

Chapter 2 MAIN PLANE

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DESCRIPTION AND OPERATION

General

1. The wing units, cantilevered from the fuselage, are recessed at their trailing edges to accommodate and support the ailerons, flaps and dive brakes. Built integrally with each wing are the stub boom, the engine air-intake and the main undercarriage diaphragm structure. Four flexible bag-type fuel tanks are housed in each wing, the details of which are given in Sect. 4, Chap. 2.

2. Each wing unit is of light-alloy construction and consists of a single I-section main spar attached by ribs to a false rear spar. Nose and trailing edge ribs project from the forward and after faces of the respective spars. The skin covering is

strengthened internally with span-wise stiffeners which are themselves attached to the ribs. A large area of the undersurface of the main plane, inboard of the stub boom, comprises the inner fuel tank door which is secured by countersunk bolts. Circular cover plates, on the upper and lower surfaces of the main plane, give access to the outer wing fuel tanks and to the structure.

Spars (fig. 1)

3. The main spar is a channel-section light-alloy pressing, comprising three lengths which are bolted and riveted together with butt and strap joints. The top and bottom

booms, which taper both in plan and elevation, are riveted to the channel flanges. The spar is further strengthened by extruded stiffeners riveted to the web. The rear false spar is a channel-section pressing with top and bottom booms riveted to the flanges.

Attachment joints (fig. 6)

4. The upper and lower eye-end fittings of the main spar are secured to the cross-tube fork ends on bulkhead No. 4 (joints "A" and "B"). Forward of the upper main spar fitting is the drag member, attached by a special bolt to a transverse tie strap on bulkhead No. 3 (joint "C").

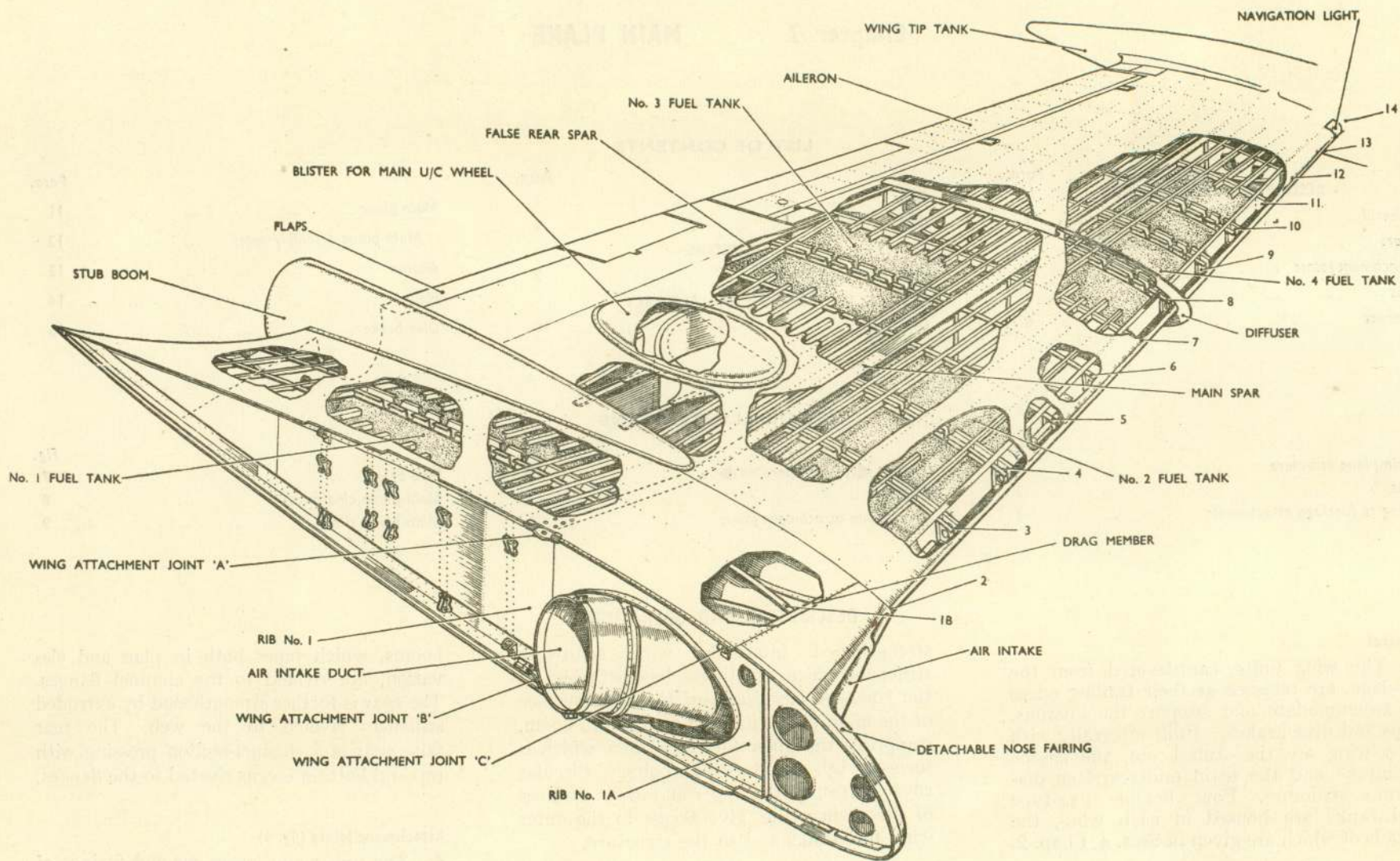


Fig. 1. Main plane structure

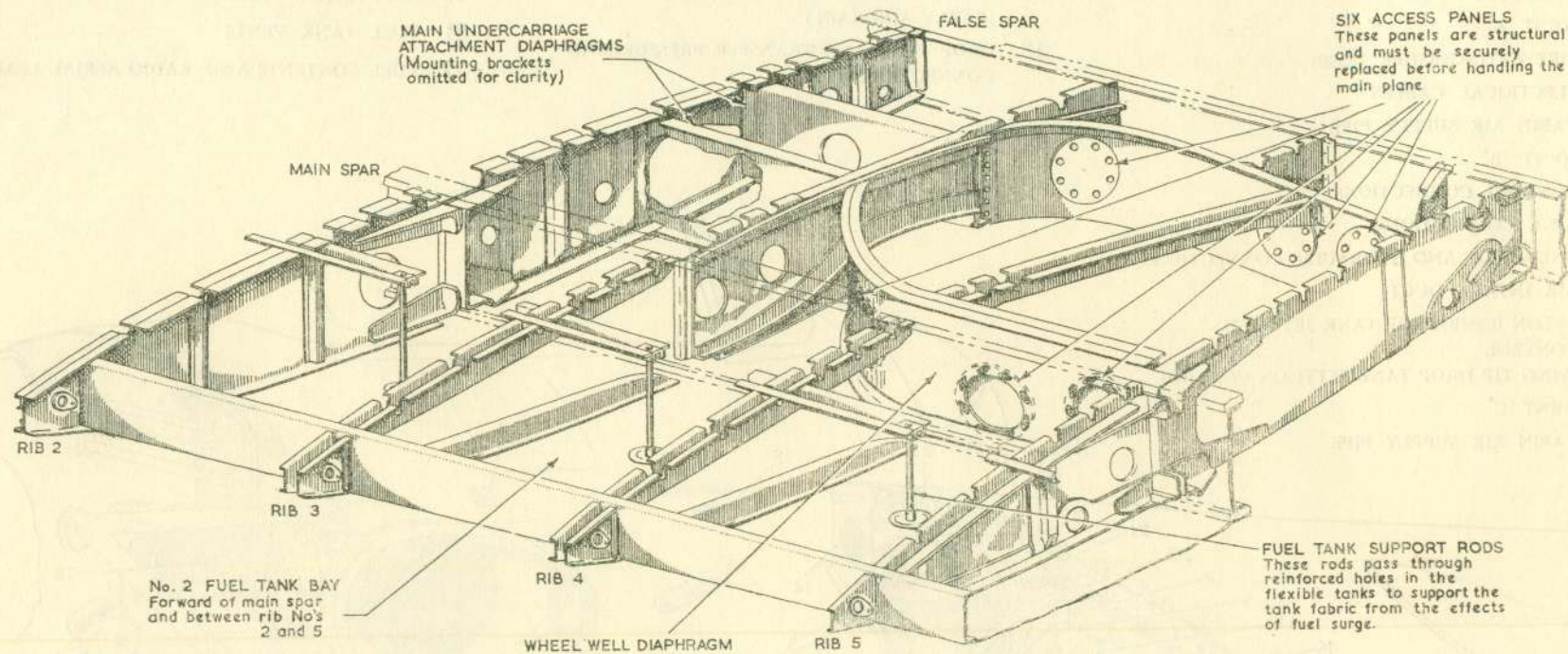


Fig. 2. Ribs

Ribs


5. The construction of some typical ribs (No. 2 to 5) is shown in fig. 2. Ribs 1 to 6 are strengthened for the attachment of the tail boom, main undercarriage and drop tank.

Ailerons (fig. 4)

6. Each aileron comprises a single channel-section spar to which the trailing edge ribs and nose fairings are attached, the whole framework being covered with light-alloy skin. The leading edge fits closely to the curved shroud plate, between the three hinges securing each aileron to the main plane and carries the mass-balance weights. The inboard trailing edge of each aileron is recessed to accommodate the servo tab,

which is hinged at three points. A full description of the aileron operating mechanism is given in Chapter 4 of this Section.

Flaps (fig. 5)

7. Each split trailing edge flap consists of two sections independently hinged on either side of the main plane and interconnected by a torque tube assembly. 

Dive brakes (fig. 7)

8. Immediately outboard of each flap are the dive brake surfaces, each consisting of a central channel-section spar with ribs attached on each side. The whole structure is covered with light-alloy skin. The two

rectangular holes in each dive brake are to eliminate the tendency to buffet under certain operating conditions. Each dive brake is hinged at two points about its centre of pressure.

SERVICING**Main plane components**

9. The main plane components require little servicing except lubrication of the control surface hinges at the periods laid down in Vol. 5. The lubrication requirements for main plane components are indicated in Sect. 3, Chap. 4. The aileron and aileron tab hinges have sealed ball races which are packed with grease on assembly and should need no further attention during the normal life of the aircraft. The main

- 1 FLYING CONTROL CABLES
- 2 FUEL CONNECTIONS
- 3 JOINT 'A'
- 4 FIRE EXTINGUISHER HOSE
- 5 ELECTRICAL CABLES
- 6 CABIN AIR SUPPLY PIPE
- 7 JOINT 'B'
- 8 BONDING CONNECTIONS
- 9 A.S.I. CONNECTIONS
- 10 PNEUMATIC AND HYDRAULIC CONNECTIONS
- 11 AIR INTAKE DUCT
- 12 PYLON BOMB/DROP TANK JETTISON CONTROL
- 13 WING TIP DROP TANK JETTISON CONTROL
- 14 JOINT 'C'
- 15 CABIN AIR SUPPLY PIPE

- 16 ELEVATOR TRIM TAB CONTROLS
- 17 GROUND-FLIGHT MASTER SWITCH (EARLY AIRCRAFT)
- 18 DROP TANK AND TRANSFER PRESSURISING CONNECTIONS

- 19 ELECTRICAL CABLES (R.P. AND BOMBS)
- 20 ELECTRICAL CABLES
- 21 FUEL TANK VENTS
- 22 FUEL CONTENTS AND RADIO AERIAL LEADS

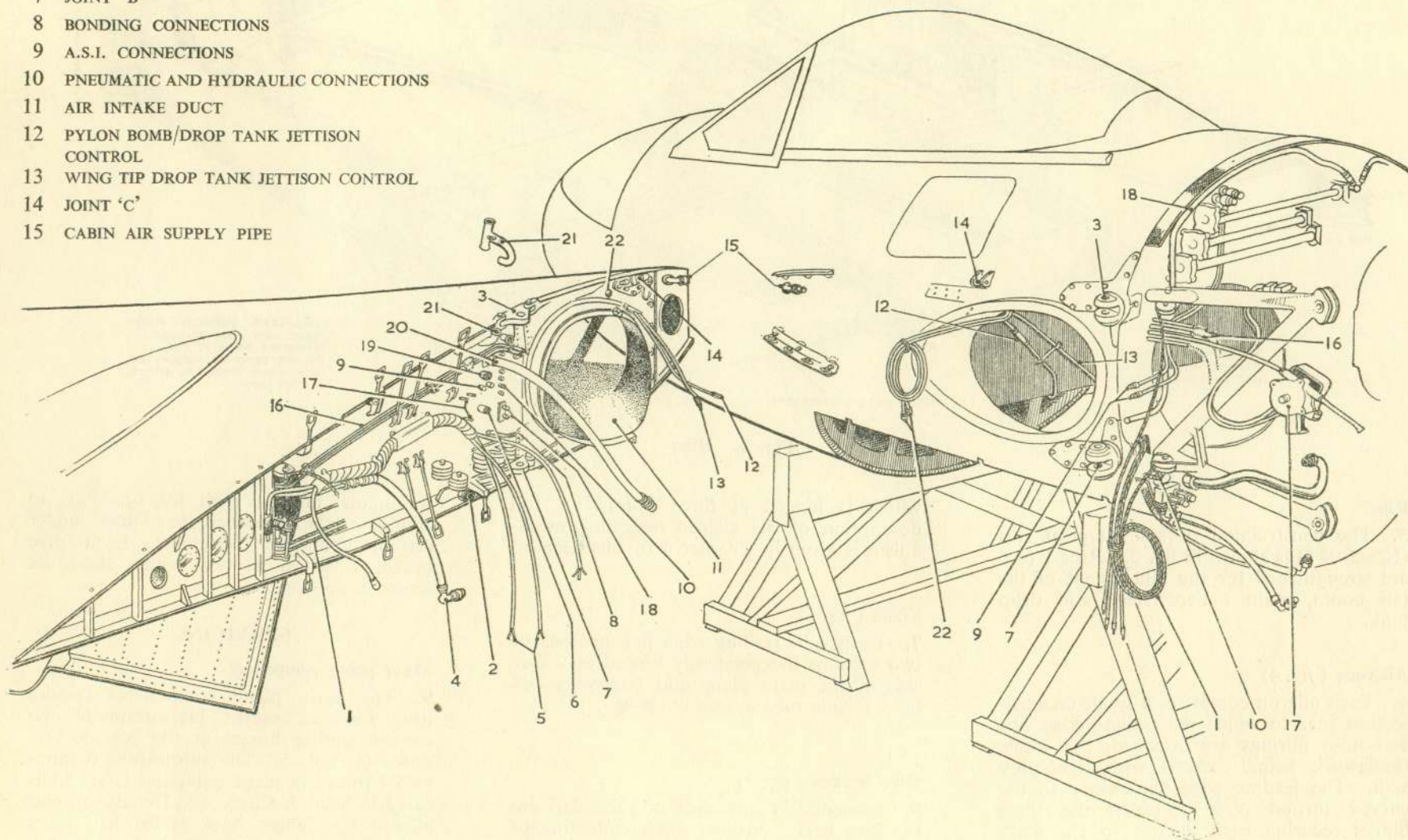


Fig. 3. Wing to fuselage attachments

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servicing operations are concerned with the mechanism of the flying controls which are fully described in Chap. 4 of this section. The procedure for checking the rigging of the main plane and the location of drain holes and access panels are given in Sect. 2, Chap. 4.

REMOVAL AND ASSEMBLY

General

10. The recommended sequence of operations for the removal of the main planes, ailerons, flaps and dive brakes are given in the following paragraphs. In each instance, the order has been arranged to suit the removal of the port unit, and, unless otherwise stated, the procedure for the starboard side is similar. The order of assembly is normally the reverse of that given for removal but, where necessary, additional assembly instructions are given at the end of each relevant paragraph. When assembling the main plane, reference should be made to para. 12 before commencing the operation. While it is generally advisable to follow the sequence given, it may be necessary to alter the order to suit particular requirements. Fig. 8 indicates the clearances which must be obtained during assembly.

Main plane (fig. 3)

Note . . .

The three main plane attachment bolts of each wing unit should be treated with penetrating oil at least one hour before extraction.

11. Before attempting to remove either wing unit, the engine cowlings, tail cone fairing and fuselage fuel tank must be dismantled and removed as described in Sect. 4. With the aircraft suitably trestled (Sect. 2, Chap. 4), the pressures in the hydraulic and pneumatic systems released and the electrical systems disconnected (Chap. 6 and 7), proceed as follows:—

- (1) Remove the upper and lower wing root fairings and the inboard nose sections of the air-intake ducts.
- (2) Disconnect the fire extinguisher bottles, wing tank fuel connections, fuel tank

vents and the drop tank transfer and pressurising connections at No. 1 rib.

- (3) Operate the cockpit control levers so that the three hydraulic selector valves, on No. 2 bulkhead are set in the mid position, then disconnect the hydraulic and pneumatic pipe unions on No. 1 rib.
- (4) Disconnect all electrical and aerial lead connections at their sockets, or at the junction blocks on the engine mounting, and the bonding connection.

Note . . .

The access panel to the cold-air unit must be removed before the radio aerial and fuel contents gauge leads are disconnected.

- (5) Disconnect the wing tip drop tank and pylon bomb/drop tank jettison control cables from the Teleflex control units in the cockpit, to allow the cables to be withdrawn through their conduits when the main plane is removed.
- (6) With the flaps down, disconnect all flying control cables at the turnbuckles on No. 1 rib and at the rear face of the false spar.
- (7) *On the port wing unit only.* Disconnect the fire extinguisher hose at the pipe connection on the engine. Uncouple the two A.S.I. unions, cabin air supply pipe and the GROUND-FLIGHT master switch at No. 1 rib. Forward of the air-intake duct, disconnect the air supply pipes to the cabin. Disconnect the elevator trim control Teleflex cables at the aft face of the rear false spar, then uncouple the two conduits connectors aft of the bulkhead No. 4, so that the cables may be withdrawn through their conduits on No. 1 rib when the main plane is removed.
- (8) *On the starboard wing unit only.* Disconnect the generator cooling duct and fuel pressure vent pipe connection at No. 1 rib.

- (9) Withdraw the bolts from the strap securing the intermediate portion to the forward portion of the air-intake duct and release the two large Jubilee clips from the rubber joint to the engine. Slide the rubber joint over the duct, then remove the duct.
 - (10) The tail plane and both booms must be adequately supported against spring, if only one tail boom attachment is to be dismantled. Chap. 3 of this Section describe the methods of trestling, disconnecting the cables, pipes and electrical leads and detaching the boom from the main plane stub.
 - (11) After ensuring that all pipes, cables, ducts, electrical and radio leads at the main plane to fuselage joint have been disconnected and tied clear, adjust the trestles so that the main attachment bolts are free to turn in their fittings without using undue force.
- Note . . .**
It is important that the man detailed for the checking of the attachment bolts should remain on the wing unit for the extraction of the bolts.
- (12) Withdraw the bolts from the joints "A", "B" and "C" (fig. 6) using the spanners and extractors listed in Sect. 2, Chap. 4.
 - (13) The main plane may now be manhandled on to trestles or slung, as illustrated in fig. 9.

Main plane assembly notes

- 12.** (1) Lubricate the Teleflex cables (Sect. 2, Chap. 4) and thread them through the conduits before the main-plane is offered up to the fuselage. Insert the fuel contents gauge and aerial leads through No. 1 rib in a similar manner.
- (2) Ensure that only new or reconditioned bolts are used and that the bolts and mating holes in the attachment lugs have been carefully examined before

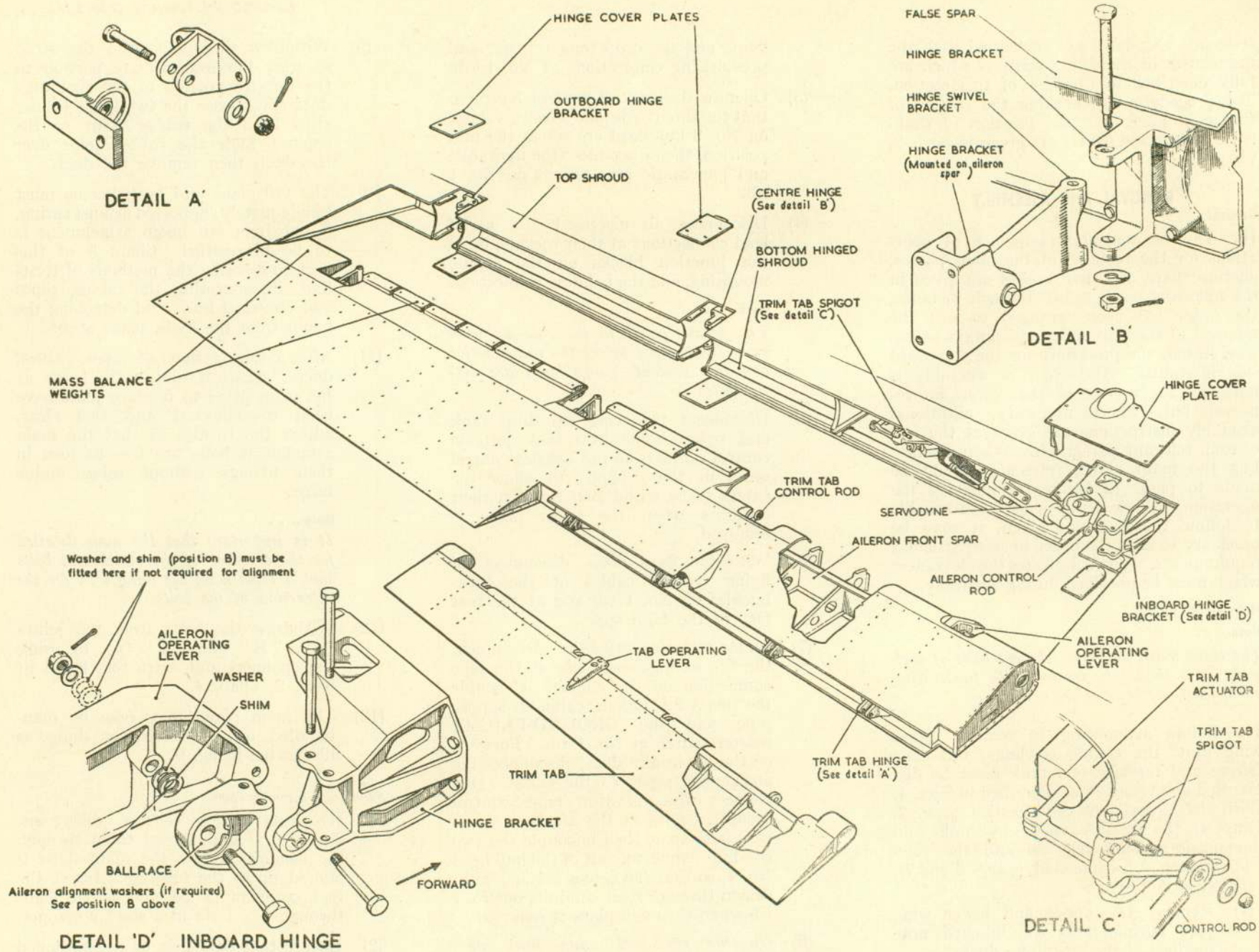


Fig. 4. Aileron (power-operated)

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inserting the bolts. The bolts must be clean and lightly smeared with grease, ZX-13.

- (3) Align the attachment lugs accurately, then insert the bolts carefully and screw them in finger-tight to the full depth of the fork end to test for concentricity. Under no circumstances should any extreme force, i.e., hammering, be used to drive the bolts home. It is advisable to detail one man to insert these bolts.
- (4) After assembly, check the rigging and symmetry of the main plane in accordance with the instructions in Sect. 2, Chap. 4.

Note . . .

When fitting a new main plane, reference must be made to Vol. 6, Pt. 1, Chap. 3 for additional fitting instructions.

Aileron (fig. 4)

13. Remove the aileron as follows:—

- (1) Disconnect the trim tab control rod from the tab operating lever.
- (2) Remove the cover plates from the appropriate wing unit above and below the three hinges.
- (3) Withdraw the screws from the lower hinged shrouds and remove the shrouds.
- (4) Remove the upper half of the nose fairing inboard of the inner hinge.
- (5) Withdraw the split pin from the special nut and the horizontal securing bolt from the inboard hinge.
- (6) Support the aileron and withdraw the attachment bolts from the centre and outboard vertical hinge brackets.

When reassembling the ailerons, reference should be made to Chap. 4 of this Section for the rigging instructions, and to Detail 'D' of fig. 4 for the fitting of the washers on the inboard hinge. The hinge bolts must always be replaced on the assembly from which they were taken.

Flaps (fig. 5)

14. The flaps must first be lowered and the inner and outer sections removed, as a unit, as follows:—

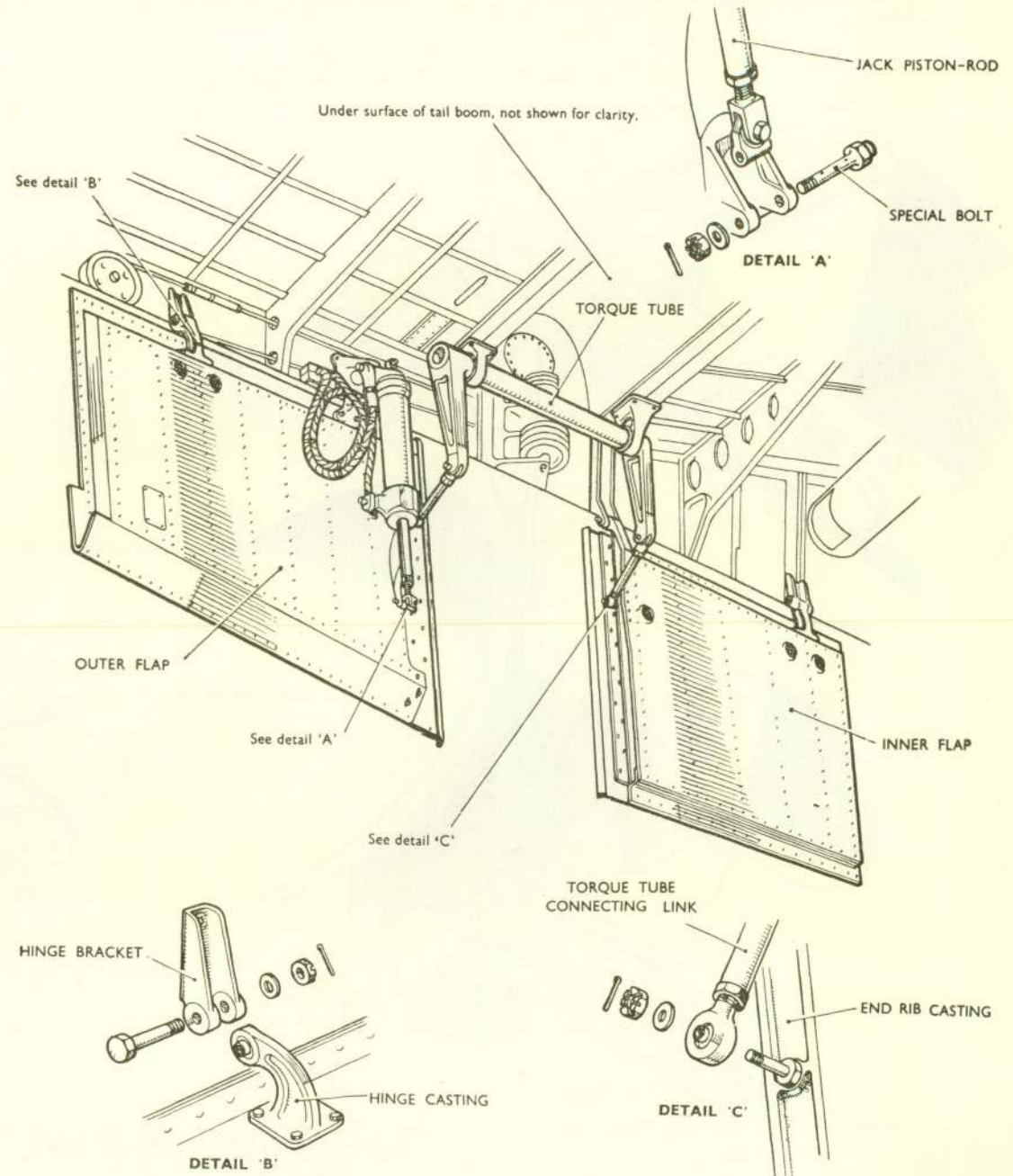


Fig. 5. Flap (port)

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(1) Withdraw the special bolt, then remove the jack piston-rod from its attachment bracket.

(2) Disconnect the inner and outer torque tube connecting links.

(3) Support the flap and withdraw the four hinge bolts.

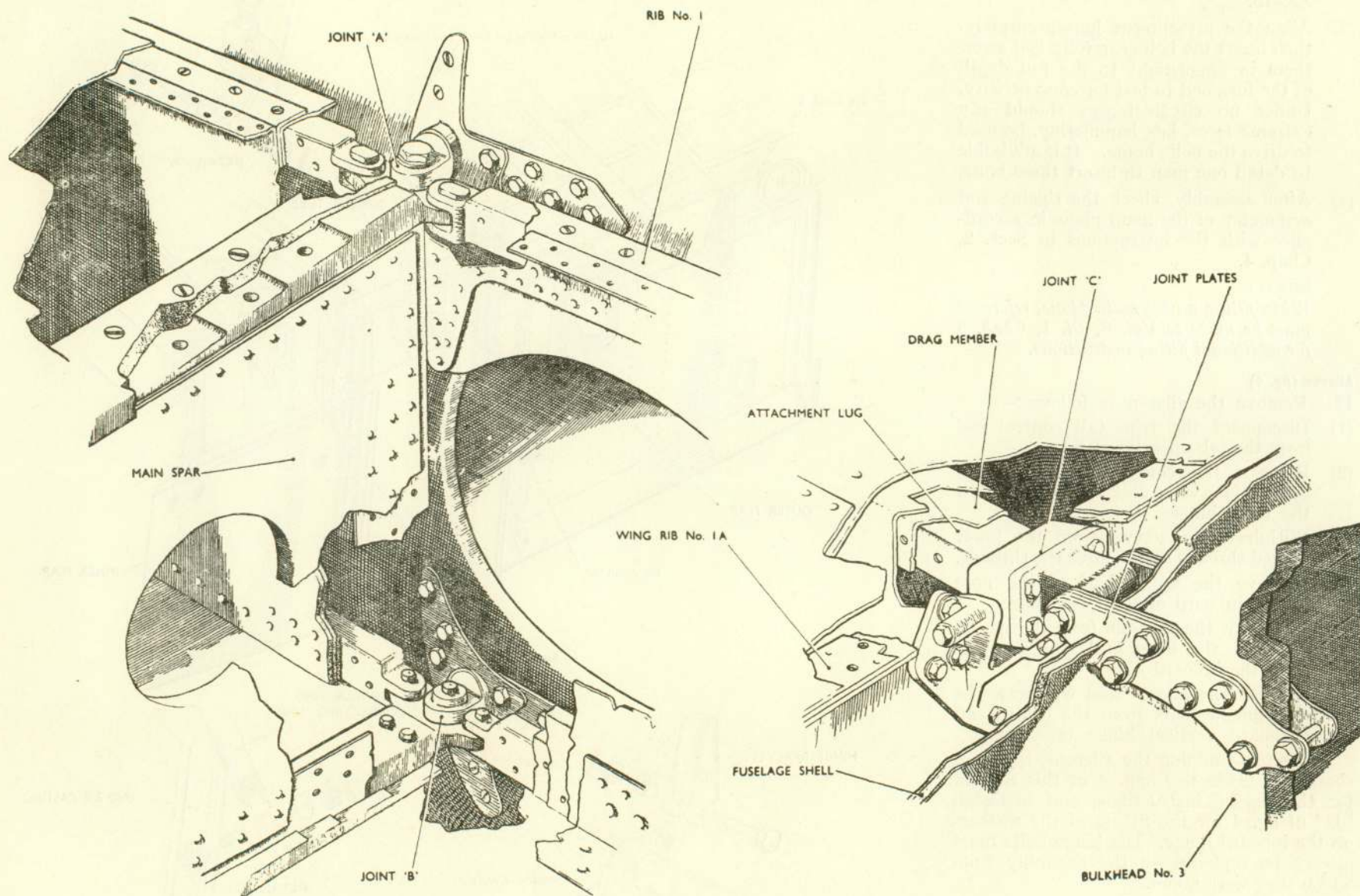


Fig. 6. Main plane attachment joints

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15. When assembling the flaps, reference must be made to Chap. 4 of this Section for rigging instructions and the following points noted :—

- (1) The leading edge of the flap centre portion and the flanges of the stub boom must be dressed back to conform with the required clearances (fig. 8). The flanges of the stub boom must be dressed to line up with the centre portion of the flap.
- (2) Check that the two hinge bolts clear the boom flanges, removing any part of the flange in the way of the bolt to give 0.05 in. to 0.1 in. clearance.
- (3) A rivet landing of 0.3 in. MIN. along the flap leading edge must be obtained.
- (4) To obtain a good fit between the centre flap and boom, laminated shimming, up to 0.06 in. MAX., may be inserted between the pick-up surfaces of the inner, outer and centre flap portions.

Dive brake (fig. 7)

16. With the dive brakes in the OUT position :—

- (1) Withdraw the special bolt and remove the jack piston-rod fork end from its attachment bracket.
- (2) Remove the circular access panel from the underside of the main plane immediately outboard of the dive brake.
- (3) Withdraw the split pins, nuts and washers and special bolts from the outboard hinge block on the main plane.
- (4) Support the dive brake, withdraw the inner hinge bolt and pull the dive brake rearwards to withdraw the outboard hinge block.

17. When assembling, it is important to ensure that the outboard hinge block is assembled to the dive brake before offering up to its appropriate wing. After assembly, the jacks must be rigged in accordance with the instructions in Chap. 4 of this Section.

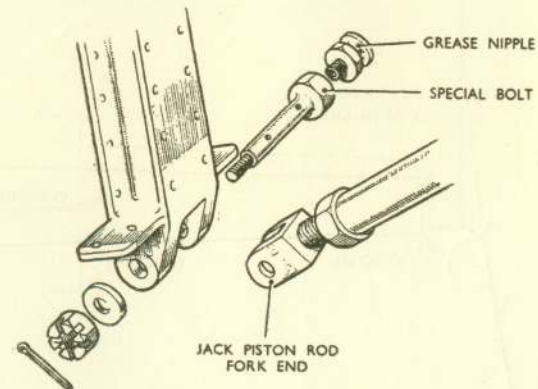
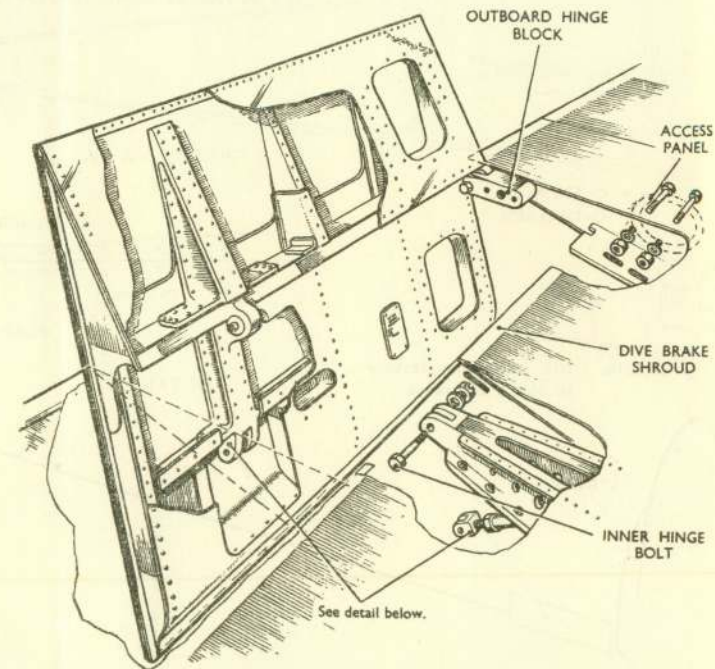


Fig. 7. Dive brake (port)

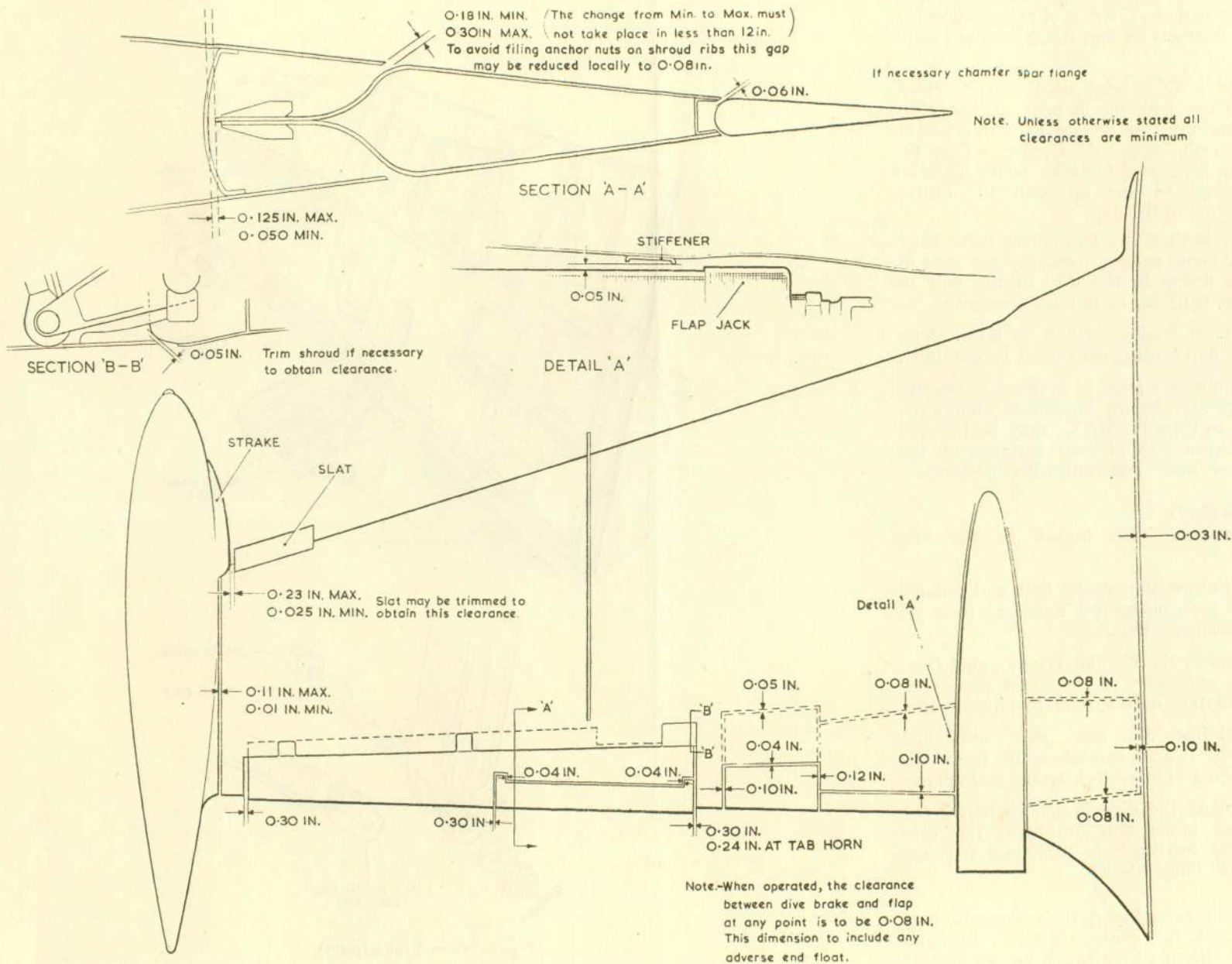


Fig. 8. Main plane clearances

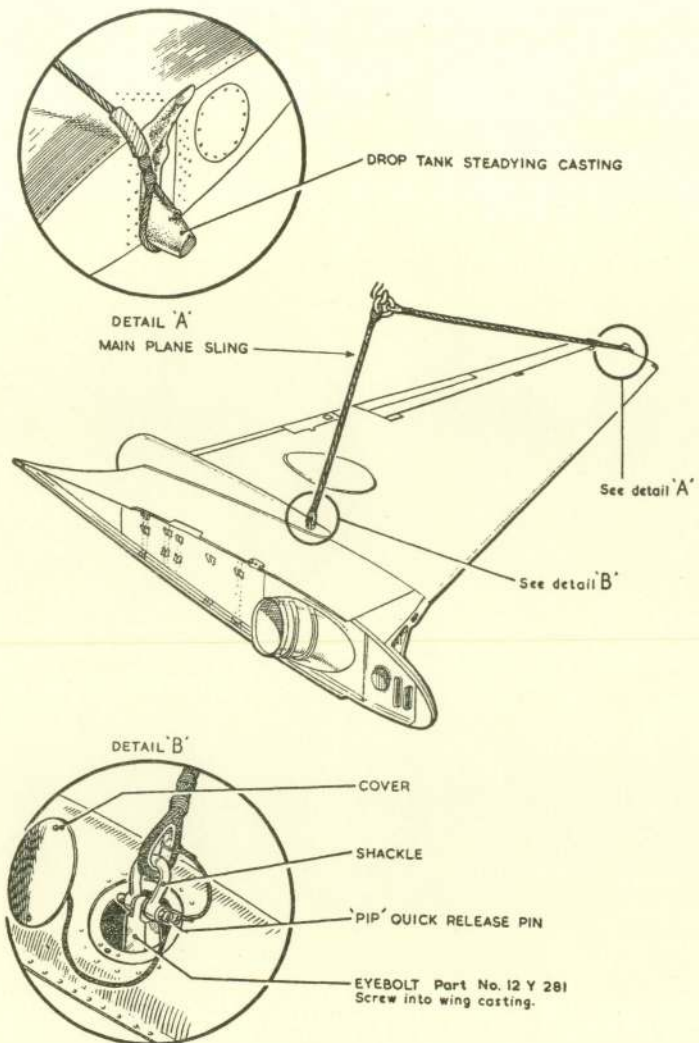


Fig. 9. Main plane sling



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