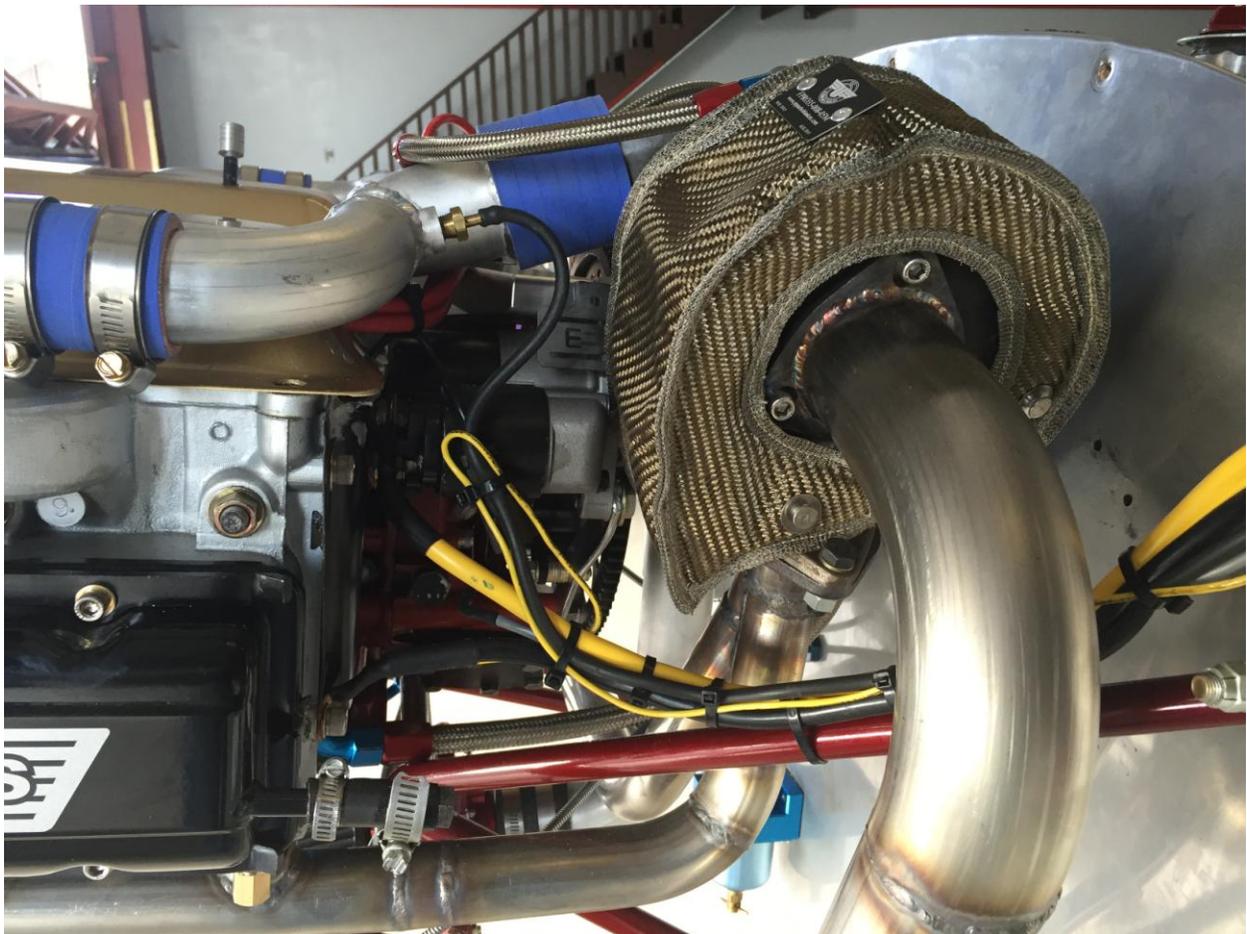


Nov 20, 2018

A little update on our turbo and prop testing on our Saberwing. The turbocharger system is a non-wastegated Rajay turbo with carbon seals. We use a Aerocarb 35mm carb in a draw through setup. This means that the air enters the filter, through the carb, mixes with fuel, and is drawn through the turbocharger compressor, and into the intake manifold. This is the simplest turbo setup you can make. It requires that you be up to speed on understanding engine monitoring and setting power levels carefully because you could easily overboost the engine and cause internal damage. We don't use an intercooler because the vaporized fuel provides much of the cooling and our intake manifold is quite short. There are many advantages to the turbo that we will demonstrate shortly but one is that highly vaporized and pressurized fuel/air mix enters all the cylinders very evenly, allowing for a more balanced cylinder burn. On the normally aspirated version of the corvaire you will get lean and rich cylinders because of flow dynamics and differences depending on power levels, intake turbulence and throttle plate positions.

Engine Data: Spyder 120 HP Engine. New counterweighted 1/4" stroked IFB crankshaft with new asymmetric thrust pistons, .060 full finned cylinders, OT10 Cam - advanced 3 degrees. 95 HP heads modified for lower compression at 8.5:1. Stainless exhaust valves and stainless exhaust system. Timing on our Ball bearing distributor (point and electronic) set at 12 degree internal advance for a total advance of 24 degrees. We are using vernier controls for the throttle and mixture to ensure smooth power inputs and adjustments.



First test prop : Sensenich 54X54 wood prop

Results: First several hours on the plane we kept our power levels conservative and not going over 30" MAP. Airplane was light and not fully fueled (full is 42 gallons so we kept at about 15-20 gallons most of the time). Engine ran very smooth and even. Climb outs were as expected at 500-700 ft/min and take off rolls were nice. Fuel burn was about 7 gallons/hr on takeoff and climb. Cruise performance was smooth and normal with speeds of 155mph at 28" and 165 at 30". We then started to test to higher altitudes and boosting once we had about 10 hours on the turbo. I would boost to 32 inches on takeoff and use 30 " in climb. At 10,000 feet we found that the engine would be turning about 3600 rpm at 35" MAP and 150 mph indicated. This information confirmed what I knew which is that we needed more prop. To take advantage of the turbo at altitude I would need to keep the RPM at a reasonable level. My goal would be to have 3600 rpm at 35" at 15,000 feet altitude.



Second test prop: Sensenich 56X58

Results: There was a noticeable decrease in takeoff and climb performance at lower altitudes so we elected to begin boosting the engine slightly on takeoffs to offset the extra pitch. I currently use 36" MAP on takeoff (have tested to 40") and once I am about 500' above the runway start to throttle it back to 30-32" in a 135mph climb. CHTs never get over 375 degrees and engine is very smooth. Great climb performance (750+) on the takeoff and reduced to 500'/min on climb out. Fuel burn at 36" moves up to 8.5 gal/hr but i admit I have it set a bit

rich....fuel is cheap. I ran this configuration for many (about 100 hours to date) hours - flew to Sun n Fun and Oshkosh 2017 and more. A few weeks ago Larry and I decided to do some higher altitude checks on it so we got our oxygen loaded and took off. Our standard climb rates were 500'/min up to about 9000 feet (using the TruTrak autopilot---sweet!) and leveling off to check performance. Our CHTs were very moderate and oil temps tended to climb a bit (230 degrees – pre cooler temp) We flew around a few minutes and then climbed up to 12,000 feet. Again we leveled off to check our cooling capacity and speeds at different power settings so we could reference RPMs. IT was getting cold. We then did a 300'/min climb to 15,500. The airplane would climb faster (500'/min) or better but as the angle of attack increases we noticed that the CHTs would also climb faster....the air is getting thinner so not cooling as well. At 15,500 we are on oxygen, set our power at 28" and mixture. Indicated was 150mph. True probably 175. Our fuel burn was about 6 gal hour at this stage....setting the mixture is much more sensitive. The airplane is flying very smoothly and quietly at this point. Oil temps spike much more easily but also cool down quicker. We flew around for a few minutes and boy it was cold. For another final check we advanced the throttle to the stop. We still had 36"MAP available and RPMs were just at 3600 rpm. We had a good prop for this kind of flying. We did a short climb demonstrating that we could still climb 500'/min but temps start to climb quicker than I like. It was time to come back home. A few minutes at slowing down gradually so as not to shock cool the engine and we were back on the ground and in warm air.



What did we learn: Love this engine combination on the Sabrewing. It can do 190mph flat out down low and still have great high altitude performance. What is our service ceiling?...not sure

but higher than I will normally operate. The airplane performs within my expectations and sometimes beyond. It is so much fun to fly. The autopilot makes it smooth and easy, the iLevel and Ipad combo make navigation easy, the MGL instrumentation works, and the engine is so smooth and clean in performance and build.



Third Test Prop: Sensenich (see a trend here..) 3 blade composite - hollow core - ground adjustable 58" prop.

Results: This prop is really pretty to look at. Installation is more complex but the adjustability may be worth it. We have only done a couple tests on it but the initial results seem really positive. I see an increase in rollout and climb and should get better cruise performance. It will take me a few weeks to do these tests. You can follow on our Facebook pages if you want. I will do another update soon.

What's Next? Because the Rajay turbos are harder to find we have found somebody that will produce a turbo will similar mapping that we will start testing soon. Larry is ready to put one of the 120 Turbo engines on his Saberwing after seeing the performance differences we have between our aircraft. He is still running the 100HP engine so only can cruise in the 150 mph range for now. I will be doing some changes to our prototype soon to improve its performance even more such as cleaning up some of the small drag areas - gap seals and intake

ramps. The cowling may get closed in tighter and add cowl flap doors to adjust cooling ability. I may do some tailwheel changes to reduce drag there as well. The Oil cooler may get an improved intake to allow more air to enter at altitude. The engine itself may get a couple this done. We are thinking about a cockpit adjustable distributor timing control to increase timing at altitude and to help us to determine best timing advances for the turbo engine. We are also looking to improve our MGL RPM signal pickups to eliminate high rpm fluctuations. There is still a lot to do along with all the other things in life going on.



More to come....