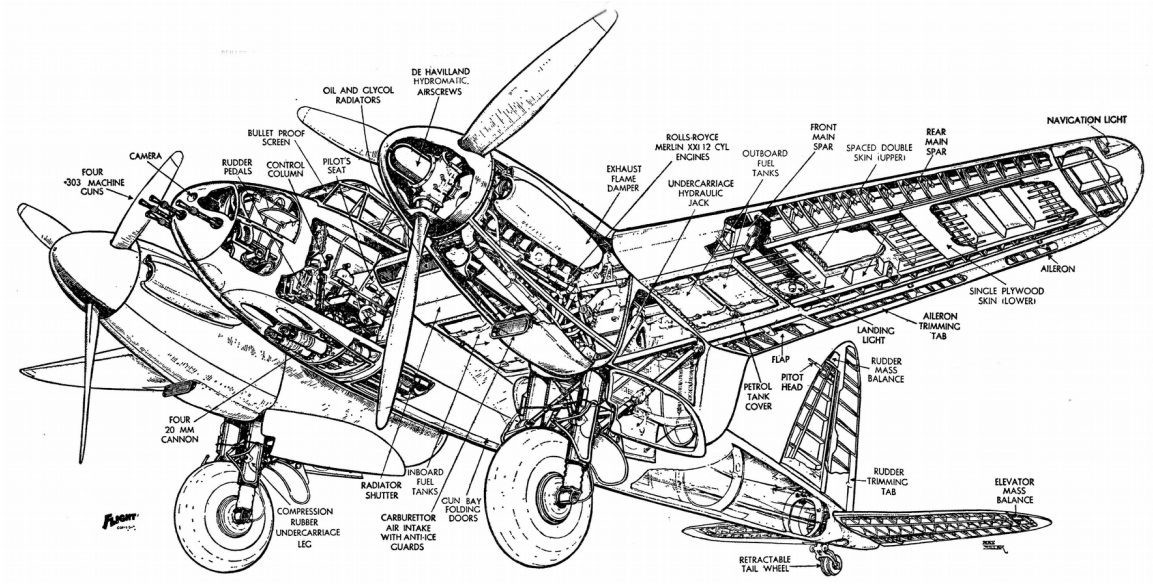
Tony Nijhuis 1.8 m Mosquito

Build history



Peter Scott © 2018
Last edit 26 June 2019

Table of Contents

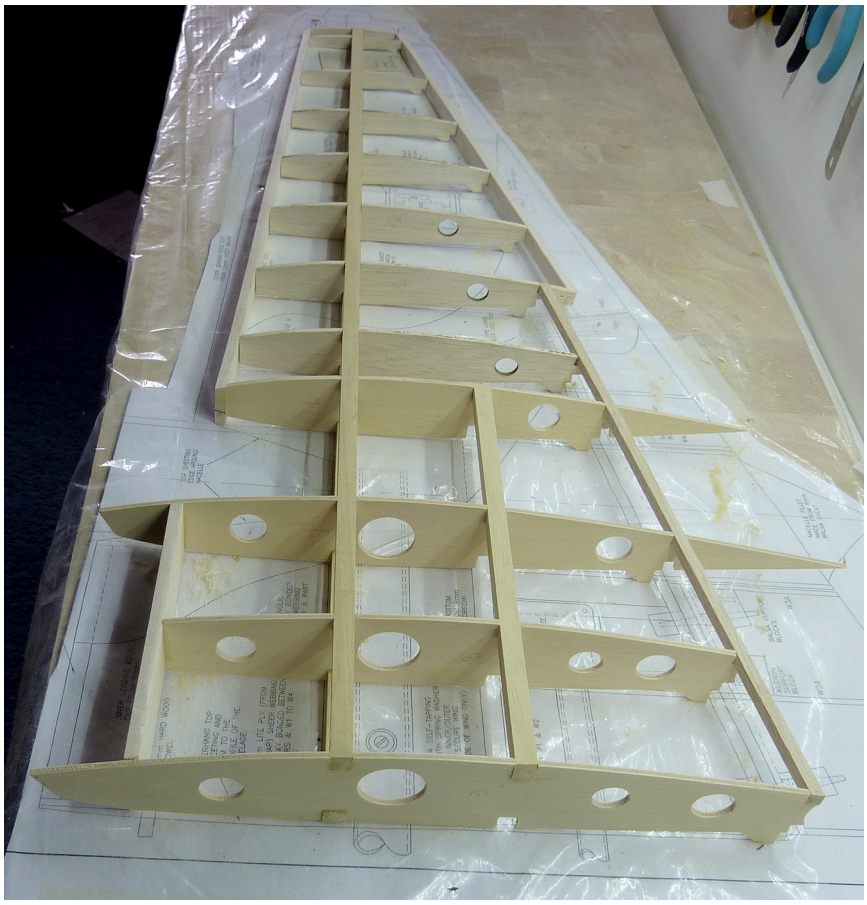
This is a well-designed model for traditional build with balsa and ply. The plans are excellent and CNC cut sheets and wood packs are available. However the build is **definitely not** for the beginner. To avoid mistakes it is crucial to be able to read what are quite complicated plans. There are good text instructions and photographs but they do not cover everything. You will not build this model correctly if you cannot interpret lines on different views of the parts. There will be times when you are on your own to make your decisions about what to do. That's why I wrote this guide to show you how I did it.

I numbered parts with a pencil before removing them from the sheets. On the plans there are useful diagrams of what is on each CNC wood sheet. Some parts need fettling, mostly for angle, and it is sometimes easy to orientate them incorrectly. All need the tabs trimming and hairy edges or charring sanded. Check three times and glue once, especially if using Roket. Please read the section on plan errors before starting the build. I have marked the text with ***PLAN!** where this applies.

Most parts can be bought through Tony Nijhuis' website, tonynijhuisdesigns.co.uk, except the steerable retractable tailwheel, which is left to the builder to choose and complete to a scalish appearance. Scale exhaust manifolds seem difficult to find. I could fit the exhaust flame dampers as on the early marks but the nacelles will be wrong.

The span of the model is 1.82m. As the original is 16.52m this makes it scale 1:9. If I build a 1/5 scale that would be 3.3m.

Right wing



Ribs and spars
14 Aug Build started with the right wing using PVA for joining spars and Roket for gluing ribs to the lower spar. Lightly sanded edges of ribs to remove most of the charring or cutter hairs and had to deepen the spar notches on some ribs. Used PVA for upper spar as the Roket sets too quickly. Rear spar glued in using PVA. I used a syringe for the PVA then added some PVA fillets to some of the rib/spar CA joins. I'll add more later.

15 Aug Added top short spar. Cut and fitted inner leading and trailing edges from supplied 6mm sheet. I

cut the pieces for left wing at same time. Also inner plate in radiator cavity. I used syringed PVA.

16 Aug Sanded the leading and trailing edges of the top surface of the wing and sanded the ribs and spars using an aluminium block.

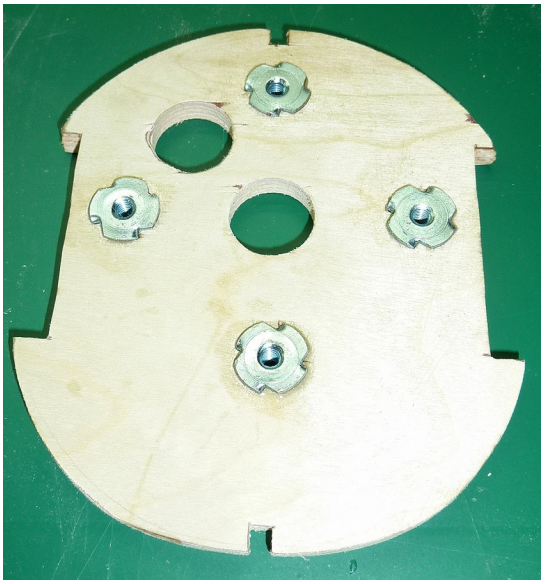
17 Aug Check weighed the 2.4 mm wing sheeting sheet. All but three are very close to 28g. The other three will be used where only part is needed. Edge joined three sheets using tape and balsa cement, wiping off the surplus with Lidl solvent Then sanded both sides with a foam block, especially the joins. Cement worked very well. Traced the wing outline onto tracing paper. Will allow extra width for curvature, mistakes and sanding.

Nacelle

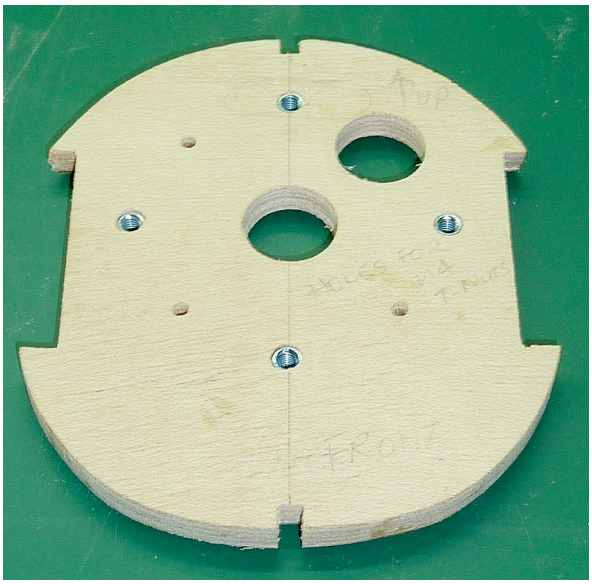
18 Aug Cut free and sanded the main parts for the right nacelle. Some trimming needed to get a perfect fit especially on the slots. It is important to do trial fits before gluing as it is very easy to get it wrong. I marked positions of formers clearly on sides from plan as well as ‘this way up’ arrows.

19 Aug I test-assembled one motor. I decided to laminate some 1mm birch ply on the rear side of the motor plate. It is only liteply. The extra wood will add very little weight and a lot of strength. The mounting holes were in the wrong place. I mounted the motor 45º from the plan position and similar for the wire hole. The left wing will be a mirror image to balance the weight of the wires.

20 Aug I used steel M4 T-nuts to allow easier motor fitting and removal and avoid the need for rear washers. For the centre hole and the wire hole I used a diamond hole saw. I screwed in M4 screws before fitting the T-nuts to check the threads. I used epoxy on the T-nuts then hammered them in. I then squeezed them fully home with a G-cramp.



Back

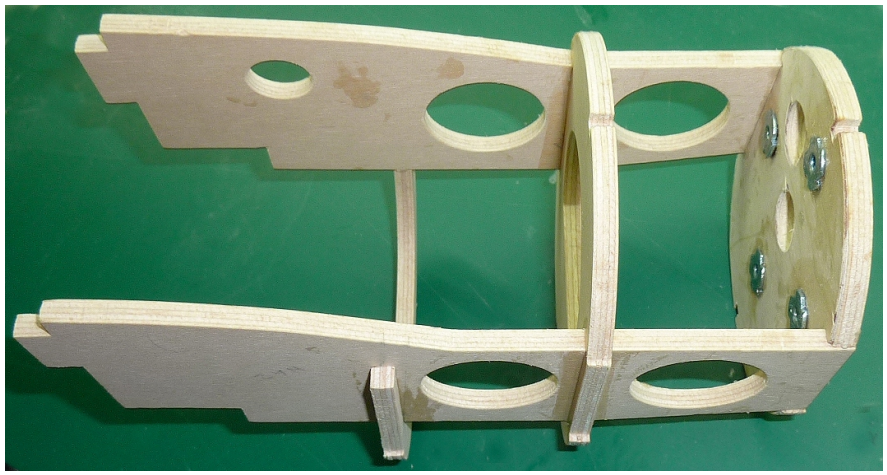


Front

21 Aug. Started to glue up nacelle. It is very possible to glue it out of square. I glued the motor bulkhead (N2) on first with syringed PVA after sliding on N3. I clamped and checked it for true using a square. When it was set I glued in the next two pieces (N3 and N4). I got one piece upsidedown the first time but fortunately noticed in time. I scraped off the PVA and redid it. The first coat seemed to improve the fix anyway.

It is **VERY** easy to get this wrong. I recommend the following order. Identify the inner and outer sides from the plan. Mark each with lines to indicate where the formers go. You will need to shave the middle former slots to ensure a smooth sliding fit and the front former to accommodate the angles of the sides. Then mark the top of each side. Mark the tops of the formers. Assemble without glue and when you are sure the orientations are correct mark matching points on sides and formers with As, Bs, Cs etc. Glue and clamp. I used syringed PVA and added a further PVA fillet after clamping.

The nacelle after first gluing



25 Aug I built the second nacelle before I needed it, in the mistaken belief that I had got them confused and had built the wrong one.

26 Aug Some thoughts. I will fit some two core wires to each wing tip so I can fit navigation lights connected to a power pair if I can find or make the transparent covers. For power I might use the ESC's red and black or a servo lead using a Y-lead. I might not use them but they are there if I do. I must try out the full S.BUS system as described below before sheeting the wings. There will be different routes for the wires for S.BUS and conventional. If I use the latter then switched sound will not be possible from one receiver.

27 Aug I have decided to try to make plaster moulds from the nose and spinner plastic parts so I can cast them from fibreglass using cloth and Aero-Poxy. These will be stronger and a bit thicker so I can sand them to a better finish. The plastic parts are a bit rough in places.

S.BUS

I set up the complete S.BUS system on the bench, except the ESCs and motors. I can test it all out and see how long the NiMH battery lasts. Next job is to set it up on my Taranis. I'll use the old one then transfer it when I've got it right.

5 Sept The whole radio system worked on S.BUS except for the rear retract. I reverted the fuselage to direct connections with the receiver as shown in the picture below. Then I found a different retract that worked on S.BUS so I went back to an S.BUS decoder in the fuselage.

My fibreglass experiment has had a set-back. Aero-Poxy does not seem as rigid as normal epoxy so I must get some standard materials. Release seems to be a problem too. I used three coats of wax but a trial piece did not come away at all easily from the plaster. Unless I can find a better release method I might not be able to use these moulds. I will do another test after about twelve coats of wax as suggested on forums for porous materials and I will also try sprayed-on PVA release.

Sheeting

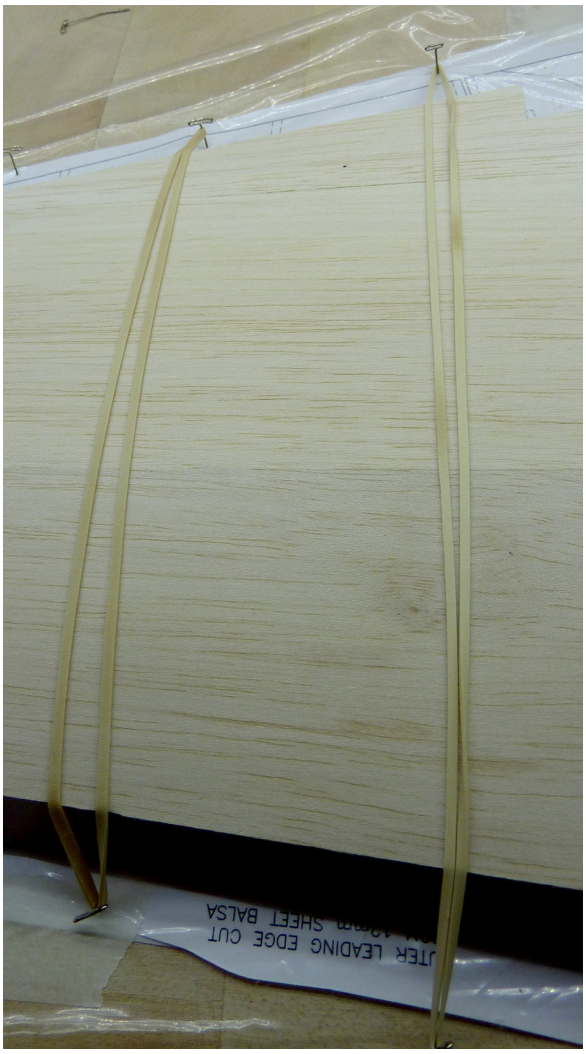
10 Sept Planning only. The next step is to fix the top surface wing sheeting. I have already joined and sanded three sheets to cover the whole wing. I will lay the wing on the sheet and mark around it, then cut the sheet with a decent allowance all round. I will mark the rib positions on the leading and trailing edges so I can put a rule across to position pins. After pinning the wing down I will apply PVA from a syringe from the leading edge back to the spar. Then I will pin the sheet in place. Then I will glue and pin the sheet aft of the spar. That way I can avoid any loose joins. For the underside sheeting I will cut some jig pieces, as suggested by Tony Nijhuis (TN), to avoid warps.

6 Oct A bit of a gap doing other things. It gave me time to think over the wing sheeting. In the past I have always sheeted a piece at a time. This made pinning easy but left pin holes and led to less than perfect sheet joins. This time I followed TN's advice and joined the sheets as described above. This led me to wonder how to hold the sheet down on the wing whilst the glue dried, without being able to see if the sheet was properly in contact all over. The above method seemed a bit hazardous.

I decided on what I think might be a new method. After pinning the wing frame to the building board, I pushed in pairs of pins, one on each side of the wing, at an angle to hold rubber bands. A trial run without glue showed it worked.

Here is the whole wing with the bands on. Take care as you put the bands on in case the farther pin jumps out into your face. Note the four balsa positioning blocks held down with pins. The sheet is butted against them before dropping it onto the glue.

Extra small pieces of sheet are needed in two places.



This detail shows two pairs of pins and rubber bands in place.

11 Oct I glued on the sheet using the above method. I used a wide syringe tip with PVA for the actual gluing. I filled two 5ml syringe bodies with glue otherwise I would have run out. I added the two remaining pieces of sheet and left all overnight to set completely.

12 Oct I added 3mm liteply and balsa shear webs using syringed PVA and many clamps. The sheeting seemed to be well attached but I added PVA fillets anyway using a syringe. I have to make a final decision about whether to use S.BUS as I will have to install wires next. I made three jigs to hold the wing 10mm off the board when sheeting the underside.

14 Oct Thoughts. I am about to trim off the rib tabs and fit the spar tubes. TN shows large fillets of epoxy to attach it to the shear web and main spar. However the fillet between the tube and the upper sheeting is difficult to run in. I hope a syringe will do it. Must change the build sequence so the tubes are fitted before top sheet is done.

I am going to use S.BUS with the decoders in the flap servo box. If I change my mind later I can rewire for conventional PWM connections.

7 Nov Trimmed the top sheeting to size using a new scalpel blade and the plane. I remembered to leave overhangs for the flaps. ***PLAN!**

9 Nov Trimmed off the rib tabs. Shaped the trailing edge with a plane and sanded the frame. Fitted the servo bearers as on the plan, but instead of small cross pieces I filled the remaining space with laminated thin ply. The servos I chose were slightly deeper than those on the plan so on one side I needed extra bearer width to take the screws. Final shaping was done with a cylindrical sanding cylinder in a Dremel. I am using SLEC plastic mounts.

Tubes and servo mounts

10 Nov Glued the paxolin wing tubes in and added the epoxy fillets. Could only fillet from the underside because of the top sheeting so will have to do the same on the other wing to keep the weight the same. Used 20g of epoxy (Hobby King 15 min) measured into a pot using a balance.

Wing tube fillets and flap servo mount

Aileron servo mount

13 Nov Installed a thick servo wire for the aileron servo. Tested that it worked. The first one didn't so was thrown away. Added a twin wire to the wing tip for navigation lights, if I can find or make light covers. Both wires end in the flap servo compartment, where I will be putting the S.BUS decoder. I measured dimensions to the centre of each servo bay so I can cut them out after sheeting. I drew these on the wing plan. I joined three wing sheets and cut them to the shape for the underside of the wing, slightly oversize of course. I fitted the wing onto three pinned down jig pieces and then glued using the same method as above. See picture.

You can see the three jigs under it.

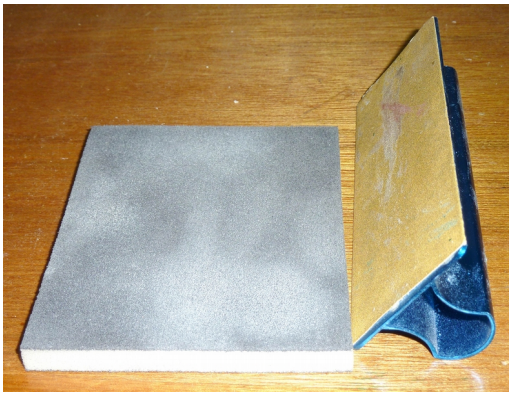
15 Nov I added the additional small pieces for the radiator bay and the rear nacelle area

16 Nov I trimmed the sheet all round leaving an overhang for the flaps. Using the measurements I had written on the plan, I marked the centres of the servo bays lightly in pencil on the sheet. The wing is now extremely rigid.

18 Nov I cut out the holes for the servo boxes, but only to the edges of the underlying holes. I will use a holesaw to to make the round corners of the final holes in the sheet, but will leave that till later as the edges will be visible and must not be damaged.

The sheeting was becoming a bit dented so I sanded, filled and sanded it with an aluminium sanding block with 240 grit stuck on and a foam sanding pad. I then applied two coats of Eze-Kote to harden the wood. I left the wood bare where parts will be glued to it, for example round the nacelle. EzeKote is excellent stuff and very light. It is also slightly flexible. I might put a layer of 24 g/dm^2 glass cloth on, with a few more coats of EzeKote, when the nacelle and leading and trailing edges are finished.

The aluminium and foam sanding blocks



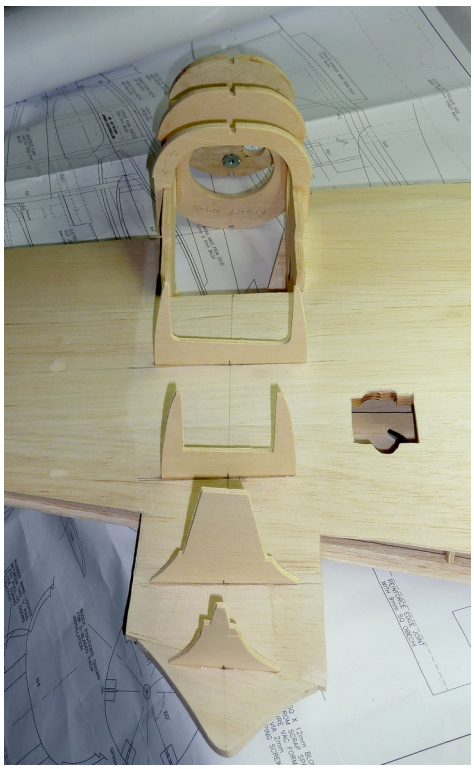
Thoughts: The radiator air intakes appear to be open on the plan. I am not happy about the extra drag so I think I will add a filler piece a little way back and paint it black.

Ailerons and flaps

19 Nov After a visual check that they were all numbered I removed the parts for the right wing flaps and aileron from the sheets. They all needed a brief brush with the aluminium sanding block to removed the hairy bits, the remains of the tabs and the scorching. The flap leading edges are tricky. The cross-sections seem to show a different thickness (15mm) than the plan (13mm). It is important to study the cross-sections as the leading edge is semi-circular and overlaps the upper and lower sheets. I will face the edges of the wing ribs where the flaps and ailerons are with 0.4mm ply to improve the appearance and durability. I glued up the lower half of the inboard flap and left it for completion when dry.

22 Nov Released and sanded the nacelle formers. Marked the centre line on the underside sheet and the positions of the formers at right angles using a square. They are shaped to suit the dihedral so must be marked to avoid gluing them the wrong way round.

***PLAN!** The outer rib F3 for the inboard flap is too short. I had to fill in the gap with additional balsa block. No problem but a puzzle at the time.



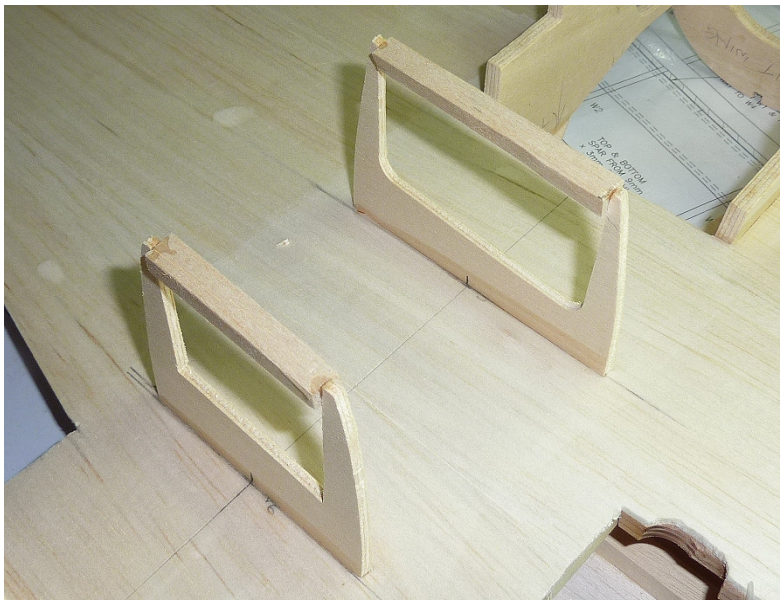
More on the nacelle Cut the rear piece out of sheet (not in CNC pack) and glued in position. I made up the rear block out of three layers of 20 mm soft balsa. After triple checking orientation, I glued the formers using Roket Max. Wonderful stuff. Must buy some more. Tony Nijhuis says he like to build quickly. No wonder he uses Roket. It really is a case of hold for ten seconds and fixed. I added PVA syringed fillets to the formers.

WARNING! You can draw lining up marks at the centres of N5 to N7 but N8 is different. The mark isn't on the centre line and must be found from the plan. I got the first nacelle wrong as you see from the picture. I had to adjust the shape by sanding one side and adding sheet to the other.
I finally released and sanded the retract plate and marked it for holes. TN's pictures show nuts and bolts. I fitted M4 T-nuts and will use Loktite.

Also added a 12mm balsa outer leading edge

23 Nov Planed and sanded the leading edge. Forgot the mask so coughed for a while. Der! Filled the gaps, some created when I had to cut away some PVA that would not sand. Only disadvantage of PVA. I am wondering whether to embed a round carbon fibre rod into the very front to improve dent resistance.

The prototype formers shown on the plan were solid and had to be cut away after the sides were fitted. TN said that they were modified on the production version. However large forces are applied to curve the sides so I added some temporary cross-pieces in a similar way to that shown in TN's photograph.



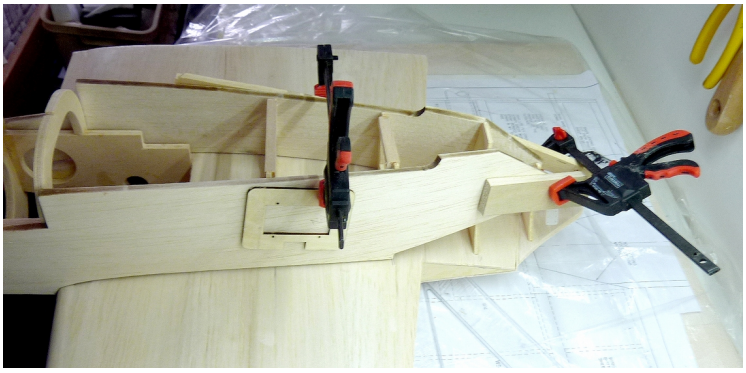
Glued the nacelle sides onto N2 to N4 with PVA using a clamp and rubber bands. One side was slightly above the sheeting due to not checking that the leading edge profile was exactly right. Maybe bending the dampened rear part will enable it to be pulled down.

24 Nov I wetted both sides of the thick balsa sides of the nacelle with a paint brush. After a while, and with some trepidation, I used clamps and scraps of hardwood to pull the sides together at the rear and the top. There was one 'crack' but nothing seemed to have broken. I will leave the wood to dry in its new position before gluing. I wouldn't normally have thought it a good idea to have wood constantly under stress like that but I guess TN knows what he is about.

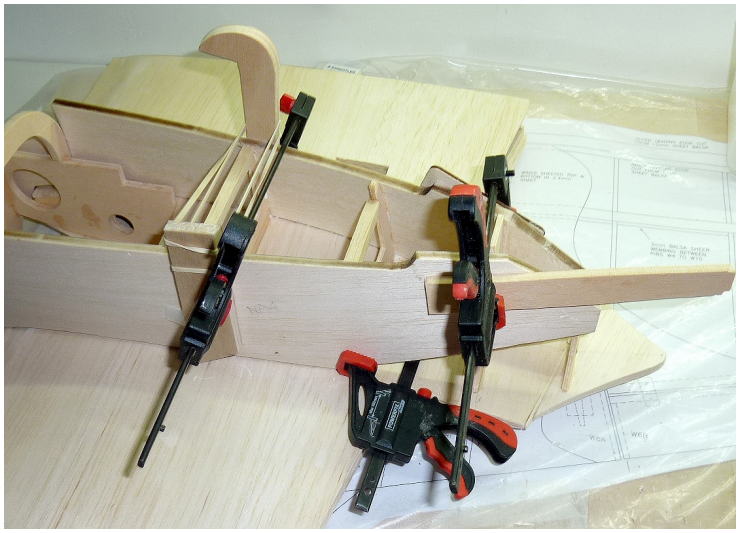
Having just struggled to glue the nacelle sides I really don't like it. The 'crack' was the top of one of the formers breaking off. Even with the bracers in place the cutaway formers are fragile. It was difficult to clamp the sides into good contact with the formers especially at the bottom. I had to dismantle one clamp, poke it under the rear of the sides and put it back together. I could not clamp onto the last former at all until the others had hardened. As Able Seaman Johnson says in the Navy Lark, 'I'm not 'appy, I'm not!'.

Perhaps the solution is to soak the sides in water until **very** pliant before gluing them anywhere, then clamp them into shape until dry. Then glue the whole lot at once. Alternatively several thinner balsa sheets could be twisted into place with PVA between. I have found this lamination method very good for large complex curves and stronger than solid sheet. They wouldn't need powerful clamping. If I am not happy with the sides I will probably remove the existing sides and do that in this case. One tip would be to put the centres of the formers back into place with wedges until the structure is stable.

Nacelle sides drying



Nacelle sides glued



***PLAN!** These two pictures show the sheet repair. The first is the incorrect quadrilateral cutout shown on the plan filled in with sheet. There is an underlayer of sheet. The second shows the sheet cut away to the correct shape. N9 now fits in the position shown on the plan.

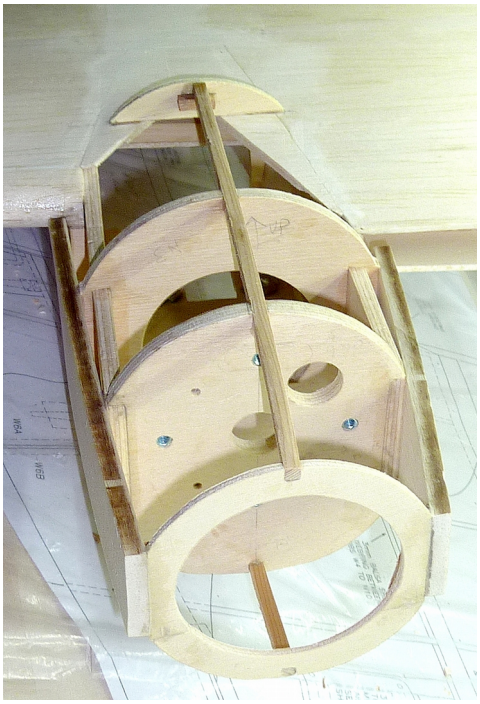
26 Nov

Pulled the front of the nacelle sides in with a clamp and glued in N1 with PVA. N1 is very flimsy and I think not up to the job. I will glue on 0.8mm birch ply onto each side on the one for the left wing. I will add some spruce bits to strengthen the one already fitted. I slightly widened and deepened the notches on N1 to N4 to take the longerons. I might use spruce.

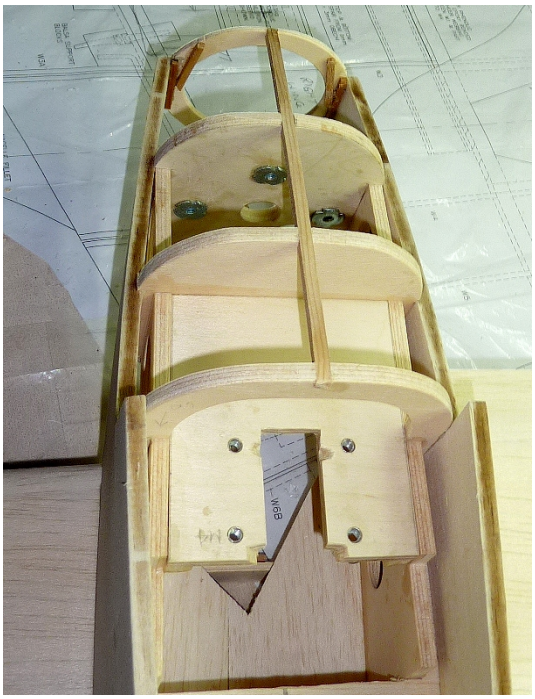
27 Nov Fixed M4 steel T-nuts into the retract plate, using a pedestal drill and 5.5mm drill. After checking the threads with a screw, I hammered and G-cramped them into place using epoxy glue. The ply is thick enough for them not to stick out. Added the square 9mm obechi braces. When dry sand the mating edges to make sure the plate slides in easily enough to allow a good film of glue.

VERY IMPORTANT: Offer up the retract mechanism to the cutout for it before you glue the retract plate into the nacelle. There are small bracing triangles on the mechanism that need parts cut out from the plate and I needed to enlarge the cutout slightly. This is very difficult to do once glued in place so MUST be done in advance.

28 Nov Added spruce stringers to the nacelle front. Put in PVA fillets between sides and sheeting.



Front



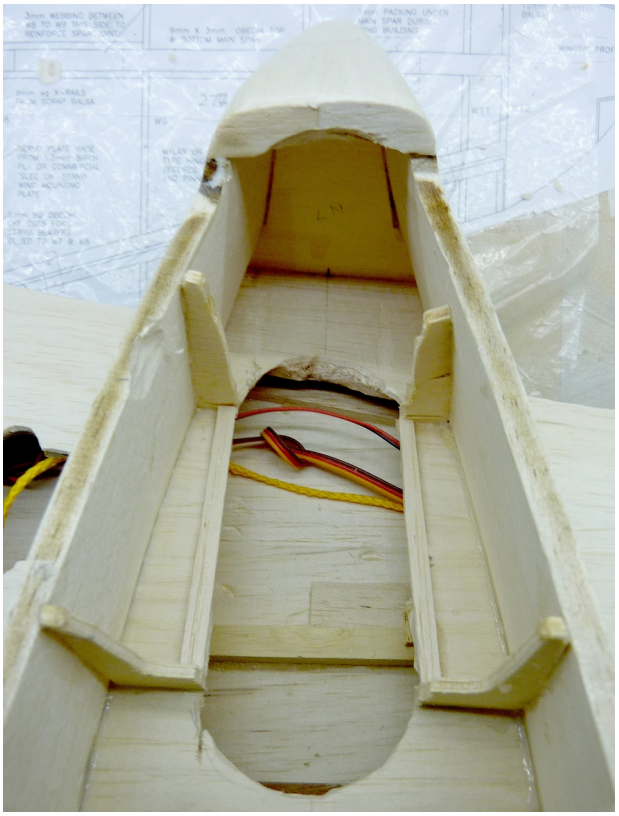
Rear

Sheeting and shaping the nacelle

1 Dec This is quite difficult. I usually plank in strips. TN suggests using large pieces of 3mm balsa. This is quick but it is also easy to waste a lot wood through mistakes. Most of the shapes are complicated with few or no straight edges, so are difficult to get right. Starting with the nacelle bottom sheeting I cut the shapes out of 1mm card first. When I was sure they were correct I cut out the balsa. Similarly the shape of the rear is tricky. I made templates for the two fill in bits then added extra bits of wood by eye till the cross-section looked right. After an initial block trimming by eye, by tracing from the plan I cut a card template for the outline with end datum points being the curve in the sides by N7 and

the top of the extra triangular bit. Then after marking a pencil line on the block I was confident that I wouldn't overdo it with the plane.

3 Dec All the nacelle sheeting done except the undercarriage doors. Not keen on planking in large sheets. Even with a card template, it is difficult to get it to fit without gaps, and holding it down onto the formers was difficult. I used a combination of pins, clamps and rubber bands. I might strip plank the left wing nacelle. Takes longer but much neater. Mixed up loads of microballoon/EzeKote filler to fill the gaps and holes.



Not yet happy with the rear of the nacelle. I've looked at several pictures of the fullsize and still can't quite see how the sides are shaped.A bit more trial and error I guess.

I faced the sides of the nacelle next to the flaps with 0.4 mm birch ply. This neatens and strengthens them. Finished by applying two coats of ExeKote to harden the wood.

4 Dec I wasn't happy with the line of the inboard side of the top nacelle sheeting. It dipped in a bit, so I cut out the wood and filler and glued in a piece of balsa to shape when the cement dries. I could have left it but I would always have seen it on the upper wing surface and someone would have pointed it out. Always looks worse when painted.
Laminated the wing tip and planed and sanded it roughly to shape. I cut a hole into which to push the wire for the tip lights.

Had another go at shaping the nacelle rear sides. I thinned out the profile and one side. I mixed up a lot of filler and filled to what I think is the right shape.

5 Dec Still wasn't right, so I did a lot more cutting and sanding. Then I did some more filling. Some more EzeKote hardened up the surface.

6 Dec Still at the filling and sanding. Getting closer. I think planking would produce a better effect, though I now know the problem was the wrong position of N8.

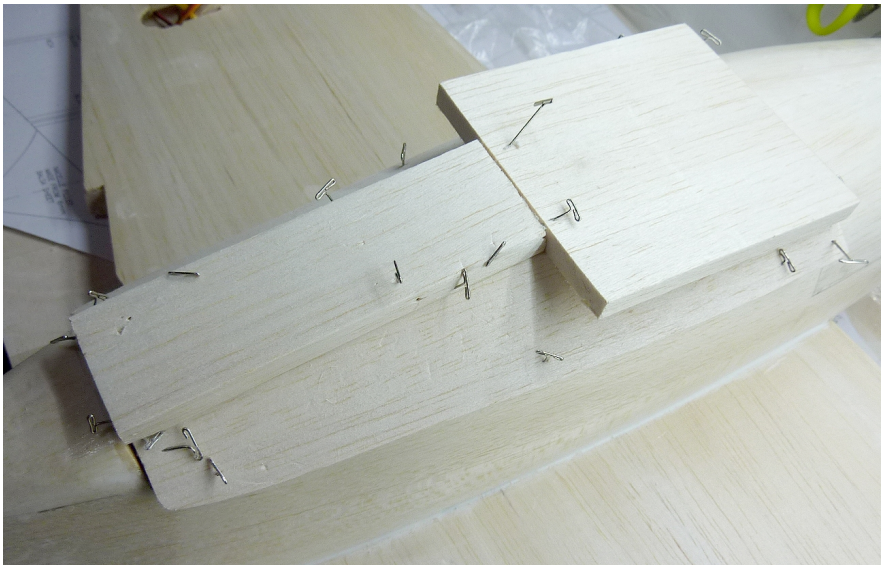
Wheels and doors

7 Dec Had a last fill, sand, EzeKote of the nacelle rear. OK now I think.

Time to make the undercarriage doors. However, first I did a trial fit of the wheel. I have the straight eye of a scientist/engineer. I looked at the wheel and I looked at the nacelle and I didn't see how it could fit. The wheel remains vertical, unlike the sideways retracts where it

is the thickness of the wheel that has to be accomodated. I get the same impression looking at pictures of the full-size aircraft. And I was wrong but it was close. You have to cut away an area of lower sheeting, the central part of the smaller bottom spar and the central parts of the formers N5 and N6. I did it with a combination of small hacksaw, large and small knives and a Dremel with a ball-end grinder on it. It is easy to punch a hole in the upper sheeting by mistake. Fortunately I only made a small one. I also had to grind a sliver off one side where the leg touched. I did my best but it wasn't as neat as TN achieved (unless he Photoshopped the pictures of course). It was great to see the wheel move in and out under the control of a servo tester. I will have to put washers or thin ply under two of the screws to tilt the wheel into full retraction. I decided to tidy up the cutout edges with balsa strip as shown in the picture.

As usual I made a card template for the main part of the doors and cut the 12mm balsa. I glued N4a into place. TN says temporarily but I think I will leave it and pads on the doors to give a positive lock.



The main pair of pieces for the doors had to be shaped and trimmed to fit, then chamfered to fit against the nacelle sides and for the 9mm flat tops to be fitted. I pinned them into position and then pinned and glued the two flat top pieces, using balsa cement. Once shaped I will strengthen them with glass and EzeKote before taking out the maximum amount of wood above the centre of the wheel.

8 Dec Here are the unseparated doors after shaping and strengthening with 24g/m^2 glass and EzeKote. The inside is before grinding out for the wheel.

I decided not to shape the doors glued in place as shown in TN's photos. This way I can face the ends of the doors and nacelle with thin ply to fit perfectly before cutting down the middle. What remains to discover is how much of the inside to remove with my Dremel to allow the doors to sit down on the retracted wheel when closed and to hang realistically when open. I wonder whether I should make a female mould from the doors so I can make doors out of fibreglass. It was a **very** tight fit leaving only a thin layer of wood above the wheel centre. Good job I glassed it.

I bored a hole throught the wing tip for the navigation light wire. I will fill the hole once the wire is in place but at least I'll know where it is.

Left wing

I cleared the building board and laid out the plan for the left wing. I won't record progress on that unless I do something differently from the right. Except to say that I am now sold on using Roket Max as a spot welder followed up by syringed PVA. The only time I don't use Roket is when something has to be manoevred into place, like a top spar. PVA only then.

Two changes:
1 On N8 I marked the position to go on the pencilled centre line from the plan. Unlike N5 to N7 it isn't in the centre of the base of the part.

2 I experimented with soaking the sides in cold water to make them more flexible, rather than brushing water on. The wood is hard and tough but using a scrap piece I found that ten or fifteen minutes soaking fully submerged in cold water really increased the pliability. Once bent the wood remained bent. So I gave the sides a fifteen minute soak using the guttering trough system I invented, which is on my website. I then cloth-dried it and clamped it into place and left it overnight to dry.

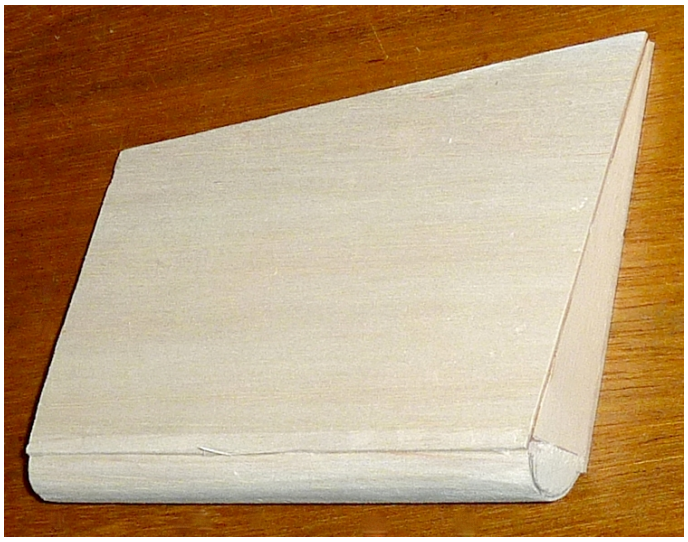
Here are the sides glued at the front. You can see the rear parts holding the curve. They were glued when the front had cured.

Shaping and matching nacelles

1 Jan 2019 One tricky bit is to shape the rear of the nacelle. Or, to be more exact, to shape them both to be the same. The slightly concave sides can only be done by eye. For the silhouette I made yet another template by tracing from the plan. Then plenty of planing, knife cutting, sanding and filling. Then harden the surface with EzeKote, sand again and repeat until right.

Ailerons and flaps again

17 Feb Time off for lots of winter flying.
Now its time to shape and hang the flaps and ailerons. The flaps are very tricky as they include a half-round filler to stop air spill. The hinges must be inset so the pivot point is at the centre of the circle. The top and bottom flap surfaces form a step above and below the half-round and butt up against projections of the wing surface This smooths the air flow when the flaps are raised. I will be adding these projections using hard balsa or hardwood once the flaps are trial fitted. This picture shows one flap with the half round roughly shaped and sanded. I will be using the largest Robart 3/16" round hinges for the flaps. I will put Robart hinge pockets into the flaps so the flaps can be removed, even though there will have to be non-scale holes for the allen key to be inserted to tighten or loosen the grub screws. It will make easier the installation of the steel wire that transfers the flap movement from inboard to outboard. On the larger Mosquito I will have a separate servo for each flap. I should have done that on this model. There are plenty of channels on FrSky S.BUS. The other ends of the hinges will be glued permanently into the wings.



Spinners

I debated making the spinners from glass fibre rovings in epoxy resin. I would use a plaster mould cast around the plastic mouldings supplied. However I wondered about how easy they would be to balance. I then found aluminium spinners of exactly the 97mm right size from Sarik Hobbies (https://www.sarikhobbies.com), listed as Supermarine Spitfire 1A

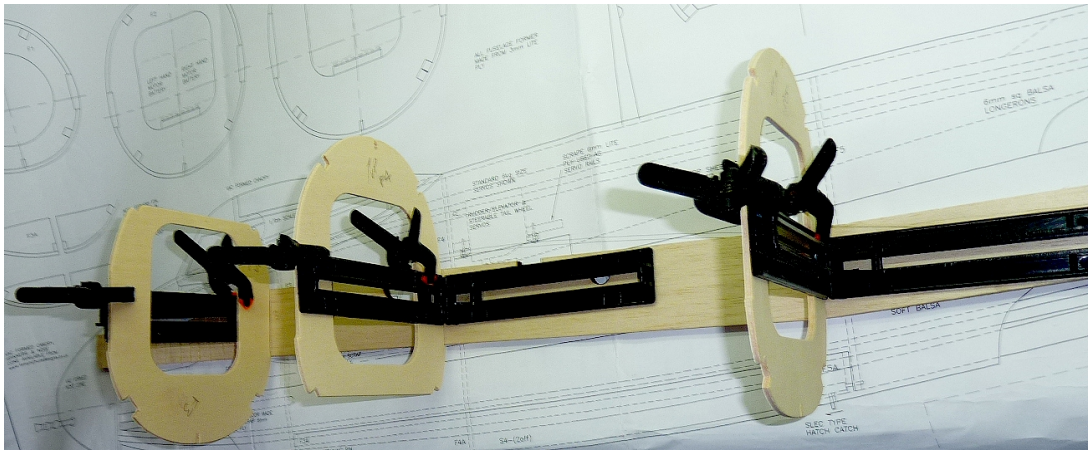
(69”). They are pretty much the correct rounded profile. The motor I use has an M8 thread on the prop adaptor so I also had to buy brass spinner nuts internally threaded M8 at one end and M5 at the other. I got those from banggood.com. M6 would have been better but was not available. I will have to add some sort of packing washer to allow the M5 screw to be tight.

Fuselage

15 May This is quite a complicated structure. Careful study of the two views, the text and the pictures is needed. TN says you must use a jig to ensure symmetry so I made one out of SLEC brackets and printed plastic sheet, 18mm MDF and some M5 T-nuts. I fixed the plan view to the jig board with masking tape. I got the centre line dead straight by measuring the distance from the plan border to a line on the jig at several points before taping, then checking the centre line with a one metre straight edge. I then covered the whole plan with cling film, also taped down. I had already labelled the various parts, cut them from the sheets, trimmed off the joint flashing and sanded the charred or hairy edges. It is a good idea to mark the formers with arrow to show which way up they go, using the plan to be sure.

The first job was to glue the scarf joint of the two pieces that make up the fuselage sides. I pinned the fronts down onto polythene sheet on a SLEC balsa building board, then glued and pinned the rears to them with PVA. I left them overnight. Because the sides curve in they are a bit long compared with the centre line. It is difficult to judge exactly the correct position for the two scarfed edges. The sides can be trimmed if too long, and it is better than too short.

16 May The fronts of the side pieces have to be slotted to allow them to bend. I did this with a small hacksaw before starting the assembly, rather than later as TN suggests. I marked the fuselage sides with the former positions, then glued F3 to F5 in place using syringed PVA. I held them vertical by clamping them to SLEC jig brackets as seen here.

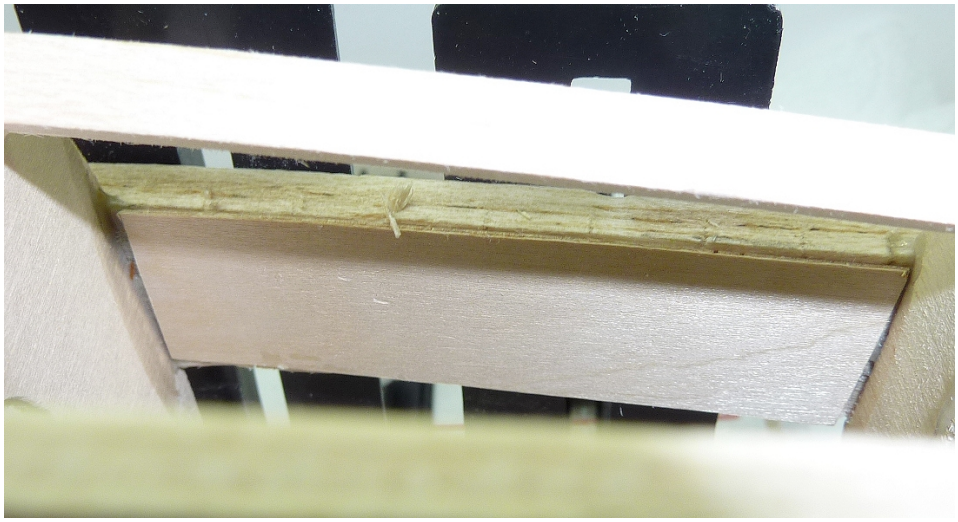


TN is definitely correct about the need for a jig. To start with the sides are all over the place and must be firmly held in the correct place over the plan.

Here you see the SLEC jig in full use. I used loose jig brackets as squares to ensure that the formers were vertical. I used the top stringers as a guide for correct placement, obviously without gluing yet.

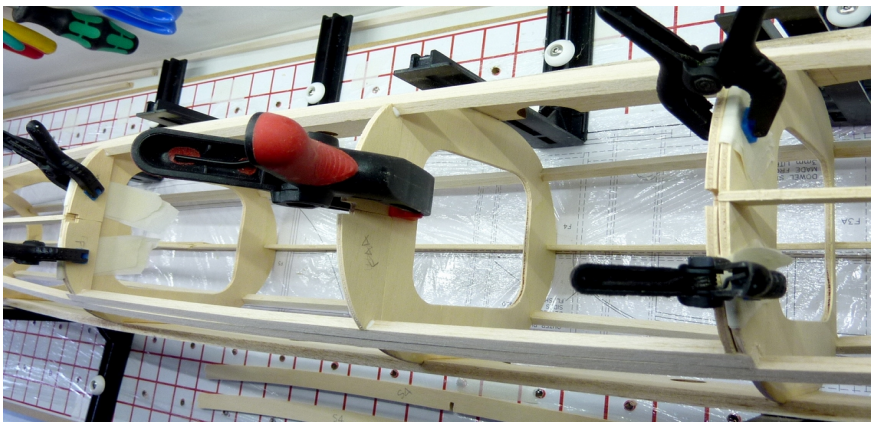
***PLAN!** Be careful about former F8. The sheet layout diagram marks the rectangle in the middle as F8, whereas it is actually the complicated shape around it. The plan makes this clear but it is easy to discard this essential bit. The top and bottom slots on F8 are too wide and need packing. The bending of the rear fuselage sides does not require great force as was the case with the nacelle sides. I did not need clamps, only the jig brackets.

17 May I wetted the front of the sides and bent them around the front two formers using jig brackets and a rubber band. When dry I glued them with PVA. I added fillets to one side of all of the formers to strengthen their joins with the sides and applied a fillet of syringed PVA to the other side. I added 0.8mm birch ply liners on the slotted areas to strengthen the nose. Tiny extra weight but great strength. You can just see the slots sawn to improve bending.

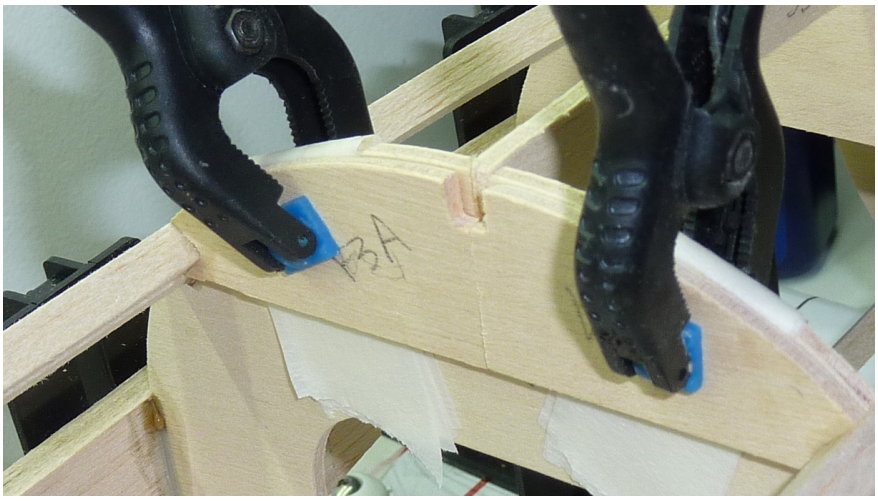


18 May Added top spines and longerons.

20 May I turned the fuselage over and replaced in jig. Added bottom spines and longerons.



I clamped the bomb bay half formers after gluing to the stringers. I used four layers of masking tape between them and the formers to give a cutting gap.



Here is a closeup of the F3A pieces in place just before gluing in the spines. You can see the four layers of masking tape.

I will measure the exact distance back from the front to the positions for cutting the bomb bay. I must find a way to fix the batteries in before I sheet the fuselage.

22 May Trimmed the spines, which were a little long and glued them to the bomb bay door formers.

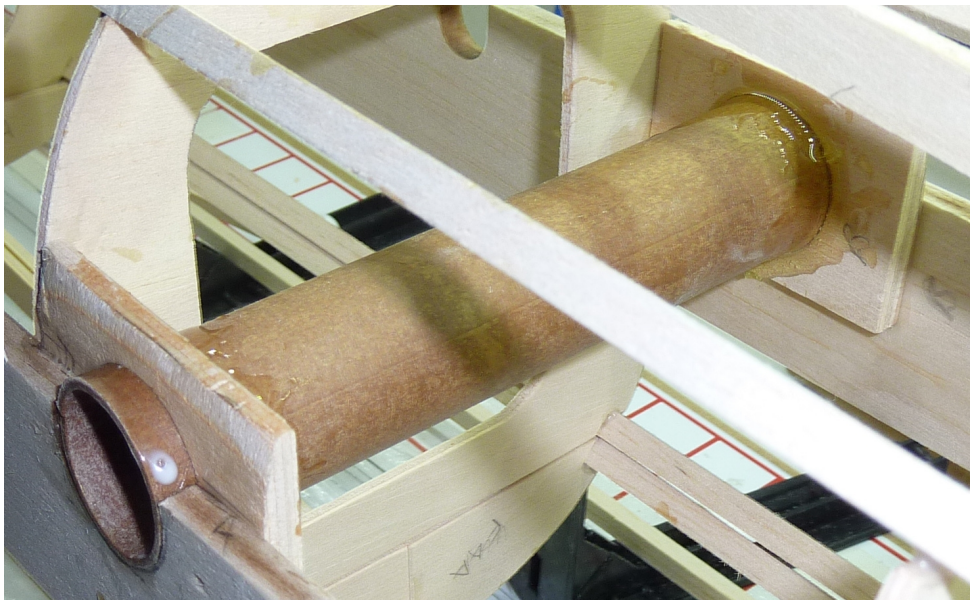
26 May I cut the bomb doors free from the small amounts of glue that had spread and from the longerons stubs on N3 and N5. I also removed the masking tape packing.

Wing spar tubes

27 May There is no information about how or when to fit the spar tube reinforcements FD1 and FD2 nor the tubes. Clearly this must be done before sheeting.

10 Jun I fitted the front, large wing spar tube. The FD1 ply doublers had to be planed and sanded to follow the curvature of the fuselage for later planking. I glued it all using PVA, as the tube is paxolin. I added expoxy fillets to the inside when the PVA was dry. I won't fit the rear tube in yet. The wings will need to be in position to ensure a good sliding fit.

Spar tube in place



Batteries

11 Jun TN specifies that the model needs two 4S batteries. One builder I spoke to squeezes foam around the batteries to jam them in place but I think that could cause over heating. On a different model I found it useful to make a battery carrier out of liteply for twin batteries, so will do that here. I glued 6mm square bearers on the front three formers and will fit a ply plate. I have yet to decide how to fix the battery carrier down. There is no guidance about battery fixing in TH's photo or text file. The plan shows 4S 6Ah batteries side by side on edge each with dimensions 160 x 47 x 37 mm. There are two Zippy compacts that nearly meet the specification:

5.8 Ah	158 x 45 x 40	40C = 232A	562g
6.2 Ah	158 x 46 x 41	40C = 248A	589g

They are just a little thick so I will have to measure to see if they will work. TN implies that weight might be needed in the nose so the heavier higher capacity ones might be the best choice. If I have to trim away the formers at the sides I will strengthen them with vertical spruce pieces. This must all be done before sheeting.

Alternatively I could use a single higher capacity battery supplying both motors, for example:

Turnigy High Capacity	10Ah	168 x 69 x 38	12C = 120A	902g
Turnigy Graphene	10Ah	168 x 69 x 40	15C = 150A	936g

Though slightly longer, both are lighter and smaller in cross-section than a pair of the Zippys. Current is more than adequate and I could use a FrSky 150A current sensor to monitor capacity. As a final option I could go for a single 5S or 6S battery. That would keep down the current and give more power, but need a smaller propellor. For example:

Turnigy Graphene	8Ah	6S	170 x 69 x 48	15C = 120A	1110g
Turnigy High Capacity	8Ah	6S	146 x 77 x 51	12C = 96A	1110g

Though a lower Ah capacity, because of their higher voltages these batteries will hold 20% more energy than the 4S ones. The holes in the formers are (W x H):

F3 77 x95 F2 77 x 82 F1 72 dia (could be opened up)

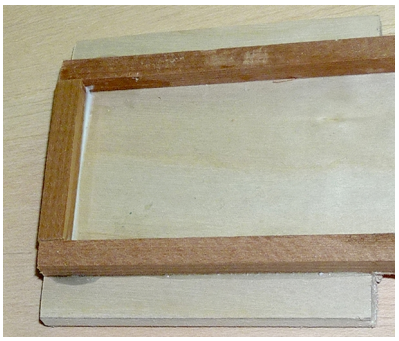
In the end I settled for the graphene 8Ah 6S. I tested it with one of the motors and the 14 x 10 three-bladed ???.

Battery mount

This is in two parts. I glued a plate onto the formers. This is laminated from 6mm hard balsa and 0.8mm birch ply on each side. The plate has two 6mm square spruce side runners and a similar nose end stop. At the nose end I glued on a location tab under which the battery plate locates. The 6mm lite ply battery holder has an M5 T-nut positioned over a hole in the glued on plate. The battery is put onto velcro on the holder and strapped down, then the assembly is slid into the plate and fixed with an M5 screw.

Plate with spruce runners

End stop



This is the beast of a battery- a Turnigy Graphene 8Ah 6S

Location tab

Battery holder

Battery holder in place

Cooling

I am concerned that the motors are totally enclosed and might overheat. I have decided to use the exhaust baffles, incorrectly open at the front, to funnel some air in. I can add blocking pieces for static viewing. There should be enough leakage in the undercarriage doors to allow warm air to exit. I did debate using the radiator slots opened up to pump air in but decided this was complicated and unlikely to work. The air intakes for the carburettors are too far back to be usable without S-shaped ducting.

I spotted a TN Mosquito at a recent model fly-in. I asked the builder if he had problems with over-heating. He hadn't, and none of the possible intakes (exhaust shrouds, air intakes and radiator baffles) were open and used. I will just use the shrouds open at front and back.

Colours

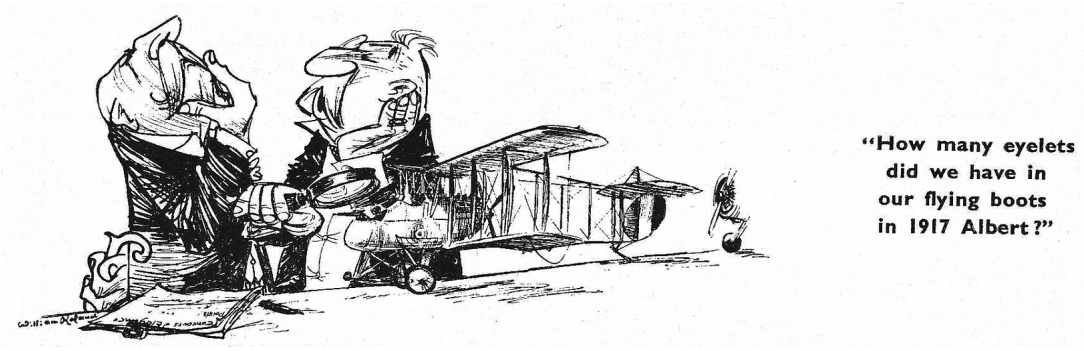
What a minefield! It is clear that there was, and is, no exact definition of the ‘correct’ colours used on the Mosquito. Each source of information gives slightly different colour definitions and names. One consistent, though possibly not perfectly correct, source is the US Federal Standard FS595. A good lookup is on https://www.e-paint.co.uk/Lab_values.asp.

Based on a document by W.S.Marshall, of RAF colours of WW2, here is my shot at correctness together with probable acrylic colours from Tamiya and Italeri. The RGB and Hex are numeric definitions of the quantity of primary colours in the mix. You might recognise the hex from your computer image editing software such as Paint or Photoshop.

	FS595	Tamiya	Italeri		RGB	Hex
Dark green	FS:34079	T:XF-61	4723AP	Dark green	66/68/51	#5A6349
Sky (Type S)	FS:34583	T:XF-21	4778AP	Hellblau	178/182/152	#B2B698
Ocean Grey	FS:36152	T:XF-54	4775AP	Dark sea grey	85/94/87	#686E71

I think the Tamiya is probably the closest but the pots are small. Even using an airbrush, which is frugal on paint, many pots will be needed for this substantial airframe.

In the end it is debatable how far to go with this. I am reminded of this cartoon from Aeromodeller in the 1960’s.



Finish

From the Haynes manual I learned that surfaces were painted with two coats of red nitrate dope. Then it was covered with a linen-weave cotton fabric called ‘Madapolam’, named after the Andhra Pradesh village in India where it is made. Then it was given three more coats of red and finally two coats of an aluminium dope. Then the paint was sprayed on. I think that using 24g/m^2 glass cloth with one or two more layers of EzeKote should give a similar finish. I will experiment on scrap before committing.

Electrical and radio

1 The 4-Max PO-5055-595 motors specify a maximum of 54A and the ESC is quoted as 60A. Therefore XT60 connectors should be fine. However this model will share 4Ah 4S batteries with the WOT trainer and other larger models. I will therefore fit XT90 connectors. I had to buy a new solder gun. My 100W one was marginal when soldering XT90, so I got a 175W one. In the end that proved marginal so on the suggestion of a club colleague I bought a gas powered iron. Outstanding. Beautiful, quick, bright joints.
2 The ESCs are in the nacelles. Only two wires are needed back to the fuselage so I will solder these to the ESC wires after checking that XT90s will fit through the wing holes. If they don't I will use 4mm bullets inside the wing.
3 All six servos will be digital so battery drain might be a problem. The choice is between a 2.3 Ah NiMH Rx battery or a 5A BEC and 2.2 Ah Lipo. A NiMH will be lighter and more compact. I will have a charging socket in the switch under the floor in the cockpit so I can charge on the field without removing the NiMH. Taranis telemetry will alert me by voice if the Rx battery voltage falls beyond a safe limit. Maybe it will be NiMH then.
4 I will try out S.BUS connections to the wings and possibly fuselage servos/retract as well. See also 9 below.
5 Depending on how happy I am with the fairly crude but simple nacelle door closing system shown on the plan, I might build an Arduino nano sequencer to drive door servos. It would mean adding a power transistor to drive the retract from the Arduino.
6 This is my first twin engine model. I don't know how well balanced the motor powers will be. I will run each ESC off a different Rx channel allowing me to match the powers if I need to, by adjusting the weight of the throttle signal to each.
7 I will use a separate servo for tailwheel steering. A small metal geared servo will do. I don't want to risk of the retract causing the rudder to misplace in the event of a retract foul up.
8 The specified motors should be more than powerful enough. They are similar to the E-Flite power 46 that I use in a Wot Trainer with a bit more power. The single motor gives a sustained vertical climb in that.
9 I don't want run the risk of the servos overloading the receiver. I will use a power distributor board to provide power to the servos and retracts and the S.BUS signals to the S.BUS to PWM converters.

Radio channels

1 Throttle left and sound or use for both
2 Aileron left
3 Elevator
4 Rudder and tailwheel
5 Aileron right
6 Throttle right (if power balancing needed) and sound
7 Undercarriage retracts
8 Flaps

Armaments

Though they varied, Mosquitoes were generally equipped with Browning M1919 0.303 machine guns and Hispano-Suiza II 20mm cannons. No-one seems to make scale models of the Brownings so I must make some. An RCM&E tip was to shrink heatshrink tubing

onto a former, which is then slid out. I'll try it. The cannons are enclosed so only four black holes are needed. I found a superb resource created by Jon that I can recommend to anyone building warbirds: http://browningmgs.com/

Protection

I usually use wing bags made from insulation sheet to avoid car boot rash. With the propellors in the wings I am not sure how to do this for the Mosquito. Must I make a box?

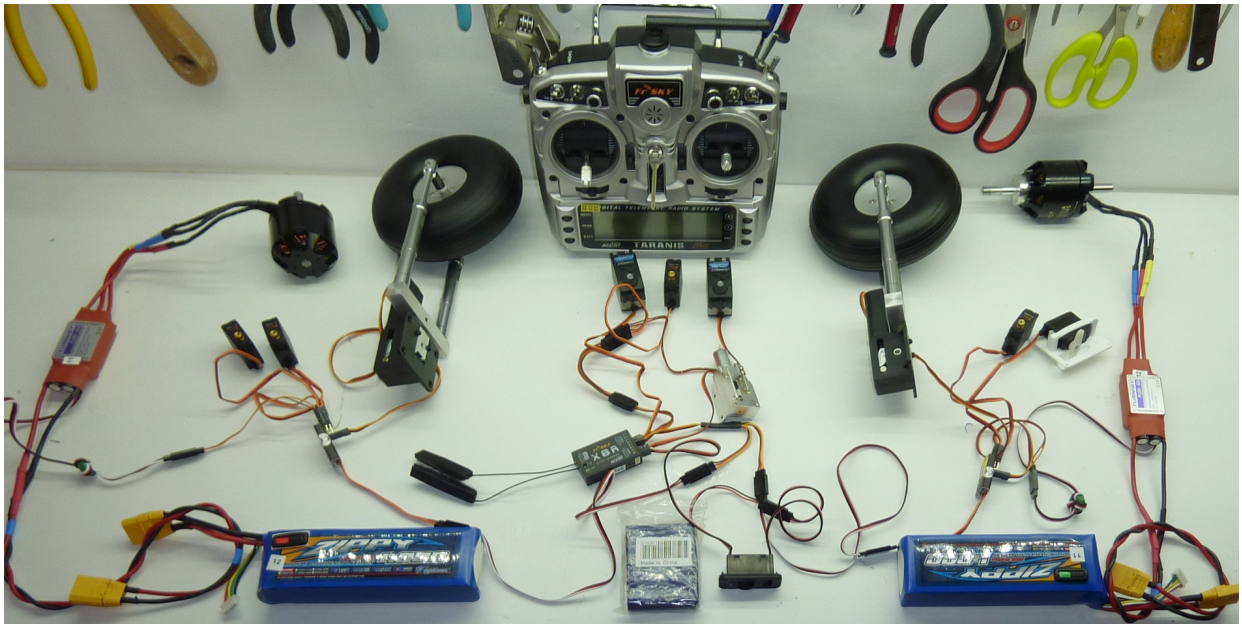
Pictures

This is Tony Nijhuis' prototype model with exhaust flame dampers. Variants from Mk IVs onwards often didn't have them. They got another 10 mph from the exhaust thrust without dampers

Must research KA114. I can't find a source of 1/9 scale exhausts so I will probably use dampers anyway.

Full electrical layout

Note the single wire to each wing



Though it isn't relevant to this build this is an amazing site describing the build of a working quarter-scale Merlin engine. http://quarterscalemerlin.com/

Göring said:

> *In 1940 I could at least fly as far as Glasgow in most of my aircraft, but not now! It makes me furious when I see the Mosquito. I turn green and yellow with envy. The British, who can afford aluminium better than we can, knock together a beautiful wooden aircraft that every piano factory over there is building, and they give it a speed which they have now increased yet again. What do you make of that? There is nothing the British do not have. They have the geniuses and we have the nincompoops. After the war is over I'm going to buy a British radio set – then at least I'll own something that has always worked. From wikipedia*

Other sources of information

Haynes Manuals has published a book about the Mosquito, titled 'de Havilland Mosquito Owners' Workshop Manual'. For the builder, or simply enthusiast, it is a treasure chest and I highly recommend it. I thought I did quite a good job on old photographs with Photoshop but the graphics people have done a first class job sharpening and cleaning the pictures. There are many other books in this series. I have listed those current in November 2018 in a page on my website under 'Data'.

Wheels

No-where can I find data on the size of the main and tail wheels. The best I can do is to measure off the sharp drawings on page 404 of Sharp and Bowyer's excellent book, 'Mosquito'.

These are my calculations for the main wheels:
Fuselage length stated on drawing 41' 2" 12.5 m 12500 mm
Fuselage length measured on drawing 65 mm
Wheel diameter measured on drawing 6 mm
Wheel diameter = 6 * 12500 / 65 = 1150 mm or in archaic units 3' 11" (probably 4')
At 1/9 scale this is 127mm so TN got it right
At 1/5 scale this is 230 mm (I'll see what turns up on the scaled up plan. Yes correct.)

Area loading

This model will be heavy for its wing area. TN suggests a wing loading of about 138 g/dm$^{2.}$ which is high. Normally you wouldn't go higher than 40. I imagine it will need to be flown fast and firmly like the full size machine.

S.BUS planning table

S.BUS planning table for FrSky decoders

Model	MOSQUITO	Date	23 OCT 2018

Left wing			Fuselage			Right wing		
Label M1	Rx channel	Decoder 1 channel	Label M3	Rx channel	Decoder 3 channel	Label M2	Rx channel	Decoder 2 channel
Thr (twin)	1	1	Thr (single)			Thr (twin)	6	1
Aileron	2	2	Elevator	3	1	Aileron	5	2
Flap	8	3	Rud/wheel	4	2	Flap	8	3
Retract	7	4	Retract	7	3	Retract	7	4

Auxiliary functions		
	Rx channel	Decoder 4 channel
Kill switch		

Installation notes

Separate throttle channels to allow balancing

Lights (if used) will be off ESCs or servo leads

Receiver		No:
Ch	Function	Input
1	THROTTLE L	STICK
2	AILERON L	STICK
3	ELEVATOR	STICK
4	RUDDER	STICK
5	AILERON R	STICK
6	THROTTLE R	STICK
7	RETRACTS	SE
8	FLAPS	S1
9		
10		
11		
12		
13		
14		
15		
16		

Mistakes on the plan

Just three so far. Marked ***PLAN!** In the text where relevant

1 **Top wing sheeting**: On the plan the cutaway area of top sheeting for the nacelle is shown as a quadrilateral going back to the spar. This is too wide so the last former N9 cannot be glued to the sheeting. Change your plan to match the photograph which shows a shorter triangular cutaway. I told TN about it and I think the plan has been changed but I still think it isn't the same as the photograph. Best to use the photo as the guide for cutting the triangle.
2 Last rib in the inboard flaps is too short.
3 F8 is the complex shape on the plan not the rectangle marked F8 on the sheet layouts on the plan. The top and bottom F8 slots are too large.

February 14, 1949 – the RL249's fatal flight

9.35pm - Pilot Officer Richard 'Dickie' Colbourne and Flight Sergeant William Kirby take off from RAF Coltishall airfield. Shortly after taking off. both engines failed, and the pilot managed to crash-land the Mosquito in a small copse of trees about four miles from the airfield. The aircraft suffered severe damage and - laden with fuel - immediately caught fire. Pilot Colbourne. who had got clear of the wreckage, realised his navigator must still be trapped inside.

Interesting method for hanging control surfaces, from RCSD June 2017