

S-21 Outbound Progress Report 12-1-16

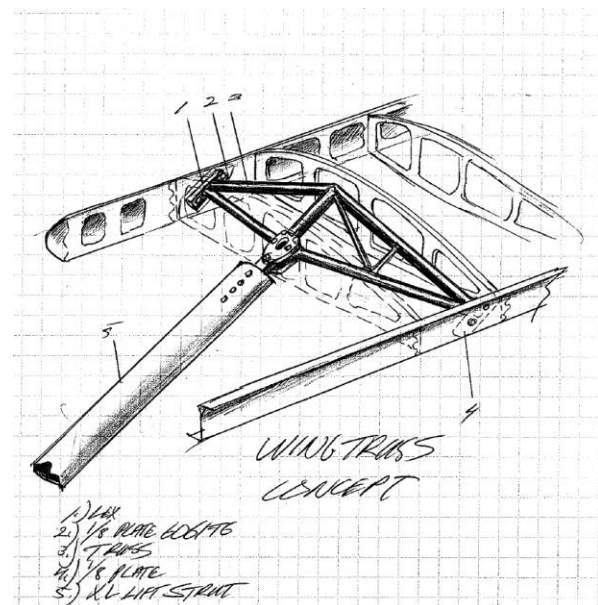
The wing is the thing. Our efforts have been concentrated mostly on the wing these past few weeks, doing the static load testing of various wing truss designs, to final skin layouts and control system final design.

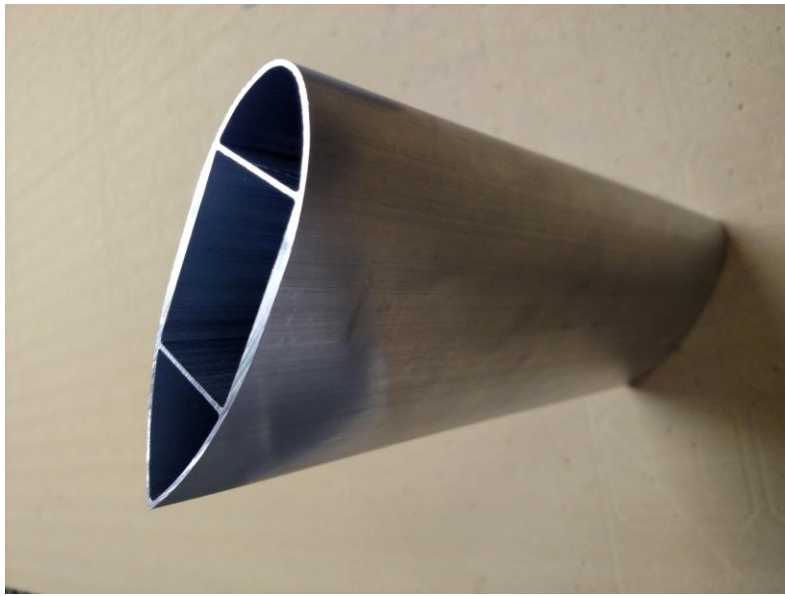
We used 4 different truss designs in static load tests, to arrive at the most optimized and load proven article. We started with a 3.9 pound truss, went up to 5.5 pounds, and optimized the final version down to 4.88 pounds. Not bad for a part that will be loaded to 9500 plus pounds if you pull over 9 Gs at 1800 pounds gross.



What material to use for truss was debated, from milling out an aluminum bar stock, a custom extrusion, to welded steel tubing. The welded steel tubing won out because of ease of manufacture, and great weight to strength. The concern about having a steel part tucked up inside the wing was overcome by providing it with internal oil treatment and powder coating. We also will use .020" thick Lexan barriers that sandwich between the truss and wing spars.

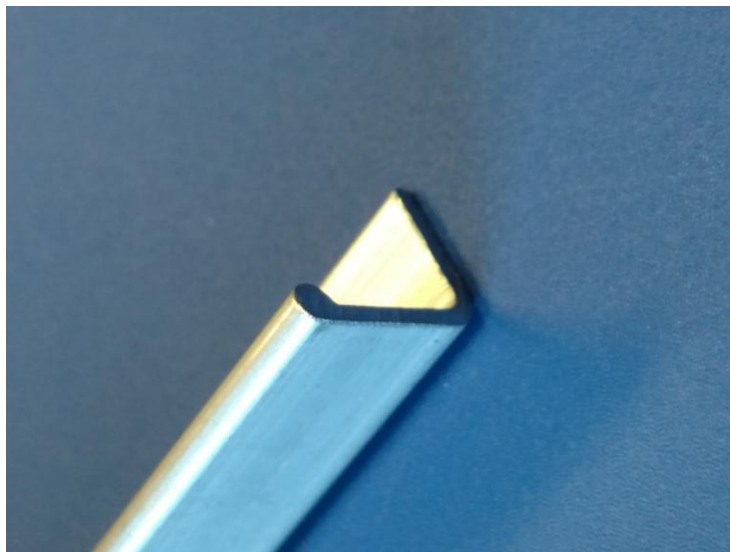
The truss is used to connect the front and rear spars to the single lift strut (Luscombe style). Originally, we were to test fly a dual strut wing, like the one displayed at Airventure, thinking it would be faster to get something flying. After doing the wing test, it made sense to skip over the dual strut wing for the single strut design.



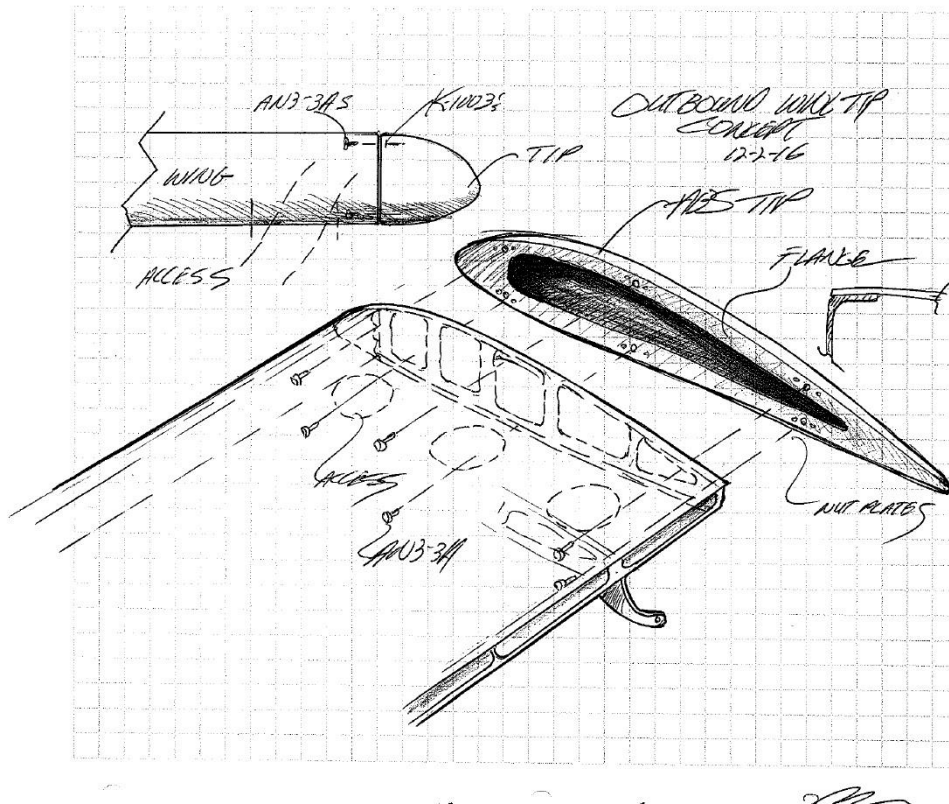


Of course a single strut wing needs a bigger strut over a dual set up. A larger strut was designed and extruded featuring dual internal webs. This increases the negative load carry with a very small weight increase. The larger strut weighs in at .98 pounds per foot. The total weight of the dual struts system is 11.25 pounds. The total with truss and single strut and fittings is 12.25 pounds. This is a weight increase of 2 pounds for the single strut design. Well worth it for the lower part count, ease of assembly and drag reduction.

Wing and fuselage stringers will be pre-drilled and also made from a custom extrusion. It is a small angle featuring a bulb-flange design. Stringers prevent skin buckling by reducing the free span area between bulkhead and ribs. The extrusion is small but mighty, providing stiffness for very low weight. Having them pre-drilled to final hole size will greatly advance assembly.



Wing tip design will feature a flush mount system. This means there will not be a row of screws outlining the root edge of the tip. The plan is to use thermal formed ABS in a two part design. The outer tip will be a typical teardrop shape, the second part glues flush to the outer parts rim forming a mating flange allowing the assembly to bolt to the tip rib. Two access panels will be provided to allow install and removal. It should be one of the most drag free and builder friendly ways of mounting a wing-tip.



We plan on flying a set of S-21 wings on the prototype Raven. This may allow early shipment of wing kits. Details of this plan will be sent to depositors. Meanwhile, tooling development continues on the rest of the tailcone and tail surfaces.

Stay tuned, more to follow...RJS