THE RVATOR

FIRST ISSUE 2010

THE HOBBS METER

6,670

COMPLETED RVS

"I-GLCK is flying and I feel the happyness of old times when I was in the Air Force, flying fighters." Glauco Nuzzi, Rome, Italy.

FILLING UP AT A DIFFERENT PUMP

If you haven't seen it yet, look it up! Under editor Marc Cook's supervision, *Kitplanes* magazine has taken more of consumer-reports, "yeah, but does it work in the real world?' approach — and here's an example:

The cover article in the April 2010 issue, written by Van's chief engineer Ken Krueger, covers Kurt Goodfellow's diesel (yes, diesel!) powered RV-9. Kurt engineered his own installation of the British WAM-120 inverted three cylinder, two-stroke, turbocharged, supercharged, liquid-cooled, direct-drive heavy fuel engine.

As Ken says, Kurt is a "good wrench" with extensive diesel experience and he's come up with a very tidy installation.

Kurt's RV-9 weighs and flies very much like an O-235 powered version, but of course, the forced induction allows it to retain power better as it climbs.

The article contains details of Kurt's airplane and the results of a "same-day, same-way" fly-off with the factory O-320 powered airplane.

Good read!

SPACE CADET

FLYING THE "HEAVY GLIDER" WITH VAN

PAUL DYE

Facing a few more switches and displays than he's used to, Van prepares to fly the Space Shuttle.

Over the course of my flying career, I have had the opportunity to fly with guys who were the top in their class at test pilot schools. Now, I had the privilege of flying with a fellow who needs no introduction here – Van himself! The occasion was a visit to mid-winter Houston, which meant that the weather was pretty bad – but that was fine, as we weren't going to be flying in it anyway. We were going to be giving it our best in the world's only Space Shuttle Motion Base Simulator.

Late last year I offered Van a tour of the NASA facilities here on the Gulf Coast if he ever got by, and it turns out he was going to be passing through after a soaring convention, so he called to take me up on the offer. Getting approval to fly guests in the "Base" is not easy, but with enough prior arrangement I was able to book a couple of hours (cancellable at any time due to a higher priority user) for a demo flight. Van brought along a couple of family members, and it so happened that Doug Reeves was available to come and take a few pictures. Louise wasn't about to be left out, so we had a full house! We had to be out of the building on time, as the prime crew for this weekend's launch was coming in later, and strict quarantine is being observed.

I invited Van to try out the left seat as I settled in to the right, and the others strapped in to the "jump seats." Five point harnesses all around, as our first and most important goal was safety. Watching this machine lurch around the big simulator bay from the outside is enough to convince anyone to cinch down on those straps -- it can hurt you if you're not careful! Our first run was one unique to the Space Shuttle – a launch and ascent to orbit. That's going to orbit in just eight and a half minutes from a standing start.

With everyone secure, we had the operator pull the chocks, lower the ramp, and take us to "extended pitch". Extended pitch is a little different than what you might be used to in a simulator – the cab rears back to an almost vertical orientation, and everyone ends up lying on their backs. Out the left window, the Florida coastline and launch tower is visible. "Go for Motion, go for Run" I call, and the countdown clock resumes at 2 minutes. All is peaceful until the engines start to spin up

No matter what you're flying, arriving on the centerline is a good thing.

At right: Van and Paul Dye share a smile in the world's fastest glider.

at T-6 seconds. The displays come alive to show the thrust building to 100%. When the clock hits zero, the solid fuel boosters light, and off we go! The disconnect from the earth is sudden and quite shaky – solids burn in a way that makes the vehicle feel like you're driving fast over a poor gravel road. The tower disappears quickly, and we roll to the launch azimuth, heads down and going like scat!

Hands off, we monitor the systems as the vehicle does its thing, accelerating through Mach 1 in less than a minute. At a little less than two minutes, we feel the thrust diminish from the solids, and with a bright flash in the forward windows, they're gone. The liquid-fueled main engines push on, smooth as velvet, building acceleration as the vehicle lightens. Pushed back in our seats, we watch the Mach number and altitude climb, then see the trajectory knee over as we leave the greater part of the atmosphere below and begin to accelerate horizontally. With a minute to go to engine shutdown, we feel the maximum G's as the vehicle lightens - the engines throttle back to keep us in limits, then shutdown on time. "Welcome to orbit everyone" I call out….and then ask the operator to turn us around and get ready for some landings! After all, flying uphill is very cool, but landing the shuttle is the secret dream of most pilots. The "World's Heaviest Glider" is something you have to experience to appreciate.

It took just a couple of minutes for the operator to turn us around for a "50K" reset. "Van, this one is going to be all yours", I said. " We'll be coming out of reset about 50,000', having just crossed over the runway and headed towards the Heading Alignment Cone (HAC) – think of it as a continuous turn to final from an overhead approach. Look through the HUD, put the little airplane symbol on the guidance square, and don't forget to enjoy the view as we land in about 4 minutes!"

Van is, as you would expect, a very good stick. As the sim came alive, I punched off the autopilot and suggested he do a couple of pitch and roll doublets to see how it handles, and it was evident he was used to 'first flights' – he had a very smooth and gentle approach to flying. As we approach the HAC and the guidance asked for a roll, we smoothly banked to about 45 degrees and tracked as if we were on rails. As we slid around the final few degrees of turn and on to final, I called the runway way up the top of the windshield – it tends to appear there when you are on a 19 degree glide slope! Dropping through 10,000' on final, about 5 miles from the runway at 300 knots (+/-), I briefed Van on the "preflare" coming at 2,000'.

"The pre-flare is a 1.3G pull on to a final glide slope of about a half a degree. You want to cross the threshold at about 60 feet, and then not mess with it, as PIO is very common if you try to sweeten the landing in ground effect. You'll cross the fence at about 260 knots – be ready for the speed! I'll get the gear at 400', and deploy the drag chute after touchdown. End the pre-flare with the velocity vector a hairs-width below the horizon, and you should be about right." We were down to 2,000' in the time it took for me to brief all that, and the Shuttle responded to Van's touch as we entered the preflare, smoothly changing our aim point to the runway (we had been aiming about 7,000' short due to the planned excess energy), about 2500' down. I called altitudes,

After a lifetime of keeping his designs as simple as possible, Van contemplates the complexities of an aircraft that uses a room full of people and equipment to fulfill its mission.

dropped the gear, and we settled nicely to a gratifying "chirp" of both main trucks. "Chute is out, 180 knots, de-rotate" I called, and Van pushed the nose down gently to plant the nose gear, steering us to a final stop using brakes as required. The combination of visuals and motion create a very good illusion of flight – enough to keep you holding the brakes after touchdown, even though the simulator has stopped and is turning around for the next run. "Congratulations Dick – you landed the Shuttle on your first try!" I said, as we shook hands and got ready for another approach. I was not surprised that an experienced glider pilot like Van would have little trouble with our "heavy" – even if the speeds are five or six times what he's used to.

In the hour we had left, we cycled everyone through the left seat for a landing or two, and I only had to touch the stick on my side a few times to nudge things back towards center. Doug and Louise both had very nice touchdown parameters, and no electrons (or hydraulics) were hurt in the simulated world in which we were cocooned. We finished up the session by rearing back for one more ascent – but this one had a "flaky" center engine. In fact, it was so flaky it quit on us just after we got rid of the solids. (Maybe because I pushed the 'Center Engine Shutdown' button, but that's just a guess…) This put us in the precarious position of needing to do a Return to Launch Site Abort, or RTLS. You know the "Impossible Turn"? In the case of the Shuttle, this means climbing to almost 400,000' while reversing your velocity to head back to the Cape. In the big resulting "outside loop", you change from going east at about 8,000 knots to going west at almost the same velocity.

When the big external tank is almost empty, the remaining engines shut down, and we got rid of it with a little pitch maneuver, then recover our angle of attack and begin flying like a big supersonic glider. When everything works right (and this day, it did), you end up with enough energy to glide back to the KSC runway and land like before. I let Dick take over about Mach 2.2 to get a little supersonic stick time, and he made the normally buffeted ride as smooth as possible. Things smooth out once you get subsonic, and we made the runway nicely. One more Shuttle saved for another day! (It does raise the question of how you log the time though – it might be the world's only multi-engined motor-glider…)

It was wonderful getting a chance to share my day-job flying world with a guy who has given us all such great flying machines to play with in our leisure time. With the Shuttle program coming to an end, I was really pleased that he was able to make the time before this magnificent simulator joins our other space program relics as a historical monument, never to heave its mighty mass about the building again. Van proved what I always say – flying is flying, no matter what the machine. You treat the airplane with respect, concentration, and dedication, whether it is a Cub, an RV, or the Shuttle…and with a smooth touch, they all contribute to the eternal joy of flight!

VAN ADDS:

A session in the SSS was a unique and rewarding opportunity. I can't thank Paul enough for going out of his way and arranging for this. I approached this opportunity with both eager anticipation and trepidation. I had heard lots of stories about pilots "crashing" simulators----hard on egos, even if the flight equipment remains undamaged. Fortunately, with Paul's coaching, I didn't wreck anything. I must also thank Paul for his gracious comments in relating my flying skills. He's a good PR man, and has agreed to keep my flight traces as confidential.

What's it like to fly the Shuttle Simulator? Probably somewhat like a very sophisticated computer game. In fact, I suspect I could have done better if I had experience with computer games. The control stick did not have the aerodynamic feedback which I am used to and has a 1/10 second reaction delay. Flying is largely a matter of reacting to images and indication on the windscreen and HUD. That said, it was a blast.

The Space Shuttle is sometimes referred to as the world's heaviest glider. Most of you know that I fly sailplanes. A performance comparison (contrast?) might be interesting. The Shuttle has a glide ratio of 4.5 to 1. In my new Antares Sailplane it is 56 to 1. The shuttle has a sink rate, at low altitude, of around 10,000 ft. per minute. For the Antares it is less than one percent of that: 96 fpm. In the four minutes the Shuttle takes descending from 50,000 ft. to touch down., the Antares could land too – if it started the descent at 400' AGL! If I could get the Antares to 50,000 ft., the descent time would be-----well, I could get a good start reading War and Peace on the way down. The final approach angle of the shuttle is 19 degees. vs. just under 1 degree for the sailplane. At its max. L/D speed of 70 mph, my Antares will lose just under 100 ft. per mile. From this, it should be obvious why I like to fly it… but then, the real life Shuttle would be fun also -- though I doubt that I could afford the insurance. I really envy the Astronauts.

"NEW BLUE" HEADS FOR FLORIDA

MITCH LOCK

The LSA Expo in Sebring, Florida, though just a few years old, is quickly becoming one of, if not *the,* premier event for the Light Sport Aircraft movement. All of the major players in the game were going to be there, so it was time Van's Aircraft entered this arena. This was also going to be the first major event at which my RV-12 *New Blue* was to be displayed. I couldn't wait to get there.

Jill and Dave got off from Frederick, MD, a bit later than I did so I had some time to relax. A quick sandwich and a tour of the military aircraft they have on display at the museum helped pass the time. They arrived at 1100 and with a quick pit stop and refuel, we were ready to head south. First stop was to be Waycross, GA, 280 nautical miles away. At last, we had a chance to make a true wing-to-wing comparison of the RV-12 and another LSA. Hickory Airport is in Class D air-

Build it and they will come...although maybe not all at once. Set up day at the Sport Aviation Expo.

Opening day was January 21st, with the 20th set aside as vendor setup day. So, at 0700 on the 19th I launched into a crystal clear sky and calm surface winds from my home base in Maryland bound for Hickory, NC. There I was to rendezvous with Jill Tallman and Dave Hirschman of *AOPA Pilot* magazine flying AOPA's Remos GX. I was plagued with head winds, no matter which altitude I tried. I finally settled in at 4,500 feet as the best compromise. The Dynon autopilot tracked straight and true for 272 nautical miles, and we cruised at a true airspeed of 115 KTS, burning 5 GPH at 5,200 RPM. GPS ground speeds never rose above 105 KTS, sometimes dipping to around 95. Oh, well. My headwind was a tailwind for someone else. Time was 2:55 and took 15.3 gallons to fill the tank.

space with a broad runway, so we decided to takeoff as a flight of two. Jill was left seat in the Remos, Dave did the talking with controllers, and I was to fly wing. We briefed to do tandem takeoff with the rest of the flight being well separated but together. Now, to be fair, they did have two aboard, but I was pretty well loaded too, taking what I needed to represent Van's at the Expo, plus my personal stuff, laptop, etc. They lined up on the left side of the runway and applied full power. I counted to five and went full throttle. Observed rolling distance was just about the same, with the 12 taking a bit less. The first difference between these two airplanes quickly became apparent. As soon as I became airborne, I had to pull the power back to 4,000 RPMs from the normal 4,900 or I'd blow by them. I liked this.

Variations on the LSA theme, both powered by the same engine. Dave Hirschmann traded his RV-3 for AOPA's Remos, while Van's Mitch Lock flew the RV-12. Slowly.

We decided to stay low at 3,500 feet for the leg. Winds were light but still somewhat on the nose. Once level, I set my power setting to the usual 5,200 rpm. From my position about ¼ mile back and to their right, I didn't just creep up on them. I blew by them. I was going significantly faster even though they had set cruise power to 5,300 rpm. I fiddled with my power setting until I maintained their exact speed. Anything over 4,700 rpm, and I'd walk away. I liked this even more.

The weather was about as VFR as it gets on the East Coast during winter. Temps in the 60s, almost unlimited visibility, and a slight wind out of the west. We stayed within a mile of each other the whole leg, landing in Waycross in 3:15. Comparison of the fuel tickets showed the RV-12 burning 12.3 gallons vs. 16.5 for the Remos. Now I was really lovin' life.

Our last leg was from Waycross to Sebring. We landed right at dusk, giving the newly installed lighting kit its first try. This wasn't the first time I'd raced the sunset to a destination in the RV-12, but now it didn't matter who won. It had been a full day of flying and the call of a good meal and a bed was just too inviting to take time to refuel that evening. I'm certain the disparity in fuel burned was just as dramatic.

The 20th was vendor setup day so after I planted the RV-12 in front of the tent and arranged all of my handouts and literature. I got my only real chance to wander around and see who showed up. As promised, all the manufacturers were represented. You know, some of these LSAs are pretty good lookin' airplanes. I'd love to have a chance to compare their flying characteristics to the Twelve, but this is just not the place for competitors to get demo rides. (The Tecnam team in Richmond, VA have asked me to come down and trade rides some time this spring. I'm really looking forward to that. I'll let you know what I find out.)

The first two days of the Expo were pretty much what I had expected. Traffic around the airplane and thru the tent was steady but not overwhelming. I had four demo rides scheduled for each day but had to cancel them all due to high winds. Maybe I was being a bit too conservative, but then again, who do I work for?

Two years ago, when I finally convinced Tom Green to bring me aboard, he gave me a solid warning, "Be prepared for an onslaught of humanity." It finally arrived on Saturday with a flood starting right at the gate opening. People were two and three deep around the airplane all day long and most were not just the casual 'show me what you got' types. They were honestly interested in the RV-12, wanting to know what it really takes to build one, and of course, I always get, "What does it really cost?" The folks who have been around kit building for some time were most amazed by two things: First, that the kit comes with *everything* you need to make it fly and second, the completeness and quality of the construction plans/manual. Builders of some of the other E-LSA kits were actually astounded by what Van's has produced. Some of them didn't talk to me directly, but you could tell by their wishful stares at the plans that this is what they wanted, but didn't get.

Of course, most of our competitors made a pass through at one time or another. All were friendly folks who believe, as we do, that a sale of any aircraft is good for us all. One fellow with a vendor's badge walked around and around the airplane. When I finally got over to him I met Randy Schlitter of Rans Aircraft. Real nice guy and with compliments for the RV-12. He even regaled me with stories of Van and the friendly competition they've enjoyed over the years.

The day ended with four demo rides. Two were present RV owners who were about to turn the page to the LSA chapter of their flying lives. The other two had

No grass, no crowds, and the howling in the background comes from race cars rather than jets...so, no, it's not Oshkosh. It's the LSA show in Sebring, Florida.

Mitch reports that things picked up on Saturday.

never flown in any RV before, if you can imagine that. Both were astounded at the control harmony, light touch and stability compared to some of the other LSAs they had tried over the last few days. I told them that all RVs fly like this. Both said, "Now I see why there so many RVs out there." I just smiled.

Saturday evening brought the arrival of Scott McDaniels and Ed Chesney, the prototype gurus at Van's. They were to attend the Rotax School at Lockwood Aviation the following week. This marked the first time anyone from the Left Coast office of Van's had seen *New Blue*. I can't say I wasn't a bit nervous to have the lead guys in RV building critique my work. I suppose I passed inspection for I never saw Scott or Ed purse their lips, point at anything and shake their heads negatively.

I'd never seen *New Blue* in the air, because, until this day, I'd always been in it whenever it flew. I wanted to see it in the air and getting them to fly it wasn't difficult. The first thing that struck me is how quiet the engine is. I missed the fly-by they made at 1,300' because I didn't hear the airplane coming. I was also impressed by how bright the nav and landing lights were in the twilight. Good system. I'll put this system in any subsequent RV I may build.

The return home was scheduled for Monday. However, a large cold front was moving up the East Coast triggering heavy rains keeping me in the Florida wintertime warmth one more day. Drat! Again flying with the AOPA folks, we launched Tuesday morning. The front had made its way quite far north so it took a while for us to catch up with the gusty winds that are always on the back side of a frontal passage. Landing in Baxley, GA with 13 knot, slightly gusting, winds almost directly down the runway was hardly a challenge for the 12. The next stop would be Danville, VA. After about half an hour in the air, Dave radioed and asked if I wanted to go on ahead. We all wanted to get home and he knew I was holding back to stay with them. He didn't have to ask twice. We said our goodbyes over the airwaves and I pushed up the throttle.

The ASOS at Danville warned me of quartering winds to my left at 17 knots, gusting 25 for runway 35. Oh boy. Piloting test coming. I gotta say, the little airplane did me right with more than enough rudder to stay straight, both of us doing our parts. My prayers for a tailwind were finally answered on the final leg home. With groundspeeds of 140 knots, the last 170 NM took just a bit over an hour.

The whole experience was tremendously satisfying for me. The open arms of prospective builders, getting to know Dave and Jill and having Scott and Ed there were the highlights. I was also happy to find that the RV-12 is not just a short-legged day-hopper, but a comfortable cross-country flyer, albeit slower than my RV-8. Taking in half of the eastern seaboard at 3,500' reminded me why I started flying in the first place.

It's hard to imagine having had a better trip, but with Sun 'N Fun coming soon and Oshkosh on the horizon, I'll try.

ROTARY POWER IN AN RV-7A

DENNIS HAVERLAH

I've owned several different certified aircraft during the past 35 years of flying. Based on that experience, I conceived the desire to build a small, fast, fuel and efficient aircraft I could fly for fun. I was looking for low operating cost and the ability to go cross-country at 170 + mph. I also wanted to use an alternative engine to lower the initial cost and greatly decrease the overhaul parts cost compared to Lycoming and Continental. I knew the reciprocating action of piston engines, potential valve and cylinder failures, use of non-adjustable magneto timing for ignition and poor fuel distribution would be eliminated if a rotary engine were used.

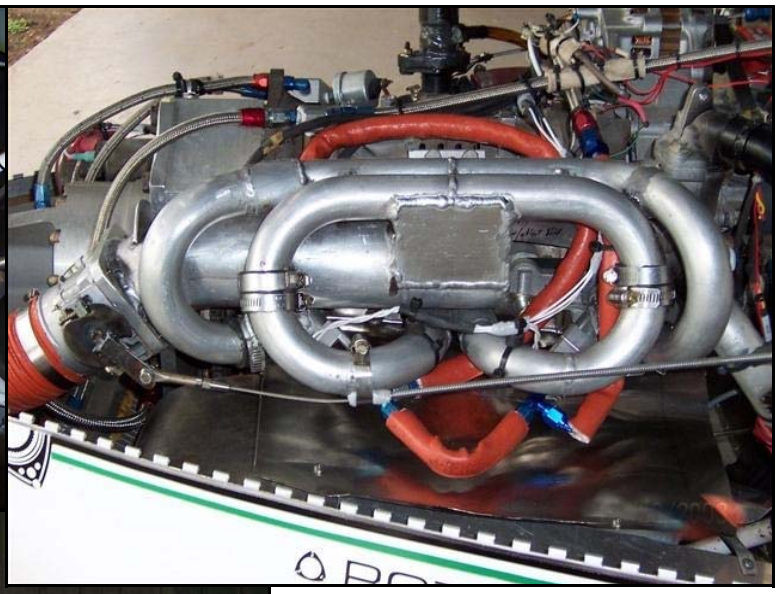
A neighbor was building a Van's RV-7A with a 180 HP Lycoming and after studying the design I decided the RV-7A offered the performance and flexibility I wanted. I had been following the use of the Mazda rotary engines on the rotary web site - flyrotary@lancaironline.net. Several aircraft including RV-6s were flying successfully with 1970 and 1980s rotary engines, usually out of RX-7s. About this time Mazda announced their new RX-8 automobile, powered by an improved rotary engine designed to produce maximum power at increased RPM. Shortly thereafter, Floridian Tracy Crook - the man behind Real World Solutions and supplier of rotary engine controllers, engine monitors and prop reduction drive units - announced a new prop reduction drive suitable for the higher rpm of this Renesis engine.

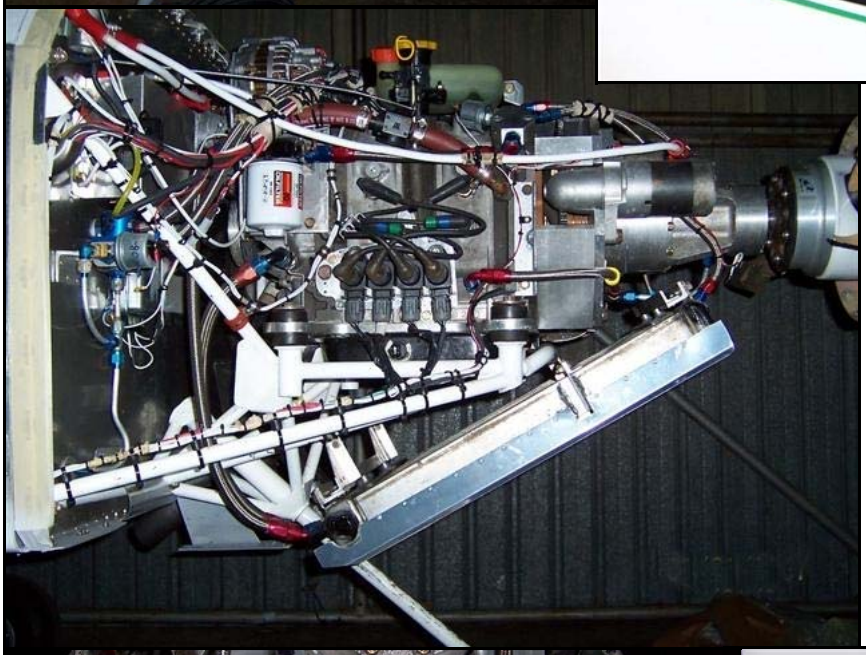
I'm a retired engineer with degrees in Aerospace and Mechanical and enjoy working on hardware, so when all the factors came together, it pushed me over the edge. I sold my SeaRey and ordered the RV kit.

I ordered the RV-7 tail kit in March 2004. The standard kit was complete and ready for an engine within one year. I took a year off airplane building to assist my daughter with some home remodeling work and then spent another year completing the engine installation and painting the airplane.

I purchased a Renesis engine (as removed) from an auto salvage yard for $2855. The engine included a 100 amp alternator, complete intake and exhaust manifold and the ignition coils The car had 9,200 miles on it when wrecked. I did not disassemble the engine but only modified exterior items necessary to use it in the aircraft. Modifications included a smaller pulley for the crankshaft to reduce water pump and alternator rpm, replacement of the crankshaft warm-up pellet and rotating the alternator toward the right to lower its profile. I used the Mazda water pump, alternator, spark plugs, ignition coils and wires, fuel injectors and parts of the intake manifold and exhaust systems. (I believe this is the first Renesis rotary engine to be taken from a car and flown in an aircraft - Tracy Crook built a short block Renesis and flew it in his RV-4 a year earlier.) I purchased Tracy Crook's EC-2 engine controller, EM-2 engine monitor and the 2.85:1 RD-1C prop speed reduction drive.

While I did all the construction and painting, a talented neighbor performed the aluminum and stainless steel welding necessary to build new intake and exhaust systems and modify the oil and water radiators. The motor mount was purchased from a custom builder. I had seen pictures of the Power Sport Rotary aircraft and found I could get the rotary cowl they used from James Aircraft. I wanted that cowl because it





A gallery of Dennis Haverlah's Renesis rotary installation

Top left: Exhaust systems have traditionally been one of the most difficult nuts to crack on rotary installations. The design of the Renesis engine allowed Dennis to put his system entirely within the cowl. He says it's so quiet his neighbors call him the "stealth" airplane.

Above: A custom intake system improved power output.

Left: even with large radiators, exhaust and a gearbox, the engine installation makes a tidy package on the nose of the RV-7A.

Lower left: Coolant and oil radiators live on the bottom of the engine, fed by the large chin scoop on the cowl.

Below: A custom cockpit-adjustable cowl flap helps regulate coolant temperatures.

used one inlet below the spinner for all engine air. With this cowl I was able to mount the radiators below the engine and use the bottom of the cowl as a wedge diffuser directing the cooling air into the radiators.

First flight was on May 17, 2007. Empty weight is 1114 lbs. and empty CG is 76 inches; numbers quite typical of traditional Lycoming powered RV-7s. I have no interior except the basic seats. I installed the Dynon EFIS and the Dynon autopilot. Strobes, nav and landing lights are installed.

Initially the water and oil cooling was very marginal. I performed some pressure tests and found the air outlet at the firewall was too small and airflow through the radiators was not evenly distributed. I modified the rear lower cowl to enlarge the outlet and also added an adjustable cowl flap. My radiators are mounted side-by-side below the engine and I found I needed to reshape the inlet duct to improve the air distribution through the oil and water radiators. I also cut an opening in the cowl just below the spinner to provide air directly into the engine intake air filter. This research and the modifications took about three months.

Initial performance numbers were disappointing when I compared them to my neighbor's RV-7A. I estimated I was only producing 165 -170 HP. In early 2009, I designed a completely new intake system. It is based on dynamic intake effect (DIE) where the closing of an intake valve causes the moving air to bounce off the valve, creating a pressure wave. The wave travels at the speed of sound to the other intake valve and arrives there just before that valve closes. This increases the amount of air that enters the combustion chamber. (The rotary, of course, has no valves. It uses the sides of the rotor to open and close intake ports – but the effect is the same) The new intake has resulted in greater acceleration during take-off as well as increased climb and cruise performance. The increased power output increased my water and oil temps, but they remained within limits. Based on aircraft performance, I estimate it now compares to a 185 HP Lycoming powered RV-7A. (I want to give credit to Ed Anderson for his help in reviewing the DIE theory and applying it to the rotary design - Ed built and flies an RV-6A with an RX-7 rotary and posts frequently on flyrotary@lancaironline.net.) I checked my receipts and found I spent $13,300 on the total engine installation excluding the Catto composite two blade prop (76’ diameter/88” pitch) and spinner.

Rotary engines produced before the Renesis have a very loud and energetic exhaust – so energetic that mufflers and exhaust systems regularly failed. The Renesis exhaust is much tamer and my exhaust has performed flawlessly so far. I was able to mount the muffler inside the cowl. My exhaust system produces a very quiet low frequency sound. It is so quiet my neighbors (I live in an airpark community) call my RV-7A the stealth airplane! I probably could redesign the exhaust system to improve the flow. This would probably increase HP and the raise the exhaust noise. At this time I don't feel this is worth the time and money to implement.

As soon as I had the 40 hours flown off I departed for Florida and Tracy Crook's Rotary Round-Up. The next summer I flew to Oshkosh with my brother as a passenger. I also took my wife to Chicago to visit grandkids. The aircraft is a rocket compared to anything else I've flown. Its performance compares favorably to a turboprop Bonanza I flew for a small company a few years ago.

I have operated the engine for about 220 hrs and have 195 hours of flight time. I normally use mogas - with or without ethanol - and use avgas only when necessary. Fuel efficiency compares well with the 180 hp Lycoming. On one two-hour flight in loose formation with my neighbor's 180 hp Lycoming RV-7A I used about 1.7 gal. less fuel. I was using mogas and he used avgas. I am very happy with the smoothness of the rotary compared to piston engines - the rotary really is a poor man's turbine!

CROSS-COUNTRY RECORD

Dr. Jerry Jackson, an engineer who resides in Del Mar, California, recently set a new unofficial round-trip transcontinental speed record by flying his RV-6A (N214MJ) from the West Coast to Florida and back in just over a day. He took off from San Diego, California before dawn on Saturday, January 30; landed in Jacksonville, Florida later that evening; and made it back to San Diego by dawn the following morning, January 31. In all, he flew almost 4200 miles at an average speed of 174 mph, shattering the old record by three days. Heading east, he climbed to 17,000 feet to catch the jet stream, and at times reached ground speeds of over 300 mph. Using a satellite tracking device, Jerry was able to send a position report back to family and colleagues every hour, to keep them posted of progress. He was greeted by his wife, Nina, and a group of friends upon landing, and celebrated with some pre-dawn champagne and much-needed sleep.

Dr. Jackson has applied for an official aviation record with the National Aeronautics Association, as a "round-trip transcontinental speed record for piston engine airplanes". The flight was documented by the FAA at take-off and landing both in San Diego and Jacksonville, and took 24 hours and 10 minutes. Jerry has been flying for 34 years, and has over 2500 flight hours. His RV-6A is serial number 23212, took four years to build, and a year to modify for the record flight. He has over 1350 hours in the plane, which has been flying for almost 13 years.

IN THE SHOP

KEN SCOTT

RV-12 DEVELOPMENT AT MY HOUSE

The crush of fourth quarter orders pushed RV-12 wing kits out four months and more, so I decided to take the more readily available Powerplant kit when I could get it, keep working, and build the wings last. It's not the preferred method but you can get away with it – especially if you have access to the entire plans set, so you can see what's coming if you build out of sequence.

The big day arrived and I wrote a correspondingly big check. Actually, it was the single biggest personal check I have ever written and it caused heart palpitations that were audible to people across the room – the price of the RV-12 Powerplant kit is more than I spent to build my complete RV-6. Of course, eighteen years of inflation makes the comparison completely useless, but I still quiver when I see that many digits to the left of the decimal point. The crating guys patted me on the head, loaded my spanking new Rotax 912ULS and all the corresponding bits into my Honda Element, and I headed home.

Ten days later, the engine is hung on the front of the fuselage and almost all the wiring and hose hookups are complete. The instructions are excellent, but intensely concentrated. You do not want to miss a single sentence. Things that weren't clear to me when I read the plans at first cleared up quickly when I had the engine to look at.

It seems odd to start engine installation by taking big parts of the engine, but that's what you have to do – the ignition coils come off, the expansion tank and hoses come off, the induction tubes come off, the carbs come off. This is necessary to fit the fiberglass shroud that will duct cooling air taken from the left cowling "nostril" over the cylinder bases and the drip pans that protect the carbs from the exhaust.

This is a place to be very careful and deliberate. Silence the phone, turn off the radio, put the dog out and Pay Attention. Every fastener you remove must go back in the right place. Every assembly you remove uses delicate O-rings to seal. Every cable has a clamp.

The first thing I realized is that I needed a set of metric "hex sockets" – essentially a set of sockets with hex keys permanently mounted in them. Many of the fasteners used on the Rotax use this internal hex (aka "allen head") fasteners and the only way to torque them is to use these sockets on a torque wrench. I found a decent set at Home Depot for about $15.00. You will need a good, preferably ratcheting, torque wrench to set the required values found in the Rotax Heavy Maintenance Manual. Speaking of which:

The Rotax manuals are provided on compact discs that you can read on your computer. This makes them searchable and portable, but does require that you have ready access to a computer from your shop. I have an old laptop with sufficient memory to do the job, so it moved from the office to the shop. The keys don't work so well when they're covered in proseal, but what the heck…a computer is just as much an essential tool as a torque wrench when you're building an RV-12.

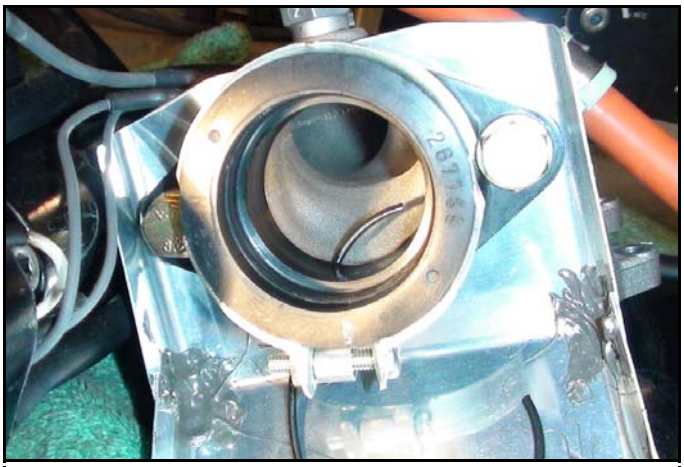
The most difficult task (at least so far) has been the installation of the heater door control cable on DWG 49-09. This innocuous little A-740 cable is routed through the firewall, down through all the congestion of wires and hoses to the right side of the engine, then back across, parallel to the firewall, to the heater door behind the radiator on the left. It looks simple enough on the drawing… but there's three sets of those @#*# double adel clamps that I've learned to hate. In this case they are almost unreachable, tucked up behind the exhaust system that was installed in the previous step. I managed it, but next time I would reverse the order and install that cable before the exhaust and radiator are in the way.

I've learned that reading posts and websites on the internet is a sure way to retard building progress. There's *so* many words... And just as many more just a click away. It's easy to blow an hour poking at a keyboard — an hour that could really have *accomplished* something if it were spent in the shop. Having said that, somewhere along the line I discovered ***Tony Tessitore's RV-12 website***, and since he and I are usually working on the same thing at the same time, I look once a week or so. I stole his idea for pressure checking the fuel system (not the tank, but the system) and the quality of the work I see there makes me try harder.

By the time you read this, I should be past the engine phase and on to the wings, riveting ribs to spars while wondering if I should really spend the money on that cool LED lighting kit…

RV-12 DEVELOPMENT AT VAN'S

Our factory RV-12 is now flying with a set of wheel fairings – something that has been planned all along, but is just now possible. Initial tests suggest a top speed increase of around three knots. Mitch Lock is 'beta testing' an installation on New Blue and when he Is done and his suggestions incorporated, a wheel fairing kit will be (eventually) available. Before you pick up the phone, no, we don't know exactly when that will be — months, at the soonest. Calls and emails on the subject just slow us down, so please, be patient and watch our website.



WHAT HAPPENS WHEN AN O-RING IS MISPLACED

When we heard that one of the first RV-12s to fly had suffered a damaged cylinder, we were — to put it mildly — quite surprised. Rotax 912s have a deserved reputation for being internally robust and running for thousands of hours. An engine failure just a few hours from new is almost unknown.

The builder removed the engine and sent it to a Rotax shop. The photos above show what they found, after quite a bit of detective work.

RV-12 builders must remove the carburetors from the engine to bolt in the drip pans which are made from sheet aluminum. The carbs are held to the intake manifold by bolts and rubber sleeves, and inside the mating face of the intake manifold is a machined recess which houses an o-ring.

Somewhere in this process, the o-ring had not been placed back in the recess —instead, it was put on the wrong side of the drip pan — and when the carb was re-installed, it was pushed quite a ways from its intended postion. This resulted in a significant air leak in the intake manifold. Adding excess air to the fuel/air mixture leaving the carb and heading toward the intake valve results in a very lean mixture. So lean that it will not burn properly in the cylinder — and in fact, burn the piston.

The bad news: expensive repair

The good news: the cause was positively identified, it's not a flaw in the engine, and it's easy to avoid.

FLY-IN SEASON KICKS OFF AT SUN'NFUN

It's hard to believe, especially in parts of the country that are still buried in snow and ice, but February daffodils are blooming outside Van's front door.

Optimistic little buggers.

Spring isn't *really* here yet, but the yellow blossoms remind us that a trip to Florida and Sun 'N Fun is looming on the horizon. It's a long, long way to go in a small VFR airplane in April, so, while I may look forward to some sun and warm weather, I always lose a little sleep before we go. There's always two frontal systems, sometimes three, to penetrate on both the outbound and homeward legs.

This year we're going to do things a bit differently. Gus will fly commercial to Washington DC, spend a couple days with his brother, then pick up N220RV (our Continental powered RV-10 now living with Mitch Lock in Maryland) and take it to Florida. Mitch will fly his blue RV-12.

Meanwhile, Mike Seager will take his RV-7 and a crew — personnel not yet determined — will take the company RV-9A and they will make the long trek from Aurora to Lakeland.

The show opens April 13. We have arranged an RV Banquet for the evening of Wednesday, April 14. It will be held on the field, in a large tent near the Museum. Beverages and Hangar Lies begin at 5:30, dinner will be served at 6:30. Tickets are available now, $20.00/head. Tickets ordered in advance may be picked up at our booth. Any unsold or cancelled tickets will be sold first come/first served at the booth.

Demo rides in the RV-12, RV-7, RV-9A and RV-10 will be available. Sign up at our booth. Not every airplane will fly every day, so check the schedule carefully when you sign up and make sure the airplane you want to fly in will indeed be available when you are! Be prepared to travel — it is very difficult to operate from Lakeland during the show, so we fly rides out of nearby Plant City airport.

NEWEST RVATOR LANDS SAFELY

So how did Van top an experience like flying the Space Shuttle Simulator?

Easy.

He and Diane celebrated the arrival their first grandchild, Lily Agnes, born on February 11, 2010 to daughter Cheryl and her husband Tom. Birth weight was 7 lb. 12 oz.

Mother, baby, and all others are doing fine.

BACK TO SCHOOL!

SCOTT MCDANIELS

I realized a long time ago that life is much more interesting if I am constantly challenging myself to learn a new skill or learn an unfamiliar subject. Since my position in the Prototype Shop at Van's Aircraft directly involved me in the development process of our RV-12 LSA kit, I had no shortage of new skills and knowledge that I needed to learn. Besides all of the new requirements for documentation, testing, quality control processes, etc., there was the other new challenge…and its name is Rotax 912ULS.

My partner in the proto shop, Ed Chesney, and I learned a couple of things from the very start. We found the documentation for the engine is very good (though there are occasional challenges that are obviously the result of "lost in translation" clarity going from German to English). On the other hand, we found we needed to forget just about everything we had previously learned about reciprocating aircraft engines. We spent a lot of time reading, researching information online, and talking with people with an extensive background operating and maintaining the Rotax engine. We feel that we ended up with a well-documented engine installation that meets the requirements of the Rotax 912 Installation manual, and is easy for an RV-12 builder to replicate by simply following the construction manual step-by-step. Note that I said "installation"…more about that in a moment.

Ed Chesney and Scott McDaniels are now qualified to wrench on our S-LSA RV-12.

Now that the RV-12 kit development program is winding down, what do you suppose Ed and I did? We got some Rotax factory certified training. Why now, after we'd just spent almost four years learning all of the intimate details of this engine (a few of them the hard way)? Well, we had to if we were to legally work on the engine installation in our RV-12 demonstrator.

Let me explain…

The way the LSA certification process works is that the aircraft (or component) manufacturer is given the sole responsibility for self-certifying that their product meets the consensus standard(s) as spelled out in the applicable ASTMs. Along with this comes some other responsibilities. Their approval must be obtained before an S-LSA aircraft owner makes any modifications. Another responsibility, that ties in with meeting the ASTM requirements for the maintenance and repair documentation, is to stipulate the level of certification required for all of the different maintenance, repair, and inspection processes their product requires.

Just like all other S-LSA aircraft, the RV-12 has a maintenance manual written specifically for it. In that manual, each maintenance or inspection process listed requires a specific level of certification. Because Van's Aircraft did not produce the powerplant, it is not our responsibility to specify what level of certification is required for working on it. In the case of the RV-12, this falls to Rotax. In their documentation, Rotax specifies that factory certified training is required for all service and repair work on the 912 series engines – even simple things like oil changes. (Before you get all riled up… note that this only applies to S-LSA aircraft. An RV-12 certificated as an E-LSA is an experimental category airplane and there are no regulations regarding who can maintain or repair it. There is just the standard-issue requirement in the operating limitations stipulating the certification level required for signing off the yearly condition inspection – for an E-LSA, that's an A&P or a LSA Repairman Inspector.)

While the Rotax requirement has no effect on RV-12 builders, it *did* have an effect on Ed and me, starting on the day that our RV-12 demonstrator received its S-LSA airworthiness certificate. We were operating in a gray area because, even though our years of experience working on the engine filled FAR 65.107 requirements for pre-requisite experience in specific maintenance tasks, we still didn't have the training stipulated by Rotax.

So, off to school we go. We decided to attend Rotax Flying & Safety Club (RFSC) certified training at probably the most experienced Rotax service facility in North America: the Aero Technical Institute at Lockwood Aviation in Sebring Florida. Their January classes coincided with the Light Sport Expo, so we arranged to arrive a day early, hang out with Van's East Coast rep Mitch Lock, and take a detailed look at some of the competition. (When I attend OSH and other major fly-ins, I rarely get time to look at much other than a mass of people within our display area.)

We attended two classes. The first was the Service Specialty course which provides instruction on all of the general maintenance tasks such as oil

changes (yes, there is a right and a wrong way), carb synchronization, and completing the 100 hour or annual condition inspection. The second class was the Maintenance Specialty Course. This is a continuation to the Service Class (the service class is a pre-requisite) and provides more advanced understanding of engine systems and installation issues, troubleshooting, and major component disassembly. Dean Vogel, who operates the Aero Technical Institute portion of Lockwood Aviation, taught both classes. It was obvious to both of us that Dean knows a LOT about the 912 engine. He says this comes from both working with their shop personnel, and helping owners resolve engine problems (often self-induced during installation or maintenance).

So what did Ed and I come away from the classes with? Besides becoming iRMT's (Independent Rotax Maintenance Technicians) at the Maintenance Specialty level, we gained a much deeper understanding of the whys and wherefores of this compact little engine. We wish now we had taken these classes at the beginning of the RV-12 development project.

The amount of value Ed and I received from the classes, considering the amount of prior experience we have, makes me certain that they would be of great benefit to anyone new to the 912 engine. We think that anyone maintaining or servicing the engine in an RV-12 should take at least the Specialty Service level class, regardless of whether or not they are required to by the rules. You may have been able to follow the RV-12 engine installation portion of the construction manual with out any trouble, but there is a lot more to know than what is provided there. There are so many specific details that need to be understood -- some of which can result in engine damage if ignored. Considering the amount of money and time RV-12s builders invest in their airplane, the class it is well worth the cost of tuition and related travel expenses. The classes are held at many places around the country and a schedule can be found at the RFSC web site http://www.rotaxflyingclub.com/. Some classes are scheduled to coincide with major fly-in events. The cost generally runs between $450 – 500 per class (at the Aero Technical Institute they were $450).

If you do decide to make a trip to sunny Florida and delve more deeply into your new Rotax, tell Dean that Ed and Scott sent you.