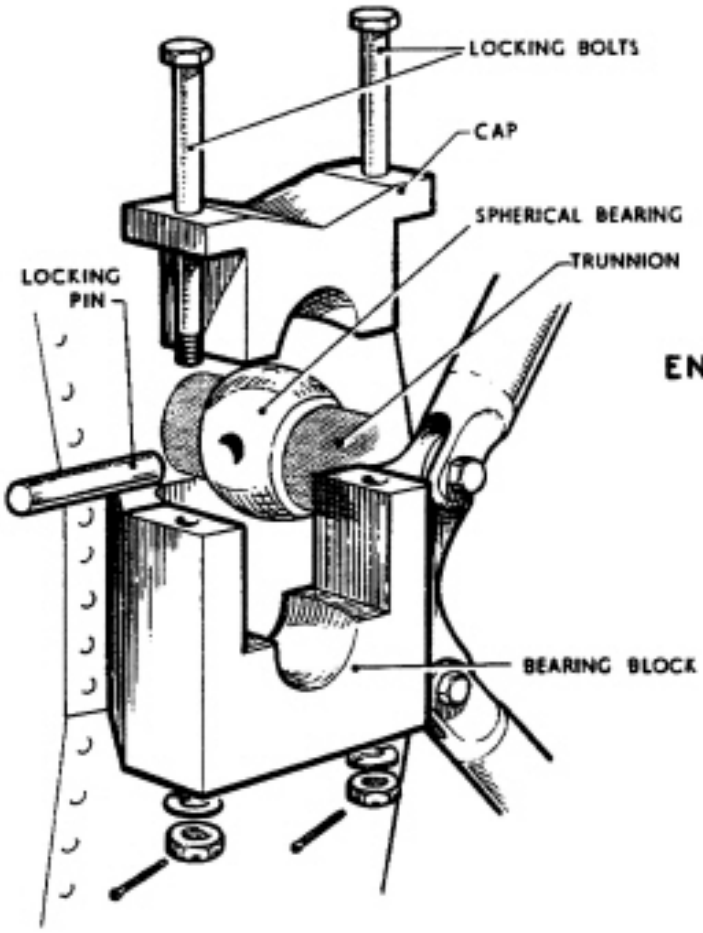
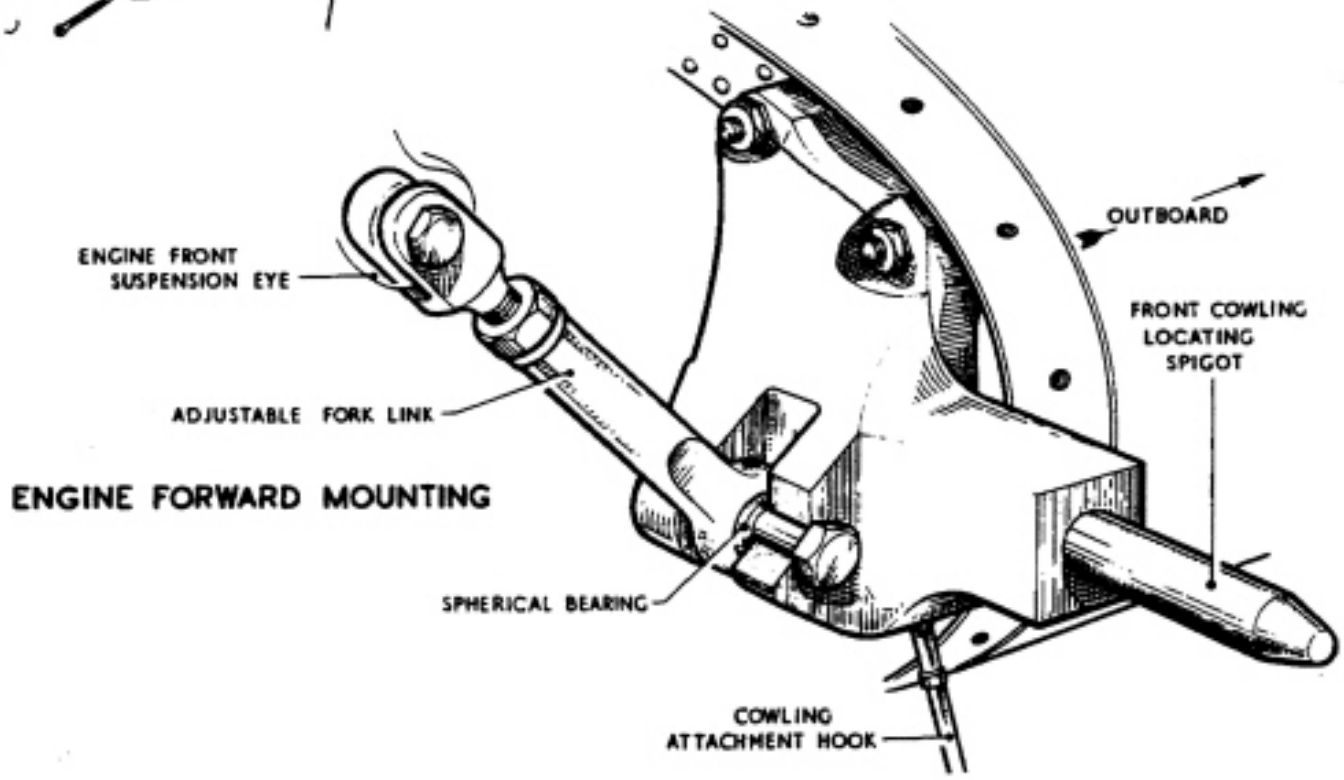


ENGINE REAR MOUNTING

NOTE:- WHEN INSTALLING A NEW ENGINE THE HOLES IN THE ENGINE INBOARD TRUNNION AND THE SPHERICAL BEARING MUST BE REAMED ON ASSEMBLY TO 3/8" ±·0004 TO FIT THE LOCKING PIN



ENGINE FORWARD MOUNTING

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Fig.1 Engine mountings

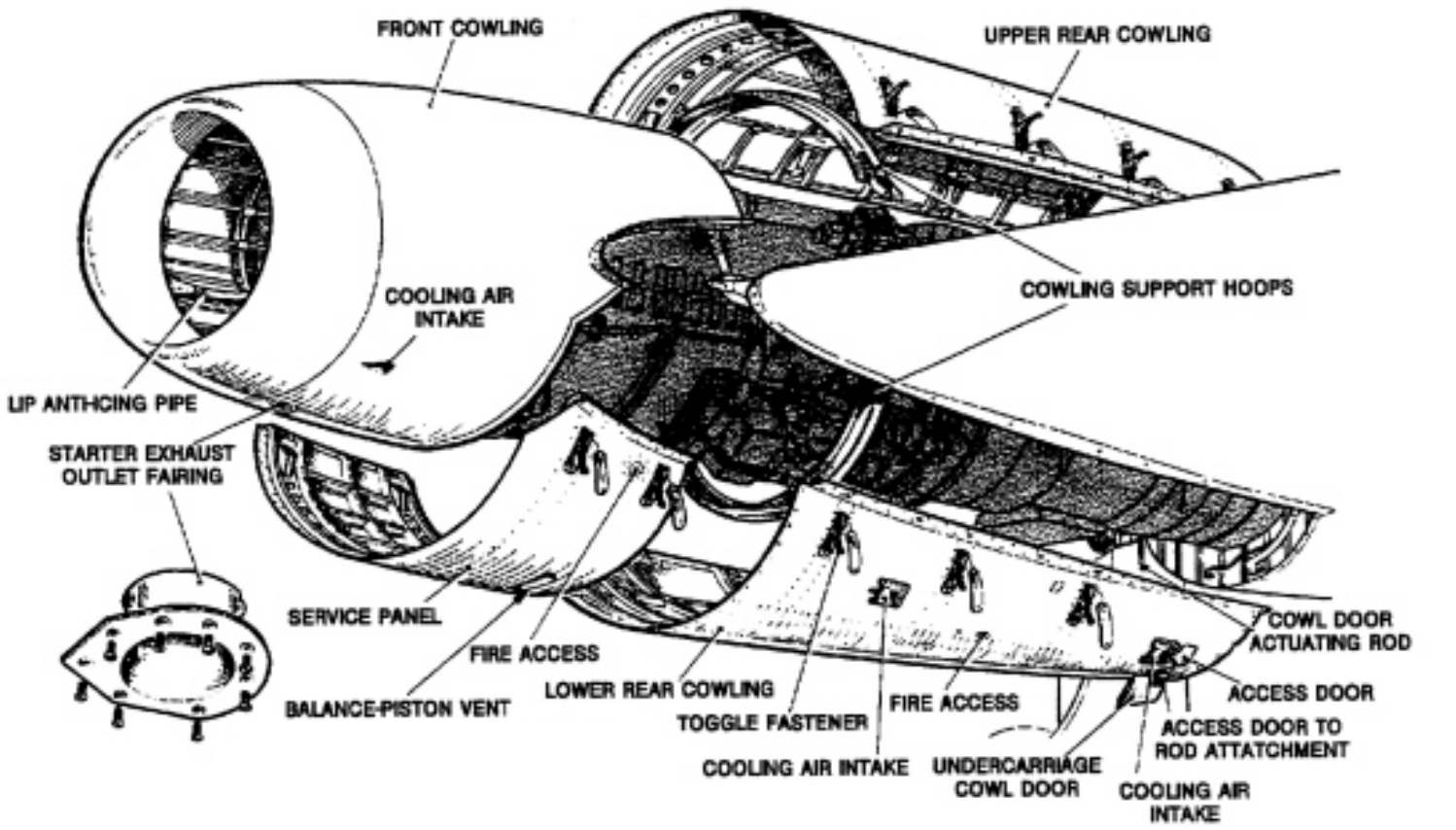


Fig.2 Cowling panels

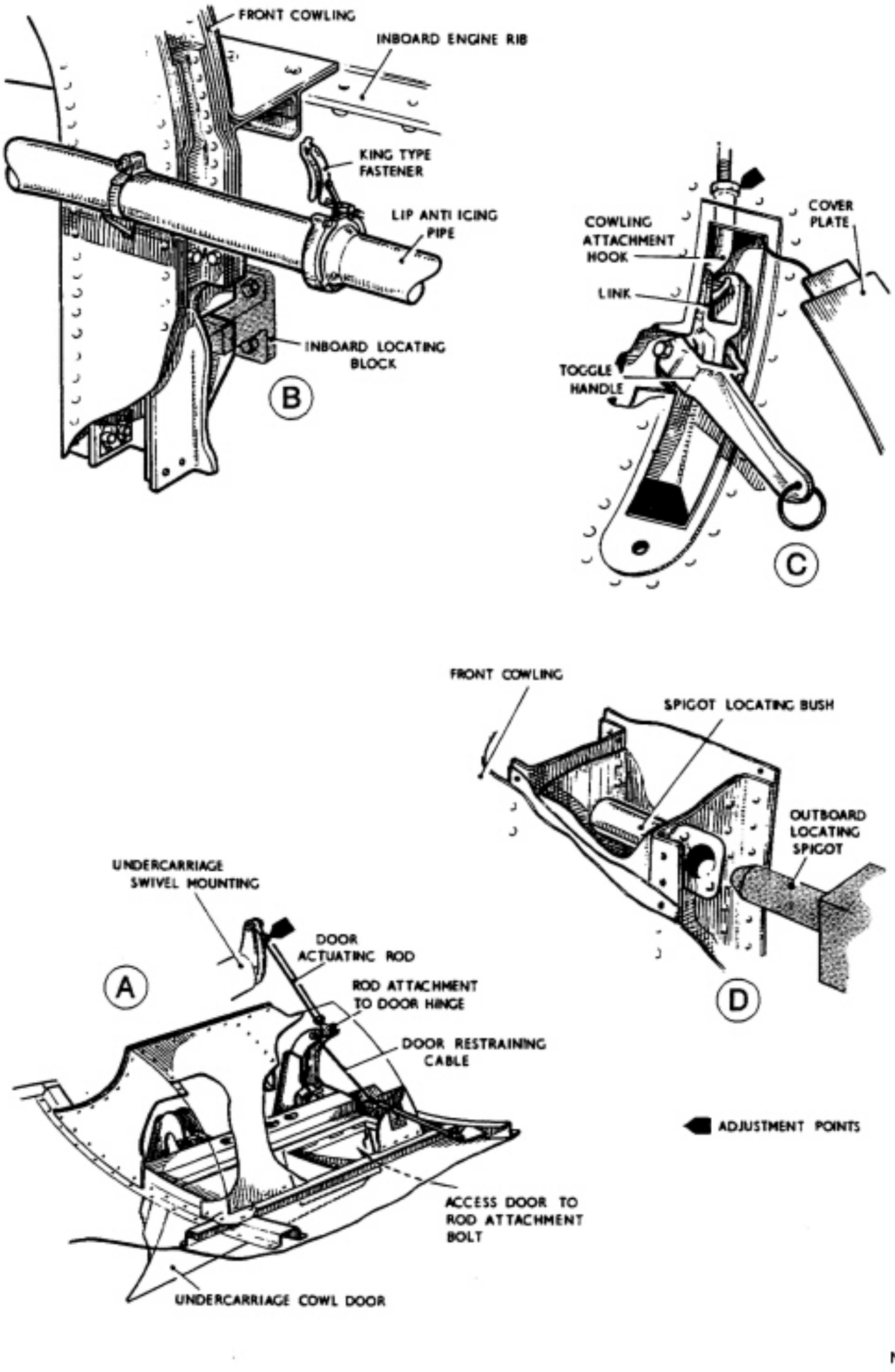


Fig.3 Cowling panel details

1.4 Engine starting is by an I.P.N. turbo-starter Type LTSA70, Mk.18, mounted on the front of the engine and enclosed by the nose cone in the air intake. Each engine drives and accessory gearbox mounted in the inner wing leading edge. The gearbox, turbo-starter, jet pipe and transition section are not included in the E.C.U., but form part of the airframe installation. For a complete description of the E.C.U. reference should be made to AP 102C-1506-1, and the engine starting system to AP 103D-0208-16A.

ENGINE MOUNTINGS (fig.1)

1.5 Cast light alloy mounting brackets, bolted to the inboard and outboard engine ribs, carry adjustable, self-aligning fork-ended link attachment rods, which are bolted to the suspension eyes on the engine mounting cradle. At the rear mountings, trunnions secured to the engine nozzle box casing are fitted with spherical bearings which support the engine in bearing blocks bolted to vertical beams on the inboard and outboard engine ribs. The inboard spherical bearing is pinned to the engine trunnion, and the outboard bearing is allowed to 'float' to take up expansion. Capping pieces are bolted to the bearing blocks to secure the bearings in their seatings.

JET PIPE MOUNTING

1.6 The jet pipe is bolted at its forward end to a short transition section fig.12, which is in turn attached to the engine exhaust unit by two locking clamps, the tongues of which engage in machined grooves in keep plates on the transition section. Both joints are shrouded with heat shields. The forward end of the jet pipe is also attached by two quick release pins to a slide which rests on light alloy rails suspended from the jet-pipe tunnel structure; the rails extend from the front to the rear spars (fig.12). Adjustable eccentric bearing rollers, mounted on brackets bolted to the rear spar casting, pick up in machined housings one on each side of the jet pipe and provide for adjustment of the propelling nozzle and for expansion during operation.

ENGINE COWLINGS (fig.2)

1.7 The engine cowling consists of a front cowl, upper and lower rear cowling panels and a service panel, all of which are removable; upper and lower support hoops of reinforced top-hat section are attached to brackets at the top and bottom of vertical support channels on the inboard and outboard engine ribs. The front cowl, which is located on a spigot (detail D. fig.3) incorporated in the outboard front engine mounting bracket, and a support block (detail B. fig.3) on the engine inboard rib, extends aft at the top to the upper support hoop and to the service panel at the bottom, and is secured by screws which locate in anchor nuts on the inboard and outboard engine rib flanges, and secure the cowling to the upper support hoop; the front cowling incorporates cooling air intakes. The service panel which is fitted between the front and the lower rear cowling panels incorporates a cooling air outlet duct and gives access to the general maintenance points on the engine; this panel is secured by four quick release toggle fasteners only. The upper and lower rear cowling panels extended aft from the support hoops to the firewall at the main spar. Both panels are secured by quick release toggle fasteners and Dzus fasteners at the edges abutting the engine ribs and screws along the rear edges. A small hinged door (fig.3 detail A) which is operated mechanically by the movement of the undercarriage is incorporated in the lower rear cowling panel; the mechanical linkage is by a rod to a lever on the bearing housing at the top of the undercarriage shock absorber. This rod must be disconnected before the panel can be removed; full instruction for removing the cowlings are given later in this chapter.

1.8 The quick release toggle fasteners (fig.3, detail C) each consists of a toggle handle and spring-loaded link, which engages a hook-end on an adjustable tie rod attached to the engine ribs. Each fastener is secured by moving the toggle handle over-centre when it is recessed in the housing and protected by a flush-fitting cover plate locked by a Dzus fastener. To release a fastener, the cover plate is removed and the toggle handle raised by the ring in the end of the handle.

REMOVAL AND INSTALLATION

SAFETY AND MAINTENANCE NOTES

3.0 'Safety and Maintenance Notes' (AP 101B-0409A-5A2) are to be complied with throughout the work detailed in these operations.

ENGINE COWLINGS

Removal

3.1 Refer to figs.2 and 3

(1) Release the Dzus fasteners, remove the cover plates and release the toggle fasteners (detail C). Remove the "Service" panel. This panel must be removed before the front cowling can be removed.

(2) Release the Dzus fasteners, remove the cover plates, release the toggle fasteners and attachment screws and remove the upper rear cowling.

(3) Open the access panel (detail A) by releasing the two 'flick' fasteners.

(4) Remove the split pin, slotted nut and washer, and withdraw the bolt attaching the actuating rod to the undercarriage cowl door hinge. Replace the bolt and nut.

(5) Release the Dzus fasteners, remove the cover plates, release the toggle fasteners and remove the rear attachment screws and remove the lower rear cowling.

(6) Open the access panel on the inboard side of the front cowling, and release the King type fastener on the lip de-icing pipe (detail B).

(7) Remove the eight retaining bolts and remove the starter fairing.

(8) Remove the front cowling attachment bolts and withdraw the front cowling from the locating spigot (detail D) and the support block (detail B). If difficulty is experienced, a short lever may be inserted between the engine forward mounting and the panel to ease the cowling from the spigot.

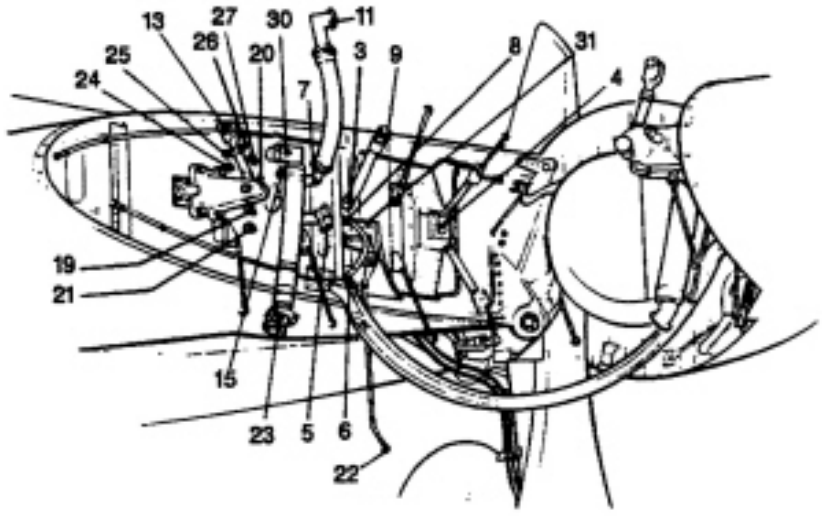
Installation

3.2

CAUTIONS . . .

(1) Ensure true alignment when refitting cowls or panels, by adjusting at each end of the rod assemblies. On completion check for sufficient thread engagement by using the inspection holes at each end of the rod assembly. Avoid over-tensioning of the assembly. Correct tensioning is indicated by the effort required to close the toggle handle manually. Only reasonable hand pressure should be applied.

(2) Avoid twisting the hook to force engagement, without first loosening the locknut. It is essential to obtain correct hook alignment before assembly of a cowl or panel.



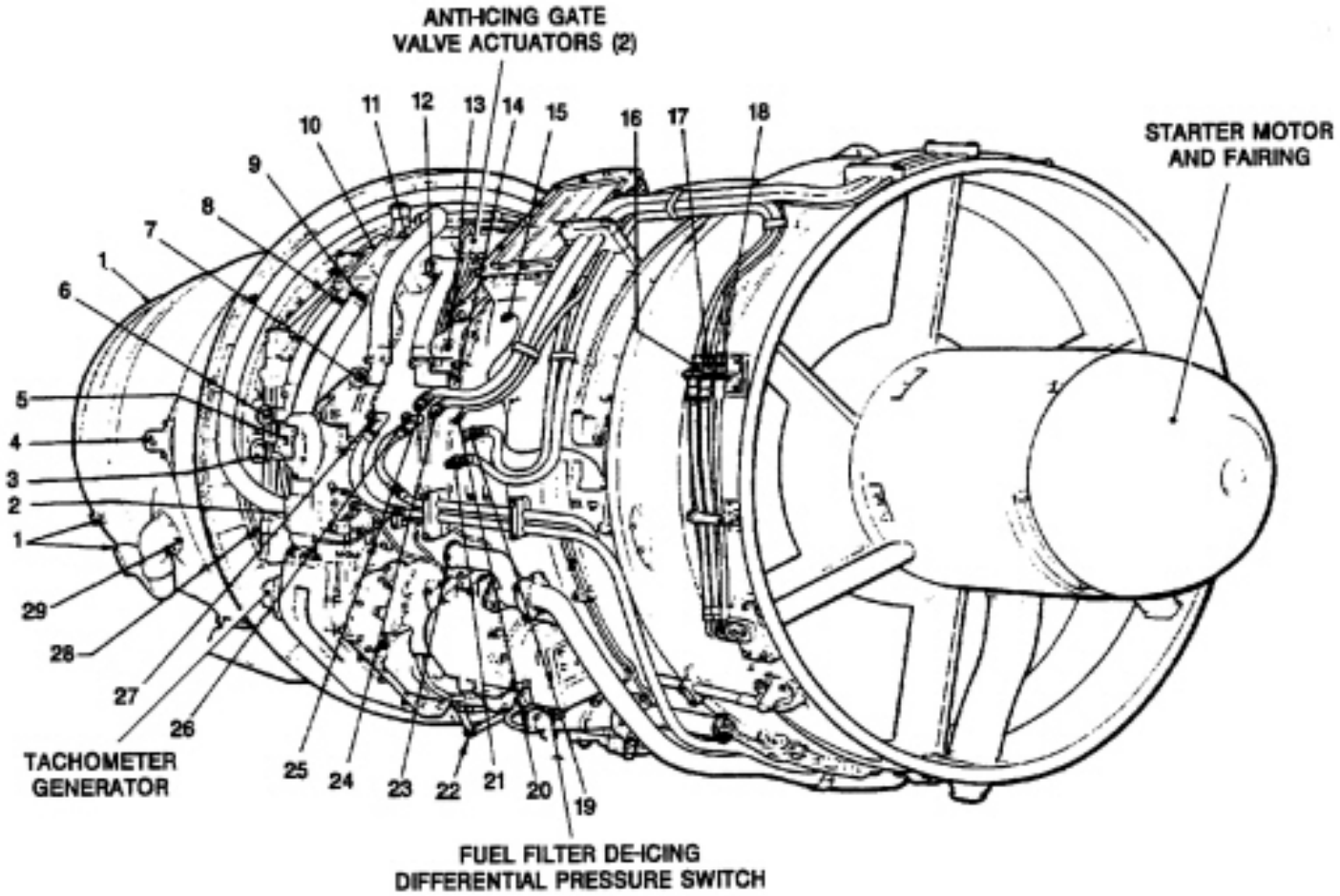


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Fig.10 Engine change unit removal

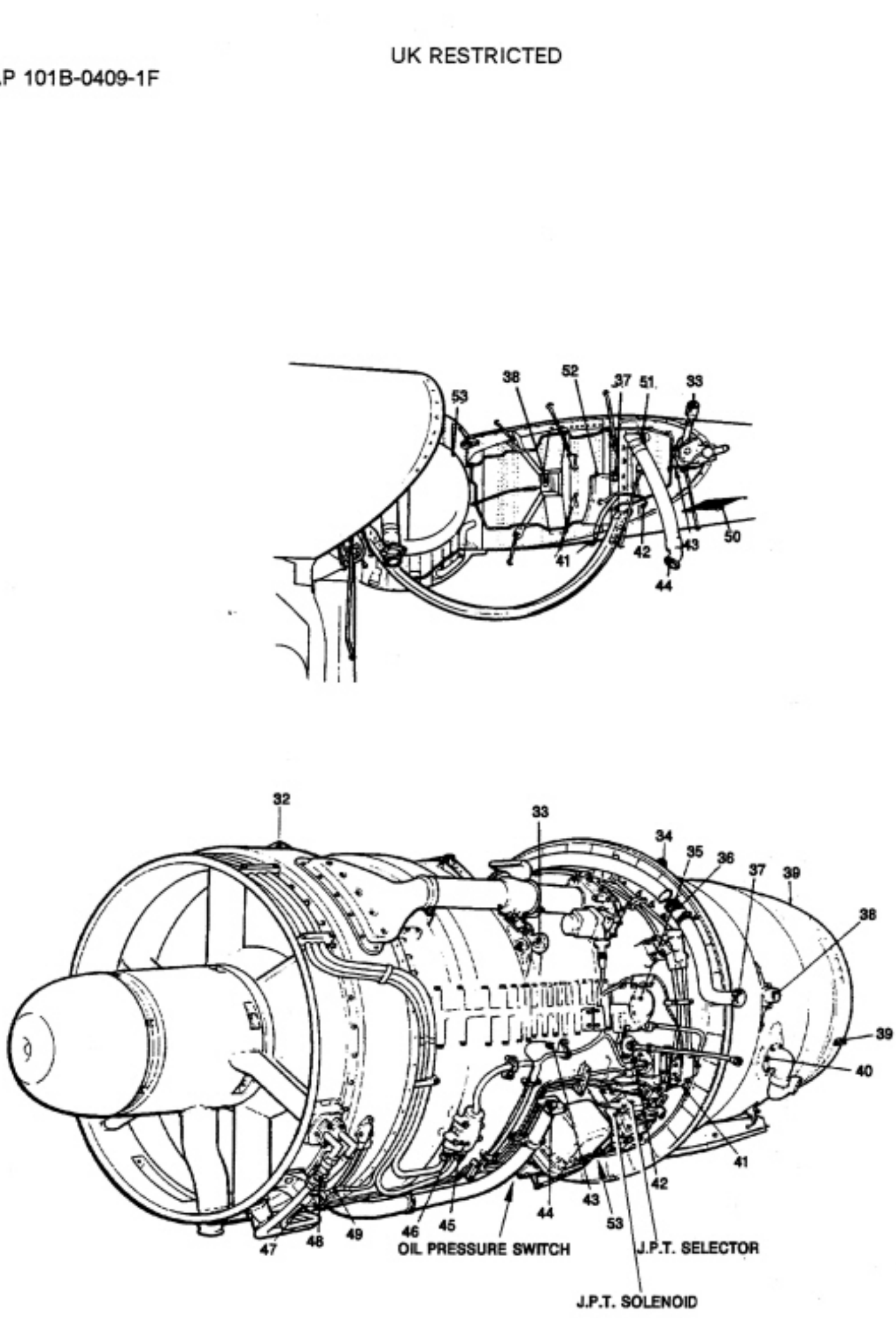

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Fig.11 Engine change unit removal

Key to fig.10, 11 Engine change unit removal

1 Wing bolts
2 Wheelcase breather pipe connection
3 Fuel heater
4 Rear mounting trunnion and bearing
5 Accessory gearbox drive - shaft connection
6 General cooling duct
7 Cabin pressure pipe
8 Air to generator pipe connection
9 Fuel heater air pipe connection
10 Air to generator pipe connection
11 Cabin pressure pipe connection
12 Lip de-icing pipe connection
13 Engine front suspension eye
14 Lip de-icing pipe
15 Fire wire connector
16 Engine starter electrical connection
17 Engine starter electrical connection
18 Engine starter electrical connection
19 Engine starter cables
20 Loom 11J connection
21 Engine starter cables
22 Throttle control link-rod
23 Main fuel pipe connection
24 Loom 11L connection
25 Loom 11M connection
26 IPN starter fuel pipe
27 IPN starter air pipe
28 Ignition cable
29 Cooling air duct
30 Bulkhead fuel pipe union
31 Sealing plate
32 Forward slinging eye
33 Engine front suspension eye
34 Aft slinging eye
35 Accessories gearbox drive-shaft connection
36 Jubilee clips
37 Clamp block
38 Rear mounting trunnion and bearing
39 Wing bolts
40 Cooling air duct
41 Ignition cable
42 Recuperator air pipe
43 Fire wire connector
44 Main fuel pipe connection
45 Electrical plug
46 Electrical socket
47 Starter air pipe
48 Starter fuel pipe
49 Low pressure switch
50 Access hole
51 Bulkhead fuel pipe union
52 Sealing plate
53 Throttle control link-rod

(17) Disconnect the plug and socket (25) (loom 11M) at the inboard engine rib.

WARNING . . .

ISO-PROPYL NITRATE FUEL, CATELENE B (AVPIN), USED IN THE FOLLOWING OPERATIONS CAN BE HAZARDOUS TO HEALTH. REFER TO THE ISO-PROPYL NITRATE FUEL, CATELENE B (AVPIN) WARNING IN THE PRELIMINARY PAGES OF THIS PUBLICATION.

(18) Disconnect and drain the I.P.N. starter fuel pipe (26) and the starter air pipe (27) at the inboard engine rib.

(19) Disconnect the air pipe to the fuel heater (3) at the inboard engine rib.

(20) Disconnect the air pipe to the generator cooling outlet duct (6) by releasing the King type fastener.

(21) Disconnect the cabin pressure pipe (7) at the inboard engine rib by releasing the King type fastener.

(22) Disconnect the accessory gearbox drive-shaft (5) by removing the four attachment nuts and tab washers.

(23) Disconnect the throttle control link-rod (22) by removing the split pin, slotted nut, washer and bolt.

(24) Disconnect the wheelcase breather pipe in the outer wing through access hole (50), and remove the clamp block (37).

(25) Slacken the jubilee clips (36) on the wheelcase breather pipe and remove the short length of pipe.

(26) Slacken the six wing bolts (1) and (39) securing the exhaust shield (fig.12) and remove the exhaust shield.

(27) Remove the split pins, slacken the locking screws on the inboard and outboard clamp blocks (fig.12, detail A) securing the transition section to the engine exhaust unit, and remove the clamps.

(28) Slide the jet pipe aft to clear the engine exhaust unit.

(29) Using a suitable crane (engine weight 2 900 lbf) fit the engine sling (Chap.07, Table 2) to the fore and aft slinging eyes (32) and (34), and take the weight of the engine.

(30) Remove the split pins, slotted nuts, washers and attachment bolts from the engine front suspension eyes (13) and (33).

(31) Break the locking wire, remove the split pins, slotted nuts, washers and bolts, and remove the capping pieces securing the engine rear mounting trunnions in the mounting blocks 4 and 38. Details of the engine mounting are shown in fig.1.

(32) Lift the engine clear of the airframe, remove the locating pin from the inboard trunnion (fig.1) and remove the spherical bearings from the trunnions (4) and (38).

(33) Lower the engine and secure to the transit stand (Chap.07, Table 2).

Note . . .

When a replacement E.C.U. is to be installed the pipes and components removed from the original engine in the following Operations (34 to 43) should be retained and fitted to the new unit prior to installation.

(34) Break the locking wire and disconnect the starter fuel and air pipes at (48) and (47) respectively, release the clamp blocks securing the pipes to the engine, and remove the pipes.

(35) Disconnect the cable from the low pressure switch (49).

(36) Disconnect the plugs and sockets (45) and (46) at the engine services junction box.

(37) Disconnect the engine starter cables at the plugs and sockets (16), (17) and (18), release the relevant clamps and remove the cables operations (35), (36) and (37).

(38) Disconnect the air intake lip de-icing pipe by releasing the King fastener at (12) and remove the pipe, adapter and gasket.

(39) Release the King type fastener at (11), and remove the cabin pressure pipe, adapter and gasket.

(40) Release the King type fastener at (9), and remove the air pipe to the fuel heater, nipple, adapter and gasket.

(41) Release the King type fastener at (8), and remove the air to generator pipe, adapter and gasket.

(42) Remove the four clips securing the wheelcase breather pipe to the engine fireproof bulkhead, remove the attachment bolts and tab washers at (2) and remove the breather pipe. Fit the blanking cap by means of the 1/4 in. B.S.F. set screws and tab washers supplied with the engine.

(43) Disconnect and remove the engine drain pipes.

(44) Remove the engine starter refer (Chap.48).

(45) Check the E.C.U. with the E.C.U. checking list.

Removal-starboard

3.4 The procedure for the removal of the starboard engine differs from that for the port E.C.U. only in the following details:-

(1) Disconnect the fuel recuperator pipe at (8).

(2) Disconnect the wheelcase breather pipe at (2) and at the outboard rib.

(3) Disconnect the accessories gearbox drive-shaft at (35).

(4) Disconnect the air pipe to the generator cooling outlet at (10).

(5) Disconnect the cabin pressure pipe at (11).

(6) Disconnect the throttle control link rod (53), on the inboard side of the engine.

(12) Couple up the other short length of flexible fuel pipe to the union on the outboard rib at (51) and to the main fuel pipe at (44) by means of the manacle clamp.

Note . . .

When fitting pipe adapters the gaskets must be renewed and sealed with 'weleseal' jointing compound, and all union nuts must be wirelocked.

WARNING . . .

WELESEAL JOINTING COMPOUND, USED IN THE FOLLOWING OPERATIONS CAN BE HAZARDOUS TO HEALTH. REFER TO THE WELESEAL WARNING IN THE PRELIMINARY PAGES OF THIS PUBLICATION

(13) Carry out Operations (3) to (10) (para.3.3) inclusive in the reverse order.

Installation-starboard

3.6 The procedure for installing a starboard E.C.U. is, like that for a port E.C.U., generally a reversal of the removal operations, except that when refitting the fuel pipe (fig.11, item 44) a clearance of 3/8 in. must be achieved between it and the adjacent heater pipe. Jet pipe clearance checks (fig.13) must always be made after an E.C.U. change.

JET PIPE (fig.12)

Removal

3.7

(1) Unscrew the mushroom head screws and remove the jet pipe rear fairing.

(2) Remove the eight thermocouples at the rear of the jet pipe.

(3) Remove the two rear upper surface jet pipe tunnel access panels.

(4) Refer to fig.1 and remove the service panel, and upper and lower rear cowling panels.

(5) Slacken the six wing-bolts and remove the two halves of the exhaust shield.

(6) Remove the split pins, slacken the locking screws and remove the two clamp blocks attaching the transition section to the engine exhaust unit (detail A).

(7) Remove the two 1/4 in. bolts and tab washers attaching the two halves of the heat shield and remove the heat shield.

(8) Slacken the screws on the rear bearing rollers as far as possible (detail C).

Notes . . .

(1) Where the E.C.U. has been removed prior to removal of the jet pipe, access to the rear transition section bolts will no longer be restricted, and they can be removed without recourse to the special-to-type spanners.

(2) Care must be exercised to prevent damage to the engine ring and undercarriage main forgoings when performing operation (9) which follows.

(9) Remove the bolts and tab washers, and the nuts, bolts and washers securing the transition section to the jet pipe. Special spanners are provided to facilitate the removal of these bolts where access is restricted.

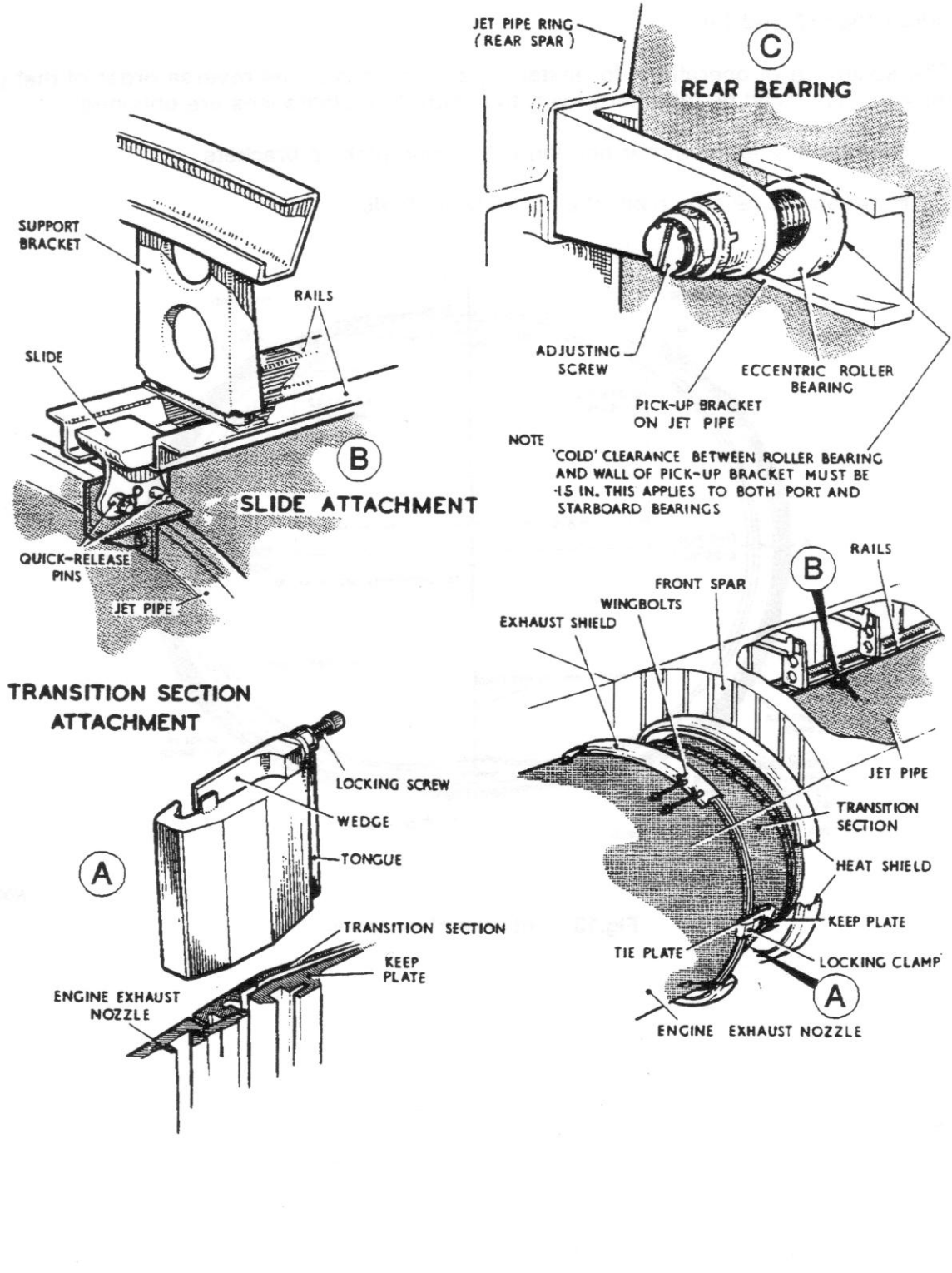

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Fig.12 Jet pipe installation

(10) Support the transition section while sliding the jet pipe aft sufficiently to allow the transition section to be removed.

(11) Slide the jet pipe aft to the full extent of its travel and support the jet pipe while removing the quick-release pins attaching the jet pipe to the slide (detail B) and remove the jet pipe, taking care that the heat insulation blankets are not damaged.

Installation (figs.12 and 13)

3.8 The sequence of operations for installing a jet pipe is in the reverse order of that given for removal. Care must be taken however, to ensure that clearances are obtained:-

(1) Between the jet pipe rear bearing rollers and pick-up brackets.

(2) Between the jet pipe blanket and the heat shield.

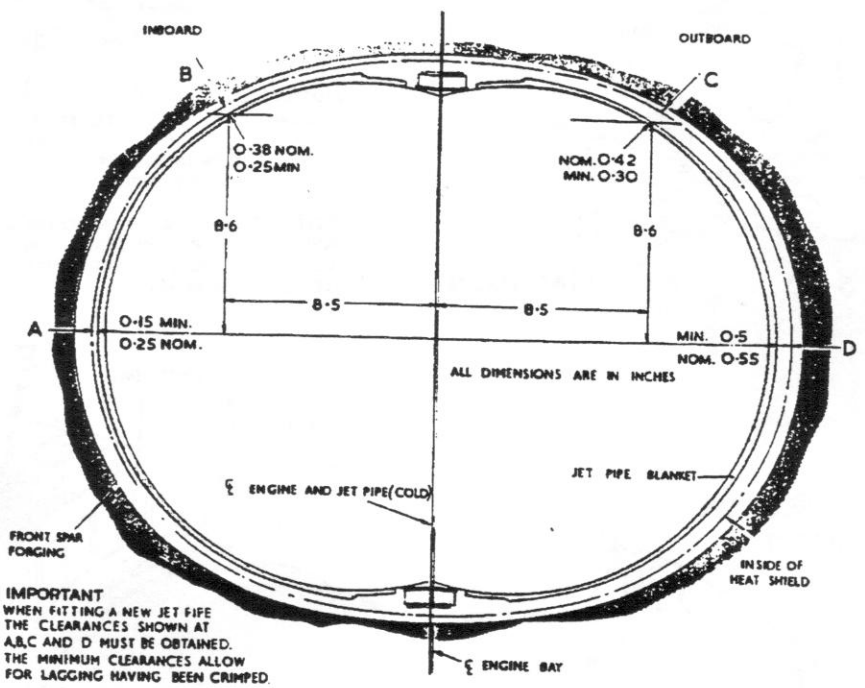

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Fig.13 Jet pipe clearances