



RVator's Log

Newsletter of the Twin Cities RV Builder's Group

March 2017

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Upcoming Events

April 8 - Twin Cities RV Builders April Meeting.
Lake Elmo Airport, MN.

See page 10.

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Minnesota Wing Van's Air Force

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Shop Notes

- Doug

About this time each winter I teach a class at our church on financial management. Not that I am a great expert on the topic but I figured squeezing out enough bucks from our budget to build an RV might give me some penny-pinching qualifications. We usually have a couple dozen students ranging from newlyweds to old geezers like me. One session covers retirement planning and it's interesting to talk about not only saving for retirement, but just what do you actually do when you "retire." Oh sure, I'll play golf, go on a cruise, move to Florida, and buy the obligatory champaign-colored Buick LeSabre (I probably just offended you Buick owners... I apologize!) Those of us in the airline biz knew that we were mandated to retire at age 60 (now 65). So a specific deadline loomed and you had plenty of time to come up with a master plan.



I'd been flying my RV-4 and loved the airplane but it wasn't much of a comfortable traveler for my long-suffering co-pilot. As retirement loomed, I made a list of things I might like to do: flight instruct, fly corporate or charter, maybe work at Cirrus demonstrating cool airplanes. But I had really already done all that stuff and it sounded a lot like work. What I really wanted to do was build a traveling RV where long-suffering co-pilot wouldn't have to look at the back of my head. A generous buy-out from NWA made the thought of another RV project a possibility. So I stashed the old flight bag in the basement, sold the RV-4 and cleaned up the rusty rivet gun and started the RV-7 project.

For those of you builders, you know what comes next. Days, weeks, months, and then years of continuous "work". But it's fun, challenging, and usually enjoyable. For an old retiree like me, you always have something to do and you fall into that routine of heading down to the shop or out to the hangar each day. And little by little, progress is made and you finally have a really cool flying machine.

My -7 has now been flying 5 years and 550 hours. We've taken a number of

great trips to California, Maine, Michigan, Colorado, Montana and hope to do many more. There is usually something to tweak on the airplane most all the time, but I am not as totally engrossed in it as I was during the construction phase. In fact, for the last couple summers, my RV building has been replaced with a totally unrelated "hobby": babysitting!

Yep, that's right, babysitting! #1 son Craig has a seasonal job and I've dusted off long-dormant parenting skills and have been taking care of grandbaby #1 Chet (and now #2 Clay as well).



Back in 1982, we started 'em young. Jean and one-week-old Craig about to fly to Michigan in my buddy's Cessna's 182.



Naturally Chet and me have spent lots of time looking at airplane pictures, playing with toy airplanes, making airplane sounds, and smashing a lot of those little balsa gliders. Yep, I've got him hooked. But... I had not taken him flying... yet...

Like many moms, Brittany was somewhat... shall we say, ... protective. Frankly I never pushed the idea of Chet's first ride at all. Craig did all of the campaigning and finally he won her over. Thus on a beautifully calm November evening, it was time.

We all assembled at the hangar and I first had to find a bunch of cushions to get Chet adequately strapped in. Chet's a pretty cool three-year old and he was ready to go with a calm excitement. He was propped up just high enough to see over the side (he did comment that the RV had really big windows). We took off and headed out to the east over Hudson. "Grandpa, I see ponds, I see

lakes, I see houses, and I see boats..." You get the idea. He had a ball.

Yep, there was a time when I spend hours agonizing over what primer to use and the relative merits of a tip up or a slider. But that all seems lost in the past as I watch the joy on that little guy's face enjoying his first ride with grandpa. Worth every penny!

"Man must rise above the Earth — to the top of the atmosphere and beyond — for only thus will he fully understand the world in which he lives." — Socrates

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Six Things I've Learned (so far) by Building a RV-12

- Bob Collins

It wasn't long after reaching a deal to sell my RV-7A (medical issues) that I started wondering how it is I was going to spend my golden years. Flying the plane was a key part -- THE key part -- of my post-working life. Now, medical issues put the kibosh on that.



But the month or so it took to actually deliver the plane to its new owner in Grand Rapids, MI., gave me more time to think

about things. I've never broken 100, so golf was out. And I've never had any interest in sitting around the Fleming Field terminal and joining the "old man's club" -- the group that does less flying than talking about the way things used to be and ought to be again -- especially in this political environment.

I liked building airplanes. That's how I'm going to spend my retirement years.

I gave each of my son's a generous share of the proceeds from the sale, but still had enough money left to build an RV-12, or at least get started on building an RV-12 and the first of the kits was delivered in late December.

My how things have changed.

I am not building; I am assembling. But I am also learning and that, so far, has been the goal, even though I'm building the plane as an E-LSA, which does not allow me to deviate from the plans and doesn't even result in my name going on the

data plate. It still presents an intellectual challenge, and that's mostly what I'm looking for.



I'm 59 hours into the project and hitting the home stretch of the empennage kit and here's what I've learned so far:

1) You can't assume that the build will be easy just because you built an RV already. There are differences between the earlier kits and the relatively "easy" RV-12. Van's does a lot of work for you, true. But there's a cultural difference in how the project is presented to you and if you're not careful, you'll get burned. If you're arrogant or cocky about things, you'll be humbled by buying more parts

2) Reading the instructions is like learning a new language. RV-10 and 14 builders are used to having the instructions and plans on the same page. Easy. But for 7A a builder, Van's transitions you from the "narrative" of the instructions to just looking at the big ISO drawings to figure what you should do. By the end of the project, there's no hand holding. You're on your own. Don't screw it up.

The RV-12 is different. Every step is documented and you need to "kill" your instinct to assume what needs to be done. You have to take the plans literally, which also eliminates your practice of being able to see *why* you're making this next step, and not another one.

The RV-12 instructions are more like Ikea.

3) Because you become dependent on doing what the instructions say – and only what the instructions say – you might be tempted to ignore what you already know. This includes deburring and making sure holes are properly sized. I'm fairly well convinced, now, that builders who are building 12s as their first plane, are just taking parts out of the crate and assembling without employing some pretty important preparation steps.

I also found that for LP4-3 rivets, the pre-punched holes (which are supposed to already being full sized) aren't. A rep from Van's said on VAF that the only holes that need to be drilled are those that need to be matched, and those that are going to be countersunk. This is wrong and you realize this is wrong when you find yourself trying to jam a rivet into a hole where it won't fit, just because Van's says they will.

You have to be really careful not to delegate to Van's what you *know* to be proper standards and techniques just because the instruction gets you used to the idea of doing so.

This is the danger of taking things too literally where if Van's says something is so, it must be so. A friend on VAF speculates that whatever tooling Van's is using has worn slightly after so many kits to the point where the holes are undersized. A reamer is your friend. So is deburring.

4) That said, Van's is amazing. The parts fit together beautifully. If something isn't lining up quite right, stop! You've done something wrong. They're that good.

5) But you cannot make a mistake. The 7A was pretty forgiving on mistakes. If you had to abandon a hole, for example, you can drill holes on either side and use two rivets. You can't do that on a 12.



Van's method of saving weight is fascinating and, I think, instructive. They scallop the rib flanges between holes to save weight, so you no longer have an option of shifting hole locations if you mess up. So the lesson is clear: Don't mess up. And that gets back to #1. You have to really concentrate on what you're doing.

But Van's obsession with saving weight has become my obsession, too. I'm using very little primer, for example, in a bid to save a little weight and to be more practical. For the record, when I sold my RV-7A, nobody asked about primer.

6) Don't sell your tools when you're done. I didn't expect to build another airplane, although even when I finished the 7A, I missed building. I sold a few – the C-Frame I wouldn't need anymore, for example – but I could've kept those clecoes, and maybe the hand seamer.

But, really, the best part about building a second plane, is already having the tools to do it. There's no waiting around for an Aircraft Spruce order, or even not knowing what to do when a challenge presents itself because you've already got the tool and the knowledge of how to do it. And that feeds directly to the most important requirement for building any airplane: the confidence that you can do it, and a standard for doing it properly.

I don't know if I'll ever actually fly this plane; the medical issues are still medical issues and I'm not the type to ignore them merely because the rules surrounding medical certification are changing.

If I don't, I don't. I can always build another one.

A Tale of Deferred Maintenance

- Nancy Burkholder

Looking back over 15 years of RV ownership I can say that the RV community is the foundation upon which I fly. Left to my own devices I would be flying my C-150 or my ultralight. I know there is so much I do not know about flying and maintaining my RV, yet here I am. This latest episode is one more learning experience built on dozens of previous learning experiences.

I've owned my RV6 since the summer of 2001. I bought this Canadian built plane after seeing it at the RV Forum in Red Wing. Tom Berge performed the pre-buy inspection and the rest is history.



Overall the plane has been a good flyer with one nagging issue; high CHTs on takeoff. Typically the CHTs would approach and easily pass 400F after climbing to pattern altitude. The WOT fuel flow on takeoff was 15.7 GPH, which was lower than the 18 GPH I had read was recommended for an IO-360 engine. I managed to tame the temperatures by pulling the power and aggressively leaning upon reaching pattern altitude.

In 2007 I replaced the Hartzell constant speed prop that was subject to repetitive AD's with a blended airfoil prop from Vans. I also replaced the propeller governor because the original governor was incompatible with the new propeller. The

old propeller used counterweights to assist varying the blade pitch and the governor supplied oil pressure opposite what needed for the new propeller. Early on I noticed that at full RPM the RPM surged about 50 RPM. This behavior was a known issue on earlier models of the MT governor. After learning this condition was not a safety of flight issue, and given how little time I ran the engine WOT and full RPM, and being unable to find a solution, I decided to learn to live with it.

In 2011 I had the throttle body overhauled by Airflow Performance. The engine would sputter and backfire at reduced power in the pattern. I had flown the plane for about 10 years so I figured it was time to let experts have a peek. I asked them measure the fuel flow and they reported the fuel flow was within specification for the corresponding airflow. I put the issue on the back burner and continued flying.

Fast forward to October 2016 when I flew with Tom Berge for my biannual flight review. Tom took notice of both issues pointing out they were not normal. I acknowledged the operation wasn't perfect but I had learned to live with it. Wrong answer. Tom did some research and determined that most people flying IO-360's had at least 17 GPH WOT. Tom suggested I have the throttle body adjusted to increase the maximum fuel flow. I again contacted Airflow Performance and after some back-and-forth email they acknowledged they could increase the fuel flow even though they insisted the unit was within specification as is. I made the decision to continue flying and wait for mid-Winter before undertaking the task.

In January 2017 Tom and I pulled the throttle body and governor. I shipped the throttle body to Airflow Performance and hand carried the governor to Maxwell Propeller. Maxwell tested the governor and it performed without issue. A few weeks later I received the throttle body from Airflow Performance and we put the plane back together. The fuel injection system worked splendid with 17 to 17.5 GPH WOT fuel flow. For the first time since owning the plane I could climb out from take-off WOT to 4000' with the CHTs rising and stabilizing in the 370F range.

The propeller surging issue is still an issue. During the test flight Tom observed the oil pressure fluctuating between 70 and 80 lbs. while the prop was surging. Dialing back to 2650 RPM diminished the surging while the oil pressure continued to fluctuate. Tom and I will be investigating this issue further with plans to inspect the oil pressure relief valve. In the meantime I continue to fly with the maximum RPM reduced to 2650.

One issue down, one more to go...

Follow-up..... The new oil pressure relief valve improved the oil pressure stability but did not cure the problem completely. The prop surging is reduced to about 50 RPM. Tom and I will continue to explore the issue. Overall the performance is much improved. The CHT issue is solved and the oil pressure fluctuations are less than with the old valve.

Part 4 – Landings

- Tom Berge



Paul Simon sings, “There must be 50 ways to leave your lover”. Following that line of thinking, there must be 50 ways to land an airplane as well. I tend to teach one particular way and while it works, there are many variations

that get the job done quite nicely. I suspect half of what’s taught gets incorporated into my student’s habits, while the other half gets thrown into the garbage. Each of us takes in all of the available information, organizes it to fit our own ideals and then we do what we feel work’s best.

In my previous three articles, I mentioned controls and who does what. How to takeoff by giving it what it wants and letting it do its thing, then lastly to commit to your actions during emergencies. In the last of this series I’ll discuss landings. Now to be sure, there’s no way to cover everything one needs to know to land an RV much less any aircraft in the space allotted. Heck, I’m still learning how to do it myself with any regularity. I also don’t want to spend too much time regurgitating what you should already know about patterns, so let’s look at some of the little tips I believe help.



First of all, be consistent! Do the same thing at the same time, every time. Try to slow down long before you get to the pattern. Yes, you can zip into the pattern at some triple digit speed and still manage to slow down for landings, but why? Try the mix it up with most certified planes and you’ll find yourself overtaking them. I come into the pattern just above flap extension speed, say 90 knots or so and lower half flaps as early in the downwind as possible. Why early you ask? Flaps cause the nose to pitch down so I can see better at the 80-85 knots I like to fly the downwind. Flaps also add drag, which requires a bit more power to maintain altitude, which in turn gives me more control. And speaking of power, I try to fly with specific settings. Whether it’s manifold pressure or RPM, know what the numbers should be. Another hint that’ll help

you with your landings is to TRIM THE AIRPLANE! If you fail to properly trim the airplane, your speed control will require lots of attention at a time when other things are vying for that same slice of attention. I’ll trim such that letting go of the stick shows no noticeable movement of the nose. It also helps me keep a light grip on the stick. Abeam the threshold, reduce the power and let the nose fall. If you are trimmed on downwind, removing power will cause the nose to drop as it tries to maintain the trimmed airspeed. This works unless you add backpressure on the stick. Before the base turn, slowly start to trim the nose up to reduce speed, turn base, full flaps, trim for final approach speed.

If all is well, my speed should be stabilizing and all that’s left to do is adjust power to maintain glide path. Turn final and start asking the two questions we need the answers to. Do I have the power to make the runway? What is my speed? If the aiming point is sliding under the nose, too much power, if rising above the nose, not enough. You’re better off making lots of very minute power adjustments rather than one big change. Keep an eye on the speed. Once the runway is made, and just before crossing the threshold, smoothly remove all remaining power. Then continue all the way into the flaring process.

You may have noticed I didn’t mention a specific approach speed. Because these are home-built aircraft, construction consistency is not reliable. I’ve seen as much as a 12-knot spread in indicated stall speeds. If I mention a specific approach speed, it may or may not work with your RV and once in your



head, may be difficult to dislodge. Concerning the flare, I mentioned it as a process, not an action. I typically see pilots flare as an action, in one fell swoop. Doing so abruptly stops the descent followed shortly by a fall. A flare is a process in which backpressure is slowly and smoothly applied to slow the descent rate until a smooth touchdown is achieved. When the mains are just above the runway, bring the nose slightly up, stop moving and be patient. In an RV tri-gear you should be able to see perhaps 70% of the remaining runway ahead. Also, don’t initiate the flare until over the runway. During the early stages of training, I typically see the nose start coming up about halfway down final and have to say, “Stop raising the nose”. Doing so slows the airplane below your approach speed and the sink rate increases leading to a hard landing. I suspect this is due to trying to match the sight picture from previous airplanes flown. Or it could be the feeling we’re about to stick the airplane into the numbers like a lawn dart, also related to the new and different sight picture. And of course, control the nose wheel. Don’t just quit when the mains touch and let the nose wheel slam down. Your smart phone can wait. Hold the nose wheel just above the runway until the elevator is about to give up, then set it down.



Where to look? In asking my students where they look when landing, most will say the far end of the runway to which I reply, "Why, are we landing there?" Seriously, aren't we trying to land at the approach end? The answer to the question is look everywhere. Up close for descent rate and height information and out a bit for drift and alignment information. By a bit, maybe 2-3 stripes worth. A common statement I hear is using peripheral vision to judge descent and height above ground. Peripheral vision is good for movement, basic color, and knowing something is there. Peripheral vision is not good for detail information and frankly, if you want a good landing, detail is your friend. Try to keep your eyes moving to gather as much information as possible. Staring at the far end of the runway simply makes you blind. Heck, staring anywhere blinds you to the obvious. Check out this video.

<https://www.youtube.com/watch?v=vJG698U2Mvo>

Slow the hands down, keep the eyes moving, make lots of very small corrections and remember to breathe. Be very patient and keep track of your speed. And that's hint number 4, watch your speed. By the way, there's a direct relationship between the sight picture out front and your speed. Once on speed, take note of the horizon and keep it constant. If the nose is going up or down in relation to the horizon, it's a good bet your speed is changing. Now, let's go fly and see who can scare whom the most.

N66AP Instrument Panel Upgrade Project Part II

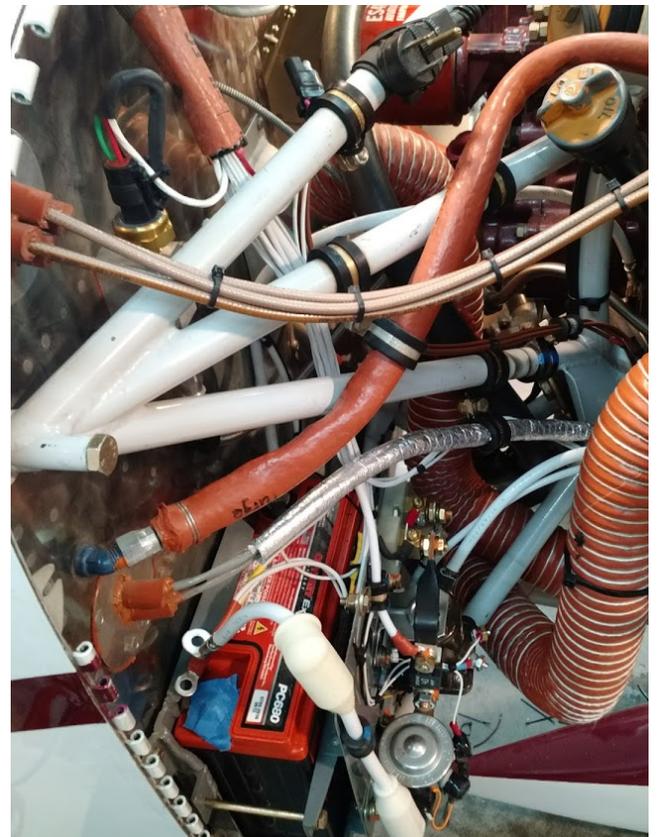
- Alex Peterson, RV6-A, March 2017

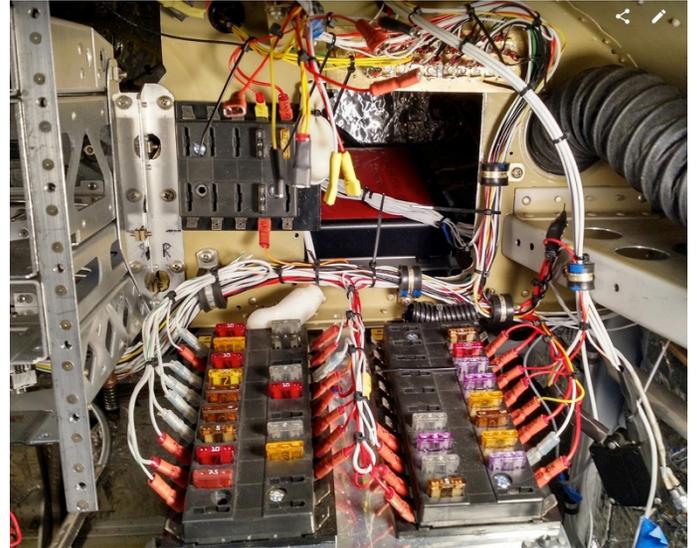
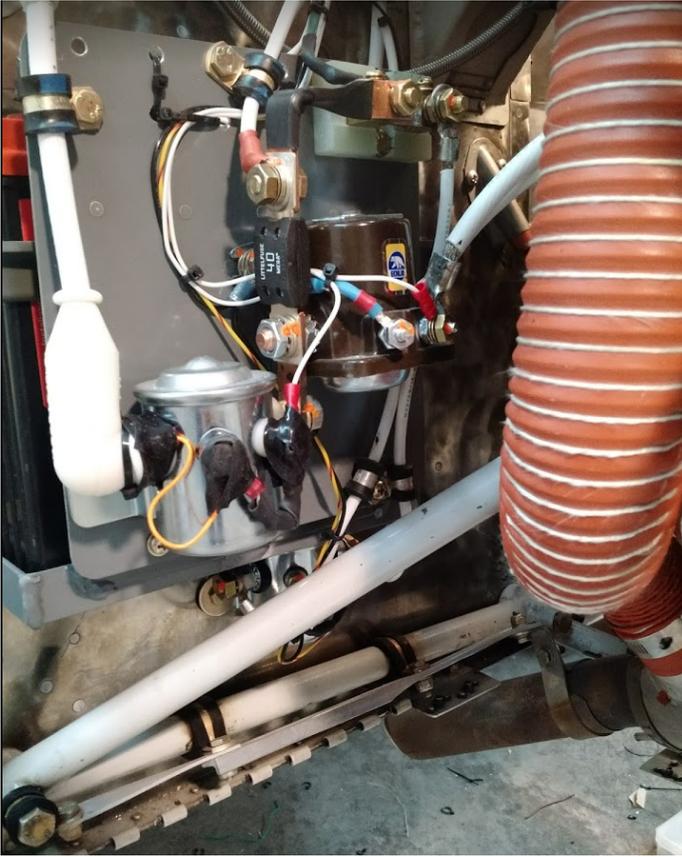
I wrote part 1 about this project for the December Newsletter, just as I was getting into the thick of the panel and electrical system redesign. We left things pretty much a complete mess at that point. Many people have asked if anyone was hurt in the crash!!



The project had two distinct goals: 1) update the panel/avionics and 2) redesign the electrical system for maintainability purposes.

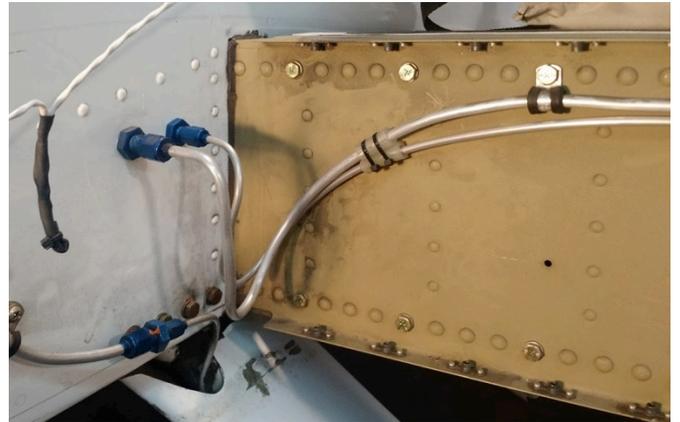
The 6's were designed with the battery on the floor between the pilots' feet, behind the firewall. The master and starter solenoids were mounted on the aft side of the firewall, on the prop governor recess. My fuse panels were mounted between the firewall and the sub-panel. After 15 years of occasionally having to climb up under there for maintenance or modification, I decided I'd had enough. I moved the batteries and solenoids to forward of the firewall, designing and building my own mount:



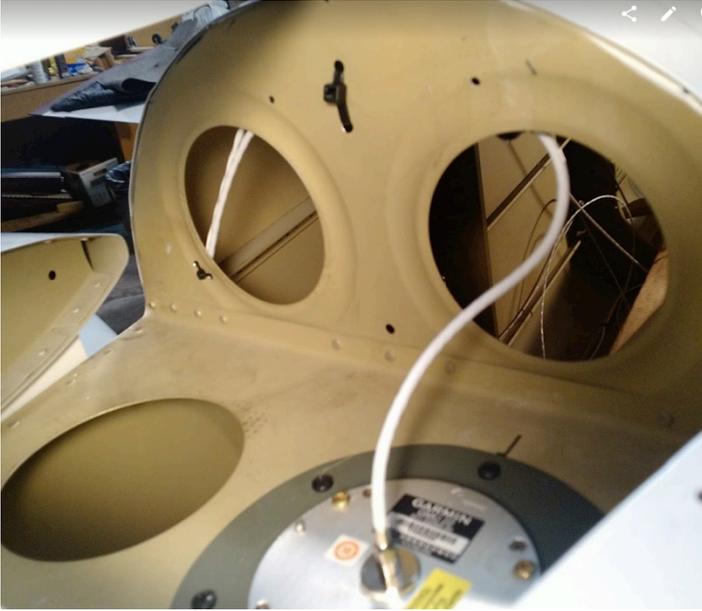


I designed a panel which would have a G3X Touch 10" EFIS as the main attraction. I added Garmin's new remote transponder, the GTX-45R, as well as Garmin's autopilot system. I kept the 430W, as it is the source for the ADSB position data (as well as allowing the plane to easily be upgraded to IFR capable again, should I wish). I opted also for having an angle of attack capability, so a new pitot tube was added into the same mount as the previous one. The fuel tanks on the 6 are very easy to remove, which was the only way I could run the additional pneumatic line to the pitot.

The battery mount is a weldment I fabricated from aluminum angles. I mounted the master and starter solenoids directly to a plate, which acts also to retain the battery. Onto this same plate, I also mounted the ammeter shunt as well as a 40-amp slow blow fuse, which protects the wires to the alternator and master fuse panel inside the plane. Another addition was the solenoid under the battery, which is part of an over-voltage protection system. While the avionics can take a fairly large voltage overload, I'm more concerned about keeping the dual Lightspeed Plasma III ignitions healthy in the event of an overvoltage condition. They are rated to tolerate voltages into the 30 volt range, but.... To have or not have O/V protection is an ongoing, raging discussion similar to which primer to use. Inside the plane, I moved all three-fuse buses to a location between the sub panel and the panel. The battery bus is mounted on the sub-panel, while the master and avionics buses are mounted on a tray, which fastens between the bottom of the panel and the sub-panels. This is a very good location, as it can support itself while the panel is not present, making wiring very easy with wide-open access. Here is a photo of it partially complete:



The magnetometer is mounted on the deck under the vertical stabilizer.



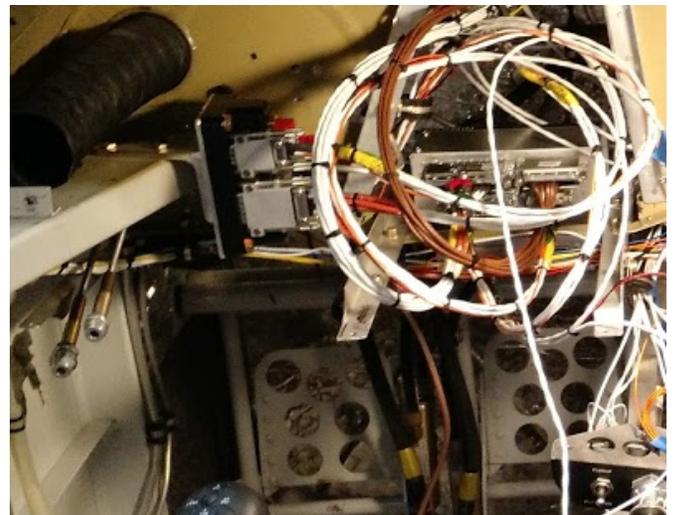
A fair bit of work was involved with switching from my old Century autopilot servos to the Garmin units, especially working up inside the wing. I built an adaptor bracket, which mounted to the existing nut plates used for the Century servo. I also had to use a 90-degree back shell for the connector to avoid having wires sticking out of the top wing skin...



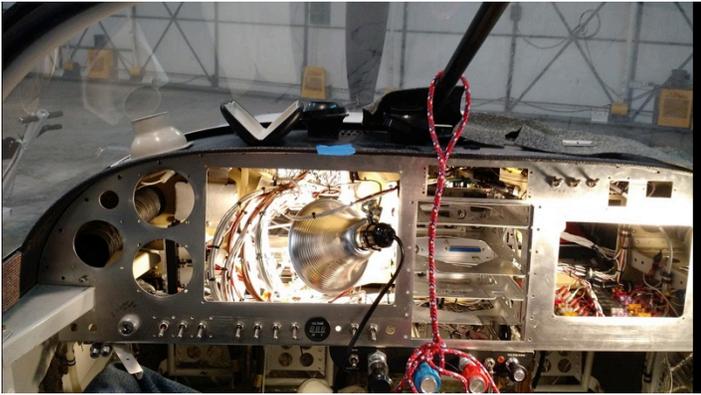
The pitch servo was a bit easier, but also not in a great position in which to work:



As part of the G3X system, there are three other units, which must be mounted. One is the AHRS, which can be seen mounted vertically on the left side of this picture. Another box, which connects to all the various engine parameters, can be seen with the four connectors facing aft. It is mounted just forward of the sub panel. Directly under it is another box (not visible in this picture), which is an ARINC adaptor, which allows the various functions of the 430W's navigation capabilities to interface with the G3X. Note that all the harnesses have been made with generous service loops. These loops were ultimately fastened for stability more than is shown here.



It was finally time to put the new panel in! Here it is seen with the radio trays fabricated, and all the harnesses fabricated.



A very exciting milestone – it passed the smoke test!



Here's the end result:



First flight was on February 8th! It is very strange flying a new, yet very familiar plane. I am still learning (and will be for years!) the various functions of the EFIS. It is really amazing what capabilities we have now in our little airplanes we build in the garage. Oh, and I did snag a \$500 rebate from the FAA for a new install of ADSB capability!

Between November 25th and February 8th, I spent 324 hours on this project, which is about right as we guessed it'd be about 150 hours! About half of the time was related to redoing the electrical systems. About 30 hours were spent building harnesses (almost all of which I did sitting in the copilot seat). I'm very happy with how everything turned out.

Regarding what was learned; several things come to mind, not in any particular order. Don't be afraid to mount things below the sub-panel, as there are a couple inches of usable space, which won't interfere with anything. Think about maintenance when locating items. Imagine that you have to replace said item, because you surely might have to. I can get to almost everything without climbing under the panel, which becomes more valuable as I age! I cut a hole on the copilot side, which will fit the smaller G3X screen, perhaps to be added at a later date. This hole makes for great access to the fuse panels and other items.

Make sure all the wiring harnesses are long enough such that they can be brought to aft of the panel should you need to access them. This is not as easy as it might sound. I defined a point, circled in the picture below, as sort of a main hub. All the harnesses for the avionics stack start there, and arc around individually to each connector in the avionics stack as depicted somewhat by the arc. If a wire needed to go from the top device in the stack to the one directly below it, it first had to go back to the circled location, and then back to the stack.



I debated upgrading the panel for a few years – there is never a perfect time to do so – but I feel I did this at the right time. Now, to plan the next trips!!!!

Twin Cities RV Builders Group
12 Island View Lane
North Oaks, MN 55127

First Class

Twin Cities RV Builders April Meeting

Saturday, April 8, 2017, 10:00 am
Doug and Paul's hangar, 41C Mooney Lane, Lake Elmo Airport

You can never have too much room in an RV, right?? A couple years ago Van recognized his next design should be a 2-place RV for the pilot who wants some more elbow room. Thus the RV-14 was born!!



Last year, RV-10 builder/pilot Tim Olson gave a talk on his flying adventures with his family all over the country. We are inviting him back in April to discuss the building and flying of his brand new RV-14 (one of the first finished!). And... weather permitting we hope to have it on display inside for your viewing pleasure.

Plus the usual coffee and goodies. One word.... Please park on the hard surface wherever you may find it as the ground may still be soft. Our MAC personnel will thank you for it.

See you then!!!!!!