



RVator's Log

Newsletter of the Twin Cities RV Builder's Group

March 2012

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Upcoming Events

March 24: Bernie Weiss and Tom Berge have invited us to Bernie's shop to check out his RV-9 project. Tom is chock full of building time savers. Miss this meeting and it may take you six extra months to build your RV!!! (Details on page 8!!!)

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Minnesota Wing Van's Air Force

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Shop Notes

YES... you will finish it!!!

I think many of us are often overwhelmed by the magnitude of building an RV. Especially for newbies, the brain just can't wrap itself around all the myriad of tasks to be accomplished to finish a real, flying, airplane. Many years ago, Bill Benedict, general manager of Van's Aircraft, told me, "Just keep at it.. even a little bit at a time, and sooner or later, you WILL finish it." As you know, the RV-7 is my second (and guaranteed last) RV project but even then, there were times when I wondered, "Would I ever really get this machine flying?"



For the last couple months, it has been the BIG PUSH. The RV was beginning to look like an airplane, and if I squinted really hard, I could begin to imagine it finally rolling out of the hangar and taking flight.

Wings....

Around Christmas time, it finally occurred to me that the next big step was to dust off those wings sitting in the corner of the hangar and get them on the airframe. Fortunately, local -7A builder Scott Hutchison had whipped up a neat set of machined taper pins for the purpose of temporarily holding the wings in place. He also had built a really cool spreader tool that would "pry" apart the center section components just a smidge to allow the spars to slide in easier. So we all got together one morning and in the course of about 30 minutes, we had the wings in place with the machined pins (slightly under-size from the close-tolerance bolts that will be used permanently). BTW... use plenty of grease as well.



With the wings in place, the lower fuselage skins can be drilled for the attaching nutplates, and a whole bunch of little things can be wrapped up in preparation for the final wing fit. A week or so later, we took off the wings and I then installed a bunch of nutplates and a dozen or so other "minor" jobs.

The night before the "real" wing installation, I put the close-tolerance wing bolts in the freezer to shrink them down a zillionth of an inch. The gang assembled again and we re-installed the wing using the tapered pins again. Then, one by one, we replaced the pins with a frozen and well-greased "super-bolt". They tapped in easy as pie. Next day, the nuts were torqued and the bird had wings!

Delinquent electrons...

Several days were spent hooking up the electrical terminals at the wing roots and also the fuel lines running from the tanks to the fuel pump. One of the requirements outlined in FAA/EAA flight test guide is to determine the fuel flow output of the boost pump. It needs to put out adequate pressure to supply the engine at full power. The guide gives you a formula to use based on the horsepower of the engine and in my case, the fuel pumps need to pump at least 20 gph. So I put about 5 gallons in each tank, unhooked the fuel line going into the fuel servo, set up a bucket, and hit the switch. After lots of gurgling, fuel began pouring into the bucket and using a stopwatch I determined it was pumping about 50 gph (more than enough!) That was



great! I then did a quick test to be sure the fuel selector would shut off the fuel. I moved the Andair selector to off and the fuel stopped just fine. I selected the left tank, turned the boost pump on, ... no fuel!. Switched to the right tank.. still no fuel. The pump was running but nothing was happening. A quick call to Airflow Performance (who builds the pump) and they really didn't have any great ideas as to what was happening. Hangar neighbor (and RV-6 pilot) Jerry Golden happened to come by and he thought air was in the system somehow. Sure enough, he stuck a plastic tube up the fuel line, sucked on it (brave soul!), and fuel started flowing again. More lessons learned (like don't intentionally run a tank dry on a fuel-injected system.... it may not start back up!)

A couple days later it was time to calibrate the fuel tanks. It became apparent real fast that something was amiss. As I would add fuel to the left tank, both the left and right tank indications would increase. Well that didn't seem quite right. After much troubleshooting and a talk with Advanced Flight Systems, it was decided that something was wrong in the engine computer box itself. So now I had to remove the AFS 3500 and send it back to the factory. Tom Berge had warned me that you really have to plan to be able to remove equipment. I managed to wrangle the box out of the panel (wasn't easy) and sent it out to Portland. AFS called a couple days later and said a circuit board was fried. Somehow I had crossed some wires at some point and sent 12 volts into the 4 volt fuel indication circuit. They fixed it, sent it back, I wrangled it back into place and all was well.

All told there were several other little glitches found during the final assembly. The moral of the story be sure to PLAN FOR MAINTENANCE. For every installation, plan on how you can easily remove it. It just might break!

By mid-February, I had just passed 2500 hours of labor and I was ready. I had Tom come for one last "super" inspection. He found about a dozen items that I should correct. No big show stoppers, but in a day or two I had them corrected and I was ready. A weight and balance was wrapped up (1138 pounds empty) and I got all of the FAA paperwork together. I hand delivered the package to the FAA MIDO office at MSP and in short order Tim Mahoney and I had an appointment confirmed for the final DAR inspection.

Tim's task is to be sure you comply with the applicable FAR's to meet the requirements for the



issuance of a special airworthiness certificate. His actual airframe inspection is quite general. Most of the time is spent in reviewing your operating limitations and test area. Data plate in place.... N numbers the right size.... Placards in place... Just follow the rules and you will have no problems. Tim was satisfied. I was now ready to fly!

Well not quite. It took me about three days to get everything back on the airplane (inspection plates, wing root fairings, wheel pants, cowling, and so on). #1 wife Jean (really the only one!) had to be there and she wouldn't be free until Friday, 2/24 so I had plenty of time. Finally the day arrived and the weather was not ideal. It was snowing in the morning a but predicted to stop and improve so we push the takeoff time to noon. The weather improved and Tom Berge came over with his yellow -7A to fly chase. Peter Fruehling brought his super camera to get everything recorded. The family was there along with the usual Lake Elmo crowd. I taxied out to runway 32 and carefully went through the checklist one last time. Tom and Peter would stay on the ground until I got airborne and flew for a little while. The wind was right down the runway but a little brisk (probably around 15 knots). I added the power and it REALLY accelerated. In fact it was off the ground before I had the power all the way up. The video shows a 3.5 second takeoff run! There is NO substitute for horsepower!



I orbited around the airport at just about full power for about 5 minutes and then Tom and Peter took off. We joined up and flew east of the St. Croix River and compared airspeeds, which were within a couple knots of each other. I did a clean stall (50 knot break) and once with full flaps (46 kts) and then back to the airport. The -7 handled well and seems much easier to land than my old RV-4. The landing was relatively acceptable and we all declared mission accomplished.

The "new" 22DW will be a great cross-country machine. It has the automation of my old 757 but burns WAY less fuel! Hope to have the time flown off by the end of March and a new Wipaire paint job sometime this summer. Fun... fun... fun...!!!!

* * * * *

Mark's First Solo

-Doug

In January, Tom Berge made the first test flight of Mark Erickson's new RV-9A. Tom reported a great flying airplane with all the outstanding characteristics of the RV-9A. With a Cato three-bladed prop, a -9 is about as close to a competition sailplane as you get (and you don't need a tow plane!!). It does not want to go down. You might think that should not be a problem but it really throws new RV-9(A) pilots for a loop. I've given a couple checkouts in fixed-pitch 9's and the new pilots invariably had troubles initially setting up for an approach and arriving at the preferred "near" end of the runway.

Tom had given Mark a fair amount of dual in his RV-7A but it has a constant speed prop, which is a totally different type of animal. I worked a little with Mark as well in Tom's machine

and we found that you can simulate the glide characteristics of the -9 by several different ways.



One can try different combinations of partial or no flaps, pulling the prop control to high pitch and even landing with partial power.



Mark had a pretty good handle on what to expect when he soloed his -9A. Tom cut him loose in mid-February and he jumped in his airplane and did just fine. Mark is now flying off his test time and we'll be looking forward to seeing him on the fly-in circuit this summer!

Thinking Through the Unthinkable

-David Domeier, Van's AirForce forum

Twice since beginning to fly an experimental airplane, I have had to deal with an unexpected problem that cut the flight short.

The single most important factor is recovering from the psychological shock of the unexpected event and to fly the airplane. Only then can the brain function well enough to make the decisions necessary to survive the event. Practice and advanced decision making is very important, but action does not kick in until the brain has accepted the fact this is for real and it is time to take appropriate action.

Decisions (or policy mandating certain actions) made before

any event occurs can make the process more likely to end favorably. But there still has to be a factor built in for the time delay between the event occurring and when the brain reacts. Not many of us are spring loaded for an engine failure immediately after take off unless there a conscious effort to think about it as power it advanced for take off. It should be on the check list, it is so important, as we all become much too relaxed after dozens of successful take offs.

A decision to turn back during an engine failure on takeoff is controversial because it is a personal one. Its almost like which church you belong to or belonging to none. I made a decision a long time ago to NEVER turn back because I know the factors that will affect the success of doing so may not be in place or apparent, like the wind for example, and there is no time to sort it out. Once the turn is initiated there's no turning back to landing straight ahead. Much of what happens next is out of your control. So from this (personal) perspective, there is a conviction the odds of survival are best making the best of a controlled crash straight ahead. And this conviction comes after reading just about every word of how to successfully complete a turn around after take off. It simply is not for me (a personal decision).

In flight events resulting in an unplanned landing are a different matter. It is important to have some idea how far the airplane will glide and have mental picture of what an appropriate visual slope looks like not just on final but overhead and on down wind leg. That can only be accomplished with practice and trying to remember key altitudes at various points in the pattern. Practicing idle engine approaches is a good method of learning the necessary mental pictures but keep in mind it may be just a bit different with a windmilling or stopped prop.

Once, while simply enjoying fall colors from about 800' AGL, the engine quit and the prop stopped with no warning whatever. The reaction to the

event was frozen for a few seconds as the brain did not immediately comprehend that the flight was going down, like



right now. It was going to contact earth and to have some choice in the matter as to where this would happen, the "fly the airplane" premise kicked in. There are not many choices of where the landing would be, but somewhere had to be selected. You do the best you can and it is important to get some control over the situation as soon as possible. That's why "fly the airplane" is so important. Once the brain has latched on to

fly the airplane, other necessary procedures can be accomplished - if there is time.

All of this stuff needs to be thought about. It is easy to get lulled into enjoying very moment of flight, it can be so rewarding. But after having experienced a couple unexpected events, no flight is as relaxing as it was. There always is an awareness that stuff happens. Flying over a densely populated area or an area with no roads or people or decent landing site always makes me feel just a bit uneasy. I still do it but it is not without some misgivings.

That risk meter in the brain is always active and it is a constant process of accepting what it is saying or doing something about getting it back into an acceptable range. We all have different markings on that meter and we need to heed them. To fly without knowing or appreciating the risks is the worst possible way to fly.

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*Ed note: At the top of all Northwest Airlines emergency checklists was the boldface type: **FLY THE AIRPLANE**. My Delta Airlines buddies now tell me the southern culture of the old Delta has resulted in a revised checklist with the bold-face header: **GIT 'ER DONE***

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Do you REALLY look under the hood??

- Randy Richmond, A&P, from Van's AirForce

As an IA, I work on all kinds of planes and I have seen a lot of scary stuff! People (not just RVers) are always asking me if there could be a way to do oil changes without removing the cowling or at least just removing the top cowling. A lot of plane's cowlings are a huge pain to remove and install. I always tell them I won't change their oil unless I remove the entire cowling because of all the stuff I've found over the years during a simple oil change.

I think a lot of people just don't realize what a **violent environment** it is inside an engine cowling. Cold air, hot air, electricity, fuel, oil, paint, plastic, rubber, steel, aluminum, copper, brass, etc. all being heated, cooled, shaken, and vibrated to death. It causes all kinds of issues. Some of the crazy things I've seen are broken exhaust systems, carbs with loose bowl screws, broken air boxes laying in the bottom of the cowling, cracked cylinders, the spring steel wire inside scat hoses cut-



ting deep into engine mount tubes, exhaust pipes, hoses, and wires. It doesn't matter how new the airplane is. I've worked on brand new planes right out of the factories with **less than 50 hours on them** and found these.

How to Diagnose and Fix a Heavy Wing

- Van's Aircraft

Ed note: Having just completed the initial test flight of my RV-7, everyone asks whether it has a heavy win (I lucked out). I think there is still confusion as to how to remedy this situation if you do have this problem early on. Here is a rerun on the topic from Van's website:

If there is one question that requires a lot of time answering at Van's it is the "I just did my first flight and a wing is heavy, what do I do?" question. It usually is followed by the corollary "which aileron am I supposed to squash?"

There turns out to be a bit of reasoning involved in the answer. It is simple and yet it is not obvious to the pilot who has just spent 2-4 years of all of his spare time and energy to complete and fly his brand new airplane. He thinks he built it PERFECT and is dismayed that something is wrong.

First and foremost, **DON'T DO ANYTHING** for the first few hours of flight. If the aircraft is flyable, then fly it. There are factors that may not have been thought about quite yet on the first hour of flight. For the wings to be neutral (no wing heaviness) the fuel quantifies must be equal in both tanks and for side by side aircraft where the pilot sits on the left side a weight would need to be in the right seat. All gear leg fairings, intersection fairings and wheel pants must be in place.

Now, after the plane has been flown a while (10+ hours) and



the pilot has determined that a wing heaviness exists, then it is time to try and see what is wrong. The first step to fix the problem is to quantify it. It is easy and is worth the effort. Fill both fuel tanks, then takeoff using the HEAVY wing tank and climb to a cruise altitude of 8-9000 feet. Use a power setting of at least 75% or wide open, whichever comes first, and fly on that tank till the wing no longer feels heavy. At this point, the weight differential of the two tanks equals the heaviness. Land and fill the tank, multiply the gallons by 6 lbs/gal and you have a starting number. If the heaviness is less than 18 lbs, then it is a minor condition. You would bum off that much fuel on a long climb to altitude for a trip and it may not warrant fixing.

Listed below is a sequence that may solve problems of heavier situations: 1. Check the rigging of the entire airframe.

Set longerons in the flying level condition. Recheck the angle of incidence of the wings.

Recheck the vertical stabilizer. Is it up the middle of the airframe? Is it twisted somehow?

Use the wing template to cross check the aileron and flap alignment. If any of the above are wrong, FIX 'EM. 2. Is the "BALL" out in level cruise flight (75% power)? It is the first thing to fix!

If so, fit a trim tab to the rudder. Start with a big one and trim it down until the ball is centered at cruise speeds.

3. Now back to the ailerons! Of all of the wing heavy problems the commonest one that can easily be identified and fixed is poor aileron symmetry. In flight, the aileron surfaces are exposed to some fairly high speed airflow. If during the instal-

lation of the ailerons, one aileron is installed with its spar in a different vertical location with respect to the rear spar of the wing than the other aileron, then you will have a problem. Since the ailerons are interconnected by the push tubes and control column, they must reach equilibrium during flight. If the deflection forces produced by the airflow are not identical then the ailerons will automatically move to a position where these forces are equalized.

Obviously if the equilibrium position produces an aileron deflection, then the plane will want to roll. The more the deflection, the heavier the wing roll tendency. The fix for a problem of this nature is easy.

Recheck the centerline of the tooling holes of the main wing ribs and the aileron ribs to be sure they are above the bearing pivot holes in the aileron attach brackets (per plans). This displacement should be checked on both inboard and outboard ends of the ailerons for both wings while the ailerons are set in trail with the wing template. The absolute dimension is not as critical as is the fact that both ends of each aileron and both ailerons be the same. If they are off by as little as 1/8" anywhere relative to each other, then it must be fixed. The fix is to simply purchase new A-406 BLANK or A-407 BLANK aileron attach brackets and drill displaced attaching holes in them to correct the asymmetry. (RV- 9/9A and RV-10 builders will find the parts oversize but useable with trimming). Slotting the attach holes in the original attach brackets for test purposes is fine but the final hole position should be transferred to new brackets for permanent installation.

Now go fly it again. Several slight adjustments may be needed so have patience.

For all planes except RV-9/9A and RV-10 there is an additional correction that can be done: If there remains a wing heavy condition in excess of the 3 gallon (18 lb) one mentioned above, then the next step is to adjust the trailing edge radius of one of the ailerons. **Reduce the trailing edge radius of the LIGHT wing.** This procedure should be approached carefully as it can have a significant impact. Squeeze it a little and then go fly it. DON'T try to fix it all at once.

The final solution for all models, if all else fails, is to simply add a trim tab. All of the construction manuals for the aircraft detail a wedge type trim tab that does not affect appearances too much.

Great Safety Website

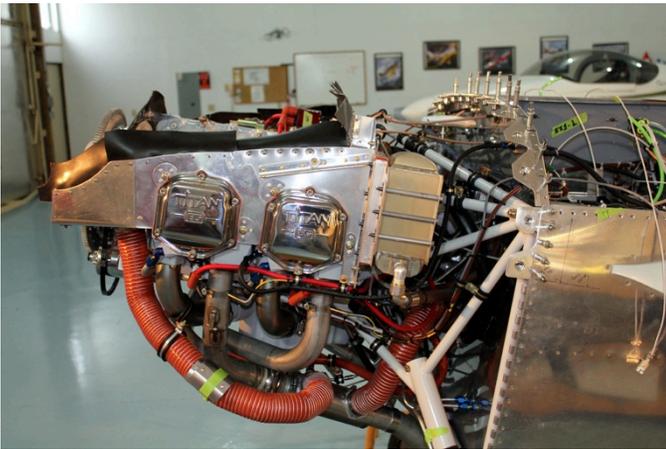
MN Winger Cliff Peterson sent a note to tell us about a great safety website. It is authored by master CFI Gene Benson, a highly experienced instructor and specialist in aviation human factors. LOTS of great stuff here: www.genebenson.com/

The Famous Berge Slide-valve

-Doug

One of my BIG requirements in planning the build of my RV-7 was to have plenty of heat. We do live in the north country and I planned to do as much flying in the wintertime as possible. My RV-4 was never really all that warm even with THREE heat muffers. Tom Berge advised to seal the cabin well and pump in lots of heat. I had flown with Tom a lot in his RV-7A and we were never cold even flying in temperatures down into the low teens.

So my plan was to replicate his system. First, I began with a basic Vetterman crossover exhaust system



The nice thing about this layout is that there is plenty of room to install two heat muffers. And that is a must for Minnesota flying!! Essentially there are two pathways for heat into the cabin. The left side has fresh air being picked up on the front of the baffle down to the left heat muff. The right side picks up fresh air from the rear of the right baffle and down to its respective heat muff.

These two heat sources now go to Tom Berge's now-famous slider valve. It's a simple, low-profile sliding system that



has a stainless slider shutter that controls the two openings into the cabin. There has always been a controversy about what happens to the hot air when the valve is closed. Will it melt something? The answer is no. Tom's -7A has over 800 hours of trouble free operation and his old RV-6 had over 1000 hours with a similar valve. The air is just not all that hot (less than 300 degrees by his measurement).

When it came time for me to install an alternate air source for my fuel injected IO-375, I concluded I really didn't like Van's rotary valve kit. So, using Tom's heat valve for inspiration, I built an alternate air slide valve, which provides a 2" diameter air open on the bottom of the filtered air box. A Bowden cable controls the action. Simple and clean.



Now that my RV-7 is flying (12 hours of this writing), I can attest that the heat is perfect. I have been flying without a jacket in OAT's down to 15 degrees F with about 3/4 of the cabin heat valve open. And the alternate air valve works just fine as well. One last word however, if you install the Vetterman RV muffler system, you will have to utilize a regular Van's heat valve to dump out the hot air when the valve is closed. The mufflers put out much higher temp air and Larry Vetterman recommends that the hot air be dumped overboard.

Head's Up for June: RV mini-forum

- Doug

The club will be participating in the Annual Fleming Field Fly-In at South St. Paul, MN on **Saturday June 2**. There will be a series of forums all day with speakers discussing insurance, avionics, and of course RVs!! Our portion of the day is from 3:30 TO 5:30 pm. Yours truly begins with a general introduction to RVs (and the club) with a showing of Van's latest promotional video. Other speakers will be Pete Howell, Peter Fruehling, and Tom Irlbeck. This will be our June gathering so come on over and spend a couple hours with us!! Details are here: <http://www.flemingfield.com/Flyin.html>

Minnesota Wing – Van’s Air Force
65 15th Ave. SW
New Brighton, MN 55112-3454

First Class

Minnesota Wing Spring Meeting

Saturday, March 24, 2012, 10 am

Bernie Weiss’ shop/garage
534 S. Mississippi River Blvd. St. Paul, MN 55116



Relive the days of yesteryear when we crammed into a builder’s shop to check out his project. Bernie is working on a new RV-9 (yes, a taildragger!) with all sorts of cool Garmin avionics planned for the panel. Bernie and able assistant Tom Berge will give us a tour of his -9 fuselage and point out a host of time saving tips (this is Bernie’s second RV and Tom has lost count of how many projects he has helped with).

Directions:

Bernie’s home is on the east side of the river on Mississippi River Blvd, south of Randolph. His shop is behind his home on the alley running north and south between Randolph on the north and W. Hartford on the south. Check out Google maps or program your Garmin magic GPS box to take you there. If you have any questions on finding his shop, send Doug a note at dcw@mnwing.org or call 651-398-1184

It might be tight, but we will have coffee and goodies as well. Parking will be either on Mississippi River Blvd (look for a sign or balloon) or either W. Hartford or Randolph and walk down the alley to Bernie’s garage (again look for a sign or balloon). Navigation issues??? Call Doug at 651-398-1184 or Bernie at 612-845-6178. See you then!!!