

Peter Jenkins - B J Craft Anthem with TMCR, Part 8

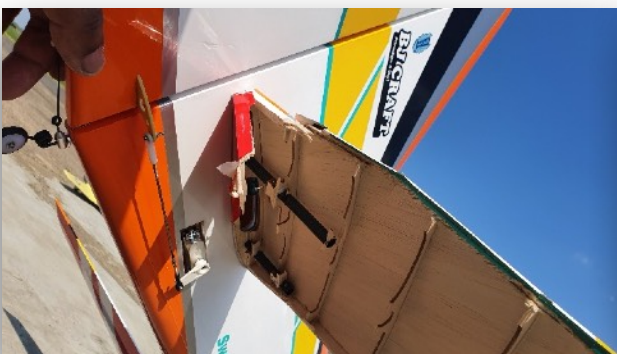
Oops

You may have noticed that there has been a gap between the last flight report on my Anthem. There is a very good reason for this.

On the 22nd flight, I had planned to fly another trimming session and to re-check some earlier trim settings. My first check after take off and a 180 deg turn was to check that the thrust line was still providing no pitch change at least for the immediate period after the throttle change. I used around 85% power for this check and as all was well, reduced power back to datum and then commenced my turnaround manoeuvre which was a half reverse Cuban 8. Unfortunately, soon after establishing the 45 deg climb, I heard a loud crack and felt that I had lost all control. The aircraft had by now rolled to the right and with a shock, I saw there was no starboard tailplane. I had reduced power once I heard the cracking noise and the aircraft gradually pitched nose down.

At this point, I felt that my control was so degraded that the aircraft might end up in a total loss! However, by using almost full left stick and some up elevator as well as advancing power to datum, I found I could level the aircraft. It was on the downwind side of the airfield so I set up a gentle descent with a view to landing off a long approach. The aircraft was heading towards the crop and on urging from my colleague I decided to try a turn to the right and then turn back onto heading so I could land on the full-size runway. The roll to the right was easy enough but rolling back and then rolling left proved to be much more difficult. By the time I had the aircraft back to wings level, it was overshooting the runway onto some rough grass. However, the ground speed was low as there was a strongish wind blowing and I was headed directly into it. I managed, or at least thought I'd managed, to flare the aircraft for landing, some 50 yds away from me, which appeared to be quite a soft landing.

On reaching the aircraft, I saw that the starboard tailplane was still attached but when I got the aircraft back to the pits and looked underneath, there was no bottom sheeting there. The elevator and the servo and push rod were also missing. See photos below.



After communication with B J Park, the Anthem designer, he put the finger on the JR 3301 servos I'd used for the elevators. In his view, the plastic gears were on the weak side and putting a long servo arm onto this servo was the most likely cause of the gears stripping. Now, I've used plastic geared JR and Futaba mini servos for elevators for a long time and I had never heard that the 3301 was considered to have a weak gear train. However, there was no disputing the fact that both elevator servos had stripped their gears.

Assuming that the starboard elevator servo gear train failed just after I pulled up into the 45 deg climb, this would have allowed the elevator to flap away and lead to flutter inducing force on the starboard tailplane. Flutter is usually denoted by a buzzing noise and I never heard this but then again, the aircraft was about 200m away from me. Flutter is exceptionally destructive over a very short period of time. This would have accounted for the structural destruction of the starboard tail plane which had the bottom section ripped off and the elevator, with servo still attached, went with it. I had put a servo lock on the elevator lead and that was still attached to the socket in the fuselage! Perhaps it was a good thing the elevator lead managed to break free avoiding having the servo and elevator flapping around interfering with the rudder.

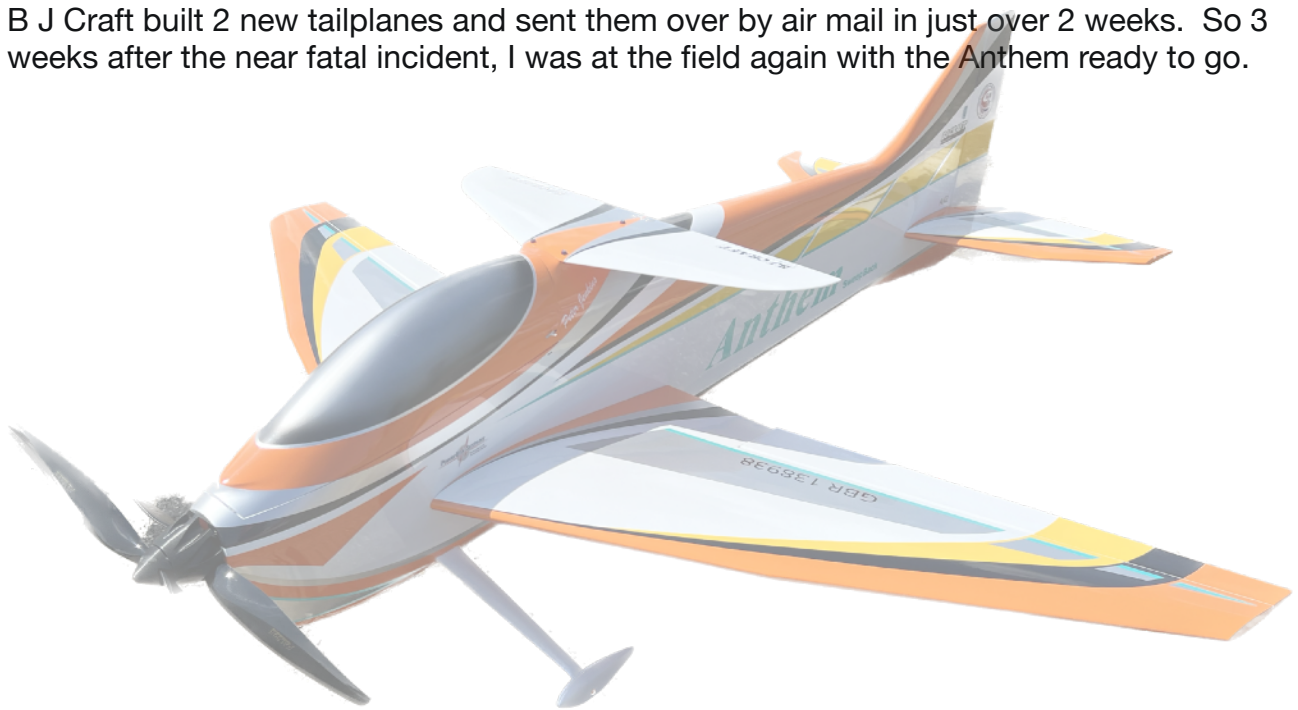
I felt it prudent to replace both tail planes since I had no idea what the port tail plane had been subjected to. The other piece of damage was to the starboard u/c leg that got stuck in a hole in the rough grass and damaged the section bolted to the u/c plate. The fuselage also showed signs of a crack running aft from the join between the u/c box and the fuselage side. A short while later when re-checking the aileron throws, I found that both aileron servos, Futaba BLS153s, developed a jitter when I placed the control surface throw measuring device on the aileron. The BLS 153 has plastic gears yet has never given me any problems in other installations. Since the jitter disappeared as soon as I moved the aileron stick I decided that the shock of the flutter failure may have damaged the 153 gear trains and since the ailerons were at neutral at the time of the flutter incident the damage would have been to those gears in contact at that position. Thankfully, they were not so damaged as to cause a problem with control but I was not prepared to use them unless I could replace the gear train. Guess what – no supply of gears! So, 2 new aileron servos were needed as well.

In the end, I've ended up with all MKS servos as follows: Ailerons – HV 737; Elevators HV 69, Rudder HV 747 (originally fitted). I also replaced the aileron and rudder control rods with Secraft 3mm turnbuckles and 3mm ball links. I had carefully examined the elevator pushrods and they were sound so I re-used them.

So, why had I used long control arms on the original elevator servos? Well, I had used the provided elevator horns without checking how far the clevis hole was (there was only 1) from the elevator surface. Turned out that this distance was 30mm. The standard JR arm only went to under 20mm hence the need for the longer arm in order to get full elevator movement – by full I mean that the elevator contacted the tail plane. The seeds of the over stress of the 3301 gear train were, therefore, the direct result of an overly long elevator horn. Unfortunately, the geometry of the elevator horn did not allow space for drilling another hole closer to the elevator surface. Rummaging around in my bits container, I came across some ZN Line metal horns with a distance of 20 mm from the base to the clevis hole. They were retained by quite small 2mm wood screws. I sent off for a selection of 2mm wood screws of increasing length.

Turned out that the elevator was thick enough to allow a 15mm length screw to be used without reaching the other side of the surface. So, that's what I used. Having cut the thread, I put a drop of thin cyano into the screw holes to toughen up the balsa. I tried this out on the old elevator where the control horn join to the elevator had failed. It was epoxied in place! With the ZN Line horn in place with the 2 x 15mm long screws, I could not exert enough force using my thumb on the horn to break it out of the elevator. I thought the 15mm long screws would do the job.

B J Craft built 2 new tailplanes and sent them over by air mail in just over 2 weeks. So 3 weeks after the near fatal incident, I was at the field again with the Anthem ready to go.



I had a degree of trepidation as I opened up the throttle but the flight went off uneventfully. As it happened, despite changing all the control rods and 4 of the 5 servos, I only needed 2 clicks of up elevator, 2 clicks of right rudder and 4 clicks of right aileron to get the aircraft flying S&L.

You may recall that I had started with the CG at the mid-point of the recommended range – 300mm aft of the wing root LE. I then moved the battery tray back by 70 mm to move the CG further aft – about 305/6mm aft. On my second flight, I decided to try moving the pack back a further 70mm and this gave a neutral handling aircraft – probably gave a CG of 310mm which is the aft limit. I always feel uncomfortable with this situation! The spin still required about 20% of in-spin aileron so there was little to be gained from the aft CG.

So, for the 3rd flight, which was the P23 schedule, I reverted to the CG of 305/306mm aft. The aircraft performed better than the pilot managed! None of the tweaks I had introduced during earlier trimming needed revisiting so now I can focus on practicing for my first competition.

Needless to say, it was a huge relief not to have lost the whole aircraft which, at one stage, seemed inevitable!