

## ***Pre-Paint>Fuselage>Empennage>Fit vertical tail fin***

### **Objectives of this task:**

To fit the vertical tail fin to the fuselage, including fitting the static probe, static tube, optional strobe light wiring and the VHF antenna coax cable.

This is a complex task and you should note that the final fitting, which entails the use of epoxy resin and flock to bond the fin to the fuselage and glass fibre cloth to reinforce the joint, **must** be completed in one continuous action from start to finish. This task will take most of a day – in our factory with trained staff we allow a morning to final fit and reinforce the fin, so plan on at least that amount of time and probably quite a bit more.

You will need at least 1, preferably 2, other people to help you with the final fitting of the vertical tail fin – do **not** try to do it by yourself.



Vertical fin set in place with the peel cloth removed

### **Materials and equipment required:**

Card # 3J 'Rudder' for the VHF antenna

Glass cloth and peel cloth bags labelled: "Tail Fin" and "Outer Reo Tail Fin"

Epoxy resin and flock

5-minute Araldite and flock

2 lengths of 2" aluminium angle, waxed, each one at least the length of the join

Plumb bob and string line

Builders level

### ***Prepare the vertical fin***



Start by laying the vertical fin on its side and drilling out the marked inspection hole on the left-hand side with a hole saw.

Turn the vertical fin over and cut out the marked slot for the rudder cable: drill each end of the slot then use a jigsaw to join the two holes.



Remove any burrs – the exact sizing of the hole and slot will be finalized once the vertical fin has been fitted into place.

Using a round file, enlarge the static probe mount hole in the top front of the vertical fin – it needs to be large enough to pass the static tube and draw wire through easily. The finished hole size is not critical. Take care not to file through the pre-installed drawstring: for this reason using a drill is not recommended. If fitting the optional strobe to the top of the fin then you should fit the mounting base now: flock the base to the forward top of the fin and screw in place.

### ***Pull the static tube and the electrical cables through the fin***

Lay the vertical fin beside the fuselage on trestles set at the same height as the fin mounting stub. Lay the strake across the mounting stub.

Locate the drawstrings inside the fin that will be used for the electrical cables and the static tube. Tie a length of wire to the static tube drawstring and pull it through – the friction of the static tube being pulled may cause a drawstring to break.



The static tube and the strobe cable (if fitted) run through the front hole and the VHF antenna cable runs through the rear hole as shown in the photo at right.



Tie the draw wire to the static tube and strobe cable (if fitted) and the drawstring to the VHF antennae cable. The photos above show the recommended method: loop the draw wire or string around the tube or cable to be pulled then tape the end of the draw wire or string so that when it is pulled it will tighten the knot. Tape the end of the tube or cable to be pulled to streamline it and avoid it catching on anything. Cloth tape is stronger than masking tape and is recommended for this purpose.

Pull the static tube/strobe wiring and VHF cable up through the fin and out of their respective holes, then tie a knot or tape a mixing stick across the end of each tube or cable at right angles to prevent them slipping back inside the fin.

### ***Test fit the vertical fin***

Fit a 6G self-tapping screw to each side rear of the fuselage stub at the bottom of the joggle – the intention here is to prevent the back of the fin from being able to slip down further than the joggle at the back. These screws will be removed once the fin has been flocked and pop riveted in position prior to being glassed.

Tape the rudder cable threads then push the cable forwards until it can be tucked inside the slot in the mounting stub.

Lift the fin up over the mounting stub and slide down into place.

Take care that the join to the fuselage at the front of the strake is smooth and even, so that there is one continuous line along the entire length of the strake – if there is any discontinuity it will look extremely disappointing when paint is applied so take care to get it exactly right at this time.

Cut a foam wedge to fit at the base of the fin reinforcing channel – it should sit on the horizontal stabiliser as shown at right.

Mark the block with an arrow so that it will be placed the right way around.

When you are satisfied that the fin will fit correctly, remove it from the mounting stub and lay it back on the trestles.



### ***Level the aircraft***



Because the correct alignment of the vertical fin is particularly important the aircraft should be fixed in a “wings level” attitude prior to the final fit.

Place a 3” block on the top of each front wing mounting lug and place a spirit level across the top of the cabin so that it rests on both blocks.

Pack the main wheels as required to level the aircraft.

### ***Final fit the vertical fin***

You will need 2 other people to help you position and final fit the vertical fin. This step takes around 2½ hours in our factory with experienced personnel, so allow yourself at the very least 4 hours, possibly longer depending if your helpers can lay up glass fibre cloth with you or not.

Remove the peel cloth from both sides of the fuselage and the mounting stub and from the inside and outside of the vertical fin. Use a scraper to remove any edge strips of the peel cloth that have not peeled off cleanly. Lightly sand the inner surface of the vertical fin, the outer surfaces of the mounting stub and the front of the fin reinforcing channel.

Mix a batch of resin and carefully brush coat all surfaces to be joined in this step. Add flock and mix, then apply a 3 – 5mm coat of flock to one side of all surfaces to be joined in this step: both sides of the mounting stub and the front of the fin reinforcing channel.



With one person holding each side of the vertical fin, lift the fin into position and lower it down while holding the sides apart. Take care not to let the fin just slide down into place because it will push all the flock out of the join, and keep the fin in the joggle, not below it.

When the fin is all the way down allow the sides to push in and onto the flock. Push the fin all the way forward and check the fit, particularly at the strake/fuselage join.

Tie a plumb bob to a string line and fix the string line to the top of the vertical fin then align the fin until it is precisely vertical: the string line should be exactly in the centre of the fin when viewed from the rear as indicated by the yellow line in the photo below.

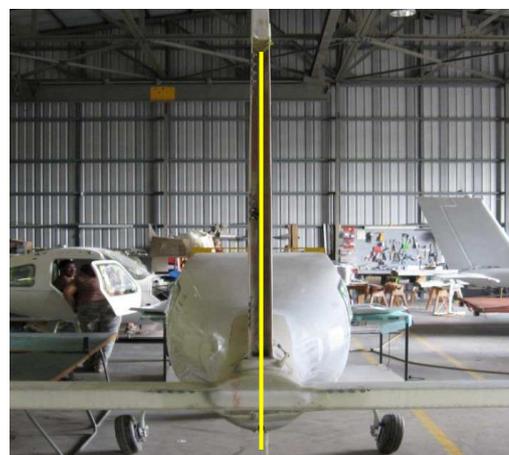
***Recheck*** this alignment at every step from here on.

Once the alignment is correct, secure the fin in position. You could use a strip of heavy adhesive tape from the outside edge of the horizontal stabiliser, over the top of the vertical fin and down to the other side of the horizontal stabiliser. ***Recheck***.

Rivet the front of the strake into place with a countersunk pop rivet at each side of the strake and then rivet at each side of the inspection hole and the rudder cable slot. ***Recheck***.

Remove the self-tapping screws from under the fin.

Wipe away the squeezed-out flock from each side of the join with a clean mixing stick.



### ***Reinforce the fuselage to vertical fin join***

This step involves laying up 3 layers of glass fibre cloth to each side of the join.

If you are doing the laying up alone then do each side one at a time – finish one side completely before moving on to the other side. On the other hand, if your helpers are capable of laying up glass fibre cloth then both sides can be done at the same time.



Start by mixing a fresh batch of resin and coating the left-hand join, then lay up 3 layers of glass fibre cloth from the bag labelled “*Outer Reo Tail Fin*” as shown above, taking care to brush each layer in with absolutely no air bubbles.

Depending on the temperature you may need to mix a fresh batch of resin part-way through the task if it starts to become too thick to brush out easily. If this happens, mix the fresh batch quickly and keep right on brushing the glass fibre cloth into place with the new batch – the glassing process must not stop until it is complete and the fin has been clamped in place.



When the 3<sup>rd</sup> layer has been brushed into place, place 2 strips of peel cloth (from the same bag), one on the fin and one along the empennage, and brush them on taking care to brush out any ripples or creases.

Repeat the procedure for the right-hand side: 3 layers of cloth and then the peel cloth.

### Reinforce the fin spar

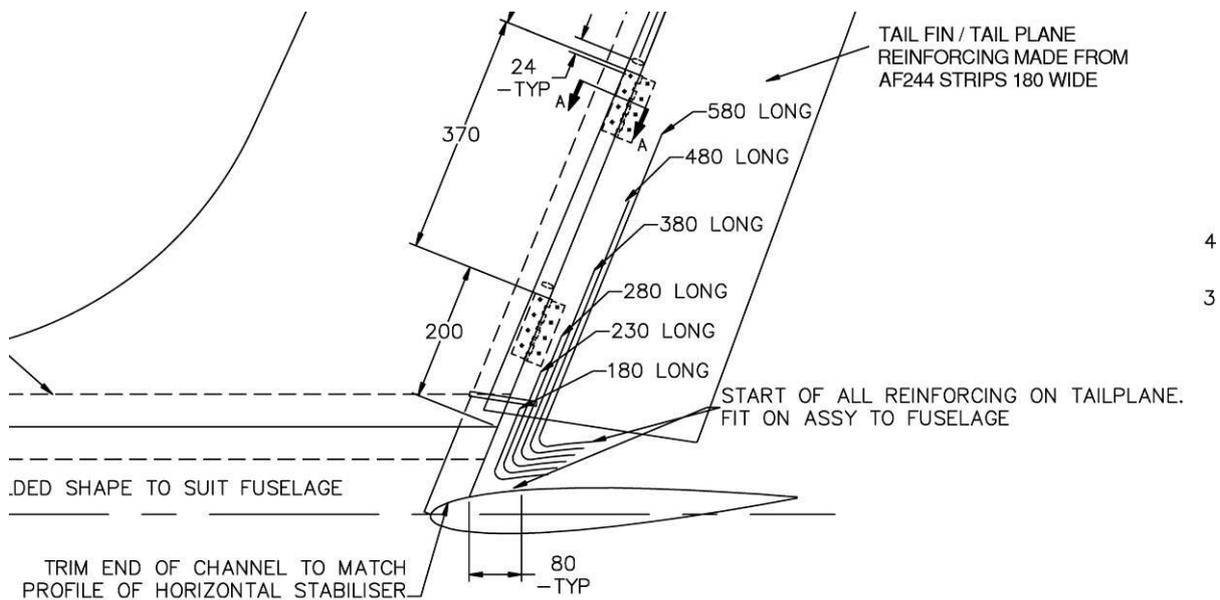
Coat the foam wedge that you cut previously with resin and fit it into place at the base of the fin spar channel, with the bottom resting on the horizontal stabiliser.

Apply flock to smooth the transition between the block and the vertical fin and the block and the horizontal stabiliser.

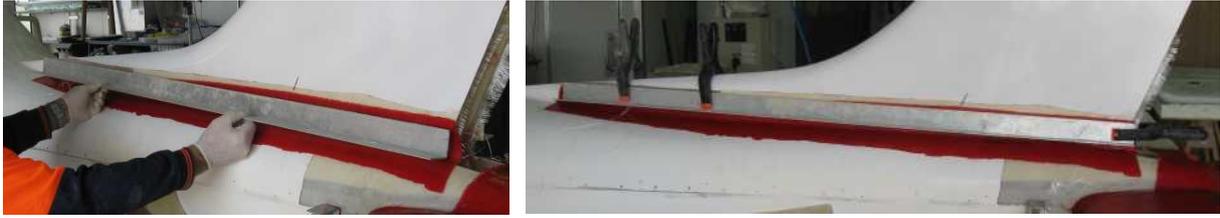


Open the bag labelled “Outer Reo Tail Fin” and take out the 6 “T” shaped pieces of glass fibre cloth: the top of the “T” is intended to be fitted inside the fin reinforcing channel while the rest of the cloth is fixed to the top of the horizontal stabiliser as shown above right.

Apply the 6 layers of glass fibre cloth from the bag labelled “Tail Fin” to the inside of the fin spar channel, starting with the smallest layer first and progressively adding each longer layer until complete as shown on the drawing below. No peel cloth is required.



### Clamp the join



Wax one side of each of 2 lengths of aluminium angle so that the flock will not stick and place along the full length each side of the join line and secure with a clamp at the front and the rear and one as close to the middle as possible.

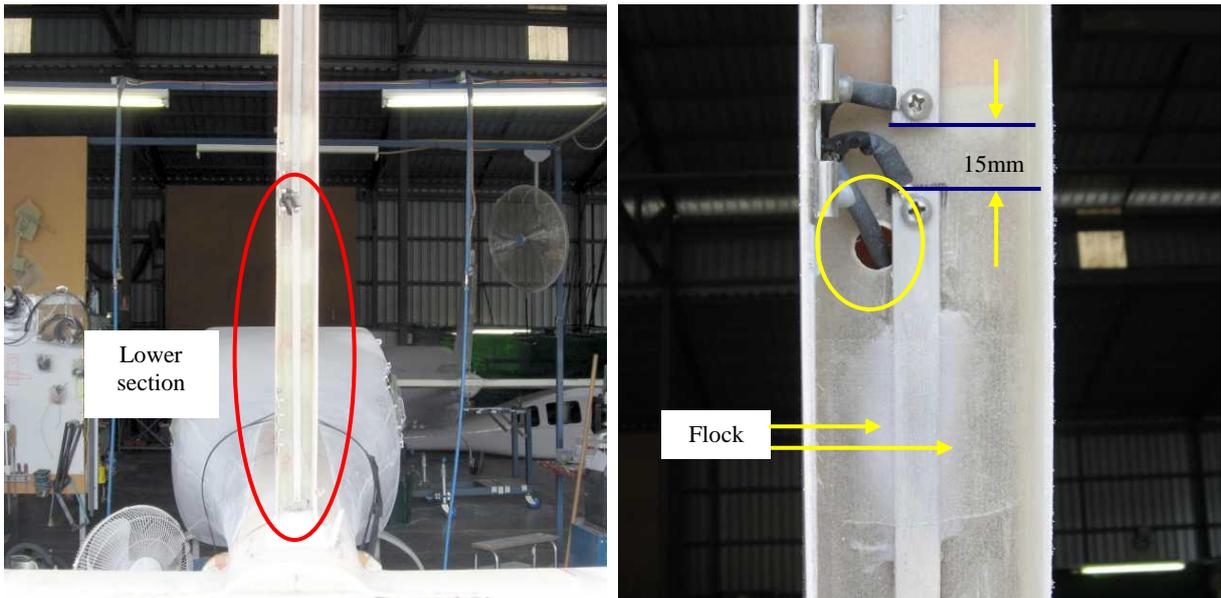
This step really requires 3 people: 2 to place the aluminium channels in position (one person per side) and one to put the clamps on. This is a critical step!

Take great care **not** to move the aluminium channels **at all** once they touch the peel cloth – if they are allowed to move *even slightly* then the glass fibre cloth may move with them which could weaken the join, so be **very careful** at this point! Leave overnight to cure.

Next day remove the aluminium channels and the peel cloth, then use a hole saw to open the inspection hole and a drill and jigsaw to recut the rudder cable slot. File out any rough edges.

Use a small wire hook to pull the rudder cable out of the slot.

### Fit the VHF Antenna



Ensure that the VHF coax cable exit hole is on the hinge (left-hand) side of the vertical fin – elongate the hole with a file if it is not. Sand the back of the lower section of the VHF antenna and place it so that it is exactly 15mm below the upper section and fix it in place with 5-minute Araldite.

Note that the factory fitted upper section of the antenna has been offset slightly to the left to allow for rudder movement: keep the lower section of the antenna exactly in line vertically with the upper section. Ensure that the threaded hole for the electrical connection is at the top of the lower section as shown above right.

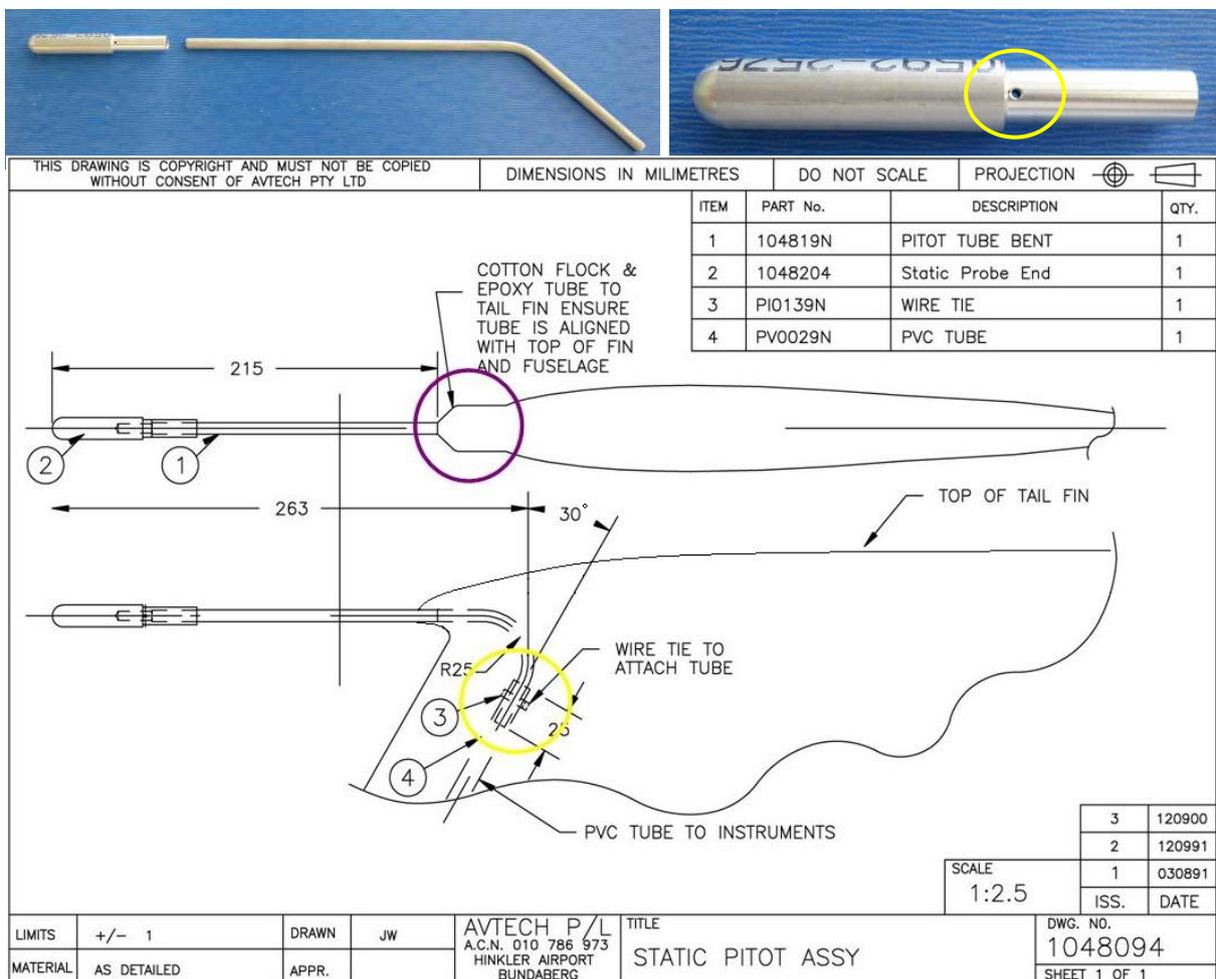
Mix some resin and lay up 2 pieces of glass fibre cloth across each section of the antenna in 3 places, using flock to fill the gaps at each side of the antenna before placing the cloth. Leave overnight to cure.

Next day, shorten the VHF coax cable to length, and fit ferrite toroids, crimp 4.5mm electrical ring terminal connectors to the inner cable and the outer coax sheath and fit heat shrink tubing over the terminal joins, as shown in the sketch below.

Screw the inner cable to the TOP section and the braided coax sheath to the LOWER section. Tuck any excess cable back into the vertical fin and seal completely with silicone sealant.

### Fit the static probe assembly

Assemble the static probe: using a drop of Loctite fit the bullet-nose end to the static tube, making sure that the vent hole (circled) will be horizontal when the static probe is installed.



Put a smear of super glue around the base of the static tube then slide the PVC tube over the base of the static tube by at least 25mm and fix firmly in place with 2 lock wire ties.

Take particular care that the PVC tube is well secured to the static tube because once the static probe assembly has been flocked in place there will be no access for repair work.

Push the static probe assembly back into the hole at the front top of the vertical fin so that the static probe assembly is parallel with the top of the vertical fin and centred laterally in the fin.

Secure the static probe assembly in place with 5-minute Araldite and hold it in place while the Araldite dries. Mix up a batch of resin and coat the area around the base of the static probe assembly, and then add some flock to make a firm mix and shape around the base of the static probe assembly to form a smooth transition from the static probe to the fin. Leave to cure overnight and then sand to a smooth tapered finish.

This completes the *Pre-Paint>Fuselage>Empennage>Fit vertical fin* task.