Peter Jenkins - B J Craft Anthem with TMCR, Part 7

More Trimming

I have now flown the Anthem in two more sessions.

I am increasingly impressed with the motor system - the TMCR and the 2 D3 ESCs. With the recommended 23x20 props, the motor has excellent power, far more than would be needed normally but as Adam Debowski, the designer, says, it's helpful to have the extra power on high wind days when you have to drive the aircraft forward against the wind to get the geometry of loops right.

I should also correct anyone who thinks that I said the ESC provides air speed control. It provides prop speed control. That means you still need to use the throttle for uplines, 45 deg climbs and downlines but you only need to move the throttle about 3 clicks for a 45 up line and 4/5 clicks for a vertical upline. You still need to use the throttle though!

Talking of up and down lines, the geometry of introducing more downthrust into the motor mount is bringing the bottom of the rear spinner a little too close to the nose ring. So, I've experimented with a mix from THRO to ELE that comes in from a few clicks after the datum S&L setting to give a touch of down elevator. Today, I spent some time refining this and I think it is now just about rock solid on the upline hands off. Of course, that doesn't mean to say that it's that simple as you need to lean the aircraft into the head/side wind to compensate for the wind direction affecting the aircraft's position over the ground. The downline is again achieved as hands off with a mix triggered by a fully closed throttle and as per the upline needs management in strong winds to achieve a vertical downline with respect to the ground.

The spin is now almost sorted as I ended up with a significant in-spin aileron mix triggered by full down elevator and full left or right rudder. I manage the upright spin by manually using the ailerons having turned down the aileron movement in SPIN mode.

The snap roll on the 45 deg up line now seems to be sorted as the snap rate is now sufficiently slow that I can usually catch the aircraft after the 1 1/2 snaps with wings almost level and by recovering the elevator to a touch of up, the aircraft attitude is close the the entry 45 deg. Guess I'm always going to lose points on this one until I can figure out how to stop the snap at exactly 1 1/2 snaps and on the 45 deg line exactly!

Landing continues to require a high degree of concentration as even closing the throttle a small amount makes a significant difference to the aircraft's speed. I am getting used to it slowly though.

Overall, the aircraft is showing a significant improvement in its handling compared with the Element. BJ has clearly made a number of small changes in geometry and aerodynamics that gives the swept wing Anthem an edge over the Element. At least that justifies my decision to buy the Anthem rather than soldiering on with the Element. That having been said, the D3 ESC gives the Anthem by far the biggest improvement over the Element that has to use the Jeti Spin 99 ESC as the contra in the Element, the Ralph Schweizer CRS cannot use the D3 because of its rapid response to throttle movement.

I felt that I needed a bit more elevator to make sure that the wing stayed stalled when the spin was entered. The longer servo arms arrived today and so I swapped out the smaller arms. As you can see from the photo, I'm only using a slightly greater arm length. The elevators now are able to just close the V gap between the tail plane and the elevator without stalling the servo. So, the next time I'm out with the Anthem I'll see how the spin goes with the slightly greater elevator movement.



Just put in another 5 flights on the Anthem taking total flights to 21.

So, the CG position where I have pushed the flight packs back to (4 cm aft of the battery tray front) seems to be fine. There is around 2 clicks for elevator and aileron in the KE mix so my next move will be to make and glue in some new battery tray retention brackets thus allowing the packs to sit on the whole tray and not just half the tray! That will also allow an even more rearward CG (I started at 300 mm aft of the wing LE at the root with the aft limit quoted at 330 mm). Not sure exactly where the CG is with the pack in its current position - will have to do a rough balance at some point. If moving the CG back even more towards 330 mm eliminates the need for the KE mix without affecting other aspects of the aircraft's handling I might be tempted to do that. However, that may cause an access problem to the Rx battery and the Ultraguard as the latter needs to be switched off after the Rx battery is switched off. Something to watch!

The new longer elevator servo arms have allowed me to reduce servo movement from 135% back to 100% and this in turn reduced the misalignment at full down elevator to just a smidge. Interestingly, full up elevator has both elevators in exactly the same position. However, the increased elevator movement, which to be fair, was not really very much as the V in the TP/ Elevator is closed, doesn't seem to have affected the spin as much as adding in-spin aileron. I have gone back to a mix for the inverted spin using the rudder as master and the ailerons as slave to give a repeatable aileron deflection. The aircraft seems to favour spinning to the left when inverted so I'll stick with that but going right might need a bit more aileron. That's for next time's trimming session.

The snap speed is now fine provided I don't overdo the throttle! Interestingly, I tried both inverted and upright snaps and both seem fine. It's all now down to timing and catching the attitude as the snap is exited.

I tried the rudder at very low speed and at the very high speed and that showed that left rudder always produces a left yaw in both cases. A full size test pilot with experience of swept wing jets suggested I try this as on the Hawk the yaw from the rudder reversed between low and high speed. This is more to do with the Hawk's rudder being above the fuselage centre line unlike an F3A design where the rudder area is equalised above and below the fuselage centre line.

I had a couple of flights to try the current FAI P schedule and was surprised at how well the aircraft tracked and at the tremendous speed control the TMCR/Dc combo provides. I think this is going to be an excellent aircraft provided I don't screw it up with piloting errors - all to easy!

Having started with the CG at mid point (300 mm aft of the root LE), I had moved the main pack back a further 70 mm and nothing seemed to get worse but the amount of mixing required for knife edge reduced. So, as I couldn't move the pack any further back without falling off the battery tray, I've moved the tray back by 70 mm. That will allow the pack to sit squarely on the tray and I'll be able to experiment with moving the CG a bit further aft to see if things improve or get worse!

The only issue was that access to the wing bolt location that was in front of the wing tube is now blocked - see at the bottom left just below the rear tray support! So, have now had to use the alternative wing bolt position behind the wing tube.



If you compare the two side-by-side views you will see how much further back I have moved the battery pack. This moves the CG from the mid-point, 300 mm behind the wing root LE, to around 305 cm aft or so. If I move the packs back so they are once again hanging off the back of the battery tray, I will be able to reach the rearward CG limit of 320 mm aft of the wing root LE.

What moving the CG aft has done is to reduce the KE coupling that there was before. It may be that moving the pack further aft will, as in the case of the Element, completely eliminate the KE coupling but at that stage it becomes difficult to access the Rx battery and may make it difficult to switch off the Ultra Guard after flight!



Mid CG



CG further aft