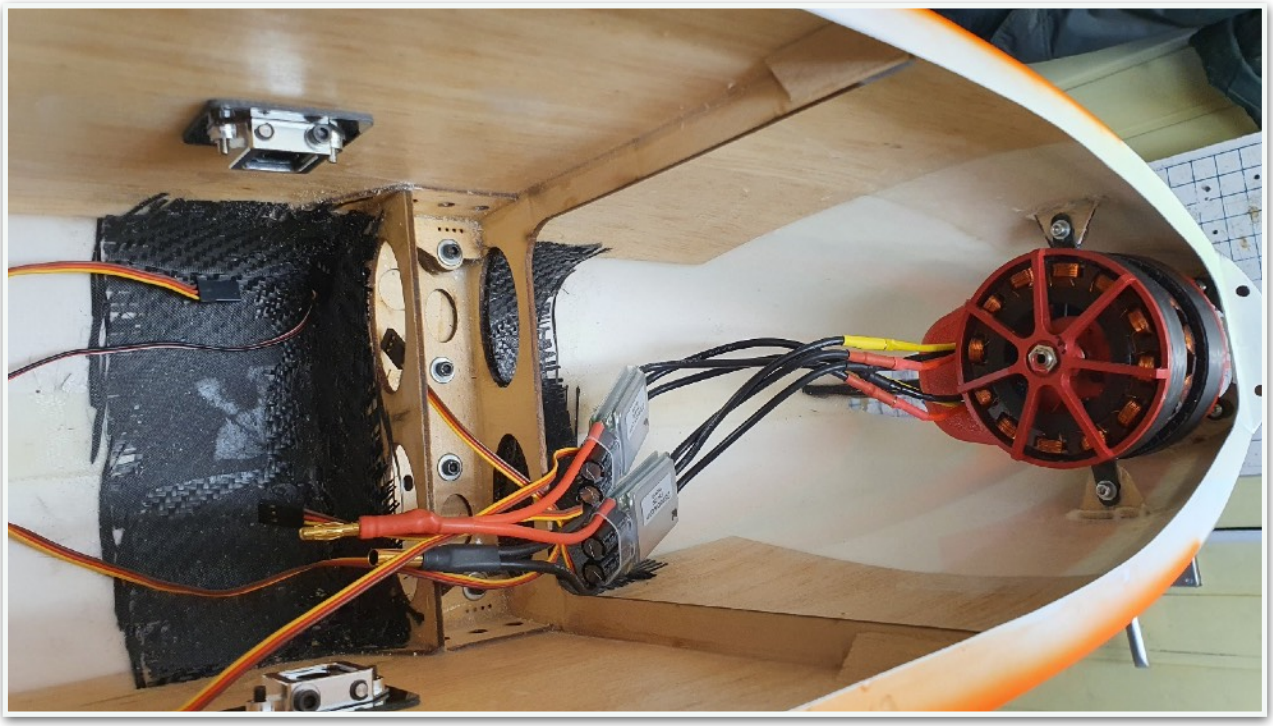
Peter Jenkins - B J Craft Anthem with TMCR, Part 5

Assembly

On the home straight now! First thing to do was to assemble the aircraft and do some final geometry checks.

The first job was to bolt the motor back into place. The 2 ESCs are shown connected in the photo.



What I also wanted to do was to identify the centre line of the motor so that I could arrange to fit the drive battery tray so that the mid-point of the flight pack was aligned with the motor centre. I wanted to reduce as much as possible any off-centre weight when rolling. Remember that the flight pack, 2 x 5S 5000 mah LiPos weight 1.2 Kg! Offering up the battery tray with the flight batteries nailed to it was a great help in identifying the correct mounting height.

With the motor back in, I then bolted the u/c back in. I also took the opportunity to remove the wheel spats and put some rubber solution on the face of the spat that abuts the u/c leg. This gives a good grip of the spat but allows some compliance if the spat hits something hard!

The tailplanes and canalyser were next to be bolted into position followed by the wings. I had already marked the wings with the 3 CG positions of forward, middle and aft. The measurements from the LE were 280 mm forward, 300 mm centre and 320 mm aft. I taped a piece of strong parcel string at the mid-point CG at the wing root so that I could feel the mid-point when I lifted the aircraft with my fingers.

I had previously measured that the rear of the canalyser needed to be raised by 5 mm to get the canalyser to an incidence of 0.7 deg or the same as the wing's incidence. I then checked the

canalyser to see if it was square to the wing. I measured from each edge of the canalyser to the wing immediately below it using a steel rule. This showed that the canalyser was tilted by a small amount to port. A bit of trial and error showed that this required 2 thicknesses of 1 mm ply to be placed just behind the front starboard bolt to level the canalyser. The tail plane appeared to be horizontal.

Next, I bolted on the 2 props and spinners, taped the canopy with its 2 canopy latches in the correct place and then checked the CG by standing at the front of the aircraft and lifting it by fingertip on the two bits of carpet thread I had taped to the wings.

If you look carefully, you will see a piece of masking tape under the wing at the root with the forward and rear limits of the CG and the piece of carpet thread at the mid-point.

The result was that the aircraft was only just nose heavy. In the description of the Anthem on Bondarero's site, B J Park states that he used the CG position at 300 mm aft of the LE as his CG but went on to say use the most aft position you fell happy with. The battery tray mounting system allows the packs to be slid forward and aft by a maximum of 20 mm each way. The mounting system also allows for more than one position for the tray to be set – I'll show a picture of this later on.

After those checks, I placed the Rx; the Optipower Ultra guard (a battery backup); the switch and the Rx battery at the mid-point of the required CG. Then placed the battery tray with 2 LiPos held in place with Velcro straps at a best guess location.

I have one more item to fit and that is the Flight Coach hardware. This is a very clever piece of software that has been developed by a group of F3A pilots spread between Britain and New Zealand. It uses a GPS module with a small processor that captures the aircraft's flight path and attitude so that you can play back your flight on your PC to see how and where you flew. I've had this system for some time but never got round to fitting it to my current aircraft.

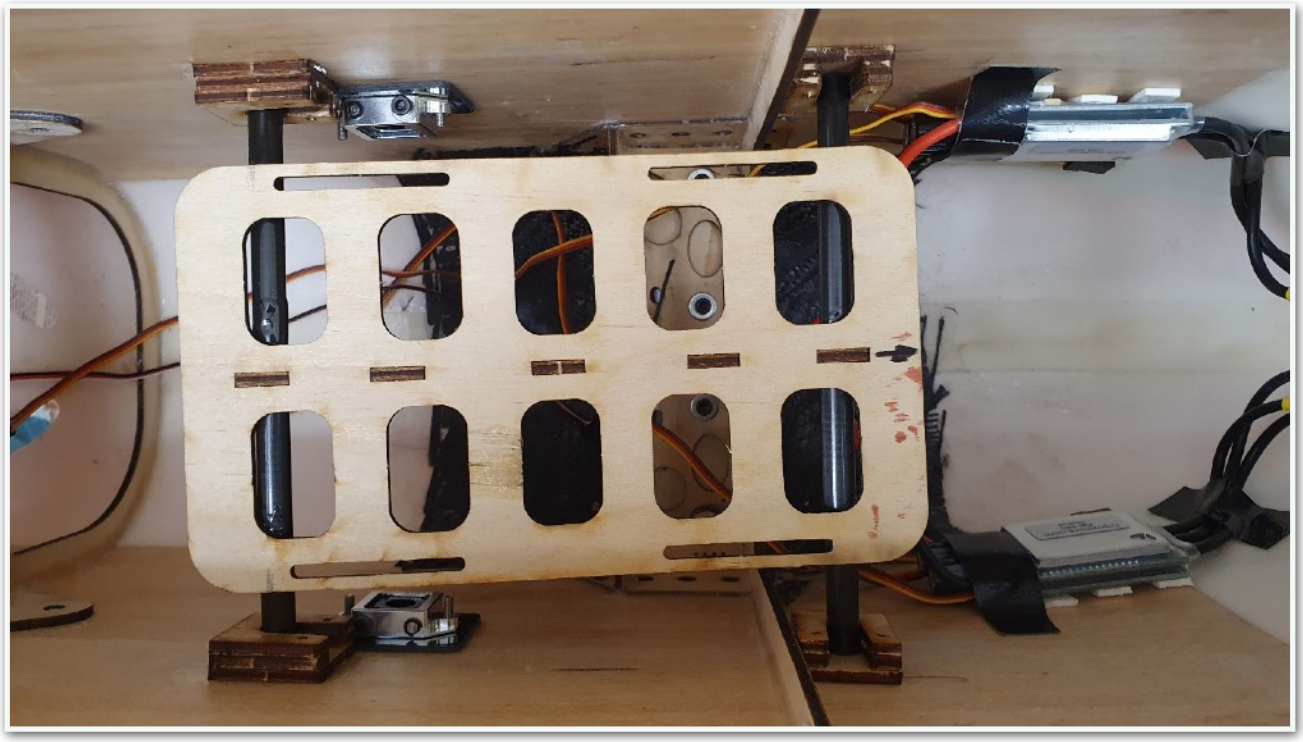
The next photo shows the positioning of all the loose equipment in the fuselage.

The next task will be to secure the 2 ESCs. My original idea was to build a balsa shelf but as this was approaching 90g I decided to go the simple route and used double sided tape to secure the ESCs to the fuselage wall. I used strips of Gorilla tape to secure the 3 phase leads and the rear of the ESCs – cheap and light!

Having established a position for the flight pack, the next job was to assemble the battery tray and glue it into position. The tray I have chosen is easily removable since this makes any maintenance, or repair(!), of the undercarriage much easier. The tray is all ply with 2 carbon tubes that fit into ply supports that are glued to the fuselage sides. So, I dry assembled the battery tray. The photo below shows the tray upside down so you can see the way the carbon tubes and central spar are attached.

The design for securing the carbon rods was a set of 4 supports that allow the rods to drop in vertically and then be secured by a shaped ply piece screwed together. However, I wanted to reduce the number of screws to be used so turned the rear supports on their side. This would allow the carbon tube to be slid into them and then the front drops into the front mounts to be secured with servo screws.

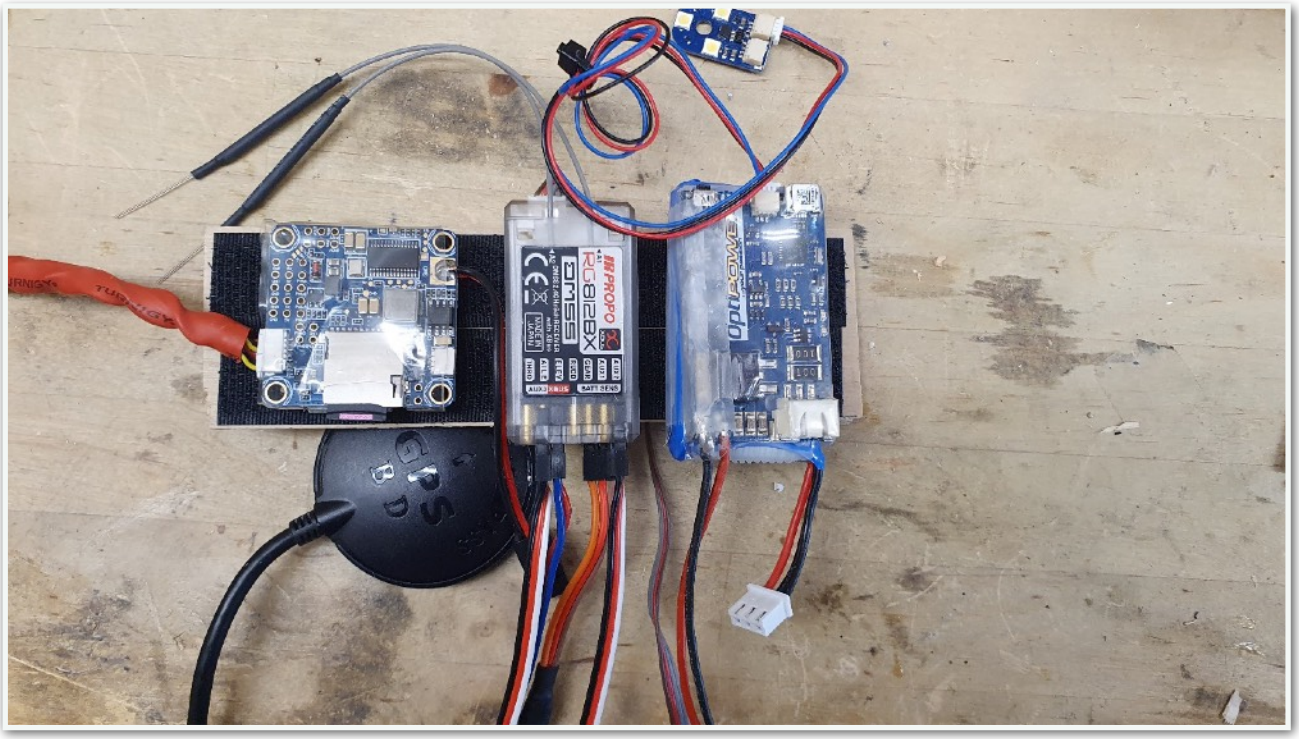
Once these supports were in place, I glued the carbon rods to the battery tray and placed the tray and rods in position so that the glue would set with the rods in the optimized positions! The photo also shows the front locking bracket and 2 servo screws that will secure the tray.



My original idea of mounting the Rx, battery back-up and Flight Coach hardware on the mid point CG position raised the issue of how easily this equipment could be accessed. However, moving the mounting tray down towards the bottom of the fuselage looked like providing easier access than having it towards the top.

I made up a tray out of 1/8 in balsa with a 1 mm ply facing with some cut down TE stock to increase the gluing area and then stuck Velcro across it.

The idea was to mount the Flight Coach PCB, the Rx and the Optipower Ultra guard on it as shown.

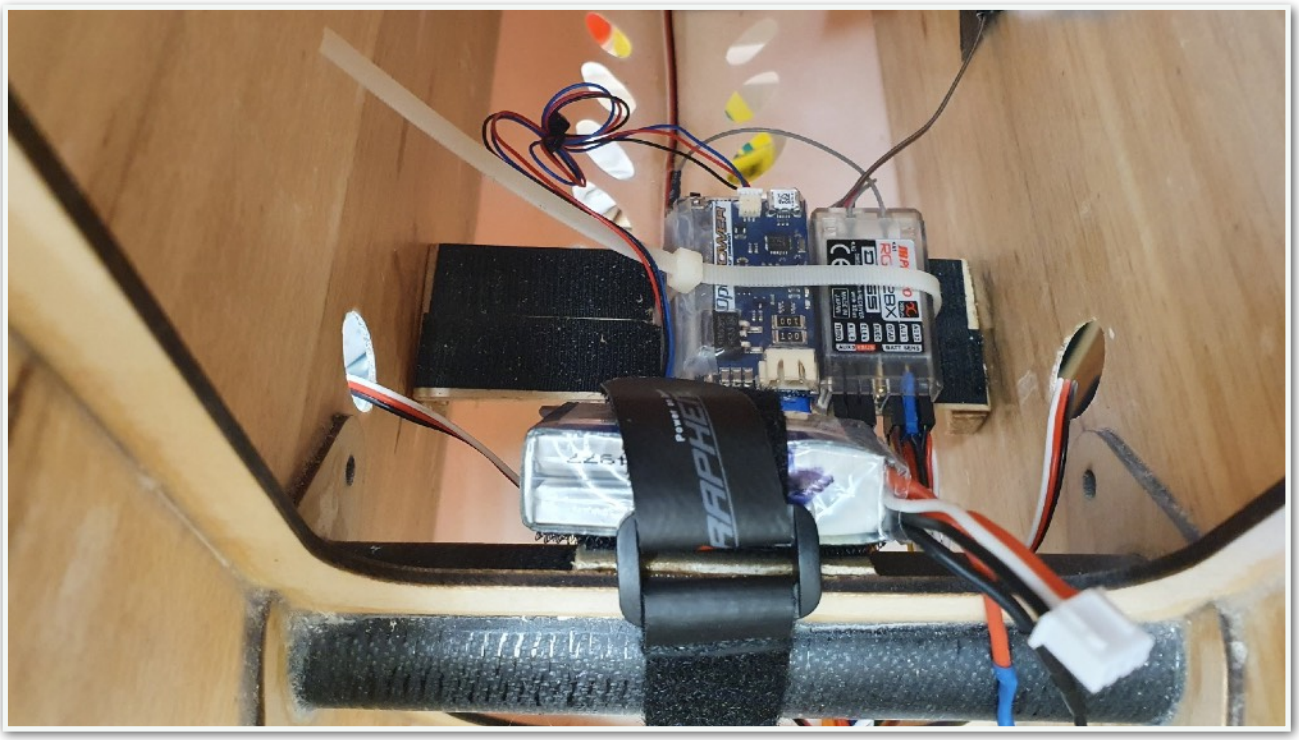


Thankfully, as you can see, that was a viable solution. The Flight Coach module, is connected to the large round black object that is the GPS compass and will provide the aircraft's path relative to the points that will define the aerobatic box. The Ultra Guard is powered by a 2S 450mAh LiPo that sits under the PCB. The balance lead is plugged into the socket at the bottom right of the PCB and I needed to be able to access this so that the LiPo could be unplugged and replugged to avoid current drain.

As a digression, the Ultra Guard senses the battery voltage being fed to the Rx and then sets a figure that is 0.5 v below that. If it sees the voltage drop to that figure it will start feeding power to the Rx and will set the 3 LEDs flashing (you can just see them at the top of the picture).

I then drilled 2 x 3.5 mm holes either side of the Rx and Ultraguard and inserted a tywrap left loose. Then it was time to epoxy the board into position.

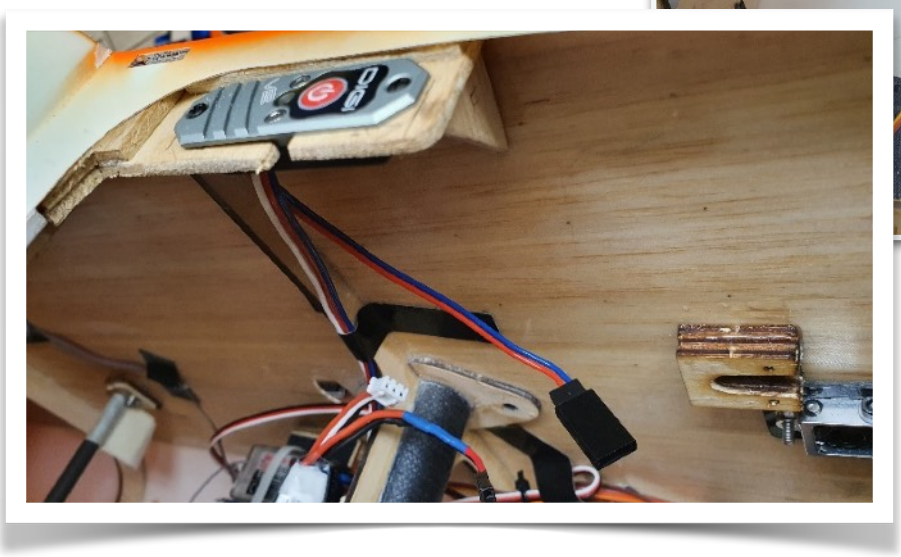
I also decided on the position for the 2S 850 mAh Rx LiPo. I made up a balsa plate and glued that to the back of the wing tube and the frame that sits on the tube. You can just see this in the photo. Finally, I connected up the Rx to the Xbus lead and the 2 motor leads and fitted the 2 aileron fly leads. These will be glued to the fuselage side so that I will just need to plug in the wing servo extension from outside the fuselage. This arrangement avoids having to put a servo lock onto the aileron lead since the inboard end will be glued to the fuselage and the yaw thrust is very low. This arrangement has worked without any problems on my previous 2 aircraft.



After connecting everything, I switched on the radio to make sure everything worked as required. It did!

I then turned to fitting the 2 canopy locks to the canopy. This requires some careful positioning of the canopy lock to avoid fouling the canopy structure and then cutting slots in the canopy to enable the locking lever to operate. The final part is drilling a hole in the canopy arch on the fuselage for the locking pin to engage with. I also glued 2 pieced of 2 mm ply to the rear of the canopy arch to support the engagement pin.

The final part of the build was to select a position for the Rx switch, make the ply plate to mount it onto and then glue it in place.



So, that concludes the assembly of the Anthem. I will go over it with a fine tooth comb to double check everything before committing to the maiden.

I still have some setting up on the Tx to do but since that is a JR specific function I'll just list what I will be setting up:

- I use 3 rates covering: spinning, landing and aerobatics. The control throws for aerobatics are less that 10 deg for ailerons and elevators and 35 deg for the rudder. Landing gets slightly larger throws while spinning gives full elevator and rudder with ailerons at landing rates.
- I set up a number of logical switches – Stick position in JR parlance – that provide the following:
    - A downline mix that is triggered when the throttle is fully closed. This will give a slight amount of down elevator to keep any vertical dive from pitching towards the canopy in still wind conditions
    - Additional rudder deflection when full rudder is applied in Aerobatics mode – this is to provide additional rudder for stall turns
    - Snap settings that will be triggered by pushing the right hand stick right into each of the four corners. This triggers elevator, rudder and aileron deflections that I tweak to provide a clear pitch up, or down, from the elevator and a rapid rotation from rudder and aileron deflection.

< End of Part 5>