
23T. Bonding on fuselage top moulding - trigear

The bonding of the top moulding to the rest of the fuselage will make the structure complete and extremely stiff in torsion. Although the forward fuselage is already stiff with the cockpit module bonded in, it would be inadvisable to add the lift pin sockets, flap control system, or engine to the lower fuselage before the top is added, as you may find things have moved slightly afterwards.

Before the top moulding is bonded in place, however, there are several tasks that can be carried out now which will save working in awkward places (i.e. the inside of the rear fuselage) unnecessarily.

Trim servo wiring and antenna cable

The extension cable for the trim servo should be added to the wires coming out of it. Fasten the cable to the fuselage side (the port side may be easiest for running the wires into the back of the panel). Cable tie bases, bonded to the fuselage side will enable easy attachment. A hole will be required through the baggage bay bulkhead for the wiring to pass through. Allow also for any antenna cables you may wish to install. Arrange the wiring, etc. to run underneath the door surround in the cockpit area.

The most convenient place for the VHF radio antenna, a simple dipole made from copper tape, is on the inside surface of the rear, port side flange of the fin's rudder shroud. Instead of installing the cable in the fuselage, though, it may be easier to make up the antenna assembly on the bench beforehand and then thread the cable through from the rear of the fuselage. However, making provision for mounting the cable within the rear fuselage at this stage is a good idea.

Cockpit frames

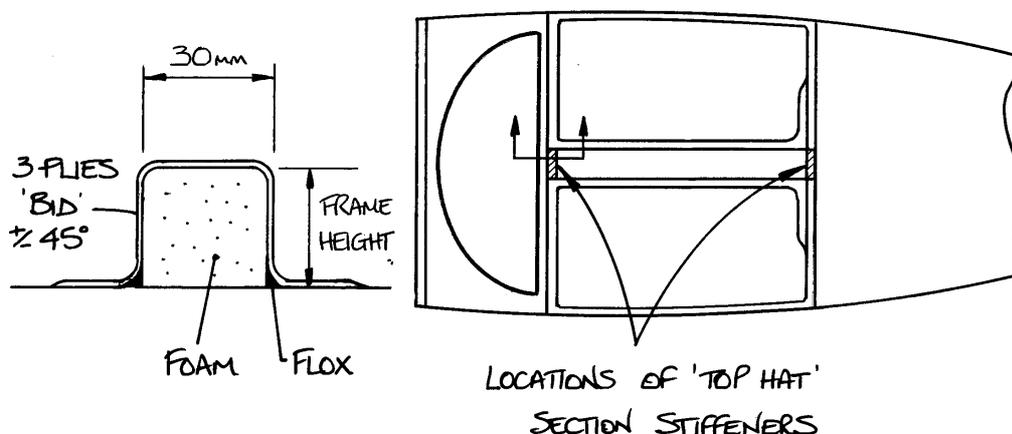


Fig 1. Section of 'top hat' section stiffener and locations.



To provide extra strength and stiffness in the cockpit area the frames formed by the front and rear of the door apertures must be joined. To achieve this, 'top hat' section stiffeners will span the gap between them giving a continuous path for loads to follow.

Cut and carve pieces of scrap foam to fit between the door apertures as detailed in figure 3. Thoroughly scuff sand the area around where they will fit and squidge them in position with floc, then immediately lay-up three plies of 'bid' at $\pm 45^\circ$ to cover the foam and run on to the surrounding structure by approximately 3 cm (1-1/4"). Cover with peel ply and, having made sure the moulding is properly supported and not twisted, allow to cure before disturbing.

Ceiling panel

Although not essential, a panel spanning the area in between the door apertures can be a useful and tidy addition. Sockets for headsets, for example, can be fitted in this panel, keeping leads away from controls, etc. You will need access to the bolts of the door hinges that would be covered by the panel; strategically placed holes will allow this.

If you decide to fit a ceiling panel it's probably easiest to do it now while you can work on it without standing on your head. 3 mm plywood would be a suitable material for this panel.

Access panels

An access panel at the rear of the fuselage will make maintenance tasks on the various assemblies on and around the rear bulkhead easier. The positions for this panel and a smaller viewing hole are shown in figure 2. The method of construction is described below.

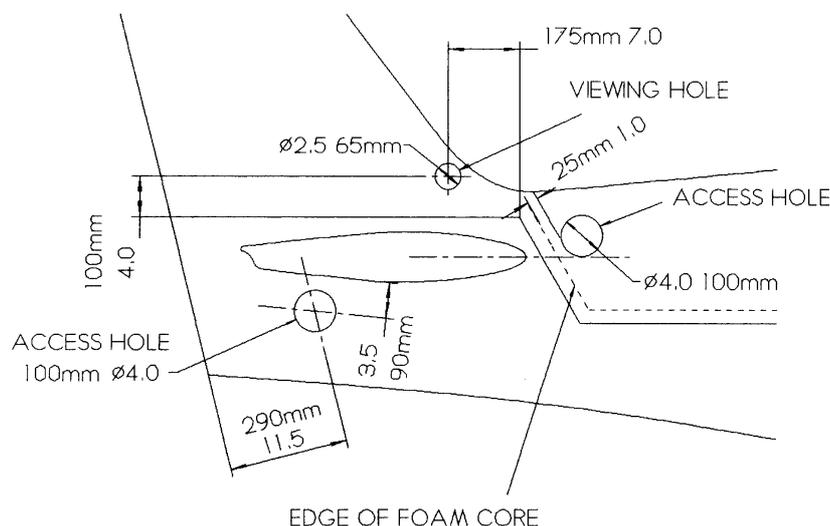


Fig 2. Positions of access and viewing panels.

If you are right handed it would be most sensible to fit the access panels and the viewing panel to the starboard side. Variations on hole positions from those shown must be approved by Europa.

Access panels

To make the access panels and the reinforcements around the holes, the following technique should be employed. Dimensions given are for the main access holes. For the viewing hole in the base of the fin all dimensions except the flange width should be reduced by 38 mm (1.5").

1. Cover the area where the access panel will be with plastic sheet to act as a release film. Lay-up a "splash" (a thin glassfibre moulding), to be used as a mould to make the panel from, onto the release film - (figure 3).

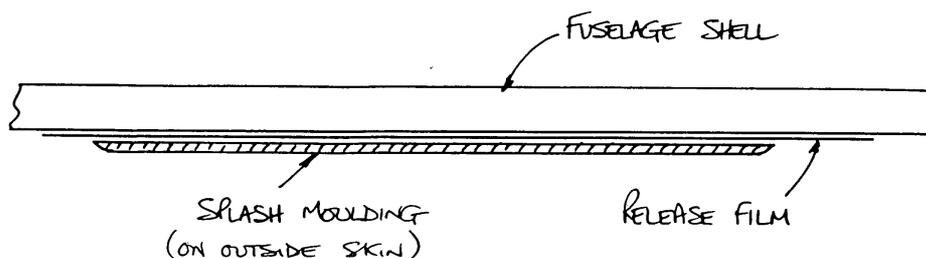


Fig 3. Layout of "splash".

2. Cut a hole through the fuselage shell 25 mm (1") larger than the desired access hole. The maximum diameter for the access hole should be kept to 100 mm (4") - (figure 4).

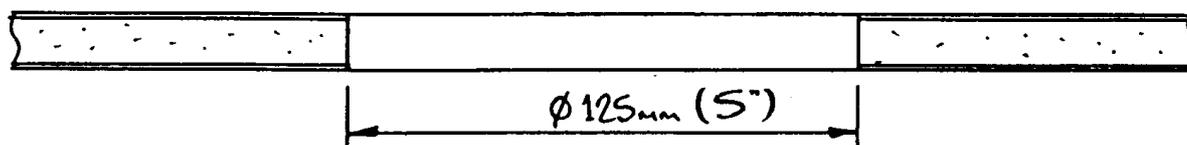


Fig 4. Hole cut out.

3. Cut the foam core and inside skin back 10 - 15 mm (0.4 - 0.6") from the hole's edge, then chamfer them back at about 45° - (figure 5).

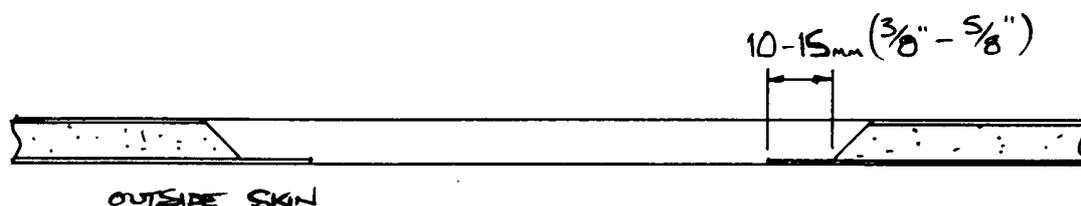


Fig 5. Hole chamfer.

4. Make a new panel from 4 plies of 'bid' on the 'splash' mould, and trim to fit the hole.



5. Cover the panel's inside surface with release film or tape, then hold in position in the hole with blobs of rapid epoxy, or hot glue on the outside skin.
6. Lay-up reinforcement plies of 2 plies of 'bid', the second ply being at 45° to the first, around the hole. These plies should lap onto the access panel by about 20 - 30 mm (0.8 - 1.2") and be about 20 cm (8") in diameter - (figure 6). Also layup a further 2 plies of 'bid' as extra flange reinforcement.

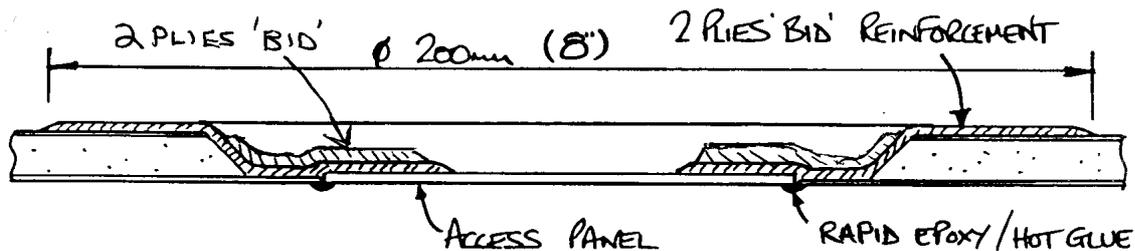


Fig 6. Reinforcement.

7. After cure, remove the panel and trim the flange around the hole to about 12 - 13 mm (1/2") in width - (figure 7).

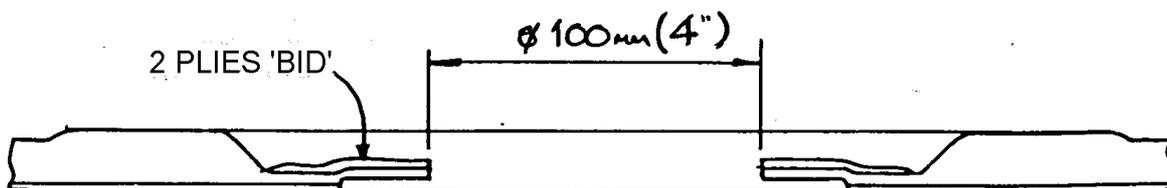


Fig 7. Flange trimming.

8. Attachment of each panel is to be with three AN525-10R8 bolts and MS21047-3 anchor nuts which are secured with TAPK33BS rivets.

Trial fit of the top moulding

First of all, position the top moulding in place on the bottom moulding and identify areas which may need adjusting to enable the desired fit to be achieved. The front flange of the top moulding sits in front of the firewall. Areas to expect attention are the firewall and the area of the top moulding in which it comes into contact, the pitch stop assembly height, and the rear bulkhead. It is preferable to have a slight gap between bulkheads and the fuselage inside skin as opposed to them being in contact, making small adjustments difficult. A 2-3 mm gap is ideal.

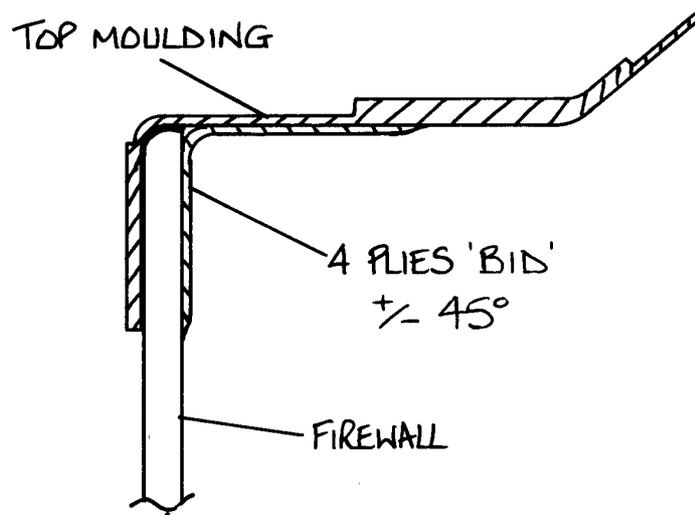


Fig 8. Joint between firewall and fuselage top moulding.

Correct positioning can be guided by the lining up of the rear flanges, the joggle joint and the rear face of the front flange in contact with the firewall. Figure 8 shows how this particular joint will be.

With the top moulding in the correct place drill four or five holes through the joggle flanges along each side of both top and bottom mouldings with a $\frac{1}{8}$ " drill and insert a Cleco in each hole to hold the two mouldings together. Ensure the tailplane torque tube is still level with the forward part of the fuselage.

When you are satisfied you have the correct fit mark the top moulding where the two bulkheads at the pitch control stop uprights will be, then remove it in preparation for bonding.

Fin sternpost

The fin sternpost is a separate moulding which will eventually be bonded to the trailing edges of both the top and bottom halves of the fuselage. At this stage it will only be clecoed in place.

Position the moulding so that its trailing edge lines up with the trailing edges of the fuselage bottom moulding. If the fuselage top and bottom halves do not match exactly at the trailing edge then they will need to be trimmed as appropriate to get a straight line from top to bottom.



Drill a series of 1/8" holes through both the fuselage rear flange and the sternpost moulding and cleco the two parts together. Use at least 6 clecos in the lower moulding. Making sure that the sternpost remains secure remove the top half of the fuselage.

You will probably need to keep in position the spacer you have installed forward of the tailplane fairing, to prevent the torque tube from becoming stiff to operate, until after the top moulding has been bonded in place. This can be fitted permanently if so desired.

Preparation for top moulding attachment

Now you should be ready for the steps that will transform what's been looking like a boat into what should start looking like part of an aeroplane.

If, for any reason, you've removed the main pitch push-rod, do be sure to re-install it before the fuselage top moulding is permanently in place. It can be installed later but it's not much fun to do and requires a bit of surgery.

Scuff sand the joint areas of both top and bottom mouldings and also an area at least 5 cm (2") each side of the marked lines where the bulkheads will be. Sand also the bulkheads each side including the firewall and the area where the top of the pitch control stop uprights will be, as mounting brackets will be attached here later.

Bonding and taping

Prepare a mixture of Araldite 420, adding flox to prevent it from running, then apply it to the jointing area of the bottom moulding and the rear bulkhead edges before placing the top moulding in place. Rivet the flanges together using the previously drilled holes to make sure good contact exists between the jointing surfaces. You may have to drill more holes to add rivets in areas if the flange bulges locally. The rivets are only to ensure consolidation of the joints and will be removed after cure. Wipe away any excess adhesive and leave to cure.

Tapes

The joint between the top moulding and the rear of the firewall will require tapes.

Before applying the tapes fill any gaps with flox.

Make the tapes from 4 plies of 'bid' at $\pm 45^\circ$ and 50 mm (2") wide, lapping them evenly on to the top moulding and rear of the firewall.

Pitch control stop upper brackets

This is an awkward job from which you could not be saved as it is obviously necessary to have the top moulding in place to lay-up mounting brackets for the top of the pitch control stop assembly. You can make life a little bit easier by laying up 4 plies of 'bid' at $\pm 45^\circ$ on sheets of plastic film and trimming them to squares of about 10 cm x 7.5 cm just prior to crawling into the fuselage.



Lay plastic over the tops of the side supports, to prevent them being bonded inadvertently, and hold it down each side with tape. Put the bracket lay-ups in place onto the top of the fuselage and down onto each plastic protected side support. Covering the edges with peel ply should help things stay in place. After cure, remove the peel ply and plastic release film and get ready for the *really* awkward bit.

Drill one hole through both the flange and side support with a 4.8 mm drill to accept an AN3-5A bolt and, using AN970-3 washers as you have at the bottom, fasten it securely with MS21042-3 nuts. You'll need an angle drill or angle chuck for this.

Upper pitch control stop

The pitch control upper stop is to be made from 12 mm plywood attached, edge on, directly to the fuselage top. Without this stop the mass balance weights would strike the fuselage skin. Similar to the lower stop, the weights should contact the stop approximately half-way along their total length.

Shape the piece of plywood to fit the dorsal inside the fuselage at the appropriate location and adjust its size so that, when the weights are in contact with it, the trailing edge of the tailplanes are at 4° down. Allow for a bead of bath sealing type silicone to be added to the stop to absorb the worst of any hard impact. Bond the stop in place with Araldite 420 and flox, holding it in place with the mass balance weights hard up against it until it cures.



INTENTIONALLY BLANK