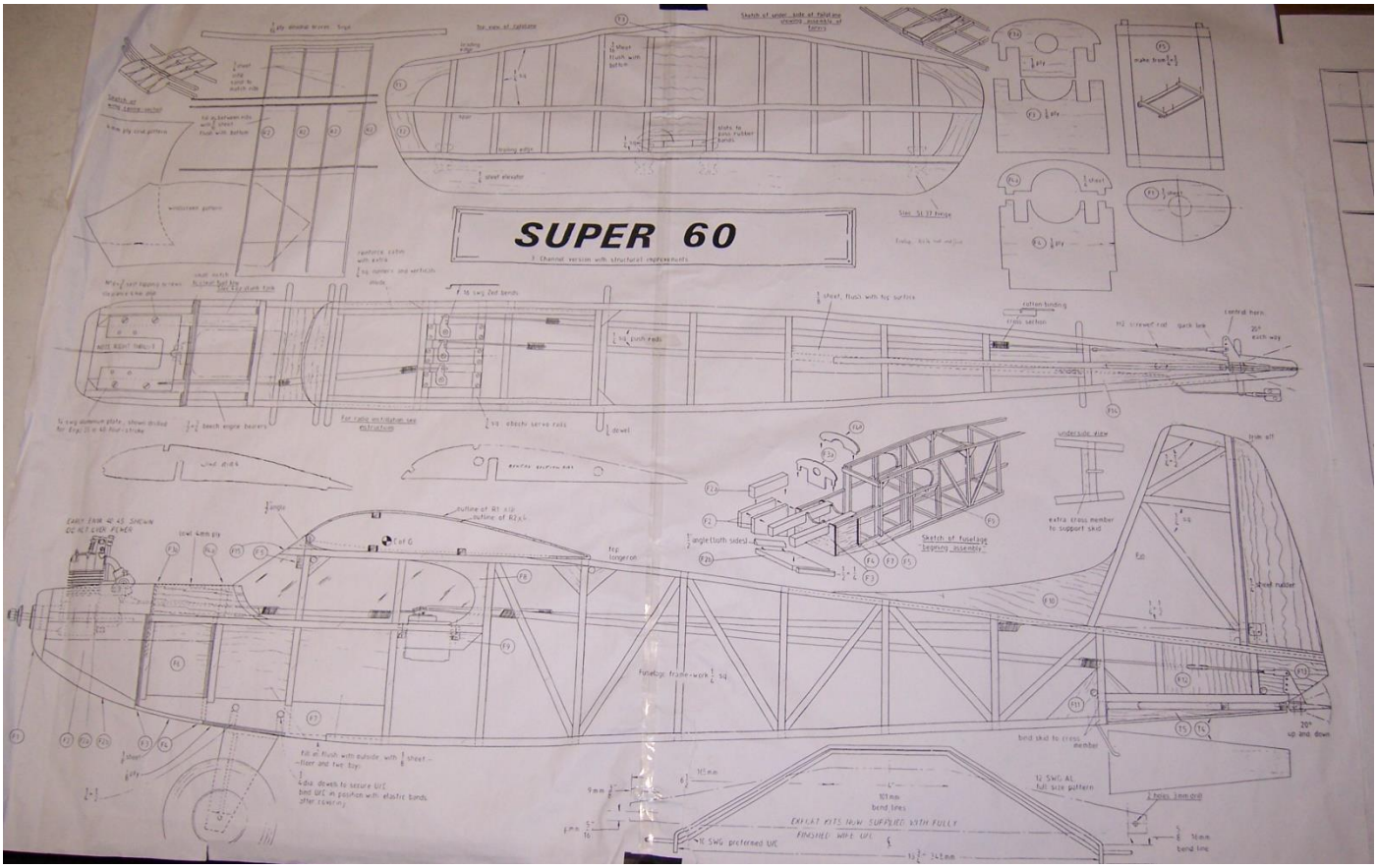
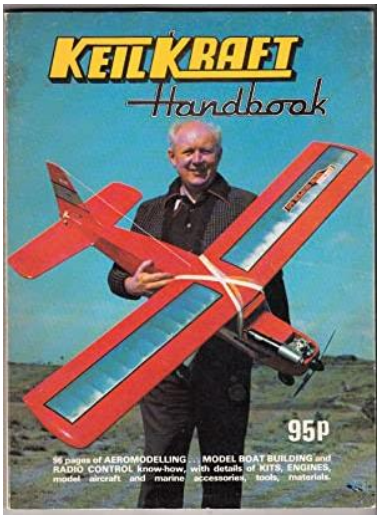
SUPER 60 BUILD LOG

I mentioned at the end of 2019 that I was planning to build a brace of electric models for flying at Kendall Park during 2020. The largest of these was the Keilkraft Super 60, a timeless design that first came out in 1961 as a single channel model, and which is still a popular trainer/sports design today.



When I first got back into RC nearly 10 years ago, a 3-channel Super 60 was to be my 'large' trainer, as I could remember the 1979 Keil Kraft Handbook I had received as a birthday present, which had a very smart Super 60 held by its proud owner on the front cover.



In short, I'd always wanted to build one since first getting into aeromodelling.

However, I was 'persuaded' by experienced club flyers to go with a kit built 4-channel Great Planes PT40 before I had got round to building the Super 60, as I already had my 'wings' with a 3-channel Hobbyzone Super Cub.

The PT40 served me very well, both for my own training/sport flying and as a solid glow trainer for instructing newcomers to the hobby. However, after over 350 logged flights over the years, several inevitable prangs, and changes in my own views as to what is the best all round 'tool' ***for me*** for instructing newcomers, I have now decided to retire the PT40 completely, and scratch build an electric Super 60, eventually with two sets of wings, one with and one without ailerons.

The criteria for me choosing the design were;

- I'd always wanted one to fly as my own sport model,
- Good size for training/sport flying, while not being too expensive to set up as an electric model
- As an electric model, ideal for training (no significant fuel cost)
- Suits my preferred flying style (I enjoy 3-channel flying) while having some aerobatic capability (4ch version)
- Can be built light enough for good endurance with electrics
- Lots of positive on-line feedback regarding Super 60 builds etc
- All built-up structure, therefore relatively cheap to build the airframe, and can re-use servos from the PT40.
- It's a 'classic' – why wouldn't you build one!?

There is an age-old argument in model-flying circles as to which is best for training newcomers to RC flying, three or four channel operation. It's frustrating there are some in the hobby who refer to 3-channel operation as nothing more than 'guided free-flight' – my 3-ch Sharkface will loop, roll almost axially and can cope with more wind than some much larger and supposedly more aerobatic models.

My own experiences have convinced me that the only true answer to the question of 'which is better' is…***neither***, they are simply different; it simply depends on what the aptitude of the individual learner as to which may be more appropriate for learning on – there is more than one viable approach to learning to fly RC (don't get me started on the merits of powered gliders…).

Perhaps some more experienced model flyers lose sight of what the MFNZ wings program is actually for, ie ensuring the ***safe*** operation of model aircraft.

It is entirely possible to gain the basic 'Wings' certificate with a rudder/elevator/throttle (RET) model and continue sport flying without having to resort to 'full-house' (4ch) operation. However, most flyers who start with a 3-channel model choose to progress to 4-channels as the options for future models are much increased.

It would also be more difficult to fly fairly accurate aerobatic manoeuvres with a basic 3-channel trainer (though not necessarily impossible, depending on the model), important if you are wishing to complete your Advanced Power (Aerobatics) cert.

What I have noticed over the last few years of instructing is that ***starting*** on 3-channels is ***generally*** easier for older newcomers than 4-channels. For some individuals it allows quicker success in flying 'solo', perhaps because there is one less control to worry about.

In Mode 2 operation, where the rudder function can be re-assigned to the aileron channel, this allows single stick flying once the throttle level is set, just like aileron/elevator function on a 4-channel model (and, indeed, similar to the joystick on some full-size light aircraft). Once the learner has started to gain confidence in consistent circuits, altitude control and general throttle control, a decision can be made whether to move to 4 channels or not. As long as a beginner eventually understands the differences in ***how*** a model turns with RET control compared with full house, and can reflect on the potential of both systems, the choice is theirs.

I've read that the Super 60 flies equally well on 3 or 4 channels, although it is certainly more versatile with ailerons if aerobatics is your thing (but there are more suitable models for this anyway).

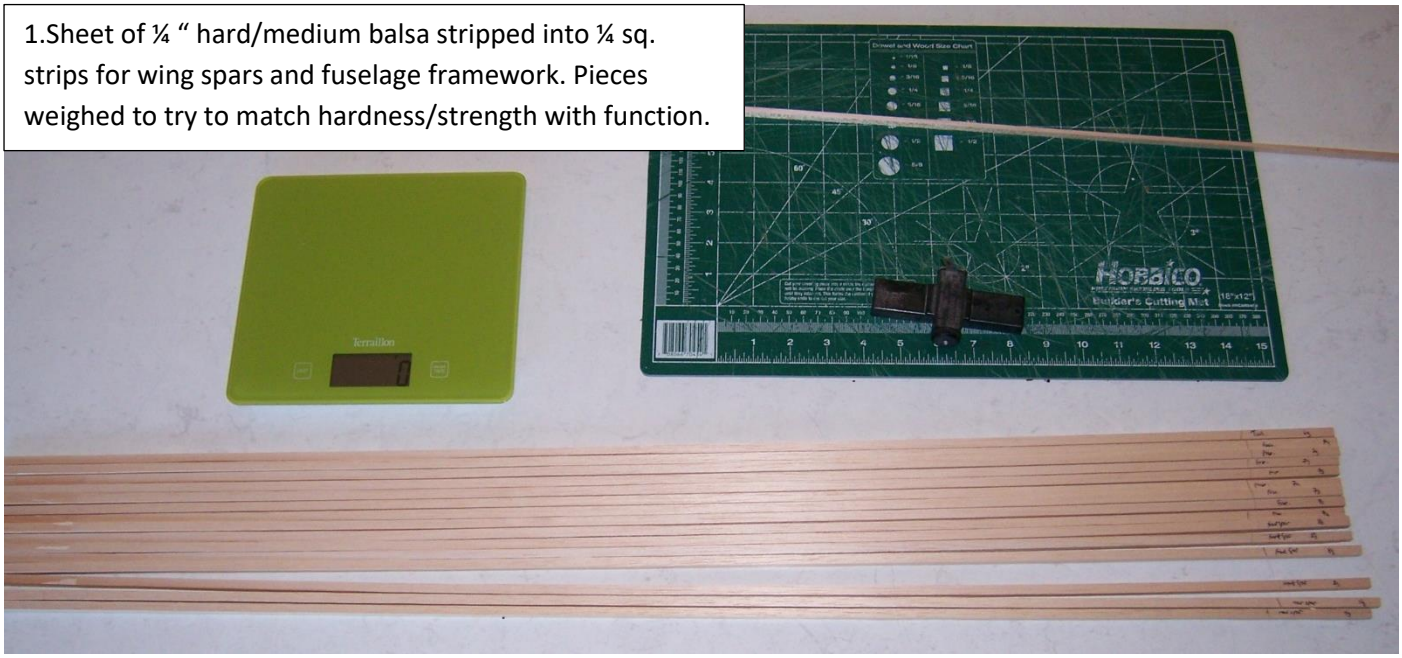
An extended stand-down from work gave me an extra few weeks, so a decision was made to start the 3-ch Super 60 build, the aileron wing coming perhaps later.

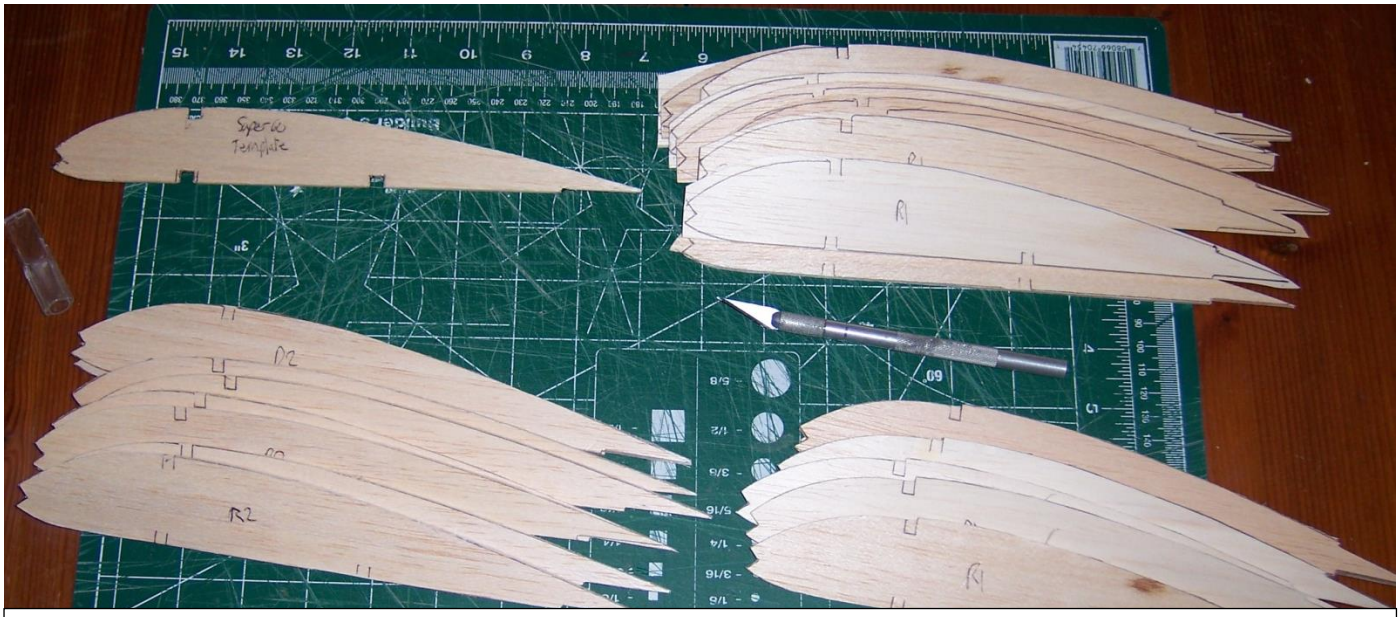
So here we go…

DAY ONE.*(31MAY2020)*

NOTE; Construction is very straightforward, BUT with some thought, it becomes apparent that the wing ***building construction sequence is critical***, if sufficient access for clamping components during gluing operations is to be maintained. LE sheeting must be left until dihedral braces are fitted, as these ***must*** be clamped. Also, main spar shear webs are fitted ***after*** the LE sheeting, as this requires clamping to the upper forward spar as the glue cures.

1.Sheet of ¼ " hard/medium balsa stripped into ¼ sq. strips for wing spars and fuselage framework. Pieces weighed to try to match hardness/strength with function.

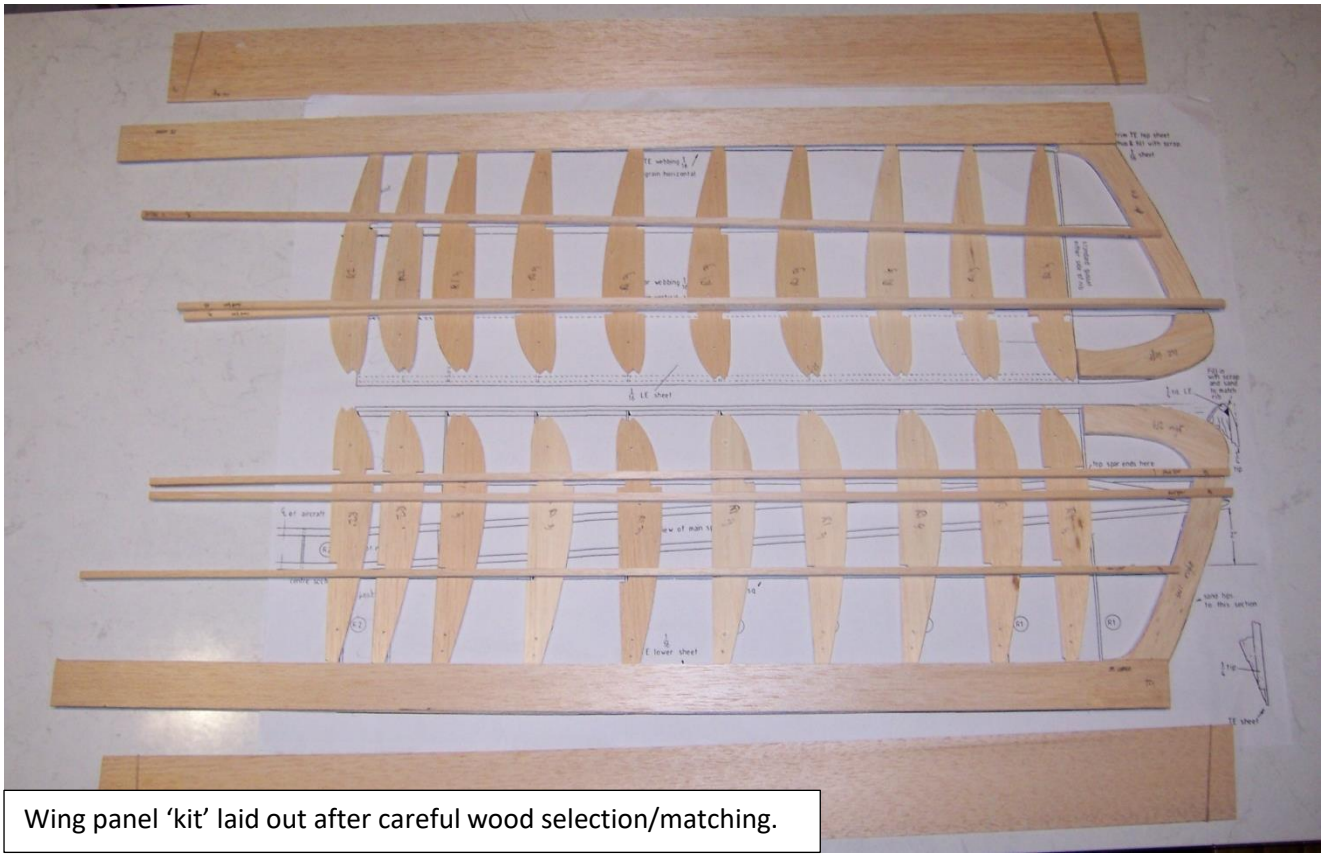




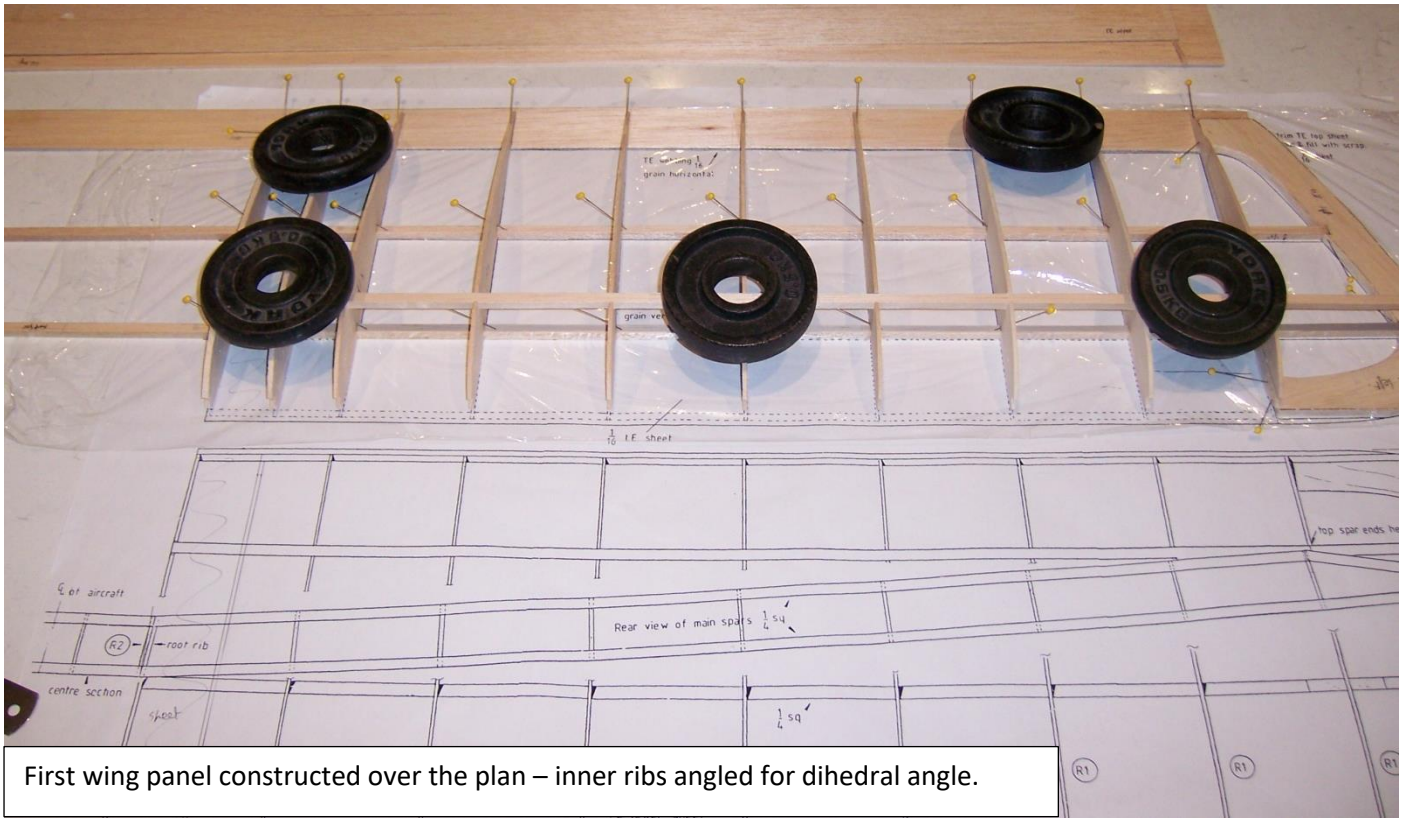
2.R1, R2 ribs marked out using template and carefully cut with knife. Scrap-box 3/32 sheet used where possible - ribs are not key 'structural' components. They will be weighed later to try to match each wing panel.

DAY TWO*.(01JUN2020)*

Ribs stacked, sanded and spar-slots cut/filed.

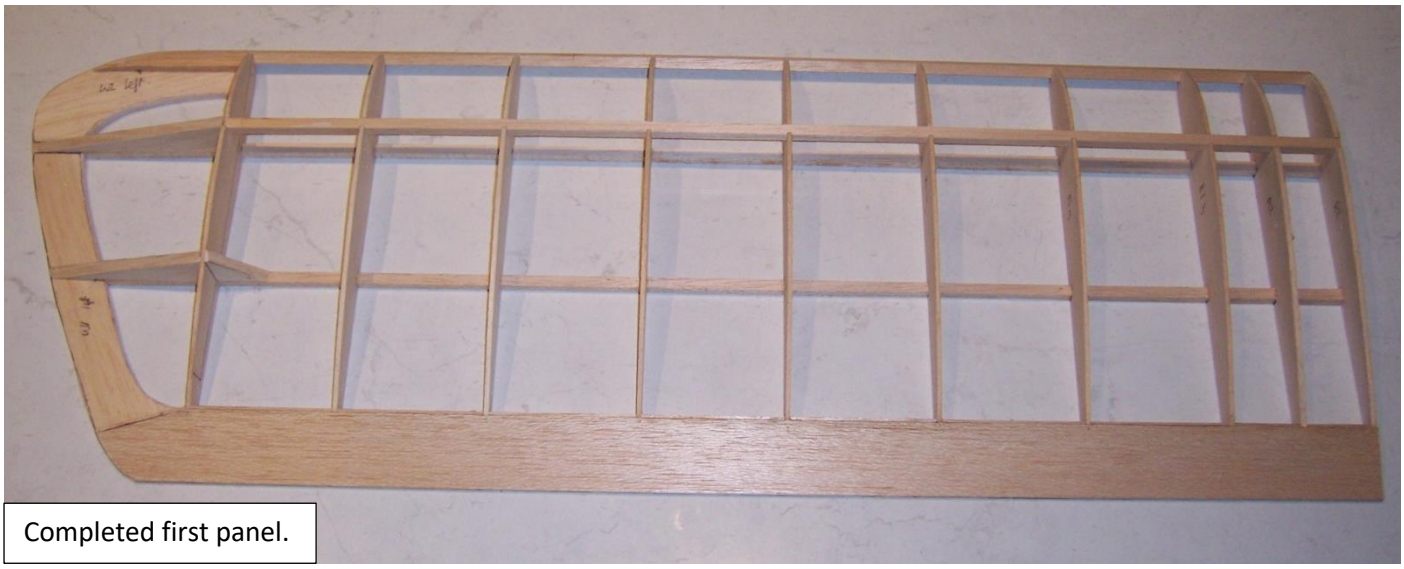


Wing panel ‘kit’ laid out after careful wood selection/matching.

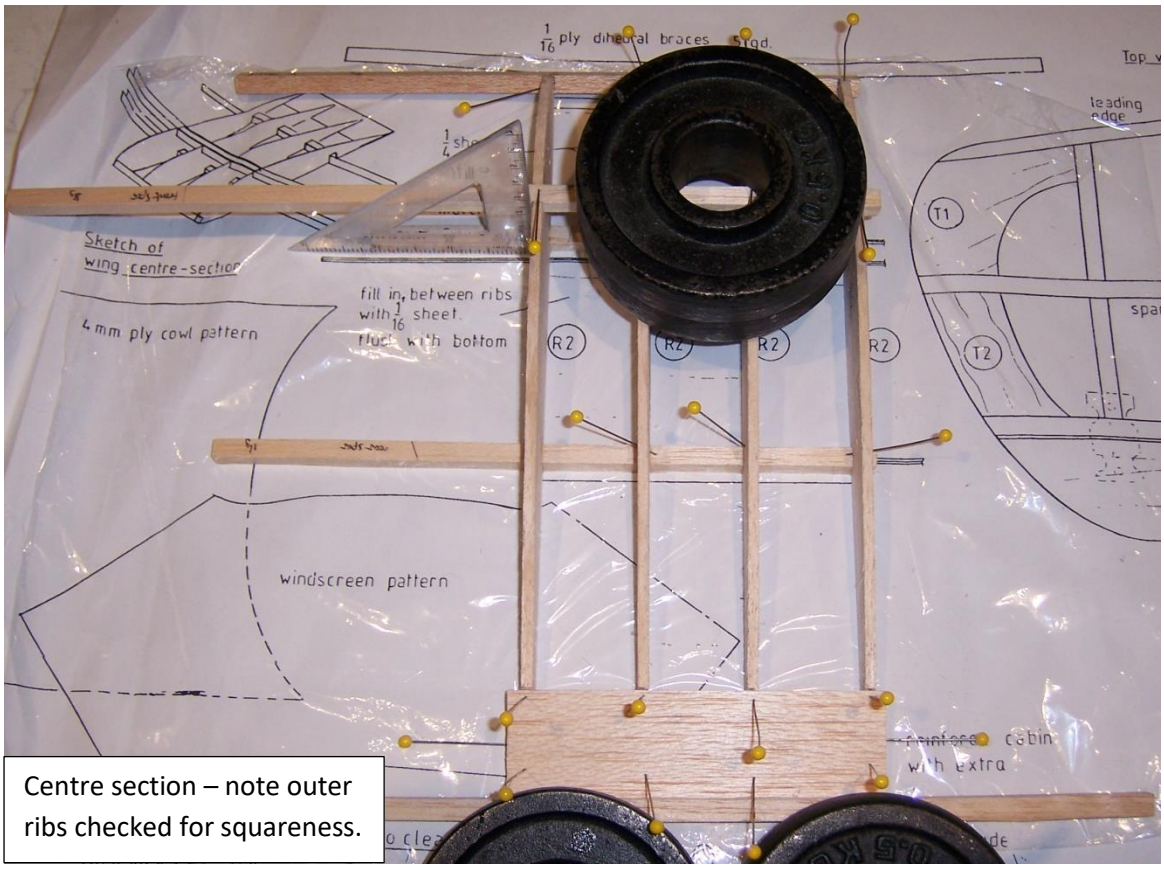


First wing panel constructed over the plan – inner ribs angled for dihedral angle.

DAY THREE. *(02JUN2020)*

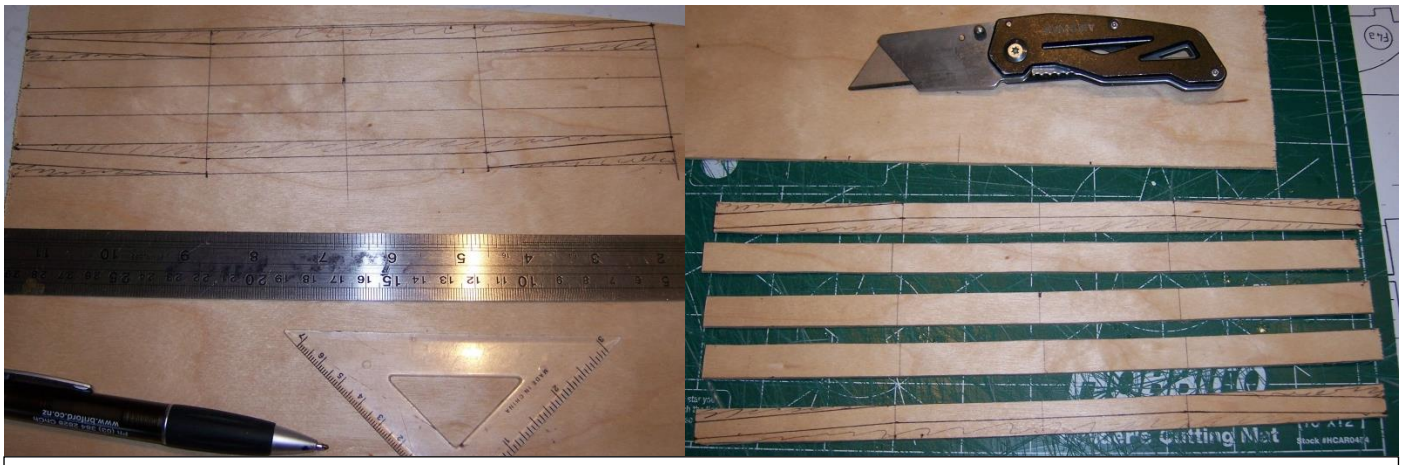


Completed first panel.

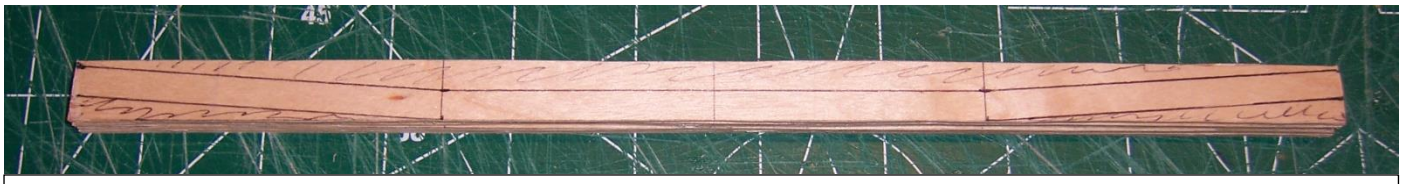


Centre section – note outer ribs checked for squareness.

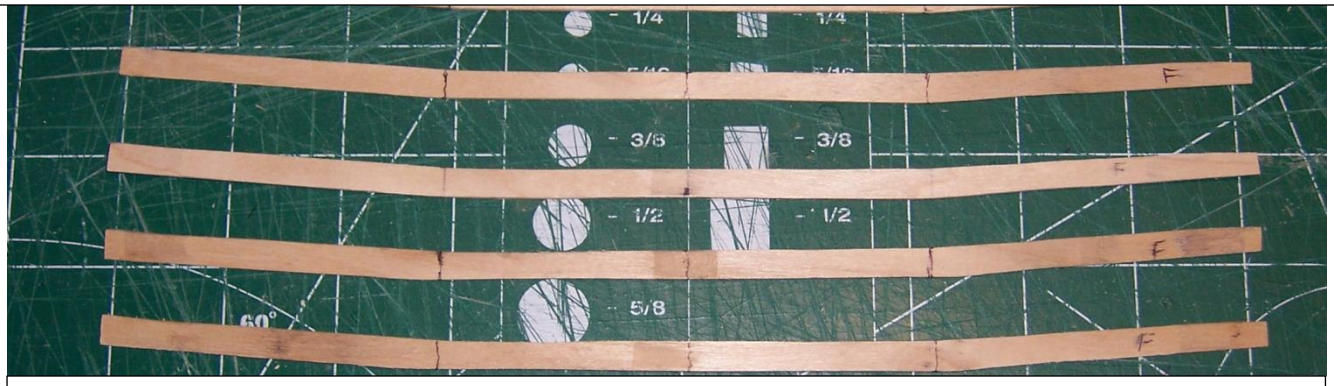
DAY FOUR.*(03JUN2020)*



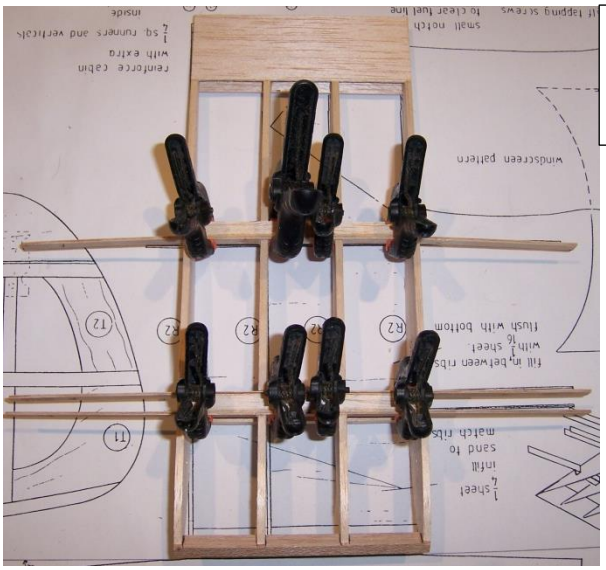
Marking out for 5 identical dihedral braces from 1/16” birch ply. Made using sandwich method to ensure they are as similar as possible. Blanks cut out using heavy ‘Stanley’ knife (No11 blade too fine and wears too fast on ply)



5 dihedral brace blanks taped together with double sided sticky tape for cutting out with power fretsaw, then sanding for cleaning up edges.

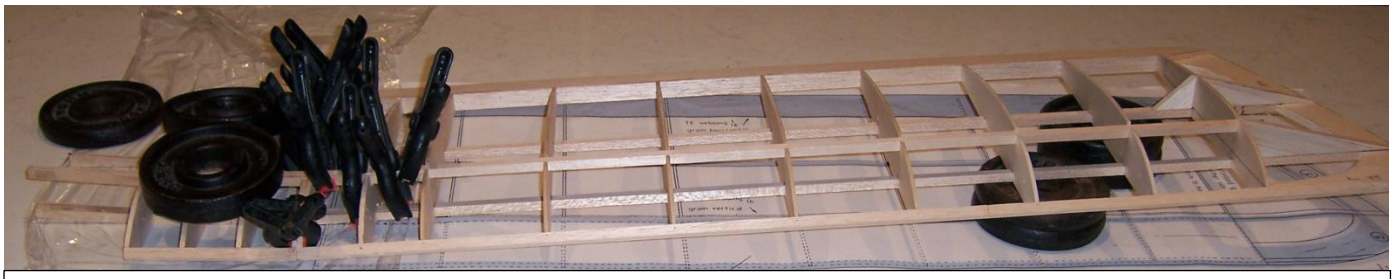


As well as cleaning up edges, surfaces are sanded to roughen slightly and clean off residual adhesive from sticky tape. Front/rear surfaces marked F and R so that they can be aligned as closely as possible.

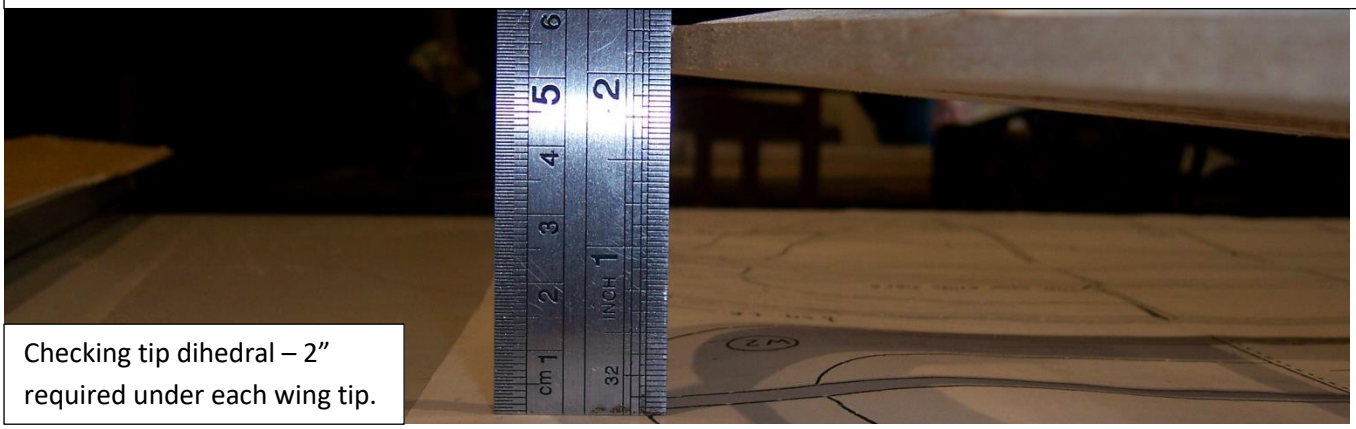


Slots are carefully cut into the centre section ribs using a razor saw, the braces are carefully aligned and then glued, clamping securely to ensure good adhesion.

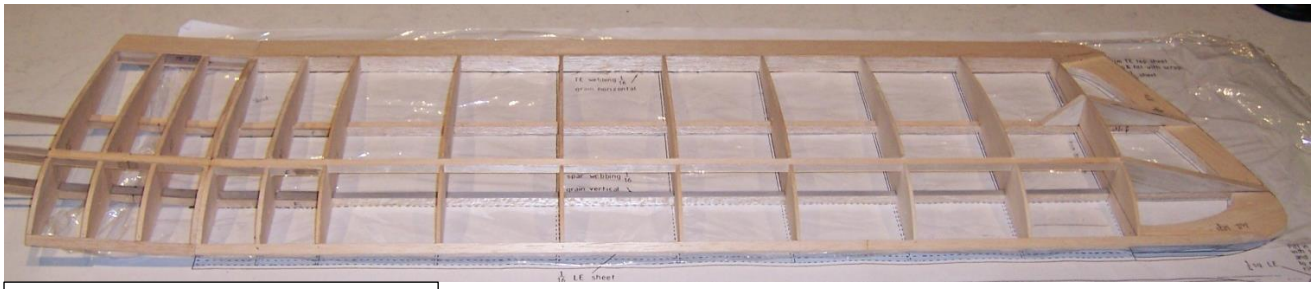
Slots again cut, this time into the root ribs of the wing panel. It is important that the braces can slide in smoothly, as once glue is applied to the ribs/braces/spars, time becomes a factor for assembling accurately before the glue begins to cure – I used PVA here, but some may prefer 24 hour epoxy.



Centre section mated with wing panel after glue applied – some ‘working into joints’ required as glue can be wiped off sliding braces into position. Care taken to align centre and wing panels accurately; tips blocked up and centre weighted so it remains flat on the board. Operational sequence is critical to allow adequate clamping.



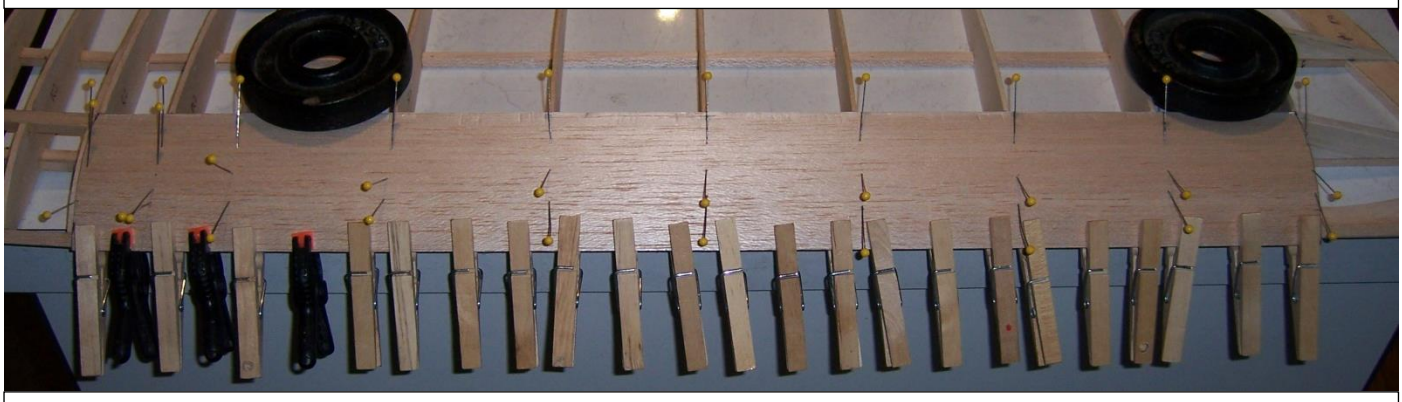
Checking tip dihedral – 2” required under each wing tip.



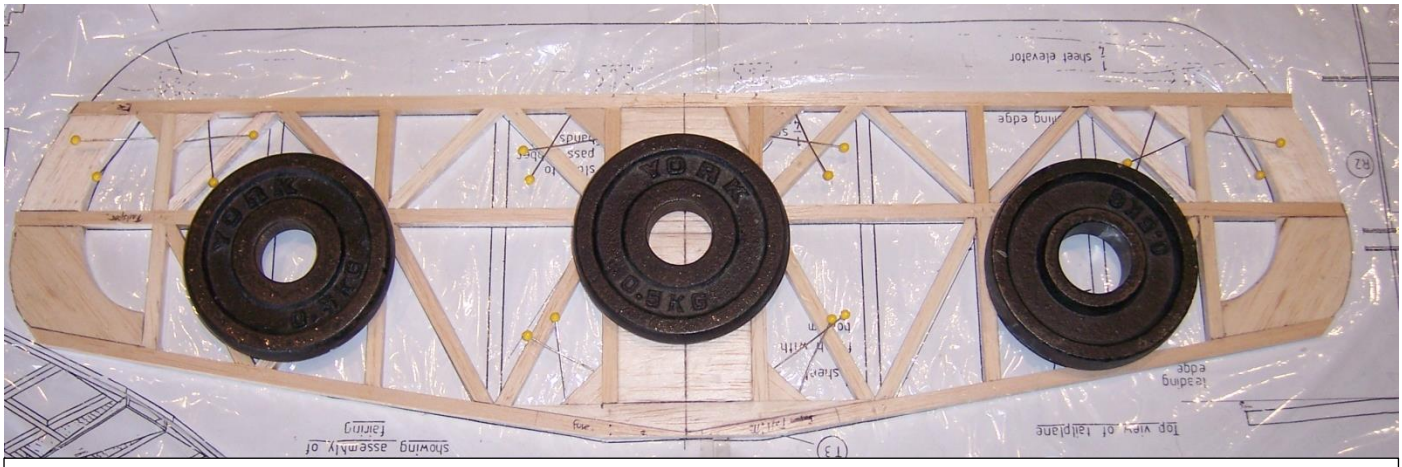
Work completed by end of Day4.

DAY FIVE*.(04JUN2020)*

Rear edge of LE sheeting glued and clamped; maintaining the correct curvature of this sheeting is critical, so I've found it is best to carry this out in two stages to allow sufficient time for adequate clamping before the PVA begins to set .

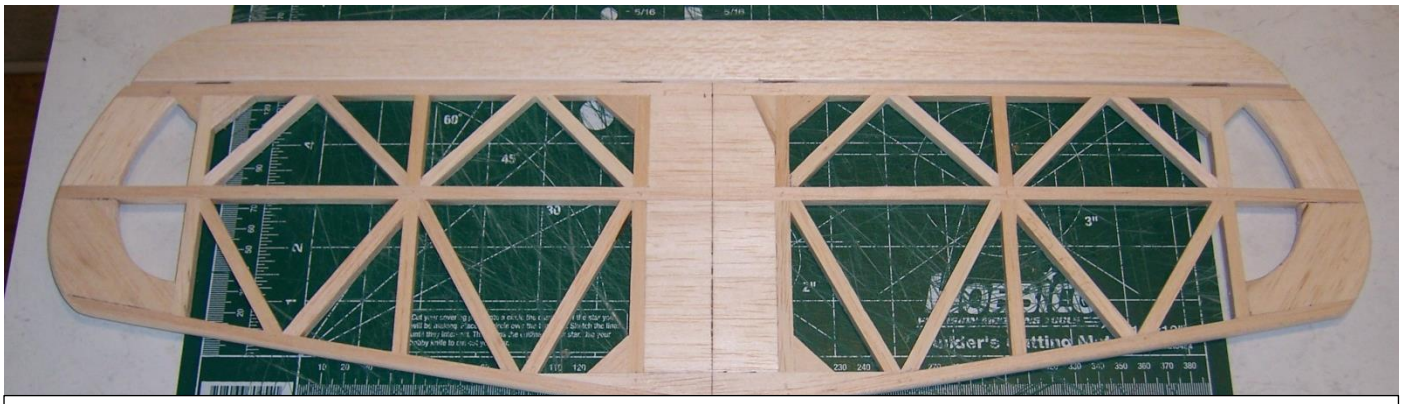


Once the rear edge PVA has cured, the underside of the sheeting is marked with the rib positions and glue applied, as well as applied to the top surface of the LE. The sheeting is carefully pulled tight to the curve of the rib and clamped along the LE, extra pins applied to try and ensure the upper edges of the ribs remain in contact with the sheet as the PVA sets. Thin CA glue can also be used for this area, but I have found that PVA gives a better joint (less brittle), even though it takes longer to execute.

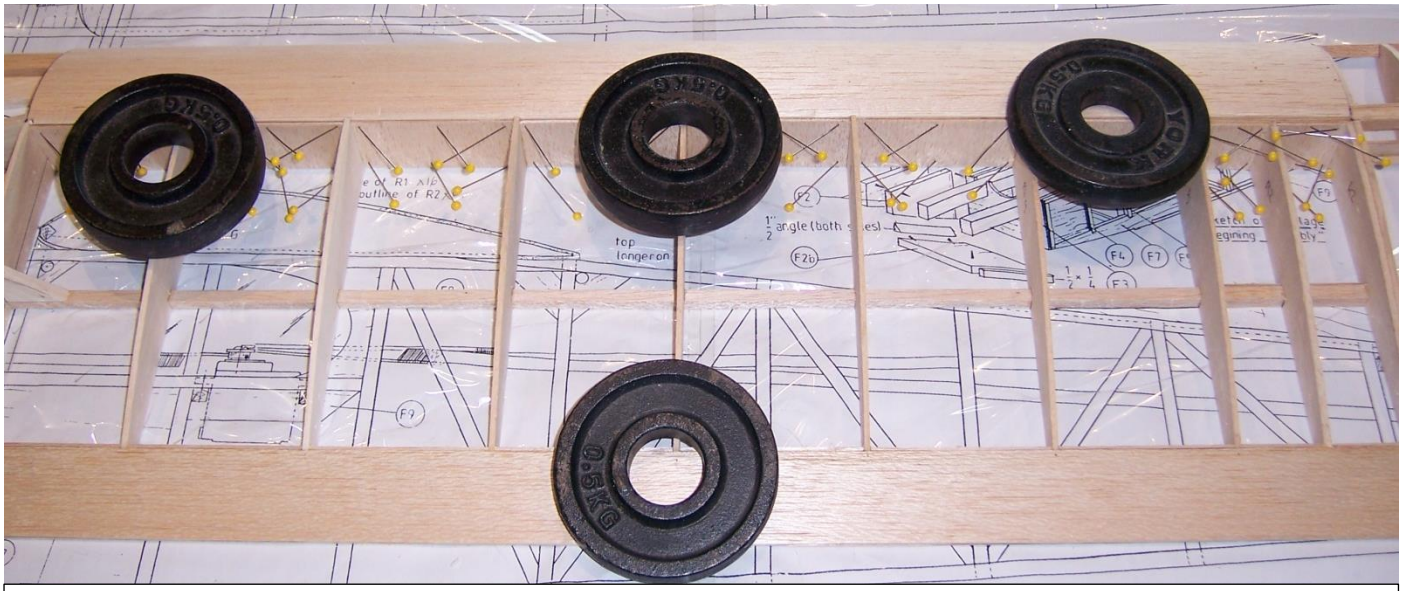


While LE sheeting joints were curing, the tailplane was started, with a few changes to the plan structure. Some of the structural members are replaced with diagonals as these help prevent any warping during covering. Also, gussets are added where the hinge-slots are to be cut to provide a little extra 'meat'. The tailplane will be glued permanently in place, so slots for rubber bands as shown on the plan are unnecessary.

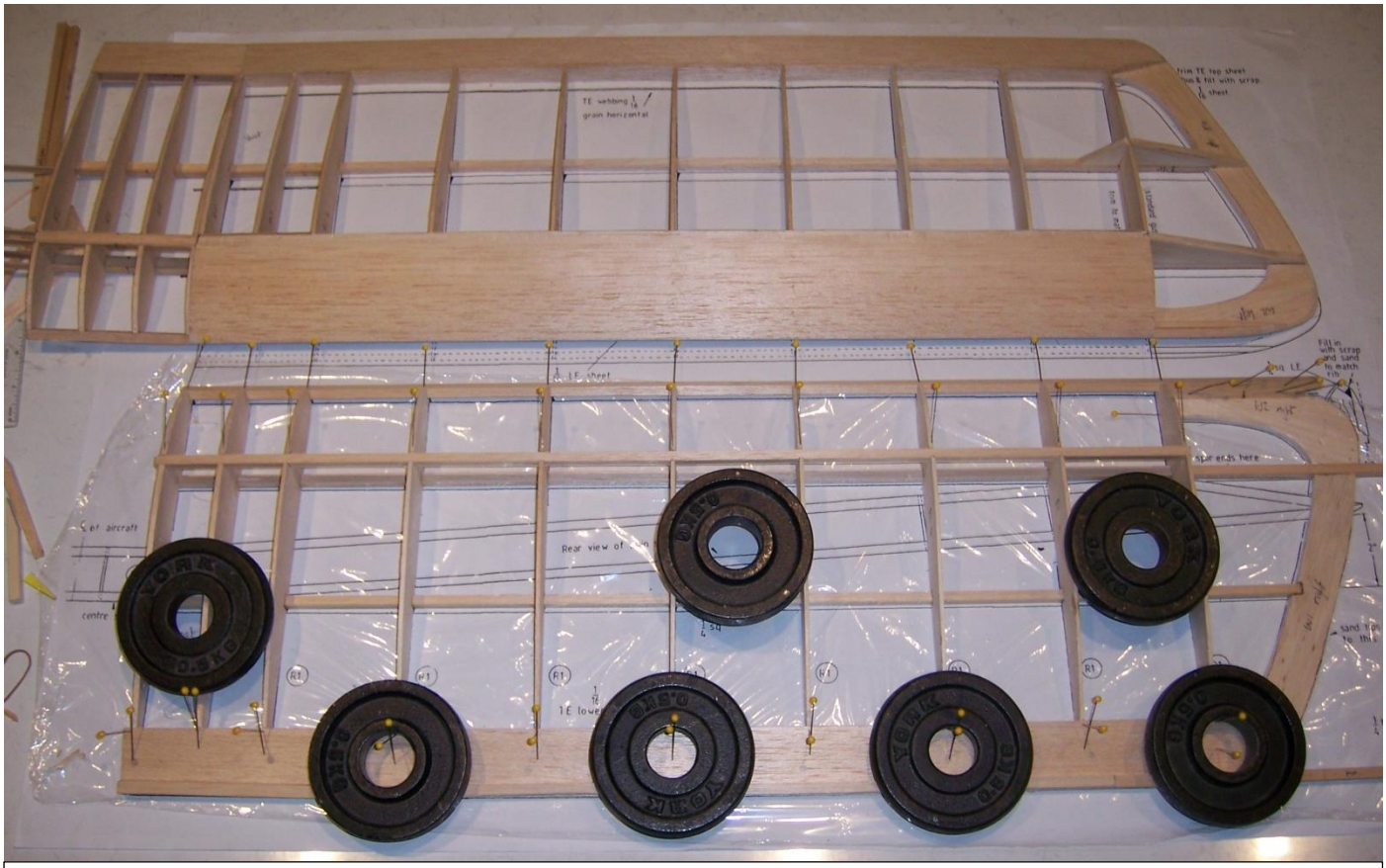
DAY SIX.*(05JUN2020)*



Tailpane and elevator completed, sanded to shape and hinge-slots cut and hinges temporarily fitted.



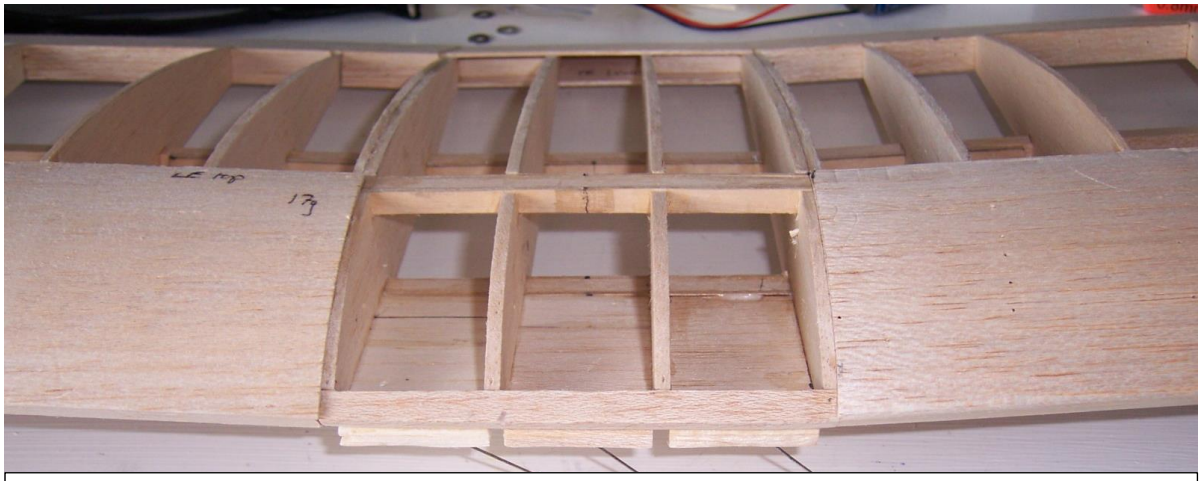
Main spar shear webs fitted and glued on LH wing panel.



With LH wing panel construction complete, all build steps prior to joining to centre section repeated for the RH wing panel.

DAY SEVEN.*(06JUN2020)*

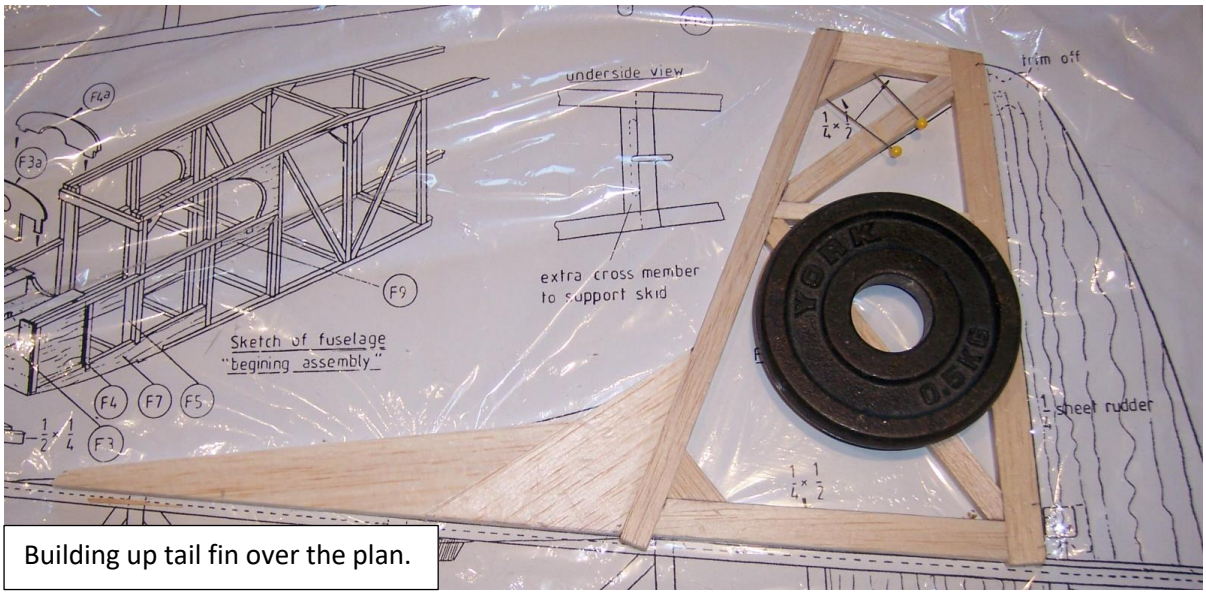
Final panel wing joining; again, care taken with setting correct dihedral (2” at tip). Once satisfied with position, joint clamped firmly and left several hours before unclamping for next build step.



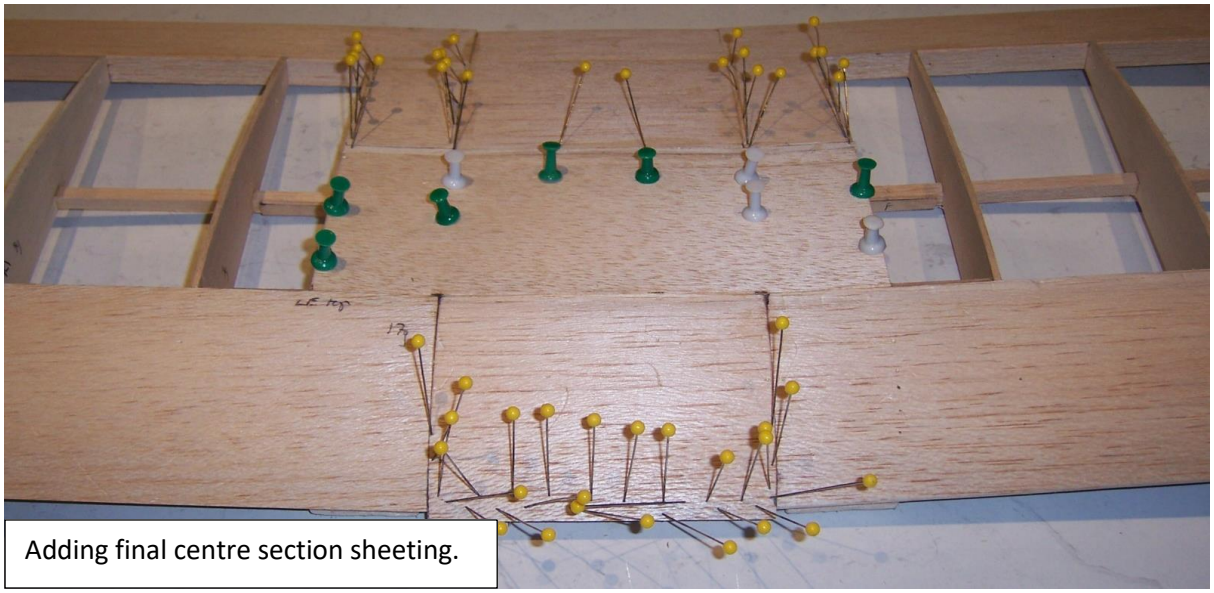
After adding LE sheeting and main spar webs to RH panel, centre ¼ “ LE under sheet added. Note TE stock inserts between TE sheet; this is to help ensure structure does not ‘crush’ when wing is banded on firmly.

DAY EIGHT.(07JUN2020)

Centre under side 1/16 sheeting added between ribs out to first half-bay of outer panels to support wing reinforcement bandage which will be added around dihedral joints.

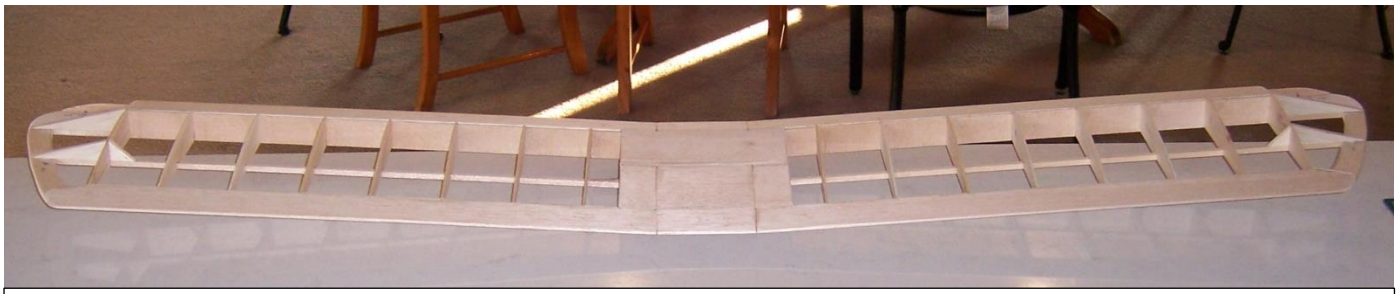


Building up tail fin over the plan.

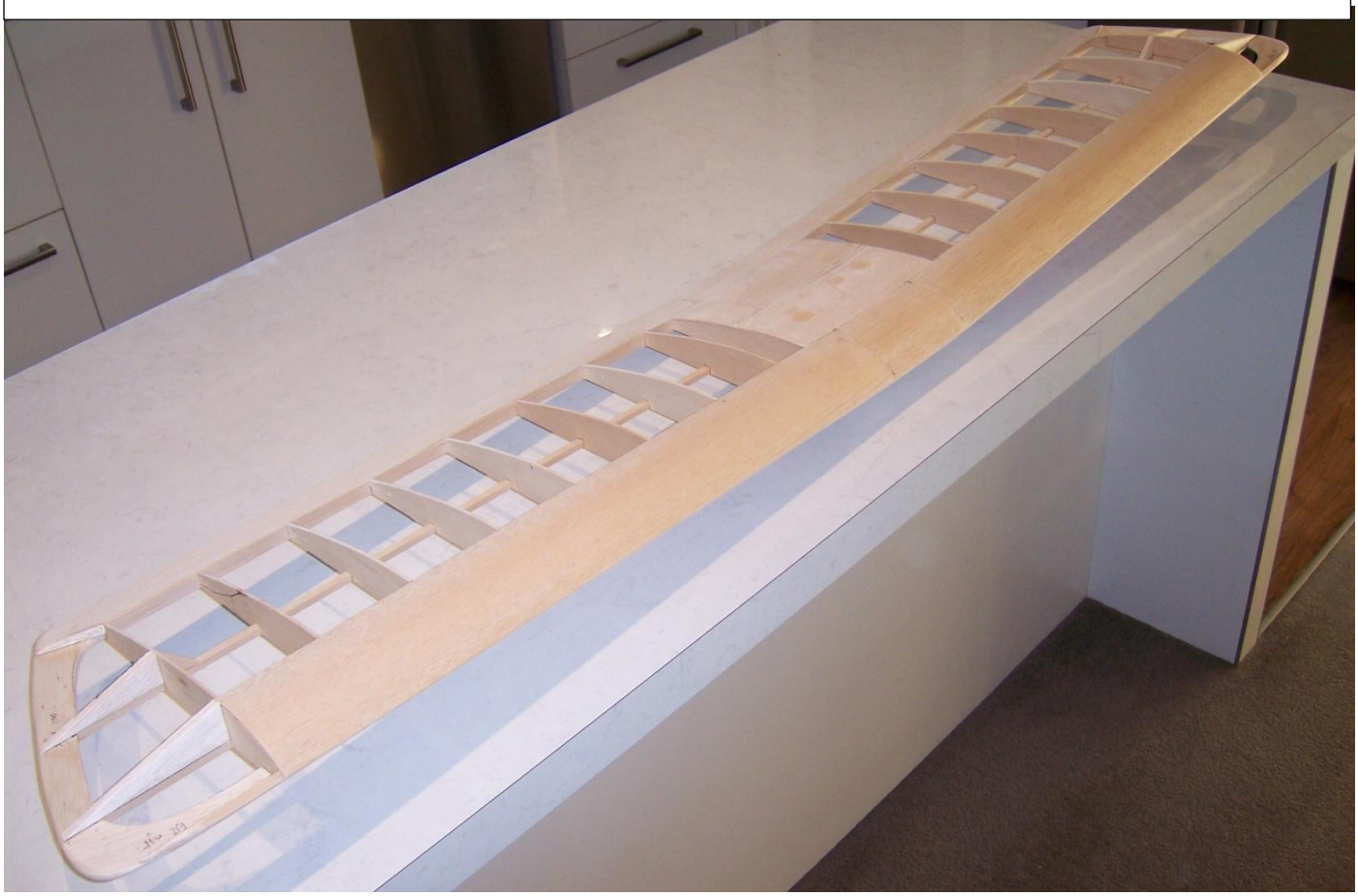


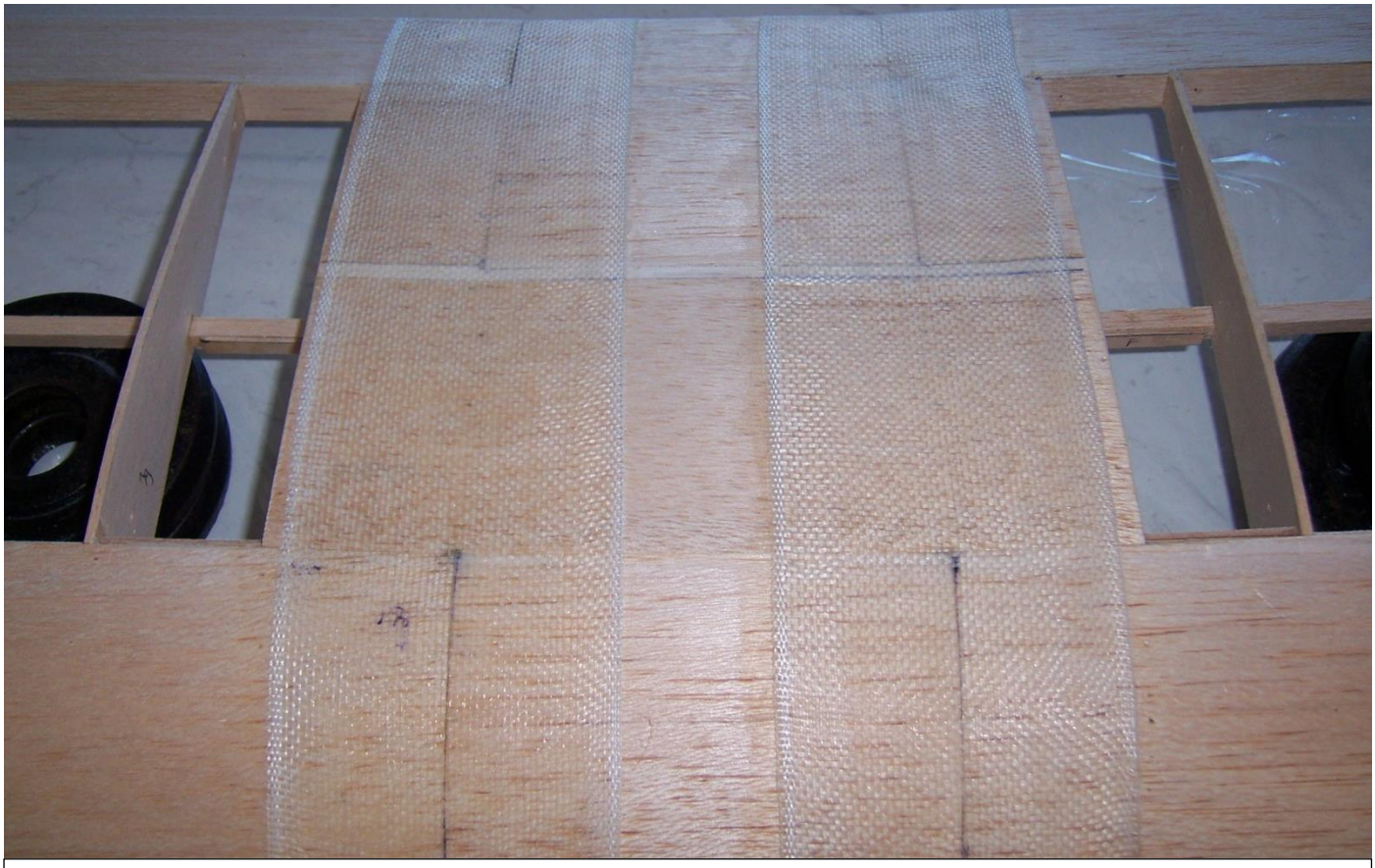
Adding final centre section sheeting.

DAY NINE.(08JUN2020)

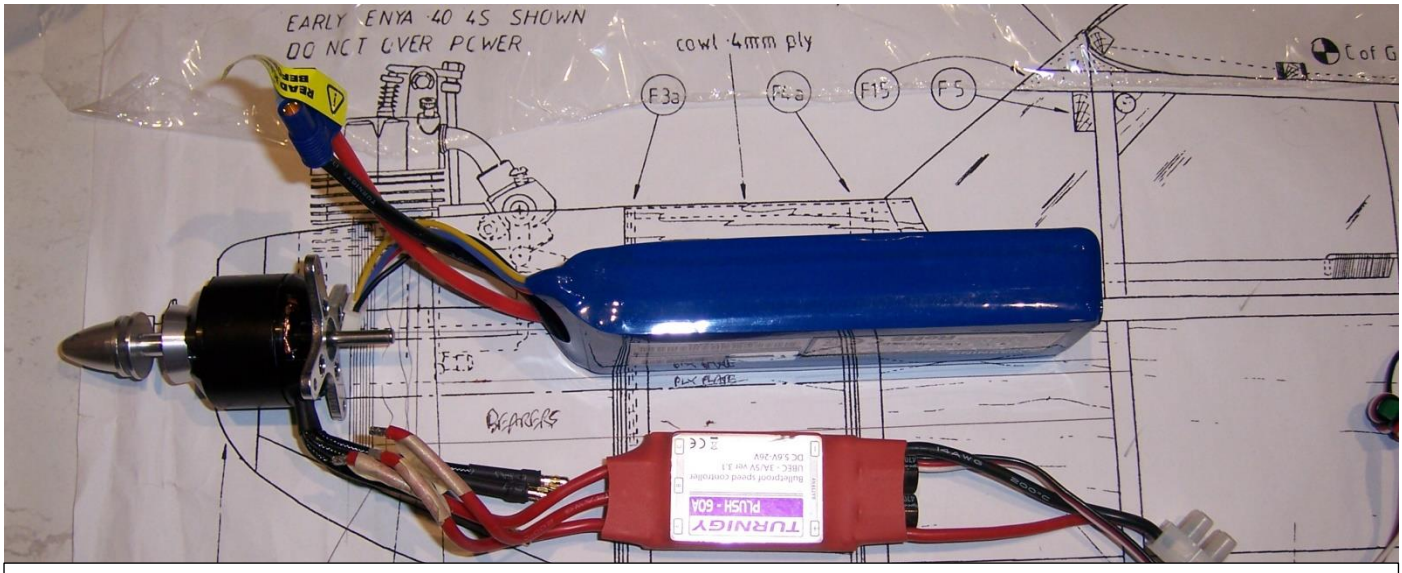


Final shaping and sanding of main wings completed!

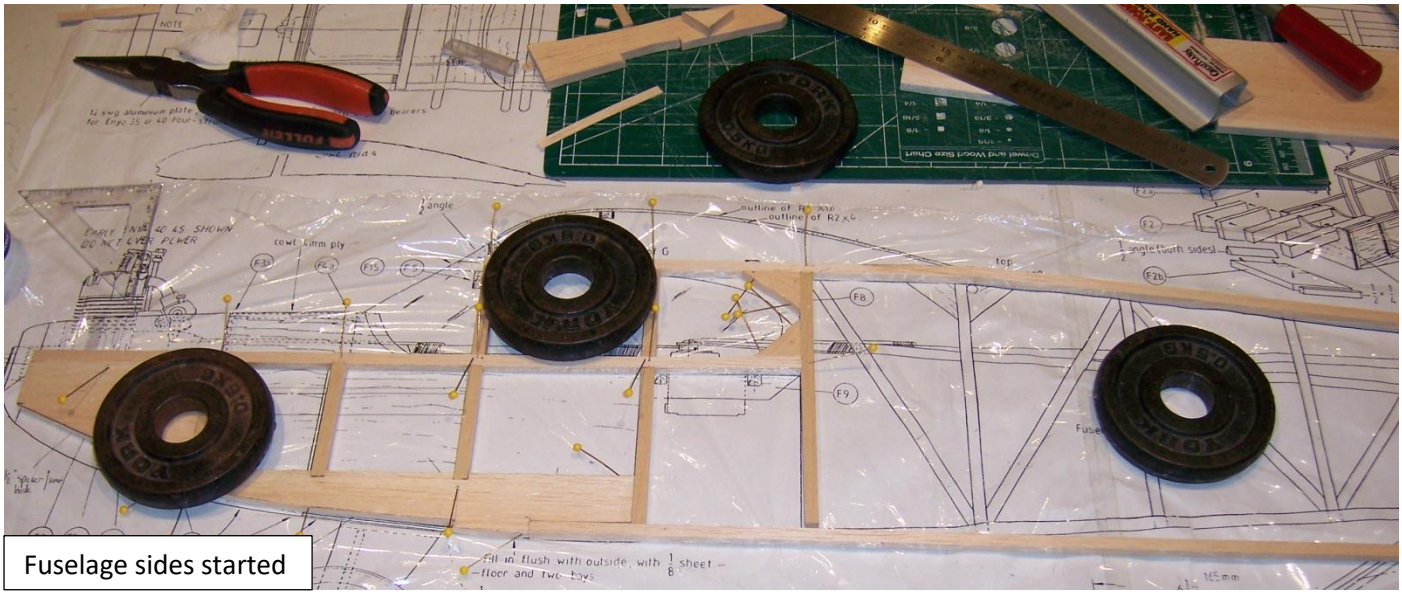




Wing join reinforcement bandages – 3” PVA soaked glass tape .These also provide protection against wing bands.

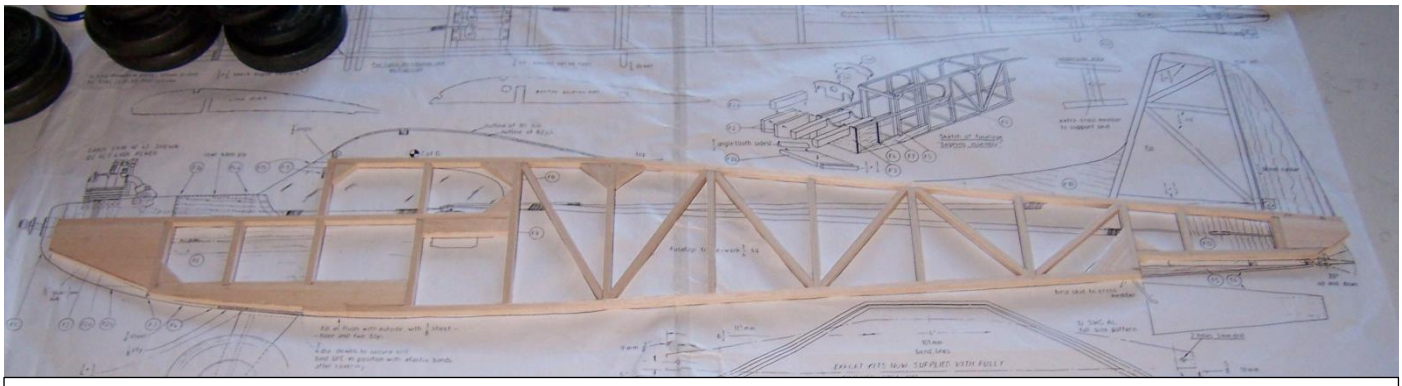


Before commencing fuselage structure, motor, battery and ESC are laid over the plan to work out any required structural changes due to electric conversion. F3 is left out completely, bearers reduced in size and lowered to mount battery/ESC plate, new forward motor mount drawn in. This arrangement worked well in Ghost Rider.



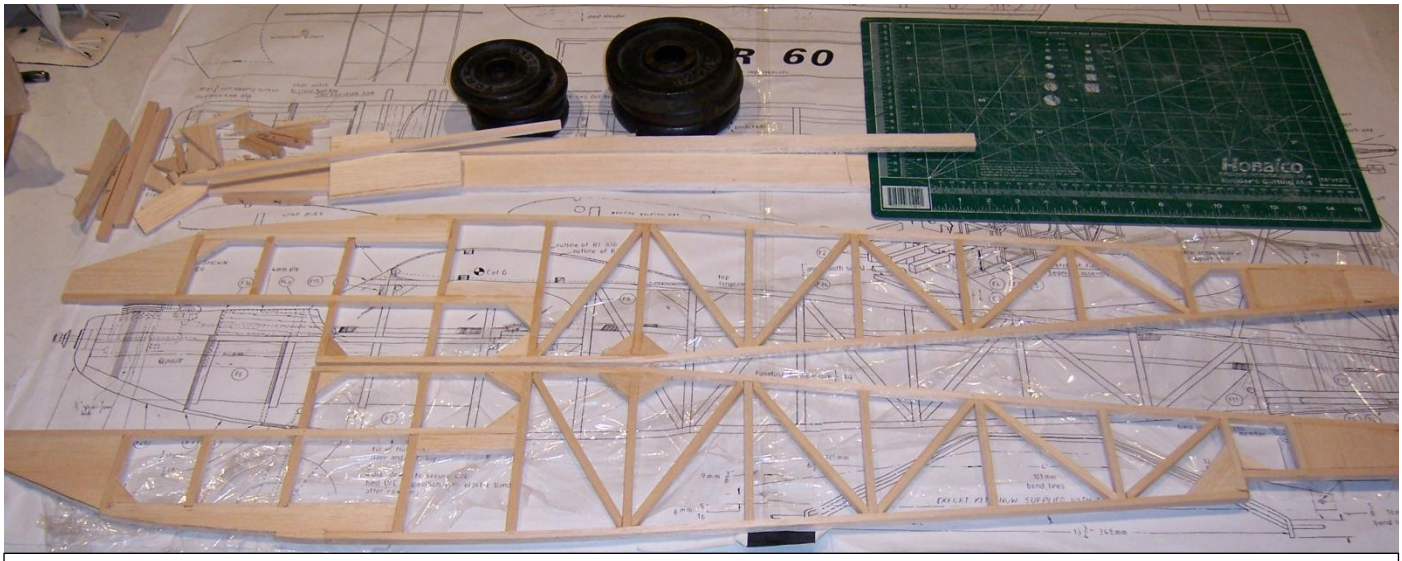
Fuselage sides started

DAY TEN.(09JUN2020)



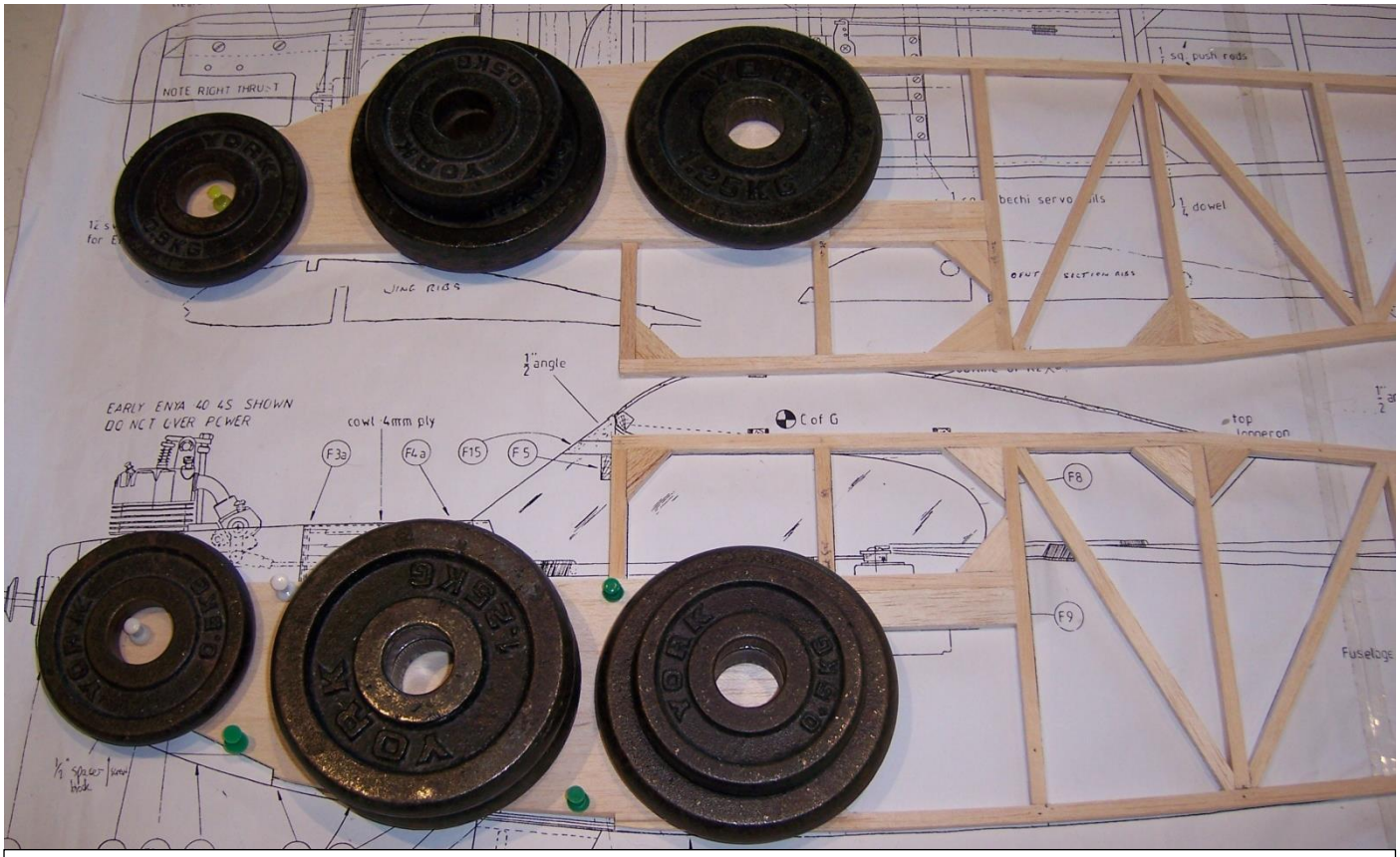
First frame completed

Construction of second side frame by laying over the first frame to obtain matched pair.

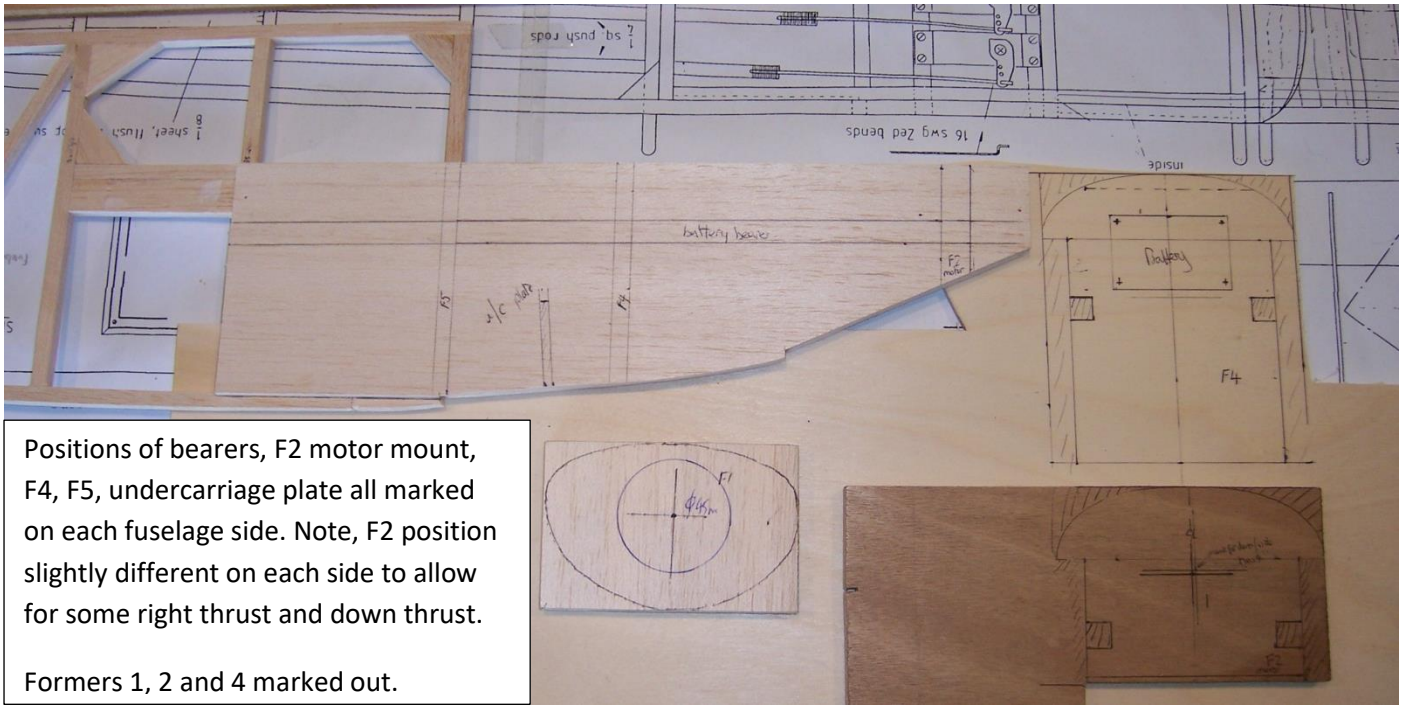


Two side frames complete. These require sanding before adding various doublers etc to nose area, before formers are added. At this stage, some reflection required to work out exactly how the electric conversion construction is to proceed.

DAY ELEVEN.*(11/06/2020)*

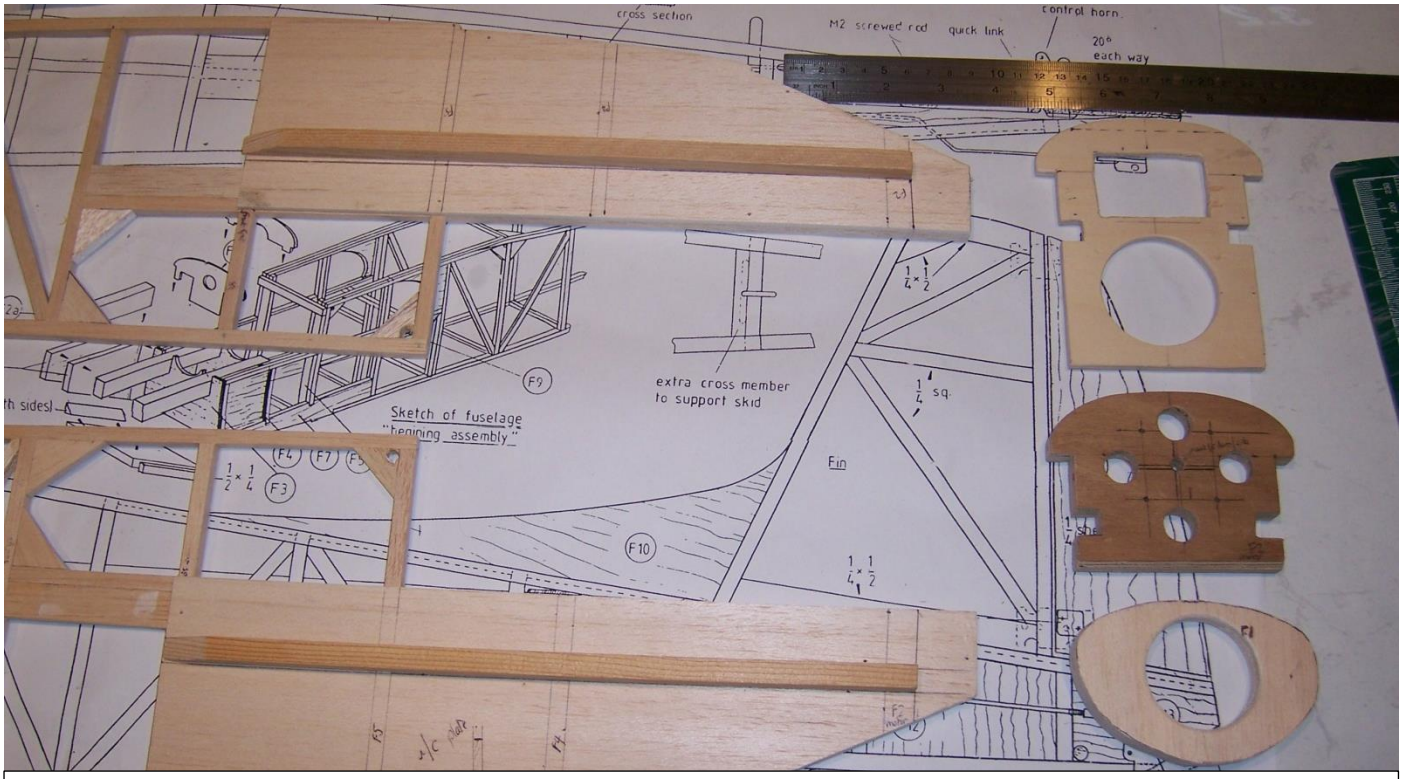


After some reflection, it was decided to change nose construction, allowing easy access for battery and ESC along similar lines to method used in the Ghost Rider build, i.e. use bearers in a suitable position as they provide structural rigidity as well as a secure anchor point for a dedicated battery/ESC mounting plate screwed into place. To allow this, 1/8” sheet balsa doubler glued to inside of both fuselage frames back to first cabin bay.



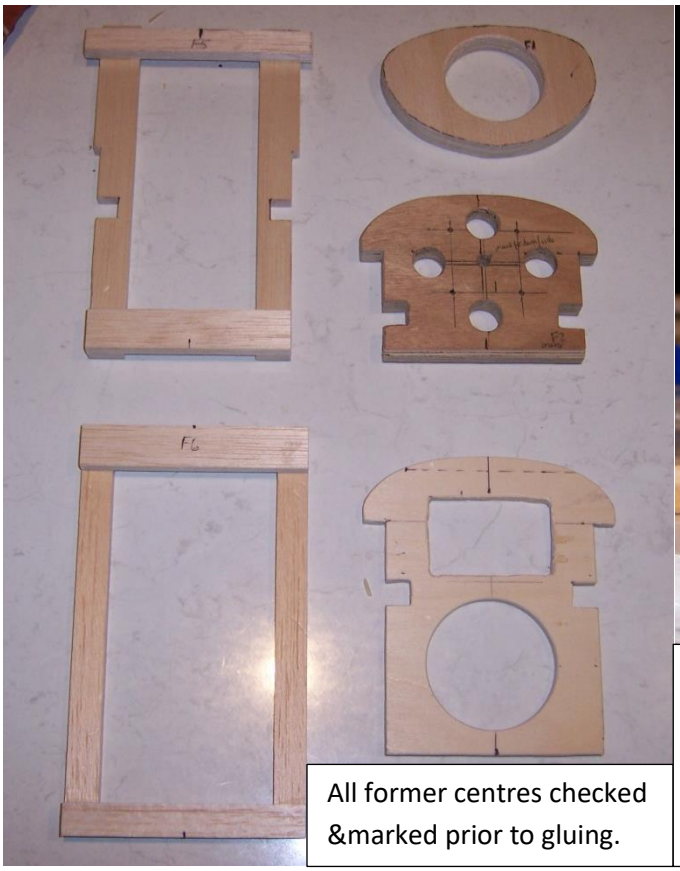
Positions of bearers, F2 motor mount, F4, F5, undercarriage plate all marked on each fuselage side. Note, F2 position slightly different on each side to allow for some right thrust and down thrust.

Formers 1, 2 and 4 marked out.

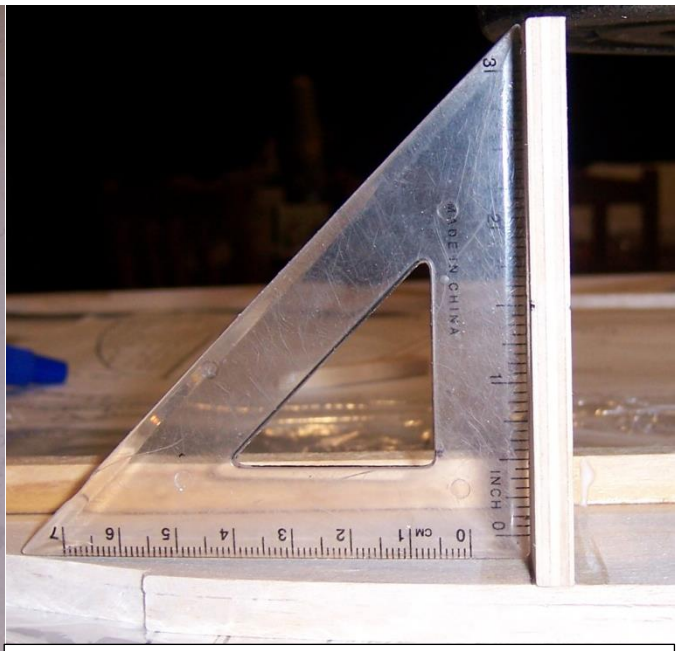


Formers cut out; F1 from 4 laminations of cross-grained 1/8 balsa sheet, F2 from 12mm gaboon ply - marked and drilled off centre to allow for right/down thrust as well as for ESC cooling holes, F4 from 6mm ply has holes cut for battery and lightness. Bearers are now glued in place, ensuring good fit with formers.

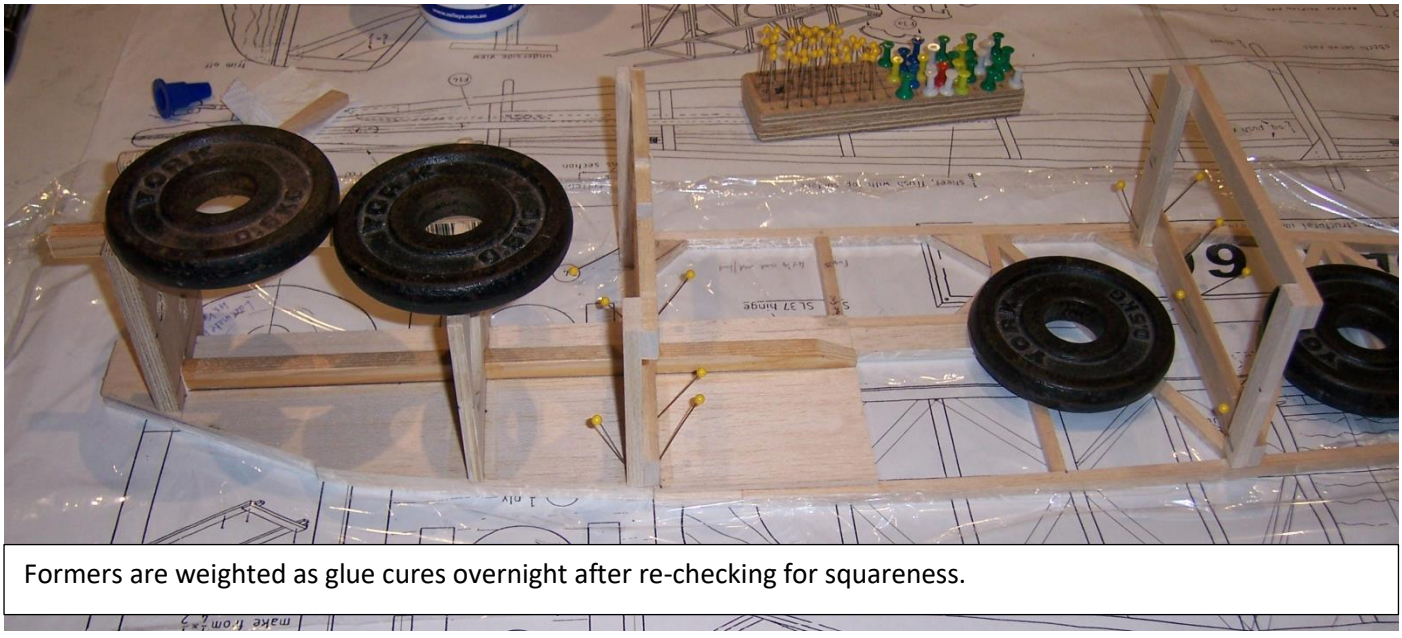
DAY TWELVE.*(12JUN2020)*



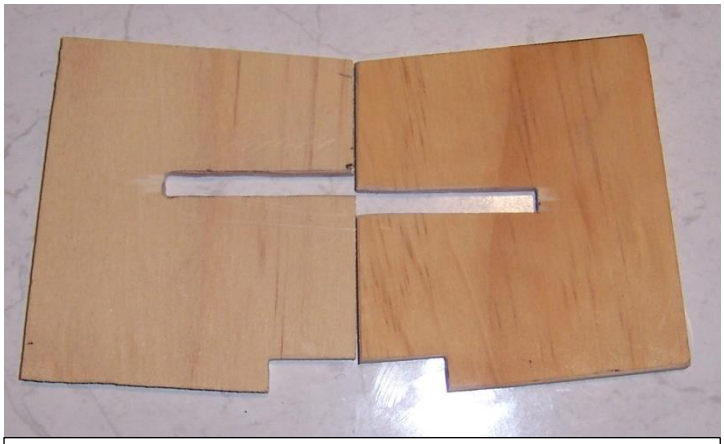
All former centres checked &marked prior to gluing.



Formers carefully glued to 1st fuselage side, ensuring squareness, except for F2 which is checked for correct amount of side-thrust angle. Care taken here is rewarded later when completing fuselage construction – 'banana' fuselages are hard to trim!

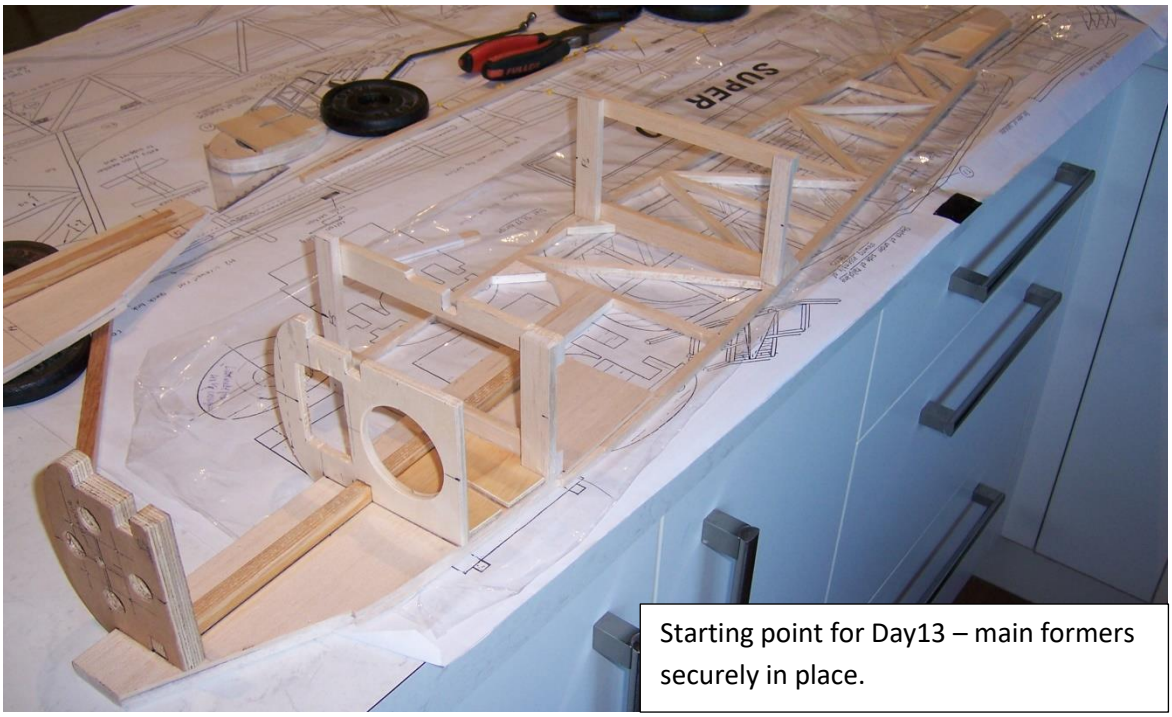


Formers are weighted as glue cures overnight after re-checking for squareness.

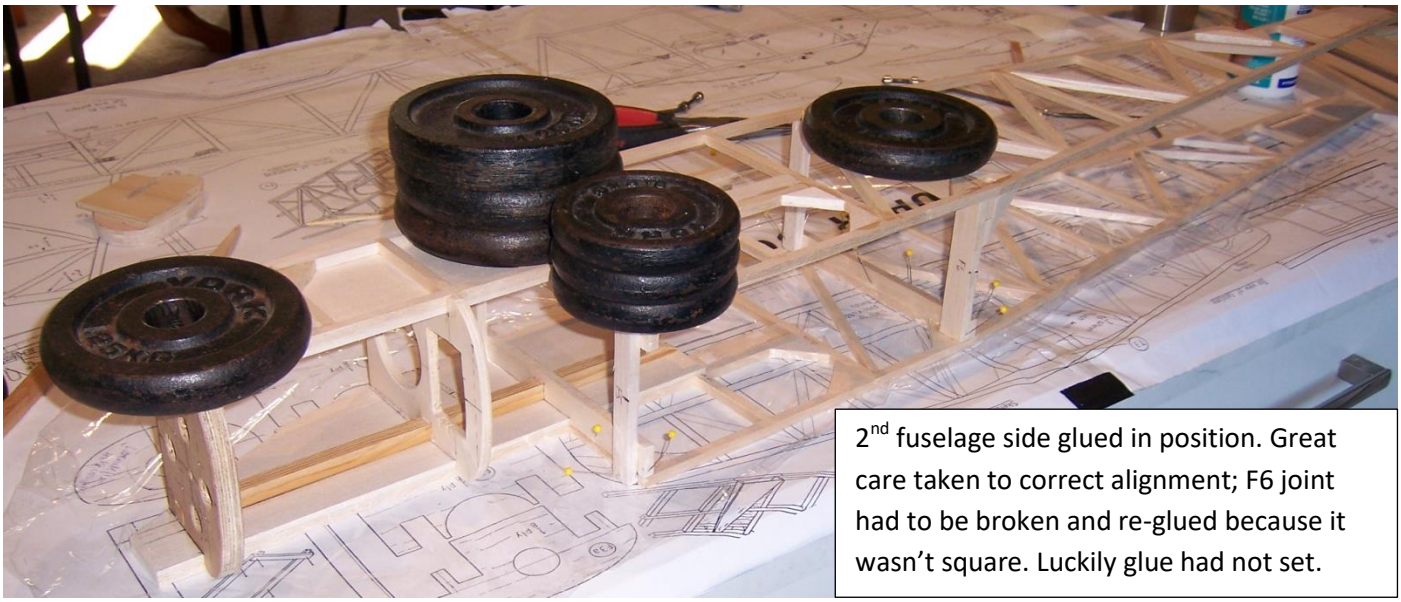


Undercarriage mounting plates made up – note slots cut are staggered to allow legs to fit next to each other.

DAY THIRTEEN.*(13JUN2020)*

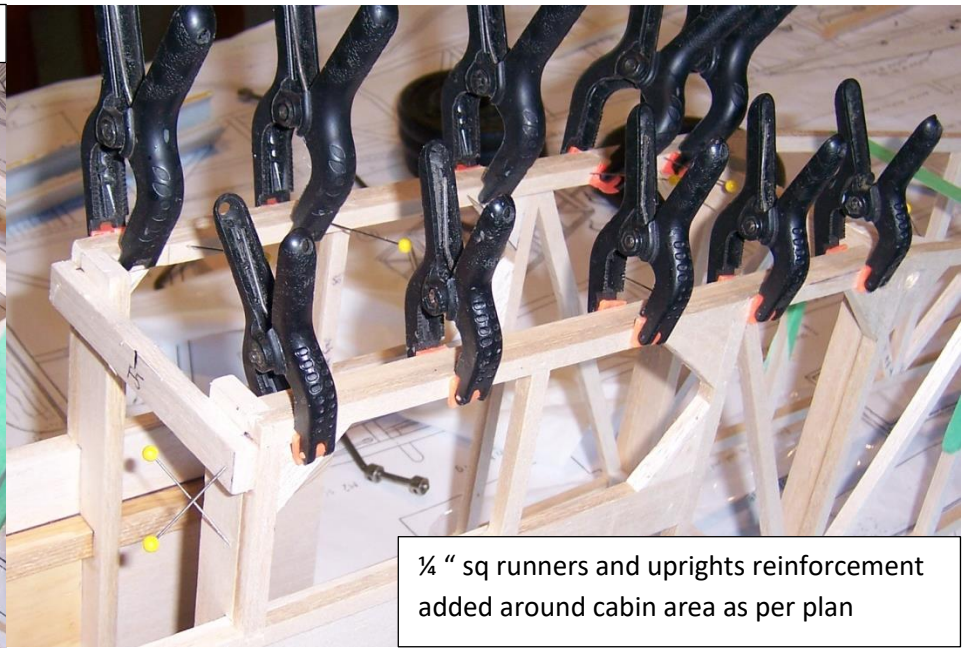


Starting point for Day13 – main formers securely in place.



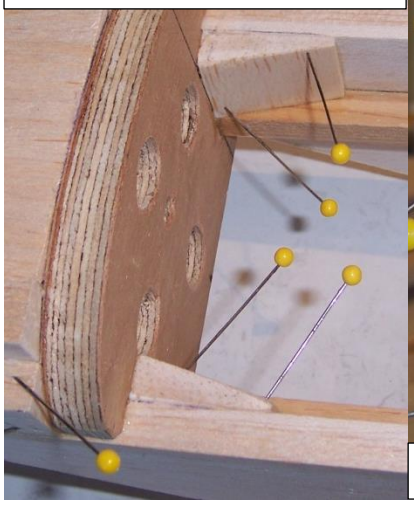
2nd fuselage side glued in position. Great care taken to correct alignment; F6 joint had to be broken and re-glued because it wasn't square. Luckily glue had not set.

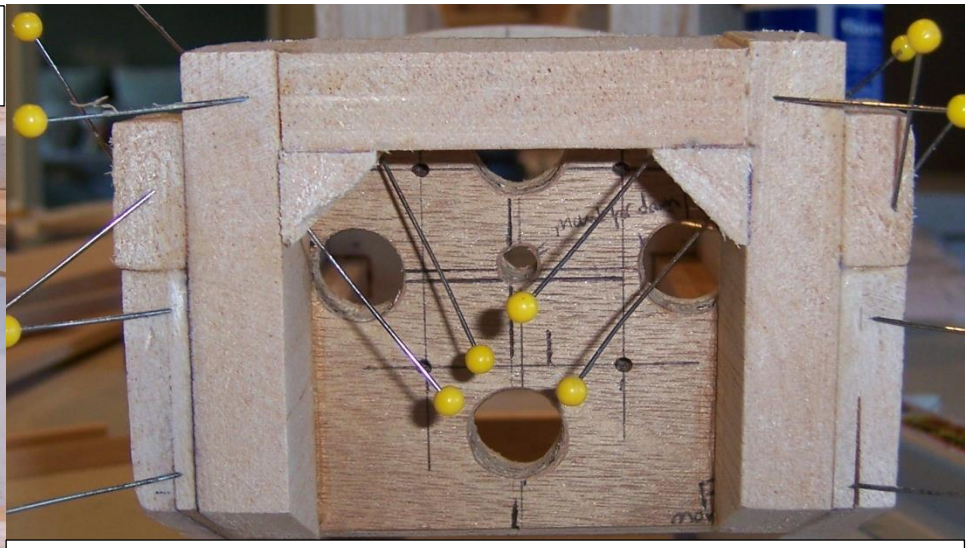
Gussets added in key positions



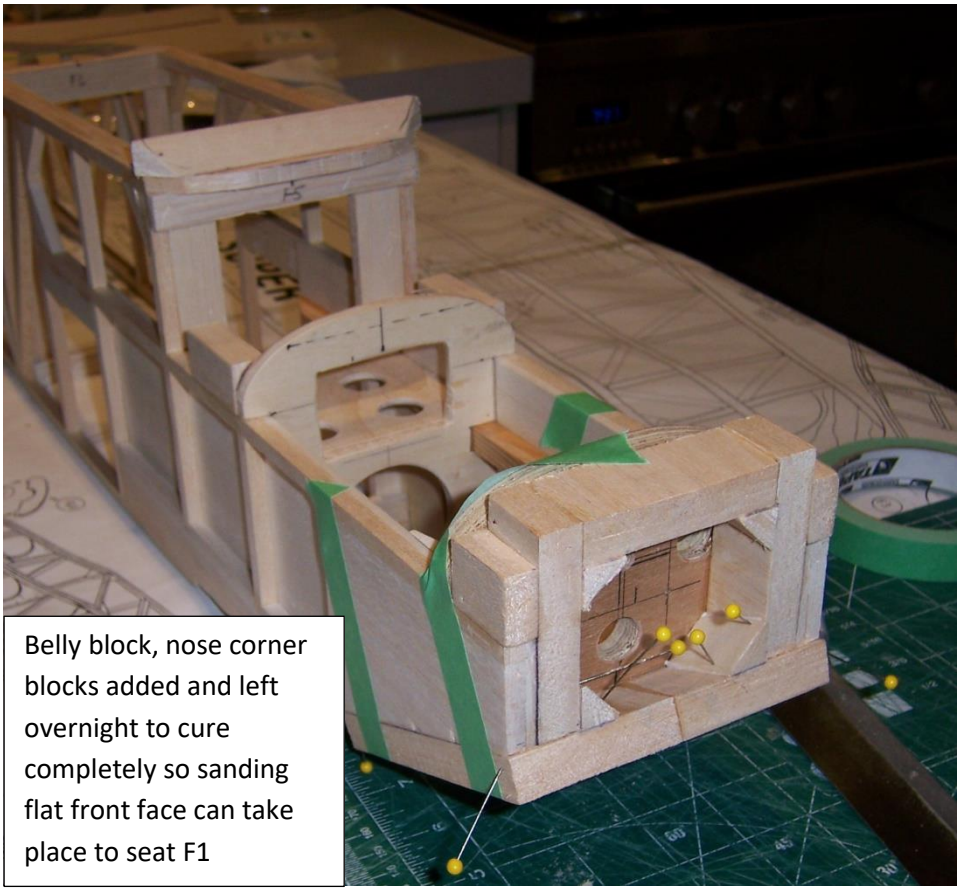
¼ " sq runners and uprights reinforcement added around cabin area as per plan

Gusset reinforcement added around motor mount F2



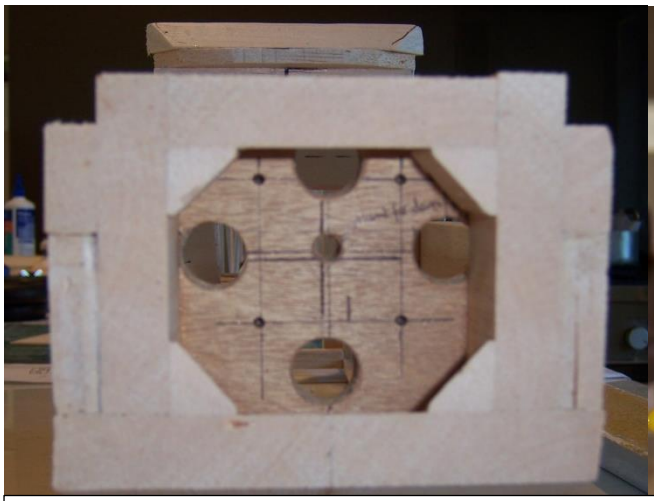


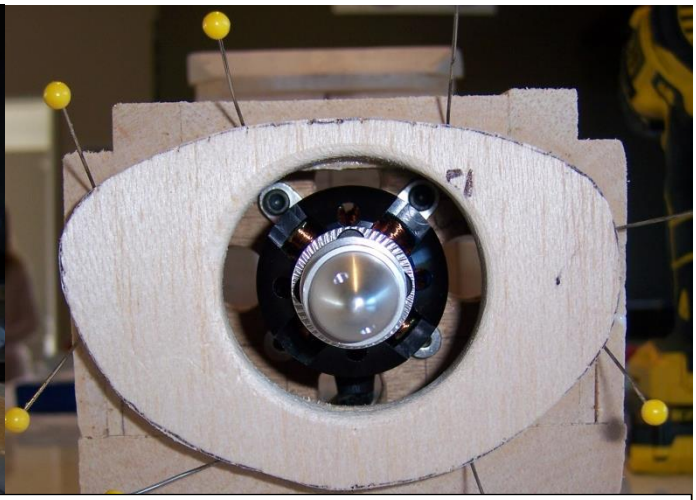
Build up of nose block pieces; these will be carved to streamlined shape



Belly block, nose corner blocks added and left overnight to cure completely so sanding flat front face can take place to seat F1

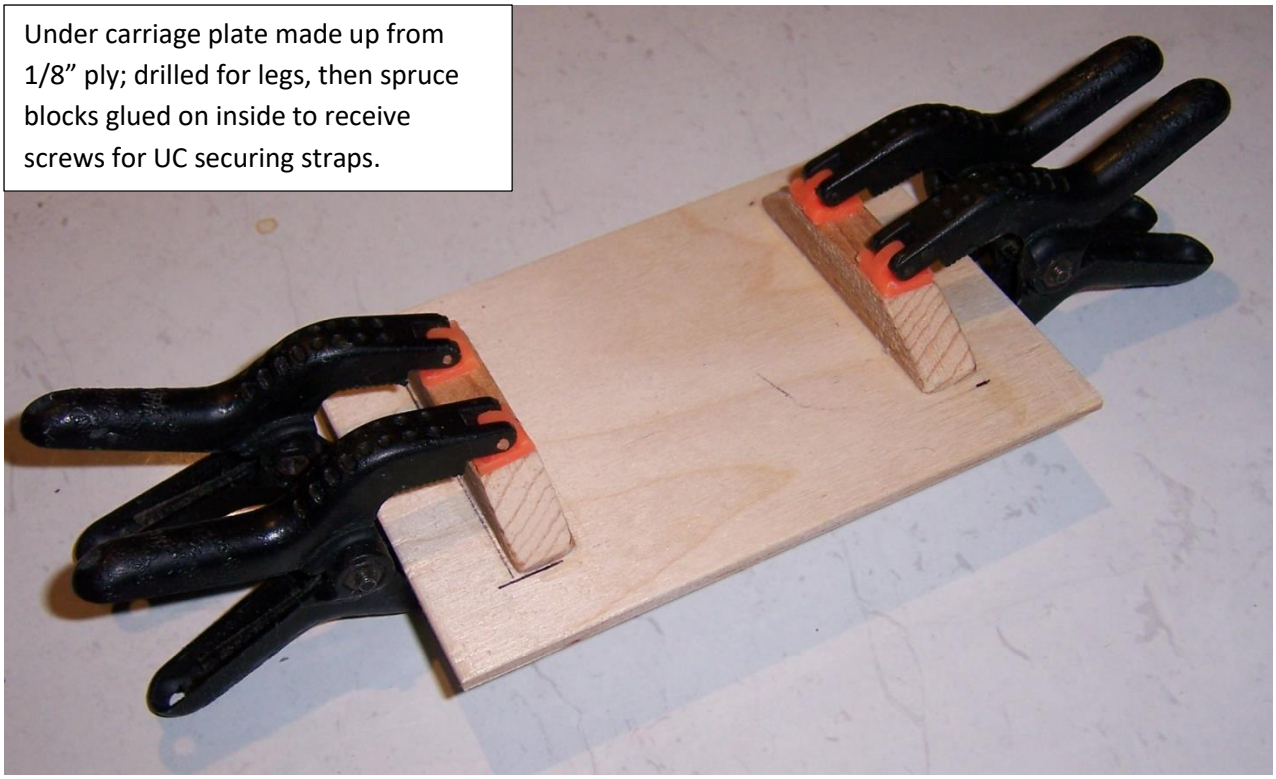
DAY FOURTEEN. *(14JUN2020)*



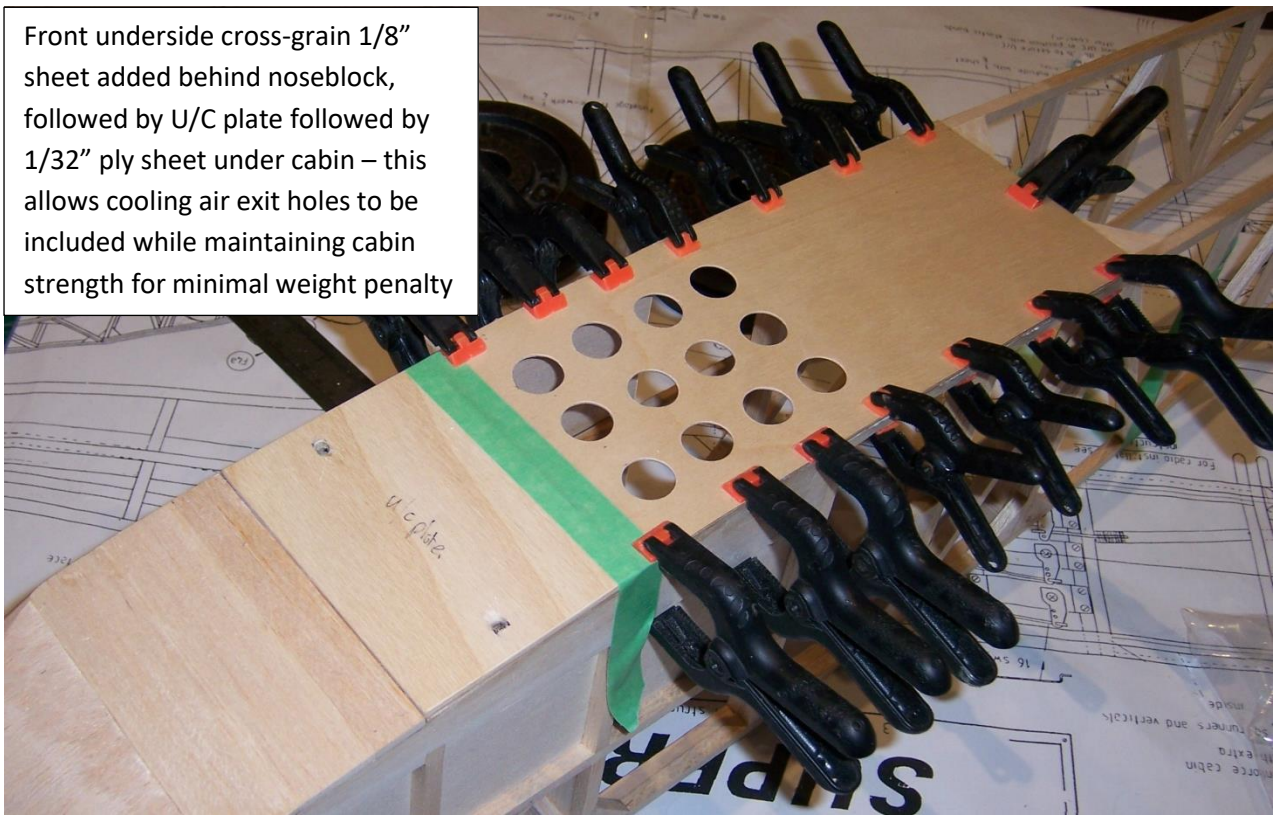


Nose block front face sanded flush. Motor mount holes drilled for M3 hex-bolts. Motor located to help centre F1 hole, which is checked/fettled for clearance for future motor access. F1 then glued in place.

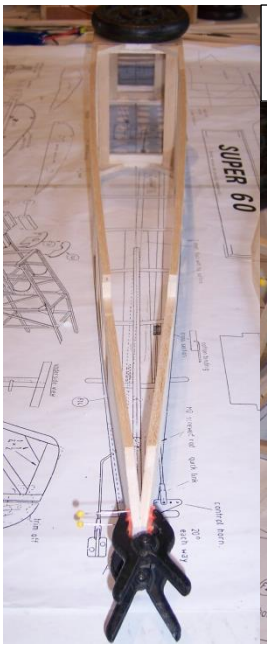
Under carriage plate made up from 1/8” ply; drilled for legs, then spruce blocks glued on inside to receive screws for UC securing straps.



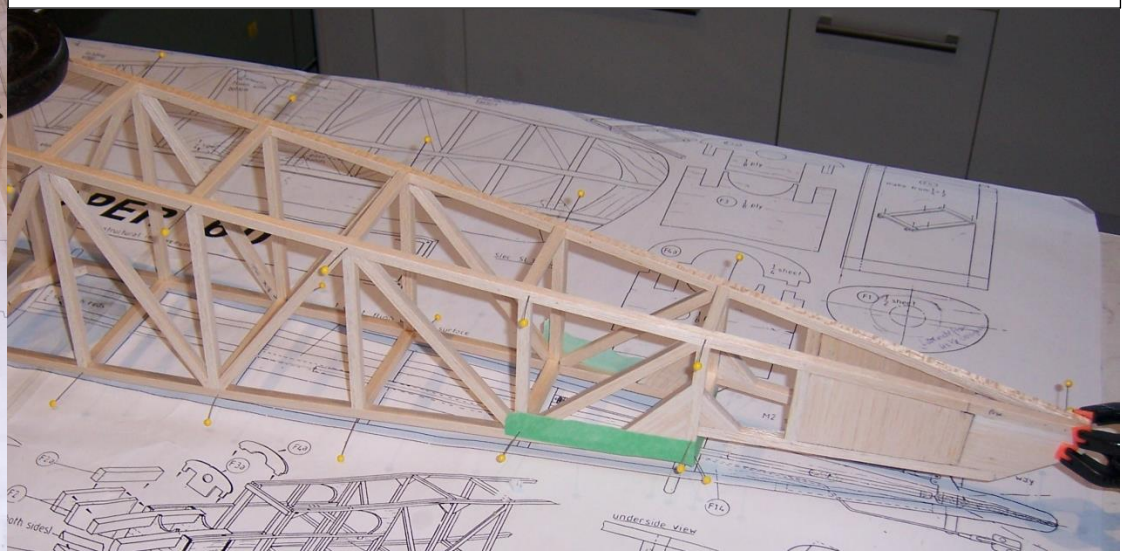
Front underside cross-grain 1/8” sheet added behind noseblock, followed by U/C plate followed by 1/32” ply sheet under cabin – this allows cooling air exit holes to be included while maintaining cabin strength for minimal weight penalty

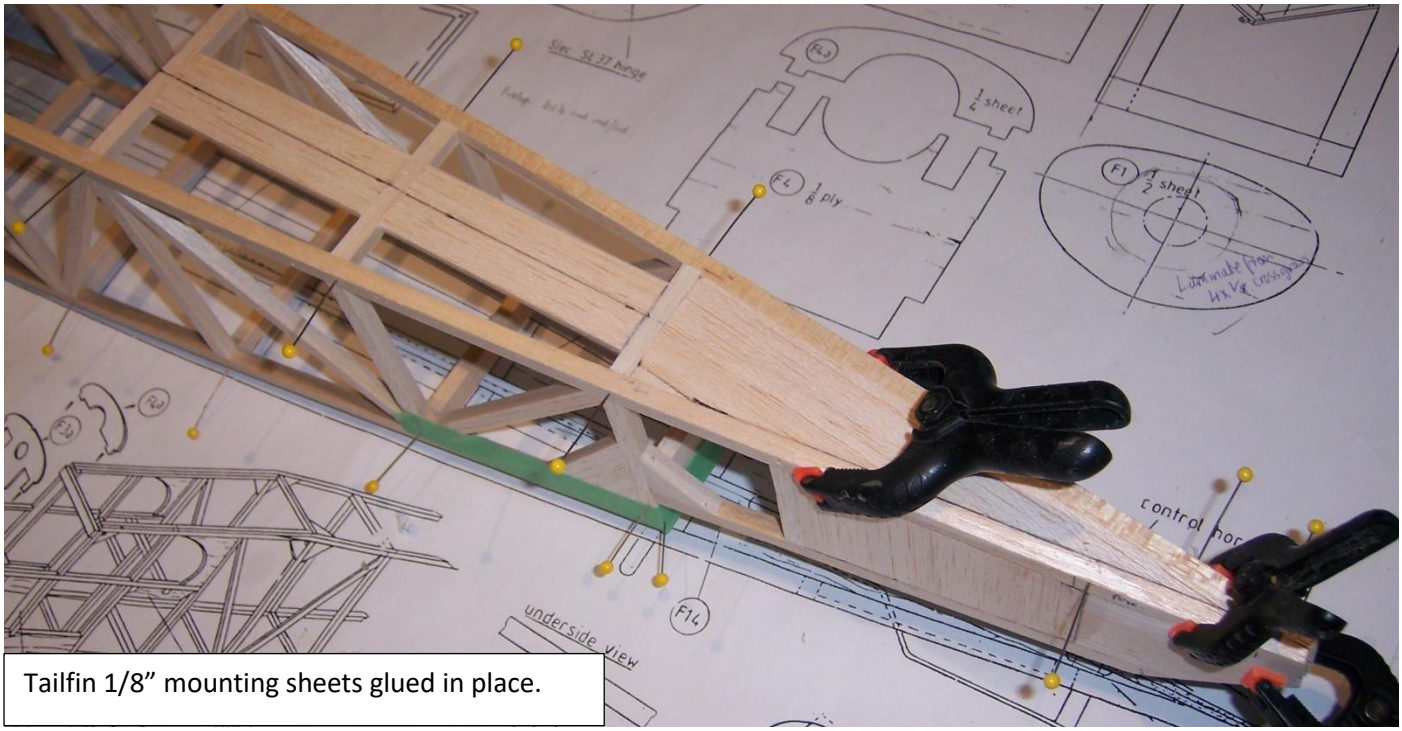


DAY FIFTEEN.*(15JUN2020)*

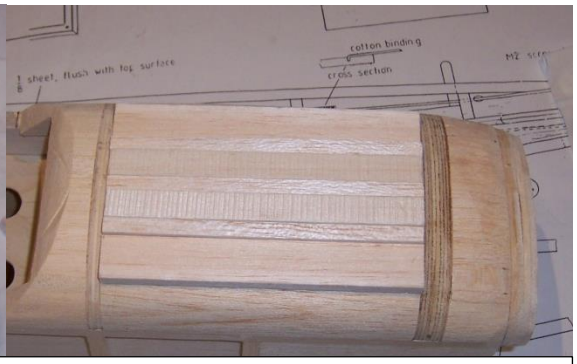


Rear fuselage ends brought together over centreline and all struts/spacers added, checking for symmetry throughout.



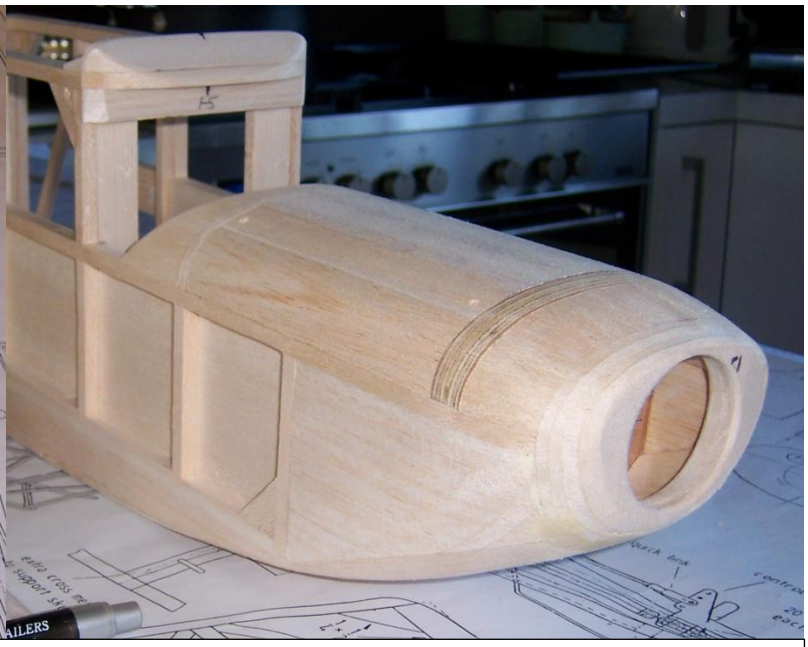


Tailfin 1/8” mounting sheets glued in place.



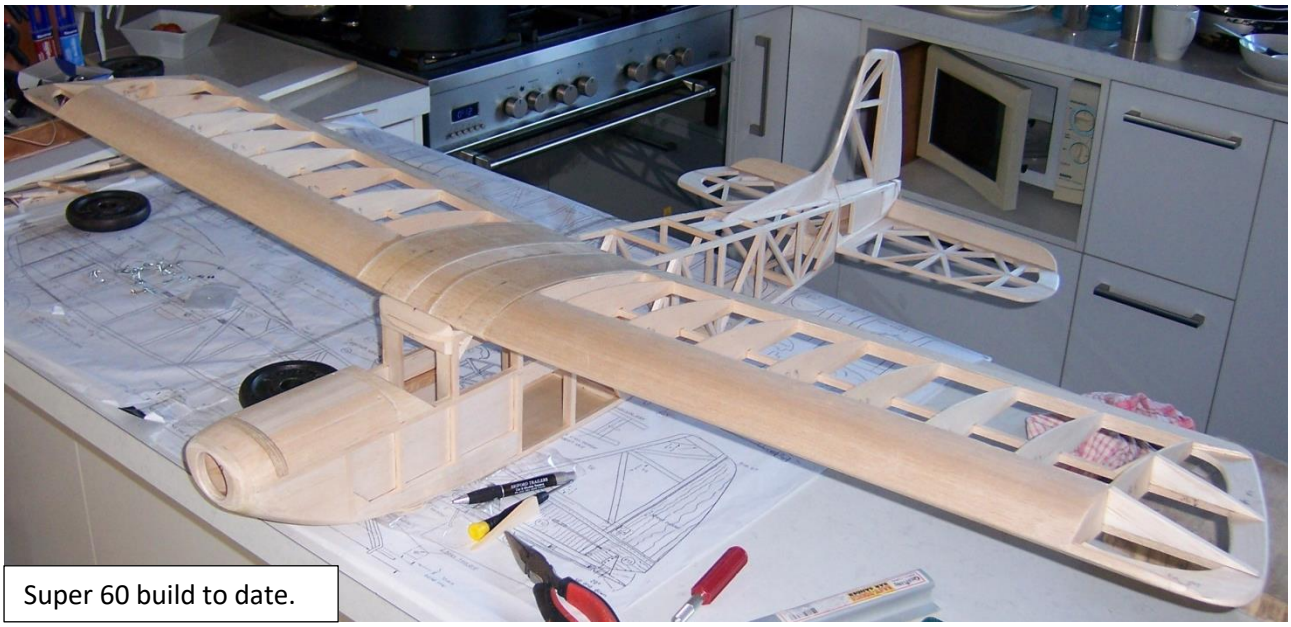
After more rough carving/sanding around the nose area, some thought given to hatch design. Hatch is large, allowing easy battery/ESC access, comprising of 1/8” ply plate with light grade balsa scrap glued on top, then carved to shape. Bass wood 3/8 blocks are glued into the corners of front compartment for hatch to rest on and as secure anchor points for hatch screws, hatch will be located into F2 with wire ‘pins’.

DAY FIFTEEN.*(17JUN2020)*



Nose area carved and sanded to shape with hatch in place – Super 60's attractive lines start to become apparent.

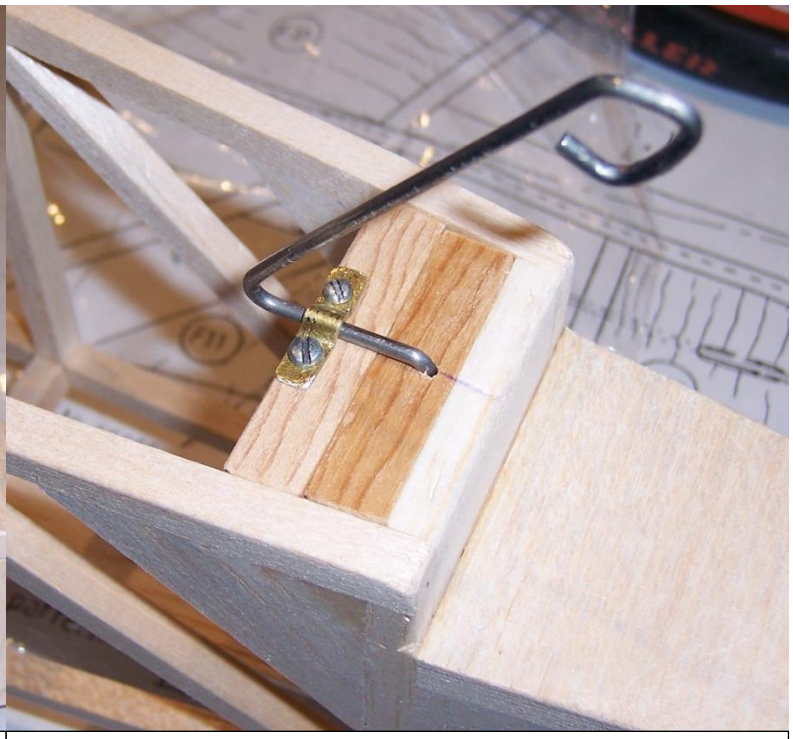
ESC plate made up and installed temporarily. Balsa spacer glued in to cover the rear of motor shaft which protrudes into front compartment.



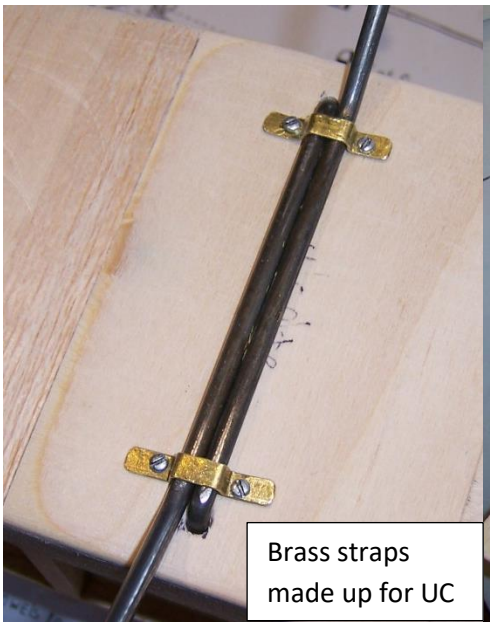
Super 60 build to date.

DAY SEVENTEEN.(18JUN2020)

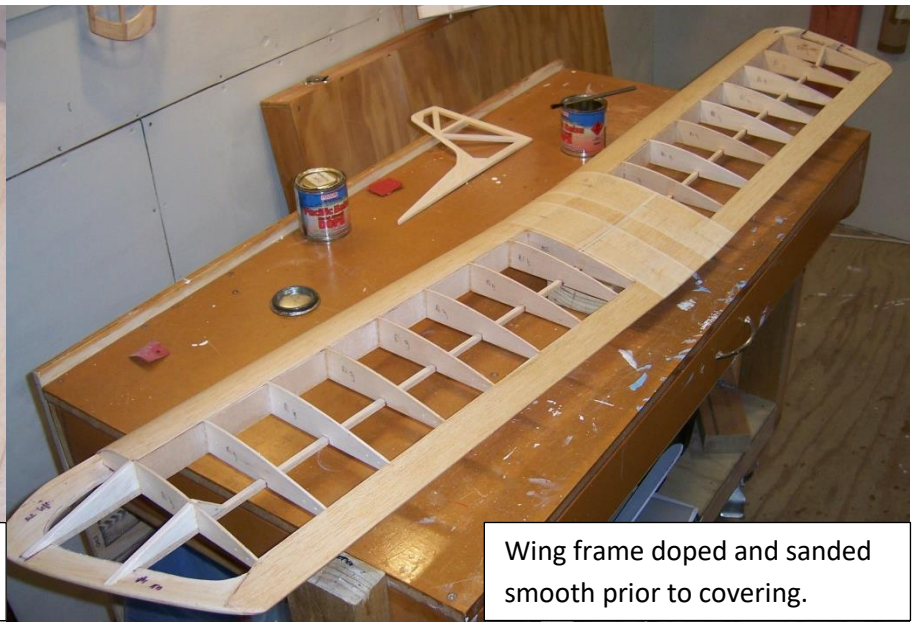
Tail skid spruce blocks glued into place.



Tail skid temporarily fitted with brass strap prior to covering.

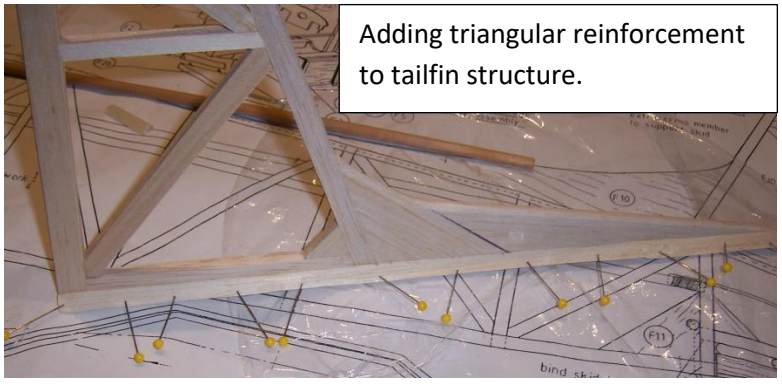


Brass straps made up for UC



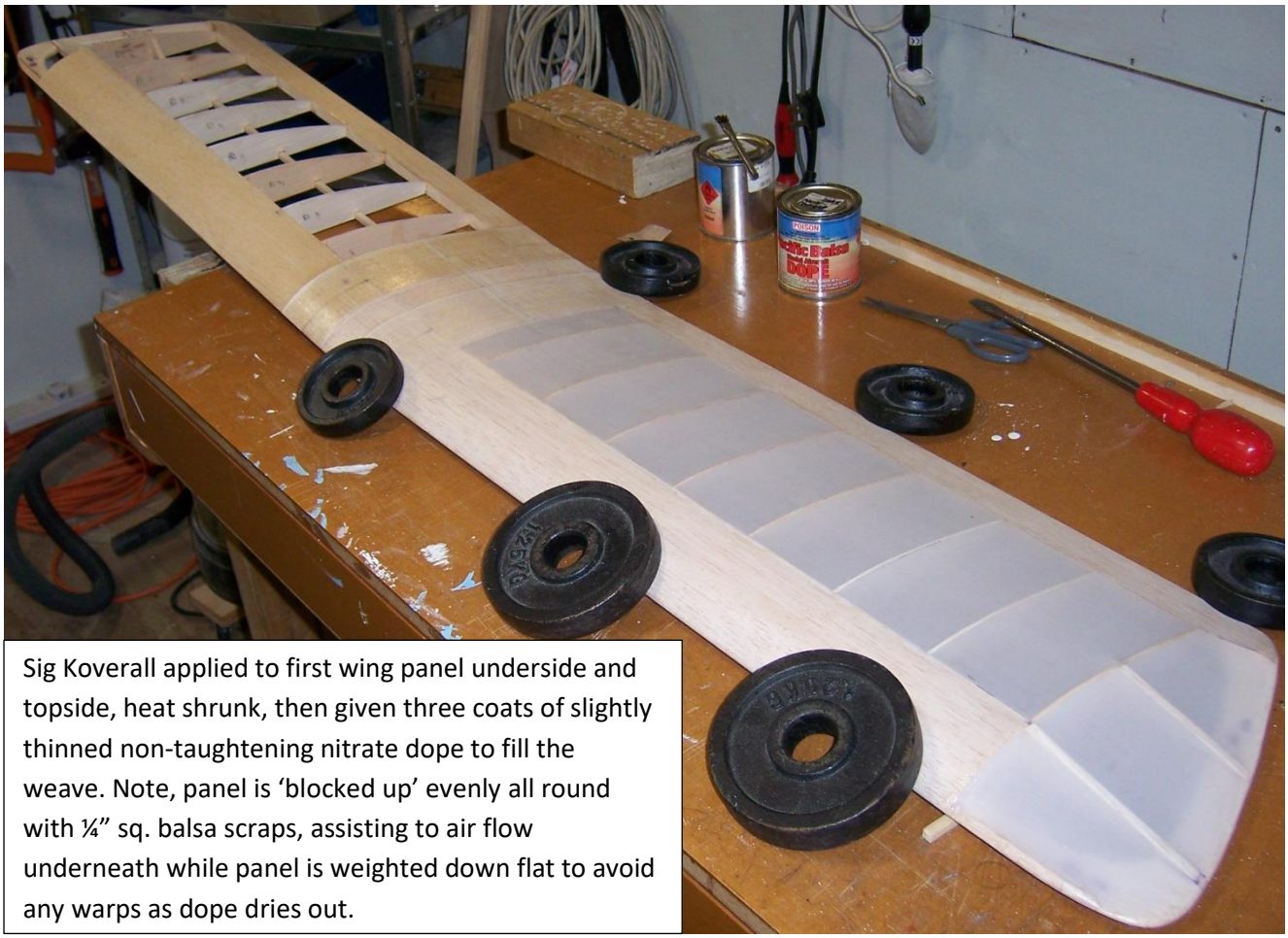
Wing frame doped and sanded smooth prior to covering.

DAY EIGHTEEN.(19JUN2020)



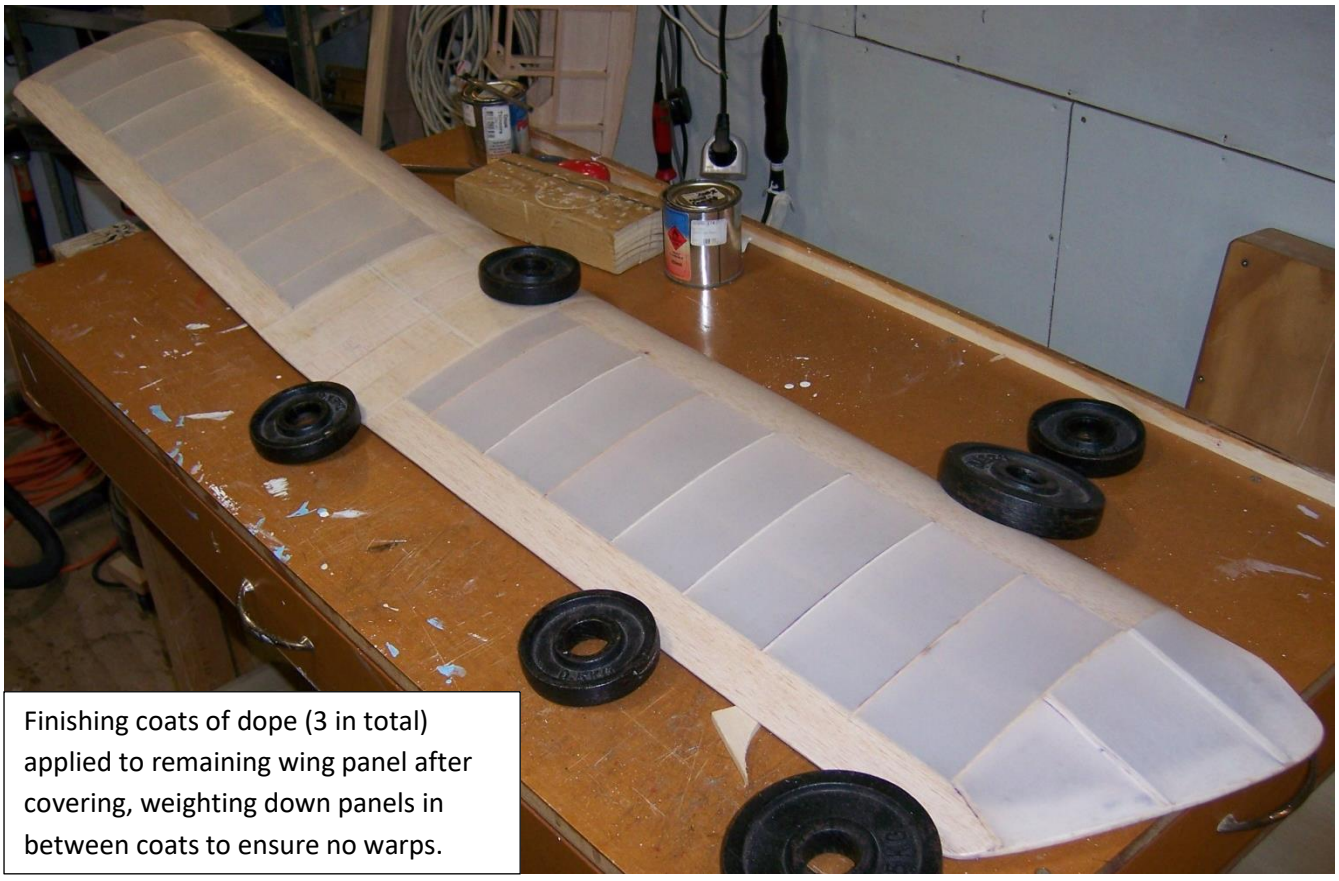
Adding triangular reinforcement to tailfin structure.

DAY NINETEEN.*(20JUN2020)*



Sig Koverall applied to first wing panel underside and topside, heat shrunk, then given three coats of slightly thinned non-taughtening nitrate dope to fill the weave. Note, panel is 'blocked up' evenly all round with ¼" sq. balsa scraps, assisting to air flow underneath while panel is weighted down flat to avoid any warps as dope dries out.

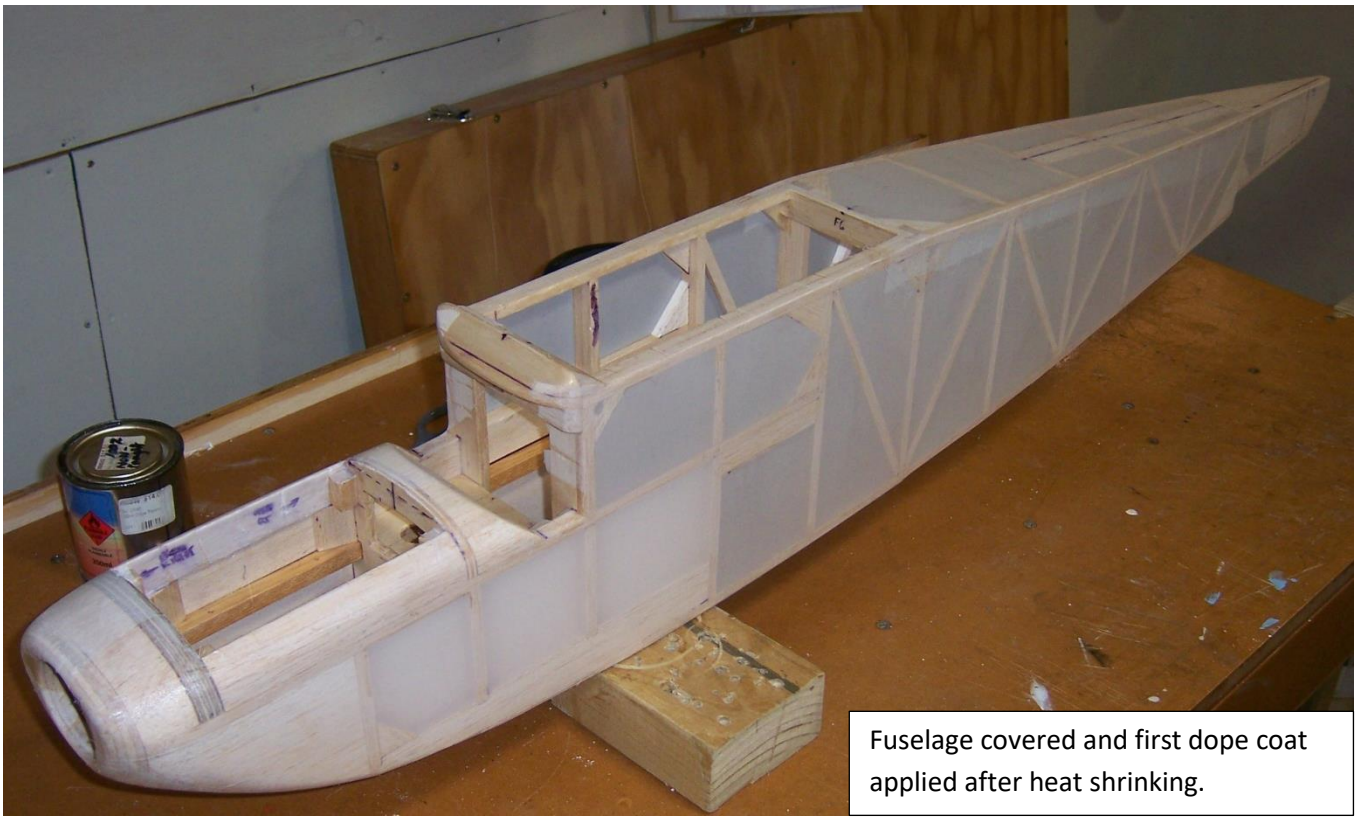
DAY TWENTY.*(21JUN2020)*



Finishing coats of dope (3 in total) applied to remaining wing panel after covering, weighting down panels in between coats to ensure no warps.

Dope undercoats on fuselage

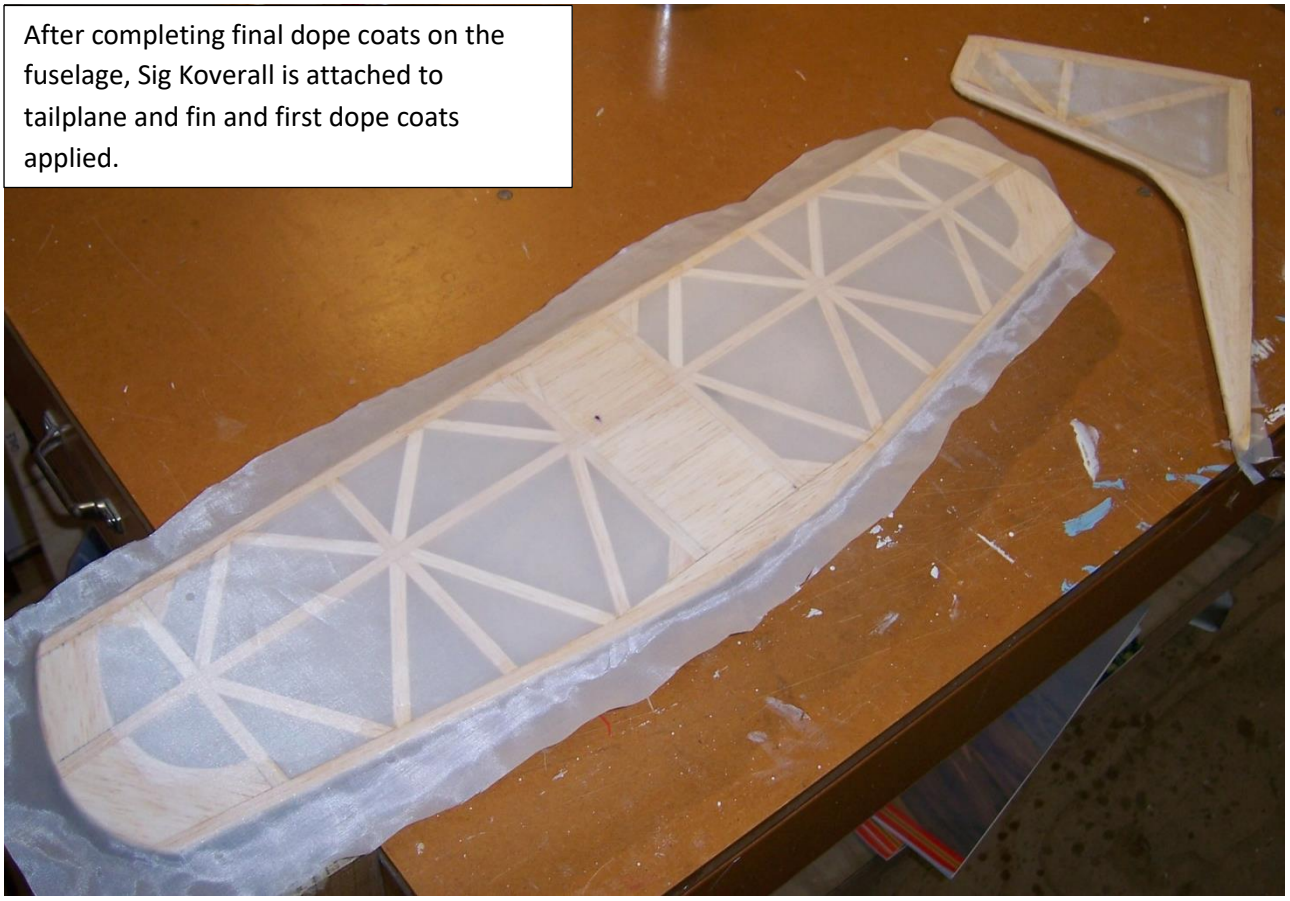
DAY TWENTY-ONE.*(23JUN2020)*



Fuselage covered and first dope coat applied after heat shrinking.

DAY TWENTY-TWO/THREE.*(26-27JUN2020)*

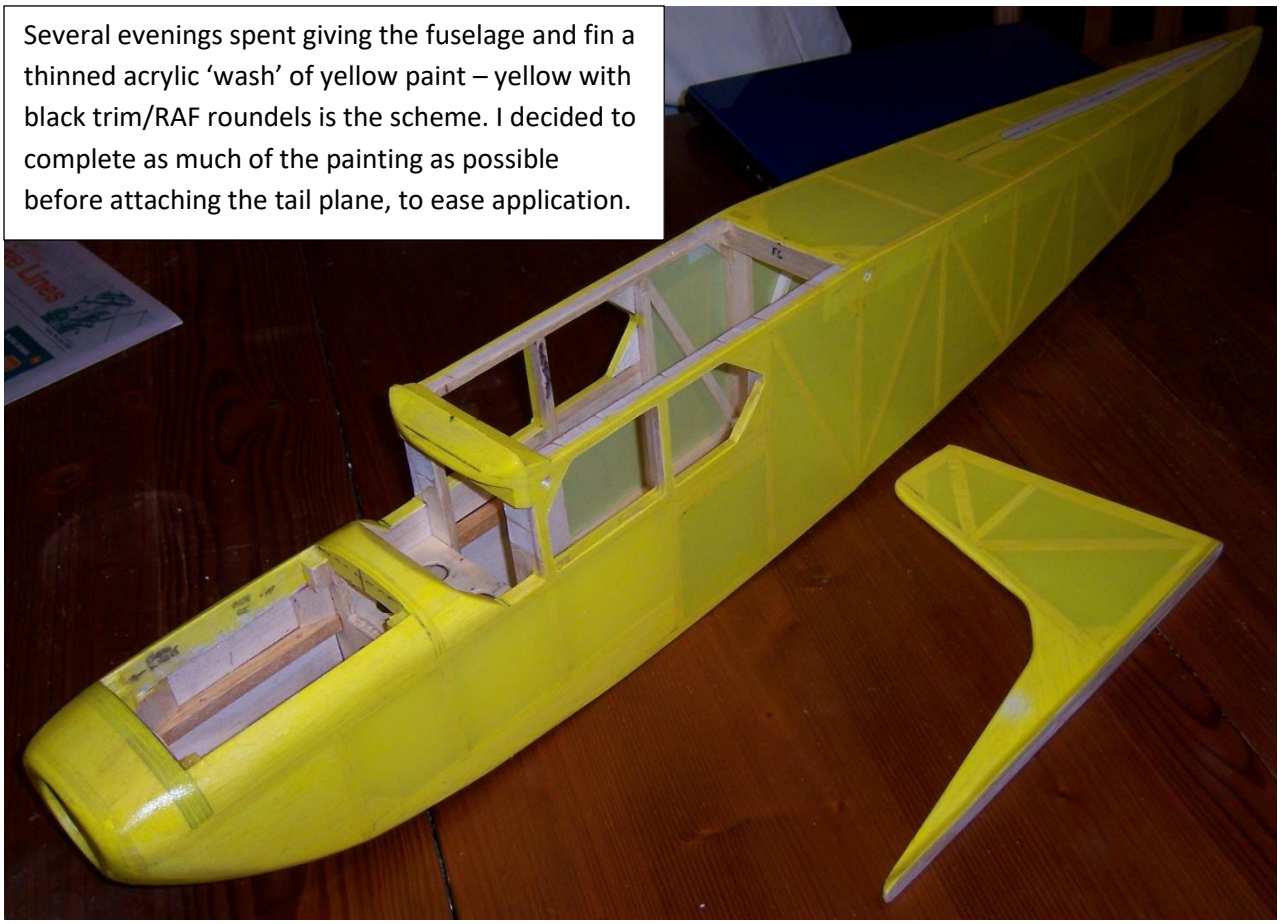
After completing final dope coats on the fuselage, Sig Koverall is attached to tailplane and fin and first dope coats applied.



Rudder and elevator also covered and doped.

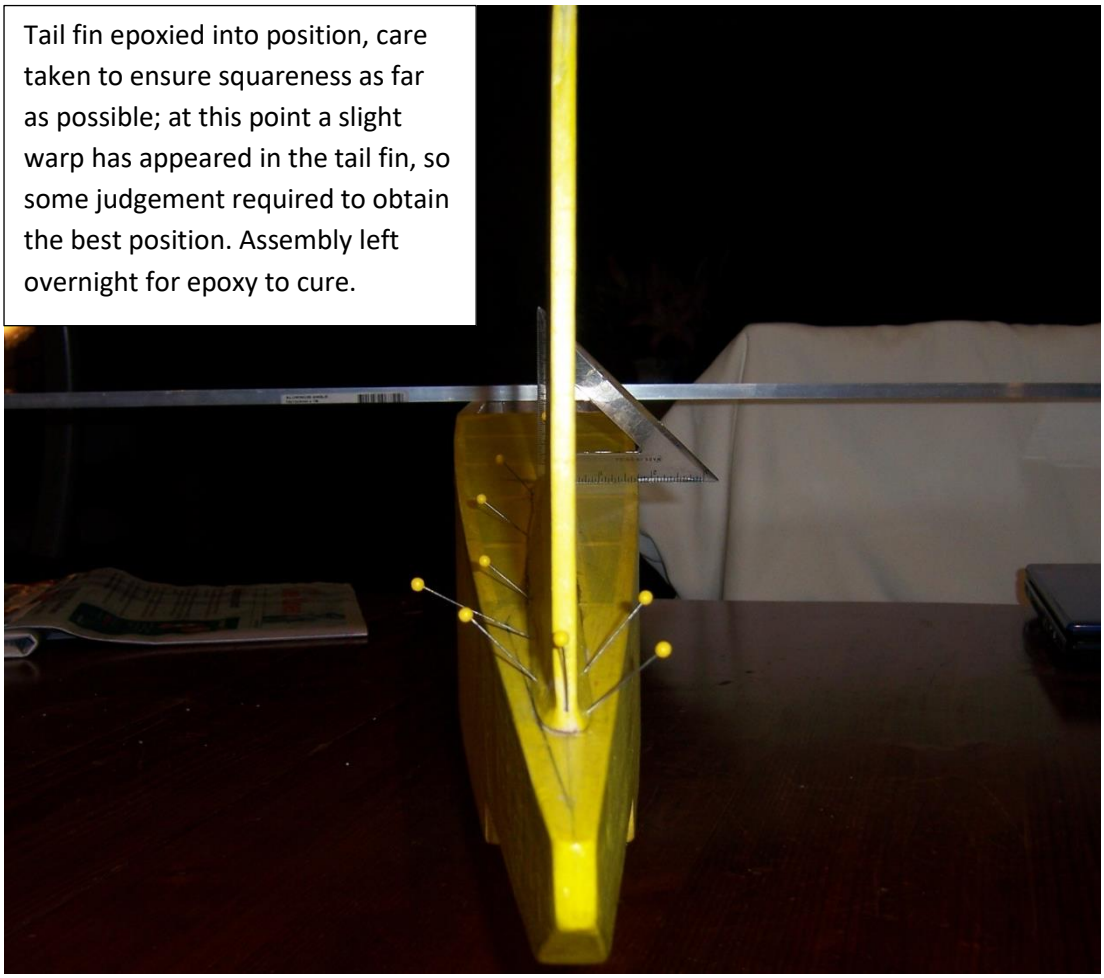
DAY(S) 24.*(28JUN – 2JUL2020)*

Several evenings spent giving the fuselage and fin a thinned acrylic 'wash' of yellow paint – yellow with black trim/RAF roundels is the scheme. I decided to complete as much of the painting as possible before attaching the tail plane, to ease application.



DAY25.*(03JUL2020)*

Tail fin epoxied into position, care taken to ensure squareness as far as possible; at this point a slight warp has appeared in the tail fin, so some judgement required to obtain the best position. Assembly left overnight for epoxy to cure.

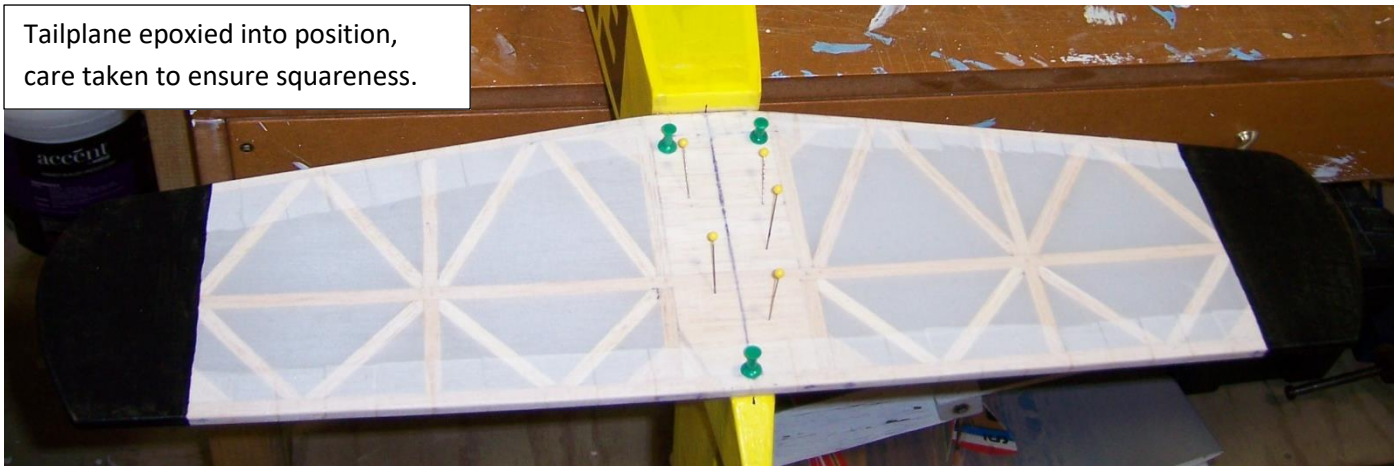


DAY 26 *(04JUL2020)*

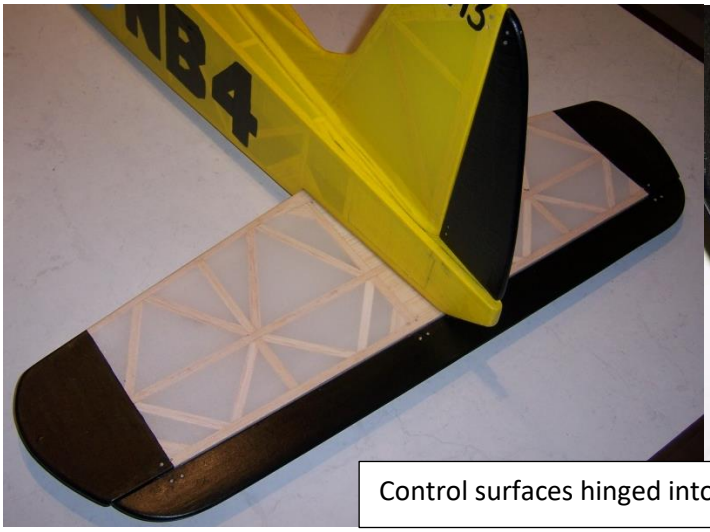
Paint details on fuselage

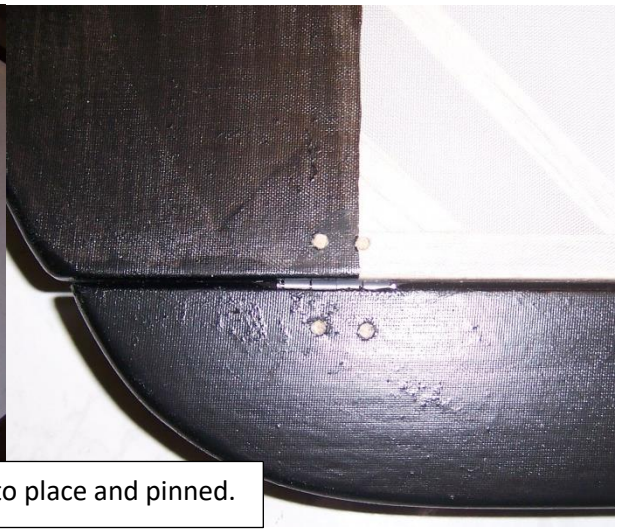
DAY 27 *(06JUL2020)*

Tailplane epoxied into position,
care taken to ensure squareness.

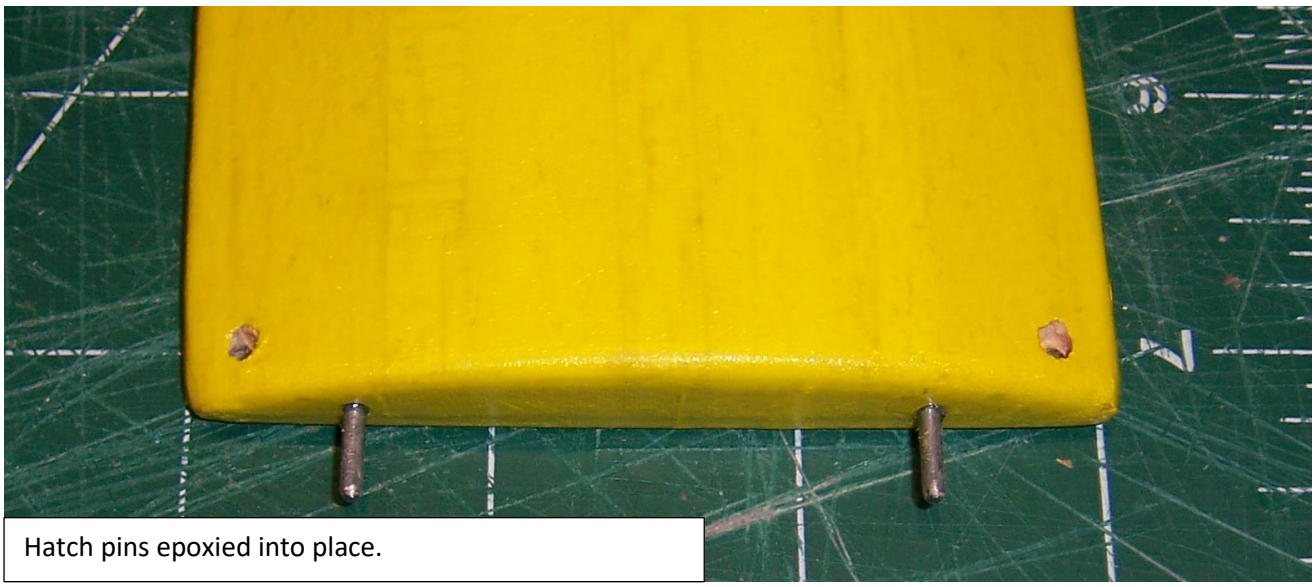


DAY 28 *(07JUL2020)*

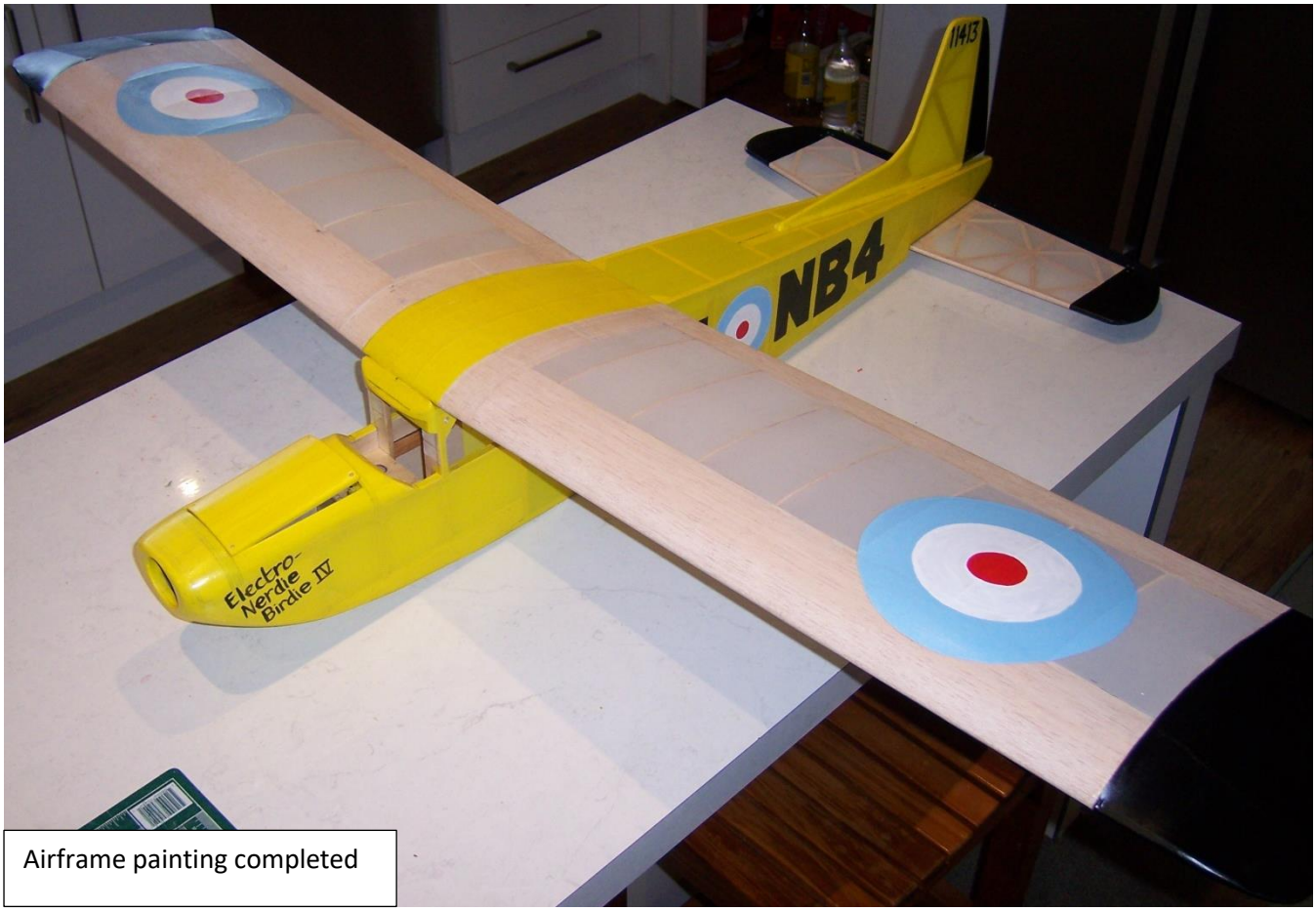




Control surfaces hinged into place and pinned.



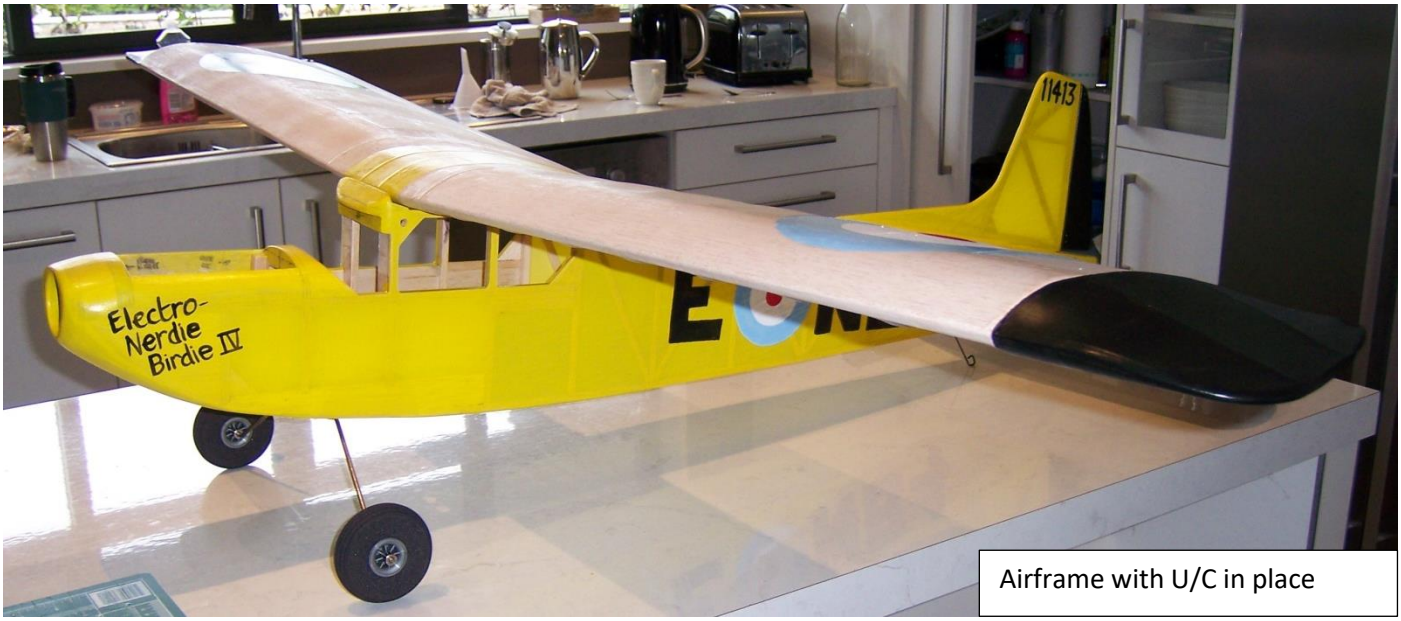
Hatch pins epoxied into place.



Airframe painting completed

DAY 29. *(08JUL2020)*

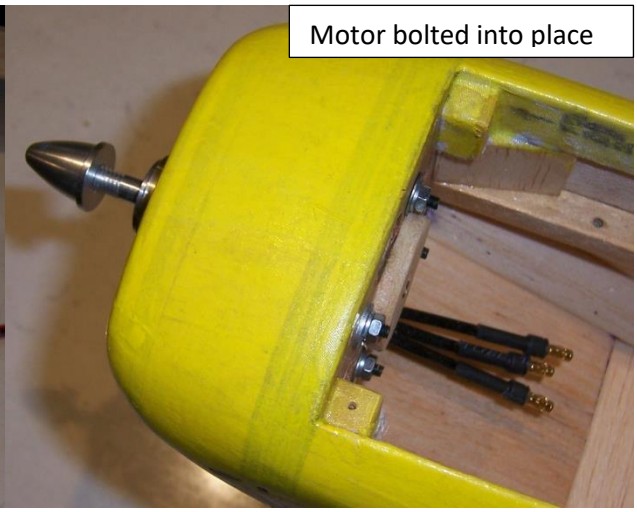
U/C and tailskid clamped into place



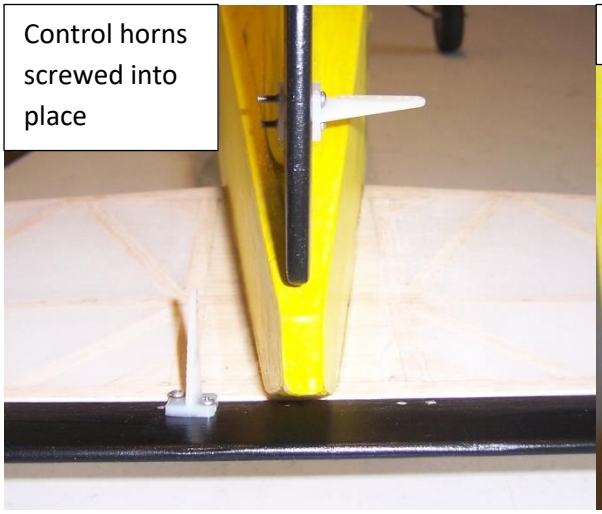
Airframe with U/C in place

Install wing dowels

Motor bolted into place



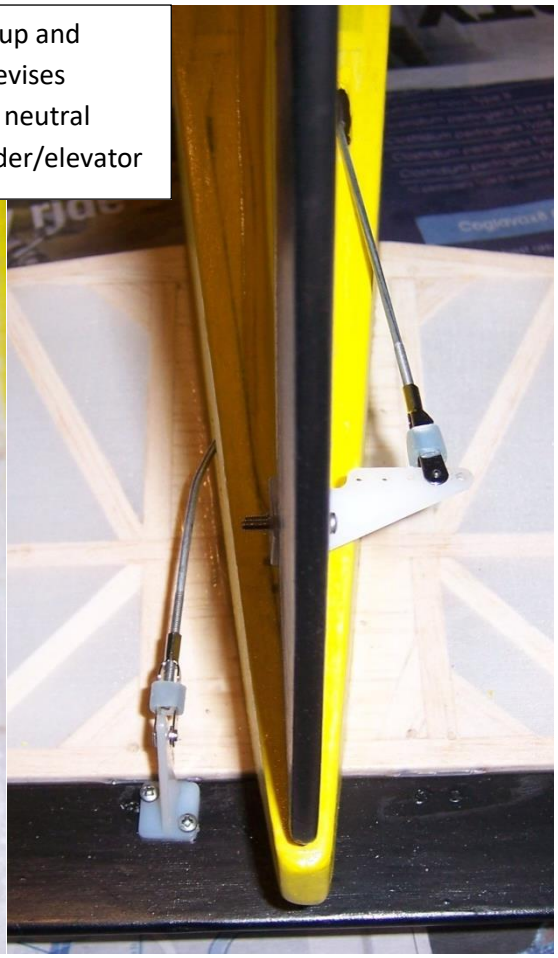
Control horns screwed into place

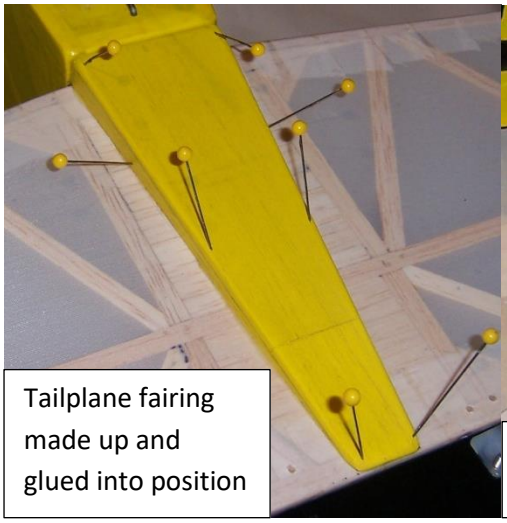


Servo rails epoxied into position and servos mounted.

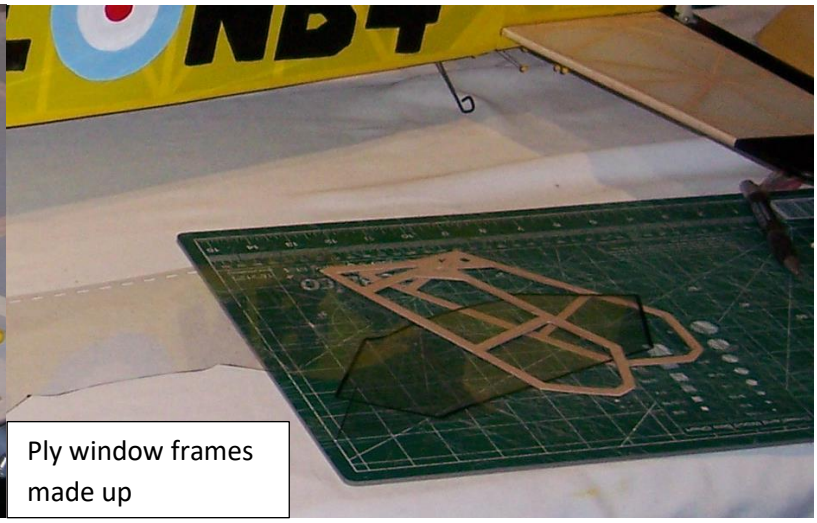
DAY 30.(09JUL2020)

Pushrods made up and installed, end clevises adjusted to give neutral position for rudder/elevator



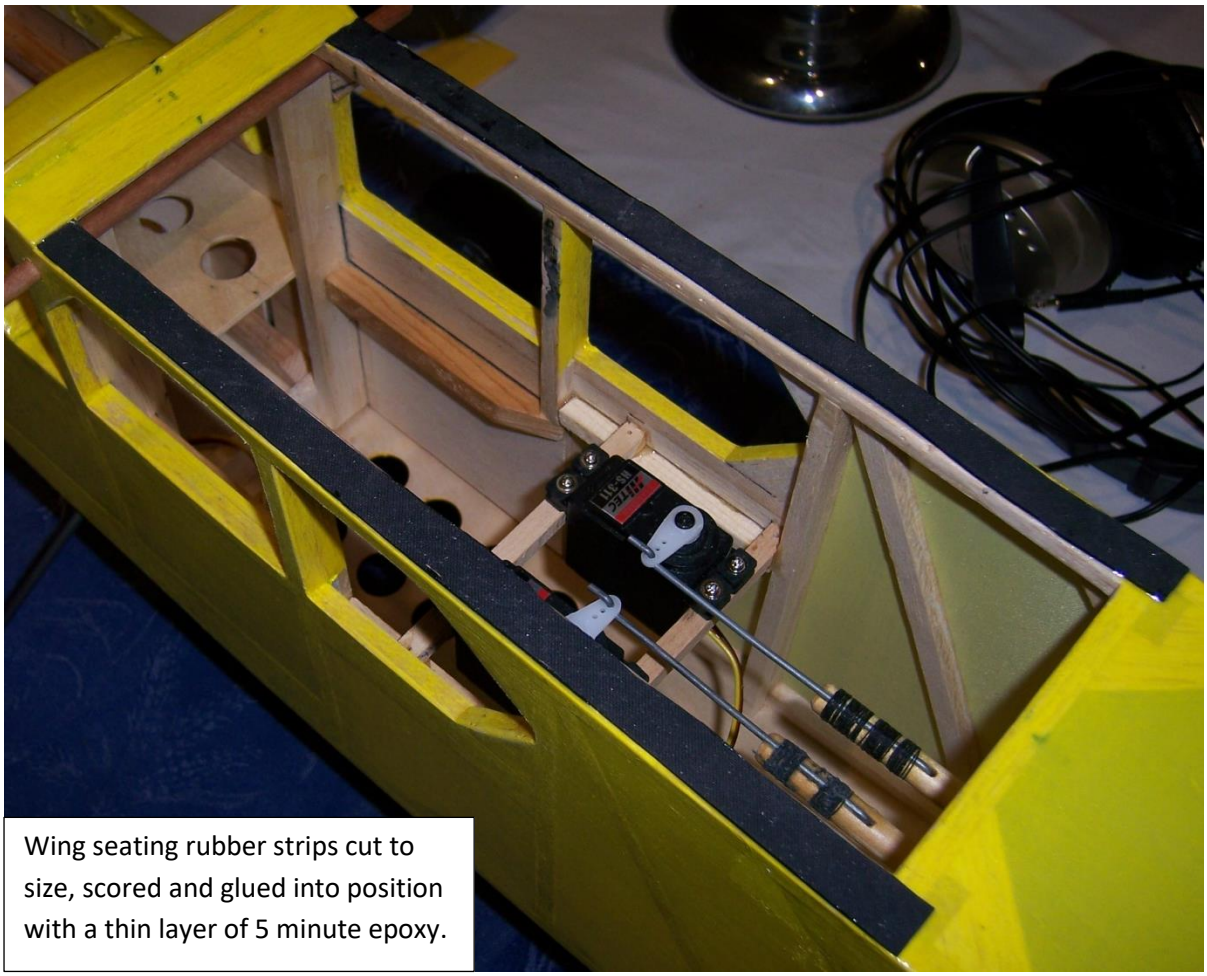


Tailplane fairing made up and glued into position

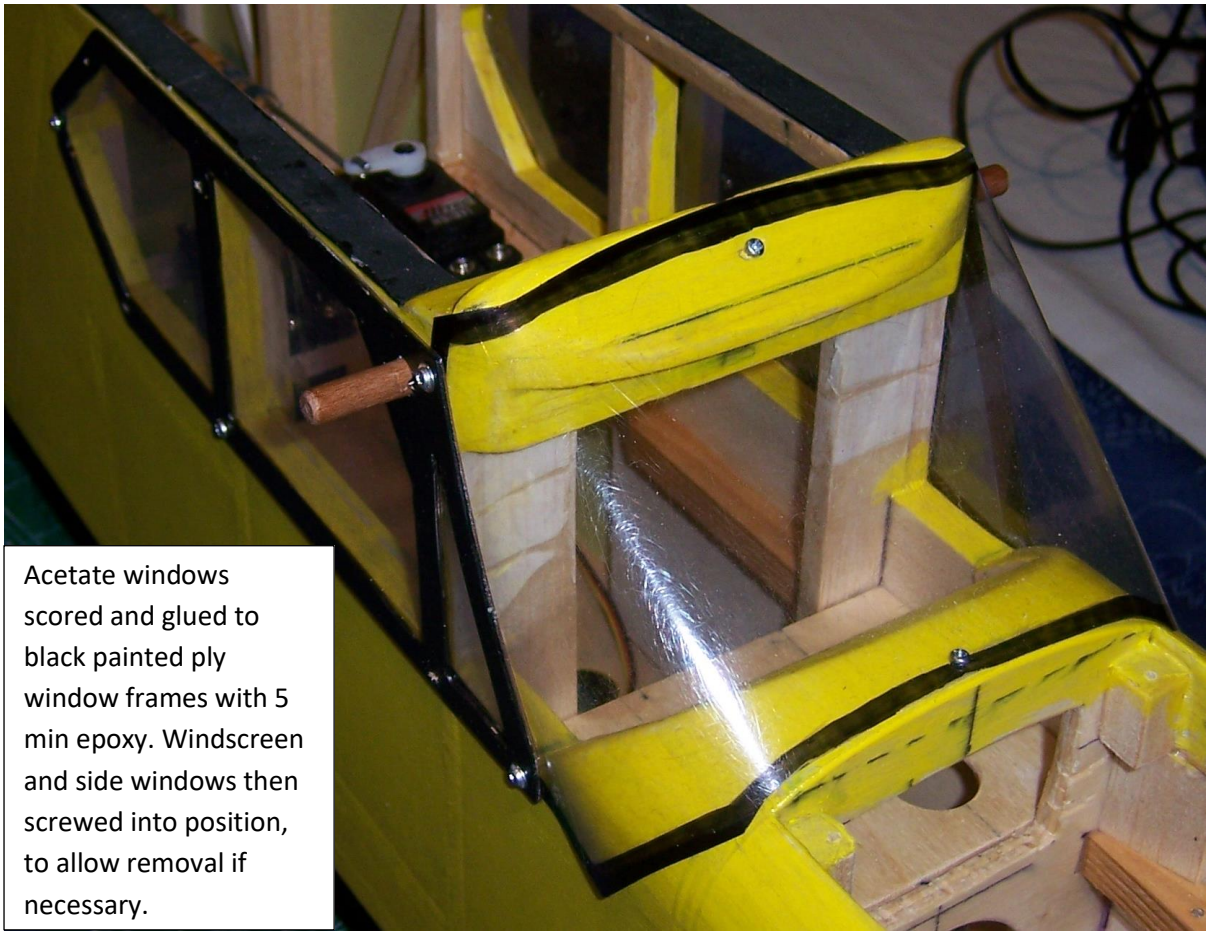


Ply window frames made up

DAY 31 .(15JUL2020)

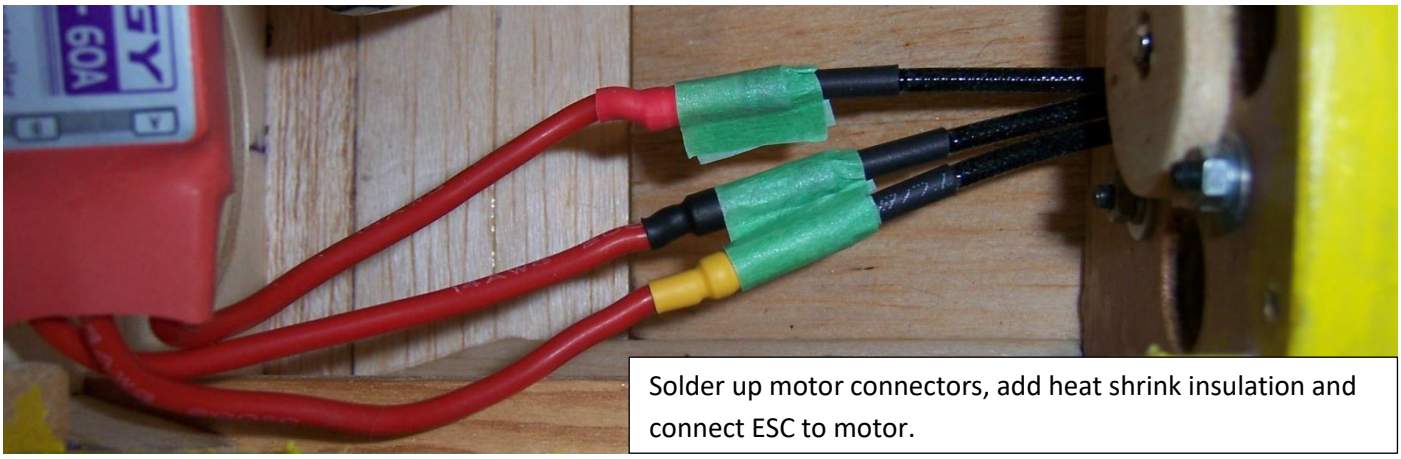


Wing seating rubber strips cut to size, scored and glued into position with a thin layer of 5 minute epoxy.

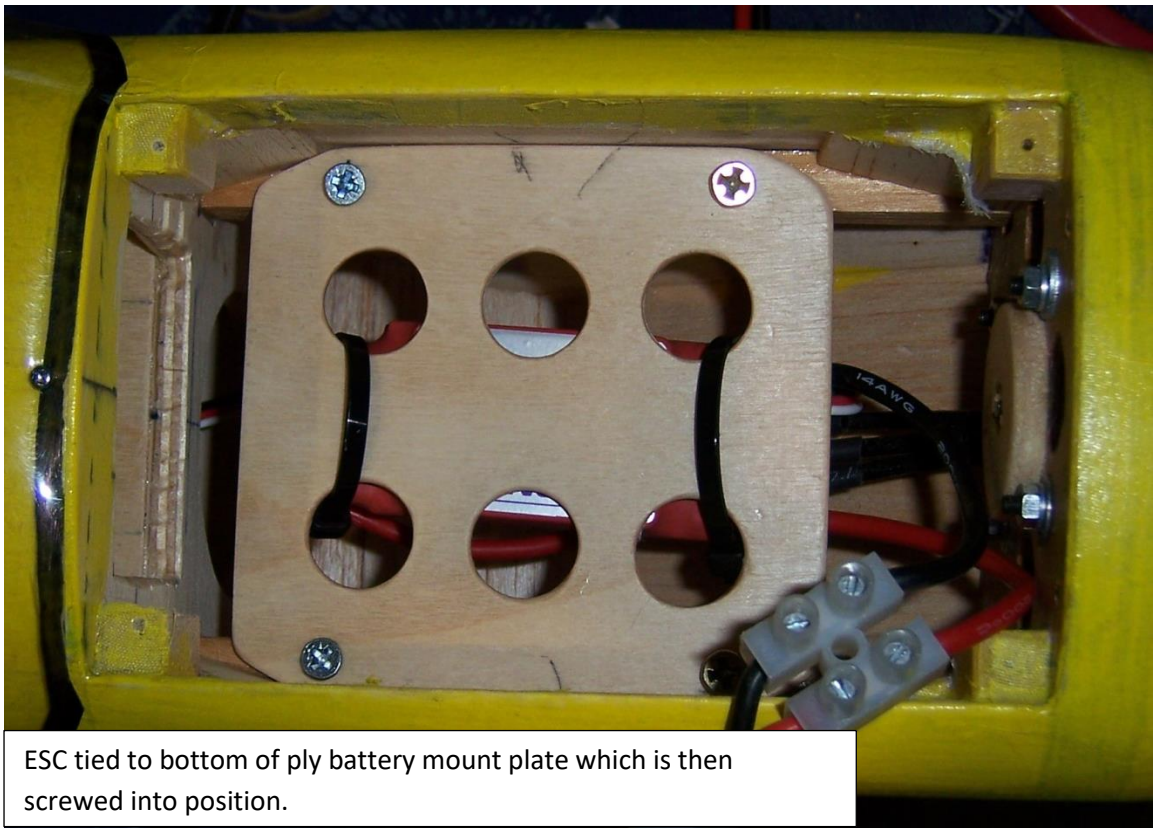


Acetate windows scored and glued to black painted ply window frames with 5 min epoxy. Windscreen and side windows then screwed into position, to allow removal if necessary.

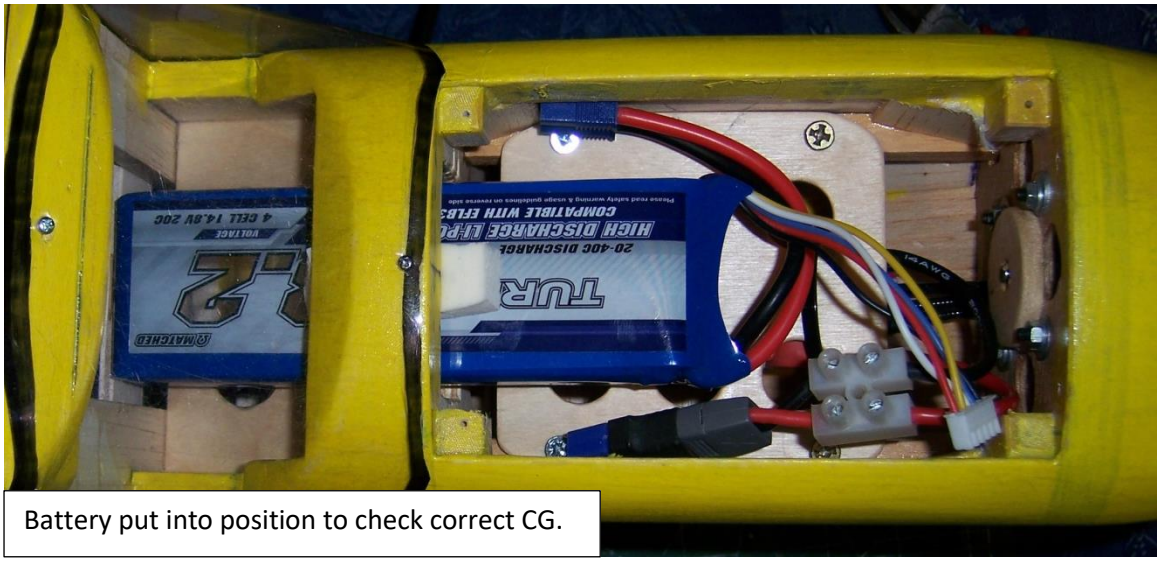
DAY 32. *(16JUL2020)*



Solder up motor connectors, add heat shrink insulation and connect ESC to motor.



ESC tied to bottom of ply battery mount plate which is then screwed into position.



Battery put into position to check correct CG.

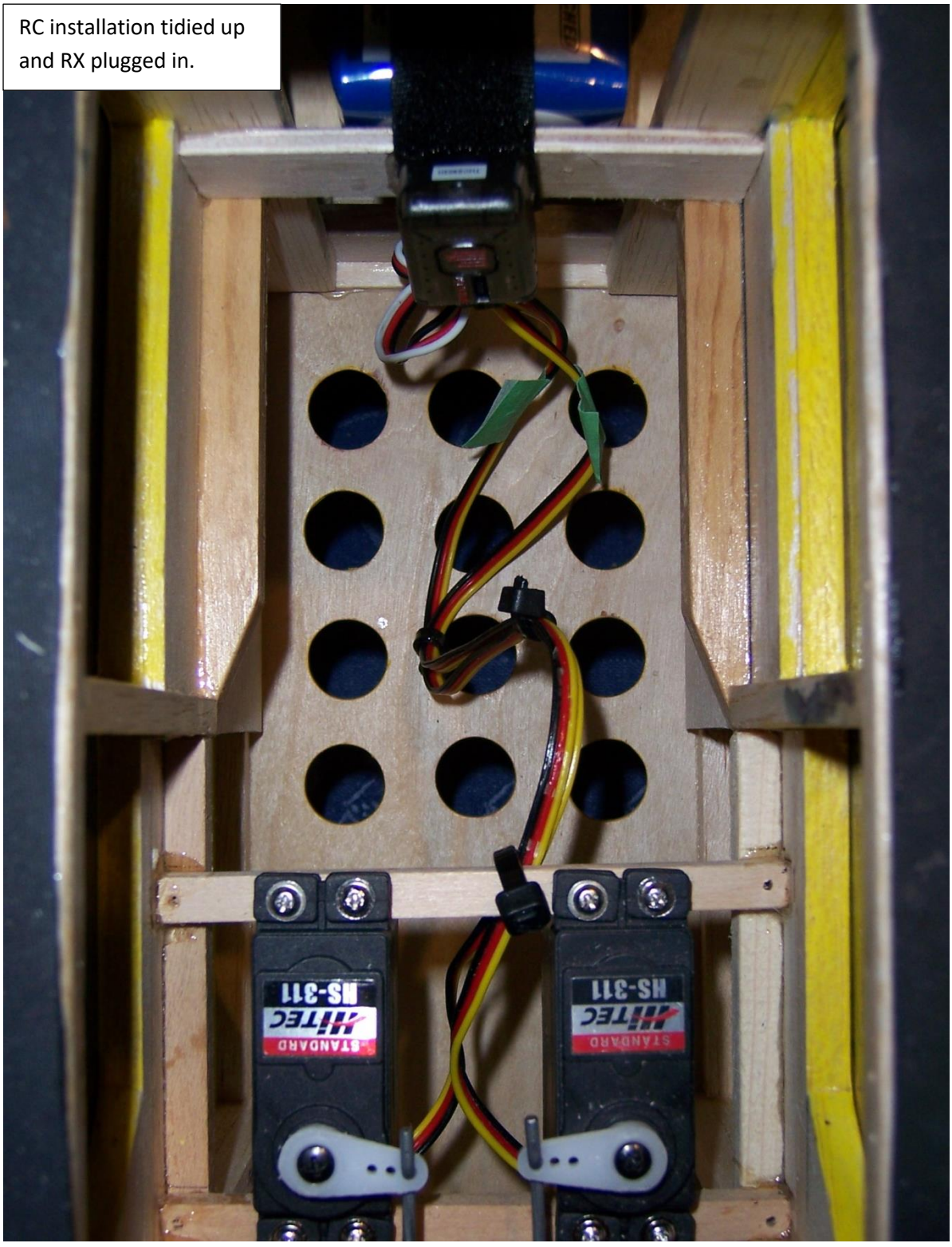
Velcro battery retaining straps epoxied into position.

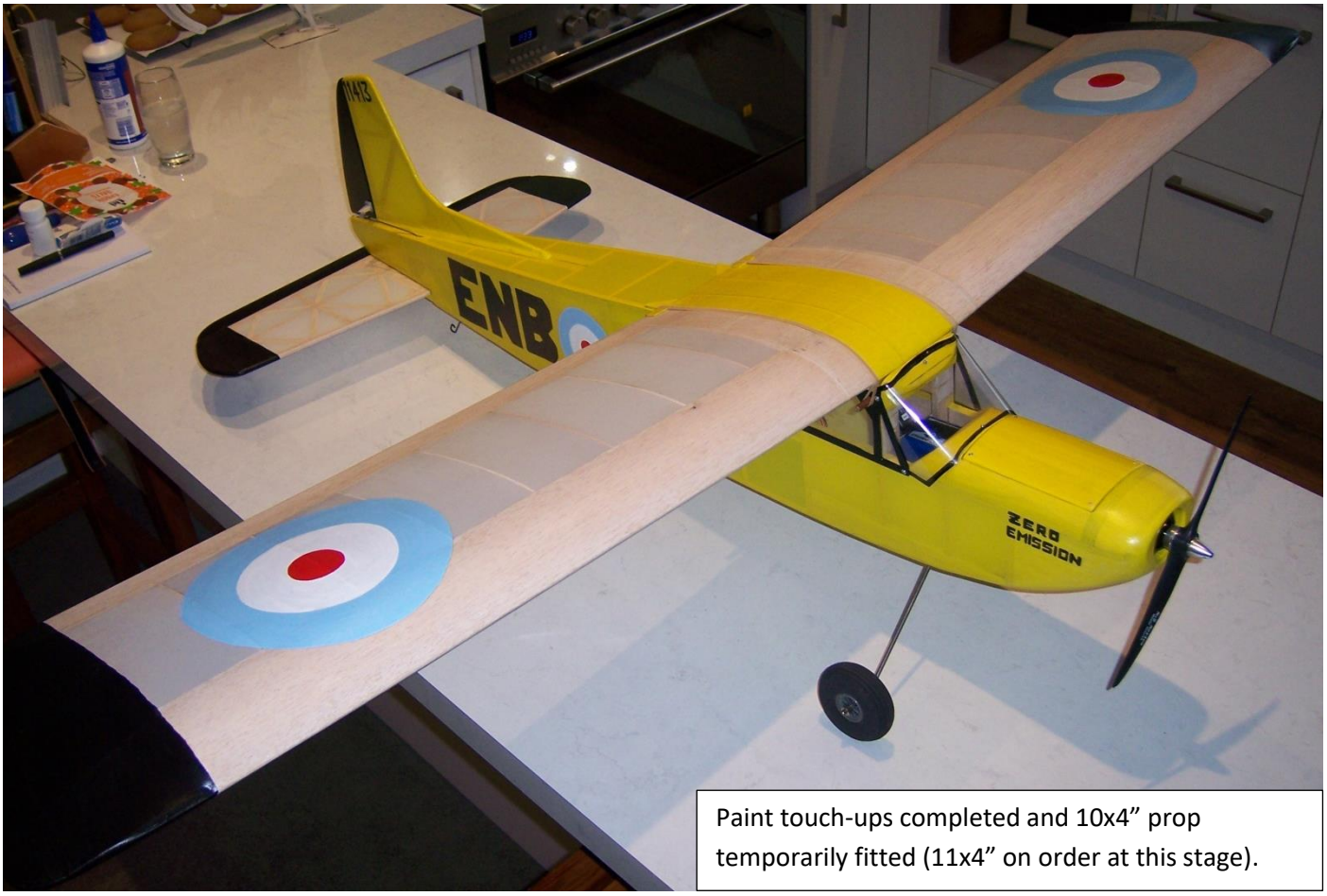
Velcro epoxied to Spektrum AR410 Sport Receiver, which is then placed into position.

Ply plates for further wing band reinforcement and wing mount position epoxied in place.

DAY33.*(18JUL2020)*

RC installation tidied up and RX plugged in.





Paint touch-ups completed and 10x4” prop temporarily fitted (11x4” on order at this stage).

Ready for maiden.

DAY 34. MAIDEN DAY *(WED. 22JUL2020)*

The final specs. for the maiden flight ended up as follows;

Span 63"

Weight(incl.batt.) 3lbs.13ozs

Wing loading 14.3 ozs/sq.ft.

Motor/prop SURPASS C3536 1050kv turning 10x4"prop

ESC Turnigy Plush 60A

Battery Turnigy 3200mAh 4s

RX Spektrum AR410 4ch

Servos 2 off Hitec HS311 standard 3.7kgcm @4.8v (Rudd/Elev.)

The wind conditions were not really suitable for test flights, i.e. blustery and getting stronger, but I felt the model's size would allow it to cope, which it did, but only with more throttle than would have been normal for a plane this light (under 4lbs). The 10x4" prop had to rev quite high to produce useful amounts of thrust – I will switch to an 11x4" asap. The first take-off into the wind only required about 10 feet to get off the ground, such was the head wind. After a

couple of 'hairy' moments during the two flights (1min and 3 min respectively) it was decided to curtail any further test flying until calmer conditions.

On first impressions, the model flies really well but is better suited to calmer conditions to get the most from it. The battery was only down to 71% after these two test flights, and I'd had to use far more throttle than I would normally have done on training or 'sports' flights, so I estimate training flights will be up to at least 12 minutes duration – experimentation will give me a better idea. The first change would be the use of an 11x4" prop.

Another possibility is the use of a 3s battery of similar capacity eg 3200mAh. This will allow the revs to come down and the use of a larger diameter/pitch prop. I suspect this combination might ultimately be more efficient, the lower revs helping keep the current within manageable limits.

To anyone reading this, I hope you enjoyed reading the build, and if you haven't already built a Super 60, go on – it's a classic!