings. The outer wings are of swept-back design with slight negative dihedral and

carry the wing fuel tanks, pylons and the main undercarriages. The wings incorporate conventional ailerons and split trailing edge flaps, the ailerons being provided with hydroboosters to facilitate their operation at high speed. The stub wing structure is described in Sect. 3, Chap. 1.

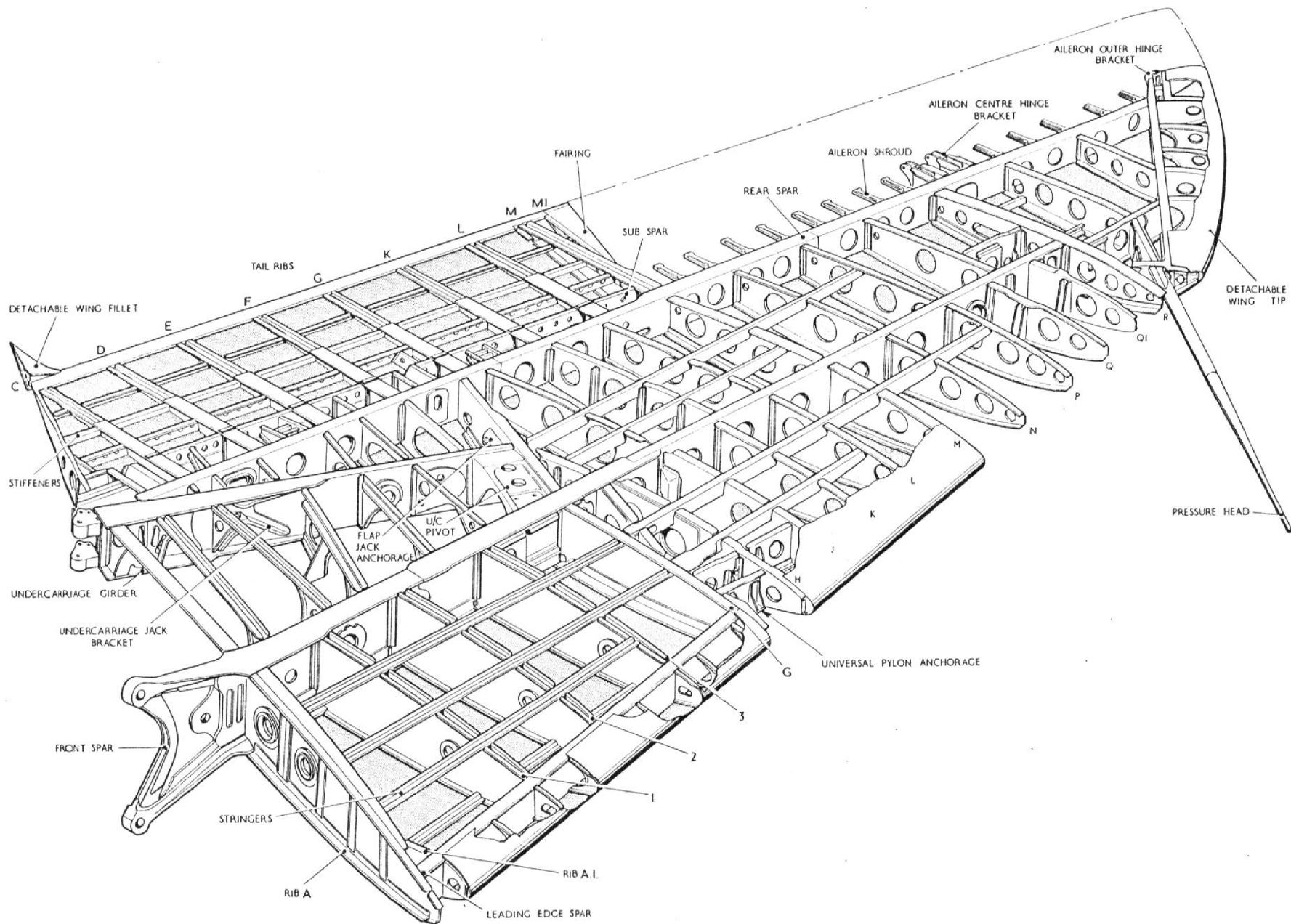


Fig. 1. Outer Wing  
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**Outer wings (fig. 1)**

3. Each outer wing is an all metal stressed skin cantilever structure consisting of leading edge, front and rear spars, undercarriage girder, nose ribs, inter-spar ribs and tail ribs, it is covered with a heavy-gauge light-alloy skin which is additionally strengthened by stringers and stiffeners. A detachable wing tip which extends from the leading edge to aft of the rear spar completes the structure. Ribs A, G, M and R are of heavier construction than the remaining ribs and with the front spar, undercarriage girder and rear spar form the major framework of the outer wing. The wing fuel tanks are carried forward of the front spar in compartments formed between nose ribs A and G; the leading edge of the wing over this portion is removable for access to the tanks. Inboard pylons when fitted are bolted to the underside of the wing outboard of the fuel tank compartments.

**Spars and undercarriage girder**

4. Both spars are fabricated in three portions, but are continuous when assembled, both inboard ends of the inner portions carry high-tensile wing attachment fittings which pick up with the fittings on the fuselage stub wing frames. The undercarriage girder is attached to the inboard end of the rear spar and extends outward and forward to the inter-spar rib G, thus forming a box-like structure between the two spars in which the main undercarriage is housed when retracted. The undercarriage pivot block is accommodated at the outboard end of this structure being attached to the front spar, inter-spar rib G and the undercarriage girder.

**Trailing edge and aileron shroud**

5. The trailing edge structure, aft of the rear spar, consists of a number of tail ribs extending from the wing root to the aileron shroud. These ribs are recessed to form the flap housing. The flap is mounted on four bearing brackets located as follows:—Be-

tween tail ribs A and C, at rib E, between tail ribs F and G and at rib L. The aileron shroud structure extends from tail rib M to the outer rib and is attached to the rear spar. Rib M carries the aileron inner hinge, the outer rib carries the outer hinge and the centre hinges are mounted on the shroud structure.

**Fuel tank compartments**

6. The flexible-bag type fuel tanks in each outer wing are contained in four compartments formed between the leading edge spar and front spar in the region of ribs A to G. These compartments are sealed from the remaining structure and each other by moulded packing attached to the ribs and spars, and are provided with internal skinning to support the tanks. The leading edge forward of these compartments is detachable to provide access to the tanks, it consists of a curved light-alloy shell stiffened by a number of dished nose ribs. The nosing is attached to the top and bottom booms of the leading edge spar and to the nose ribs extending forward from this spar.

**Pylon attachments**

7. One universal pylon is fitted to each wing, carrying either bombs or a drop fuel tank. The pylon is bolted to the undersurface of the outer wing, forward of the front spar, in the region of nose ribs G to J, in which region the structure is strengthened by spanwise ribs located just aft of the nosing and by reinforcing plates on the lower wing skin between the nose ribs. Eleven machined stampings in the form of mounting brackets with nut plates attached are riveted to the spanwise ribs and nose ribs H and J. The pylon is bolted to these mounting brackets by special bolts extending through the top member of the pylon and wing skin to engage with the nut plates on the mountings. Access panels and cover plates are provided to give access to the fuel and electrical connections between the wing and pylon.

**Inboard pylons**

8. The structure of the inboard pylons consists of a top member of light alloy channel between two extruded angles connected by a cover plate. A light alloy bottom member completes the main structure. The top and bottom members are connected at intervals by vertical angles between which are steel bridge pieces. The whole is covered with a metal skin to form a structure which, when bolted to the underside of the wing (para. 7), houses the bomb release mechanism, the fuzing mechanisms and electrical cables, etc., together with the fuel pipes and valves necessary when a drop fuel tank is fitted in lieu of a bomb.

**By-pass valve**

9. When a pylon is not fitted, the disconnected air and fuel pipes are interconnected by means of a by-pass valve which takes the form of a ducted plate. A blanking plate is provided to fit over the by-pass valve in place of the pylon, thus completing the inter-connection. *The plate must be fitted at all times when the pylon is not assembled to the wing.*

**Aileron operating gear**

10. The aileron hydrobooster and operating gear is housed between ribs R and S in a bay formed by these two ribs, a diaphragm and the rear spar. The gear consists of the booster jack, control tubes and levers, all of which are carried on two sets of bearing blocks attached to the outboard face of rib R. For further information on this installation, refer to Sect. 3, Chap. 4.

**Wing tip**

11. The detachable wing tip consists of a light-alloy shell stiffened by a number of ribs, it is attached to the wing outer rib. A housing with a transparent window, containing the navigation lamp, is incorporated at its leading edge. The pressure head, which is mounted to a rib extending diagonally from the forward end of rib R to rib S, projects forward from the leading edge of the port wing tip.

### Flaps

12. The flaps are of conventional design, each consisting of a single spar with a number of ribs covered on the undersurface only with a light-alloy skin. A reinforcing plate is incorporated along the upper surface of the trailing edge. Each flap is hinged at four points (*para. 5*) and extends from the wing root to just inboard of the ailerons.

### Ailerons

13. Each aileron consists of a main spar with a number of ribs and stiffeners covered with a light-alloy skin. They are hinged at three points, the centre point having a double hinge (*para. 5*). The port aileron incorporates a small electrically-operated trim-tab in its inboard trailing edge. The ailerons are provided with hydro-boosters to facilitate operation at high speed.

## SERVICING

### General

14. Little servicing is necessary to the main plane apart from the various systems incorporated therein; these are described in the various Chapters of this Volume dealing with the systems concerned. The instructions given in this Chapter, will therefore, only include items not covered in other Chapters.

15. After servicing, it is necessary to check that all access panels and doors are securely locked and flush with the surrounding structure; this is very important as any alteration in contour will give rise to a shock-wave, resulting in a vast increase in drag and consequently a loss in performance as well as the possibility of the panels becoming detached in flight. Extreme care must, therefore, always be taken, during removal or fitment of the access panels, to ensure that they are not damaged or distorted in any way.

### Lubrication

16. The principal lubrication points for the main plane are given in Sect. 3, Chap. 4. The remaining points are dealt with in this Chapter and are given on fig. 16, 17 and 18 with a key to the lubricants on fig. 15.

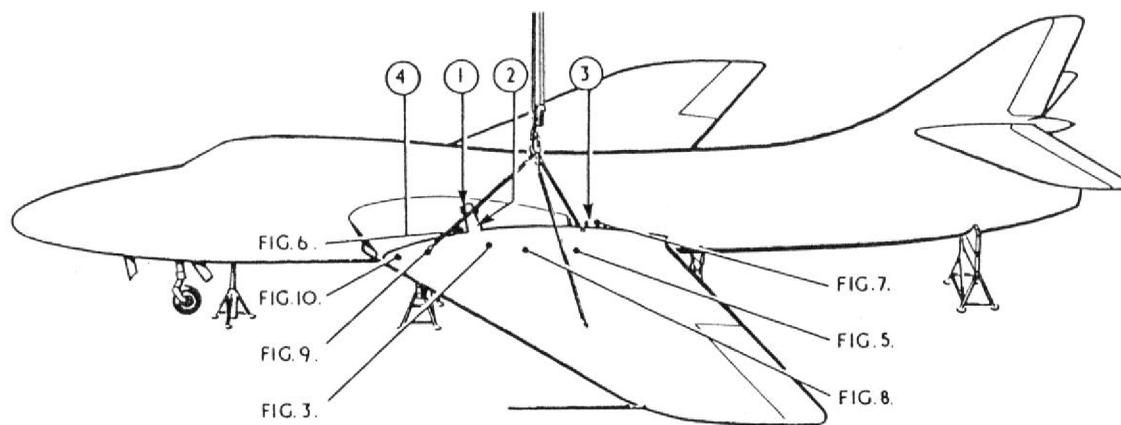


Fig. 2. Removing wing

## REMOVAL AND ASSEMBLY

### General

17. The separation of the outer wings from the stub wing and the removal of the various major components, together with the method of slinging during removal, is shown in the illustrations contained in this Chapter. In general, the assembly of the units is a reversal of the removal, but where there is any special assembly feature it is covered in the key to the illustration.

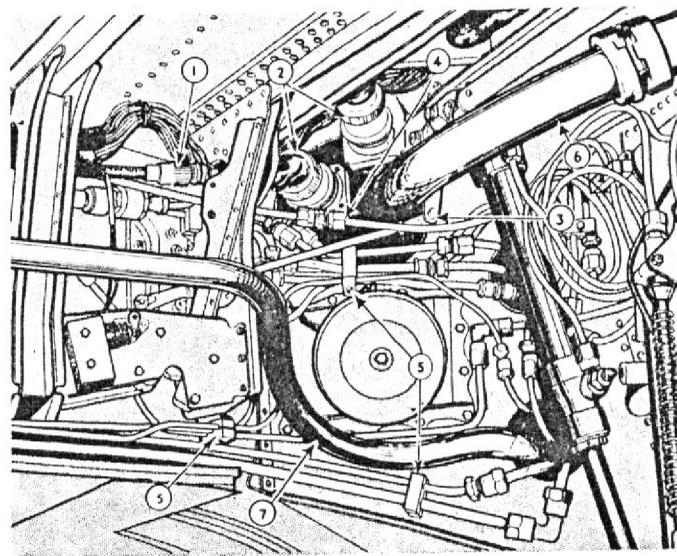


Fig. 3. Connections at front spar (port)

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## KEY TO FIGS. 2 TO 10

## Removal of Wings

Jack and trestle the aircraft (*Sect. 2, Chap. 4*), and place two additional trestles beneath the centre fuselage (*Sect. 3, Chap. 1*).

Render the aircraft electrically safe (*Sect. 5, Chap. 1*).

Dissipate the hydraulic fluid pressure (*Sect. 3, Chap. 6*).

Remove the access panels over the front and rear spar joints (*fig. 2, items 1, 2 and 3 and the panels forward of the front spar for the refuelling pressure relief valve, item 4*).

Remove the pressure head from the port wing as described later in this Chapter.

Drain the wing fuel tanks (*Sect. 2, Chap. 2*). If fitted, remove the wing drop tanks or external stores from the pylons (*Sect. 2, Chap. 2*). Should it be required to remove the pylons, reference should be made to *fig. 20*.

From inside the wheel well, disconnect all the services between the fuselage and the wing.

For disconnecting the port wing (*front spar*) refer to *fig. 3*. Disconnect the aerial lead (1) and the electrical supply leads (2). Detach the wheel door lock controls from the lever (3). Disconnect the Teleflex control tube at (4) and at the connection to the swivel block on the bracket attached to the fuselage, leave loose. Unscrew the locknut and the Teleflex cable at the end connected to the link on the wheel door and also at the leg fairing lock. Withdraw the cable at this lock, coil up and attach it securely to the wing structure.

Referring again to *fig. 3* dismantle the clamps (5) and remove the short lengths of pipes by disconnecting the unions at both ends of the pipe.

Remove the transfer pipe (7) by disconnecting the clamp fitting, similar to (8) at *fig. 4*, of the tank connection and at the union forward of the front spar.

For the starboard wing (*front spar*) refer to *fig. 4*. Dismantle the clamp (1). Remove the

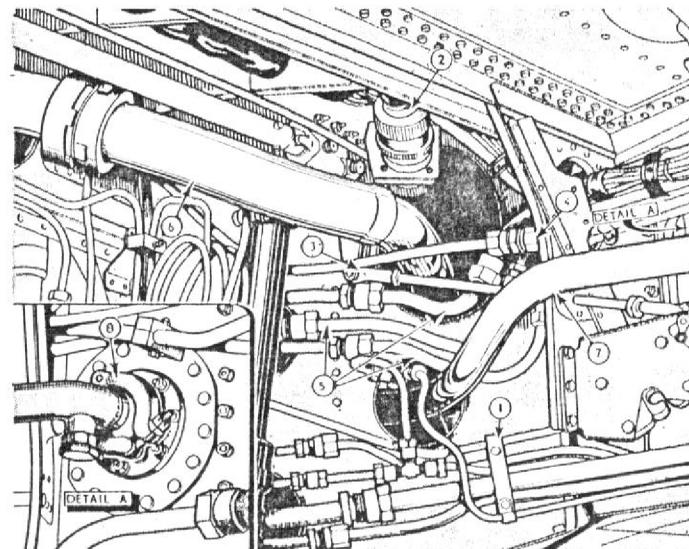


Fig. 4. Connections at front spar (Starboard)

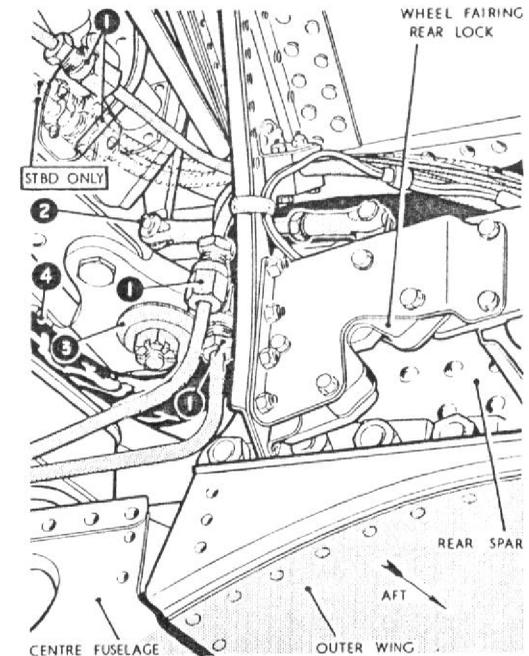


Fig. 5. Connections at rear spar (port)

short lengths of pipe by disconnecting the unions at both ends. Disconnect the electrical supply lead (2). Detach the wheel door lock controls from lever (3). Disconnect Teleflex control (4). Remove the short lengths of pipe (5) and the fuel pipe (6) by disconnecting the unions at both ends of the pipes. Remove the transfer pipe (7) by disconnecting the clamp fitting, (8) detail A, at the tank connection and at the union forward of the front spar.

Refer to *fig. 5* for either port or starboard wing. Disconnect the pipes (1) and the lever (2).

**Note . . .**

There are three hydraulic pipes at this point for the port wing and five for the starboard wing.

KEY TO FIGS. 2 TO 10 (Contd.)

Removal of Wings (Contd.)

Disconnect and stow away the electrical supply cable A.4, (4), the plug and socket is located between the drag members on the side of the fuselage.

Through the access hole (*port and starboard*) in the bottom surface of the stub wing forward of the front spar, first remove the pressure relief valve fig. 6 (1) by taking out the screws securing the valve to the mounting brackets and disconnecting the outer sleeve on the pipe (3).

Detach the mounting brackets (2) and remove the pipe (3).

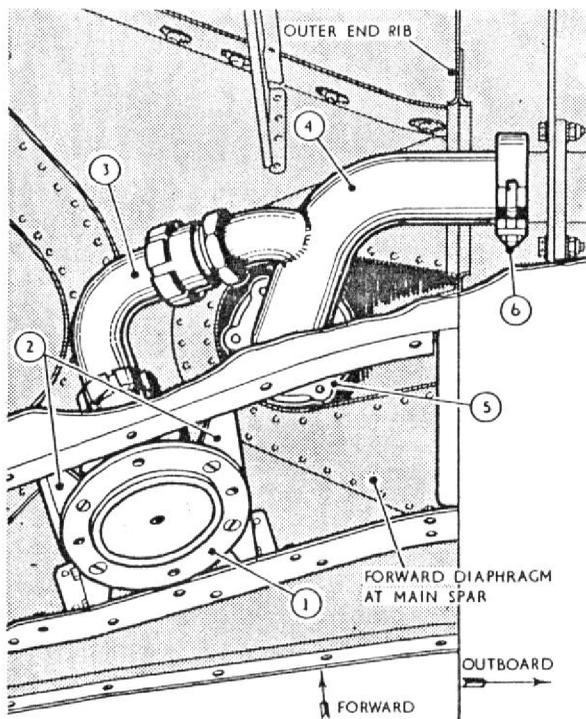


Fig. 6. Fuel pipe connections forward of front spar

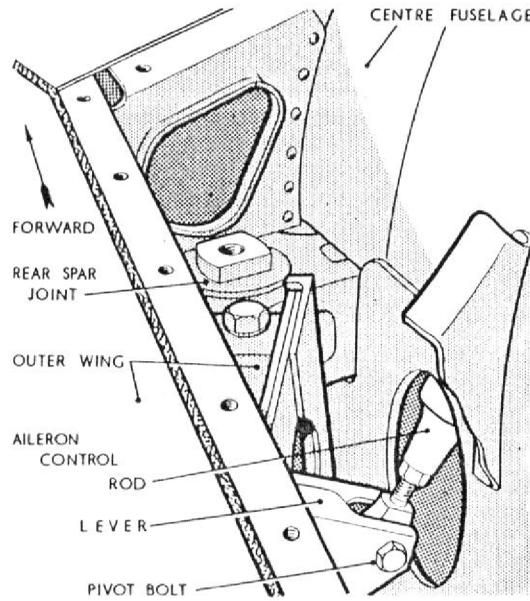


Fig. 7. Details of rear spar joint

Unscrew the bolts at (5) and the clamp fixing at (6) and remove the pipe (4), taking care not to lose the rubber sealing rings at each joint.

Disconnect the aileron control rod (*fig. 7*) by removing the pivot bolt. While at this access hole disconnect the three rear pipes. The two pipes running forward should not be disturbed.

Blank off all exposed pipe connections.

Remove the small access panel over the wheel axle in the leg fairing and remove the undercarriage wheel.

Procure an undercarriage up-lock tool (*Ref. 26FX/95080*) refer to *fig. 8* and proceed as follows:—

Insert the hook portion of the tool over the spigot mounting as shown and allow the screwed rod portion to hang down minus its retaining plate, washer and nut.

Connect a hydraulic ground rig direct to the main undercarriage jack via the pipes which have been disconnected from the stub wing.

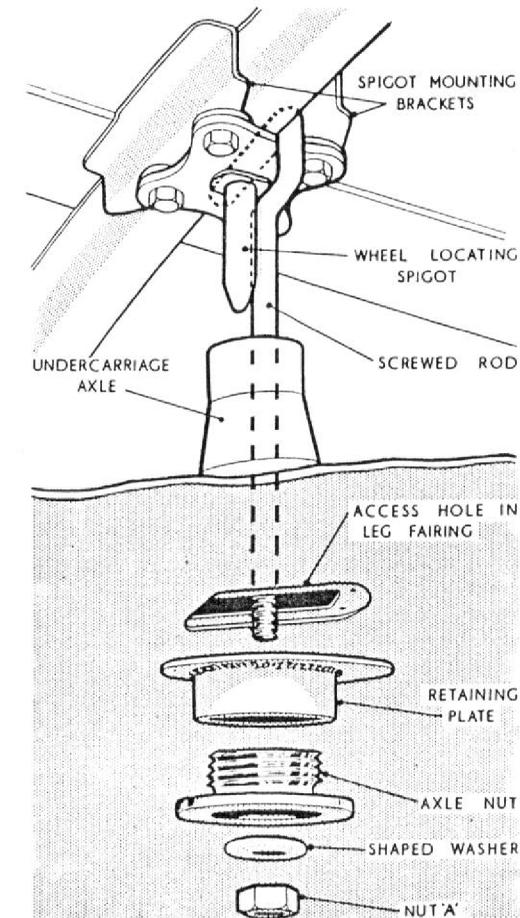


Fig. 8. Undercarriage up-lock tool

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## KEY TO FIGS. 2 TO 10 (Contd.)

## Removal of Wings (Contd.)

Partially retract the leg until the axle is approaching the end of the screwed rod. Ensure that this is in line with the hole through the axle and continue retracting the leg until the screwed rod passes through the hole in the centre of the axle. Secure the undercarriage leg in the retracted position by assembling the retaining plate, axle nut, and shaped washer and screwing up the nut 'A'.

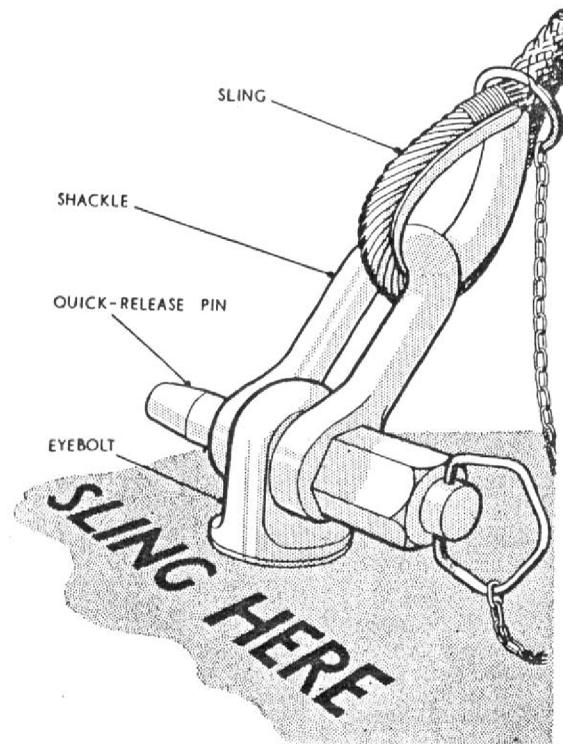


Fig. 9. Sling attachment

Disconnect the ground rig.

Remove the screwed plugs from the lifting sockets in the upper surface of the wing. Detach the eye-bolts from the sling, screw them into the wing lifting sockets and assemble the sling (fig. 9). Ensure that the sling cable marked "FORWARD" is fitted into the eye-bolt forward of the front spar. Remove the access panel (fig. 10) and withdraw the pin from the socket and spigot.

Take the weight of the wing from the trestles via the sling ensuring that the opposite wing not yet removed is correctly supported by its trestles.

Remove the split pins, slotted nuts and cup washers (3) fig. 5 at the rear spar joints and withdraw the pins using extractor (Ref. No. 26FX/95059).

Remove the split pins, slotted nuts and cup washers from the front spar joints and withdraw the pins using extractor (Ref. No. 26FX/95058).

Remove the split taper bushes from the front spar joints with bush extractor (Ref. No. 26FX/95140) and from the rear spar joints with bush extractor (Ref. No. 26FX/95141).

The wing may now be slung clear and placed on cradles (Ref. No. 26FX/95022 and 26FX/95023) supported by U.J. trestles No. 6.

To prevent damage and injury to personnel, while the wing is being slung, it is recommended that the small trailing-edge fillet be removed by unscrewing the six counter-sunk screws and the two bolts securing it to the wing structure (*this can only be done after the wing is detached from the centre section*).

Note . . .

When reassembling the main planes to the aircraft, the pins and bushes securing the wings (port and starboard) at the front and rear spar pin joints, together with the joint faces and the spigot, pin and socket at the nosespar pin joint must be well lubricated with oil OX-14.

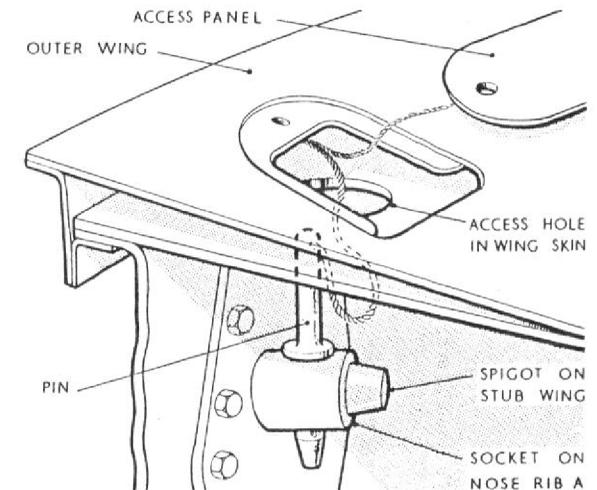


Fig. 10. Locating spigot and socket

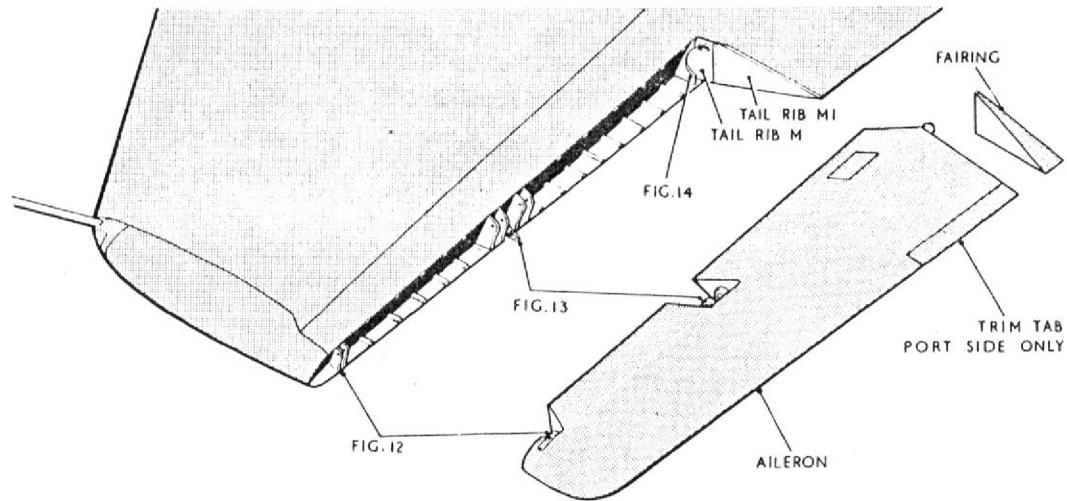


Fig. 11. Removing aileron

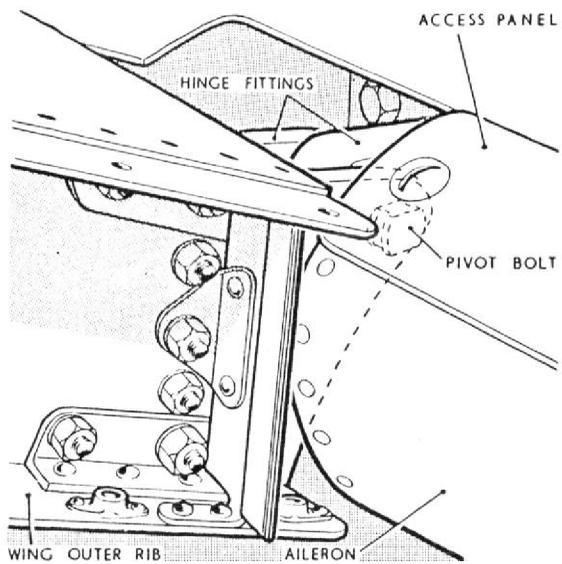


Fig. 12. Outer hinge

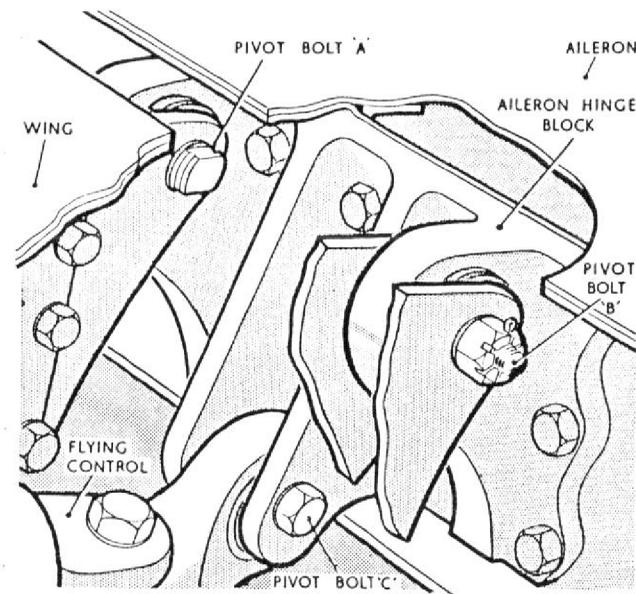


Fig. 13. Centre hinge

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## KEY TO FIGS. 11 TO 14

## Removal of aileron

Note . . .

Operations marked with an asterisk apply to the removal of the port aileron only.

Remove the fairing between the inboard end of the aileron and tail rib M1 (fig. 11) by unscrewing and removing the twelve counter-sunk screws.

\*Lower the flaps to expose the access door in the port flap roof, between tail ribs L and M. Render the aircraft electrically safe (Sect. 5, Chap. 1). Remove the access door and release T.B.27 from its mounting and draw it and its cables through the access hole, remove the actuator and transmitter cables from the terminal block. Replace the terminal block temporarily on its mounting and re-fit the access door. Close the flaps with an electrical supply from the ground trolley.

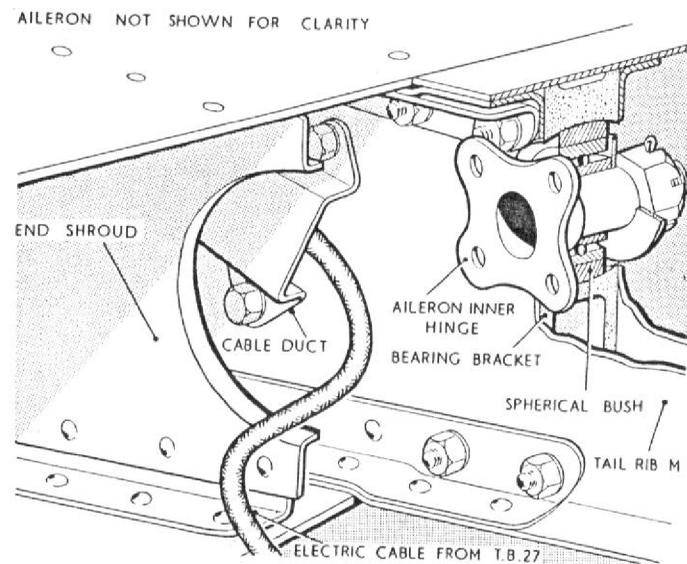


Fig. 14. Inner hinge

Support the aileron in the neutral position and remove the split pin, slotted nut and washer from the pivot bolt 'C' (fig. 13) connecting the flying controls to the aileron hinge block and remove the pivot bolt. From the aileron hinge block remove the split pins, slotted nuts and washers and withdraw the pivot bolts 'A' and 'B' (fig. 13) from the two centre hinges.

Lower the aileron as far as it will go and support it while in this position, thus exposing the access panel (fig. 12) in the top surface of the aileron, adjacent to and outboard of the outer hinge. Remove the panel after taking out the two screws. Remove the split pin, slotted nut and washer from the pivot bolt and withdraw it from the outer hinge fittings and out through the access hole.

The aileron may now be removed by raising it to the neutral position, swinging the outboard end rearwards sufficiently to separate the centre and outer hinge fittings and by lifting the outboard end. The inner hinge (fig. 14) will pivot with the spherical bush in the bearing bracket on tail rib M, when the hinge fittings have cleared one another, ease the inner hinge bearing out of the spherical bush.

\*Before finally removing the port aileron pull the electrical supply leads, from the actuator and transmitter, through the duct on tail rib M.

#### Assembly

The assembly of the aileron, is, in general, a reversal of the above procedure.

Note . . .

If either a port or starboard replacement aileron is fitted, the trimming tab on the port aileron must be adjusted after the test flight for the new components, in accordance with the instructions given in Sect. 3, Chap. 4 and the aircraft Servicing Form amended to record the new setting.

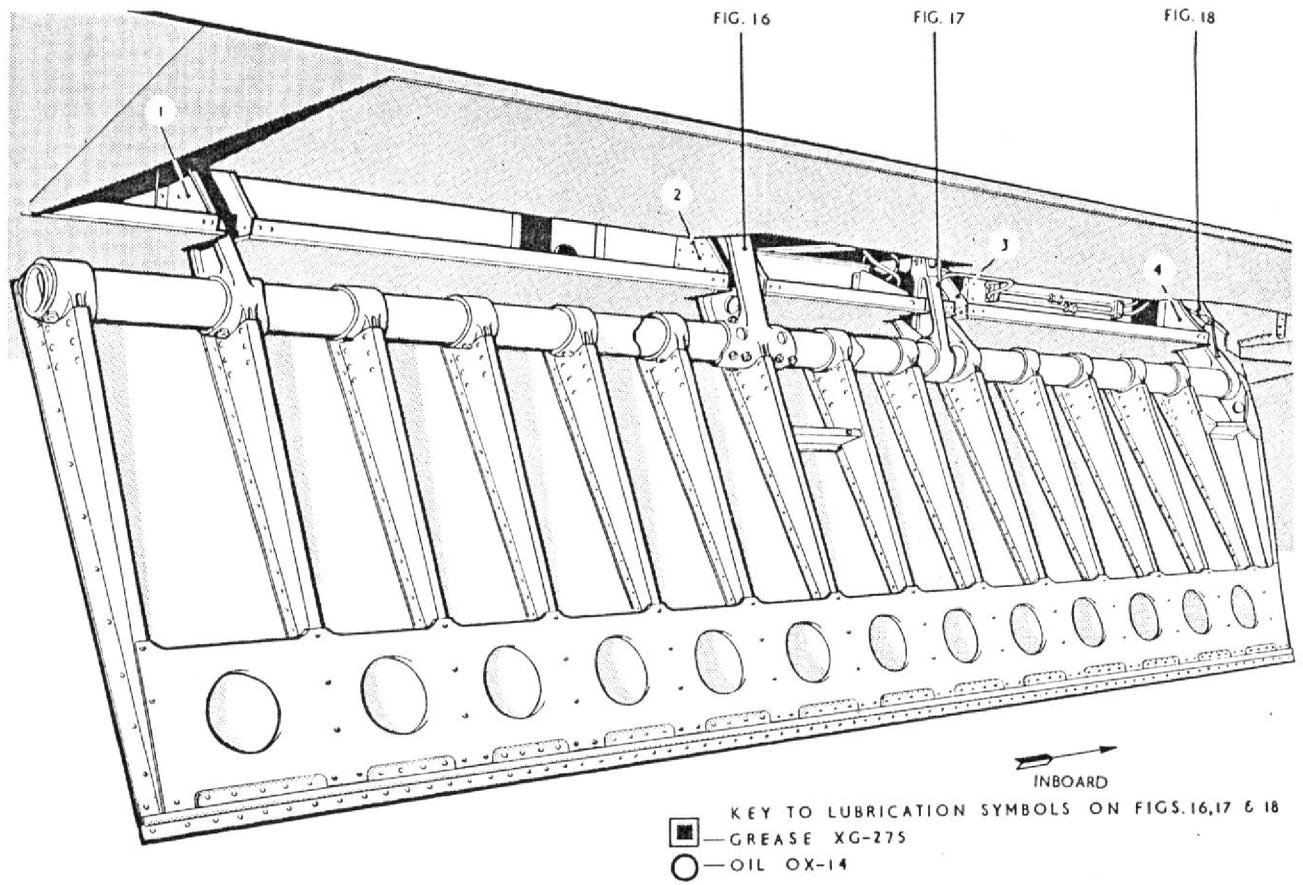


Fig. 15. Removing flaps

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## KEY TO FIGS. 15 TO 18

## Removal of flaps

Note . . .

Removal of the port flap is dealt with in this text. The removal sequence of the starboard flap is similar but of opposite hand.

Lower the flaps to the maximum extended position (Sect. 3, Chap. 4).

Render the aircraft electrically safe (Sect. 5, Chap. 1).

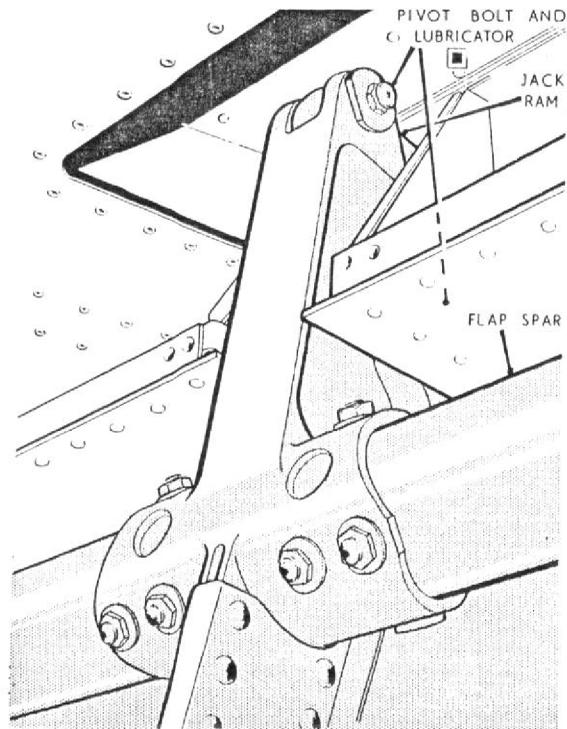


Fig. 16. Operating jack attachment

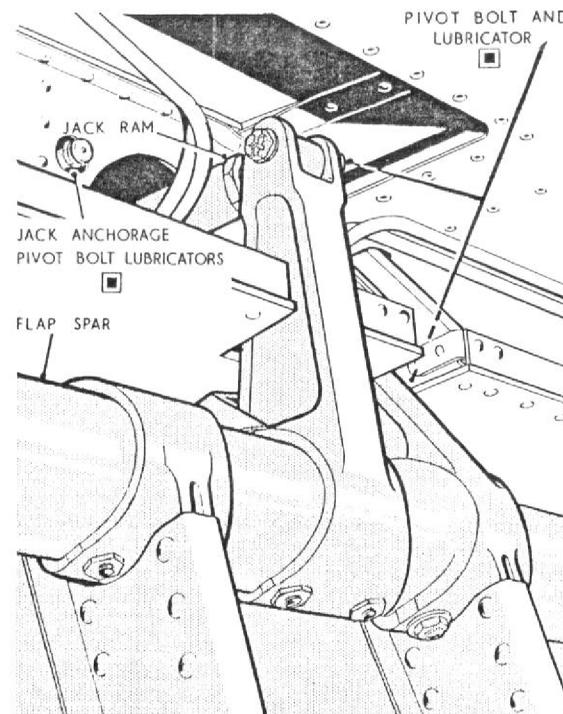


Fig. 17. Synchronising jack attachment

Support the flap and remove the split pin, slotted nut, washer and bolt connecting the operating jack to the flap spar lever (fig. 16) and similarly at the synchronising jack (fig. 17).

At the inboard end of the port flap spar remove the split pin, washer and pivot pin from the control rod and lever (fig. 18).

At the four bearing brackets fig. 15 (1); (2); (3) and (4) remove the 2BA bolt from the locking plate, and remove the locking plate. Unscrew the pivot bolts and remove the flap. The sleeve should be removed from each bearing bracket and retained with the pivot bolts and locking plates pending refitment of flap.

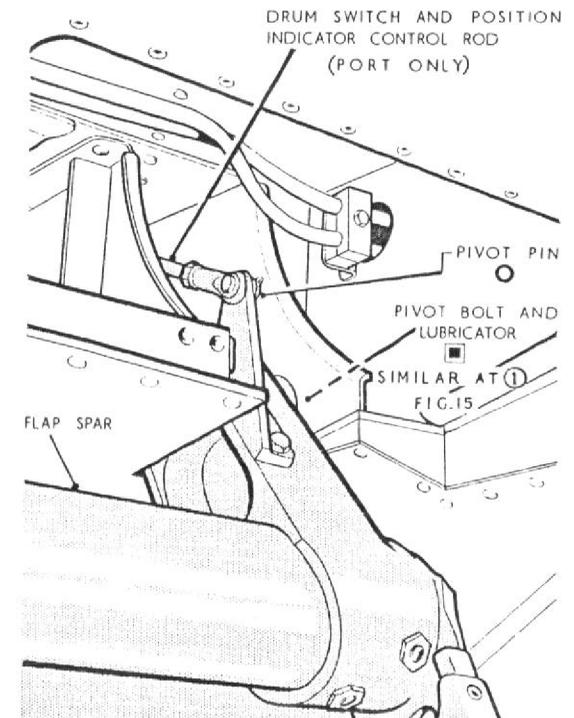


Fig. 18. Drum switch, etc., control rod attachment

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**KEY TO FIG. 19**

**Removing wing tip and pressure head**

Unscrew and remove the countersunk screws securing the navigation light window and remove the window by sliding it along, and off, the pressure head.

Support the wing tip and detach it by removing the countersunk screws and withdraw the wing tip spigots out of the wing outer rib.

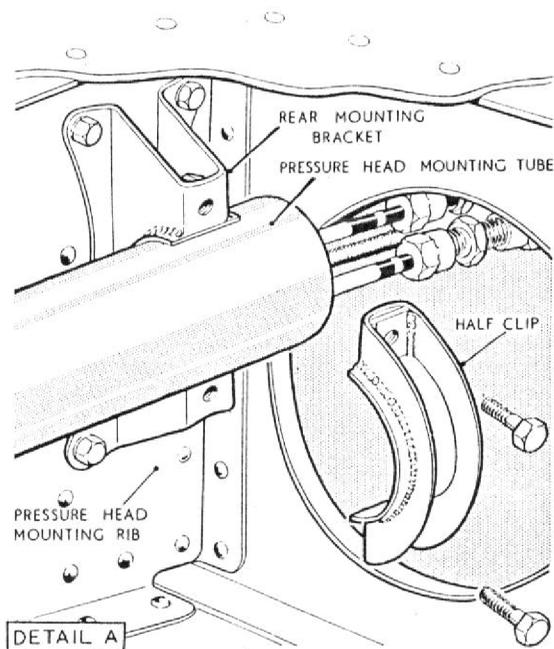
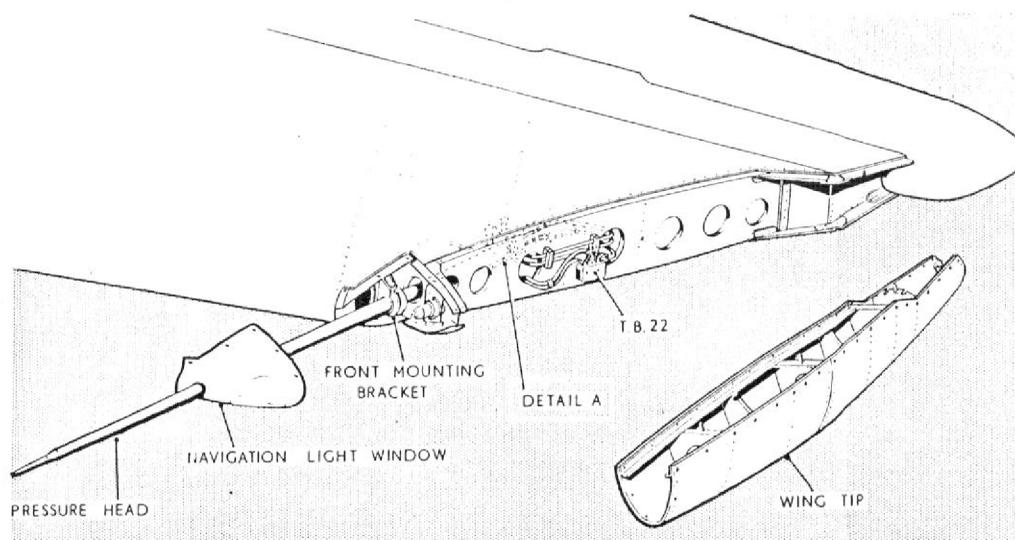
Render the aircraft electrically safe (*Sect. 5, Chap. 1*). Disconnect at T.B.22 the electrical supply leads from the pressure head, taking care not to disturb the leads from the navigation light at the same terminal block.

Disconnect the static and pressure pipes at the rear end of the pressure head, the unions being reached through the lightening holes in the wing outer rib.

Remove the two half clips from the mounting brackets on the pressure head mounting rib. Access to the clip on the rear mounting being gained through the lightening hole in the wing outer rib.

Withdraw the pressure head, complete with pipes and electrical supply lead, from the wing structure.

On re-assembly, check that the rubber seal on the port navigation light window is securely fixed to the fairing.



**Fig. 19. Removing wing tip and pressure head**

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## KEY TO FIG. 20

## Assembling inboard pylon

The inboard pylons are fitted to the wings as follows:—

Remove the access panel (4). Render the aircraft electrically safe (*Sect. 5, Chap. 1*).

From the bottom skin of the wing at (1), remove the inner and outer cover plates (*Part No. A.198509 and A.198510 respectively*).

From the bottom skin of the wing at (2), remove the cover plates (*Part No. B.206470 port and B.206471 starboard*).

From the bottom skin of the wing at (3), remove the inner and outer cover plates (*Part No. A.198511 and F.198512 respectively*).

Obtain the pylons.

Ensure that the fuel and air valve is free from foreign matter and that the valve is working freely. Assemble the pipes (*if not already fitted*) to the fuel and air valve, ensuring that the Dowty 'O' rings are correctly positioned, and secure the pipe couplings with 22 S.W.G. non-corrodible locking wire.

Offer up the pylon to the wing, engaging the pipes through the orifice (2) with the existing by-pass valve in the wing and fitting the connector of the electrical lead (5) from the pylon through (3) to connect with the plug in the wing. Secure the pylon to the wing with the bolts (6) (*Ref. 26FX/7993*).

## Note . . .

*If Mod. 964, which introduces thicker pylon attachment nuts of stainless steel, is embodied on the aircraft, the special (longer) bolts (Mod. 965) (Pt. No. F.244905), which have a white marking, must be used for securing the pylon to the undersurface of the mainplane.*

Carry out the electrical checks called for in Sect. 5, Chap. 1 of this Volume. Replace the access panel (4).

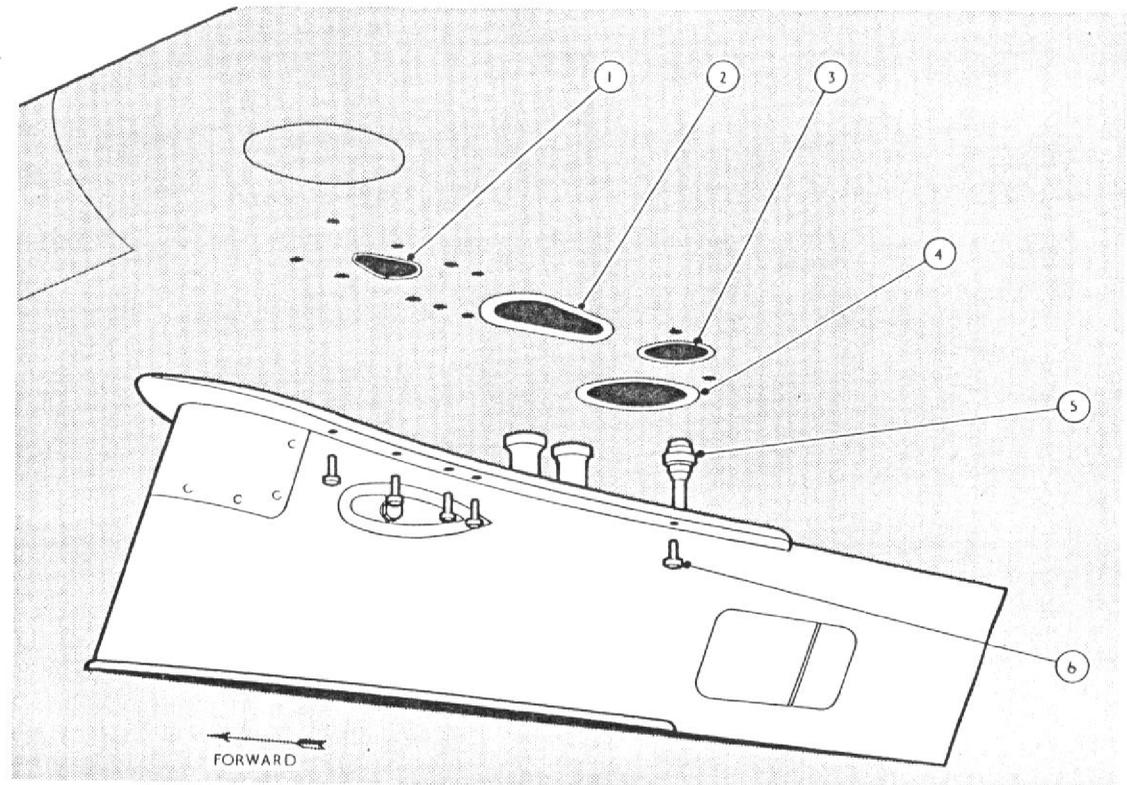


Fig. 20. Assembling inboard pylon

## Note . . .

*When stores are not being carried on the pylons, a security bar, 0.50 ins. dia. and 2.75 ins. long, (Part No. F.224996) must be clamped between the closed jaws of the release unit and drawn up (hand tight) to the Sole plate.*

## Removal

The removal of the pylons is, in general, a reversal of the assembly procedure, but when the pylons have been removed, the blanking plates at (1), (2) and (3) must be re-fitted into position.





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