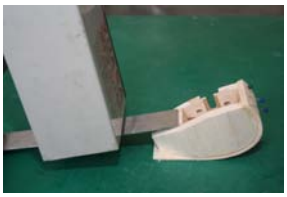
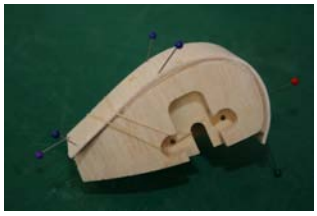
inside here. Turn upside down and clamp with weight. (Make sure before you fitted SP9 that you had sanded off the tab nibs at the end).



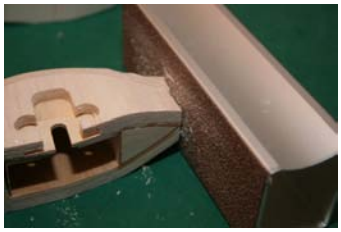


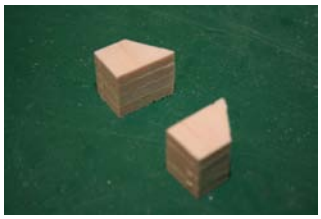
2.46.13 Build up the next layers, making sure for each layer that the join line between the longer and shorter sections is sanded flush and smooth before adding the next layer. After the three layers of SP9/SP10, there is a narrower layer of Sp11/SP12, and then the final one of SP13/SP14. Try to keep these last two layers reasonably central, they will act as a guide when shaping. You will find that the joint line between the shorter andlonger pieces won't be coincident, since the radius is getting bigger, nevertheless when you get to SP13/14 make sure that SP14 reaches far enough aft to meet the angle of the rear vertical edge. You can move SP13 around a bit because of course the front under-section will be heavily rounded off.

2.46.14 As an alternative to the above, you can instead pre-join all the longer and shorter sections with resin, sanding the joint lines smooth before laminating. However, this is a little more tricky to keep everything pulled down and firmly clamped over the whole length of each piece. Give it a try for a few pieces anyway, and see how you get on.

2.46.15 A further refinement of the above, if you're happy using slow cyano, is to use the cyano just around the forward tightly curved section. (Still dampen the balsa of course). Then brush resin over the rest of the joint, pull it tightly to the end, invert it and clamp with a heavy weight as mentioned above in 2.46.12.

2.46.16 Next add SP17 to the open triangular space just behind the wheel arch, flush with the undersurface. You may need to slightly reshape this part to get a good fit. Also laminate four of the SP16's together. Then sand the rear edge flat and glue the SP16 assembly to it. Now sit back and consider how you are going to turn this rather ugly lump into a beautifully streamlined wheel cover.





2.46.17 May we suggest, (having done it a few times), the following: Using the ply guide SP18, draw around it on the top and the bottom. Also draw a line down the centre. Use a razor saw, razor plane or a No26 scalpel to shape the spat working from the centre of each side towards each end until close to the guide lines. Now, working from the centre top, and looking from the front, start rounding off the edges, a little each side at a time, until you get close to an overall rounded shape.

Now is the time to switch to using coarse sandpaper, (say 60 grit) to start getting the profile even better. Check the view from the front, the back, and all angles in between as you work, to make sure that the spat shape stays symmetrical.

Finish with medium and then fine sandpaper or sanding blocks, down to 250 grit. Give yourself a pat on the back, and see if you can do as well or better for the second one.

However, if you make what appears to be a bad mistake, then lightweight filler will probably solve the problem!

2.46.18 ASSEMBLY. The design attempts to make the means of spat attachment as inconspicuous as possible, and to this end the nuts which finally attach the spat are concealed in slots in the inside of the spat. This makes it difficult to use an ordinary spanner to tighten the nuts - however see below.

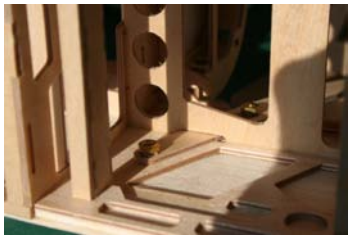
2.46.19 Take two 2.5mm x 8mm bolts (per spat) and file the head as shown on the drawing GNF234-2. Install the bolt from the inside of the spat, and epoxy in place. When dry,

you will be able to slide the spat bolts into the slots of the axle plate, and lock in place with spring washers and a nut. An M2.5 nut-runner is really useful for this job.

However, you can cut away a little more of the spat around the nuts, and use a box or socket spanner or conventional spanner.

2.47 CABANES

2.47.1 These are made from ply parts CB1 (forward) and CB2 (aft). Position them with the wider parts at the top facing forward. Thread them down through the gaps in FT1, line them up with the holes in FS1, and bolt them in place with the pan headed M2.5 x 6mm bolts and nuts supplied. (Nuts on the inside). Don't forget the lock-washers! Fit the upper bolts in place first, and then swing the cabane until the lower holes line up.



2.47.2 The front hatch will now be quite tricky to fit since the upper central wing section is not fitted yet. When it is, the cabanes are splayed outwards into a gentle 'S' shape when viewed from the front, which gives more clearance to fit the hatch.

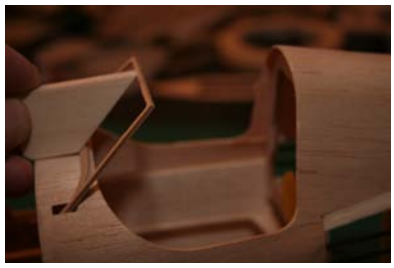
2.47.3 The cabanes are faced only on the outside with balsa CB1a and CB2a, but these must be laminated only after the upper central wing section is made and fitted. See Section 3. The lower edges of the facings sit down on FT1 just inside FS1. Damp them well to assist

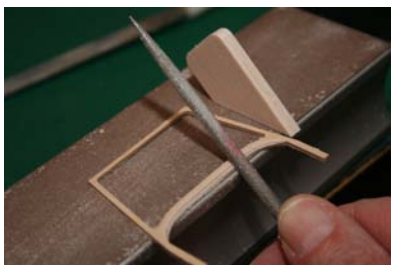
taking up the curves - and clamp in a couple of places until the glue is well cured. Then round off the edges of the balsa down to the ply.

2.48 WINDSCREEN *Drawing GNF234-6*

2.48.1 This is made up from ply parts WS1 (main screen) and WS2 (side screens), and the 'glass' in-fills WS1a and WS2a. The main screen uprights ar extended below the deck, and fit through holes pre-cut in FD2 and F4a, and this not only positions the screen centrally but also sets the rake angle. It 's best to finally fit the screen after the fuselage is covered, but the joining up of the side screens needs to be done now, and then the assembly removed until after covering.

2.48.2 Position WS1 through the holes and note that the screen should adopt the angle of rake shown on the drawings. The lower edge of the screen rail needs to be *very* heavily chamfered, (see photo for technique) so that the front edge of the rail sits down on the deck without leaving an unsightly gap. Lay the frame on a block above the work bench and use a file at the angle copied from WS3. Make sure the chamfer goes right across the bottom rail including the curved section up to the beginning of the uprights. Best file to use here is a half round. Check rake angle with WS3. Be careful with the screen frame at this stage, because the cross-rails have the grain across them, which makes them relatively weak. They will be strengthened greatly by the addition of the plastic 'glass' inserts, but of course it's best to wait until the frames are painted before fitting these.





2.48.3 The side screen front pillar fits on the <u>side</u> of the main screen side pillar, (not behind it), so the sides of the main screen need to be chamfered as shown on the illustration on drg GNF234-6, so as to set up the side frames at the correct angle. The side screens will then rest against the main screen frame and just below the front edge of the cockpit side to sit as shown on the drawing. Chamfer the bottom edges of the side screen on the outside – see notes on the drawing. Also use a small file or sandpaper to round off all the edges (especially the outside ones) of the three frames. (EXCEPT of course, the outer edge of the main frame uprights which have been chamfered as above).

2.48.4 When you are happy and have made a port and starboard side, with the main frame inserted glue the side frames to it with resin taking care to line up the front edges of the side screens and main screen and also not to bond any part of the screen to the deck at this stage. When set, remove the assembly and carefully round off the outside front edges.

2.48.5 The next stage for the screen will be to paint the frame, best done before fitting the plastic inserts. Make sure it's well sanded, primed and sanded again, and probably primed and sanded yet again, before painting in your desired colour. The insert for the main frame can be fitted at this stage, using very, very small quantities of cyano or RC Modellers Glue, (which goes clear as it dries), apllied and spread out thinly with a brush before inserting the glass. Lay the frame front side down and place the screen through the back of the frame. The inserts should be a comfortable fit, and hold in position requiring only the very smallest amount of adhesive to retain them. Note that the 'glass' panels are thinner than the screen rails, so try and position the glass centrally within the thickness of the ply rails for the best effect. It's best to leave the side screen 'glass' until the complete assembly is finally fitted to the fuselage.

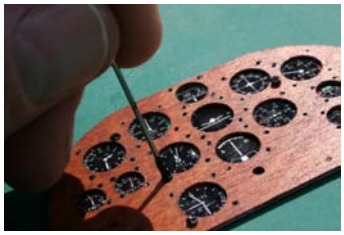
2.48.6 Fixing the screen after the fuselage is covered will make the covering much easier. Also the cockpit edging strip (see 2.49.3) should also be fitted before the screen. Once all that is done, insert the bonded screen pillars through the holes, cut away a small strip of the film covering below the screen and also where the rear of the side screens contact the deck, and bond the screen and pillars to the deck and where they pass through F4a. Resin or slow cyano are fine for this. Also bond the side screens to the cockpit sides – you will need to cut away some of the cockpit edging.

2.48.7 Once all that is dry, fit the sidescreen infills. Sand off any projections beyond the face of F4a, so the hatch will fit closely to it.

2.49 COCKPIT DETAILS Drg GNF234-6

2.49.1 Dashboard.

2.49.1.1 Stain or paint the dashboard F4d as you wish. There are holes around each instrument to represent the screws which would fix the instruments to the dashboard, and some of the instruments have a larger hole to represent an adjustment knob. Cut a very short length of the 2mm plastic tubing and push this into the larger holes. The tip of the scalpel is useful for positioning the tube. You will now need some black paint, (we used Hammerite Smooth black for this, it has just the right consistency and is commonly available). Now, using a pin apply the paint to the inside of the holes. Allow some paint to semi-harden on the tip of the pin, and this will grip the paint you are applying and stop too much running onto the dashboard. Build up the thickness for each hole with several applications. The tube 'knobs' will also need filling up in the same way. The paint here will glue the tube in position.



2.49.1.2 There are holes drilled along the bottom of the dashboard, if you wish you can insert into these small pins with the heads cut off to represent switches, knobs etc.

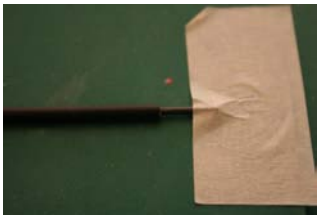
2.49.1.3 Cut out and mount the printed dashboard F4i to the rear of F4d. '3M SprayMount™ is good for this, since it doesn't affect the photo paper and is re-positionable. Then mount the assembly against F4. First, you will need to make a 2mm hole in F4i where the latch pin tube goes. Insert the dash starboard side first, and then bend the dash slightly convex and push the port side in. You will probably find that the dash will stay firmly in position, locating on the latch pin tube, and the latch pin guide on the starboard side, without any further fixing to F4.

2.49.2 Headrest

Sand a radius around all the front edges of HR1. If you have a small amount of thin leather, maybe from an old worn-out glove for example, stretch it around the headrest before you glue it in place. Leave enough space around the edge for the cockpit edging, or alternatively fit the edging first. See below.

2.49.3 Cockpit edging

2.49.3.1 This is best added after the fuselage has been covered, since it then also covers the edge of the covering material around the cockpit. It is made from a length of 2mm black pvc tube, carefully slit down the middle and pushed over the sides. About 330mm is required, we supply about 450mm to give some spare to practice with. To slit the tube, first insert a length of the 1.5mm carbon rod right through it so it projects either end. Then tape the carbon rod to your cutting mat, then the tube to the carbon and mat together so that the tube is gently stretched. Place a straight



edge along its length, half way across the tube, and press it down firmly while using a *brand new* scalpel blade to pierce through one side of the tube. The inner rod prevents cutting right through the black tube. The split tube can be partially opened up, and then clipped over the edge of the cockpit sides. Cyano bonds the PVC sleeving very well, but use only tiny amounts applied just under the outside edge at least an inch behind where you've got to. RC Modellers glue is also effective and gives you a little more time.

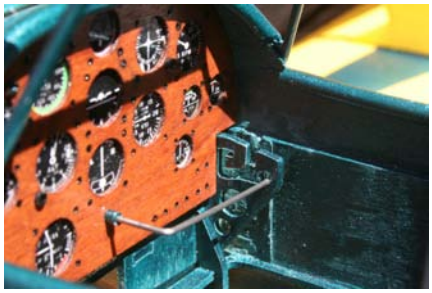
2.49.3.2 Start at the centre of the front edge behind the screen and work around the cockpit, smoothing it into place and tacking it as you go.

2.49.4 Seat

This is made up from ST1 & ST2. ST1 is the seat back and is slightly curved. The curve on the rear part of ST2 will set up the correct shape. The tabs on the rear of the seat squab fit into the slots in the bottom of ST1. Note the cut-away in ST2 to suit the elevator servo. As with the headrest it's a good idea to cover the seat with thin leather or suitable cloth, or with covering film, as this will strengthen the seat as well as finish it off nicely. Attach the seat with a small piece of Velcro™ between the seat back and F5. To release the seat, don't pull it off by the seat itself, but insert the blade of a screwdriver between the velcro halves, and twist.

2.49.5 **Hatch release** - fitted as noted in 2.40.6

Released ...



... Latched

2.49.6 **Pilot** - sits on the seat over the servo. A bust figure such as the 1/9th scale Sportsman pilot figure from JP Distribution fits well, and is in keeping with this aircraft. It can be fixed to the seat back with adhesive or Velcro, but you can also fashion some hips and legs from scrap balsa and foam – there is room for legs under the dashboard.

2.50 STABILISER & ELEVATORS

2.50.1 These are made in the same way as the fin and rudder, but have a little more complication because the stabiliser is in two halves, which plug in to the fuselage and are held in place by a 'V' shaped brace each side. The brace is located on the stabiliser by a removable pin and clamped to the fuselage via an M2x8 bolt and nut thus allowing the stabiliser to be removed for covering or accident repair. The elevators are also separate and driven each side by the elevator linkage. Because of the plug-in system, the stabilizer halves have aluminium tubes built-in to match similar ones in the fuselage, through which carbon rod joiners are fitted.

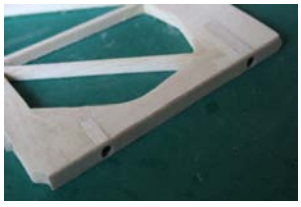
2.50.2 Although we appreciate that this model is small enough not to need a removable tail from a transport perspective, we have made it so since the design also provides a very robust fixing at a potential weak point. It also makes for much easier covering and greatly simplifies the work required should a repair be necessary. And if you did need to tuck the model into a small box for transport, also then it would be useful. It is also a useful design study for the larger versions in the Finch series.

2.50.3 Starting with the stabilisers, make up the outline with parts St1 ~ St4, and then the diagonal braces St5 ~ St9. Note that each joint is locked with a dovetail. Bond with penetrating glue, make sure everything is completely flat. If using Superphatic apply to both sides. As with the rudder leave to dry (if not using instant thin cyano) with a weight over the assembly and poly bag sheet to prevent bonding to the bench.

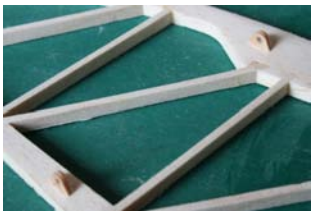
2.50.4 Mark the length of tube for each slot with a scalpel blade, transfer tube and blade to board without separating them, and roll tube under the blade to cut. Fit the aluminium tubes into each slot, where they fit *at the bottom* of the slot – so remember here that the two halves are handed. Lay them out on the board just to make sure. Bond in place with cyano or a thin film of epoxy.

Make sure the tube is flush with ST1, and not projecting, because the ply root facing ST10 will be glued to the face of ST1. Fill in the space above the tube with scrap balsa, and plane or sand flush.

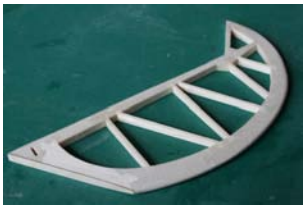
Glue ST10 to the root, making sure no glue gets in to the tubes. The holes in ST10 are very slightly smaller than the aluminum tube, and a bit bigger than the carbon tube joiners – of course.



2.50.5 Sand lightly both sides, and plane/sand the leading edge to section. Remember to mark the centre of the leading edge, as with the rudder, so that as you sand it you keep the upper and lower profiles the same. (See GNF234-2 for section sketch).Then bush the holes in the two ply trunnions TS3 with 2mm plastic tube, and fit them into the slots from the underneath of each stab half. The TS3's will be a firm fit in the stab, and could be glued in place, but you may find it easier to cover the stabs if this is left until after covering. That completes the stabs for now.

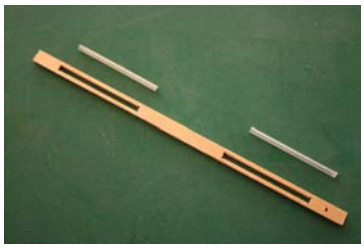


2.50.6 Proceed with the elevators in the same way, with the outline set by parts E1 ~ E6, and the diagonals E7 ~ E12. As usual, sand both sides very lightly, and draw a light guide line at half-thickness around the rear and side edges. Reinforce the inside angled edge with ply part E13. Taper the trailing edge similarly as for the rudder, and E13 will make a useful template. Use a long sanding block to cover the whole of the rear half of the elevator, (see diagram on drg GNF234-2), and follow the section of E13 while sanding parallel to the hinge line. Blend the trailing edge taper into a rounded section at the ends of the elevator, and match this up to the leading edge section of the stabilizer.



2.50.7 Next step is to hinge the elevators to the stabiliser halves. The technique is exactly the same as for the fin and rudder, (so refer to that as well if you are doing this first – see sections 2.42.3 ~ 2.42.11), but in this case you will need the guides SHTG and EHTG, for the stabiliser and elevator, which both have a guide

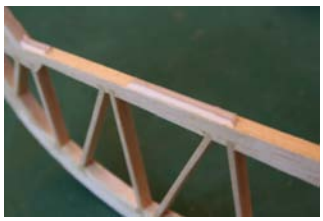
hole cut in one end. Tape the guides to the respective hinge faces, lining up the end with the hole with the inner edge of each component. Proceed as for the fin and rudder. Photos on the right show the stabiliser.



Photos above and below show the elevator ...

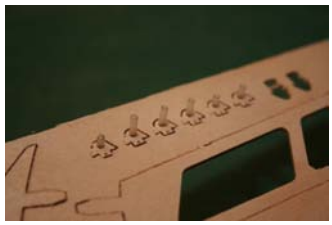
Guide carefully removed ...

Fillet of RC Modellers Glue added along each hinge tube...



2.50.8 When you get as far as putting in the hinge pin, cut it about 4mm or so over-length and bend the 4mm around at 45deg to match the inner end of ST2. Remember when inserting the hinge pin to file/grind a bevel on the end to help the pin find the tube centres on the way through. If you have been careful in locating and fixing the hinge tubes you will have no problems.

2.50.9 Now for a bit of wooden engineering … Cut out the ply 'V' brace TS1, the ply trunnion pairs TS2, (four per V brace), and the epoxy glass trunnions TS5. Bush the TS2's with the 2mm tube, which you may find easier to do while the parts are still retained in the mother sheet. Spares are provided since these small parts are easily lost!



Round off the edges of TS1 all around the perimeter, and glue in place the two pairs of TS2's and one pair of epoxy glass TS5's. Long-nosed pliers are

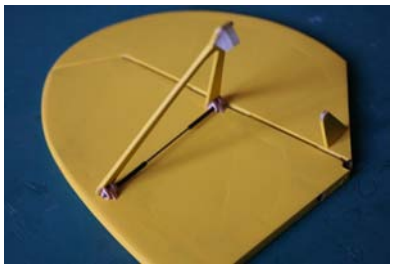
ideal for positioning the trunnions into the V brace slots. Repeat for the other one, making sure – very sure – that it is the opposite hand. Note the small hole just below one pair of trunnions to mark the side of the V brace that faces forward.

2.50.10 Check the fit of the stabiliser anchor bracket TS4 in the slots provided in the rear of the fuselage. It fits

across the upper surface of FB4b. Make very sure it is positioned centrally, then bond in place with thin cyano or epoxy.

2.50.11 The two carbon rod stabiliser joiners are now required. Measure off the correct lengths, (68mm and 38mm) and cut by rolling under a craft knife initially, (to prevent fibres splitting away) and then a fine tooth saw. Sand a small bevel at each end, insert the joiners and plug the stabilizer halves onto them. Invert the model, and see by offering up the 'V' brace that this will eventually lock the stabs in place. But first you need the pin to join up the V Brace TS2's with the TS3's on the stabilizer.

2.50.12 The pin is made from 1mm wire and links the stabiliser TS3's and the 'V' brace TS2's. Cut a short length (about 2mm) of the 2mm tube and epoxy or cyano it to one end of the pin. The wire will be (eventually) cut with about 3mm protruding at the other end, but for the moment cut it about 15mm over-length. This will do for now, for initial checking and setting up. When everything is fitted and the model covered, then the pin can be cut to final length, and another short length of tube fixed to the free end with a very small amount of epoxy, (don't use cyano – it will wick through and glue everything together).



The plan also shows an alternative and neat method for fixing the pin as follows. The pin is cut to a length with only about a ½mm or less protrusion at each end. When it's threaded through the first trunnion set, thread two 12mm lengths of 1½mm heatshrink tubing on before locating through the second trunnion set. Position these against each trunnion set and when shrunk, the pin will be trapped. If you ever need to remove it, then just slit the rubber tube. The tail will be covered when you do this, so protect the covering from the hot air with some aluminium foil.

2.50.13 Remount the tail and fix the inner end of TS1 to TS4 with an M2x8 bolt. Thread the bolt through from the front, and *loosely* fasten with a lockwasher and nut. Note that TS4 has an oval hole to allow for the tightest adjustment .

2.50.14 Repeat for the other side. Make sure the stabs are pushed firmly home against the fuselage, and then nip up the nuts, which will clamp the epoxy glass trunnions TS5 to TS4. This will firmly locate the stabiliser.

2.50.15 The elevator horns EH1 and rudder closed loop horns RH1a and RH1b can be pushed in for now, so you can set up the radio linkage, which is easier to do before covering. (See covering notes later). The fit will be quite firm but if you decide to glue these in place at this stage, it isn't much of an issue - it just means that when you come to cover the underneath of the elevator or the sides of the rudder, you will need to make a slit in the covering where the horn is. Note the port and starboard rudder horn tabs share the same slot in the rudder, one behind the other.

2.51 MOTOR MOUNT – ELECTRIC

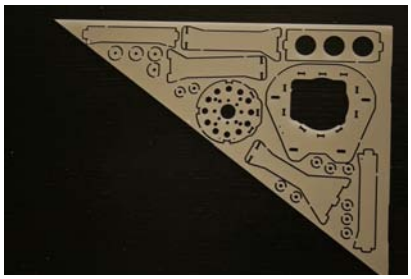
Refer to Drg GNF234-11

2.51.1 This mount is custom designed for the Greenfinch, and will take up to nominal 300W-350W brushless outrunner motors up to 37mm in diameter, though 200W motors of 28mm diameter will usually have sufficient power for energetic performance. (300W motors will give good vertical performance if required). The design of the mount is slightly asymmetric in plan so that it can be mounted offset to the port side if the motor is set up with right side thrust.

2.51.2 The front plate has holes arranged to accept the bolt centres on most motors. Check yours first before assembly. Although not absolutely necessary it's helpful if the motor wires exit directly beneath the motor so they can pass through the holes in the lower motor plate to the area beneath for connection to the ESC. If there is a problem, let us know along with fixing details and we will endeavour to provide you with a face plate that matches exactly.

2.51.3 The mount back plate EM35BP has an aperture large enough to allow a typical 3S LiPo battery to pass through it into the motor compartment, if required for balance purposes. However, leave sufficient space between the back of the motor and the front of the battery for air to circulate. If the CG is still behind where it should be, (only likely if you are using a lighter motor or battery), then bolt or tie wrap a lead weight or similar to the underneath of the motor cage.

2.51.4 Cut out all the parts from epoxy glass sheet EG15/2, clean up the mating surfaces and trial fit together as shown in the exploded view and described in the next paragraph. Slots are machined for material just over 1.6mm, but epoxy glass thicknesses tend to vary a bit, and if you find some of the tabs are a little too tight to fit easily, then use a file - carefully - on the tabs rather than open out the slots.

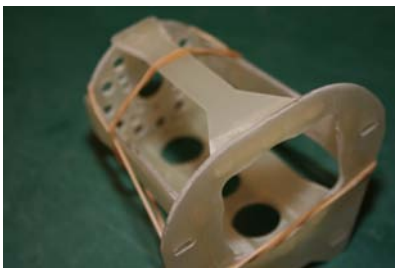


2.51.5 It pays to practice the assembly of the parts a few times so that when you come to finally epoxy it all together you won't get into too much of a sticky mess. *First of all* - note that the Back Plate EM35BP and the Front Plate EM35FP each have two small witness holes drilled in one of their sides. When assembling the parts

as below, arrange these holes to be on the LEFT hand side, (and with the widest part of the Back Plate upwards).
Start by fitting the Top Plate EM35TP, and one of the Side Plates EM35SP into the front of the Back Plate, so they are all sticking upwards. Then fit the other Side Plate and the two Lower Side Plates EM35LSP followed by the Lower Plate EM35LP. Next fit the Front Plate (making sure the witness holes are on the left), aligning the slots in the lower part of it first with the tabs on the Lower Side plates - and then with the tab on the Lower Plate. (The Lower Plate tab is shorter than the other two). The side and top plates clip around the front plate, and can be pushed in from the edges. (This is easier than trying to line up lots of tabs with slots all at the same time, especially when it's all sticky with epoxy!).

2.51.6 When happy that everything fits nicely together, mix up some high strength epoxy, (note: MUST be high strength, the best is the 24 hour type, definitely NOT the 5 minute kind). Araldite 'Precision' is very good for this job. Make up about the amount shown in the photograph. Also make sure the hardener and resin are VERY well mixed and in the correct relative quantities – usually equal, apply it first of all to the top and side joints of the back plate. Then dip the rear tabs of the top plate into the epoxy, and insert them into the back plate. Do the same with one of the side plates, then proceed with the other plates, leaving the Lower Plate until last. Before inserting that, make sure the lower edges of the Lower Side Plates have a steady fillet of glue along their lengths and the same along the matching edges of the Lower Plate. Then, when the Lower Plate is inserted the glue will help to keep the lower three elements in position while glue is applied to the mating surfaces of the front ends of the elements,

and to the joint areas of the Front Plate.
Locate the Front Plate into position and fit the parts as with the dry run. Take your time, the glue will (should!) be workable for at least half an hour. Leave a small fillet of glue around each joint, check each joint fully inserted and everything properly aligned, and place to one side to cure. With the 12 or 24 hour epoxy, placing it on a radiator will usefully speed up the curing process.



2.51.7 Insert the motor through the back of the mount and fix it to the front plate according to the instructions that came with it. Use lock-washers under the bolt heads and make sure the bolts are not so long that they foul the coils within.

2.51.8 Fix the mount to F1, using four M2.5 x 16mm bolts in the positions indicated on the drawing.
We recommend initially arranging the mount with 2 degrees of down and side thrust, and to achieve this place the spacers TWS1 and metal washers between the mount and F1 as shown on the drawing GNF234-11, and choose the centre set of holes in F1. You will need to offset the motor mount to the left, (looking from behind), to get the propellor centre in the middle of the cowl. Use the Nut Spreader Washers NSW1 & 2 under the nuts - NSW2 has a flat on one side so as not to clash with F1Hb. These washers stop the nuts/lock-washers crushing the ply F1, which could eventually cause the nuts to loosen. The surgeons pliers mentioned in section 1, especially the ones with cranked jaws, are really useful here for holding the nuts in position while the bolts are screwed into them. Don't forget the lock-washers.

2.51.9 The final alignment of the motor mount is best done as a joint operation with locating and fixing the cowl, (see section 2.43). If you decide to mount the motor with no side or down thrust, assemble the mount with 2 epoxy glass spacers TSW1 at each mounting point, and choose the lowest set of holes in F1. This will place the motor at about the right position for the cowl.

2.52 MOTOR MOUNT – I.C. – (if supplied)

2.52.1 Refer to the drawings with the IC mount parts, and follow the construction techniques and alignment procedures as for the electric mount. You will have the added complication of drilling through F1

for your throttle cable. To get the best controllability for your motor, make sure the linkage with your throttle servo is as direct as possible, does not bind anywhere and that there is no lost motion – either at the connections to the horns, or – if you are using a snake - with unsupported bends.

2.52.2 If the motor throttle horn is made of metal, try to use a plastic link to connect to it – it's always a good idea to avoid vibrating metal to metal contact as far as interference with your radio is concerned, though we understand this is probably no longer such a problem with 2.4Ghz radio systems.