

35. Fitting doors

Overview

In this chapter you will be trimming your doors to fit the openings in the fuselage top, attaching hinges, rubber seal and door latches, bonding the perspex side and front screens into place and finally fitting the gas struts to support the doors when open. Figure 1 at the end of this chapter shows the general arrangement of the door assembly.

Basic principles

If you are to achieve a draught and waterproof door then a seal of some sort needs to be incorporated into the design. Usually this seal is some type of rubber extrusion that needs to be compressed. This is either done by “slamming”, o.k. for a heavy car door or, as on your Europa, by tapered ‘shoot’ bolts. You will need to take special care when making the holes in the fuselage door recess to accept the shoot bolts, making sure that as you close the door latch the door is pulled down into its final closed position.

Remember - *think three times, measure twice and cut it once! Also study figures 1-5 before you start.*

Step 1

Trim the doors as necessary to fit the rebates in the fuselage top. You will notice that although the doors are quite stiff and rigid you will need to spring them into place, this is quite normal, the tapered shoot-bolts pull them down to the shape of the fuselage and onto the rubber seal once the hinges have been fitted.

Cut four lengths of hinge MS20001-5 as shown in figure 2. The hinge pin can be cut to the same exact length as it is captured within the hinge recess on the top moulding.

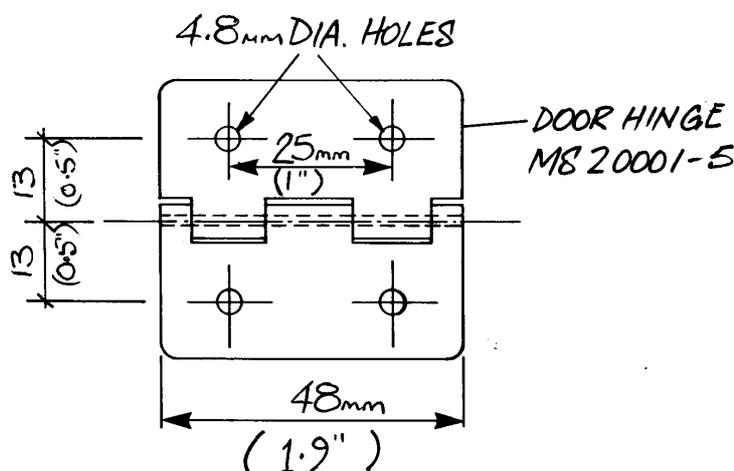


Fig 2. Typical hinge dimensions. 4 off required.



Step 2

Using a straight edge to align the hinges onto the doors, and referring to figure 3 on the facing page, mark and mount the hinge to the doors with two countersunk MS24693-C272 screws per hinge. To keep the outside skin nice and flush you will need to carefully counterbore a hole on the outside of the door tang to hide the MS21042-3 nut. On final assembly this can be potted with Araldite 420 and flox. You will notice, when looking at the hinge mounting points on both the doors and the fuselage, that you get an optical illusion. When we were building the original plugs we kept having to reassure ourselves that the hinge points were on the same plane, do you have the same problem?

You will have to trim the door tang so that there is a gap of at least 8 mm (5/16") between its end and the fuselage to allow the door to be opened fully.

Step 3

Apply a few dabs of rapid epoxy to the hinge flange to bond the door temporarily to the fuselage. A small piece of sponge rubber can be placed in the hinge to help spring the hinge against the fuselage. See figure 4.

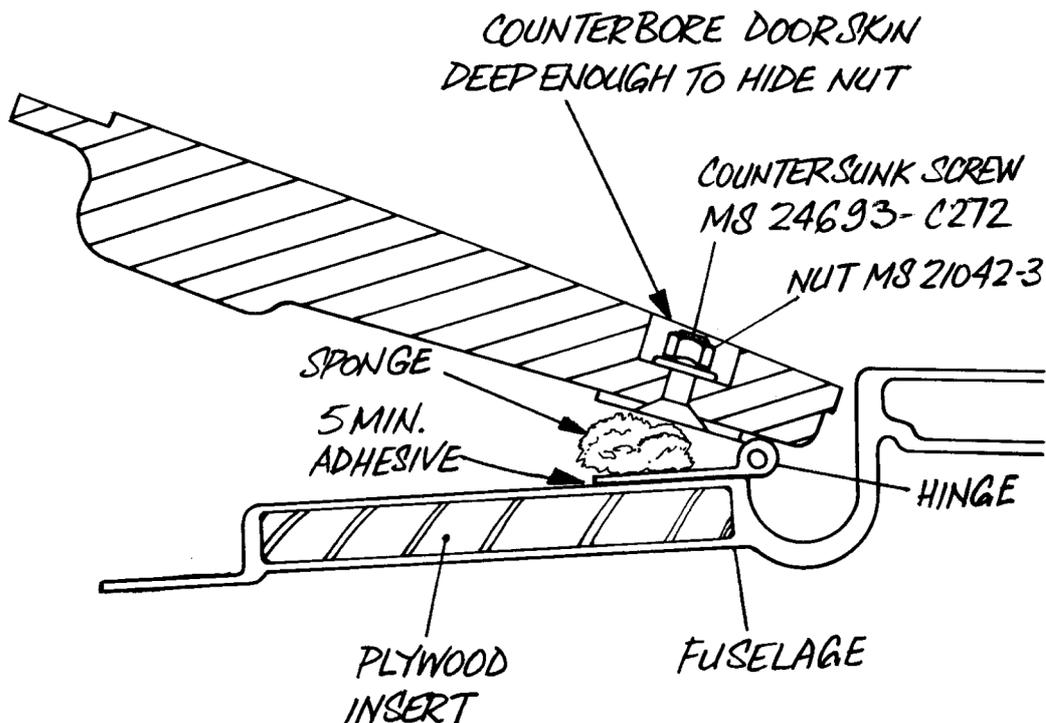


Fig 4. Temporarily attaching the door to the fuselage.

Once the rapid epoxy has hardened the door can be carefully opened and checked for operation. If all is well, drill two 4.8 mm holes through each hinge and the fuselage top and attach the door with AN525-10R10 bolts, AN970-3 washers and MS21042-3 nuts.

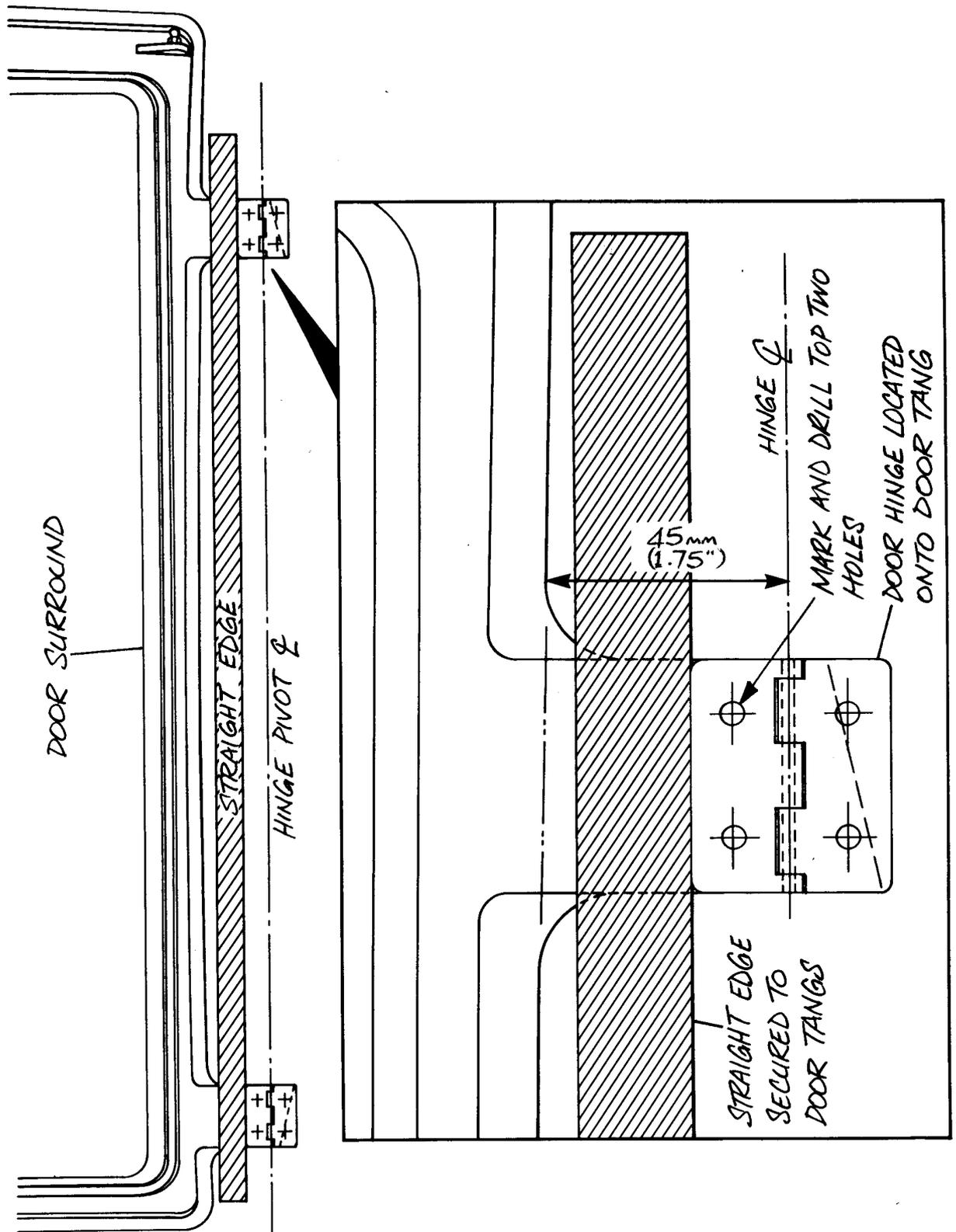


Fig 3. Mounting hinges onto hinge lugs.



Step 4

Remove the doors from the hinges and now permanently bond the doors and hinges only together with Araldite 420 mixed with a little flox. Refit the MS24693 screws, potting the MS21042-3 nuts with Araldite 420/flox at the same time. See figure 5.

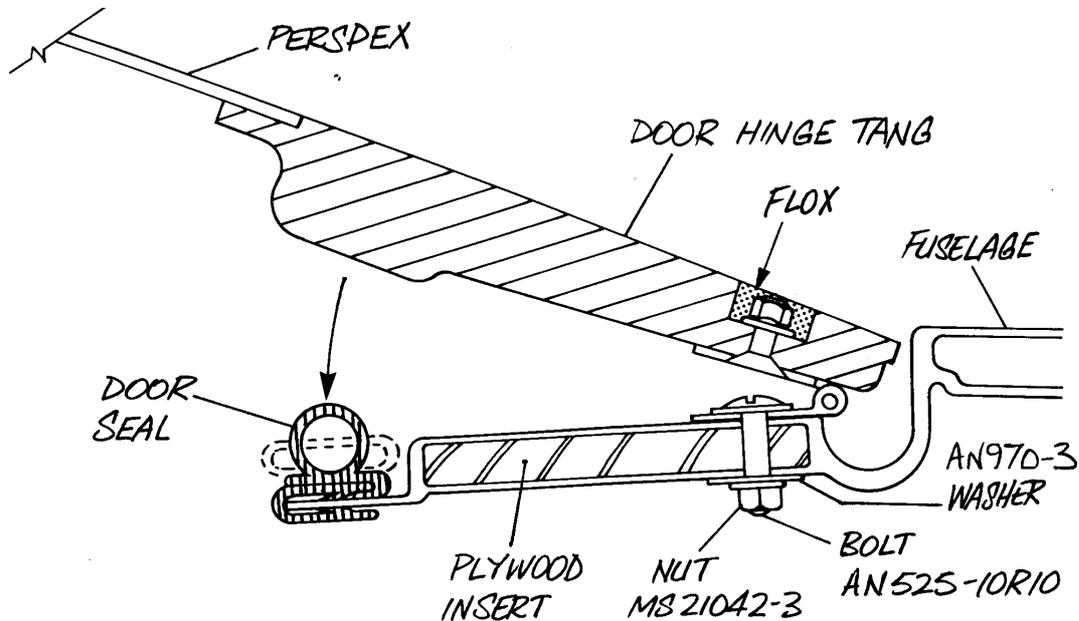


Fig 5. Fastening the doors to the fuselage.

Do **not** bond the hinge to the fuselage permanently otherwise you will not be able to remove your doors for painting etc.

Step 5

In this step you will be cutting the holes in the door rebates to accept the shoot bolts, but first reinforce the area where the holes will be by applying 4 plies of 'bid' 30 mm x 30 mm at the back of the door rebates (unmoulded side).

Once this layup has fully cured apply a small dab of wet ink, or paint to the very end of the shoot-bolts. With the door fully pushed home, move the door handle towards the closed position until the end of the bolt strikes and, hopefully, leaves a witness mark on the door reveal.

This is your starting point; drill a 1/4" hole and then with a round file *carefully* open up the hole just enough to allow a shoot bolt guide to fit in the door recess, so that when the shoot-bolts are fully extended, the doors are fully secured and flush with the outside of the fuselage. Use dabs of paint on the shoot-bolt each time you want to enlarge the hole so that you can see which areas need filing. Shorten the shoot bolt guides so that they protrude only 10 - 12 mm (3/8" - 1/2") through the door frame and, ensuring that there is a gap of only 1 - 2 mm between the guides in the door and the frame, bond them in with Araldite 420 and flox.



Make a fillet around the body of the guide to give it support.

Note: *To ensure the shoot bolt guide alignment is maintained whilst the Araldite is curing, have the door closed and latched.*

Step 6

Trim the door reveal carefully so the flange is approximately 20 mm (3/4") wide and fit the rubber seal extrusion so that it butts up against the door frame. Refer to figure 5. Make the joint to be somewhere near the gas strut channel to reduce the chance of leaks or accidentally pulling it off the flange when getting in or out.

Step 7

When you are satisfied with the fit of your doors you are ready to fit the perspex to both the doors and the front screen. Taking extreme care trial fit the screens into their rebates. You will need a 1 mm gap minimum between the edge of the screen and the rebate all around. The best way to trim perspex is with a sanding block and 80 grit paper, taking care to sand along the edges and not across them. Take your time with this or you could ruin your whole day!!

Once you are happy with their fit, mask up all the areas which are not within the rebated bonding area with PVC (insulating) tape and polythene sheet. Using fine sandpaper smooth all the edges of the perspex and lightly sand the areas to be bonded. A quick wipe around the bonding areas only and you are ready to go.

Remember, with all bonding cleanliness is next to Godliness so no greasy fingers!

Step 8

Scuff sand the rebated areas of the doors and front screen that will contact the perspex and wipe clean with a cloth lightly moistened with Acetone or MEK. Don't allow these solvents, including their vapours, any where near the perspex screens at all costs.

Step 9

It is advisable to bond in the side and front screens at different times; if you do them all at once you will not be able to get inside the aircraft to clean off any surplus adhesive. That is unless you intend leaving someone in the aircraft overnight.

Using Araldite 420, with sufficient flox added to it to stop it from running, coat the door or windscreen rebate. Carefully lift in the screen to be bonded. You can use masking tape to help hold it into place and even garden canes or strips of wood sprung against the side of your workshop to keep everything held down into the rebate.



A useful tip is to make some temporary spacers from wire to stop the screen from sliding down to the bottom of the rebate. These spacers can be left in until the adhesive has cured and then carefully removed.

Preparation is really important in this job, get someone to help and have a dry run first.

Allow the adhesive to cure fully before opening the doors.

Step 10

Gas struts

Refer to figure 1, then drill and tap the small moulded lug on the door with a 4.2 mm drill and a 5 mm tap to accept the ball connect fitting at the end of the gas strut. Loctite the fitting into the door lug using Loctite 243 and lock it with a 5 mm check nut.

Open the door and hold it so that its lower flange is about 1m (39 1/4") above the door recess (where you place the spirit level for setting the fuselage level). With the gas strut attached to the door lug at the cylinder end swing it around to indicate where the lower ball fitting should be positioned in the door surround flange, and drill through with a 5 mm drill.

Bond into place with rapid epoxy an AN970-3 large area washer at the back of the fuselage flange to spread the load, then attach the ball fitting with a 5 mm check nut.

Note: *The gas struts are charged to a pressure sufficient to lift the completed doors and have oil in them to damp the last few degrees of movement when opening. The damper will only work if the cylinder is uppermost.*

Warning: *There is a spring loaded valve in the end of the gas strut cylinder for charging it with gas. The slightest tap on the end of the valve to discharge gas will make the gas strut too weak to lift the door. If the strut becomes too weak for any reason, re-pressurization must be done with specialist equipment. The correct charge should give a force of 180N (40 lb. force) at room temperature.*

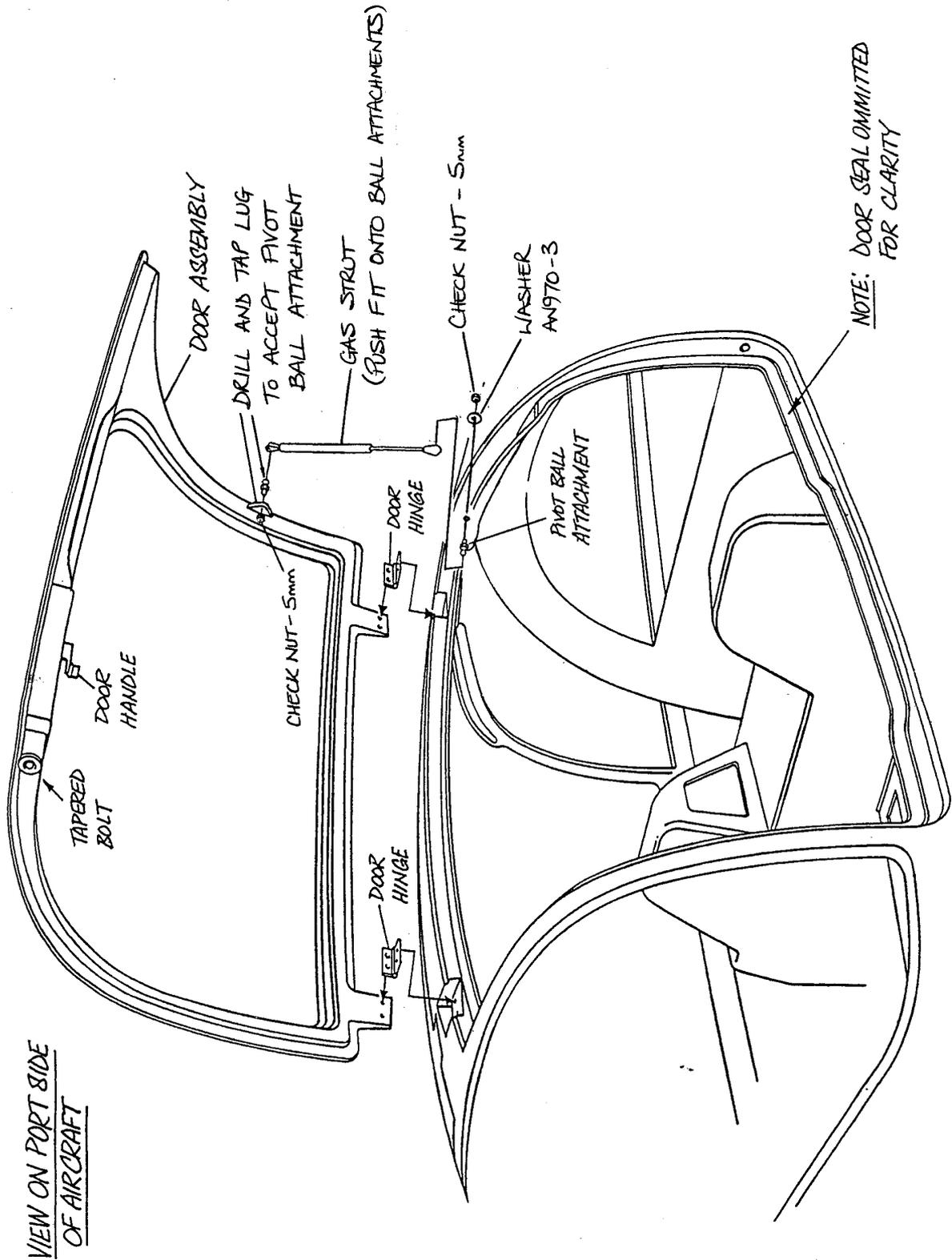


Fig 1. Fitting doors to fuselage.



INTENTIONALLY BLANK