May 15, 2016

About RToucan, Hybrid Jett60, pushrods and soldered connections

Damaging the brand new model is not a very pleasant experience but I am sort of used to it.
Some say it is a very cruel hobby but you can learn a lot about yourself.

In my case, I am learning how much beating I can take "until morale improves".

This is what I have learned from my latest misfortune:

1. Do not use the engine that hit the pavement at 90 km/h without disassembling it completely.
2. Do not use small diameter, fine threaded rods in the pushrod of the large plane.

Ad.1 Jett60 used recently in my RToucan was not a healthy engine. After the Great White crash in the summer of 2015, I replaced the front portion of the engine shaft, inspected the crankcase and removed the head and the back plate only looking inside.

I did not remove and inspect the bearings, ignoring the slight clicking/brushing sound coming from the engine. The engine run ok after the crash but ok was not good enough in this case.

When the engine, that is a hybrid of old and new Jett parts, was run for the first time in RToucan with 13x5 Zinger prop., **the maximum launch RPM were below 8,000 in full 2 cycle mode, instead of being in 2-4-2 break. Full 2-cycle maximum RPM meant that the engine was running at much lower power. The RPM band within which the engine produces its peak torque is limited and my Jett was simply at the right hand end of this band (https://en.wikipedia.org/wiki/File:Powerband.gif)**

The RTF plane dry weight was 67 oz., the wings loading 13.3 oz./sq.ft. and the lines length, eyelet to eyelet, 61 ft. The radius of flight, from my body center to the CG of the plane was, ~66-67 ft.

The plane was sluggish in the level flight and there was not enough lines tension.

With 13x6 prop., the speed and the lines tension increased a bit but there was still not enough tension for me to risk the loops.

Flying the next time, I used 12x7 APC prop. and, though the launch RPM went up to 8,300 in full 2 cycle mode, the plane was still sluggish for me. Despite this, I risked the loop and ended up with the plane hitting the pavement inverted at ~70 degrees. This saved the plane but the entire top aft portion of the fuselage has been cracked and partially sheared.

To make a long story short: the launch RPM were numerically ok. but the engine was lacking power being already in the max. 2 cycle mode during launch. **Please refer to my previous publication titled Jett60 break_RToucan_Apr.25, 2016.pdf, in which I wrote that the low RPM problem was solved – it was not!**

After lengthy discussion with Brett Buck, Randy Smith and many other "people in the know" on Stunthanger.com, I run many ground tests using the engine with many different props., two different head shims and two different venturis. The results were disappointing.

According to Brett Buck, Jett 60 with the header/muffler should reach the maximum of ~13,000 RPM on 12.25x3.75 APC in full 2 cycle mode. I got max 10,800 RPM in full 2 cycle mode.

To get 2-4-2 break, I had to lower the RPM to 8,000 with this prop. and this is unacceptable.

With other tested props., the engine behavior was the same – full 2 cycle RPM and the 2-4-2 break RPM were ~2,000 lower than expected.

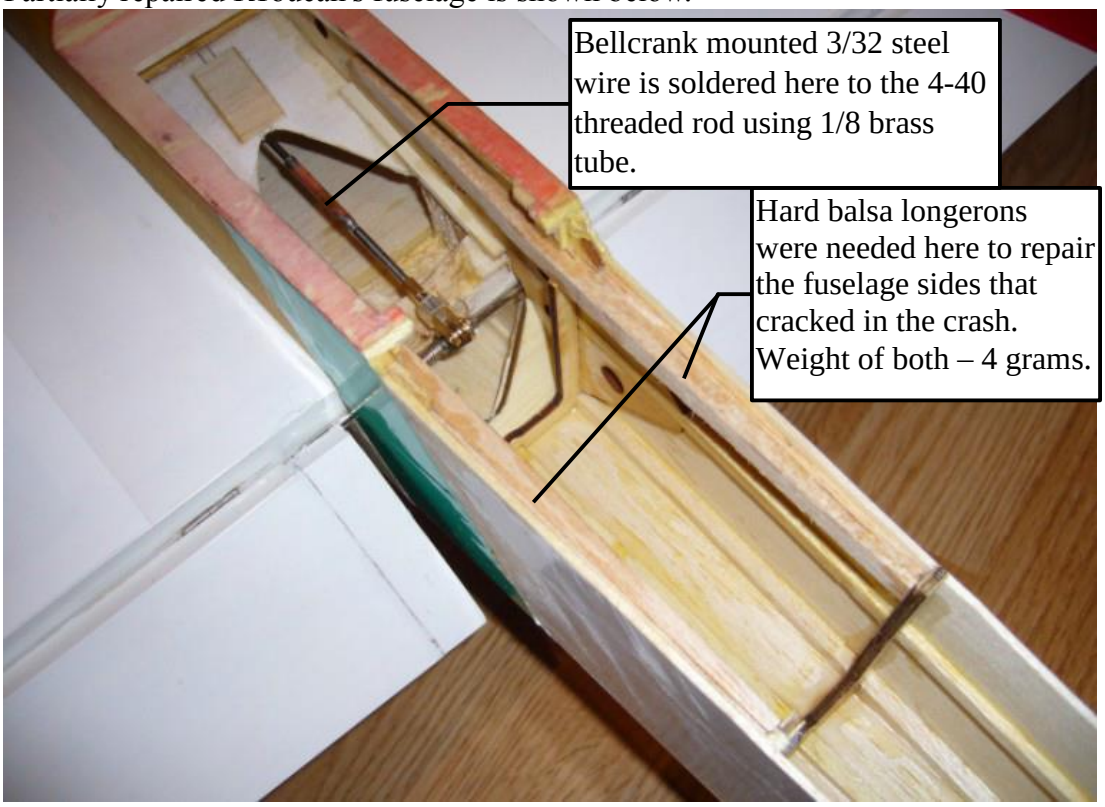
Conclusion: I suspect the bearings are damaged and the engine is fighting larger internal resistance. The nature of this damage is such that the resistance grows only when the engine is running and not while the propeller is turned by hand.

The other possibility: new RO-Jett parts (liner and piston) do not work well with old shaft and crankcase in terms of fuel transfer.

I need the tools to disassemble the engine completely and remove and check the bearings.

For repaired RToucan, I will use the brand new EVO60 NX with the C/L venturi.

Ad.2 Partially repaired RToucan's fuselage is shown below.



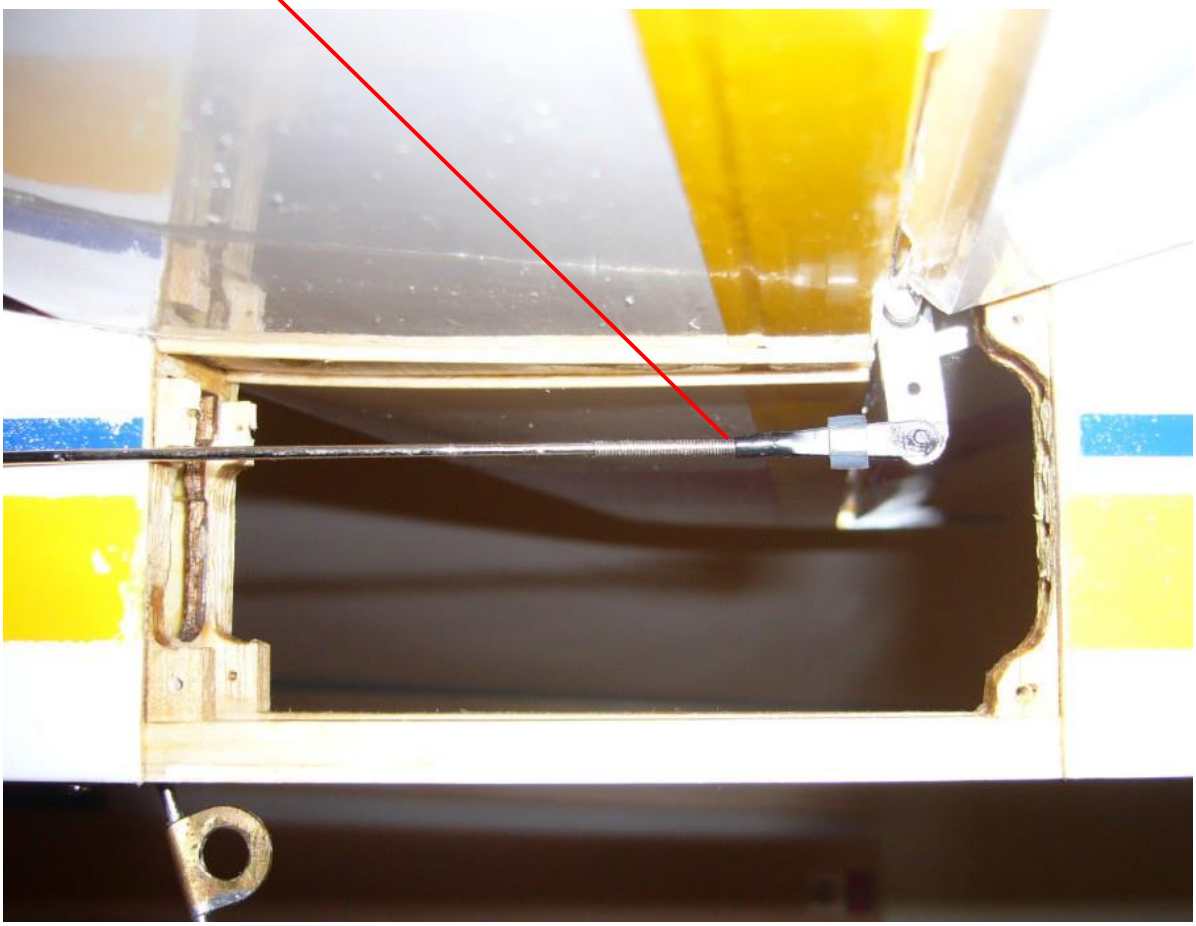
The soldered connection visible above was rebuilt and uses now the coarse 4-40 threaded rod instead of 2-56 fine thread rod. Original Score ARF 2-56 spring clip has been replaced by Sullivan "gold" steel 4-40 threaded spring clip.

This soldered connection has been tested using a separately built test piece that survived 55 lbf. static tensile load.

I suspect the 2-56 threaded rod with original Score ARF spring clip connected to the elevator horn failed in flight and this was the root cause of the crash.

I have found this 2-56 thread disconnected and partially damaged after the crash and the threaded connection is now very loose.

This connection will be replaced by 4-40 coarse threaded rod and the Sullivan clip.



The carbon composite tube of the pushrod (not shown) has the hard wood plugs on both ends and both 4-40 threaded rods will be epoxied in these plugs.

The aerodynamic forces that develop on flaps and elevator of the C/L model, can be roughly calculated using the formula F=1/2 RHO*V^2*AREA. This assumes that flaps and elevator simply resist the air flow acting as air brakes and this assumption is very conservative.

For the large plane like RToucan these forces are: ~5.5 lbf. for the flaps and ~3.5 lbf. for the elevator and this is definitely not too much. **Why did the 2-56 threaded connection failed? Probably I will never know for sure but be aware of cheap, Chinese made pushrods, threads and clevises.**