

Outbound Progress Report 32

Outbound Performance with the Rotax 915iS

Flight testing of a trike and tailwheel Rotax 915iS equipped S-21 is yielding some interesting performance data and impressions. The engine install is an impressive array of wires, lines, hoses, black boxes, and heat exchangers. It was a challenge to reach the level of cooling required and after many configurations, the oil cooler and radiator were placed up front. This required major modifications to the existing cowling. The intercooler is side-mounted with a generous air scoop. Naca scoops of two sizes were tried, but in the end the external scoop won. After asking around the industry, other installers ran into the same challenge keeping the manifold temperature under the limit of 120F. This seems to be a very low threshold. All the operators of 915's I spoke with have largely ignored this limit, citing the engine protects itself by enriching the mixture, thus boost continues. We saw manifold temps up to 160F and still had boost. In fact, not once during all of our testing did the turbo waste gate open. What we were able to accomplish in the attempt to keep inlet air under 120F, was less spread between manifold temperature and OAT. The good news is the system never stays above 120F once climb angle and throttle are reduced. There may be days with high ambient air temperatures raising operator concern as rail lights and manifold over-temp warnings appear.



Performance is similar to the Titan 340, with the Titan winning in initial rate of climb and true airspeeds. Our test plane had a fixed pitch prop while a customer plane has the Airmaster. The customer plane is showing higher rates of climb and at least 5 MPH faster cruise. As expected, take-offs are shorter due to the constant speed prop and 70 pounds less weight.

A lower fuel burn was one of the goals of using the 915iS and it seems there is some advantage. At this point we cannot confirm the exact GPH's. Fuel burn looks to be about a gallon per-hour less than the Titan.

The engine is exceptionally smooth and easy to operate. At RPM's above 5000 there is a turbo whine that may be appealing to some. I found it OK, but noticeably different than the 912

series. It is a FADEC engine. If the FAA changes the light sport rules to allow controllable props it will allow the full potential of the 915. The word is they will allow them on FADEC engines.

I have been predicting the 915 to be a game changer



and it is in some respects. After flying two S-21's with this engine, it does show potential for greater range, higher service ceiling, greater rates of climb and payloads, and possibly even higher cruise speeds above 12,500' over the Titan 340, provided it is equipped with constant speed prop. Does this make the Titan obsolete? A Titan 340 with a constant speed prop is going to be a hard-to-beat combo. With a fixed pitch prop we are seeing an average of 600 FPM rate of climb at gross to 12,500' and true airspeeds 10 MPH higher at 7000'. With more testing of the 915 powered Outbound I predict we will start to see where it really shines. We plan to head to Colorado to locations above 4000'. This is where a turbo charger and lower gross weight with a given payload will prove out their worth. It is also where the 915 should match the Titan in power-to-weight when both planes are loaded to the payloads and range.

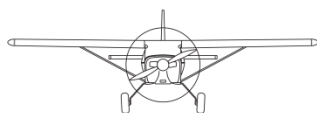
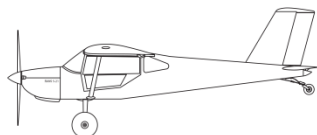
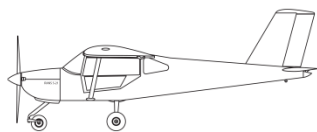
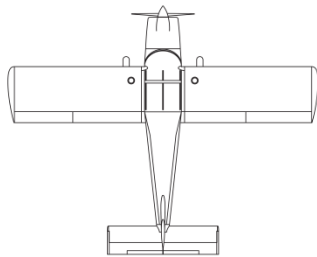
RANS®

Updated 1/30/2020

S-21 OUTBOUND

All metal, all purpose.

SPECS AND PERFORMANCE



SPECIFICATIONS	ROTAX 912 ULS	ROTAX 915 IS	TITAN x-340
Wing Span	28 ft.	28 ft.	28 ft.
Wing Area	141 sq. ft.	141 sq. ft.	141 sq. ft.
MAC	5.06 ft	5.06 ft	5.06 ft
Aspect	5.05	5.05	5.05
Length	22.41 ft.	22.41 ft.	22.41 ft.
Height Tailwheel	78"	78"	78"
Height Trike	102.65"	102.65"	102.65"
Cockpit Width	46.5 in.	46.5 in.	46.5 in.
Headroom	42 in.	42 in.	42 in.
Legroom	46 in.	46 in.	46 in.
Number of Seats	2	2	2
Doors	2	2	2
Landing Gear***	F/TDTK	F/TDTK	F/TDTK
Baggage Volume	24 cu. ft.	24 cu. ft.	24 cu. ft.
Baggage Capacity	80 lbs.	120 lbs.	180 lbs.
Fuel Capacity	45 gal. us.	50 gal. us.	50 gal. us.

POWER PLANT	ROTAX 912 ULS	ROTAX 915 IS	TITAN x-340
Output	100 hp	141 hp	180 hp
Oil Capacity	3 qt.	3 qt.	8 qt.
Coolant Capacity	2.5 qt.	3 qt.	n/a
Propeller Diameter	75 in.	75 in.	80 in.
Propeller Type	Gr. Adj.	Gr. Adj.	Gr. Adj.
Fuel G.P.H	5.5 @ 75%	7 @ 75%	8 @ 75%

WEIGHTS & LOADINGS	ROTAX 912 ULS	ROTAX 915 IS	TITAN x-340
Gross Weight	1320 lbs. (1600 lbs.*)	1320 lbs. (1600 lbs.*)	1320 lbs. (1600 lbs.*)
Empty Weight	820 lbs.	915 lbs.	985 lbs.
Useful Load	500 lbs. (790 lbs.*)	405 lbs. (685 lbs.*)	335 lbs. (615 lbs.*)
Wing Loading	9.36 lbs./ft ²	13.47 lbs./ft ²	13.47 lbs./ft ²
Power Loading	13.2 lbs./hp	12.76 lbs./hp	10.55 lbs./hp
Limit Loading	+6 / -2	+6 / -2	+6 / -2

PERFORMANCE	ROTAX 912 ULS	ROTAX 915 IS	TITAN x-340
Take Off Roll	350 ft.	315 ft.	325 ft.
Rate of Climb	850 fpm	1400 fpm	1500 fpm
Service Ceiling	12,500 ft.	20,000 ft.	14,000 ft.
Vc	120 mph	145 mph	155 mph
Vne	215 mph	215 mph	215 mph
Stall Clean	46 mph	50 mph	50 mph
Stall Flaps	38 mph	40 mph	40 mph
Roll Rate	100°/sec	100°/sec	100°/sec
Glide Ratio	9.5:1	9.5:1	9.5:1
Landing Roll	350 ft.	375 ft.	375 ft.
Endurance**	6.75 hrs.	6.6 hrs.	5 hrs.
Range	852 miles	957 miles	750 miles

* EAB (Experimental/Amateur-Built)

** Plus 5 hr. reserve

*** F/TDTK= Fixed, Convertible/ Taildragger or Trike

We are guessing that engine install kits will be available late summer 2020. The install kit will be sold with our traditional completeness featuring carbon cowlings, fixed pitch or constant speed prop choices. Rotax is currently working on changing to larger oil lines and fittings. Our kit will be reflecting that change. This change may or may not affect our timeline for the install kits. The larger lines may impact mounting of the oil cooler and radiator. If you do not purchase a 915iS engine through us, make sure it has the larger lines and you have the proper placement of the intercooler ports. To insure proper fit, we suggest you order through RANS.

Sun-n-Fun 2020

With our tremendous back-log of orders we have decided not to attend S-n-F this year. I know a number of clients with kits on order were asking about the demo flight schedule, which I regret not being able to accommodate. However, I feel that keeping our crew busy building kits and ready-to-fly planes will be a better outcome for all. This means during the time of the Sun-n-Fun show we will be happy to perform demo flights out of our facilities in Hays, Kansas should anyone venture to the Midwest. At this time, we do plan to attend Sun-n-Fun in 2021.

Sand Bars and 22" Tundra Tires

The river bed changed from wide salt flats to beamy sand bars. Our flight of 4 planes was searching for sand bars and the salt flats would be a bonus. Our flight included an S-7S with 26 ABW's and the extra wide Matco tailwheel, a trike S-6ES (modified with a sport wing covered in Oratec) and 22" tundra tires all around, a S-20 with an Airmaster prop and 22" tundra's, and our 340 powered S-21. We were at 1730 gross in the Outbound, sporting the stock 22" Tundra tires and 8" tailwheel. Everyone except the S-7S had passengers, so this would be a great

comparison of the S-21 to our other models. It has been a while since I landed on a sand bar and never on a potentially mushy salt flat.

The first to land was the S-7S since he was the tour guide and had frequented this location. There is always the question of moisture creating soft spots and as he taxied to the side of his landing roll out he



radioed it was firm. We all followed, with the S-21 landing last. Once out of the plane and walking around I noted the texture of the salty sand was dry with sporadic wet patches. You could see our tracks as light scoring, not much different, if at all, over the lighter planes. Our landing distance was only a few feet more, with the dual brake calipers on the 22" tundra's very powerful and easy to modulate. With ample back stick there is no tendency to lift the tail during hard braking.

The next landing was a sand bar and again, we were last to land. That means the sand was loosened up and about the limit for 22" diameter tires and 8" pneumatic tailwheel. We landed downwind and even though the wind was light (3 to 5 MPH), it added some distance. Walking around the sand bar we noted frequent sink holes. I walked the sandbar where we would back taxi to assure solid ground. For easier rolling I back taxied solo. Once my passenger was onboard we blasted off with no issues.

I concluded the 22" stock tires will suffice for even loose sand bars at near gross, but require more vigilance and skill. Had we done the same locations with the 26" ABW it is obvious there would have been more floatation on the soft sand resulting in less effort to taxi. If I was making a habit of lots of impromptu landing sites, I would go with the 26" Alaska Bushwheels. Maybe 29's for more extreme off field work, but be ready for a little reduction in speed and climb performance (5 MPH off cruise, and 50 to 100 ROC).



Door Assembly and Using VHB

Some builders have asked where to apply the VHB as per a recent revision to the door assembly. The figure drawing below shows it is ONLY used under the "C" shaped extrusion. Applying the VHB anywhere else, like under the Lexan window and the square tube welded door frame, will turn assembly of the door into a real challenge.



Tweaking Doors

A few builders have noticed during high speed flight that the doors tend to swell open about midway up from the bottom. This is due to not being fitted correctly. It is a matter of bending the frame so the middle front part of the door is slightly inside the station 2 tube. Pin the door in place and grasp the door frame at the bottom and push in at the middle. After test flying, if the door still does not seal, place a small chunk of wood at the bottom of the door, between the door and bottom of the airframe, and bend as needed.



Changes to the Outbound Kits

Due to issues with packing and shipping damage, we are going to stop providing the ailerons, flaps, and rudders with the larger radius formed on the part. This means the same method to roll the leading edge of the elevator will be used on the rudder. The same PVC tube used on the elevator is also used on the rudder. There is no need to pre-form the leading edges of the aileron and flap since merely clecoing the skin to the ribs forms the curve needed. This adds a couple of build hours at most to the kit, but there is a reward! Kits impacted with this change will receive some extra goodies well worth the effort to roll those skins. You will get the wing to strut fairings AND the gear leg to fuselage fairings added into the kit as standard equipment at no extra charge. This will be a running change to occur once the stock of rolled aileron, flap and rudder parts are depleted.

Design Intent of Interior

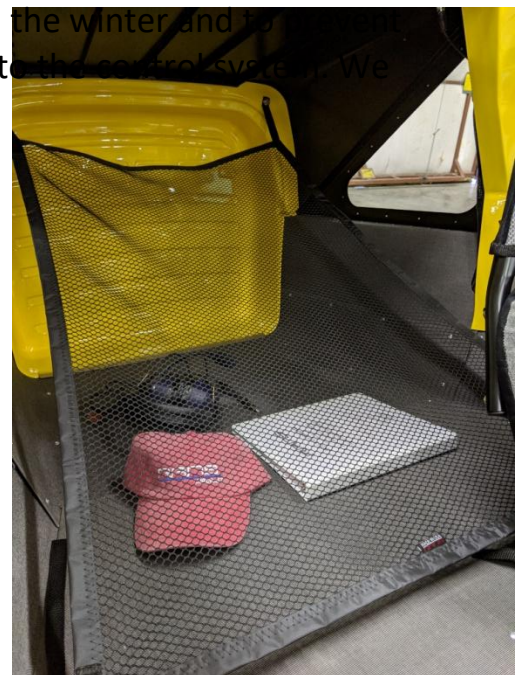
As more builders come closer to completion of their S-21's we are seeing the usual modifications being shared on social media. This is one of the great things about building EAB. Meanwhile, we want to share more about why we provide such a complete kit and solid reasons to use the provided components. In this case the interior parts. We included a full-component set to allow the finishing-out of the interior. These parts include panels that create



a more cozy cabin in the winter and to keep items from falling into the controls system. We made the fit-up as tight as possible to affect this aspect. If you do modify these parts keep in mind the original design intent; we want to keep you safe and not have a loose ball point

pen or skirt ruin your day, although the latter may have an impact whether on board or not!

A cargo net is provided to secure items in the baggage area. This is crucial when bouncing around in turbulence as well as landing in the rough. The cargo net should keep baggage items from coming forward and secure in the event of a sudden stop or flip over. So please use this feature! Again, we would hate to see a suitcase full of high heels or a tool bag come crashing into your head!



Thanks for stopping in and more to come! RJS