
28T. Flap control system and rear baggage bay - trigear

The flaps are driven, via the pins in each flap root, by a cross-tube which is hinged to brackets mounted through the fuselage floor, the flap hinge centre being below the fuselage. The general arrangement is shown in figure 1 at the end of this chapter.

The cross-tube is pushed or pulled to extend or retract the flaps by an electrically operated linear actuator, which is mounted to the rear fuselage floor.

The baggage bay floor extends over the flap cross tube, and is fitted with two underfloor compartments - one for the battery and the other for an electric fuel pump. The rear of the baggage bay is closed by a bulkhead which includes a removable panel to provide access to the rear fuselage.

Flap actuating cross tube installation

Step 1

Mounting the cross-tube

Clean the rim of both GE12E bearings and bond each, using Loctite 638, into a thoroughly cleaned bearing housing FL17.

Next, push the bearing housings into the ends of the flap cross-tube FL15, don't bond them in at this stage. Refer to figure 1 at the end of this chapter.

The bearing housing serves two purposes; i) to hold the bearing in the end of the tube and ii) to prevent the ball swivelling further than a few degrees which makes insertion of the flap drive pin easier during rigging of the wings. The self-aligning ball is necessary as, when the flap operates, the flap drive pin alters its relative angle to the tube.

Step 2

The next step is to support the cross-tube on the flap drive pins with the wings rigged to the fuselage. Before this can be done, however, curved slots through the fuselage sides for the cross-tube will need to be cut.

Note: Any scribed lines found on the fuselage sides indicating the curved slots for the flap cross-tube should be ignored.

Rig the wings to the fuselage and mark the arc of the flap drive pin centre on each side of the fuselage from fully retracted to approximately 30° down.



Mark each side of your line to allow sufficient space for the cross-tube to pass through with about 3-4 mm clearance each side. Cut the slot at the flap-retracted area first, extending it as required to allow full movement of the cross-tube.

With the slot cut, hang the cross-tube on the flap drive pins, with the twin lugs that are near the centre of the tube on the *starboard* side and set the flaps to the retracted position using your wing template. There should be a small clearance between the bearing in the cross-tube and the flap root rib. Without a clearance, the flaps will be pushed outboard as they retract. Cut the cross tube as necessary. When you're happy with the length of the cross-tube, bond in the bearing housings FL17 using Loctite 638.

Step 3

Hinge arm slots

To determine the slot positions for the hinge arms and brackets to pass through the fuselage bottom skin, slide the hinge arms FL16 between the pairs of outer lugs on the cross-tube and clamp them so that they touch the fuselage floor. Checking that there is equal clearance at the flap root each side of the cross-tube, mark a line on the floor on the outboard side of each hinge arm. This marks the outboard edge of the slots. Extend these lines from the baggage bay rear bulkhead 90 mm (3-1/2") aft ensuring they run parallel to the centreline. Mark a second line 15 mm (5/8") inboard of and parallel to these lines to define the slot width. Cut out the material between the lines to make the two slots for the hinge arms and brackets. See figure 2.

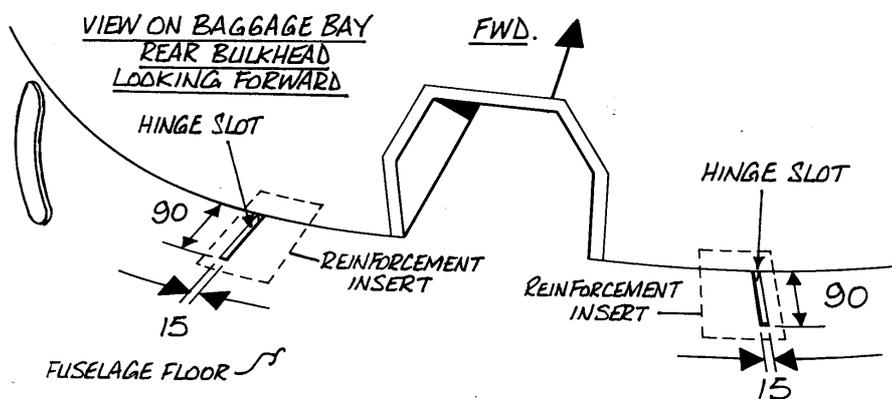


Fig 2. Slots through fuselage floor for cross-tube hinges.

Step 4

Trial set-up with hinge brackets

Pass the hinge brackets FL18P and FL18S through the slots in the floor so that each bracket's mounting flange is pointing inboard, and is therefore over the reinforcement inserts. The brackets' horn is oriented forwards.

Note : The P and S of the part numbers indicate Port and Starboard.

Install an AIC 040604 bearing in each cross-tube hinge arm FL16 with Loctite 638 then attach them to the brackets according to figure 9 which is to be found at the end of this chapter. With the flaps up check that the brackets FL18 are where they should be by swinging the hinge arms up to engage between the lugs on the cross-tube. Make any necessary adjustments to the slots in the fuselage floor then mark lines on the fuselage floor to help re-position the brackets later.

Step 5

Hinge bracket installation

Remove all the parts from the slots then scuff sand the underside of the brackets' flanges and the fuselage floor, where they will be in contact, in preparation for bonding. Don't rub off the reference lines though.

With the wings rigged to the fuselage and all retaining pins inserted, remove the inboard flap hinge pivot bolts and thread a string through the holes of both inboard flap hinges and both cross-tube hinge brackets.

Important: *The hole centres of both hinge brackets must be lined up, as close as possible, with the hole centres of the inboard flap hinge holes.*

If required, remove material from the slot in the fuselage to allow for correct alignment. Prepare any shims or wedges that may be required to set the brackets in their correct position.

The brackets must be set up as shown in figure 3, both being parallel to each other and with both mounting flanges level with each other.

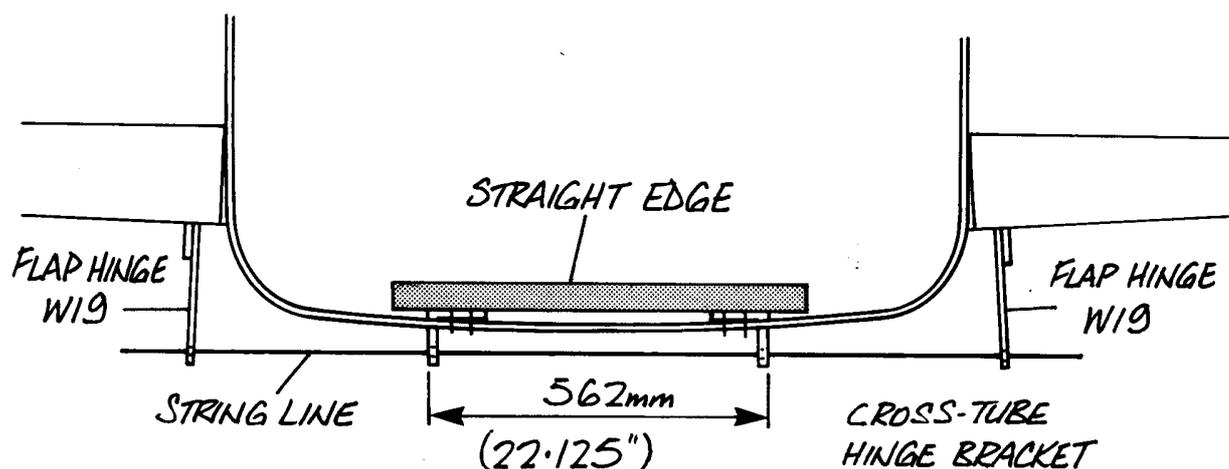


Fig 3. FL18 brackets viewed from behind.



Step 6

When you are satisfied with the set up for the brackets, mix up some Araldite 420 with flox and bed them in place on the fuselage floor, ensuring the correct position is re-achieved before allowing them to cure fully.

The edges of the slots which are not covered by the brackets should be sealed with flox. First push the exposed foam between the skins back a few millimetres, then trowel the flox in. Don't disturb the set up of the brackets if you decide to do this at the same time as bedding in the brackets.

Step 7

After cure, drill through the four holes in each bracket right through the fuselage floor with a 4.8 mm drill. Install AN525-10R16 bolts in each hole from the underside, with an AN970-3 washer under the bolt head to spread the load. Use an AN960-10L washer under each MS21042-3 nut.

Remove the string from the hinge pivot holes and replace the bolts that were removed from the flaps. A section through the hinge pivot to remind you of the assembly sequence is shown in figure 4.

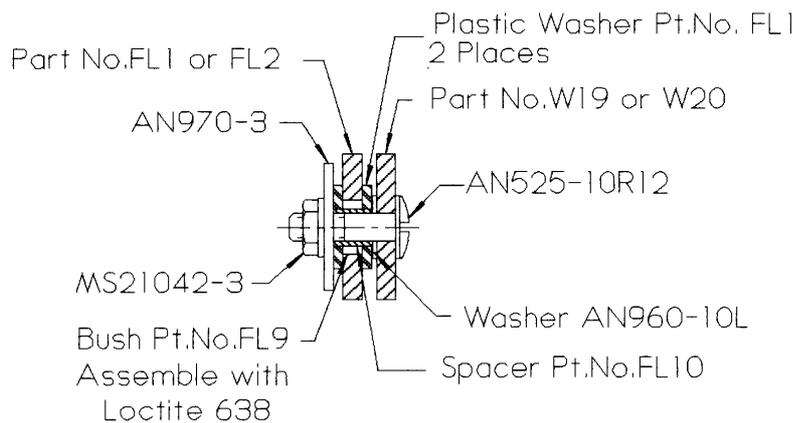


Fig 4. Section through flap hinge pivot.

Step 8

Attach the hinge arms FL16 to the brackets FL18 then swing them up to engage between the two pairs of lugs that are welded to the cross-tube, rotating the tube so that the lugs and the hinge arms are in line. Clamp the lugs and hinge arms together then, using the two small diameter holes in each lug as a centre, drill right through with a 4.8 mm drill. Insert an AN3-5A bolt in each hole and reposition the clamp if necessary before drilling the second hole then, placing on an AN960-10L washer, tighten each bolt up with an MS21042-3 nut and remove the clamps.

The flaps will now extend and retract together and only require linking to the flap operating mechanism.

Actuator installation

The flap actuator is mounted at the motor end to its mounting bracket FL26 which is fastened to the fuselage floor. The floor will require a local plywood hard point and glass fibre reinforcement to be added. The rod-end is bolted to the lugs which are welded to the flap actuating cross-tube.

Step 9

Floor reinforcement

Preparation

Mark out the area on the inside fuselage floor for the position of the 3 mm plywood hard point according to figure 5.

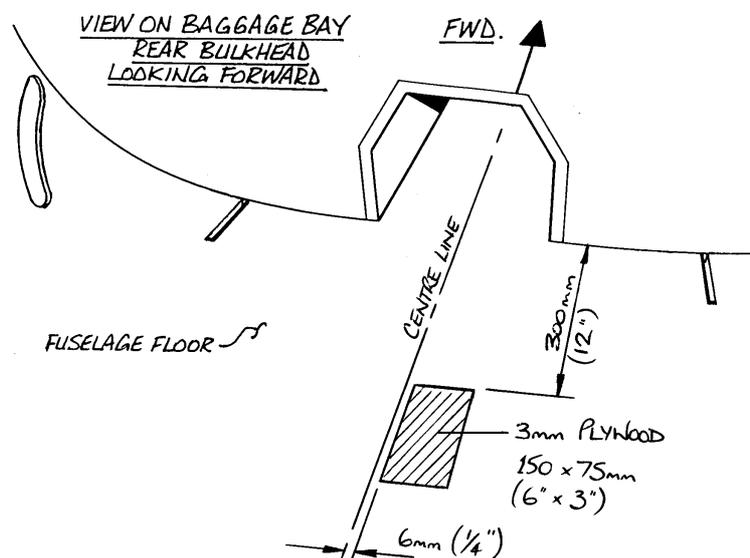


Fig 5. Flap drive reinforcement position.

Taking care not to cut through the outside skin, cut out the inner skin and foam core within the marked out area. Cut a piece to fit in place of the removed foam. allow about 2 - 3 mm (1/8") clearance all round.

Step 10

Hardpoint installation

Scuff sand the fuselage skin surrounding the cut out area to a border of approximately 5 -6 cm (2 - 2 1/2"). Cut out 4 plies of 'bid' at $\pm 45^\circ$ 25 cm x 18 cm (10" x 7") and lay-up two plies into the cavity, lapping onto the inside skin. Apply floc around the edges of the cavity to avoid air bubbles forming.



Apply a skim of floc to both sides of the plywood insert and squidge it in place, removing any excess floc which oozes out before applying the two remaining plies of 'bid' over the top. Peel ply all over and allow to cure.

Linear actuator preparation

Drill out the two mounting lugs from 8mm to 5/16" - there will be very little material to remove. Fit a spacer W14 across these two lugs using Loctite 638.

Fit the adaptor FL30 to the hole in the end of the plastic piston, again opening out the hole to 5/16" if necessary. Fit FL14 spacers to the cross hole in the piston, and locate the adaptor and spacers in place with an AN4-12A bolt, MS21042-4 stiffnut and AN960-416 washer.

Mounting brackets

Figure 6 shows the attachment arrangement of the linear actuator. The mounting bracket FL26 will be bonded and bolted to the floor through the hard point.

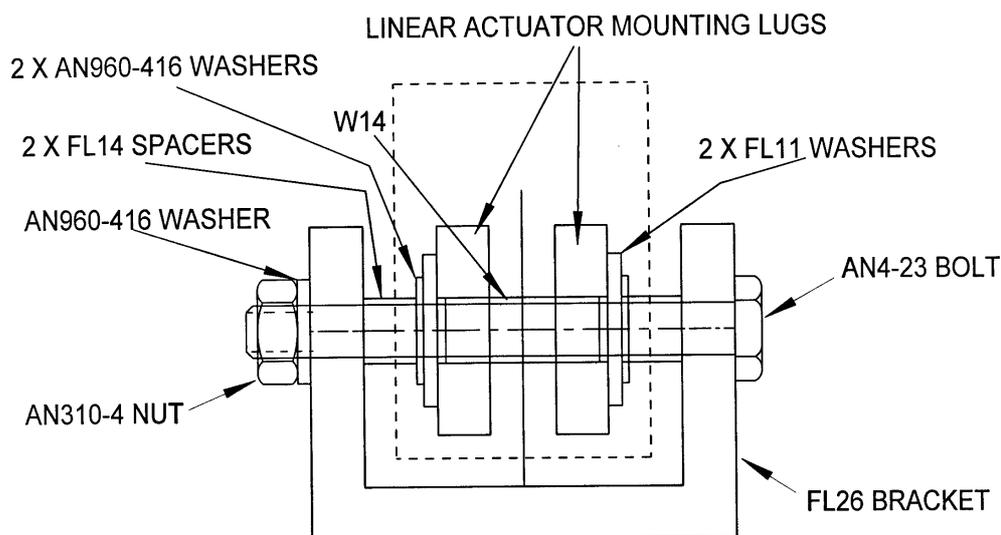


Fig 6. Assembly of linear actuator to FL26.

A photo of the actuator assembled to the mounting bracket is shown in figure 7.



Fig 7. Actuator assembled to mounting bracket.

Step 11

Installation

Using a 12 volt battery run the motor of the actuator to fully extend the push-rod. Next, scuff sand the base of the actuator mounting bracket FL26 and then attach it to the motor end of the actuator; the motor should be orientated as shown in figure . With the wings rigged to the fuselage and the flaps in their retracted position, fasten the flap actuator by its rod-end to the lugs on the flap cross-tube according to figure 8.

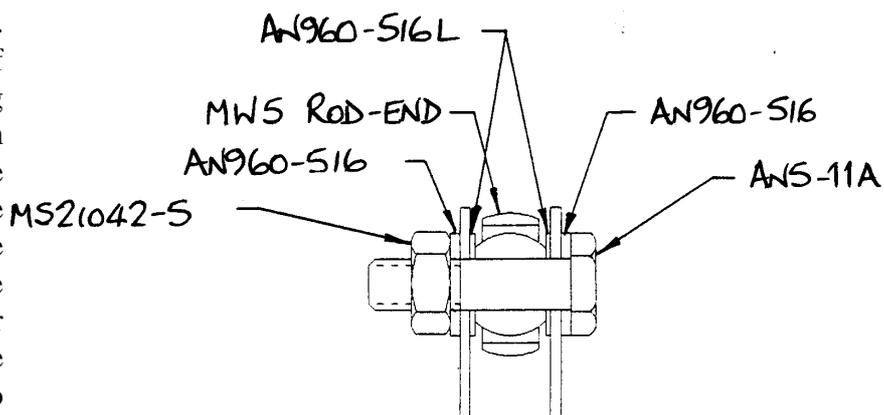


Fig 8. Section of bolt and washer arrangement for rod-end.



Ensuring that the actuator is at 90° to the flap cross-tube rest the bracket on the fuselage floor, which should lie on the hard point. Mark its position on the fuselage floor as a reference then apply a skim of Araldite420 and flox to its base. Reposition the bracket to the reference point and remove any excess adhesive before allowing to cure undisturbed. Double check that nothing has moved before leaving it.

After cure remove the actuator from the mounting bracket and drill through the bracket and right through the fuselage floor with a 4.8mm drill using the existing holes as a guide.

Install AN525-10R12 bolts from the outside, with AN970-3 washers under their heads, and secure them with MS21042-3 nuts.

Step 12

Flap root extension

When you made the flaps, one of the first things you did was put aside the root portion of the foam core. If you can still find them, now is when they become useful.

With the flaps retracted, fit the foam cores to the flap root, carving it away as required to clear the fuselage side. Add foam in the places that don't quite reach the fuselage side then attach the core, with the trailing edge support block still in place, to the end of the flange with rapid epoxy.

Remove the flaps from the wings and, with the foam covered in peel ply, layup 2 plies of 'bid' over the outside of the foam, lapping about 2 cm (1") onto the flap root flange. You will need to do the outside skin in two stages to achieve the 'glass to glass' trailing edge as on all the control surfaces.

After cure, trim the layup then dig out the foam, removing the peel ply, then layup 2 plies of 'bid' on the inside of the flanges, again lapping onto them about 2 cm (1"). Use flox where the two layups divide each side of the flap root flange to prevent air bubbles forming.

After cure, trim the edges to leave you with a 5-10 mm (1/4") gap between the flange extension and the fuselage.

Finally, cut an inspection hole of about 25 mm (1") diameter through the top of the flap root flange directly above the flap drive pin. This enables sighting the engagement of the pin into the flap drive cross-tube whilst rigging. A perspex window could be bonded into the hole if desired.

Flap operating switch

A toggle switch is used to operate the flaps, as a rocker switch may cause confusion between pitch trim and flaps. A suggested position for this switch was given in Chapter 24.

The switch is a double pole, double throw (DPDT) type switch and it is spring loaded off in its centre position. Although the switch is marked "AC only" it is suitable for the use with the low current drain through it to operate the actuator.

Figure 9 shows the electrical circuit that should be used, in conjunction with the main circuit diagram in the Electrical Chapter.

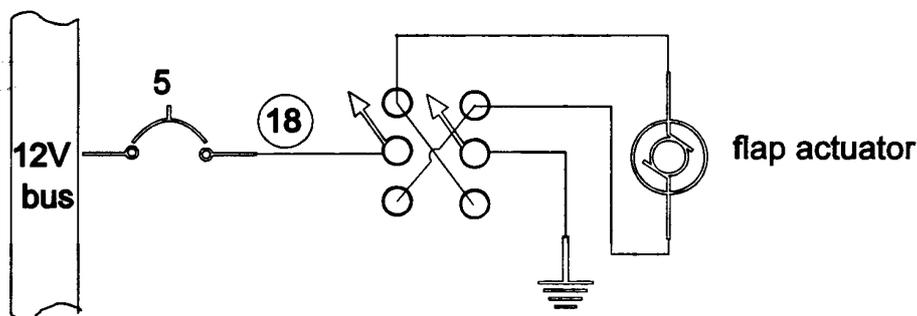


Fig 9. Flap switch circuit diagram.

Step 14

Flap position indicator

As the selection of flap angle is dependant on the length of time the switch is operated, some means of checking the flap angle is required. The full size template, figure 3 in Annex A, may be used to add markings to the port side flap upper surface. With the flaps retracted the 0° mark and the mark on the wing trailing edge should line up with the pilot's line of sight. The majority of the other markings will be hidden under the wing's flap close out flange.

As the flap extends the markings on the flap appear to move towards the wing root, and the flap movement may be stopped to align them with the mark on the wing to select the desired flap angle.

Application

First cut out the template and attach it to the flap in the position indicated by the dimensions and the dotted line.

Note: *There will be slight misalignments due to parallax if you move your head forwards or backwards. Choose the position you will be sitting in when operating the aircraft. To add the lines to the wing surface, punch through each end of each line and mark through these holes onto the flap surface. Either paint lines or add adhesive backed pinstripping tape to join the marks.*

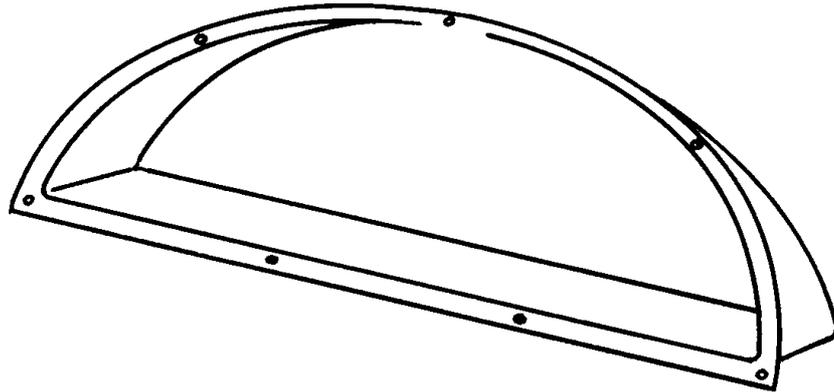
Baggage bay rear bulkhead

Step 15

Preparation

The moulding for the baggage bay rear bulkhead and floor (part no. F02A) incorporates joggles for two compartments under the floor, and for the rear fuselage access panel (part no. F08).

The 'D' shaped access panel which fits into the rear bulkhead is fitted with seven bolts: four along the base flange and three around the upper flange.



Mark out the hole centres on the panel so that they are approximately 13 mm (1/2") from the edges and spaced equidistantly. See figure 10.

Fig 10. Fastener holes in rear access panel F08.

Position the panel in the aperture in the rear bulkhead and secure it with tape. Drill through both the panel and the rear bulkhead with a 4.8 mm drill at each of the seven hole centres. Remove the panel and install MS21047-3 anchor nuts on the rear side of the bulkhead using TAPK33BS rivets. Don't omit to countersink the glassfibre flanges for the rivets with a drill.

Countersink the forward face of the holes in the panel with a drill to accept NAS1169C10 Tinnerman washers. The panel is now ready for installation using MS24693-S272 screws.

The two access panels in the baggage bay floor are made from 3 mm plywood. Cut out the plywood to match the joggles in the moulding, and, using a similar technique to that for the panel above, fit the plywood using four AN525-10R8 bolts, one in each corner, which will screw into MS21047-3 anchor nuts, held in place by TAPK33BS pop rivets..

Installation

The front flange of the bulkhead fits over the rear of the cockpit module. The first job is to cut away the centre of the bulkhead front floor so that it matches the rear of the cockpit module.

To support the weight of baggage and to stiffen the floor four 3mm thick plywood support ribs are fitted underneath the floor. The positions are shown in figure 11.

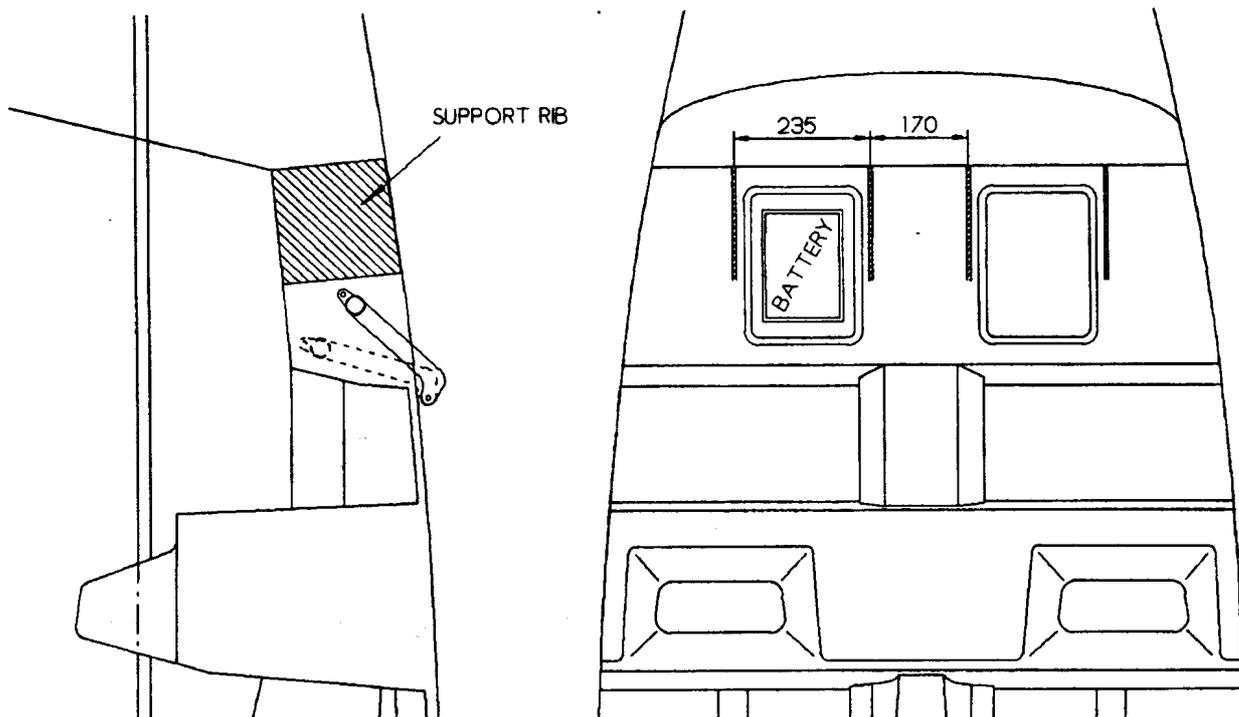


Fig 11. Baggage bay support ribs.

The ribs are to be fitted to the rear of the panel to ensure clearance for the operation of the flap drive cross tube.

Trial fit the bulkhead in place and measure the height of the ribs. Cut out the ribs approximately 3 mm (1/8") less in height than the measured figure and 20 cm (8") long, then layup one ply of 'bid' at $\pm 45^\circ$ onto each side. Scuff sand the areas of the underfloor / baggage bay floor where the ribs will fit. Attach the ribs to the bulkhead with a Araldite420/flox mixture. After cure the joint should be reinforced with 2 plies of bid at $\pm 45^\circ$ lapping onto the ribs and bulkhead by 25 mm (1").

Scuff sand all the areas where the bulkhead will fit onto the fuselage and onto the rear of the cockpit module section of the baggage bay.

Drill and cleco the bulkhead front flange onto the rear face of the cockpit module. Remove the clecos and bond the bulkhead onto the cockpit module with Araldite 420/flox; fit the clecos or use rivets to hold the items securely whilst the adhesive cures.

Layup 2 plies of 'bid' onto the bottom of the floor support ribs, lapping them onto the fuselage floor and ribs by 25 mm (1"). Also layup 2 plies of 'bid' each side of the join between the fuselage and the rear baggage bay bulkhead, lapping them onto each by 25 mm (1").

