

Peter Jenkins - B J Craft Anthem with TMCR, Part 6

Setup & Basic Trimming

Having set up the Tx, my biggest problem was trying to get the twin motor setup to connect to the 2 throttle curves and the 2 associated mixes. This is because the D3 ESC requires four idle settings as follows:

- Ground – closed throttle shuts down the motors
- Spin – set for around 300rpm
- Land – set for about 100-200rpm
- Aerobatics – set for 1,300 – 1,500rpm

The recommended rpm for 50% throttle is around 3,000rpm and full power with wide open throttle. I only ever felt I needed more than 80% power once and that was when checking out the up/down thrust. So, there is plenty of power from this combination. Incidentally, Debowski recommends 23 x 20 props for front and rear although he says that the 22 x 20 props are OK for “light” airframes like the Anthem.

Incidentally, the all up weight of the aircraft with and without the drive batteries is as follows:

- Weight without drive battery pack = 3,805g
- Weight with drive battery pack = 5,008g

The FAI requirement is that the weight of an electrically powered aircraft shall not exceed 5,000g but they allow a 1% variation so up to 5,050g would be acceptable. In any event, I have flight packs that are lighter and would drop below the 5,000g limit. For domestic competitions, this is not an issue.



In the end, fiddling around with the 2 ESCs proved too taxing so I went back to a single motor channel and connected the 2 ESCs via a Y lead! That took me 15 mins to set up!

So, the great day arrived and I ended up at Knettishall in the afternoon to be met by a cloudless blue sky – I hate those conditions as it's so easy to lose the aircraft against the blue sky – and a lowish wind but at 90deg to the runway!



After assembling the model and checking everything over yet again, I did the obligatory range check and got a club mate to move the model through 4 quadrants to check the radio reception while doing the range check. All checked out as did the Failsafe check.

This photo shows the wing sweepback very clearly.



So, I carried the Anthem out to the runway, walked back to the Pilots' Box and opened up the throttle to half power. The wind chose that moment to send in a strongish gust that required use of the rudder to maintain the take off track! Once airborne, the aircraft felt distinctly odd and had a marked yaw to the left. It took quite a few beeps of rudder trim to sort that out. Interestingly, when back on the ground I looked at the fin/rudder alignment and it was perfect! I can only conclude that setting up the rudder in my shed where I don't have the space to take a step back was not a good idea!

I was expecting that there would need to be some elevator trim and some aileron trim required to enable hands off level flight. I was not wrong. After landing, I could see that the elevator required 20 clicks of up and the ailerons about 8 clicks of left. There is no adjustability for the tail plane so I will need to tape the elevators in their current level flight position and adjust the pushrods to allow the servos to go back to neutral.

The aileron trim can be taken out by adjusting the wing incidence. Since the port wing was producing a tad too much lift and causing a bank to the right, I needed to reduce the port wing's incidence. This requires the incidence adjuster to be turned clockwise to move the wing down.

Before doing that I loosened off the rear adjuster clamp and the wing bolt and turned the adjuster a quarter turn then secured the clamps.

On the first flight, I also carried out the standard CG position check by pulling up to 45 degrees and rolling inverted and then releasing the elevator stick. The aircraft pitched slowly towards the canopy which was what the designer suggested was ideal. I was using the mid point of the CG range that the designer had used.

The landing produced a hear stopping moment when at about 2 ft off the ground, and having almost completed the round out, I closed the throttle as I would normally do – quickly! Wrong! The D3 ESC is the fastest acting ESC there is and as it directly controls the prop speed even when slowing down it was as if an air brake had been applied. The aircraft dropped onto its u/c and bounced a little! To solve this problem, I raised the landing idle speed and also determined not to take power off too quickly during the flare!

(Photo courtesy of Ron Gray)



The second flight was much better as regards its general smoothness although I had omitted to reduce the aileron rate from 30% of full rates. After landing I reduced that to 25% and will check that at the next flying session.

I tried upright and inverted spinning on the 2nd flight. The upright spin is clearly a spin but quite slow whereas the inverted spin was a bit of a waffly affair. I will have to see if I can get any move down elevator to help to keep the wing stalled or, if that doesn't work, then I'll use a mix on the rudder to bring in a small amount of in-spin aileron. A point to remember for inverted spinning is that the aileron needs to move in the opposite direction to the rudder.

The vertical up line was now straight as a die and so was the downline as regards the yaw axis. I had used a mix from fully closed throttle to 5 units of down elevator to keep the downline vertical in zero wind conditions. Two trial downlines showed a slight tendency to pitch to the canopy so after landing I increased the mix to 7 units of down elevator.

The next check was for Knife Edge. What I was looking for here once I had established a roll to wings vertical was whether there was a pitch to/from the canopy and whether the roll increased or decreased. The JR XG11 helpfully has a pre-set mix for rudder as master and elevator and aileron as slave. Turns out that the aircraft pitches to the canopy and the roll tends to decrease on both knife edges. Solutions are to try moving the CG aft to see if that reduces or eliminates the problem or use the KE mixes. That's for the next flying session.

I checked the side thrust setting (0 in this case) by pulling to the vertical and applying power and checking to see that the aircraft went straight up without needing any rudder correction. This is close but not quite there. I was using 4 clicks of trim for each beep of the trimmer for the initial flights but I have now set this to 1 click per beep for more exact trimming.

The other thing was to check the down thrust was correct. I flew in straight and level at my datum throttle setting of half throttle. The JR XG11 has a stick alert that I set to beep at 50% so that I know I am at half throttle. As the aircraft passes in front of me I smoothly open the throttle to full power. I am looking to see if the nose rises or falls immediately. If there is no change in this instantaneous attitude then the thrust line is correct. The aircraft will start to climb of course once the speed rises but I'm looking for that instantaneous change. That worked out fine so I was happy that will not need any tweaking.

As a side issue, I keep some mixes on a switch that is separate to the main Flight Mode switch. The downline mix is one of these and the other is the knife edge mix. I switch these out as part of my landing checks to make sure that I have the aircraft correctly configured for landing. Landing with the downline mix active is exciting as the nose pitches down as you close the throttle when you are less than a foot off the ground! With my other F3A aircraft, I don't have an idle set for aerobatic flying as the prop braking function only works when the throttle is fully closed. With the D3 ESC with its governed rpm this is no longer the case as braking is there at any throttle opening. So, for those aircraft, I select an idle of around 100rpm. That gives me an instant response to throttle even from fully closed which is very useful when you just want to add a touch of power to counter a slight under shoot as you don't have to move the throttle several clicks up from idle before the motor suddenly bursts into life and gives you a bit more power than you intended!

There are a lot more trimming flights required to get the aircraft fully trimmed out – probably a total of 20 – covering all sorts of things such as: spinning, speed of snap rolls, lateral balance checks, general feel of the controls to get roll and pitch rates right.

The other interesting thing was the difference between the fuselages of the Element and the Anthem. As you can see from the photo below, the Element has a taller fuselage, around a couple of inches, compared with the Anthem. The two fuselages are exactly the same length so you can see that the Element appears to be a little dumpy in comparison.



I will post again once I have finished trimming and have flown the aircraft through a number of times with the current FAI schedule with my views on the Anthem and Debowski TMCR combination. Right now, I would say that even after just 2 flights it's very promising.

Having returned home, I set about preparing the aircraft for its next trimming session by adjusting the rudder and elevator linkages so that the control surfaces were in the trimmed position but with the servo back to centre. So, the rudder now looks like this with the servo at neutral.



I've also increased the idle speed for landing and will try and remember not to close the throttle till the aircraft has landed!

< End of Part 6 >