
17. Bonding cockpit module into fuselage

Before the cockpit module is finally bonded into the lower fuselage, there are a few tasks which require to be carried out whilst you have good access to its underside and the inside of the fuselage bottom moulding.

Fuel system

The fuel selector valve (part no. 6749) and the fuel lines connecting it to the tank are to be fitted while they are easily accessible. The remainder of the fuel system depends, to a certain degree, on your engine choice and is covered later in this manual and in the engine manual. The engine is fed from the fuel tank from either side of the centre tunnel, the side being selected by means of a four position, two-way selector valve. Two of the four positions that may be selected with the valve turn the fuel off.

Fuel selector valve

The handle of the fuel selector valve has a small pointer on it which may be difficult to see when the valve is mounted in position. It is suggested that the pointer be filed off and the handle itself be regarded as the pointer.

For placarding, make a disk, with a radius at least the length of the selector handle, that can be mounted on the tunnel, and clamped by the two bolts which will go through the lug to secure the valve. Placard the four positions that the handle will click into with clear markings of :-

OFF, OFF, MAIN and RESERVE.

The MAIN tank selection should be connected to the port tank outlet and RESERVE should be connected to the starboard tank outlet. The placard will eventually be fitted to the cockpit module tunnel side over the cockpit trim, so put it away for safe keeping.

There is a rectangular area situated on the port side of the tunnel just forward of the seat back bulkhead which does not have any foam core. The fuel selector valve is mounted to this so that the handle is on the port side in the cockpit convenient for the pilot. Position the valve as shown, in the photograph, figure 1. Drill one 8 mm diameter hole for the spindle. Place the valve with the orientation as shown, with the opposing inlets vertical and the remaining port pointing aft. Slide an AN970-4 washer on the AN4-15A bolts and pass the bolts through the tunnel wall. Next slide an AN960-516 washer and W14 spacer over each bolt, then fit the selector valve and secure it with MS21042-4 nuts. You may need to crop one of the AN970-4 washers.

Fit three FPA904/A unions to the selector valve.



Fig 1. Fuel selector valve mounting, seen through starboard access hole.

Access panel for fuel selector valve

Opposite the fuel valve is to be a 100mm (4") diameter access hole which will be closed off using a glassfibre panel attached with three AN525-10R8 bolts into MS21047-3 anchor nuts held in place with TAPK33BS pop rivets. On later cockpit modules there is a round area without foam core opposite the rectangular fuel valve mounting area. This is for the access hole.

Similarly later baggage bay rear bulkheads incorporate, in the "D" panel which you cut out, a reinforced triangular portion from which three circular 130 mm (5") access panel covers can be cut. You will need one for the fuel selector valve access panel, and two more later for the fuel tank outlet access panels which go in the fuselage underside, so now would be a good time to cut all three out.

The manufacture of the access holes is similar to that used for the aileron bellcrank access holes (see page 8-7).

Fuel hoses

Referring to the fuel system schematic diagram at the end of the fuel system chapter, fit fuel hoses to the valve as follows:-



Attach a 1.6 m (63") length of the 8mm Fuel Hose to the selector valve outlet (the port which is opposite to the mounting bolts). Lead it through the tunnel in the fuel tank and tape it out of the way for now. The outlet from the port side of the tank should be connected to the valve inlet port which will be pointing towards the aircraft floor, and the remaining valve port is, by default, connected to the tank's starboard outlet. Clamp all connections with Clip000 hose clamps.

Fuel sight gauge

The fuel sight gauge tubing is to be connected to the screwed in fitting in the port side (main) fuel outlet fitting of the fuel tank. Refer to the fuel system illustration at the end of the fuel system chapter. Secure the hose using a 291-600 clip.

To route the sight gauge tubing forward to the firewall bulkhead drill a 15 mm (5/8") diameter hole through the base of the seat back bulkhead on the port side immediately ahead of where the fuel sight gauge outlet is. Drill a similar hole through the thigh support, close to the floor and centre console, and a further hole through the flange of the vertical part of the thigh support.

Push the restrictor FS02 about 2.5 cm (1") deep into one end of the sight gauge tube, inserting the drilled end first. Oriented this way you will be able to see any debris that may find its way into the fuel.

Fuel tank outlets access panels

To enable easy access to the fuel outlet fittings it is desirable to fit access panels in the fuselage floor; this is a requirement in the U.K. The latest fuselage lower halves incorporate two 125 mm (5") diameter recesses situated close to the fuel tank outlet positions. Cut out each recess to a diameter of 100 mm (4"). Using the two fibreglass circles cut from the "D" panel which was removed from the baggage bay rear bulkhead, make up and fit access panels, using the same method as has just been used for the fuel selector access panel.

Rudder cable pulleys / seat belt attachment

To take the rudder cables underneath the pitch torque tube and the flap drive tube a pulley is installed on each side of the central tunnel of the cockpit module. The hard-point it is to be bolted to doubles as a mounting for the inboard seat belts.

Locate the hard point moulded into the cockpit module's central tunnel wall at the lowest and rear-most point of the seat area.

To enable accurate measurements to be made, place a straight edge across the wheel well adjacent to the hard point areas and mark the cockpit module as shown in figure 2. The dimensions for the seat belt holes are to be taken from the edge of the insert which is visible through the glassfibre.

The pulley's diameter should coincide approximately with the rear vertical face and be about 6 mm (1/4") from the under surface.

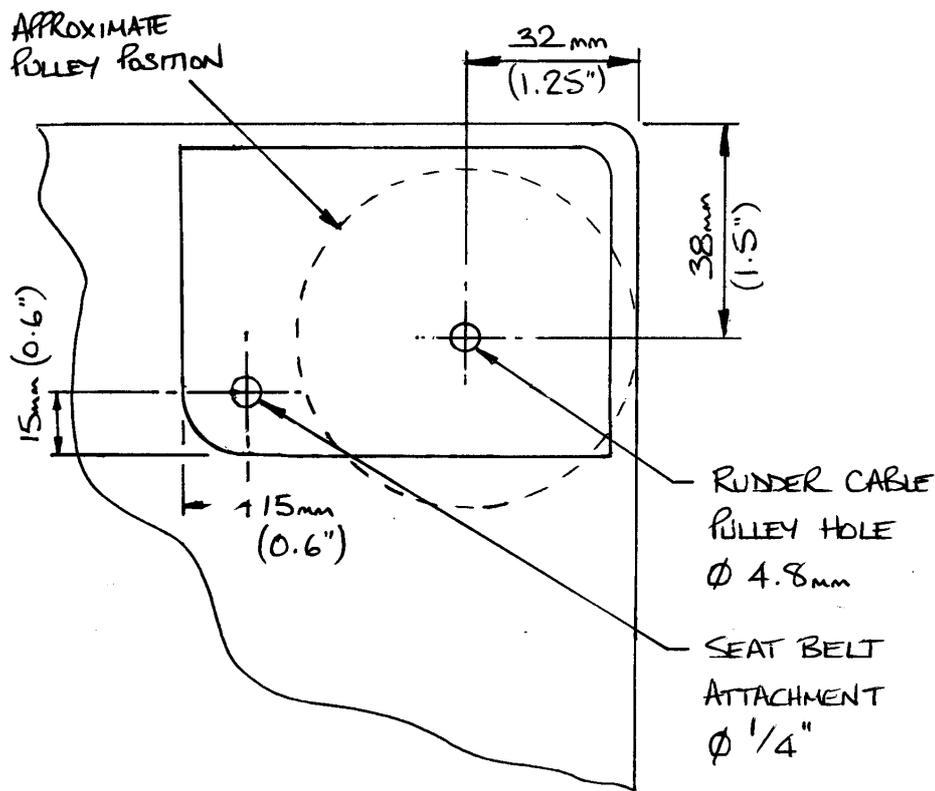


Fig 2. Detail of metal insert at bottom rear of wheel well.

Mark the opposite side in the same manner then drill through with a 4.8 mm drill as square as possible to the inside surface for the pulley holes and with a 1/4" drill for the seat belt holes.

Step 1

Preparation for bonding

Lift the cockpit module, complete with control system and fuel tank, into the bottom fuselage moulding. Set the 323mm (12.7") dimension as shown in Chapter 16 figure 4. Clamp, or hold with clecos, the fuselage sides to the cockpit module and check that it is positioned as you had it during the trimming stage. Cut open the hole in the fuselage sides for the spars but leave them undersize by about 15 mm (1/2") all around.

Check that all the controls are clear of interference and make adjustments to ensure clearance as required.

Make a mental note of all the areas which are not in contact with the fuselage bottom so you don't coat them with adhesive unnecessarily. When you are happy that nothing is binding and all is as it should be, remove the cockpit module and set it again upside down.



Scuff sand all contact areas on both the fuselage and cockpit module in preparation for bonding.

You will need to make several mixes of Araldite 420 adhesive/flox mixture to bond the cockpit module in place, so an extra pair of hands mixing whilst you do the application can be a great help.

Before you start mixing adhesive, ensure you have available; up to 800 grams of Araldite 420 plus the appropriate quantity of hardener, a drill with $\frac{1}{8}$ " bits, several cheap aluminium $\frac{1}{8}$ " dome head pop rivets, rivet gun, clecos, a handful of $\frac{1}{8}$ " load spreading washers and some weights.

Step 2

Bonding cockpit module in place

Mix about 100 grams of Araldite 420 adhesive at a time with the appropriate amount of hardener and add some flox to make a mixture which will not slump or run on vertical surfaces. Coat the cockpit module bonding areas generously with the Araldite 420/flox mixture but stay well clear of control bearings.

Carefully lower the cockpit module into the bottom fuselage and locate it with clecos or $\frac{1}{8}$ " bolts and nuts at the bottom of the firewall. Use the load spreading washers with the clecos to prevent them pulling through. You may find that there is a tapered gap between the front of the cockpit module centre tunnel and the firewall; this is acceptable, but ensure that the gap is filled with Araldite 420/flox.

Note: *It can take time for the adhesive to ooze out of small gaps and allow the cockpit module to settle in the correct position.*

Add fasteners moving aft then outboard and up and, having located the cockpit module all over, identify areas which are not in full contact and either add small weights locally or drill through both cockpit module and fuselage and add a fastener.

You may end up with quite a number of fasteners to hold the cockpit module hard up against the fuselage bottom, but they will all be removed after cure.

Check that control movement is still free. If there are any gaps still existing greater than 3 mm ($\frac{1}{8}$ "), (viewing from underneath with a lamp on the inside may help show up voids) trowel Araldite 420/flox into them. Smaller gaps may require Araldite 420 without flox.

Wipe away any excess adhesive then leave to fully cure before removing the fasteners by either drilling out, in the case of rivets or tapping out if you have used bolts. The remaining holes will be plugged with flox when blending out the join between fuselage halves.



Step 3

Aileron quick-connect brackets

Open up the holes each side of the fuselage so that they follow the inside line of the CS14 brackets. It would be advisable to remove the CS15 bellcranks from the CS14 brackets for this stage as you are about to bond the brackets to the fuselage, which stiffens them considerably.

Scuff sand the inside surface of the CS14 brackets, the bulkhead that the CS14 brackets are mounted to and the adjacent areas of the fuselage outside skin in preparation for bonding.

Bonding the brackets to the fuselage stiffens the CS14 brackets considerably. Lay up brackets of three plies of 'bid' at +/- 45° to run from the inner faces of the CS14 brackets and the bulkhead around onto the outside skin, lapping approximately 4 cm (1.5") onto both surfaces.

Cockpit module to firewall

Scuff sand the firewall and the cockpit module's flanges abutting the firewall in preparation for bonding. Lay-up three plies of 'bid' at +/-45°, lapping a minimum of 2.5 cm (1") onto each part.

Cockpit module rear bulkhead to fuselage

Tapes of two plies of 'bid' at +/-45° are also required to bracket the rear face of the cockpit module to the fuselage. There is a separate upper rear bulkhead which will be fitted later.

Cockpit seat pans

Using scrap blue foam, make up spacers to fill the areas each side of the control tunnels, so that a flat surface results for the seat pans.

Control column boots

This would be a good time to install control column boots to stop any foreign objects from entering the aileron torque tubes. The boots are not supplied as part of the kit, and the exact design is left to you. Make sure that, when installed, the boots do not restrict control column movement.

Flap motor hard point (trigear only)

You may like to incorporate the flap motor mounting hard point at this stage since access now is easier than later on when the top will have been fitted. Instructions for this are in chapter 28T at page 5.