2020 Lockdown Build Log – SFM Mustang Warbird

Introduction

As a Civil Engineer, I have been building things for more years than I care to recall, so assembling kits in retirement comes naturally. In the 2020 Covid winter it is the obvious way to keep occupied, get to know the garden shed intimately, and keep out of the way of the Management. My shed (to call it a workshop would be flattery) has heating, lighting, a radio and a nice barstool, so is ideal for creating something while enjoying some solitary contemplation.

I was surprised not to find a build log for this model on YouTube (usually so useful for checking out a build before committing), hence this log, which is written in the hope that it will be interesting for Club's members. I am not an expert builder by any means, so keep this in mind when reading what follows - I hope it will keep the grey matter sparking for some of you in these strange times.

Arrival!

October 22nd 2020- the box arrives.

Getting hold of this model was not easy – it seems that covid has badly affected distribution logistics and the normal suppliers were all out of stock – along with much other modelling gear presently. The model is made in Taiwan under the Super Flying Model logo and distributed in UK by Ripmax, who seem to be having issues. So in the end it came via the Amazon behemoth (at a higher price, which obliged me to sign up for an Amazon credit card for the discount) under the Jamara label, which is a German hobby distributor. Boring,

boring, so on to some actual modelling stuff: why did I choose this model? Well, it is big at 1.4m wingspan and I like big planes, it will be my first ‘scale warbird’, it has a nice big removable canopy for access to a spacious inside, and wheel retracts are an option (what a luxury).

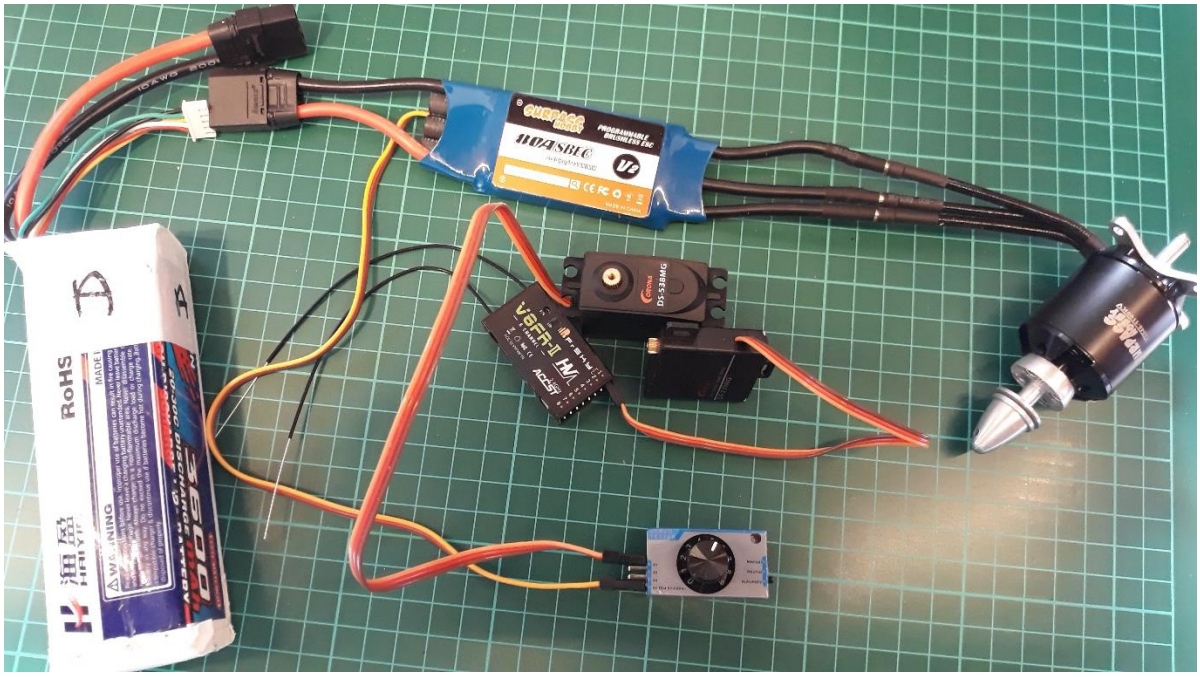
A quick unboxing to check for damage/missing items – all seems OK amazingly. All the gubbins are provided, including a pilot with an enigmatic sideways smirk – I hope however that he looks straight ahead during actual flying.

Getting Ready:

Naturally as a good modeller I had already ordered all the innards for the plane – all based on using the same 4S power packs used for my trusty Panic biplane (these were expensive, after all), and for a model that will fly all-up at about 2.5kg I need upwards of 800W for reasonably lively flight (I work on about 250W per kg minimum). Very low KV motors are nice for torque, but I wanted to get the max out of the 15V from the 4S so went for a slightly higher KV motor which would give the power needed without too large a prop. Yes, starting from scratch, a lower KV motor with a 5 or 6S battery would be the choice, but ….. The Surpass motor I use on the Panic was reasonably priced and has survived so far without problems (except for a near fatal unplanned landing caused by a missing grub screw on the motor shaft: lesson – check all gear carefully on arrival). So I plumped for the Surpass 3548 here - this actually has a 28 x 26 rotor winding (motor sizing terminology is almost as confusing as the Covid rules) and is 1100KV, rated optimistically at 1000W top whack (i.e. for a few seconds before melting), and I hope will deliver 800W at about 70A without complaining, on a 12x6 prop. Are you paying attention at the back? Not to do anything by halves, a Surpass 80A SBEC ESC, which was substantially more expensive than the motor!

was chosen (and will do for just about any plane I may have in the future). I recently learned that an S(switched)BEC will adjust the supply allocated to the servos and other loads according to demand, which should reduce risk of servos failure – with wheel retracts fitted, this must be a good thing. The setup will of course be tested on a power meter later on – an essential piece of kit for all power-mad modellers. During my search for gear, I found online two new suppliers who impressed – RCLife and RapidRC. RCLife have a good stock of Surpass gear – worth adding to your bookmarks for model supplies.

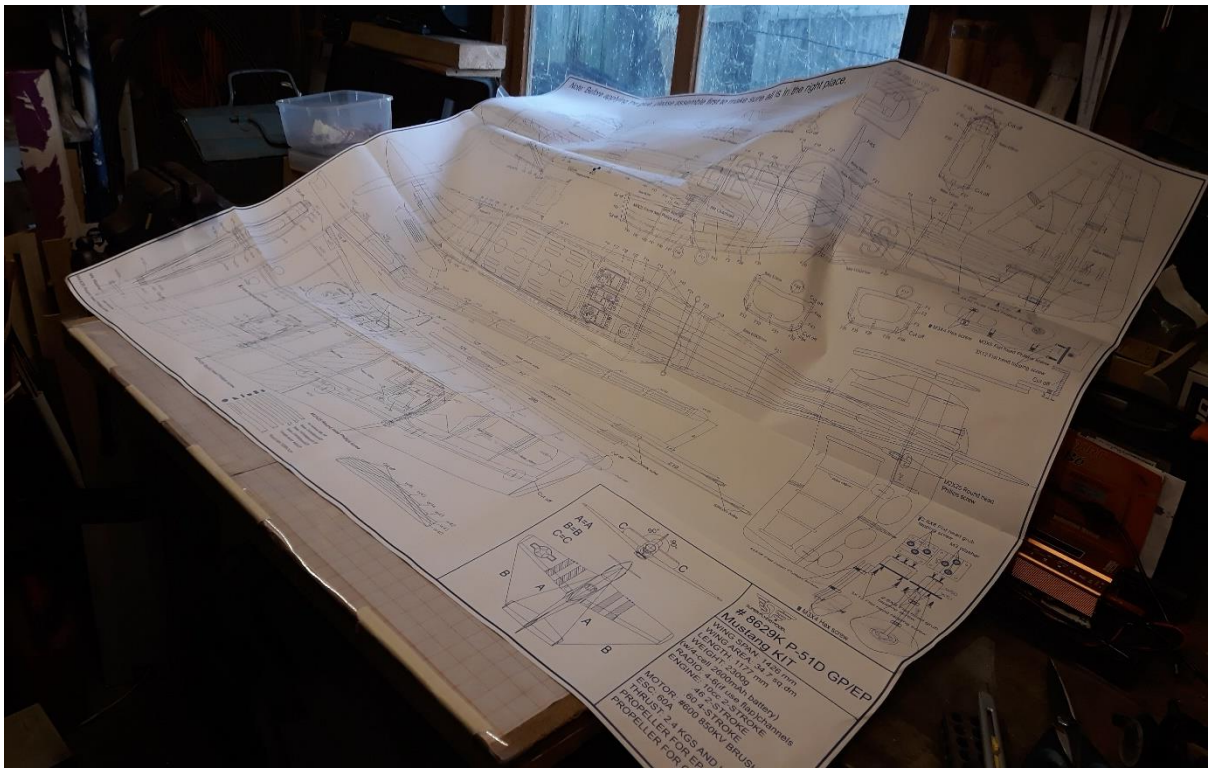
In the meantime, some soldering/connection work to put the power train together, bind the receiver, and test the servos.



The receiver is a FrSky 8-channel RX which is non-telemetry (but connectable to their telemetry modules it appears – this is beyond my ken presently) and reasonably priced. Binding to my Radiomaster TX16 was easy once I deciphered the instruction leaflet (the usual problem with translated Chinese instructions) and used the binding plug provided. Servos are Corona metal geared digital – 2 full size at about 50g and 4 thin wing servos for the ailerons and flaps. The 8 channel RX means I don't need Y- leads for the servos – I am happier with this setup which should provide more flexibility for operating these wing control surfaces. Next up – the actual build!

Starting the Build

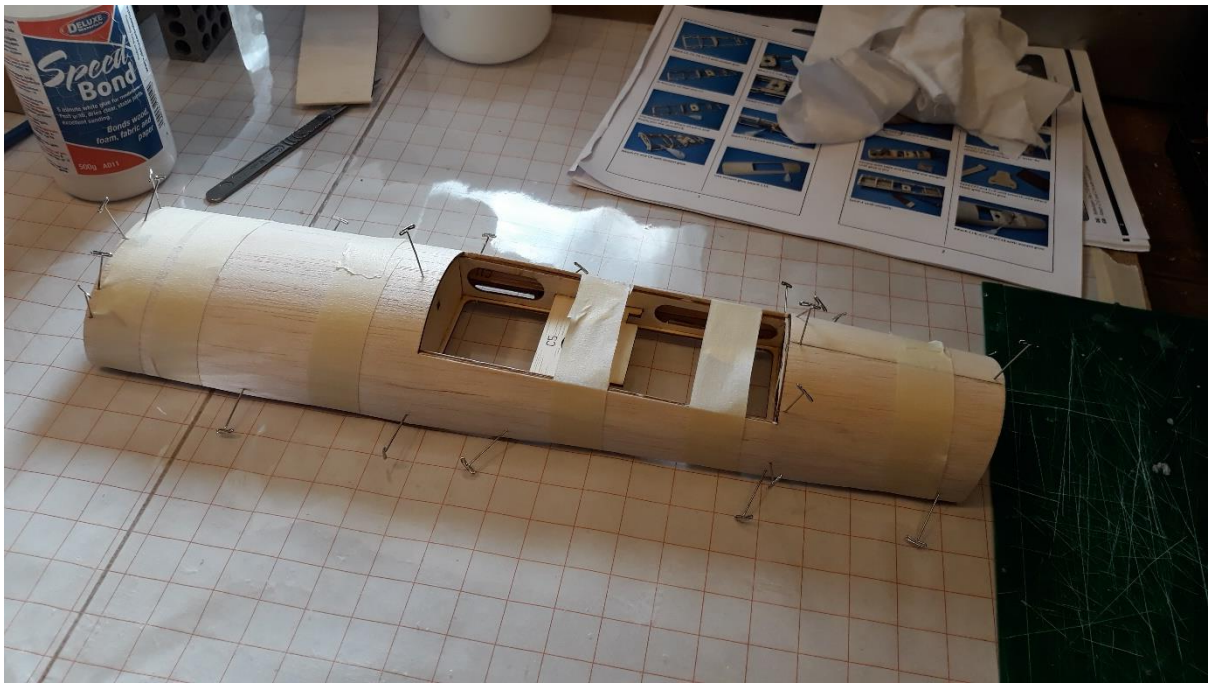
The plan is much bigger than my building board , which is only the size of a kitchen cabinet door because that's exactly what it is - a spare kitchen cabinet door with cork tiles glued on, squared paper, and plastic film to avoid glue problems.



A very flat, stiff platform with lines at right angles being essential for accurate building, as we all know.

We start with building the removable canopy section, and believe it or not the very first 2 pieces to be glued have wrong tab locations – not a problem to deal with, but not reassuring either. The second issue is a few scraggy laser cuts. What a perfectionist I am. I note that the manual goes for cyano glue generally, except for ply doubling and other critical bits. My usual methodology is to use cyano for convenient assembly and lining up (i.e. a sort of tacking), with white glue for the main work, especially for stressed bits like the wings. Cyano is a brittle glue - white glue is more flexible so will reduce stress at joints – but I could be wrong (again). I am using medium 'No Nonsense' cyano from Screwfix, which is reliable, works when needed with my spray-can of Activator, and is recommended. It's thin enough to wick for initial tacking, and a second application to complete the job.

Despite a few further part-number errors on the plan, this progressed languidly (at time of writing, lockdown Pt. 2 – ‘apocalyse’ has just been announced, so what’s the hurry?), with one part – only the servo tray, luckily – totally missing. The build is producing loads of ply from the laser pushouts, so no panic.



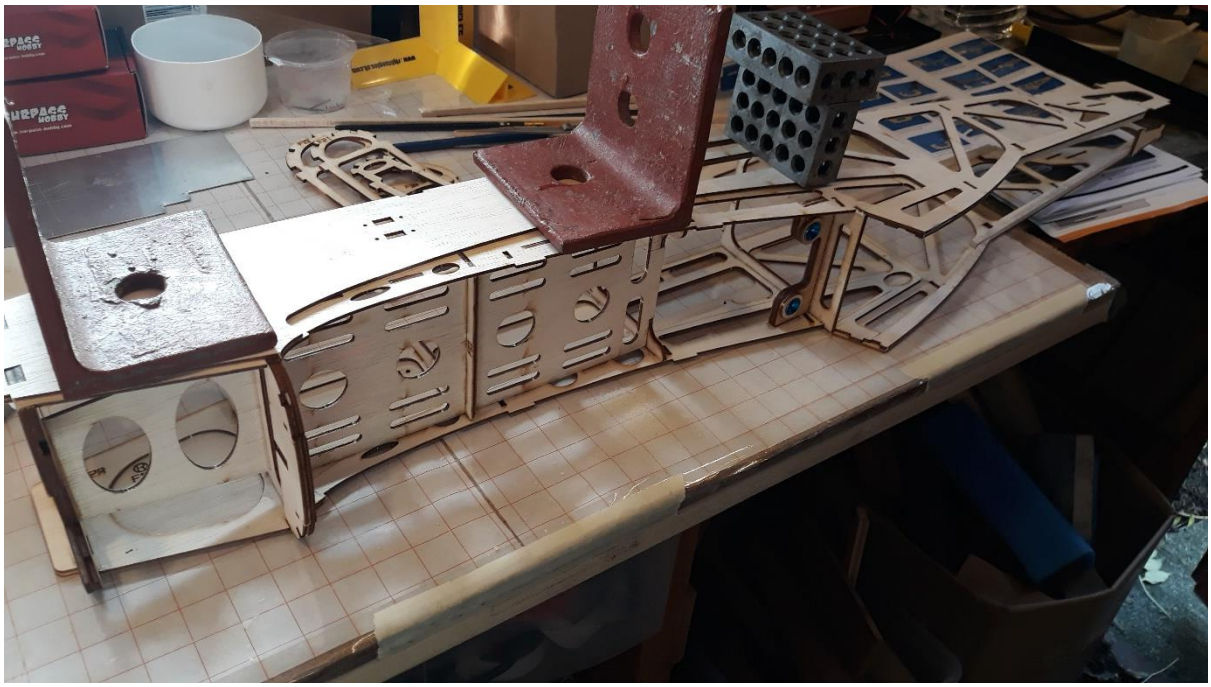
No further problems ensued, and the removable canopy unit was completed, sprayed internally, and Pilot Smirky McSmirkface seated inside.

The photo also shows a little 400mm span indoor foam sheet plaything that I am concurrently materialising from a cheap Amazon/Ebay kit using, as the power train, various bits from previous disasters – who says that males can't multi task? My patented method of keeping the X-profile fuselage and everything else nice and square is shown next to the real work in hand. This technique wasn't entirely successful, but no doubt the little devil will still fly. Next up – the fuselage.

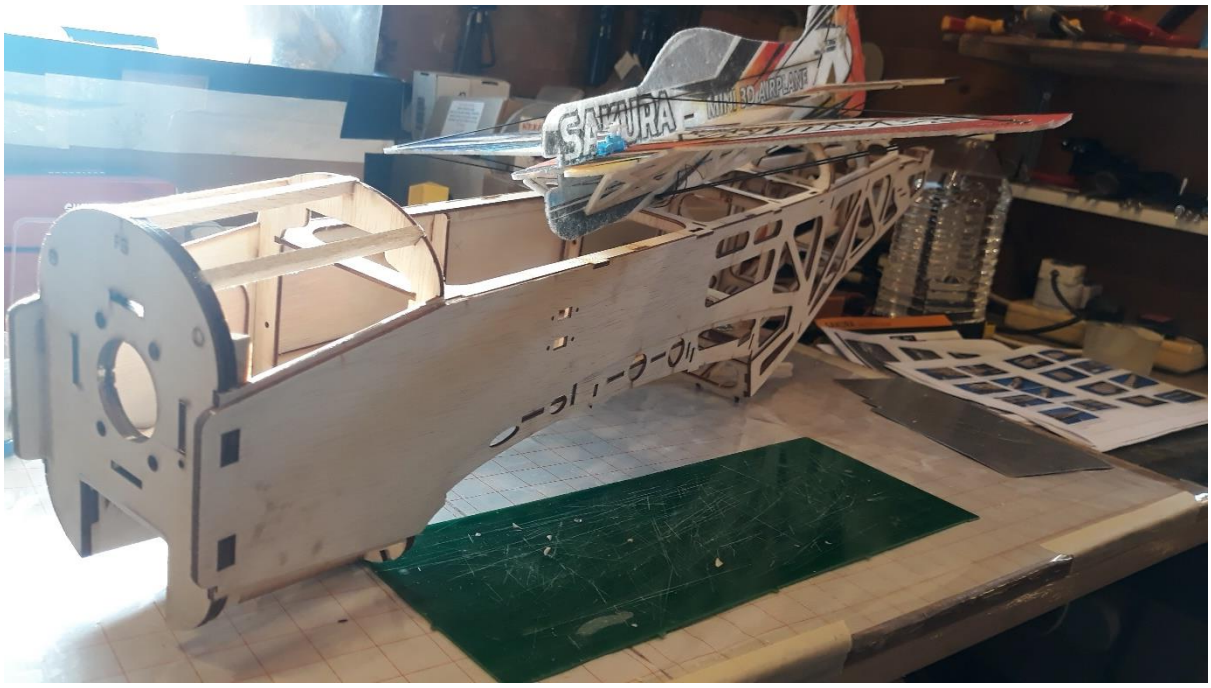
The Big Bits

Work on the fuselage is gathering momentum, with occasional input on the indoor mini-thing. Care is taken to keep everything square and true, critically making sure that the fuselage is symmetrical around the line from the front to the tail – this is where the nice long straight lines on the board are so useful. So far, there's been no need to place items over plan in the traditional way – everything is locking into place nicely (more or less).

Heavy metal items are useful at this stage:



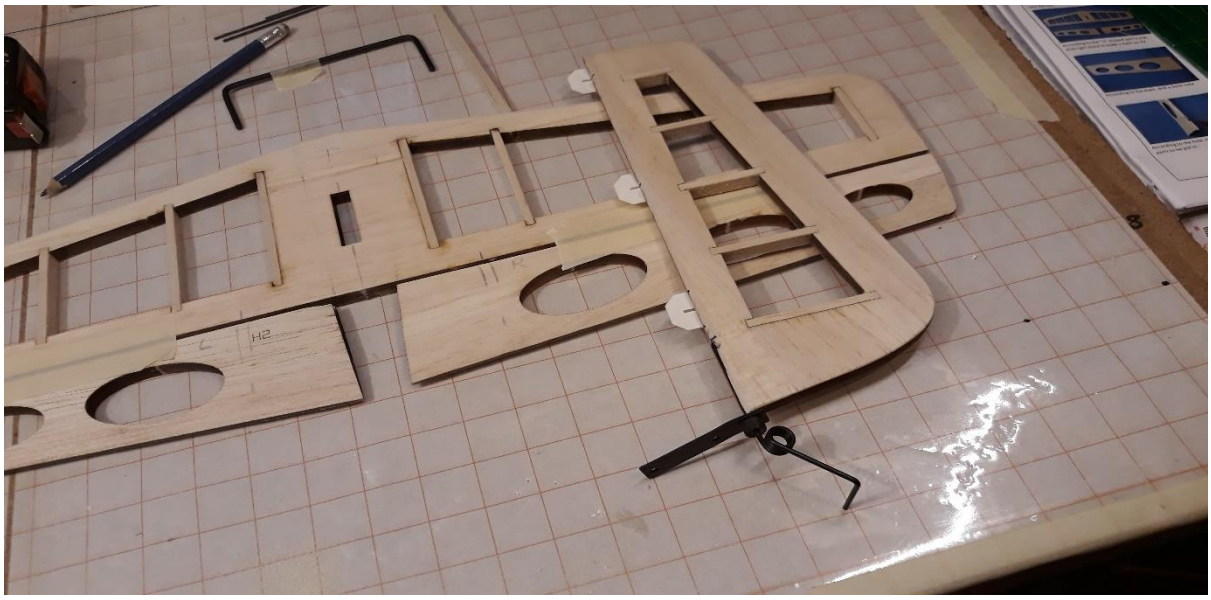
We are now into curving thin balsa for the outer surfaces. I usually wet these pieces for a minute before placing and gluing, but our manual here suggests soaking, placing without glue (bands or masking tape), leaving to dry, after which we pretty much have the final shape, then we trim and glue. I have the time and it sounds good to me, so I will try it out.



The mini – indoor thing is looking good too, and appears to be mating with the bigger flier.

More or less done:

Time to leave the fuselage for a while and build the rudder fin and tailplane – nice thick balsa with cross-grain stiffeners: assembled and leading edges sanded – for me, quite a therapeutic little job. Some covering to be done (later) before these items are added to the fuselage. Quite hefty hardware involved at this stage – a nice tail wheel strut fixed to the rudder and a rather large U-bar to connect the elevator halves together . Since I don't possess one of those natty bench drills and had to drill the necessary holes by eye, these halves didn't quite align – the solution involved two big clamps and some brute force to bend the bar. Well, whatever works.



And the indoor flyer is well on the way too. Time now for the wings.

Wingtime

The wings are substantially skinned (which I like), and the first job is to put together the top and bottom skins (carefully).

The size of the plane is beginning to become apparent. At this time, the covering issue formed in my brain – what colour and what covering? Oracover is not cheap but in my experience can't be bettered, so I rooted around the interweb for the best price and ordered a couple of rolls of light grey, which should convey the required illusion of dirty military aluminium. Probably best to confess here that I believe life is too short to worry about reproducing rivets and such like on scale models – it's not as if anyone really thinks the model is really a Mustang, or whatever – so if it looks roughly like a WWII fighter, good enough. Actually, the decals provided with the kit are pretty good and will no doubt be impressive when it's all done.

Work on the wing structure follows, and we all know, I hope, that rule no. 1 is 'don't build in a warp'. This means paying attention and being methodical and patient, helped by a good flat surface and some proper pins. In this case, the ribs have nibs at each end which allow alignment during assembly to ensure straight leading and trailing edges. The 'Panic' build used a temporary strip placed along the leading/trailing edge for the same purpose. I prefer this approach, as the nibs are not idiot proof and can be inaccurate or damaged. However, 'by eye' is the best final judge, since it involves a connection to about 30 billion brain neurones and consequently is pretty reliable. The wing build went well, and the manual's technique of skinning the upper surface with the nibs in place makes good sense and produces a wing stiff enough for removing nibs and fixing the lower skin with minimum risk of warping.

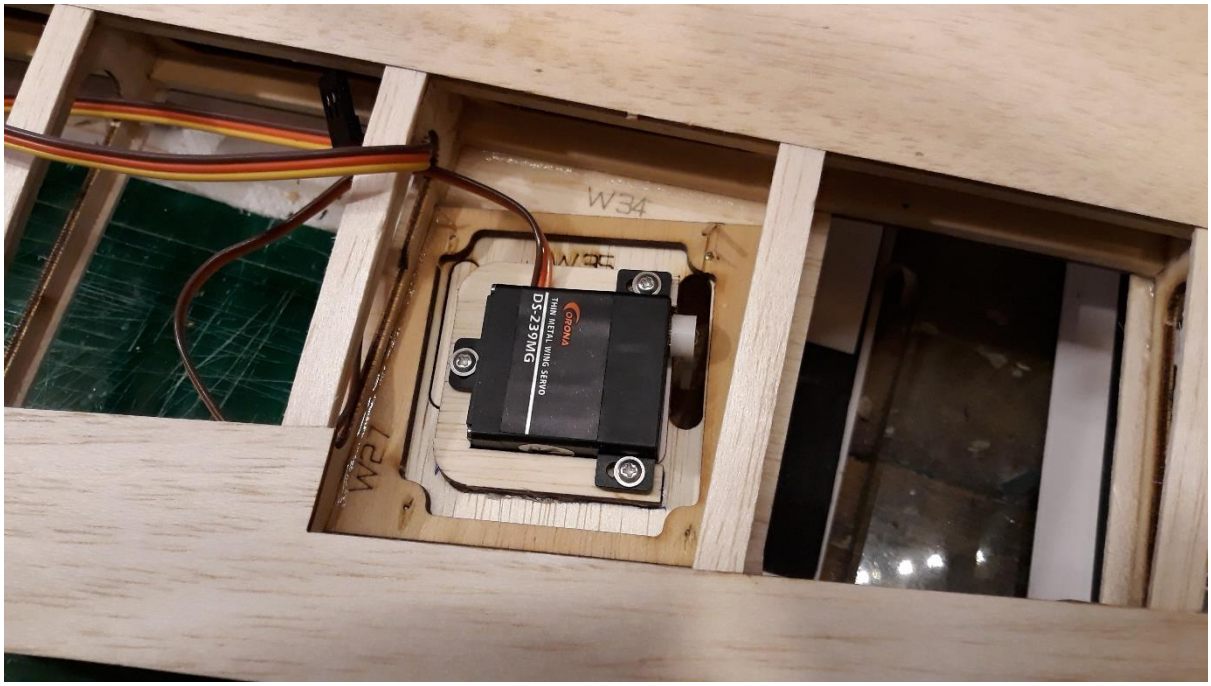
I added white glue along most edges after the upper skin was set for extra security. The finished wing was as stiff as a butcher's dead dog (after Boris Johnson, P.M.). Fixing the upper skin properly was critical, and a belt-and-braces approach was taken, involving pins, weights, masking tape and stiffeners to ensure straight edges.

The only problem was with the second wing half, where the main spar had been hanging around for a few days and had somehow developed a curve. I didn't notice this until the wing was half built, and some emergency cutting and straightening was needed to remove (most of) this curve – a lesson there to check everything as you go.

Lots of careful shaving and sanding, and we had two wings and a fuselage – the heavy lifting done.

A pot of 30 minute epoxy is mixed and the wing halves joined with a thick ply connecting strut. Time to install 4 wing servos, and the electrics so that we don't have to feed in wiring after covering.

By coincidence, the servos shown in the manual appear to be the same servos I ordered, and are therefore a perfect fit in the mountings provided – nice surprise.



The same applies for the wheel retracts I ordered, except that the leg holes for the wheel legs needed to be drilled out to suit the diameter of the legs. This needed to be done carefully to avoid nadgering the retract mechanisms. Also some mods to the wheel cuff fixings was needed to minimise the projection of the assembly outside the wing profile, in the closed position. We got there, more or less, in the end.

Take Cover

Now I am mentally preparing for the covering jobs on the wings, fin, tailplane and control surfaces, but first – lots of sanding to get good smooth surfaces. I know that the Oracover will not hide any surface defects! Covering is going well – as coverers will know, this is largely a matter of learning from experience, but Oracover does allow mistakes to be corrected, unlike the cheaper products that leave the pigment on the surface when repositioning.

At this time I am dealing with the clear plastic engine cowl and pilot canopy. The cowl comes in 2 halves that have to be glued together – a bit tricky to get a good finish here. Some black matt metal spray paint helps, and I have sprayed the nose cone black too. The chosen colour scheme was based on studying Mustang pictures on the net and also on what I had available on the shelf. An intake hole had to be cut in the cowl below the spinner, for air cooling the interior bits – a bit tricky. So we ended up with a matt black spinner and matt black front section of the cowl, with a matt black panel on the upper fuselage engine area (as frequently used in the real plane for dissipating engine heat). The rest of the plastic cowl will be Oracovered, and I was very glad that I did a test first on an offcut, to check for distortion of the cowl material from the iron heat –because it did soften and ripple at a relatively low (tacking) setting. So this operation will be done very carefully at minimum heat and maybe with a heat gun rather than the iron.

So on to covering the control surfaces and then the wings – a long job requiring patience and some skill acquired on the covering iron. Then finalising the wing servos installation and doing the hinge work on the flaps and ailerons.

Take Control

This induced covering iron fatigue, and a break was needed – so we moved to installing the rudder and elevator servos in the fuselage, and making the pushrods from the wire and dowel provided. I didn't like the look of the plastic clevises in the kit, and went for aluminium clevises with grub screw fixing – these are more robust and allow easy fine adjustment. The servo ends were metal standoff pieces as supplied and were fine (and adjustable). The arrangement gave me good control response for rudder and elevator, with minimal play.

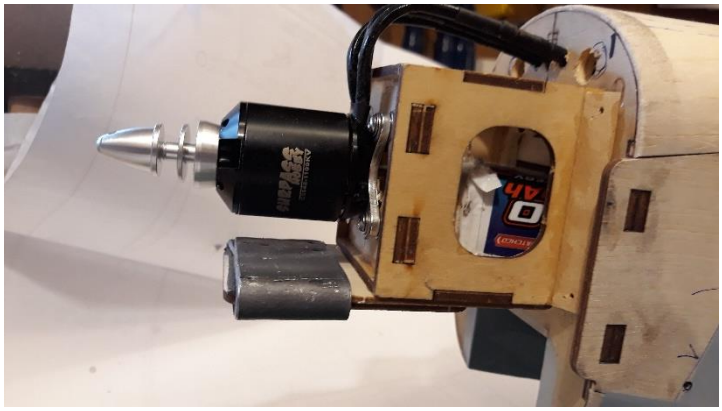
Now time to cover the fuselage, working from in the normal way from the underside up, and from the back to front. Where the iron couldn't be used (concave surfaces), the heat gun was applied instead. Matt black for the cowling, spinner and upper forward fuselage was sorted, and covering of part of the cowl reasonably successful with the lowest iron setting and great care not to overheat.

Decals followed for fuselage and wings, which greatly improved the situation visually.

First, Fry your Servos

Somehow during the setting up of servos, I managed to fry the flap servos (still learning to use Open TX), so two more had to be ordered – oops, it was all going far too well up to this point anyway.

So while awaiting the replacement servos, let's install the motor and ESC, put everything together and see where our C.G. is going to be. As usual with my builds, we have a problem, Houston. C.G. too far back even with battery fully forward in the bay – a quick check with temporary lead shows around 280g. is needed in the nose to balance, so the decision is to modify the bay so that the battery can be as far forward as possible, i.e. about 2mm clear of the back end of the motor shaft! This reminds me that I had to do the same thing with the Panic bi-plane too. Maybe a bigger (heavier) motor would have been better in the first place? Some fiddly work was needed to achieve this, but necessary to minimise the final weight of lead I will need at the front. A second check after repositioning the battery and making a secure battery bay showed that some (less) lead was still needed up front.

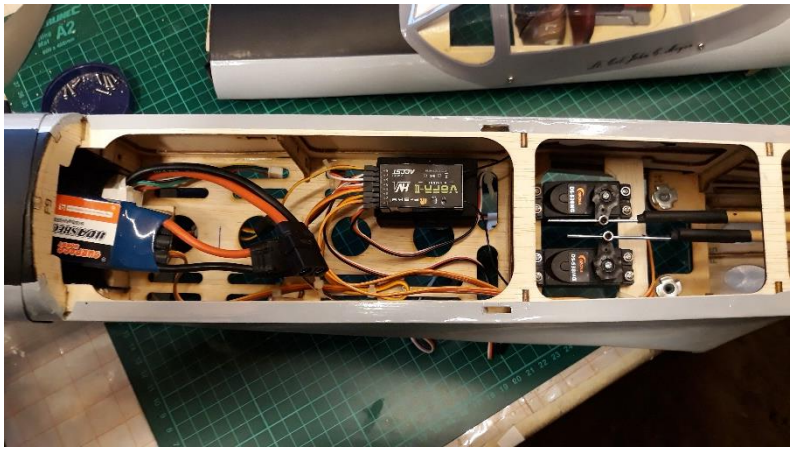


Time to install my patented 'Extend-O-Lead' device to allow some lead sheet to be placed as near to the nose as possible.

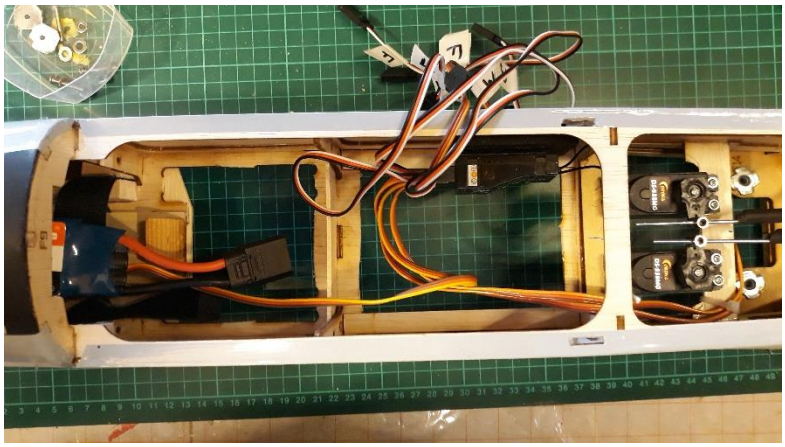
And a check on the all-up weight of the plane without lead showed about 200g under the flying weight stated in the kit specs, so some good news there at least. Let's hope that the power meter test (later) reveals that we have enough power to get the beast into the air.

The replacement servos arrive, are tested, and installed. Another lesson learnt here – for the original servos, I had tried the setup with servos connected, and probably fried them by too much output from the TX. But the OpenTX software gives a display of the output on each channel on the TX screen, so operation can be checked without having to connect the servos. (The desktop software also has a fancy simulator function to do the same, but for some reason I prefer to do it directly on the TX). Some considerable trial and error time later, I cracked the issue and had working flaps on a 3-position switch – up, 30 degrees for take-off, and 45 degrees for landing.

Although there is plenty of space in the fuselage for RX/battery/servos, the servos leads have to be stuffed into the small space between the wing upper surface and the fuselage servo/battery tray (so that the wing can be removed/attached).



Time to look at making more space here by removing some of the tray to allow servo wiring to go up into the fuselage space. So we remove most of two panels, add ply strips reinforcement at edges to maintain structural stiffness (the Engineer talking here), move the RX to the fuselage side, and hey presto.



This modification also means the wing can be fixed before the servo leads are connected – much easier at the field. What a genius.

This is it I think, apart from the power meter test to check that at full throttle we are within the ratings for motor and ESC, and that there is enough power to get her in the air.

It’s December 24th and the power check shows about 950W at about 75A with the 12X6 prop. – should be more than enough for take-off but with the 4S 3600 lipos the flight time will probably be fairly short, which could be a good thing considering my flying skills. As for the maiden flight plan, the Panic was about 6 months between build and flight, so with the 3rd wave approaching, this could be repeated for the Mustang. Maybe another build is needed in the meantime?

The End?