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# 1. 2015

## 1.1 October

### 1.1.1 About me (2015-10-11 21:02)

Hello! My name is George Fahmy and I'm building a Van's Aircraft RV-7 and I'll be documenting my build on this website! Its going to definitely be a big project, but I think I should be able to handle it.

My callsign N890GF is a combination of my birth month/year/initials. I spent a long time debating what I wanted as my callsign, and after repeating this out loud over and over again, it just rolls off the tongue and that's when I reserved it with the FAA!

Ever since I was a young boy I knew I was going to be an engineer, I was drawn to taking things apart and putting them back together. I started flying remote control planes early on in life and when I got to college I began studying Aerospace Engineering. I also continued flying remote control planes and they kept getting bigger and bigger. When I graduated college and got my first job, I decided to pursue my pilots license and on March 16th 2016 I passed my checkride and became a Private Pilot! My dream of flying has become a reality, now I am trying to fulfill the other half of that dream which is to fly a plane I built myself.

I can't wait to get to that point, but until then I'm glad to share my progress and this experience with everyone!

-George

### 1.1.2 Finished One Work Bench (2015-10-18 02:01)

I spent the day getting a bunch of wood and tools together to build a couple EAA 1000 Workbenches. These things are great! It will end up costing me about \$60 a piece for both completed benches and these will last me a lifetime. Check out the plans here if you're interested: [1]EAA 1000 Workbench

Heres the wood after I cut it to the correct sizes

[2]



And here is a complete Table! I haven't done woodworking a long time, so this was a great exercise to get back into building stuff. I'll build the second table tomorrow, you can see all the wood on the bottom shelf.[3]



1. <http://www.eaa1000.av.org/technic1/worktabl/tablefig.htm>
2. [https://n890gf.com/wp-content/uploads/2015/10/img\\_2186.jpg](https://n890gf.com/wp-content/uploads/2015/10/img_2186.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/10/img\\_2188.jpg](https://n890gf.com/wp-content/uploads/2015/10/img_2188.jpg)

### **1.1.3 Ordered more tools (2015-10-18 03:07)**

Today after completing my workbench I went ahead and placed an order for a Vans RV Toolkit from Isham Tools. I have read many good things about this toolkit on [1][vansairforce.net](http://vansairforce.net) and that's what I am going with. I will probably collect more tools throughout the build, but figured that's a good place to start.

1. <http://vansairforce.net/>

#### **1.1.4 Finished my Workbenches (2015-10-19 02:54)**

Today I finished my second workbench, and did some organization and clean up of the garage. Short day today, but glad I knocked out that second bench. Really love the design and how sturdy they are. There probably won't be any updates for a while, Im waiting for the tools to deliver and then ill be ordering my RV-7 Empennage kit! I'm very excited about beginning this process.

[1]



1. [https://n890gf.com/wp-content/uploads/2015/10/img\\_2194.jpg](https://n890gf.com/wp-content/uploads/2015/10/img_2194.jpg)

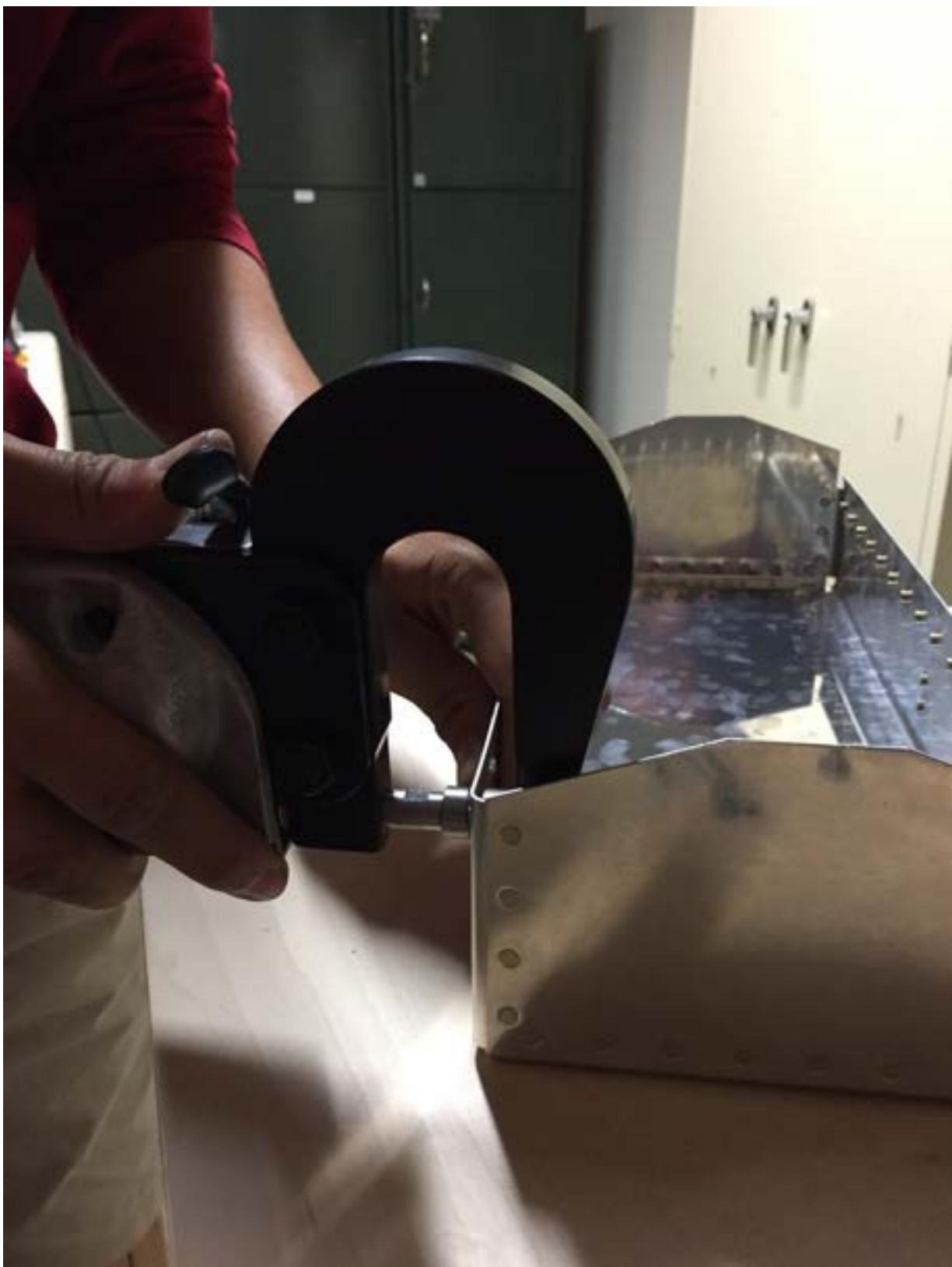
## **1.2 November**

### **1.2.1 Finished (95%) the workshop and Vans Practice Toolbox kit (2015-11-08 04:36)**

It's been a few weeks of cleaning the garage and organizing everything onto some new shelves we got so that I can finally finish setting up the workshop.

I also got my Isham Toolkit delivery last weekend and spent a little while checking out all the tools that come with it. But today I put those tools to good use and finished the Vans RV training Toolkit.

It's a small toolbox that demonstrates some of the building techniques used in building their planes. It took me about 3 hours to knock it out, I had to take my time with the first few rivets, but once I got the hang of it it went pretty quick.



Using the pneumatic squeezer really helped. I got consistent and straight rivets, both flush  
16

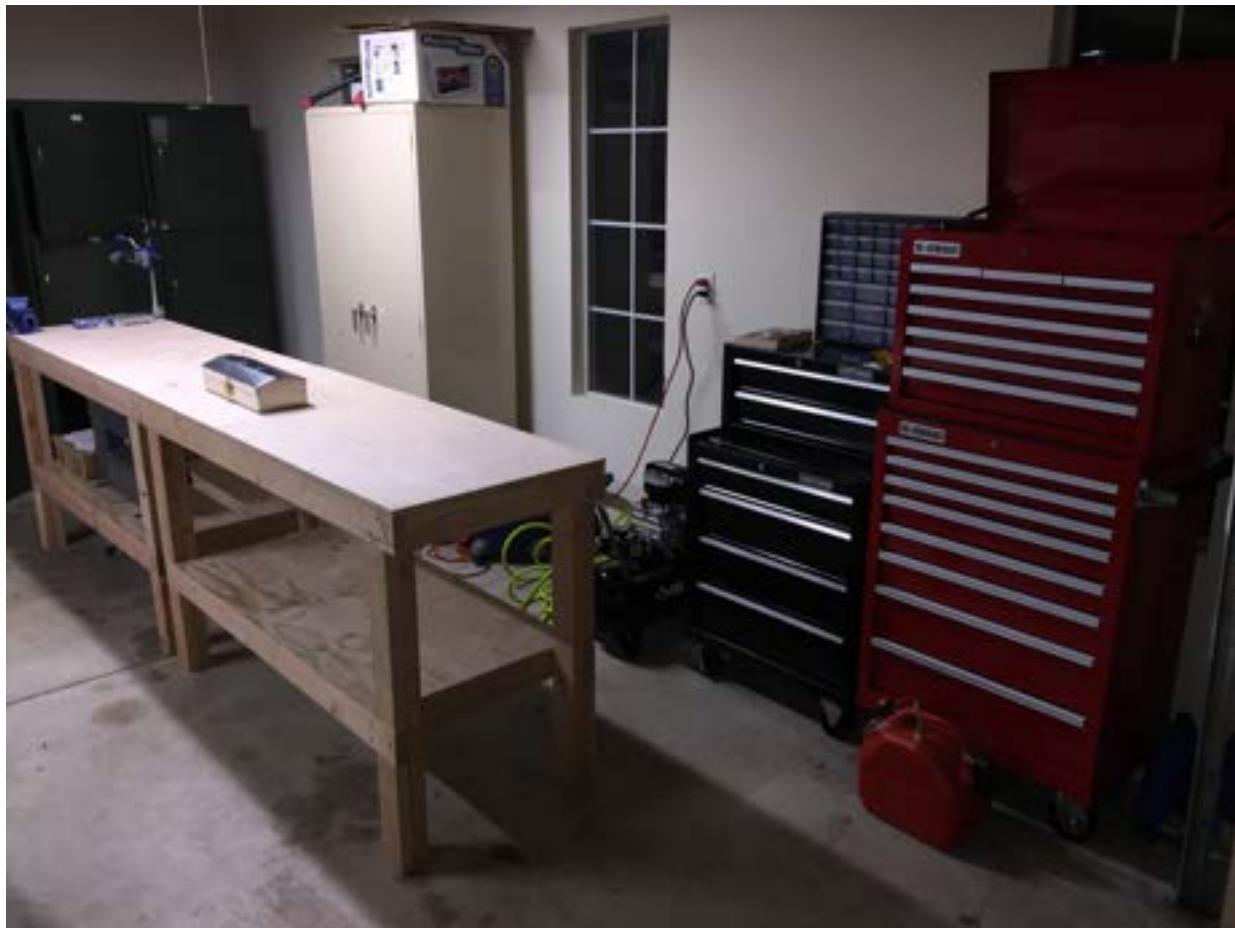
and the button head rivets.

[2]



Even though it's just a toolbox, it's still the first step in building my plane, and I think it was a nice preview into how much work this will really be. I look forward to every minute of it!

[3]



Pretty soon there will be a plane in here! (Hopefully)

Next time I post I will be doing the more difficult practice kit for the control surfaces. That will definitely be a fun one.

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2310-0.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2310-0.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2311.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2311.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2308.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2308.jpg)

### **1.2.2 Ordered Empennage Kit (2015-11-16 02:51)**

[1]



Here's the garage all done (the pile in the middle is 'give-away') and with the garage empty again I figure why not place the order for the tail!

The shelves in the back right are for inventorying items as I get them and also tool storage and miscellaneous items (currently storing my old RC airplane junk in boxes).

Next post I will be unpacking my empennage kit!

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2368.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2368.jpg)

### **1.2.3 Empennage kit day 1 (2015-11-22 02:21)**

My empennage kit arrived yesterday, and this morning I woke up bright and early to begin the unboxing experience.

[1]



This is just a small fraction of the parts that are in the kit, but I went through the packing list and marked each item with a check as I found it and inventoried it.

[2]



Here's all the parts on the shelves sorted by the control surfaces, and the plans laid out on the workbench. I spent a good hour reading the first section for the emp and going over the drawings to become more familiar with them.

[3]



I then began the rear spar assembly, after rounding the rear spar reinforcing bars and finishing the edges I clecoed the two spar halves to the bars and then match drilled the holes to #30.



Once the holes were drilled out, I match drilled the rear spar hinge brackets to the spar also to #30. The powder coating really makes the holes small for the clecos.

[5]



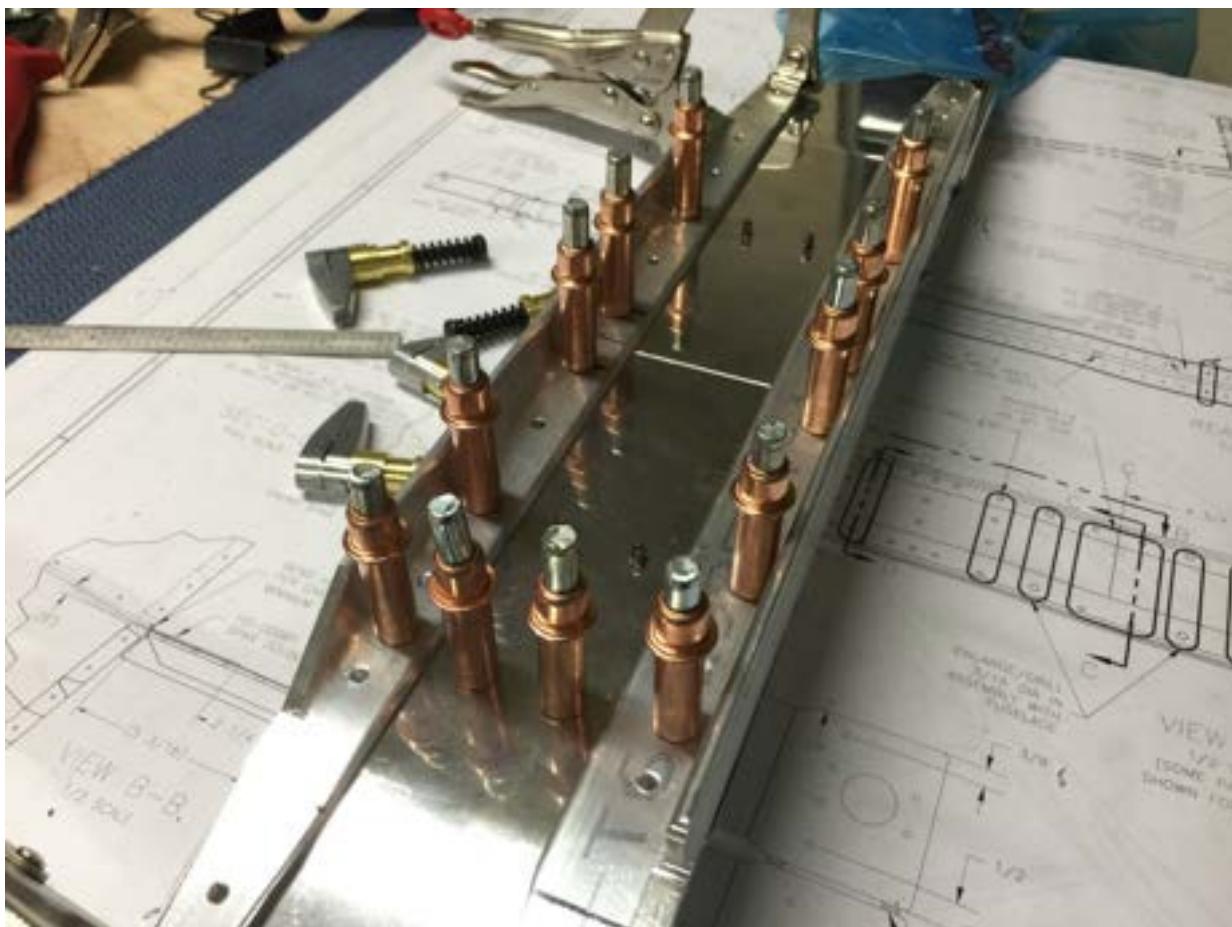
Then I match drilled the center bearing mounts to the center bearing and match drilled it to the rear spar. This will all be removed, primed and then riveted together.

All in all, I think it was a good and productive first day of my RV-7 project!

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2394-0.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2394-0.jpg)
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5. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2449.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2449.jpg)

#### **1.2.4 Horizontal stab (2015-11-23 07:36)**

Today was a big day, I spent about 8 hours on the stab.



I finished smoothing out the front spar reinforcing bars and match drilling everything to the spars, along with the spar doublers.

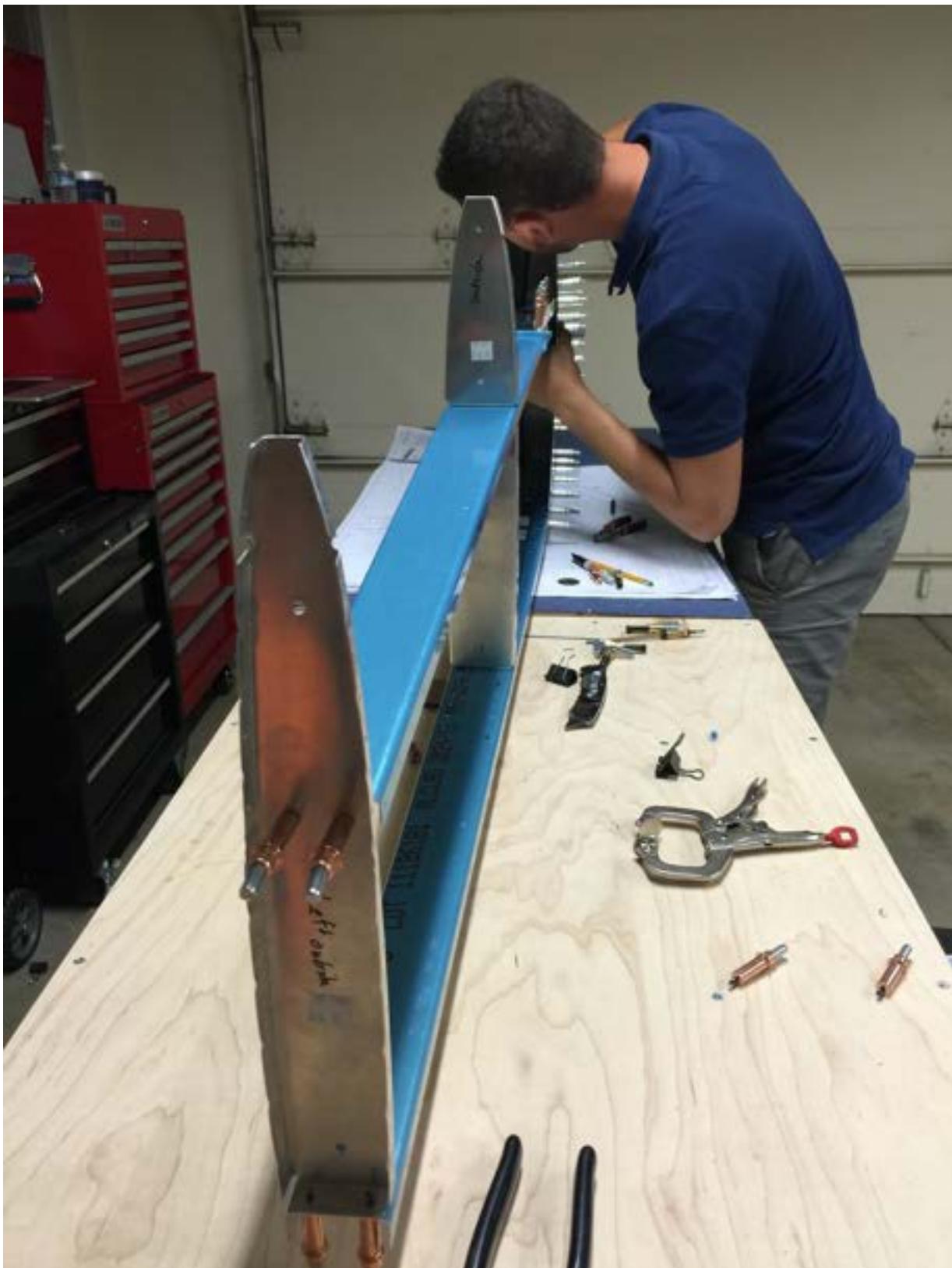
[2]



I then clecoed the Stab skeleton together, match drilled the rib holes to the spars and deburred the holes.

[3]

26

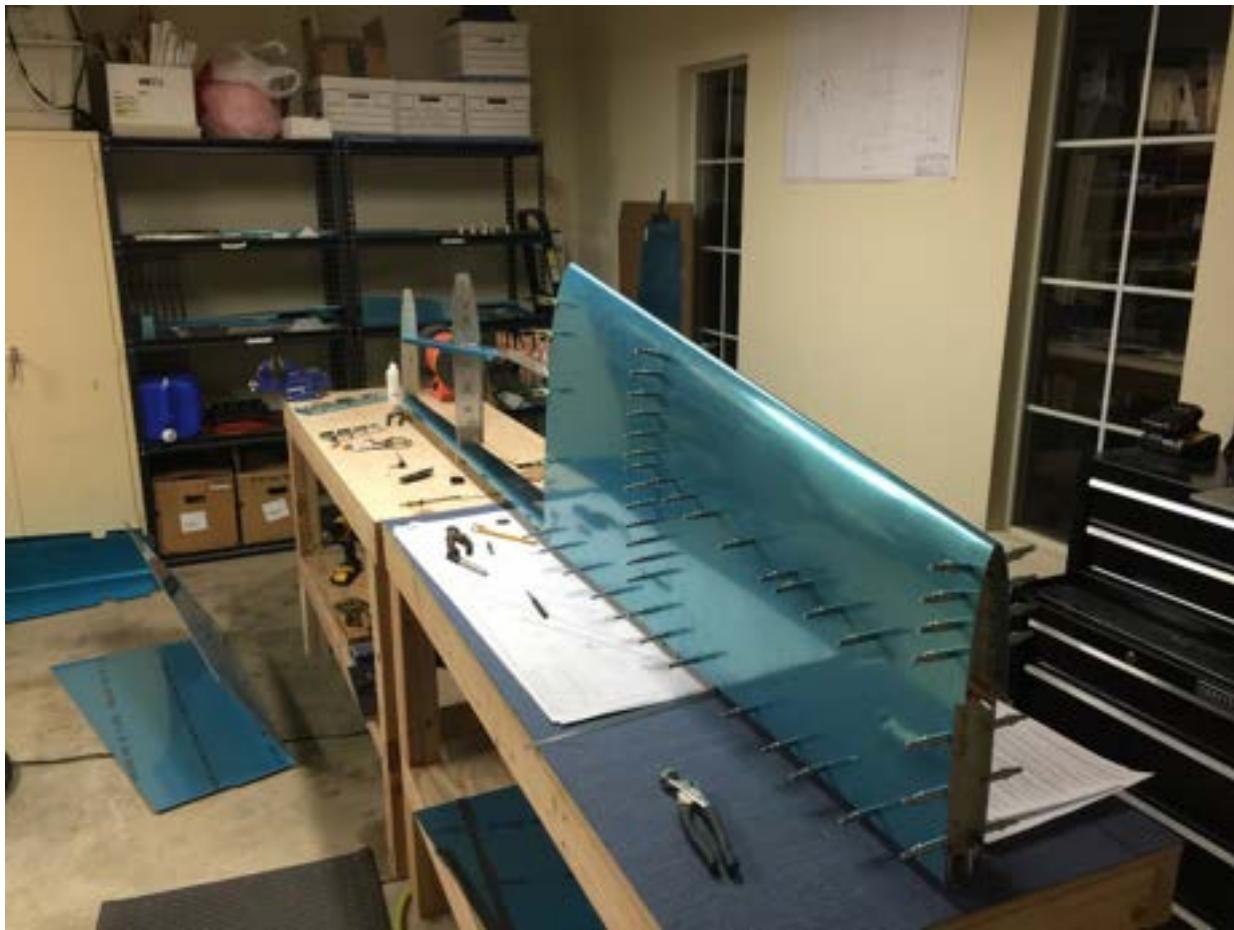


[4]



I then managed to get the skin all clecoed on to the frame, that was super hard to get it flush with the ribs, the aluminum is under-bent when it's shipped.

[5]



I then clamped and marked the hole positions for the remaining spar holes and the inner ribs that have to be drilled to match the skin.

Overall it was a productive day, I'm still getting the hang of the part naming convention and the drawing call-outs. It's only the second day, but I can see the progress which is a good sign!

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2452.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2452.jpg)
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4. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2462.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2462.jpg)
5. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2467.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2467.jpg)

### **1.2.5 Match drilled Horizontal Stab (2015-11-24 09:23)**

Today I finished the assembly on the H-Stab, right side and left sides have been match drilled and are ready for dimpling.

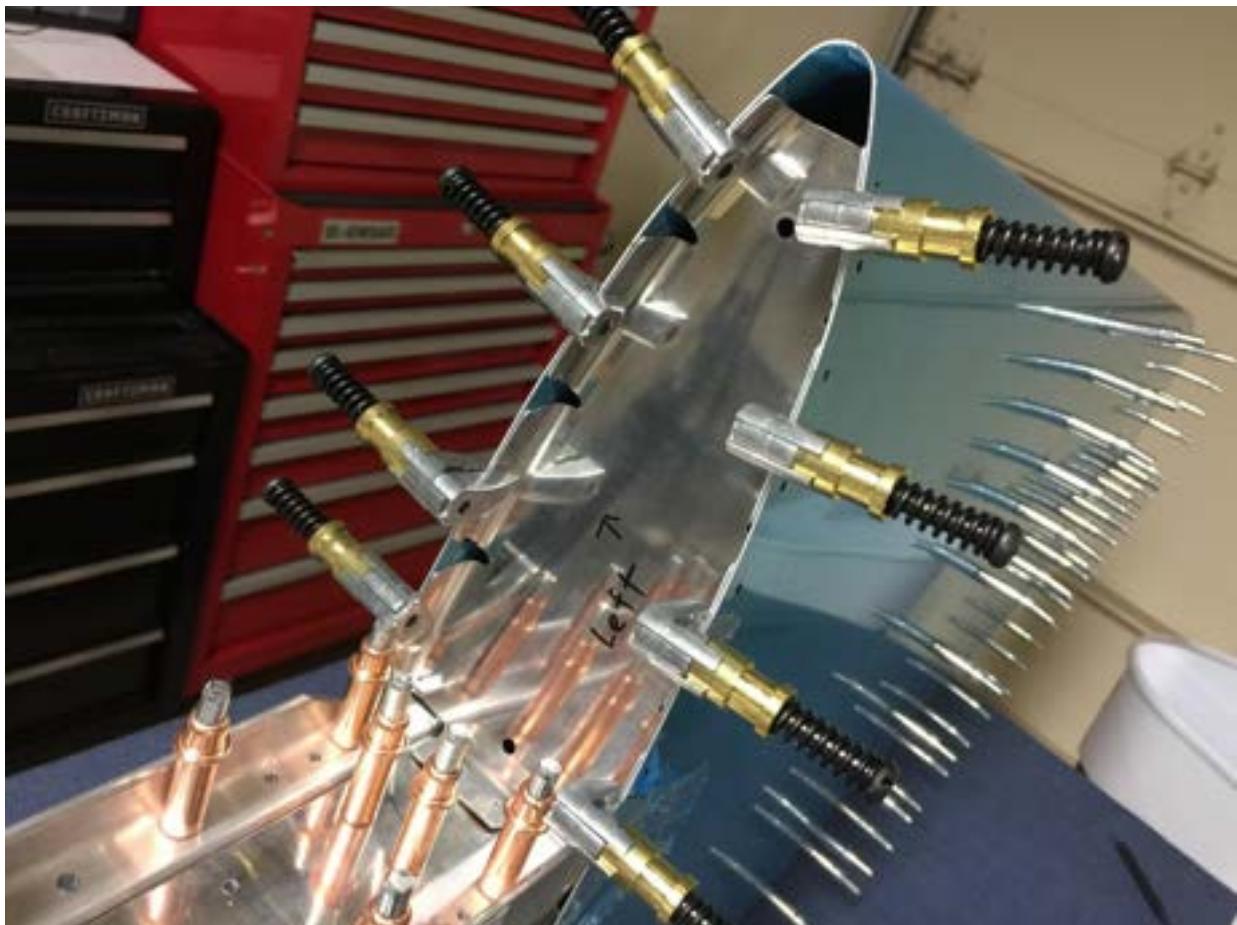
[1]



This was after wrestling the second skin onto the skeleton.

[2]

30



I then lined up and clamped the center ribs for drilling. These were then removed, de-burred and then clecoed in place so that the remaining holes in the spar can be drilled.

[3]



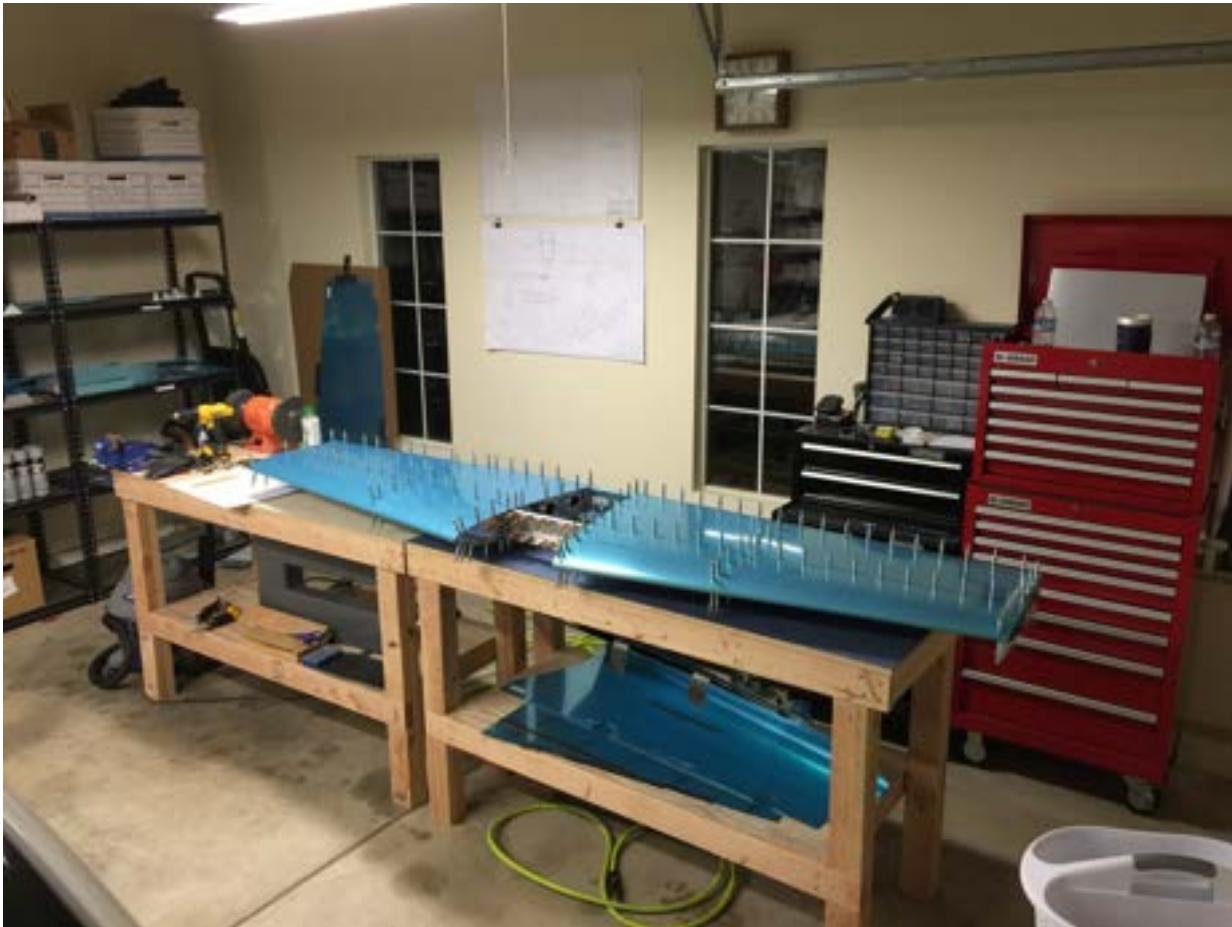
My mom got this shot of me and my helper Cairo. Although she can't match drill, hold a bucking bar, or really do anything, she always puts a smile on my face.

[4]



This selfie is purely for scale.

[5]



This looks similar to the first one, but the skins and skeleton have all been match drilled. Next step is dimpling and priming.

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2471.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2471.jpg)
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### **1.2.6 Disassembled and Prepared Horizontal Stab. (2015-11-25 07:39)**

No pictures today, I didn't get much time in the shop with a long work day and a late meeting. I did get enough time to disassemble the stab and get it ready for dimpling and priming. Hopefully I can put in some good work tomorrow.

## **1.2.7 Deburred and Dimpled H-Stab (2015-11-26 08:14)**

Today I spent 4 hours deburring, edge finishing, surface prepping and dimpling the horizontal stabilizer skeleton and skins.

[1]



I did all of the dimpling on the ribs and spar using the pneumatic squeezer and the -3 dimple set. I then used the DRDT-2 to dimple the skins. I used cushions on either side of the dimpler to keep the skins flat. It's great being able to squeeze the dimples quietly rather than hammering

them, I was doing this while everyone else in the house was asleep. Can't recommend this enough!

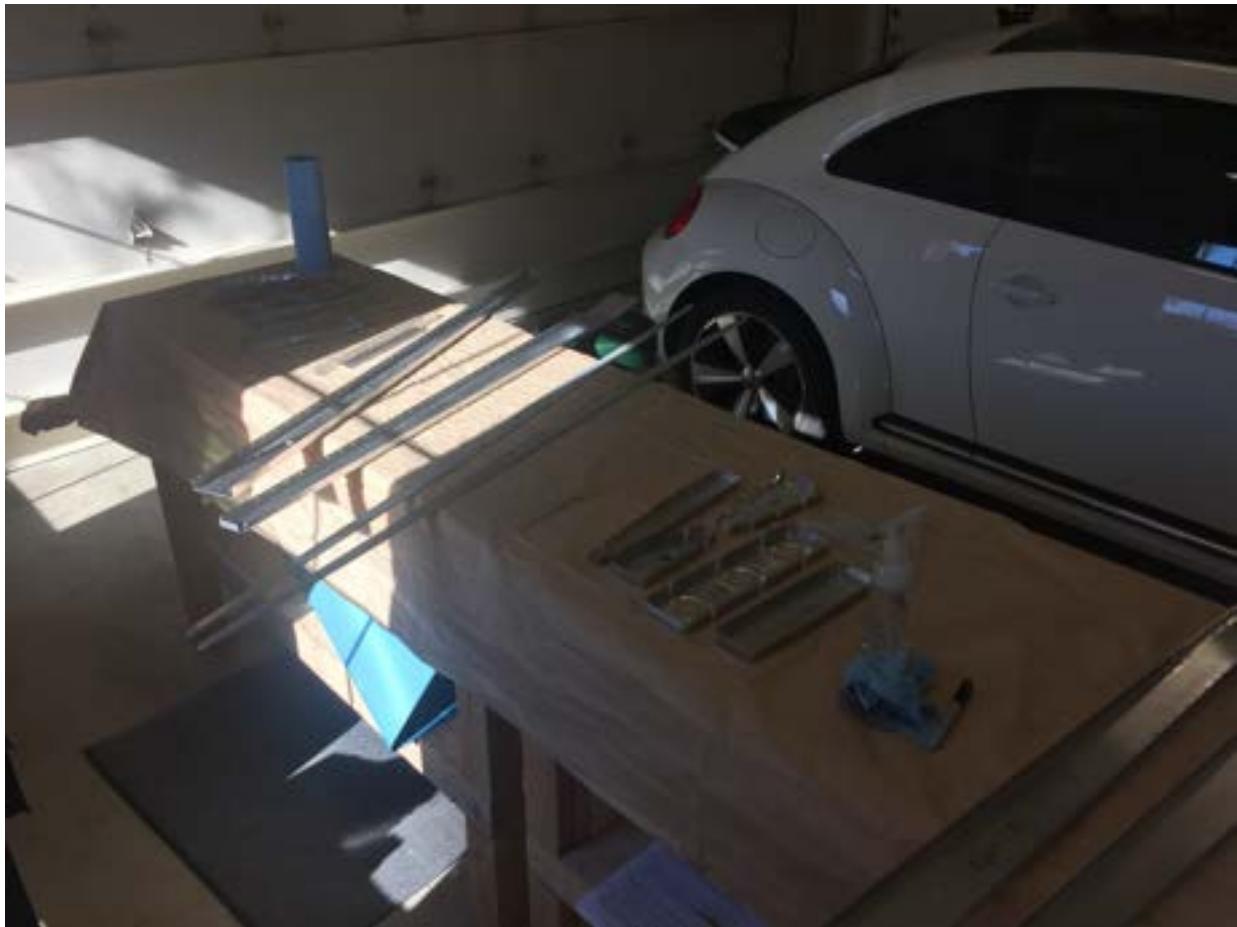
Tomorrow is going to be priming and beginning of the riveting process!

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2492.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2492.jpg)

### **1.2.8 Primed and began riveting stab & Happy Thanksgiving! (2015-11-27 07:40)**

This morning I cleaned, and primed all the internal structure. I'm using a self etching primer that's super easy to use. I also primed the rivet holes of the interior of the skins.

[1]



The paper used to ship the parts is perfect for painting on. I then used a heat gun to dry the primer a little quicker.

I then began to rivet the rear spar to the reinforcing bars.

[2]



This is the first rivet set in the spar, and thus began the riveting! I will spend many days in  
38

this position for riveting

[3]



Here's a close up of the shop head of the rivet, once the gap on the squeezer was set for this rivet length, it was perfect rivet after perfect rivet.

[4]



Tomorrow I'll begin riveting the skins.

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2499.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2499.jpg)
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3. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2502.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2502.jpg)
4. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2503.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2503.jpg)

### **1.2.9 Continued riveting the stab (2015-11-28 15:28)**

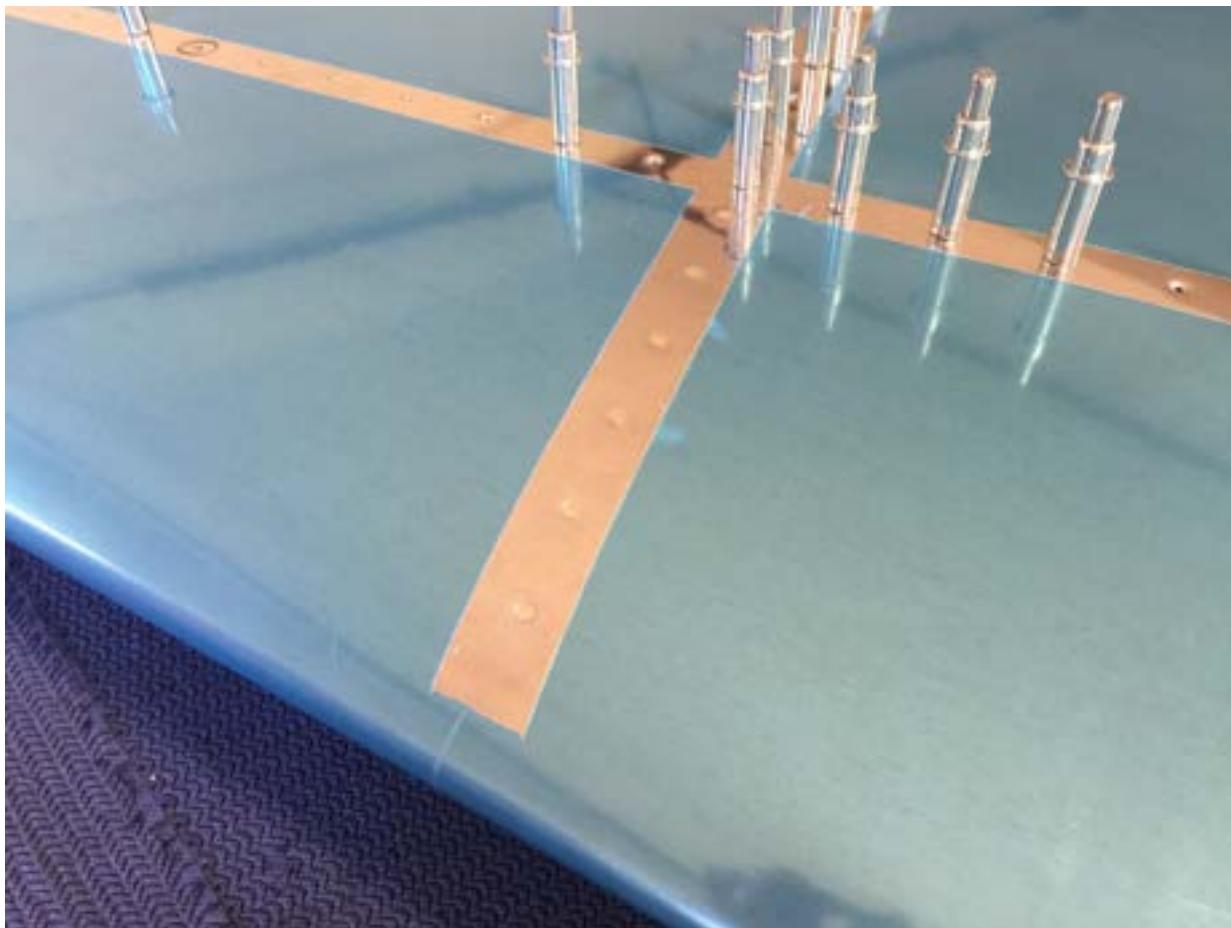
Yesterday I continued to rivet the skeleton together and began riveting the skins to the spars and ribs. Here you can see the middle nose and main ribs clecoed to the skin. The nose rib gets flush riveted to the skin.

[1]



This was super difficult to get the skin to lay flat against the nose rib, but a little gorilla tape helped to get every rivet flush.

[2]



Once both the top and bottom of the skins were riveted to the nose rib, I put the front spar assembly into the skin and clecoed and rivet the tip rib to the front spar

[3]

42



I used clecoes in every hole to try to keep everything aligned as perfectly as possible. Then I inserted the middle main rib again and blind riveted it to the middle nose rib.

[4]



Today I will finish riveting the middle main rib, and front spar to the skins. It's fun to see progress, it's good motivation to keep going.

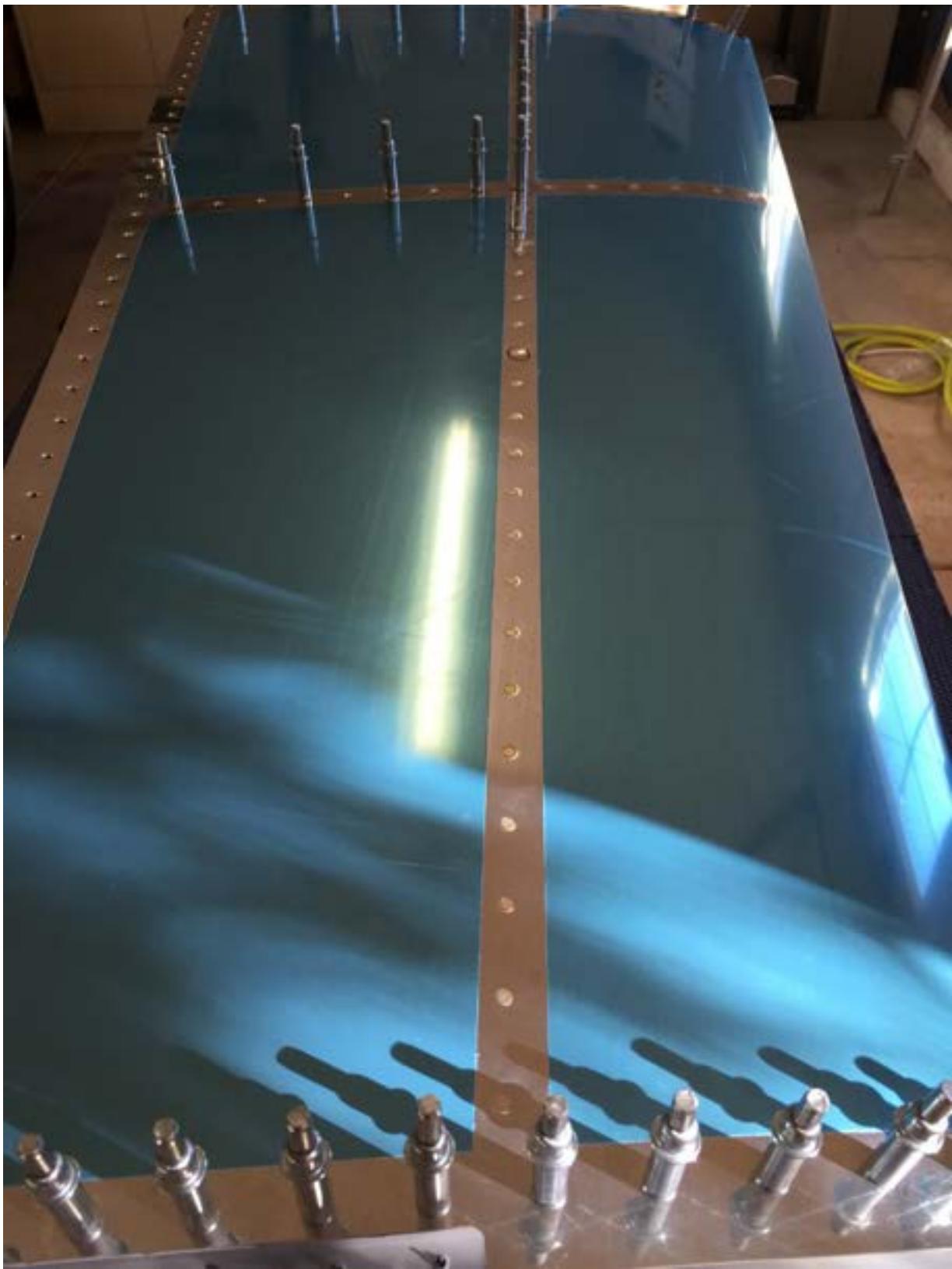


1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2504.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2504.jpg)
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### **1.2.10 Finished Horizontal Stabilizer (2015-11-29 03:56)**

Today I spent a 7 hour session, bringing my total to 30 hours, to finish riveting the h-stab.

[1]



I began by riveting the front spar to the skin. Having a riveting buddy would have been great, but it was a good experience to do this by myself. Working in the tight spaces was tricky, but the tungsten bucking bar really made it easy to get consistent shop heads on the rivets.

[2]

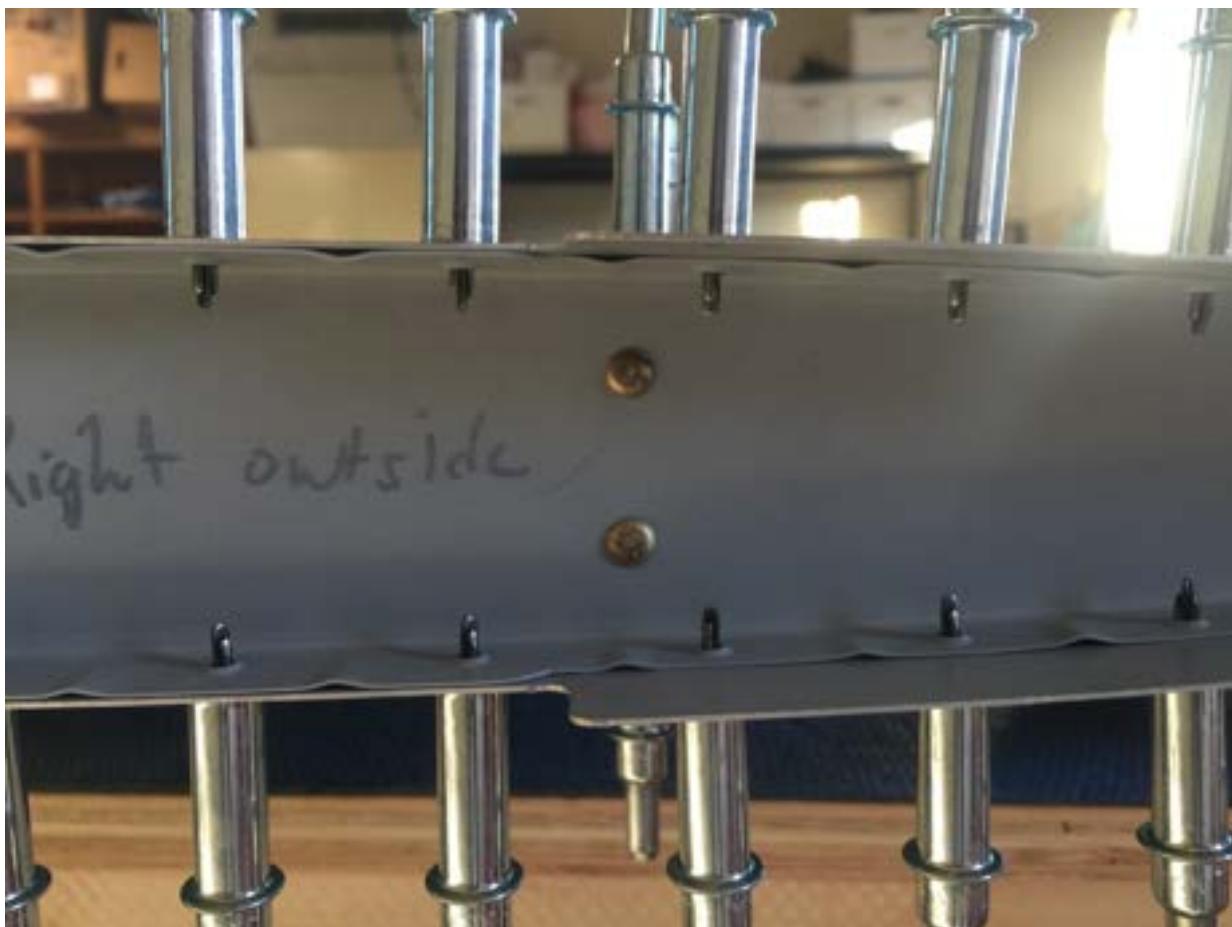


Here's the pop rivets holding the right side middle main rib to the spar and nose rib. This paved the way for riveting the right side skin to the spar and ribs.

[3]



Here you can see the shop heads on the spar. I didn't guage each and every one of them, but I eyeballed and judged that it was all within range of one that was measured.

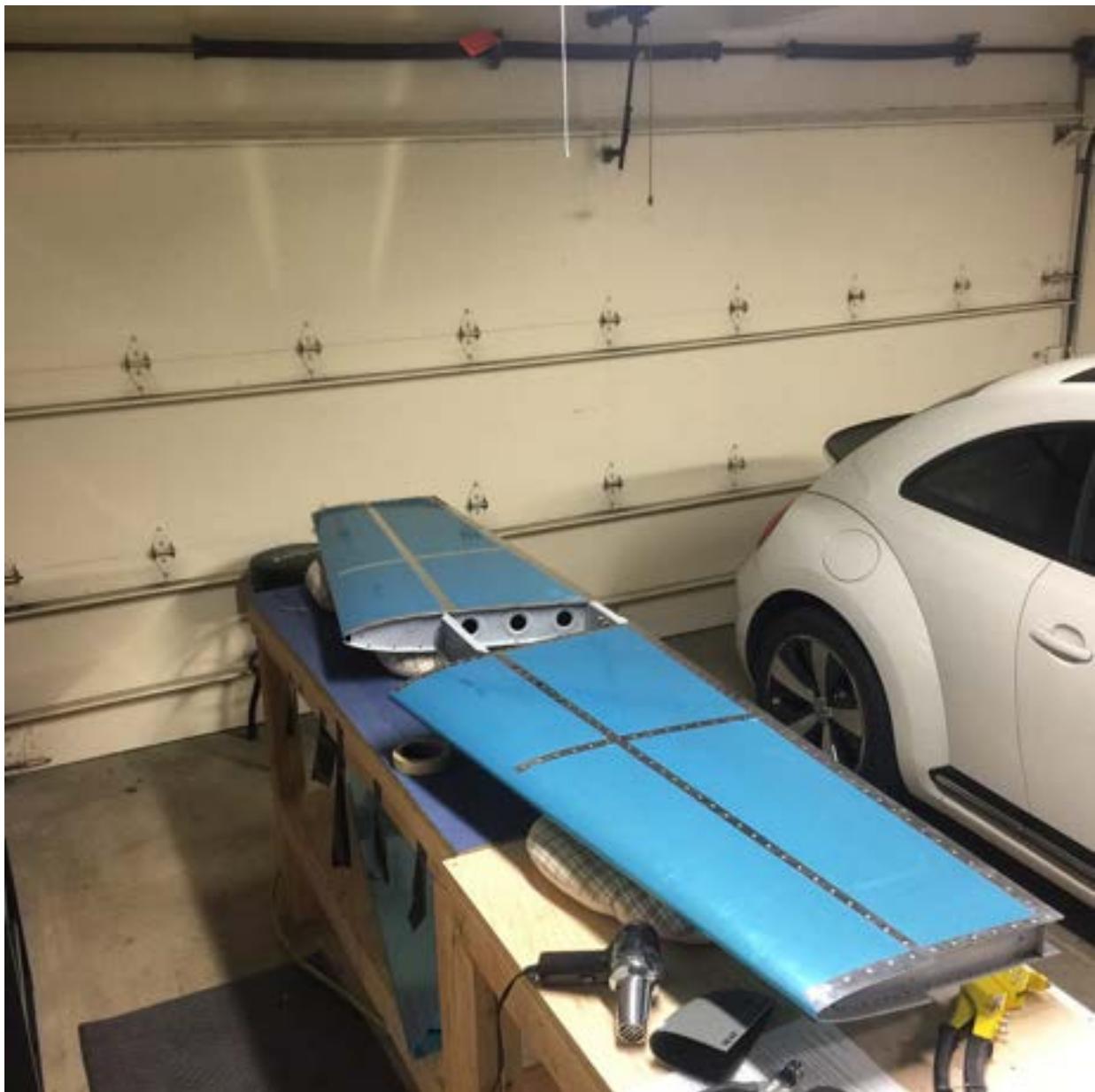


Here are the universal rivets holding the front spar to the tip rib, another tricky spot to hold the bucking bar.

In the end, the stab's flush rivets all came out perfect. I only had to drill out 2, luckily both were pretty easy and came out without enlarging the hole.



Here's the inboard ribs riveted to the skins. Each one flush on the skin, and to the right depth on the shop head side.



And the final product, all ready to start flying! Seeing the first completed piece just makes me want to keep building! On to the V-stab!

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2511.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2511.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2521.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2521.jpg)
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6. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2532.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2532.jpg)

### **1.2.11 Began vertical stab (2015-11-30 03:16)**

Today I spent a couple hours on the vertical stab.

[1]



I spent about an hour clecoing the skeleton and then match drilling all the holes in the rear spar. I then edge finished all the ribs, per the plans, and then clecoed the assembly together.

[2]



I then put the skin on and clecoed and match drilled all the holes to #40.

1. [https://n890gf.com/wp-content/uploads/2015/11/img\\_2534.jpg](https://n890gf.com/wp-content/uploads/2015/11/img_2534.jpg)

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## **1.3 December**

### **1.3.1 Prepped vertical stab (2015-12-01 07:12)**

Today I spent 3 hours disassembling and prepping all the surfaces for priming.

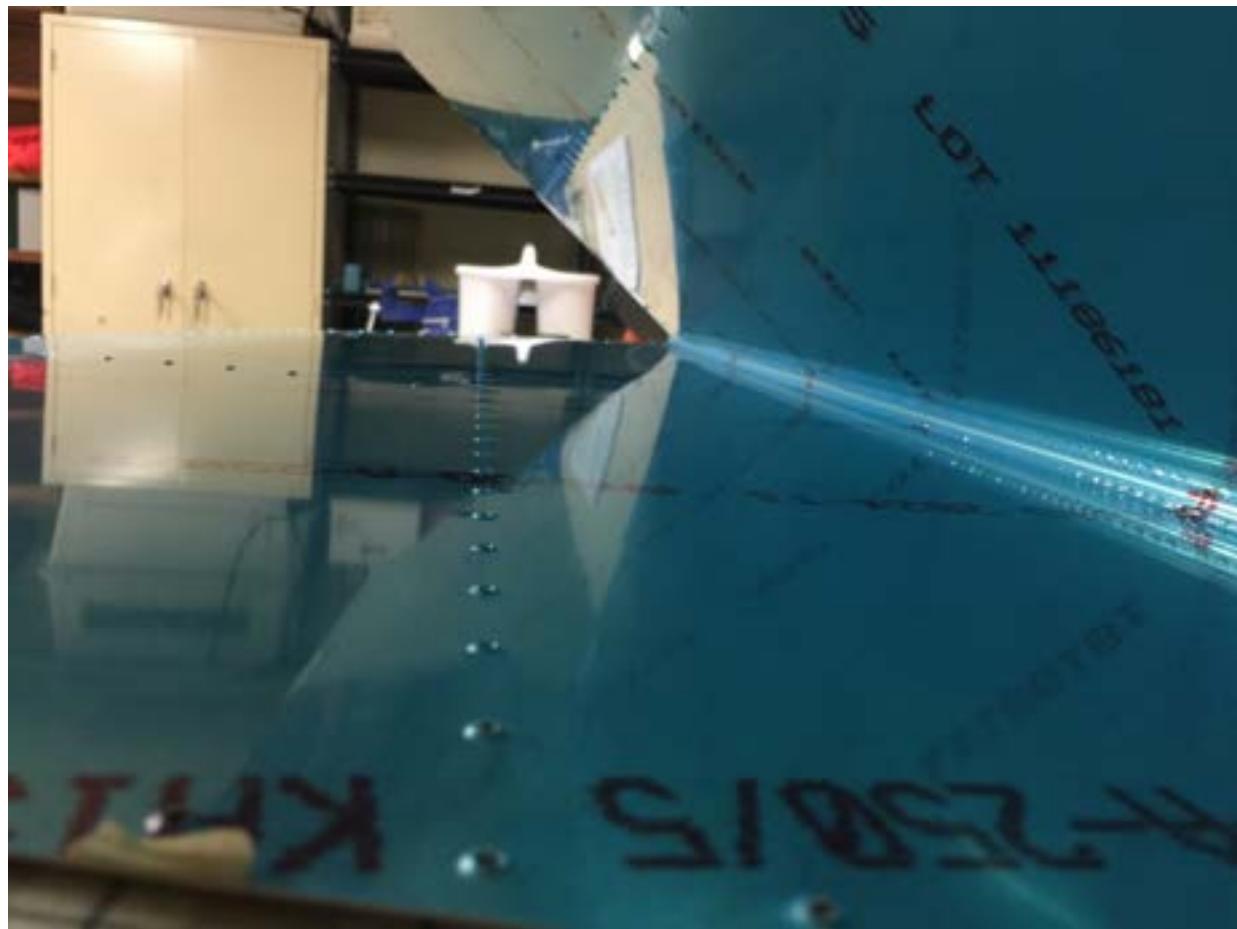
[1]

54



Here you can see the dimples on the vertical stab skin, these will accept the flush rivets that attach the rear spar to the skin.

[2]



Here's another view of the dimples, these were all reached with the DRDT-2 dimpler. Super easy to use and very quiet.

[3]

56



Here you can see the counter sinks for the rear spar dimples, this is necessary because the front side of the spar will sit flush against the rear fuselage bulkhead.

You can also see the surface prep for the primer, this was done on all internal components and the interior of the skins along the rivets.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2539.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2539.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2540.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2540.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2541.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2541.jpg)

### **1.3.2 Began riveting vertical stab (2015-12-02 22:38)**

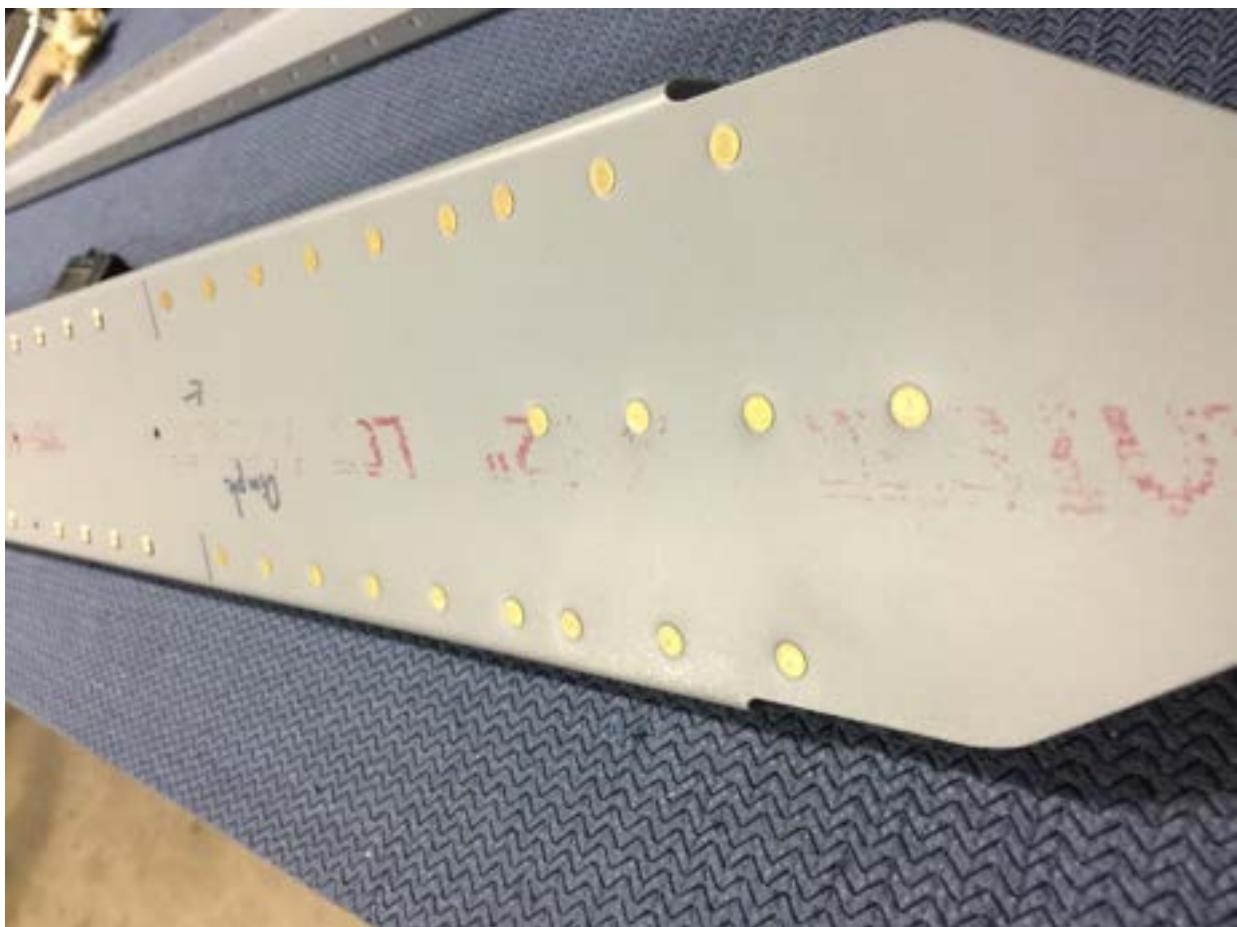
Tonight I spent 2 hours and I cleaned, primed and began riveting the vertical stab.

[1]



Here's all the skeleton parts after priming.

[2]



Here's the rear spar flush rivets set. I was able to reach all of these with a squeezer, the ones holding the bottom rudder hinge bracket were a little tricky, but I managed to set them with no issues.

[3]

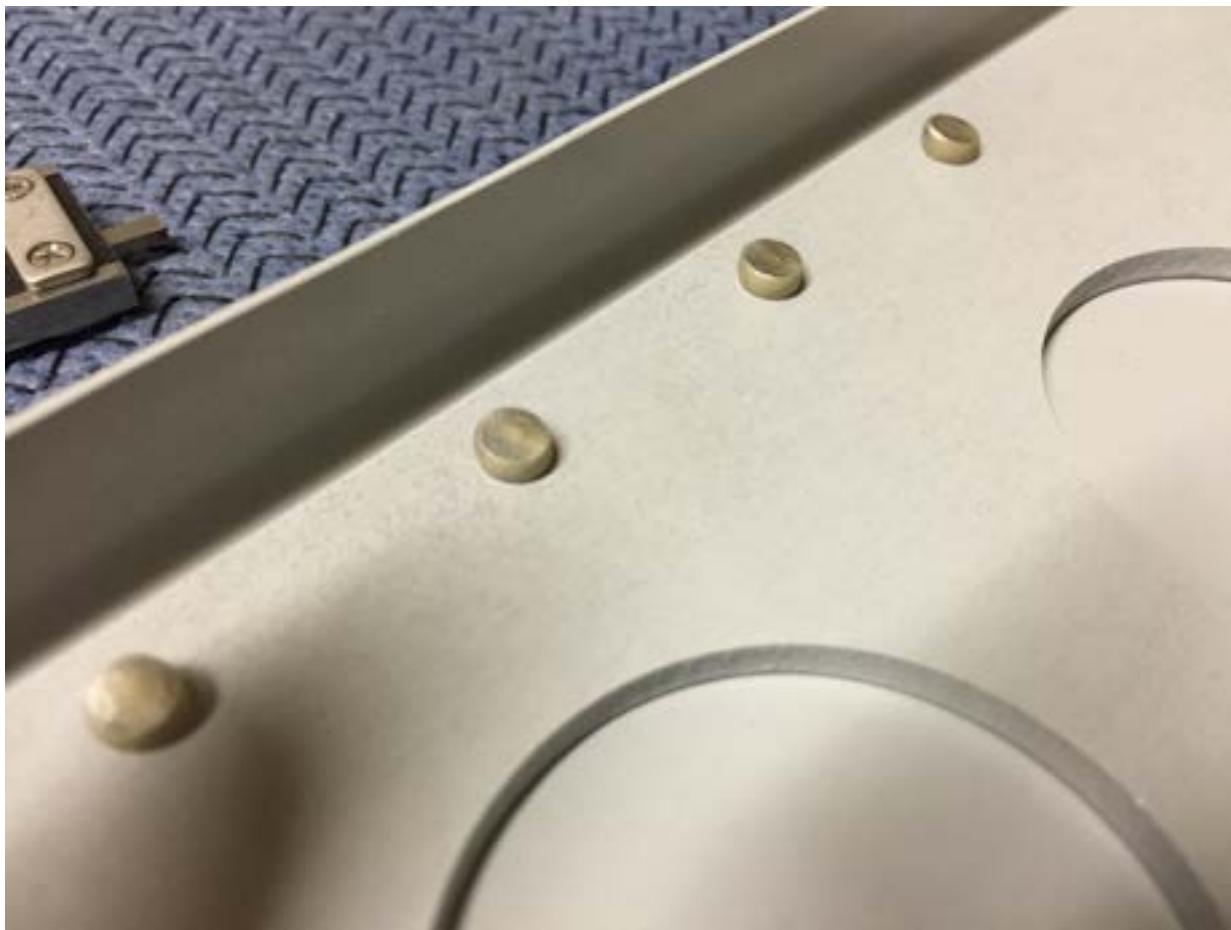


These have to be flush because this is where the rear stab is flush against the fuselage.



Here you can see all the universal rivets between the rear spar and the reinforcing bar. The missing rivets will be riveted to the ribs when closing up the stab.

[5]



Here's a close up of the shop heads, they were perfectly measured to be 0.1875" using calipers. That makes them exactly 1.5x the original rivet diameter.

I also began riveting the front spar assembly to the ribs, but it was too late to get out the rivet gun for the lower ribs. The angle on the nose rib flange is too tight to get the squeezer in and I didn't want to bend it. I'll have to do the rest of that in the morning.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2564.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2564.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2565.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2565.jpg)
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### **1.3.3 Finished Vertical stab and... (2015-12-03 23:50)**

...I placed the order for my quick build wings and fuselage! It's a big step for me (also a big purchase) and I'm excited to enter into the next phase.

This morning before work I got up and riveted the root ribs to the front spar of the vertical stab.

[1]

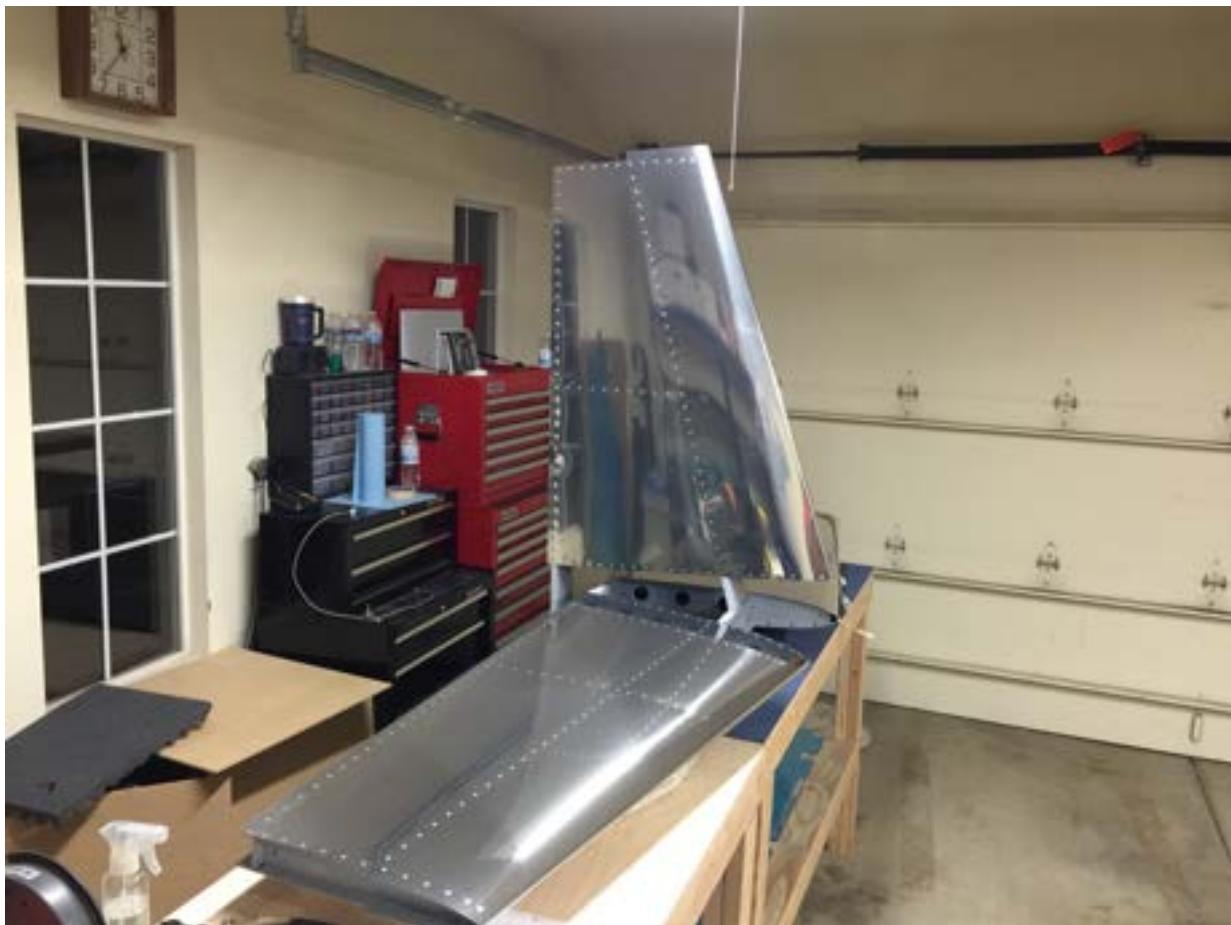


I the. Proceeded to rivet the skin to the front spar and middle rib, here you can see all the shop heads on the front spar as well as the middle rib.

[2]



After the front spar was riveted to the skin, I used my squeezer to rivet the rear spar to the skins followed by the root and tip ribs. Here's the end result!



[4]

65



And here's the obligatory empennage mock up. It's so cool to see this come together. Approaching my second week of work, I will begin work on the rudder.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2573.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2573.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2575.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2575.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2584.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2584.jpg)
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### **1.3.4 Began the rudder (2015-12-05 22:21)**

Today I started working on the rudder. I began by trimming to size the rudder skin stiffeners.

[1]



Once they were cut to size roughly I then used my scotchbrite wheel to shape and deburr all the edges of the stiffeners. I then match drilled all the stiffeners to the skins.

[2]



Once they were match drilled I then disassembled it again to deburr the holes and prep the stiffeners and skins for dimpling.

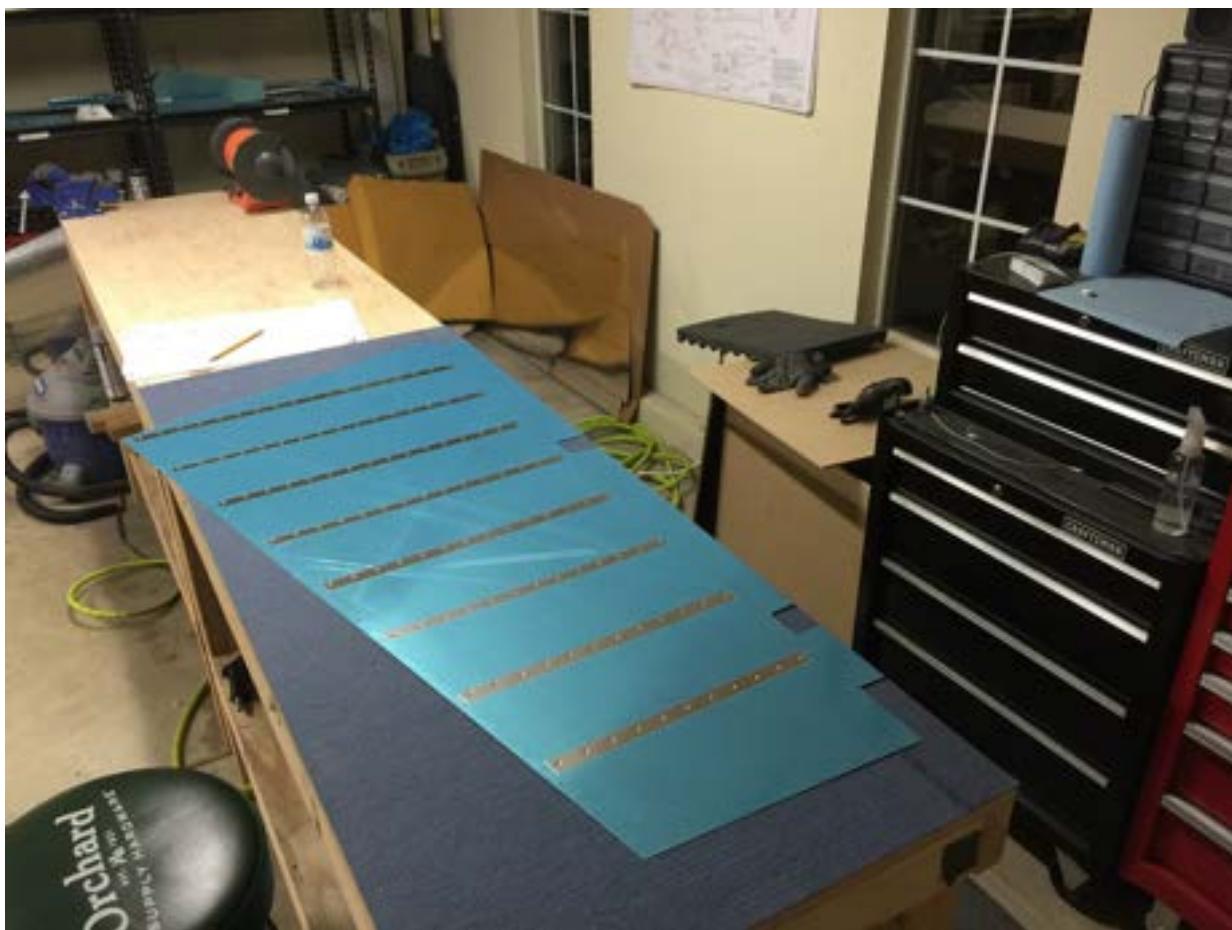


Here you can see all 232 dimples in the stiffener. I then had to do the same in the skins.

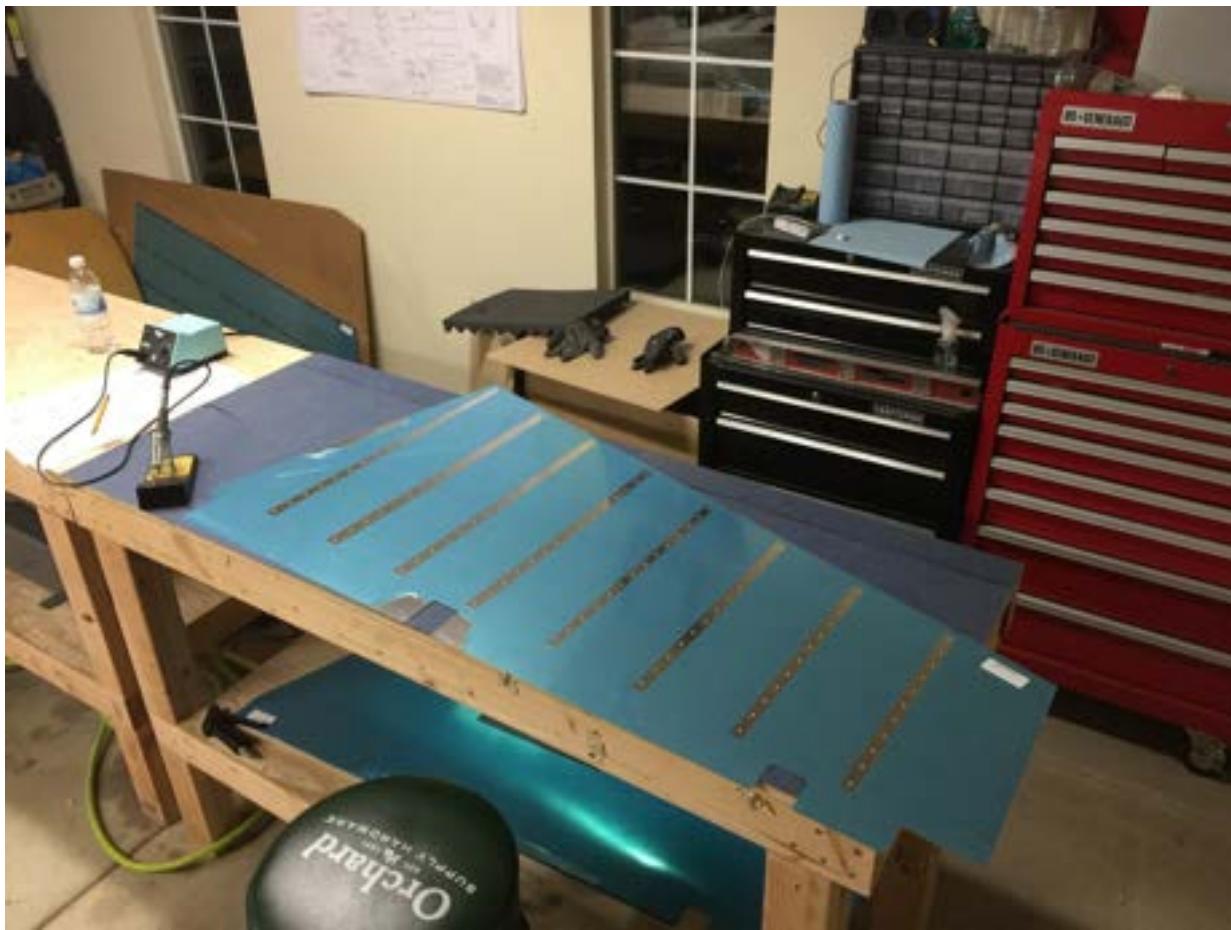
[4]



Here you can see the skins being dimpled using the DRDT-2 dimpler. I used some old foam to support the skins, soft and easy to move around.



[6]



Here the skins have been dimpled and the plastic has been removed for the rivets.

I didn't grab any pictures, but I also scuffed, cleaned, and primed all the stiffeners and the interior of the skins along the rivet holes. Next step is to back rivet the stiffeners to the skins but it was getting too late to get out the rivet gun.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2588.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2588.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2590-0.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2590-0.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2591.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2591.jpg)
4. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2592.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2592.jpg)
5. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2594.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2594.jpg)
6. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2593.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2593.jpg)

### 1.3.5 Continued work on the rudder (2015-12-06 23:22)

This morning I riveted all the stiffeners to the skins, even got a little help from mom on a few of the rivets. In the end all of them came out perfectly.

[1]



Next I began on the rudder skeleton. It's a much more involved structure than the stabs were.

[2]



Here you can see the counter-balance skin clecoed onto the tip rib and the counter-balance rib. Once everything was clecoed I match drilled everything together.



And here is the rudder all drilled together.

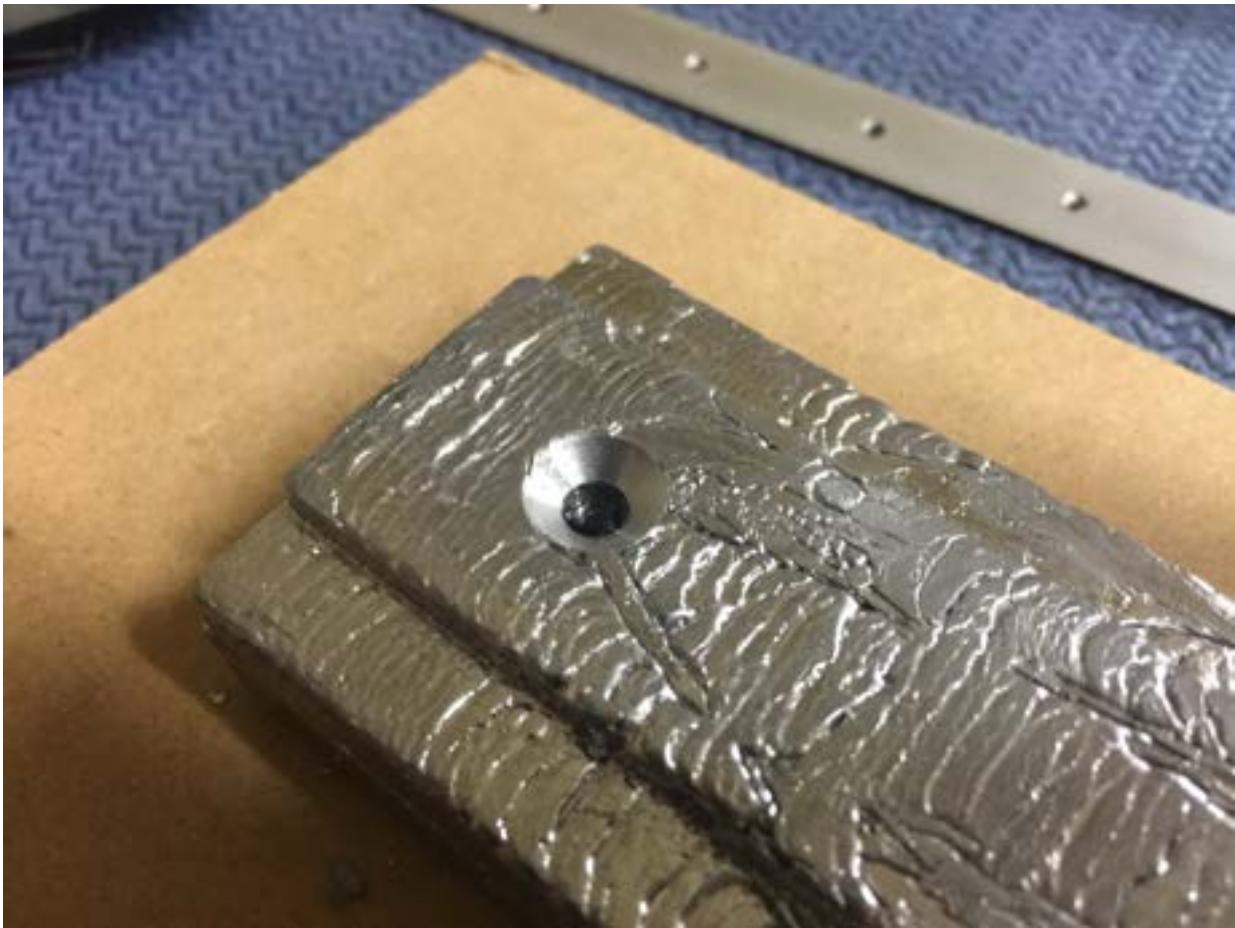
[4]



I then disassembled everything and deburred all the holes.

[5]

76



I also countersunk the lead counter-balance weight for the dimples and screws that will hold this to the rib.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2636.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2636.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2637.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2637.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2638.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2638.jpg)
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5. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2640.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2640.jpg)

### **1.3.6 Continued rudder (2015-12-09 23:31)**

Today I dimpled the rudder structure and skins in preparation for priming.

[1]



Here you can see the dimpling of the skins trailing edge. I then dimpled the other skin and called it a day, I'll prime the internal parts and begin riveting tomorrow night hopefully.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2646.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2646.jpg)

### **1.3.7 Riveted rudder (2015-12-12 19:21)**

Today I cleaned and primed all the rudder parts, then assembled, riveted and glued the trailing edge. I also received the ship date for my quick build wings and fuse.



I've got nearly 4 months to finish the elevators. I hope I don't run out of time 😊

[2]



Here you can see the rivets on the reinforce the plate and the spar. The three reinforcement plate are all very similar. The hole in the center has a nut-plate riveted as well, this will accept the rudder hinges.

[3]

80



Here you can see the blind rivets holding the rudder brace. Also the shop heads of the lower reinforce the plate.

[4]

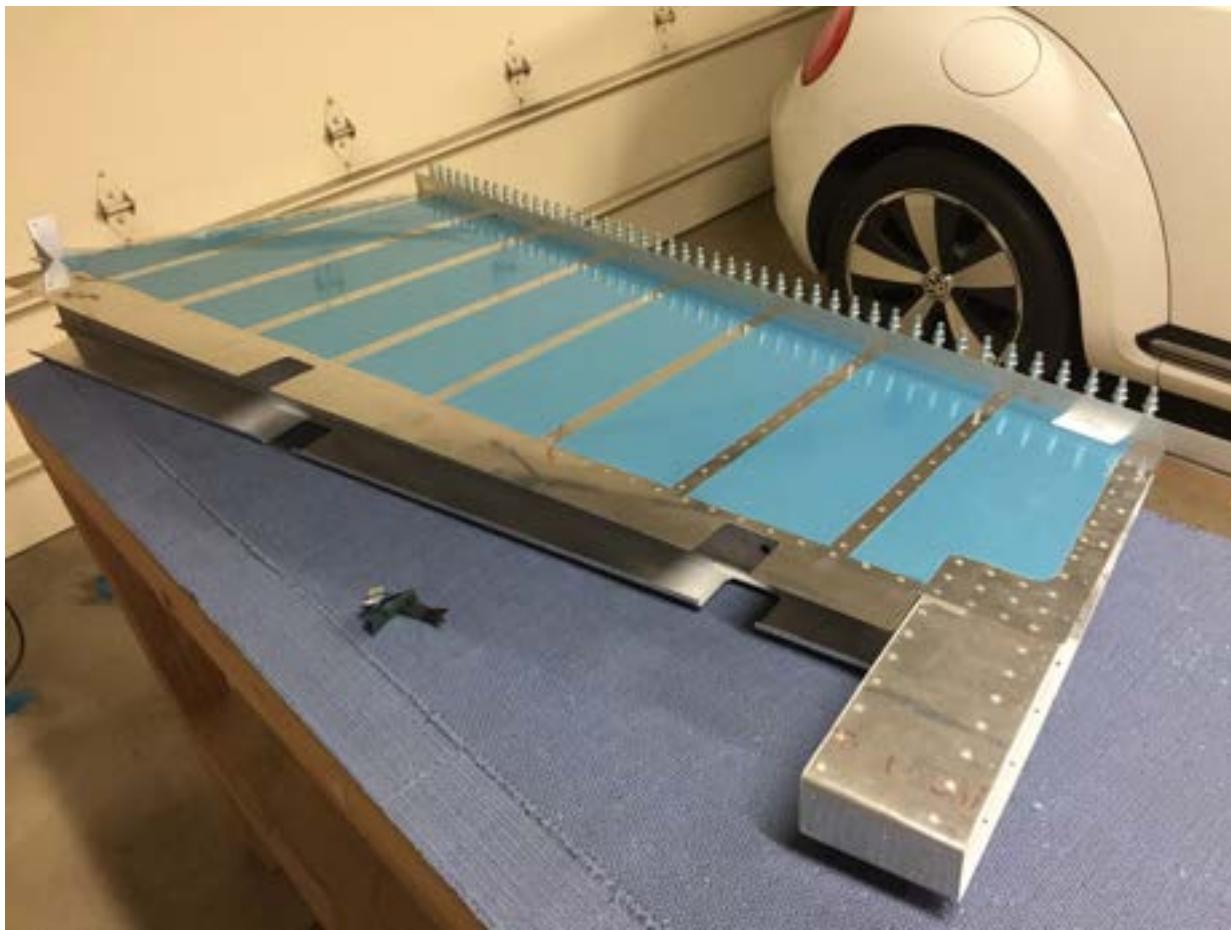


Here you can see the spar and skins riveted together.



Here's the lower rib riveted to the skin and lower faring flanges. Also the blind rivets holding the rudder brace.

[6]



A few days ago I bought some angle stock from Home Depot and match drilled them to the trailing edge. Here you can see it all clecoed together to check straightness. I then disassembled it and applied the sealant to the trailing edge wedge. It was extremely messy and sticky.



Here you can see the trailing edge re-clipped and glued. Once this cures in a couple days I'll remove the angle and then I'll be ready to rivet the trailing edge together.

All in all I think the 7 hours I spent today were well worth it.

1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2691.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2691.jpg)
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2693.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2693.jpg)
3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2699.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2699.jpg)
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5. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2705.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2705.jpg)
6. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2701.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2701.jpg)
7. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2708.jpg](https://n890gf.com/wp-content/uploads/2015/12/img_2708.jpg)

### **1.3.8 Quick update (2015-12-16 09:39)**

I thought I'd give a quick update on stuff, I won't be back in the shop until next week, but I did take off the aluminum angles on the rudder trailing edge, and it turned out perfectly straight. Now I just have to rivet it with some double flush rivets and then I can mark the rudder as

complete, then it's on to the elevators!

### **1.3.9 Finished rudder (2015-12-27 00:29)**

Today I woke up early and got the trailing edge of the rudder riveted and leading edge rolled. It was good to experience this solo because it was a true test of workmanship and luckily I ended up with a straight trailing edge and round leading edge.



Here you can see that there's no hook in the trailing edge, it's not perfectly straight at every rivet, but it's not hooked. I can try little by little to smooth out the small waves, but it's not critical.

[2]



And here is the rudder hung on the vertical stab. It was surprisingly hard to fit the bolts into  
88

the hinges, not going to be an easy thing to remove if needed later.

All in all, the 3 hours I spent were well worth it, and glad to knock off another assembly.  
On to the elevators!

[3]



1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2784.jpeg](https://n890gf.com/wp-content/uploads/2015/12/img_2784.jpeg)

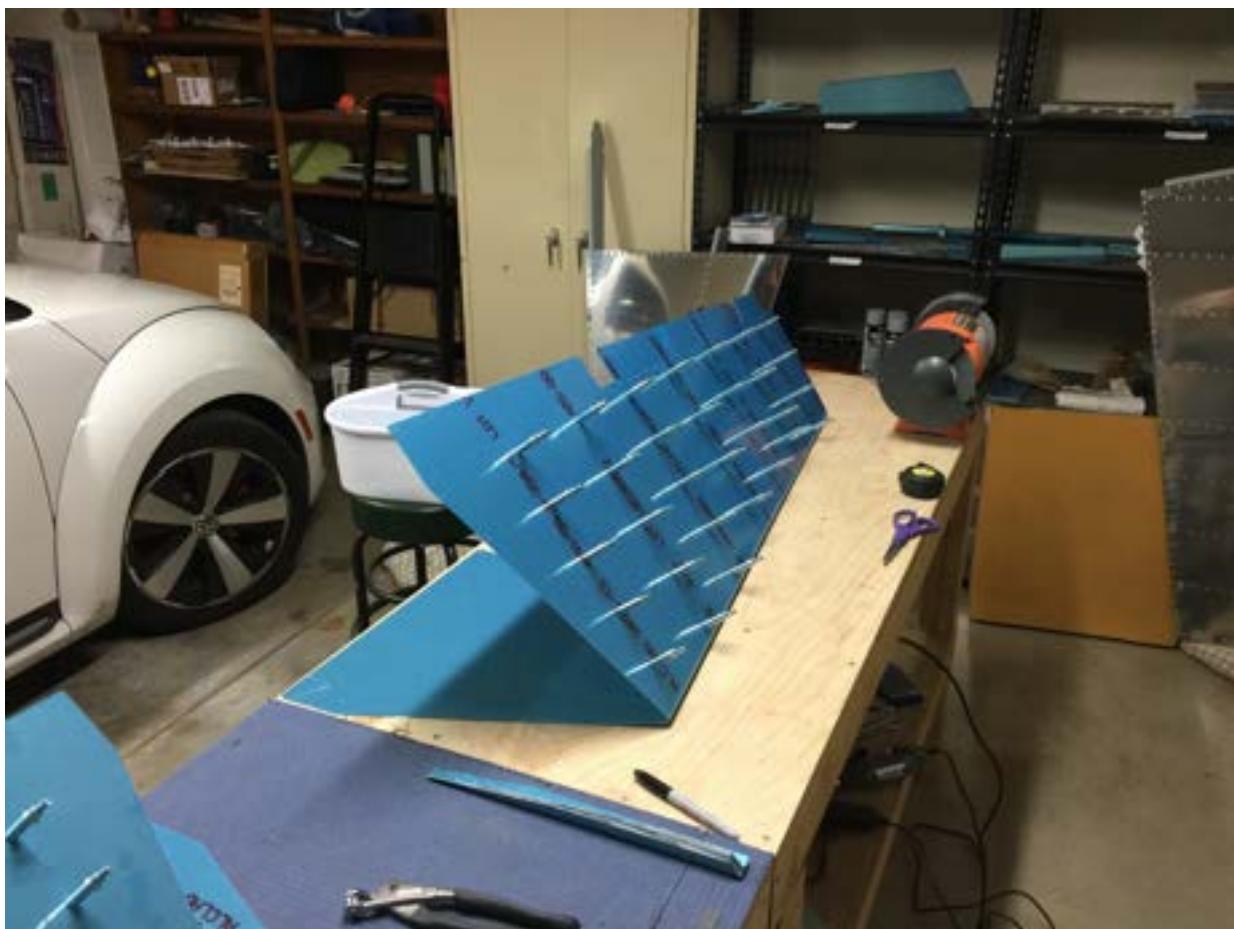
2. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2772.jpeg](https://n890gf.com/wp-content/uploads/2015/12/img_2772.jpeg)

3. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2775.jpeg](https://n890gf.com/wp-content/uploads/2015/12/img_2775.jpeg)

### **1.3.10 Began elevators (2015-12-27 17:43)**

Today I cut all the stiffeners to length and clecoed them to the skins. Only spent about an hour today but making a start is key.

[1]



1. [https://n890gf.com/wp-content/uploads/2015/12/img\\_2787.jpeg](https://n890gf.com/wp-content/uploads/2015/12/img_2787.jpeg)



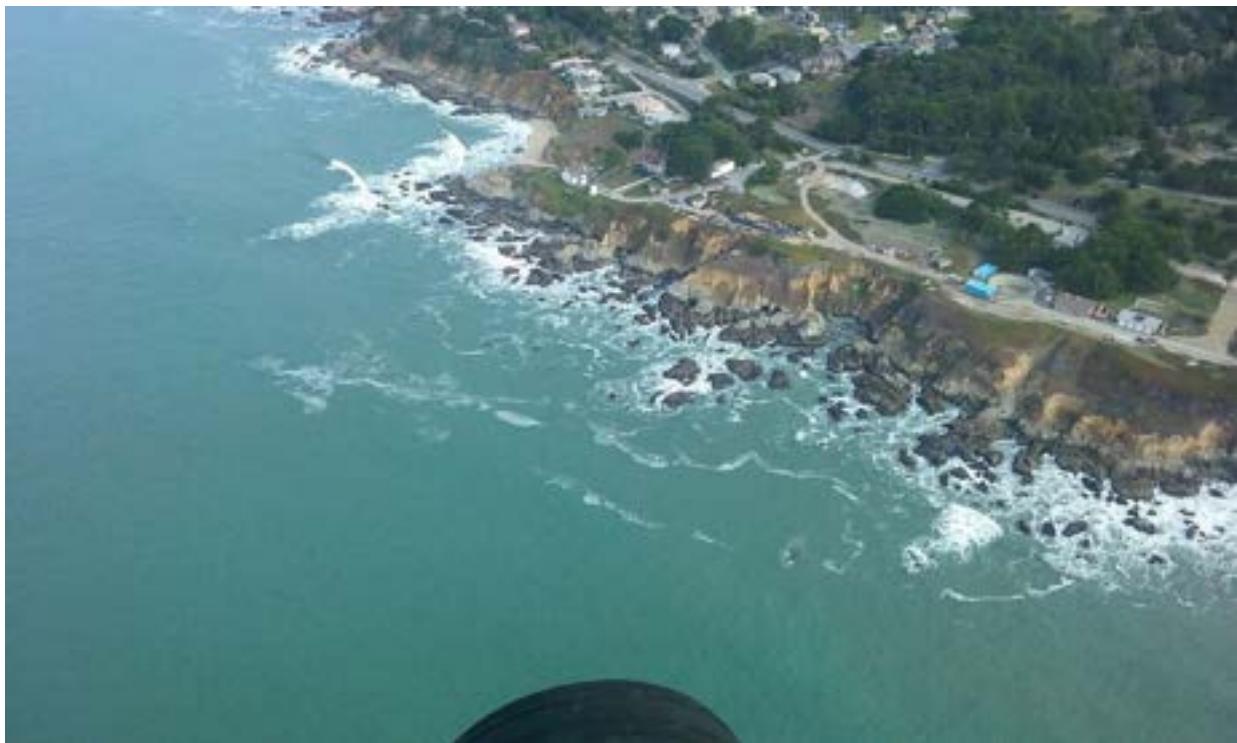
## 2. 2016

### 2.1 January

#### 2.1.1 Finished my last hour of IFR (2016-01-02 13:36)

Today I went up with my instructor to get my last hour under the hood before my checkride. Beautiful weather over half moon bay, couldn't ask for a better way to start the year. Now to finish those elevators...

[1]



[2]



1. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2812.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2812.jpeg)

2. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2811.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2811.jpeg)

### **2.1.2 Continued elevators (2016-01-02 22:54)**

This evening I finished match drilling and dimpling the elevators and elevator stiffeners, no pictures but pretty routine work. Tomorrow I'll edge finish and deburr the parts in preparation for priming and riveting.

### **2.1.3 More elevator work (2016-01-03 21:48)**

Tonight I spent about half hour prepping the trim servo mounting provisions. Not much to show, but I dimpled the #6 screw holes and prepped the surface for priming.

### **2.1.4 Back at it again! (2016-01-17 18:40)**

After what seems like a couple weeks of very little work on the plane, my uncle came over to help me out and we spent about 3 hours today doing some edge finishing and deburring and surface prep on the elevator stiffeners.

Once that was done I countersunk the holes for the plate-nuts and riveted them in place. This is the plate that holds the electric trim servo on, and I also fit the servo to the mounting brackets and the brackets to the mounting plate. Not too much to show, by the countersinking was spot on, ended up with perfectly flush rivets.



Once I find the time again I'll be priming the stiffeners and then riveting them to the skins. Slow progress but with the fuse and wings arriving in April, I have nearly 3 months to finish everything, so I've been slowing the pace down so I can enjoy some other areas of my life. Til next time!

1. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2934.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2934.jpeg)

## 2.1.5 Elevator (2016-01-20 23:27)

Tonight I prepped and primed the skin stiffeners for the elevators, also got the trim servo parts primed and riveted. Not much tonight but still making progress.



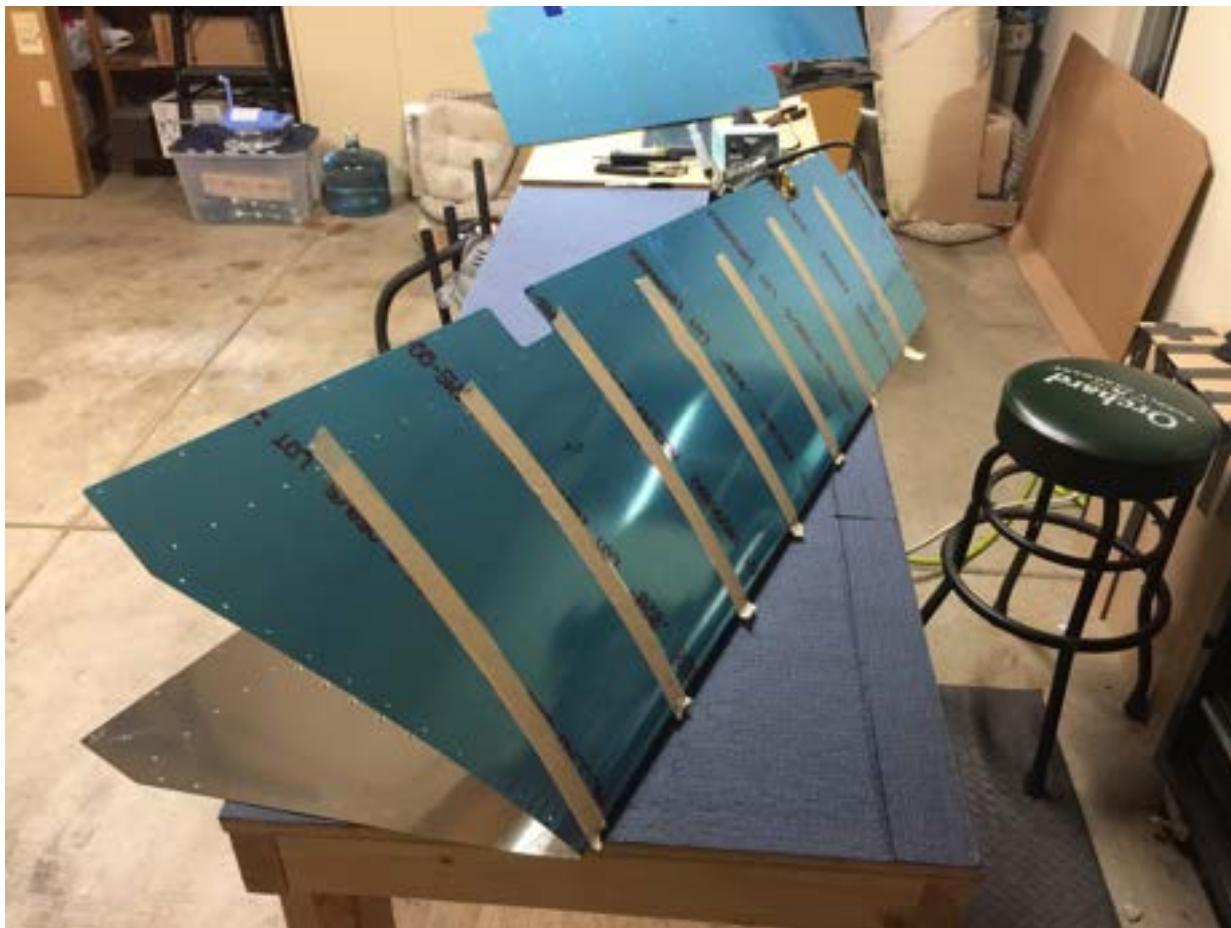
I cleaned all the parts prior to priming.

1. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2952.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2952.jpeg)

## 2.1.6 Elevator rivets (2016-01-26 21:48)

While prepping the elevators for riveting I ran out of tape to hold the rivets for back riveting. My personal preference is to prep both elevators before riveting, so it will have to wait until tomorrow.

[1]



Here you can see the rivets all taped in for the skin stiffeners. The left elevator is sitting in the background, I'll prep that and hopefully get them all riveted tomorrow night.



If you look closely you can see the rivets all lined up, the more I look at the polished aluminum the more tempted I am finish the plane with exposed aluminum.

1. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2956.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2956.jpeg)
2. [https://n890gf.com/wp-content/uploads/2016/01/img\\_2955.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_2955.jpeg)

### **2.1.7 Finished Stiffeners (2016-01-30 22:53)**

Tonight I put a couple hours into finishing up he stiffeners. I was hesitant to bend the skins out of the way to back rivet the last rivet in the stiffeners, but in the end all of the rivets turned out perfect!

[1]



Here you can see the rivets set in the stiffener. All measured with the rivet guage and set good.



Here's both elevators riveted with the skin stiffeners. Next step is to bend the trailing edges, and then move on to the skeleton.

1. [https://n890gf.com/wp-content/uploads/2016/01/img\\_3028.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_3028.jpeg)
2. [https://n890gf.com/wp-content/uploads/2016/01/img\\_3033.jpeg](https://n890gf.com/wp-content/uploads/2016/01/img_3033.jpeg)

## 2.2 February

### 2.2.1 Elevator skeleton (2016-02-03 08:04)

Yesterday I put in a few hours on the skeleton.

[1]



Here are all the parts laid out before edge finishing and deburring. The end ribs and counter-balance ribs on the left have already been fluted.



In this photo, all the parts have been edge finished and deburred.

[3]

103



Here is the skeleton laid out in the left elevator skin, I've already drilled and prepped both elevator counterbalance weights and have set them aside. Next step is to bend the trailing edges of the skins so I can match drill the skins to the under structure.



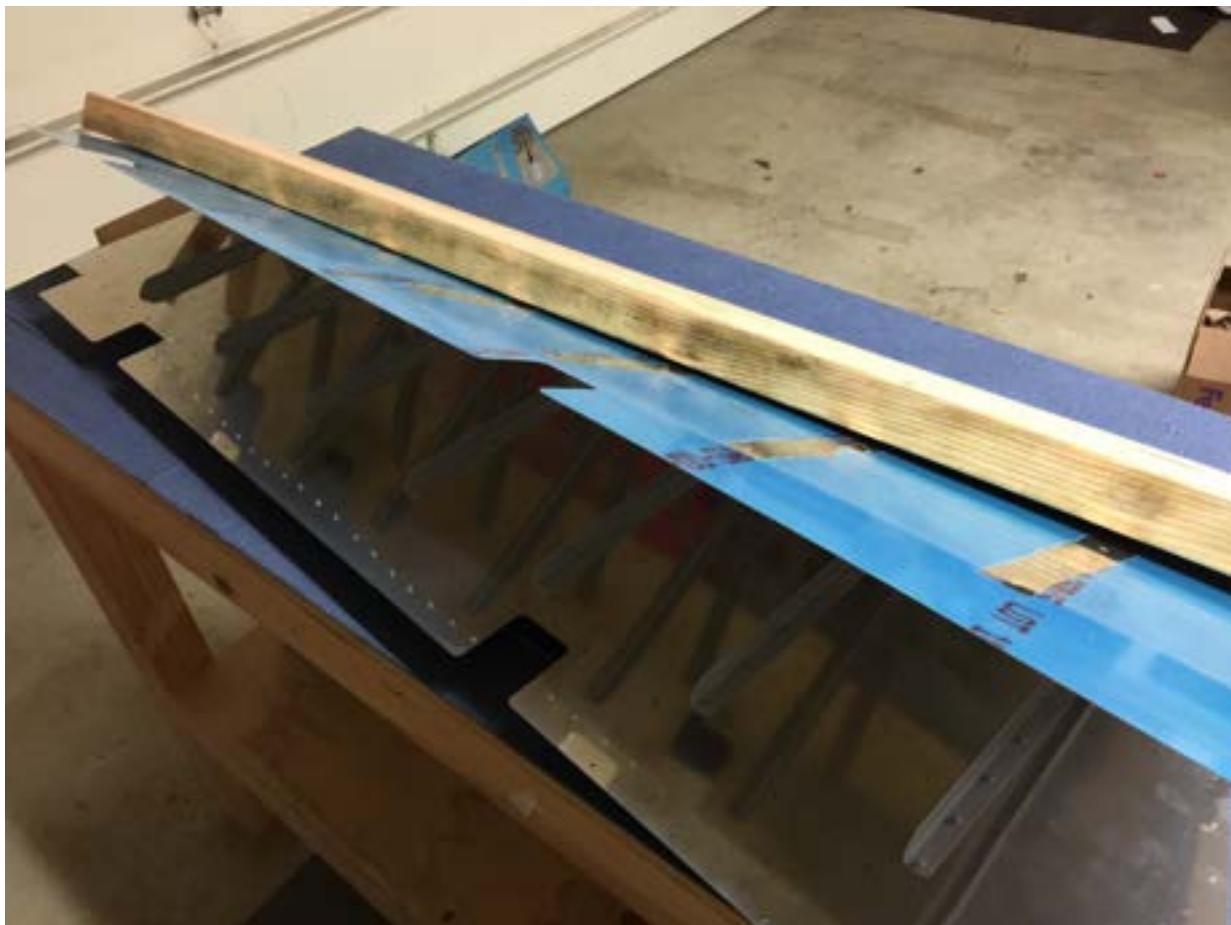
Here's a close up of the counterbalance rib and elevator tip rib attached to the spar.

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2. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3044.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3044.jpeg)
3. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3045.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3045.jpeg)
4. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3046.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3046.jpeg)

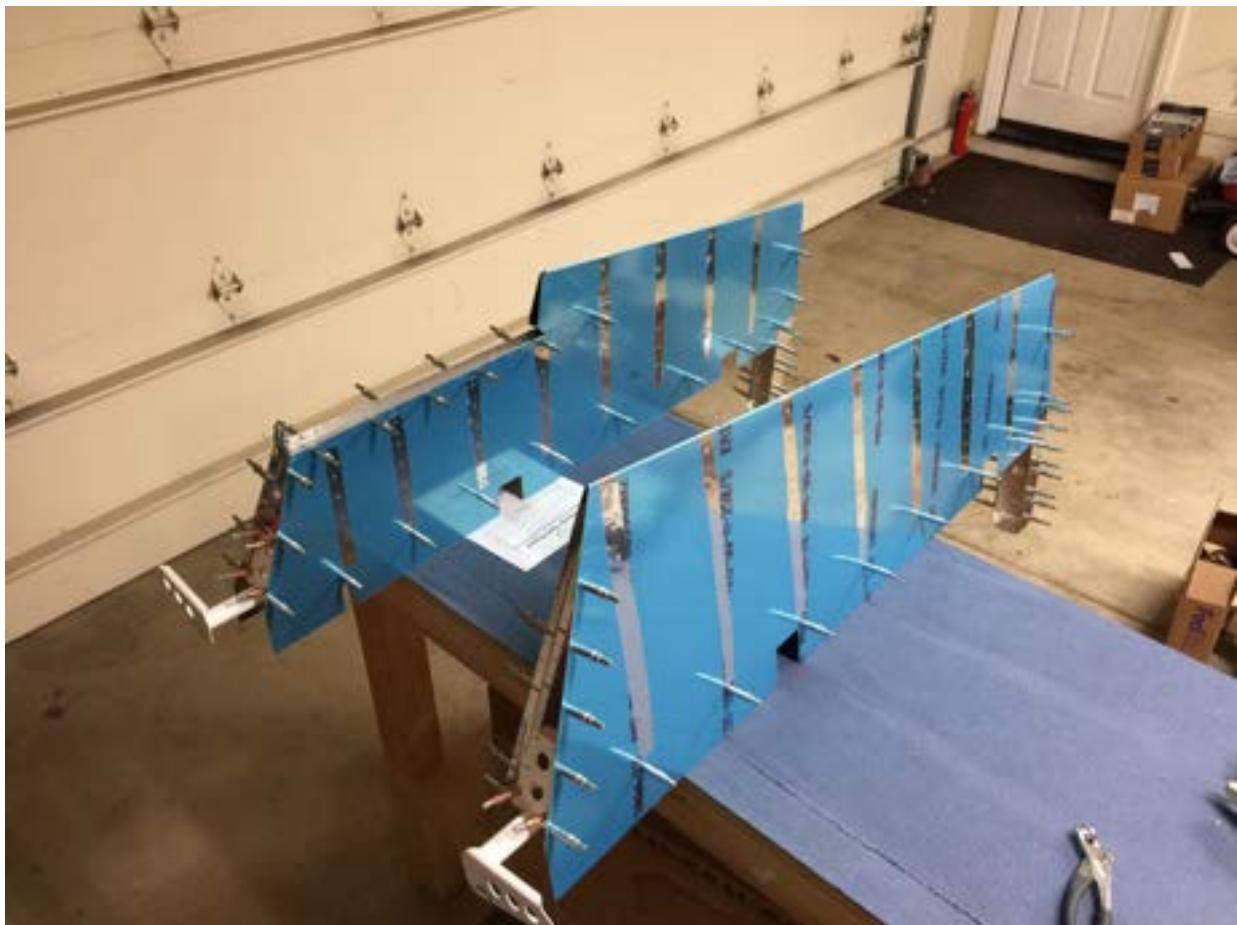
### **2.2.2 Bent trailing edge (2016-02-04 22:28)**

Today I swung by Home Depot and picked up a 2x8 to build a bending brake.

[1]



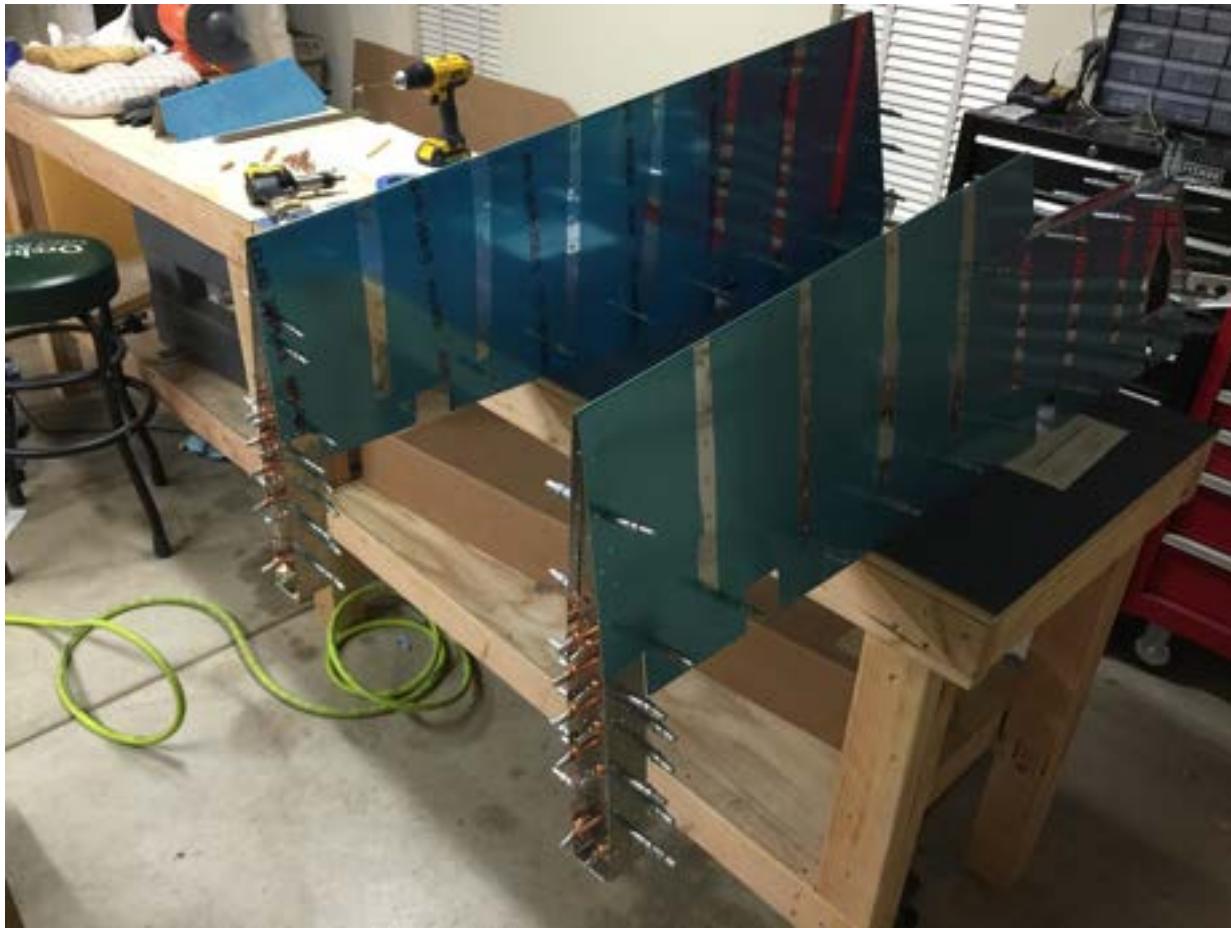
Here I'm bending the trailing edge on the right skin. The left skin didn't require as much force but it took basically my whole weight pressing down on it.



Here are both skins bent and clecoed to the skeleton. I also drilled all the holes to final size in prep for disassembly.

All in all I put in a good 2 hours tonight.

[3]



1. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3049.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3049.jpeg)
2. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3050.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3050.jpeg)
3. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3051.jpeg](https://n890gf.com/wp-content/uploads/2016/02/img_3051.jpeg)

### **2.2.3 Tech inspection (2016-02-09 23:17)**

Tonight I had my local tech counselor Jason Beaver come checkout my build progress. He built his own RV-7 and knows a lot about what good quality looks like. He pointed out a few things that I need to take care of, but in the end everything is looking good and I am clear to continue working. I should be closing up the elevators soon and then I'll have just over a month for some fiberglass work to keep me occupied before the fuse and wings arrive.

## **2.2.4 Dimples (2016-02-18 23:51)**

Today I spent a couple hours prepping all the holes for riveting the elevators. I started out with countersinking the required parts for flush rivets, the spars and the left elevator rear spar. I also countersunk the two counterweights.

[1]



Here's the rear spar countersunk.

After I finished countersinking I dimpled the rest of the holes of the skeleton and skins in prep for priming. Spent about 2 hours total tonight.

1. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3092.jpg](https://n890gf.com/wp-content/uploads/2016/02/img_3092.jpg)

## **2.2.5 Primed elevator skeleton (2016-02-29 22:11)**

Tonight I spent some time surface prepping and priming all the elevator skeleton parts. Not too long but quality time priming everything.

[1]



[2]

110



Here's both the left and right skeleton parts prepped and primed. I also spent a significant amount of time trying to cut down the right elevator counterbalance lead weight. I still have some work to go before it's ready. Next step is to rivet the right elevator

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2. [https://n890gf.com/wp-content/uploads/2016/02/img\\_3429.jpg](https://n890gf.com/wp-content/uploads/2016/02/img_3429.jpg)

## 2.3 March

### 2.3.1 Began riveting elevator (2016-03-01 21:32)

Tonight I began riveting the right elevator.

[1]



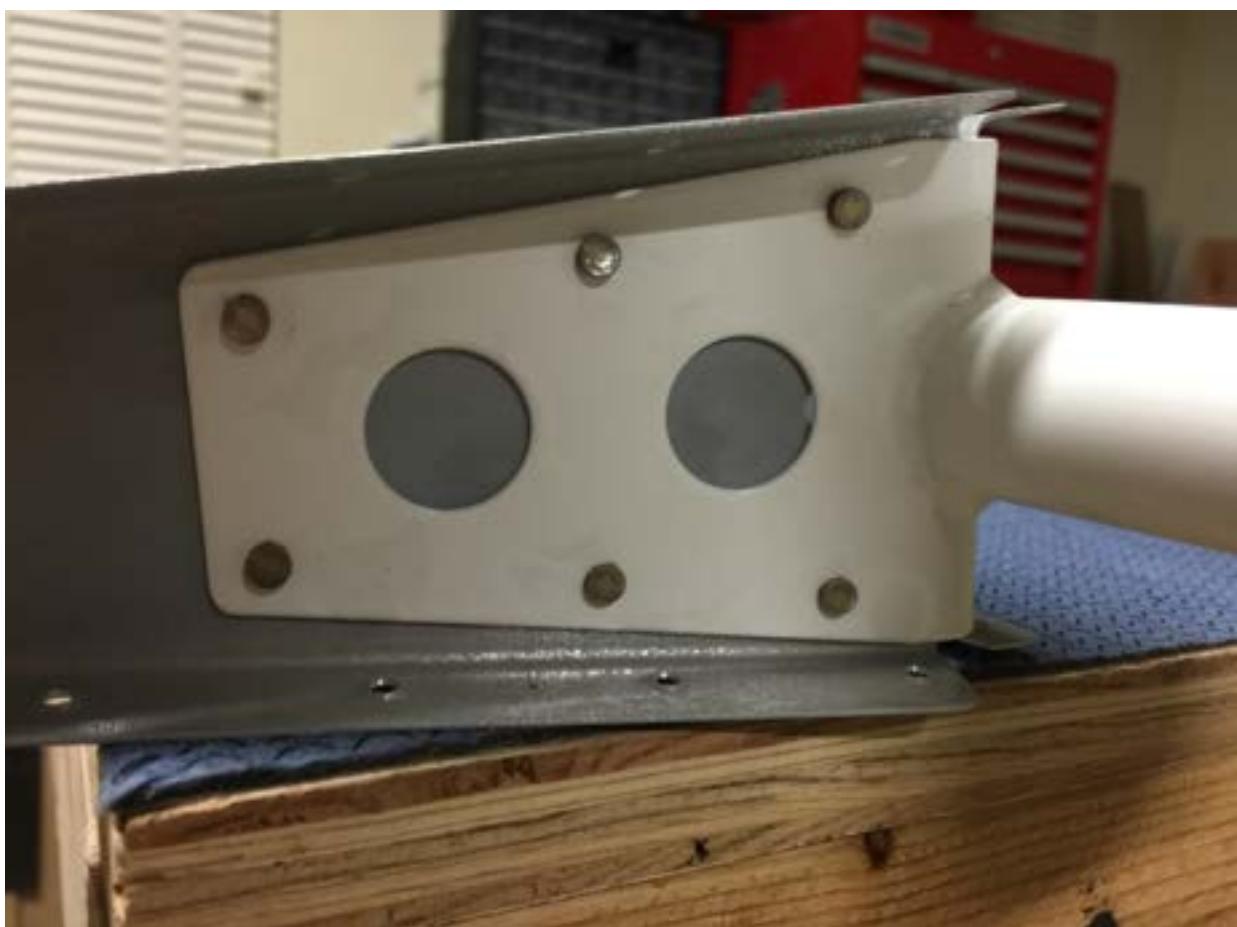


Started off by riveting the nutplates and reinforcement plates to the spar. Then I riveted the inboard rib.

[3]



Then I riveted the elevator horn k. Here you can see the rivets for the rib to spar attachment and the factory heads of the elevator horn rivets.



[5]

115



Here's the shop heads of the elevator horn rivets.





I then riveted the end rib and counterweight rib to the spar. Here you can see the shop heads.

I then prepped the the skin with the counterweight skin and counterweight. Next up is to begin riveting the skeleton to the skin.

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2. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3435.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3435.jpg)
3. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3432.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3432.jpg)
4. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3433.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3433.jpg)
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7. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3437.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3437.jpg)

### 2.3.2 Riveted right elevator (2016-03-02 23:49)

Tonight I stopped by Home Depot to buy a saw that I could use to finish cutting the lead counterweight. It was by far the most difficult task to date. 2 hours of cutting and filing.

Once that was done, I refitted it to the elevator. I then put silicon caulk at the trailing

edge of the stiffeners, and then clecoed the skin onto the skeleton.

[1]



I then riveted the skin on and fitted the fiberglass tip just for fun.

[2]



One down and one to go!

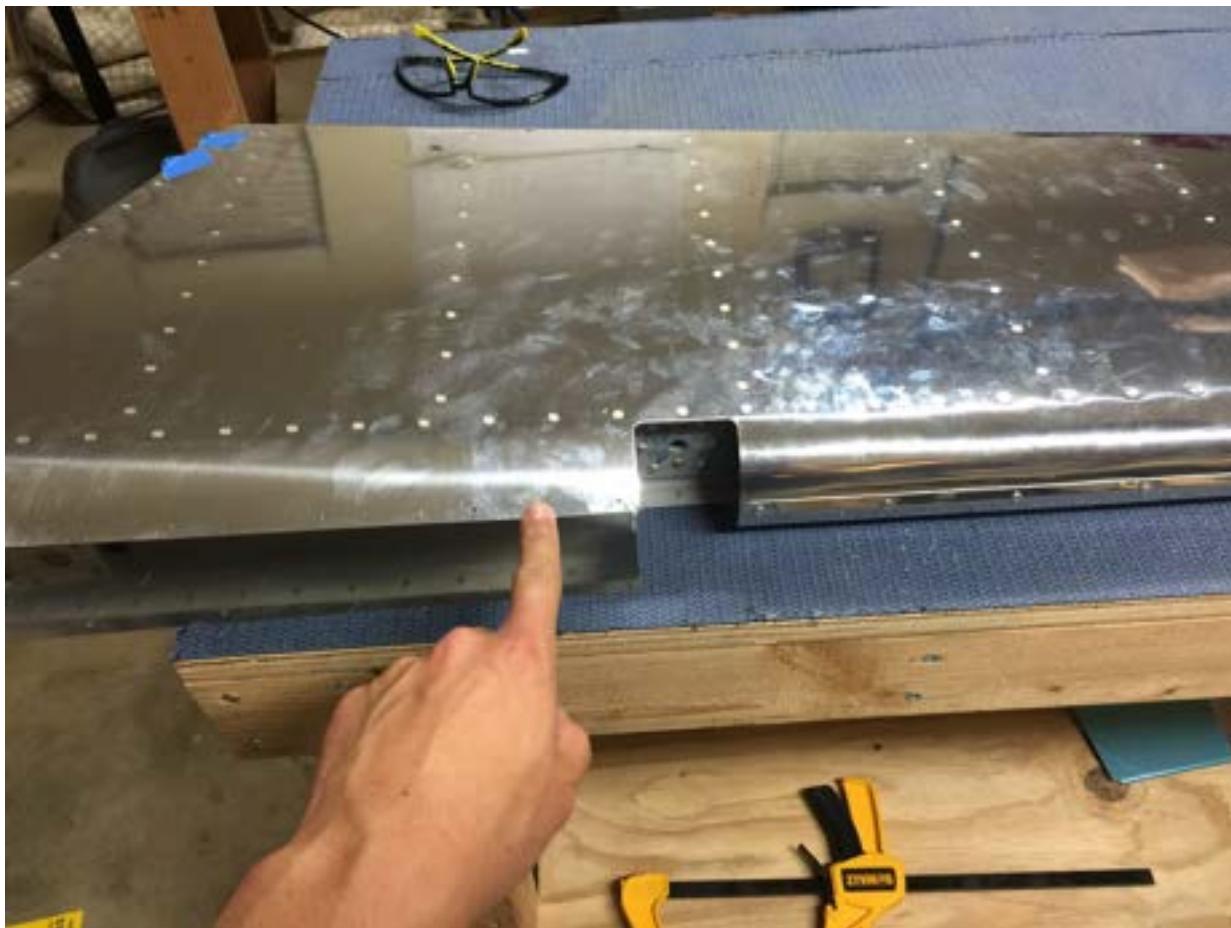
1. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3445.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3445.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3444.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3444.jpg)

### 2.3.3 Finished right elevator (2016-03-09 14:09)

Last night I finished the last four rivets on the inboard rib at the trailing edge, finished rolling the leading edges and blind riveted everything together.

[1]

120



Here you can see the pre-bent leading edges vs the completed leading edges. The trick here to get enough of a bend that the rivets aren't strained holding the two halves together.

[2]



Here you can see another view of the leading edge before/after.

[3]

122



This view shows the rivets and the two mating surfaces of the leading edge.

I also put the berrings in and measured them to 13/16ths per the plans. Now on to the left elevator and trim tab

1. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3541.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3541.jpg)
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3. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3543.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3543.jpg)

### **2.3.4 Fiberglass tips (2016-03-09 22:14)**

Tonight I spent about an hour on the vertical stab and rudder fiberglass tips.

[1]



Here's the rudder tip riveted to the rudder, it will be filled and sanded to smooth out all the joints.

[2]



VS tip riveted on, the opening will be filled and the joint also filled and glassed to make the transition unnoticeable.

1. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3546.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3546.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3544.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3544.jpg)

### **2.3.5 Busy week (2016-03-18 09:11)**

This week has been a very intense week, but I'll start with the news that I passed my PPL checkride on Wednesday! It was a grueling 8 hour day including hour long flights to and from the examiners airport, and 2 hours for the checkride itself, 3 hours for the oral exam! But at the end of the day, I flew home a private pilot!

On the building front, I've completed riveting the left elevator structure to the skin, I also began work on the trim tab, I am going deviating from the plans in regards to folding the tabs, and I'll be fabricating riblets for the elevator and trim tab. It should make for an easier time overall. I hope to close out the left elevator this weekend, if I'm not out flying friends and family around that is!

### **2.3.6 First passenger! (2016-03-29 11:58)**

Not much building has been going on the last couple weeks. After getting my license I've finally taken my first passenger up: my sister! It was a windy morning but it was a good first experience, it doesn't get much bumpier than what we were flying in. She flew like a champ though, held her lunch down, and had a fun time! I can't wait to take people flying in my own plane one day!



I'm finishing up the left elevator soon, with the trim tab nearly done and just the leading edges left to complete (minus all the fiberglass work) I hope to have this finished up in the next couple weeks. My QB fuse and wings should be ready sometime in April, I have yet to receive an official date, but hopefully soon.

1. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3851.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3851.jpg)

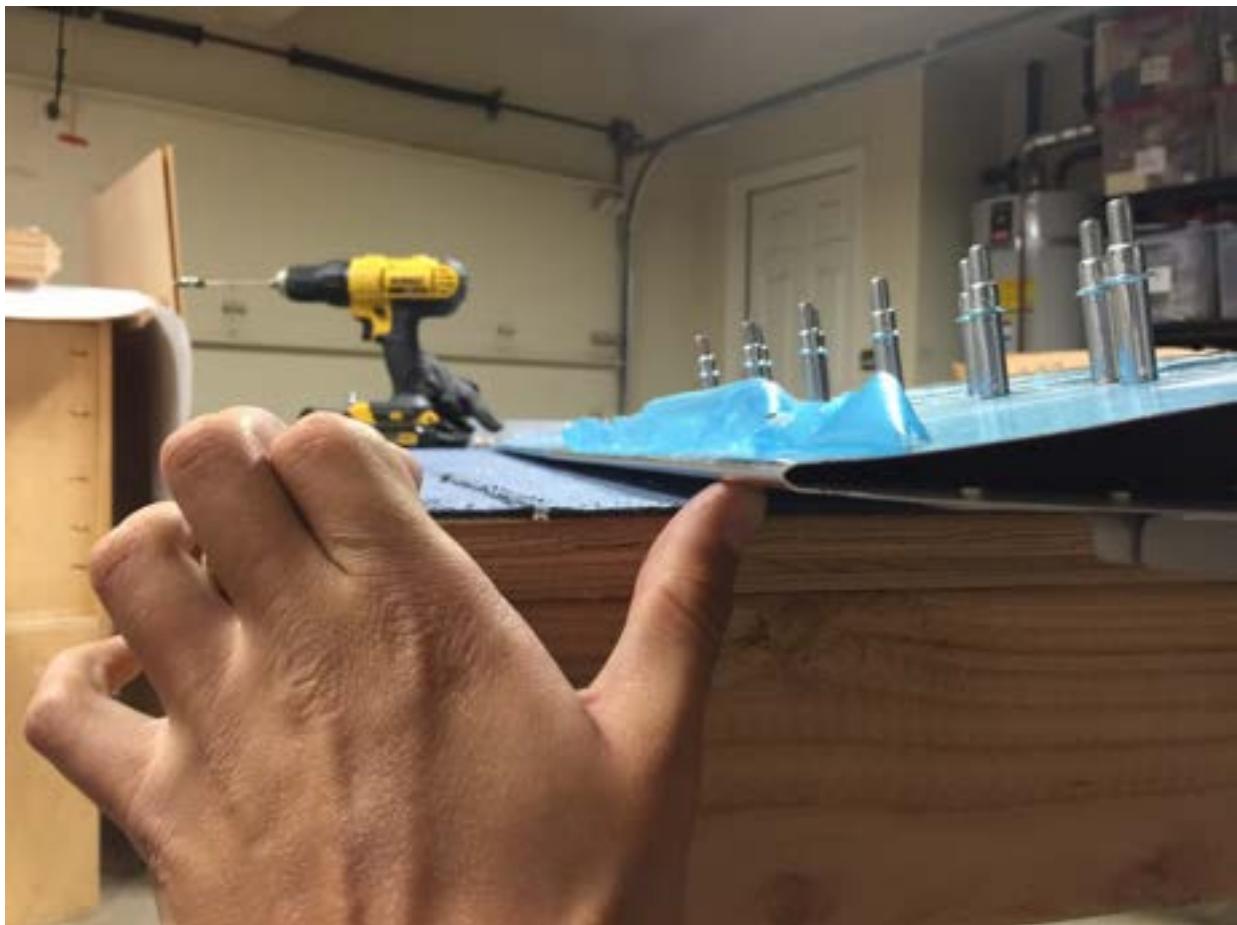
### **2.3.7 Trim tab (2016-03-31 07:32)**

Last night I spent a couple hours on the trim tab. I'm deviating from the plans and I removed the tabs from the elevator and trim tab and I'll be making riblets. I've seen several people attempt to make the trim tab following the plans and it can be very difficult. By going down this route it is a lot easier.

[1]



Here's the tab after I lined everything up and match drilled the hinge to the elevator. Everything lined up perfectly!



Here you can see the trailing edges of the trim tab and elevator are perfectly straight. There's a little curve in the tab skin that I'll straighten out before riveting the the hinge.

[3]

129



Here are the bottom rivets holding the trim tab spar to the tab skin. You can also see the push rod attachment point on the bottom of the tab.

Next up is final prep of the the riblets, and I might need to drill out some of the rivets along the edge of the tab, and then fab the riblets and re-rivet things together.

1. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3854.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3854.jpg)
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3. [https://n890gf.com/wp-content/uploads/2016/03/img\\_3856.jpg](https://n890gf.com/wp-content/uploads/2016/03/img_3856.jpg)

## 2.4 April

### 2.4.1 QB kit (2016-04-09 07:09)

Yesterday was a good day! I got a call from Van's saying my QB fuselage and wings are here and ready to go! So I paid the final payment and it's now in the queue for shipping. I have maybe 3-4 hours left on the empennage (minus fiberglass) and should get that knocked out this weekend. Then I'll have a week and a half or so before the kits are shipped to me to clean

and prep the garage. It's amazing how quickly time flies when you're having fun building!

#### 2.4.2 Left elevator leading edges (2016-04-26 09:29)

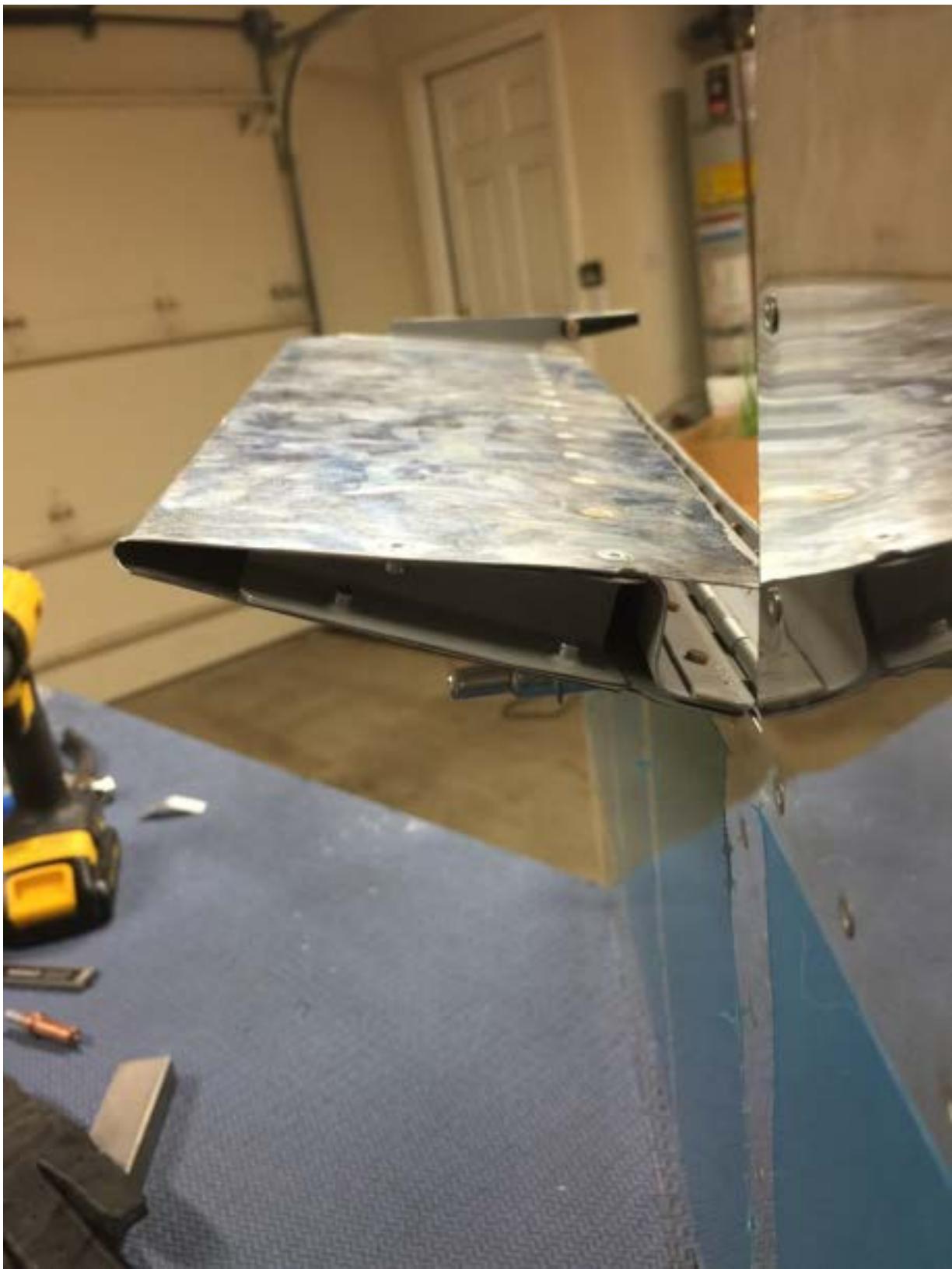
Over the last few days I've been making slow progress, but nevertheless, my fuselage and wings are arriving tomorrow, so I have to finish off the empennage and make room in the garage for the plane.

[1]



Here you can see the first two outboard sections of the leading edge rolled, this is by far the hardest part of the elevator. I also managed to knock out the rest of the trim tab riveting and alignment. I will need to measure and adjust the threaded rod that attaches the servo to the tab, but that can be done at any time.

[2]



Here you can see one of the riblets that I made for the inboard trim tab edge. It's not perfect, but it pretty good. Next step on the list is the elevator alignment to the Hstab, and drilling the center bearing to the elevator horns, then I'll be ready for the QB Kit that arrives tomorrow

1. [https://n890gf.com/wp-content/uploads/2016/04/img\\_4271.jpg](https://n890gf.com/wp-content/uploads/2016/04/img_4271.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/04/img\\_4253.jpg](https://n890gf.com/wp-content/uploads/2016/04/img_4253.jpg)

### **2.4.3 Received Fuse and Wings (2016-04-28 21:10)**

Today was a big day! I went to the service terminal and loaded up my fuse and wings on a uhaul and brought them home.

[1]



I got a 20' truck and went to the terminal, the ABF guys were really nice and in about 3 minutes both crates were in the truck and I was on my way.

[2]



First thing I did was start to rip the crate apart to look at the beauty inside.

[3]

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It was so nice seeing the fuse for the first time.

[4]

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My buddy Norio came by to help me unload the truck, it was definitely a two man job. We began with the wing crate and removed the wings from the truck one at a time.



Using the styrofoam that came in the crate I propped up the wings temporarily to get them out of the way.



We continued to pull out more and more parts and miles of paper.



Slowly we were able to disassemble the crate enough to get the fuse out. It's easily movable by two people.



And here's the garage with the wings and fuse. It looks messy but once I spend some time organizing and fabricating my wing stand then it will all start coming together.

And just for good measure, to make sure it fit correctly...



Yup, it fits!

1. [https://n890gf.com/wp-content/uploads/2016/04/img\\_4273.jpg](https://n890gf.com/wp-content/uploads/2016/04/img_4273.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/04/img\\_0852.jpg](https://n890gf.com/wp-content/uploads/2016/04/img_0852.jpg)
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## 2.5 May

### 2.5.1 Wing stand (2016-05-03 22:32)

Tonight I spent sometime cleaning up the fuselage crate and cutting the wood into manageable pieces for clean up. I also got my wingstand built. It needs some modifications but it's done.

I'm going to add some casters to it to make it mobile and to raise it up a bit too.

[1]

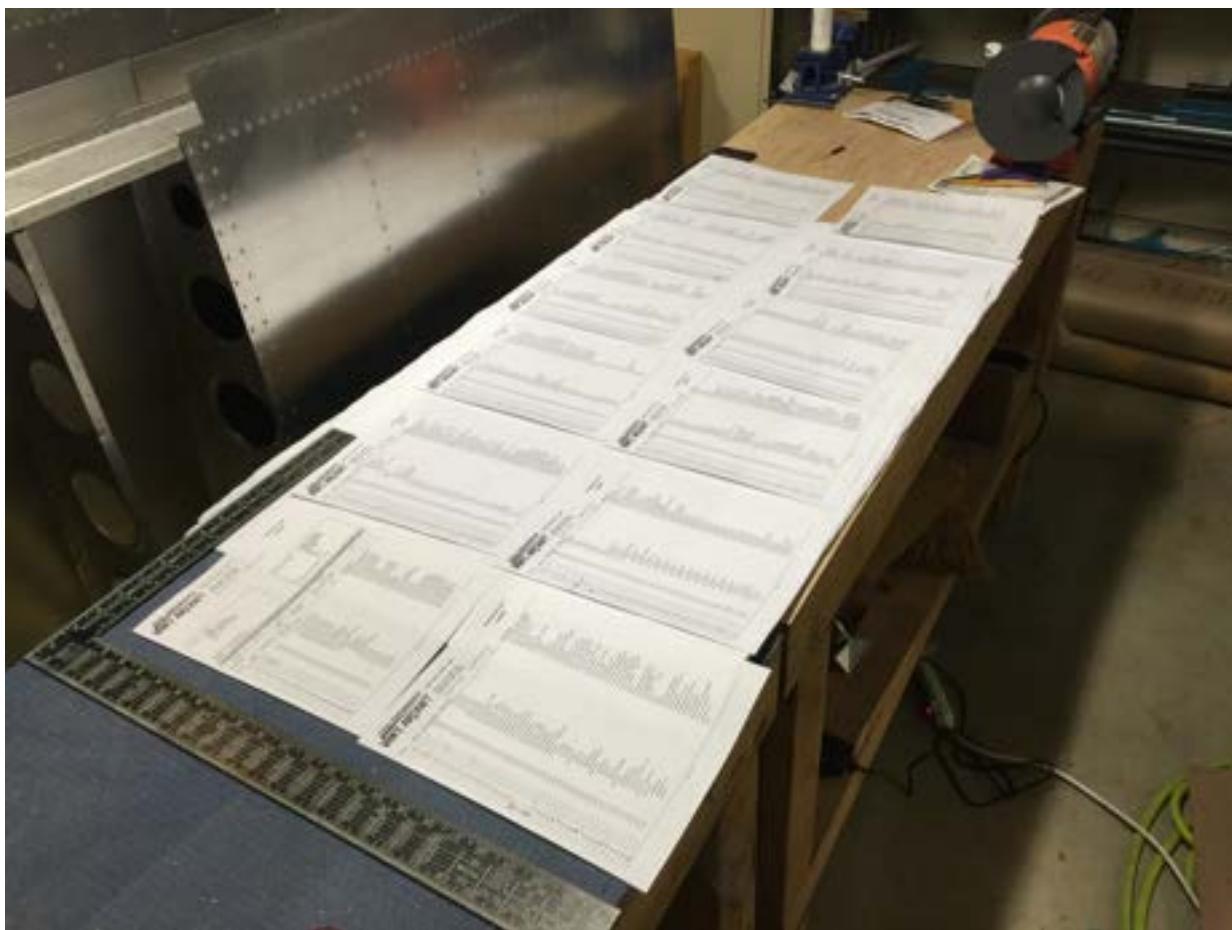


1. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4348.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4348.jpg)

## 2.5.2 Inventory (2016-05-07 00:05)

Tonight I spent a few hours to inventory my kit. I went through the boxes and went through all the different bags. There are A LOT of parts!

[1]



12 pages of parts. I also made some more room to move around in the garage. I have to do some clean up before I can start working on stuff though.

[2]

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Hopefully gonna get that table out and clear the whole side of the garage and then should have plenty of room to work.

1. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4354.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4354.jpg)
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### **2.5.3 Finished elevator (2016-05-11 00:20)**

Tonight I spent a few hours finishing off the left elevator. After spending the last couple days organizing and rearranging the shop with the wings and fuselage, I finally got around to finishing off the last few things on the elevator (minus the fiberglass).

I rolled the last segment of the leading edge and inserted the eye bolt hinges and set the jam nuts. I then spent some time adjusting the trim servo and trim tab.

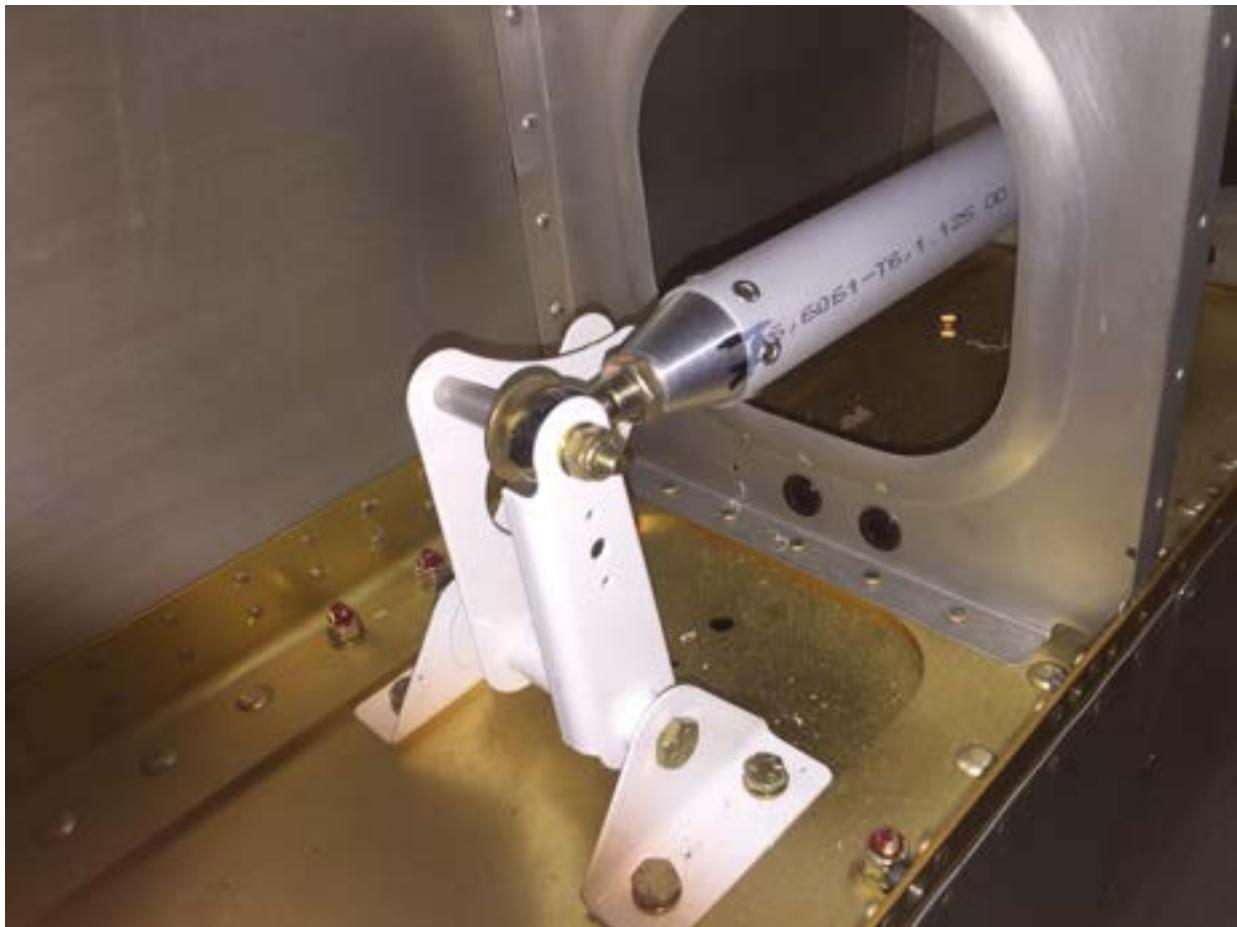
I don't plan on using the trim tab indicator and switch from Ray Allen, but for alignment it was great. These wires will be routed up through the fuselage and then attached to the trim switch on my control stick.

[wpvideo TO6HbjJx]

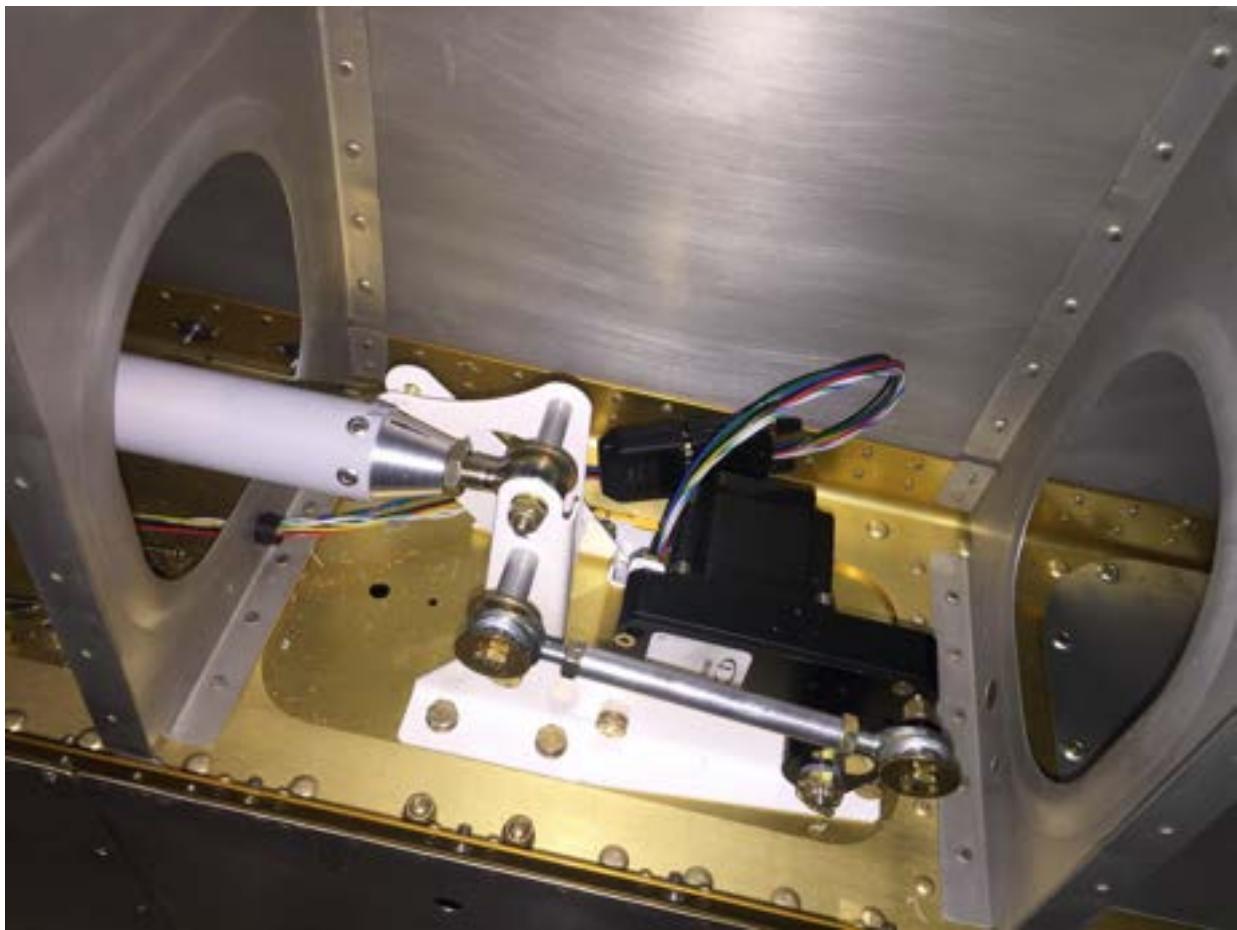
## 2.5.4 Wings (2016-05-15 23:40)

Today I spent about 6 hours working on the wings and wing parts. I began by cutting the pushrods to length. I then primed and riveted the pushrod ends to the tubes.

[1]



[2]





I then installed them in the wings. The rod end bearings will be adjusted to the final length when everything gets put together. I also put the autopilot servo wiring harness through the wing. Earlier in the day I put two dsub9 connectors on and connected them together.

I also assembled the aileron attachment brackets.

[4]





Here you can see them clecoed to the wings. The right wing brackets are also mounted to the wing. I'm going to hold off attaching them to the wing permanently so I can perform the latest service bulletin that Vans released. It will require some removal of the rivets, but it will be beneficial for safety.

1. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4389-1.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4389-1.jpg)
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## 2.5.5 Ailerons and flaps (2016-05-16 23:32)

Tonight I spent some time on the ailerons and flaps. Since I went with the quick build wings the aileron and flaps were all complete except a few things here and there. I started out by attaching the flap braces to the wings, I match drilled and deburred the edges and holes then blind riveted them to the rear spars.



These will get riveted to the bottom skin wth the flap hinge. Another difference between the slow build and quick build wings is that the flap brace gets blind rivets instead of solid rivets ( it's hard to get a bucking bar inside a closed up wing).

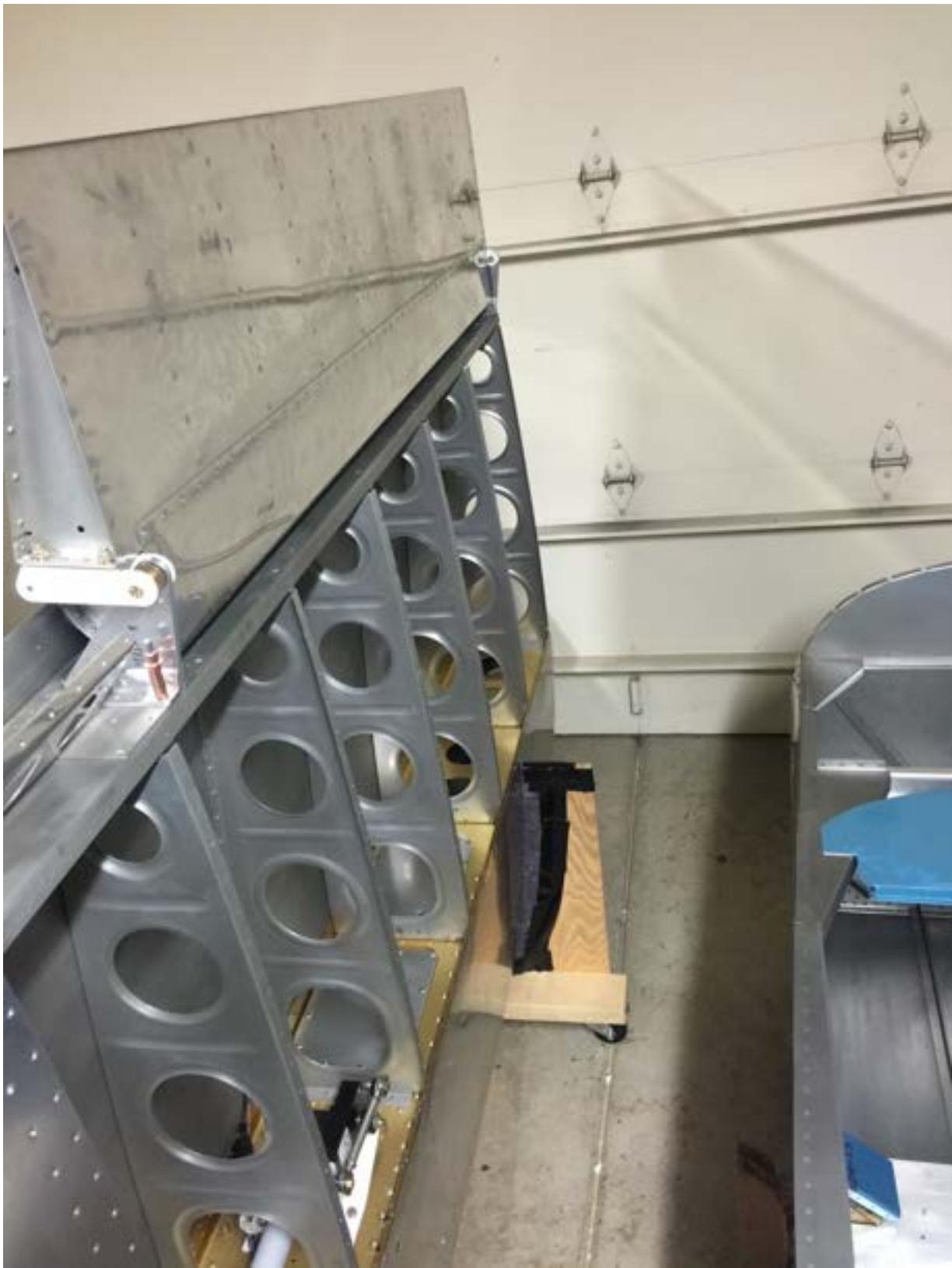
Next I got out the aileron attachment subkit and prepped and bolted the aileron attachment brackets to the aileron. I couldn't help myself but to attach it to the wing.

[2]



It's cool to see some more control surfaces going onto the plane. I haven't torqued anything fully because I will remove this several times during the fitting and alignment.

[3]



The aileron adds a nice amount of wing area, once I get some free time I'm going to pull out my old Aerospace Engineering books and see what kind of wing this is from a mathematical stand point. Very exciting to get more pieces together!

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## **2.5.6 Horizontal stab and elevators (2016-05-18 23:41)**

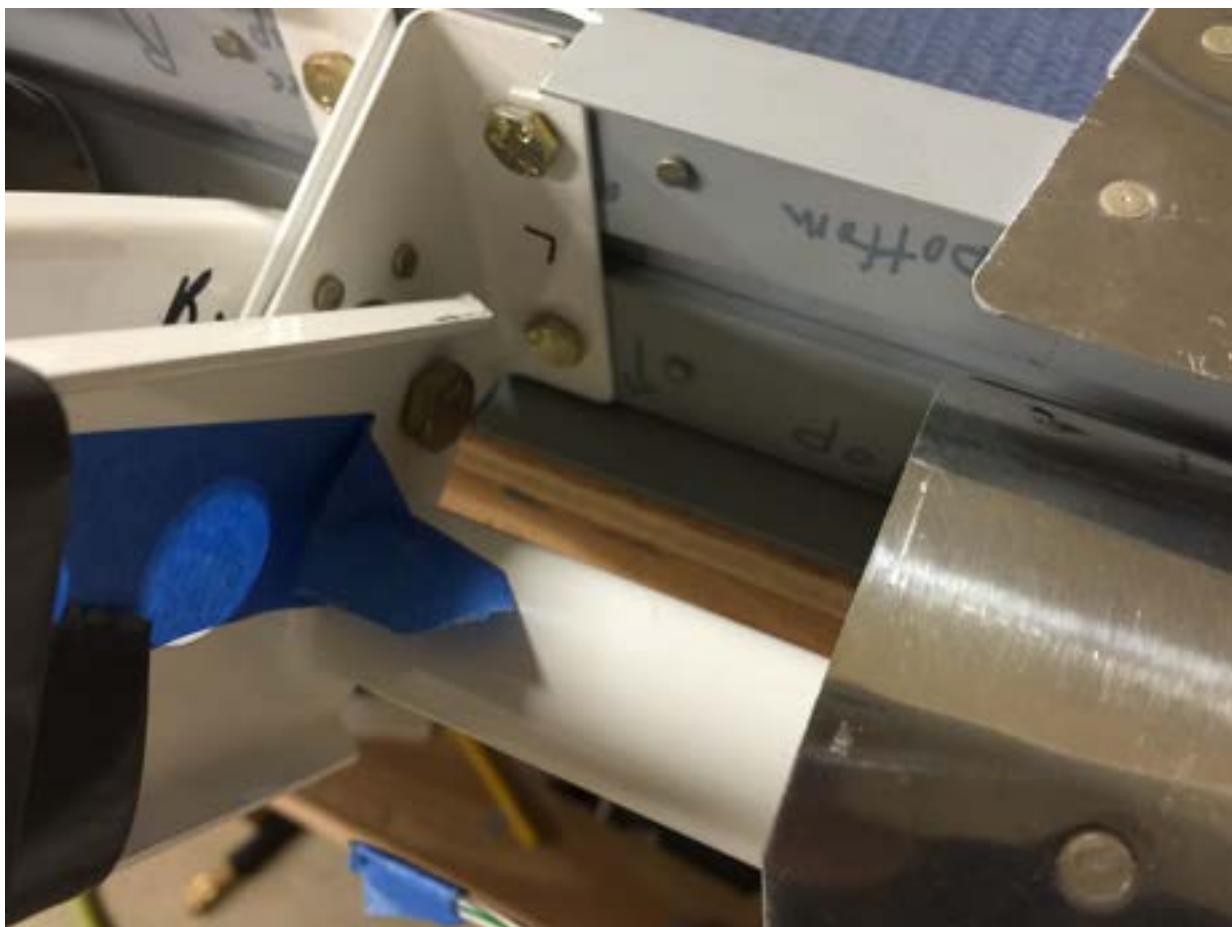
Tonight I pulled down the horizontal stab and fit the elevators to the stab. The final step in finishing the elevators required drilling the horns to the center bearing. I purchased a 1/4" OD drill bushing with a 3/32" ID. I then drilled #40 pilot holes in the horns and then stepped them up to 1/4 for the AN4 bolt.

[1]



[2]

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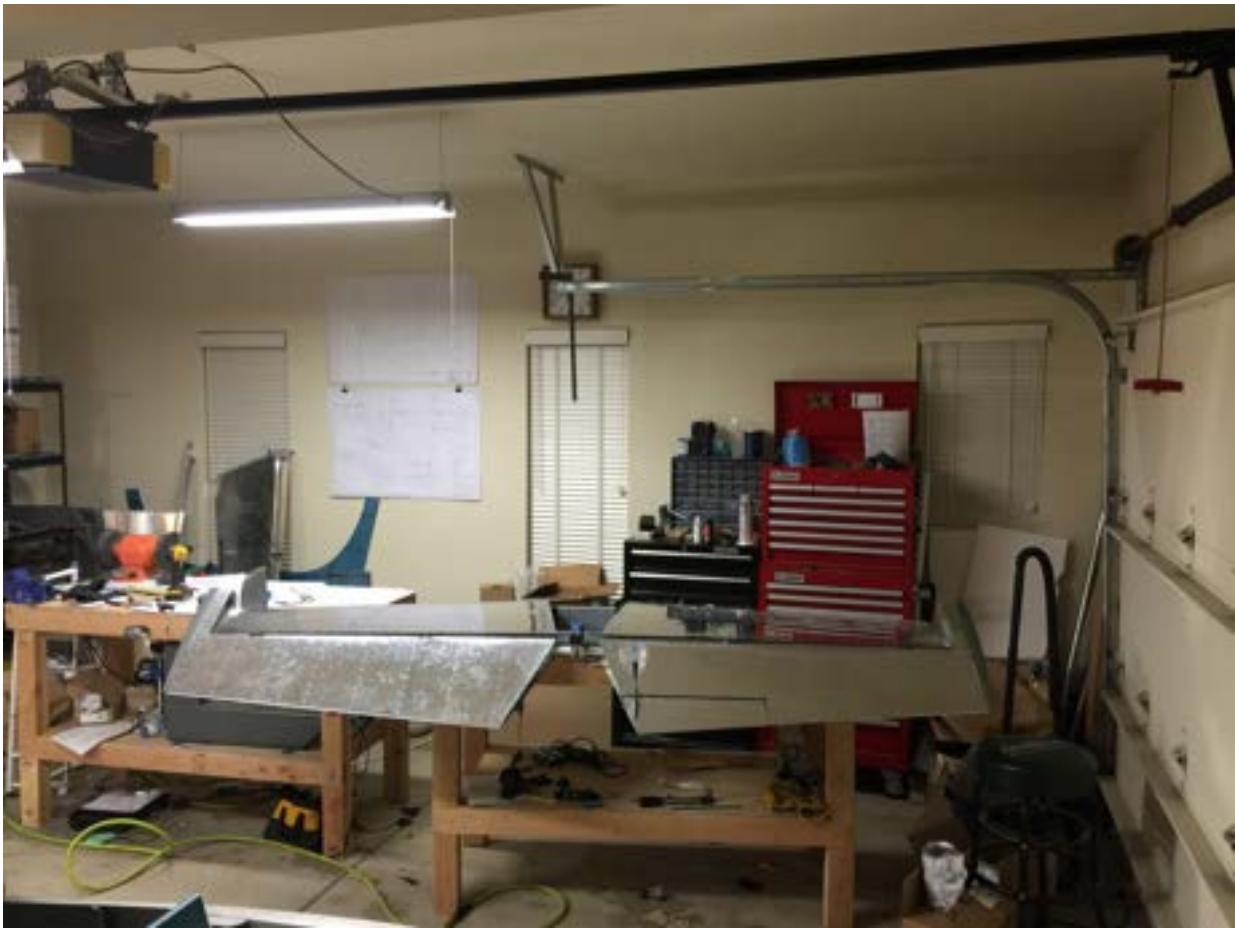
Here you can see the bolt at the base of the elevator horns. Once this was drilled the elevators swung freely with no binding in either direction. It was a smooth as butter!

[3]

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I also took this time to cut the horn notches in the aft spar, this will get cleaned up and then reprimed. I also fit the fiberglass tips just to see what it looked like, I'm holding off on the fiberglass work until later.



The tail feathers look so good! Can't wait to fit this up to the fuse in the future! You can see the trim tab on the left elevator (the whole thing is upside down) it still needs to be slightly adjusted for the trim tab push rod from the servo, but other than little things here and there, the empennage is done!

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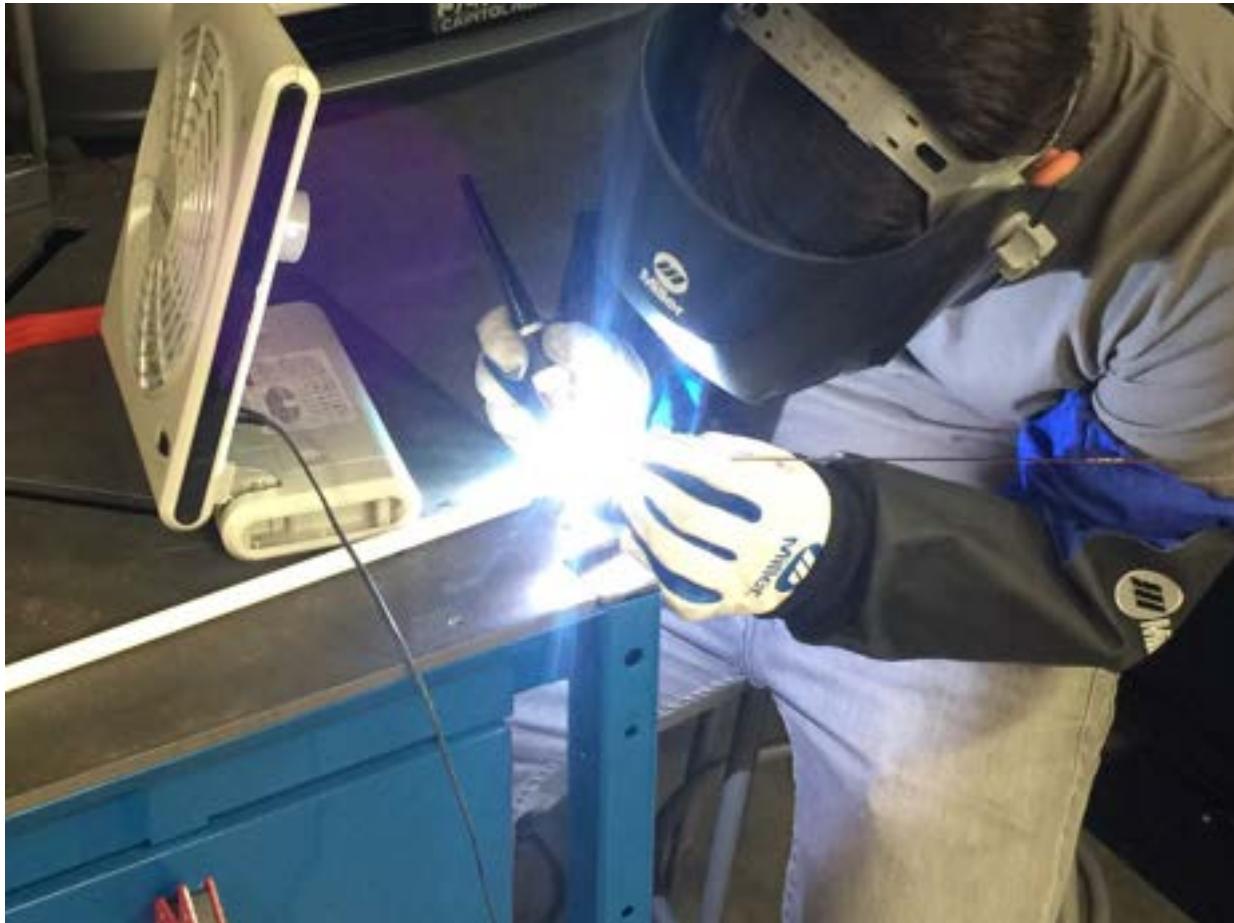
## 2.5.7 Ailerons and pushrods (2016-05-28 23:14)

Today was a busy day, I helped my mom move some old furniture down to her office, so I had to get a uhaul and load it up with everything. Fortunately it also included a bunch of stuff from the garage, so now I have nearly half the garage now cleaned. More room means easier to move around the fuse and wings.

A few days ago I had my friend help me out by welding the aileron pushrods. The manual calls for two aluminum rivets that hold the threaded steel bung to the steel tube. I didn't like the way it would have been held together and the aluminum holding the steel together

doesn't bode well in my mind. The welding my buddy did is much much stronger and also looks cleaner than the rivets would have.

[1]



Tonight I decided to rig up the ailerons, so I lined them up with the tooling holes in the end rib, and using the aileron bellcrank jig to line up the pushrods, I adjusted the lengths of the pushrods until everything fit perfectly. I disassembled them and set everything aside for now, I need to prime the pushrods again because the powdercoating had to be removed for welding.

I also received an order from Aircraft Spruce with some shielded wires and some snap bushings. I finished rigging up the pitot tube plumbing in the wing as well as the wiring for the wingtip lighting. I'm planning on going with full nav/strobe and landing lights in the wing tips with another strobe on the tail. But that's for much later in the build.

1. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4427.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4427.jpg)

## 2.5.8 Drilled left flap hinges, lower wing skin (2016-05-29 21:54)

Today I decided to knock out the left flap hinges and rigging. I began by aligning the aileron using the bellcrank jig, and slotting a few bolts in the tooling holes in the main outboard rib.

[1]



Here's the jig installed along with the lower outboard skin clecoed to the wing. With this installed I was able to then align the flap to the aileron trailing edge.

[2]



Here you can see the flap hinge clecoed to the wing, the mark on the lower right side is a 1/4" mark along the whole hinge. In order to align the trailing edge of the aileron with the flap I had to raise the hinge and flap about 1/16 of an inch, after it was drilled it's perfectly aligned with the aileron.



Here you can see the flap hinge on the left clecoed to the wing, and the flap above. Everything will get final alignment before riveting, and then again when attaching the wings to the fuselage.



While I had the lower outboard skin clecoed on for the flap installation I decided to match drill the skin to the ribs and spars. There's a lot of rivets for this one skin. Now all that's left for this wing is to dimple this skin and the under-structure, but before I can rivet this I need to route a wire conduit for the wingtip lighting. It's a bundle of 4 shielded wires wth 10 or so wires inside.

Next up is the right wing.

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3. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4440.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4440.jpg)
4. [https://n890gf.com/wp-content/uploads/2016/05/img\\_4441.jpg](https://n890gf.com/wp-content/uploads/2016/05/img_4441.jpg)

## 2.5.9 Right flap and lower wing skin, pitot tube (2016-05-30 22:41)

Today I rigged up the remaining flap and lower wing skin on the right wing.



Here you can see the flap and aileron are perfectly aligned. The gap between the two is 1/64" under 1/4" but with final riveting of the flaps and when I rig the aileron I can increase that gap to at least 1/4".

[2]

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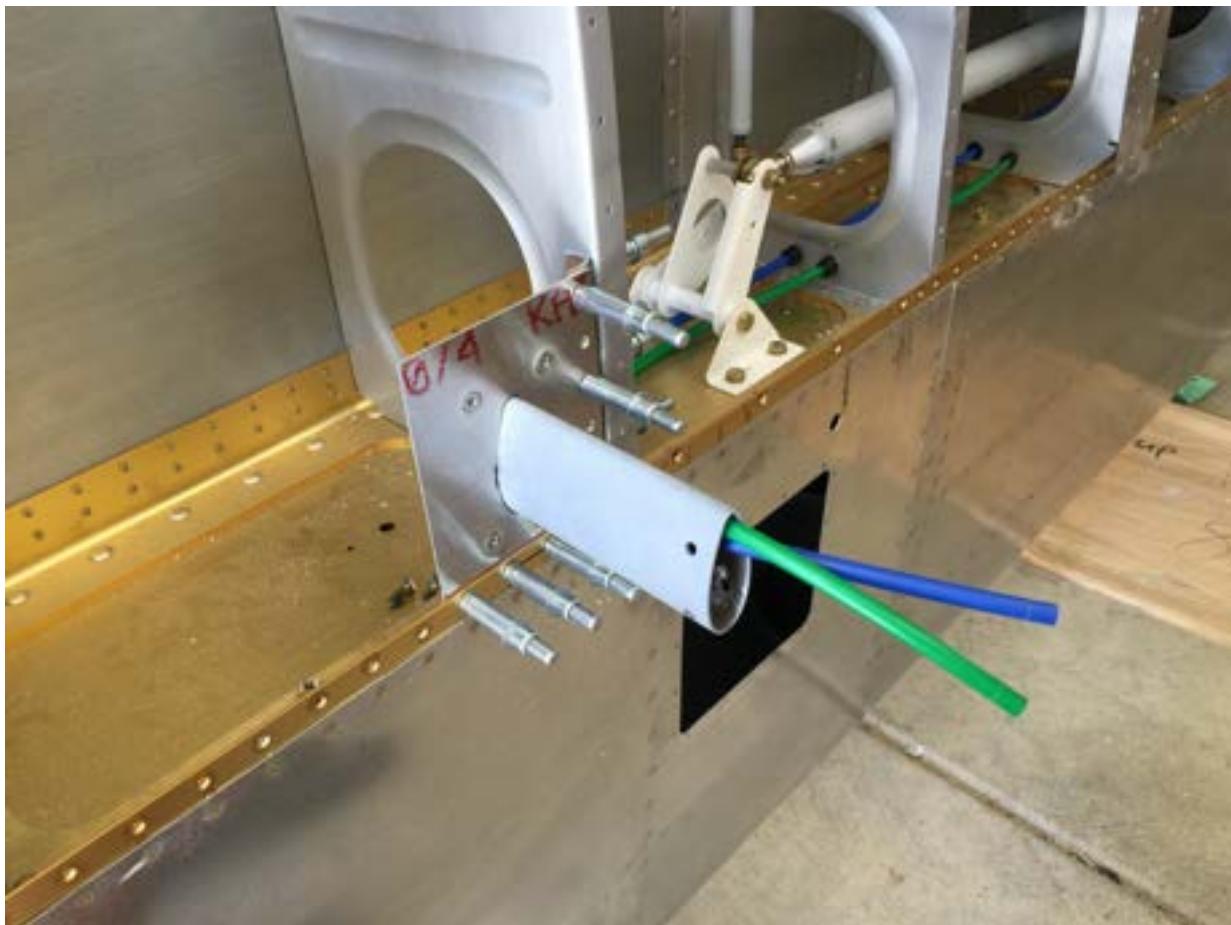
Here's the shop with the lower wing skin on the right wing it's been match drilled to the structure.



Here's the flap drilled to the structure. It's perfectly aligned from the inboard to the outboard section of the flap.

[4]

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I also rigged up The pitot tube mount. I fabricated a bracket that's clecoed to the rib. I decided to mount the pitot tube just outboard of the outboard access hatch. Some builders find this could interfere with the tiedown location (the small hole just above the square cutout). As long as I don't get careless with tieing down the plane it shouldn't be an issue.



Here you can see the bracket clecoed to the rib and Lito mount bracket. Here the pitot tube was installed temporarily.



The pitot tube mount can be removed from the plane with 4 screws that will install in dimples on the skin. This is incredibly strong as it is, but once I rivet the skin on it will be rock solid.



I also drilled and tapped the pitot tube for #6 screws to mount it flush with pitot tube mast.

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## 2.6 June

### 2.6.1 Cleaned shop and worked on wings (2016-06-05 21:25)

With the empennage 99 % complete (fiberglass work not done yet) I finally got some hooks up on the wall to get everything out of the way.

[1]



I also spent some time cleaning up the garage and getting things reorganized after I slacked a little and shop got a little messy. I then spent some time finishing up the pitot tube mounting

provisions.

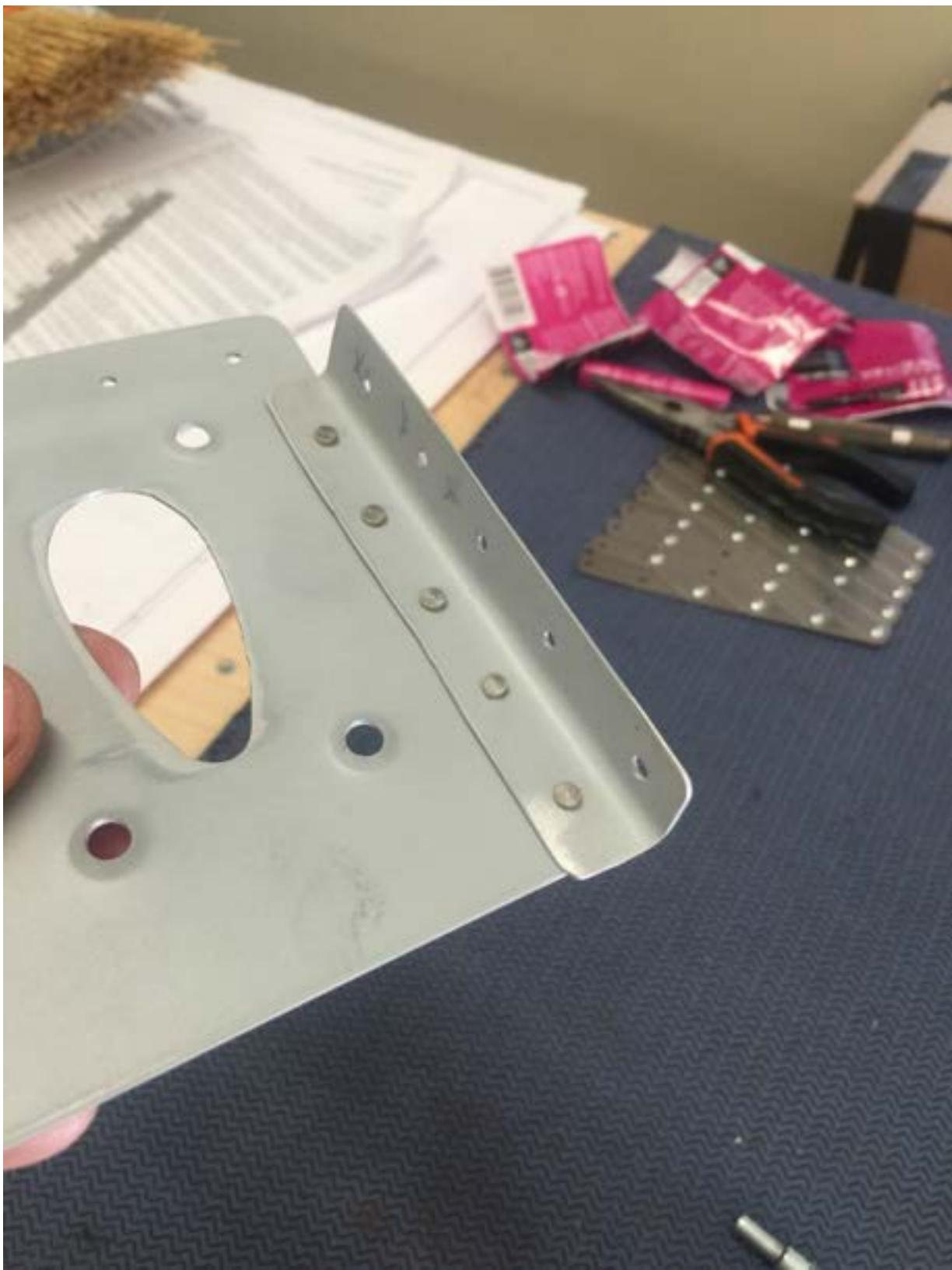
[2]



Here's the pitot tube mounting plate, the rivets on the side attach to an angle support that

will get riveted to the rib.

[3]



Once I finished this I installed it in the wing. Currently there are no rivets that go through the  
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wing skin into this plate except the ones that go through the spar. I may add more but the mounting screws hold the pitot mast and the whole installing is extremely rigid.

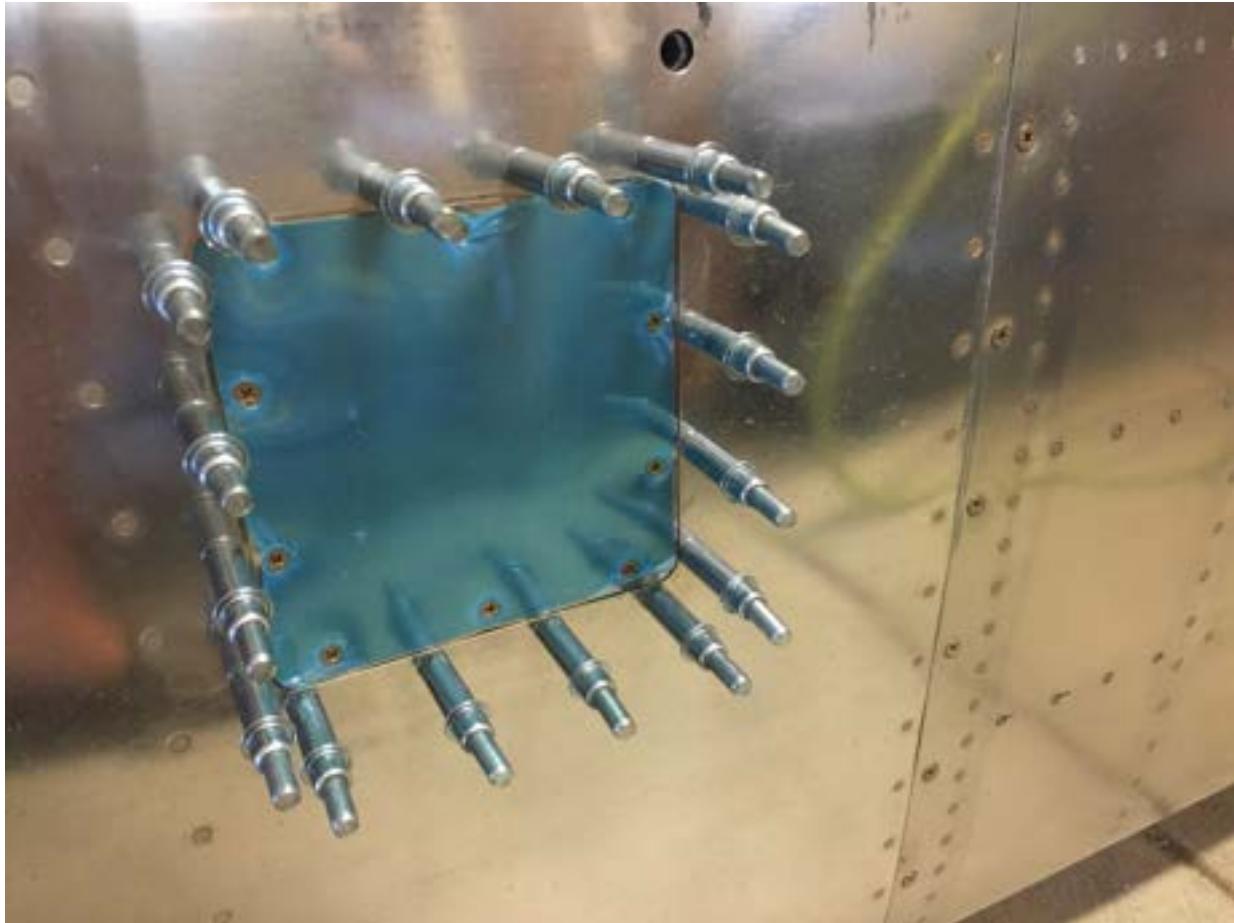
[4]



Even with the setup clecoed, the pitot tube is extremely rigid. I've flown many Skyhawks that have more movement in the pitot tubes by a factor of 10!

I also closed up the stall warning access plate (the hole behind the pitot tube)

[5]



The doubler plate is installed behind and held in by the clecoes, the cover plate is installed with screws into plate nuts that have been riveted to the doubler. The doubler has been match drilled, dimpled, deburred, and primed and can be installed at any time.

The Dynon pitot tube has angle of attack along with airspeed, which will indicate stall visually (on the EFIS) and audibly via my headset.

The wings are getting close to complete (or at least the majority of the work) and I will soon begin the work on the fuselage!

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## 2.6.2 To-do list (2016-06-23 09:37)

It's been a few weeks since I've worked on the project. Family parties and graduations and stuff have been popping up and work has gotten very busy so I haven't had any time to get to the garage. However, I put together a list of what needs to be done on the wings to close them out.

- Remove ailerons/flaps
- Dimple/surface-prep aileron braces
- Prep aileron reinforcement brackets for the service bulletin
- Dimple top skin for aileron brace flush rivets
- Dimple/rivet flap hinges to bottom skin
- Install pvc wiring conduit through lightening holes
- Dimple/prime/edge finish the remaining left and right bottom skins
- Install nutplates for last access panels
- Rivet aileron brackets
- Dimple remaining ribs
- Rivet bottom skin

It seems like a long list but it's pretty standard stuff. I'm going to hold off on riveting the bottom skin for quite a while, however everything else can probably be completed in a day of solid work. I didn't include the wingtip work in this list because I'm planning on holding off on that for a long time as well. With the wiring conduit in the wing I should have no issues wiring up my landing/nav/strobe lights later on.



Here's the current status of the shop. 'Till next time!

1. [https://n890gf.com/wp-content/uploads/2016/06/img\\_4444-1.jpg](https://n890gf.com/wp-content/uploads/2016/06/img_4444-1.jpg)

## 2.7 August

### 2.7.1 Back at it (finally) (2016-08-07 00:31)

I finally had a little bit of time to get back into the garage! Work has been killer over the last few weeks and I've had no energy. But today I got a little bit done. I removed the aileron and flap from the left wing, prepped the flap hinge for riveting and set it back and realigned it. No pictures but it's pretty straight forward stuff. Next on the list is to perform the SB for the aileron brackets. Which shouldn't be too hard considering they aren't riveted on yet. Hopefully I can find time tomorrow to do it. Til next time!

## 2.7.2 Wings (2016-08-13 22:00)

Today I spent a few hours working on the left wing. [1]



I started out by removing the flap and aileron, so I could get access to the aileron brackets. Because I didn't rivet the brackets, I was able to perform the bracket service bulletin.

[2]



It involved riveted two doubler plates to the backside of the spar behind the aileron bracket. Here you can see the row of rivets holding those doublers in place.

I then proceeded to install the aileron gap fairing.



Of course I edge finished, deburred, and primed the surface prior to riveting. Once that was installed I spent some time installing the aileron and determining the correct washer count and making sure I can get access to everything.

I then installed the aileron with the alignment bracket on the bell-crank to align the flap and check the gap between the two.



I also installed a PVC conduit for wingtip lighting. I fabricated some small L brackets to attach some adel clamps to hold the conduit. Once I finalize those I will be ready to mount the conduit and the wing will essentially be done! (Obviously the skin remains, but there's no rush to install that until much later.)

1. [https://n890gf.com/wp-content/uploads/2016/08/img\\_4732-1.jpg](https://n890gf.com/wp-content/uploads/2016/08/img_4732-1.jpg)
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4. [https://n890gf.com/wp-content/uploads/2016/08/img\\_4736-1.jpg](https://n890gf.com/wp-content/uploads/2016/08/img_4736-1.jpg)

### **2.7.3 VAF hat (2016-08-22 07:20)**

I decided to join the club and make myself a VAF hat to wear when I'm out and about to represent one of the greatest communities I've joined.



[2]Vansairforce has been a huge help in providing information during my build. I've had nearly every question answered by someone on the forums. I'm proud to represent a community that is helpful, kind, and supportive during the long and sometimes very difficult process of building. Can't wait to hop in my plane with my VAF hat and explore the world!

1. [https://n890gf.com/wp-content/uploads/2016/08/img\\_4764.jpg](https://n890gf.com/wp-content/uploads/2016/08/img_4764.jpg)
2. <http://vansairforce.net/>

## 2.8 October

### 2.8.1 Flap hinges (2016-10-30 15:33)

Had a little free time today so I finished the flap hinge modification. [1]



Similar to what a lot of rv builders do, I cut out three of the loops and then bent the hinge pin at 90 deg. This allows the hinge pins to each the last loop on either end. [2]



Not shown here but I took two loops from spare hinge material and will fabricate a bracket that will be screwed to the flap brace. Then repeat the same thing for the other wing.

1. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4998.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4998.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4997.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4997.jpg)

## 2.8.2 Fuel Tank Work (2016-10-30 15:34)

I got an order of ProSeal adhesive for my fuel tanks and did a bit a work on them today. I'm using the float type fuel level sensors and they need to be attached to the fuel tank access plate. [1]



I attached the platenuts and then covered them with ProSeal, once those cured a bit I then attached the fuel level sensor with ProSeal between the plate and the sensor as well as around all the corners. [2]



The screws were then covered with ProSeal and let to cure. Once I bond this to the tank it shouldn't be a source of any leaks (if there are any at all). This process was mirrored for both sides. [3]



The float wire on the right side broke when I was bending it per the design spec so I need to call vans and see if they can send me a replacement. Otherwise, these will get installed soon. I still need to ProSeal the AN fitting for the fuel pickup. A bead of glue will go between the access plate and inboard rib when it's installed.

I also (finally) got the wing wire conduit installed. I went with a pvc conduit for its simplicity of installing in the QB wing. [4]



It's held in by adel clamps attached to the ribs. I will also add a safety wire to each clamp to make sure it can't come loose. [5]



This is the clamp that I modified to be able to attach to the rib. There are provisions for wiring a heated pitot tube if I decide to go that way, for right now it's unheated.

Hopefully work will slow down a bit in the near future and I can get more work done on the project. It's been far too long without time to work on it, till next time!

1. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4911.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4911.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4912.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4912.jpg)
3. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4916.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4916.jpg)
4. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4917.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4917.jpg)
5. [https://n890gf.com/wp-content/uploads/2016/10/img\\_4908.jpg](https://n890gf.com/wp-content/uploads/2016/10/img_4908.jpg)

## 2.9 November

### 2.9.1 Fuel tank (2016-11-13 19:45)

Today I had some free time so I decided to work on the fuel tank. I spent a fair amount of time taking the tank off the wing. When I got to the final main bolt holding the tank on, I realized it

was stripped! I spent nearly 30 minutes trying to get the bolt out. [1]



I finally got the tank off and onto the bench. I spent some time checking all the seams and proseal used. The quality of the QB tanks is really good. I then worked on getting the access panel fitted. I also did a preliminary check of my leak test setup. [2]



It consists of some plastic tubing attached to the vent line. I have it taped to the lower edge of the tank. Once I seal the access panel I can then pressurize the tank to the recommended 1 psi, and check for leaks. If it holds pressure then I will be very happy!

I am going to take the second tank off before I do any more work on this one. I feel better doing both in parallel instead of sequentially. [3]



Looking into the tank through the access panel. The fuel level sensor will be located in this bay of the tank.

1. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5057.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5057.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5053.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5053.jpg)
3. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5056.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5056.jpg)

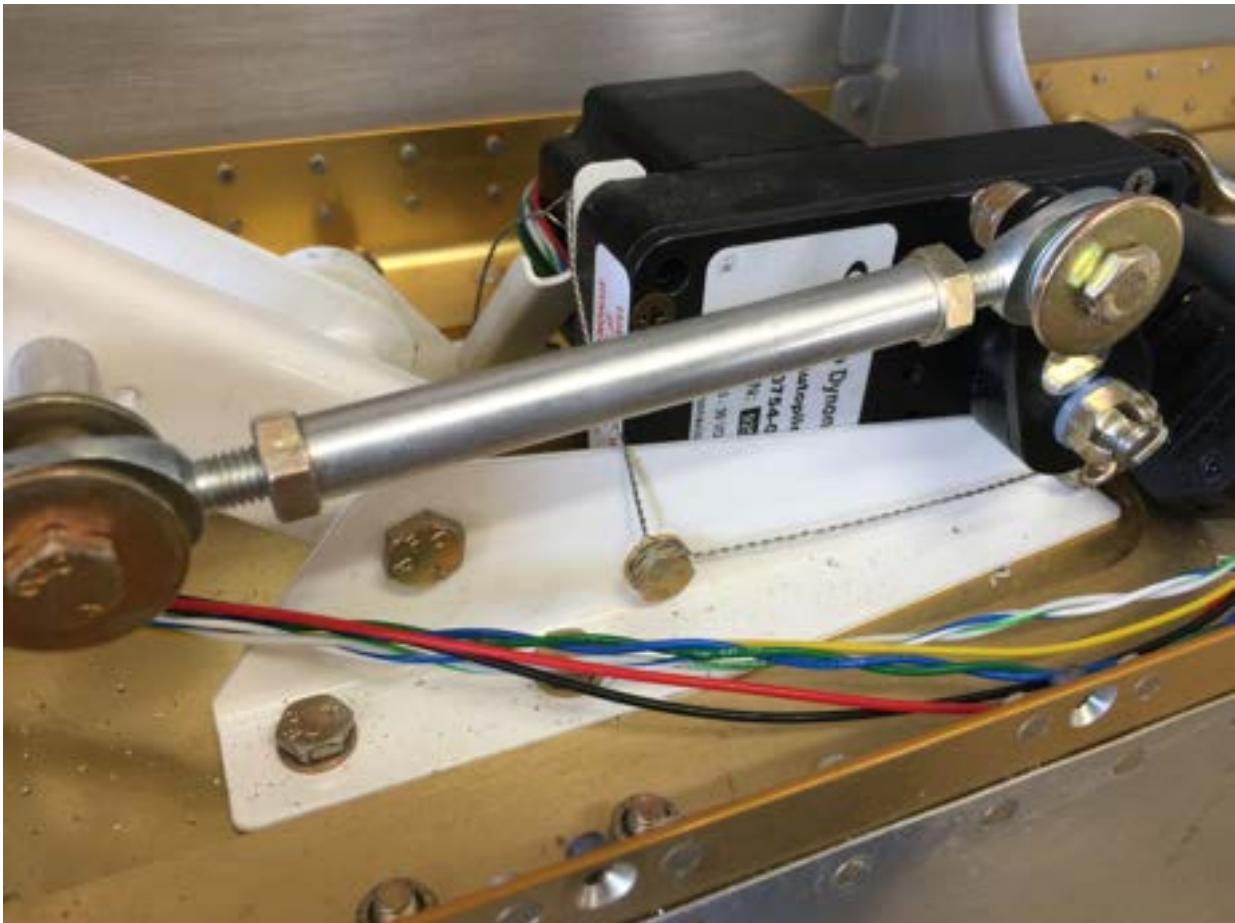
## 2.9.2 Thanksgiving work (2016-11-24 13:09)

Happy thanksgiving to my US friends! Today being a day off for us, I spent a few hours this morning in the garage.

I started by prepping and riveting the flap hinge on the remaining wing, the flaps are officially on! (Temporarily)[1]



I then spent some time safety wiring my autopilot servo, it was a bit tricky and I had to redo it a few times. But I eventually got it! [2]



It's not perfect, but it works. The wire will prevent any of the three bolts from backing out. [3]



The end of it (top left in the image) will be out through a small hole im going to drill through the bracket. This will secure the final bolt.

I then spent some time removing the remaining fuel tank in preparation for sealing the access panel. I really hope I don't have to continuously remove and install it. It's very tedious work. [4]



You can see on the left tank (right side) I have the pressure testing manometer hooked up. Once I seal the access panel to the tank, I will pressurize the tank up to 1psi or so and monitor the pressure to see if it's leaking. This can be the most nerve racking part because if there's a leak, it could be tough to find. Fingers crossed!

Until next time, Happy Thanksgiving!

1. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5079.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5079.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5077.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5077.jpg)
3. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5078.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5078.jpg)
4. [https://n890gf.com/wp-content/uploads/2016/11/img\\_5081.jpg](https://n890gf.com/wp-content/uploads/2016/11/img_5081.jpg)

### 2.9.3 Fuel tank access plates (2016-11-26 15:55)

Today I spent about an hour prepping and sealing the fuel tank access plates. This was very messy and I didn't get any pictures during the process. The fuel tank pick up lines and bulk-head fittings were glued and torqued. Also the anti rotation brackets were riveted and then sealed with tank sealant. Once those cure in a couple days I'll be able to fully seal up the tanks.

I also spent some time on the remaining wing, I prepped the flap hinge loops by removing 3 loops from near the center of the flap. This will allow for easy installation of the flaps during final assembly.

## **2.10 December**

### **2.10.1 Tanks are Leak Free! (2016-12-04 19:24)**

I finished sealing the tanks about a week ago, and the last two days I spent leak testing them. I made a water manometer and pressurized the tank to about 20" of water. Over the course of 4 hours the tank pressure fluctuated a little, as the temperature rose in the garage the pressure went up slightly. I didn't bother doing the math to calculate the pressure rise, but it's safe to say if there was a leak it wouldn't go up. Just to be safe I also sprayed the whole tank with soapy water to see if bubbles formed. This actually cooled the tank down a bit as the cold water was sprayed on, and the pressure dropped down. [1]



This is the setup I did for both tanks. And both are rock solid. A big milestone under my belt and I'm glad it's over! I performed a similar test for the other tank and let it sit

overnight. Again no drop in pressure and no bubbles formed at any point on the tank.

I then spent some time installing the tanks onto the wings, once they are installed there's only a couple more things to do to mark the wings done.

1. Install right aileron and brackets.

2. Install wiring conduit in right wing

3. Deburr and install bottom skins

4. Wing tips

3 and 4 will be pushed off until the very end of the build. There's no rush in installing the bottom skins as it's better to have access than to not. 1 and 2 should be a few hours work and then I'm done! Wings will be put into storage and then fuselage time.

1. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5128.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5128.jpg)

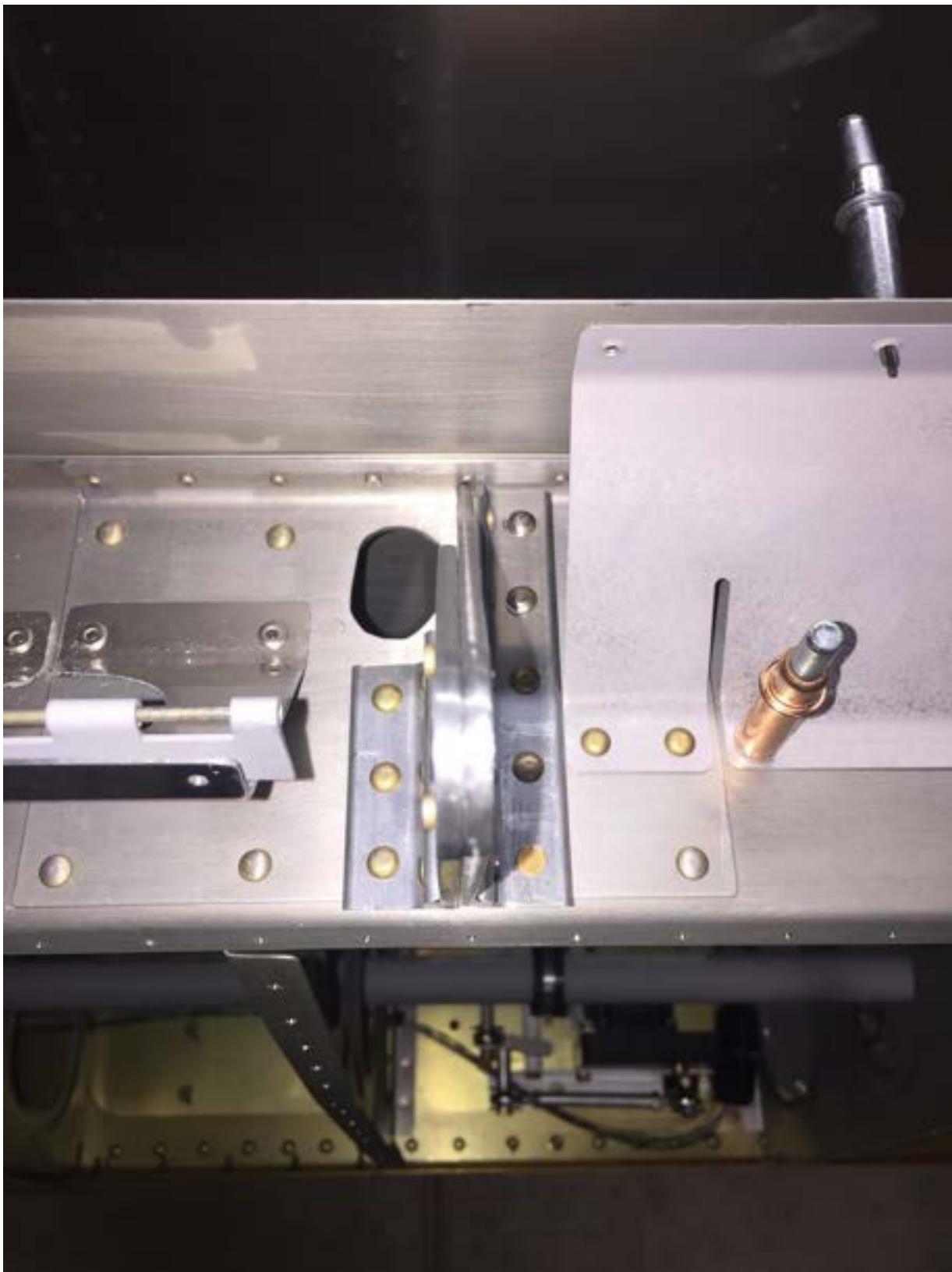
## **2.10.2 Right Aileron Brackets and Gap Faring (2016-12-17 20:02)**

Tonight I spent a couple hours working on the right wing. I started by removing the gap fairing and brackets that were clecoed on the wing. I surface prepped and primed the gap fairing, and match drilled and dimpled the holes as necessary. I also took this opportunity to install the aileron brackets with the service bulletin Vans posted a few months back. I already did this to the left wing. [1]



[2]

199



Here you can see the back and front of the aileron bracket, with the reinforcement plates on the front of the rear spar (img 1). Rivets had to be shot and bucked because my rivet squeezer doesn't reach some of the rivets.

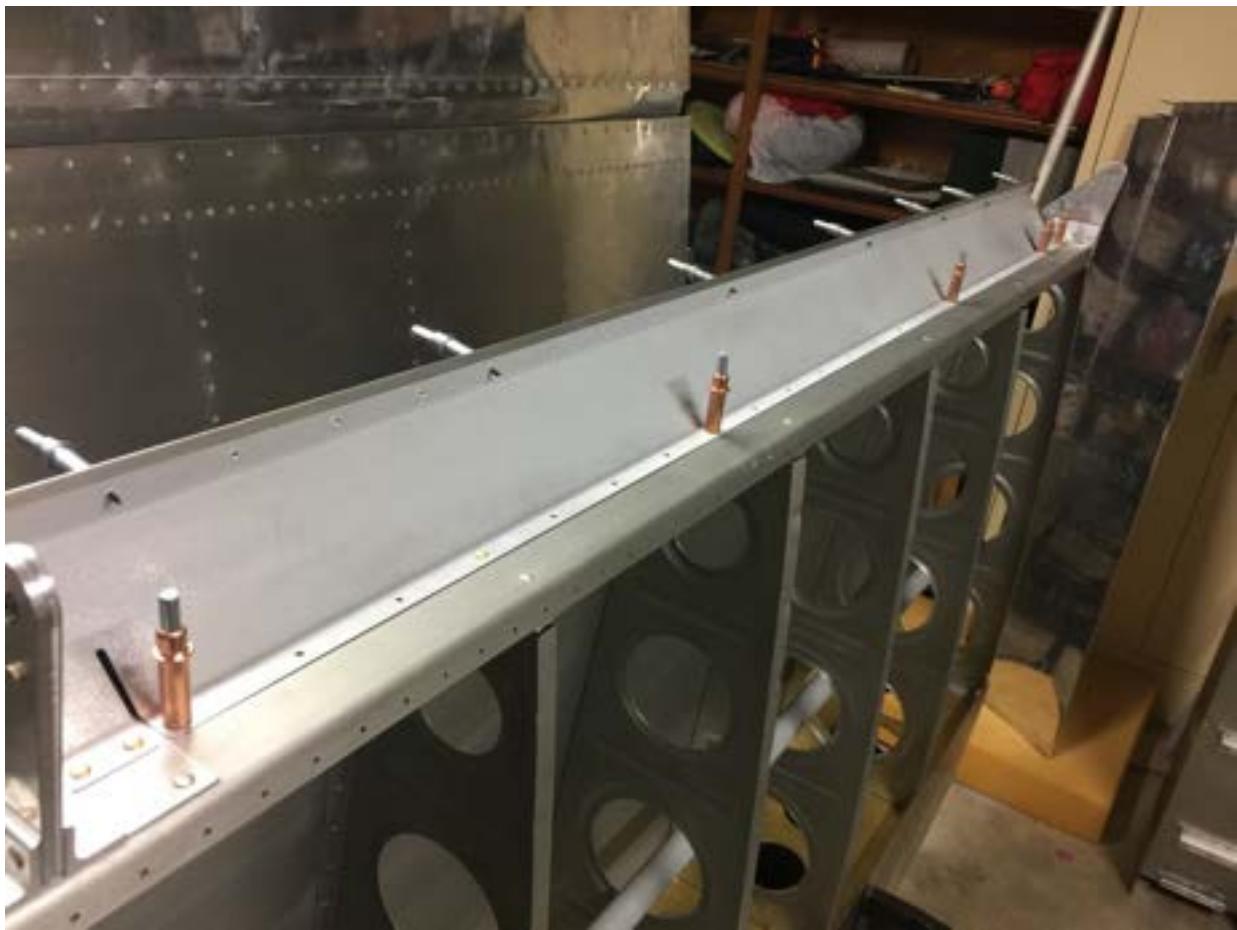
[3]



[4]



I also installed the outside bracket which was relatively straightforward. Again here's the outside and inside of the rivets holding the bracket on.  
Finally I riveted the gap fairing in place.



Here you can see it clecoed in position. I then installed rivets and was able to reach all of them with the squeezer.



Here's all the button head rivets holding the fairing to the rear spar.



Here's the inside of the spar. Again rivets were checked and squeezed for consistency when setting them, which is the best thing about the squeezer.



Also thought I'd share a general update and include a short walkthrough of the shop.

[wpvideo 9hi6M0Uk]

1. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5139-1.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5139-1.jpg)
2. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5141-1.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5141-1.jpg)
3. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5145-1.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5145-1.jpg)
4. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5144-1.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5144-1.jpg)
5. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5140-2.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5140-2.jpg)
6. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5149-3.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5149-3.jpg)
7. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5148-3.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5148-3.jpg)
8. [https://n890gf.com/wp-content/uploads/2016/12/img\\_5146.jpg](https://n890gf.com/wp-content/uploads/2016/12/img_5146.jpg)

# 3. 2017

## 3.1 February

### 3.1.1 Back at it (almost) (2017-02-05 20:52)

Yesterday I had the rare day where I could get away and get into the garage. After spending about 5 minutes looking at everything I realized I needed to spend the day cleaning the shop before attempting to do any work on the fuselage.

Over the last 6 months or so, more and more junk started piling up, and it became more difficult even walk around. Now that the wings are done I decided to move everything out and do a full clean sweep.

[1]



With the plane in the driveway I got out the vacuum and broom and swept and cleaned all the leaves and junk out of the garage. [2]



Also organized the benches and put everything away, I have a bad habit of leaving my tools and everything out on the tables, so I decided to clean those off as well.



The end result, plane back in the shop with plenty of room to begin work. Plan is to store the wings in the other garage to have nearly the whole garage to work on the fuse. Just need to build a fuse stand and then I'm good to go.

I'll be doing more updates moving forward, I'm going to be working a lot more often on the project.

1. [https://n890gf.com/wp-content/uploads/2017/02/img\\_2147.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_2147.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/02/img\\_2148.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_2148.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/02/img\\_2155.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_2155.jpg)

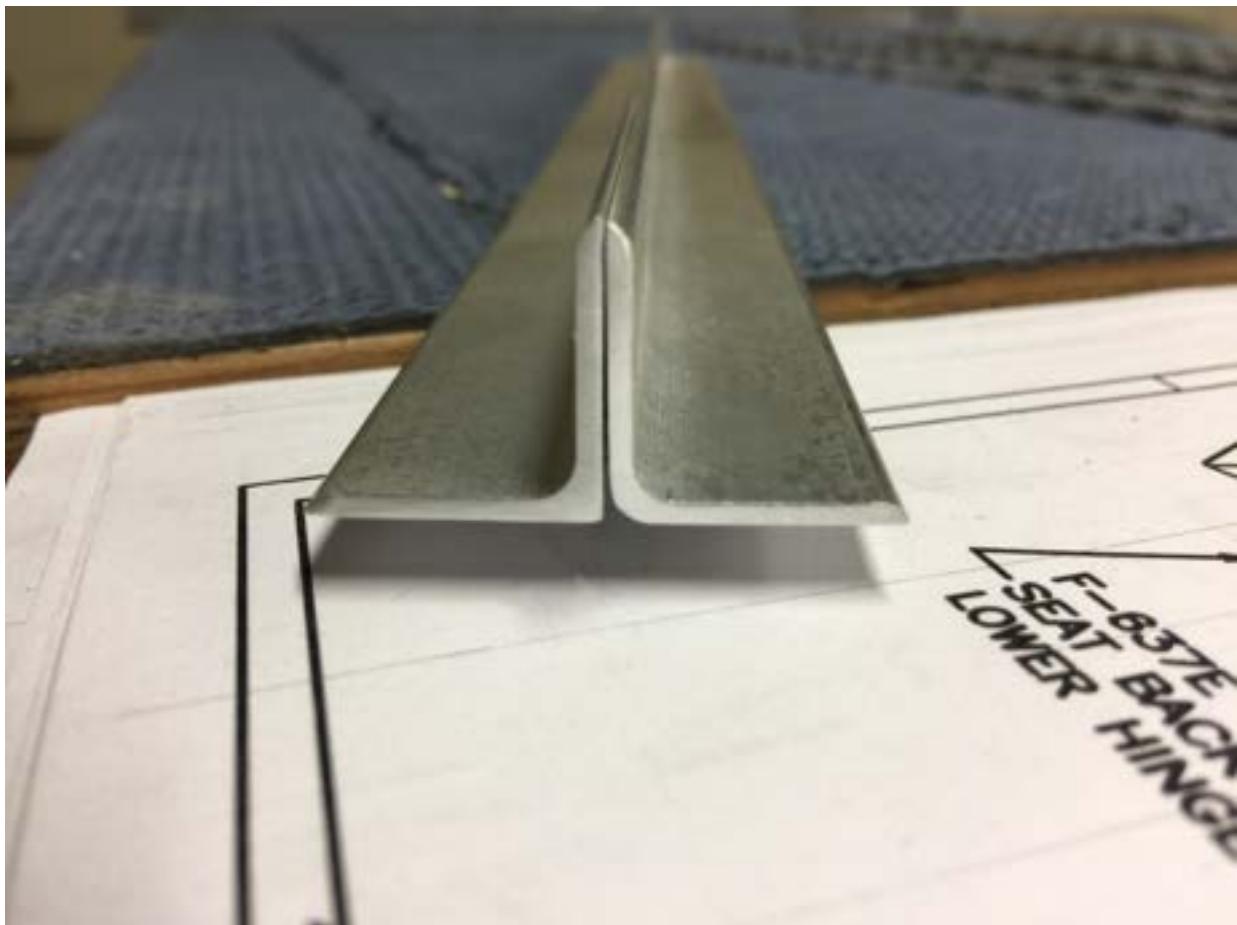
### **3.1.2 Seats (2017-02-14 00:55)**

Today I started on the fuselage by getting some work done on the seats.

I started by cutting the angle stock to size and then shaping and prepping all the hinges for drilling. [1]



The side angles are made from .125" thick and the cross supports are made from .060. Per the drawings I radiused the top angle to be able to fit inside the seat. [2]



Here you can see the difference between the radiused and stock angle.

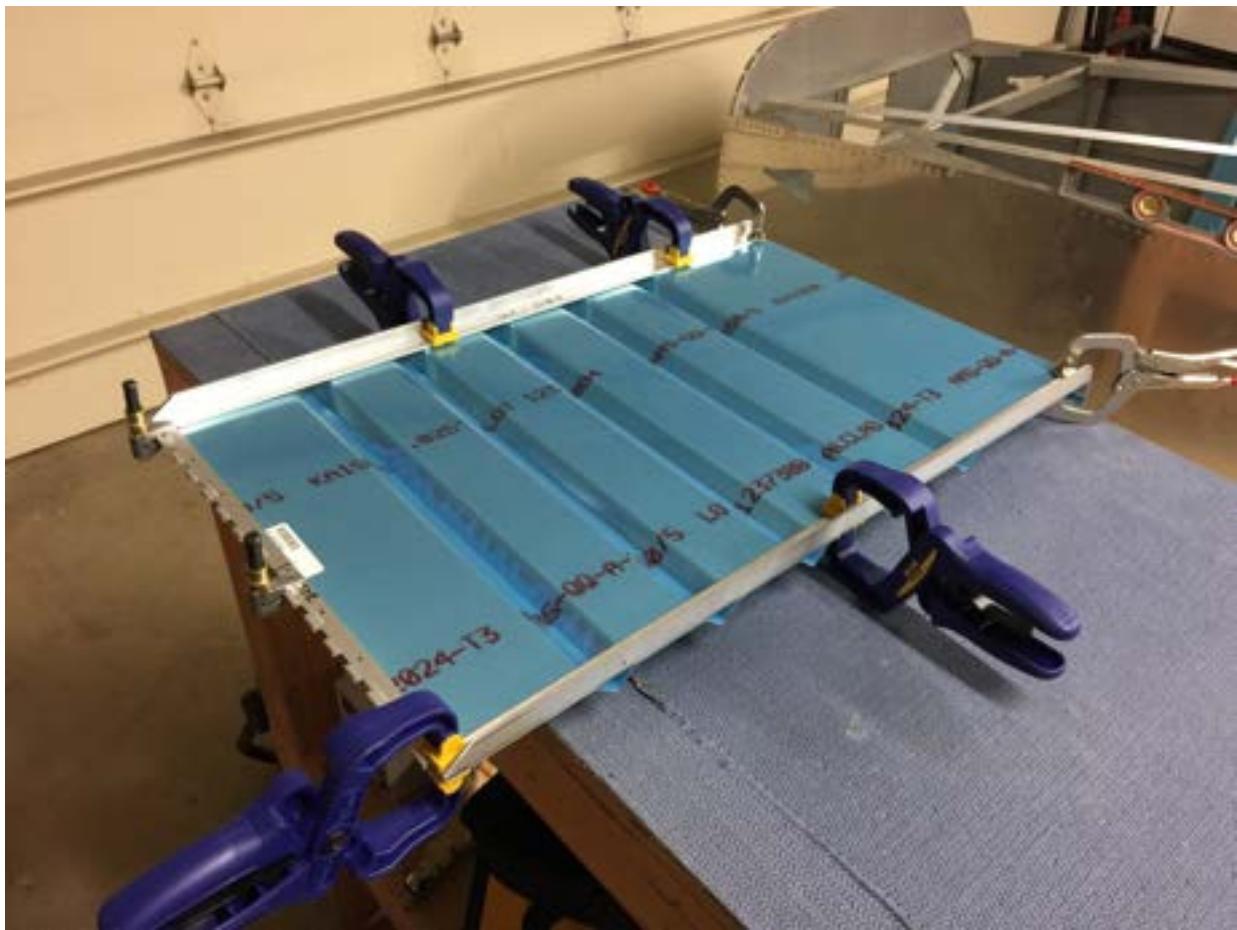
[3]



Here you can see how it fits in the seat. This allows it to sit flush against the skin for riveting.

[4]

212



Here I have everything clamped in place after shaping and aligning everything.

[5]

213



I didn't get any pictures during the drilling process, but here's the seat in the plane after everything was drilled to #40. This will all get drilled to #30 for the -4 rivets.

Next is to make the remaining seat! I was tempted to sit in it, but I don't have the fuselage supported enough yet. I'm in the process of building a fuselage stand.



1. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0066.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0066.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0069.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0069.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0068.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0068.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0070.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0070.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0071.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0071.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0064.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0064.jpg)

### 3.1.3 More fuselage work (2017-02-20 23:28)

Today I spent some time working with the quick build fuselage. Because a lot of the work was done in the factory, there are parts in place that are held by temporary rivets. I went through and removed all of them and began disassembling the panels from the interior.

Next I began with the control column and control stick installations. I'm kind of jumping the gun on this because it will just have to come back out, but there's something about giving the plane the control sticks that was kinda cool.

I also drilled all the seat rivets to #30 for the -4 rivets.

I need to build a fuselage rack because right now it's sitting on a furniture dolly and is too low. Before I work on the fuse any more I'll build the frame to hold the fuse. [1]



1. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0064-1.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0064-1.jpg)

### **3.1.4 Floors (2017-02-23 08:47)**

Didn't get much time in the shop yesterday, but I did spend about an hour removing all the temporary rivets holding the interior panels in place. I drilled out about 50 pop rivets, and removed the seat floors and baggage area floors, along with the two side panels where the flap weldment will be mounted. Also removed the baggage bulkhead panels. Not much progress, but every step counts.



1. [https://n890gf.com/wp-content/uploads/2017/02/img\\_0095.jpg](https://n890gf.com/wp-content/uploads/2017/02/img_0095.jpg)

## 3.2 March

### 3.2.1 Rudder Pedals (2017-03-26 00:52)

Today I got out the parts for the rudder pedal assembly. I'm only going with pilot side brakes so I only had to deal with one set of parts.

I started by getting out the brake pedal plates and assorted parts. I just got a bench top bandsaw which made life SO MUCH BETTER! I immediately cut the angle stock to size.

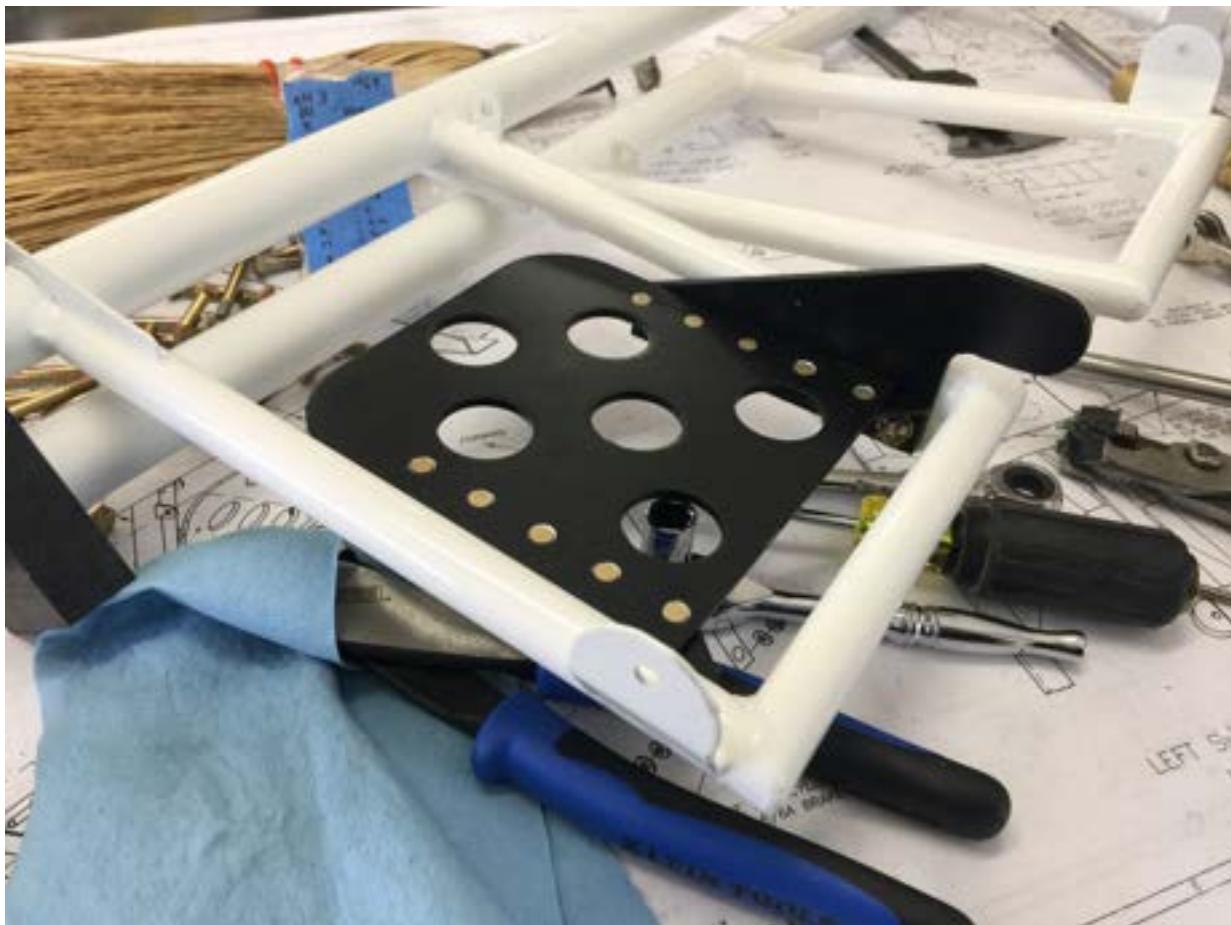
I then drilled the angle stock to the plates based on the prepunched holes, deburred and primed all the parts. I also decided on painting the pedals a satin black. I think the gold rivets and black make for a nice contrast. [1]





Here are the finished parts. I'm *mostly* happy with them, but I'm going to go with it.

Once the pedals were finished I began assembly to the rudder weldment. [3]



Here's the pedal installed before I attached the master cylinders. These are held on by two AN3 bolts and castle nuts with cotter pins. [4]



I couldn't resist test fitting them in the fuse. Tomorrow I will continue installation and will most likely make several mounting points for adjustable pedal location. I also routed the rudder cables through the fuse but didn't get a picture of it.

1. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0261.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0261.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0260.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0260.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0262.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0262.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0264.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0264.jpg)

### **3.2.2 Fuse rotisserie and seatback (2017-03-27 23:38)**

This update is for yesterday and today.

I began by finally getting the fuse up on the rotisserie. It was quite the effort but totally worth it. [1]



It's about 2ft higher off the ground and much easier to work on. Rotating it to the orientation I need will be extremely valuable.

I followed this by drilling and fitting the flap weldment and bearing blocks. [2]



[3]

223

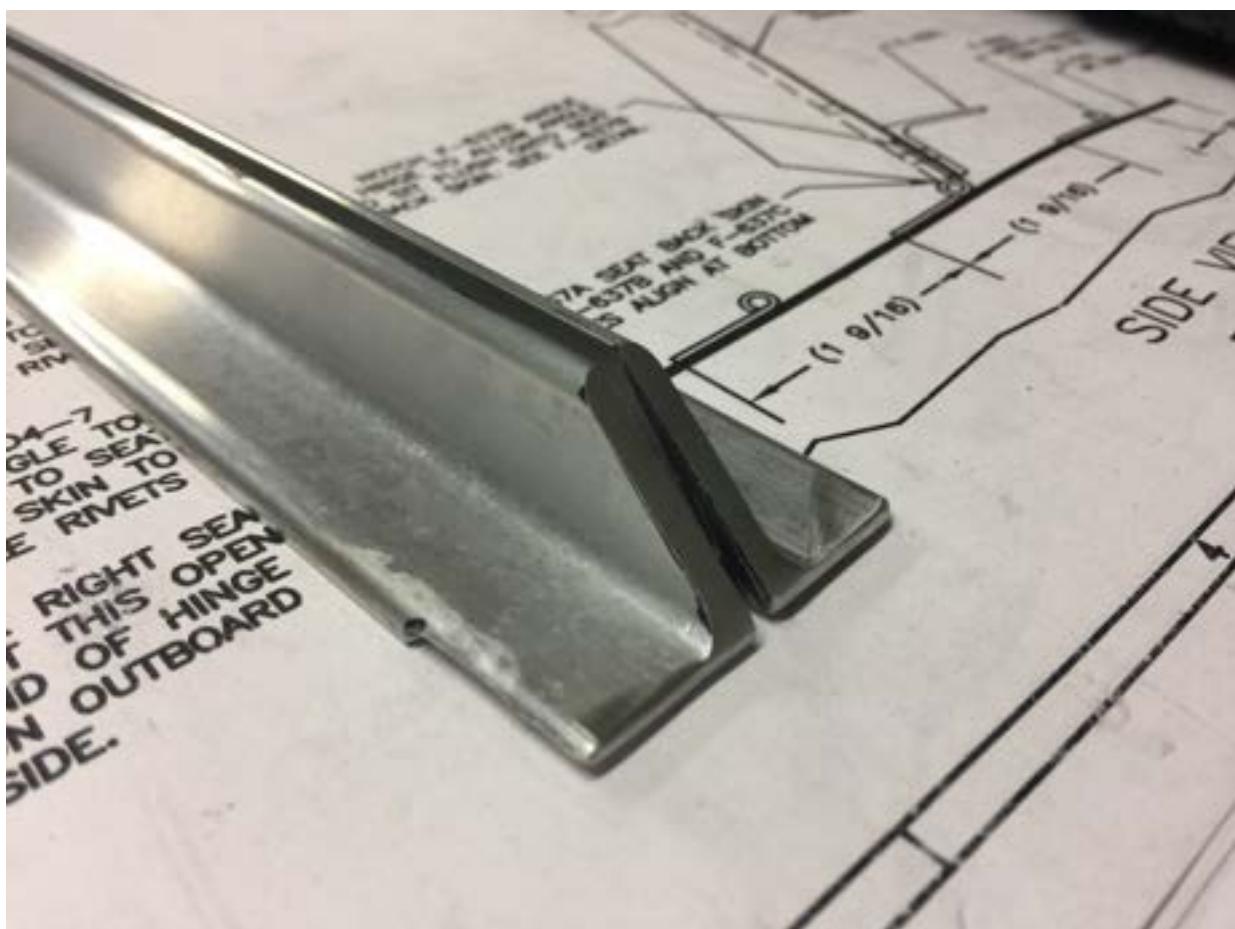


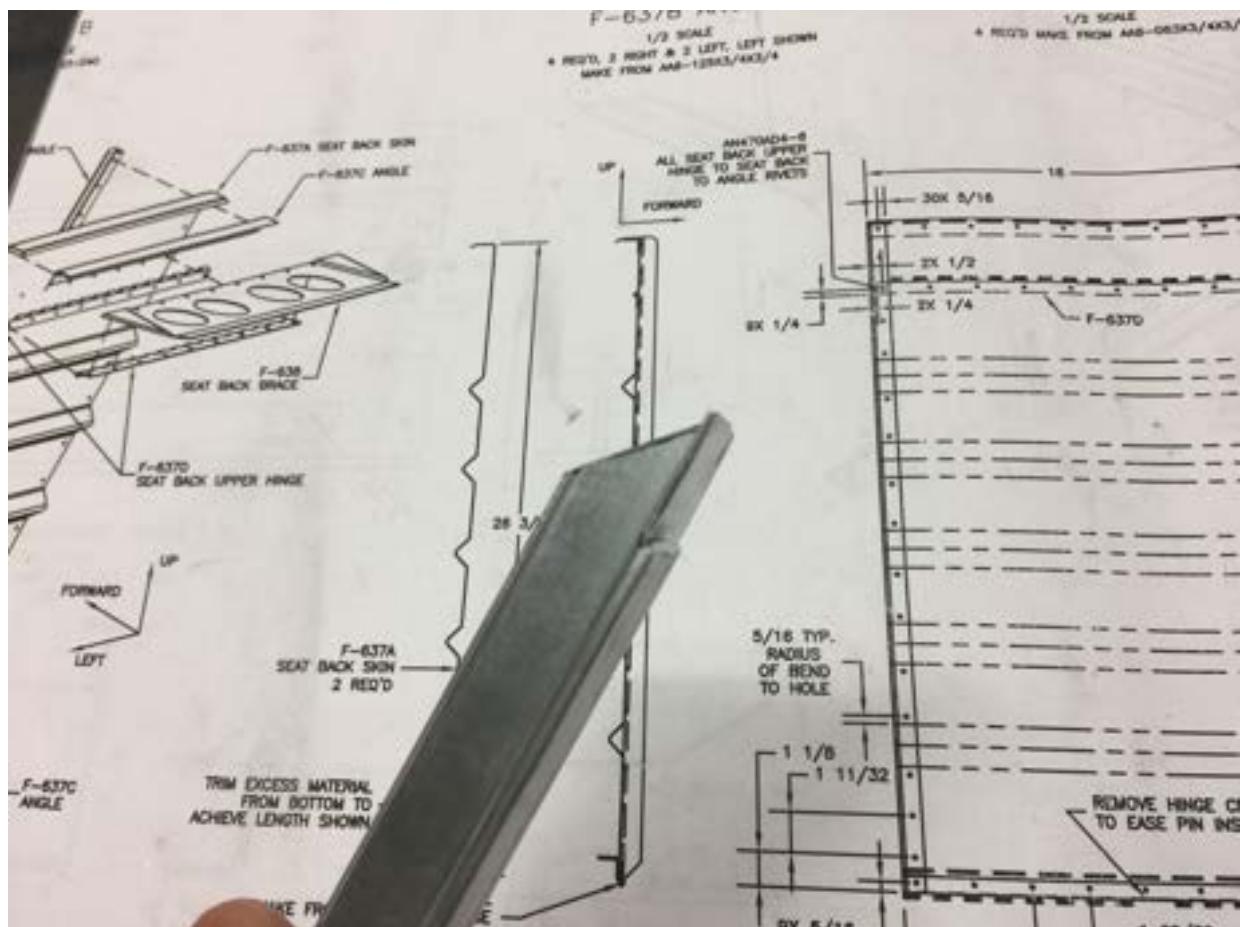
The bearing blocks were tougher to drill than I had expected but it all fits and motion is smooth.

I then installed the two static ports on either side of the fuse, they are just two pop rivets drilled out. They will be glued in place and plumbed along with the pitot tube plumbing. [4]



Today I decided to finish up the second seatback. I began by utilizing my new bandsaw to cut he angle stock to size. It had already paid for itself in time savings and no headaches.  
[5]





Cutting the notches took me more than an hour last time (using the wrong tool sucks) as well as making nice even angles. I then used my scotchbrite wheel to buff and smooth everything out. [7]



For the FAA as proof I'm the one building! :) and after about 3 hours I have my pilots seat! [8]



After this photo was taken I drilled all the holes to #30 and then disassembled everything in prep for priming and riveting. But that's for tomorrow!

1. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0268.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0268.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0269.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0269.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0270.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0270.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0272.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0272.jpg)
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7. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0276.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0276.jpg)
8. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0280.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0280.jpg)

### 3.2.3 Tail wheel spring (2017-03-29 23:48)

Tonight I spent a couple hours fitting the tail wheel spring mount in the fuse. It is not fun. [1]



The template fits nicely, I then transferred the cutout to the metal and began by drilling the curved part using a unibit. I then proceeded to cut the straighter part using some snips

and got it to roughly the right shape. A lot of filing and dremelling got it down to the final shape. [2]



Still not perfect, but I will finalize it as I fit the mount. Tomorrow I'll continue fitting the mount and measuring and then hopefully drill the mounting bolt holes. My goal is to have the tailcone fully riveted by the end of the weekend. Cheers!

1. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0281.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0281.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/03/img\\_0282.jpg](https://n890gf.com/wp-content/uploads/2017/03/img_0282.jpg)

### **3.3 April**

#### **3.3.1 Tail wheel mount (2017-04-02 22:36)**

Another day working on the weldment and the fit of the tail wheel mount. Being a quick build fuselage, all of this work has to be done somewhat out of order. [1]



Here's the weldment aligned and drilled to match the bulkhead. These were measured and originally drilled to #30 so that I could hold it in place with clecos. [2]



Here's the mount sandwiched between the two bulkheads. This is looking in from the top of the tail cone. It's a bit hard to see but there's a very small gap between the weldment and the aft most bulkhead. I'll fabricate a wedge out of some scrap aluminum and it will fill the gap. [3]



[4]

235



I then fabricated the rudder stops. They are made from .125" thick aluminum angle stock. I then match drilled and clecoed them on to verify alignment. They might need some slight adjustment once I fit the vertical stab and rudder. [5]



After measuring and aligning multiple times, I enlarged the initial holes to final size for the AN4 bolt. The steel is substantially more difficult to drill through than the aluminum. I also

drilled a hole in the bottom of the fuse skin to allow access for a socket wrench to reach the bolt that will bolt the tail wheel spring in the mount (that's the hole in the weldment). Next up is to remove the weldment, surface prep and the prime it and install it permanently.

1. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0299.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0299.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0302.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0302.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0301.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0301.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0300.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0300.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0303.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0303.jpg)

### **3.3.2 Tailcone & Rollbar (2017-04-09 22:24)**

This weekend I got in a few hours of work and finished off the tailcone. It was quite a lot of work aligning and measuring the tail wheel mount. It needs to be aligned perfectly so that when I drill vertical stab to the assembly, I meet all the edge distance requirements. [1]



Here's the weldment after it was primed and installed. The alignment is perfect, measuring 5 times and drilling once really does pay off. [2]





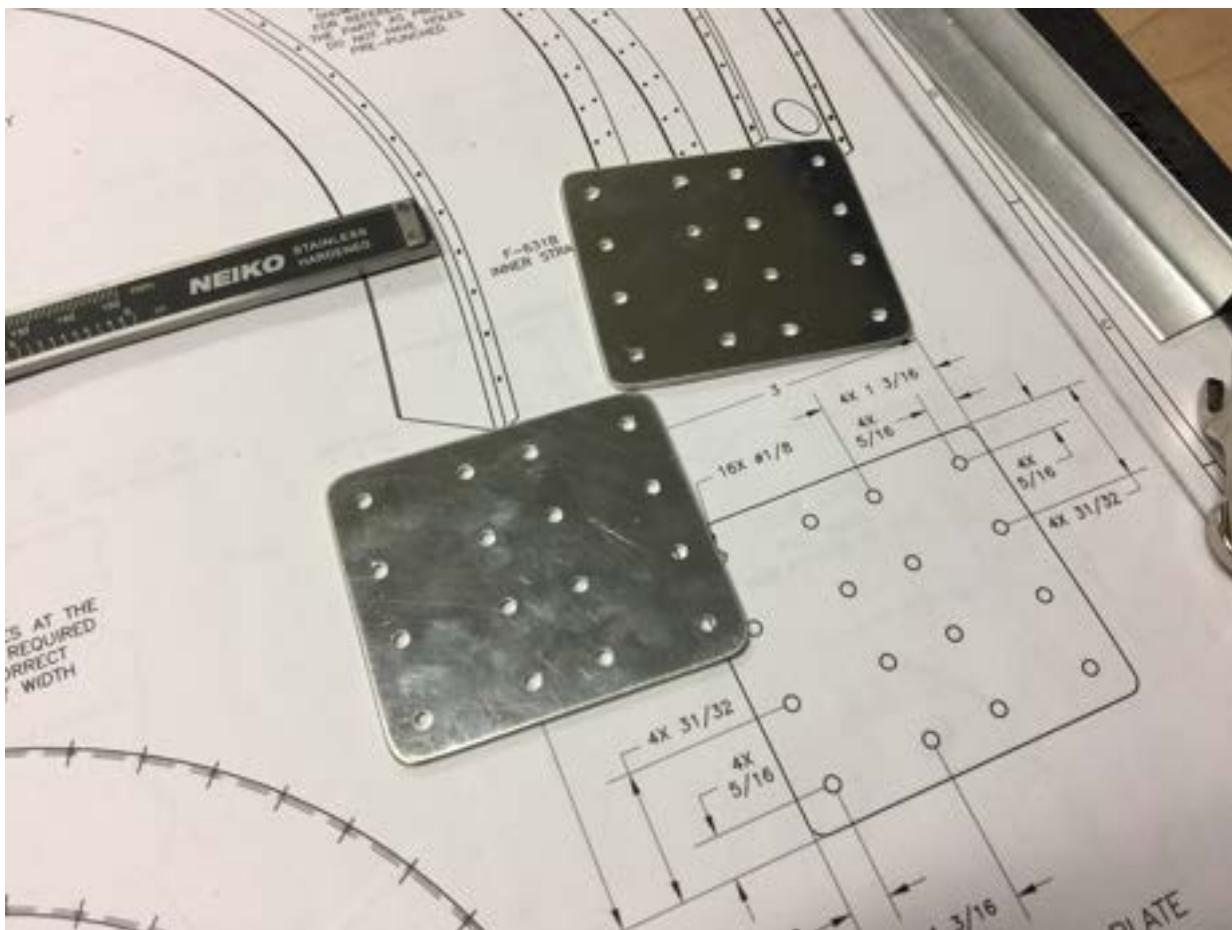
Here is the aft bulkhead riveted on with the rudder stops. I actually had a lot of fun fabricating those parts.

I then decided my next project will be the rollbar. [4]

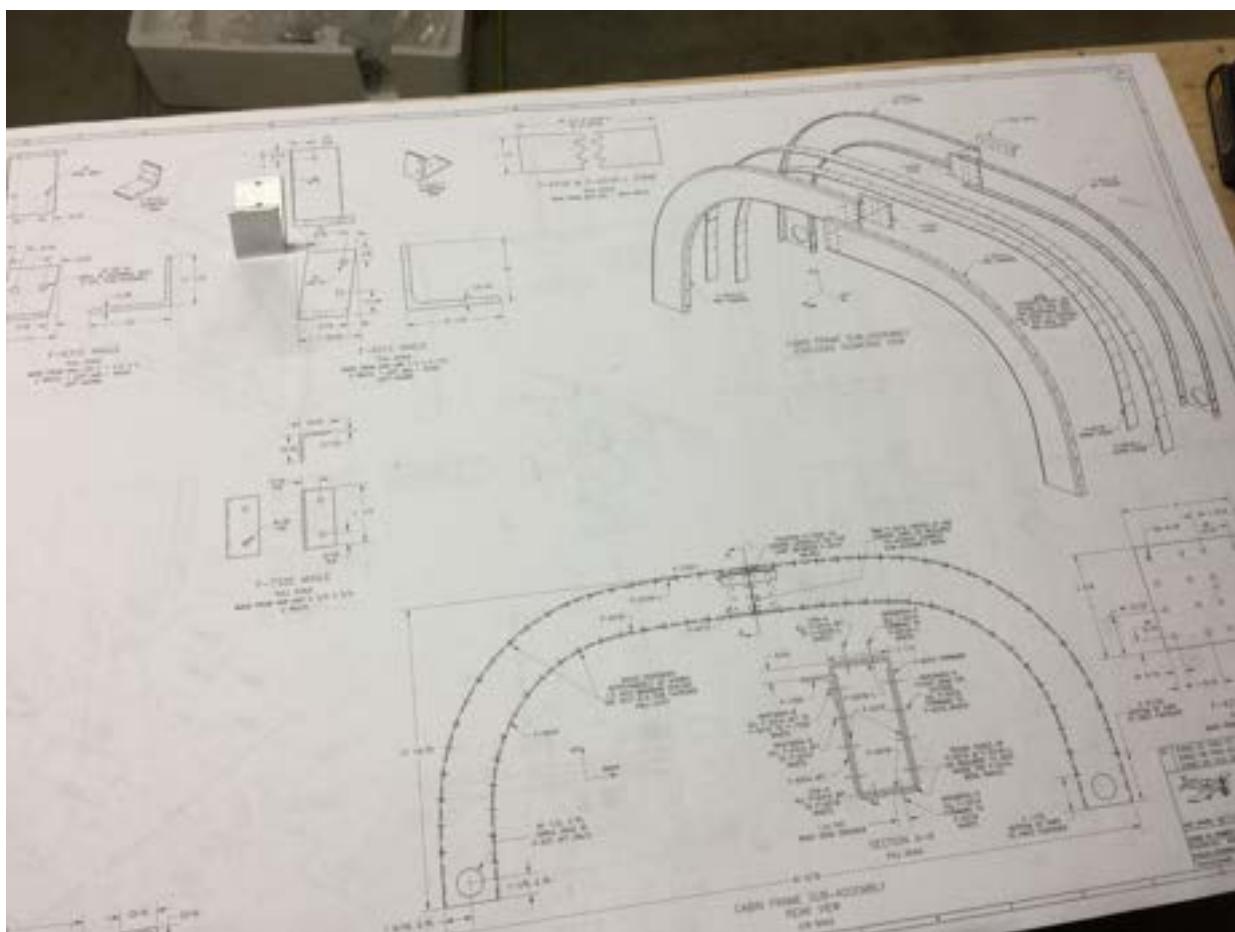


I spent a solid hour cleaning up the shop and putting tools away and vacuuming all the aluminum scrap. I tend to be a bit lazy when it comes to putting my tools away, so I have to do big cleanups every once in a while.

I started by getting the aluminum channels out and clamped them to the table. It will take some adjusting to get the alignment right, but so far measurements have come out perfect. [5]



I then fabricated the two plates that will join the channels together. Along with all the L brackets that needed to be made. I can't say it enough...but my bandsaw is the greatest tool I've purchased! [6]



Here's the full sized drawing to give a perspective of what I'm working on. And a completed L bracket in the top left corner. [7]



Drilled the holes to #30 per the drawing, but they will be opened up to 1/4" for the bolts when it's mounted to the fuselage.

Hopefully I get some time this week to work a bit more, but I'll play it by ear.

1. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0341.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0341.jpg)
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3. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0342.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0342.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0344.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0344.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0346.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0346.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0348.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0348.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0347.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0347.jpg)

### 3.3.3 Roll bar (2017-04-15 00:39)

Tonight I spent about 3 hours working on the rollbar. It's a very tedious job and requires a lot of precision. [1]



I began by placing the plate I made last week onto the two rear channels. After measuring and checking the width of the rollbar I drilled the plate to the channels and clecoed it in place. I then placed the lower strip into the channel. I measured the rivet holes and used my center punch to mark the points. The holes are 1.5" apart and 1/4" away from the edge of the channel. [2]



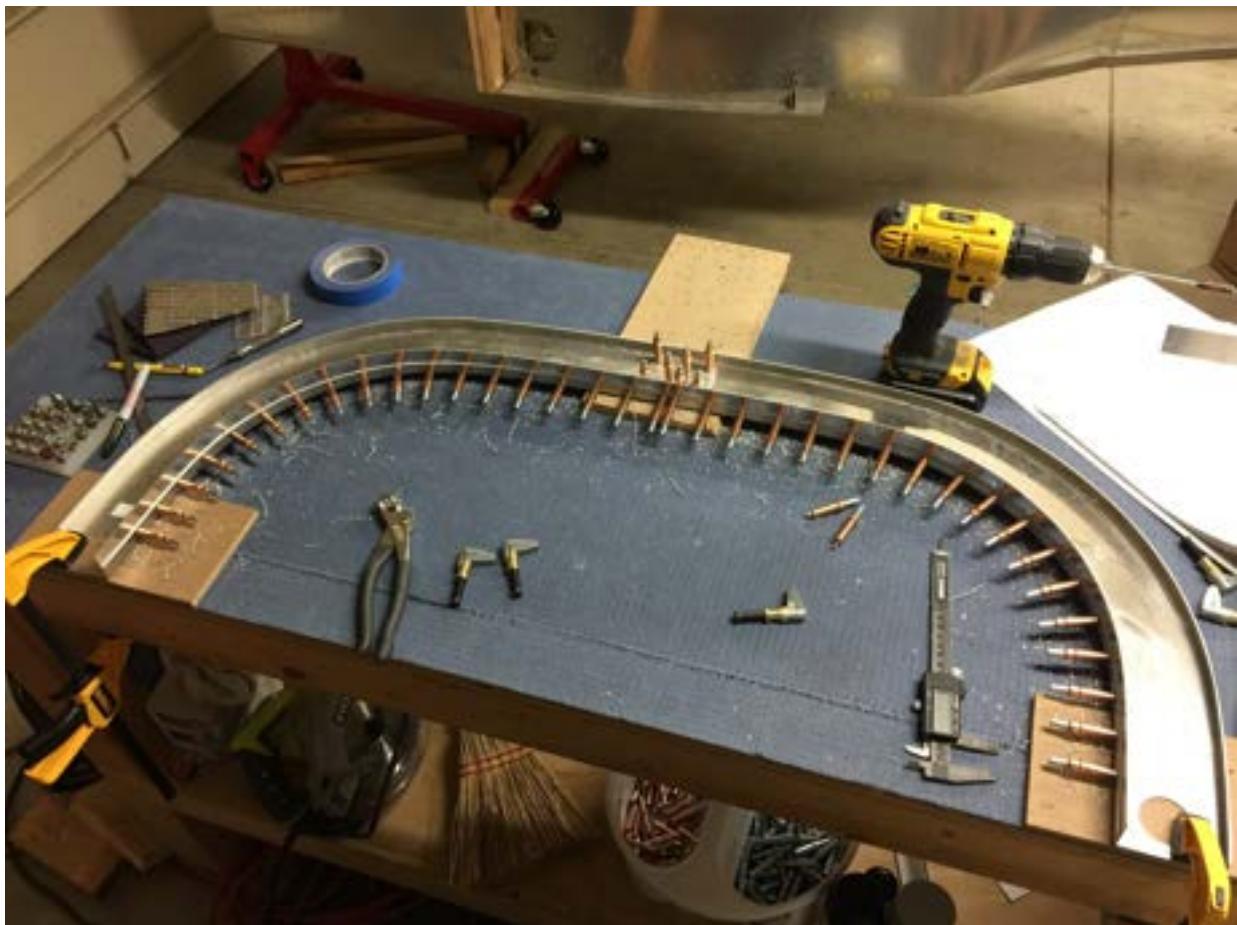
This is the first half of the lower strip drilled and clecoed. It doesn't look like much, but this alone took me about 45 minutes. [3]



Where's the inside of the strip.

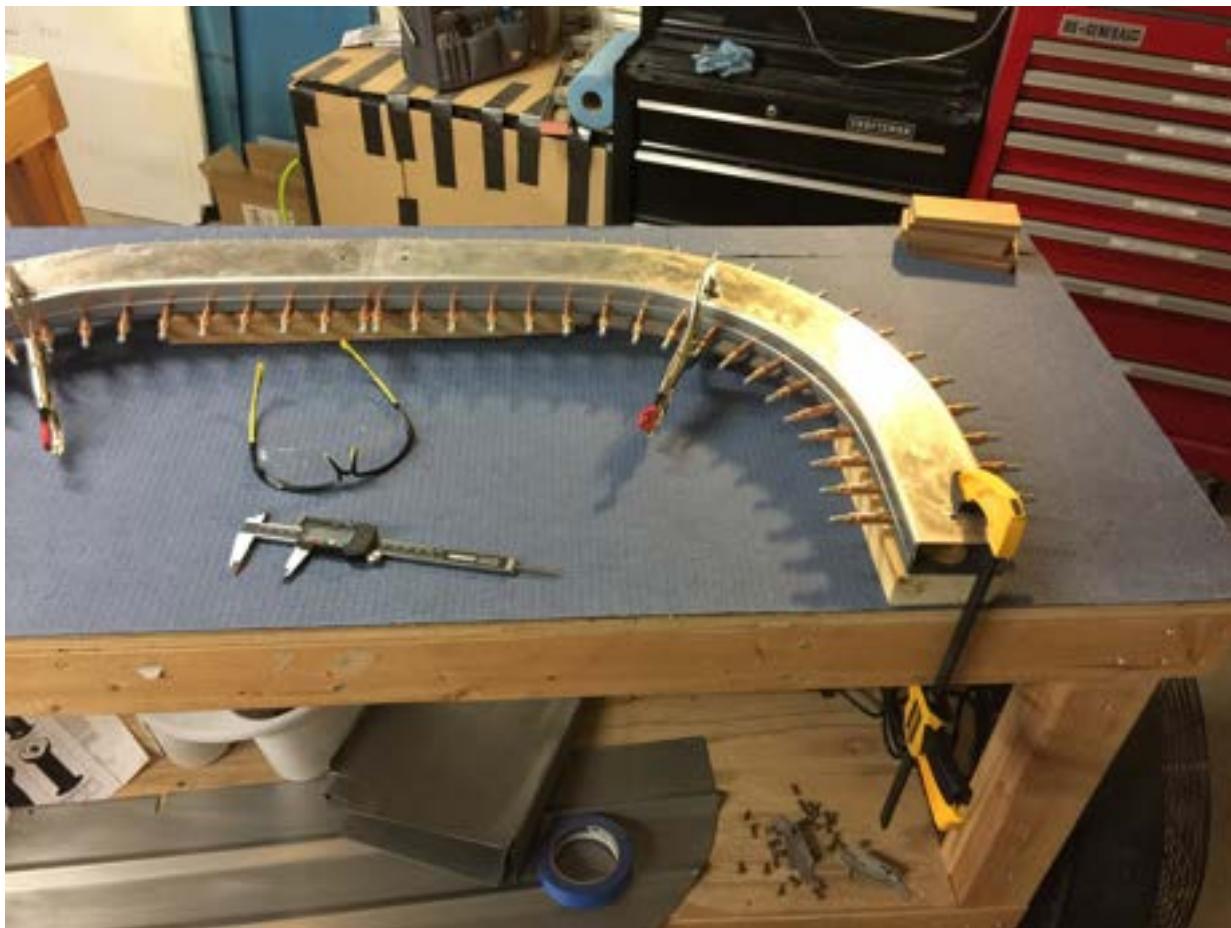
[4]

248



I managed to finish both sides of the strip and everything measured up perfectly! I then proceeded to do the top strip. It's the same process. I then took out the other half of the rollbar and placed that on the strips and clamped them in place. I'm using blocks of wood to keep it off the table, but I'm not happy with the potential for it to twist. I'm going to figure out a better way to do it. [5]





Tomorrow I'm hoping to finish up the rollbar!

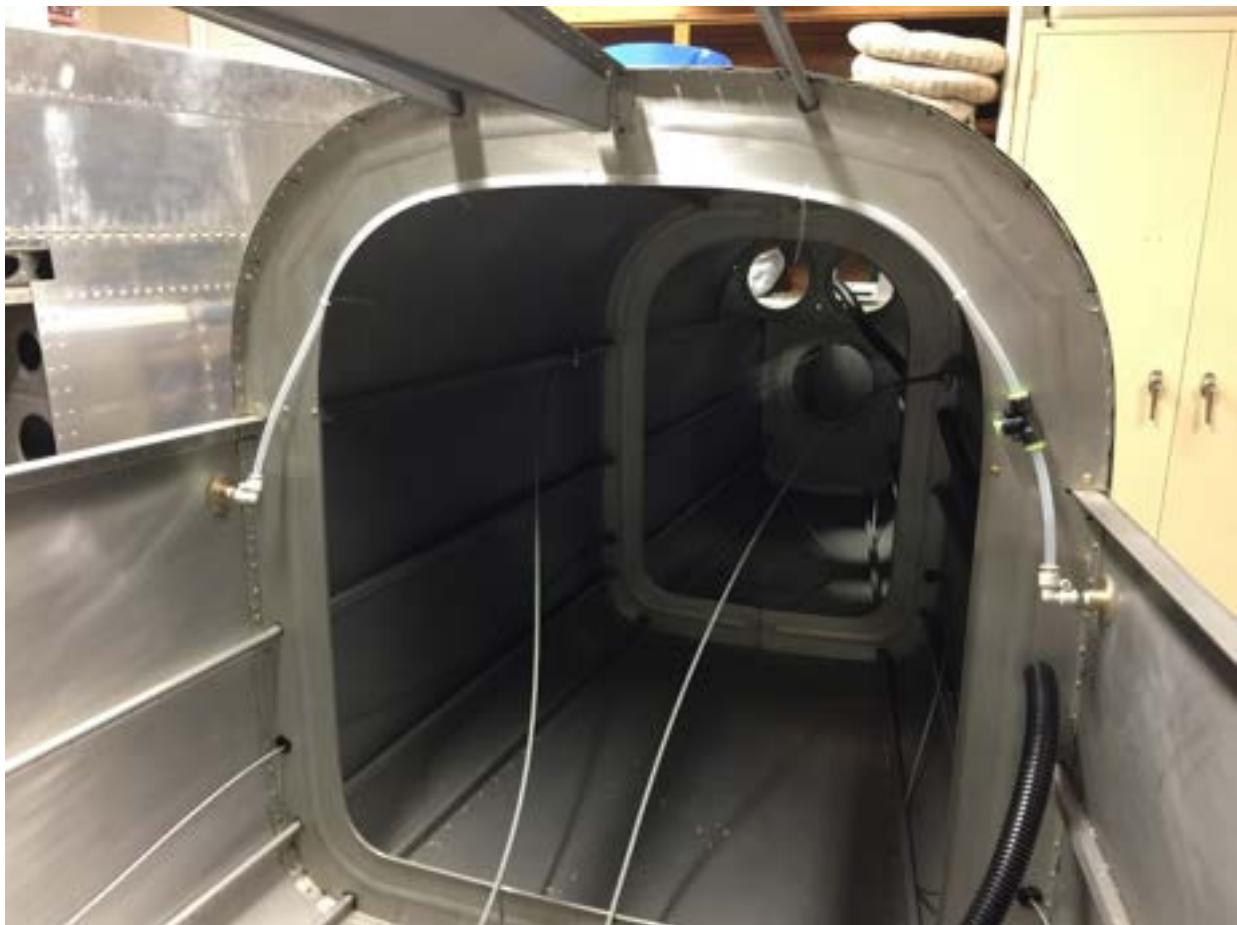
1. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0382.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0382.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0384.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0384.jpg)
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4. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0387.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0387.jpg)
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6. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0389.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0389.jpg)

### 3.3.4 Static ports and wiring conduit (2017-04-20 23:39)

Tonight I spend a couple hours in the shop. I began by installing the static ports to the side of the fuselage. [1]



This is the exterior. It sits about 1/32th of an inch higher than the skin. There's another one on the other side of the fuse. [2]



Here you can see the two static ports connected together and a T fitting to combine the two to be able to attach the static line to the avionics.

I then installed the two seatbelt anchor cables. They are held on by an AN4-7A bolt. I had great difficulty torquing these because of the lack of reach.

I finished off the night by installing wiring conduit under the baggage floor, and down the side of the fuse to the tailcone. [3]



Here's the conduit. The baggage floor will be riveted on top and access will be non-existent.

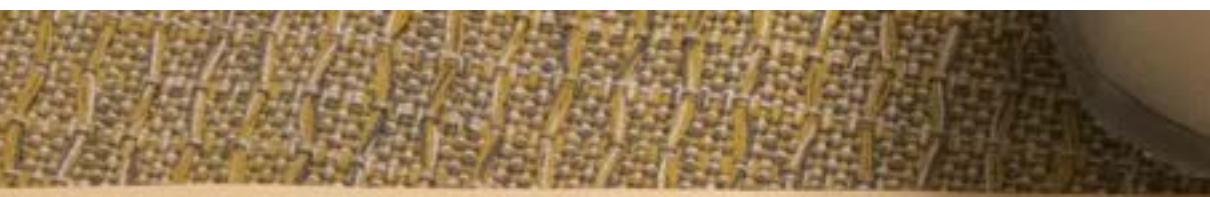


Here's the conduit going to the tail. This I incredibly loud snaking this through the 3/4" holes. This will house the wires for the trim servo as well as for the tail strobe and position light. The conduit will also get anchored with some zip ties.

1. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0405.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0405.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0407.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0407.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0408.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0408.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0409.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0409.jpg)

### **3.3.5 Received Finish Kit confirmation (2017-04-27 22:31)**

Today I came home to a lovely piece of mail. I received my confirmation and approximate shipping date! If I assume the earliest shipping, that gives me just about 6 weeks before I get it. There's plenty to do, but it should be plenty of time to finish everything that needs to be done. [1]



## VAN'S AIRCRAFT, INC.

14401 N.E. KEE RD. • AURORA, OREGON 97002 • (503) 678-6545



Dear Customer,

Your kit is scheduled to be crated the week/month of 10/12/17. Our goal is to ship the kit during this week/month. We will not crate your kit until you return a signed verified copy of your order. You can email this to [kits@vansaircraft.com](mailto:kits@vansaircraft.com) or fax or mail. PLEASE KEEP A COPY OF YOUR ORDER FOR YOUR OWN INFORMATION.

### SHIPPING DATE

Please allow at least 5-7 working days from the end of the scheduled crating week for the kit to be delivered by truck or 4-6 weeks by sea freight. Be prepared for early shipping. If you can't accept a kit until a certain date due to a vacation, business trip, or other, please advise us so we can delay shipping. Customers who are picking up their kits at Van's will be called to arrange the day and time.

### PAYMENT

**FOR STANDARD KITS:** We cannot start the crating process until the final payment has been received. It is important to have your final payment at Van's Aircraft no later than 1 WEEK prior to the scheduled crating date. If final payment has not been received when needed, your shipment will be delayed until the next group of orders is sent to crating or until the kit is paid. **FOR QUICK-BUILD KITS:** You will be called to take care of the balance due and to discuss the shipping options at the time of the QB arrival at our factory. **FOR ALL KITS:** If you are picking up your kit at Van's, you can bring the payment with you. *Kits that are delayed due to non-payment of the balance are subject to the new pricing in effect at the time of shipment especially if the delay continues into the following year. Full payments will not hold pricing if the shipping delay is customer instigated.*

### CHANGES

Please examine your order carefully and advise us of any changes or errors. **ANY CHANGES TO A KIT ORDER MUST BE RECEIVED IN WRITING 2-3 WEEKS BEFORE THE CRATING DATE.** Postponements in shipping or cancellations must also be done in writing.

### SHIPPING

Kit shipments are sent by truck, air freight, or sea freight and the charges can either be collect or prepaid depending on the freight company. The freight companies with whom we do business provide significant discounts only if we ship to an area serviced directly by them. *Van's will do our very best to ship using a carrier that services your area directly.* The freight company is instructed by us to call you prior to delivery, and at that time, you can inquire about the freight charges and the methods of payment they will accept. It is the responsibility of the person receiving the freight to find a way to offload the crates from the truck. Although the driver might help, they typically don't carry forklifts or dollies. You can request "liftgate" service for an added cost through most freight companies. Quickbuild kits would require a forklift or a lot of strong people to help offload.

### KIT ARRIVAL

1. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0417.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0417.jpg)

### **3.3.6 Fuse work (2017-04-30 18:40)**

Got a few hours to work on the plane today. I temporarily fit the roll bar. [1]



Here you can see the bracket doesn't fit one top of the flange. For the tip up canopy it needs to be trimmed. [2]





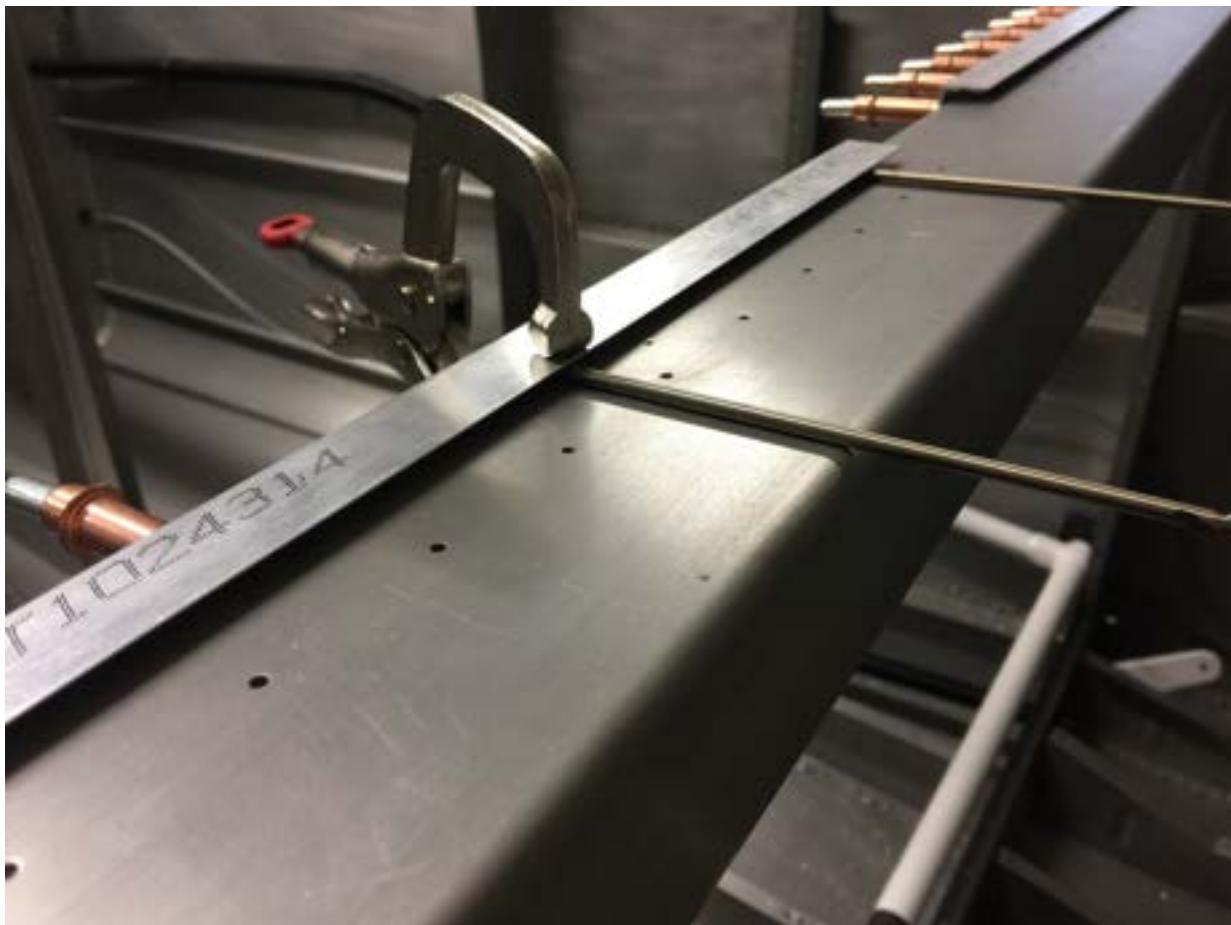
Here I've marked where I need to cut the metal. [4]



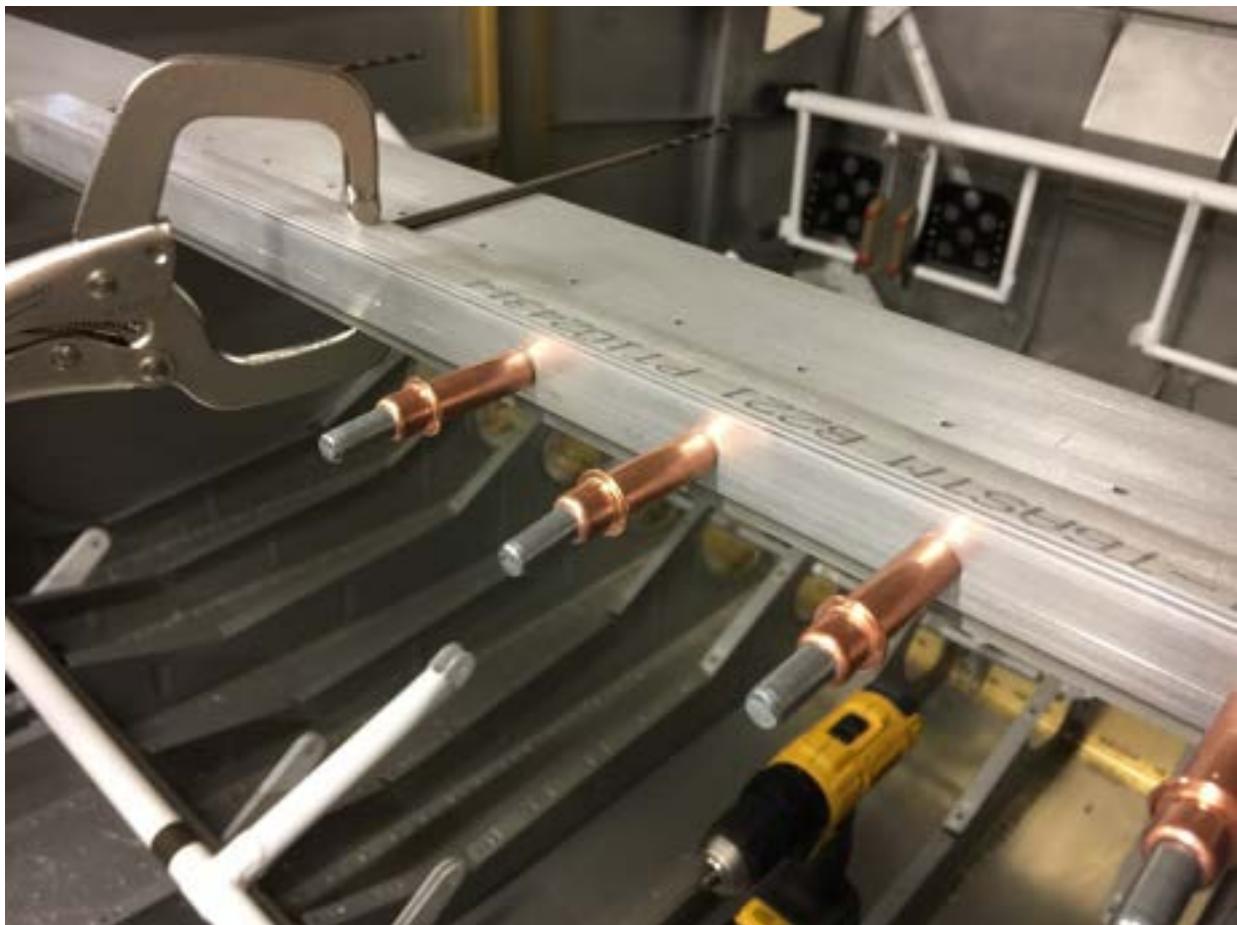


This is after I've removed the required material, I rough cut using my angle grinder and then filed it down to the line. I radiused the corner and then hit the whole thing with scotchbrite. It was a lot more difficult than I thought.

I then spent some time fitting the seatback slots to the cross beam. [6]

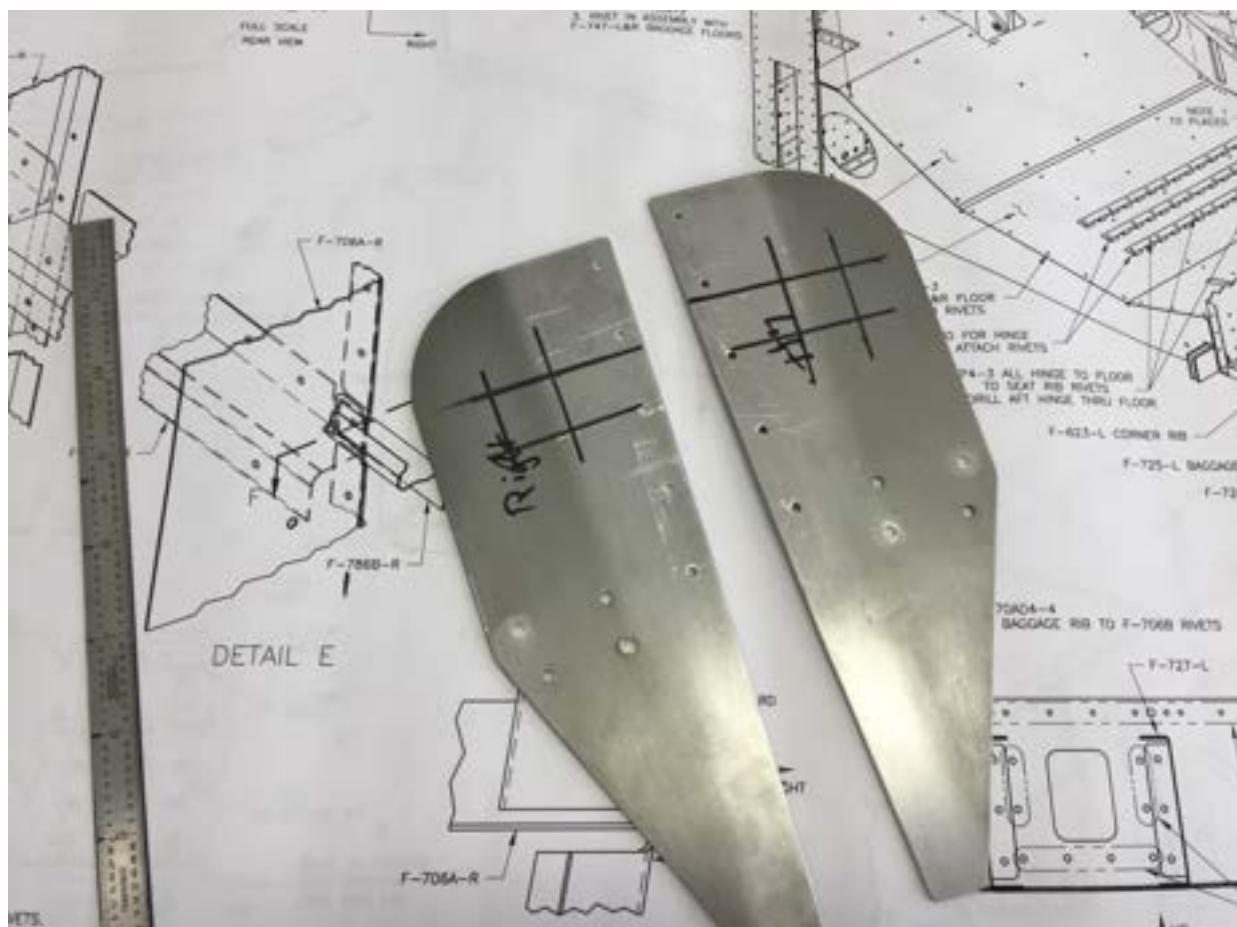


I've clamped the angle bracket, to the brace here and used some #30 drill bits to get the 1/8th spacing required. [7]



Here's another view of the angle after I've drilled it partially to the cross brace.

I also marked out the holes for the canopy attach slots. These need to be modified for either slider or tip up, luckily it wasn't too difficult. [8]





I then refit the roll bar to the fuse after fitting everything back together. I still need to adjust the height of the roll bar. [10]



Here's the aft channel clamped. This will get drilled to the roll bar and riveted together.

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2. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0426.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0426.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0425.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0425.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0428.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0428.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0429.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0429.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/04/img\\_0432.jpg](https://n890gf.com/wp-content/uploads/2017/04/img_0432.jpg)
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## 3.4 May

### 3.4.1 Seatback supports (2017-05-01 23:22)

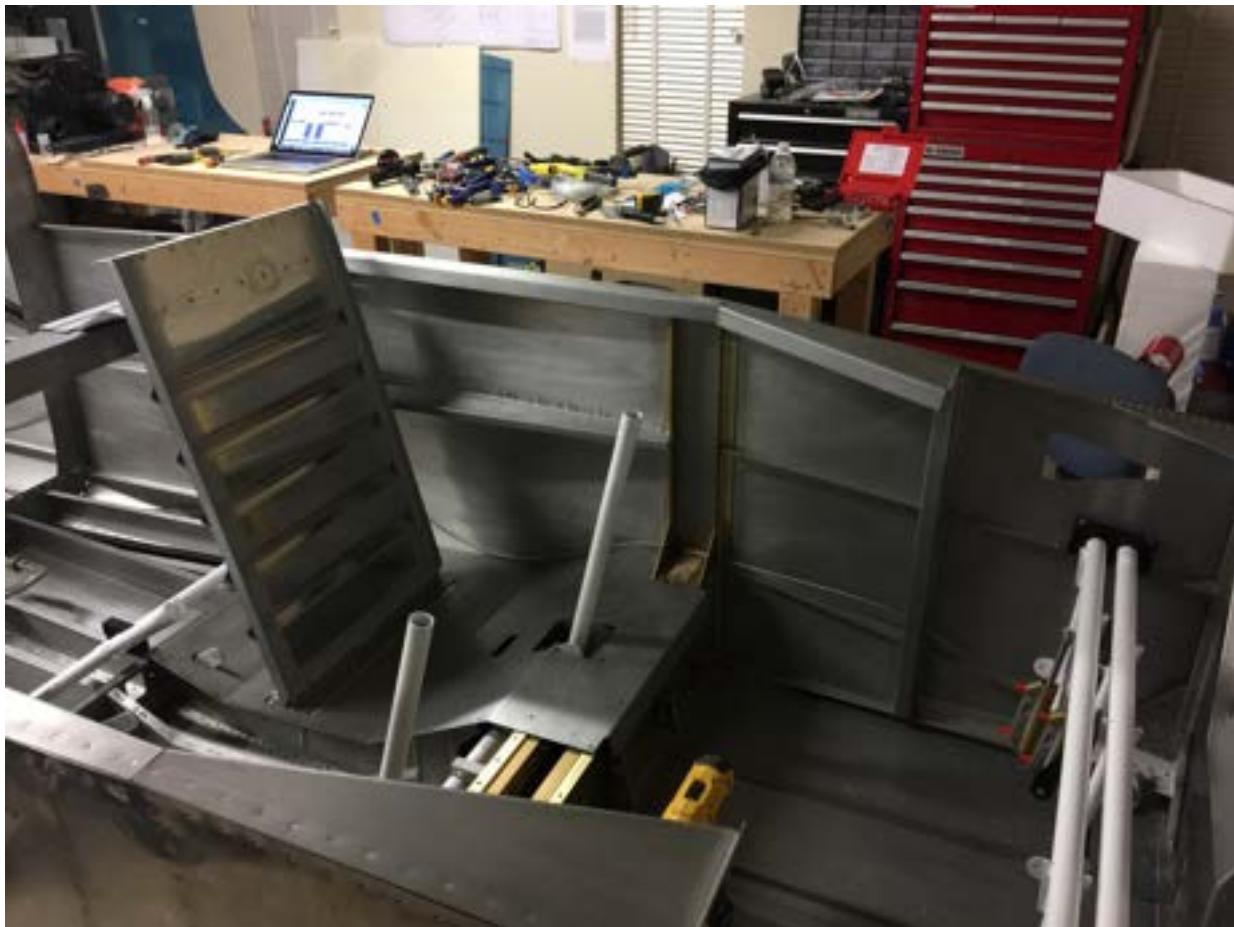
No pictures tonight, but I spent about an hour on the seatback supports. It consists of 3 pieces per side, a spacer, a bent piece of Alclad, and an angle. The assembly is riveted together and allows for 2 intermediate stops for the seatback to adjust the angle of the back. I'm planning on using a custom interior from Classic Aero Designs, and it uses a seat with an integrated support, I'll only use this assembly if I ever use the Vans stock seatbacks.

### 3.4.2 Drilled rudder pedals (2017-05-06 00:29)

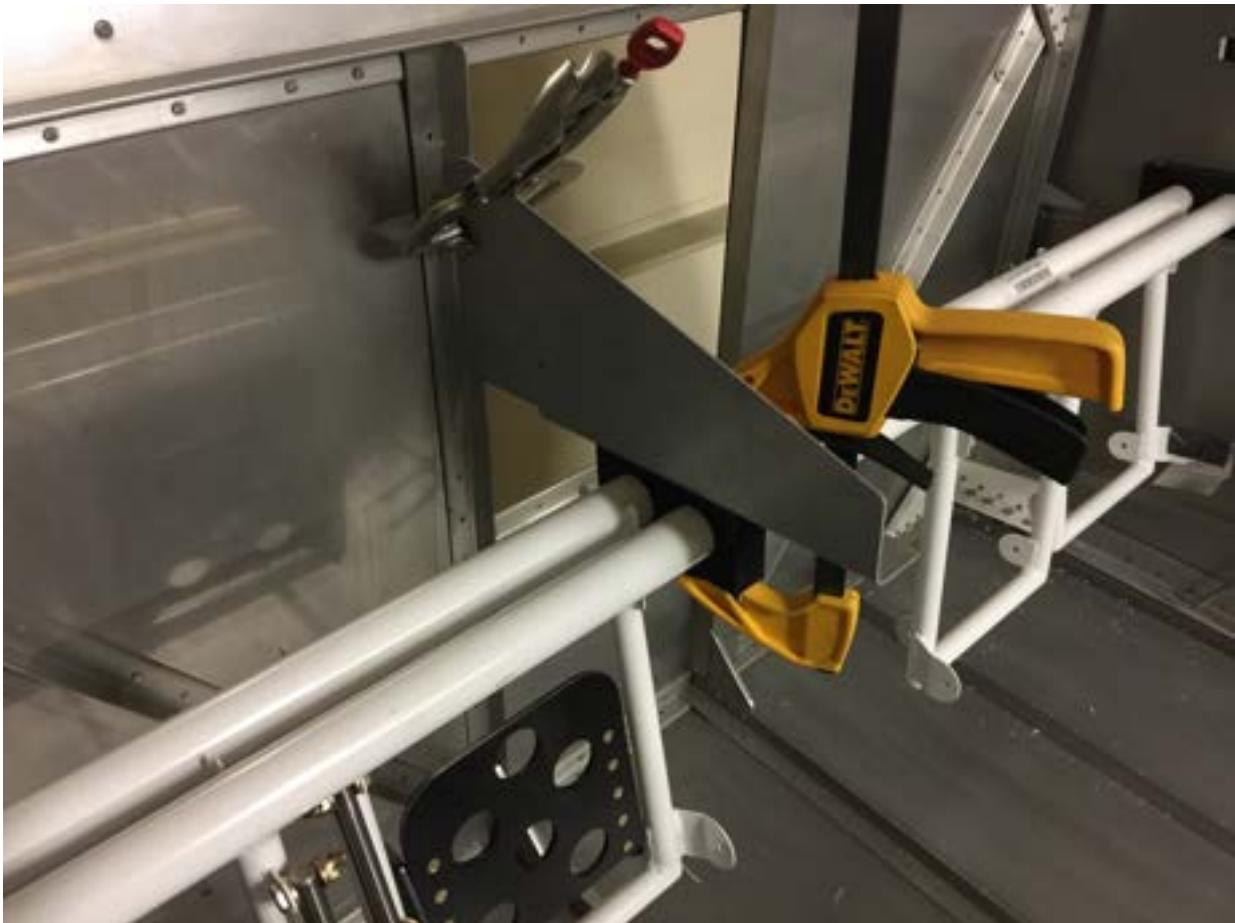
Tonight I spent a couple hours drilling the rudder pedal assembly to the fuselage. I began by measuring and marking the skin stiffener 3" back from the firewall. I initially marked the hole locations and then made the 2 additional mounting locations. Here you can see the rudder pedal bearing block in the middle position. [1]



I then temporarily installed the seat floors and the seatback so that I could get a feel for the location of the pedals relative to how I would sit. [2]



This is all temporary as I get more of the forward fuselage assembled I will most certainly need to adjust things. For now I selected the middle location as that felt the most natural for me. [3]



I then installed and drilled the rudder pedal brace. This will get the same treatment as the skin stiffeners so that the assembly will be adjustable. This will also get trimmed so reduce weight.

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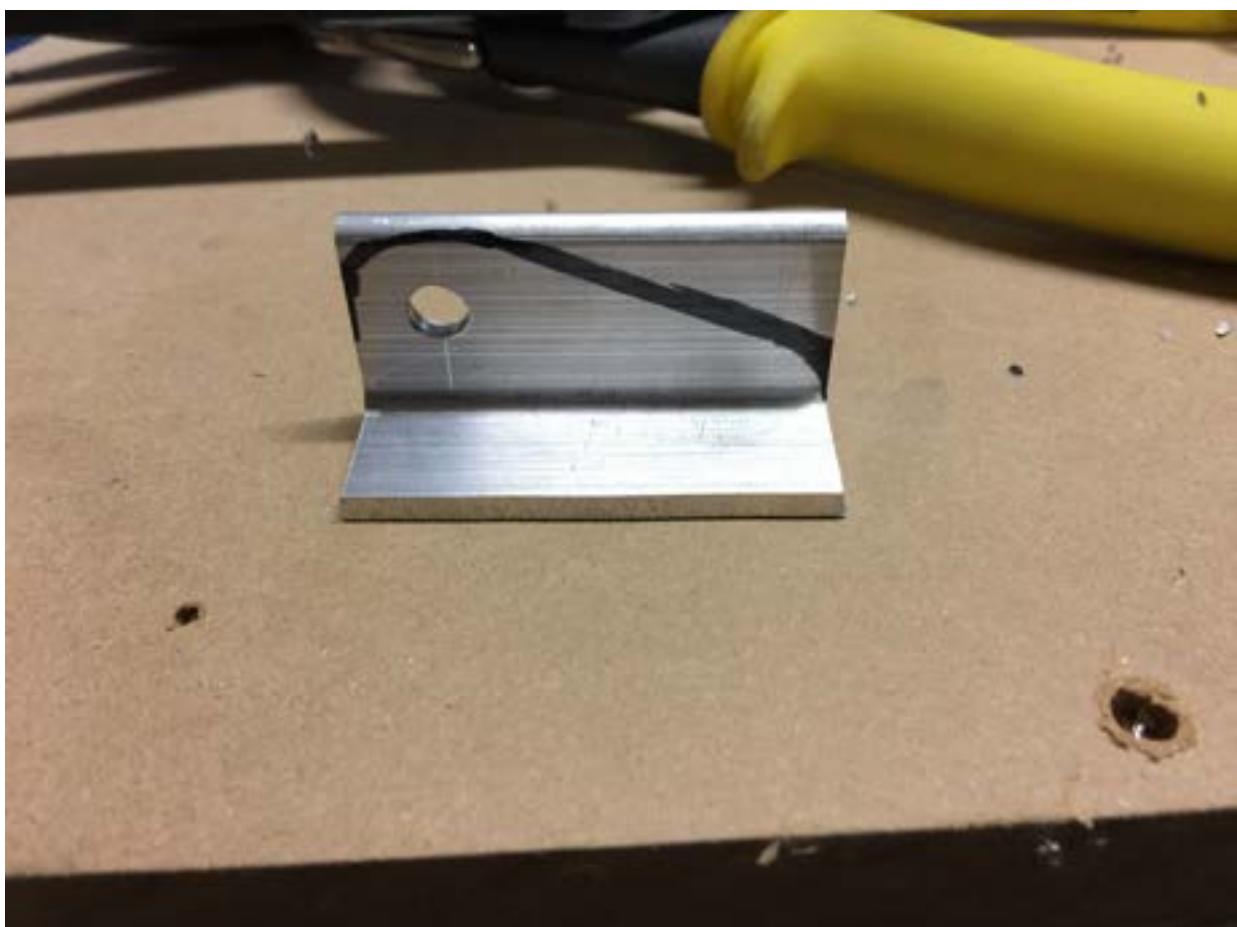
### **3.4.3 Flap actuator (2017-05-07 00:17)**

My goal for today was to get the flap motor mounted to the center channel that houses it. [1]



I started by drilling the holes in the motor arm to safety wire the bearing to the actuator. The motor uses a screw gear to raise and lower the flaps, and if this were to ever get loose it could back out entirely and the flaps would become loose. The safety wire prevents it from backing out.

I then fabricated the motor mounting angle bracket. It's made from 0.063" angle stock. [2]  
270



[3]

271



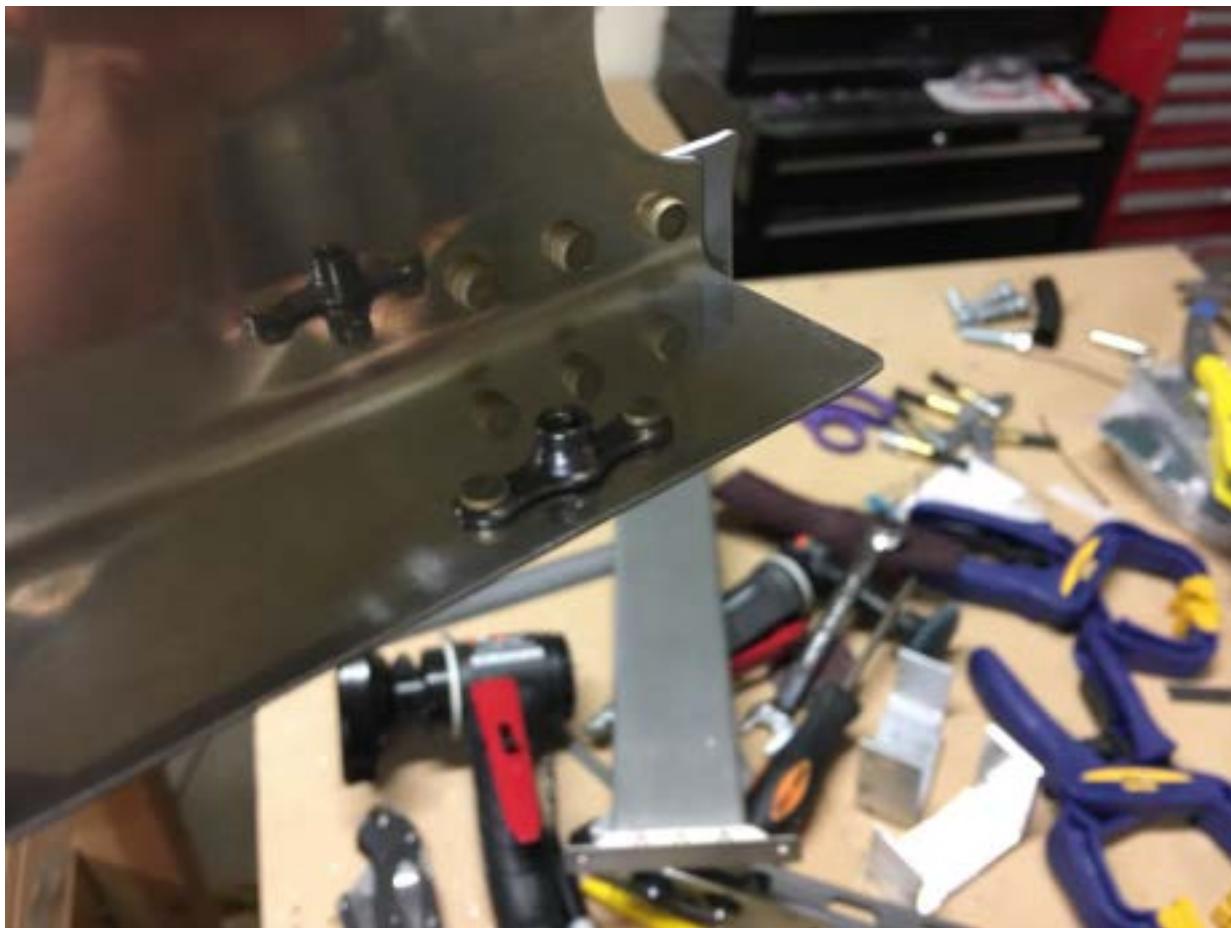
Here's the finished angle with the 1/4" bolt hole drilled.

I also fabricated the other attach brackets for the center channel that allows the channel to screw to the floor and to the seatback brace. [4]



[5]

273



I also riveted all the nutplates that are used to attach the side covers. [6]



Here's the motor installed in the channel after the mounting brackets were primed and riveted to the channel. I greased the bolt and installed the washers and cotter pin. This isn't torqued down because it has to pivot when the flaps move. [7]



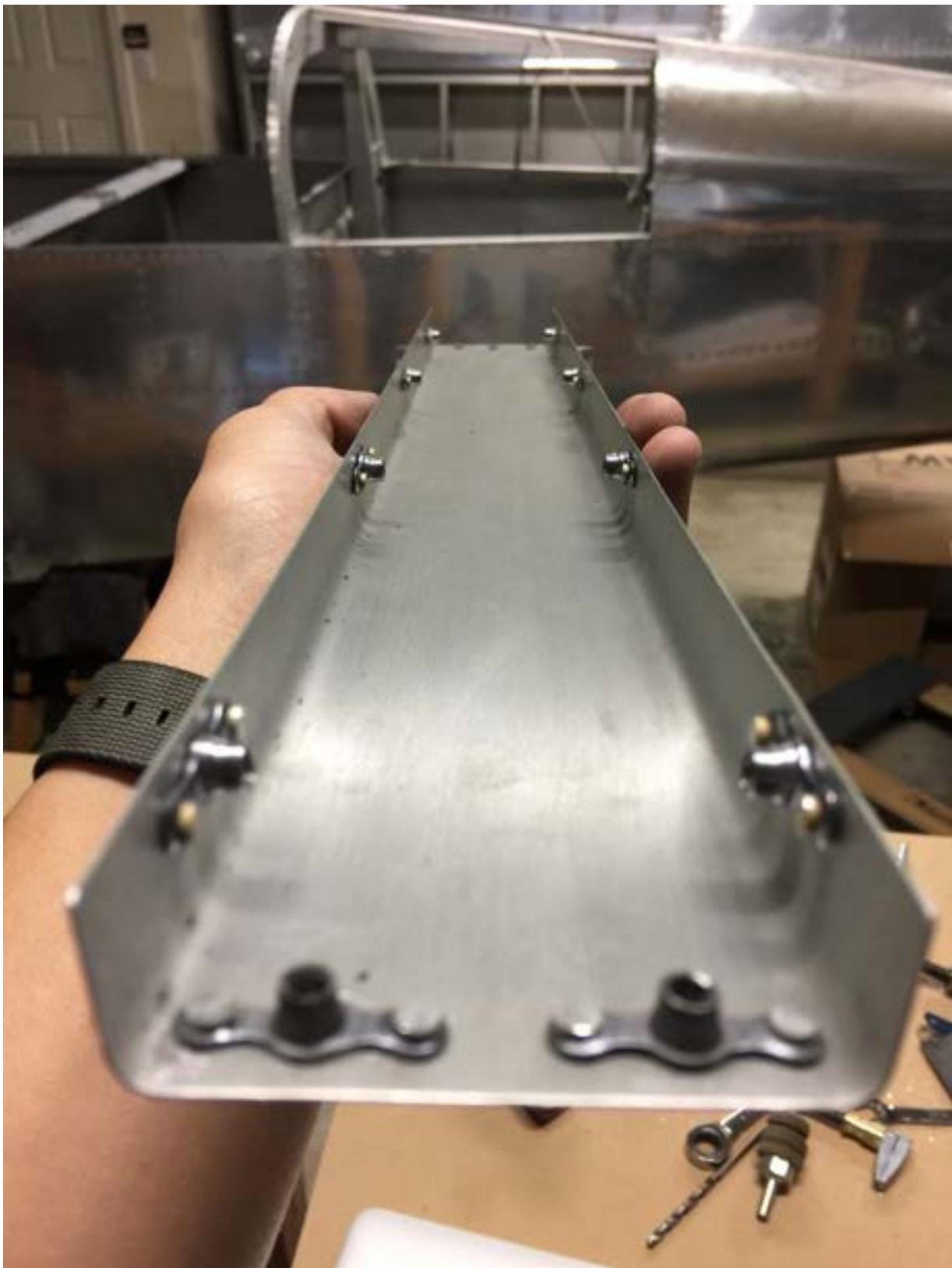
Here's the bolt from the outside.

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### 3.4.4 More fuse work (2017-05-07 23:16)

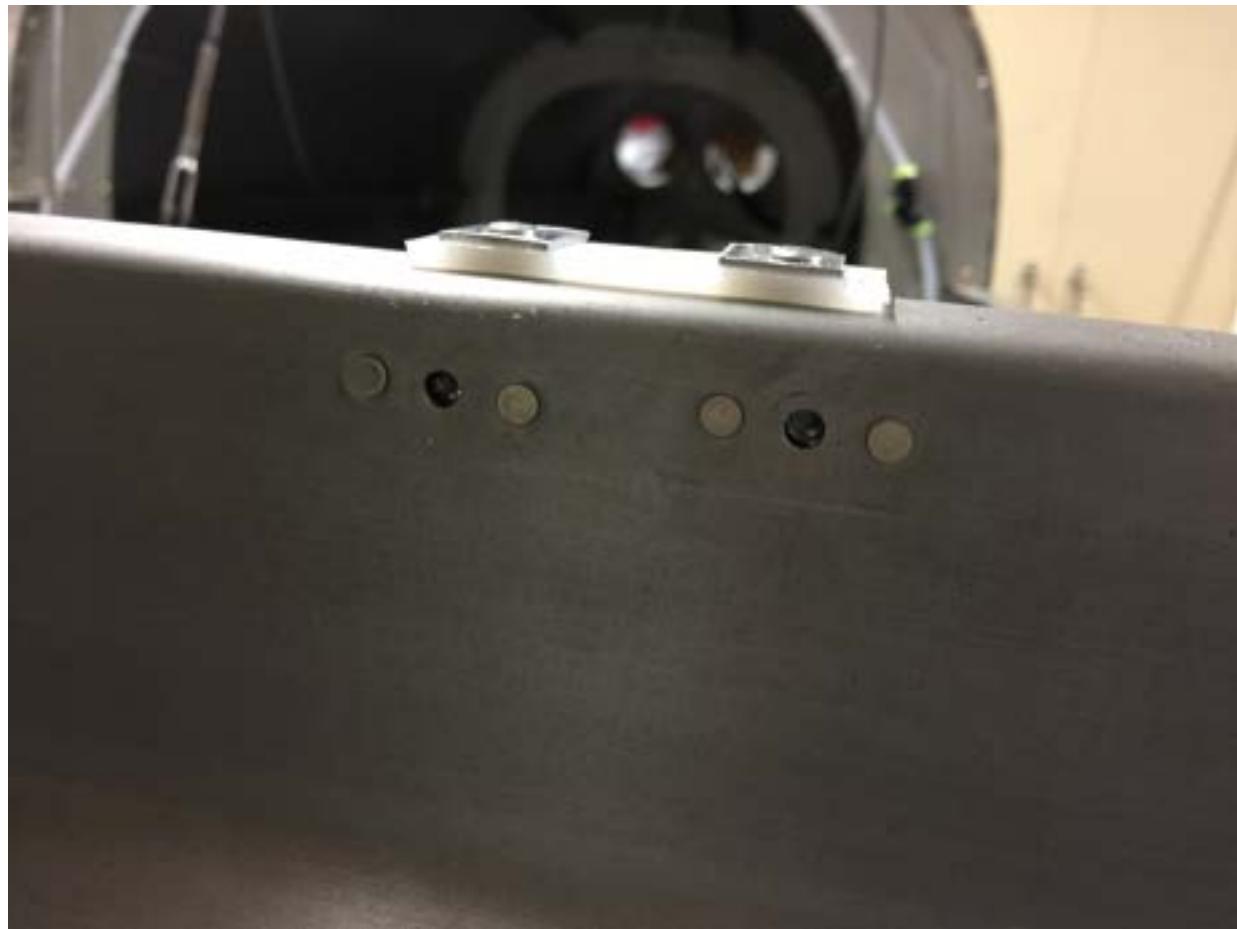
Today I spent a few hours doing some more work for the flap installation as well as work on the baggage bulkhead.

I started by riveting all the nutplates to the rear channel support. [1]



I installed it in the fuselage and installed the side panel covers to match drill the screw holes. There are 4 screws that hold the covers to the forward and aft channels.

I then decided to work on the baggage bulkhead and seatbelt cable pass-through. [2]

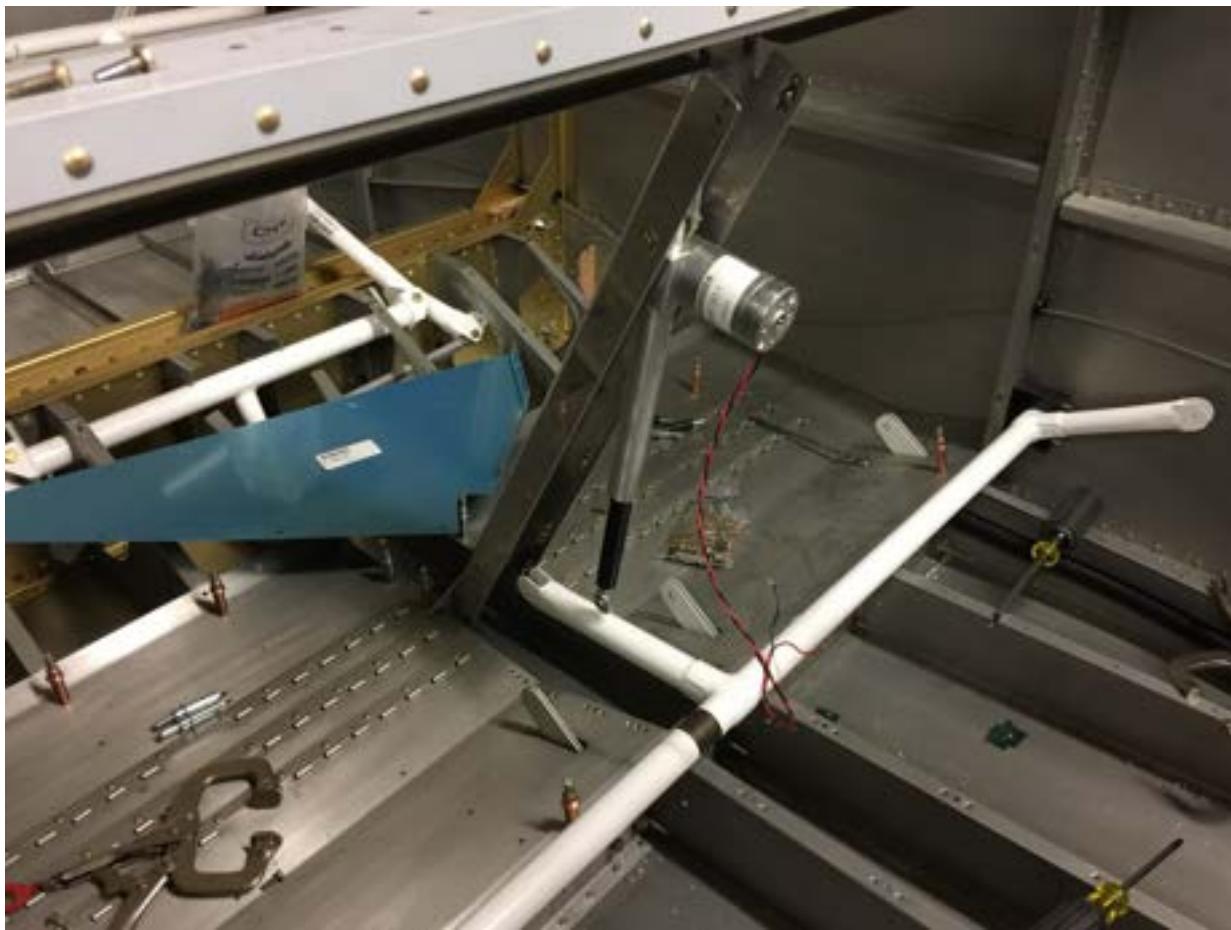


Here I've installed two nutplates that allow the top baggage panel to attach to the lower one where the seatbelt cable passes through. There are two plastic wear blocks that prevent the cable from contacting the aluminum. [3]



Here's the top panel with the wear block riveted in place.

Here's the forward flap channel with the flap motor installed but not attached to the flap weldment. [4]



I'm waiting for an order from Aircraft Spruce with some components that I would like to install under the seat floors, then I will rivet the seats and the baggage floors in place.

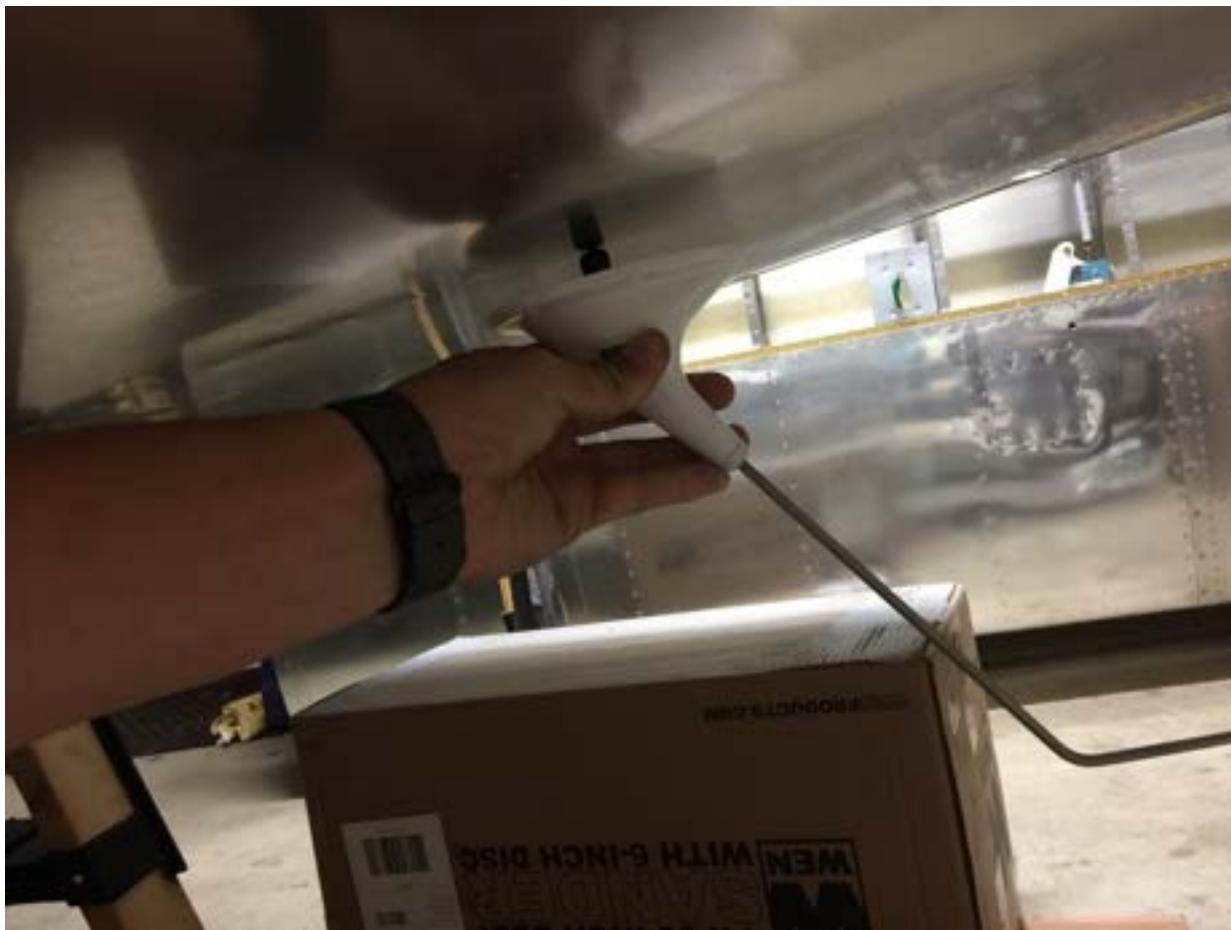
1. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0498.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0498.jpg)
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### 3.4.5 Antennas (2017-05-10 21:49)

I got several orders from Aircraft Spruce in the mail today including 3 of the antennas I'm going to use in my plane. One is the Comm radio antenna. It's a "bent whip" style antenna that will mount to the underside of the plane. [1]



I measured and marked the center line in the fuse behind the baggage bulkhead. The reason I decided to mount it here is that it's just aft of the elevator bellcrank. It's the closest forward I can mount it on the centerline of the fuse without dealing with the elevator pushrod that runs through the center. [2]



It's externally mounted with 4 screws and is connected to the radio with a BNC connector and some rg400 coax.

The other two antennas I got are for the ADSB (978mhz and 1090mhz) and the transponder (1090mhz). [3]



They are identical in design and will be mounted symmetrically under the pilot and copilot seats from the underside of the plane. [4]



Once I get these two blade antennas mounted I can rivet the seat floors to the fuselage.

I also received my Andair fuel pump. It will mount just forward of the seats below the fuel selector valve. [5]



I also got an order from Vans with my master relay and my starter relay. [6]



The silver master relay will connect to the battery and to the master switch. It will provide direct power to the starter relay and to the rest of the plane. The starter relay has an intermittent duty cycle and will provide power to start the engine when the starter button is pressed.

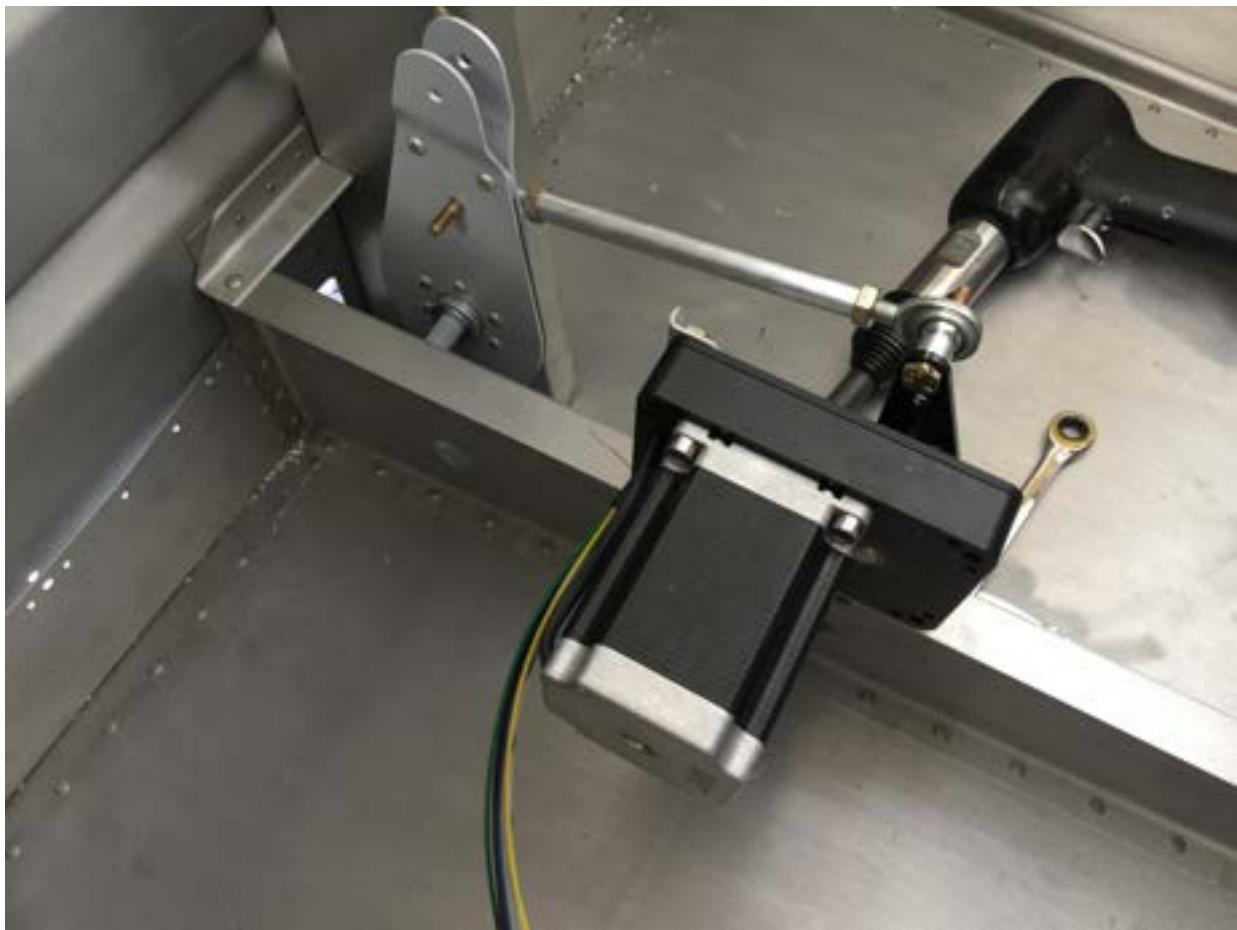
1. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0515.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0515.jpg)
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### 3.4.6 Fuse tasks (2017-05-14 21:32)

This weekend I spent some time working on some more fuse work. I started by assembling the elevator bellcrank. [1]



Once I match drilled the parts together I measured and drilled the hole for the autopilot pushrod. I then disassembled and primed all the parts and riveted it together. [2]



I also installed the autopilot servo temporarily to measure and align the pushrod.

I then measured and installed the comm antenna just behind the auto pilot servo along the aircraft centerline. [3]



I modified the doubler plate to fit next to the center support. I'm debating whether or not to add another support to stiffen the area a bit more.

I then prepped the baggage floors for riveting. [4]



I cleaned out the area under the floor with my vacuum as well as secured the wiring conduit. Here you can see the floor clecoed in with the LP-4 blind rivets ready for installing.  
[5]



The center tunnel cover is installed here, so platenuts are installed to allow the cover to be removable. You can also see the platenut I installed for the flap center bearing block attachment bolts. [6]



Here are the aft platenuts and rivets that hold the floor to the baggage bulkhead. The baggage panel covers screw to these platenuts. [7]



The right side floor is prepped and ready for installation.

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4. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0526-1.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0526-1.jpg)
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6. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0529.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0529.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0530.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0530.jpg)

### 3.4.7 Seats and antennas (2017-05-29 22:16)

Today I spent a few hours prepping the aft seat pans for riveting. I wanted to install the two remaining antennas on the underside of the fuse. This includes the transponder and ADSB antennas. Both are blade style antennas. [1]



[2]  
294



I used the provided templates to ensure alignment. And I centered the antenna between the two seat ribs in each case. I then installed the two antennas and torqued the nuts. [3]



Here you can see the two antennas mounted. I will install the BNC connectors once I know where the wires will route.

Now that the antennas were installed I began final prep for riveting the seat floors. I began by vacuuming out all the debris from the drilling and then clecoed the seat in. [4]



I then used LP3-4 pop rivets to rivet the seat floor in. I also installed the crotch strap brackets which can be seen at the bottom of the picture. [5]



Here is the picture during the drilling. I used two 1/8th" drill bits to ensure the spacing was correct. I drilled the brackets to the ribs and then disassembled and deburred, primed, and then riveted the assembly in. [6]



I took a break from riveting and wired up the pitch autopilot servo. I then ran the wiring harness through the conduit under the seats and stored the wire there for now. I also ran the wire to the tail for the rear position/strobe light, and the elevator trim servo. Once I install the elevator it will be a quick hook up to the servo and a few wires for the tail light and the wiring will be done in the aft fuse. [7]



Here's the autopilot servo wire bundled. Also the two white wires are routed inboard and forward to the forward fuse in front of the spar. These will route up to the panel.

Tomorrow I'll put in the copilot's seat floor and then begin work on the center tunnel between the two seats.

1. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0677.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0677.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0678.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0678.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0679.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0679.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0684.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0684.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0682.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0682.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0687.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0687.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/05/img\\_0688.jpg](https://n890gf.com/wp-content/uploads/2017/05/img_0688.jpg)

## 3.5 June

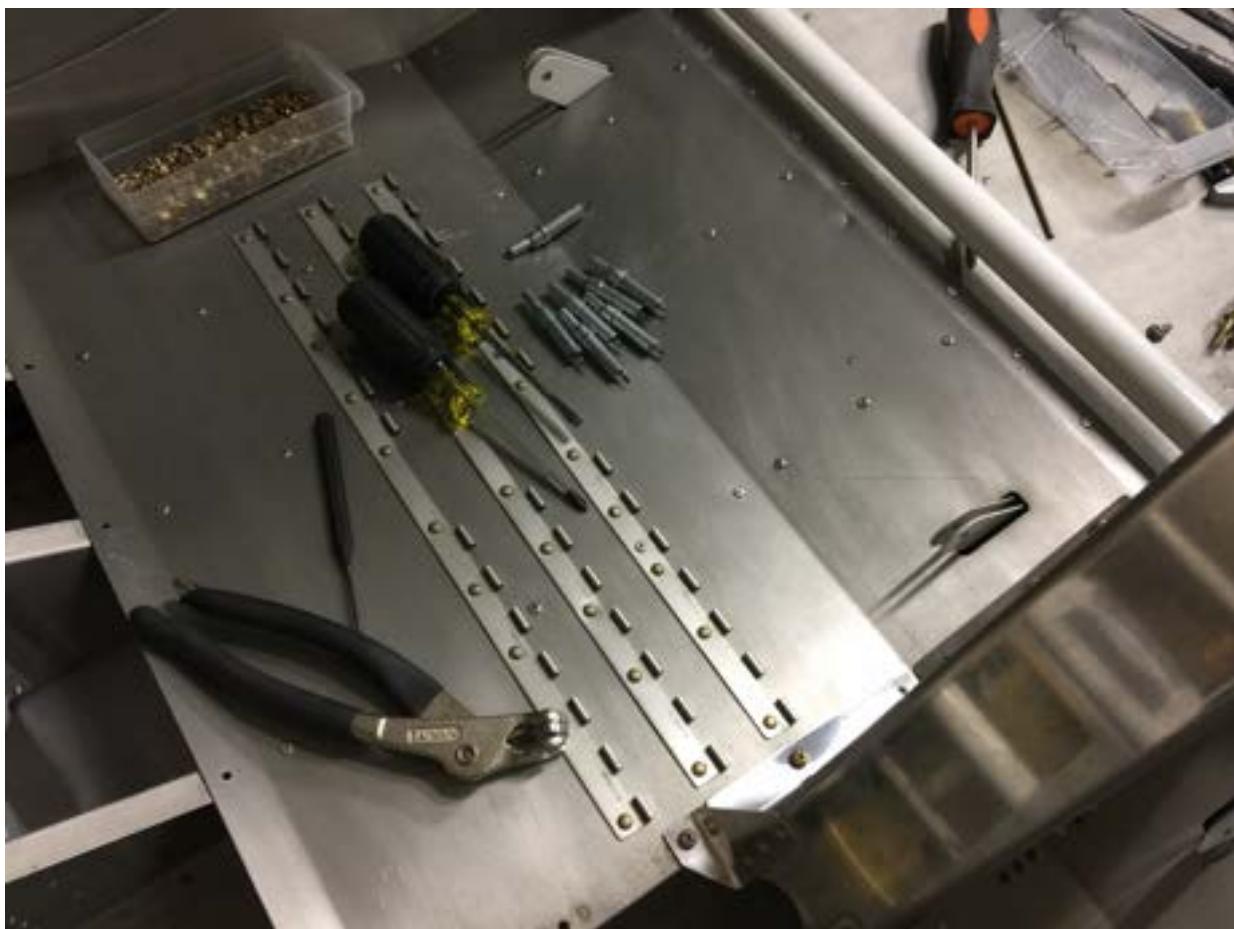
### 3.5.1 Copilot's seat (2017-06-04 17:59)

Today I spent a few hours working on the copilot's seat and crotch strap anchor. It's an awkward part to rivet in, but I eventually got it. [1]



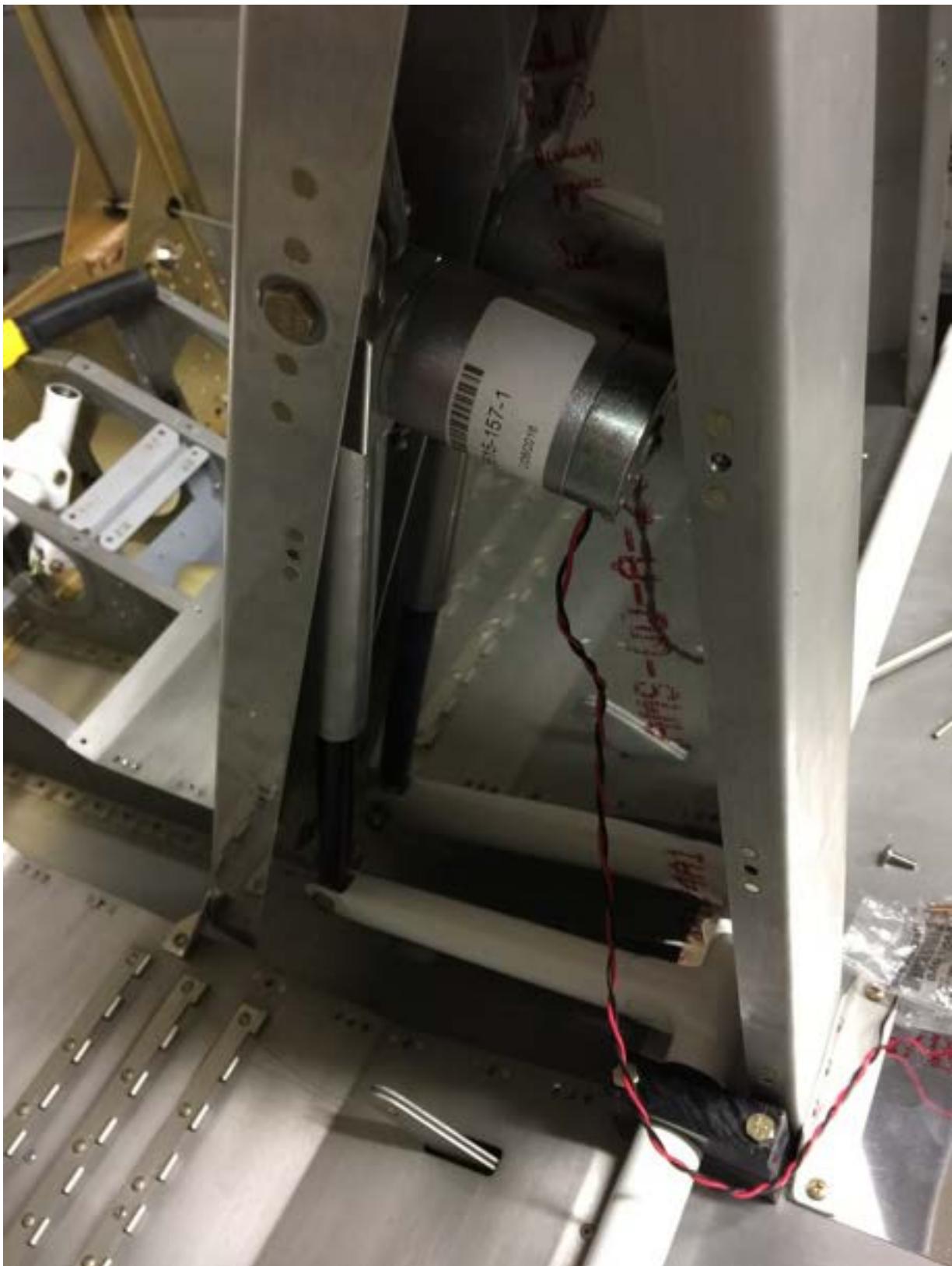
Here you can see it riveted between the seat ribs just to the right of the copilot's stick attachment (Stick is removed for now). Once I match drilled it to the ribs I removed it, de-  
302

burred, primed, and then riveted the nutplates, then riveted the two pieces into the fuselage. [2]



Once I got the crotch strap in stalled I then vaccumed and cleaned out the underside of the seat pan. I then installed it with the LP-4 pop rivets.

I also installed the flap motor assembly and one of the side covers. [3]



Here is the flap motor attached temporarily with the AN4-10A bolt to the flap actuator weldment (white). I also have the flap position sensor that will attach to the weldment to relay

the position of the flaps to the flight computer. [4]



The cabin area is nearing completion, next up is to install the rollbar to the cross brace and fit the top skin to prep it for match drilling.

1. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0735.png](https://n890gf.com/wp-content/uploads/2017/06/img_0735.png)
2. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0732.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0732.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0734.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0734.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0731.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0731.jpg)

### **3.5.2 Work work work - fuse (2017-06-10 22:26)**

Had a solid day of work in the shop. My goal was to get the rollbar, and final top skin fitted.

I started by finishing the riveting on the canopy frame and mounting brackets. [1]



Here are the very messy rivets that hold the angle to the bulkhead. I don't have any tools that could get to these rivets cleanly, but I got it done. [2]



I then measured and aligned the rollbar brackets and drilled them to the frame. This is the left side. I then bolted this to the structure. [3]



The right side was much easier for some reason.

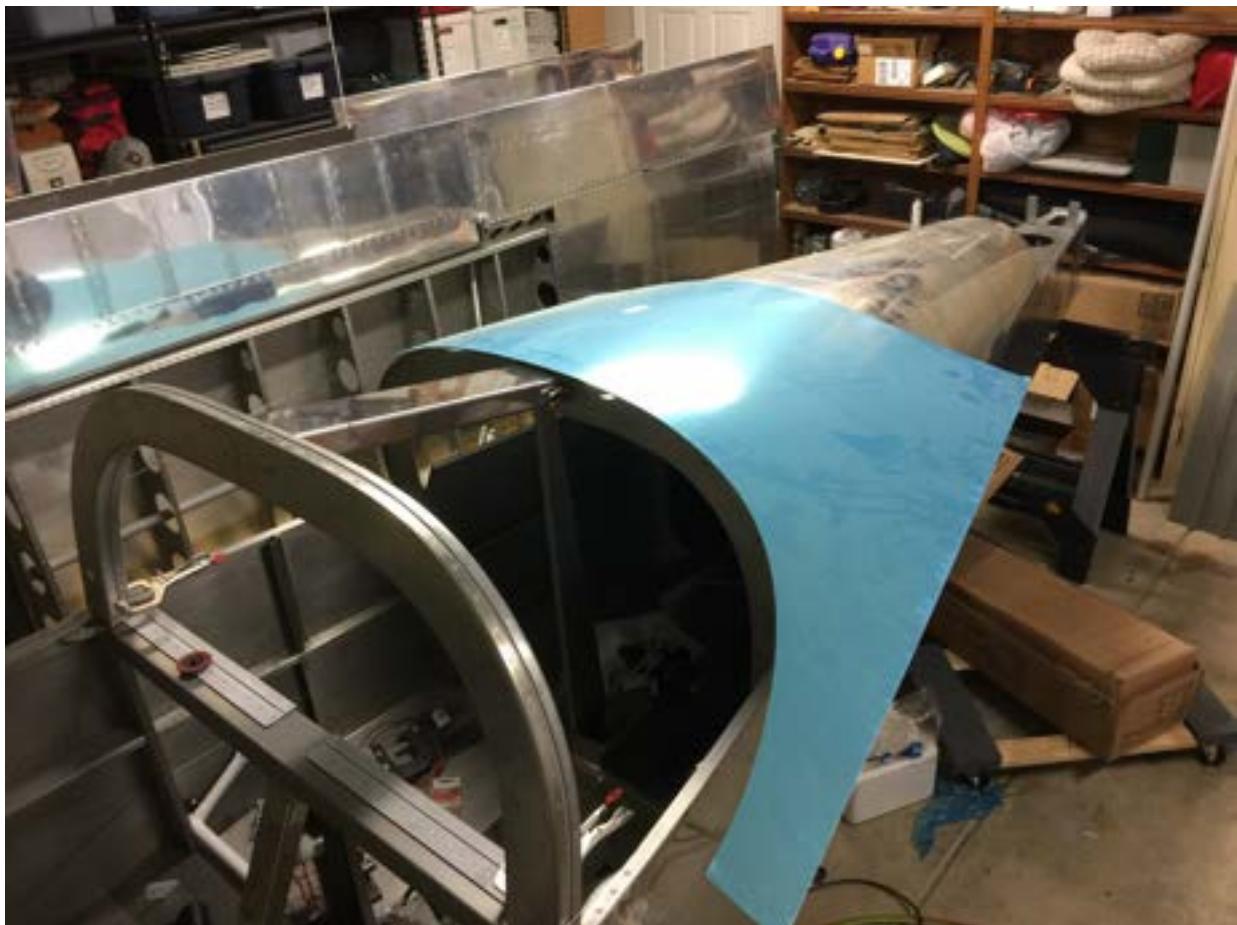
Once I bolted these to the frame, I mounted the rollbar. [4]



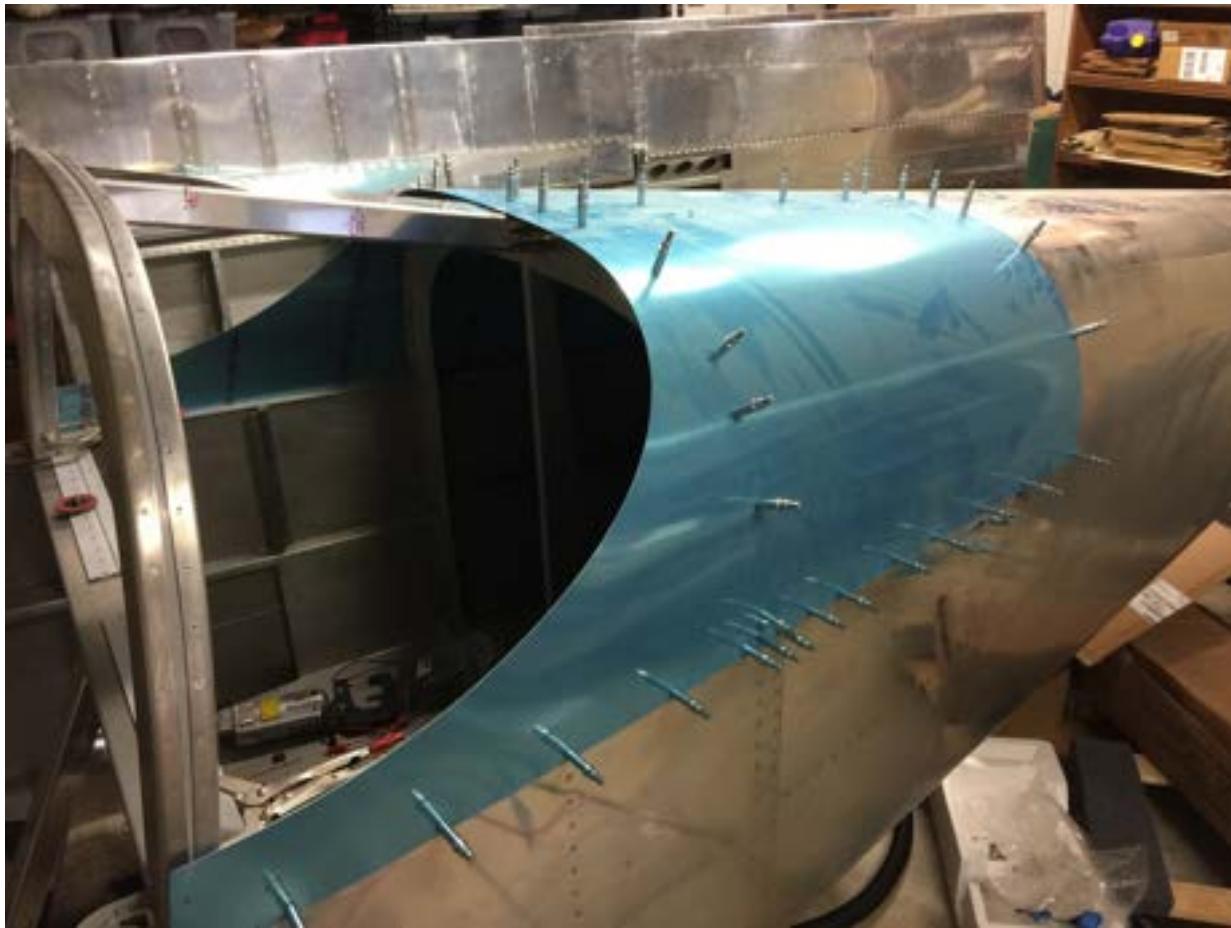
I clamped the rollbar to the now bolted on brackets. I also fitted the channel to the baggage bulkhead and to the rollbar. [5]



I then filed down the brackets to match the contour of the skin. This is to allow the final skin to bolt to the rollbar without any bends. [6]



Once I finished filing the brackets I got out the fuse skin and laid it out, I then clecoed it to the fuselage to prep for match drilling. [7]



Here's the final skin clecoed to the fuse. The rear window will nestle under he skin and on top of the rollbar. This skin will get riveted later on after I finish mounting more components behind the baggage wall. Still need to install the transponder and the ELT.

1. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0769.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0769.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0770.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0770.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0773.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0773.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0774.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0774.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0775.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0775.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0776.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0776.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/06/img\\_0777.jpg](https://n890gf.com/wp-content/uploads/2017/06/img_0777.jpg)

## 3.6 July

### 3.6.1 Received Finishing Kit (2017-07-02 16:02)

I received my Finishing almost two weeks ago now, and I finally had the time to inventory it.  
[1]



The biggest thing in the crate is obviously the canopy, which is now sitting on the couch. [2]



It happens to fit perfectly, and is resting on some pillows. The only parts I did not receive are the main gear legs and the tubes for the main gear. Everything else was in order. I organized all the hardware and places the parts on on my shelf ready to be used in the future.

I still have a few tasks left on the fuselage before I can begin constructing the canopy frame and other Finishing tasks.

1. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0816.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0816.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0818.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0818.jpg)

### **3.6.2 Finishing Kit and fuse work (2017-07-09 23:23)**

This is a two part update

I finished inventorying my finishing Kit. There are three items on backorder that should be in a couple weeks. I've stored everything on my shelves and the big parts are managed with.

I also got some work done on the fuselage. I finished the center tunnel cover. It mounts between the two seats. I botched the z brackets and had to improvise. It will be filled in and covered so will be unnoticed. [1]



You can see the upper portion of the tunnel cover has some additional rivets on the insides. [2]

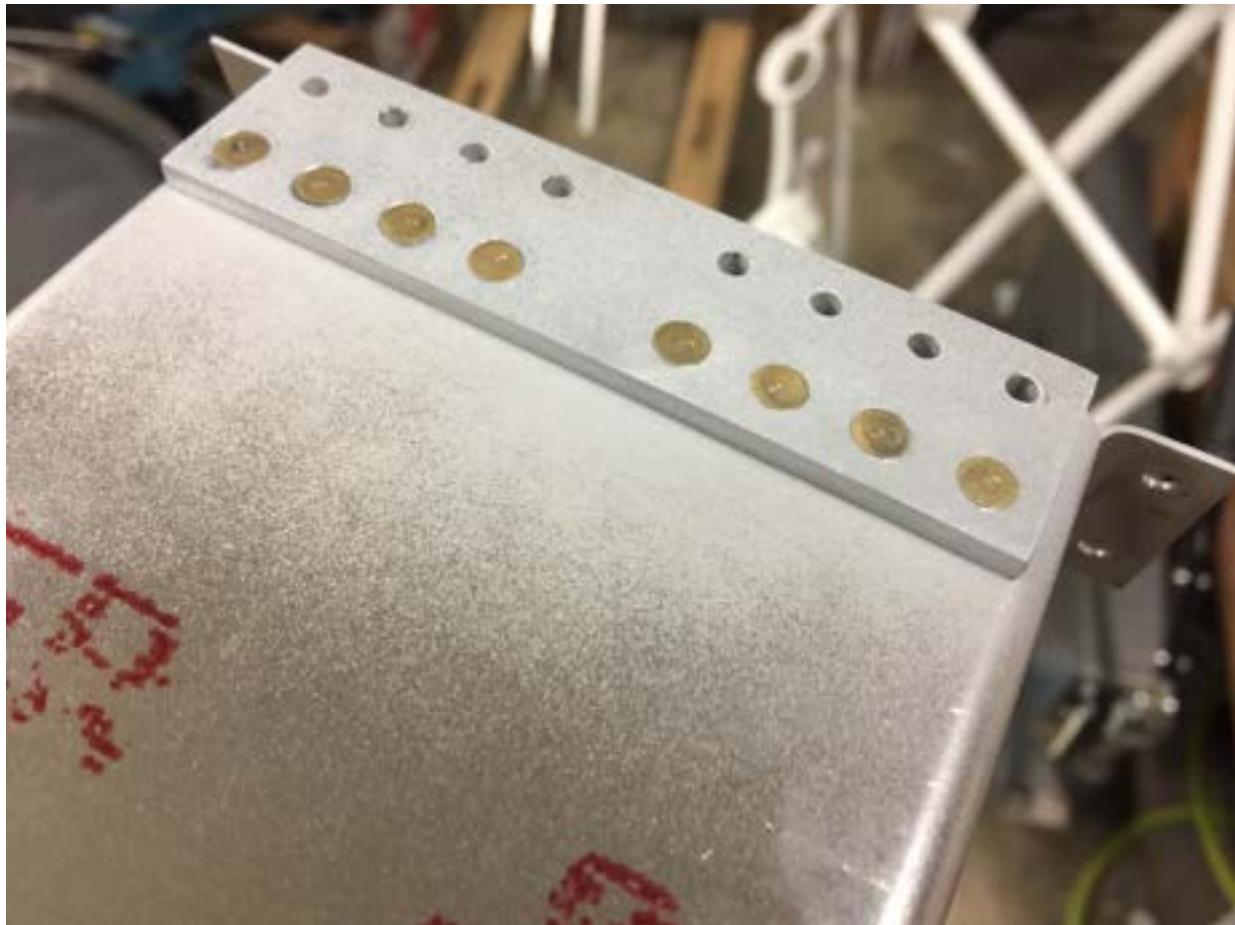


This is the cover primed and nearly ready to install. I spent time filling, sanding and smoothing down the rivets on the top plate, they are nearly invisible now that it's primed. [3]



There is one that it slightly visible, but this will be covered by carpet anyway.

I also peeped and primed the rear window center channel spacer. This is countersunk and riveted to the channel. [4]



The remaining 8 holes will be riveted along with the final fuselage skin, the baggage bulkhead, and the gusset plate. All in all, there will be 5 layers of metal sandwiched. [5]



I also spent the time to finish drilling and bolting the rollbar to the mounting brackets and attached the assembly to the fuselage. Once everything was drilled, I removed the rollbar and center channel from the fuselage and riveted the two together.

1. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0923.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0923.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0922.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0922.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0924.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0924.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0927.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0927.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/07/img\\_0928.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_0928.jpg)

### **3.6.3 Panel fitting (2017-07-22 21:14)**

It's been a while since I've had time to work on the project. I received a box from Vans a few days back containing the wheel innertubes and main landing gear. I installed the tubes into the tires and then assembled the wheels. Once I install the landing gear I will install the wheel bearings and wheels.

Today I assembled the panel into the fuselage for an initial fitting. [1]



The panel has some additional brackets and supports that I will need to fabricate.

1. [https://n890gf.com/wp-content/uploads/2017/07/img\\_1112.jpg](https://n890gf.com/wp-content/uploads/2017/07/img_1112.jpg)

## 3.7 August

### 3.7.1 Fuse work - avionics (2017-08-05 22:37)

It's been a while since I've had time to work on the plane, and this past week I was dealing with a slight cold.

I received some of my avionics over the last few weeks, and a couple days ago I got my primary EFIS. I got started today by making a custom mount for the ADAHRS. [1]



It has been bent to follow the contours of the j stringers and the center support. It consists of some angle supports and .040 aluminum. [2]



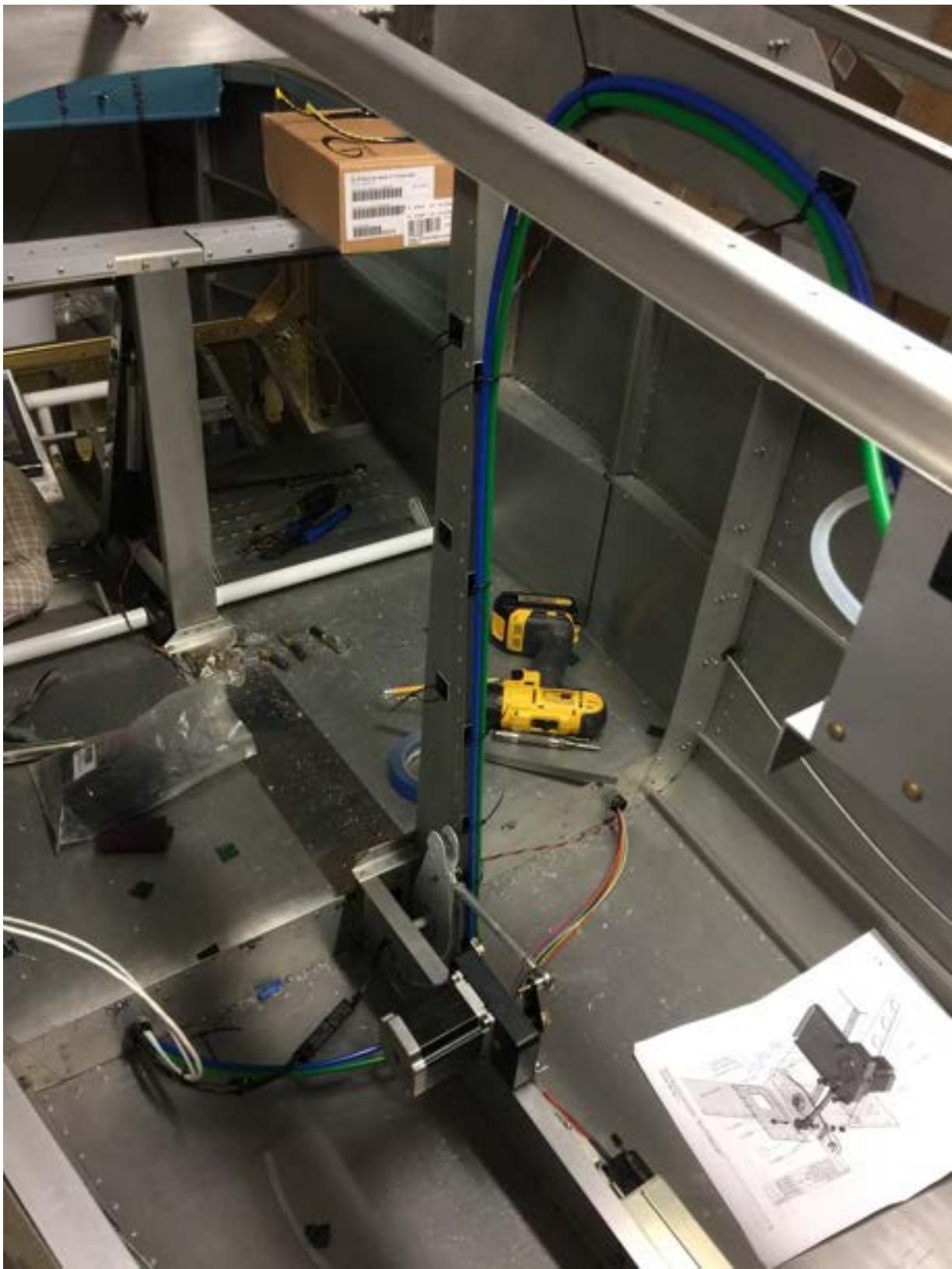
It is screwed to the supports and will get much stiffer once the skin is riveted on. The adhars is then screwed to nutplates on the mount so that it is removable.

I also installed my gps antenna with 4 nutplates and some countersunk -8 screws. [3]  
322



Here's the inside shot showing the nutplates.

I also routed the plumbing for the pitot system with some zip ties. [4]



After this I also installed the transponder on the bottom support. [5]



The Comm antenna is just forward of the transponder and will have the antenna routed forward through the wiring conduit.

The last step for wiring avionics is to connect the ADAHRS to the network.

I also booted up my skyview hdx for the first time. This thing is beautiful! [6]



I used the test network cable to hook up the computer and see if I could get attitude info. [7]



Next up is to work on panel and forward fuselage work.

1. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1156.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1156.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1159.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1159.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1155.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1155.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1160.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1160.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1161.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1161.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1151.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1151.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1153.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1153.jpg)

### 3.7.2 Panel (2017-08-07 07:44)

Yesterday I spent a few hours working on the panel support angle. [1]



This angle was drilled and then notched with the bandsaw so that it can follow the contour of the panel. [2]



Here's how it looks as it takes form. I then drilled this to the panel with a #30 bit for the -4 rivets. [3]



This is the angle clecoed to the panel. [4]



I also mocked up the panel layout and drew switch location and other peripherals. [5]



I then decided to hook up the ADAHRS and GPS to the display. I was able to get a fix on position and also noticed that my mounting of the ADAHRS was off just a tiny tiny bit. I will have to shim it with something very thin. [6]



1. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1165.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1165.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1164.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1164.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1167.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1167.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1166.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1166.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1171-1.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1171-1.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1170.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1170.jpg)

### 3.7.3 Ordered Engine (2017-08-08 07:57)

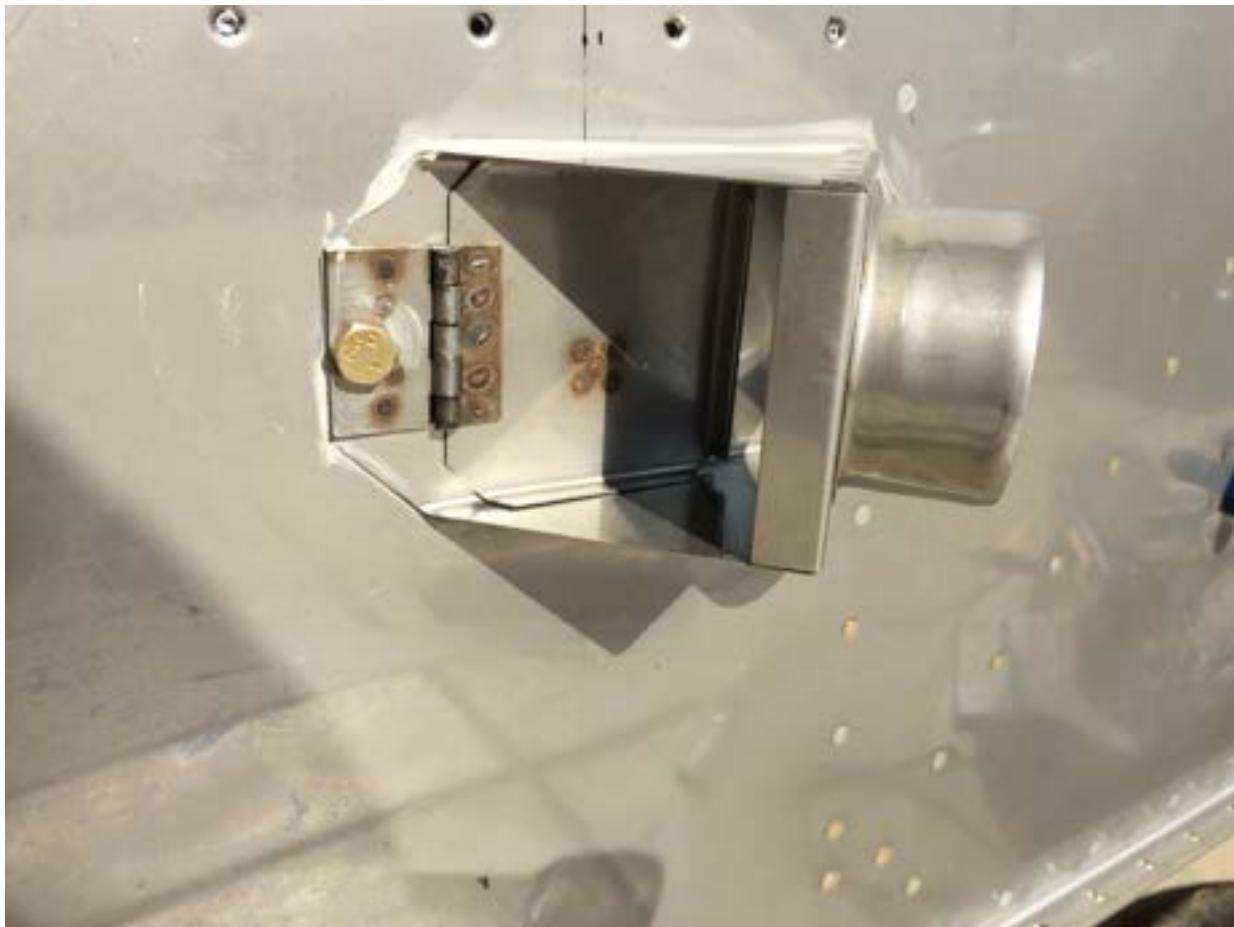
I placed the order for my engine today! It's a big step and will force me to work super hard over the next 6 weeks in order to be ready for it.

I'm going with a Superior Air Parts XP-360. It's an IO-360 fuel injected engine with dual P-mag electronic ignition, also got the optional Superior Cold air induction, and it is configured for a constant speed prop. Total comes out to \$30,350.

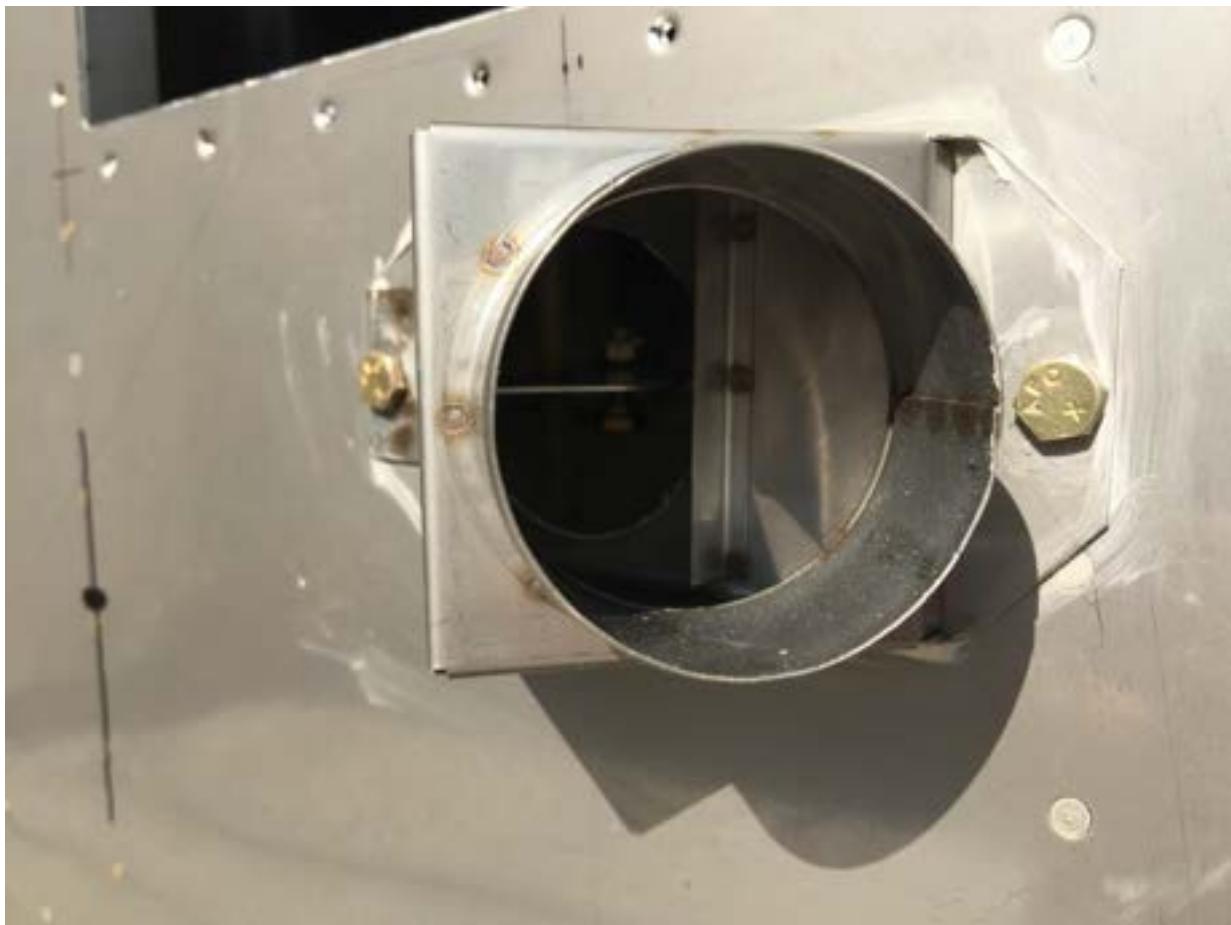
I am very excited about it and can't wait to install it on the plane!

### **3.7.4 Firewall Prep (2017-08-21 07:54)**

Yesterday I spent several hours installing a bunch of firewall components. I started by drilling a 2" hole for the stainless steel heater box. I then positioned it and drilled the two holes for mounting. [1]



It came with a tube of firewall sealant, I lined the underside and then bolted it in place. [2]



A tube will attach to this end and a heat muff surrounding the exhaust on the other.

I then began measuring and lining up the battery tray. I'm going with an EarthX lithium battery. [3]



This is mounted using three bolts from the inside of the firewall. [4]



I also installed my vent line ports. These are some fancy aerodynamic covers that I got from JD Air. They require a 5/8th hole and mount from the inside. [5]



Here are the two vents installed.

I then installed the brake reservoir. It's mounted on the passenger side in case I want to add copilot brakes later on. [6]



The hydraulic low pressure line attaches to the inside of this reservoir.

Lastly I installed the master relay and starter relay. This took some work mainly due to the slightly different battery case. I had to drop the pair down a bit lower than the standard installation spot. [7]



Here's everything installed on the firewall. You can see the relays just below the battery.

Next up, firewalls recess, then the engine mount.

1. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1215.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1215.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1217.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1217.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1222.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1222.jpg)
4. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1221.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1221.jpg)
5. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1220.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1220.jpg)
6. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1223.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1223.jpg)
7. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1226.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1226.jpg)

### 3.7.5 Received Engine! (2017-08-28 22:05)

Today I received my engine! Its AWESOME! I ordered mine from Superior Air Parts. The engine is an XP-IO360-B1HD2. It's 185hp with a cold air induction system and duel P-Mag electronic ignitions. It's going to be incredible! [1]



[2]

341



Here's a shot from the back of the engine, you can see the two P-Mags on the back (gold and black) on either side of the oil filter. The oil filler neck is on the right side behind cylinder 3.

I'm setting up a large order from Vans that include a lot of the firewall forward kit components, but I need to delete several things because of the custom configuration of my engine.

1. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1280.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1280.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1281.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1281.jpg)

### **3.7.6 Installed engine mount (2017-08-30 22:12)**

Tonight I wanted to mount the engine mount in preparation for hanging the engine in a few weeks. It took some force, but I managed to install it tonight. [1]



I only have the 4 outside bolts installed. The remain two on the bottom I didn't install yet because I need to fabricate some shims. [2]



Here you can see the gap between the engine mount and the firewall. I'll fabricate a small shim and then I'll install the remaining two bolts.

Next up is to install the landing gear!

1. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1288.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1288.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/08/img\\_1289.jpg](https://n890gf.com/wp-content/uploads/2017/08/img_1289.jpg)

## 3.8 September

### 3.8.1 Installed landing gear (2017-09-04 19:44)

Today I spent a few hours installing the landing gear and wheels. It was an extremely tight fit, but by design. [1]



Here's the right landing gear bolted in place and torqued. This will be painted over. Same as the left. [2]



It looks so cool. [3]

346



The plane is much taller now that it's on its gear. Still a few things to do before mounting the engine. But it's getting close.

1. [https://n890gf.com/wp-content/uploads/2017/09/img\\_1335.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_1335.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/09/img\\_1333.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_1333.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/09/img\\_1337.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_1337.jpg)

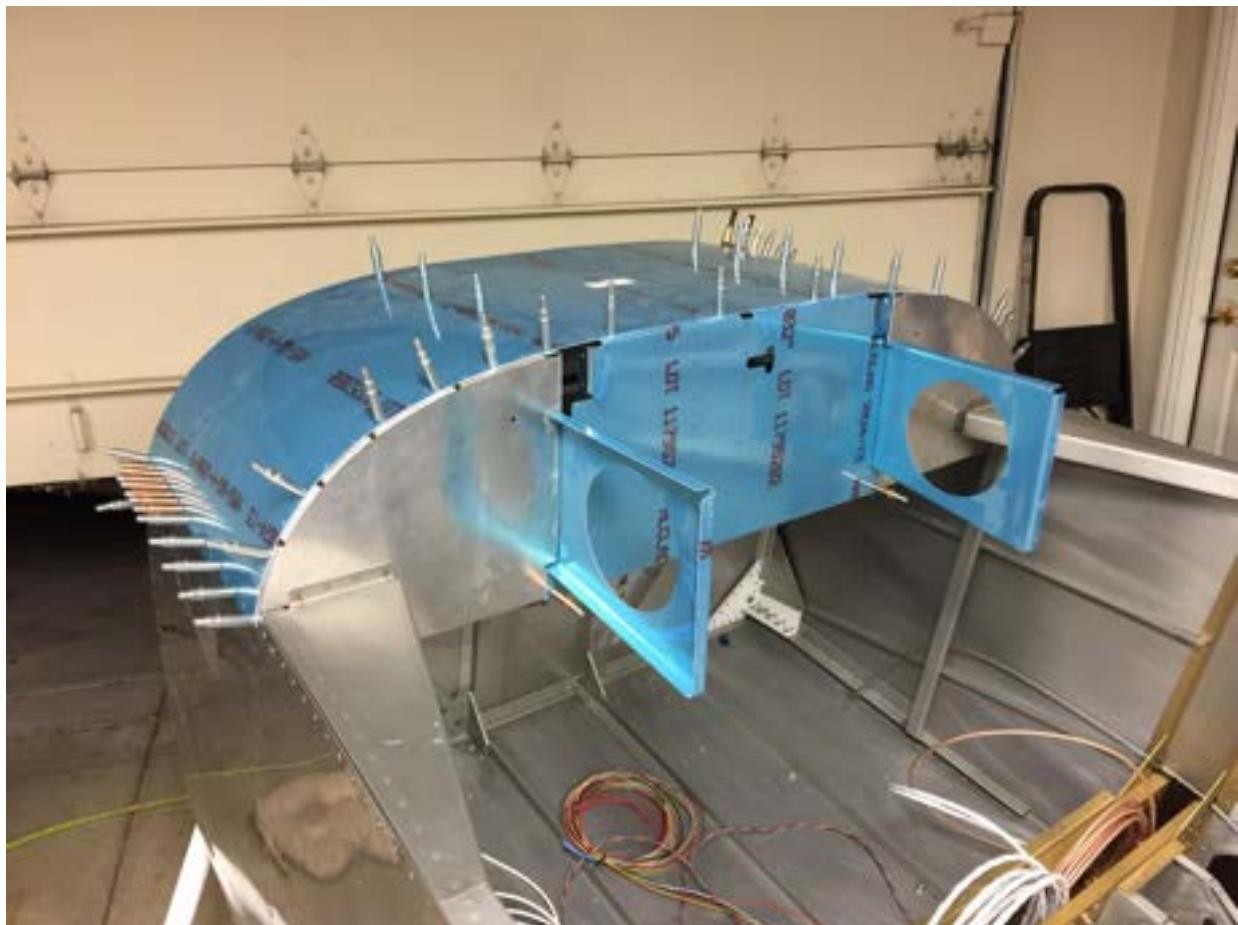
### **3.8.2 Front deck (2017-09-18 11:37)**

This weekend I spent nearly 20 hours working on the project. It was extremely satisfying to get quality time on it. [1]



I spent the time working on the panel, subpanel and forward ribs and forward top skin. Here's the center sub panel with the forward channel.

[2]



Here's the subpanel installed with the top skin fitted. I spent some time with the alignment to ensure he structure was straight. [3]



I then drilled the top skin to the firewall flange. You can see it clecoed here across the top.

I then made the seal support flanges for the subpanel and prepped and riveted the sub-panel components together. The center subpanel is separate from the two outboard panels in order to install it in the fuselage.

1. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2818.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2818.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2030.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2030.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2785.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2785.jpg)

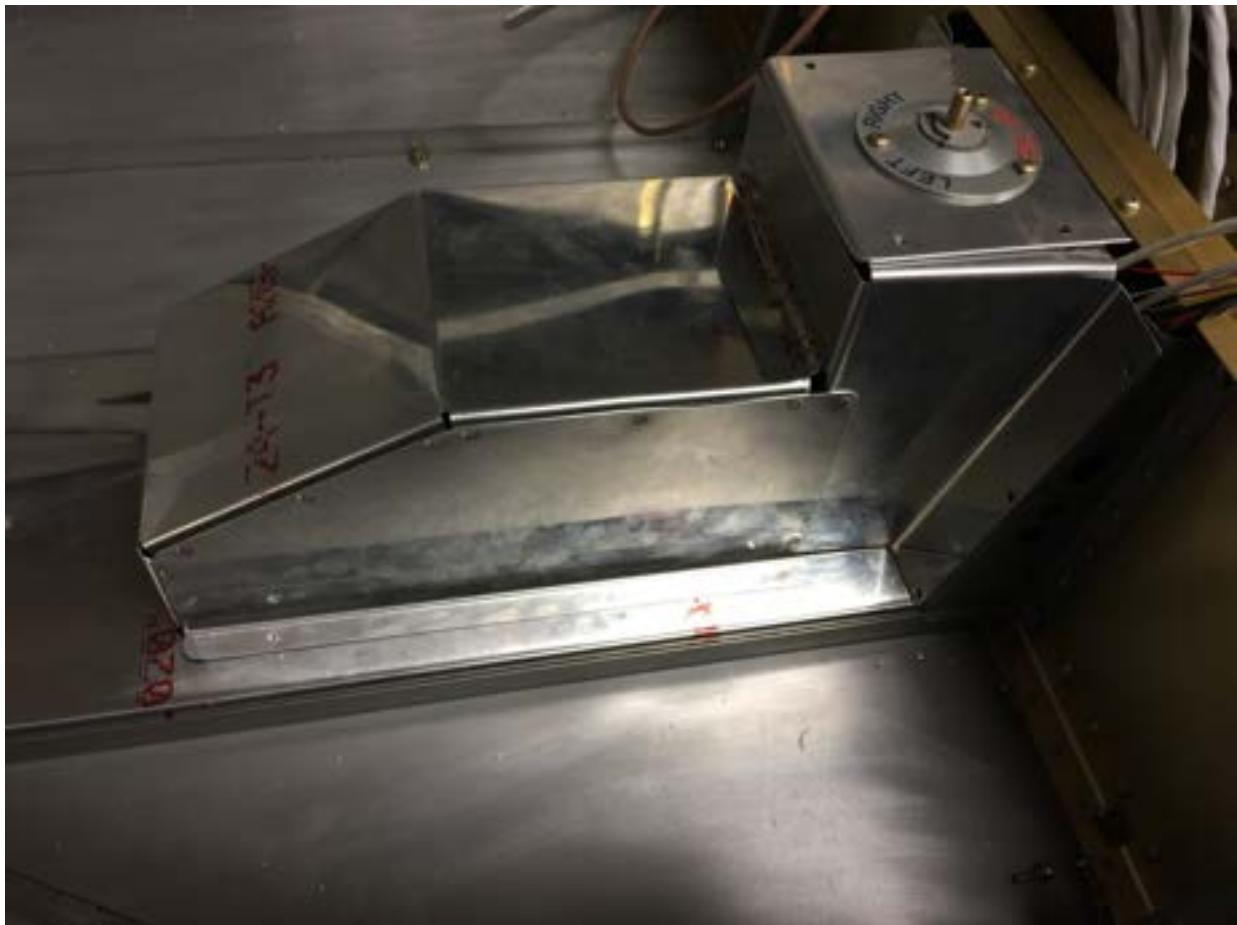
### **3.8.3 Center console (2017-09-24 23:52)**

Today I spent the day working on the center console and fuel pump and covers. I started by installing the heater baffle to the center floor cover. [1]



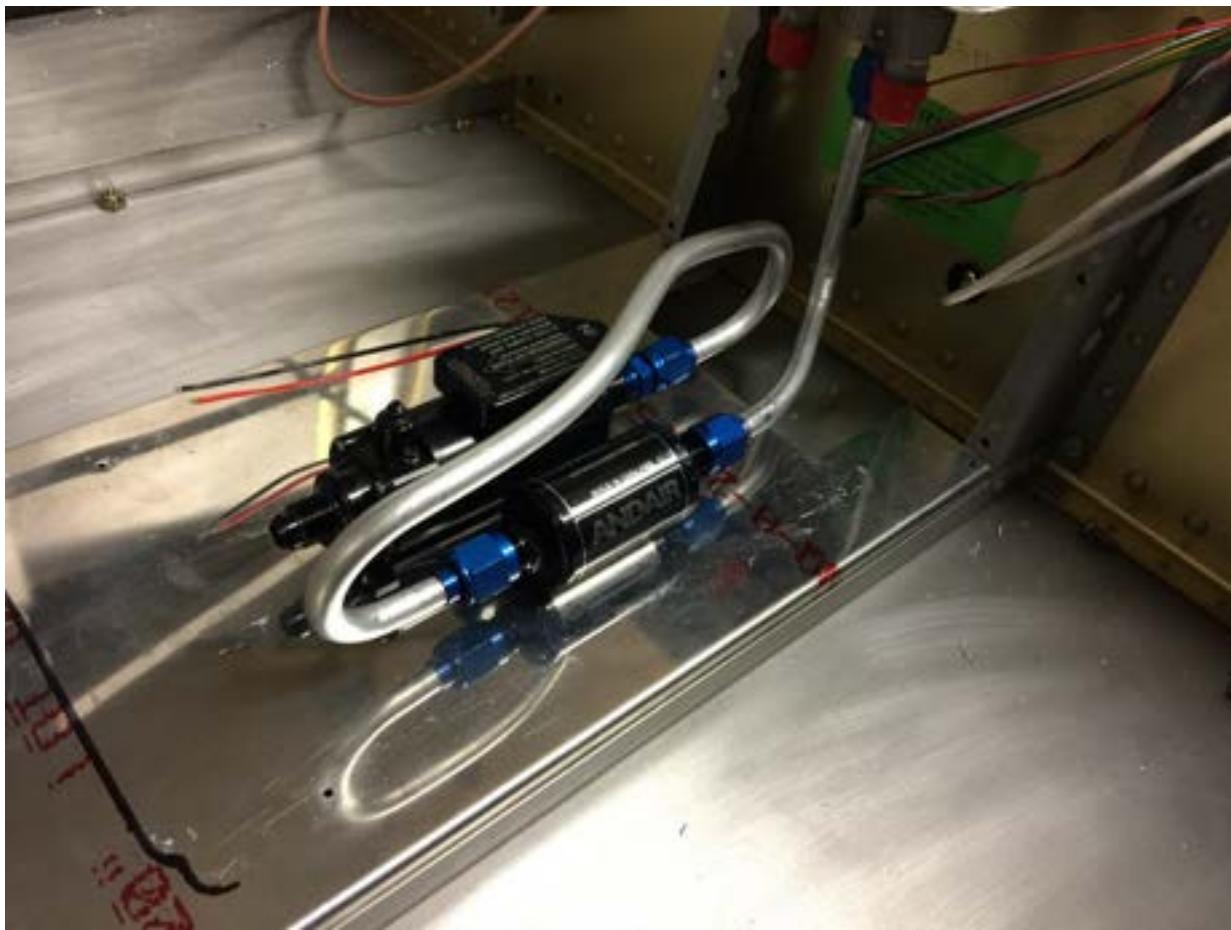
You can see the baffle installed here in the center of the image. It will guide hot air into the cabin and out the vents on the right.

I then installed the fuel selector valve and the fuel pump cover to figure out where it will align. [2]



Here's the fuel pump cover in the left side attached to the fuel selector cover. I riveted these together and will make the pair removable as opposed to making them separate.

I then began experimenting with the fuel pump and the selector fuel line. I'm going with the Andair pump and filter, which is longer than the one from Vans. I tried to bend a fuel line from the selector to the fuel filter but it was not far enough back to fit under the cover. I ended up going with a side-by-side setup below. [3]



Fuel will come from the wings to the selector and then down through the filter and back to the pump. This will allow me plenty of space to fit the pump under the cover which is marked by the black line on the left. The output of the fuel pump will route down under the cover and then forward to the firewall.

#airplane #aviation #avgeek #homebuilt #rv7 #vansaircraft #privatepilot #pilot #flying #aerobatics #generalaviation #avnerd

1. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2137.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2137.jpg)

2. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2136.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2136.jpg)

3. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2133.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2133.jpg)

### 3.8.4 Vent lines (2017-09-30 22:41)

Today I made the vent lines for the fuel tanks. I installed the vent elbows in the sides of the fuselage and then began measuring the length for the tubes. [1]



Here you can see the AN818 fitting. Mirrored on the right side. This will attach to the fuel tank in the wings. [2]



Here is the inside of the fuse. The vent line snakes up and around then attaches to the floor vent. [3]



Here's the left side. The tube bends around the stringer and the rudder cable, then bends around the perimeter. A lot of the bends had to be made by hand, and it's quite tough.

[4]



Here's the complex bend around the cable.

358

The pair of the vent lines will be installed and then I can begin installing the other cabin systems.

1. [https://n890gf.com/wp-content/uploads/2017/09/img\\_2186.jpg](https://n890gf.com/wp-content/uploads/2017/09/img_2186.jpg)
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## 3.9 October

### 3.9.1 Engine work (2017-10-01 20:50)



Today I spent a few hours cleaning the shop and installing some fittings on the engine. My goal is to hang the engine next weekend.

I started by rotating the prop governor and installed the cable bracket. [1]



I cut the safety wire on the six screws holding the governor so that I could rotate the lever arm. I then installed the cable bracket in white and reinstalled the screws and re-safety wired them.

I needed to install the oil cooler fittings, but that requires removing the right p-mag. Once off I could easily screw the fitting in. [2]



This is the fitting installed and with tape over it to keep moisture out. You can see how tight it is to get a wrench on there.

The other oil fitting is much easier. [3]



The fitting (with tape over it) is right above the left p-mag and just under the oil breather tube (with the red cap).

I also installed the fuel pump outlet and fitting for the fuel pressure. [4]

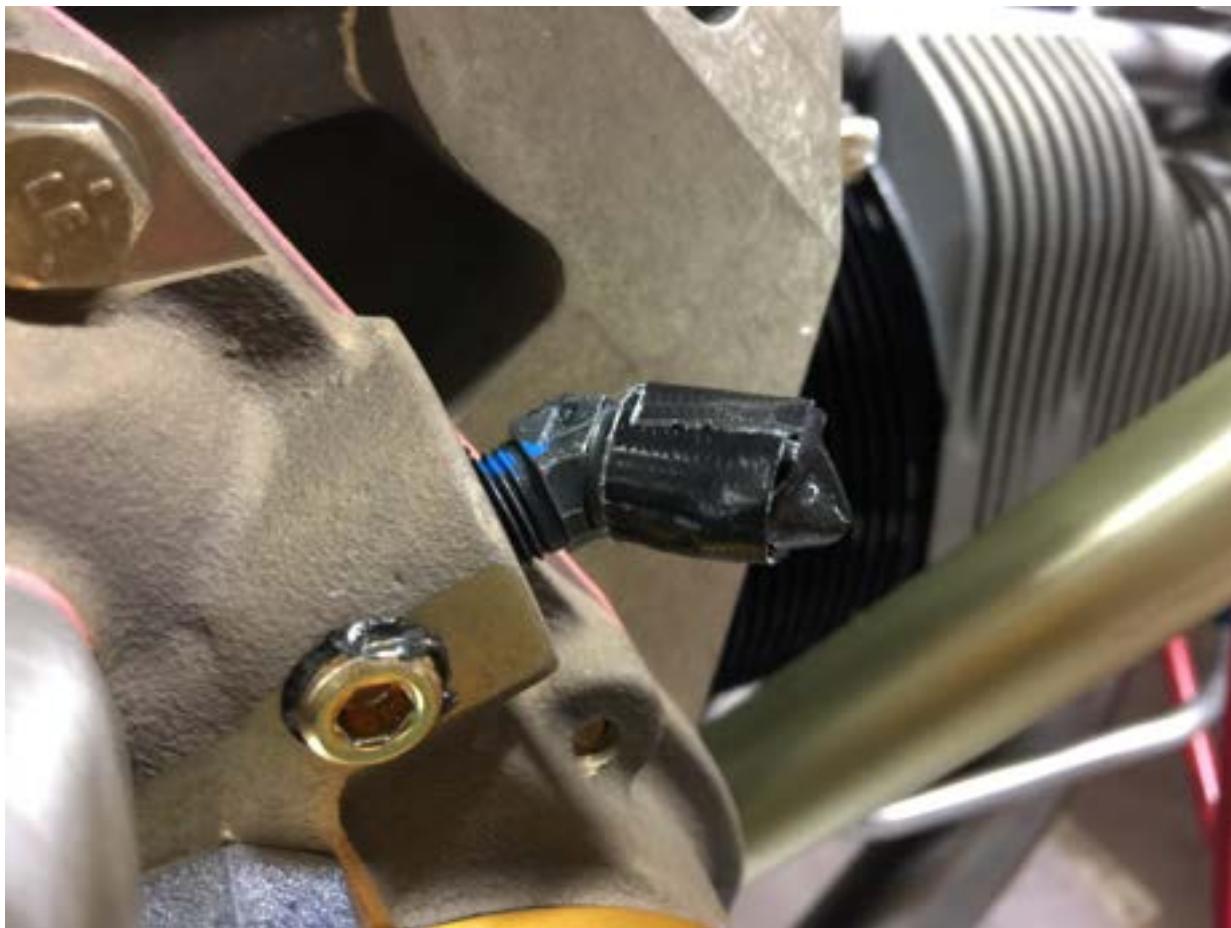


Fuel will come out the bottom port and go to the fuel servo near the front of the engine.

I also installed the oil pressure fitting

[5]

363



And the manifold pressure fitting from the number 3 cylinder. [6]  
364



You can see it here wrapped in tape just above the oil return line.

I finally installed the fuel overflow fitting to the fuel pump. [7]



There are a few more things to install, but that can be done after the engine is hung. There are a few more holes I need to drill in the firewall for cables and wires, but that's no more than an hour of work, and I'm hoping to get it done some time this week.

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6. [https://n890gf.com/wp-content/uploads/2017/10/img\\_2203.jpg](https://n890gf.com/wp-content/uploads/2017/10/img_2203.jpg)
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### 3.9.2 Hung the Engine! (2017-10-08 08:02)

Yesterday I hit a huge milestone. After many weeks of prep for this moment, I have officially installed my first airplane engine! It was more difficult than I thought, but everything lined up great once I figured out the technique.

First a huge thank you to my uncle for helping me out, definitely needed his strength and even one of his tools.

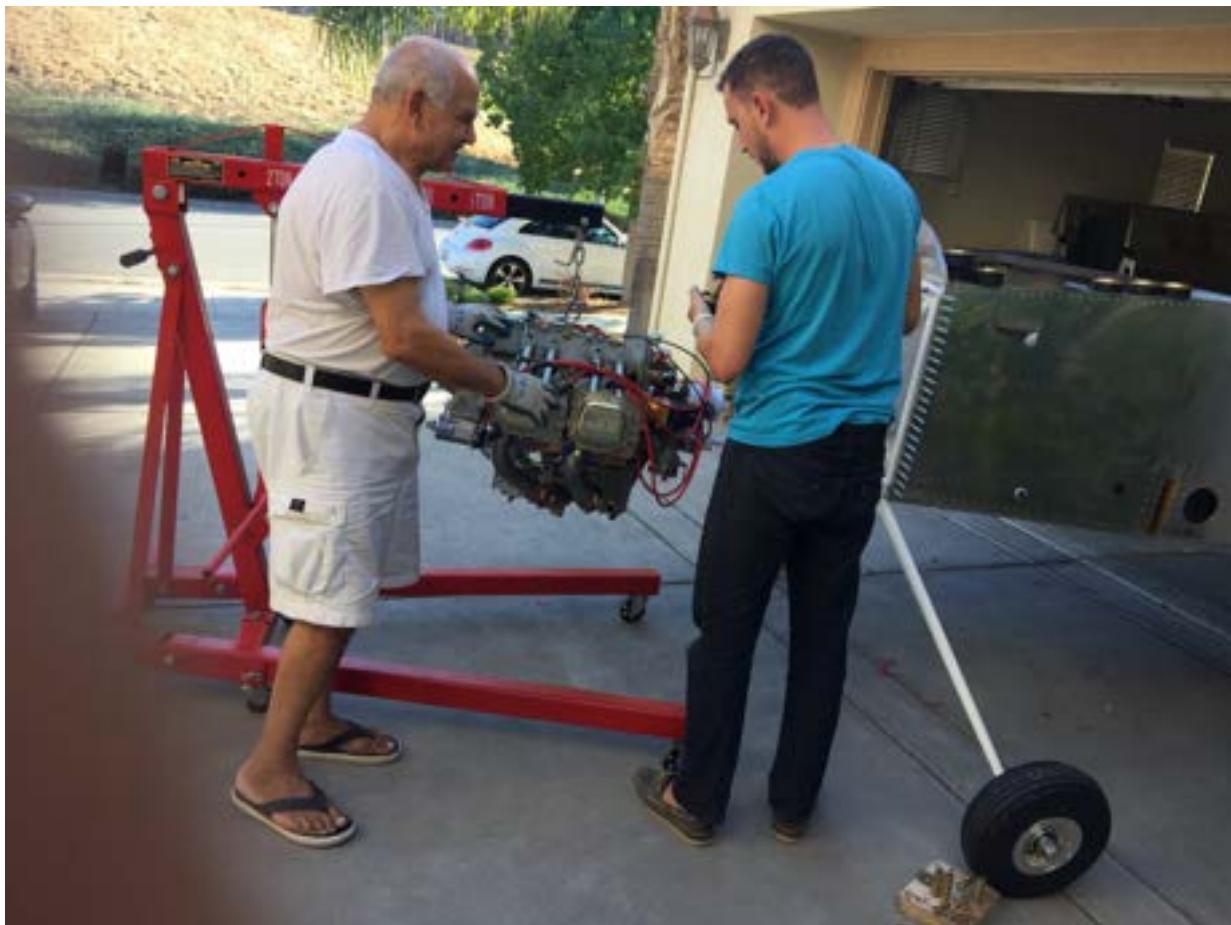
We began by repositioning the plane into the shade, and I propped the tail up on one of my saw horses to bring the nose down a bit. [1]



We then hoisted the engine and rolled it to the plane. [2]



It was a bit nerve wracking, but the hoist was pretty stable. [3]



The alignment process was quite tricky, and getting even one of the bolts to align took some wiggling and repositioning. [4]



With a dynafocal type 1 Mount, the bolts converge on the CG of the engine *when tightened*. This made it difficult to align everything initially until we tightened everything down.



Removing the hoist and letting it hang was one of the coolest things ever!



I got everything back into the garage and will begin installing some of the engine instrumentation and continue moving forward!

1. [https://n890gf.com/wp-content/uploads/2017/10/img\\_2251.jpg](https://n890gf.com/wp-content/uploads/2017/10/img_2251.jpg)
2. [https://n890gf.com/wp-content/uploads/2017/10/img\\_2252.jpg](https://n890gf.com/wp-content/uploads/2017/10/img_2252.jpg)
3. [https://n890gf.com/wp-content/uploads/2017/10/img\\_2255.jpg](https://n890gf.com/wp-content/uploads/2017/10/img_2255.jpg)
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## 3.10 November

### 3.10.1 Canopy frame (2017-11-24 21:45)

Yesterday I spent a few hours working on the canopy frame components.

I started by cutting the plastic bushing blocks for the canopy frame hinges.

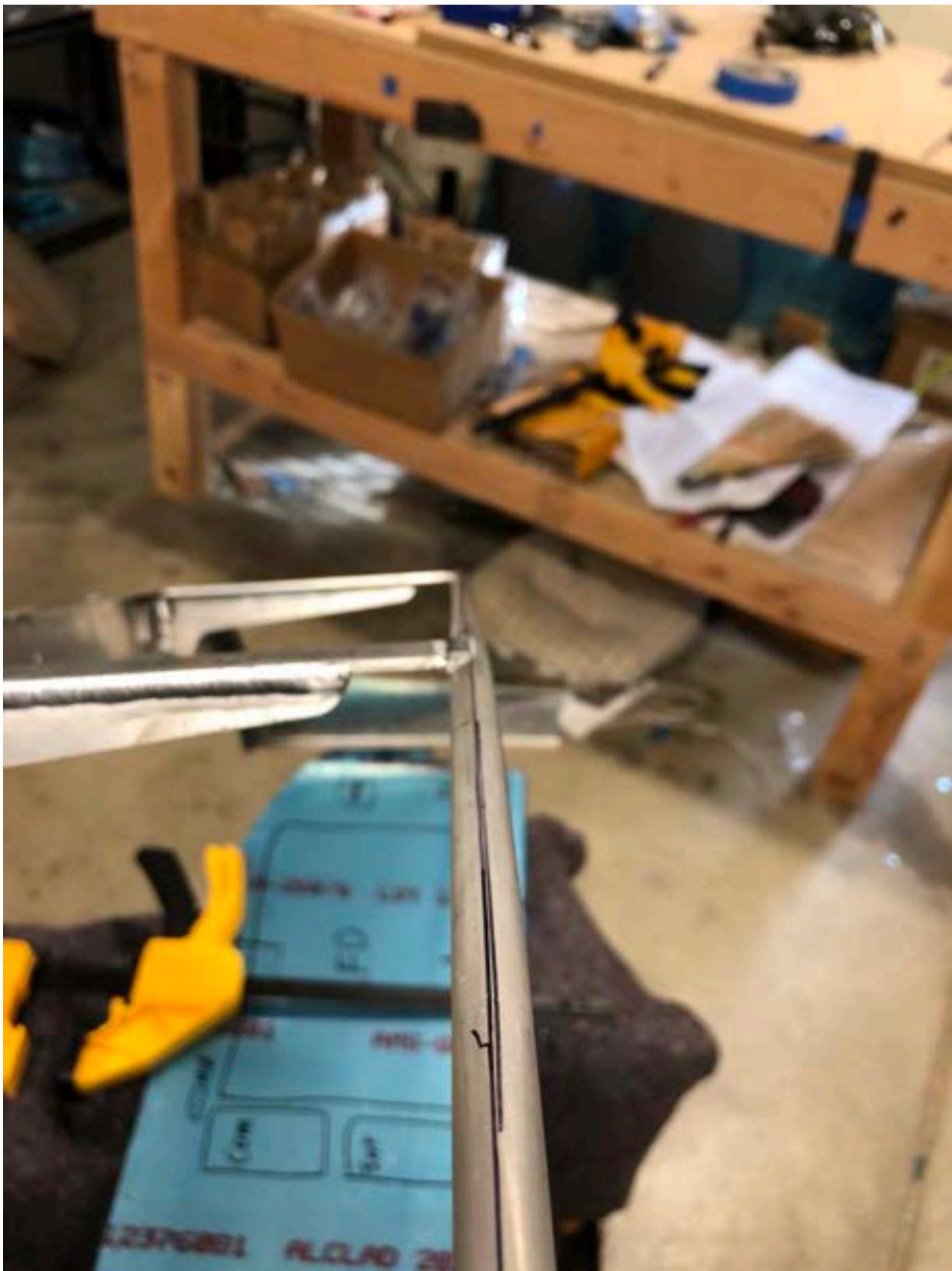




I then fit the blocks into the sub panel. Then installed the top skin



I then got the canopy frame out and prepped it by drawing a line down the center tube of the frame.



This is used to align the frame skin for drilling into the tube.

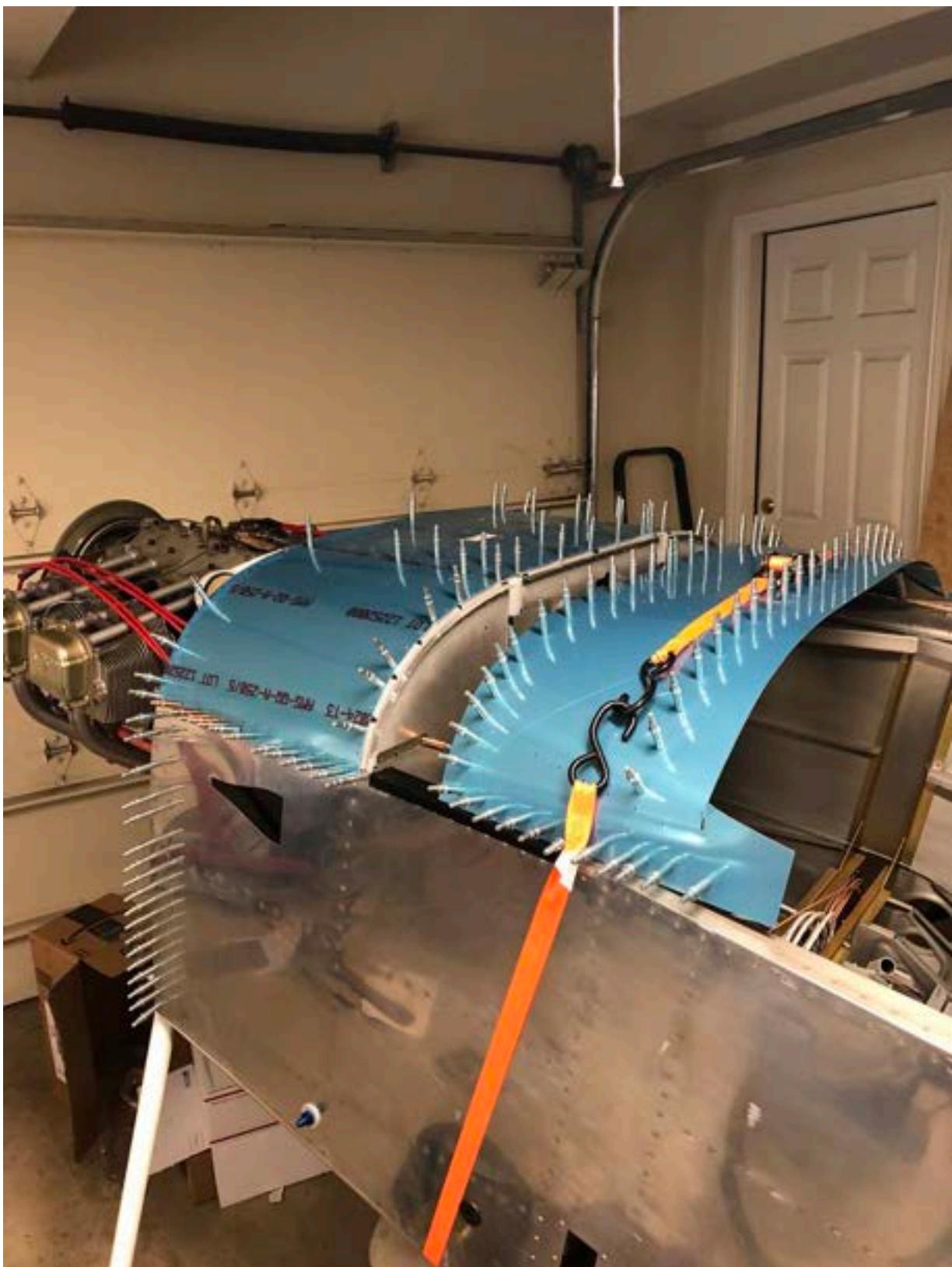


Here's the skin clecoed onto the frame at the forward end. I will drill the remaining holes through the skin into the frame.

Next up is to fit the frame and hinges to the sub panel and bushing blocks, then align everything and drill the hinges.

### **3.10.2 Canopy hinges (2017-11-25 19:06)**

Today I spent most of the day working on the frame fitting and hinges.



I started out by clecoeing the skin to the frame and forward fuselage. I'm using a strap to tighten everything down.

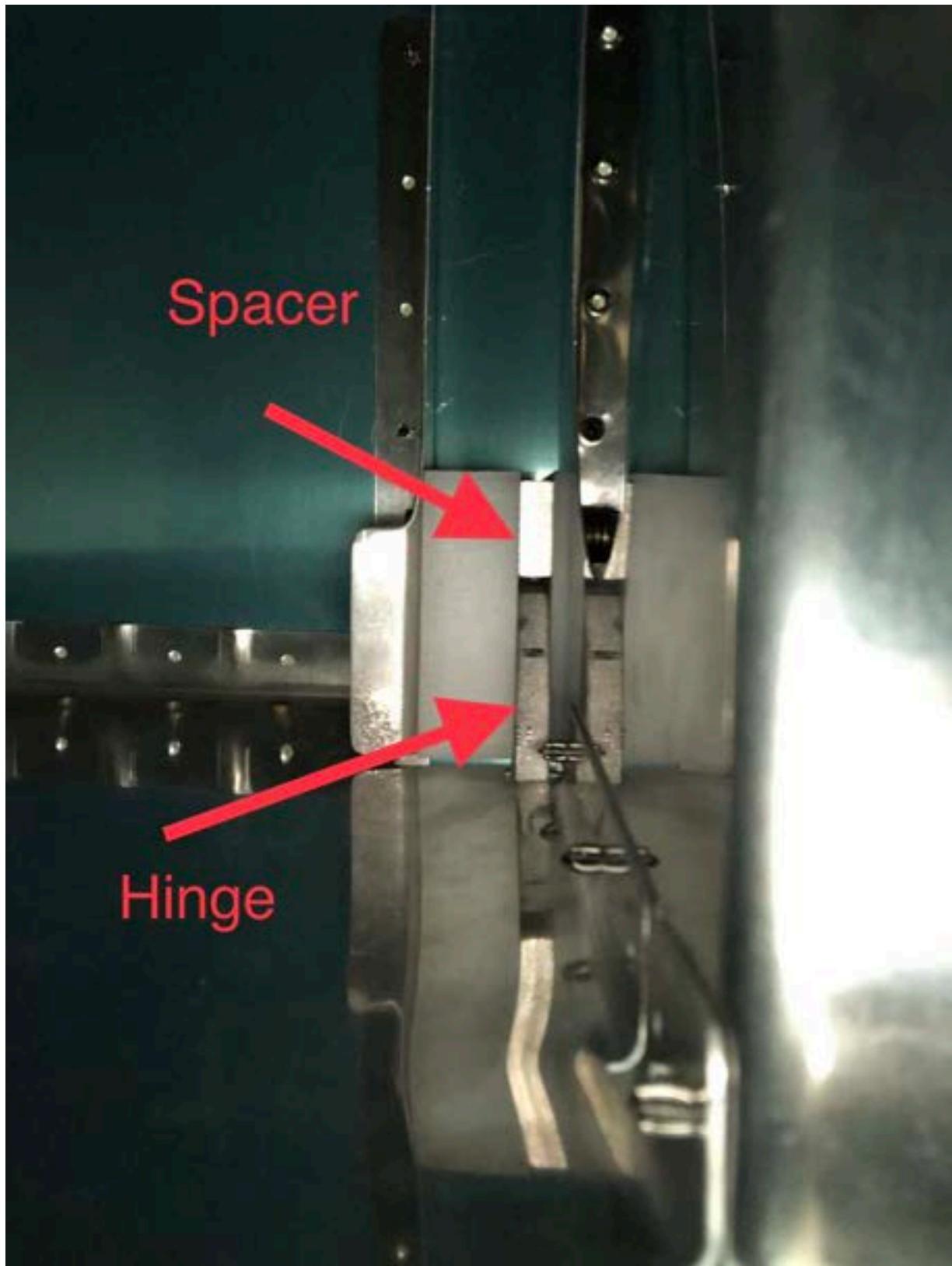


Once I got everything lined up, I tightened the strap and some clamps to get the skins to line up.





Here you can see the clamps holding the frame down, and the alignment of the skins. I have a uniform gap all along the skins. I also ensured that my hinge spacers have enough clearance from the hinges.



Here you can see the spacing between the spacer and the hinge. I've read that this has caused problems for people, so I made my spacer 1/8th of an inch narrower.

I then lined everything up and drilled the splice plate for the frame.



Initially drilled to #40, this allows for some adjustments if necessary. I also drilled the hinge joints to #30, where the hinge meets the cross rib.



After everything was drilled I removed the canopy frame and the skin and prepped everything, primed required surfaces, and riveted the frame together.

I didn't get any pictures of it, but i drilled the canopy hinge holes to 1/4" and then enlarged them to 3/8th for the bushings. I then fit the frame to the fuselage and immediately had interference from the canopy seal supports.



This picture shows the gap between the frame (on the left) and the seal (wavy on the right) with the blue film in the gap. This is a nice gap, however when rotating the frame up

the center portion of the frame hits the center seal. I will file it down until it swings freely.

### 3.10.3 Canopy frame (2017-11-26 20:09)

Today I spent some time working on the canopy frame side rails and ribs.



Here's the frame attached and pivoted forward to check the clearance. I then got the side frame pieces out and prepped those, along with the attach brackets for the frame.

Here you can see the side frame drilled and clecoed to the rib



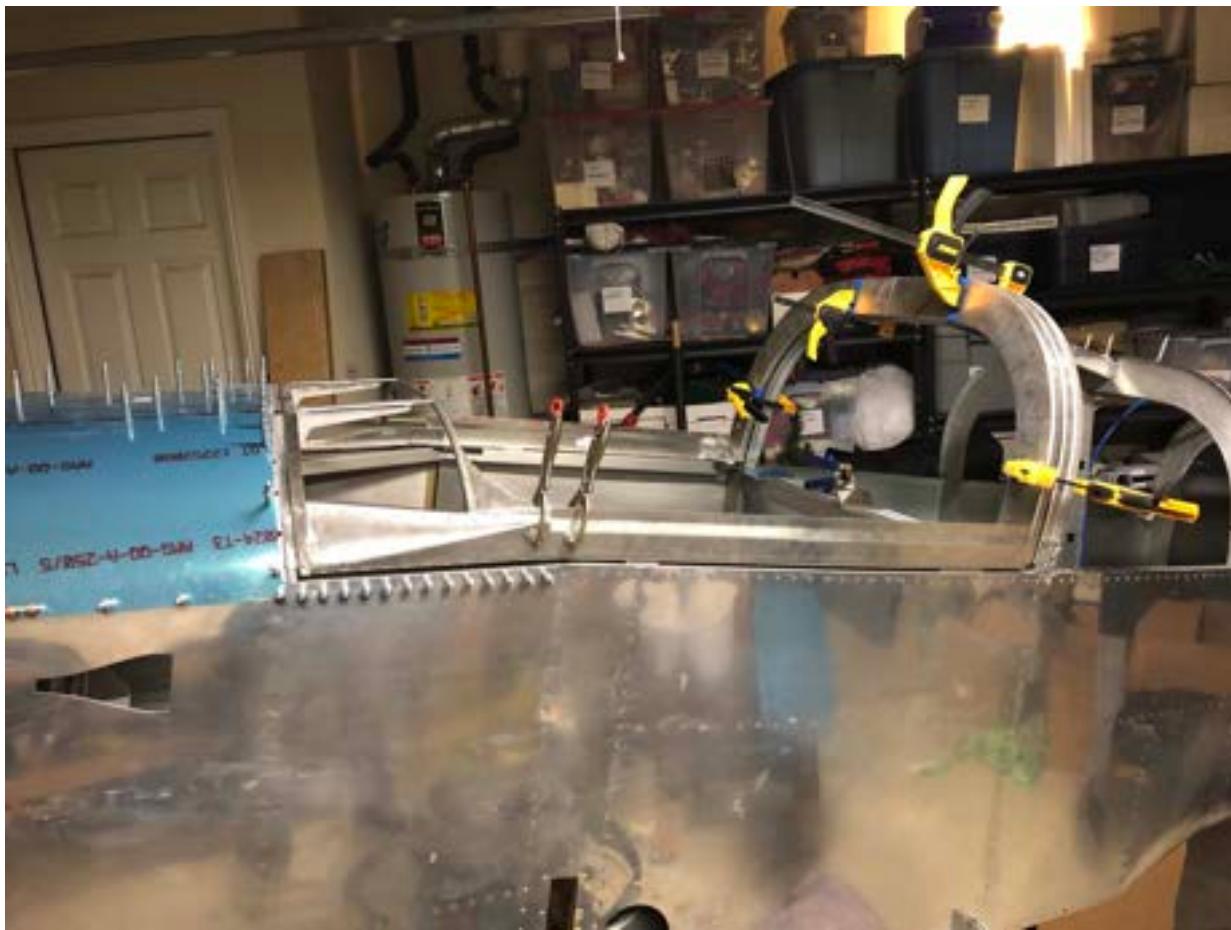
And here is the side frame attached to the forward frame.



I then drilled the side brackets to both pieces.



The gap you see between the splice bracket and the frame on the left will be filled with a wedge.

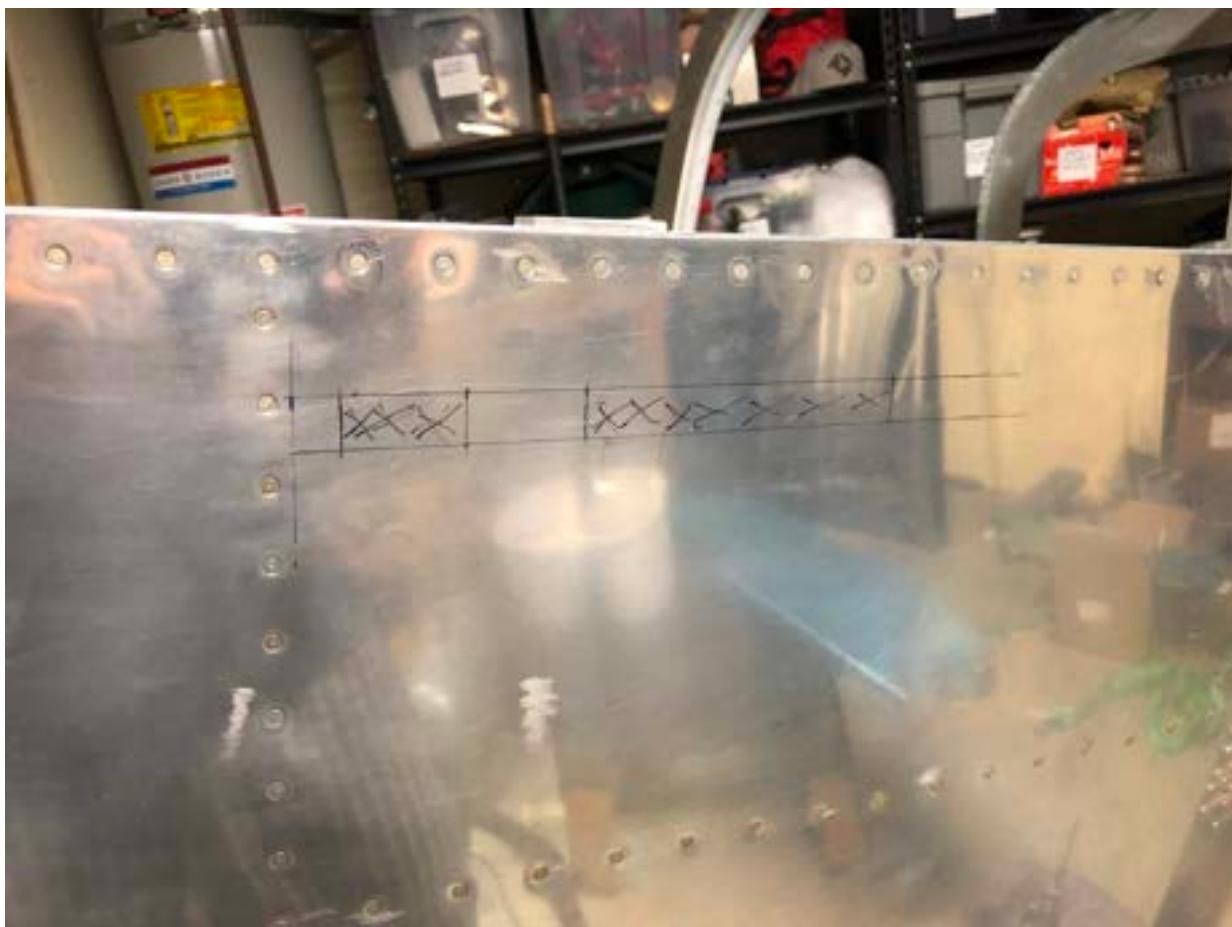


This looks so cool!

### 3.10.4 Canopy latch (2017-11-29 19:58)

Today I spent a few hours working on the canopy latch. I'm going with a latch from JDAir that is a nice machined aluminum.

I started by measuring and marking the side skin for the latch cutout.



It's slightly different from the plans due to the thickness of the latch.

I then measuring and aligned the latch angles.



The notch in the top angle is for the ball joint that activates the canopy latch fingers. I'll work on that tomorrow.



The thickness of the skin is 0.032" so I installed the latch with that offset in order for the latch to sit flush with the skin.



### 3.11 December

#### 3.11.1 Canopy latch (2017-12-01 08:01)

Yesterday my friend Mina came over and helped me out with some canopy latch work.

We started by fitting the rear latch to the fuselage.



This is the latch spanning the width of the fuse. We clamped it in place and then back drilled the holes through the fuselage bulkhead.



Here you can see the two bolts through the bulkhead.

While Mina was working on the latch fingers and mechanism, I spent some time on the skin cutout for the latch.



This is the cutout beginning to take shape. I'll need to finesse it a bit more to get everything to fit perfectly.

Here's the latch lever attached to the rear latch mechanism.



Once I finish the skin cutout I will fabricate the push rod that attaches this lever to the latch.

### **3.11.2 Canopy (2017-12-14 19:49)**



Last weekend I started on my canopy. I did the initial trim cuts to get rid of the clamping flange.



Here's the canopy on the benches with the rear flange marked for cutting. I cut all four sides off.

Today I spent the whole day working on the canopy, trimming it to fit.



Here's the canopy sitting on the plane for the first time. The forward flange is still very large and needed to be trimmed significantly.



I then made the first trim cut, and the canopy fit much better. It took a few iterations before getting the fit nice.



Here you can see a small 1/32nd inch gap on the side of the front of the canopy.



Here's the center where the gap is slightly bigger, about 1/16th of an inch. I'm really happy with this fit, but needed to pull the sides in a bit. I cut a more gradual curve where the sides started curving in.



I then lined everything up, and taped the canopy in place for final measurements. I then laid out tape along the cut line for the "big cut".



I'll do this cut tomorrow.

I'm glad the canopy is fitting nicely. I was worried that the shape of the canopy was going to be tough to get right.



I will say it looks super cool, starting to really come together!

### **3.11.3 Big Cut (2017-12-15 23:29)**

Today I spent a few hours in the garage working on the canopy. Goal for the day was to make the big cut.



I started by putting the canopy on my work bench and screwed down some scrap wood to hold  
410

he canopy in place. The whole cut took about 15 minutes, mainly because I had to wait for my air compressor to catch up.



I set up some space heaters under the canopy to keep everything nice and warm. Temp was about 85 when I made the cut.



The cut was nice and straight and I finished the edges with my file and some sand paper.  
412



I then put the forward section back in the plane to check the alignment. With the top rear section lined up with my centerline, the sides shifted forward about 1/8th of an inch. This should relax back when I make the final cuts along the front of the canopy.



# 4. 2018

## 4.1 January

### 4.1.1 Hoses (2018-01-01 09:25)

Happy new year!

Yesterday I got a box of hoses from Tom at TSFlightlines. First and foremost, I want to say that it was some of the greatest service I've had from any supplier during my project.

A couple weeks ago I sent an email expressing interest, and Tom immediately responded. A few back and forth emails and I was out in the garage measuring hose runs.

I put together a list of lengths and applications, packed up a box of my existing hoses that came with the engine, and shipped them to Tom.

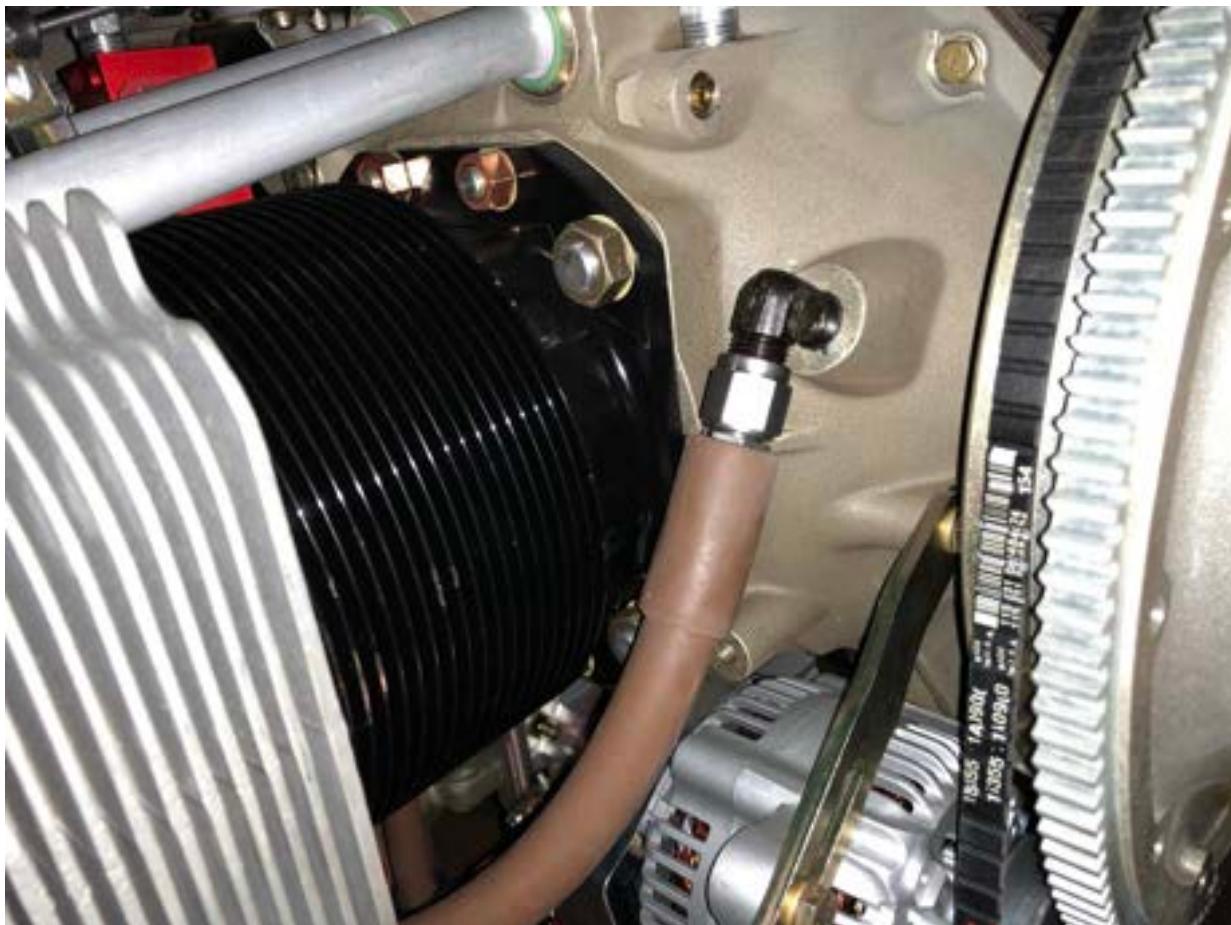
Tom let me know he received my package and almost immediately he turned it around and shipped me my finished hoses. It was incredible service. I opened up the box yesterday, and in about 10 minutes, all the hoses on the plane were installed, everything lined up perfectly. It was one of the easiest things I've done thus far on the project. I will also say, the price for the hoses and service is incredibly reasonable and worth every penny. I highly recommend them!











#### **4.1.2 Installed ELT and ADS-B (2018-01-08 09:28)**

The goal for the weekend was to install the Vans ELT mount and the ELT in the plane. It's mounted on the right side behind the baggage bulkhead. The Vans mount has you use blind rivets to attach the bracket on the stringers than run along the side of the fuselage. It's extremely difficult to get the rivet squeezer into the right position to drive the rivets properly, but I managed. I also decided to install the ADS-B module on the same bracket because there was plenty of room.



Once I had everything in position I ran the wires through the conduit. This includes the harness for the ADS-B, the phone line for the ELT, the 3-conductor wire for the ELT power and gps, and the rg-400 coax cable for the ADS-B antenna. I somehow managed to fit everything through the two conduits I have running under the seats. Only thing left to do is attach the antenna to the ELT and the ADS-B. By closing those two units out, the tail is now completely wired! Everything else will be forward of the seats and under the panel.

#### 4.1.3 Cables and wires (2018-01-10 22:53)

Today I spent a few hours working on the ELT DIN wire, which is the power, ground, and GPS serial Rx. This allows the ELT to transmit GPS location.



I soldered the shielded 3 conductor wire to the connector, insulated it with some silicone, then soldered the short 4th wire, which is connected to a small LED to test the gps

signal. Once that's verified as working, that short wire gets cut and insulated against cable coming from the connector.

I also measured and cut the coax cable for the ADS-B antenna. It's routed through the center rib near the pitot tubing.



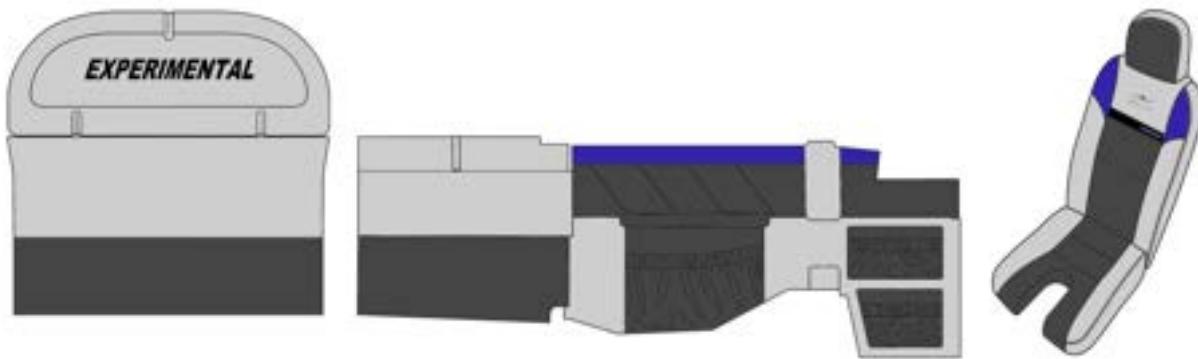
Here you can see the elevator bell crank in its forward most position. Plenty of clearance to everything routed there, and considering the way I have things secured there is no

relative motion between the antenna, pitot/AOA tubes, and the surrounding structure. I then crimped the BNC connector on the other end and connected it to the module.



I then spent some time experimenting with the Engine Module location and sensor harnesses. Once I install the rudder pedals I can rivet the panel sub structure and begin systems installation. It will be temporary, just to make the wire harness, then things will be removed for the interior painting that I will do.

I also confirmed and placed the order for my interior. I am going with Classic Aero Designs in Oregon. They have some really nice options and custom colors.



I am going with an all leather interior, with their Aviator seats, with the headrest option. The seats also have my N number embroidered and an RV-7 logo. I am very pleased with the service and support that I got from Classic Aero. A few back and forth emails and one phone call, and everything was figured out and the order placed. I am very excited about this!

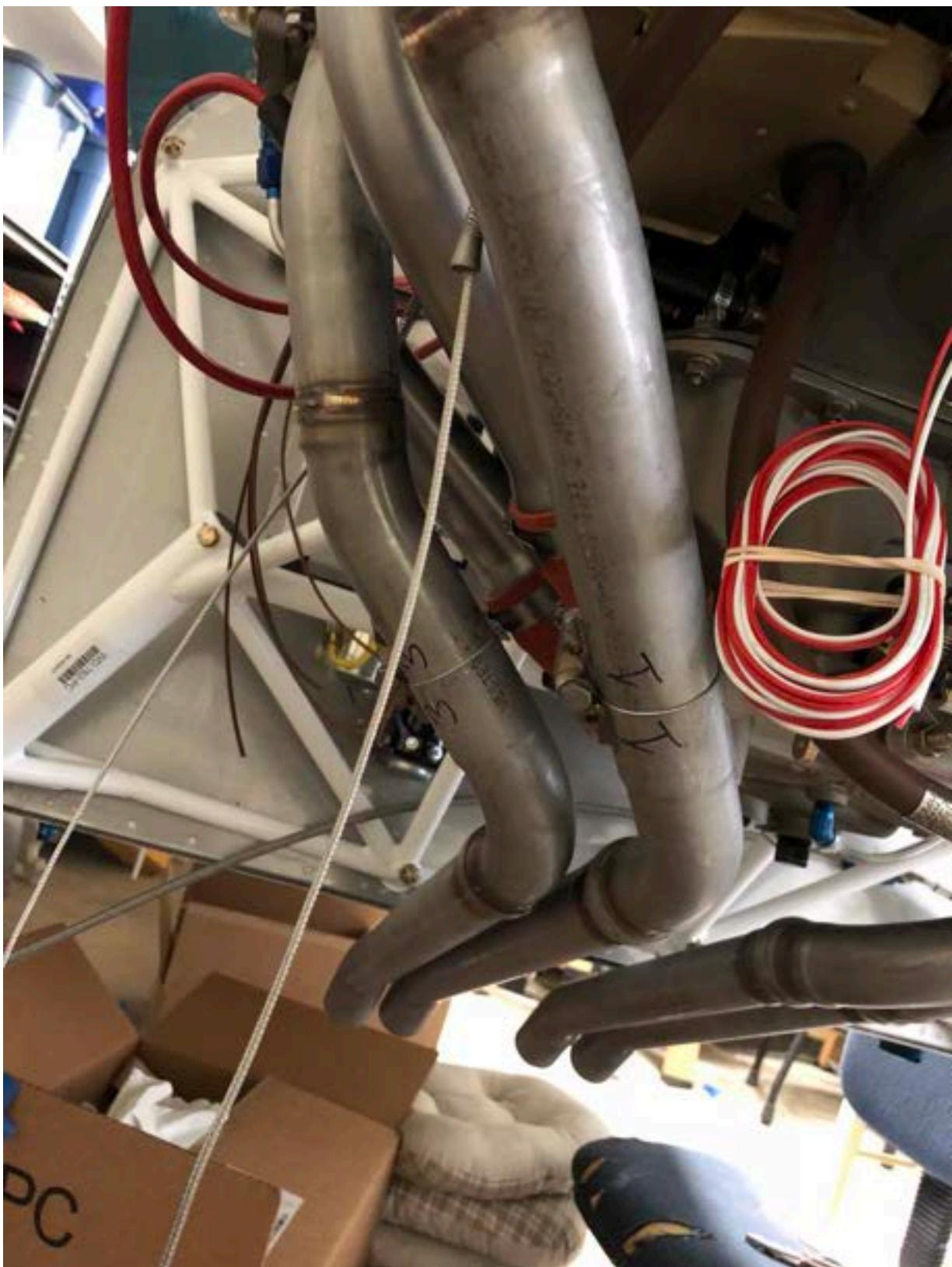
## 4.2 February

### 4.2.1 Exhaust (2018-02-11 14:17)

I received my exhaust on Friday. It's a special 4 pipe exhaust from Vetterman Exhaust. The standard RV 7 exhaust won't work with the Superior Cold Air sump I have on my engine. I spent a couple hours prepping and then fitting the exhaust on the engine.



(Ignore the boxes) one thing I need to do is still rivet the lower portion of the firewall where the exhaust exits the cowl. I will remove the lower half of the pipes at the slip joint.



I didn't take a picture of it, but I also installed the 4 EGT sensors. I measured down 2" from the flange. I wanted to keep it on the straight section before the first elbow so that I can

ensure identical distances on each cylinder.



I'll line up the ball joints on all 4 pipes and then fabricate the support bracket and in-

stall the heat muff. Then exhaust complete.

#### **4.2.2 Engine temp probes (2018-02-17 10:13)**

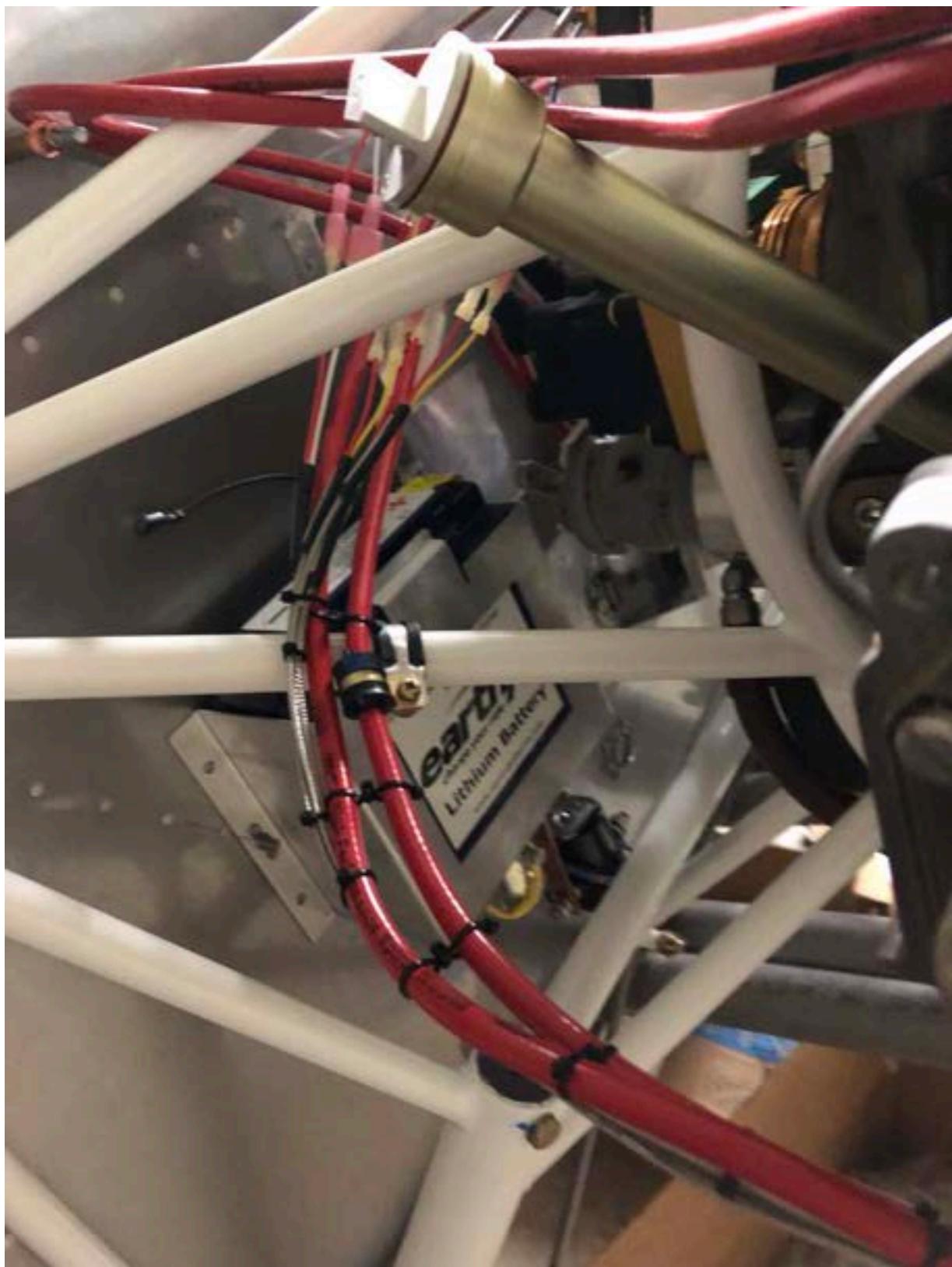
Yesterday I spent about an hour measuring and trimming the engine monitor temp sensors to their correct lengths. I then crimped on the blade style connectors that will hook to the EGT and CHT sensors. I still have to fabricate the fuel flow sensor wires and a few other probes in the engine bay before sealing off the wiring forward of the firewall.

#### **4.2.3 Wire organization (2018-02-17 17:39)**

Today I spent a couple hours finishing up the sensor connectors and wire routing for the ignition wires, and sensor wires.



Here's the left side of the engine with the wires secured and routed somewhat correctly. I will probably need to adjust it when I install the oil cooler.



I used some adel clamps and zip ties to space the ignition wires correctly and securely.



The routing behind the engine will need to be cleaned up and secured once I finalize everything.



#### 4.2.4 Engine baffle (2018-02-22 22:59)

Tonight I got started on the engine baffle. I had my friend Mike over to help out and it's a good project to jump in on. We went through the inventory and confirmed everything was there. Then he got started on deburring everything while I spent some time cleaning up the shop.



We got started kind of late but spent a solid 2 hours on it. Having help is always a great thing so I'm sure you'll see more of him as the project goes on.



Feels good to get back into the shop after a while.

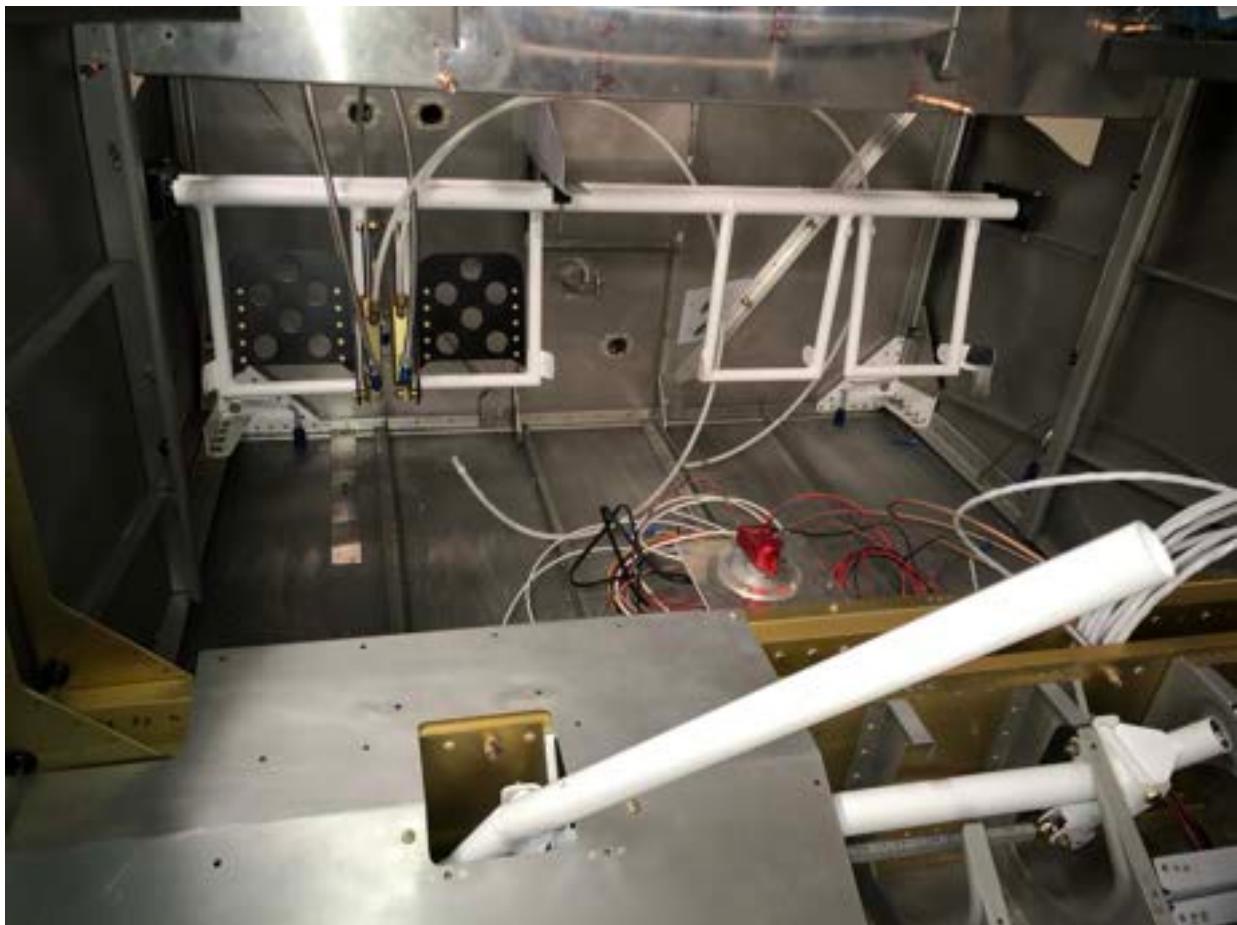
## 4.3 March

### 4.3.1 Baffle and rudder pedals (2018-03-09 22:48)

Tonight I finished deburring all the baffle parts. It's tedious because of all the unusual shapes and bends. I will go over it once more with a scotchbrite pad before final assembly.



I'm ordering my interior from [1]Classic Aero Design and I needed to provide the distance from the firewall to the approximate location of my heels will be. This required installing the rudder pedals (which nothing is preventing me from installing permanently) and then sitting in the plane and measuring to my heels.

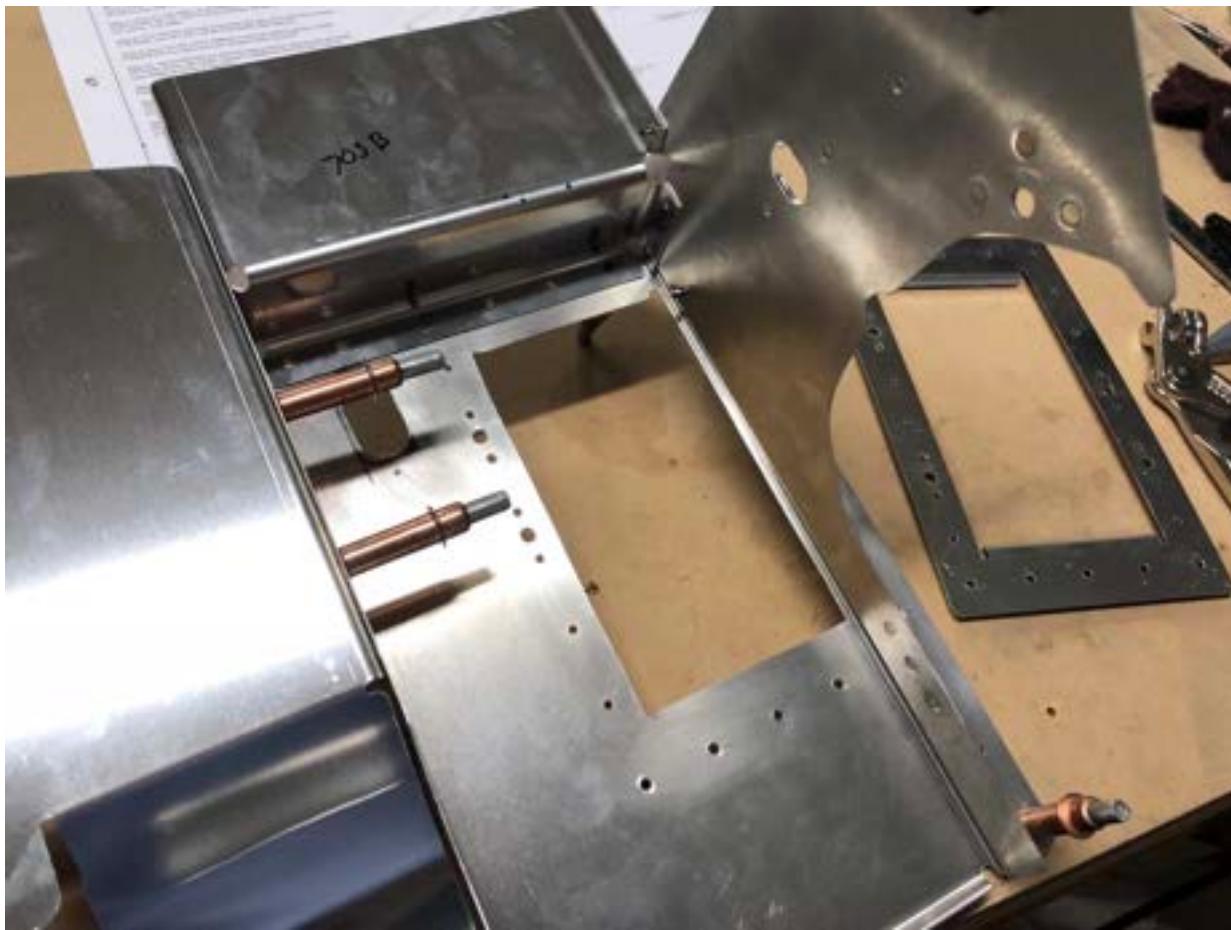


With the pedals installed, placed some cushions that were the correct thickness, and then sat in the plane. The distance from the firewall to my heels was approximately 10". I hope this is the correct measurement. The seating position felt pretty natural, except I might need to boost myself up with some extra cushions.

1. classic.aero

#### 4.3.2 Engine baffle (2018-03-18 19:01)

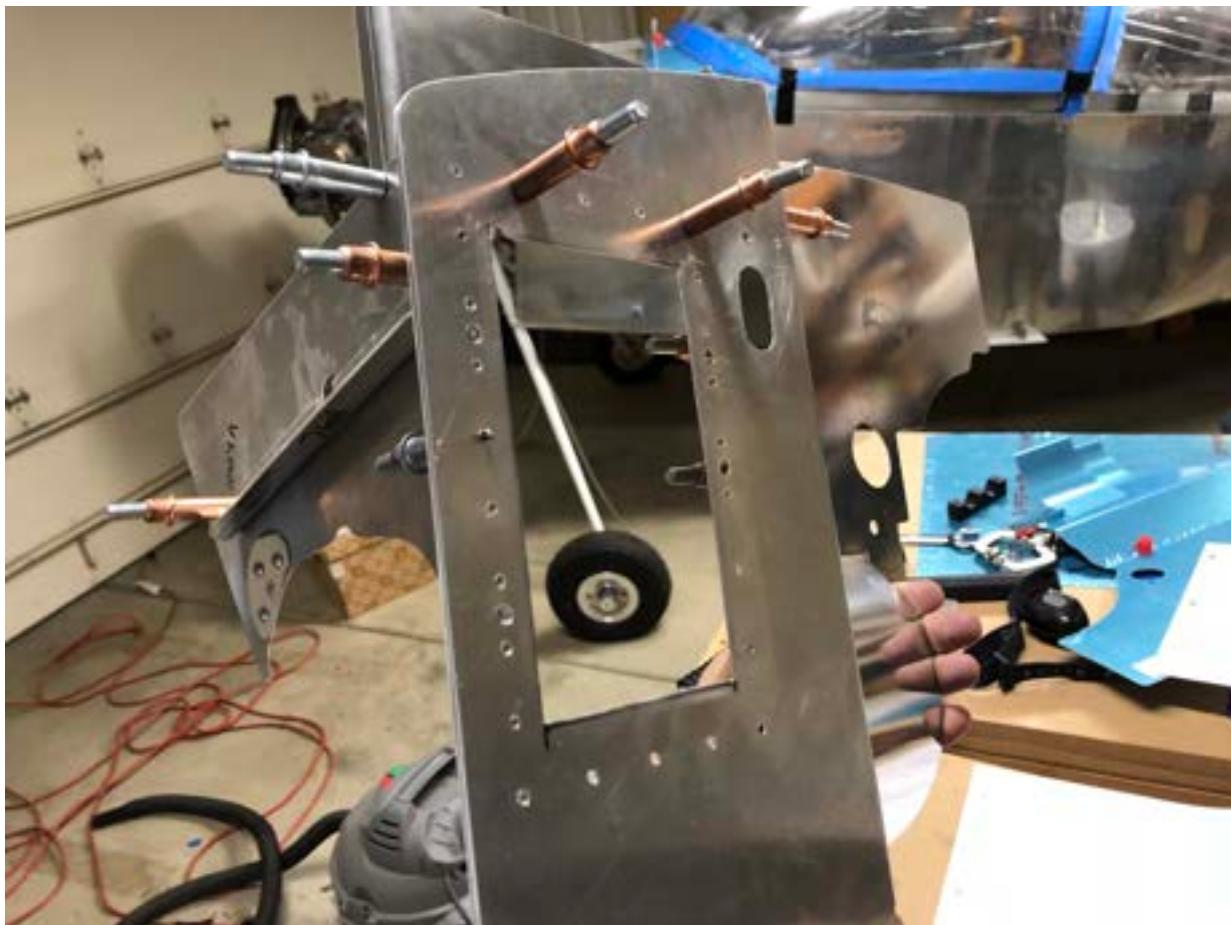
Today I spent about five hours working on the engine baffle. It's a very complex set of parts that connect and wrap around the engine.



I started by using the oil cooler doubler (fat right) to cut a hole in the aft baffle. You can see the part with the hole and the rivet holes match-drilled. I then clecoed the parts together to ensure everything was aligned.



I also installed the mounting screw doublers and the reinforcing rib.



Here's the back of the baffle. The oil cooler doubler and oil cooler mount here.  
440



I then test fit the baffle section to the engine. Everything lines up nicely. I also mounted the oil cooler to ensure everything can fit. The two oil hoses will attach to the inside of the oil cooler.



Here's the inside of the baffle where air will pass through the oil cooler. I mounted the cooler high enough to ensure the most air flow. If I need to restrict it because it's running cool, I can also cover part of the cooler.



Here's the oil cooler mounted to the baffle. The oil hoses are then attached to 90deg fittings into the cooler.

#### **4.3.3 More baffle work (2018-03-20 23:08)**

The metal work on the baffle is one of the most complex parts of the plane. I started out tonight by continuing on the right aft baffle.



I prepped and riveted all the doubler plates.





Here are the doubler plates riveted to the #3 cylinder baffle.



I also riveted on the heat muff air intake and screen. The stock intake from vans is quite flimsy. I might replace it with something stronger.

I'm waiting to rivet the side and aft baffle parts together before final fitting on the en-  
448

gine.

I then riveted the doublers on to the #1 and #2 cylinder baffles and test fitted them onto the engine.



It's starting to come together. I then began fitting the forward intake ramps and reinforcements.



I'm using a custom prop oil line from TS flightlines so the hole for the oil line will have to be slightly larger.



Here you can see a test fit. I'll have to crest a custom gasket to go around the hose to ensure no relative movement. There's a small amount of room around the hose, but I'll have to open it up a little bit.

#### 4.3.4 Baffle and pushrods (2018-03-25 20:41)

This weekend I spent a few hours continuing the work on the baffle. This primarily was focused on the baffle fit around the valve cover gaskets. I had the parts on and off several times to remove more material and then check the fit.

I then spent time on the inlet ramps.





Here you can see the left and right inlet ramps. The left ramp (cylinder 2) will also have the intake filter. This piece will get modified to accept the filter as well as the snorkel that routes

air down and to the air intake on the engine.



Just to give myself a change of pace, I spent some time making the remaining two pushrods. The elevator pushrods consist of a smaller rod that attaches the control sticks to the elevator bellcrank, and then from the bellcrank back to the elevators.

On a side note, my interior from [1]Classic Aero Desings arrived! I'm going with a full custom interior using the Sportsman2 side panels and Aviator seats. They are absolutely perfect and look SO good!



I'm not quite ready to install them just yet, but here's a sneak peak at one of the seats.

1. classic.aero

## 4.4 May

### 4.4.1 Received my prop! (2018-05-10 22:14)

Today it was Christmas in May! I got my prop delivered by American Propeller out of Redding, CA. I ordered a three blade MT Prop. It's a composite, constant speed propeller.



Tracy from American Propeller did a great job unloading it from the truck and placing it in the shop.



I had to make some room (still have to clean up a bit) to put the prop on the table. I will install it for the first time this weekend.



here's my hand on the widest part of the blade for comparison. It's a 72" diameter prop.



I took the spinner off and man is that some gorgeous machining and fabrication.

I'm thoroughly impressed with MT prop and I'm sure the performance will match.

#### 4.4.2 Propeller (2018-05-13 20:56)



Today I installed my beautiful MT propeller! It's a huge milestone!



I received it last Thursday, and I had to finish a couple other things that needed to be installed behind the starter ring, namely the alternator mounting bracket. I also took this opportunity to pull the starter and grind off the mounting boss that was interfering with the intake snorkel.



Here you can see it after I ground it down. Now the snorkel can fit without any modification.

I then took my time installing the prop. The mounting bolts can only turn a couple turns at a time before having to wiggle the prop and tighten another one.



Once I got them all tighten I torqued it by hand for now, but MT calls for 65ft-lbs if torque on the bolts and then safety wiring them in pairs. I will do that later just in case (I really really

hope not) I have to take the prop off again.



It's just so cool to look at.



I just had to test fit the top cowl, it's still high by about 3/4 of an inch, it's sitting on the baffles, which I have yet to modify. Now that the prop is on I can start with the cowl fitting and

then continue working on the baffles.

And of course...Happy Mothers Day!

#### 4.4.3 Wing skins (2018-05-20 00:02)

Today I had my friend Norio over to help me out a bit on the project. After a few hours of catching up and some good bbq we spent some time in the shop. No pictures tonight, but we got the final wing skins dimpled and nearly ready to install. Left to do is a bit more edge finishing and then riveting.

### 4.5 July

#### 4.5.1 Modified Wing Rear Spars (2018-07-29 20:49)

Today I finally got off my lazy butt and got back in the garage. It's been more than a month since I've touched the project.

I started by making a giant list of all the tasks that I could think of in order to finish the project.

Things to do	Time	Firewall-PWS	Time	Interior	Time	Wings	Time	Auxiliaries	Time
1. Fairing				0.2 install forward carpet		0.2 cut rear spar attach		1. install VFM Pro	-
2. Install elevator pushrods		0.2 install sensor manifold		0.2 install heating carpet		0.2 install bottom fairing skin +2		2. install drywires hole	-
3. Install left and right fuel lines		0.2 install air囊		0.2 install heating carpet		0.2 install pitot tube		0.2 install radio	-
4. Rudder motor housing attach bolts		0.3 finish buffing		0.3 install heating carpet		0.3 install seal -back flange		0.2 install intercom	-
5. Install roll bar system		0.2 install upper spark plug		0.2 install arm rests		0.5 install wing tip lighting wires		0.2 install autopilot panel	-
6. Install canopy frame bracing		0.2 install exhaust fairing		0.2 install seat-back flanges		0.2 install wing tips		1. install button panel	-
7. Install canopy frame springs		0.2 install heat shuff		0.2 install floors		0.2 drill fuel tank bracket to fuselage		0.5 install switches	-
8. Install canopy frame roll bar		0.2 install heater tubing		0.2 install side panels		0.2 install fuel level wiring		1. measure out wiring	-
9. Install canopy		0.3 install mag filter tubes		0.3 install fairing for arm rests		0.2 drill rear spar attach (front fl wing)		0.2 make wiring harness	-
10. Dimpling fairing on canopy		0.2 install alternator blast tube		0.2 install top motor cover panels		0.2 install landing & nav lights in engine		install fuel wiring	-
11. Install wing fuel tank bracket supports		0.3 install moisture bellows		0.2 install fuel pump-cover carpeting		0.2 install landing & nav lights in engine		install engine monitor system	-
12. Rudder-rudder pedal installation		0.2 install thermal bracket		0.2 install luggage area pockets		0.2 install rear luggage bolt/thead lower		wire up control sticks to panel	-
13. Install VFM supports		0.2 install vertical power PWS (regular wiring for now)		0.2 install luggage floor		0.2			
14. Install subpanel		0.2 decide on phenom (probably)		0.2 install rear luggage bolt/thead lower		0.2			
15. Install forward center panels		0.2 install oil temp-wiring		0.2 install seat belts		0.2			
16. Install fuel pump		0.2 make p/mg wiring harness #2		0.2 install control stick rays allen grips		0.2			
17. Drill hole in firewall for fuel line		0.2 install interior		0.2 install center tunnel carpet		0.2			
18. Install fuel bulkhead fitting		0.2 add alternate on Rsp		0.2 install seat		0.2			
19. Install fuel pump-cover		0.2 install alternate on Rsp		0.2 install seat harness		0.2			
20. Plumb the fuel system		0.2 modify baffle for snorkie		0.2 install seat belts		0.2			
21. Install center section bolts that are missing		0.2 install air filter							
22. Install alternate aileron cable		0.2 modify lower aileron for landing gear							
23. Install alternate rudder cable		0.2 install alternate on upper aileron							
24. Install alternate flap covers		0.2 install skyhook flanges for coverd							
25. Install panel mounting brackets		0.2 cut cowl to right size							
26. Install NACA ducts		0.2							
27. Install vents		0.2 cut off door on upper cowl							
28. Install cooling ducts		0.2							
29. Install throttle cable		0.2							
30. Install moisture cable		0.2							
31. Install prop cable		0.2							
32. Install heater valve cable		0.2							
33. Install alt air cable		0.2							
34.									
35.									
36. Total (hours)		1.85							
37.									
38.									

The goal being that I can estimate effort and duration of each task. Given everything I could think of and the effort needed, it looks like I have about 500hours left (give or take).

Once I finished this, I decided to something on the wings that was easy, to get back in the mood.





The quickbuild wings need their rear spar modified for the -7. The wings are identical for the -8, and this is why they are larger. I marked the rear spars where they needed to be trimmed.





I then used my dremel with cutoff wheel to cut the spare down to just before the line. I will hand file the rest when I am fitting the wings.

## 4.6 August

### 4.6.1 Flap motor housing (2018-08-12 18:24)

First off, I got myself a hangar! I've been checking the hangars at the San Martin airport for a while, and finally got in contact with them and got the hangar last Wednesday! It's a nice T hangar that's north facing (shaded all day), and has plenty of room for the project. I'll be migrating there over the next couple weeks.

Before making the big move, there's still a couple things that I want to finish up in the garage. The first thing was that when I installed the canopy release mechanism, I realized that the flap housing was being pushed backwards and wouldn't install. So I modified the mounting holes, and everything lines up much nicer.



This will get installed with a couple washers and the offset of the holes won't be noticed.

I also installed the elevator push rod that goes through the center tunnel, since I had everything off. It needed some coaxing but it installed just fine.



The push rod connects the control sticks to the bell crank that's right behind the baggage bulkhead.

I also cut some two conductor wire to length for the flap motor power lines, and added a couple connectors so that it's removable. Once it's installed this will get a zip tie wrapped around it between the tabs and it will be fully secure.



Next up is to finish the canopy frame.

# 5. 2019

## 5.1 February

### 5.1.1 Plane Has a New Home (2019-02-11 18:24)

After three and a half years in the garage. I finally moved the plane to its new home in my hangar!

There was probably a lot more work I could have done before moving it, but there were some circumstances that dictated I needed to move to the airport.



It started by first getting a giant truck with a lift gate. Once I got that to the house I had my friend Mike over to help me out. We removed the canopy and rear window (which I just had sitting on the plane temporarily...need to finish this) and then rolled the plane out into the driveway.



I know it doesn't look like much, but seeing the plane in the driveway is one of the coolest things.

After doing some measurements and planning over the last couple months, I realized that the wheels were too wide for the lift gate. Luckily Mike had a 4x8 sheet of plywood that we laid on top of the lift gate.



We rolled the plane forward and lined it up. If it wasn't for the plywood, this would have been a very precarious balancing issue (Thanks Mike!). [wpvideo 8pUR7WLc ]

We chocked the wheels once we made sure the engine wouldn't hit the floor of the truck when lifting, and then raised the plane up and pushed it into the truck. My girlfriend Britney did an awesome job holding the whole airplane in the air!



Once the plane was in. we loaded up the rest of the few remaining items and secured everything down. It felt a little nerve wracking having all this in the back of a truck, but it all

went off without a hitch.



I managed to drive the truck (slowly) down to the airport in San Martin and we basically did the reverse, and there were no issues. Luckily the rain held off the whole time we were moving.

[wpvideo MzmlxnKv ]

We rolled the plane in and it felt like a huge accomplishment. I immediately wanted to start mounting the tail and wings and everything on the plane, but the wings will have to wait for another time.



I loosely fit the horizontal and vertical stabilizers using some clamps. This is probably the coolest thing ever (so far)!



All in all, it was a very successful and satisfying day. I couldn't have done it without the help of Mike and Britney and of course my mom, who brought us all some lunch and helped with the moving of everything! (Garage can now be used for her car again)!

## 5.2 March

### 5.2.1 Drilled Horizontal Stab (2019-03-24 17:57)

This weekend I spent time getting the elevator horns drilled for the pushrod and the horizontal stab drilled and mounted to the fuselage.

Britney was in town visiting me this weekend so, of course, I asked her to help me work on the plane. She has been very encouraging and really wants to help on the project. So we got started by mounting the elevators to the horizontal stab on the bench.



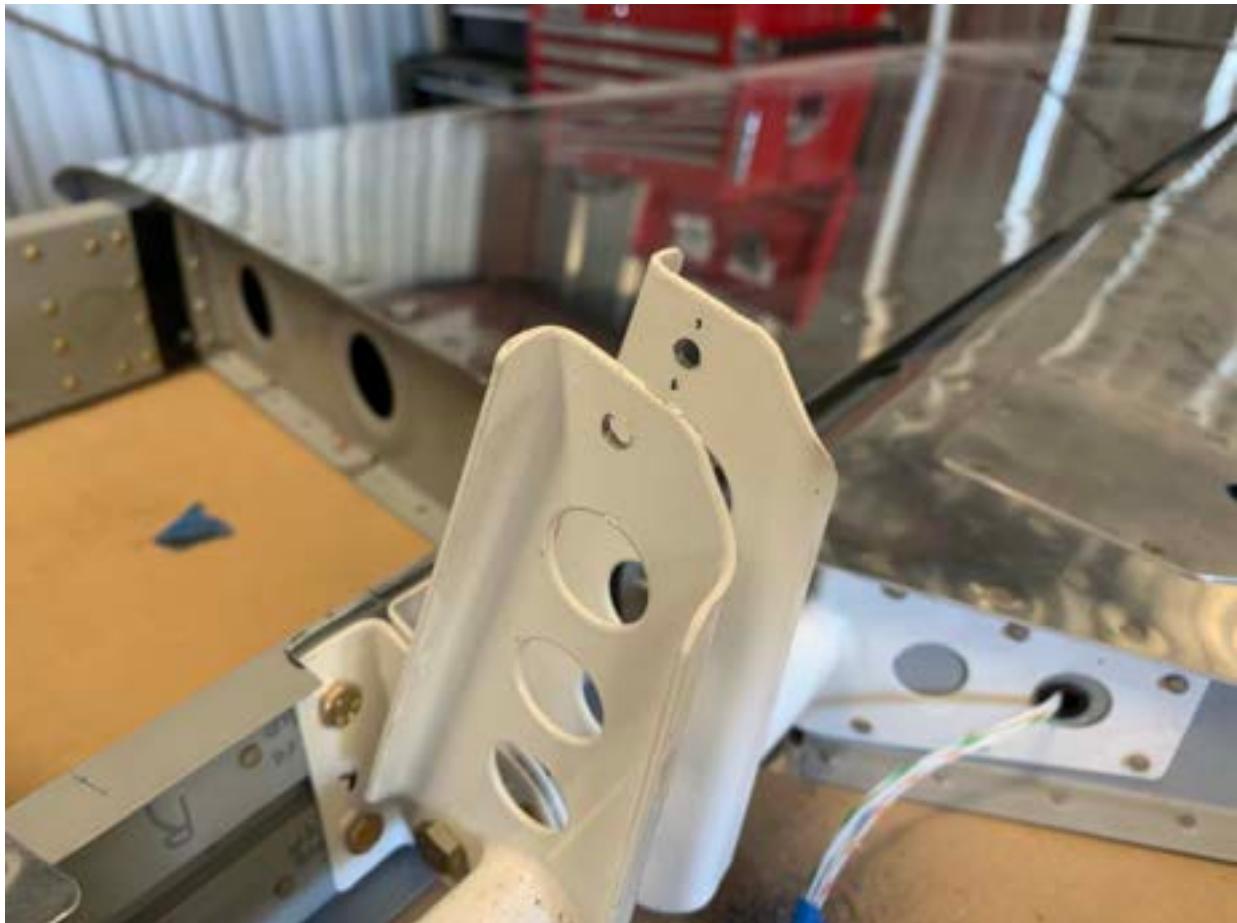
Once we got the elevators lined up and clamped, we measured which horn was aft, and then removed the left elevator.



I measured and then drilled the hole for the pushrod, and then I fabricated a block to span the gap between the horns, remounted the left elevator and placed the block between the horns. This ensured that the #30 pilot hole was drilled perfectly perpendicular.



Once the pilot hole was drilled, I enlarged it for the AN3 bolt that will eventually hold the pushrod.



The resulting holes are perfectly lined up and perpendicular.

Once this was done, we removed the elevators and then positioned the horizontal stab on the fuselage.



We measured, and then measured, and then measured again. I clamped everything into place and measured one last time.



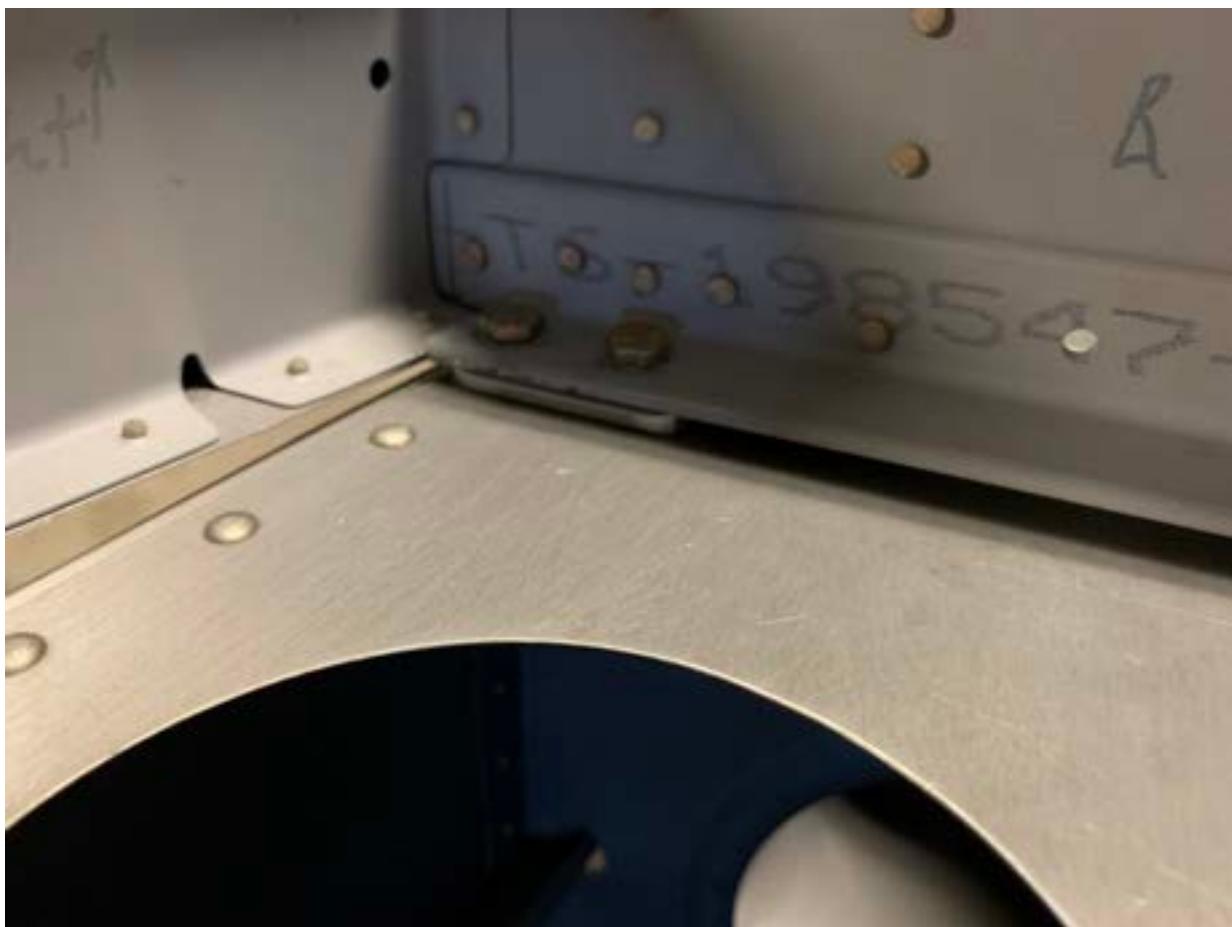
I then drilled my #30 pilot hole through the stab and then remeasured. After ensuring nothing moved, I final drilled it for the AN3 bolt and then inserted the bolt to prevent anything from shifting.



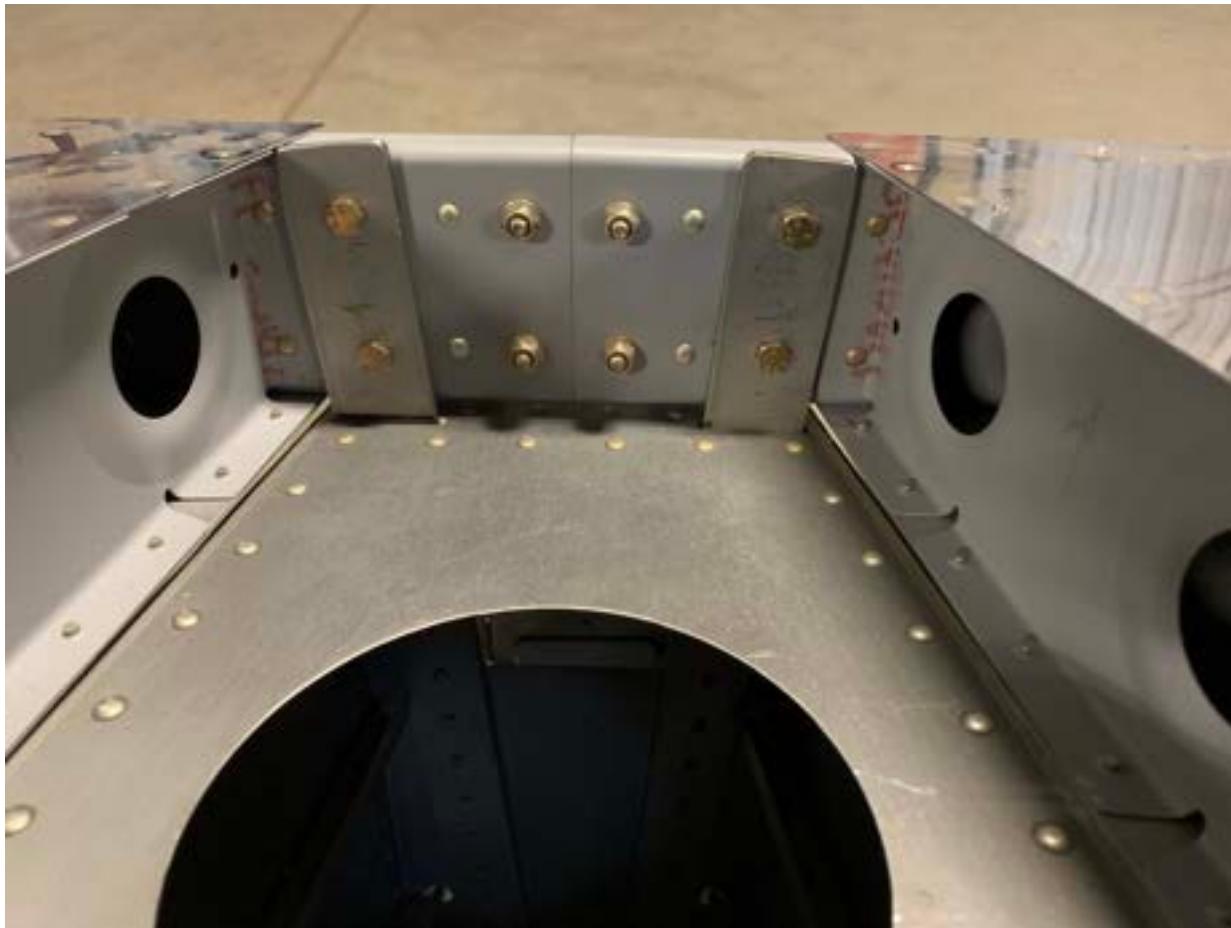


This is the underside of the outer holes after drilling the pilot holes. Edge distances for the longeron were right on the money.





I then proceeded to drill the remaining two holes, and fabricated the F-798 shims. Everything lined up and I did one final measurement, and it all remained perfectly aligned.



I bolted the forward bolts, used a 3/16th spacer to raise the rear spar to the right height, and then drilled and bolted the four holes to mount the rear spar to the fuselage.

Next up is the vertical stab!

### 5.2.2 Vertical Stabilizer (2019-03-26 23:48)

Tonight after work I spent a couple hours working on the vertical stab. Before mounting it to the fuselage, the forward spar had to have 5/8th of an inch trimmed off.



Here is the spar after trimming and filing the edges smooth.

I then mounted the stab to the fuselage and clamped it in place.



The height relative to the fuselage is important. I taped an Allan wrench to the rudder hinge to use as my reference line and to ensure everything was aligned.



After measuring the verticality of the stab by measuring from the tip to each end of the horizontal stab, I confirmed it was aligned, And then used my angle drill to drill the rear spar to the elevator stop, then inserted the bolt temporarily.



Here is the aft of the rear spar. I then did the same thing for the second bolt through the elevator stop. I then bolted both sides to hold the stab in place.

Before finalizing the forward spar bracket, the hinges have to be kept perfectly straight. I decided to use the rudder as my straight edge, because it will tell me if there is any change in the play on the rudder.



It worked great, and after ensuring it swung freely, I determined I need to fabricate a shim to go between the front spar and the bracket.



Next step is to fabricate the shim, and drill the front spar for the bracket.





## 5.3 April

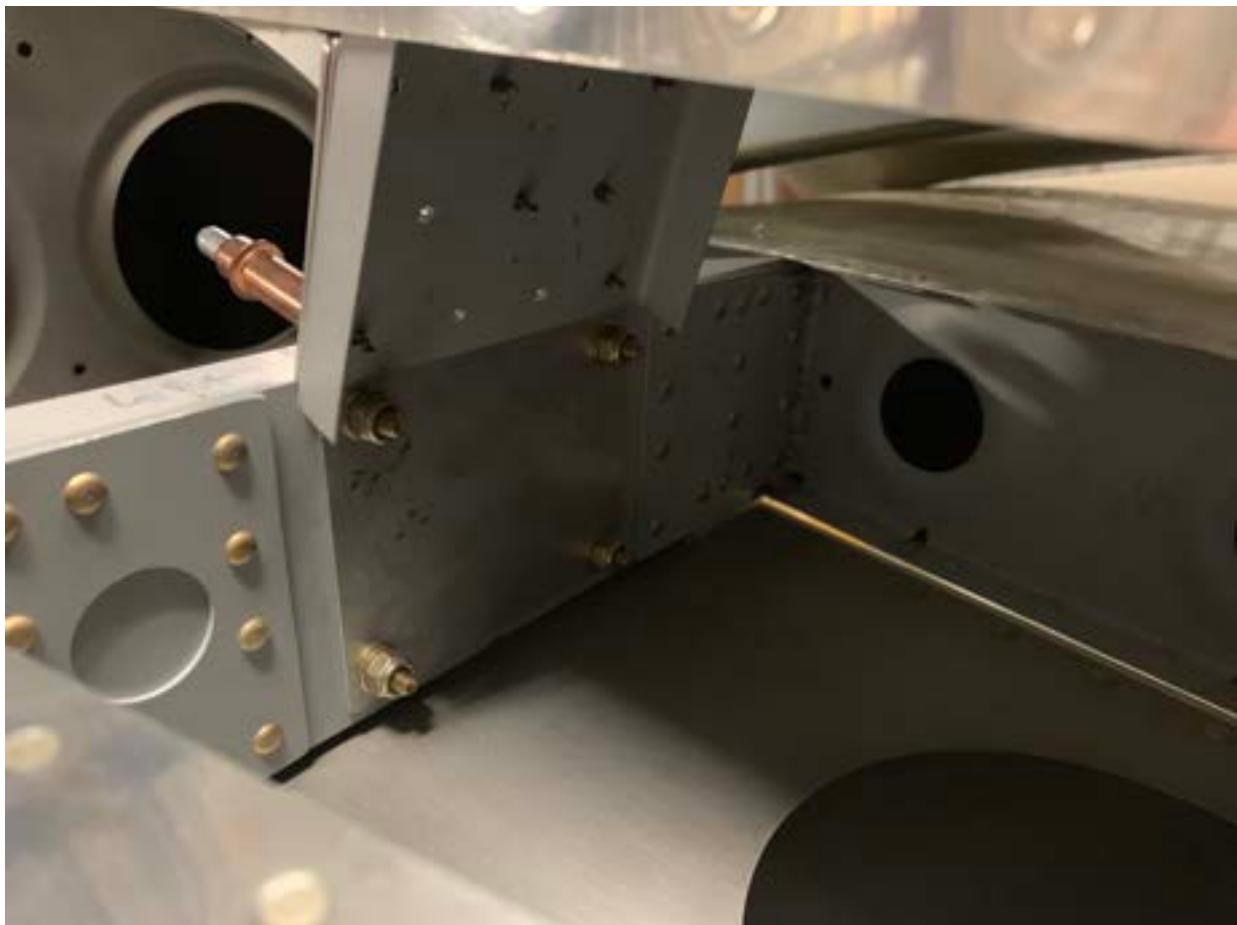
### 5.3.1 Vertical Stabilizer (2019-04-05 08:20)



I spent a few hours in the hangar to finish up the vertical stabilizer mounting to the fuselage.



I started by fabricating the shims that go between the front spar of the vertical stab and the horizontal stab mounting bracket. I then drilled them using the prepunched holes.



After measuring everything was straight and the leading edge of the vertical stab was 1/4 inch to the left of the fuselage centerline, I drilled the bracket o the horizontal stab and bolted it in place.



Then I measured and drilled the three bolts that hold the vertical stab to the rear bulkhead and tail spring mount. These bolts go through 4 or 5 layers of metal, and need to be precisely placed.

I got everything properly lined up and was able to keep the minimum edge distances on everything



I bolted everything into place to make sure the vertical stab was still straight. I also decided  
508

to check the tail fairing, just to see how it looks.

[3]



This is really starting to look cool. The last thing I did was verify the rudder still swung freely and to measuring the rudder throw.



I sanded the elevators and the rudder and everything was as smooth as silk. There was no  
510

binding of any of the control surfaces. The rudder has the required 35deg of throw, but I need to adjust the rudder stops, as the rudder exceeds the 35deg of throw before hitting the stops.

1. [https://n890gf.wordpress.com/wp-content/uploads/2019/04/img\\_2328.jpg](https://n890gf.wordpress.com/wp-content/uploads/2019/04/img_2328.jpg)
2. [https://n890gf.wordpress.com/wp-content/uploads/2019/04/img\\_2330.jpg](https://n890gf.wordpress.com/wp-content/uploads/2019/04/img_2330.jpg)
3. [https://n890gf.com/wp-content/uploads/2019/04/img\\_2333.jpg](https://n890gf.com/wp-content/uploads/2019/04/img_2333.jpg)

## 5.4 December

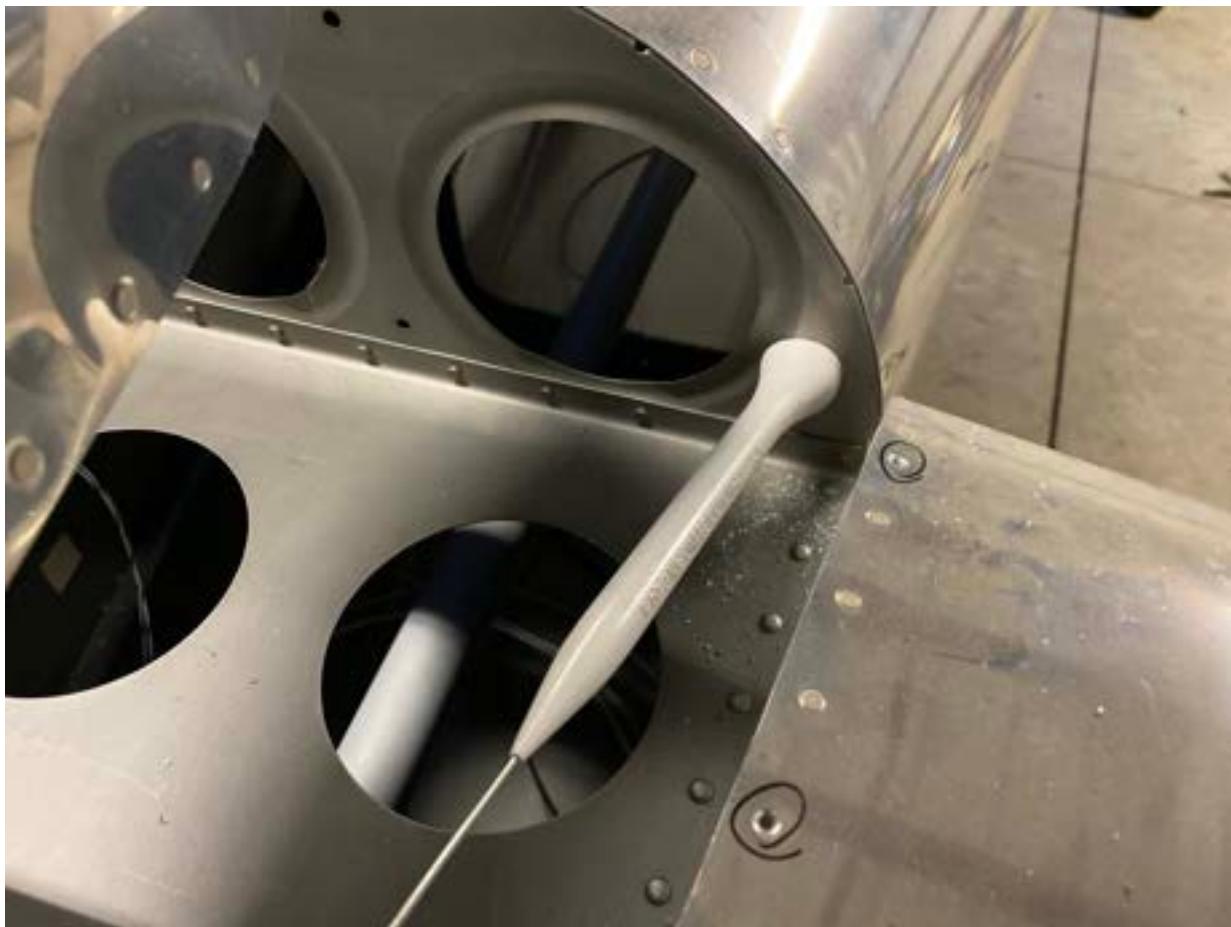
### 5.4.1 Lots of work - Canopy and Empenage (2019-12-31 18:17)



It's been a while since I've made an update...work and life have taken a priority over the last few months, but I've made some progress here and there.

Yesterday and today I spent some time working on the elevator and the autopilot servo pushrod installation. These three pushrods are kind of hard to reach and require washers in between the rod end bearings and the bell cranks, my washer wrench helped a lot. [wpvideo 4TKvZkRZ ]

I also installed my ELT antenna in the aft the airplane. It will sit under the vertical stabilizer fairing. I like this much better than mounting it on top of the fuselage.



This is looking down onto the horizontal stabilizer. It will be secured under the fairing with a clamp so as to not let the antenna rub on the fiberglass.

I also spent some time a few weeks ago working on the canopy frame and springs. I spent a few hours fabricating the attach points.





Here you can see both the canopy frame side and the fuselage side of the attachments. I originally fabricated a backing plate out of some 1/16th aluminum and two nut plates, however after some research online, I came across a CNCd version of this that is a single piece and has a back plate this is awesome. I installed those and I highly recommend them! [1]Buller Enterprises makes a few experimental parts. I purchased the ball stud mounts and the canopy guides. Easy to install and much stronger than the ones I made.

I also finished riveting and test fitting the canopy frame stiffeners.



I still need to fabricate some spacers and then prime/prep all the surfaces. But the canopy frame is getting closer to completion!



The shop is a little messy, but the plane is looking good!

I'm hoping to get more time to work on the plane in the new year. Until then, I hope that everyone has a great holiday season!

1. <https://bullenrent.com/experimental/>
2. [https://n890gf.wordpress.com/wp-content/uploads/2019/12/img\\_5881.jpg](https://n890gf.wordpress.com/wp-content/uploads/2019/12/img_5881.jpg)

# 6. 2020

## 6.1 February

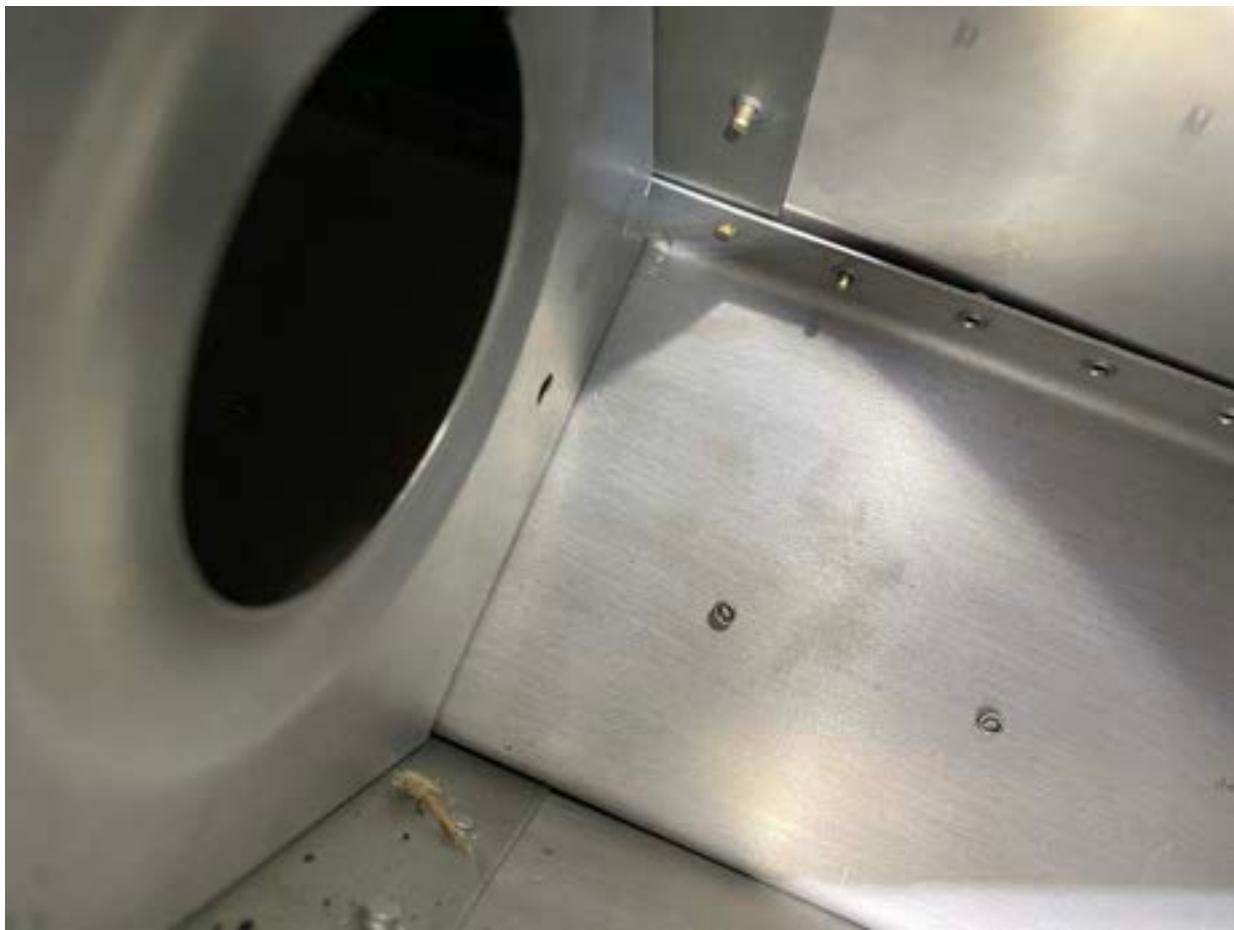
### 6.1.1 Wing skins (2020-02-26 22:25)

Tonight my buddy Norio and I spent a couple hours prepping and riveting the final lower wing skin.



Here I was checking the alignment of the ribs

After testing the fit, we bag prepping to river the inboard rivets. We started with the lower corner of the rear spar and worked our way across towards the wingtip.



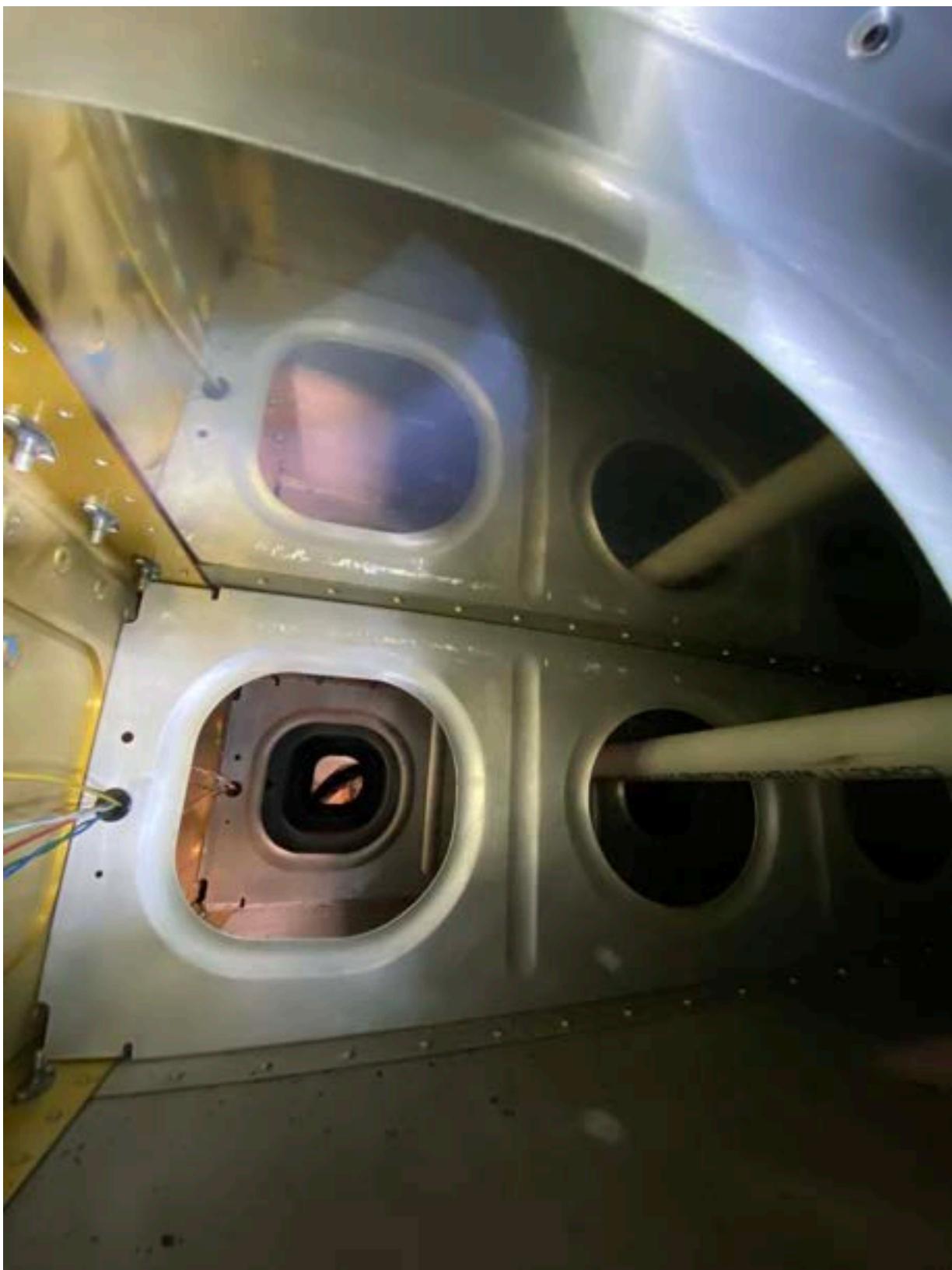
Inboard corner rivet on the rear spar

After riveting the first rivet we checked the shop head with the rivet gauge to calibrate the rivet gun as well as my hand on the bucking bar. We made some adjustments and then we dialed it in.



Rear spar inboard section riveted

Once the rear spar was riveted, we worked our way up the inboard section towards the main spar.



Inboard rib rivets

Some rivets needed to be driven a touch more, but all of these were perfectly set.

We called it a night after finishing these rivets and now that we're calibrated the rest of the wing should go much faster.

## 6.2 March

### 6.2.1 Finished closing out first wing (2020-03-09 15:44)



This weekend my buddy Norio and I spent about three hours closing out the final wing skin. It was a lot of shuffling and checking rivets after bucking them.

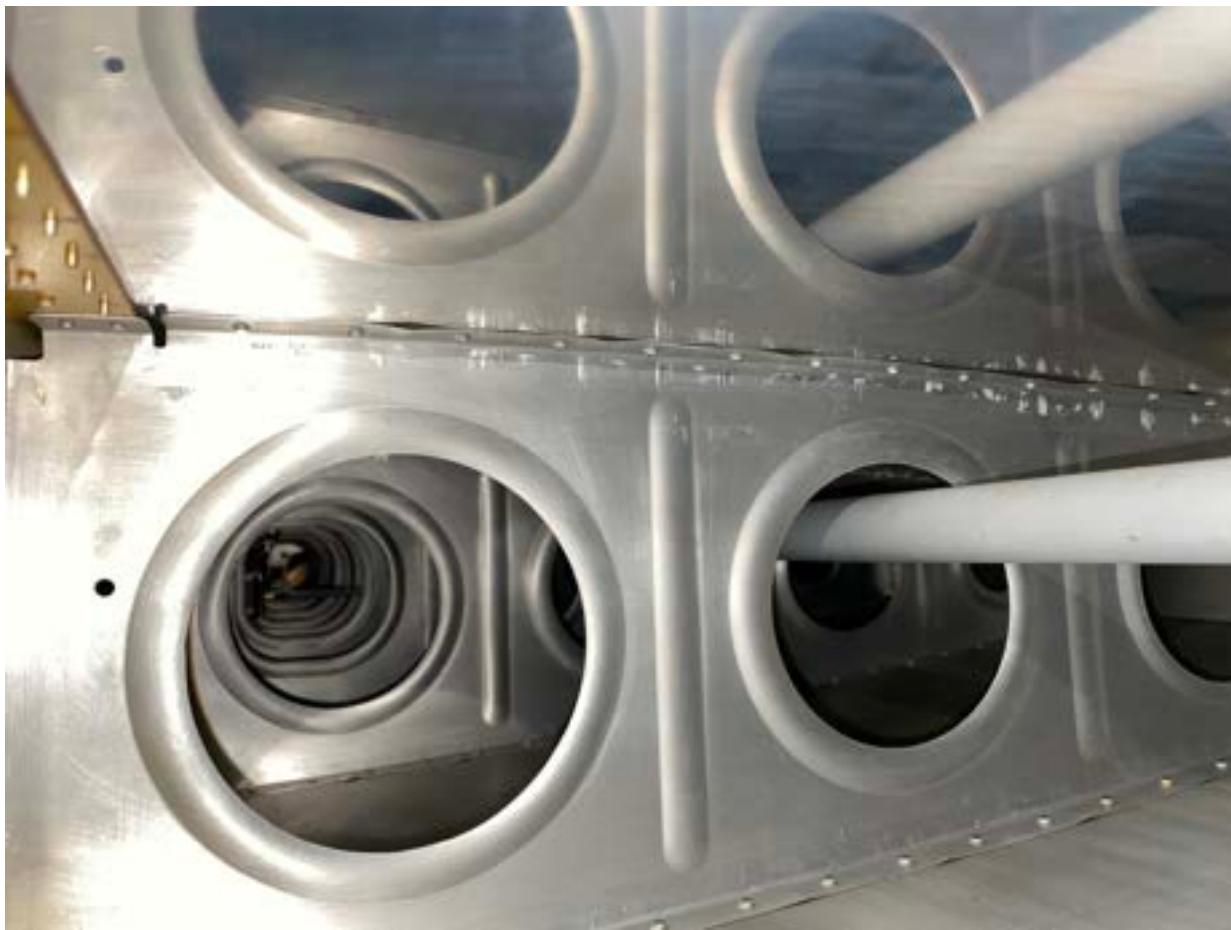
[1]



Final wing skin partially riveted

Once we got the hang of the pattern, it went quicker. Still required maneuvering my arm through tight spaces and rib lightening holes.

[2]



Interior of the wing

Here you can see the shop heads in the rib after riveting. The spar (gold on the left) has the rivets in place but not set yet.



Me checking out the rivets after finishing

The shiny panel here is the skin we completed. I was looking over the rivets to make sure there wasn't anything obviously out of place or missing. I only have the flap hinge left to rivet, which can be done solo using the squeezer.

Next I will prep the final skin for the left wing, and prepare it by marking the sequence for riveting. It will save a bunch of time trying to remember which set of rivets to go next.

1. [https://n890gf.com/wp-content/uploads/2020/03/img\\_6556.jpg](https://n890gf.com/wp-content/uploads/2020/03/img_6556.jpg)
2. [https://n890gf.com/wp-content/uploads/2020/03/img\\_6575.jpg](https://n890gf.com/wp-content/uploads/2020/03/img_6575.jpg)
3. [https://n890gf.com/wp-content/uploads/2020/03/img\\_6589.jpg](https://n890gf.com/wp-content/uploads/2020/03/img_6589.jpg)

## 6.3 May

### 6.3.1 Heat Muff, Exhaust, and Fuel Tubes (2020-05-09 21:24)

Today I spent a few hours working on the exhaust hangars, heater and the fuel lines.

It's been on my to-do list for a long long time, but I finally marked and drilled the hole in the firewall for the fuel line.



I then test fitted the fuel line between the pump and firewall fitting. I had to fabricate a new

tube in order to fit the position I drilled the hole. In hindsight I should have drilled it about one inch to the left of this, in order to provide more room for the heater scat tubing on the other side, however it should be fine.



The forward tunnel cover will go over this portion of the tubing as well as the wiring harness.

I then worked on the hangars for the exhaust as well as heat muff.



Here you can see the hangars before I installed the heat muff. The left hangar here will need to be modified to account for it.



I didn't get any pictures during the install, but here is the heater installed with the tubing. I

will need to add some support to prevent chaffing of the tubes on the engine mount.



I will also need to add some support for the fuel tubing here to prevent rubbing on the tube. It shouldn't be too difficult to keep these two separated.

I will need to fabricate a support bar to extend the exhaust mount a bit wider in order to attach the hangar in order to avoid the scat tube.

## 6.4 July

### 6.4.1 Vertical Power PPS (2020-07-21 07:45)

This weekend I had a few hours to work on the plane. It's been a couple months since I've spent a good chunk of time on it.

I decided to take off the old conventional master and starter contractors. I've decided to go with Vertical Power Primary Power System. This is a single unit that replaces the contractors, as well as current shunt and fuses. I'm also using the Vertical Power Pro solid state VPX. These two will work really well together.

[1]



Vertical Power PPS

For easiest access I mounted this on the edge of the firewall near the battery as far away from the exhaust as possible. Every bolt and post is accessible. I also crimped on the ring terminals

for the alternator and for the starter once I had this mounted.

I also wired up the J1 harness that includes all the inputs for the master switch, battery and alternator current sense and fault indicators. This will all feed into my EFIS and be displayed on the engine monitoring page.

1. [https://n890gf.com/wp-content/uploads/2020/07/img\\_7642.jpg](https://n890gf.com/wp-content/uploads/2020/07/img_7642.jpg)

## 6.5 November

### 6.5.1 Closed out the wings! (2020-11-22 18:44)



Today I hit a huge milestone! With the help of my fiancée Britney and my friend Mina, we were able to close out the final skin on the wings.

With all that's going on, I was worried that I wouldn't make much progress on the project, which has turned out to be somewhat true. But when I do get to a new milestone, it feels amazing.

[1]



Current state of the hangar

After we wrapped up the final rivets, Mina helped me put the wings back in the cradle. I couldn't help but take a wide angle pic of the whole hangar. There is a lot more space now that the wing isn't on the saw horses.

[2]



Checking the spar receptacle

There's still lots to do on the project, but getting to this point has been a great adventure!

1. [https://n890gf.com/wp-content/uploads/2020/11/img\\_8557.jpg](https://n890gf.com/wp-content/uploads/2020/11/img_8557.jpg)
2. [https://n890gf.com/wp-content/uploads/2020/11/img\\_8559.jpg](https://n890gf.com/wp-content/uploads/2020/11/img_8559.jpg)

## 6.6 December

### 6.6.1 Behind the scenes and Wire Harness (2020-12-21 12:36)

Over the last two weeks I've spent many hours working out how much stuff there is left to do. I put together a list of everything I can think of, adding effort estimates to each item and adding time spent.

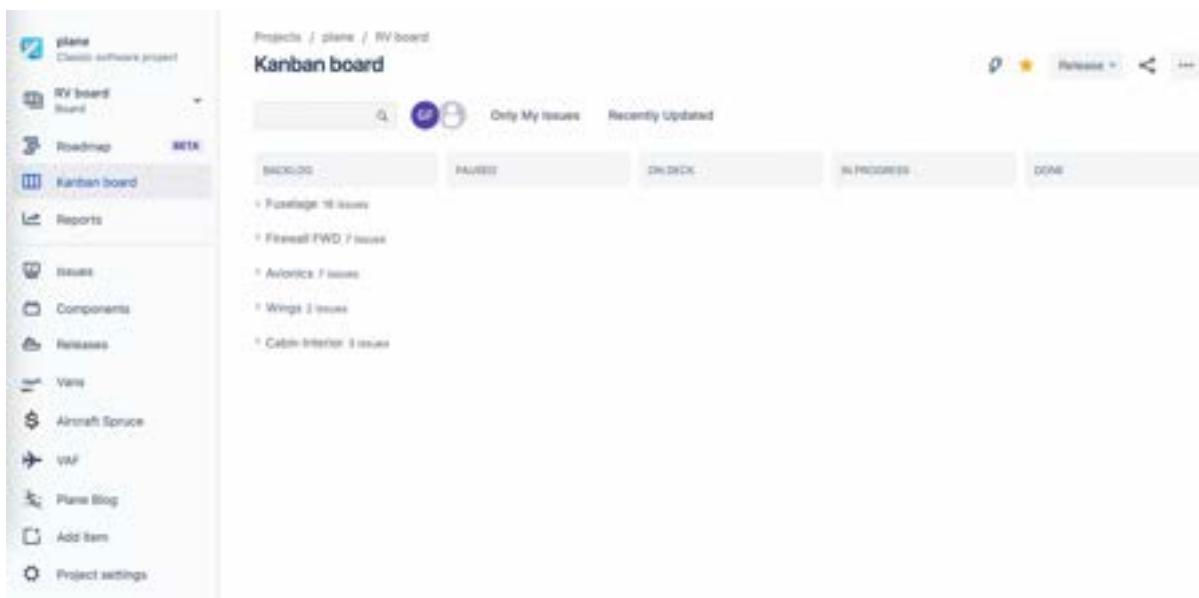
[1]

Task Name	Duration (h)	Time Spent (h)	Remaining (h)	%Complete	Status
RV-7 N890GF	225.00h	97.83h	127.18h	43.48%	In Progress
Forward Fuselage	89.00h	50.23h	43.76h	54.01%	In Progress
Rear Fuselage	66.50h	38.23h	28.26h	57.48%	In Progress
Forward FWD	26.50h	12.00h	14.50h	45.38%	In Progress
Sensors	1.50h	1.25h	0.25h	83.33%	In Progress
Electrical	11.50h	8.20h	3.30h	71.30%	In Progress
Buffet/Persum	18.00h	2.50h	13.50h	15.83%	In Progress
Exhaust	11.00h	9.00h	2.00h	90.91%	In Progress
Cowl	18.00h	0.00h	18.00h	0.00%	Not Started
Sharklet	10.00h	0.00h	10.00h	0.00%	Not Started
Cables	4.00h	4.00h	0.00h	100.00%	Complete
Interior	54.00h	2.20h	11.80h	35.71%	In Progress
Seats	4.00h	1.75h	2.25h	43.75%	In Progress
Floors	5.00h	0.00h	5.00h	0.00%	Not Started
Sidepanels	5.00h	0.45h	4.55h	9.00%	In Progress
Wings	20.00h	7.75h	12.25h	38.75%	In Progress
Airframe	14.00h	7.00h	7.00h	50.00%	In Progress
Electrical	6.00h	0.00h	6.00h	0.00%	Not Started
Paint	31.00h	12.40h	18.60h	44.44%	In Progress
Wiring	22.50h	12.45h	10.05h	55.53%	In Progress
Panel	5.50h	0.00h	5.50h	0.00%	Not Started

list of things to do

Google sheets has been awesome to organize my to-do list. I've completed about 100 hours since I made the list a few months back, so I've updated it all to be as accurate as possible. I then took the remaining items and I've been organizing them in a JIRA project I made to track my active work. This is a product I use at work on a daily basis to manage my teams' projects, so I figured I'd try it for managing my own project.

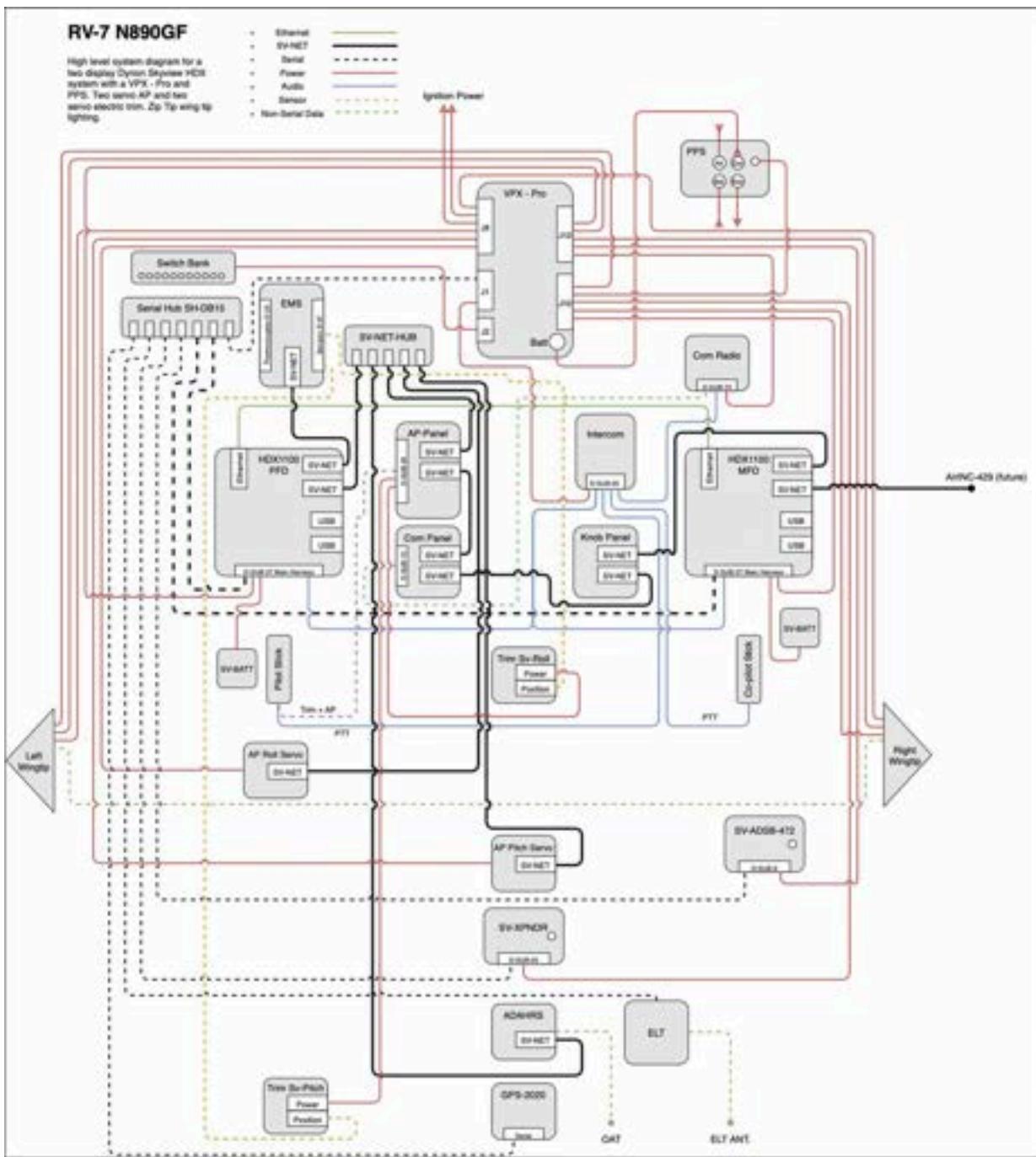
[2]



## JIRA Project

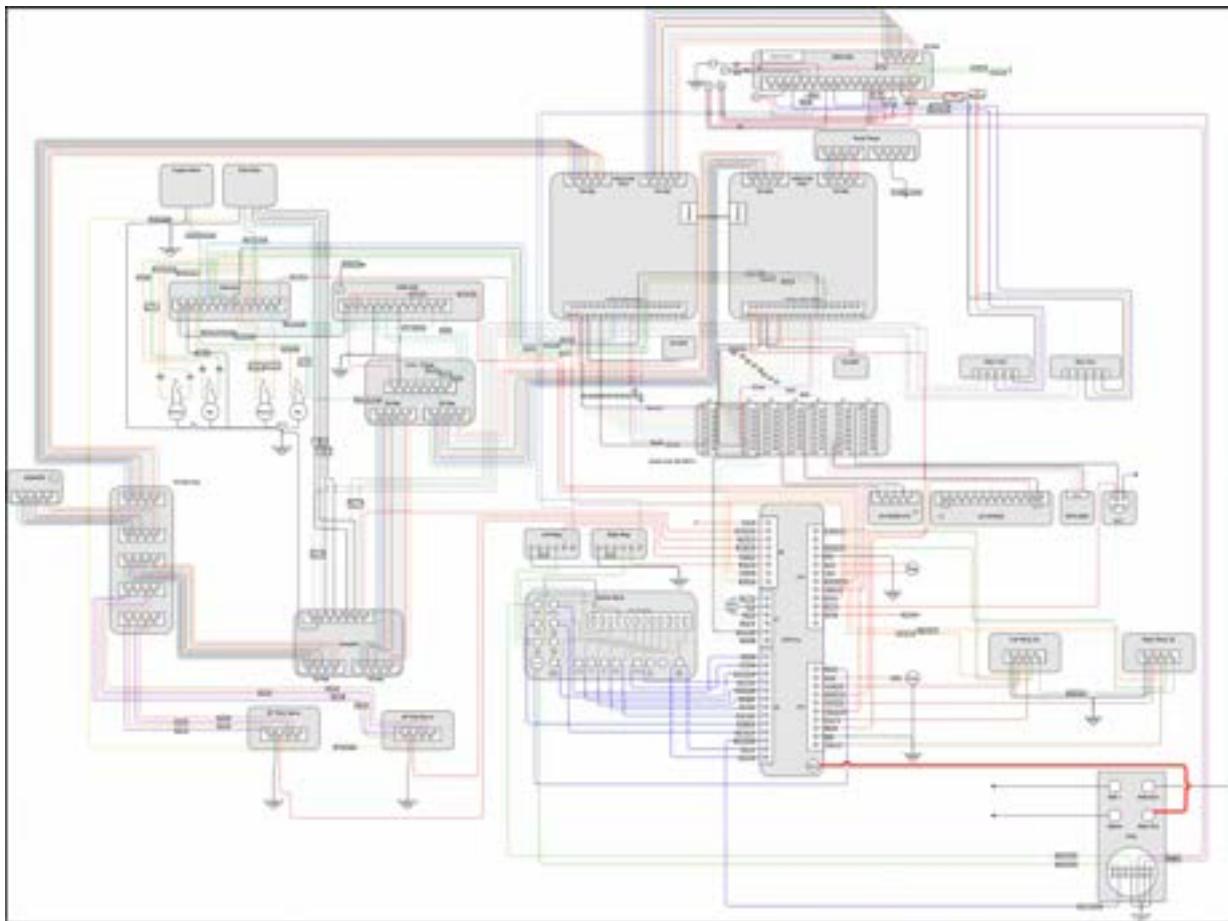
Here is the collapsed view of my project. By using this interface I can manage all my project links on the left, as well as drag and drop my to-do items into their respective statuses based on what I'm working on.

An Item I just completed - the full aircraft wiring harness. I've spent the last week designing and verifying the wire harness using [www.diagrams.net](http://www.diagrams.net) by Google. Its been great to look at pinout diagrams from my avionics suppliers and then visualize the harness pin-to-pin. It really helps me to understand the way I will make the harness.



System Block Diagram

I made a system overview block diagram to make sure I was accounting for all the items in the system. This probably doesn't have every item, but it was still great for visualizing the system.



Full System Wire Harness

I then used all the documentation I had for all the ECUs and components, and made the full system wiring harness. Again, I think this has everything covered, but I will continuously be checking the system before completely turning it on. I have a power supply that I will use for testing that has protection circuits in place in order to prevent any overcurrent or shortage issues.

1. <https://n890gf.com/wp-content/uploads/2020/12/screen-shot-2020-12-21-at-11.05.11-am.png>
2. <https://n890gf.com/wp-content/uploads/2020/12/screen-shot-2020-12-21-at-11.20.38-am.png>
3. <https://n890gf.com/wp-content/uploads/2020/12/screen-shot-2020-12-21-at-12.30.23-pm.png>
4. <https://n890gf.com/wp-content/uploads/2020/12/screen-shot-2020-12-21-at-12.00.09-pm.png>

## 6.6.2 Fuselage gussets (2020-12-30 22:52)

Today I spent a couple hours putting the forward fuselage gussets in place. They are unique to the -7 vs the -7A. The tri-gear plane rear landing gear are mounted just forward of the center

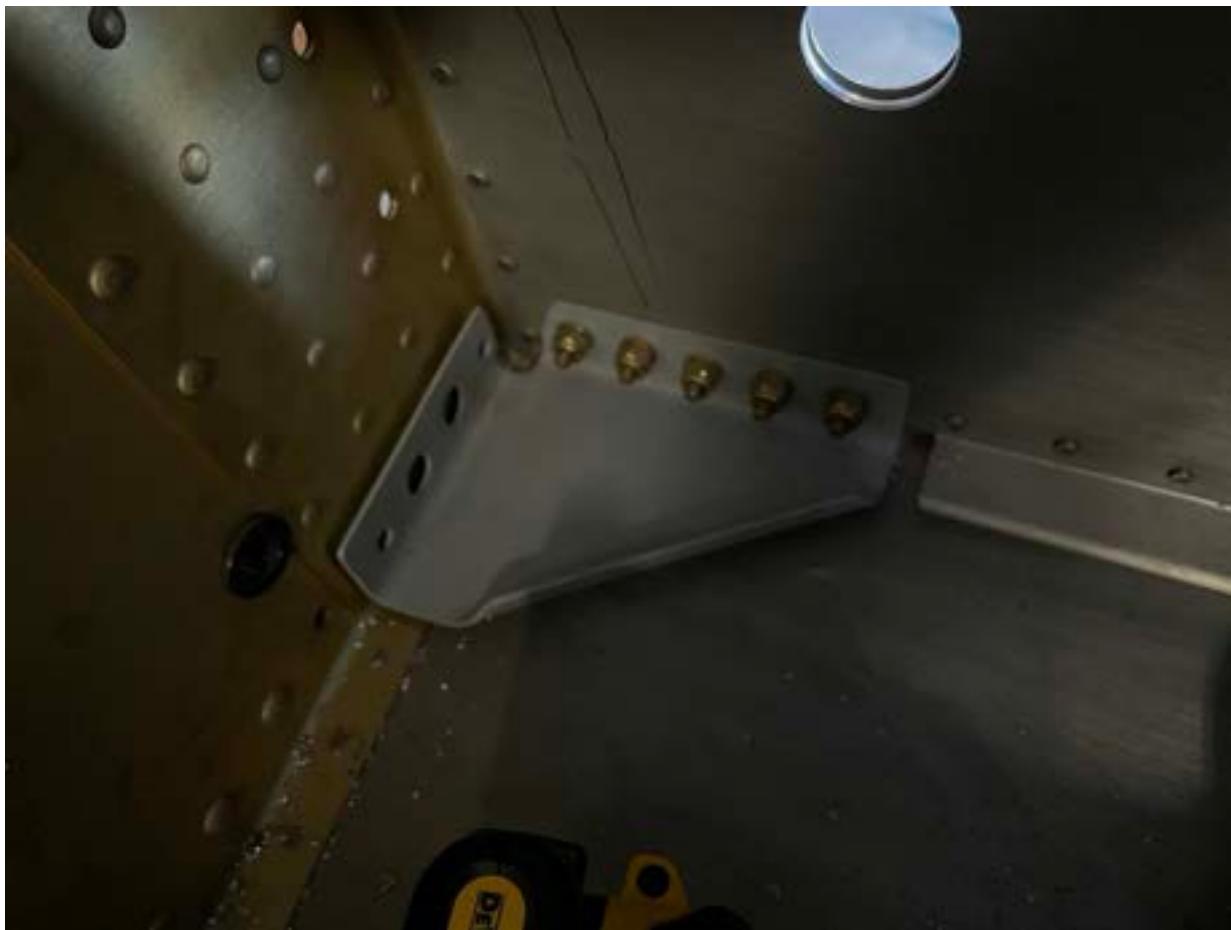
section. Since the -7 is a tail trager, there is a gap here that need to be reinforced using these gussets. They are attached to the sides of the fuselage with 5 bolts that need to be match drilled. The gussets also line up with the bottom wing attach bolts.

[1]



I lined everything up and then drilled the holes to #40 and then enlarged for the AN3 bolts. I prepped and primed these and then attached them to the fuselage. The whole interior will be painted with my interior paint, but it's good to prime all the parts especially mating surfaces.

[2]



I also spent a bit of time working on the panel attachment brackets. Since I'm using twin Skyview HDC screens, I need to move the Vans panel supports inboard. This requires making some custom brackets to attach the panel to the sub panel. I received a shipment of L stock from vans that worked perfectly for this.

I decided to wrap up the center section bolts that are used for the tricycle gear. In the tail dragged version the bolts need to be put into the center section.



[4]

543



The bottom bolts were difficult to reach but everything is now in place and torqued.  
544

I also placed the remaining two cover supports on the sides of the fuselage, forward of the center section.



Next up is to wrap up the exhaust hangar modification. And to drill the wing fuel attachment  
546

bracket to the sides of the fuselage.

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# 7. 2021

## 7.1 February

### 7.1.1 Wing tank brackets (2021-02-08 10:22)

This weekend I spent a few hours working on the plane. I wanted to get some specific things done in order to make a little progress towards fitting the wings.

[1]



Wing fuel tank attach bracket

I spent the day installing the fuel tank attach bracket to the outside of the fuselage. This required fabricating the internal support bracket and spacers. It took a little longer than I thought, but got it done.

[2]



After taking these pictures, I buffer and then primed the brackets. These are steel so they are very susceptible to corrosion. Now that these are installed. I can prep to mount and test fit the wings!

After this I spent an hour or so finishing up the exhaust hangar modification. I didn't take any pictures, but because I'm using the Vetterman 4 pipe exhaust and the heat muff, the standard Vans exhaust hanger can't be used on that side. So I fabricated a support bar that shifts the hangar mounting point outboard of the heat muff. I finished it by drilling the bolt hole for the mount and attaching it with all metal lock nuts.

I also removed the bolts for the exhaust attaching it to the engine in preparation for riveting

the firewall to the bottom skin where the exhaust exits the cowl. This isn't accessible when the exhaust is attached to the engine.

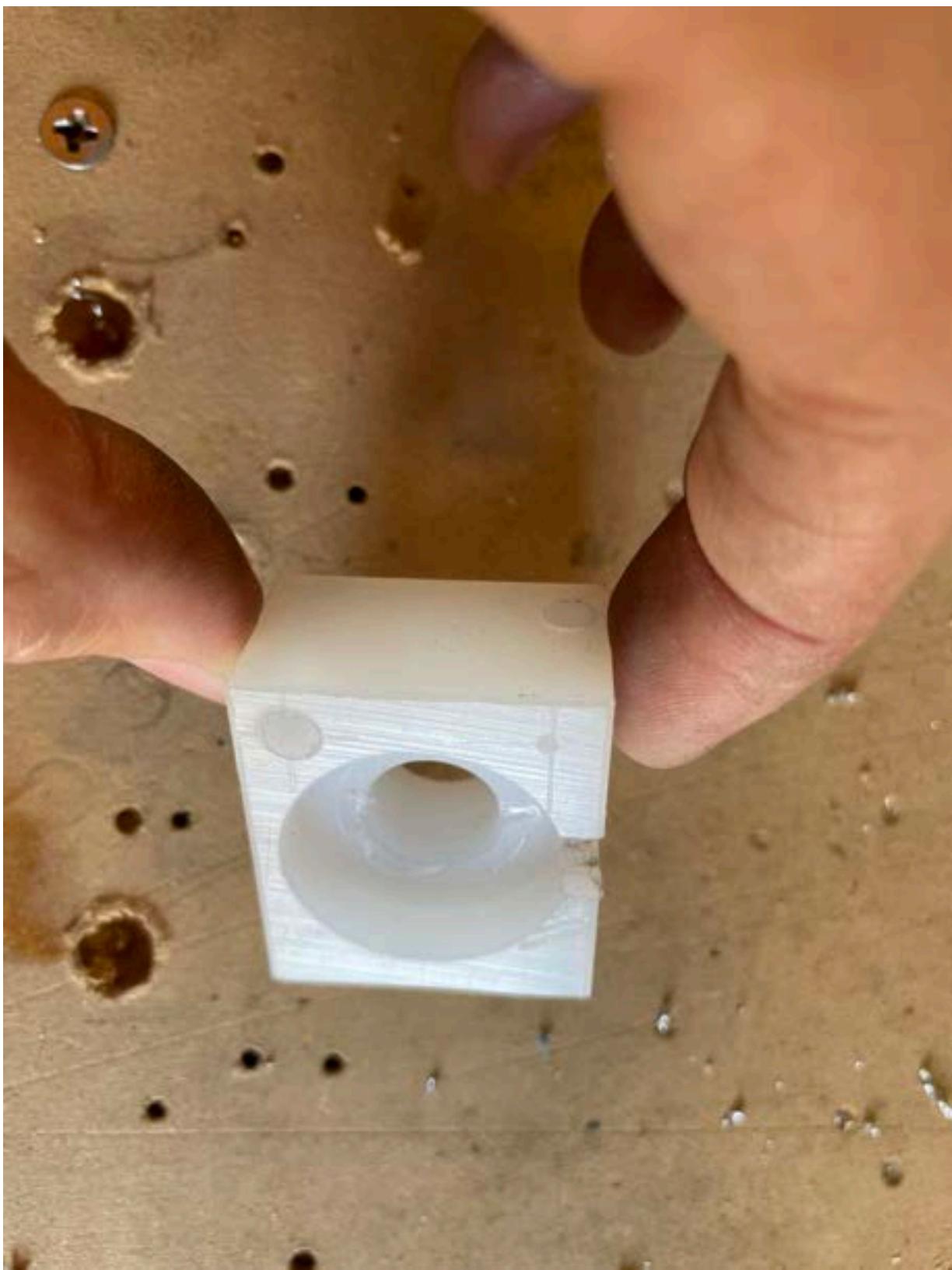
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## 7.2 June

### 7.2.1 Roll Trim System (2021-06-23 08:17)



This weekend I spent a few hours working on the roll trim system. I'm using the Ray Allen trim system from Vans, so everything is nicely packaged together into its own subsystem.



Modified trim bushing block

I started out by modifying the plastic block that holds the pivot arm. This needed two holes drilled through it for the AN3 bolts that hold it to the aluminum plate. I also botched the larger counter bored hole to allow access to the cotter pin that holds the pivot arm in place.



Mounting plate drilled

I then trimmed and match drilled the mounting plate to the seat pan holes. This allowed for a perfect fit. Once I drilled the two holes on the left, I temporarily installed it to drill the two holes on the right to the floor ribs.



Original hole and new hole in ribs

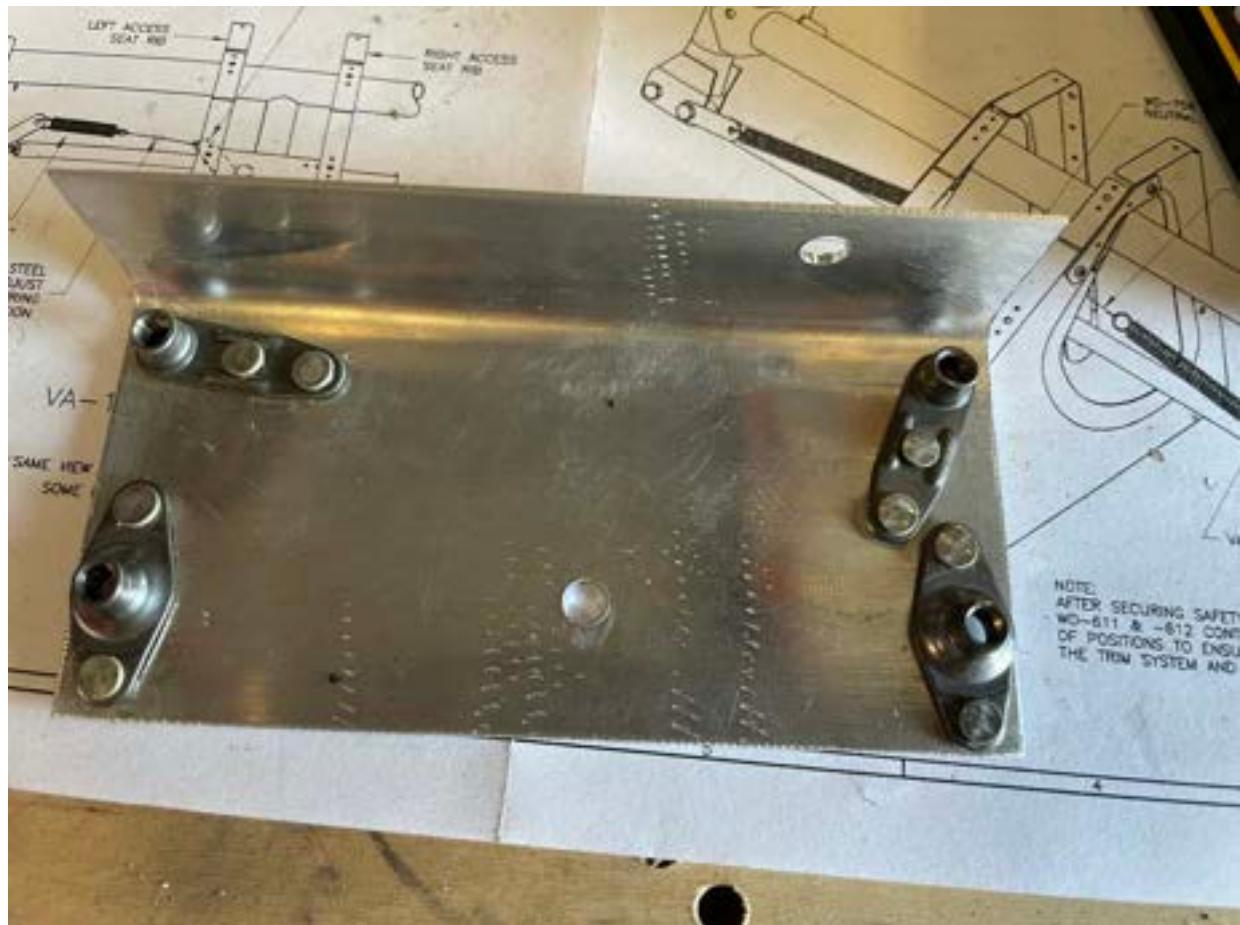
Here you can see the original hole where the nut plate was. I removed the nut plate and then used the center hole to mount the plate in order to drill the bottom hole. This was done on both sides of the center channel.



Cutting the pivot arm to the right length

I then cut the pivot arm tube to the right length so it can sit in the block and then be mounted to the metal plate. I cut off about an inch of tube. Once I did that I drilled a 1/16th hole for the cotter pin.

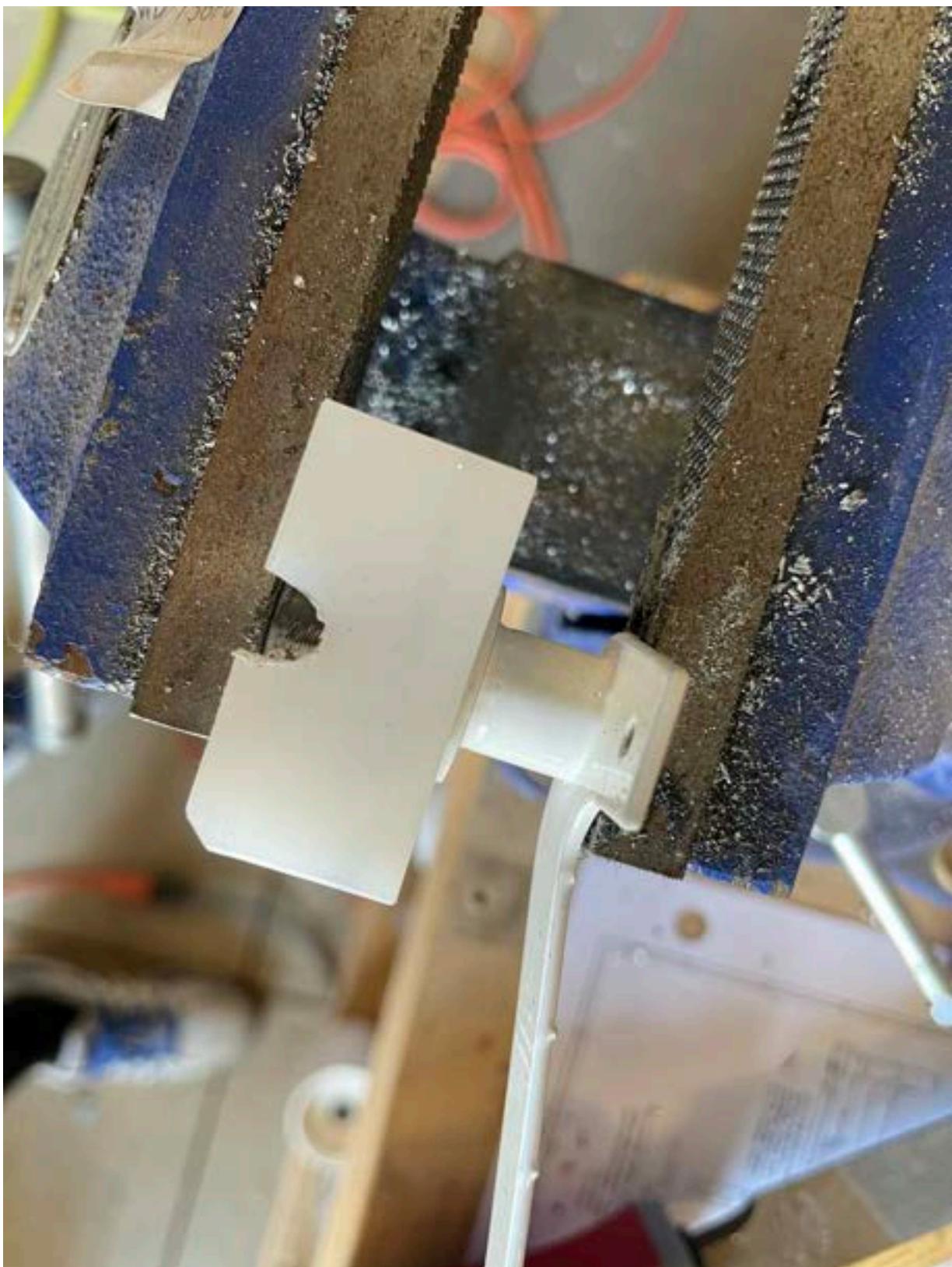
[4]



Mounting plate completed

After drilling the block to the mounting plate, I dimpled, and mounted the nut plates to the mounting plate. I will complete this plate by priming it before final installation.

[5]



Pivot arm installed into block

I then installed the pivot arm into the plastic block, and then installed the washer and cotter pin to hold it all together.



Test fitting the assembly

I then test fit the assembly by installing the bottom two screws. The top two are where the floor is held on to the ribs. The pivot arm needed to be adjusted to not rub on the control rod.

In the bottom left is the servo block. I need to drill that to the floor rib for final installation as well.

The final thing to do next time is to finishing the assembly with the control stick springs and cleaning up the assembly with some final adjustments.

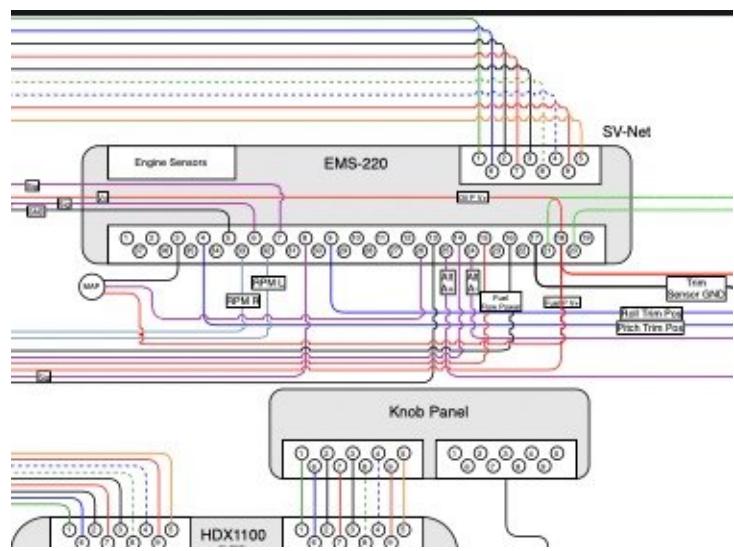
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## 7.3 November

### 7.3.1 EMS wiring (2021-11-07 08:53)

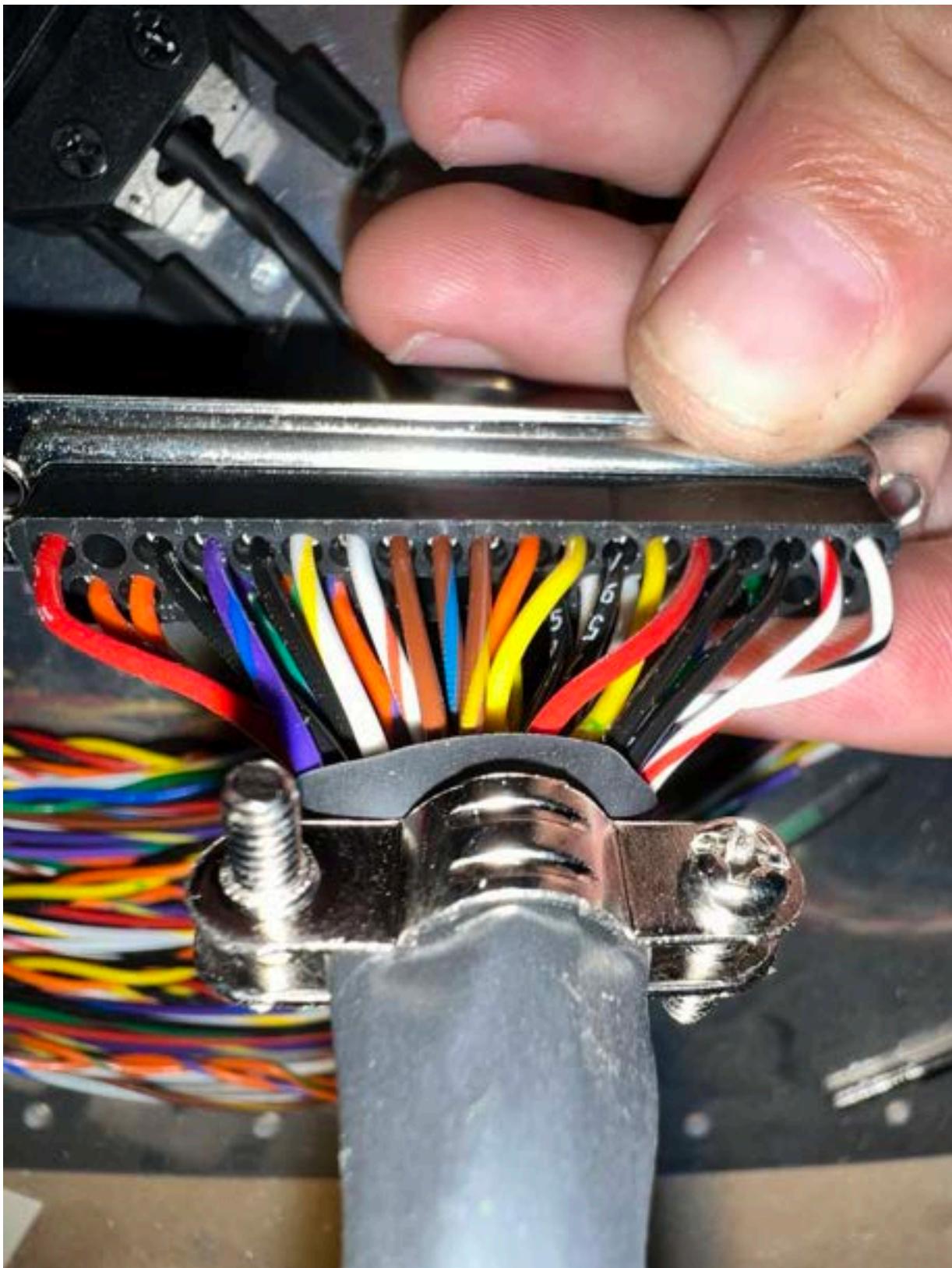
This weekend I spent time working on the main EMS wiring harness. It includes everything for engine monitoring including oil pressure, temperature, fuel flow, fuel pressure, manifold pressure, rpm, etc. It's quiet extensive.

I started by reviewing my wiring diagram that I made, and reviewed the pin out of the EMS D37 connector.



EMS box and connectors

I then opened up the main harness that is included in the skyview EMS in order to identify every pin.



Top half of the connector

I used my multimeter to check each wire and then I used that to label each one according to the function.

[3]

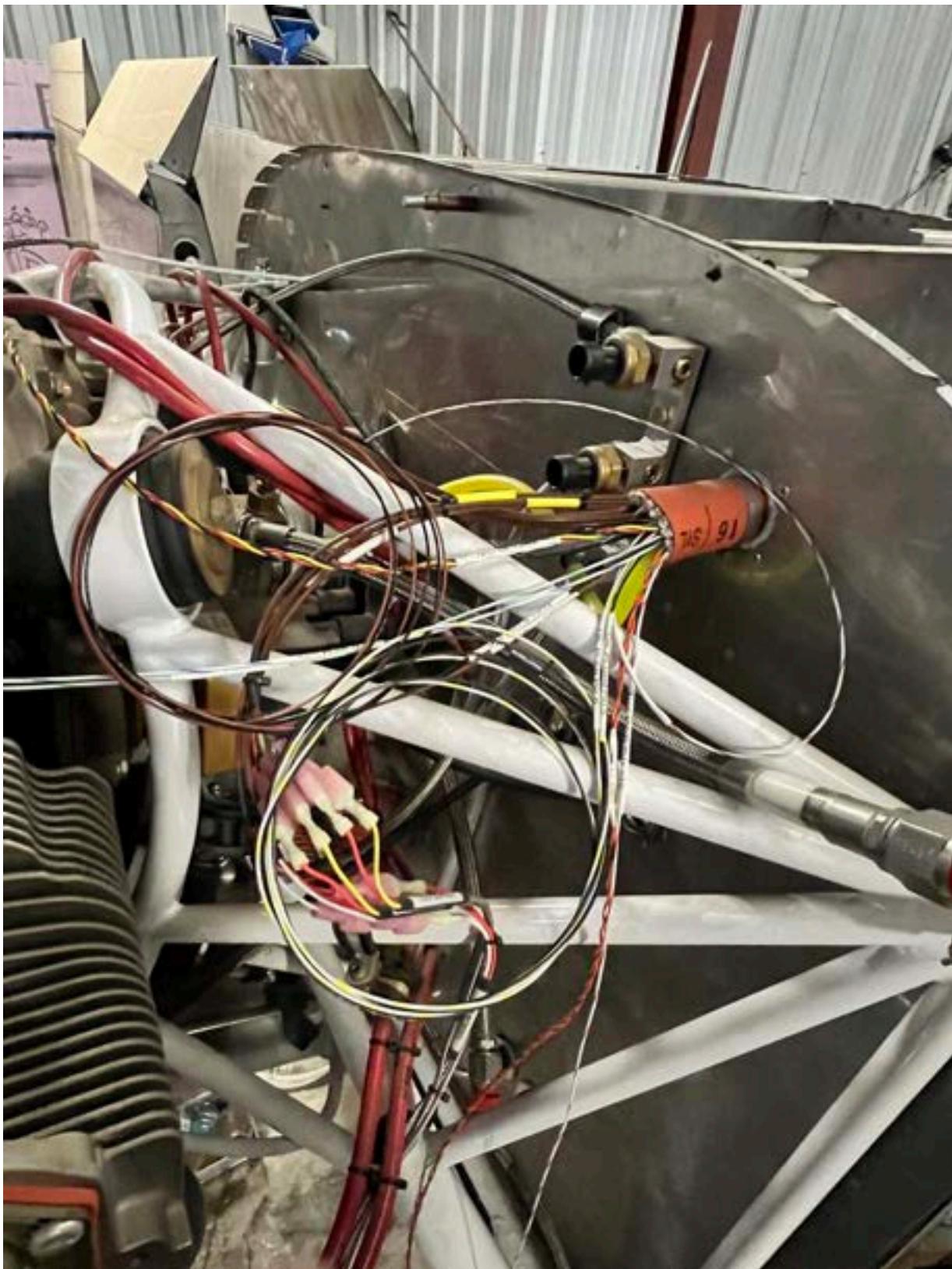


EMS temporarily installed

Here's the EMS and the main harness (silver) plugged in. As you can see in this picture, the wires are labeled and then separated out into the appropriate pairings (e.g. oil pressure power, ground and signal). Then I began to wire the engine sensors and measure the wiring runs.

[4]

568



Firewall pass-through for main harness

Here you can see the main EMS harness come through for all the firewall forward components. Mounted to the top of the firewall is the sensor manifold, which includes oil pressure, fuel pressure, and manifold pressure.

[5]



Sensor manifold closeup

Here's the oil and fuel pressure sensors mounted to the firewall. These are wired into the main harness and share their 5v source on the same pin (pin18) of the EMS. It's a common source for low power components and is shared between several other sensors.

[6]

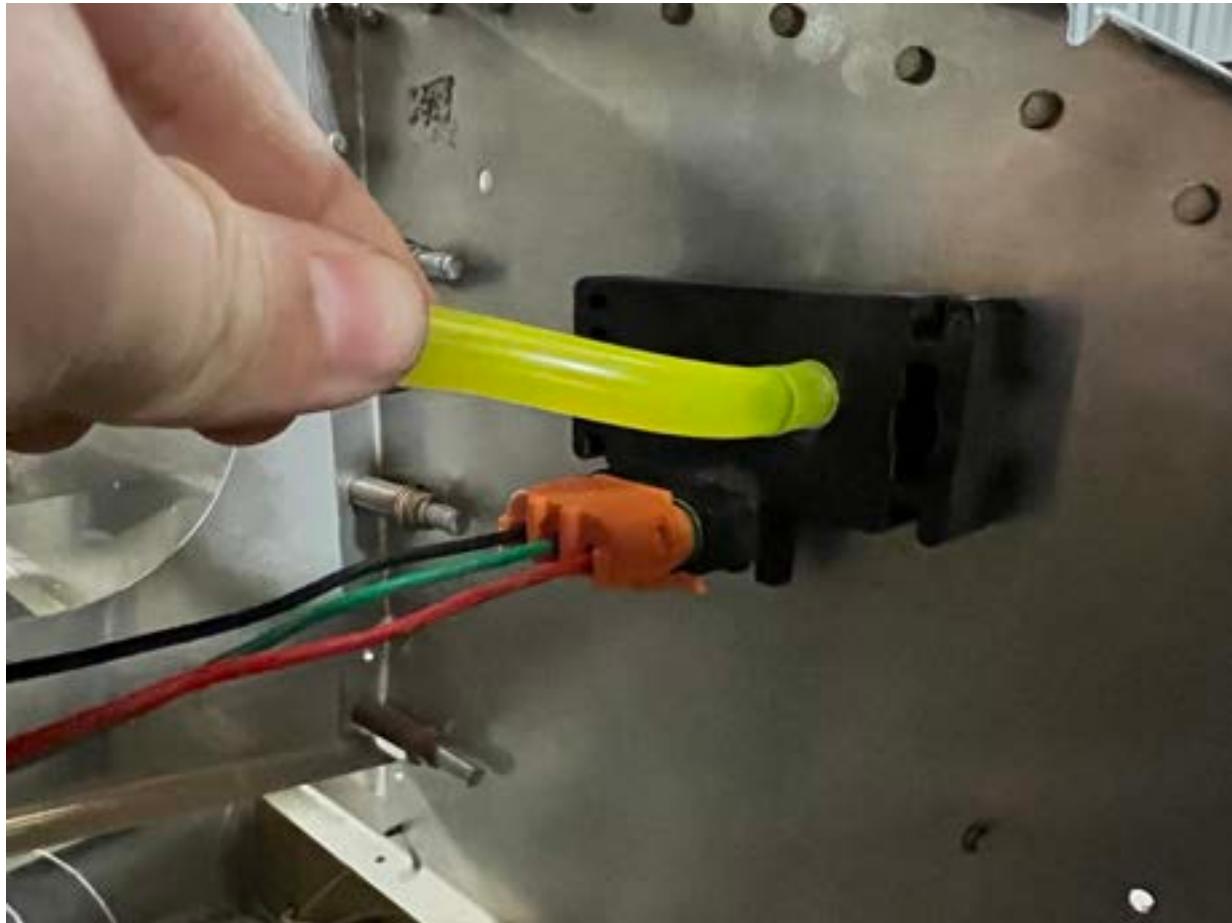
570



Oil temperature sensor

Here's a close up of the oil temp sensor wired to the harness.

[7]



Manifold pressure sensor

Here's the manifold pressure sensor. It has a tube that's connected to a T in order to share a manifold pressure source with the ignition system. E-Mag ignitions also need to know the pressure of the intake in order to adjust timing of the spark.

[8]

572



Continuing the work is a bit slow, but it's getting there. Lots left to do.

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# 8. 2022

## 8.1 January

### 8.1.1 VPX Wiring (2022-01-08 21:00)

Today I spent a few hours working on the main power harnesses. Since I'm using the Vertical Power VPX, all the power wires connect to a central distribution point including the panel switches. It's all very straightforward once you have the pins all planned out.

[1]



Vertical power VPX

Here's the VPX mounted under the panel (it's all upside down) so that I could reference the two D25 connectors for J1 and J2. The J8 connector, as well as the J10 and J12 connectit's on

the other side are used for the larger power distribution, whereas the J1 and J2 connectors are for switches (connects to ground), flap position sensor, and serial Tx/Rx for communicating with the EFIS.

[2]



J12 connector

Here's the backside of the J12 connector. Not all the pins are used, and they are left empty. I used my heat shrink tubing labeler to mark each wire for each of the five connectors.

[3]

576



All the wiring harnesses completed

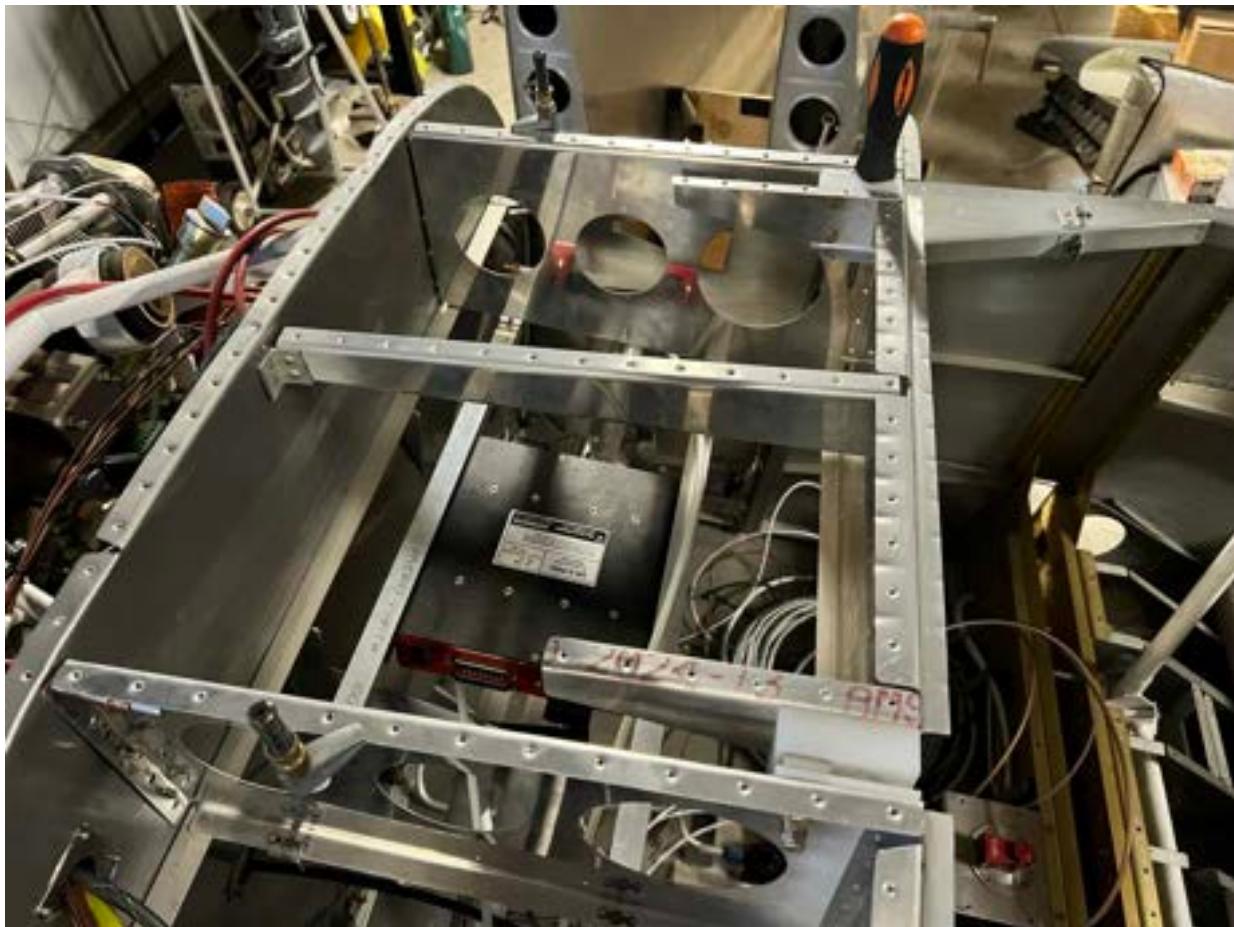
Here are all five of the main power harnesses completed. The final wire runs will need to be done in the plane, but that won't take too much effort once I rivet in the sub-panel and can start installing components. There are 50 wires here that each are labeled with their respective pins and connectors in order to easily route and attach to the correct components. I genuinely enjoyed this work and look forward to more of the avionics installation and wiring!

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### **8.1.2 VPX Installation (2022-01-16 11:11)**

Yesterday I spent most of the day at the hangar cleaning up and working on the installation of the VPX mounting brackets.

[1]



VPX

I started with the rough position of the mounting brackets under the sub panel ribs. This will be the final position of the VPX under the panel.

[2]

578



Each corner needed a nut plate installed, so I match drilled the brackets to the ribs, and then

lined up the nut plates and clamped them in place.

I then drilled all the nut plates, deburred, dimpled, and riveted the nut plates to the sub panel ribs.

[3]



Here's the close up of one of the nut plates riveted in place with the angle bracket loosely held in place with a mounting screw.

During the day, a friend of mine visited the hangar to check out the project. He took this awesome picture, thanks for hanging out (and helping) Andrew!

[4]

580



It was fun to chat about the project, and airplanes in general. I always enjoy sharing my love for aviation with other people.

Later in the day, I received a nice shipment from Dynon! My autopilot panel, and my comm radio were delivered! These are some of the final components in my avionics package. The remaining component is the second HDX screen.



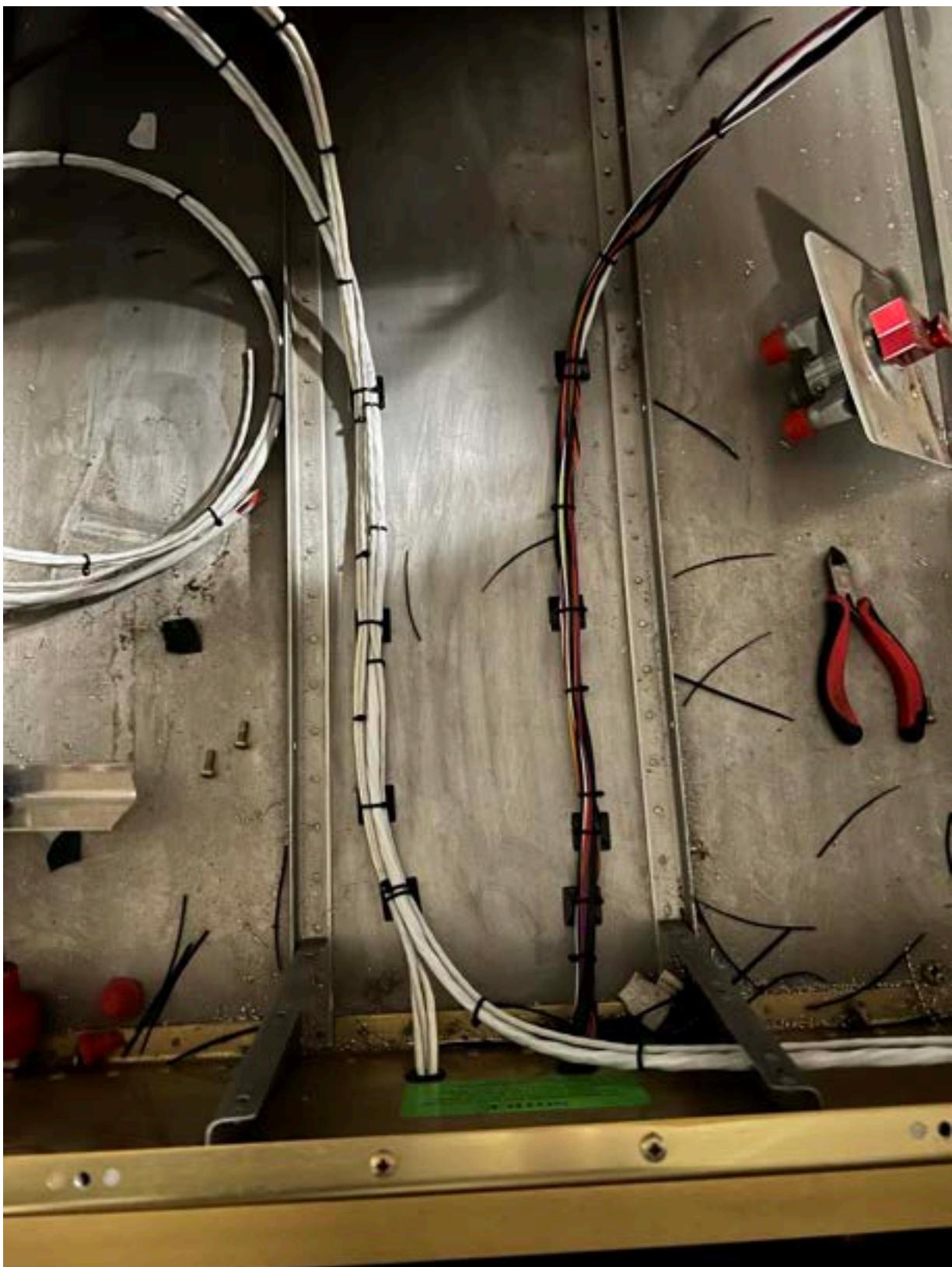
AP panel

These buttons are *very* satisfying to push! I'm looking forward to installing this in the plane soon!

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### **8.1.3 Fuselage Wiring (2022-01-23 22:38)**

Today I did a lot of wire organizing in the forward section of the fuselage, under the panel. All of the cables routed from the aft fuselage and under the seats funnels into the center section and routes on the floor up to the panel.



Once I organized the rats nest of wires I ended up with two nice bundles. These include the  
584

two trim motors, flap motor, ADSB, transponder, ELT, and ADHARS unit. These will be wired to the different serial and power connectors under the panel.



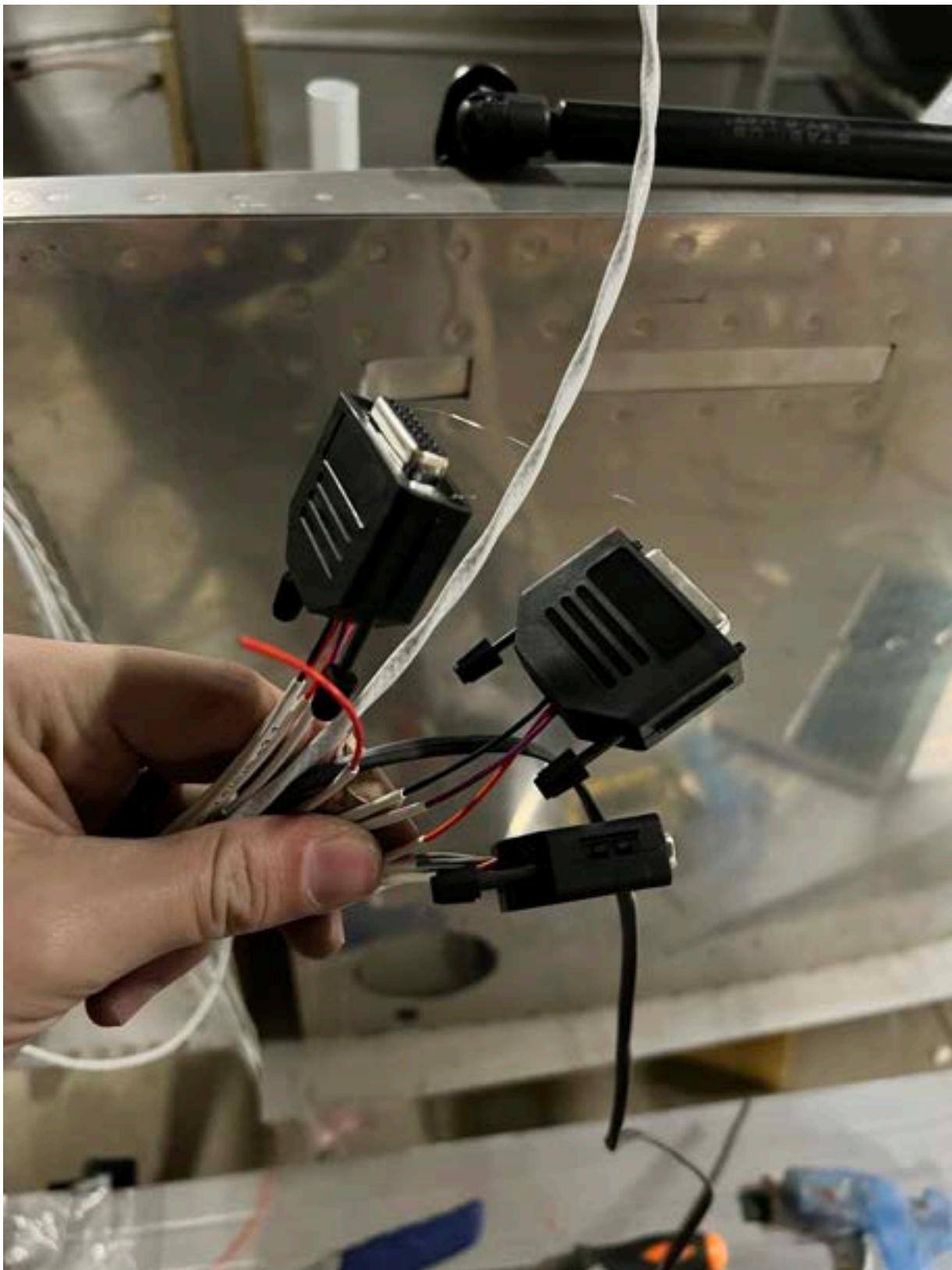
On the right side of the fuse I've separated out the radio antenna wire so that I reduce  
586

interference as much as possible. This will be behind there side panel from my interior, so it won't be seen. The RG400 coax wire has a minimum bend radius of 1in, which I am well above in all these bends.



On the left side of the fuse I've bundled my two autopilot harnesses. These are separated out  
588

from the power wires and autopilot disconnect which will route directly to the pilots stick. The Dynon autopilot harnesses are the standard SkyView Net 9 conductor harnesses except for power. So the only wires needed are the paired data wires.



Here are the Dsub15 connectors for the GPS, ADSB, and Transponder. The red wire for the 590

ADSB and Transponder are left off the connector in order to connect to the VPX. The GPS is powered by the SkyView screens, so it's fully pinned into the connector.

There are 5 components that use serial connections. In order to connect all the serial to both the PFD and MFD screens, I made a serial bus board that has 7 connections. These are all hooked up in parallel on each pin. When I connect all the connections to the board, each screen will be hooked up to each component properly. I've done the pins so that each Rx and Tx from the screens are assigned properly.

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#### **8.1.4 VPX Wiring #2 (2022-01-24 23:57)**

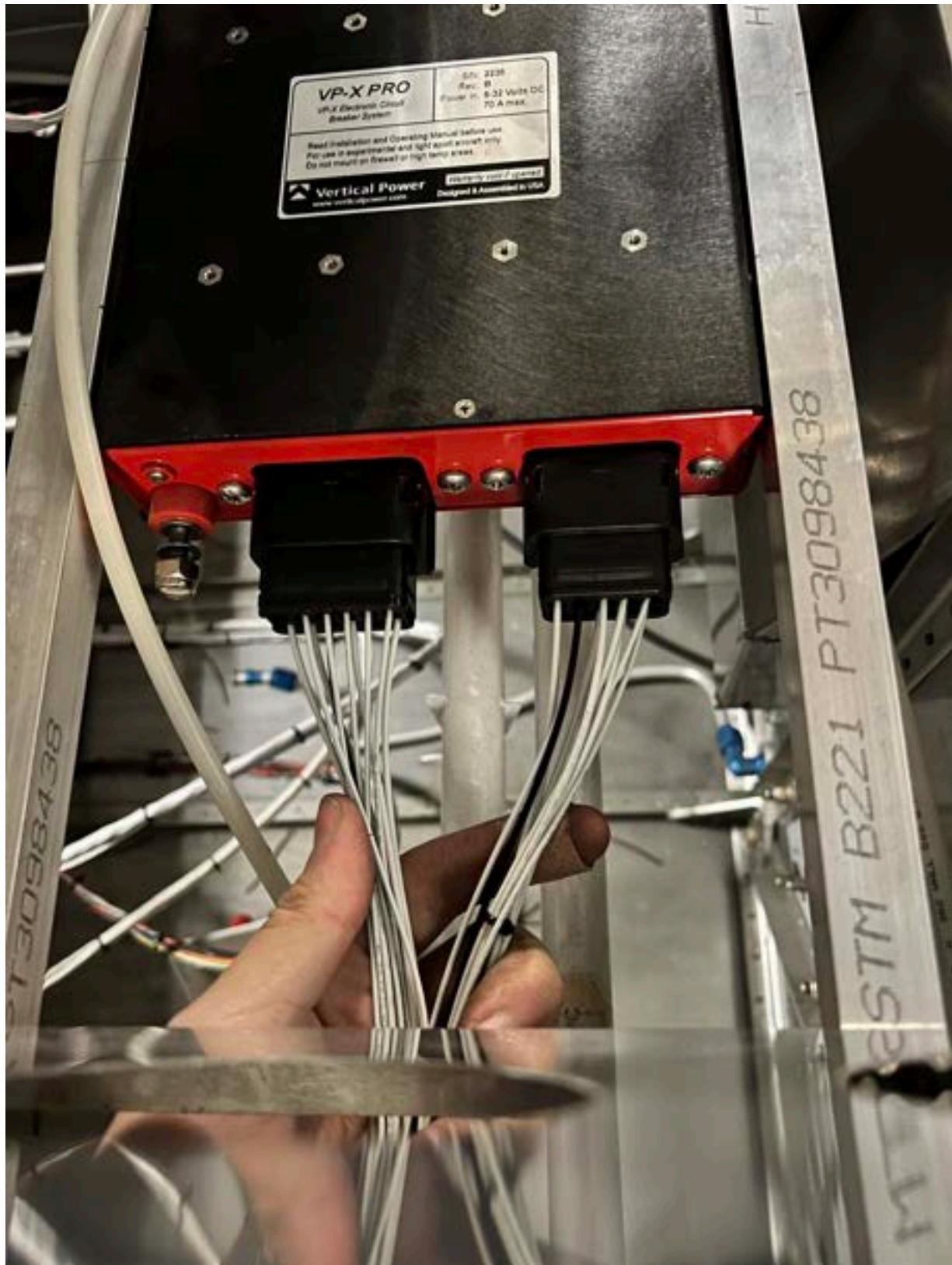
Today I continued with my wiring extravaganza. I didn't get any new pictures, but I started by beeping out the ELT DIN connector. I originally made the harness a few years ago, and forgot to write down the wire designations. I tested the connector and verified with the specs provided with the ELT and then made the DSub15 connector for the serial bus. The ELT just has serial Rx, power and ground.



Here's the DIN connector that plugs into the ELT. The tail sticking out is to test the Rx signal.  
592

It will eventually be tucked away.

[2]



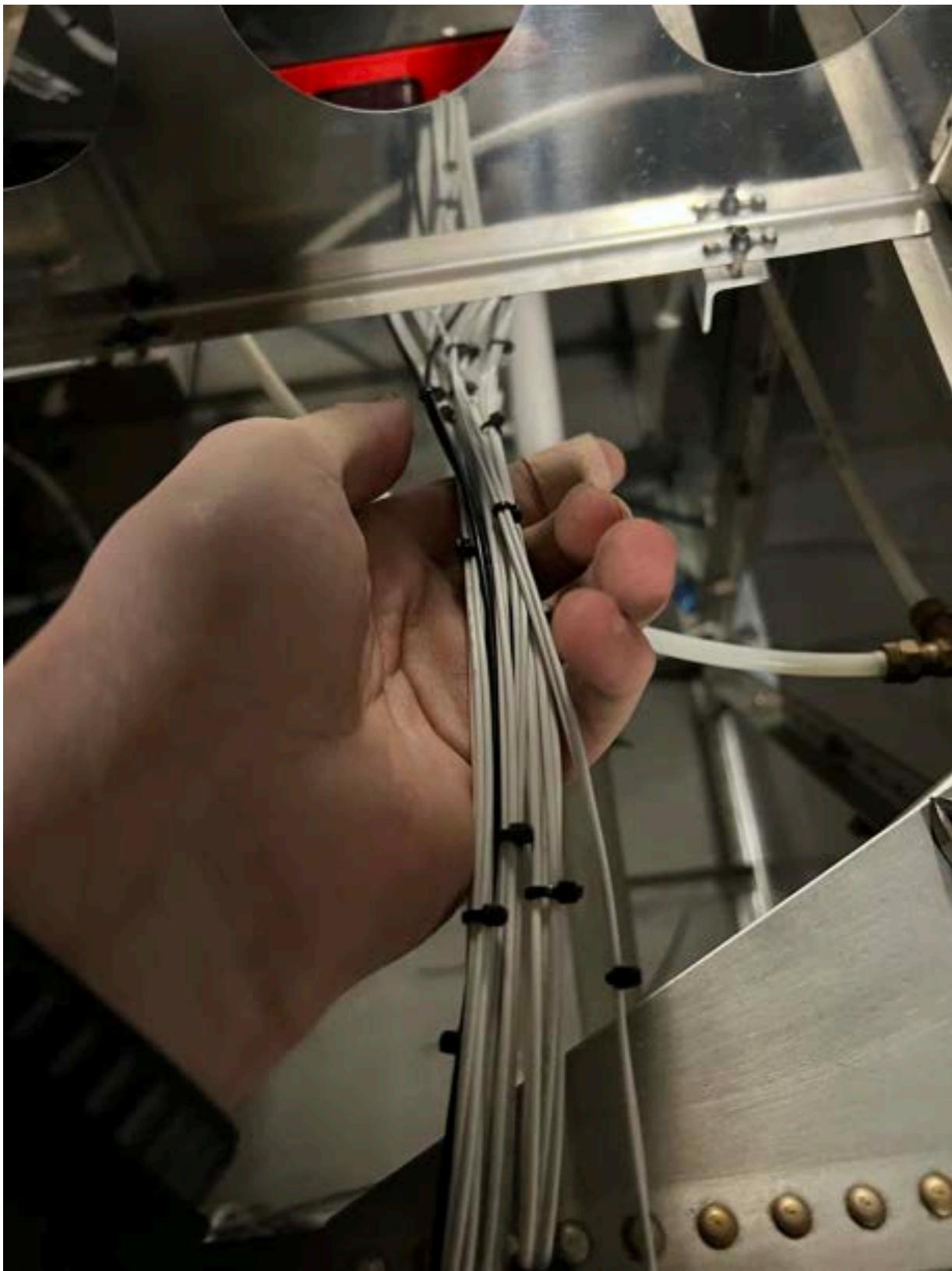
## VPX J10 & J12

Here are two of the main power connectors from the VPX. I connected these and began to separate out the bundles by where the wires needed to route.



VPX J1, J2, J8

On the other side of the VPX are the two D25 connectors J1 and J2. These are for some lower power items, like flap position sensor and interior lights, as well as the VPX serial connection. The J2 connector is for all the switches. These will go directly to the panel switches, which will be connected to ground on the other side.



Bundled by function and aircraft location

These bundles are such that each group will go to the same general area of the plane. The lighting harness for example is split into two half way down in order to go to the left and right, for each wingtip. Others are for powering the aft components such as the ADSB, transponder, and autopilot servos.



Switch bundle and serial bundle

This side contains the switch bundle, which heads off to the right side of the image from my hand, and the other bundles are for the flap position sensor, and the serial connection.



EMS and other wires

Here's a wider shot showing the EMS in it's mounting location. Once the plane is built this area will only be accessible by laying under the panel and accessing it from below.

The last thing I did was to drill the copilot's control stick for the quick release pin.



This pin allows the copilots stick to be removed in case the passenger wants a more comfort-

able ride. There will be two wires coming out of here for the copilots PTT for the radio. It will be fitted with a connector in order to make the system removable.

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## 8.2 February

### 8.2.1 Engine Controls Bracket (2022-02-09 07:34)

Yesterday I spent a few hours making the engine controls bracket. The bracket that comes in the kit is flimsy 0.032 aluminum sheet that is bent so it can attach to the bottom of the panel. I knew I wanted to use something different than the stock bracket, so I made one.



Here you can see the completed bracket. It's made from 1/4" aluminum angle. It's very hefty.

The three holes are for the throttle, prop and mixture control. The two larger holes have relief cuts made on the back of the angle to allow for the nuts to hold the controls onto the bracket.

I then lined the bracket up with the control panel, and drilled matching mounting holes. I then added some nut plates to the panel so that this can easily be mounted flush to the bottom of the panel. Now it just needs some priming and painting and the bracket is done.

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### **8.2.2 Ignition Harnesses (2022-02-15 23:37)**

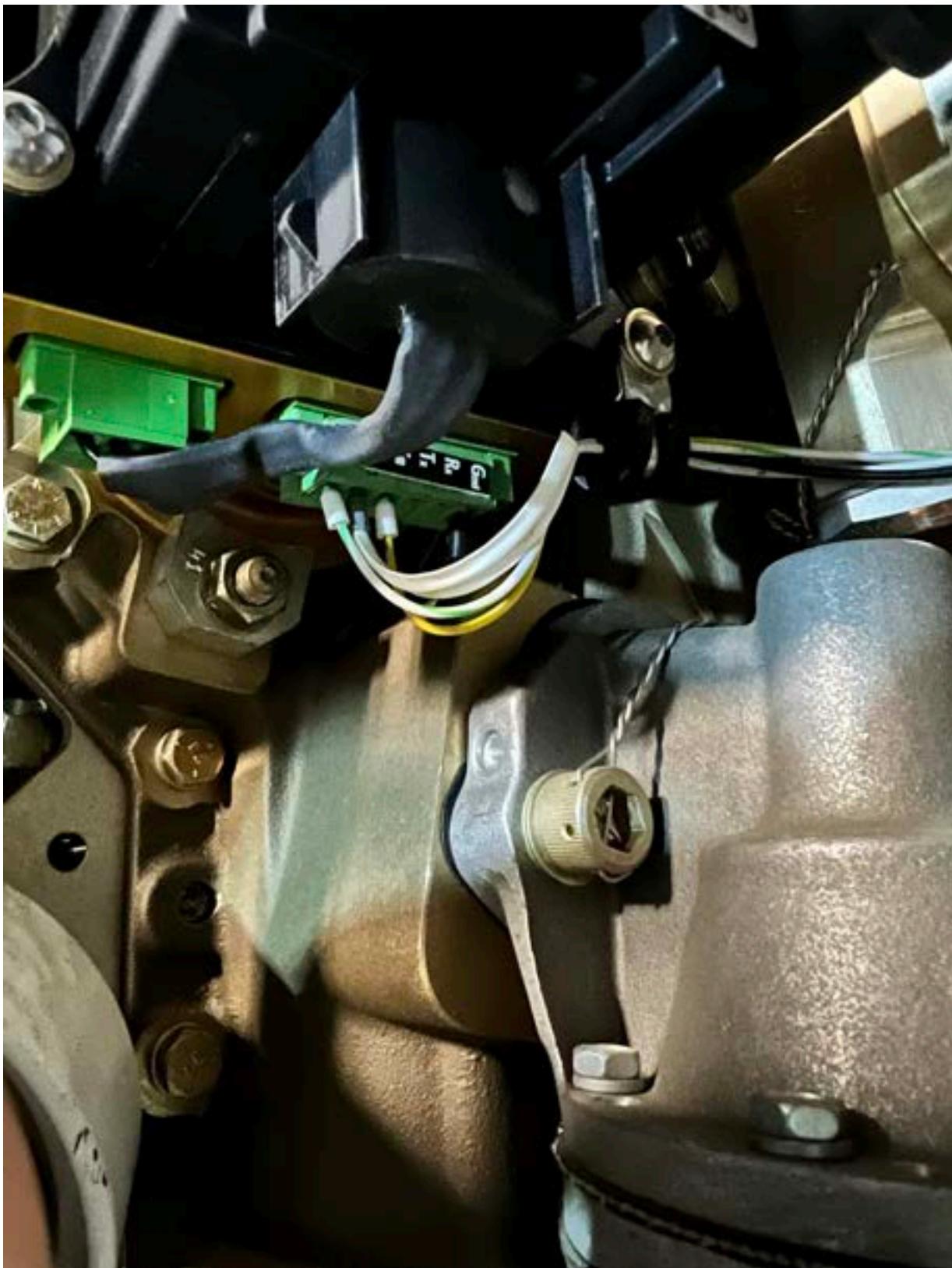
Tonight I spent a few hours making my ignition harnesses. My engine uses twin P-Mag ignitions, so I had to make two identical harness.

I started by removing the connectors on the ignitions so I can attach the wires. The connectors use a screw-clamp style connection.



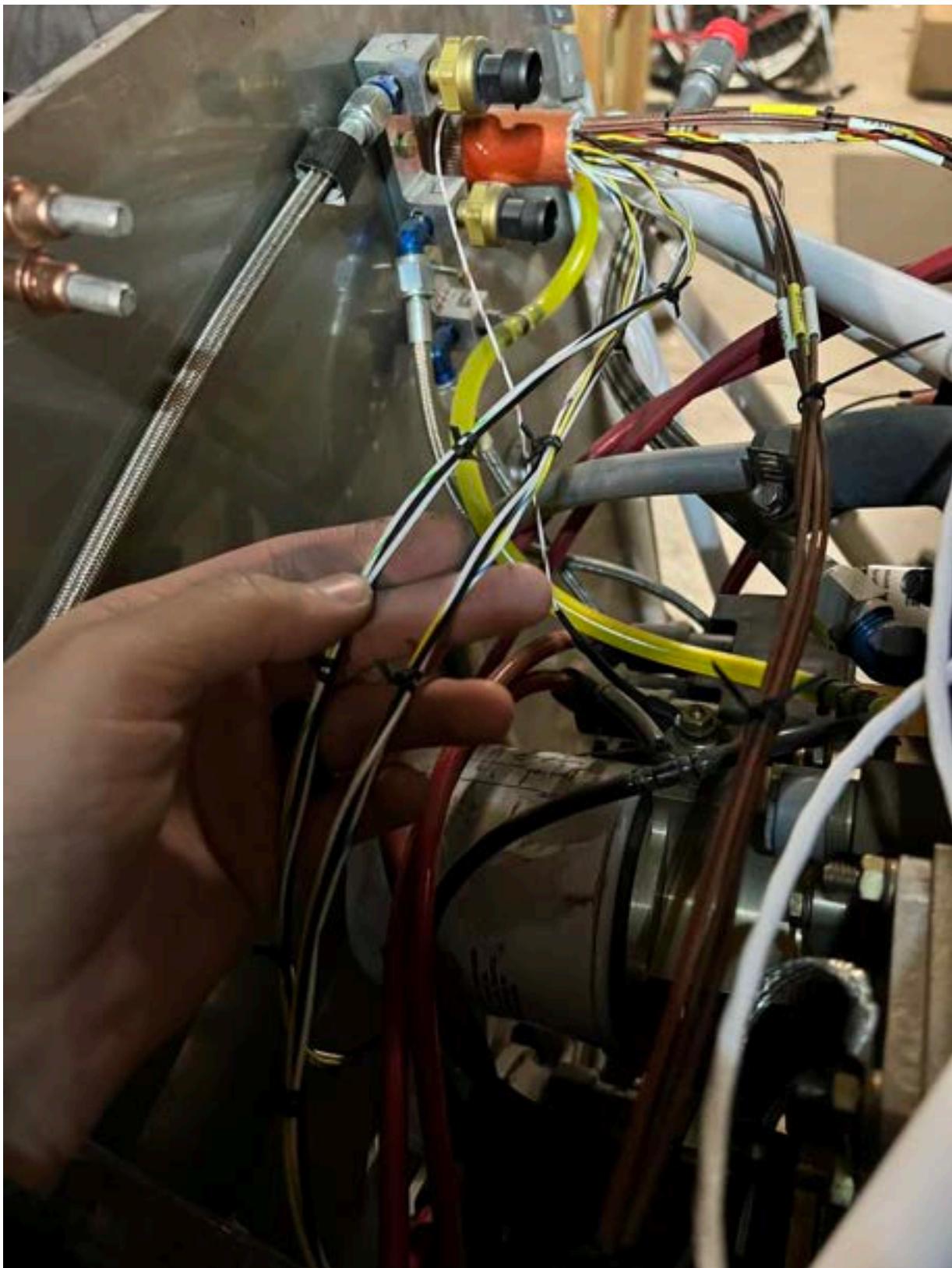
Right ignition

Here you can see the connector attached to the ignition with the wires attached. This is a six pin connector with Ground, ignition kill, power, and RPM out. There are two additional pins that can be shorted in order to change the default timing of the ignition.



Left ignition

The left ignition connector is on the bottom of the ignition and is a bit more challenging to get to, but I managed.

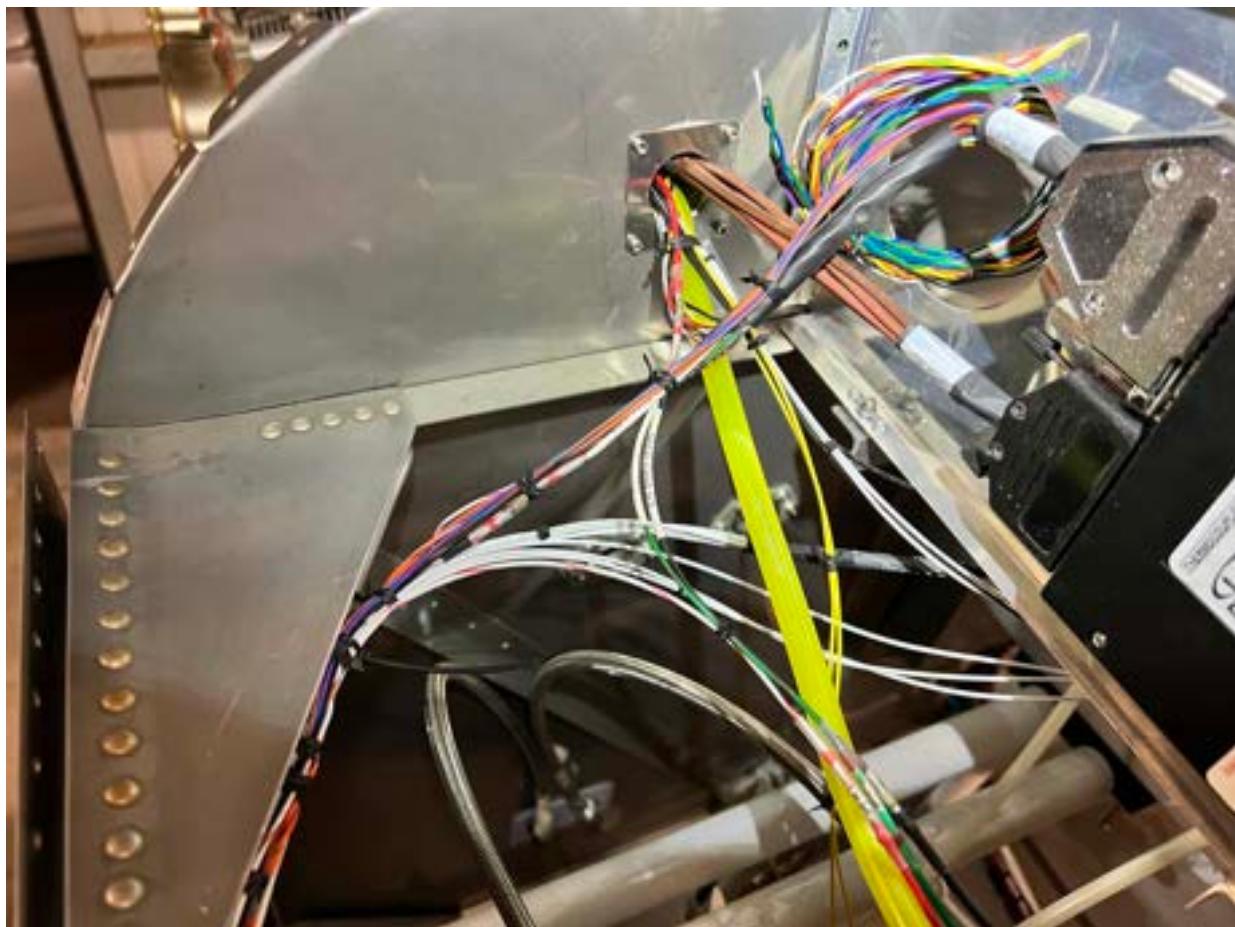


Completed harnesses

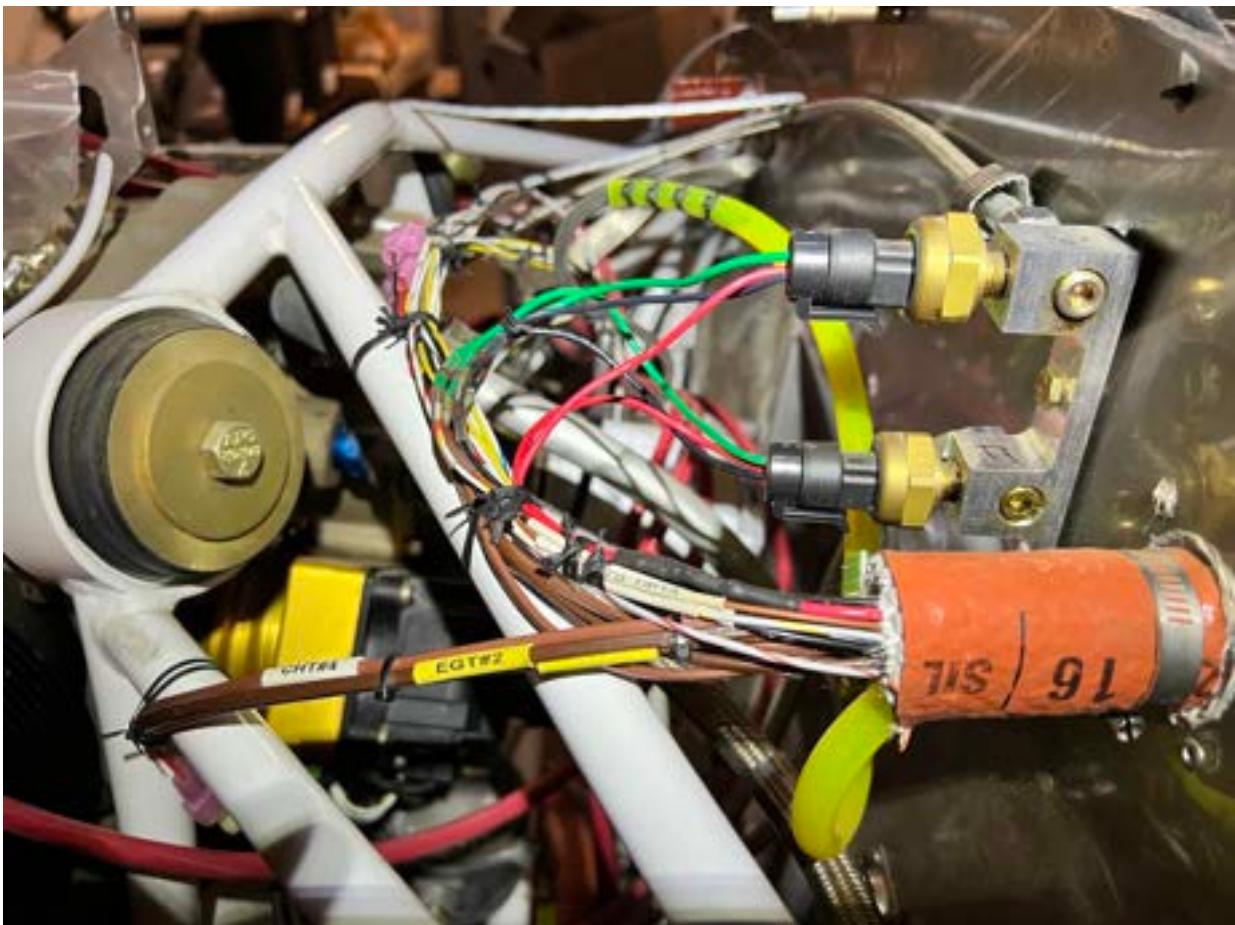
Here are the bundles completed. Looking forward to the day I get to start it up!

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### 8.2.3 More Avionics Wiring (2022-02-21 00:02)

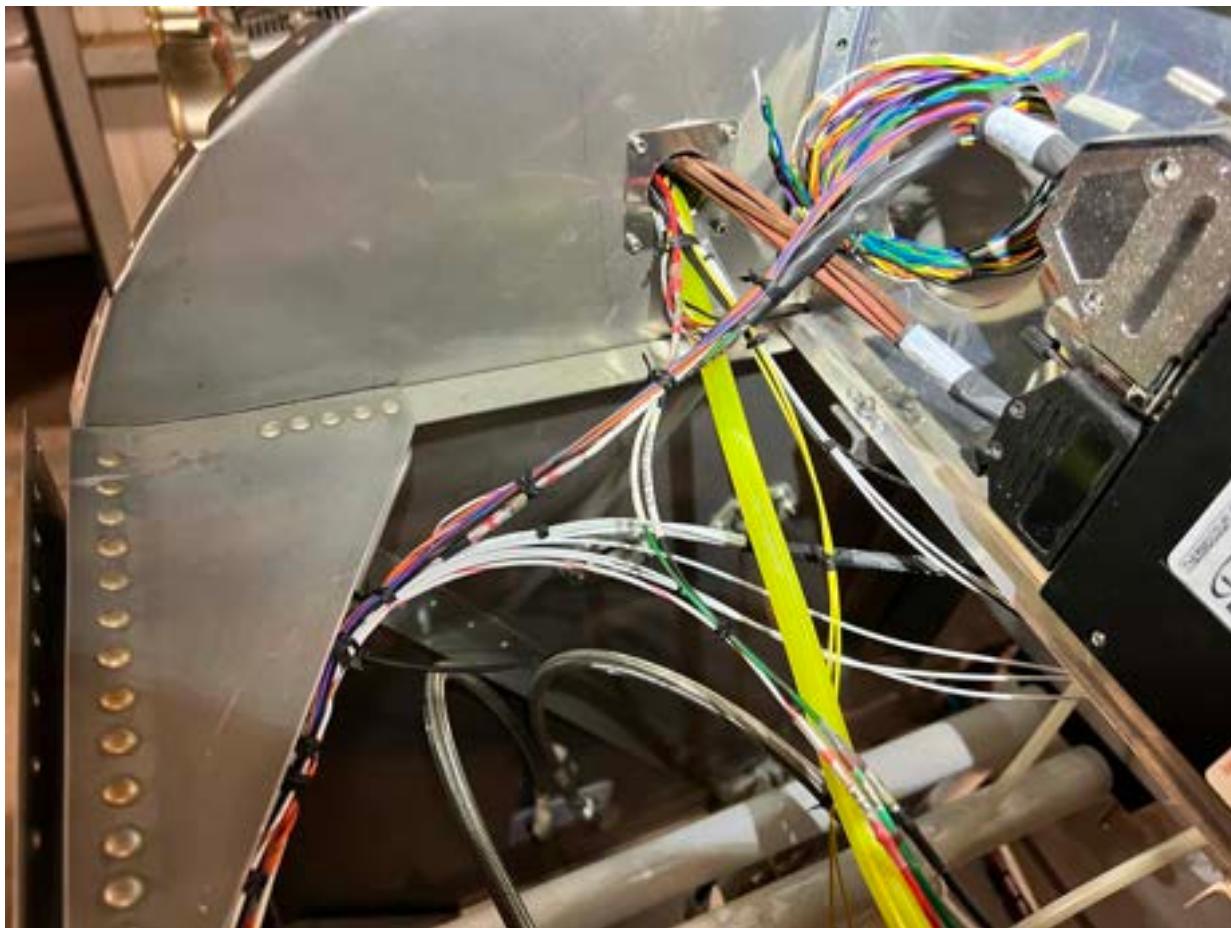


Today I spent a solid chunk of time routing wires. Making wiring harnesses has been one of my the more satisfying parts of the project so far.



Firewall forward

I started by organizing the firewall forward sensor wires. This bundle contains everything from engine temps, to oil and fuel pressure and the ignition harnesses. These are now secured to the engine mount and won't be able to move.



On the other side of the firewall I've secured everything and routed a portion of the harness down the left side of the fuselage in order to route the wires to proper area.



Center tunnel main harness bundle

This is the center section between the pilot and passenger seats. The main harness here is routed up to the vertical power above for all the power distribution. Other parts of this include all the serial connections, and the electric pitch and roll trim motors.

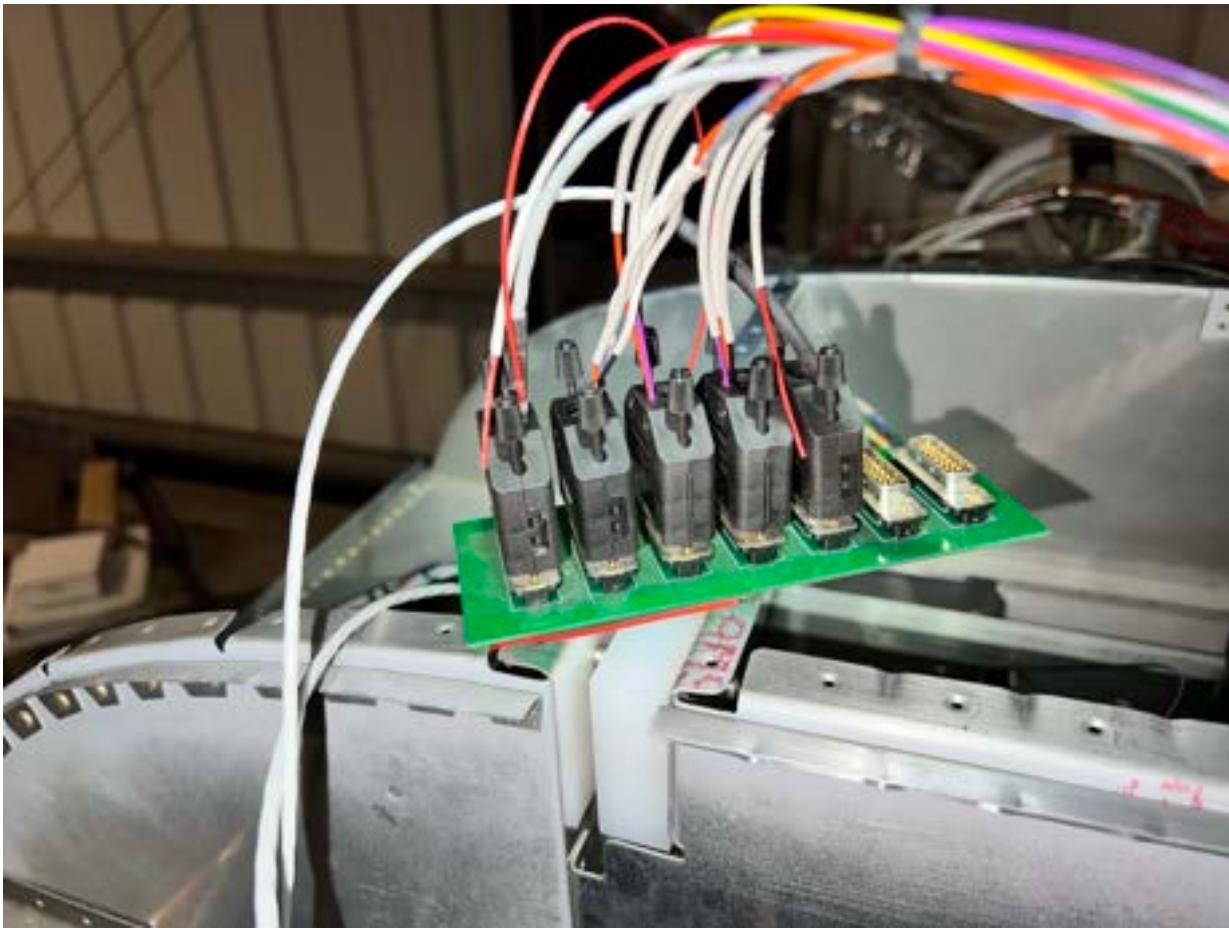
[4]



Here's another look at all the wires and how they're routed (Ignore the tie wraps and scraps). The harness splits to allow for the left and right lighting wires to route to the correct wing. I've isolated all power wires from my radio wires so that there will be no interference.

[5]

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Serial Hub

This is my serial hub, it had ports for the primary and multifunction flight displays (empty slots) and the five serial avionics. The ADSB, transponder, Vertical Power, GPS and ELT (black box) all communicate via serial. This hub allows all the components to connect to the two main flight displays in parallel for each of the five serial ports. Once I'm done with all the routing of the wires this will be mounted to the sub-panel permanently.



Fuel pump and selector valve

Once I finished with the wiring I wanted to test fit my fuel pump and selector valve. I have custom fuel hoses from TS Flightlines, so I had to modify the brackets to allow the hoses to fit (you can see the cut bracket on the left below the wires). Once I mount the wings, the two fuel hoses will attach to the fuel tanks.

1. [https://n890gf.com/wp-content/uploads/2022/02/img\\_1467.jpg](https://n890gf.com/wp-content/uploads/2022/02/img_1467.jpg)
2. [https://n890gf.com/wp-content/uploads/2022/02/img\\_1468.jpg](https://n890gf.com/wp-content/uploads/2022/02/img_1468.jpg)
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6. [https://n890gf.com/wp-content/uploads/2022/02/img\\_1473.jpg](https://n890gf.com/wp-content/uploads/2022/02/img_1473.jpg)

## 8.3 July

### 8.3.1 Panel (2022-07-31 23:04)

I've been working over the last several months on the panel layout and design. I've gone through a few iterations and I've finally settled on a design.

[1]



Panel and mock-up

I have a full size rendering of the panel so that I can visualize it as I do the detailed measurements. I have the entire thing measured out in CAD as well for the cutouts. The actual panel currently has a few reference lines marked on it for pilot/copilot centerlines, panel centerline, 1.5" ref line from the top, and finally 1" & 2" ref lines from the bottom.

Next update in a few days will have the complete panel marked and ready for cutting!

1. [https://n890gf.com/wp-content/uploads/2022/07/img\\_3353.jpg](https://n890gf.com/wp-content/uploads/2022/07/img_3353.jpg)

## 8.4 August

### 8.4.1 Panel Layout (2022-08-06 09:01)

I finished the detailed layout of the panel for the major components. I wanted to get these laid out first since they are symmetrical about the centerline.

[1]



Here you can see the cutouts marked for the two main EFISs and the four sub panels in the center. I have left room for an Avidyne (either 540 or 440) in the center, as well as a Garmin G5 on the left of the pilots screen. Given the additional cost of the Avidyne however, I will be waiting a little while to purchase that.

Next is to begin cutting the panel!

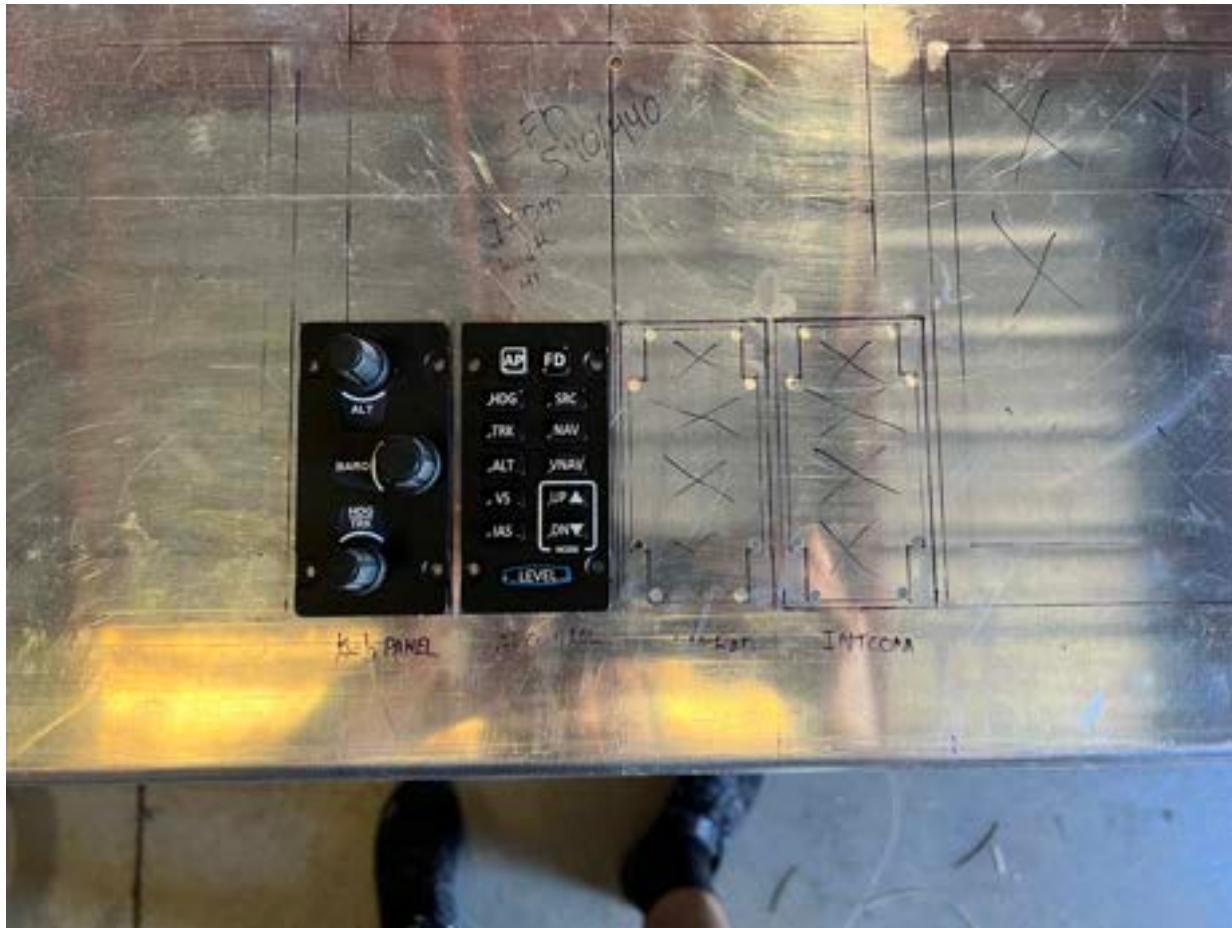
1. [https://n890gf.com/wp-content/uploads/2022/08/img\\_3358.jpg](https://n890gf.com/wp-content/uploads/2022/08/img_3358.jpg)

#### **8.4.2 Cut Panel (2022-08-07 23:21)**



Today I cut the panel for the main EFIS screens and the sub modules. I measured and compared to the CAD probably a dozen times, and luckily it all came out straight and even.

The first thing I did was look up how much the blank RV-7 panel costs on [vansaircraft.com](http://vansaircraft.com) - \$40. With that knowledge, I began to cut the first sub module hole, the knob panel.



After the knob panel went smoothly I began on the second one, the AP panel. All the modules are the same dimensions, but with the variability in my hand cuts I checked and lined up each element after test fitting.



The process begins by drilling a 1/8" hole in the corners (1/16" radius). Then using a cutoff

wheel I cut just inside the lines for the hole. Then I filed the edges to the final size so that each item fit perfectly, but with no catches or tight spots. Then using some scotchbright, I smoothed the edges out so they are soft to the touch.



Here are the four modules sitting in the panel. I need to buy some mk2000-6 nut plates so that I can screw these to the panel.



Next I cut the large hole for the main Dynon HDX displays. It was very satisfying when the  
625

display was installed. Many years to get to this point!



Finally I cut the second hole, making sure everything lined up and was square, and then test fit the second display.





One thing I was (and still am) a little concerned about, is the angled ledge on the displays. With the gap below being just less than 2", I planned to install my toggle switches centered between the display and the bottom of the panel. But with the ledge of the display sticking out a bit, I might bias the switches lower to give myself a little extra room to be comfortable flipping the switches.



Once I finalize the position of the Garmin G5 I'm going to install just to the left of the pilots

display, I'll start drilling the holes for the toggle switches. I placed one just below the screen in order to see how far up and down the switch is when toggled. It should have plenty of clearance from the display.

#### **8.4.3 Panel work (2022-08-18 06:56)**

Yesterday I spent a few hours working on the panel. I received an order of some 6-32 nut plates for mounting the sub modules onto the panel.

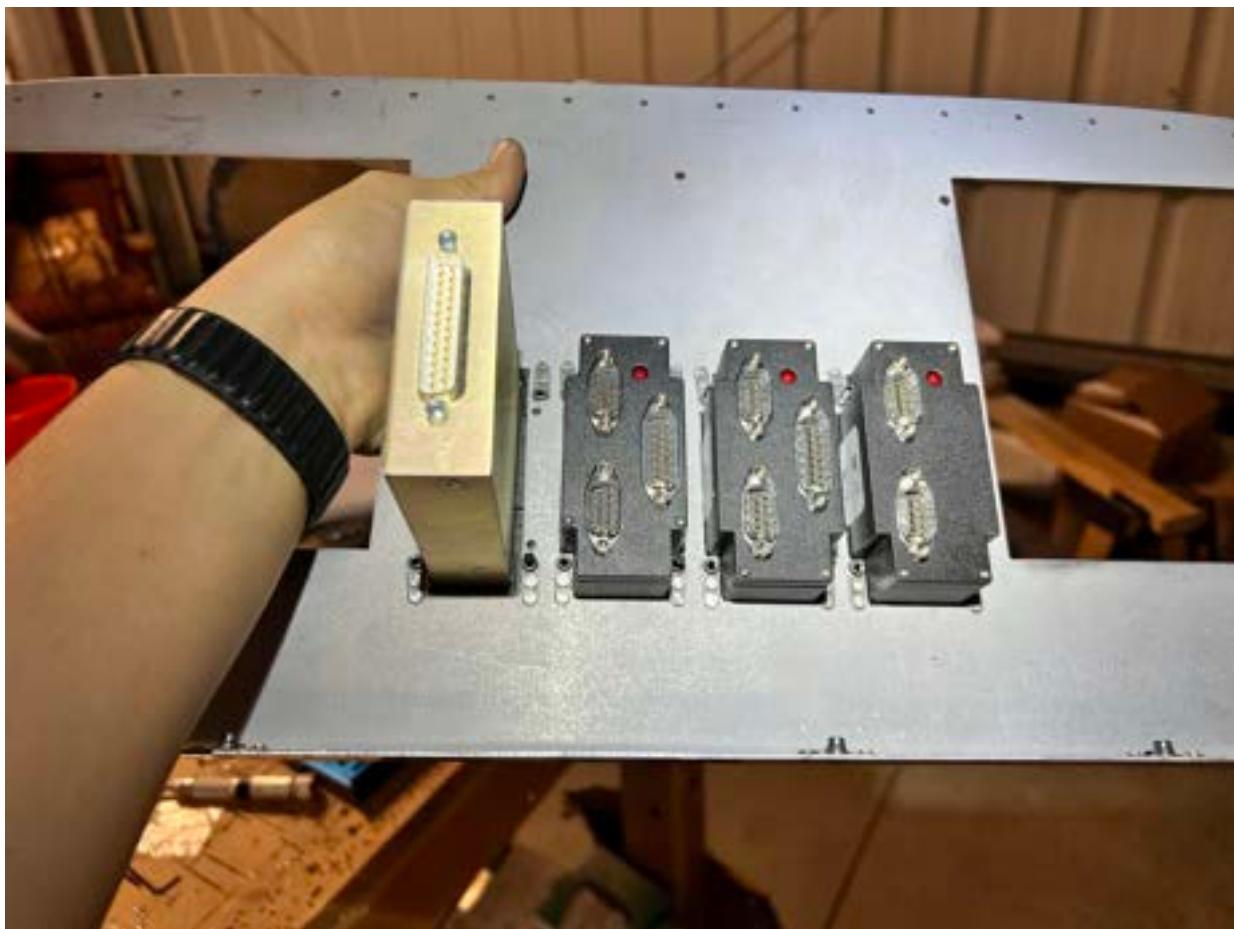
I started by doublechecking the measurements for the through-holes, and then drilled the panel. I didn't get individual photos, but here is the back once the nut plates were riveted on.

[1]



After double checking the alignment of everything individually I test fit all the components.

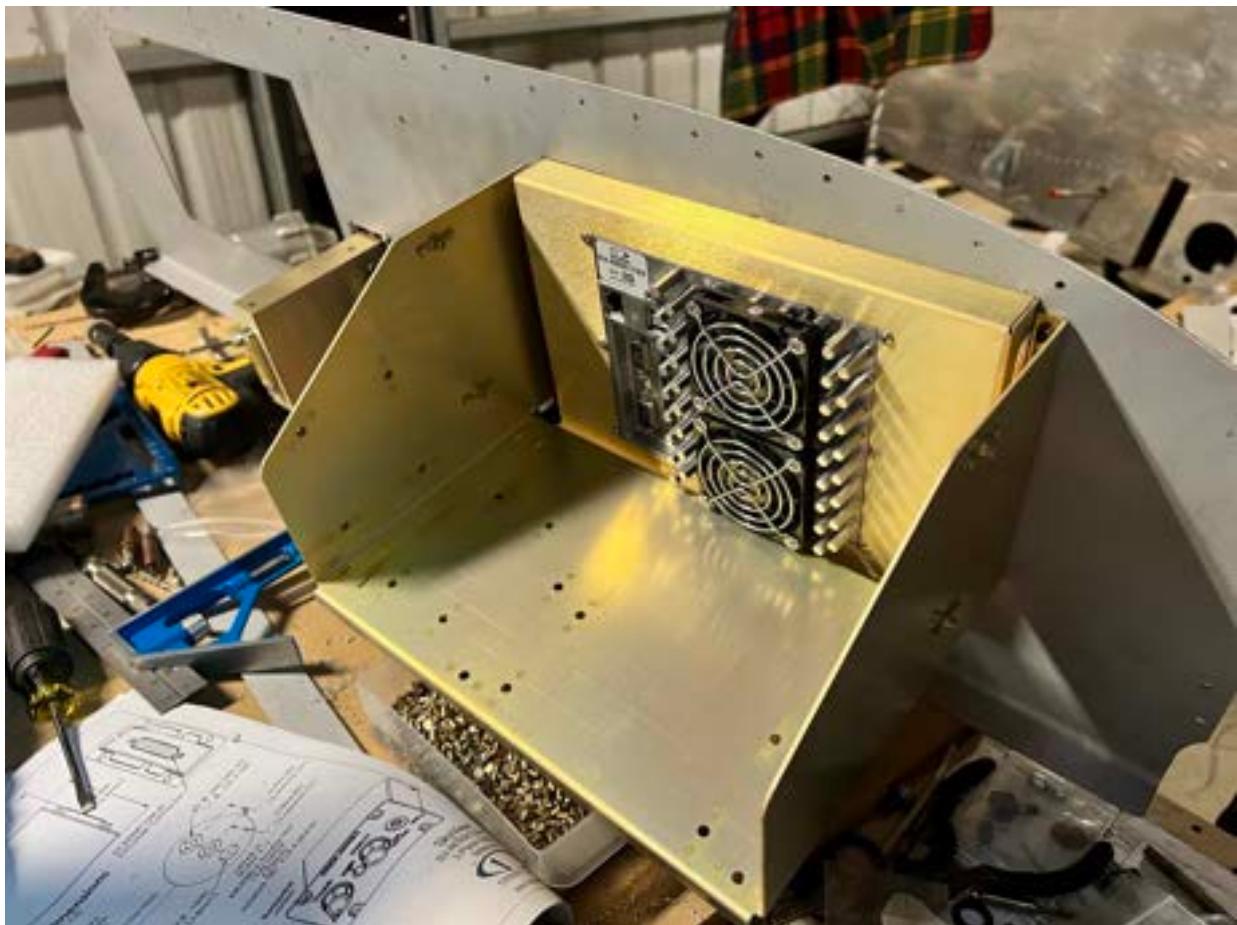
[2]



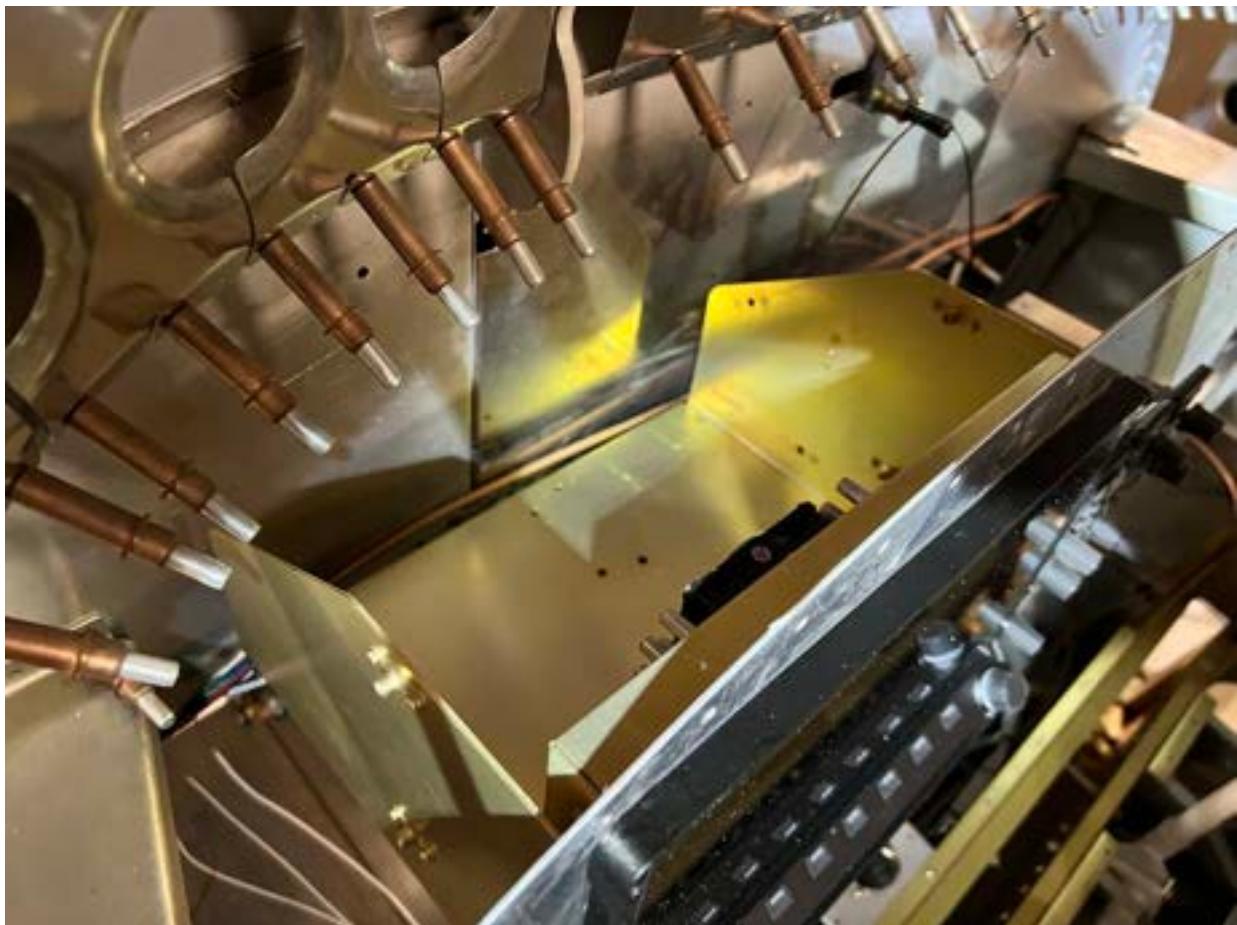
[3]



I then decided to mount the primary display tray to the back of the panel.



The panel then screws into this from the front of the panel. This will allow for some additional components to be mounted easily behind the panel.



I checked the fit by temporarily installing the panel in the plane. Plenty of room all around.



Starting to look almost like a real plane!

Next I'll begin marking and drilling the switches and some additional components including the Hobbs meter, ELT tester, the Dynon Ident button and dimmer knobs.

1. [https://n890gf.com/wp-content/uploads/2022/08/img\\_3415.jpg](https://n890gf.com/wp-content/uploads/2022/08/img_3415.jpg)
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6. [https://n890gf.com/wp-content/uploads/2022/08/img\\_3419.jpg](https://n890gf.com/wp-content/uploads/2022/08/img_3419.jpg)

#### **8.4.4 Switches (2022-08-21 00:50)**

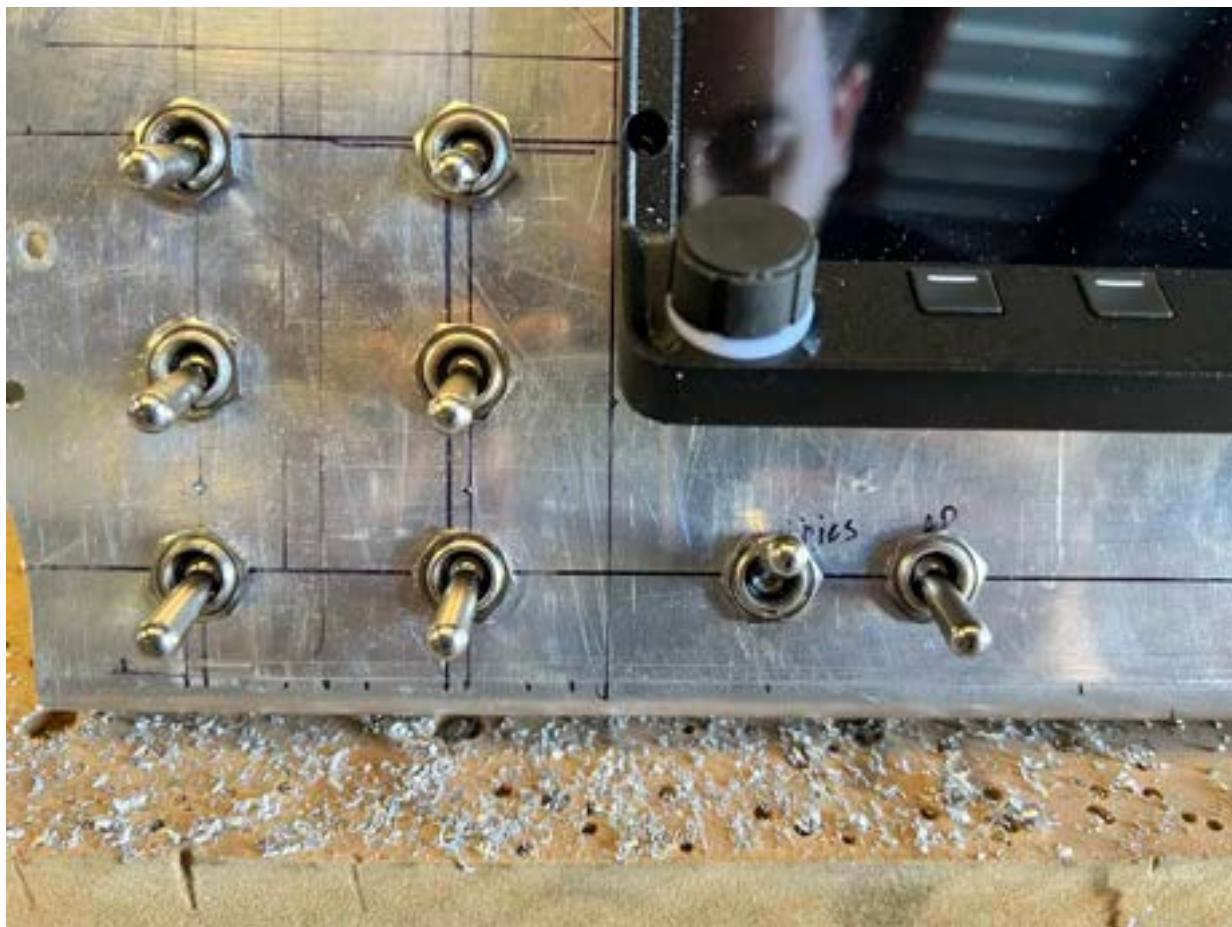
Today I worked on the switches for the panel. I have 6 switches dedicated to the primary power and engine ignition.



Here the top left is the master switch, and below is the L PMag ignition power and test switches.

The PMag ignitions have a built-in generator that kicks in above 800 RPM. The test switch allows you to ensure the ignition will continue running when power is removed.

[2]



I installed the remaining ignition switches, along with the Alternator enable switch next to the master switch. Then I installed the two switches below the display to ensure they are easy to use and are not inhibited by the angled part of the HDX screen. These are the Avionics and Auto Pilot switches.

[3]

638



Here are all the remaining switches installed. There are five switches under the display for the aircraft lights. This includes landing, taxi, strobe and nav lights, along with interior lighting. The three far right switch are the fuel pump, flaps, and engine start.



The boost pump switch is right up against the flap bracket. I may not use this given the proximity to the switch. It's all removable, so we'll see.



I also installed the Dynon dimmer knob, and the dedicated IDENT button. The ident function is useful to have a dedicated button for so I don't have to navigate the display menus. Similarly with the dimmer. Even though the system has light detection and auto adjusts the brightness, I like to have finer control.



The engine start button is a very high quality push button. It's extremely satisfying to press. Can't wait to fire up the engine with this!

1. [https://n890gf.com/wp-content/uploads/2022/08/img\\_3423.jpg](https://n890gf.com/wp-content/uploads/2022/08/img_3423.jpg)
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## 8.5 September

### 8.5.1 More panel work (2022-09-03 20:27)

Today I spent most of the day working on different parts of the panel.

[1]

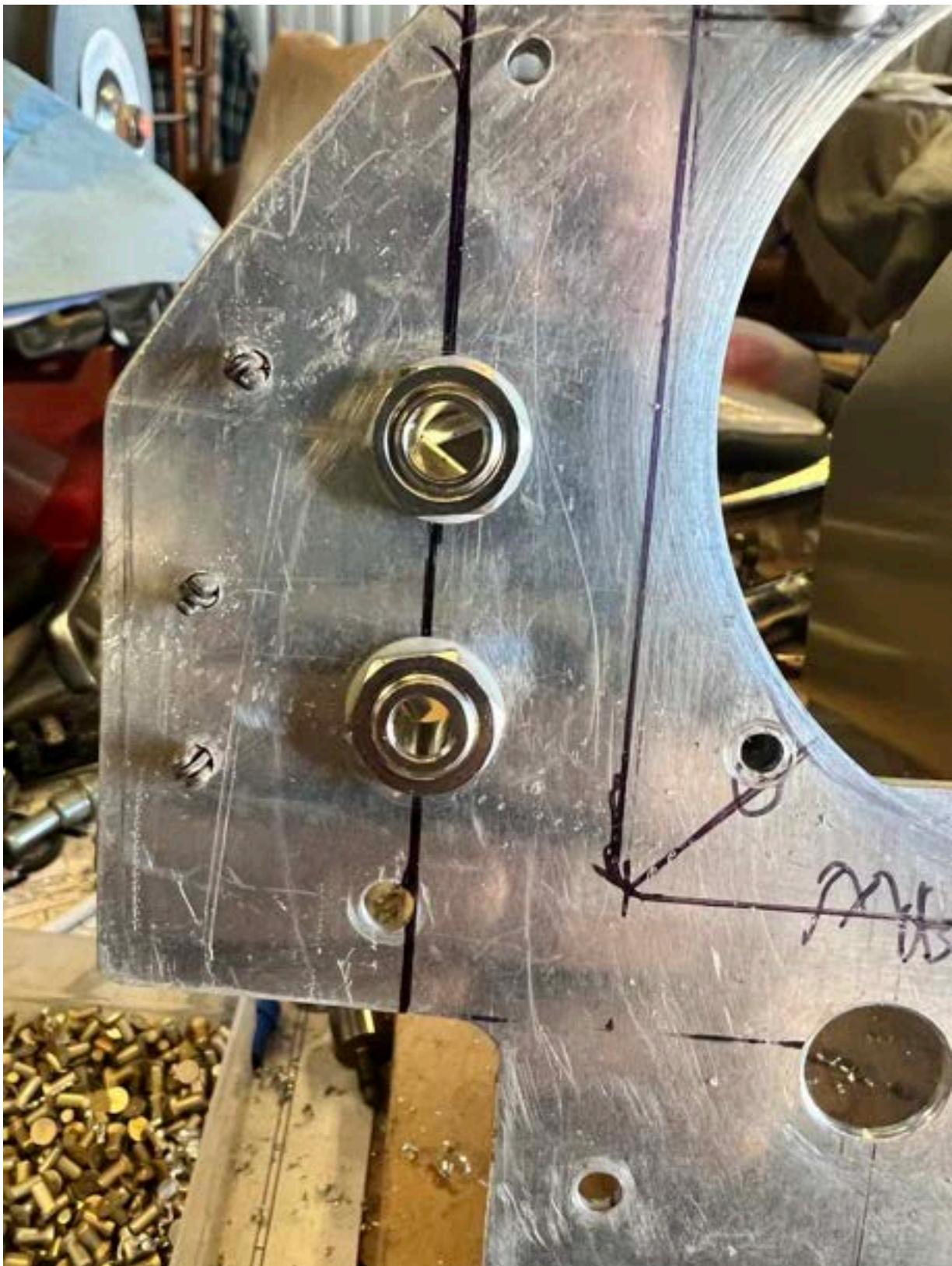


I cut the slot for the hour meter, and a double USB panel mount. These will be for updating both Dynon EFIS displays. Below the USBs will be the cabin heat control knob.

[2]



I also received my Garmin G5 that will act as my backup attitude indicator. I also added color caps to all the switches.



I also installed the headphones and microphone jacks. Here are the pilots side.

[4]



And co pilots side.

The panel is coming together. A more items to place and cut, and then the panel will be complete!

[5]



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### 8.5.2 Garmin G5 Pitot/Static Tubes (2022-09-05 20:52)



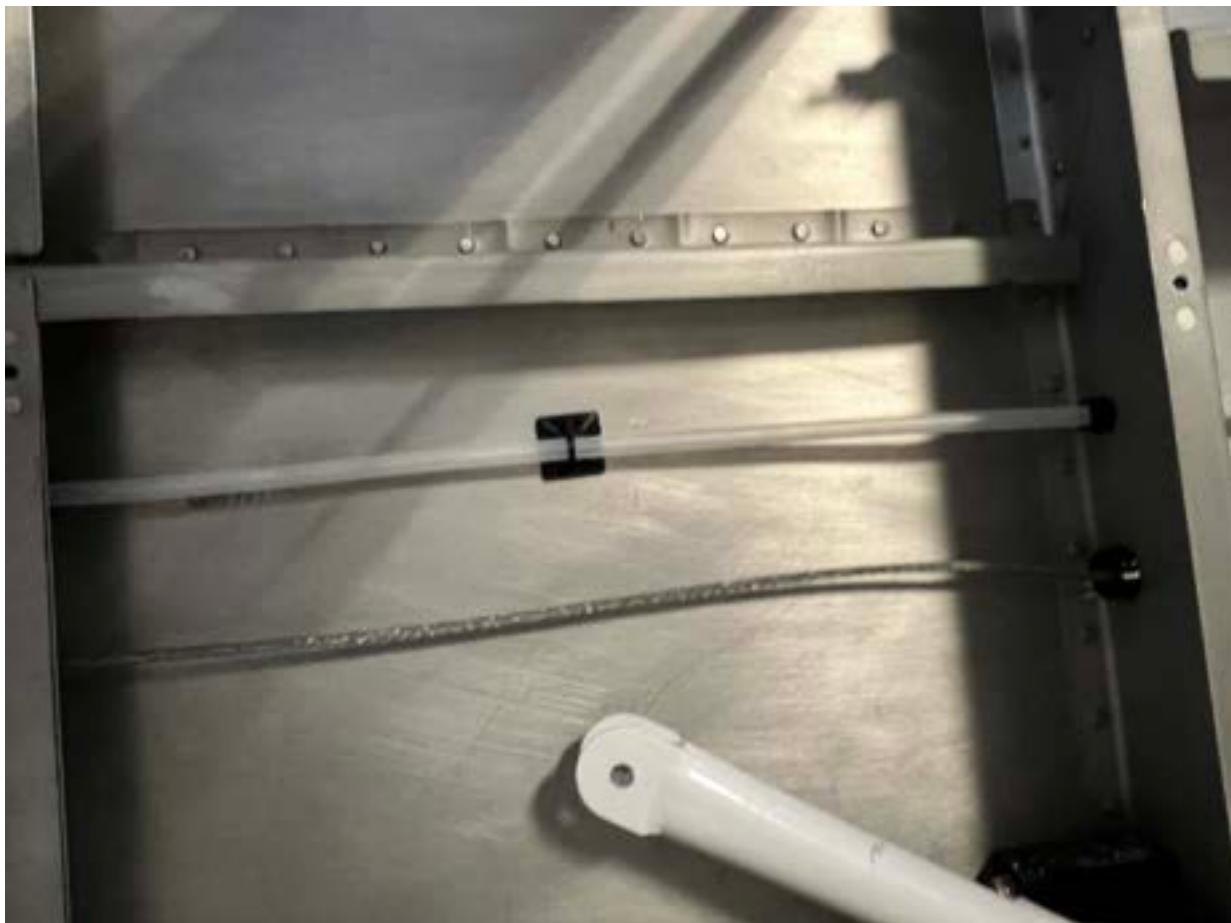
Today I spent a few hours working on getting the pitot and static lines up to the panel for the Garmin G5. The G5 will act as a backup EFIS to the Dynon.

I had to route the static line from the aft static ports to the front of the plane.



The tube here runs parallel to the rudder cable along the side of the fuselage.

[2]



It's secured with a zip tie and this will be behind a panel that also covers the flap actuator tube.

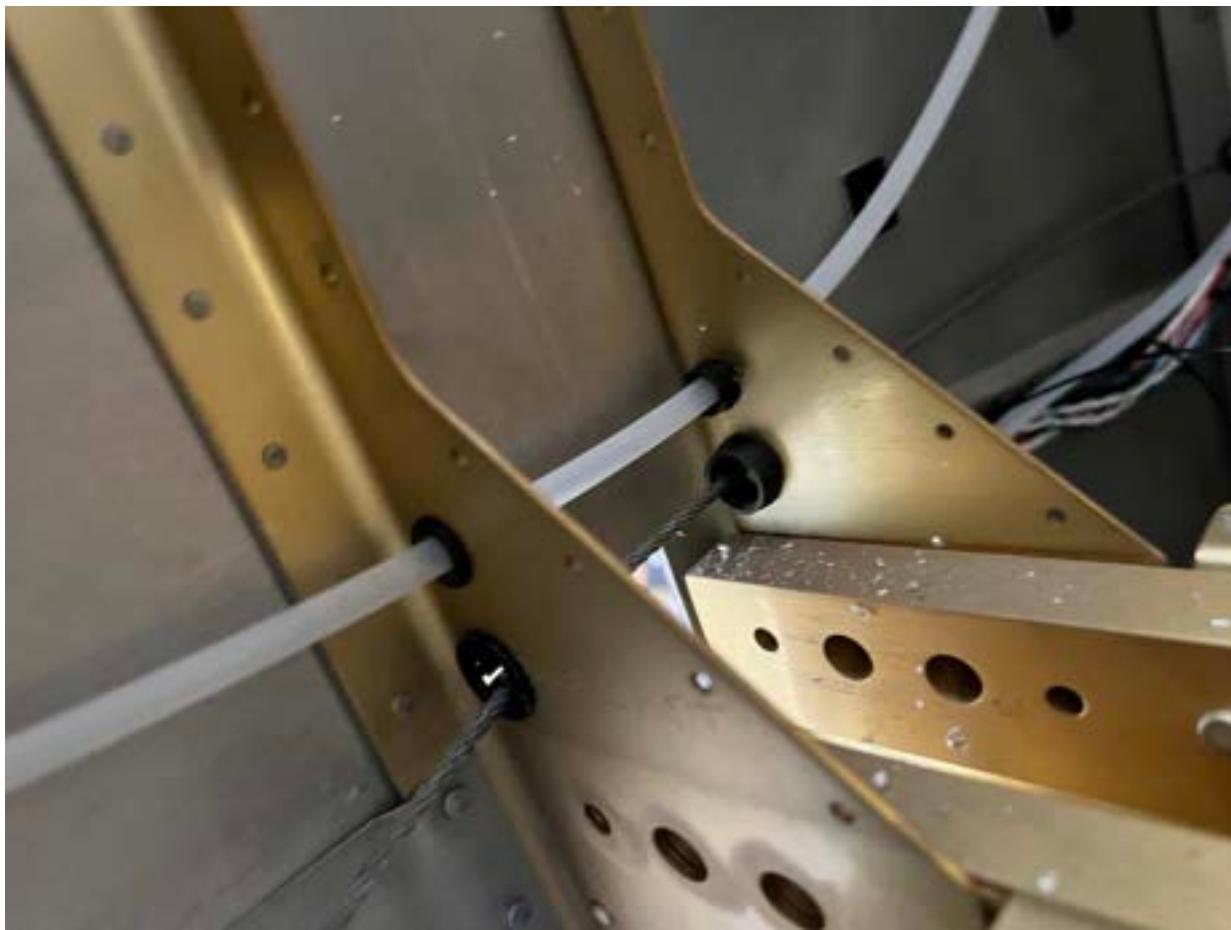
[3]



I had to drill two holes through the bulkheads. This is blind riveted and I didn't want to drill it off. The alignment took some trial and error.



Here is the routing just next to the pilots seat, this will be behind the side panel.



The final two holes put through the center channel bulkheads. From here, the static tube is routed up and to the panel and to the G5. Also on the panel will be a toggle switch an alternate static source in case of a static port failure.

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### **8.5.3 Canopy Frame & Engine Controls (2022-09-25 20:55)**

This weekend I spent almost 20 hours working on the plane.

I started by rigging the mixture, throttle, and prop cables to the engine.

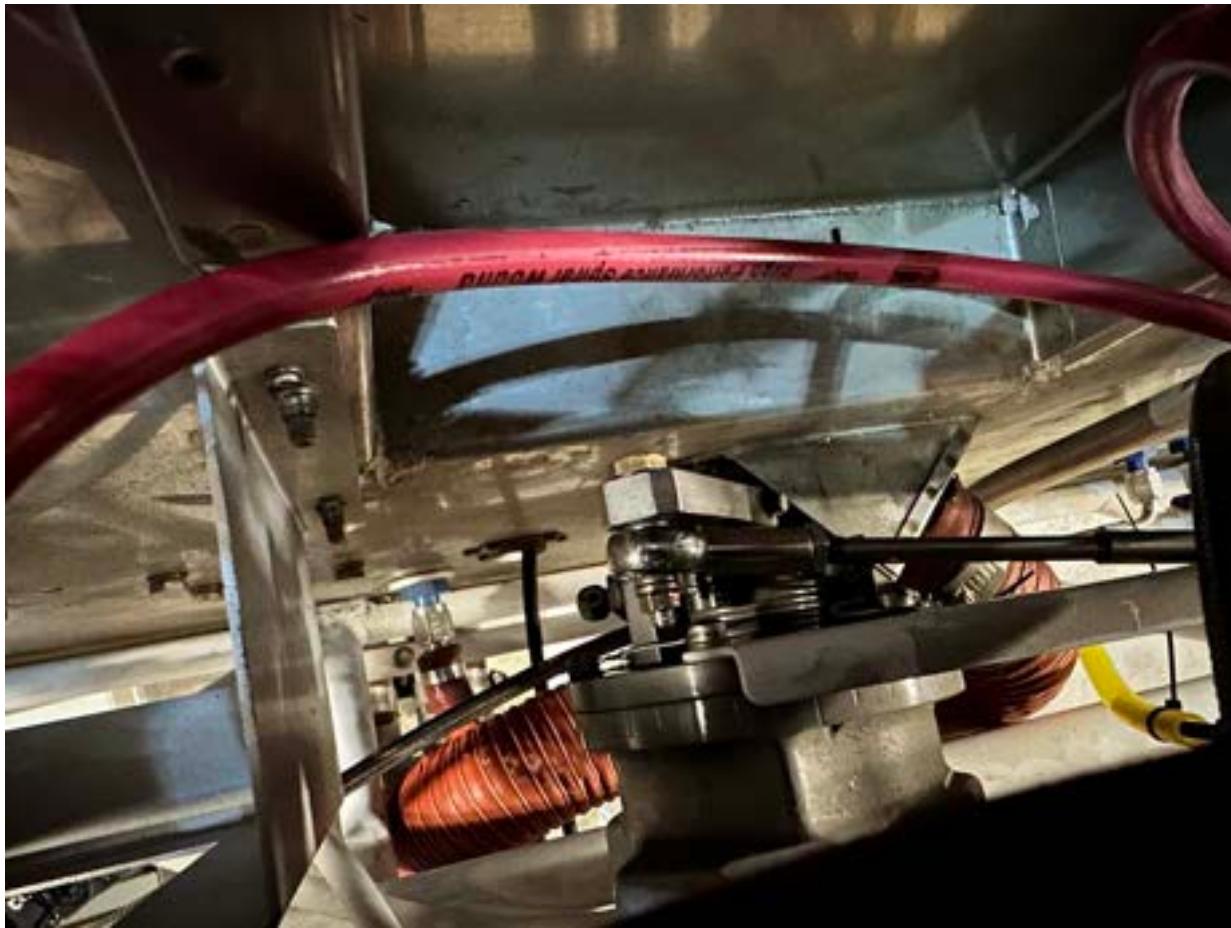
[1]



Here's the mixture bell crank. The mixture cable is attached to the right side. I got it all adjusted so that the knob reaches the stops as the servo side hits the mixture stops.

I then spent a couple hours test fitting and adjusting the prop cable. Similarly, I needed to adjust it several times so that the stops were reached without any issues.

[2]



Here is a top down view looking at the cable attached to the prop arm. The bolt will need to be adjusted, it fully clears the mechanism, but it's still too close for comfort. I'll add another washer under the bolt head to increase the clearance.

The throttle cable was a lot easier, the alignment was almost spot on. I'll need to do some slight adjustments on the servo arm.



Final adjustments to all this will be after the first engine start. But for now, everything is set from the factory.



Here's the panel test fit and the cable bracket clamped to the panel temporary.

I then spent about 5 hours riveting the canopy frame and skin together.



Here's the top of the canopy skin. The missing rivets are for the frame bracing. I will rivet the sub panel and lock-in the forward section of the fuselage before final riveting the braces, just to make sure it's all perfectly aligned.



Here's the bracing from the inside, the bottom rivets are riveted, but the top ones will be later.



Here's the panel installed so that I can test fit the frame. I might need to make a slight adjustment where the G5 is installed on the far left. It might slightly interfere with the craniotomy frame tube that runs the length from left to right along the top of the panel.

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#### **8.5.4 Canopy Bracing & Panel Lighting (2022-09-27 22:55)**

Tonight I spent a few hours finishing the canopy bracing.

[1]



Here are the rivets on the underside of the canopy skin. The bottom are pulled rivets and the top ones are solid rivets.

[2]



The center brace.

[3]

663



Here's the right side brace. One rivet will need to be redone as the bucking bar slipped.

The entire frame will get painted with my interior paint, a dark gunmetal gray.

I wrapped up the night by testing out my panel lights.



I'm using a high density led strip that has a silicone diffuser. They are very bright, but will be wired to a dimmer switch on the panel for fine adjustment. I may switch to a more blue light for better night vision. I'll be adding these strips to other parts of the interior to aid in visibility during night operations, the baggage area in particular.

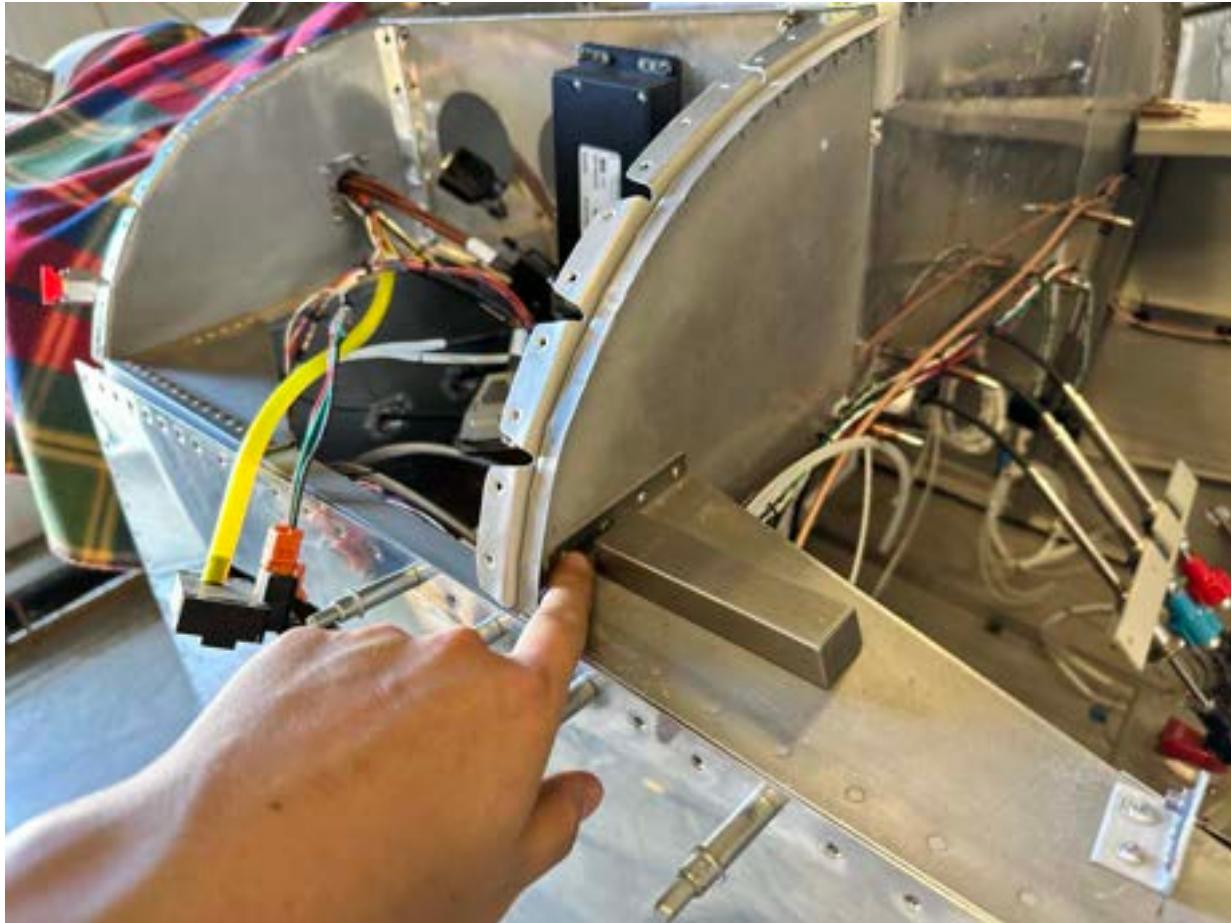
1. [https://n890gf.com/wp-content/uploads/2022/09/img\\_3700.jpg](https://n890gf.com/wp-content/uploads/2022/09/img_3700.jpg)
2. [https://n890gf.com/wp-content/uploads/2022/09/img\\_3701.jpg](https://n890gf.com/wp-content/uploads/2022/09/img_3701.jpg)
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## 8.6 October

### 8.6.1 Riveted Subpanel (2022-10-02 22:25)

This weekend I spent a few hours working on finishing up the canopy frame and sub panel riveting. I focused on riveting the subpanel completely to the fuselage to make sure that when I do final fittings of the canopy frame, everything is rock solid.

[1]



Here's the left side attach of the sub panel to the fuselage. There are six more rivets below this also attaching the sub panel to the fuse.

[2]

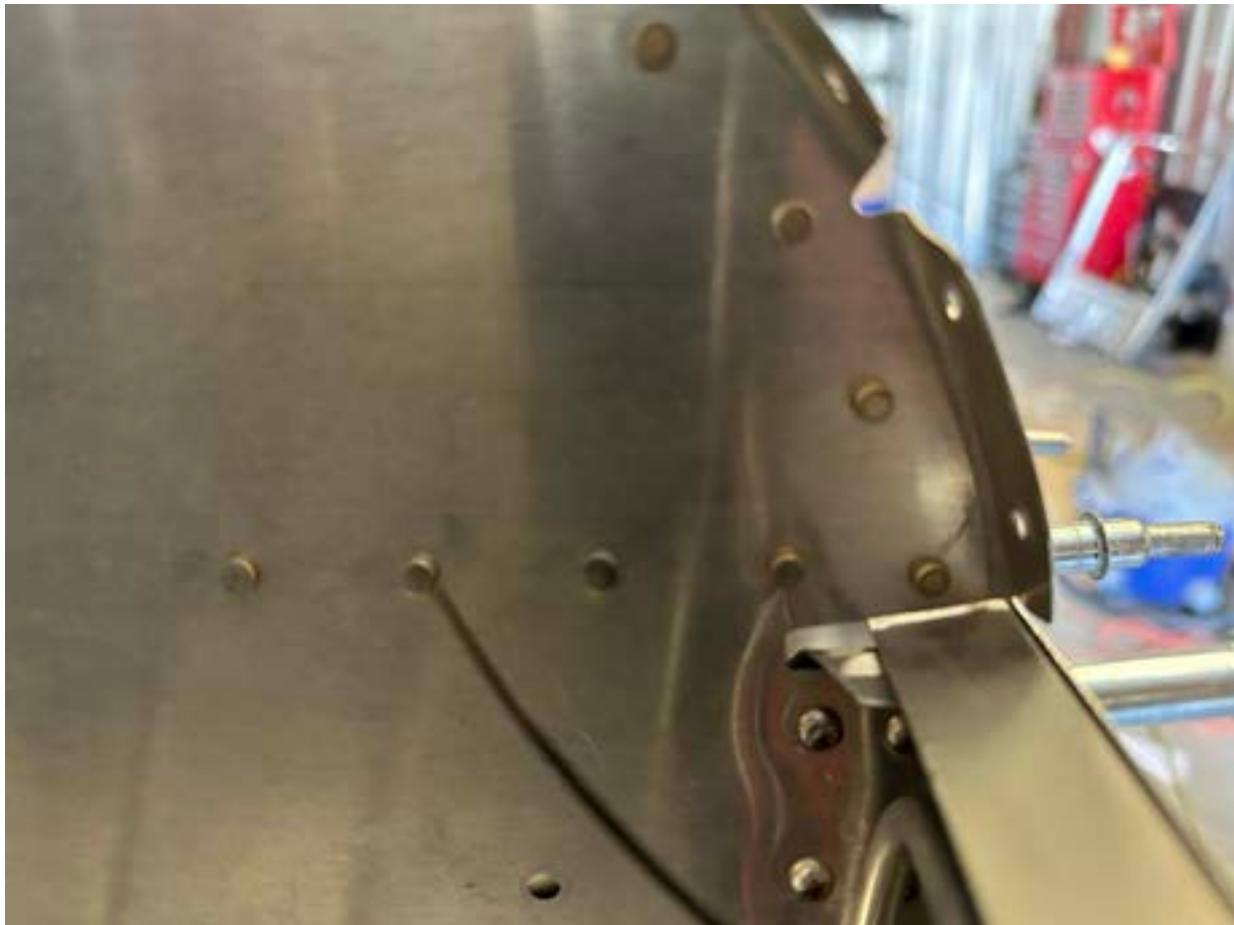
666



Here's the forward part of the subpanel attached to the supporting rib. This is mirrored on the

right side.

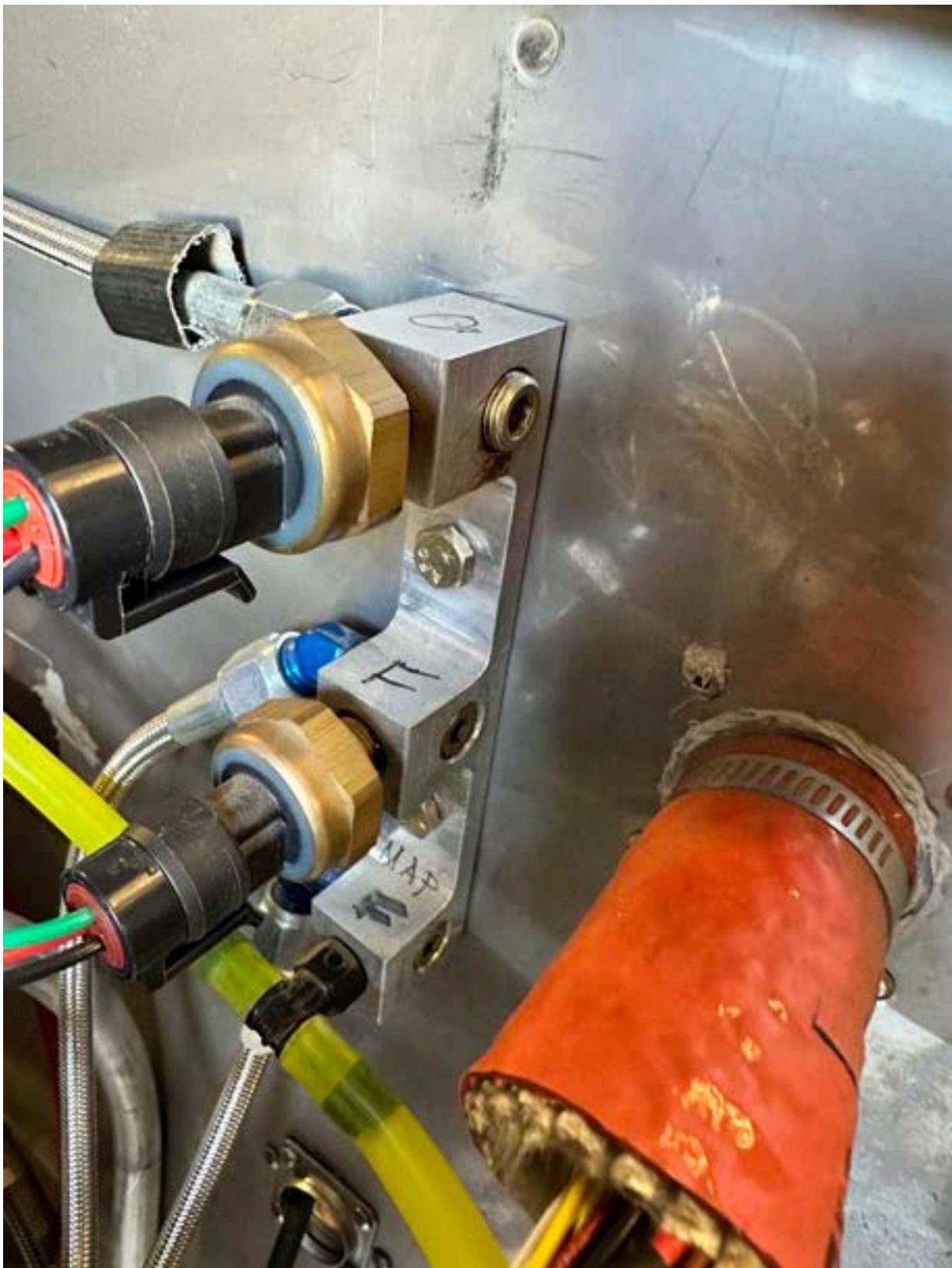
[3]



Here is the backside of the subpanel. Opposite of the first image. You can see some of the lower rivets near the fuel vent line on the bottom part of the image.

[4]

668



The sensor manifold on the firewall is now permanently attached as it is bolted to the support-

ing rib on the other side of the firewall. Now that it's riveted in place this can remain attached.

1. [https://n890gf.com/wp-content/uploads/2022/10/68635459865\\_\\_15b8c2c6-411f-4d8f-a20b-6783d0b28422.jpg](https://n890gf.com/wp-content/uploads/2022/10/68635459865__15b8c2c6-411f-4d8f-a20b-6783d0b28422.jpg)
2. [https://n890gf.com/wp-content/uploads/2022/10/img\\_3712.jpg](https://n890gf.com/wp-content/uploads/2022/10/img_3712.jpg)
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# 9. 2023

## 9.1 January

### 9.1.1 Radio (2023-01-20 00:31)

This evening I received an order with my new Bose 6-pin connector cord. I decided to use the Lemo style plugs on my plane rather than the GA plugs. The ship power for the Bose A20s is just so much more convenient.

I temporarily powered my Efis, radio and intercom to check all the wiring with the headphones.

[1]



Successful transmit and receive functionality

I was able to tune the AWOS to verify reception. Crystal clear. I then checked on the local traffic frequency with my handheld radio and everything functioned normally. A helicopter pilot happened to pass through and was able to verify my transmitting capabilities. The antenna is on the underside of the plane, and being inside the hangar I didn't expect good quality but it seemed work okay, no static or anything.



Radio functions

I've been making a lot of progress on all the avionics wiring and power circuitry as well. I plugged my laptop into the VPX and configured it with my specific setup. I also verified the PPS with the master switch on I was detecting 12V on the Main output.

[3]



Updating the databases and software

All the major systems have been installed and individually component tested. I'm now beginning to do the subsystem testing and slowly adding additional components. Once I finish manually verifying the power pins on the VPX, I'll plug all the connectors in and have the VPX supply power directly allowing me to test the switches and full circuits.

[4]

674



Checking the radio functions

I also finished installing the latch fingers on the canopy frame and verified the appropriate clearances around the fuselage and roll bar.



[6]

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Now that the frame is fully riveted it's time to prime and paint the interior, and then mask the frame where the canopy will go and paint the dashboard a flat black. Now that we've gotten through some of the biggest rain storms California has seen in a while, I'm hoping to get that knocked out soon.

1. [https://n890gf.com/wp-content/uploads/2023/01/img\\_4461.jpg](https://n890gf.com/wp-content/uploads/2023/01/img_4461.jpg)
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3. [https://n890gf.com/wp-content/uploads/2023/01/69181355018\\_\\_52a49e61-196e-46f9-9e8c-38bc9ef05030.jpg](https://n890gf.com/wp-content/uploads/2023/01/69181355018__52a49e61-196e-46f9-9e8c-38bc9ef05030.jpg)
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5. [https://n890gf.com/wp-content/uploads/2023/01/img\\_4068.jpg](https://n890gf.com/wp-content/uploads/2023/01/img_4068.jpg)
6. [https://n890gf.com/wp-content/uploads/2023/01/img\\_4072.jpg](https://n890gf.com/wp-content/uploads/2023/01/img_4072.jpg)

### **9.1.2 Switch Wiring (2023-01-28 18:38)**

Today I spent time disassembling the panel and making the wiring harness for all the switches. Since I'm using the VPX for my power distribution, all of the switches are wired directly to the

J2 connector and to ground. It simplifies the wiring and allows for a very clean setup.

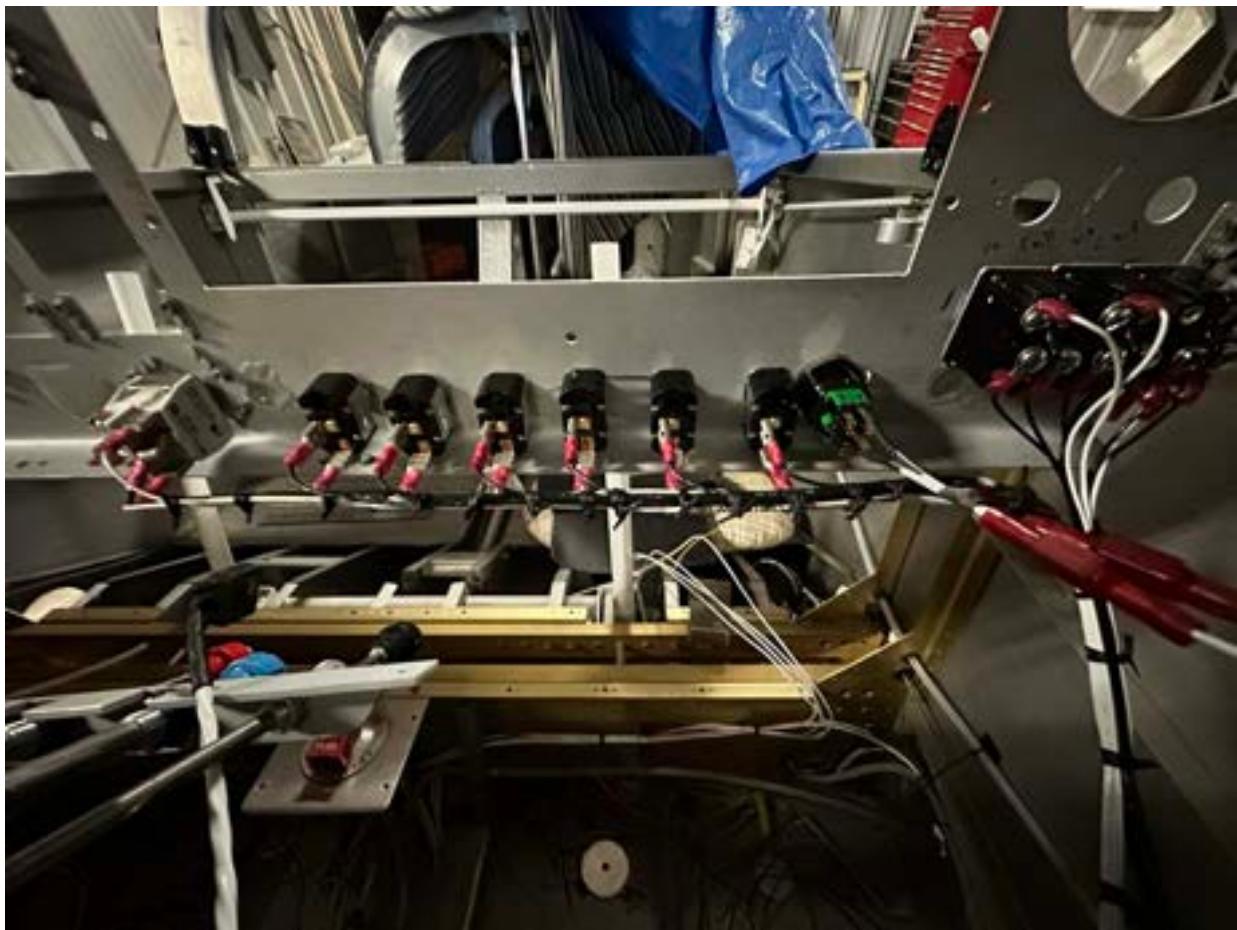
Once I had the panel out of the plane, I installed the switches so I could measure the wires and begin the assembly.

[1]

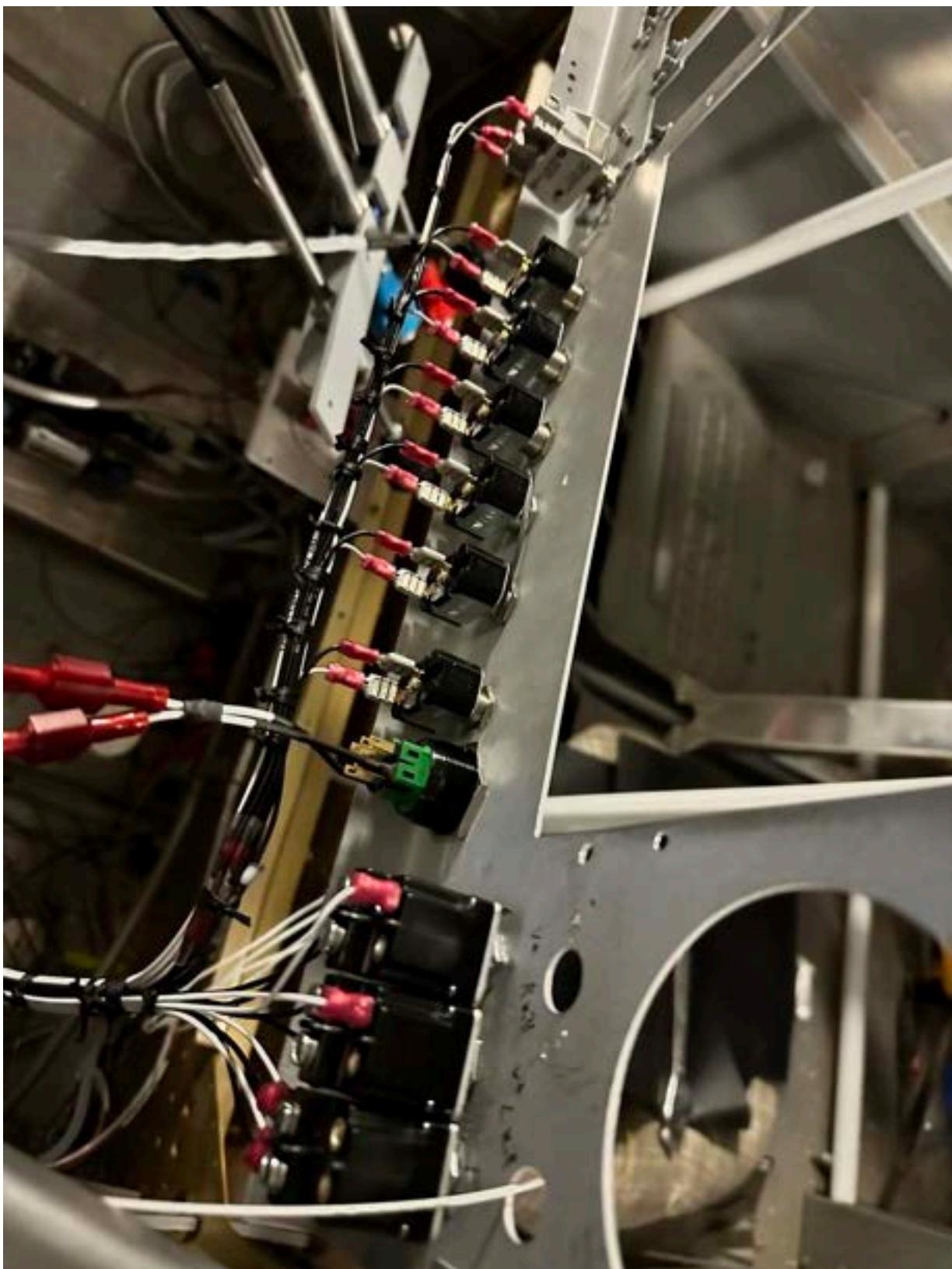


Once I had the switches in, I began wiring them and bundling the harness to that the wires could route to the VPX without too much trouble.

[2]



The resulting installation is quite clean and organized. I then tested each switch to ensure proper grounding and that the VPX pins match my wiring schematics. Next time I'll test the functionality of each switch on the VPX using my laptop.



Another angle showing the switches. There's still some cleanup of the panel to do, and then it  
680

will be ready for painting.

1. [https://n890gf.com/wp-content/uploads/2023/01/img\\_4531.jpg](https://n890gf.com/wp-content/uploads/2023/01/img_4531.jpg)
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3. [https://n890gf.com/wp-content/uploads/2023/01/img\\_4530.jpg](https://n890gf.com/wp-content/uploads/2023/01/img_4530.jpg)

## 9.2 February

### 9.2.1 Avionics Testing (2023-02-05 21:27)

I've been doing some component and subsystem testing of the avionics. I hooked up my laptop to the VPX to configure and test all the switches and devices before powering things on for the first time.

[1]



Once I powered up the avionics I was able to work through all the setup and testing of the different components.

[2]



Today I spent time wiring up the trim servos. They wire up to the autopilot panel so that they can be controlled using the Dynon auto trim functionality. I also wired up the flap position sensor. The flap sensor is wired to the VPX rather than to the Dynon EMS. The reason for this is so the VPX can monitor and control the deflection of the flaps to certain levels.

[3]



I don't have it in the picture, but I also installed the Garmin G5 and powered and tested as well. I also wired up a micro switch to the canopy latch, it displays a digital "light" on the EFIS if the canopy is open.

I've really been enjoying wiring up and testing all the avionics. Next up I'll be working on the canopy frame in preparation for the canopy bonding.

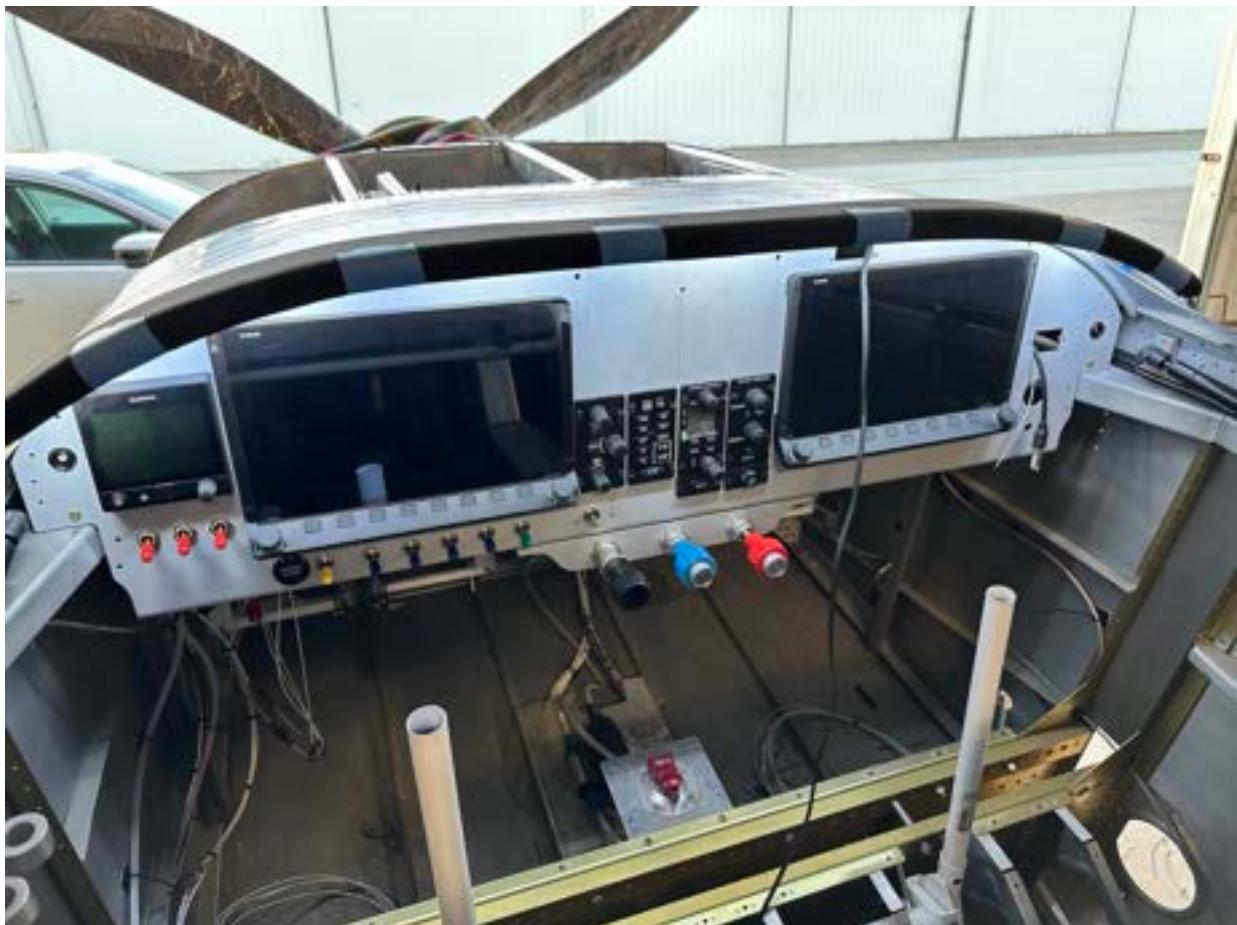
1. [https://n890gf.com/wp-content/uploads/2023/02/img\\_4543.jpg](https://n890gf.com/wp-content/uploads/2023/02/img_4543.jpg)
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3. [https://n890gf.com/wp-content/uploads/2023/02/img\\_4544.jpg](https://n890gf.com/wp-content/uploads/2023/02/img_4544.jpg)

## 9.3 April

### 9.3.1 Avionics and Panel Trim (2023-04-25 16:49)



Over the weekend I spent some time working on some of the last canopy frame items. The panel trim is something I ordered from Classic Aero Designs. It was super easy to install using the template provided and mounts directly to the canopy frame skin that covers the panel.



Here you can see the trim mounted to the top of the skin. Its about half an inch thick, is padded and finished with a nice soft leather. It's held on to the skin by 11 screws from the bottom. What's nice about it is that it hangs about .25" below the skin, which is perfect for hiding the panel light, which I have held on by tape temporarily.



I turned off my hangar lights and tested it out. The screens do cast a slight shadow over the switches, but it's not fully obstructed which is nice.

I also received my second avionics tray from Dynon and installed that. I had to modify it slightly to allow for the removal of the radio module.



Now all that's left to do is finish up the wiring cleanup, bundle all the harnesses and then it's

done! I'll remove the panel and all the avionics and prep it for paint. The canopy frame is also ready for paint which is the last thing to do before bonding the canopy to the frame.

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3. [https://n890gf.com/wp-content/uploads/2023/04/img\\_4831.jpg](https://n890gf.com/wp-content/uploads/2023/04/img_4831.jpg)

## 9.4 May

### 9.4.1 Control sticks (2023-05-05 23:48)

Tonight I spent some time working on the control sticks. When they come from the factory they are quite long. I ended up cutting off 3.75 inches. I then wired the sticks and adjusted the fit of everything.

[1]



[2]



The copilot stick is removable so the wires exit just above joint on the right side. There are only two wires for the copilot stick push-to-talk button. The pilot stick has 7 wires for the trim control, radio flip flop, radio push-to-talk, and autopilot disconnect. The wires exit from the bottom of the stick. I'll wire these to a connector in order to make it removable.

A few years back when moving to the hangar, I somehow lost the center tunnel cover. So I had to make a new one, which took a couple hours.

[3]



Here you can see it (in gray) under the center console arm rest.

[4]

690



The center console mounts to the flap cover and sits quite snug over the tunnel cover. This makes it rock solid for leaning on and using it to get in and out of the plane.

The last thing I did was to replace the NyLock nuts on my throttle bracket with all metal nuts.



This has been on my todo list for a long time and I just needed to knock it out.  
692

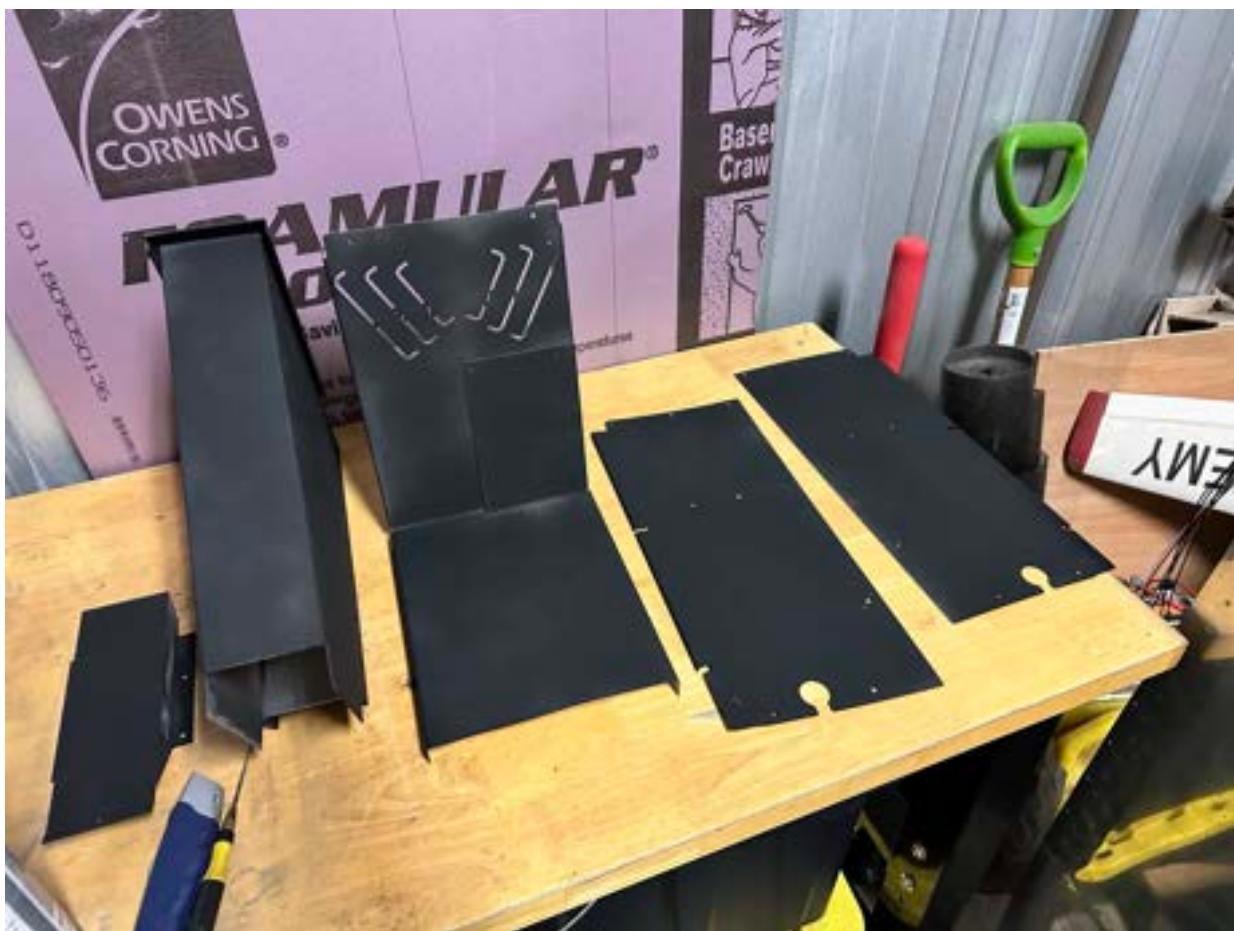
Next time I'll wrap up the control stick installation with the wiring and then the sticks are done!

1. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4871.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4871.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4873.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4873.jpg)
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#### 9.4.2 Miscellaneous Tasks (2023-05-14 22:45)

This weekend I spent some time knocking out a bunch of tasks that I needed to do in preparation to painting the interior. I need to paint the canopy frame and most of the interior parts before bonding the canopy to the frame.

[1]



I primed a bunch of parts that will be painted a dark gray. These are most of the interior panels that won't be covered by carpet.

[2]



Some of them will, but I didn't want to have exposed parts.

I then disassembled the panel and finished drilling it for some of the final components.

[3]

694



These are the holes for the dimmer knobs. One will be used for panel lighting, another for overhead/interior lighting, and the third for the baggage area. I have provisions for a fourth one, but haven't decided what I could be used for.



[5]  
696



I then cut the slots for the usb receptacles. These are for database and software updates, as well as all the chart data that the Dynon EFISs will use.



I then installed the center channel covers. On the pilots side I added provisions for a ram  
698

mount so that I can install my iPad. Having an integrated mounting solution is so much nicer than a suction cup or clamp.



Here's the passenger side cover. Most of this will be covered by the side paneling but some  
700

might exposed, which is why I painted it.

[8]



Here is the lighting controller for the knobs and the interior lighting. It's mounted to the Dynon EFIS tray.

Next week I'll be getting the paint and will be painting a lot of the interior in preparation for the canopy bonding which should happen in the next few weeks!

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3. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4899.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4899.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4900.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4900.jpg)
5. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4901.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4901.jpg)
6. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4897.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4897.jpg)

7. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4896.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4896.jpg)
8. [https://n890gf.com/wp-content/uploads/2023/05/img\\_4902.jpg](https://n890gf.com/wp-content/uploads/2023/05/img_4902.jpg)

## 9.5 June

### 9.5.1 Painting (2023-06-19 15:29)



Over the last several weeks I've been working on painting interior parts of the fuselage. There are a few areas that will be exposed metal that won't be covered by my Classic Aero Designs interior.



I painted the panel and the throttle bracket. The paint is a urethane automotive paint. I picked a dark gray. It's almost exactly in between the black and lighter gray of the leather on seats and side panels. It will be a nice bridge to tie the whole interior together.



[3]  
704

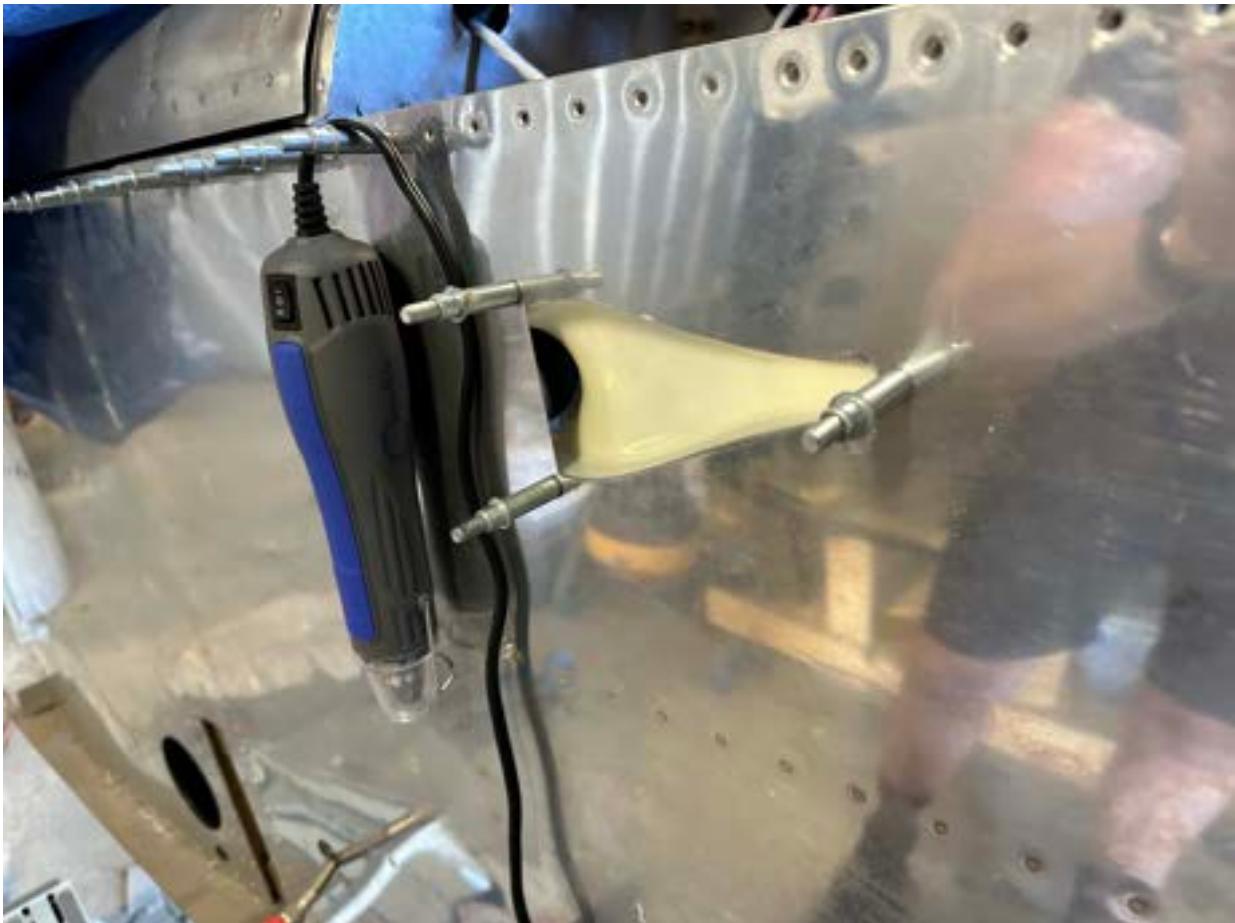


I also painted the roll bar and the canopy frame in preparation for bonding the canopy. This was the last step before permanently bonding the canopy. I also painted a few other interior parts like the flap motor housing and side panels, as well as the arm rest that I will be installing. The last thing I painted is the side rails and cross bar that side behind the seats. The rest of the interior will either be covered by side panels/pockets or carpeting.

I also temporarily installed the rudder so I can finish the rudder cable and pedal installation.



Even just adding the rudder makes the plane seem a whole lot more complete than without it.



I also permanently installed both NACA ducts for the air vents. The ducts were held in place while the epoxy cured.

Once I reinstall the panel I can fit the vents to the panel and measure the tubing.

1. [https://n890gf.com/wp-content/uploads/2023/06/70726694966\\_874ccadc-ce72-4b51-8322-1aa20e47ecf9.jpg](https://n890gf.com/wp-content/uploads/2023/06/70726694966_874ccadc-ce72-4b51-8322-1aa20e47ecf9.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/06/img\\_4981.jpg](https://n890gf.com/wp-content/uploads/2023/06/img_4981.jpg)
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4. [https://n890gf.com/wp-content/uploads/2023/06/70867355225\\_131be367-0fdb-4a1e-ad5d-a12b3c1d7663.jpg](https://n890gf.com/wp-content/uploads/2023/06/70867355225_131be367-0fdb-4a1e-ad5d-a12b3c1d7663.jpg)
5. [https://n890gf.com/wp-content/uploads/2023/06/img\\_5097.jpg](https://n890gf.com/wp-content/uploads/2023/06/img_5097.jpg)

### 9.5.2 Canopy Bonding Prep (2023-06-26 00:21)



This weekend I spent time preparing to bond the canopy to the frame. I needed to finish the canopy latch mechanism installation. I decided to modify the design slightly based on some builders logs I've read.



The latch is installed with a spring and washer that prevents it from being rotated and locked unless the handle is pulled down. This should prevent any accidental locking of the latch when no one is inside.



Here it is in the locked position. I've also added some UHMW plastic on the underside of the roll bar to protect the metal.

Once I finished the install I got to prepping the roll bar and frame for the Sikaflex glue that will be used for bonding.



I masked the whole roll bar to prevent glue from accidentally sticking to it. I've added some

1/8" spacers to the top of the bar in order to ensure the proper gap between the canopy frame and the canopy. These will hold the canopy up the required spacing above the frame. The frame and the roll bar are perfectly level with each other, so this will ensure an even gap and the appropriate amount of glue.

[4]



I then clamped the frame to the roll bar with the proper spacing blocks between the two. I also added side rail clamps that will hold the canopy in place when the glue cures. Now that all the preparations are in place I can get the canopy ready to bond.

I also ordered some foam and leather from Classic Aero Designs, the company that made the rest of my interior, in order to make an armrest.

[5]

712



It's the first time I've worked with leather and foam like this, so I may attempt to redo it, but its much nicer than resting my arm on solid metal. I have enough material to make two more if I find the desire to remake it.

1. [https://n890gf.com/wp-content/uploads/2023/06/img\\_5118.jpg](https://n890gf.com/wp-content/uploads/2023/06/img_5118.jpg)
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## 9.6 July

### 9.6.1 Panel (2023-07-24 00:17)



This weekend I applied the labels for my panel. I got them from [1]Drytransfersletters.com. They turned out perfectly and we're super easy to apply.



Here is the passenger side as I was applying them.



After applying all the labels I then applied a clear coat on top to seal everything.

While I was letting the coats dry, I spent some time doing the final masking and prep for the canopy.



It's now fully masked and ready for bonding. I'll scuff the canopy prior to applying the adhesive primer.

I came back a couple days later to install the panel in the plane for hopefully the last time. I don't think I'll need to take it fully out again.



I installed the switch guards and switches first to make sure I had everything perfectly vertical and tightened fully. Then I installed the screens.



Here is everything installed on the panel (except the Hobbs and ELT indicator). I couldn't pass up an opportunity to test everything.



Everything worked perfectly! It took me about an hour to fully install everything from start to finish. Not too bad all things considered. I have a couple things left to wire up including the avionics dimmer, and then CO monitor that is behind the panel.

1. <https://drytransferletters.com/>
2. [https://n890gf.com/wp-content/uploads/2023/07/img\\_5210.jpg](https://n890gf.com/wp-content/uploads/2023/07/img_5210.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/07/img\\_5213.jpg](https://n890gf.com/wp-content/uploads/2023/07/img_5213.jpg)
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## 9.7 August

### 9.7.1 Bonded Canopy (2023-08-07 22:05)



This weekend was a big weekend.



Test fitting the canopy for final adjustments

My friend Norio came to help with the install. We started by dry fitting the canopy and marking it for exact alignment. We walked through the process and the execution plan.



### Cleaning the glue joint

The entire process will involve Sikaflex. It's a three part marine UV resistant glue. We first wipe down the mating surfaces with Sika Aktivator 205. This preps the surface for the next step.



Canopy frame primed.



Canopy primed

We waited the required 10 minutes for the Aktivator to do its magic then we primed the surfaces with the Sika 209D primer. This stuff is quite nasty. We then waiting 30 minutes. The primer goes through three phases: very runny liquid, tacky, perfectly smooth and cured. At this point we have an hour and a half to apply the adhesive.



Applying adhesive

I started at the top of the frame and began applying the bead of Sika 295UV adhesive. I cut a V notch in the applicator tip in order to get the appropriate amount of glue for the bead. Sikaflex recommend 1/8" thickness to allow for thermal expansion.



I worked my way around the perimeter of the frame, along the sides and then finished off at the front of the frame.



I've read many posts about this process and every one of them said that they needed more adhesive. So I was hoping this would be enough



Getting ready to drop the canopy on

Norio and I then grabbed the canopy and prepped to install it. As we put it into place my wife Britney was there to make sure it was aligned to our marks (and take awesome photos).



Carefully going over the prop

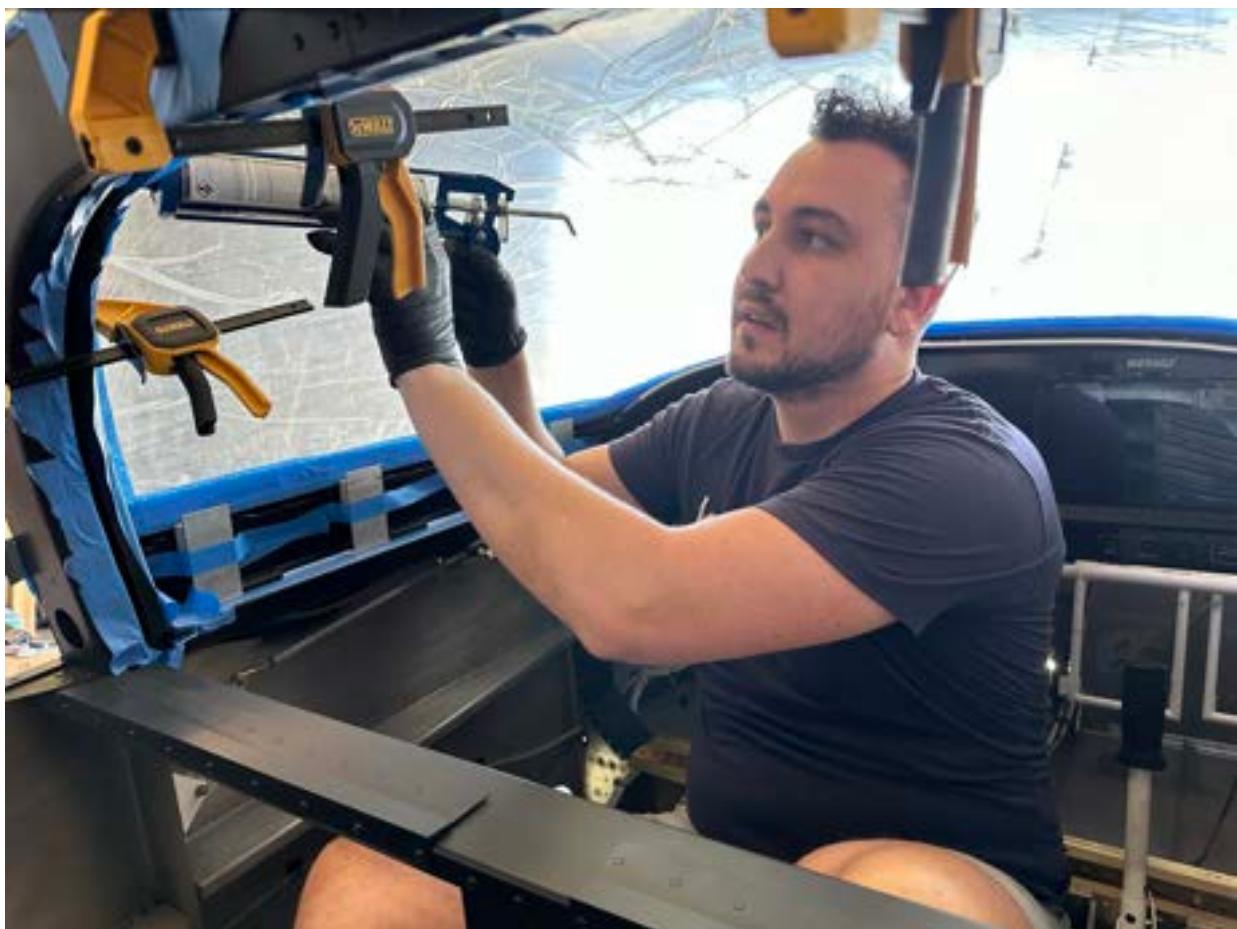


Aligning the bubble before dropping into position



Aligning and tightening the side clamps

[12]



I managed to climb inside to add the final touches and to fill any gaps.

[13]



Filling the forward canopy

I just barely managed to fit the applicator tip in the gap above the dash. I then used my finger to create a nice fillet.



I climbed back out and we did some final checks. We ended up adding a ratchet strap to hold the forward part of the canopy down.

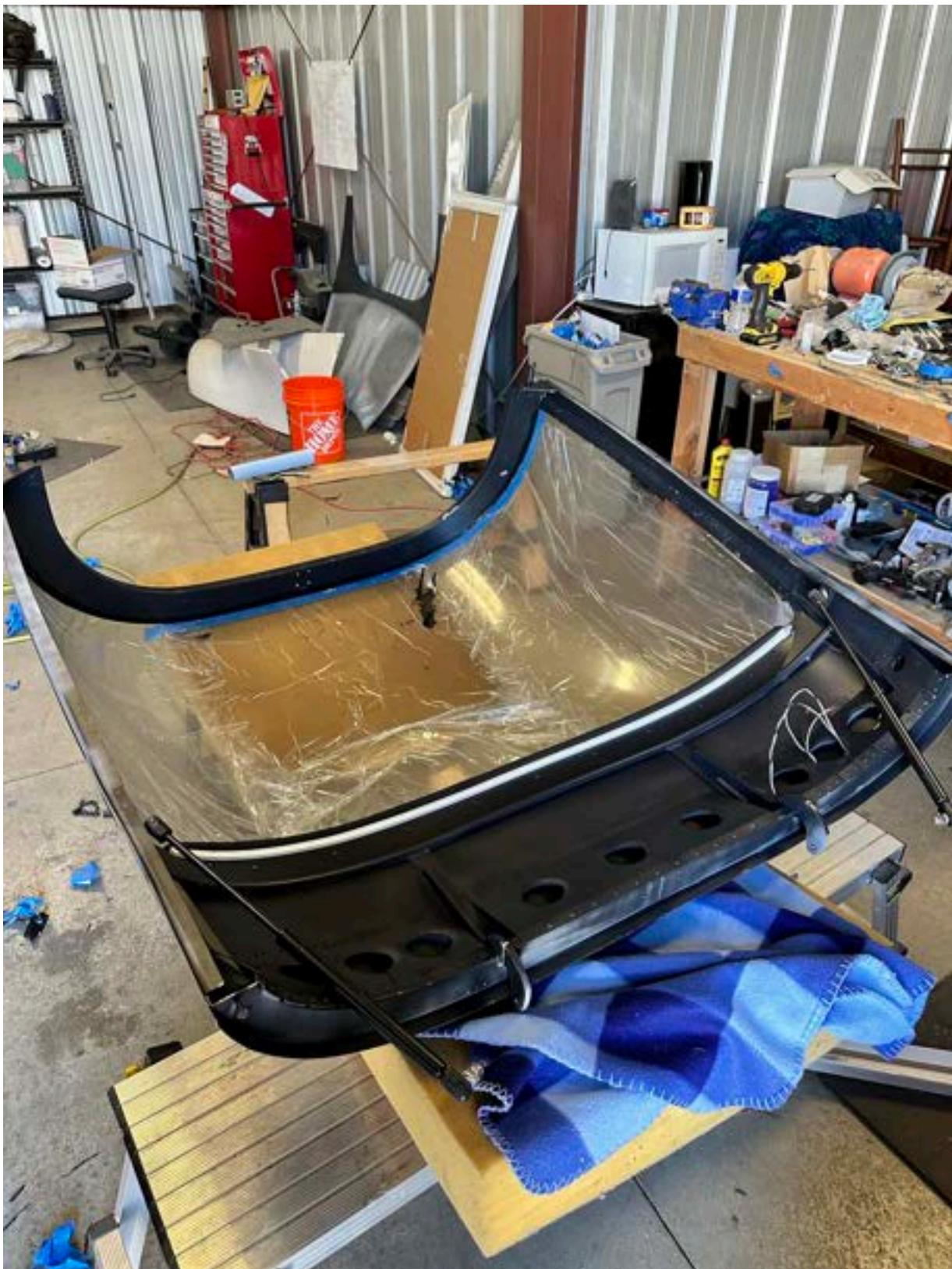


I went back the next morning to check the curing of the canopy. Everything looked great! It was a huge relief. I started removing the clamps.



Getting the excess glue off

I propped the canopy up so I could get under it and clean up the areas where there was excess squeeze out of the glue.



I also flipped it over to check for any gaps. I needed to add some glue on the rear of the  
738

canopy frame where I didn't have access during the initial fitting.

<https://videopress.com/v/Q1fo12ek?resizeToParent=true&cover=true&preloadContent=metadata&useAverageColor=true>

### First time opening the canopy

The whole experience was really great. The process was quite straightforward once I read through all the Sikaflex documentation (and referenced many posts on [18]Vans Air Force). The whole process took around 3 hours from test fitting to finished install, with an additional couple hours the next day.

1. [https://n890gf.com/wp-content/uploads/2023/08/img\\_2618.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_2618.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/08/img\\_2622.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_2622.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/08/img\\_5294.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_5294.jpg)
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14. [https://n890gf.com/wp-content/uploads/2023/08/img\\_2614.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_2614.jpg)
15. [https://n890gf.com/wp-content/uploads/2023/08/img\\_2773.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_2773.jpg)
16. [https://n890gf.com/wp-content/uploads/2023/08/img\\_2781.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_2781.jpg)
17. [https://n890gf.com/wp-content/uploads/2023/08/img\\_5459.jpg](https://n890gf.com/wp-content/uploads/2023/08/img_5459.jpg)
18. <http://www.vansairforce.net/>

## 9.8 September

### 9.8.1 Avionics Panel Lighting Update (2023-09-04 09:40)



With the Dynon HDX screens having an angled shelf for the buttons, my panel lighting (along the canopy deck) casts a shadow onto my switches and labels. I decided to install additional LED lights under the shelf to illuminate this area along side the rest of the panel.



[2]

741



In doing this installation I also decided to install an accessory (auxiliary) bus for several different components. Right now they are Panel Lighting, Bluetooth Receiver, CO monitor (may update this one), and USB power ports. I utilized a slim fuse block that has 8 slots, and I wired it up to a 15A pin on the VPX. It's not currently wired up to a switch, but can be switched on/off via the VPX controls on the EFIS.

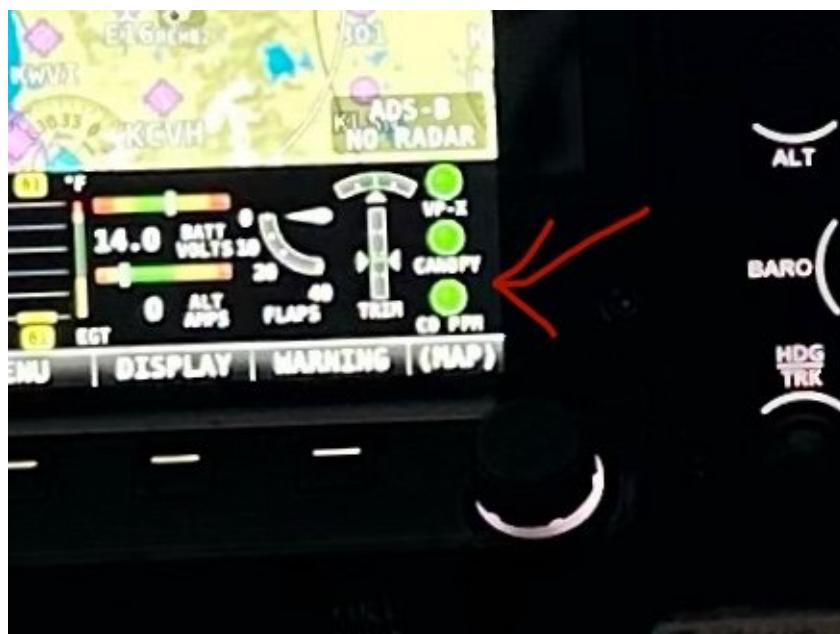
I also spent some time updating the routing of ground wires to the ground block. I also finished wiring the fuel pump connector and center tunnel mounting hardware and covers.

1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5666.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5666.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5670.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5670.jpg)

## 9.8.2 Configured CO monitor & Air Vents (2023-09-09 09:53)

I finished installing my Aithre CO monitor and wired up the signal wire to an EGPIO pin on the Dynon EMS. This allows me to configure and see CO status on the EFIS and have colored regions for different levels of CO. Aithre makes it really easy with a file that can be downloaded and saved onto the Dynon which then configures the EMS to display a CO PPM (parts per million) value on the display.

[1]



I also spent some time fabricating and installing the air vents onto the panel. This was a bit tricky as I'm utilizing the larger Stein Air air vents. Still some additional finishing work to clean up the install, but the intakes and vents are complete!

[2]



1. <https://n890gf.com/wp-content/uploads/2023/10/image.jpg>
2. <https://n890gf.com/wp-content/uploads/2023/10/image-1.jpg>

### **9.8.3 Aft Top Fuselage Skin (2023-09-14 10:00)**

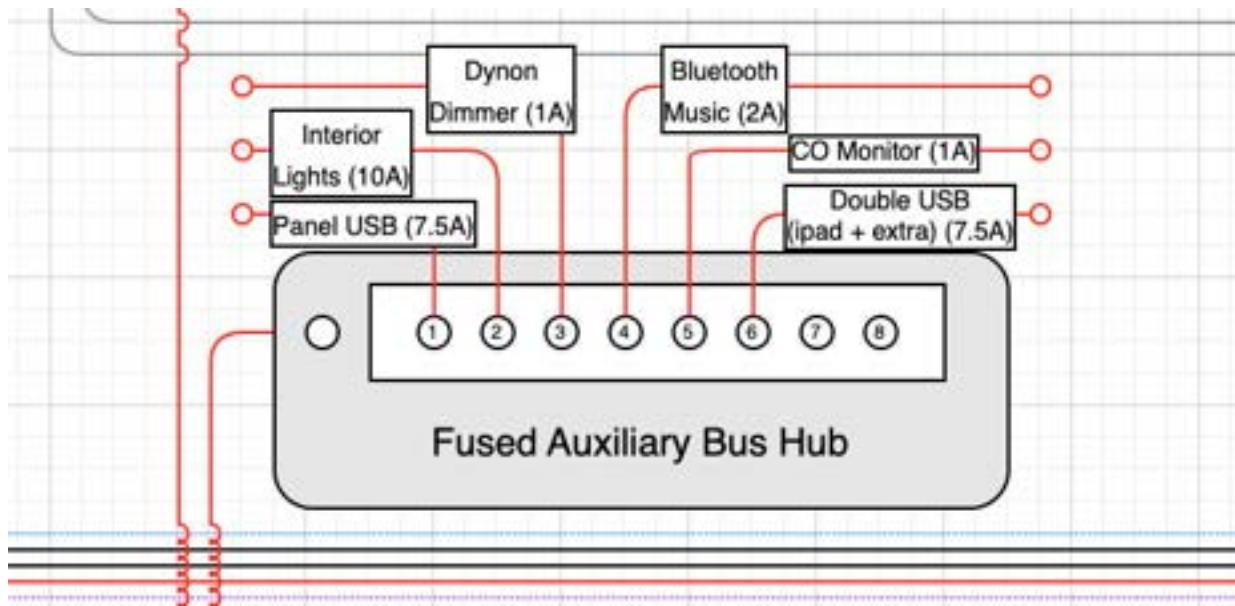


In preparation for installing the rear window, I clecoed the aft top skin to the fuse and began final trimming the rear window. It took some iterations, but I finally got a good fit.



I also wanted to make sure that the aft skin was aligned before riveting, and that there were no interferences or issues with fitting the rear window against the canopy.

I also spent some time updating my wiring diagram to reflect the new aux bus. I'm trying to keep as consistent documentation as I can in order to have the ability to review and verify in case anything isn't working as expected.



Finally, I spent some time writing up the wing installation procedure I plan on following. There are many amazing build logs out there and write-ups that describe the process, and I'm compiling my own from these many great sources. I wrote a procedure when installing my canopy, and it was tremendously helpful to have a step-by-step guide to follow so there was very little thinking needed (this is where I introduce lots of errors). This is a work in progress as I finish the aft fuselage and cabin work.

```

Wing Installation Procedure: S/ST (N) 38919

Preparations: 8/12 (394) 0800
  - Prepare Hardware Bolts by shaving down threads on some of them for alignment pins. @000
  - Remove Ailerons from wings @000
  - Remove Flaps @000 (23-09-13 18:00)
  - Get LPS Lube (or some lube for the bolts)
  - Ensure Chalk line available @000 (done 23-09-13 18:51)
  - Plumb Buds @000 (done 23-09-13 19:23)
  - Level the aircraft and secure the tail @000
  - Get Large C clamps (for rear spar clamp during drilling)
  - Draw lines on rear spar 5/8" from all edges (both on fuselage and wing) and ensure sufficient exposure so all lines can be seen @000
  - Make a #30 drill guide (use a block of wood/aluminum) @000
  - Make a 9/32 drill guide (block of wood/aluminum) @000
  - Get a .311 reamer for rear spar

Wing Install: 8/9 (394) 20
  - Careful of the bottom Fuselage skin - lower from above (slightly)
  - Prepare Aileron pushrods (wrap/protect during installation) @000
  - Align using the 7/16 HM "pins" that will help align the spar @000
  - Install two bolts (temporarily half way through) - do not tighten! @000
  - Align Rear Spar and ensure no conflicts @000
  - Do this for the second wing

Sweep Alignments: 8/9 (394) 20
  - Measure from Tail to Wingtip on each wing @000
    - Within 1/32"
  - Hang four plumbobs on the wings - tip and root, @000
  - Chalk line from the wing tip to wing tip. @000
  - Adjust wing alignment as necessary @000

Incidence Angles: 8/9 (394) 20
  - Ensure level fuselage from preparations @000
  - Draw a line on the center of the Main Spar and Rear Spar (inboard and outboard) @000
  - Hash Mark 4" inboard from wing skin edge (inboard and outboard) @000
  - Use a 1 meter level with a 4" spacer (use canopy clamp for this) spanning from Main Spar to Rear Spar @000
  - Ensure Incidence is accurate on both wings @000
  - Clamp rear spar when alignment is assured. @000

Drilling Rear Spars: 8/7 (394) 20
  - Ensure 5/8" edge distance to center of hole @000
  - Ensure 5/8" edge distance to center of hole again @000
  - Drill a starter hole #30 1/8" deep @000
  - Clamp #30 drill guide and drill all the way through @000
  - Clamp 9/32 drill guide and drill 9/32 all the way through @000
  - Ream .311 for tight fit bolt @000
  - Repeat for second wing

Fuel System: 8/5 (394) 20
  - Fuel System Backup @000
  - Fuel Level Sensor wire @000
  - Fuel Tank attach bolt: M3 0.70-10x6
    - Ensure 1/2 edge distance clearance @000
    - Start with #30 @000
    - align with the slot on the fuselage @000

Aileron Rigging: 8/3 (394)
  - Vertically align the control sticks
  - with the flap in the up position, use the aileron rigging tool and install the aileron
  - Adjust pushrod lengths so everything is aligned

Flap Rigging: 8/3 (394)
  - Install flaps
  - Fabricate Flap pushrods with rod end bearings
  - Install pushrods on flaps
  - Drill hole for initial fitting of pushrod and flap to bottom of fuselage
  - Adjust pushrod lengths accordingly and test flap deflection
  - Measure down angle - up angle minimum >30deg

Gap Seals: 8/3 (394)
  - Test fit gap seals and align with drill holes
  - Remove gap seals and install metal tabs on wing
  - Add rubber weather stripping to the gap seals and install

Wingtip Wires: 8/7 (394)
  - Route wires through side of fuselage for connection to wingtip wiring harness
  - Connect switch connector to both fuselage and wing harnesses
  - Test wing tip lighting

Zincite Installation: 8/7 (394)

```

2. <https://n890gf.com/wp-content/uploads/2023/10/screenshot-2023-10-09-at-10.56.47-am.png>
3. <https://n890gf.com/wp-content/uploads/2023/10/screenshot-2023-10-09-at-10.57.36-am.png>

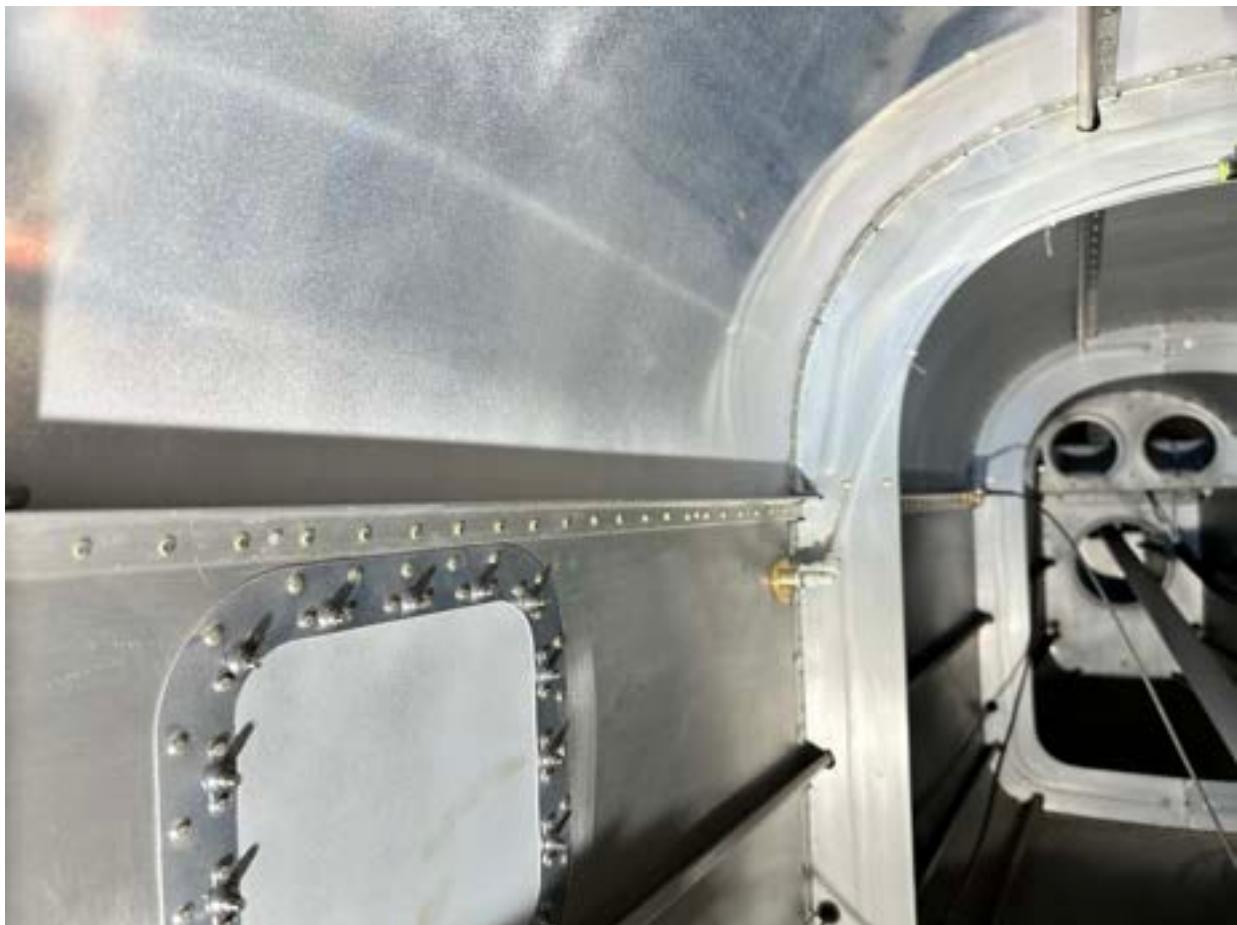
#### **9.8.4 Riveted Aft Top Skin (2023-09-17 10:08)**



Today I spent some time getting the aft top skin riveted. My wonderful wife helped my in driving the rivets while I was squished inside the aft fuse with the bucking bar. It was also a day that was a billion degrees, so we tried to get things riveted quickly. Some of the most challenging rivets to buck were the ones on the very back where the Dynon ADHARS is mounted, but we managed to get things nicely bucked.



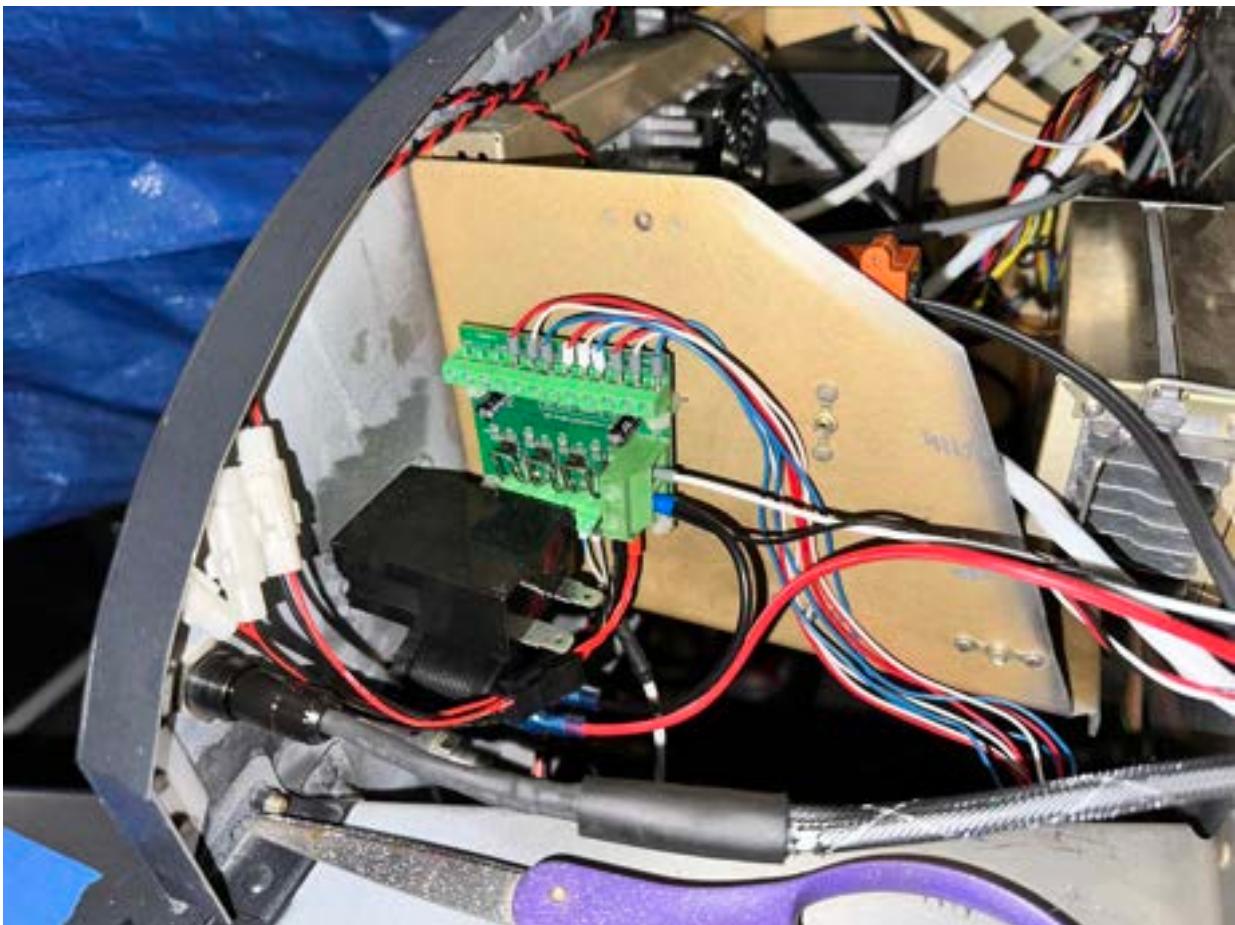
[2]  
750



I also used this opportunity to get the canopy reinstalled so I can do final fitting of the rear window and ensure everything is aligned properly. I think I can install it solo, but I didn't want to take that risk and since there were a second set of hands available, it was just easier.



I also fabricated the panel lighting connector. The main panel lights + the two under-dynon LED strips are controlled by the "Panel" dimmer on the passenger side.



1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5687.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5687.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5695.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5695.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5744.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5744.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5668-1.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5668-1.jpg)

### 9.8.5 Trimmed Rear Window (2023-09-29 10:14)



Now that the aft-fuse skin is riveted in place (mostly) I decided to continue trimming the rear window for final fitting. I Spent quite a while trying to make the leading edge of the window as straight as possible, and also aligned with the canopy. This was an iterative process, but adding a 1/8" gapping tool to the roll bar helped to ensure consistent gap. The plans call for 1/32" but that is just wayyy too small of a gap. Part of the reason I decided to go with the Sikaflex method of attachment rather than screws is to account for thermal expansion between the metal and plexi without damaging the plexi, however a 1/32" gap is so small that any thermal expansion will lock the two together.



I spent most of the time trimming the aft section of the rear window to fit under the skin as well as ensuring enough overlap under the skin for the Sikaflex. Once I had a decent fit and the appropriate clearances between the canopy and rear window, I removed the window and began prepping the aluminum surfaces and masking the edges.

Lastly, I have been annoyed by the canopy latch fingers and how much force is needed to un-latch the canopy. I spent some time sanding and modifying the latch fingers to try and get a better fit. It's an iterative process.

1. <https://n890gf.com/wp-content/uploads/2023/10/image-2.jpg>

## 9.9 October

### 9.9.1 Finished Riveting Aft Fuse Skin (2023-10-08 10:22)



Today I finished the riveting the aft skin now that the window is trimmed to the final size. Once I finished riveting I then spent some time finishing the surface prep for the SikaFlex process.



I also added a 1/32" monofilament line to set the gap between the window and the skin for the SikaFlex.

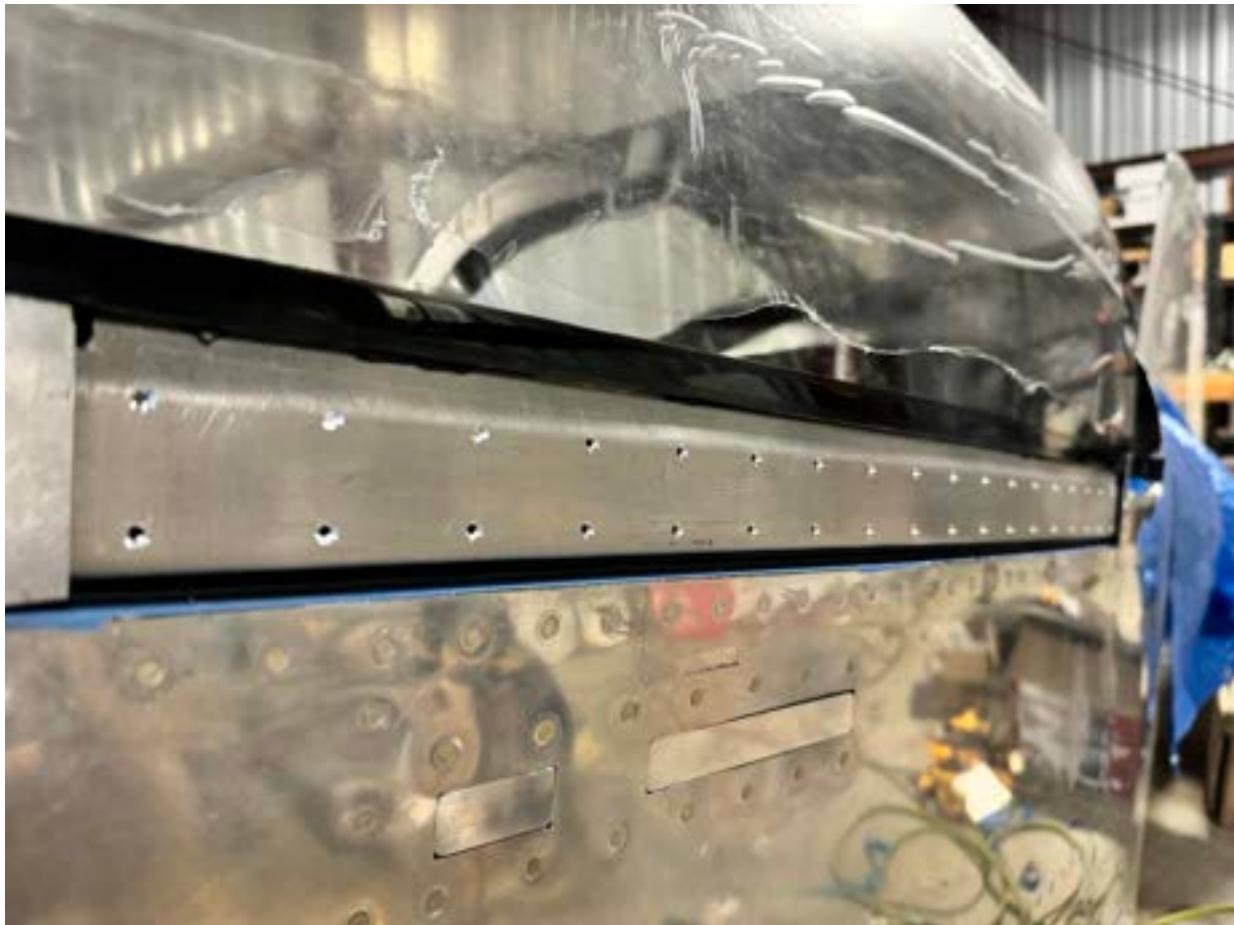
[2]



I also spent some more time adjusting the canopy latch in order to get a better fit. I think it may be getting close, but final adjustments will probably need to be made continuously until I'm happy with it.

1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5747.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5747.jpg)
2. <https://n890gf.com/wp-content/uploads/2023/10/image-3.jpg>

### **9.9.2 Canopy Side Skirts (2023-10-13 09:51)**



With the Aft fuselage skin riveted in place now it was time to fit the side skirts. I needed to fabricate the two sideskirts out of some stock aluminum. They needed to be trimmed down to the required dimensions and then aligned with the aft skin. This took some iterations, but

eventually I got a nice fit. Once the parts were temporarily taped in place, I began drilling the skirts to the canopy frame.

[1]

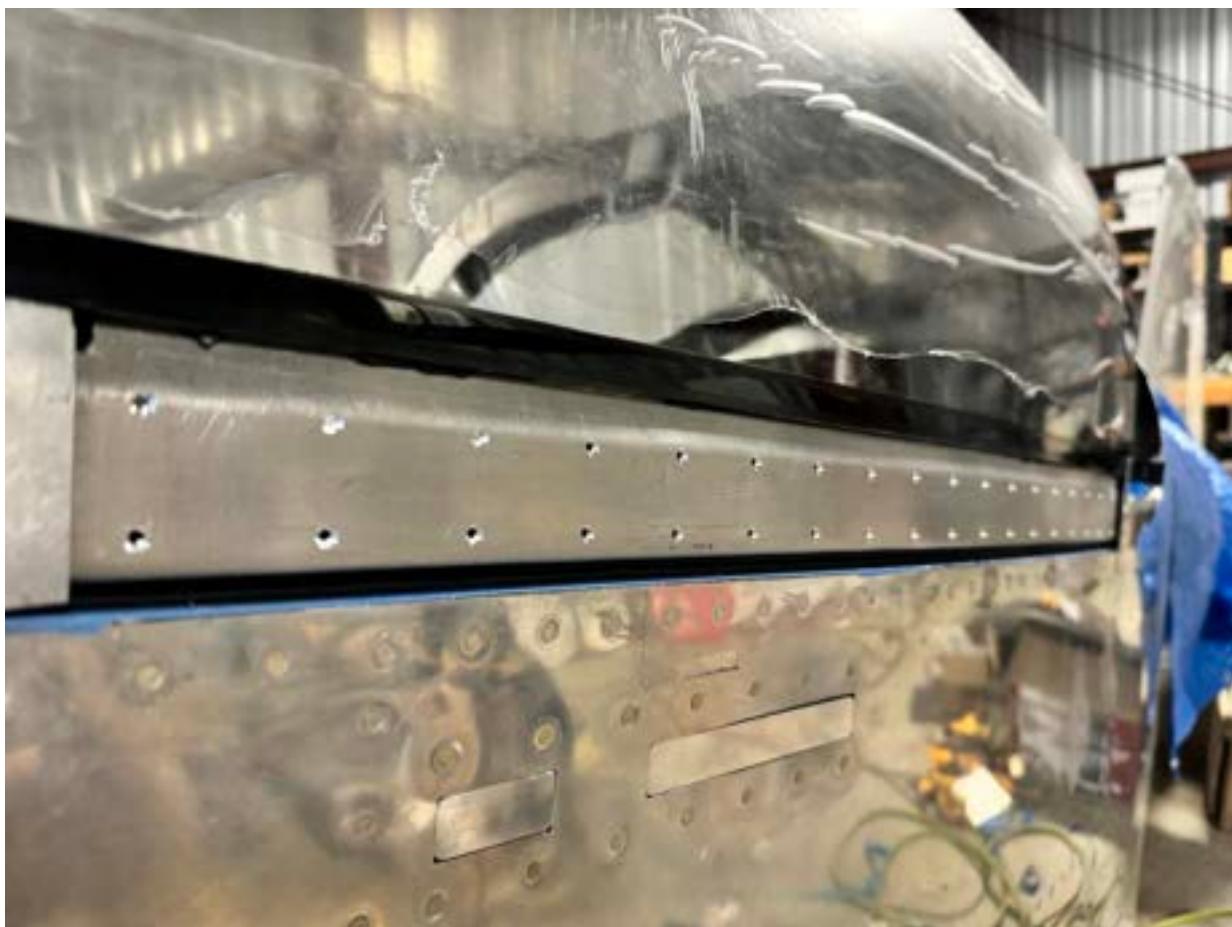


I used my rivet fan to get perfectly spaced holes, and drilled the skirts to the canopy. I needed to use some small washers in between the skirt and the frame near the front section in order to get the proper spacing and alignment with the side of the fuselage.

[2]



Once the skirts were fully drilled I removed the skirts and countersunk all the holes in the frame, and dimpled the holes in the skirts.



I also fabricated the canopy handle and marked and drilled it to the skirt and frame.



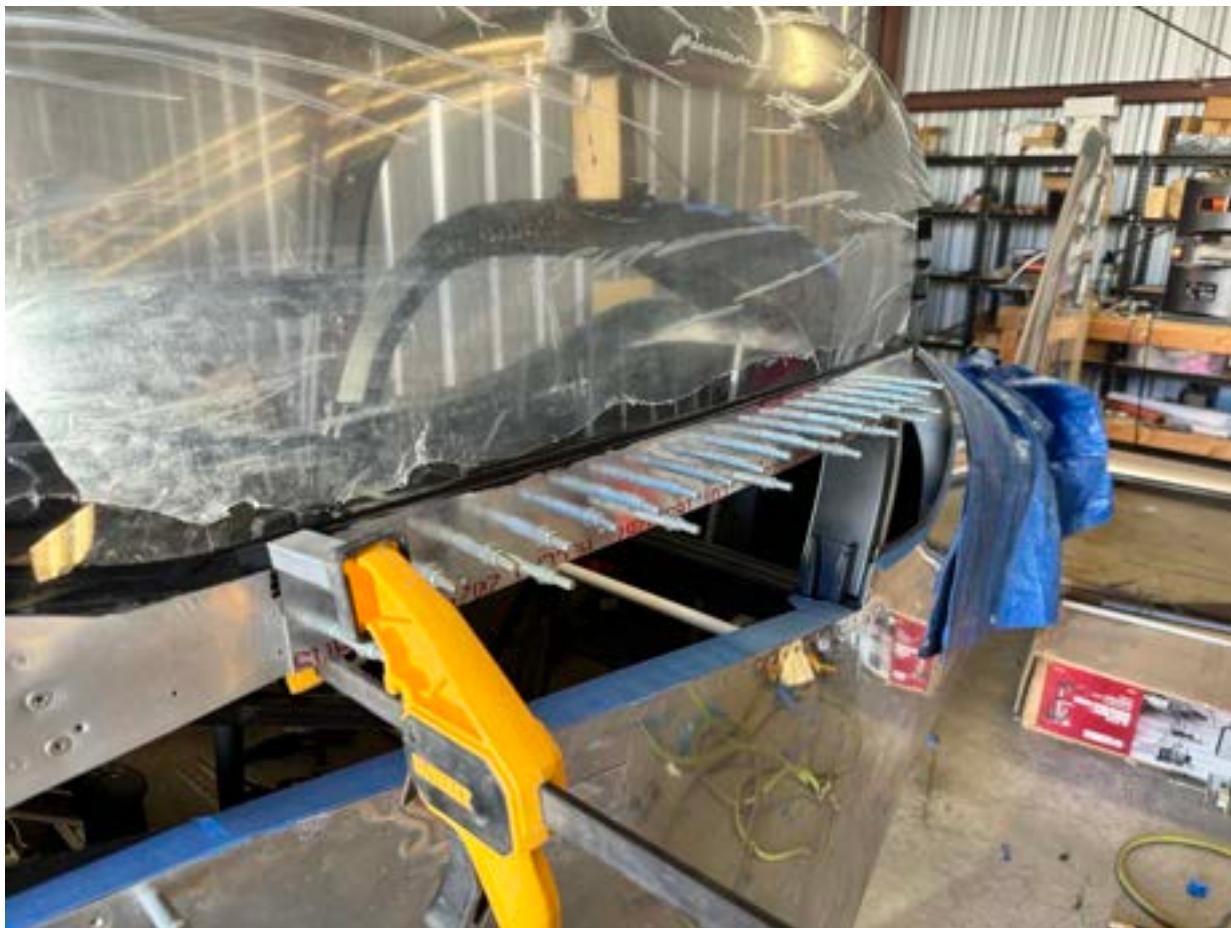
1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5765.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5765.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5764.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5764.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5761.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5761.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5766.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5766.jpg)

### 9.9.3 Installed Side Skirts (2023-10-15 09:58)



Today I installed the side skirts to the canopy. I began by completely prepping the surfaces of both the skirts and the canopy/canopy frame. Since I bonded the canopy to the frame with SikaFlex, I also am bonding the side skirts to the canopy. This requires following the same steps as before: activator, primer, glue.

Once I had all the surfaces prepped, I applied the activator and then waited the required 10 minutes. then I primed both surfaces and waited 30 minutes. I then applied a generous amount of glue and spread it out, then I clecoed the skirts in place. I needed to add a clamp to the top corners on either side, to get the skirt to sit right against the canopy.



[2]  
764



While things were setting up, I also decided to wire up a tail-mounted forward-looking camera. Years ago I added wiring provisions for adding a tail-mounted camera, but did not know what I would do in the long run. I decided to mount a wide angle mini camera to the top of the vertical stabilizer.



I wired the camera up and fed the signal into the Dynon EFIS. I spent some time working on  
766

the alignment, and once I was satisfied i tacked the camera in place with some super glue.

[4]



I will eventually build up a fiberglass and epoxy fairing to smooth out the transition to the camera. I will also likely need to make this removable, but that's for another day.

1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5773.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5773.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5774.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5774.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5786.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5786.jpg)
4. <https://n890gf.com/wp-content/uploads/2023/10/image-4.jpg>

#### 9.9.4 Installed Rear Window (2023-10-16 10:08)



Today I had two goals: rivet the side skirts, and install the rear window. I began by removing all the clamps and half the clecos. I then installed the appropriate rivets and used my squeezer to knock those out. I had to use longer rivets in a couple places where I used washers to get the appropriate spacing. I couldn't reach the aft two rivets on either side with my squeezer, so I used the rivet gun. I also riveted the canopy handle to the pilots side of the canopy.



[2]

769





I then began prepping the rear window and aft skin for bonding. Same process as before. I wiped down all the mating surfaces with the Sika Activator, waited 10 minutes and then primed all the surfaces.



Looking down at the primed surface on the rear window

Originally I was going to use short pieces of teflon coated wire as spacers for the rear window and then remove them after the glue sets (described by Bruce [5]here) , but decided to use small pieces of 1/8" thick rubber. These were small enough and dense enough that they could be placed on the rollbar and completely encased in the SikaFlex.



I then applied a bead of SikaFlex to the rollbar and to the rear window. Installing the window  
774

was a big of a challenge, and it did get quite messy, but i got everything aligned and clamped (I wish I had 4 more clamps).

[7]



Another idea I stole from Bruce was the rear window [8]aft supports. I fabricated a similar support and it worked great to hold the aft part of the window up against the interior of the fuselage skin. Once things set up a bit, I removed the masking tape and cleaned up all the edges.

[9]



1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5795.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5795.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5796.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5796.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5797.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5797.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5798.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5798.jpg)
5. <https://www.overthehills.com/RV-9A-Project/Finish-Kit/Canopy/i-2gWb5xn>
6. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5799.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5799.jpg)
7. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5800.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5800.jpg)
8. <https://www.overthehills.com/RV-9A-Project/Finish-Kit/Canopy/i-s6GsPNJ>
9. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5804.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5804.jpg)

### 9.9.5 Finished Rear Window (2023-10-17 10:26)



I came back the next day to see how the window set up. Everything turned out perfectly. I removed all the clamps and check the alignment with the canopy. The gap was just around 1/8" of an inch. I got all the tape removed and then set up some more SikaFlex to create a nice fillet on the front of the window all around the rollbar.



I was very eager to see how the window looked without the plastic, so I removed it. It looked  
778

very very clean. Really started to make the plane look more like a plane.

[2]



Now that the canopy was done, and the rear window was done, I also decided to remove the plastic from the canopy. This was a huge milestone and nearly 8 years in the making (Quickbuild kit? What Quickbuild ☺).

[3]



One last thing I had been meaning to do (and probably should have done a long time ago) was to fabricate and install the forward canopy brace clips. I don't have a picture of them, but they are small 1/2" wide pieces of aluminum that are riveted to the inside of the canopy brace just to add a little bit more rigidity to the canopy frame.

Next up: Wings!

1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5808.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5808.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5813.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5813.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5818.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5818.jpg)

### 9.9.6 Installed Wings (2023-10-29 17:00)



This weekend I hit a huge milestone - my buddy Norio and I installed the wings on the plane!

We started by first leveling the plane to make sure we had the ability to, as well as thinking it would make sliding the spars into the fuselage easier.



Once the plane was level, we began the process of installing the wing. Once we got the main spar on the left wing mostly installed, we needed to make quite a few adjustments in order for the bolt holes to line up. We eventually got the correct dihedral angle which caused the first bolt to slip in nicely. I kept the bolts in the freezer overnight to help shrink them a little, then applied some lube to aid in the bolt install.



I hopped into the cabin to get the second bolt inserted. It took a bit of coercion, as I think there may be some micro-misalignment with the fuselage structure causing quite a tight fit. I used an alignment pin that I built using some store-bought hardware. it definitely helps to get the spar in the right spot.



Once the second bolt was in, I got out and Norio was able to let go of the wingtip. The plane  
784

now had one wing! The whole process for the first wing took about an hour, because there was quite a bit of figuring things out with respect to angles and alignment. After taking a quick break, we jumped onto the second wing. At this point, my wife joined us and helped get the second wing installed in about 20 minutes. It was much smoother.

[4]



Once both wings were installed with a couple bolts, we began the rigorous process of measuring wing sweep, incidence, and symmetry. We started by first using a laser level to mark a straight line on the ground spanning the wings, that will be used to measure sweep. We then hung four plumb bobs off the leading edge of the wings and began to align them with the laser line. We also aligned the fuselage longitudinally with the laser, so we could later measure the squareness of the whole plane. At this point, we measured the sweep, and both wings were about  $1/4$ " swept forward. Van's calls for fore/aft sweep within  $1/2$ " from center, so it was already within spec, but I knew we could make minor adjustments to achieve a closer sweep angle. A few iterations of adjusting the rear spar, and we got the sweep to within  $1/8$ " of an inch. This equates to  $0.2\text{deg}$  of sweep!

[5]



After getting the sweep right, we clamped the rear spar attachment in place. Then we checked the incidence angle. The incidence is measured by spanning a level from the forward spar to the aft spar with a 3" space above the aft spar. If this angle is 0 deg (or matches the fuselage angle - which was level at 0 deg) then the incidence is correct. Van's guidance is not so much the precision of 0.0 deg incidence, but that the two wings match. In my case the initial measurement was 0.3deg off from 0 on the left wing, and 0.4 deg on the right wing. At this point we made some minor adjustments by unclamping the rear spar and adjusting it downwards. this brought the angle on the left wing to 0.0deg, and the right wing also to 0.0deg! We clamped the wings, double checked the sweep, and also took a measurement from the wingtips to the aft center of the fuselage. Both those measurements were equal to each other. At this point we wrapped up for the day.

The next morning, we came back and double checked all the measurements with a fresh eye. Everything still measured perfectly. I got out my drill guide and drilled a #30 hole through the rear spar on the left wing. The center of this hole was  $> 5/8"$  from all edges of the rear spars (on both wings) per the structural requirements. I then expanding it to a 1/4" hole using the guide. After a 1/4" I drilled the spar to 9/32 and then used a 0.311 reamer to finish the hole. The reason for doing this step is that the bolt is an AN5-10 bolt (measures 5/16" in diameter),

but the hole made by a 5/16" drill bit is *slightly* bigger (a few thousandths). For the primary bolt that locks position of the wing, it should be a super snug fit. The bolt measures 0.3125" in diameter, and the reamer is 15 thousandths *smaller* than the bolt. We did the same thing on the right wing.



At this point, we called it a day, but I got out the aileron pushrods and inserted them into the  
788

wings in preparation for rigging the controls. Similarly with the flaps, I temporarily installed the flaps to ensure that they could fully retract to the underside of the fuselage. Next time I'll finish the aileron control rigging and flap rigging.

1. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5837.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5837.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5838.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5838.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/10/img\\_6697.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_6697.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/10/img\\_6700.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_6700.jpg)
5. <https://n890gf.com/wp-content/uploads/2023/10/image-5.jpg>
6. [https://n890gf.com/wp-content/uploads/2023/10/img\\_5870.jpg](https://n890gf.com/wp-content/uploads/2023/10/img_5870.jpg)

## 9.10 November

### 9.10.1 Rigged Flaps and Ailerons (and new Canopy struts) (2023-11-11 21:00)

With the wings on the fuselage I got the flaps onto the wings so I could fabricate the flap pushrods. I started by cutting the pushrod stock to length. I then tapped both ends of the rods for 1/4-28 rod-end bearings. The plans call to use a CM-4S bearing.

[1]



The problem with this is that because it's an integrated ball into the bearing, there is no way to prevent this from backing out. The instructions call for locktite to hold it in. I will be changing this out to a CM-4M rod-end bearing with a through bolt that can be safety wired. Its much more secure and safe this way.

But while those parts are on order, I still used the default part to do the initial fitting. I installed it onto the flap and then checked the alignment with the bottom of the fuselage. I then cut the hole in the fuselage that the pushrod passes through

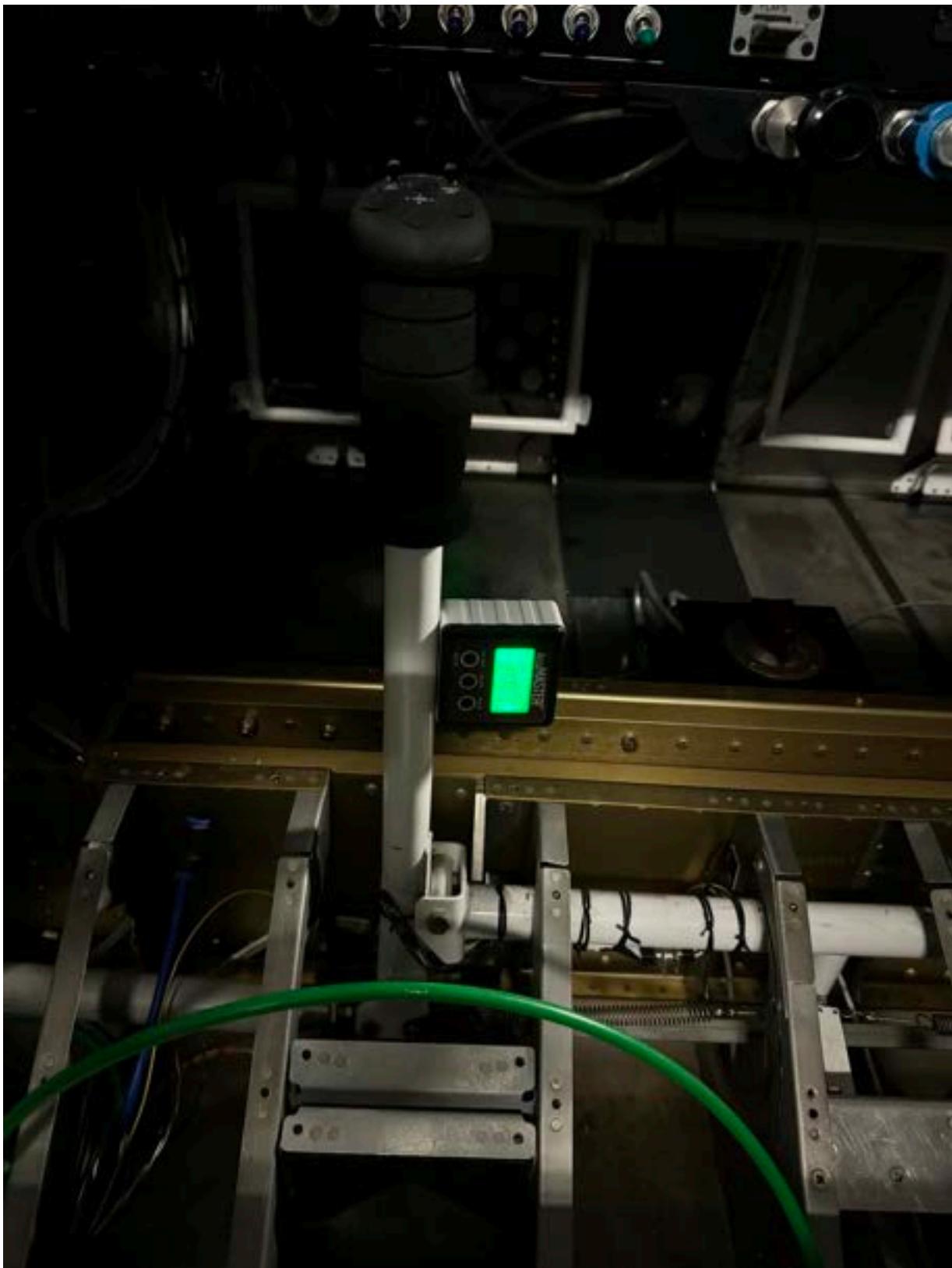
[2]



When I installed the bearing into the flap I did not put any spacers, but when I put the update rod end bearing I will be centering the bearing so its not rubbing against the side of the fuselage.

With both flaps on the plane, and aligned I was able to test the deflection of both flaps. Luckily everything was symmetric and the full flap deflection was 45deg. This is above the minimum of 40deg for the RV-7.

With the flaps installed, I then began the aileron aligning. I first began by ensuring the vertical-ness of the control sticks in the plane. When I initially aligned the pilots stick, the copilot stick was inboard by about 6deg. So I adjusted the connecting pushrod so that both sticks were perfectly aligned. It's hard to see in the pic below, but it says 89.7°, which is close enough for me.



I used a long straight edge to align the aileron with the tooling holes on the outboard rib of

the wing (per the instructions) and then ensure that it was aligned with the flaps. I then used the aileron alignment tool to ensure the bellcrank-to-aileron pushrod was the right length, and then, with the control sticks in the vertical position I adjusted the main pushrod. Once the left aileron was adjusted I did the same for the right side. Everything was perfectly aligned to within 0.1deg when comparing everything.

[4]



[5]

792



I also got the lower fuselage skins drilled to the wing skins. This has to be done now so that I can remove the wings and install all the nutplates. I also temporarily installed the wing root fairings to drill those as well. They will also be attached with screws through nutplates.



The gap between the fairings and the fuselage will be opened up to  $3/16"$  and then a rubber  
794

seal will be added before permanently reinstalling it.

I also recently saw a modification to the canopy installation that I really liked. Its a modification to the canopy lift struts geometry. I found it through [7]this post (thanks Mike). It had some great guidelines, and only a slight modification was needed for my RV-7 (the post is for an RV-6).

I measured 2" back from the panel for the forward lift brackets. The canopy brackets were 24" back from the leading edge of the canopy frame. The struts used are [8]Suspa 23.86" 20lb struts. I also purchased the brackets from there as well.





The initial fitting took some trial and error, but I got it all aligned and double checked the sup-

port capabilities. The entire canopy is very well supported all throughout the closing/opening trajectory. What's really nice about this geometry is that the canopy is supported by the struts throughout the entire cycle, but with the original geometry there is an over-center position in which the struts begin to pull the canopy down, and it is quite unstable.



Here you can see the original geometry vs the new geometry. One other big benefit to this

geometry is the increased entry/exit area.

1. <https://n890gf.com/wp-content/uploads/2023/11/screenshot-2023-11-09-at-7.51.17e280afpm.png>
2. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5879.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5879.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5916.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5916.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5882.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5882.jpg)
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6. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5883.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5883.jpg)
7. <https://vansairforce.net/community/showthread.php?t=219634>
8. <https://www.liftsupportsdepot.com/suspa-c16-21572-gas-charged-lift-support/>
9. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5877.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5877.jpg)
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11. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5876.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5876.jpg)

### 9.10.2 Finished Wings (2023-11-22 22:51)



After rigging the ailerons and flaps and making sure everything was aligned, I needed to remove the wings one more time in order to finish up some critical items. The to-do list included finishing the Root Fairing seals and drilling two more holes for the Pitot and AOA tubes (for the left wing). The Root Fairing seals have about 20 nut plates that need to be riveted to the wing in order to accept the screws that hold everything together. This required removing the wing so I have access to the inboard rib of the wing to install everything.

A few years back, a fellow builder, Vince, told me about a solo method to remove and install the wings using the wing cradle. If it wasn't for this guidance It would have been quite annoying to attempt this work by myself. The method involves putting the wing cradle under the wing when its temporarily installed in the plane, and then using some plywood clamped to the cradle to prop the wing up in its final orientation.

I used some scrap plywood my friend Norio gave me, and cut it to size such that when clamped to the cradle, it fit snuggly under the wing. I then clamped everything and tightly as I could. I hopped into the plane and began the painstaking process of removing the bolts that had been temporarily holding the wing on. Its quite a tight and awkward fit, but I managed to remove everything. I then slowly removed the wing while it was held up by the wing cradle. Success!



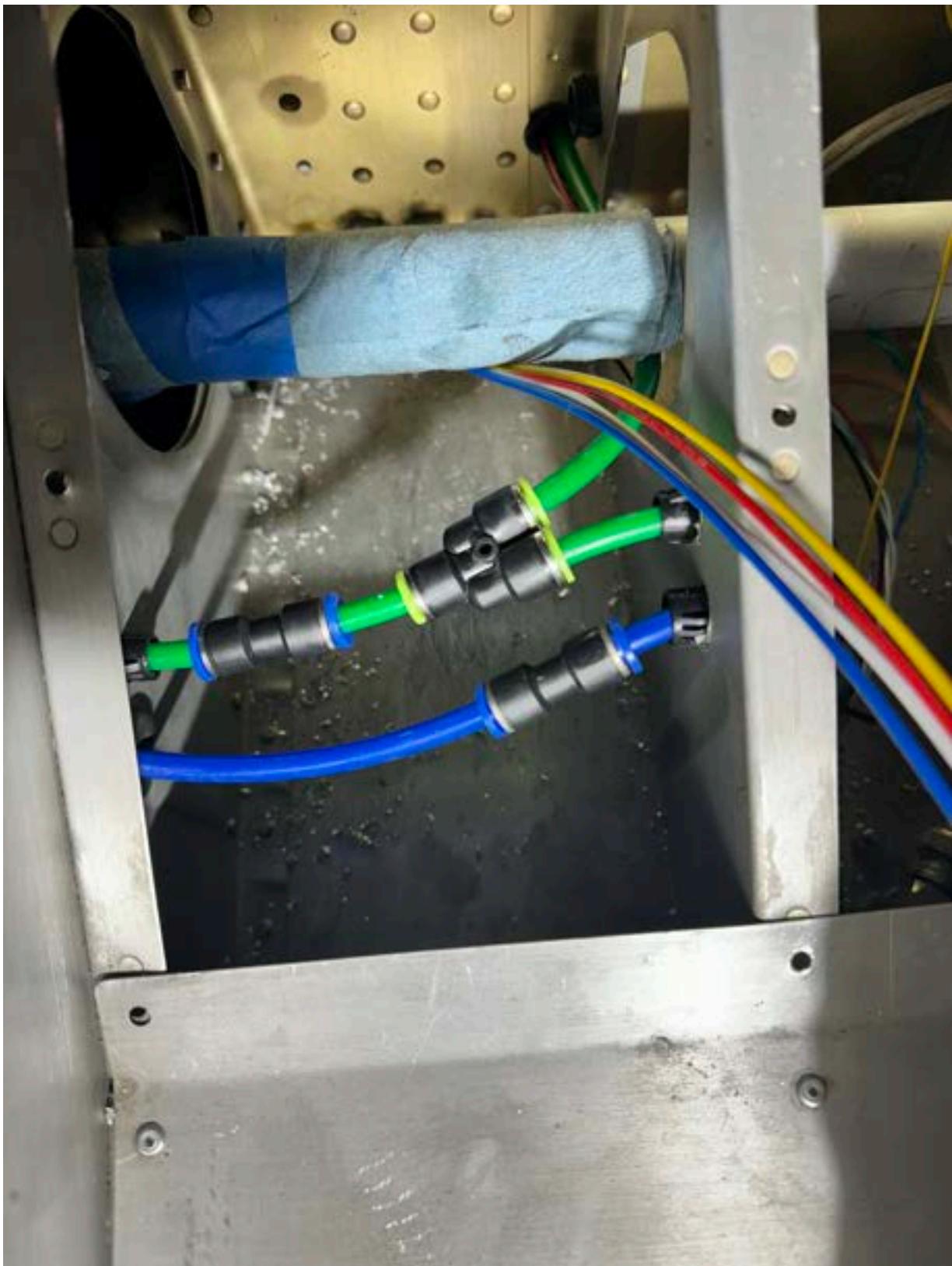
Once I had the wing off, I began the process of drilling, countersinking, dimpling, and installing  
803

the nutplates to the inboard rib of the wing. This was pretty straightforward, nothing too challenging here.



I also used this opportunity to drill two additional holes in the side of the fuselage for the pitot  
805

and angle of attack lines. Its all quite a tight fit inside this area, so trying to make sure I had everything lined up appropriately. When I initially installed the lines, I mistakenly cut one of them a couple inches too short. In this pic you can see a short segment that is used to attach everything. After taking this pic I added a longer segment in the wing under one of the access panels (where its easier to work) in order to remove this short segment under the floor pan.



I Also needed to attach the nutplate to the fuel tank bracket. This is an AN4 bolt that will slip

away in the event that the wing impacts something, in order to prevent the fuel tank from rupturing to minimize the risk of a fire. The bolt here will be safety wired.

Once I had everything drilled, and all the nutplates installed, I reinstalled the wing. The wing cradle method worked absolutely flawlessly, and makes installing the wings solo completely reasonable. I then installed all of the bolts that hold the wing, as this is the final time the wings will come off!



The next day, I went back to the hangar to repeat the entire process on the right wing. This  
809

one took me about 50 % less time, which was nice. Now that the wings are permanently installed, I can now wire up the wingtip lights, and autopilot servo, which will close out the two remaining avionics to-do items.

1. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5924.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5924.jpg)
2. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5925.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5925.jpg)
3. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5928.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5928.jpg)
4. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5926.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5926.jpg)

### 9.10.3 More Wiring (2023-11-27 16:43)



Now that the wings are installed I spent a couple hours working on some remaining wiring tasks inside the fuselage. I drilled two holes through my center section (with the guidance from [1]this post on [vansaircraft.com](http://vansaircraft.com)) in order to route my autopilot and right wingtip lighting harnesses forward of the spar. The left side wingtip lighting harness was routed through an existing hole. I will then connect the wires up to the existing wires that were in place already. I also routed the Fuel Level sensor wires through the sides of the fuselage as well. Once these last few connections are complete, the entire avionics and wiring of the aircraft will be complete.

I also took this opportunity to install my wing-walk grip. I ordered custom skateboard grip tape from [2][www.boardpusher.com](http://www.boardpusher.com), and they turned out amazing! I cut them to final size by laying them on the wing and trimming as necessary.



I came back the next day and began wiring up the lighting harnesses and the roll servo. It was

a quick job to splice the wires together and secure the bundle forward of the spar.

[4]



I got my wingtips out and propped them up on the wings. I connected the included ZipTip wiring connector and powered up the panel. On first try, the left wingtip taxi and landing light both failed to turn on, while the right side worked nominally. I then began to trace the break in the line, starting with just powering the wingtip with a power supply directly via the wiring harness. I went to disconnect the harness, and one of the ground wires separated from the connector. The ZipTips utilize two grounds - one for landing/taxi lights, and one for nav/strobe. I popped the pin out of the connected, re-stripped the wire and re-crimped a new pin. When I plugged it in, everything worked as expected!

With the panel powered up, I also updated the autopilot servo software to the latest version. When it came back online, I calibrated the servo and verified that everything worked as expected. Its fun to see the autopilot try to maneuver the plane!

1. [https://www.vansaircraft.com/wp-content/uploads/2019/01/Routing\\_Wires\\_through\\_the\\_Center\\_Section\\_Bulkheads.pdf](https://www.vansaircraft.com/wp-content/uploads/2019/01/Routing_Wires_through_the_Center_Section_Bulkheads.pdf)
2. <https://www.boardpusher.com/>
3. [https://n890gf.com/wp-content/uploads/2023/11/img\\_5936.jpg](https://n890gf.com/wp-content/uploads/2023/11/img_5936.jpg)
4. <https://n890gf.com/wp-content/uploads/2023/12/image.jpg>

## 9.11 December

### 9.11.1 Classic Aero Interior (2023-12-04 11:51)



I spent some time over the weekend beginning the installation of my [1]Classic Aero Designs Sportsman II interior with Aviator seats. There are two things I want to call out about Classic Aero - 1. the customer service and overall experience working with them over the last couple years (ordering, receiving, installation) has been great. And 2. the quality is impeccable. Everything is superb in fit, and finish, and it really makes the plane feel like a premium aircraft.

I received some guidance on the installation process, so I began by laying out the carpet in the plane to mark the locations. I then installed the velcro chips (Velcoins) that are used to hold the carpet down. They are pop-riveted to the floor pans and then the carpet is attached.



[3]

817



I then proceeded to install the seat backs, cushions and stick boot covers to really get a sense of what the interior will look like.



In the next few days I will install the remainder of the interior (for initial fitting) including the side panels, pockets, armrests, forward carpet, baggage carpet and baggage side panels as well as rear cover. It's really starting to come together!

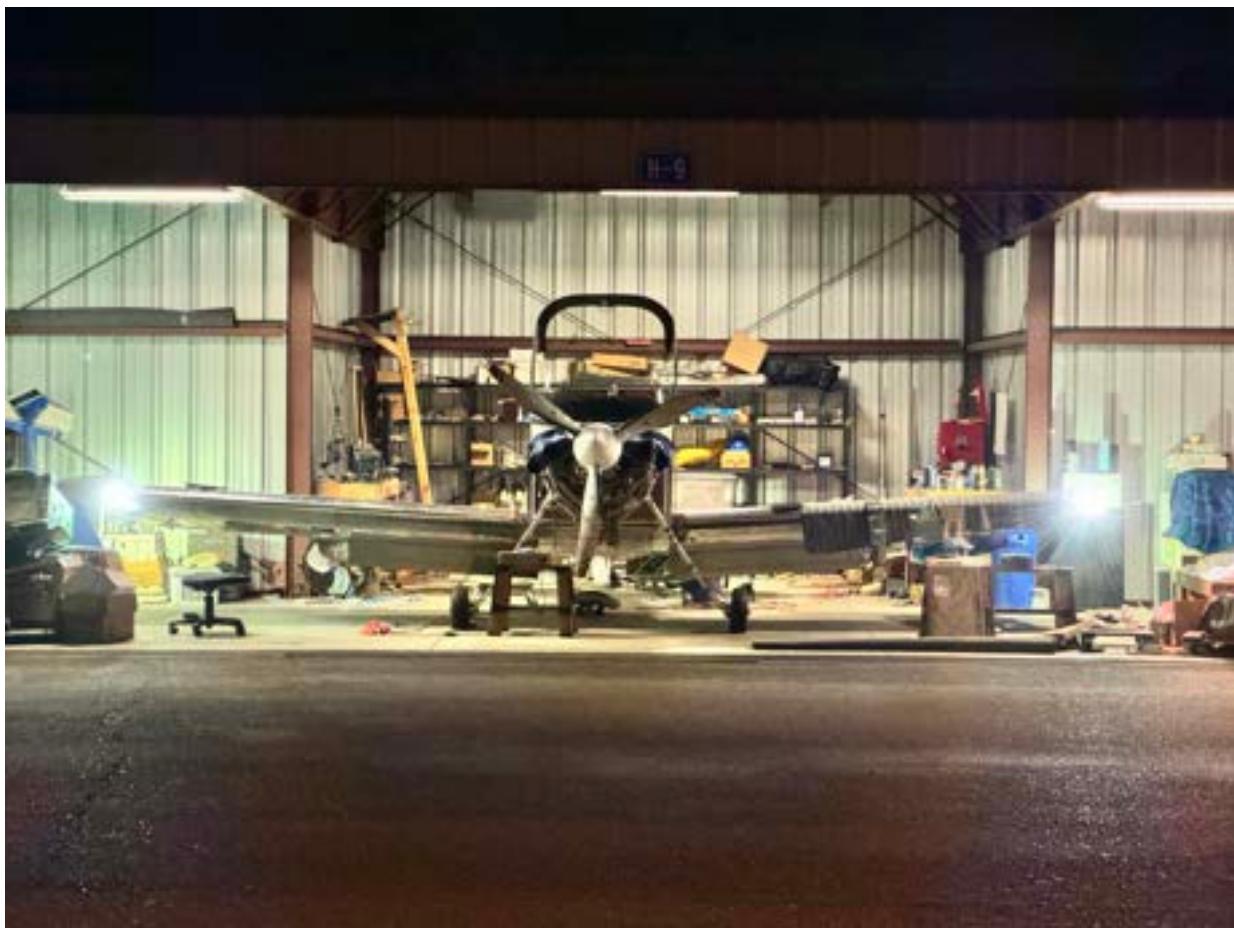
1. <https://www.classicaero.com/web/public/products/product-category.php?ProductCategoryID=12>
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# 10. 2024

## 10.1 January

### 10.1.1 ZipTips - Installed Wingtips (2024-01-03 22:00)



Happy New Year! I wrapped up 2023 and kicked off 2024 by completing the wingtip installation. I am using the [1]Aveo Engineering ZipTip Premier wingtips that have integrated lights. These include Landing, Taxi, Nav and Strobe lights with a rear position/strobe light as well. They recently announced a completely new and upgraded version - [2]Vegas. Check them out, I may upgrade in the future.

I started the installation by trimming the inboard edges of the wingtips to 5/8" width. This is so that they sit flush with the wing skins. I also trimmed back the trailing edge to provide 1/4" gap to the aileron.

I then used my ratchet strap to hold the wingtip in the right position and snug up against the leading edge.

[3]



With the strap holding the wingtip to the wing, I drilled #40 and clecoed all the holes top and bottom. Then I removed the strap. I also used this opportunity to verify the lighting was working as expected. I drilled the left wingtip, then the right followed the same process.

[4]



I removed every other Cleco and drilled to #27 for the -6 screws I'll be using. Once all the holes were drilled I removed the wingtips and began the tedious process of drilling and installing the nutplates.

I made a small nutplate jig using a -6 screw, and use that to drill all the rivet holes for the nut plates.

[5]



after drilling everything I countersunk all the rivet holes and the screw holes. The screw holes need to be counter sunk big enough to accept the dimple from the wing skin. After that, I riveted all the nutplates on to the wingtip. I repeated this process with the right wingtip.

[6]

824



Once everything was riveted, I installed the wingtips to the plane and ran the harness through to the lighting module. I powered up the panel and did a test of the lights. It was night time so I used this opportunity to test out the performance of the lights at night. They are very bright. I may need to make some minor adjustments to the taxi light angle somehow, but they are sufficient for now.



[8]



[9]



The whole process took me approximately 8 hours for all the trimming, fitting, drilling and riveting. Nothing was difficult, just tedious. I wanted to start the fiberglass work with the wingtips for this reason. Now I can proceed to rest of the fiberglass work!

1. <https://www.aveoengineering.com/ziptips-premiere-2/>
2. <https://www.aveoengineering.com/aveo-ziptips-vegas-for-vans-aircraft/>
3. <https://n890gf.com/wp-content/uploads/2024/01/image.jpg>
4. [https://n890gf.com/wp-content/uploads/2024/01/img\\_6049.jpg](https://n890gf.com/wp-content/uploads/2024/01/img_6049.jpg)
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9. <https://n890gf.com/wp-content/uploads/2024/01/trim.84566eba-34b7-4e45-a2fb-6d52b4af908a.gif>

### 10.1.2 Tidied up the Wings (2024-01-19 22:00)



Today I spent most of the day working on a bunch miscellaneous items.

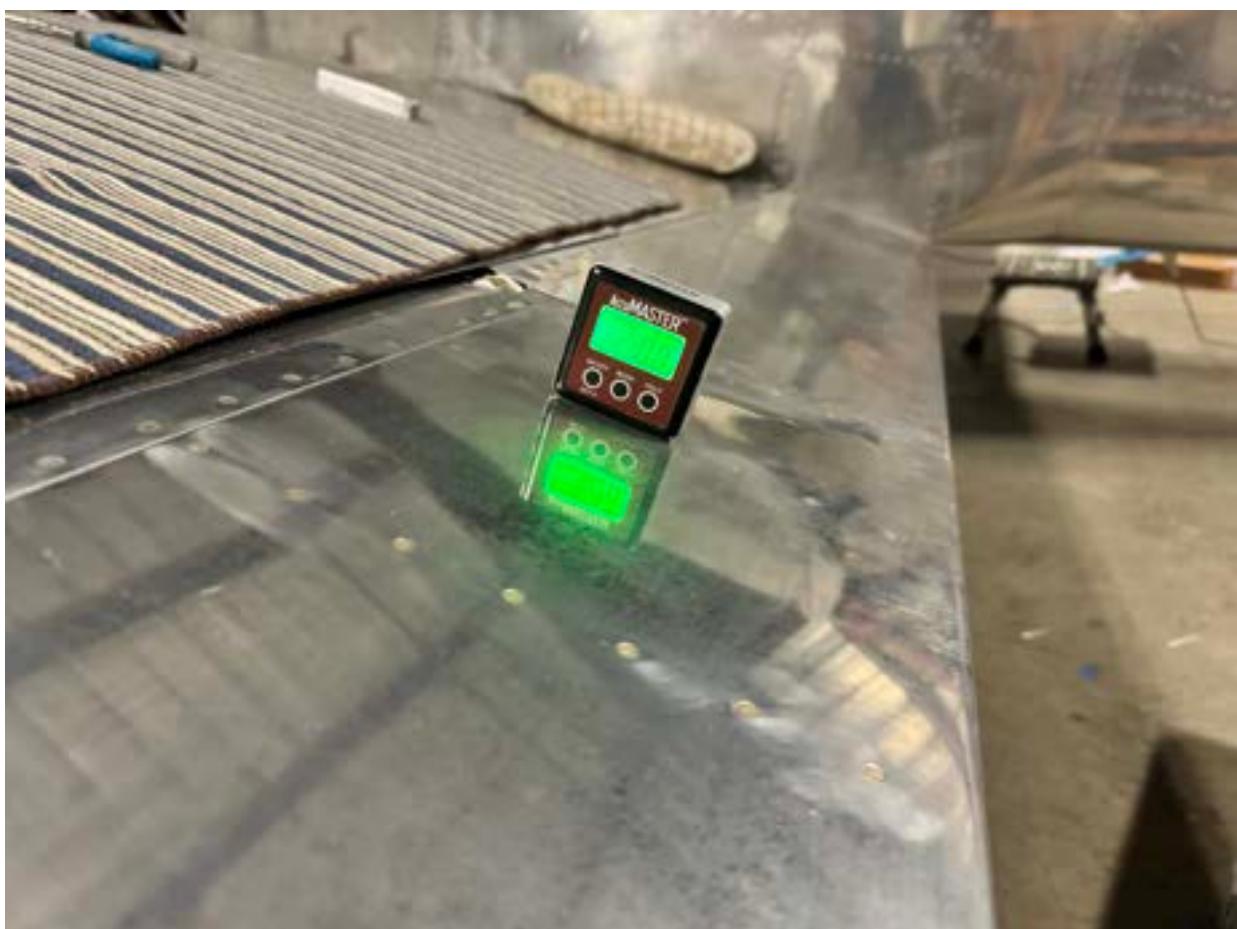
I started by fabricating my aileron stops. I am using a small delrin bushings around the aileron pushrod spacer to act as the stops.



Aileron stop bushing

After fabricating and installing I measured the deflection angles - I have 28 degs up and 16 degs down for each aileron. The specifications call for a minimum of 25 deg up and 15 deg down, so I'm within the standard range.

[2]

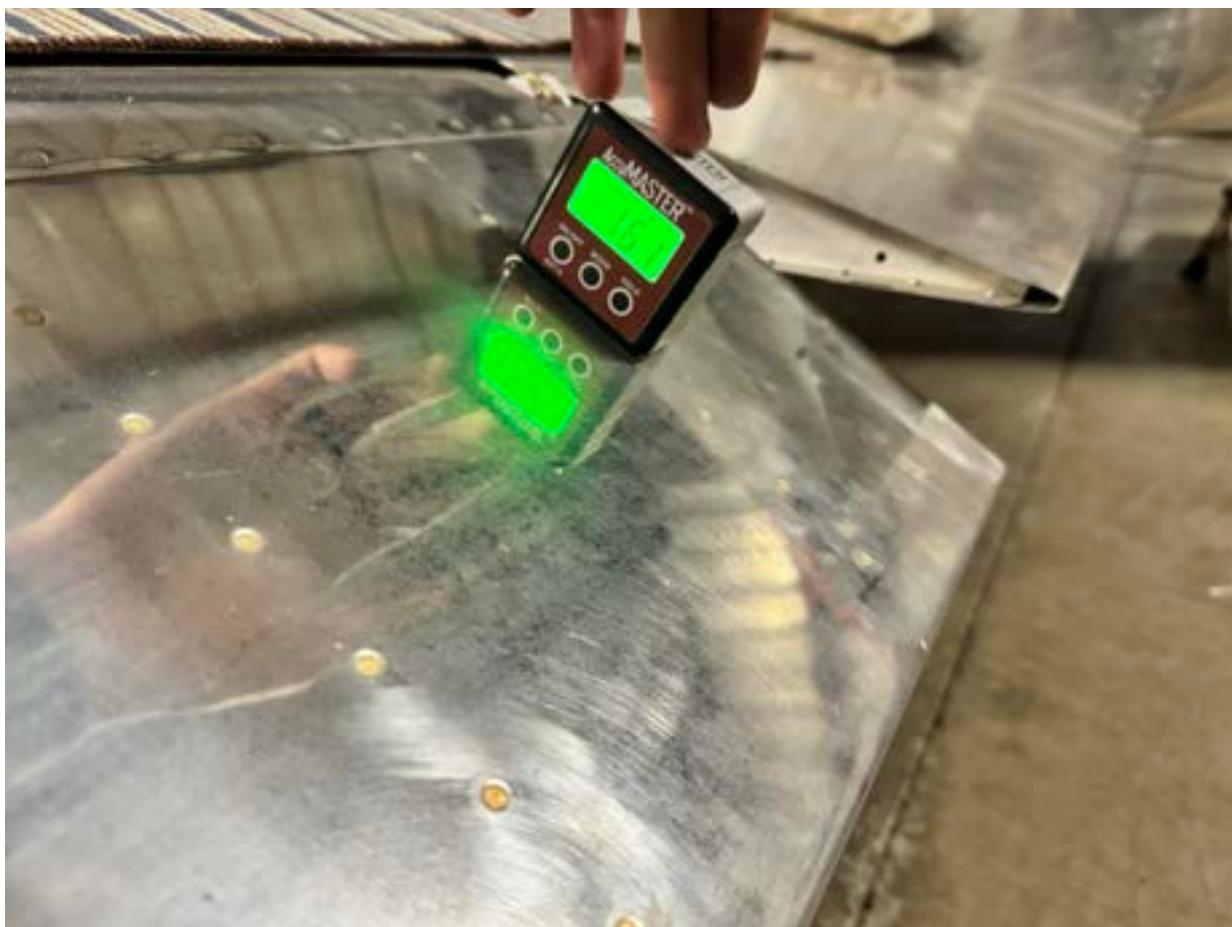


Left aileron neutral

[3]



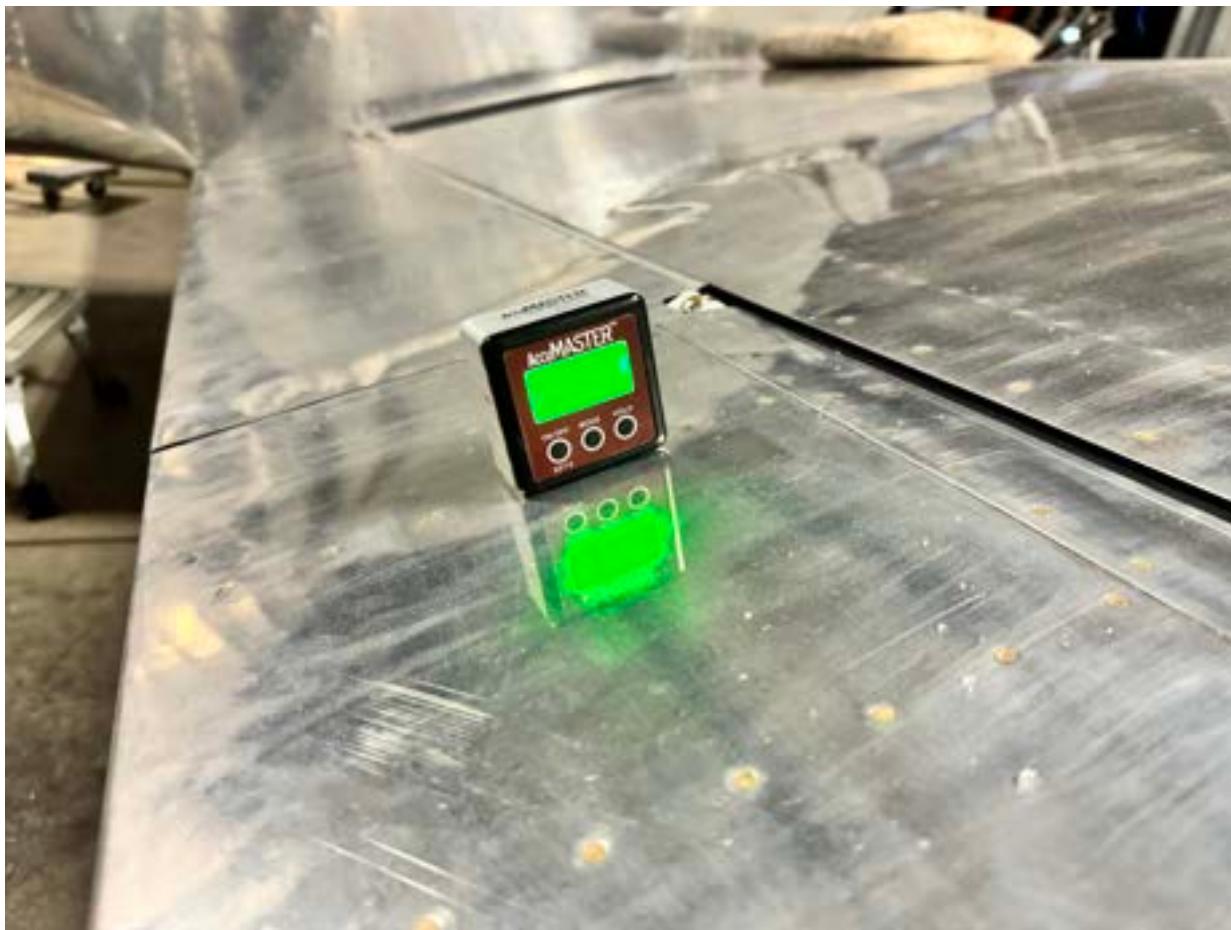
Left aileron up



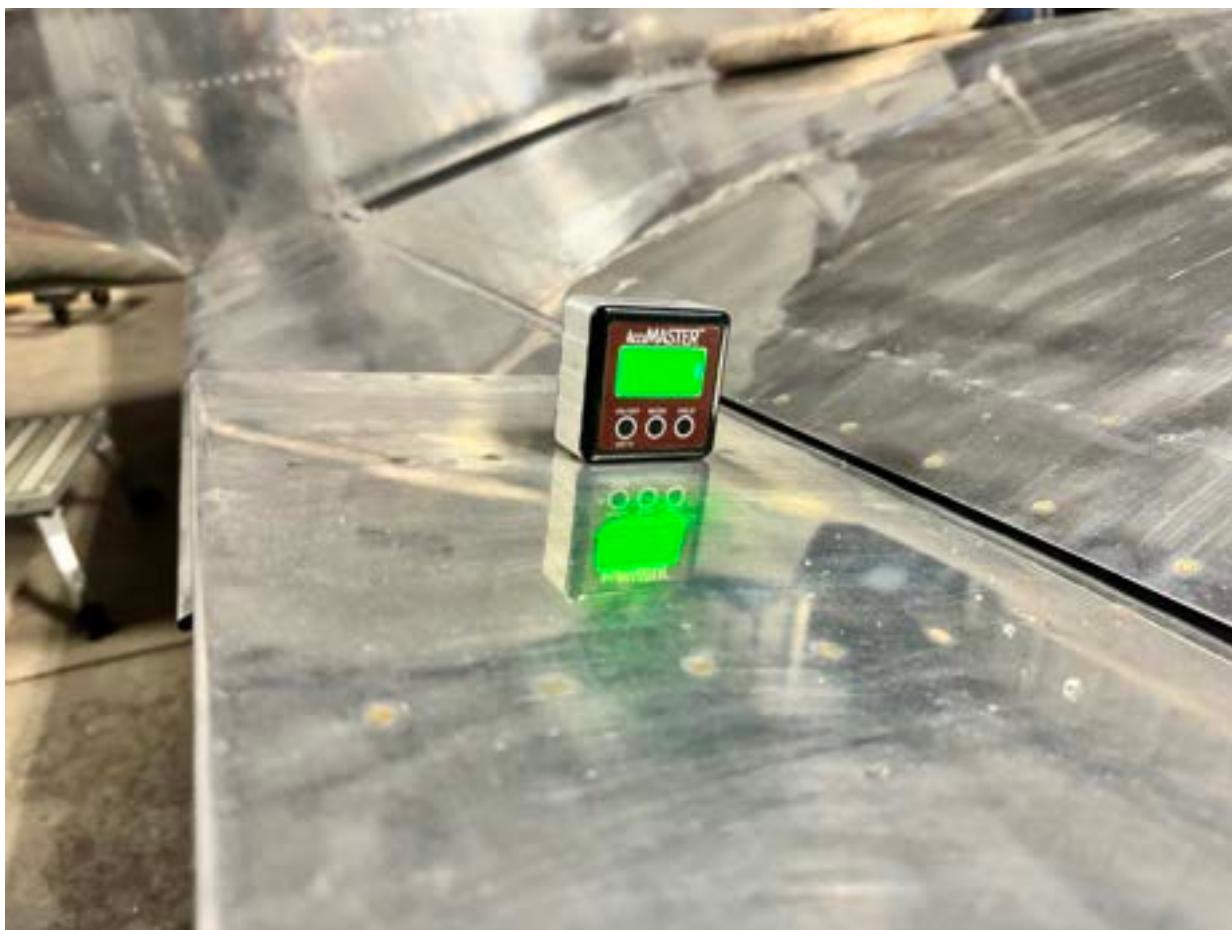
Left aileron down

[5]

833



Right aileron neutral



Right aileron up

[7]

835



Right aileron down

Next I drilled two holes in the fuel tank mounting bracket in order to attach the safety wire. These bolts are tightened snugly with a large washer in order to allow for separation from the fuselage in the event the wing is hit. The safety wire will prevent the bolts from prematurely backing out.



I also made some slight modifications to the position of my accessory bus fuse block. I needed

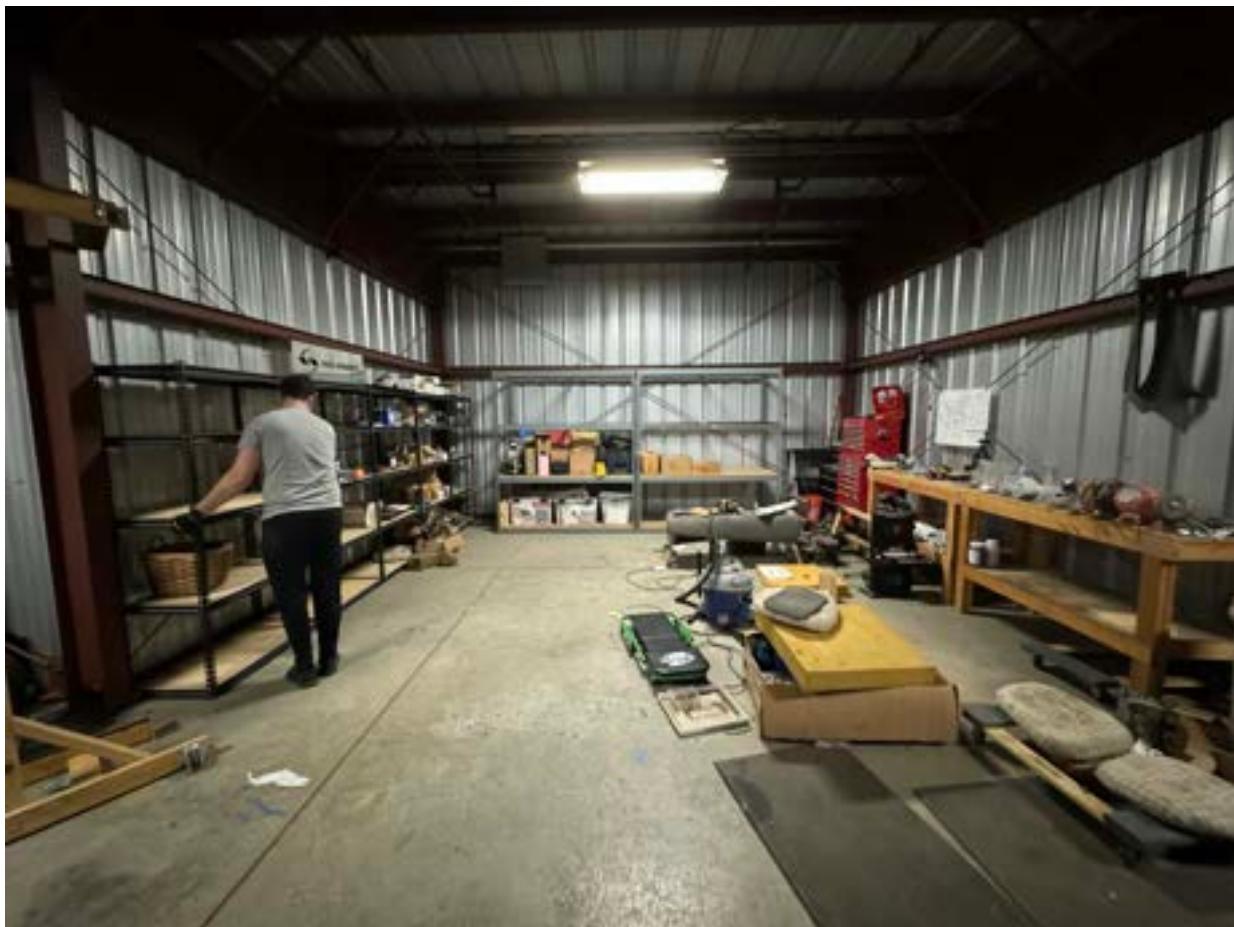
to modify the position lower in order to allow for the forward top skin to be installed. I've modified the top skin with the optional access panel kits. The panel is held in place with nutplates and the bottom of the nutplates interfered with the fuse block. Now that I've lowered the position the top skin is ready to be installed.

Last but not least, I also secured the pilot's stick wiring harness connectors, among other wiring bundles below the seat skins.

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3. [https://n890gf.com/wp-content/uploads/2024/01/img\\_6335-1.jpg](https://n890gf.com/wp-content/uploads/2024/01/img_6335-1.jpg)
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7. [https://n890gf.com/wp-content/uploads/2024/01/img\\_6340.jpg](https://n890gf.com/wp-content/uploads/2024/01/img_6340.jpg)
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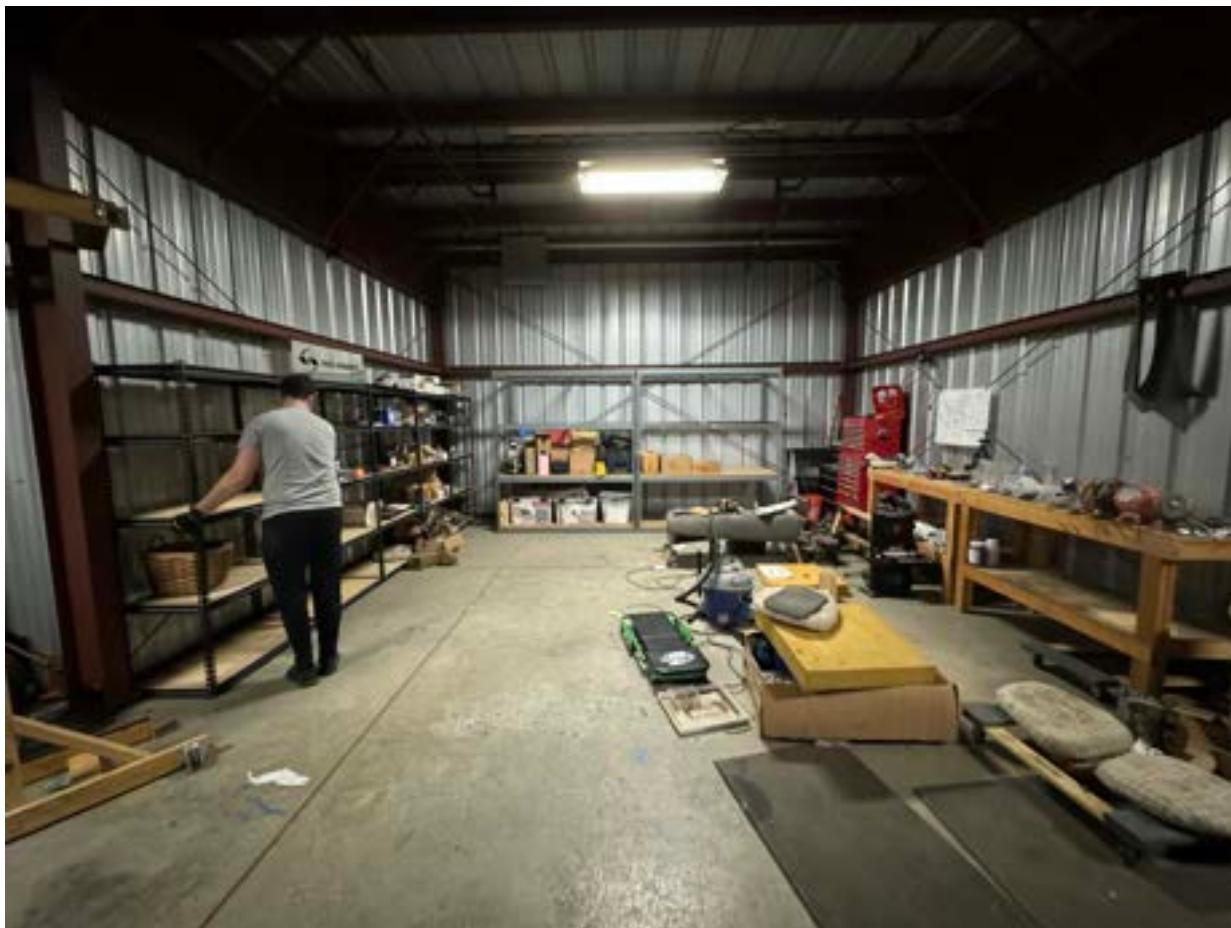
## 10.2 February

### 10.2.1 Miscellaneous Tasks (2024-02-27 13:08)



February has been a bit of a slower month in making big progress. I've spent a few evenings working on several different things. I got some new shelving units from an old storage unit that my mom was getting rid of, and they sat in the hangar for a few weeks before I finally got some time to assemble them and reorganize a lot of the stuff we have.

I spent an evening with my wife moving the old shelves and workbenches to opposite sides of the hangar, and moved the new shelves to the back wall (they're much bigger) and just general organizing of tools and parts and a lot of clean up.



We also made a trip to the Container Store and got more plastic boxes for stuff. Its always satisfying when putting things back on shelves and seeing how organized it is at the end.

I came back a few days later and worked through a short to-do list of things inside the plane. I needed to shorten the elevator pushrods so that the bellcrank would rotate aft a small amount. When I pushed the elevator fully forward, it would get a little "squishy" and if I pushed harder, it would then hit the forward (down) stop. I figured the only thing that could be causing this is that I was over rotating the autopilot servo, which is attached to the bellcrank. After shortening the pushrods, I reinstalled everything and tested the forward (and aft) stop, everything hit their stops with no problem or squishiness felt anymore. I then torqued all the bolts and marked them with torque paint.



As I was working on the larger aft pushrod, I noticed that the aft fuselage skin still needed to

be riveted. Its the portion right under the empennage, totaling 50 rivets. I'm surprised I didn't notice this earlier, but It would have been caught when I started doing the fiberglass work on the empennage fairing. I realized I needed to remove the horizontal stabilizer in order to sufficiently gain access to rivet these holes. I proceeded to remove the tail and then riveted the aft skin with no issues and then reinstalled the vertical and horizontal stabilizers.

[3]



Now that I have the elevator and rudder off the plane, I will be working on the fiberglass tips.

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3. <https://n890gf.com/wp-content/uploads/2024/02/image.jpg>



## 10.3 March

### 10.3.1 Interior Finishing & Fiberglass Start (2024-03-19 20:05)



I began wrapping up the interior controls installation by adding all the necessary washers (which are pain to install) to the Aileron Pushrod - to - Control Stick attachments. This included tightening the jam nuts on all the pushrods and ensuring that a sufficient number of threads are available on either end to ensure that if something does come loose, nothing can fully unscrew. I then marked everything with torque paint.

[1]



[2]



[3]

846



While I had the floor pans out and working on the aileron pushrods, I decided to install the

aileron pushrod boots. These are leather covers that attach over the pushrods to prevent air from entering the cabin. They are from [4]Classic Aero Designs and were quite easy to install. The provided instructions are very clear. Another great product to go with my complete interior!



In parallel to all the above items, I began working on some of the fiberglass parts on the  
849

plane. Starting with the Horizontal and Vertical Stabilizer tips. They are pop-riveted to the surfaces, and have some foam and fiberglass filling to close gaps around the attachments. I also filled the gaps and glassed over the joint after riveting them to the surfaces. This is an iterative process and the epoxy curing time allows for a lot of work to get done in between. I'm using the [6]West System Epoxy 105A (and 205A hardener). They make it super easy with the pumps - 1 pump from each is exactly the amount for proper mixing. This is going to take a few iterations to complete, but once the surfaces are bonded and glassed, I will paint over them with some primer to seal the whole thing.

[7]



[8]

850



[9]

851



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### 10.3.2 More Finishing (2024-03-29 12:00)



I added some more epoxy and filler to the tail fiberglass tip fairings, and while that was curing I spent some time wrapping up additional finish items.

I started by marking the wing root fairings for a 3/16th" gap. I marked the fairing with some black sharpie, and then used a 3/8" bolt to score a small line, resulting in a 3/16th" gap from the side of the fuselage. I then removed the fairings from the wings and used my snips to cut back to this line. I then filed this edge to smooth out the cut. After this I installed the rubber seal that will bridge this gap, and reinstalled the fairing to the wings.



After this I spent some time inside the cabin installing support braces for the panel. Originally,

the design has two large ribs that extend from the firewall all the way back to the panel through the sub panel, making the entire structure very rigid when riveted all together. With my panel design however, I removed those ribs between the sub panel and the panel so that I can fit all my avionics. As a result, I needed to fabricate some new supports that I can install between the sub panel and panel so as to not lose any rigidity. I fabricated the supports out of some 3/4" angle stock, and cut to length so I could use my avionics trays as the anchor point on the panel, and then drilled two holes through the sub panel for a screw to hold the supports.

[2]



While I was in the cabin, I finished securing all the wiring below the seat floors and in front of the spar. Additionally I also added rubber edging to the fuel line passthrough holes in the sides of the fuselage so the steel braided hoses won't rub against the fuselage. I will add additional silicone tape around the hoses to make an air tight seal (or at least more of a seal).

[3]

856



I also added the four remaining wing spar bolts. They are AN4-13A bolts that are inserted from the aft side of the center-section spar into some nutplates on the wing spar. These bolts are often missed as they are not part of the larger main bolts that go through the entire assembly. (The paint marker got a little runny)



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3. <https://n890gf.com/wp-content/uploads/2024/04/image-2.jpg>
4. <https://n890gf.com/wp-content/uploads/2024/04/image-3.jpg>

## 10.4 April

### 10.4.1 Fiberglassing (2024-04-27 21:54)



I've been spending the last few weeks finishing up the tail fairings. Lots of filling and sanding - repeat.



Here is the lower rudder fairing. I sanded off the molding for the tail light and then added  
862

some foam, epoxy filler, and a fiberglass layer. This will need some iteration until I'm satisfied.



Also on the bottom of the rudder fairing is a flat spot that needed to be added to allow  
864

clearance for the tail wheel. This will also take some additional work to finish off.

[3]

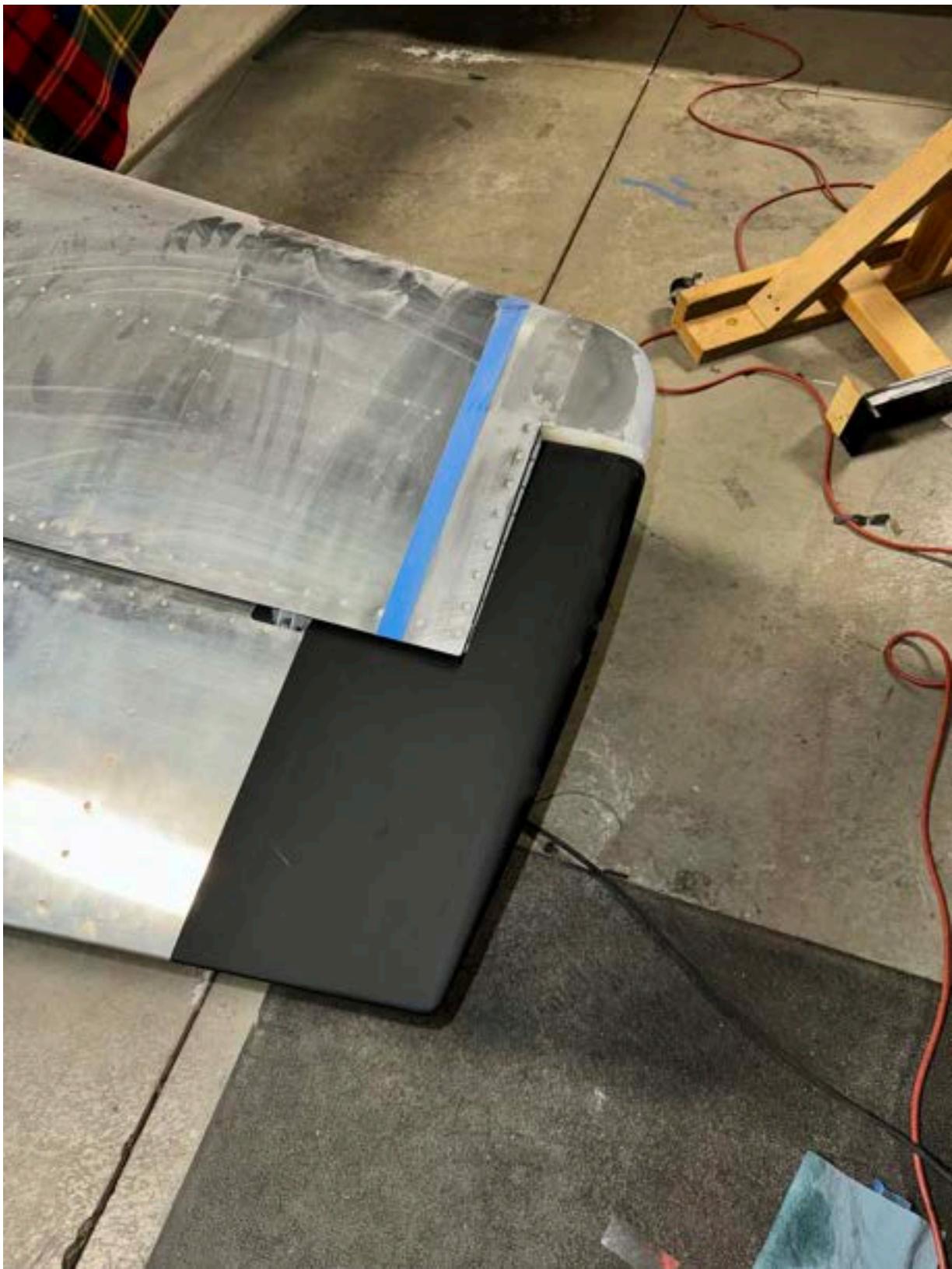


The top of the vertical stabilizer also got some filler. This one is close to complete, just another iteration and then I can prime it.

[4]



[5]  
866



The elevator fairings are done and primed. I'm very pleased with how they turned out. It's

not perfect, but more than good enough until final paint. The horizontal stabilizers also have some final filler added and will be sanded and primed next time.

The whole process involves some West Systems epoxy, cotton flox, 60 grit, 150 grit, and 320 grit sand paper. Lots of sanding.

Tail is almost done done, then I can finish up the remaining fiberglass work on the canopy, and then do the cowl. Things are coming together!

1. [https://n890gf.com/wp-content/uploads/2024/04/img\\_6817.jpg](https://n890gf.com/wp-content/uploads/2024/04/img_6817.jpg)
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## 10.5 June

### 10.5.1 More Finishing Again (2024-06-03 18:57)

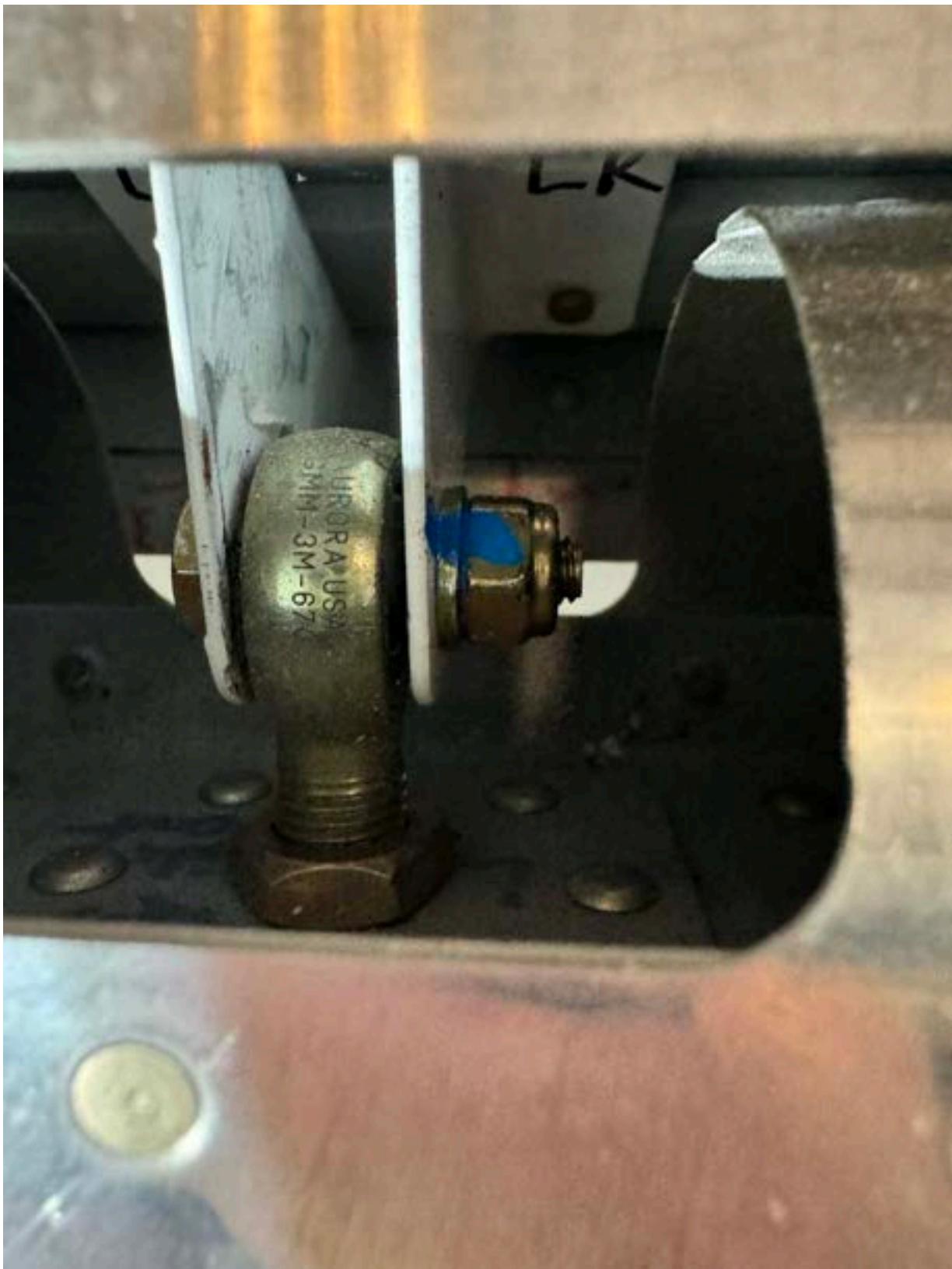
The last month has seen quite a lot of progress on lots of small items. Every trip to the hangar involves more fiberglass and epoxy sanding and finishing. The fiberglass tips for the whole tail are now complete, barring the horizontal and vertical stabilizer tips being primed. I also completed the lower rudder fairing, which needed to be modified because I'm not installing a rear tail light.



I also bolted and torqued all the elevator and rudder bolts, as well the elevator pushrod and rudder cables.

[2]

869



While waiting for epoxy to cure I spent some time installing the wheel pant brackets to the  
870

landing gear. I had been putting it off as I didn't have a method to jack the airplane up. I also filled the brake system with fluid and bled the brakes until clear bubble-free fluid came out of the return line.

[3]



I also began the process of making the canopy fairing. Its the final step to complete the canopy, and I waited to finish the tail fiberglass parts in order to build up confidence and process to ensure a smooth execution. I began by masking the window and the frame to make a 2 inch gap for the fairing.

[4]



I then mixed up some epoxy and flox to make a thick filler, and then spread it in the gap between the window the canopy frame and then covered it in the peel-ply.



I came back the next day and removed the peel-ply and then started sanding the surface. There were quite a lot of pits from the initial pass, so I mixed up a second batch and filled the gaps.





After sanding again I still had a couple spots that needed filling so I did a third pass of the filler.



After one final round of sanding I'll lay up the fiberglass and build the actual fairing. But that's for next time.

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## 10.6 July

### 10.6.1 Tail Intersection Fairing & Canopy Fiberglass (2024-07-01 10:55)

In my continued expansion into the Fiberglass world, I decided to work on the Tail Fairing.

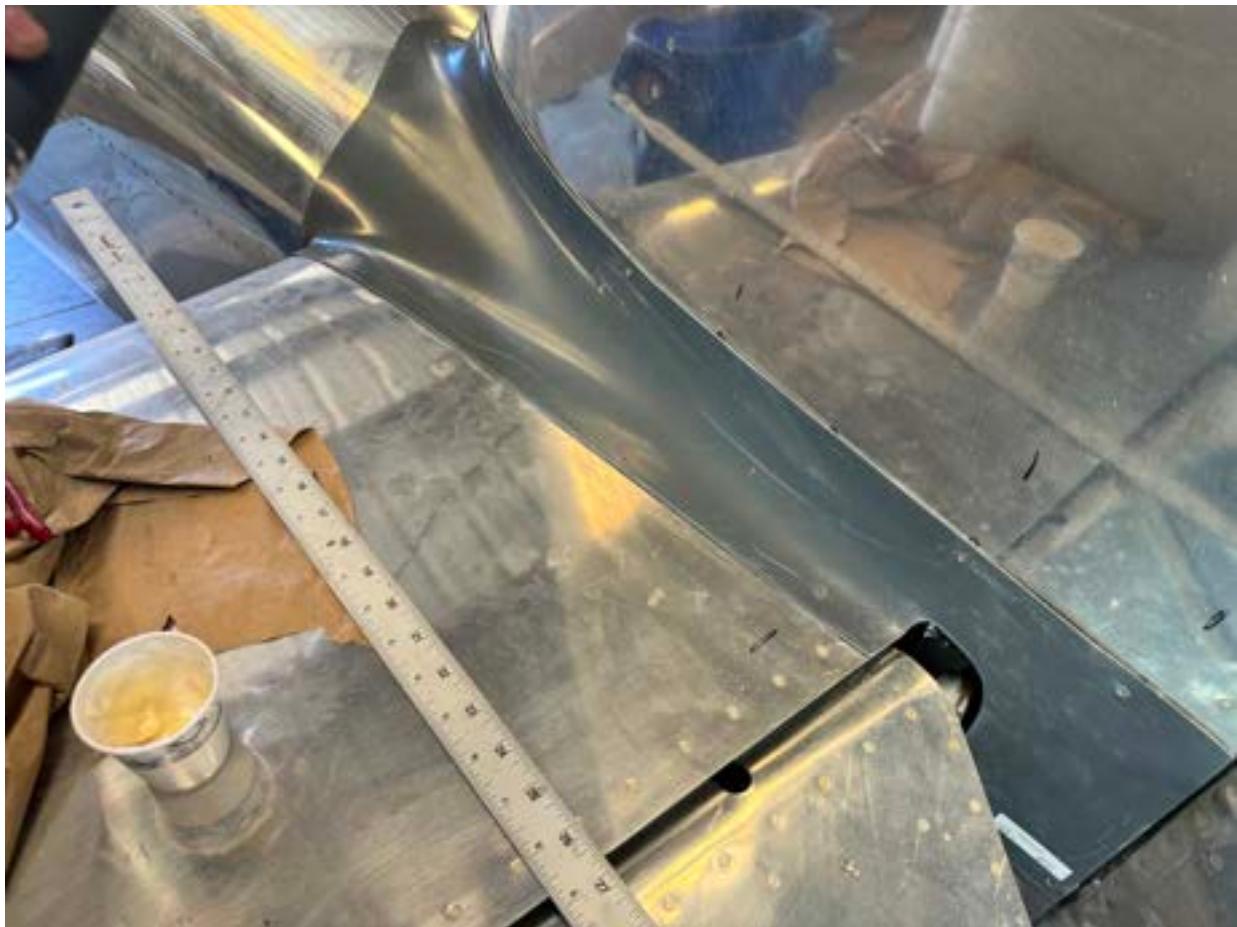
The initial fit was not perfect, but I've tried my best with sanding and a heat gun to try and massage the fiberglass into a better position around the tail.

[1]



After a few iterations of sanding to get the edges nice and straight, I used my hole-finder to match drill the fairing to the holes in the vertical and horizontal stabilizers. I used my heat gun and a long metal ruler to *mold* the fairing to the vertical stabilizer where there were some gaps. Once the alignment was as good as I could get it, I drilled the holes to #27 for #6 screws. I then riveted the nut-plates.

[2]



I also spent some time adding the vertical stabilizer top fairing rear cover. I used some foam as filler and epoxied it in place. I then used 3 layers of fiberglass on top to complete the cover. This will get sanded and blended to the fairing then primed.

[3]

878



I also did some layups of fiberglass on the canopy fairing. I used 5 layers of fiberglass starting

smaller width and getting wider until it was the full 2 inch width. After curing, I began the tedious job of more sanding. I had to use quite a lot of filler to get the surface smooth, but eventually was at a point that I could remove the initial thick pipe tape and switch to thinner electrical tape and begin smoothing the transition. I also did an initial priming of the fairing and added some more filling. The primer helps to show the high and low spots so I can more easily fill and blend. I think another iteration and this should be good to go.

[4]



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## 10.6.2 Finished Canopy Fairing (2024-07-07 22:00)

I was able to finish the canopy fairing. It took several iterations of sanding/filling/priming/repeat, but I got the fairing to a place that far exceeds what I thought I would be able to achieve.



This is the final step in the canopy fabrication. I have some minor paint clean up that I'll do as well, but I'm marking this as done.



### 10.6.3 Underside Empennage Fairing (2024-07-21 22:00)

I spent some time working on the underside fairing for the tail. I decided to go with the standard Van's design using the aluminum close out and the rubber seals. It needed some trimming to get a consistent gap along the bottom of the horizontal stab, but once it was in place, I then installed the rubber fairing and attached it with some glue.



I'll remove these and reinforce the rubber attachment to the aluminum with some stronger glue or epoxy.



I also needed to redo the vertical stabilizer top fairing. After the epoxy cured and everything was sanded, the rudder and the fairing were slightly misaligned. I removed the fiberglass gap fairing and re-did the layup, clamping the rudder and the fairing together to ensure proper alignment.



Up until now I had decided to not use a keyed ignition system, However I was talking to a

hangar neighbor about avionics and panels and after talking with him for a while, I changed my mind and decided to add a key in line with the engine start button. The key is a 2 pole switch that essentially enables the engine start button to prevent accidentally engaging the engine starter. I've got some additional panel labels on order for the key and some other items that I have since added.

[4]



Also in this picture is the [5]Rudder Trim knob I got from Aerospot Products. I hooked it up to the rudder pedals via the provided springs and checked the tension to ensure it was working properly. What's nice about this approach to rudder trim is that it also provides a steady back pressure on the rudder pedals (via the springs). I've read that some mechanical yaw damping is nice to have, and this achieves that without having to keep feet on the pedals the entire time.

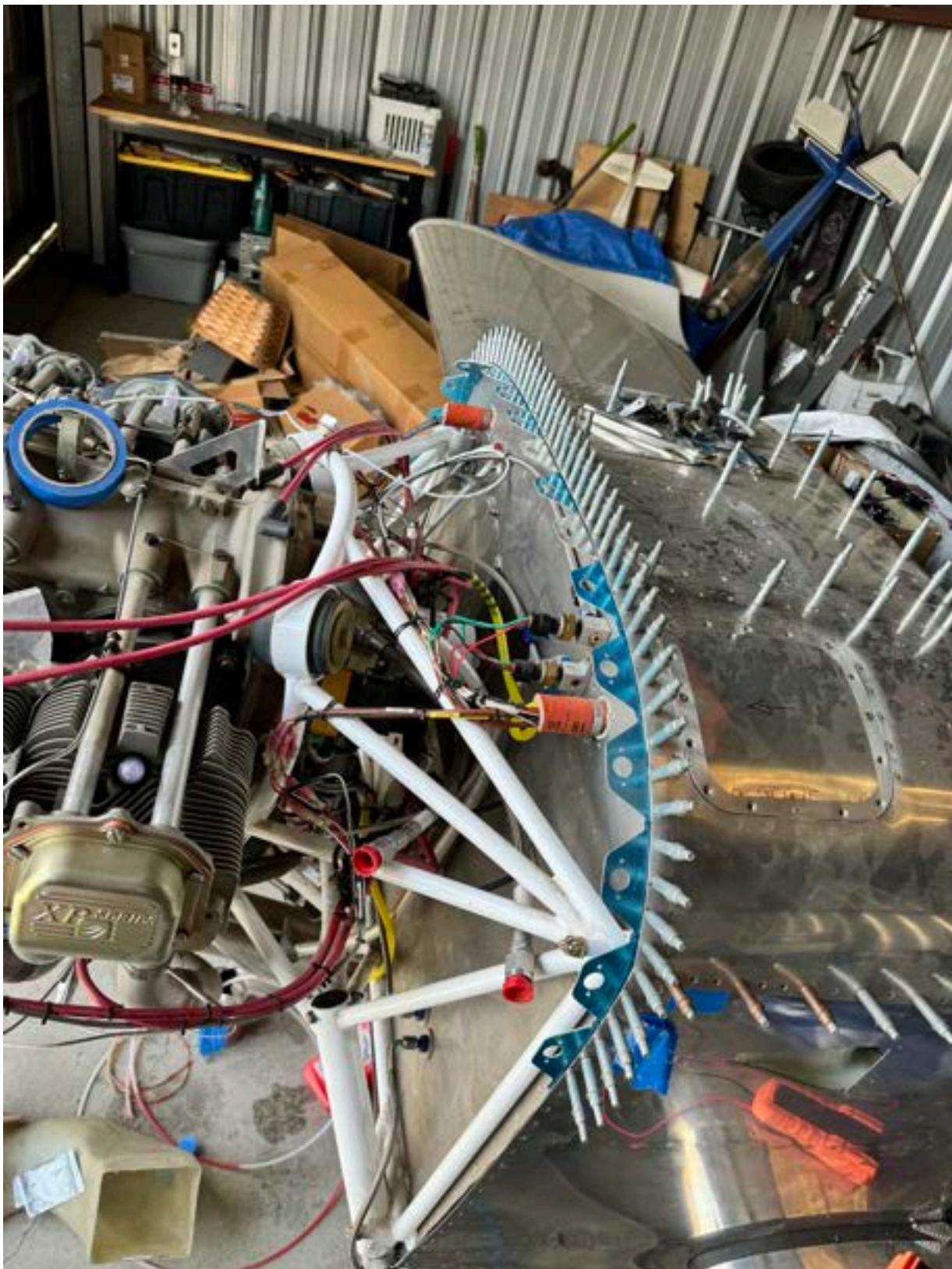
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3. <https://n890gf.com/wp-content/uploads/2024/07/image-1.jpg>

4. [https://n890gf.com/wp-content/uploads/2024/07/img\\_7177.jpg](https://n890gf.com/wp-content/uploads/2024/07/img_7177.jpg)
5. <https://www.aerosportproducts.com/product/rudder-trim/>

## **10.7 August**

### **10.7.1 Began work on Cowling (2024-08-04 23:00)**

I started work on the cowl. I'm using the [1]SkyBolt fastener system for my cowling. I began with the top cowl and alignment with the spinner. I installed the firewall flanges to support the top cowl. I'm using 3" spacing along the top center and then it transitions to 3.25" spacing towards the sides. The two outermost flanges will align with bottom cowl flanges.



Once I aligned the top cowl and it was evenly aligned I trimmed the trailing edge to mate with  
888

the fuselage skins. I'll need to massage the edge a bit to a perfect fit, but it's good enough for an initial fitting. The orange strap will be for holding the bottom cowl up.

[3]



I removed all the flanges, dimpled and surface prepped them so they can be riveted to the firewall. I'm going to hold off on this until everything has been fitted.

I also cut out the hole for the oil door. The door is a separate piece that gets fitted to the cowl with a hinge. I traced the door onto the cowl and then created a 1/2" flange. I aligned the hinge to the cowl and the door and clecoed it in place.

[4]



I also cut the slot for the latch mechanism.

890

[5]



Here it is in the closed position. After some more sanding and shaping of the door I riveted everything in place.

[6]



[7]  
892



I added a stiffener plate to the inside of the door using some scrap material from the cowl. It

should help keep the door from bulging out.

I continued work on the cowl. I aligned the top and bottom halves and removed some material from the overlapping flanges at the front of the cowl. I then reinstalled the top cowl and drilled every-other hole to cleco it to the flanges

[8]



[9]

894



I started in the middle and worked my way to the sides in order to keep everything as tight

and flush as possible. These holes will get enlarged to accept the skybolt fasteners.

Here is the other side. The oil door has been removed for now so I don't damage it.

[10]



There are some minor gaps where the cowl meets the fuselage skins. I will use some micro and epoxy filler once everything is riveted to make the interface as close to perfect as possible.

Here is the top cowl clecoed in place.

[11]

896



1. <https://store.skybolt.com/rv679j-c1p-p534.aspx>
2. [https://n890gf.com/wp-content/uploads/2024/07/img\\_7181.jpg](https://n890gf.com/wp-content/uploads/2024/07/img_7181.jpg)
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## **10.8 September**

### **10.8.1 Continued Cowling (2024-09-02 14:55)**

With the top cowl clecoed in place I was able to drill out the 15/32" holes for the SkyBolt grommets. I've spaced out the holes resulting in 17 skybolts across the top cowl.



I drilled each other hole to full size with my unibit and then full size with a 15/32" bit. I then  
899

placed the grommets in the holes and the SkyBolt receptacle on the underside and used the studs to whole the cowl in place while I removed the clecos and drilled the remaining holes.



Once all the holes were drilled I removed the cowl and put the temporary grommet retainers

on the underside to hold the grommets in place. SkyBolt provides a more permanent retaining clip, but the intention is to only apply those once the cowl is painted.

[3]



I then installed all the studs into the grommets using the SkyBolt stud pliers.

[4]

902



[5]

903



I then removed all the flanges from the firewall and prepped, primed and riveted the recepta-  
904

cles onto the flanges.

[6]

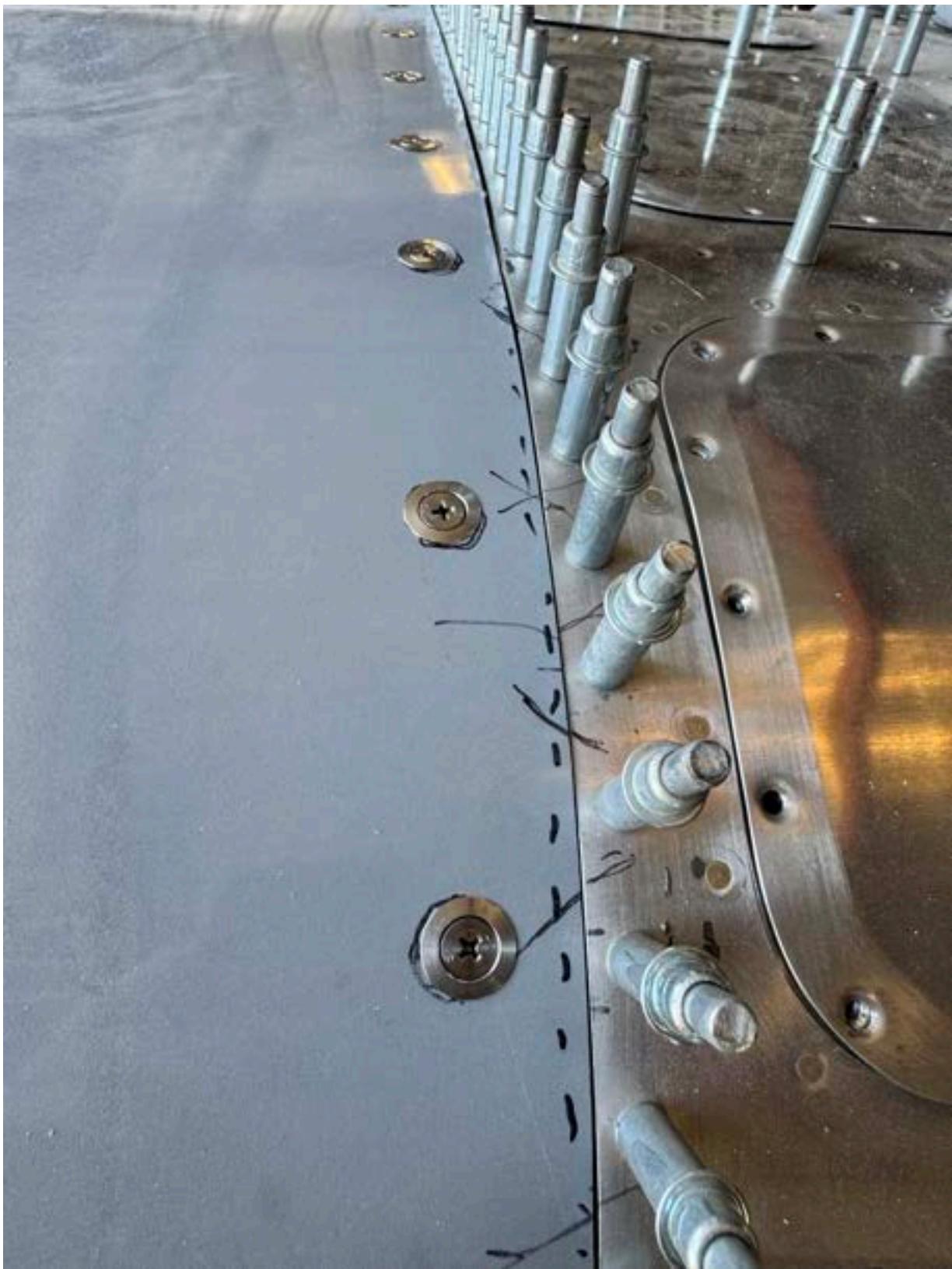


[7]



I then re-clecoed the flange-receptacles back to the firewall, and reinstalled the top cowl. I then set all the studs into the receptacles. This allows me to set the appropriate depth for the studs. I then removed the studs with a quick quarter turn, which leaves the depth unchanged, but removes the studs. I then removed the top cowl and removed all the anti-lock pins from the receptacles, which makes the depth permanent.





With the top cowl now fixed to the firewall, I can temporarily install the lower cowl. This took  
908

some annoying trial-and-error, but I managed to install the lower cowl and secure it in place with a ratchet-strap.

[10]



With the cowl temporarily held in place, I was able to align the front of the cowl and drill the three attach holes at the forward joint behind the spinner.



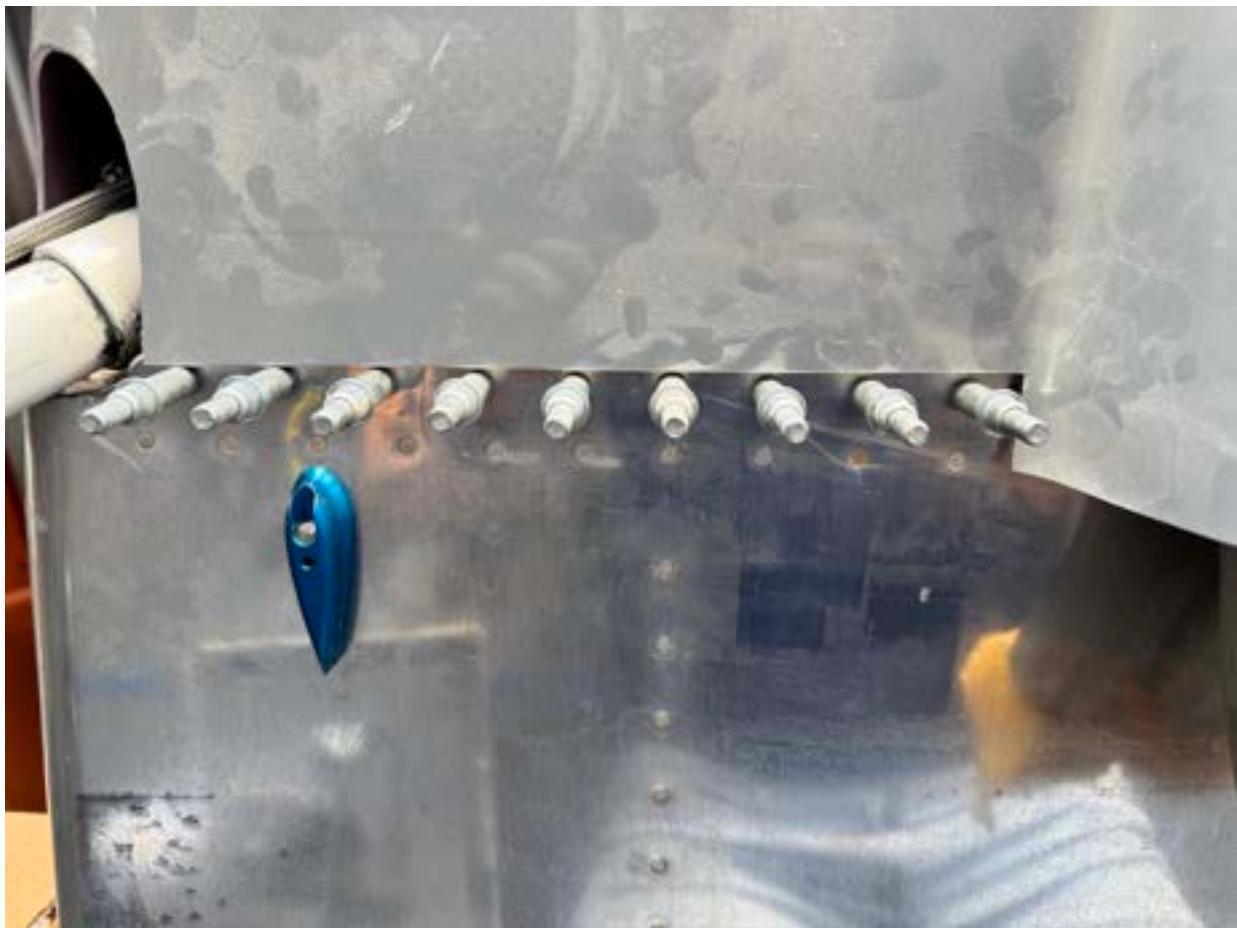
I also scored the bottom cowl where it aligns with the firewall, as well as the sides. The  
910

instructions say to cut the bottom first which allows the cowl to fully seat upwards against the lower fuselage.

[11]



[12]



Then I can cut the sides to match the fuselage.



Here you can see the flanges on the sides and bottom.

[14]



[15]



Once the flanges were on I was able to drill the lower cowl using the click adapter. I drilled the two on the side with the oil door as it was easier to access. Then removed the top cowl to drill the remaining holes on both sides.

[16]



The lower cowl can now support itself which will allow me to trim the sides to match the top  
916

cowl, followed by adding the last skybolts along the sides of the cowl to attach top to bottom.

[17]



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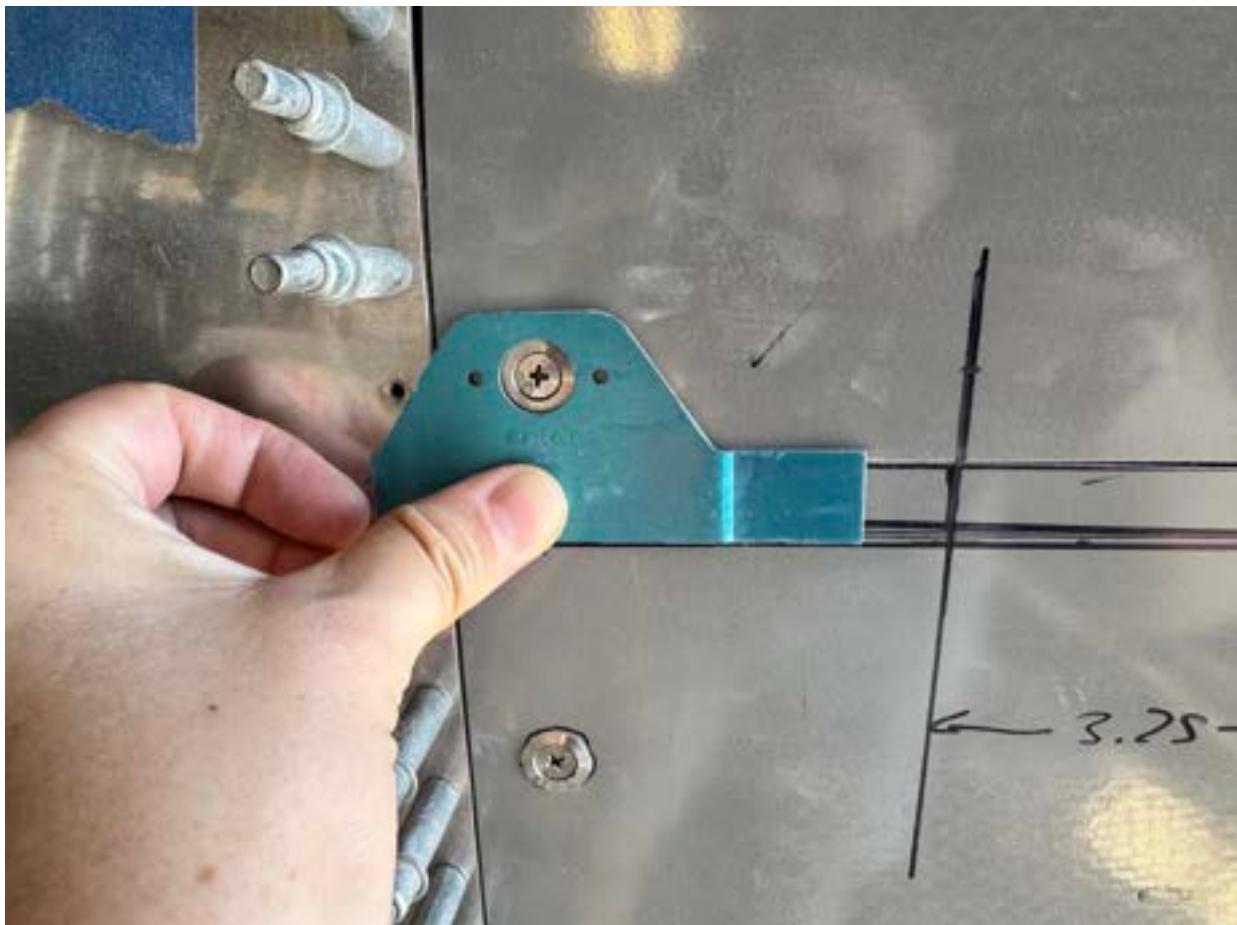
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## **10.8.2 Finished Cowling (2024-09-15 20:00)**

The last step in finishing the cowling installation is adding the SkyBolts to the split-line to join the top and bottom cowls.

I started out by marking the lower and upper cowl split-lines where they overlapped in order to make the top and bottom edges mate perfectly. Once Everything was marked, I used a long straight sanding block to sand back the edge of the lower cowl until it perfectly met the top cowl.

Next step was to add the flanges to the lower cowl. The goal here is to perfectly align the flanges with the top cowl flange at a 90° angle. I did this by first establishing how far down onto the lower cowl the flanges should sit, which was 1/2" below the split line. I lined up one of the flanges with the top cowl flange and marked the lower edge of the flange.



I then marked a 1/2" line along the bottom cowl, and then established the appropriate spacing. I chose 3.25" spacing between SkyBolts which would result in 10 (9 additional) SkyBolts across the split line.



Once everything was marked, I then drew vertical lines from the bottom cowl onto the top cowl at the 3.25" spacing. I now had the lower flange limit and the vertical alignment, and was able to mark the location on the top cowl for where to drill a number 30 pilot hole for the SkyBolts.



I marked the 9 additional holes, and then drilled them to number 30. This allowed me to cleco the flanges to the top cowl aligned with the bottom cowl along the split-line.



Once the flanges were all clecoed, I drilled all the holes to the lower cowl for the flange rivets. I then moved the flanges to the inside and drilled the top cowl skybolt pilot holes to the final size of 15/32" and installed the grommets to the top cowl.

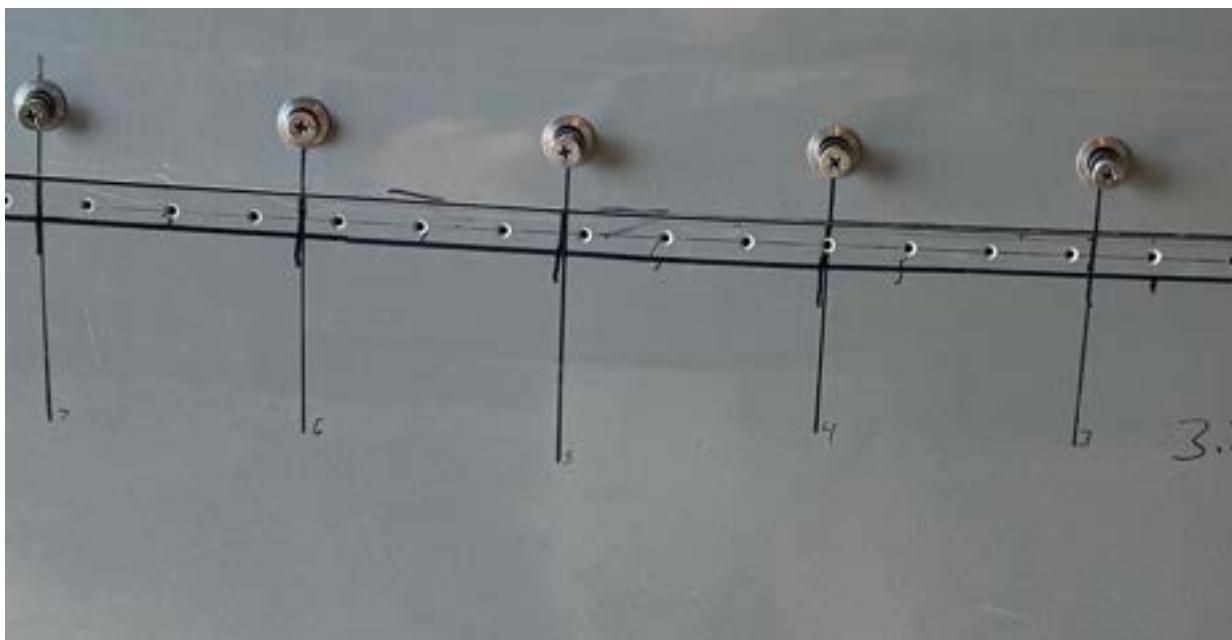


[3]

923



I also countersunk all the rivet holes on the bottom cowl. Then, I removed the top cowl and installed all the grommet retaining O-rings and installed the studs.



[4]



I then repeated this on both sides of the cowl and ensured everything is properly aligned.



After everything was fit and ready for permanent installation, I primed and prepped the flanges and installed the receptacles.



I then installed the flanges to the cowl with epoxy in prep for riveting.



I came back the next day, after the epoxy had cured and used the provided rivets from SkyBolt to rivet the flanges to the cowl.



The last step in finalizing the cowl installation is the forward inlet mounting screws. I drilled the holes with a number 10 bit for the -8 screws and marked the lower cowl for the nutplates rivet

locations, countersunk the holes, and installed the nutplates. The cowl can now be screwed in at the forward inlets completing the installation



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### **10.8.3 Began Fitting Baffles (2024-09-21 22:25)**

With the cowl complete, I can really dial in the baffles. I started by installing all the baffles on the engine. I trimmed several pieces around the aft part of the engine to better fit, as well as

around the valve covers. Once the baffles were installed, I put the lower cowl on.

[1]



Immediately I needed to trim the lower inlet ramps to fit under the cowl lip, since the lower cowl could not be installed with the ramps untrimmed.

[2]

930



With the baffle on i fabricated some spacer blocks to hold the top cowl up 5" - based on [3]this post by Bruce (slightly modified to make it easier to reach).

[4]

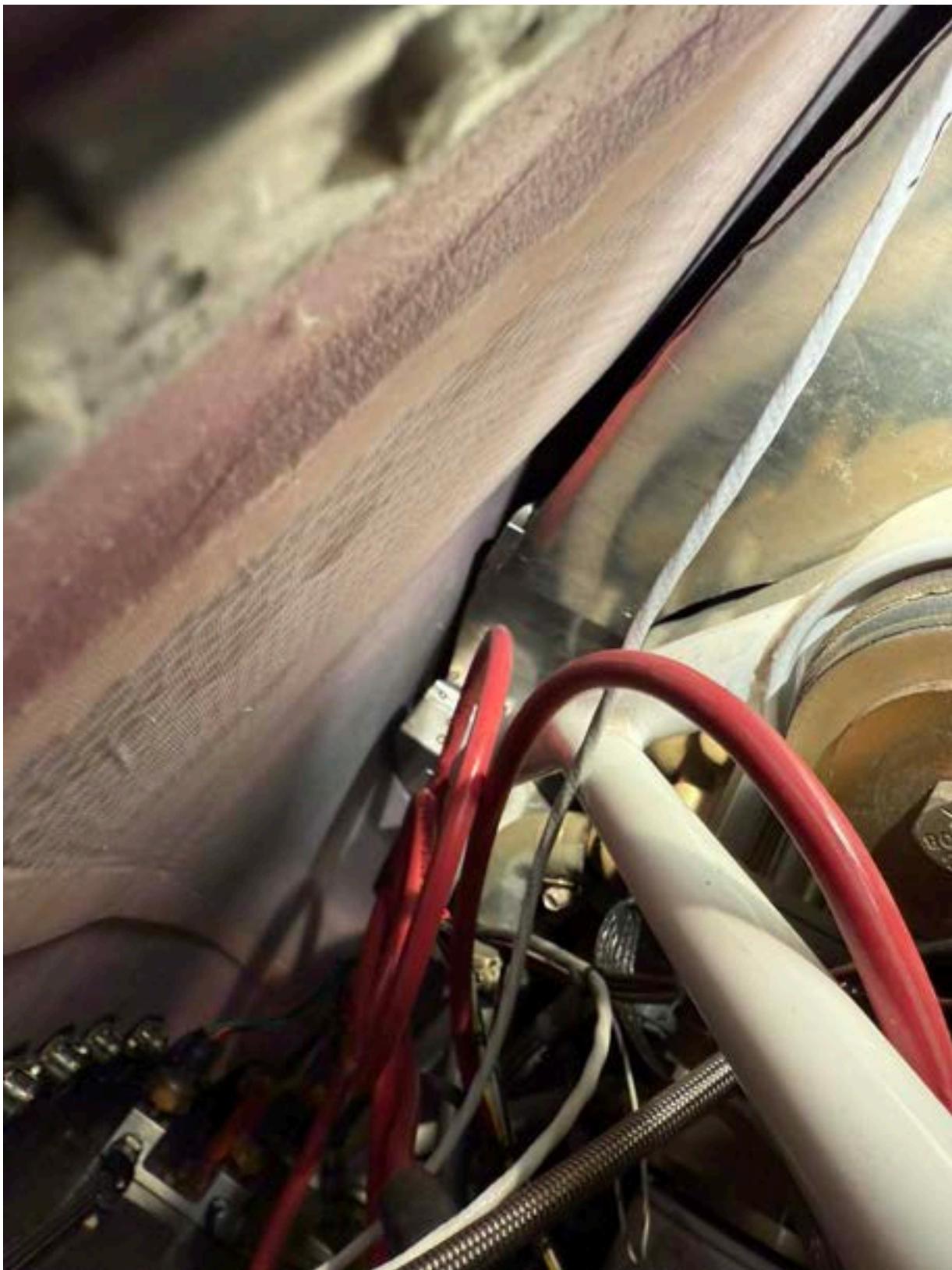
931



[5]  
932



I used the scribe attached to a sharpie pen, which measured 5.5" and used it to scribe along the outside of the baffles under the cowl. I then marked the scribe line with that sharpie and trimmed baffle back to the line. With the top cowl reinstalled, I was able to get a glimpse of the gap after trimming.





[8]

935



[9]  
936



I then added a bunch of paper clips to the baffle to use as a measure to get a 1/2" gap. Since  
937

I'm going to build a plenum, I may try to get a little extra room here.

[10]



I then trimmed the baffles down where the paperclips indicated the need. I also trimmed the forward baffles to better fit under the cowl inlets. It will take a bit to improve the fit.

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3. <https://www.overthehills.com/RV-9A-Project/Firewall-Forward/Baffles/i-5xBH9R6>
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#### **10.8.4 Started Work On Snorkel (2024-09-22 10:30)**

With the cowl done, and the baffles in progress, I decided to start on fitting the snorkel. I started by fabricating a spacer to fit in the inlet hole.

[1]



This allowed me to temporarily align the snorkel to the inlet. The starter motor had a lug that was interfering with the snorkel, so I removed it.

[2]

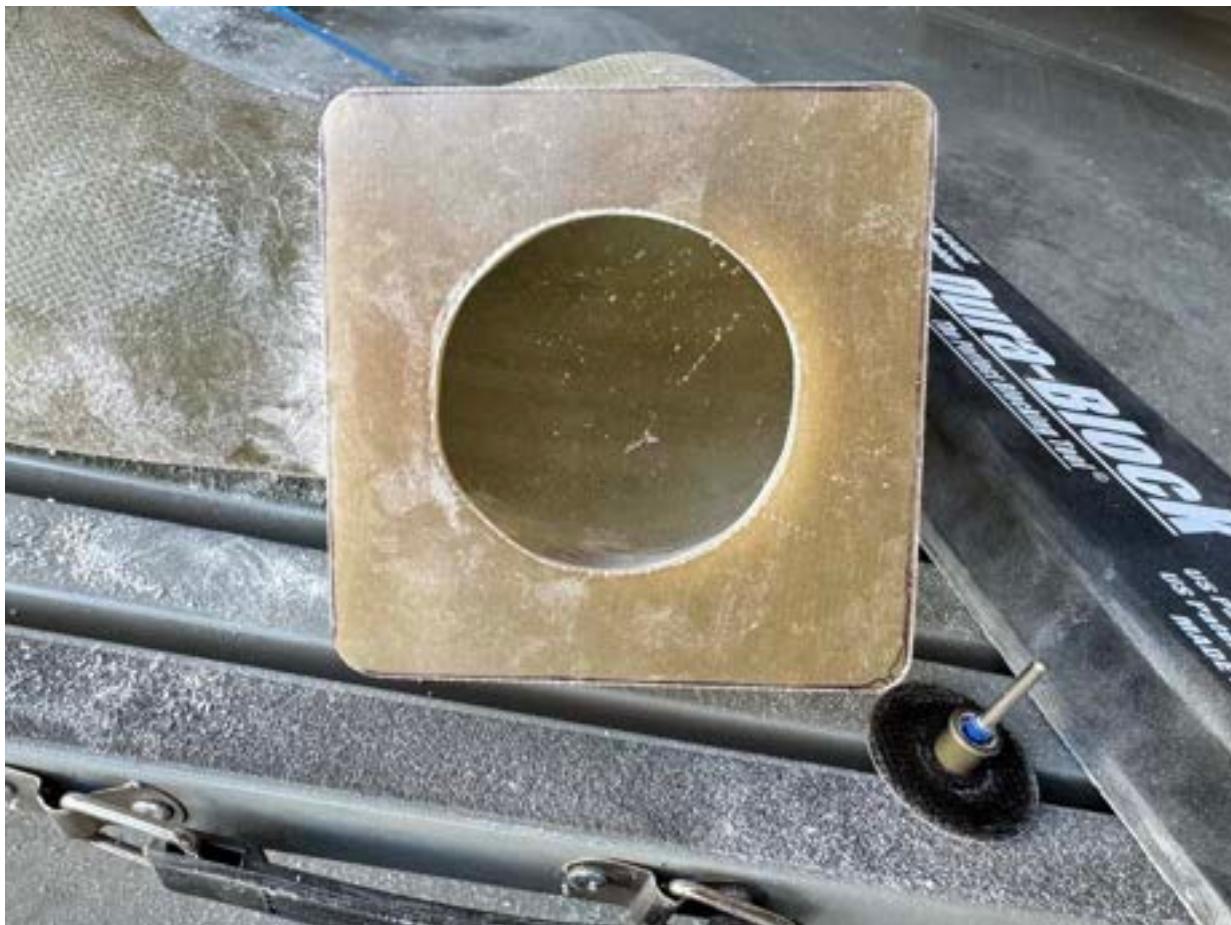


With the snorkel rotated up as much as possible, and aligned with the baffle ramp, I trimmed the sides to align with the fuel servo.



[4]

941



I moved the mixture knob all the way forward, and found that it interfered with the snorkel. I used my heat gun to soften the snorkel and pressed in with the butt of my screw driver to create an indentation. Once the snorkel cooled down, it was solid again, and left 1/4" clearance around the mixture arm. I will seal the snorkel with some additional epoxy which should increase the strength in this location, incase any was lost with the softening.



With the inlet ramps installed, I was able to align and fit the snorkel to the baffle. I then drilled

the holes to mount the snorkel to the inlet.

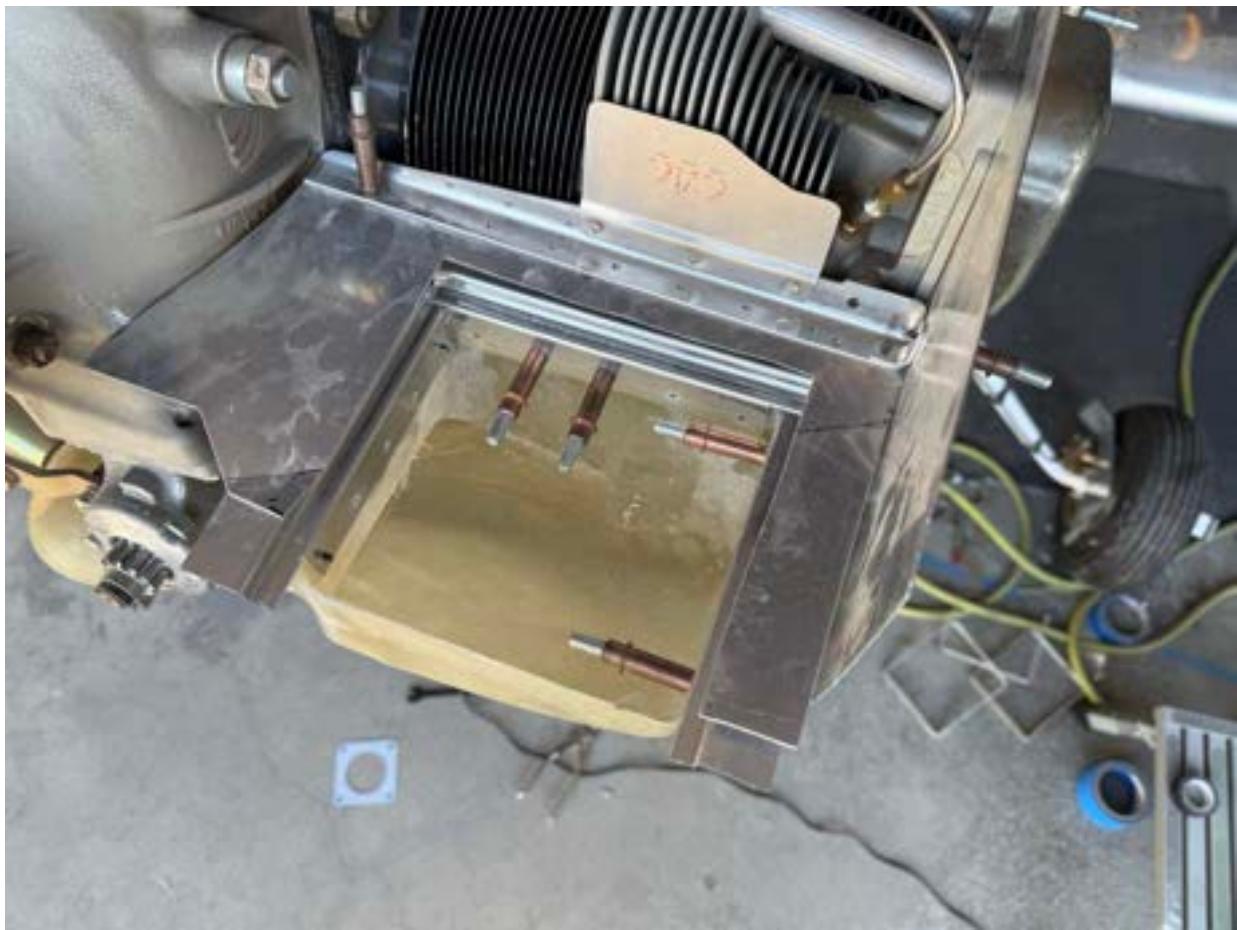
[6]



I trimmed down the snorkel to fit under the baffle by about 3/8". This allows for enough clearance under the baffle for the servo mounting flanges to fit.

[7]

944



This will get fitted to the lower baffle ramp a bit more and will secure the filter.

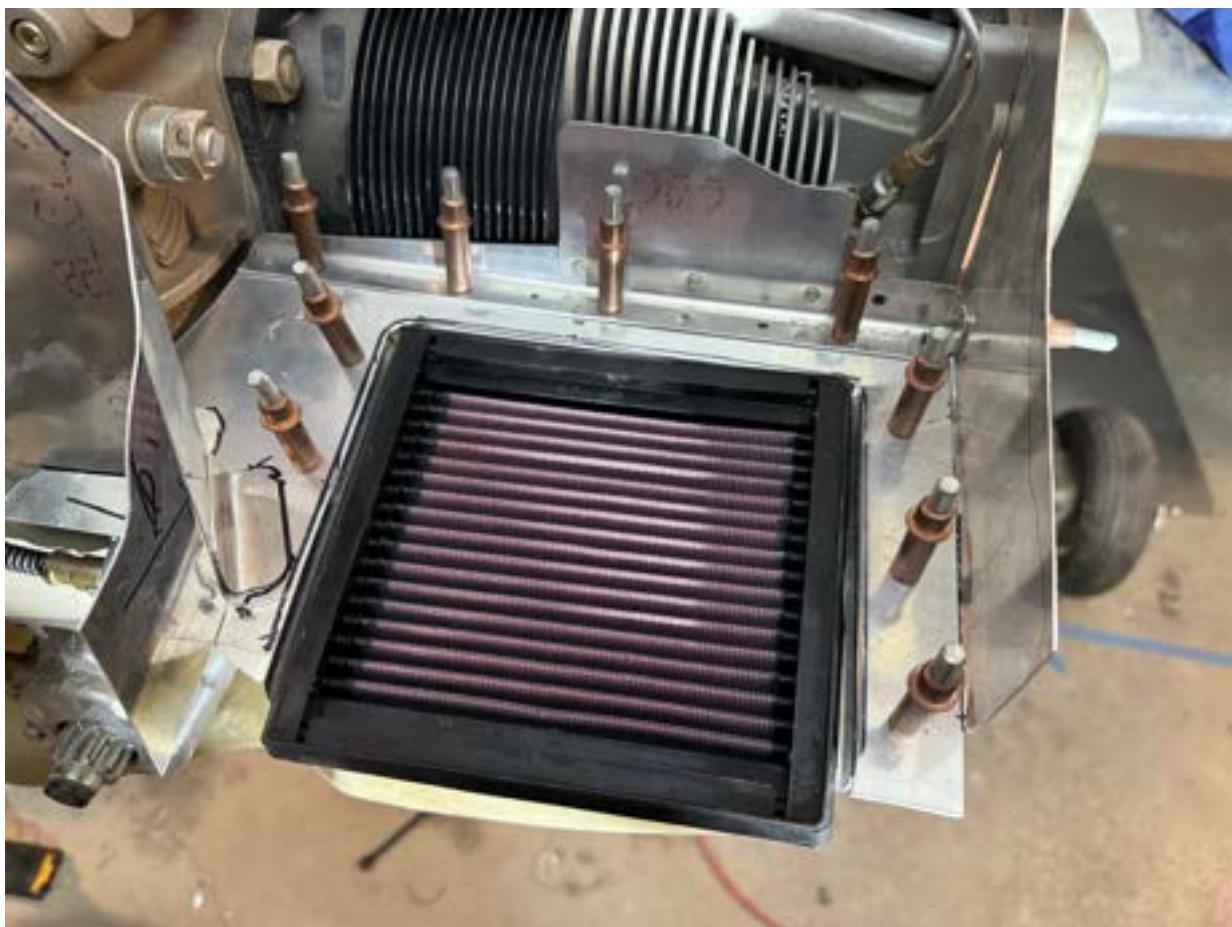
1. [https://n890gf.com/wp-content/uploads/2024/09/img\\_7475.jpg?w=1024](https://n890gf.com/wp-content/uploads/2024/09/img_7475.jpg?w=1024)
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### **10.8.5 Continued work on Snorkel and Baffles (2024-09-30 18:30)**

I continued working on fitting the snorkel to the lower baffle. I had to modify the angle of the top of the snorkel to better fit under the inlet.



There was a gap between the flanges and the underside of the inlet ramp. I added fiberglass material to the top of the snorkel, let it cure, and then re-drilled the flanges to the snorkel in order to get the flanges to sit right on the underside of the inlet baffle. Once I had the fit as good as I could get it, I drilled through the baffles into the flanges.



These holes will get enlarged to allow for screws, which will hold the retaining brackets for the air filter. There are still some modifications needed to pull the side baffle inboard a little to align with the cowl inlet.

I fabricated the support brackets for the forward-to-left-inlet baffle out of the stock angle material called out in the plans. They will be riveted to both the inlet and forward baffle.



I further trimmed the edges of the baffles to better align with cowl inlets. This is a very iterative process, and just takes some time. Once these are perfectly aligned where they need to be, I will prep, prime, and rivet the baffle sections together, and reinstall on the engine permanently.

## 10.9 October

### 10.9.1 Finished Snorkel (2024-10-14 15:50)

The last few steps to finish up the snorkel include riveting the flanges to the fiberglass. I used pop rivets, with small washer on the shop head side in order to distribute the force onto the fiberglass to prevent cracking. I also primed the snorkel.



With the flanges riveted, I then prepped and installed the nut plates that are used to mount

the top of the snorkel to the inlet baffle



I then used the mounting bolts to install the snorkel to to the fuel servo, and the inlet ramp. I also fabricated the filter retaining bracket. The lower lip of the retaining bracket is folded down to provide some stiffness. The inboard edges are also bent down to apply a bit of pressure to the filter to prevent any movement.



I need to make some final adjustments to the cowl inlets to provide enough clearance for the rubber material I will use to create the lower seal for the cowl-to-baffle seal. These marks (on the inboard edge) will be the initial cut points, and I will trim it back until I have sufficient clearance. The retaining bracket forward edge extends a bit farther forward than desired. I will trim the lower part of the cowl inlet back and adjust the height to better align with the top of the filter. retaining bracket.



### **10.9.2 Started Plenum (2024-10-15 19:00)**

Now that the baffles are all trimmed, riveted and in place on the engine, I started work on the plenum. The plenum is an alternative to the baffle seals that Vans provides. The original design uses the seals on the baffles to press up against the top cowl creating a seal to prevent air from escaping outside the baffles. The plenum acts as a seal, but is fabricated from fiberglass and attaches directly to the baffles like a lid.

There are many sources for how to build a plenum online. I'm going to combine several methods I've seen. One of them is from Dan Horton on [1]vans airforce and [2]another from Pete Howell as well. Both describe how to build a model above the engine to allow for laying up of fiberglass.

I started by laying down some plastic on the engine. I got some [3]two part expanding foam, and mixed up a small test sample before doing the big pours. Once that went well, I mixed up a batch and began pouring it on the engine.

[4]



Working on batches makes this a lot easier. The foam takes about 30s to mix, and then about 10 minutes to fully expand and harden. Here is the fully covered engine. I need to use the plastic in places to prevent the foam from spilling over.

[5]



I then used a hand saw and a rasp and sanding blocking to begin shaping the foam. The final result is a plenum shaped mold. I also began covering this with packing tape. I will continue shaping the inlets after the plenum is made.





The foam around and in the cowl inlets will be trimmed away before molding the fiberglass. The distance from the plenum/baffles to the cowl will be opened up to 3/8" to allow for enough room to fabricate gap seals.

1. <https://vansairforce.net/threads/how-to-build-a-plenum.97128/post-749817>
2. <https://vansairforce.net/threads/diy-plenum.35428/>
3. <https://a.co/d/cDKlyuF>
4. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7670.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7670.jpg)
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### **10.9.3 Continued Plenum (2024-10-16 23:04)**

Today I had my friend Norio help me out on the actual fiberglass layup of the Plenum. He's a seasoned composites expert and has helped me on many other parts ([1]canopy, [2]wings) of the plane as well.

I started the day by finishing off trimming the foam around the inlets, and covering the rest of the foam with packing tape. I then laid a sheet of plastic over the top to prevent epoxy from getting on anything.

I planned on using four layers of fiberglass and a 1/8" core to provide strength. I laid out the first layer and cut it to size around the compound corners of the baffles. I repeated this for all the layers. We then began the layup.

[3]



We used squeegees and brushes to push the epoxy and saturate the two bottom layers. I alternated a 2x2 twill weave with a 1x1 straight weave.

I shaped the core material a bit and cut it to sit around the shape of the mold. We then added the top two layers in reverse: 1x1 straight and 2x2 twill on top. Here is a close up of the

finished plenum with the core material clearly visible between the layers (the barcoded part). There are some voids right near the core that I will fill later. There is a solid two inches around the perimeter that has no gaps or voids.



We then weighed the entire thing down using some foam to distribute the load then left it to

cure overnight.

[5]



After this sets up, I will remove the plastic cover and trim the edges. If i need to reinforce anything or redo any parts, I will add subsequent layers and filler material. The whole lid can experience a couple hundred pounds of force at high speeds, so it needs to be stiff enough to not flex, which may open up gaps (reduce cooling) or cause the whole thing to crack.

The final step to this project will be creating the cowl inlet seals which will join the cowl inlets to the plenum preventing any air from leaking around the engine.

1. <https://n890gf.com/2023/08/07/bonded-canopy/>
2. <https://n890gf.com/2023/10/29/installed-wings/>

3. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7677.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7677.jpg)
4. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7679.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7679.jpg)
5. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7678.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7678.jpg)

#### **10.9.4 Finished Plenum Fabrication (2024-10-17 22:00)**

I went back to the airport to finish up the plenum. Its fully cured and super strong. The core adds a significant amount of stiffness while keeping the whole thing very light.

[1]

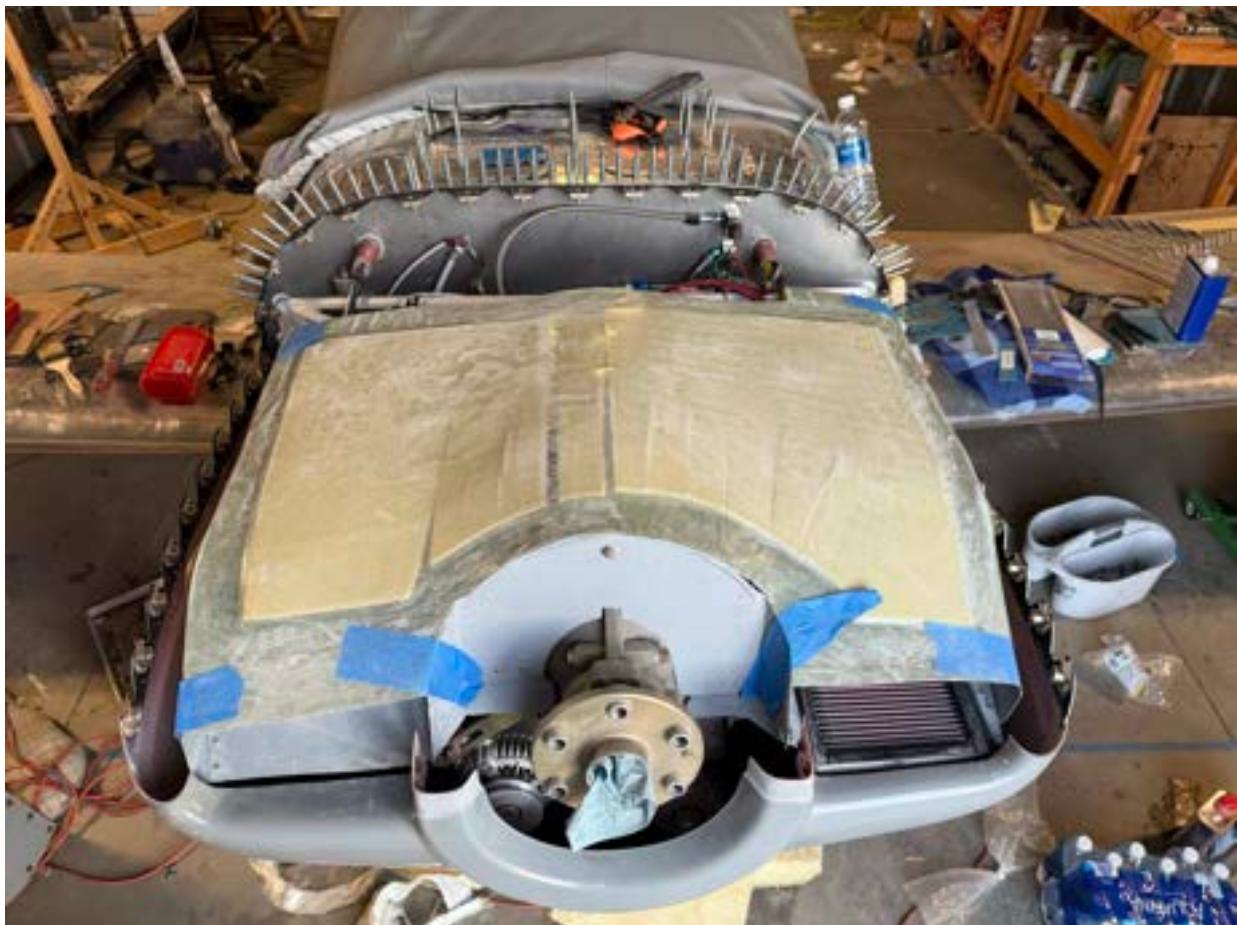


I removed the top plastic and the whole plenum just popped right off. I then trimmed the excess material around the perimeter.

[2]



it took a few iterations, but I was able to get it to fit quite nicely. There are some gaps that I will fill, but the overall fit is going to be more than sufficient.



The core material being asymmetrical is one thing that does annoy me, but its mostly asthetic at this point. The plenum will get sanded smooth and then another thin coat of tinted epoxy and some paint to finish it off.

I spent a majority of the time today working on the inlets, trimming and fitting the plenum to better align.



I opened the gap up to 3/8" to provide enough room for the gap seals that I will fabricate. I used some test material to check the fit, and it will work.



The left inlet needs some work on the outboard side. I will likely build up the plenum top again with some additional fiberglass. The height of the plenum lines up perfectly with the cowl inlet, but the gap is about 1/2" instead of 3/8".



Here is the upper inboard side of the left inlet, the gap here is much better. the test gap seal fits much nicer around this side. On the lower side I will have to work the seal around the filter, which will likely result in an odd shaped seal.

I'm waiting for a shipment of some AA3 .032 1"x1" aluminum angle from Vans. I will rivet it to the baffles and then the plenum will screw to the angles.

There are a couple things I learned during this process:

1. I should have installed the angle brackets first, and then pour the foam to create the mold. Then I could use the angle brackets to perfectly align the foam, which would result in a perfect fit rather than a mostly perfect fit.
2. I would have used six layers of fiberglass and no core material (or maybe plan the shape a bit more). There are some voids around the core edges, which I can fix, but I think six layers would be more than strong enough for this application.

3. Get enough sand bags to apply enough even weight across the entire surface.

I'm sure there are other learnings, but these are top of mind from today. If I make another plenum, I would do it this way next time.

1. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7681.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7681.jpg)
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#### **10.9.5 Installed Alternate Intake Air (2024-10-26 22:34)**

With the snorkel installed, I spent some time on the alternate intake air bypass. The bypass valve mounts to the side of the snorkel, with a pull cable installed on the panel.

I picked the least-bad spot on the panel for the pull cable. Hopefully I'll never need to use it, as that indicates the primary air intake or the filter is clogged or blocked.

I put the cable above my Garmin G5 next to the alternate static switch which is also an emergency-only item.



This spot is out of the way and does not conflict with anything on the panel or the canopy.

I then drilled a hole in the sub panel and the firewall and installed the cable passthrough ball things.



The actual intake bypass is a 2-5/8" hole. It has a flange that gets riveted to the snorkel, and then the valve is attached to with a nutplate and is secured at the top.



I cut the hole to 2" and then used my Dremel to widen it to the final size.



I temporarily clamped the flange to the snorkel and drilled the holes. I then prepped the flange for installation. I dimpled the holes and installed the k1000-08 nutplate. I also folded over the top recess to accept the intake door. I then added epoxy and flox to the back of the flange and re-clecoed it to the snorkel.



Once this cured, I sanded the whole snorkel smooth and installed the door with a -8 screw.

I attached the cable to the door using a -8 flat head screw, which was countersunk on the backside of the door, then secured to the cable.



I then took the cable and routed it down under the side of the engine and secured to the  
973

engine oil line with an adel clamp.

[7]



The bypass is designed to be single use for emergency only, and requires being reset manually once on the ground safely.

With that wrapped up, the snorkel installation is complete!

1. [https://n890gf.com/wp-content/uploads/2024/10/img\\_7695.jpg](https://n890gf.com/wp-content/uploads/2024/10/img_7695.jpg)
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### **10.9.6 Added Plenum Flanges (2024-10-30 18:00)**

I've been going back and forth on how to best attach the plenum to the engine baffles. I've seen it done several different ways. One involves riveting aluminum angle to the baffles and then adding nutplates to the angles and attaching the plenum from the top. Another way is to build up a fiberglass flange that overlaps the baffle and then adding nutplates to the inside of the baffle directly.

Without fully deciding which method(s) to go with, I started with the sides and front. Fiberglass flanges here will help to create a pretty rock solid seal, as well as help to prevent any stress fractions (which I've seen in some designs). The rear part of the baffle is the part I'm still debating whether to build up a fiberglass flange, or install the angle.

I scuffed and prepped the plenum sides and then I started laying up the flanges. I cut four layers of 9oz cloth to size, and mocked the layup before pouring the epoxy.



I used some peel-ply to try and absorb some of the extra epoxy, but it was a pretty simple  
976

layup.

[2]



I didn't get any pictures, but the other side looked nearly the same.

I came back the next day, and trimmed and cleaned up the edges, and sanded the surface back smooth. I will add some filler to finish out any of the low spots prior to painting.

[3]



I drilled the sides to the baffles to temporarily hold it in place, and then prepped to do the forward layup next.



Heres the right side, I will drill these holes to 5/32" for a -8 screw and add nutplates to the inside of the baffles.

The forward layup was a bit more tricky, as it is a complex shape with several bends. I cut the fiberglass to follow the contours and began the layup. Heres the right half of the forward section.



And the left side. I will trim the flange back to about an inch of overlap.



The center of this flange has a small gap to prevent interference from the inner support bolt/nut.

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## 10.10 November

### 10.10.1 Finished Plenum Flanges (2024-11-02 20:00)

The flange fabrication has been going really well. The front flange turned out great after trimming, and I decided to continue with the fiberglass flange method for the rear of the plenum.

Here is the front flange after trimming and drilling. I'll need to figure out the best method for screw installation once the prop and starter ring are installed.

[1]



The rear layup was similar to the forward in that I had to split the glass in the middle around the rear support bracket. I also needed to accommodate the part around the oil cooler mount.

[2]



I added the peel-ply to absorb extra epoxy.

[3]



Once this cured, I trimmed all the excess and drilled the mounting holes.

[4]

984



I drilled all the holes to 11/64th for -8 screws. Next I will install K1000-8 nutplates to the baffles.

1. [https://n890gf.com/wp-content/uploads/2024/11/img\\_7740.jpg](https://n890gf.com/wp-content/uploads/2024/11/img_7740.jpg)
2. [https://n890gf.com/wp-content/uploads/2024/11/img\\_7741.jpg](https://n890gf.com/wp-content/uploads/2024/11/img_7741.jpg)
3. [https://n890gf.com/wp-content/uploads/2024/11/img\\_7742.jpg](https://n890gf.com/wp-content/uploads/2024/11/img_7742.jpg)
4. [https://n890gf.com/wp-content/uploads/2024/11/img\\_7750.jpg](https://n890gf.com/wp-content/uploads/2024/11/img_7750.jpg)

## 10.11 December

### 10.11.1 Riveted Plenum Nutplates (2024-12-16 17:00)

I finally had some time to get back to working on the plane. I wrapped up the plenum installation by drilling K1000-8 nutplates to the baffles and counter sinking for some countersunk washers.



Now that the plenum is fully drilled, I can paint it and prep it for final installation. Here is the plenum with one of the screws installed.



Another angle. I decided to counter sink and use the washers to help distribute the load of the pressure within the plenum. The total force inside the plenum could be a couple hundred pounds when I am in cruise, so I wanted to ensure that the plenum is securely attached to the baffles.



Once the plenum is painted, I will put a bead of high-temp silicone caulking on the inside,  
988

where the lip of the baffles are, to create an air-tight seal when the plenum gets installed.



# **11. 2025**

## **11.1 January**

### **11.1.1 Forward Fuselage Top Skin (2025-01-23 21:08)**

Over the weekend I riveted the final skin (and the final rivet) of the plane.

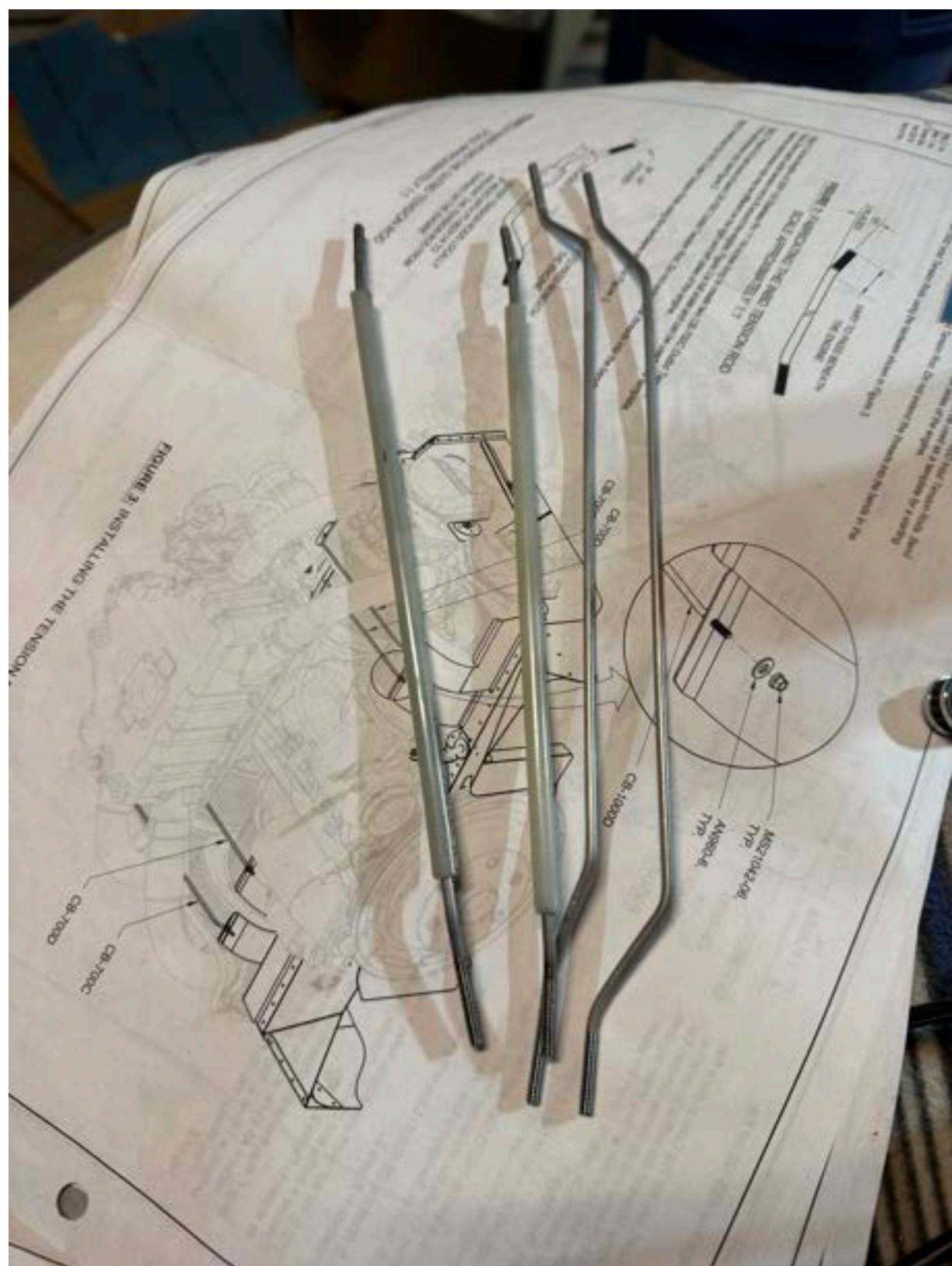
Before I got to riveting, I knocked out some items from the backlog. I needed to remove the oil filler neck in order to get to one of the bolts for the baffle.



This otherwise impossible to reach screw has been torqued and (not in the picture) marked  
992

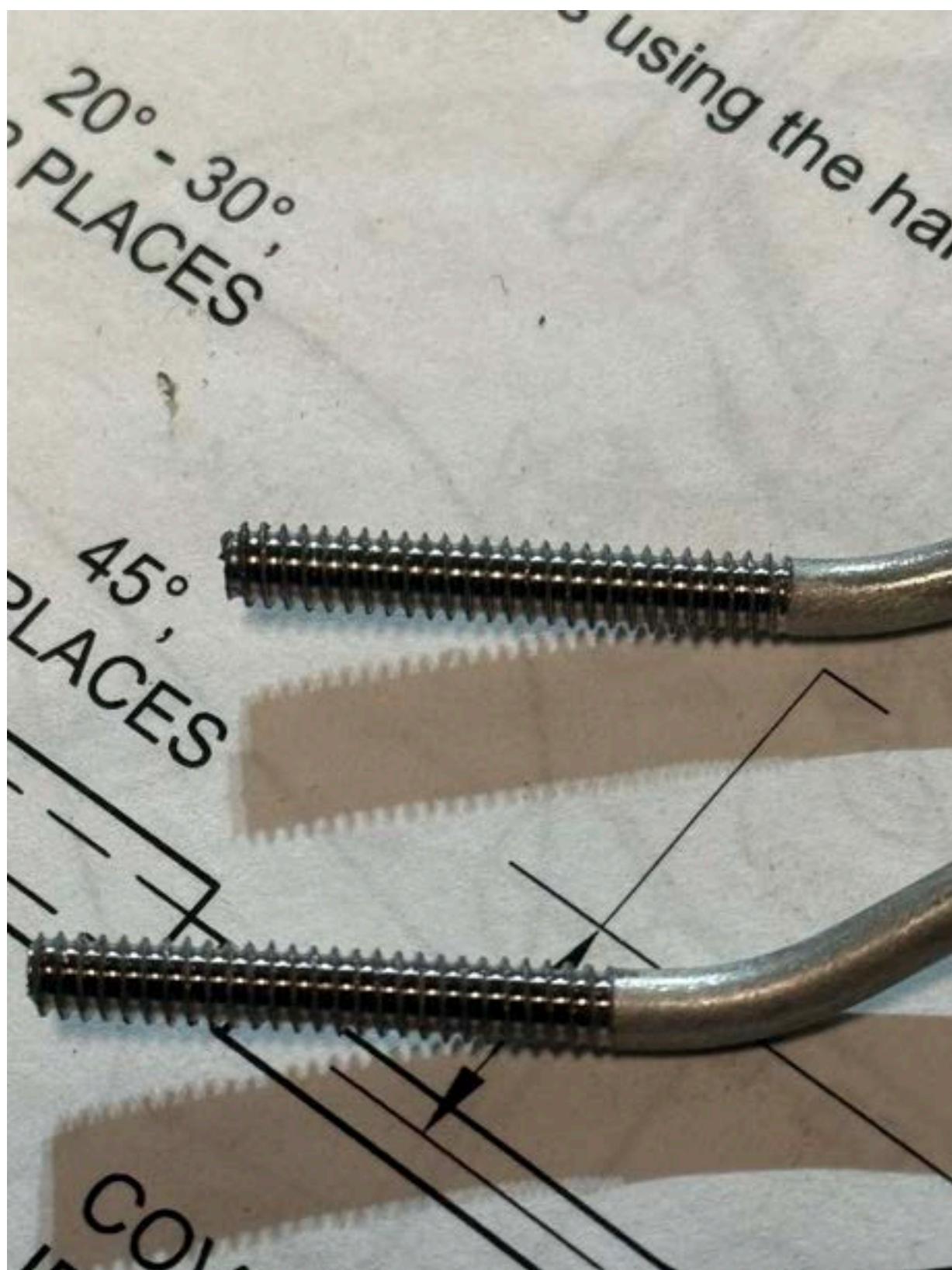
with torque paint.

I also fabricated the baffle tie-rods.



I added the plastic tubing to the remaining two rods. Highly recommend doing it prior to  
994

threading the ends.



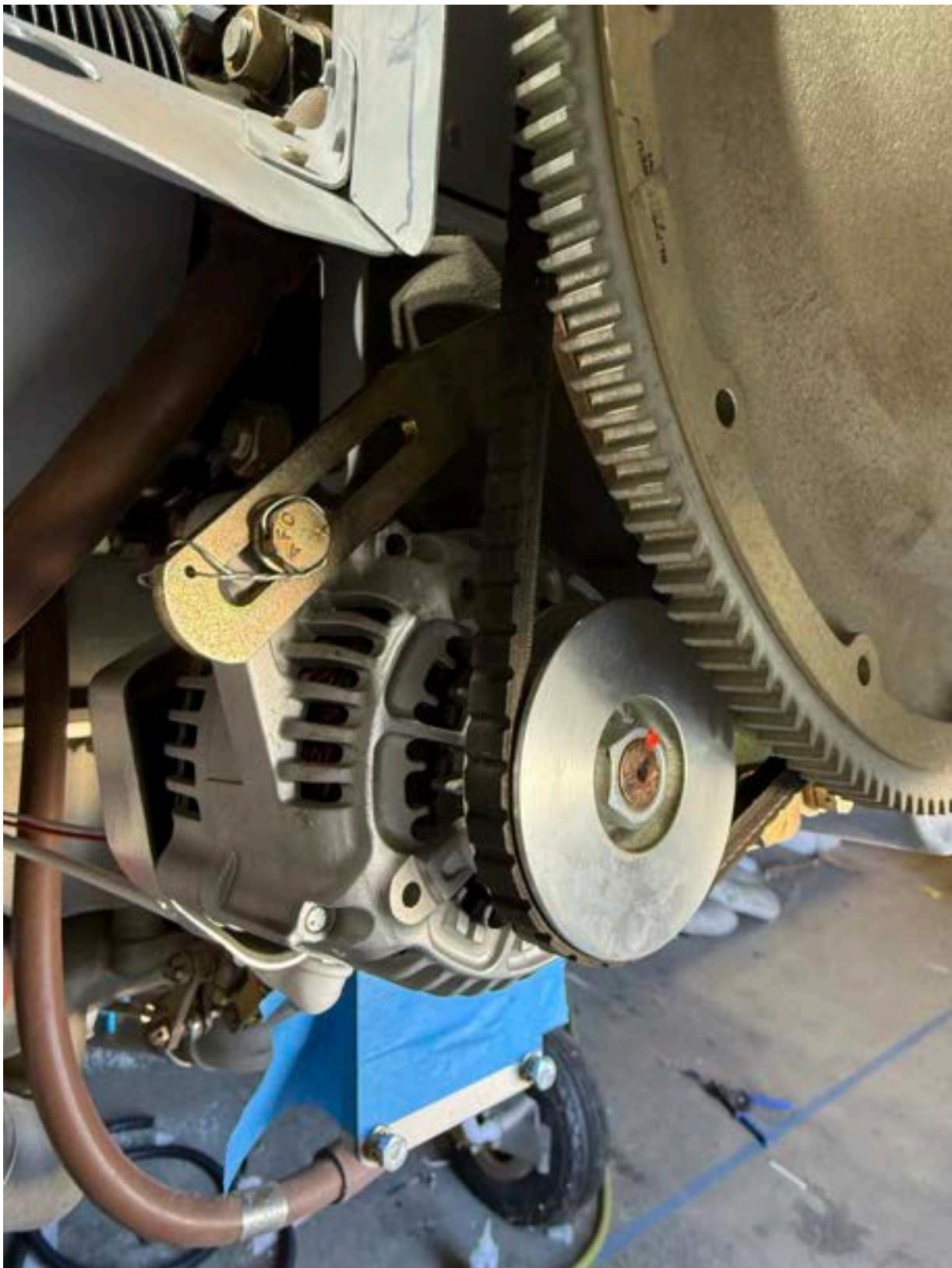
These are threaded to -6. I then installed them on the baffles. It took some iteration and some pressure, but I eventually got them installed and torqued.



The plastic tubes will protect the stainless steel from abrading the oil return lines if they end

up making contact. I may adjust things in the future if anything gets too close. (This picture reminds me I need to secure the propeller oil line (brown) and the alternator wires (red/white)).

I then torqued and safety-wired the alternator and belt. I used the method that many people have described online. For a new belt (like I have) it should be tensioned in a way that it takes 11-13 ft-lbs to turn the alternator pulley under the belt.



I then torqued and safety wired the alternator bolt.

I still have a little work to take care of firewall forward, but I wanted to knock out the fuselage skin riveting. Before I started riveting, I needed to move the engine monitor SV-EMS-220 to the other side of the avionics bay.



Looking through one of the access panels, this is now mounted inboard of the skin rivets, and

has much easier access.

I started riveting the skin from the center rib, moving towards the sub-panel and then outboard.



Here you can see the rivets long the sub-panel. The access panels I installed in the skin allowed  
1003

me to rivet this completely solo. It also makes future avionics maintenance a non-event. I should never have to crawl under the panel unless I need to make adjustments to the rudder pedals.



Here are the left side rivets. They transition to -4 rivets towards the firewall.



Here is the underside of the rivets. You can see where the EMS would have interfered with the  
1005

rivets if I had it on the other side of this rib.



Here is the completed installation. Just a bit of wiring clean up and securing, and the plane is complete. I can officially say I've riveted my last rivet (until the next one).



## 11.2 February

### 11.2.1 Forward Fuselage Hatch Gaskets (2025-02-23 18:57)

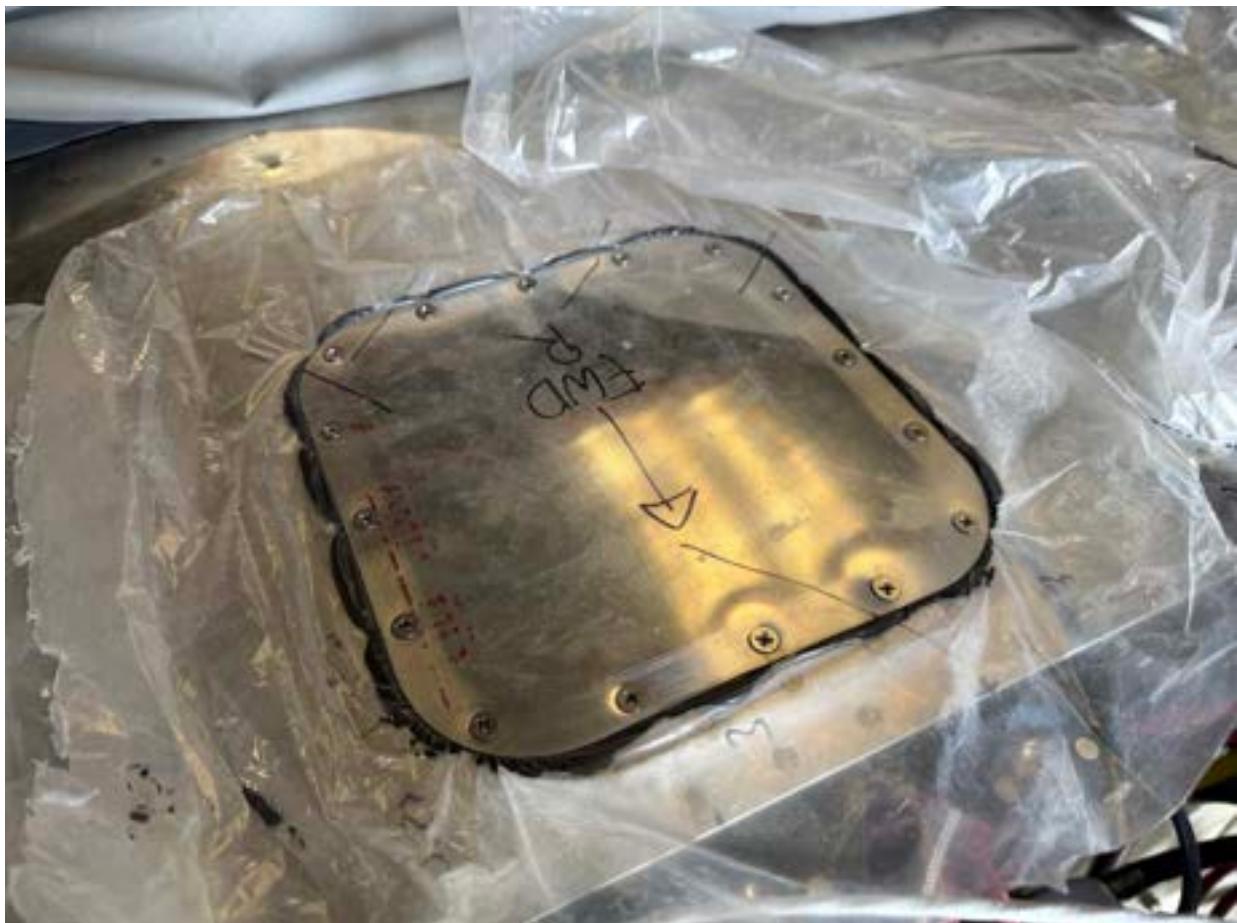
I had a big life event a few weeks ago - my son was born! I have not had much time to work on the plane obviously, but I did manage to get away today for an hour to work on some things.

A few weeks ago (before my son was born) I spent some time making the forward fuselage hatch gaskets.



Here are the flanges prior to applying ProSeal and the plastic protective film. I then applied 1008

the ProSeal to the flanges, covered it in plastic and then installed the hatch covers.



I let these cure for the last few weeks - mostly because I wasn't able to get to the hangar, but they would have been fully cured after a few days.

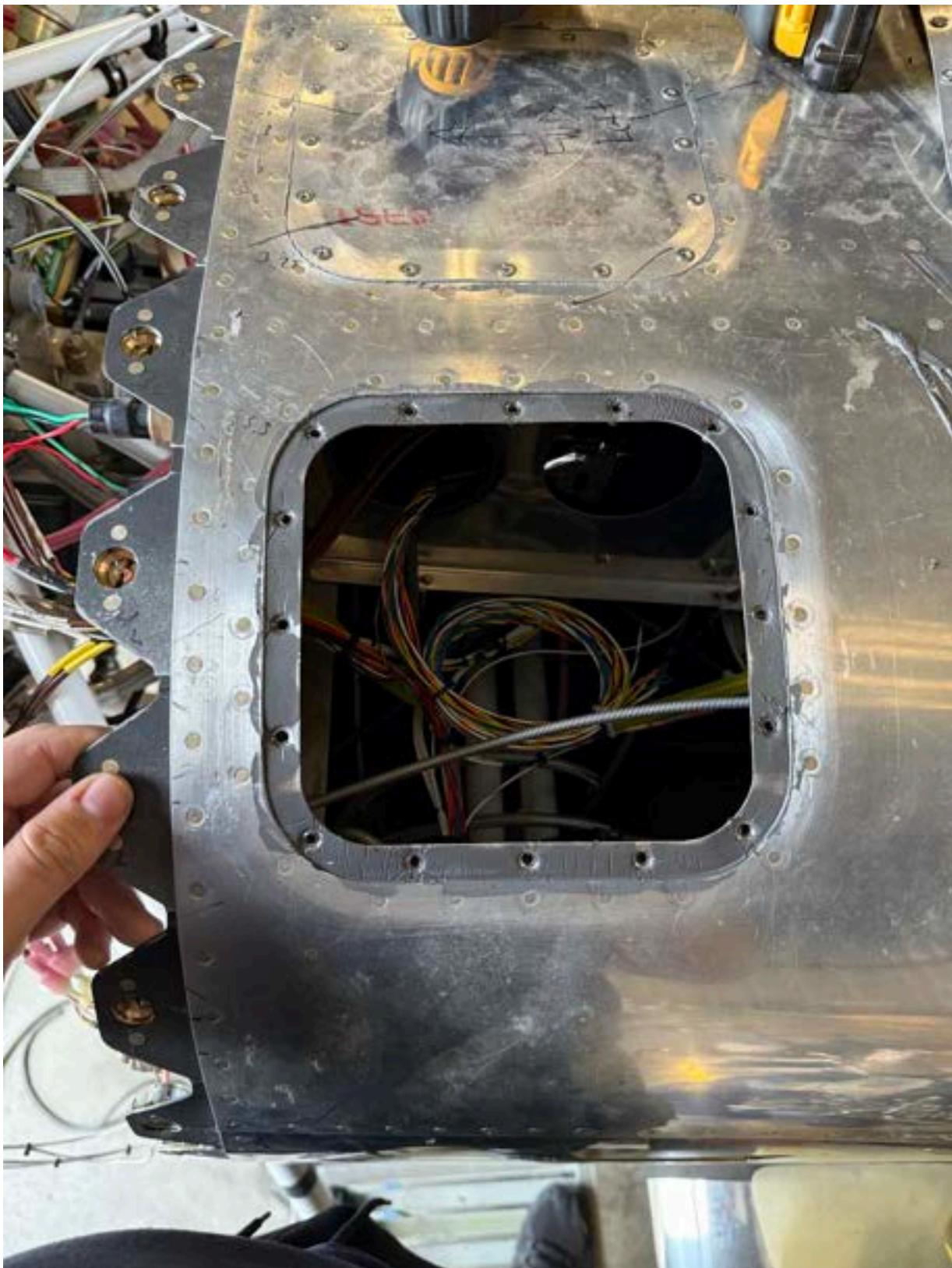


Here is the panel removed, and the plastic barrier on top of the ProSeal. Its not the most  
1010

perfect gasket, there are a couple of spots where its not fully covered, I will go back and add more material and reseal it. The plastic peeled right off leaving no residue or anything.



I then removed the plastic, and used a razor to trim the inner edges of the flanges, followed by the overflow on the outside.



The completed gasket with all edges trimmed. I then installed all the panels (as can be seen  
1013

above this one) and the forward fuselage is now complete.



Here are all the covers installed. When this is painted, all the remnants of the ProSeal will be removed with surface prep sanding, but this is done for now.

## 11.3 May

### 11.3.1 Engine Wiring Cleanup and Cowl (2025-05-18 23:09)

I finally got some time to get back to the hangar (having a newborn switches some priorities around). I spent a few hours working on FWF items including painting the interior of the cowl with some white paint.

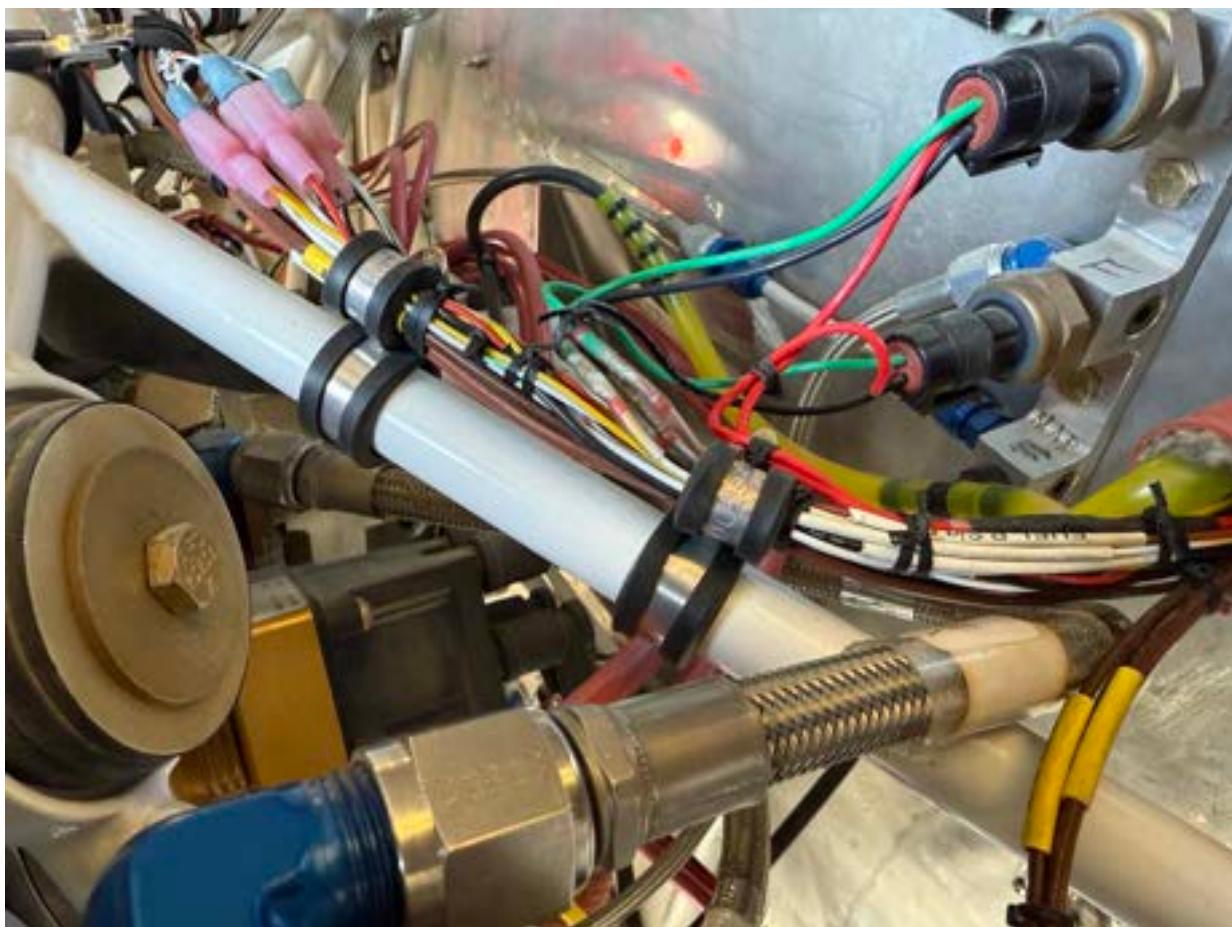


I first coated the interior with some thinned epoxy with some white dye to fill all the pin holes. I did two coats.



I then painted the entire interior with a few coats of High Temp Ceramic glossy paint. This should help with identifying oil drips/spray and make it easy(ish) to clean up.

I also added adel clamps to support wiring all through out the engine bay.

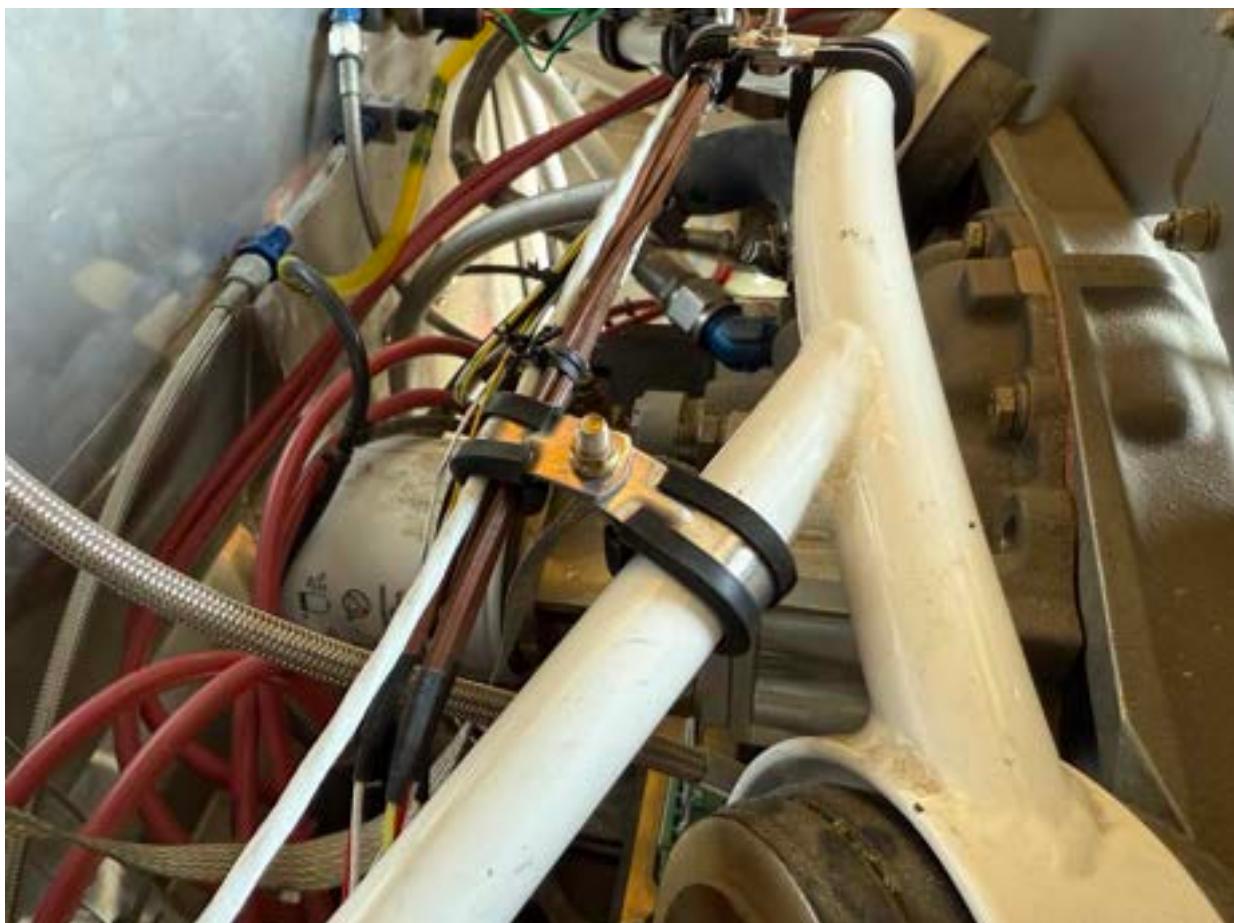


Here is the main harness with all the sensors. Its supported in 5 different spots as wires branch off to their respective sensors.



This is the primary power harness which includes the main power wire between the [1]PPS  
1018

and the [2]VPX.



Here is the additional supports holding the fuel flow sensor harness and the EGT and CHT sensor wires.



Another close up. I used all metal lock-nuts throughout the engine bay.

1. <https://verticalpower.com/index.php/products/pps>
2. <https://verticalpower.com/index.php/products/vp-x>

## 11.4 June

### 11.4.1 More FWF Cleanup (2025-06-01 23:32)

I got back to the hangar and continued working on the few remaining FWF tasks I have left.

I added additional Adel Clamps to support the alternator blast tube.



Here is another view of the aft of the alternator showing the blast tube aimed at the cooling

fan intake.



The oil line is also supported on the intake tube.



When I had my head buried under the engine, I realized I never installed the throttle cable  
1024

eyeball for the firewall passthrough when I installed the prop and mixture ones. So I installed it.



There are still a couple remaining things to clean up, including installing the battery and top spark plugs.



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