



# RVator's Log

Newsletter of the Twin Cities RV Builder's Group

## June 2014

### In this issue...

Mogas ...3  
An Oldie Renewed ...6

\* \* \* \* \*

### Upcoming Events

**June 28** – Summer lunch meeting at Bernie Weiss' hangar at Anoka County airport. See page 8 for details.

\* \* \* \* \*

### Minnesota Wing Van's Air Force

**Pres:** Doug Weiler, 651-398-1184, [dcw@mnwing.org](mailto:dcw@mnwing.org)

**Sec/Treas:** Jim Lenzmeier, 651-633-8488, [jimdilenzmeier@gmail.com](mailto:jimdilenzmeier@gmail.com)

## Shop Notes

### Planes... planes... planes...

There is a saying amid the boating community that the two happiest days of a boater's life is the day they buy it and the day they sell it. I'm not so sure if that applies to airplane owners or not (and especially RV owners). Guess it depends on the circumstances but I've never regretted owning an airplane (and especially now that I've been an RV owner for the last 20 years or so).



We have owned 11 airplanes over the years (although the first one was "before marriage".) The year was 1968 and I was one year out of high school, going to college (it was cheap then), and living with my folks. I was bringing in the "big" bucks flight instructing and working nights as a rate clerk for a trucking company. One of the pilots at my local airport had just finished restoring the cutest Piper Vagabond you'd ever saw. He decided to put it up for sale and I thought I might be able to swing it if I could convince my Dad to borrow the money with my solemn promise to make the payments. Doesn't that sound like a logical plan? The price was a staggering \$2000. My Dad was a trusting soul and I guess my salesmanship was convincing as shortly I was the new owner of N4320H.

Only 599 Vagabonds were built in 1948 and 1949. It was the first short-wing Piper with clipped Cub wings, side-by-side seating, no electrical system, and a rigid landing gear with no shock absorbers. 20H was an early PA-15 model with a rather oddball Lycoming 65 horsepower engine. I say odd in the fact that the crankcase and cylinders were all one piece so if a cylinder went bad I guess you just got another engine. I don't think it ever really generated 65 horsepower. Didn't matter to me. It was just such a cool little airplane!

The Vagabond weighed only 625 pounds empty so it was truly a kite in more than 10 knots of wind. Actually

it would motor along at about 90 mph, which wasn't too bad. Jean and I were dating at the time and we would putt-putt around to various fly-ins provided we could get back before the air warmed up and the turbulence became unbearable. Ownership of the Vagabond lasted about 18 months until one Saturday night I decided to borrow my dad's impeccable '67 Pontiac Bonneville. Jean and I had a fancy date planned and my nerdy VW bug was not going to cut it. Long story shorty, I managed to ram into another car making a left hand turn and caved in the front of my dad's highly polished baby. He never lost his cool... just come up with the bucks to fix it, he said. Thus the Vagabond went up for sale the next day. Actually I sold it quickly for \$2050. My dad was paid off and every-



thing was cool. But I always had a soft spot in my heart for Vagabonds. And Jean did not flee in terror from the kid with the little-bitty airplane.... we got married the next year.

Since then when, if we could afford it, we owned some type of flying machine. We graduated to a Citabria for a couple years in the early 70's and I taught Jean to fly it. Sold that when I got out of the Air Force and bought another Vagabond, this time a PA-17 with a Continental 65 horsepower engine that actually put out 65 horsepower. Graduated to a Cessna 170 for a while till we ran out of money (I think every airplane sale in our early years was precipitated by near bankruptcy.) With a corporate flying job came my attempt at the restoration of a Cessna 140A and won a nice award at OSH with it. Dabbled in tube and fabric with the rebuild of an Aeronca Champ but sold the project before I finished it.



Up to this point all of the airplanes we had owned were sold for more than I had in them. I was thinking this was way better than owning fancy cars and boats that depreciated so fast it made your head spin. In 1985, we bought our first true "family" airplane, a 1959 Cessna 180B. I had always admired these taildragger Cessnas. Seemed like a real "man's" airplane (guess I needed that affirmation!)

N5128E had been a camera ship all of its life based in the Maryland area. It took a while to track down a 180 that either hadn't been wrecked once or smelled of old fish (many were working machines earning their keep in Alaska). But this one had a low time engine, ugly brown paint and interior, but it was undamaged and flew straight and true. I worked on it for about 2 years and the result was a great flying station wagon. Even won Best Contemporary at OSH in 1987. As the kids grew we ended up using it less and less for family trips so in the mid-90's we sold it for almost double that we had in it. Best return on investment I ever had!



After that, one more Citabria and then we got wrapped up into the RV world and that's where we'll probably stay. Having a little putt-putt Champ might be fun again, but as long as I can keep up with the RV-7, it will suffice.

Yep, there are cheaper hobbies out there but not too many that provide so much fun. I can't golf, fishing gets my hands dirty, and my little cars won't tow a boat. Guess I'm stuck with airplanes!

\* \* \* \* \*

# Mogas – Plumbing for Dollars

- Pete Howell

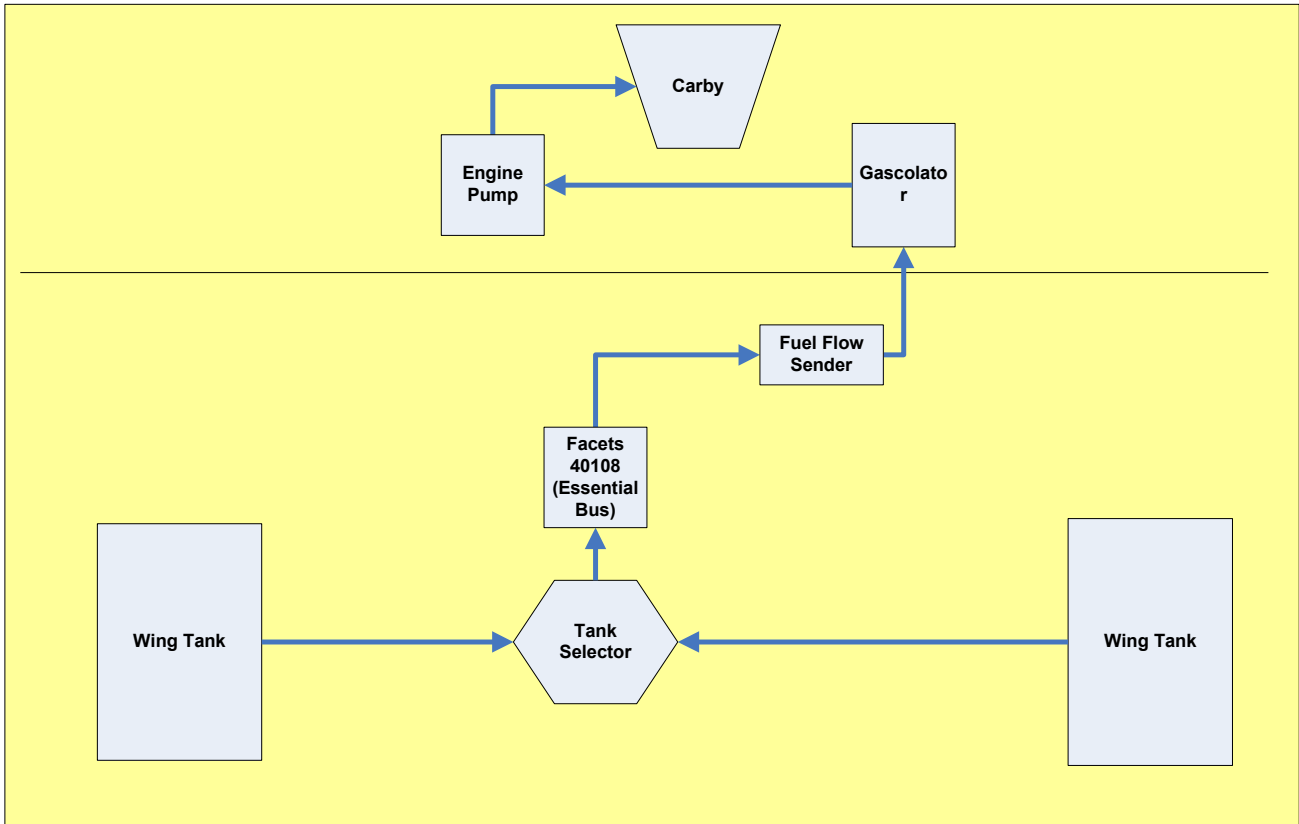


Previously in this esteemed publication, I described my successful experiments with premium unleaded, ethanol-free gasoline (yep, Mogas). It has worked well for me in my RV-9A, (O-320-160, carb, dual EI, Hartzell CS) saving considerable \$\$ over the course of the year and delivering cleaner plugs, cleaner oil, and minty fresh breath.

One Mogas challenge we have here in Minnesota is the seasonal changes made to the vapor pressure of the Mogas – vapor pressure is the measure of the volatility of gasoline, or how easily it changes from a liquid to a gas. In the winter, we want a high vapor pressure (easy evaporation) for easier starting and in the summer we want a low vapor pressure to avoid vapor lock and to keep gasoline from boiling away at ambient temps.

OK, what is vapor lock? Our fuel pumps are designed to pump non-compressible fluids, like a liquid. If that liquid changes to a gas, a compressible fluid, said pumps no worky. But you say, “Hey, I put liquid gasoline in my tanks, why do I care?” This is where the vapor pressure thing comes into play. A fluid will change state from liquid to gas (boil) based on (low) pressure and (high) temperature, so if we have liquid gasoline at high temp and low pressure, it will boil right in the fuel lines! If it boils, we have vapor lock.

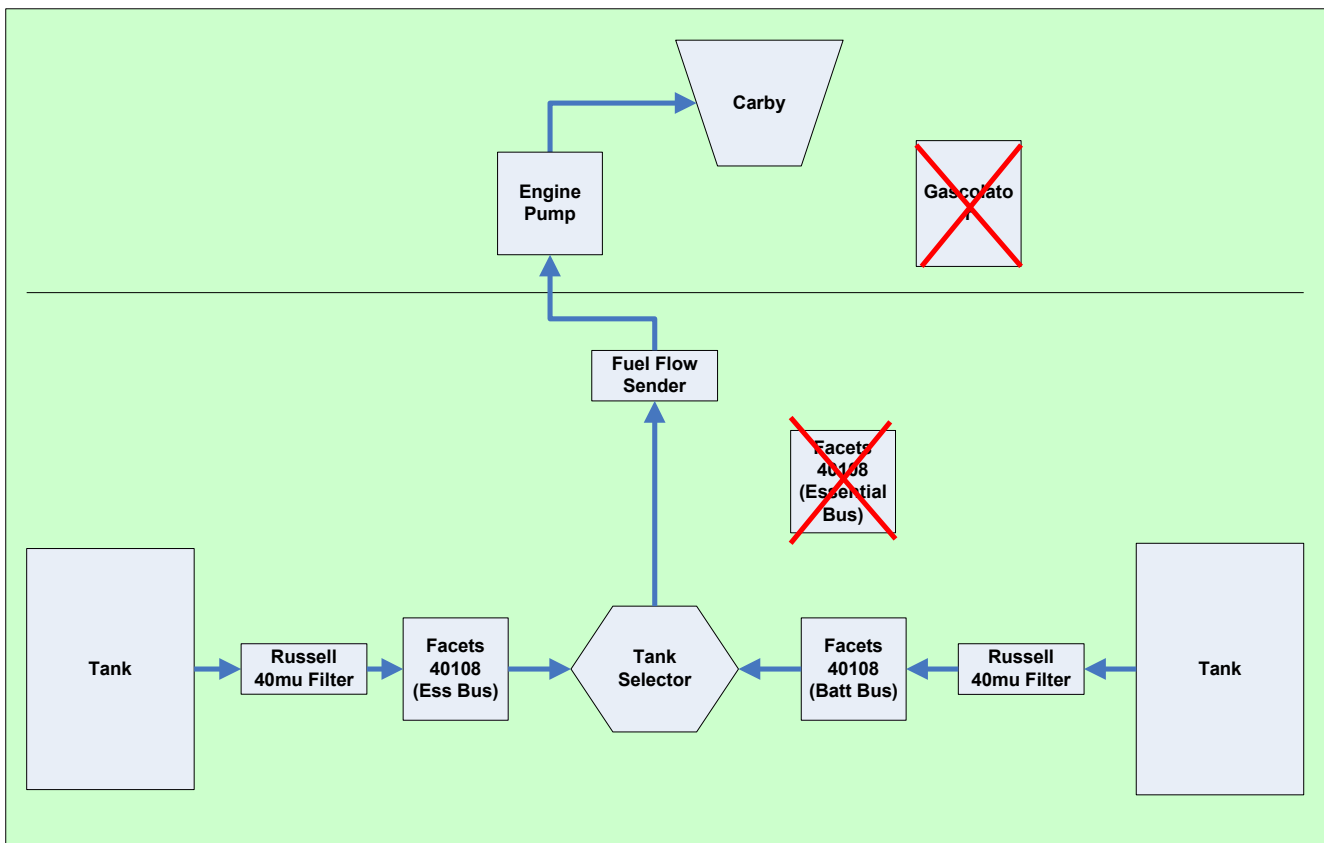
Van’s standard fuel system is not the greatest design to prevent vapor lock. It uses an engine pump located above the tanks mounted to a big block of hot metal (the engine). Sucking fuel (low pressure) through a hot pump (high temp) is a recipe to have gasoline boil. Since vapor is compressible and can’t be pumped, the carb runs out of gasoline, the fans stops, and the pilot **really** starts to sweat.



Avgas, by design, has very low vapor pressure and is resistant to vapor lock, so Van's system works well except maybe for a hot turn on a hot day. Summer Mogas is pretty good as well, but the vapor pressure is not quite as well controlled, and maybe a bit higher. This is why some non-experimental planes can't get an STC for Mogas- they will vapor lock. Winter Mogas is vapor lock prone, but when it is cold out, it has not been an issue. (Vapor pressure can be tested with a simple vacuum gauge rig.)

So how can I modify my fuel system to avoid Mogas vapor lock? Well – we can look to two places to help. 1) Hot Rodders and 2) the Mogas STC people. Hotrods have suffered vapor lock for years – tank in back, engine mounted fuel pump higher than the tank, hot temps under the hood. Sound familiar? How did they solve it? They put a boost pump under the tank to push (vs. suck) cool fuel to the engine. In some cases they kept the engine mounted pump, in some they ditch it. Works like a charm – works for motor homes with the same problem, too!

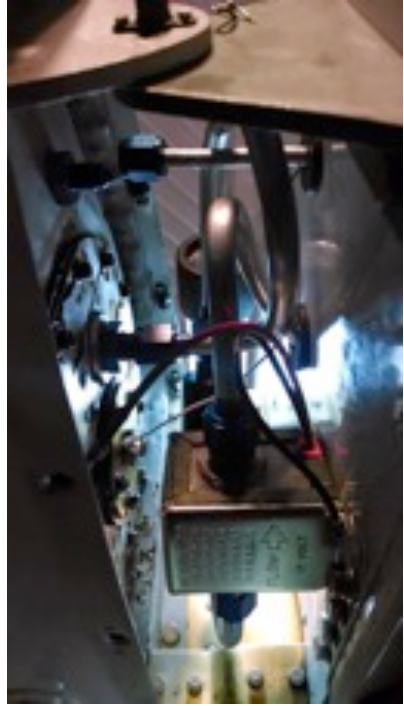
A Piper Cherokee is just like an RV (ok, stop laughing) from a fuel system point of view – low tanks, high/hot engine pump (sense a theme?) The STC for some Cherokees adds boost pumps in the cabin to push fuel to the engine. With this background, the RV-9A solution is pretty clear – add a boost pump at the tank, so that is exactly what I did – a little challenging on an assembled plane, but not impossible. I mounted a Facet 40108 fuel pump in the wing root along with a small racecar filter and some creatively bent tubes. I also plan to remove the gascolator, as I now have filters and the FWF gascolator location makes it prone to heating fuel and we now know **that** is a no-no.



I tested the fuel flow and it is over 30 GPH, so that was not a worry. Both pumps will produce about 5psi, just right for the carb. I did need to add a switch and circuit for the second pump, but that was pretty easy.

Performance is as I expected. If the fuel pressure drops in a long hot climb, a quick flick of the switch and I have cool, pressurized fuel to engine pump, versus potential vapor created by the hot engine pump sucking fuel from the tank. It was a fun weekend project and gives me more confidence in using 92UL/0EtOH Mogas in my plane! Also - I did realize I am much better at bending and flaring tube than I was 10 years ago when I was building! Contact me with any questions you may have - just don't count on intelligent answers.....

Here are some photos of the setup. Notice the pump is level with the bottom of the tank.



## An “Oldie” renewed!!

- Nancy Burkholder

*Ed note: Nancy’s RV-6 “Athena” has been a part of the MN Wing for a long time. For years, Nancy was kind enough to allow me to use it for many RV taildragger checkouts. Recently the engine was overhauled, new interior installed, and now a new panel.*

This past winter, I worked with Tom Berge to update my instrument panel; adding a second Dynon Skyview, Garmin GTR-200 radio, ADS-B, EMS, 406 MHz ELT, and panel mounted 496 GPS. The project started two years ago when Tom and I replaced the flight instruments with my first Skyview and added a two-axis autopilot. At that time I discussed with Tom my desire to replace the dated Terra radios.



The original panel with center console. The missing instrument above the throttle was an Apollo GPS.

The task of replacing the flight instruments with a Skyview took about two weeks working a few hours almost every day (I was laid off work and available). Skyview mounted to a small panel that covered area in the existing front panel holding the flight instruments. I moved the airspeed and altimeter the left of the screen. Tom suggestion removing the center console opened up the area under the panel and made maintenance down below easier.

### Evolution of Thought

I was pleased with the first Skyview's implementation. Replacing the vacuum gyro instruments with an EFIS and adding the autopilot brought Athena to a new level of sophistication. I appreciated that Tom knew how best to proceed with this complex task that affected electrical, structural, flight control, and pitot static systems. Fast forward to Fall 2013 when I approached Tom about replacing the radio. I imagined adding a second small panel that would cover the existing panel in the location of the radios. Tom suggested replacing the engine instruments as well. It took me a few weeks to warm up to the idea of extending the project to replace the engine instruments. I imagined the work involved and wondered about the risk of flying in the event of an electrical failure. Tom has been flying with a digital engine monitor for years without issue

and I overcame my reluctance to abandon the steam gauges for the display. From that point I went through a thought evolution that resulted in adding a second Skyview.

My initial upgrade plan for radios was to have two, just like my existing configuration. I knew we would need to replace the switches used to select the active radio with a real audio panel. Thinking through my desire for a second radio I realized that my primary reason for having a second radio was I could keep the first radio tuned to MIC (Crystal, MN). I used my second radio for other airports. Realizing this, and considering the cost associated with a second radio plus audio panel, I quickly came to accept having one radio with a built-in two-place intercom.



The first Dynon panel and removed center console. The button between the throttle and prop control is a starter switch. Hot engine starts with fuel injection require throttle wide open and mixture at idle cutoff. The starter can be activated with an extended finger.

By now the essential components for my panel were coming together and a wholesale replacement of the existing panel was apparent. Tom and I worked with SteinAir to source the parts and cut out the new panel. The iterative panel layout was greatly facilitated with Stein's layout tools. After about a dozen revisions I had everything laid out where I wanted. Each screen was centered with the stick and the radio and GPS were located between the screens and placed to allow room for future expansion. Switches, circuit breakers, engine controls and other artifacts were lined below the screens.

### Let the Fun Begin

Tom was right that it did not take much time to gut the existing panel, followed by much obsolete wiring. Starting in January and working weekends only (employed again) we completed the work in late April. I learned a lot helping Tom. Beyond the mundane parts like avionics and engine sensors, I learned that a project like this runs on four essential ingredi-

ents: cheap zip-ties, good zip-ties, #6 ring terminals, and at least 20' of 3/4x3/4x0.063 aircraft grade aluminum angle. The difference between cheap and good zip ties is the tab that latches the tie in place; good ties use metal. As Tom installed wiring for each subsystem he secured the wiring with cheap zip-ties. As more subsystems got installed the wiring either slipped through the cheap zip-tie, or the zip-ties got cut off or replaced. When the last wire was installed then the wire bundle was secured with good zip-ties. We had several last wires before the last-last wire was done.



The old panel removed and starting to install the new parts.

While Tom spent much time under the panel or in the baggage compartment and tail cone I fetched tools and tried to anticipate what he would need next. Tom seems to possess infinite patience in those cramped quarters doing whatever needs to be done for an installation that meets his standards. I've spent some time under the panel and I remember the overwhelming desire to get the task done as quickly as possible. Comparing Tom's installation with mine I can better appreciate that doing a job right is way more important than doing it quickly.



The old panel removed and starting to install the new parts.

When time came to apply power each component performed flawlessly. All those wires and connections worked without exception. After some investigation and tweaking of configuration settings, all systems functioned exactly as expected. The Dynon can send frequency information to the Garmin GTR-200 radio. The 496 GPS provides position to the ELT. Tom recommended a particular rattle can spray paint for the panel that imparted a gray, textured appearance that matched splendidly with the cabin interior.



I enjoy flying with the new panel. The panel looks great and all controls and switches are within easy reach.

I plan to have laser-etched placards made for labeling the switches and circuit breakers.

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

First Class

## ***Twin Cities RV Builders – Summer Gathering***

**Saturday, June 28, 11 am to ? (eatin’ around noon)**

**Bernie Weiss’ hangar, Anoka County Airport (KANE), Blaine, MN**



Join us for an informal lunch gathering courtesy of Bernie Weiss, Pete Howell, Alex Peterson, and Warren Starkebaum. On display will be several RVs recently painted by Midwest Aircraft Refinishing in Hibbing, MN. Their workmanship is outstanding!! Warren’s RV-7 is nearing completion so it will be great to checkout a new RV.

Bring along a folding chair but other than that, just come hungry!! See you then!!! **Questions or lost? Call Doug at 651-398-1184**

### **Directions:**

**From Rte 65:** Turn east on 93<sup>rd</sup> Lane NE. Turn left at airport entrance (gate code 12185). Turn right at T intersection then immediate left on India Lane.

**From I35W and Rte 10:** Go west on Rte 10 and exit on 93<sup>rd</sup> Lane. Turn right and take second airport entrance to the right and follow directions above.

**Park on grass clear of taxiways and hangar doors. Fly-ins: taxi to India Lane on west side (AKA “Fox Hollow). Park on grass opposite hangars.**