RVator's Log

Newsletter of the Twin Cities RV Builder's Group

June 2008

In this issue…

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Upcoming Events

June 28: How about an informal hamburger and brat pig-out lunch??? Warren Starkebaum will host us at his hangar at Crystal Airport. Eating starts around noon. Details on page 8.

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Minnesota Wing
Van's Air Force

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Shop Notes

Doug

Having gotten back into the building mode over the past six months, I have been playing catch-up to the "new" world of RV building. As I have said before, since finishing my RV-4 five years ago (has it been that long??), I really had not paid much attention to the innovations Van has incorporated in his recent kits. Nor have I laid awake at night agonizing over what primer to use or lamenting about all those "&*(%#&" pinholes in my cowling.

This spring (or extended winter, whatever you want to call it), I had diddled around with my empennage construction, marveling at my confidence in cranking out exemplary examples of tail surfaces thinking I could do no wrong. Back in the RV-4 days, I had a big cardboard box under my workbench that was used to catch all the messed up parts that I had bungled. The box was full by the time I finished the RV-4 tail (it still resides in my basement full of various misshapen and malformed aluminum shrapnel). The RV-7 tail, with its pre-punched, cad/cammed, computer-cut components, was rapidly coming together. It was as peace of cake.

That is until I got to the dreaded ELEVATOR TRIM TAB. Immediately I ditched the idea of bending the tab ends up, down, and around for making little bitty ribs at each end like I did on the RV-4. Years ago it has taken about half a dozen attempts to get the small ribs jest right. History seemed to be repeating itself as I struggled again trying to get the angles and dimensions just right. Finally I was happy with the ribs and clecoed the tab all together and mounted it to the elevator and all looked great. So I began to rivet the tab. From here things began to fall apart. After riveting the bottom side of the tab to the tab spar and celcoeing it all back together, it was warped big time. How is this possible? This baby is pre-punched so mistakes are impossible right?

Taking a lesson from the Hillary Clinton School of RV Building, I vowed not to give up no matter how daunting the odds are against me. I drilled out the rivets to try again this time with the plan to use blind rivets to fill the deformed holes in the skin and tab spar. The more I worked on it the worse it got. Bad memories of ruined RV-4 parts began to materialize. Finally I had to take a deep cleansing breath, swallow my pride and calmly fire up the computer, and order another tab skin and spar (Van probably pays for his motorglider with profits strictly from ruined trim tab parts). Back to the shop I admit defeat and toss RV-7 elevator tab #1 into the previously empty "screw-up box" under the workbench. I hope this box will be big enough.

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Back in December, Peter Fruehling and I ordered our QB kits together so we could combine our deliveries on one trailer. We decided to use Partain Transportation as they claimed there would be a little savings over having Van crate the kits and ship them via normal common carrier. The economy may be running behind the power curve, but that doesn't seem to be affecting Van's a great deal. We were looking at a 5-6 month backlog with planned delivery in June. So it was with mild surprise when we got a call from Vans the first part of April that our QB kits were in Oregon and ready to go. I guess the elves out in the Philippines can put a QB kit together in no time!

The entire delivery process fell into place with amazing speed. Right after Sun N Fun, we got an email from Tony Partain that his driver was ready and would be leaving on Thursday, April 24. He predicted 3-5 days to make the trip from Portland so we were expected an arrival either Sunday or Monday. Of course, about this same time, the price of diesel fuel was shooting through the roof so the original shipping quote had grown by $300. But what can you do?

On Saturday evening, April 26, Peter got a call from Partain's driver, Orin that he was here!! He claimed a big tailwind all the way as he chased a snowstorm across the county. We made plans to meet at Peter's house around noon on Sunday to off load his kit and then deliver my kit to my house in Wisconsin.

I arrived at Peter's home in North Oaks at noon and Orin rolled up shortly thereafter. The rig was interesting in that its trailer is a very large auto carrier pulled by a normal tractor-trailer. Orin was on a 3-week trip with stops in Minnesota dropping off our kits, and then picking up parts of a Cub in Brainerd, and then on to the east coast to drop off a couple finishing kits and a tail kit and then back to Oregon picking up a couple cars for the return. 36 hours at home and then he'd be on the road again. Orin said the 5 rigs of Partain Transportation are now delivering 90% of Van's large kit shipments. Amazing!

Partain will go anywhere. Orin tackles Doug's driveway.

With help from Peter's dad and Nancy Burkholder, we off-loaded Peter's fuselage in short order and then we headed for my home in Hudson with Orin in tow. Peter come along and I had a neighbor come over to provide the heavy lifting. I have a rather long drive surrounded by trees so I was convinced that we would have to carry all the parts down the driveway, but Orin figured he could back down right to the shop (after he told us of some of his harrowing delivery experiences, I guess my drive was a piece of cake). Watching Orin weasel this rig around and back down my driveway was amazing. I couldn't back a trailer like this in a zillion years.

Less than an hour after arrival, the new RV-7 QB kit was safely snuggled in my shop and Orin was on the way to Brainerd. We marveled at all the cool pieces that ARE ALMOST FINISHED!!!! At least it seems that way. I think this is going to be fun!!

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Gary's RV-10 is Airborne!

Gary Specketer reports the recent first flight of his RV-10. This is the third MN Wing RV-10 that has been completed. His report…

"This is an all electric aircraft. Two alternators, two batteries, two busses. The PFD and MFD are OP and the back up system is a Dynon. It has Tru Track autopilot and Advanced Flight Systems AOA. The Engine is a Barrett cold air induction and Aero Composites prop. It flies great and is almost impossible to mess up a landing!

I started construction in Sept 2004 and have worked on it winters only until now. I also moved it from Florida to Georgia. That move slowed me down a bit. This is the 5th aircraft that I have test flown. Dragonfly, Two Glasair III's, a Glastar and now the 10.

Another Ambitious Project – Part II

-Tom Berge, RV-7A

In the last issue I detailed an ambitious project of replacing my stock Van's cowl with a James Aircraft Holy Cowl in the attempt to cure persistently high CHT temperatures. Here are a few notes on the conversion as well as the related performance changes.

I started the project around the middle of February expecting about a month of downtime. The basic cowl install was pretty straightforward with few issues. The pressure plenum and carburetor air box turned out a little different. The biggest issue with the plenum was it did not fit the cowl. The inlet spread on the plenum at 24" did not match the cowl openings at 23.5". I noticed the difference early on, but stubbornly kept fighting it, knowing full well what I had to do. The actual fix was a very simple splice. Another issue was my two heat muffs required two flanges to draw fresh air. One was located behind cylinder #3 and the other was located in front of cylinder #2. With the Holy Cowl, the #2 cylinder location disappeared. There was no other place on the baffles to draw from. I found a right angle 2" fitting from Aircraft Spruce (part # 08-00863) and after some modifications, mounted it in front of the oil cooler on top of the plenum. This location gave me about ½" clearance from the top of the cowl and required a new routing for the scat tube.

The air box needed to be modified to accept a round inlet on the cowl to a "D" shaped inlet on Van's box. Getting the lineup correct was challenging but manageable. The worst part was drilling out forty 470-3 rivets to take the box apart. The carburetor heat flap system had to be moved further back. The baffles also needed to be removed to modify the gaps under the cylinders. James Aircraft wanted an opening of 2.25" for the heads and 1" for the barrels.

The cowling has just as many pinholes as Van's and the filling was the same pain in the rear. I have always chosen to use the piano hinge method of attaching the cowl and have had good luck with this system. Unfortunately, this cowling was perhaps the most difficult for tight pins compared to the previous cowls I have built. In Van's instructions, it is noted that after a few hours of flying, the pins loosen up. The problem was getting the darn things in to go flying. Yes, I know, a drill works wonders.

So what did the roughly $2000 conversion get me? The weight increased a total of 3.86 pounds. Of that, the nose gear fork, which I switched out according to Van's SB was lighter by 1.26 pounds, so the Holy Cowl adds about 5 pounds. The first flight yielded a speed increase of 5 knots while the cylinder head temps went up. Wait a minute! My main reason for doing the conversion was to lower my CHT's AND THEY WENT UP! This was certainly not what I had expected. Cylinders 1, 2 and 3 went up 10 degrees F. Number 4 went up a whopping 19 degrees F. How about that?

There were some differences that may explain some of the temperature rise. On my original cowl I had cut back the exit air scoop as well as added louvers from Vans'. The original opening is about 56 square inches. The louvers and cutback added another 28 square inches, so a 50% increase. I had also opened up the baffle gaps under the cylinders to get more air moving through and then closed them back to the specs that James Aircraft recommended. I have heard two different theories on this. One says to get more cooling I should have reduced the opening, thus slowing down the airflow to transfer more heat. I subscribed to allowing more air to pass through and I really don't know which theory is correct. After my initial test flight with the Holy Cowl, I again opened up the barrel gaps from 1 inch to 1.5 inches and the cylinder gaps to 2.75 inches. The temps did drop about 5 degrees, but still nowhere near what I was hoping for. Another test I ran was a manometer test which measures the pressure differential between the top and bottom of the engine. Somewhere I recall hearing that to get adequate cooling, a reading of 5.5 inches of water is required. I built an instrument that would record 9.5 inches and promptly blew my measuring fluid overboard while still in the climb. I guess I'm getting good airflow through my system!

So now what? I tried disconnecting my manifold pressure line in flight to force the Lightspeed ignition to retard the timing and this dropped my temps 4 degrees. Timing seems correct. As of this writing, my temps on #4 will run about 380 to 390 in cruise with an OAT of 60 degrees F and lean of peak. As soon as I richen up the mixture, the temps climb over 400 degrees F. At least with Van's cowl I could just keep it below 400. I suppose I could open up the exit area again as well as add the louvers, but will only do so out of desperation. One last option is kind of sneaky. My hottest cylinder is #4, and it IS the cylinder. I know this from the fact that when I had Superior cylinders, #4 was my coolest. After changing out to ECI

cylinders to solve an oil consumption issue, #4 became hottest. Cylinder # 1 is my coolest cylinder now. Perhaps a switch would put the hot cylinder out front where it can get better cooling. Talk about desperate, but what have I got to lose? This summer will be a challenge. Of course, with the never ending rise in fuel prices, I'll be running very low power, very lean and probably won't have temp issues anyway!

While the experiment might seem like a waste, and to some extent it was, I did gain speed. Now it was very expensive speed, but what speed isn't? And while beauty is in the eye of the beholder, I definitely love the new look. I would certainly recommend the cowl on a new project, but think the cost for a retrofit doesn't make sense unless, to you, speed is everything. To some, it's the only thing.

Final Engine and Performance Data

RPM	2600		Pressure Altitude	8500		IAS	159 kts
Manifold Pres.	22		OAT F/C	24/-5		TAS	179 kts
Fuel Flow	10.5		Oil Temp	195		GS North	182 kts
CHT #1	357		EGT #1	1332		GS East	174 kts
CHT #2	366		EGT #2	1408		GS South	171 kts
CHT #3	353		EGT #3	1356		GS West	178 kts
CHT #4	376		EGT #4	1314		Average GS	176 kts
TO Weight	1606#		Test Weight	1585#			

The Wonderful World of APRS
(or Where in the World is Pete?)

- Pete Howell, RV-9A

Background

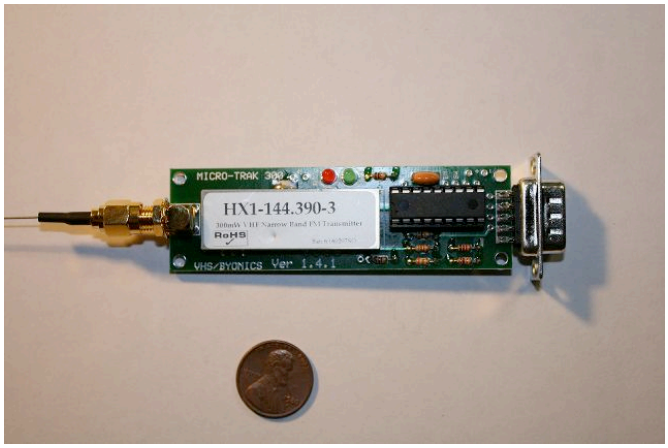
Alex Peterson thinks I am a Geek. If that means continually modifying and adding to a perfectly good, flying, airplane, then I am guilty as charged. It was in the spirit of his geekiness that I started investigating amateur radio technologies as an addition to my RV-9A. I have always wanted a gizmo that would allow people to track me real-time while flying. I thought it would be nice for my wife to be able to see where I am, or have relatives know when to pick me up when I'm inbound on cross-countries. There are some commercial satellite trackers that are really cool, but they have expensive subscription fees, and those of you who know me, I am home-brew kind of guy. That, and I hate subscription fees. (I am a wee bit on the frugal side -I can thank my mom for that.)

Amateur radio enthusiasts have developed something called **APRS Automatic Position (or Packet) Reporting System**. In its basic form, it uses a small transmitter to send your location and altitude (from GPS) to the Internet using ham radio repeaters and eventually an Internet connection called an I-gate. The information shows up on a Google maps interface on the web in near real time. (aprs.fi) The best part - it is free! Using this system requires a Ham radio license, but I found that easy to obtain by passing a 35-question multiple-guess test and paying a $14 fee. (Seriously, if you can build an airplane, you can pass this test with virtually no studying.)

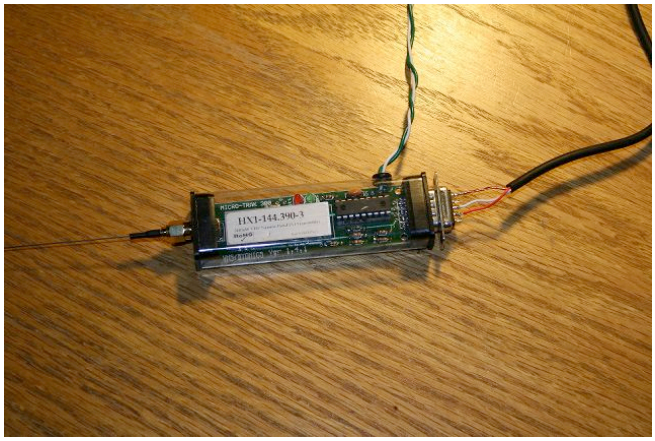
Building and Programming

First, I ordered an APRS gizmo (Microtrak 300) as a kit and built it. You can buy them assembled as well. The kit was fun and easy to build. I added a puck GPS and antenna. Total cost. ~$185 delivered.

Here is the gizmo - it is a tiny transmitter and the device that encodes the GPS info into packets, all on the same circuit board.

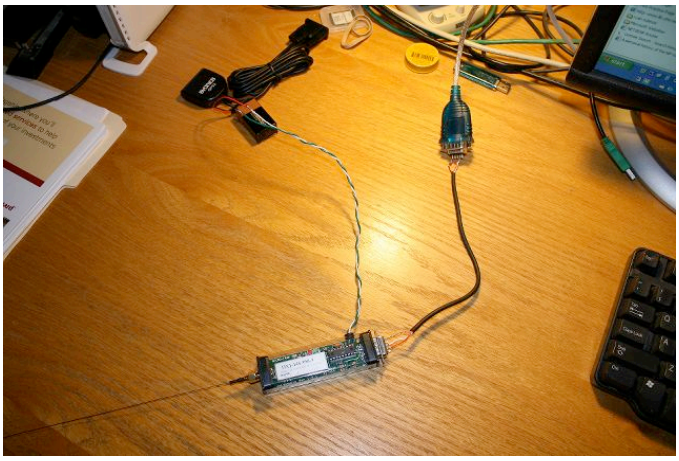


Here it is after I packaged it:



The unit connects to your PC for programming using a small Windows program and a programming cable you make. You

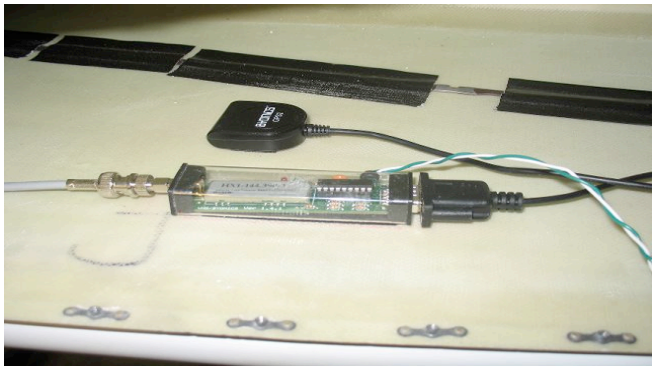
program the unit to tell it how frequently to send position information and also to provide your license information that has to be broadcast every 10 minutes or so. Here's a picture of programming the unit:



At this point, the unit was ready for installation in the RV.

Installation

I wanted a quick and easy install of the APRS tracker, so I chose a self-contained wingtip location. The thing weighs about 6 oz and is darn close to the CG, so weight and balance is negligible. All it needs it a few amps of 14V power when transmitting. I pirated power from my homebrew LED Nav lights to keep things simple. The wires are right there and the switch is already in the cockpit. The GPS gets its power directly from the circuit board, so power connection is dirt simple. A 2-pin Molex connector makes removing the wingtip a snap.



Keeping with the roll my own theme, I built a 2-meter antenna for APRS based on a design I found on the web. This antenna is made out of 300-ohm twin lead TV antenna wire, some coaxial cable, an SMA connector, and some strategically applied heat shrink.

My high school aged twins and I made and sold over 60 of these to RV enthusiasts on the Internet. If you want to build one, you can find the design at this address:

http://www.scribd.com/doc/267393/An-...VHFUHF-Antenna

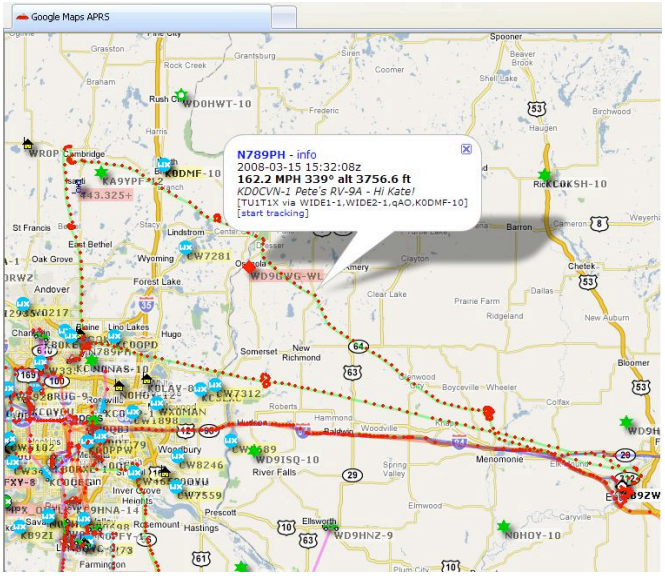
The antenna is held in place with Gorilla tape and the GPS and transmitter are attached with Velcro. The entire install took about two hours, and is completely reversible. (No holes)

Tracked!

The install done, it was time to go flying. Operation is simple, pull out of the hangar, start the plane, turn on the Nav lights. The tracker automatically acquires GPS signal, and begins transmitting. I was unsure what to expect, but was pleasantly surprised to see that my entire flight had been captured and was easily reviewed on the Internet when I got home. Even more surprising, I was able to send signal to stations over 100 miles away with the tiny transmitter!!

Here is what showed up in real-time on the web:

http://aprs.fi/?call=N789PH&mt=m&z=11&timerange=3600
(latest flight)



here it is in a picture of the mandatory feedbag flight to Eau Claire:

So there it is. Yep, it's geeky, but it's also pretty cool. I think there are some pretty nice safety aspects to it as well. In light of what happened to Steve Fossett, anything that can show where we are and might give rescue personnel and idea where to look should something unfortunate happen, is a good idea. I added "turn on NAV lights" to my startup checklist, knowing full well I can go to "stealth mode" at the flip of a switch

I had a lot fun making and tweaking this thing. I also learned about Ham radio and met some guys in the local amateur radio club. They are a lot like experimental airplane guys, friendly, and looking for a better, cheaper way to do things.

If you are interested in finding out more about APRS, Vans Air Force on the web has a complete section devoted to it.

http://www.vansairforce.com/community/forumdisplay.php?f=104

If you're looking for equipment to get started, here's the place to go:

http://www.byonics.com/microtrak/

Feel free to drop me a line with questions as well at:

pete.howell@gecko-group.com

Another "Homebuilt" Headset

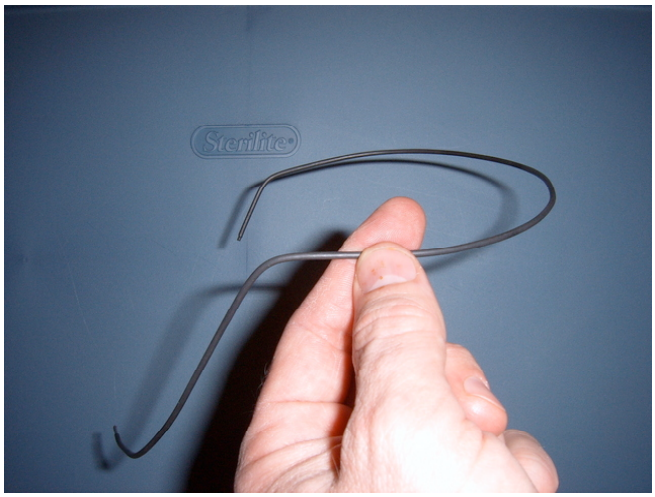
--Travis Hamblin, RV-7A

I made my own "In-the-Ear "headset using piano hinge wire, heatshrink, and parts scavenged from an old headset and decided not to have a junction box at all. I bought the Comply High Tech Noise Reduction NR-10 earphones on sale for $39.95 (normally $79.99) at:

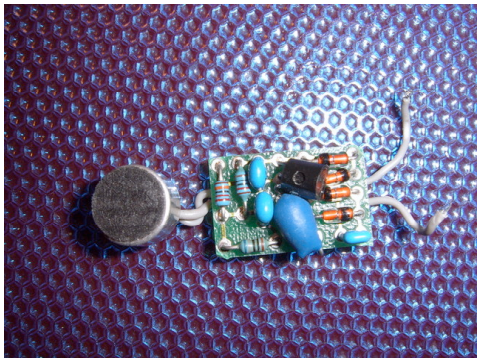
http://www.harriscomm.com/catalog/pr...ducts_id=19138.

I scavenged the noise-canceling mic and .206" mic plug from an old headset that hasn't been used in years. I left the mic and the noise-canceling circuitry in place and just made an aluminum backing plate that used JB Weld to fix the mic, circuit board and rod from the do-it-yourself headset boom. It was a simple and effective way of mounting the mic. Note that it is all hid by a foamy mic windscreen. For plugging in the earbuds I used a 1/8" to 1/4" adapter from Radio Shack, for under $5.00. I am using this as my prototype and will make a final one with all new parts that fixes anything I think needs adjusting in the prototype. Below are the pictures and my performance evaluation after a couple hours of use.

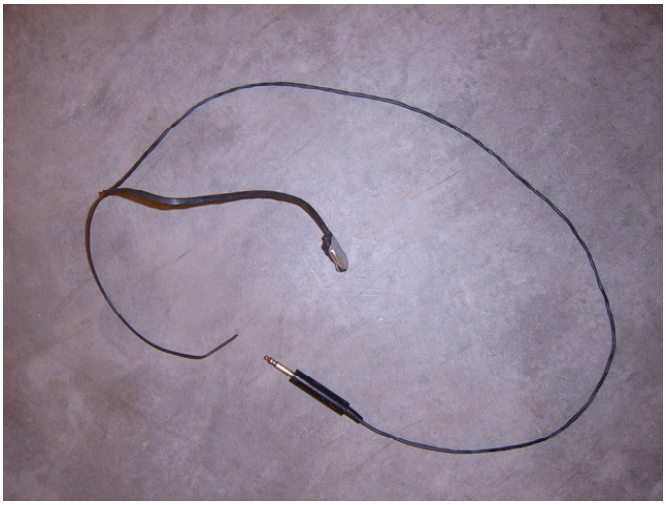
Here is the bent piano hinge covered in shrink wrap:



Here is the mic I tore out of the old headset:



Here is the completed Prototype #1 headset without the foam windscreen on it (notice it plugs straight into the .206" mic plug with no "project box needed":



As for the performance, it was AWESOME! I had no problems with the mic or the earphones. In fact, with the NR-10 earphones it was dead silent in flight even in my VERY noisy RV-7A. I have owned ANR headsets and even flew with the $1,000 Bose headsets and these earphones blew them all away. They are VERY comfortable. As for the prototype headset, it worked great, but I did notice that when I moved my head around it would move a little and every once in a while I would have to adjust the booms position. But it was VERY comfortable and I have learned how to make the next one so it doesn't move around. The only problem I have had is that the earphones are so good that they are 300 times more efficient than stock headsets.

So when I took a friend flying yesterday with conventional headsets on I had to turn the radio volume real high for those headsets to hear at a normal level, I then had to adjust down the volume on the Comply NR-10's with the inline volume control on the unit so that it was all the way down so that the volume was comfortable for me. So I have deduced that in order to make all things equal I will have to have my passengers use the Prototype #1 headset and I will make a second set for me (Prototype #2) so that we are on the same page for volume and mic and all the other settings. Besides, after flying this way I will NEVER go back to normal headsets!!

So on to Prototype #2, I had to adjust the headband a little so I would have a headset that doesn't move at all. I also decided not to scrap any more headsets for parts and to just buy new parts from Aircraft Spruce. SO I ordered the following:

11-00702 .206" COMMERCIAL MIC PLUG $6.95
11-04838 HEADSET MICROPHONE A1060 BLACK $17.50
11-04840 HEADSET MICROPHONE WINDSCREEN $1.50

I will add these parts to my new Prototype #2 headset, along with another pair of NR-10 earphones on sale for $39.95. So for $65.90 I will have a totally new unit with earphones, that is a modification of the first unit, and should stay in place REALLY well and last probably forever! Below is a picture of the now bent and ready for completion Prototype #2, I changed the bend around the ears and had it drop down a couple inches so that it goes beneath the protruding part of the back of my skull. This seems to make it stay in place a 100 times better. I also moved the wire exit point from the back of the unit to the front (ala my Halo headset); this is much nicer to me. Check out the pics:

This is the mic that ACS sells and I will install on Prototype #2, although a new foam windscreen will cover it:

This is Prototype #2, the mic will mount at the end where the two white wires now come out (missing mic, windscreen and mic plug), note the change in the shape of the headband:

I can't wait for the UPS guy to come this week with my Aircraft Spruce parts, probably only take about 20 minutes to make a couple solders and such and I will be in business! I am truly sold on these in In-the-Ear systems. I bought a Halo headset http://www.quiettechnologies.com/ a couple weeks ago to try out and I must say it is a GREAT system, although I will not be keeping it. I like the fact that he used the hearing aid technology, but the flopping tubes drive me crazy!! The manual for the Halos says not to cut them down that they have to remain the length they are. That is too bad, it just bothers me for some reason. The one thing I did not try is to put the Comply tips on the Halo headset; it would probably be a great improvement to the Halo. The stock Halo earbuds kill a lot of the noise, but they are NOWHERE near as good as the Comply tips. For you die hard Halo users you might want to try the Comply tips on your unit, if they fit you will instantly fall in love! For me, the Halo's are a very competitively priced at $349.00, but for my money the do-it-yourselfs I made are as good, or better than, the Halo's and are about $300.00 less in price.

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First Class

Minnesota Wing June Meeting

Sat. June 28, 2008, Noon to ??
Warren Starkebaum's Hangar
Crystal Airport, Crystal, MN

Our June program will be essentially no program (sounds innovative to us!!) Warren Starkebaum has graciously invited us to his hangar and the plan is burgers and brats on the grill. Don't worry about bringing anything. Just grace us with your presence, come hungry and enjoy the gathering. The club will handle all the details and if there is a plan, it will be socializing around lunch and talking RVs. We should have enough chairs but feel free to bring a lawn chair, just in case.

Pete Howell will have his RV-9A on display and geek hat on explaining his APRS system to any innocent by-standers hanging around (and he'll have some antenna units and receivers for sale as well)

And… Tom Berge will bring over his RV-7A and show off his super-duper Holy Cowl and engine plenum

Fly-Ins are welcome also… taxi to _____!!!!!!

Driving directions:

INSERT!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

SEE YA THERE!!!!!