THE RVATOR

FOURTH ISSUE 2009

THE HOBBS METER

6,357

COMPLETED RVS

Thirty-seven RVs participated in a formation demonstration at AirVenture 2009, celebrating Van's 37th year at The Show.

ROUND NUMBERS

NUMBER ONE! *The first customer-built RV-12 to fly left the ground Sept. 20, 2009, piloted by builder Brad Stiefvater of Salem, South Dakota. The event occurred just as we were posting this issue so complete coverage will have to wait until next time.*

NUMBER 100

The fledgling Light Sport Aircraft category reached an important milestone has been this summer when ***Van's RV-12 became the 100th LSA model*** to be approved according to the Light Aircraft Manufacturers Association (LAMA).

NUMBER 200

We have no idea which RV-10 was the 200th to fly in chronological time, but the 200th to appear in the Hobbs Meter section of our website was serial 40473, built by ***Tom Gesele*** of West Islip, New York. "Holy Sh**, I love this plane!" Tom says, after making the first flight on August 14.

N629RV is powered by an IO-540/Hartzell combination. Avionics include a 2 screen Grand Rapids EFIS, Garmin GNS-480 + GTX-330, Electronics International MVP-50, and TruTrak VSGV A/P.

NUMBER 3000

RV-8 kit 83000 recently flew...well, it flew in a Cessna 180. Tom Carter recently flew from his home in Big Fork, MT to pick up an empennage kit for an RV-8. It will replace his F-16, which he had to give back to the government when he retired.

When we rang up the order, it showed customer number 83000 — the 3000th empennage kit delivered since the RV-8 was introduced in 1996. That's a little less than one per working day since 80001 went to Dave Hamilton in Georgia.

THE YEAR OF THE ELECTRIC AIRPLANE

VAN

Van "gasses up" his all-electric Antares with a generator, before launching into the cloud streets above.

You don't have to be attuned to the inner circles to know that there has been a lot of buzz in the aviation media about electric powered airplanes. From this, one might conclude that the electric airplane has finally arrived and that the old joke about "needing a really long extension cord" can finally be retired. Although we at Van's have been following progress in this field for the past couple of years, my interest became more personal now that I own and fly an electric airplane of my own. A couple of months ago I took delivery of a self-launch sailplane called the Antares 20E. To my knowledge it is the only production electric airplane in the world. I am gaining first hand knowledge about the care and feeding of an electric airplane and trying to compare this experience with the press releases that I read about other electric airplanes.

I'm finding some disparity.

THE ELECTRIC AIRPLANE THAT I KNOW

The Antares 20E is a state-of-the-art high performance sailplane well suited for sport and competition soaring. It has a 20-meter span (66') and an empty weight of 1050 lbs. Its max. L/D of 56:1 is achieved at 70 mph and its min. sink is just under 100 fpm. It has a 42 Kw (56 HP) brushless motor mounted on a retractable mast similar to the retractable engine systems which have been used on gasoline powered self launch sailplanes for many years. Its empty weight is higher than comparable self-launch sailplanes primarily because there are 200 lbs. of lithium-ion batteries carried in long cavities in the inboard portions of the wings. Battery charging is accomplished by plugging into a 110v source or a portable generator. The charger is installed in the fuselage along with the other electronic stuff. (for details Google: Lange Aviation gmbh)

Electric power for a self-launch sailplane is perhaps the best entry level aviation use for electric power. Because a sailplane needs only enough powerplant endurance to take off and climb to altitude, a limited motor run time (battery capacity) is acceptable. For instance, the Antares 20E has a climb capability of 9000 to 10,000 ft. This is enough for an initial climb, usually not over 3000 ft., and then 2 or 3 in-flight re-starts. An in-flight "save" usually requires only enough climb to get to another lift source, hopefully within a few miles. If the pilot runs totally out of lift away from the home field, he can "cruise" or climb/glide for around 50-70 miles back to his home field on the remaining battery energy. On a full charge, the Antares manual claims a range of just over 70 miles in continuous motor opera-

Variations on the theme. Both the Chinese Yuneec, above, and , Randall Fischman's Electraflyer 2, below, are basically motorgliders — currently the most appropriate use of electric power.

tion cruise mode, or just over 100 miles in the sawtooth (climb/glide) mode. Presumably the cruise mode range is less because of the drag of the powerplant mast, whereas in the climb/glide mode, the majority of the distance is covered while gliding in the clean configuration. It's certainly not as much climb/range as with a gasoline powerplant system, but that is the limit of current battery technology.

There are limitations unique to electric airplane that the "electric pilot" must consider. For instance, power available decreases as battery energy lowers. The manual recommends that take-offs not be performed when the battery power is less than 65%. It is possible to take-off at a lower battery energy level, but the take off distance will be longer. Battery energy is sensitive to battery temperature. For this reason, the battery packs are wrapped with heating blankets that warm the batteries to a safe temperature range before charging or use. This, of course, consumes some of the energy stored in the battery.

Why have electric rather than gas powerplants in a self-launch sailplane? Powerplant reliability, smooth quiet running, and ease of operation are a few of the reasons. Two-stroke gasoline engines are widely used because they are small and light. However, they have proven to be high maintenance items and reliability is not as good as we've come to expect with 4-stroke aircraft engines. Operationally speaking, starting and engine extension/ retraction are multi-step functions. Numerous accidents have resulted from concentrating on engine system operation and neglecting basic flying. I have found that the single-lever, computer-controlled motor extension/retraction/ speed control of my Antares is almost sinfully simple by comparison. However, it takes a lot of computer stuff in the system to make this happen, and I wouldn't have a clue how to fix it if something malfunctioned.

THE ELECTRIC AIRPLANES I DON'T KNOW

OK, that's what I know about electric airplanes from actual experience. Now, the aviation magazines are telling us of soon-to-be-available electric powered light aircraft. Performance numbers are being quoted. Based on my 55 years of experience reading aviation magazines, I know better than to accept the printed word as absolutely accurate. I am now trying to evaluate these reports against my firsthand knowledge and experience, and share these thoughts with you.

Two of the new aircraft getting most attention are the Yuneec e430 and the ElectraFlyer-X, both two-seat composite aircraft of motor glider configuration. Both have motors with HP ratings in the mid-50s, similar to my Antares. However, though these are two-seat aircraft, their airframe weights are considerably less than the Antares. This is because the Antares has a very long, heavy, strong wing needed for high performance and competition flying and because it has a high Vne needed for competition flying. Both the Yuneec and the Electra Flyer appear to be optimized to be flown as low performance (by soaring standards) motorgliders or loiter-cruise powerplanes. As such, shorter wingspans and lighter airframe weights are possible. So, the mission profile really dictates the resultant airframe. As mentioned above, if a self-launch sailplane is the best application for the limited endurance of present day electric power systems, then the motor-glider would similarly be a suitable application.

While a high performance self-launch sailplane usually does not need to re-start its motor during an all-

Three steps to an electric take-off in the Antares: the clean motor/mast extends from the aft fuselage, locks upright and the prop begins to spin. When was the last time an electric motor didn't start?

afternoon cross-country flight, a motorglider would need to run the motor much more often under similar atmospheric conditions because of its much lower soaring performance.

Flying, staying aloft on minimum power implies flying a low airspeed where aerodynamic drag is at a minimum. For drag to be minimized, induced drag must be minimized as well as parasite drag. For this, a high aspect ratio wing like that of a sailplane is necessary. To maximize the flight endurance of any airplane, it must be flown at the speed that requires the least energy output. For instance, the Yuneec lists a cruise speed of 60 mph. Based on the estimated wing load and span loading of this aircraft, 60 mph would be the approximate speed for minimum flight power requirement. A rough approximation of power required to fly at this speed is 10-12 HP. This is indeed a low figure and is a tribute to the efficiency of the airframe. On the other hand, from the pilot's perspective, 60 mph is about the cruise speed of a 40 HP J-2 Cub. How exciting is that?

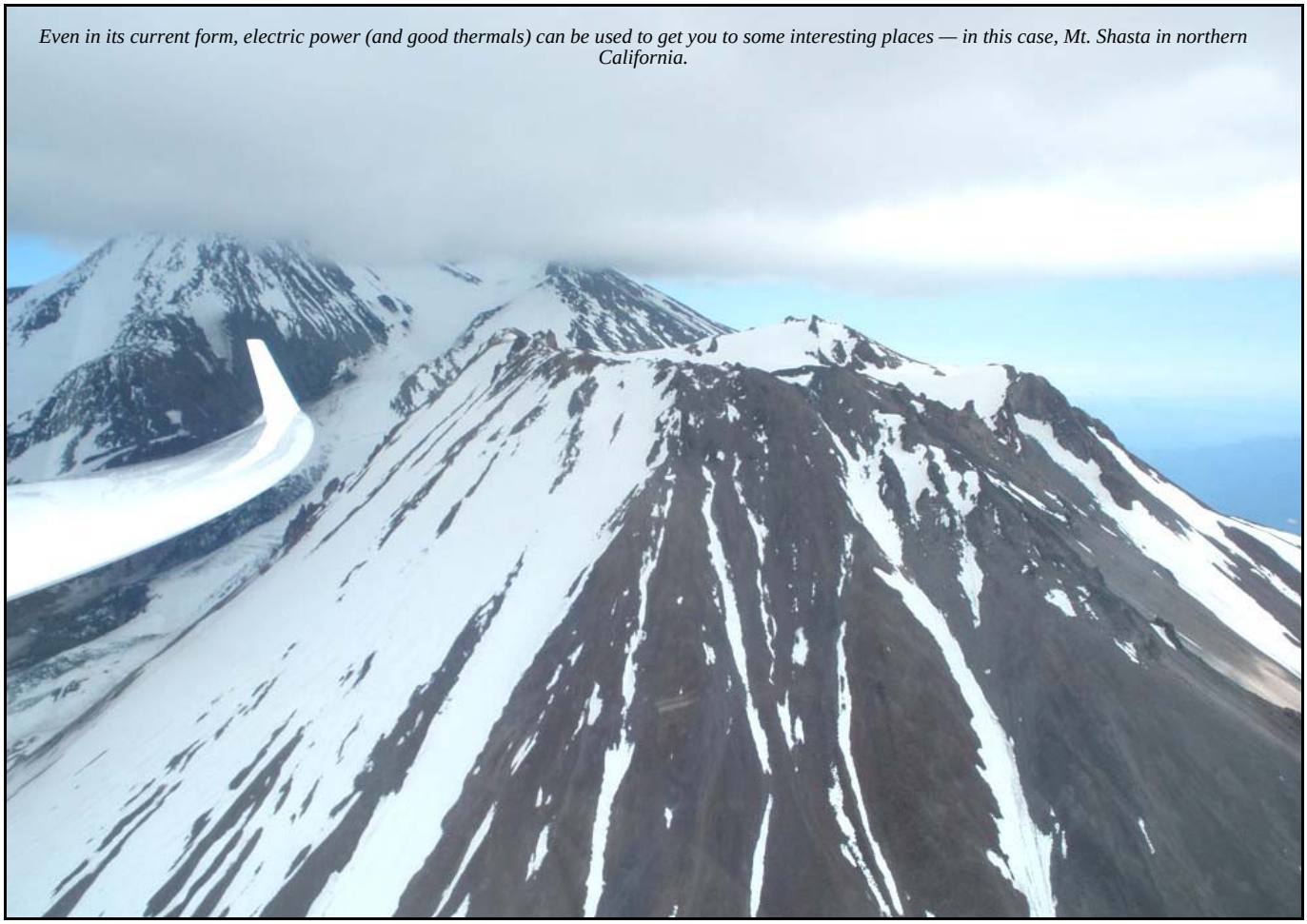
While a very low drag airframe will fly (level) on low power, it still requires lots of power to climb. The basic HP formula applies (1 HP = 33,000 ft/lb/min.), so a disproportionate amount of the battery energy is required to climb to any reasonable cruise altitude. It's alarming how fast the energy meter in my Antares winds down at climb power.

Planes of this type will realistically cost over $100,000. That's a lot of money for a plane that cruises at 60 mph and can only fly for only a short time. Sure, the cost to "refill" the batteries will be minimal, but buying gasoline (2 gph or less) for a 60 mph plane is not very expensive either. Battery packs will need to be replaced at some point, and that will be quite expensive when compared with the cost of 2 gph fuel consumption. Penny wise and pound foolish? I don't believe that the initial market for these aircraft will be based purely on economics, but rather on novelty, bragging rights, and the desire to support new technology. They might even attract a new clientele to flying: the more "greenish" people who may be turned off by the noisy, fuel hungry, lead polluting airplanes we know and love.

SPEED AND RANGE

Speed and range are the two performance parameters most often quoted for the electric airplanes. The duration of the Yuneec is stated in some magazines as 1 ½ to 2 hours, and its cruise speed as 80 mph. The Yuneec brochure lists its cruise speed as 60 mph with similar duration. Another source lists the duration at 80 mph being less than half the duration at 60 mph. This I find more believable based on my experience and my knowledge of aerodynamics, as the drag at 80 mph is almost twice that of 60 mph. So, I think that we must be careful of what we read. (Example: an RV-4 can be flown on 4 gph, and can also go 200 mph. It just can't do both at the same time).

Despite my skepticism about some of the performance claims, I hope that they will successfully demon-



Even in its current form, electric power (and good thermals) can be used to get you to some interesting places — in this case, Mt. Shasta in northern California.

strate the practicality of electric sport aircraft. I hope that we can soon get some meaningful pilot reports or flight test data on these airplanes. Right now I'm not sure. If the claims prove true, I'd run right out and get a "plug-and-play" motor system and design an airplane around it. Otherwise, we'll just have to wait and see.

SOLAR CHARGER?

Almost without exception, everyone I talk to about my electric sailplane assumes that I recharge the batteries with a solar charger. If it were only that simple! Actually, the charging *is* simple because the aircraft has a built-in charger to which I connect 110 Volt AC, either from the electric grid or a gasoline powered generator. A full charge (80%) requires around 9-10 hours. A small solar panel, like you might see on a camping trailer, produces so little current that charging would require many days -- if not weeks. Powering a 56 HP motor is entirely different than supplying current for radios and avionics; a lot of kilowatts are needed. The auto industry know this only too well. It is struggling with the issue of carrying enough batteries to provide a totally electric powered car with enough range to be practical, even for a daily commute of 50 miles or so.

OSHKOSH ELECTRIC

According to the coverage in *Sport Aviation* and *Sport Pilot* magazines electric airplanes flew regularly during Airventure. To my knowledge and that of my friend Dave Nadler -- who displayed and flew his Antares 20E there -- only one flight was made and he made it. Flight demos alone do not answer all questions, but they are a starting point. Interestingly, although the Antares was the only in-production electric airplane displayed at Oshkosh, no photo of it appeared in the EAA magazines.

I'm not absolutely sure why The Electraflyer C (a single-seat technology demonstrator which *had* flown last year) and the Yuneec e430 didn't fly at Oshkosh, but they may have had good reasons. The new Electraflyer X had not officially been signed off for flight. There were strong crosswinds during the Saturday demos. Scheduled Sunday demos were pre-empted by an accident on the runway.

SUMMATION:

I enjoy the operation of my electric powerplant on the Antares sailplane. I look forward to the day when I can operate an electric powered sport aircraft in a similar fashion and enjoy the simple powerplant operation and smooth, quiet flight.

GOIN' TO THE SHOW... AGAIN

KEN SCOTT

GETTING' THERE

After two years of flying the RV-12 to The Show, I was assigned the company flagship – the RV-10.

I liked that.

I mean, what's not to like? Room, comfort, speed… the RV-10 has it all. On the day, the weather looked good, the airplane was running fine and the tanks were full. There was one leeeeettle factor disturbing my serenity, however. I'd be flying with Van and his brother Jerry – and I'd be doing the flying. Even after twenty years of working here and flying the airplanes day in, day out, I still find it a bit intimidating to arrive at the airport and find two pilots with almost forty thousand flying hours between them pointing *me* at the left seat.

If you have an RV-10, traveling from Oregon to Oshkosh in a day is not difficult. If the winds are right, it's possible to make it with only one stop. We'd have to make at least two on this trip; one for fuel somewhere in Montana and another to drop Jerry off at Winnecone, a small asphalt strip just a few miles northwest of Oshkosh on the north shore of Lake Butte de Morte.

I managed to get the airplane running and taxi to the runway without hitting anything. After a deep breath, I made the smoothest take-off I could and pointed the airplane just to the north of Mt. Hood while holding a steady 1000'/minute climb. We'd all brought personal oxygen bottles, so it wasn't long until it was time to break those out. We leveled out at 11,500' for a few minutes, checked the winds and clouds and decided that 15,500' was a better deal. One of the reasons I love flying the RV-10 on trips is that, even with a full load, going up is never difficult.

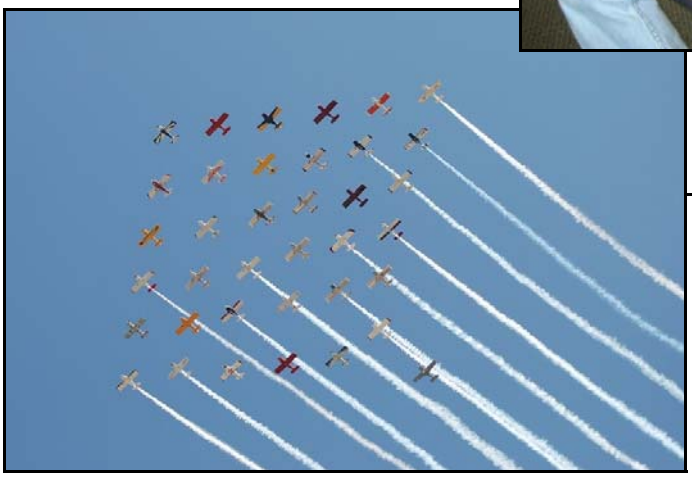
So, somewhere high over Eastern Oregon we settled in for the ride. Van appointed himself Operator of the Red Knob and adjusted the mixture for best economy. Although he couldn't get the engine to run as smoothly as his personal RV-10, which has both electronic ignition and balanced injectors, he found a relatively sweet spot about 30-35 degrees lean of peak. At full throttle and 2350 rpm, that gave us around 10-10.5 gph and a TAS of about 160 knots. With a decent tailwind, the GPS showed over 175-185 knots groundspeed. (My good intentions of keeping careful records on this trip went the way of all good intentions…).

First stop was Laurel, Montana, just southwest of Billings. Fuel's cheap in Laurel, they have all the necessary facilities and we could stay outside Billing's Class C airspace. Van and Jerry both commented that the speeds I flew the pattern seemed too slow – well, I guess if you fly with these guys and don't learn something, it really would be a wasted trip. We put on about 36 gallons and launched out of Laurel, headed east. I can't even remember what altitude we flew that leg, but I think it was in the oxygen altitudes again.

The weather and winds continued to cooperate, but a 3.5 hour leg is enough for anyone, even with an autopilot and an organic mixture controller. We decided to land in Faribault, MN, about an hour and half short of Oshkosh. We touched down with about 7.5 hours on the Hobbs since we left Oregon. At that point, Van decided he'd had enough of watching, so he took the left seat and we headed for Winneconne, bobbing and weaving around cloud build-ups. When I finally spotted the strip, I was perfectly happy Van was doing the flying. It was paved, sort of, and quite narrow. Van set us down on the near end and we rolled out in a spray of chocolate water. When we got out, we found the runway consisted of lily pads of pavement floating on – and sinking into -- sandy mud. The airplane looked like

it had been hosed by elephants. Never mind – Jerry's car was waiting, so he headed for his lodgings. Van and I launched for Ripon, just a few miles south.

As we broke ground, the sun broke through the cumulus buildups and the most amazing rainbow appeared. From our vantage point at fifteen hundred feet, it ended in a sunlit patch – directly on the airport at Oshkosh. If we could have captured that in a photo, it would have made every EAA publication for years. But before I could really think about it too much, Van twisted the RV-10 into a 3G right turn at about 80 degrees of bank and we watched an MU-2 go screaming across our nose, gear up and smokin', at 1500'. You really can't let your guard down, even for a second, around Oshkosh.



Above: Bax Seat Award winner Doug Reeves basks in his glory while attending Van's Homecoming.

Left: More coming! Thirty-seven RVs participated in a formation fly-by honoring Van's 37th year at Oshkosh.

A few minutes later, we'd overflown Ripon and were in line with several other aircraft to Fisk. Aside from the usual Wayward Cherokee, 200' higher and 10 knots faster than he was supposed to be, and oblivious to it, every one seemed to have read the notam. (This is the third Wayward Cherokee our staff has encountered on the Ripon approach in the last seven or eight years – the one we remember most was flying the wrong way down the line at Fisk with the pilot asking plaintively "what airshow? What's going on? Why do we have to get in line…?") The controllers at Fisk tried to send us to runway 27, I asked for 36, they said fine and a few minutes later we were taxiing up to our booth, about 9.5 flying hours out of Aurora.

AT THE SHOW

We were favored with the best weather I can remember. We soon knew how lucky we really were, because when we called home, we found that it was 106 F in Oregon! New records everywhere. There were showers on opening day that cancelled the airshow. Heretical as it seems, I didn't miss it a bit. No jet noise, no blatting T-6 props, just the patter of raindrops falling out of a cool sky and a chance to get a bit of rest after a couple of really long days.

One of the reasons Jerry V. had wanted to come was to see his old Northwest Airlines compatriot Terry Lutz arrive in the new Airbus A380. Terry and his new ride appeared on Tuesday afternoon, casting a shadow that enveloped most of the event. The immense four-engine jet -- the wingspan is just less than the length of a football field – purred by, performing steep climbs and pitch-overs in the pattern. I could only imagine the guys in the cockpit saying to one another "we'll never, ever, get the chance to do this again!"

Tuesday, we held our company banquet. Gus Funnell spent quite a bit of time poring over the good and bad points of previous banquets and his homework really paid off. We held it in the covered pavilion and impressed the caterers with the importance of being prepared and having enough food. They did well – when we arrived, tables were set, drinks were available and there was obviously enough food for the more than 200 people who'd bought tickets. The *Flying* magazine crew arrived to present VAF honcho Doug Reeves with their Bax Seat award -- one of the most prestigious honors in aviation journalism. Great food was followed by a great after-dinner talk by Terry Lutz about the Airbus A-380, and about his "RV" gang from Michigan. We've known Terry for many years since his days as a test pilot for Calspan Corp in New York and up through his years with Northwest Airlines. His current test pilot position with Airbus is appropriate considering his background and his talents.

It's good to see that big, cutting edge technology airplanes being test flown by pilots who are addicted to little fun airplanes as well. A few years ago Terry finished an RV-8 which he doesn't get the opportunity to fly enough since it is in Michigan and he now works in France. He managed to get it to Oshkosh, thereby becoming the first pilot to have two airplanes on the ground with the ability to fly one *inside* the other! Terry presented Van and chief engineer Ken Krueger with a scale model of the A-380, which they promised to take

Everybody at Oshkosh came home with at least one photo of the A380, but very few got to prowl the inside of the airplane. Thanks to Airbus/RV pilot Terry Lutz, Van and chief engineer Ken Krueger had just that opportunity. Top left: water ballast tanks line the fuselage — no mention if they paid extra in the first class section. Top right: the view from the bridge. There are ag pilots who spend their entire flying lives at lower altitudes than an A380 pilot sits while taxing. Center left: from the upper deck door, the wing stretches to the horizon. Center: Big, quiet and graceful. Bottom left: Ken Krueger descends the staircase contemplating the difference between what he’s just seen and an RV-12. Bottom right: Terry Lutz brought both his airplanes to AirVenture.

A couple of young ladies got their first taste of aircraft construction at the KidVenture booth. Avery Tools, Van's, Hartzell and several other businesses contributed, but it was the volunteers and the kids that made it work.

Coast rep Mitch Lock could bring his RV-12, which had flown just a couple days earlier. Instead he flew his RV-8, having wisely decided that while it might be technically legal to bring the airplane, he just didn't have enough time in it to make it smart. Scott McDaniels flew our RV-12 to Wisconsin this year, which gave him plenty of time to learn how to use the new Dynon autopilot. He arrived in good shape, and within a few hours, it was apparent that the RV-12 was the star of *our* show. There was always a crowd around it. If things got dull, we'd declare a wing-removal demo…that always pulled 'em in off the walkway! We took turns flying lots of rides in the airplane and I learned quite a bit about flying an RV-12 in a 12-15 knot direct crosswind. It turns out that takeoffs are more difficult than landings, but after you learn the necessary technique, the airplane handles it well.

KidVenture volunteer Jim White stopped by our booth to rave about the progress being made by the kids on a set of RV-12 wings. Van and Scott McDaniels paid a visit. It was impressive. Volunteers were guiding dozens of young people, eager to get their hands on tools and actually make an airplane part. Dan Majka, the man leading the project, told us he'd have been excited if the basic wing skeletons were finished by the end of the week. Instead, when our guys were there on the fourth day, one wing panel was virtually complete and the other was going together even faster. Kids and volunteers alike were enthusiastic about the kit and the experience. So was Van: "You'd think I would have seen everything after 37 trips to Oshkosh. Not so! This became very evident when I visited the Kidventure exhibit at Pioneer Airport. I had always been too busy or just unaware of the wonderful hands-on programs which are available to a wide age range of kids. Check it out on EAA.org. Get involved as a volunteer if this program motivates you."

home and reverse engineer into a new RV. It was the best banquet in a long time, and left us feeling good for the rest of the show.

Van's personal highlights included the 37-ship formation flight, led by Stu McCurdy and including Van's employee Joe Blank. "Every year this group just gets better and better," Van says. "Their formation displays now rival or surpass the big warbird formations which have been an Airventure attraction for years. Stu and all of the formation pilots are to be congratulated on their hard work, skill, and discipline. In addition to the entertainment they provide us, we should all aspire to improve our flying skills and safety using the example of planning, discipline and practice they set for us. By now you've no doubt seen the Sept. 09 issue of *Sport Aviation* which features the formation RVs on the cover and elsewhere in the magazine. Congratulations, guys! Well deserved."

Out on the flight line, we kept the RV-10, RV-12 and Mike Seager's RV-7 busy. We'd hoped that East

A symbolic moment: EAA founder Paul Poberezny drives his famous red VW down the flightline as the world's first electrically powered production airplane taxis for take-off.

CRUISIN' THE GROUNDS

My favorite part of the show came on Wednesday evening… or maybe it was Thursday. Rather than making a rapid escape from the tent back to the dorm and just hanging out, Gus, Joe, Scott McD and I spent the evening wandering among the antique and classic airplanes and then threw out our folding chairs at Theatre in the Woods to hear the crew of the Hudson River Floating Airbus tell their story.

A DH-88 taxies for takeoff

The more time I spend around airplanes, and the older I get, the more attracted I am to old airplanes. Especially airplanes that were built before the advent of the production-line metal airplanes that emerged after World War 2. Staggerwings, Wacos, a beautiful Laird (with a 450 P&W in the nose!), the first Klemm I'd ever seen close up, a Comper Swift (with a Cirrus engine instead of the Pobjoy radial I thought was standard)... it's all wonderful. The beautiful workmanship and loving care taken to preserve history and the touch of the human hand — it kind of gets to me.

I ran my fingers very gently along the ridged fabric of the Laird wing, peered longingly through the side window of a Stinson Reliant. A New Standard is built like a bridge — or a tractor, depending on which part you're looking at. One of these flies twelve hours a day at Sun 'n Fun, seating four people at a time in the front cockpit. The airplane was designed in the '20s to let barnstormers make money by hauling more than one person at a time. More than 80 years later, it is still flying and still doing exactly what it was *designed to do.* Quite a few old airplanes can still fly, but how many are still doing what they were originally designed for?

I found myself on the outskirts of Aeroshell Square, staring down the gun muzzles of a Hurricane, then standing on my tiptoes to look into the cowl of a Westland Lysander while I traced the huge exhaust ring around the front of the sleeve-valve radial and down underneath the cabin. Books call the Lysander a small, liason aircraft. Laison, yes, small, no. The thing is huge — you have to climb a several-step ladder to get in. Imagine flying this beast across the Channel on a moonless night, finding and landing in a farmers' pasture by the light of two scared Frenchmen waving flashlights, dropping off or picking up an agent, then missing the hedges on takeoff and finding your way home before dawn made you fighter-bait.

The high point of my evening came when we helped push a deHavilland DH-88 Comet from the parking area to the taxi way. DeHavilland built only five of these lovely things. Amazingly, two still survive. The airplane at Oshkosh was not one of them. Instead, it is a faithful replica built from scratch in California. For all practical purposes, it is serial number 6.

Pilot Robin Reid helped an elderly man into the back seat and prepared for an evening flight. Maybe, I thought, getting old might not be as bad as I fear if I'm still able to ride in airplanes like this. After a brief battle, Robin had both Gypsy engines running and took off, the red airplane glowing in the remaining sunlight as the wheels disappeared into the slender nacelles. It was beautiful.

By the time the day ended, I'd flown two different RVs, had my hand on a real, living, Comet, listened to two highly professional pilots describe ditching a large jet while injuring absolutely nobody — and spent a relaxed evening with intelligent, capable people I like and respect. I call that a good work day.

GETTIN' HOME

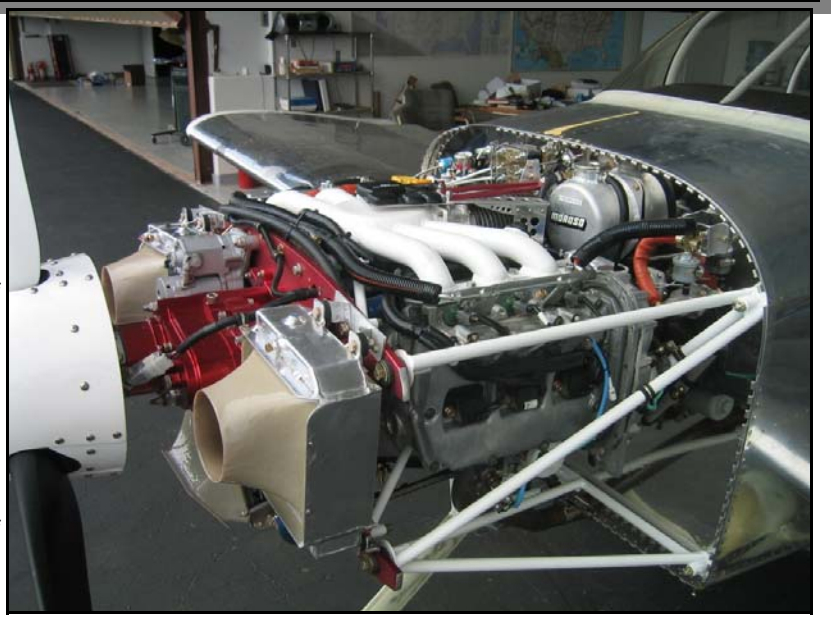
Jerry found a ride home in another RV-10 earlier in the week, so when Sunday arrived, it was just Van, me and the RV-10. When I dialed up my Weathermeister account (the best web-based weather briefing I've found) all the winds aloft were shown in red. Not good. The forecasts were correct. We departed at 8:30 Sunday morning and slogged west, staying low and fighting 20-25 knot headwinds. Anything above about 145 knots groundspeed on the GPS was cause for celebration. We stopped in Mobridge, SD, for gas. There was exactly one airplane parked on the ramp…and it was another RV-10. What are the odds?

I took us on into Butte, MT (gas $1.40 more than Laurel, MT) and from there Van flew us across the mountains and home. It's always a good moment when we can spot Mt. Hood on the western horizon. This time we saw it from almost 200 miles out. Given the persistent wind, that was a long way. Finally, the mountain slid aft of the left wing and we started downhill for home. We closed the hangar door in Aurora at about 6 p.m. Van climbed into his personal RV-10, I clambered into my RV-6 and we both flew home. Van was headed for his wedding anniversary celebration. I was looking forward to seeing The Violinist again – between music festivals and airshows we hadn't been together in more than two weeks.

When I taxied into my back yard, the gate opened and there she and Fo'Paw (a family member of the poodle persuasion) were, ready to hand me a cold drink and a warm welcome home. Somehow, at that moment, I didn't remember the headwinds at all.

ONE AIRPLANE – TWO VERY DIFFERENT ENGINES

JERRY BALLARD



A note: Van's is often perceived as being "down on" alternative engines. This is not true – after all, if someone develops an engine that can demonstrate better economy, reliability, simplicity, weight or cost than the traditional aircraft engine, who would sell more airframe kits? What we caution against is blind acceptance of performance claims and an unrealistic expectation that an alternative engine would be "just like an airplane engine only better." Jan Eggenfellner's Subaru-based engine packages have survived the test of time and marketplace better than most alternative engine packages. Testimonials on his website indicate that he has many happy customers. And notice that Van's doesn't have a dog in this race – we don't sell either Superior or Eggenfellner engines. So the following is just one experience, presented here simply because it is the result of a unique perspective.

Jerry Ballard built an RV-7A with the idea of producing a comfortable, fast, cross-country airplane. To that end he chose to power it with an Eggenfellner H-6 engine package, based around a 6-cylinder Subaru engine. After a few hours, he decided to replace that engine with a 180 hp Superior IO-360. Since it's difficult to find anyone who's flown both engines in the same airplane, we asked him for an article summarizing the differences he found between them.

IN THE BEGINNING

After 5 year and 4 months building (IMHO) a "Rolls-Royce" RV-7, I made several flights. The airplane handled like a dream come true. However, after the excitement abated (slightly) and I began looking at the performance and operational parameters of the Eggenfellner H-6 engine package, I was left with disappointment and frustration. Disappointment, because I didn't find the power I expected with this engine. Frustration because I was faced with operational difficulties, particularly cooling, I didn't think I'd have. Eventually, I was forced into a difficult decision.

THE ORIGINAL CONFIGURATION

- RV-7A with Eggenfellner H-6, Gen 3 (mod 4) gearbox with MT prop
- Two custom 8" x 8" custom radiators by Tech Welding with 2.25" core. Each radiator has a vent to allow air to be easily vented.
- Custom James diffuser inlet ducts. Inlet rings are 4.625" diameter in a James cowl
- Air/fuel ratio meter
- All fairings, wheel pants and intersection fairings installed.
- 2 Super Traps with SS packing with 6 rings removed from each with spacers added.
- Right side engine exhaust slightly re-routed to ensure it adequately clears cowl.
- Two 30 sq in exits (Tom Moore specs) to increase exit area by 60 sq in.
- Cowl was originally fitted with Gen 2 gearbox therefore I have increased separation (cowl to spinner) with Gen 3 gearbox.
- Oil cooler is original with James cowl inlet feeding it directly. Oil temps run equal to coolant temps or less by 5-17 degrees.

I did not install special scat tube for cooling gearbox, and even without it, I did not experience gearbox heating issues. Coolant temperatures were a different story.

GETTING AIRBORNE

I performed a taxi test on 7/27/2008. The OAT was 90 degrees and the coolant temp hit 250 very quickly. I shut it down ASAP. It was apparent that, in spite of a lengthy planning and design process to preclude cooling issues, my installation wasn't going to work. I began the tinkering process and made the Tom Moore designed cowl exits. I then made two separate flights in the pattern on 8/4/2008 and 8/7/2008 (OAT 67 both days) with acceptable temps, but I did have coolant overflow at engine shutdown. Prior to the taxi test, I asked about changing from Sierra brand to NPG+ and the advice I was given was "Use whatever you want, just don't exceed 220 degrees". On my third flight on 8/9/2008 (OAT 90) the temp again went to 250 degrees before I could land. Even though I was carefully checking the coolant levels before each flight, I suspect that the Sierra brand reached a boiling point and had created pockets of air creating a false level of coolant in

the system. I drained the Sierra brand and went to NPG+ and vented the system (Note: my custom radiators have vent plugs allowing for easy venting).

After changing to NPG+, I made several flights in the local area with temps high, but in the acceptable range. Based on recommendations from fellow H-6 flyers, I adjusted takeoff RPM to 2400. On the local flights I experimented with different prop RPM to see what the cruise performance would be. While I did not fully resolved the heating issues, I was able to operate on 80 degree days.

On 8/23/2008 I arranged a calibration flight with a fellow RV pilot, flying an RV-7A powered by a Lycoming O-360, to check IAS and TAS. As it turned out, my maximum speed was his cruise speed and he obviously had a power reserve. On 8/24/2008, I flew 1.8 hours, taking off at 80 OAT after a longer delay at the hold line than I wanted. The engine temp was 190 at takeoff. I took off at 2400 RPM as recommended by other H-6 owners. Operating from 5500' elevation, climb temps were at 220 to 225 and I had to continually adjust the prop RPM and step climb to 7400'. Using a higher prop RPM easily pushed coolant temps to 220 degrees forcing a return to step climb. My optimum cruise (7400 feet) was 2100 RPM, 74 OAT, 121 KIAS, 143 KTAS, 8.9 gph fuel flow, coolant temp 216, oil temp 188 and gearbox temp 196. At 2200 RPM I could go slightly faster (126 IAS, 145 TAS) but the fuel flow increased to 9.9 GPH and the coolant temps oscillated at 220 $\pm$ 2 degrees. I did not attempt to climb higher because I had to step climb to 7400 and the climb rate was not great.

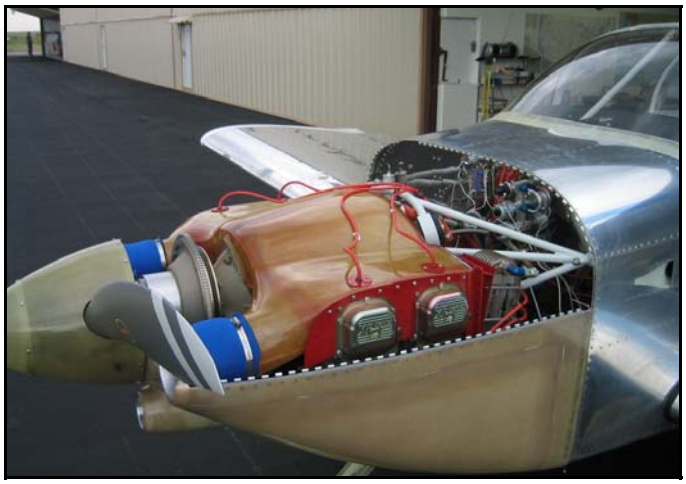
After this flight, I concluded that, with sufficient work with the cowl, larger inlets, movable cowl flaps, etc., I could probably improve the cooling characteristics and maybe even eliminate the problems. But I would have to be willing to tinker extensively with NO guarantee of a positive outcome.

I don't think that any amount of time will resolve the performance issue that I have with the H-6. For some, 143 knots cruise (164 TAS in MPH) is acceptable, but when I compare it to other RVs with 180 HP air cooled engines, the H-6 package does not – and, in my experience, can not -- live up to my expectations. The benefits that I'd hoped for when I bought this engine do not outweigh the performance downside.

I was extremely patient while I was building the RV-7A. However, I'm not so patient now that I have my aircraft completed. I want to fly it without restrictions or without thoughts of what the next mod will be. I placed an order for a Superior IO-360.

Removing the H-6

On August 24th 2008, after 6.8 hours of flight, I grounded the plane and began removing H-6 firewall forward package. This required the removal of the windscreen and the forward fuselage skin -- required because I had to have access to the top part of the fuselage just aft of the firewall. The H-6, with the Engine



Control Module (ECM), was very wiring-intensive and I had to remove it all in order to have a complete package for a potential resale. I also wanted access for to the rear of the instrument panel, as I would be modifying the panel and wiring.

The new configuration is:

- Superior IO-360 parallel valve
- 74" Hartzell blended-airfoil prop
- James plenum
- James cowl
- Van's firewall forward components

Related changes necessary for the engine swap:

- Revised the panel to accommodate the removal of the dual batteries and related voltage monitoring and switching systems. I had modularized my panel so those were not too hard.
- Removed the dual batteries placed aft of the baggage compartment for weight & balance.
- Removed the fore/aft battery cables.
- Added a starter and magneto selector switch
- Removed the dual electric fuel pumps and the associated monitoring & switching mechanisms provided with the H-6 package
- Added the electric fuel boost-pump required for the IO-360.
- Removed the cabin heater, which had been one advantage of having a water-cooled engine.
- Modified the firewall to accommodate the removal of the H-6 components and accept the IO-360 and Van's firewall forward components.
- I kept the GRT EIS4000 engine monitor but had to purchase different sensing units.

WEIGHT REDUCTION

Although the new aluminum Hartzell prop weighed about 6-8 lbs more than the 3-blade MT prop I removed, the overall weight of the airplane dropped from

1299 lbs with the H-6 installed to 1191 lbs – a reduction of 108 lbs. Weight on the nosewheel in the level flight attitude went from 322 lbs to 295.5. It's not a light airplane even after installing the Superior, but it is about 9% lighter than it was.

FLYING THE IO-360

The first flight with IO-360 was on May 26 2009. This was followed by the typical engine break-in procedures and fly-off of the remaining 40 hours in the restricted area. I found that typically I could fly TAS of 161 knots at 9.3 gph. At 7.6 gph, I could true 144 knots at 7500'. These speeds were significantly faster than I could achieve with the H-6 at similar flows.

During break-in there was a consistent 65 degree temp difference between CHT1 and CHT3. I narrowed this significantly by the addition of the recommended baffles on cylinder 1 and a smaller one on cylinder 2.

The new engine has been flawless. The H-6, while reliable enough during the brief time I flew it, does present a different thought process for monitoring. When I flew the H-6 I was constantly thinking about the electric prop and the brushes, the gearbox temp or failure, the coolant temps, the dual battery requirement and the engine's complete dependence on electric power.

I think back on a RV driver that has 2000 hours on his air-cooled engine that said "It's like a Briggs and Stratton, you start it and it just keeps going". Even though there are failure points in all engines, I take a certain amount of comfort in having dual magnetos, dual fuel pumps, hydraulic prop, etc. Once it's going, at altitude and trimmed up for flight, it just hums along. I guess the bottom line is that while I thought I'd be less concerned about failure points of the H-6, it turns out that I'm less concerned with the air cooled Superior and the hydraulic prop.

The water-cooled Subaru and MT prop was a smooth combination, but I don't really notice the vibration of the Superior and 74" prop. Other than the not having a reserve of power with the H-6, I can't really say I notice any difference in the flight characteristics of the plane with the two engines.

AND ADD TO THAT...

After Jerry had submitted his article, RV-7A builder/pilot ***Dave Domeier*** *called on an unrelated question. That jogged my memory… Dave was another who had flown both the Subaru and the Lycoming in the same airframe. In fact, Dave had gone Jerry one better and flown TWO Subarus in his airplane (no...not at the same time…).*

Originally, Dave had installed a supercharged 2.5 liter Eggenfellner. A thrown supercharger belt caused a forced landing that damaged the airplane significantly. Dave rebuilt it and in the process, installed the H-6 engine. After flying that for several months, he installed a Lycoming. There wasn't time for Dave to write up the complete story, but he was kind enough to supply us with some performance and weight numbers as a sidebar to this story.

Here are some weight and performance data on the engine change in my RV-7A:

- With Subaru H6 and special lightweight MT7 prop - 1256 lbs
- With Barrett Lycoming IO-360 180 HP Catto fixed pitch prop - 1073 lbs

H6 2-blade MT7 CS PROP	IO-360 (180 hp) 3-blade CATTO F/P PROP
8500'/ WOT	8500'/ WOT
RPM 2500	RPM 2820
FF 11.2	FF 11.8
KTAS 152 (175 mph)	KTAS 175 (201 mph)
12,500' / WOT	12,500' / WOT
RPM 2600	RPM 2710
FF 10.1	FF 10.4
KTAS 148 (170 mph)	KTAS 166 (191 mph)

Note: these numbers are not flight test scientific. Just an average pilot writing down what he sees and verifying TAS with GPS.

Typical flight planning for me is 8 gph. At this fuel flow, the H6 settled down at 143 KTAS while the Lycoming runs at 151 KTAS+.

With lean-of-peak operations, the Lycoming was running 148 KTAS at 7.4 gph to and from OSH this year. No LOP with the H-6.

David Domeier, RV-7A N707DD

ARC FINAL RULE RELEASED! *VAN*

Just as we "go to press", word arrived from the FAA announcing that the new policy was finally been published on September 16. You can read all about it at http://www.faa.gov/aircraft/gen_av/ultralights/amateur_built/media/ARC_FINAL_2008_report.pdf

The primary reasons for the ARC (Amateur Built Rule Committee) and the review of Amateur-Built rules and policy was the FAA's concern over excessive commercial builder assistance and outright pro-building. Fortunately, the FAA included EAA and industry representation on the ARC. The main concern of both EAA and mainstream industry was that the FAA might over-react and create rules which would seriously limit what kit manufacturers could provide and what amateur builders must fabricate themselves. It appears that our damage control efforts were effective.

From what I now know, it appears that the new rules/policy will require more disclosure on the part of the person applying for an Experimental Amateur-built license. Examples include provisions on forms where the applicant must specify whether or not he received commercial assistance and from whom. Also, the new 51% kit compliance checklist is expected to have a column for listing commercial assistance received on line item tasks. The bottom line is that typical amateur builders will be minimally effected by the new policy.

The FAA's stated intent is to more aggressively pursue enforcement of the prohibition of pro-building and blatant abuse of the 51% rule. Affected parties would, of course, be those providing pro-building services and those attempting to license pro-built airplanes.

From the sidelines, the new homebuilt game may seem little changed from the past. If that's so, what was the benefit of all those meetings over a three year period? I'm convinced that had not the FAA included industry members on the ARC committee, and had these members not worked long and hard, we would have seen more changes — and we wouldn't have liked them. Many thanks to Frank Paskiewicz and his FAA team for being open to industry input.

Now that the new policy has been published, it appears that for most builders it will be "business as usual". I haven't yet haven't had time to completely review the new guidelines, but will do so soon. I will also learn what can about how the FAA is working with DARs toward implementing the new policy and report back to you in the next *RVator*.

KIDS RV-12 PROJECT UNDERWAY AT VAN'S

Several issues ago, I mentioned that we were in the planning stages of a very interesting project. Under the auspices of a Portland OR-based organization known as Airway Science for Kids (ASK), a group of teens would build an RV-12 in a space provided by Van's Aircraft. Progress has been slow because of the difficulty in finding volunteer instructors and mentors who could commit to spending their summer Saturdays on the project.

Volunteers show Van's Scott McDaniels (second from left) the RV-12 wing kids built at the KidVenture facility during AirVenture '09. Scott heads up the ASK project getting underway at Van's.

Now, thanks in large part to RV-8 builder Lauran Paine's column in the August issue of *Sport Aviation,* more than enough volunteers have stepped forward. Van's R&D chief Scott McDaniels recently led an organizational meeting of volunteers, and on Sept 26, the first workshop to include students and parents will meet in Van's woodshop/shipping area. After a few Saturdays of learning shop and aircraft construction basics, an RV-12 will begin to take shape.

We're pretty excited about the idea and project, and are grateful to those who are spending their own time (and in some cases, money) to give young people the chance to participate in the constructive and interesting activity that's meant so much to us.

We will have regular progress reports and photos in upcoming *RVators.*

VAN'S HOMECOMING 2009

Van's line-up awaits inspection.

Van, Mitch Lock and Ed Johnson (who will look after Mitch's demonstrators on the East Coast) share an RV-12 moment with a couple of Homecomers.

EAA Chapter 292, Independence, Oregon, did a great job hosting Van's 2009 Homecoming Fly-in. Weather, food, and organization were all first rate.

Chapter President ***Bob Brown*** tabulated some results and sent in this report:

We had 154 people and 71 aircraft register at the sign-in table, which was open Friday and Saturday. There were more who attended, but didn't register.

The 154 people represented from 10 states and Canada. Twenty-five host families at Independence Airpark opened up their guest bedrooms, their hangar apartments and shared friendship with their guests. Some drove and stayed in hotels, some camped in tents in yards and around on the ramp.

Would you buy an airplane from this man?
Smilin' Tom Green ferried the RV-9A to Independence.

Here's the list of where folks came from:

- Alabama-2
- Colorado - 6
- California - 45
- Canada - 11
- Idaho - 7
- Oregon - 66
- South Carolina - 2
- Texas - 3
- Utah - 2
- Washington - 8
- Virginia – 2

We served over 150 people at the Friday night BBQ. After the BBQ, at least 85 people attended the Hangar Dance in the Krummel Hangar. Saturday morning, we served 215 people for breakfast. People walked the ramp all morning as aircraft came and went.

Tom Green, Van and several employees from Van's hung around their planes and around the tent and just enjoyed the beautiful weather. Saturday afternoon 25 people enjoyed the winery tour, then the beer tap opened up about 4PM and people visited in the hangar and tent until the banquet started at 6:30. The banquet was sold out after Van's sold 110 tickets, so we called the caterer, brought in some more table and chairs, sold a few more tickets and enjoyed the rest of the evening.