EAA

EXPERIMENTER

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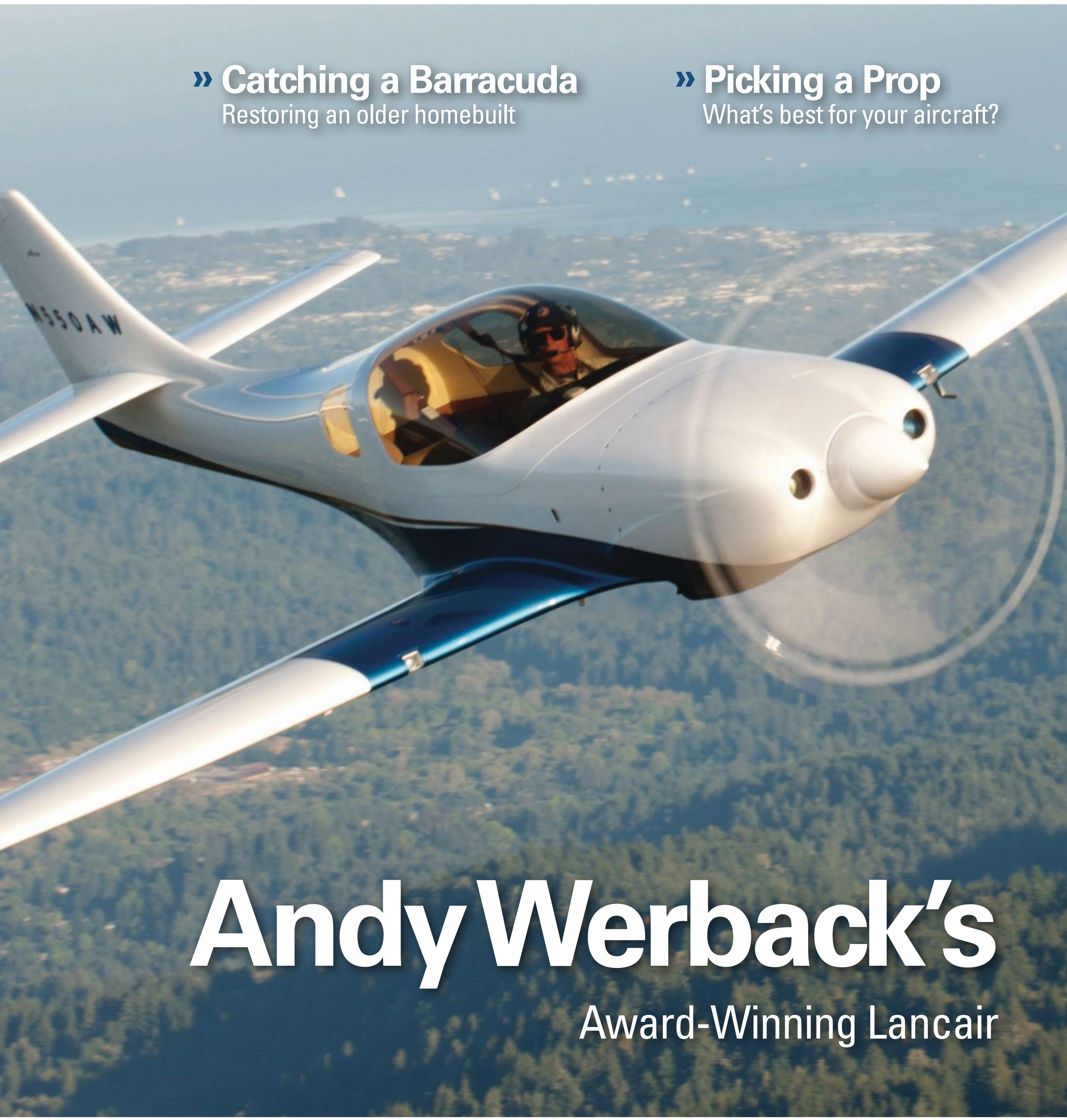

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Restoring an older homebuilt

» **Picking a Prop**
What's best for your aircraft?

Andy Werback's

Award-Winning Lancair

Lucky 13

Airplane anniversaries in 2013

By Chad Jensen

As does every year, 2013 has some notable airplane anniversaries to celebrate. I keep track of the yearly anniversaries on a spreadsheet that was started before I arrived on staff at EAA, and while it's not comprehensive, it does show the more popular designs that we've all come to know and love. Here are 13 designs to celebrate throughout this year; we will be making special mention of several of these at EAA AirVenture Oshkosh this summer.

The youngest on this list is Van's RV-9/9A. Fifteen years ago, Van's Aircraft introduced one of its most versatile designs ever, and it continues to be one of its most popular. The nonaerobatic cross-country cruiser is an all-metal kit and is well suited to today's builder. Designed for economy cruising, engines up to 160 hp are approved, and the RV flying qualities are oh-so present.

At 20 years old this year, the Seawind is one of the most unusual homebuilt kits out there. Purpose-built for water flying, but with speed in its back pocket (there is one Seawind that races in the AirVenture Cup race every year), the Seawind is quite a machine with great looks to boot! Most are powered with 300-hp-plus engines, and that means getting off the water and to your destination quickly. These airplanes are all fiberglass in construction with retractable landing gear and large, four-place cabins.

The Lancair 320/360 series airplanes came on the scene 25 years ago with one goal: Be the fastest in the 160/180-hp class. Fast glass is the name of the game here, with smooth, swoopy lines and all-fiberglass construction. A bubble canopy surrounds the pilot, providing great visibility, and a reclined seating position offers comfortable cross-country cruising.

Looking back to their 1973 roots, we have the Sonerai II and the Hiperbipe celebrating 40th anniversaries. The Sonerai II is a fast VW-powered tandem two-seater, while the Hiperbipe is a fast, fully aerobatic, side-by-side, two-seat cabin biplane.

The year 1968 saw the arrival of three designs that will celebrate 45 years in 2013: the BD-4, the Volksplane VP-1, and the Hatz CB-1. These three airplanes couldn't be further apart as far as construction is concerned. The BD-4 is an all-metal design, the VP-1 is all wood, and the Hatz biplane features tube-and-fabric construction.

Looking further back, the Thorp T-18 will celebrate its golden anniversary this year. The all-metal, low-wing, tailwheel airplane can use powerplants from 125 hp to 180 hp. The design is fast and offers economical cruising and very economical construction.

An anniversary that coincides with EAA's 60th anniversary is that of the Wittman Tailwind. This high-wing speedster is of tube-and-fabric construction with wood wings. The two-place, side-by-side airplane can be powered by engines ranging from 90 hp to 180 hp, and all of them fulfill the need for speed, just like Steve Wittman wanted.

At the age of 80, the Pietenpol Sky Scout and Knight Twister share all-wood construction. But the Knight Twister is a biplane, and the Sky Scout has a parasol wing. The differences don't end there; the Sky Scout was designed around using a Ford Model T engine, and it is still being built today with that engine. But both airplanes are single-seaters.

The oldest airplane on this noncomprehensive list of anniversaries is the granddaddy of homebuilts—the Pietenpol Air Camper at 85 years old. First flown in 1928 with a Ford Model A engine, to this day it continues to be one of the most popular plans-built airplanes available. The Brodhead Pietenpol Association even holds its own fly-in at Brodhead, Wisconsin, the week before AirVenture every year.

So while this is a list of anniversaries, the variety of airplanes available today to build is the bigger picture. From wood plans-built parasols with converted automotive engines to kit airplanes that are so advanced that new certificated airplanes look ratty by comparison, find something to build and enjoy every minute of it! EAA

On the cover: Andy Werbeck flies his AirVenture 2012 grand champion kit-built Lancair Legacy. (Photo by Chris Luvara)

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Other Airspeed Calibration Methods

I am quite disappointed in your airspeed calibration article(s).... By Ed Kolano's own admission, "This is a risky flight environment." ...But in fact, there are much better ways with much less risk.

The picture that accompanies the article on page 44 shows a GPS on the glare shield.... The problem breaks down into three phases: 1) Obtain ground speed(s); 2) correct for wind; and 3) correct for density altitude to calibrated airspeed. We must assume level flight in smooth air in all cases.

Phases 1 and 2 get you to true airspeed, which is best obtained with a GPS. You can set it to kilometers for greater accuracy, but the instrument is extremely accurate in any unit of distance.

The National Test Pilot School provides some excellent resources.

If you don't want to bother with a three-way run, then use this: At your predetermined test altitude, slowly turn until the corrected compass reads the same as the (magnetic) GPS track. You are now flying either directly upwind or directly downwind. Observe your groundspeed. Turn either 180 degrees or until the compass and GPS agree again, but in the reverse direction. Observe your groundspeed. Average them. That is the wind-corrected groundspeed, which is the true airspeed. This can be done safely and with less chance of atmospheric disturbances at higher altitudes where thermals are zero or minimal and where ground proximity risk is absent. An error of 2 or 3 degrees has almost no effect unless the wind is very strong.

Assuming your OAT is correct, your altimeter is correct, and it's set for 29.92 inches HG, then use your E6B to get your density altitude and then the same instrument to convert true airspeed to calibrated airspeed. TAS to CAS.

The more precise math can be obtained from the spreadsheets on my website.

Howard Handelman
EAA 111399

Ed Kolano responds:

Mr. Handelman is correct in that there are several methods for performing airspeed calibration. Indeed, the "three-way run" he mentions is an excellent alternative. Incidentally, the source for that procedure is a paper written in 1998 by David Gray entitled "Using GPS to Accurately Establish True Airspeed." Using GPS for a variety of flight-testing techniques may be addressed in future columns. I chose the ground course at this early stage of Experimenter because it offers a better opportunity to address attendant flight-testing considerations such as test planning, hazard analysis, risk mitigation, error sensitivity, and engineering judgment with a healthy safety emphasis while keeping the technical aspects manageable.

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AirVenture 2013 Tickets Available Online

Advance purchase admission tickets and camping are now available for the 61st annual EAA AirVenture Oshkosh, scheduled for July 29 to August 4 at Wittman Regional Airport in Oshkosh. Daily and weekly admissions are available; new members who join EAA now will immediately receive the best possible admission prices available only to EAA members.

Those who prepurchase AirVenture tickets online before June 15, 2013, receive a $2 discount on daily adult admissions and $5 on weekly adult admissions.

Advance purchase camping for Camp Scholler, which opens on June 28, 2013, provides the convenience of express registration at the campground entrance, including specially designated lines on peak arrival dates.

Advance purchase admission ticketing is again made possible through support from Jeppesen, which for more than 75 years has offered pilots an array of innovative navigation products, services, and software.

To access the advance ticketing area, visit www.AirVenture.org/tickets, make your selections, pay by credit card, and print your tickets at home. Full instructions and answers to frequently asked questions are available. Advance purchase AirVenture tickets are scanned and exchanged for an appropriate wristband at all AirVenture gates in a quick and easy process.

Photography by Jim Koepnick

New SportAir Workshops Leaders Named

EAA staffers Jennifer Bork and Lucas Hartwig have been promoted to manage the EAA SportAir Workshops, as the new program model is rolled out for 2013. Bork is the SportAir Workshops coordinator and Hartwig the Workshops logistics coordinator.

Bork joined EAA seven years ago and has worked closely with the homebuilt community on the workshop program as well as the EAA Technical Counselor and Flight Advisor programs, EAA Webinars, and more. She also served as safety programs administrator and worked in the builders' education center during EAA AirVenture Oshkosh.

Hartwig joined EAA in March 2012 as a membership services representative and has been active in several projects, including the AutoPilot member renewal program and SportAir Workshops. He will provide logistical support around the country as the new program model is established.

"Along with their past experience in working with the homebuilt community, both Jennifer and Lucas have also been active in our staff Zenith STOL CH 750 E-LSA building project," said Chad Jensen, EAA communities manager and homebuilders community manager. "We're very excited for them to start in their new roles."

New LODA Page Facilitates Easier Transition Training for Experimentals

EAA has established an online listing of Letter of Deviation Authority (LODA) holders for instruction in experimental aircraft.

The list, categorized geographically by state, includes certificated flight instructors who are authorized by the FAA to offer certain types of instruction for hire in their experimental aircraft for the purposes of type-specific training. FARs otherwise prohibit flight instructors from receiving compensation for the operating costs of an experimental aircraft.

The list of LODA-holding instructors makes finding transition training easier for builders and new owners of experimental amateur-built (E-AB) aircraft. Using an E-AB LODA instructor allows pilots to become familiar flying a similar aircraft to their own (during Phase 1 testing or at any point thereafter). Proper transition training is an essential first step toward safe operation of experimental aircraft and a key element in the continuing effort to improve aviation safety.

Publication of this list was one of four safety recommendations made by the NTSB directly to EAA in its study of amateur-built safety earlier this year. The other three recommendations, which tie directly into EAA's long-standing efforts to support the homebuilding community, include:

- Create a type club coalition that includes kit manufacturers, type clubs, and pilot and owner groups; and 1) develop transition training resources and 2) identify and apply incentives to encourage both builders of E-AB aircraft and purchasers of used E-AB aircraft to complete the training that is developed.

- Identify and apply incentives to encourage owners, builders, and pilots of E-AB aircraft to complete flight-test training prior to conducting flight tests of E-AB aircraft.

- Work with the EAA membership, aircraft kit manufacturers, and avionics manufacturers to develop standards for the recording of data in electronic flight displays, engine instruments, or other recording devices to be used in support of flight tests or continued airworthiness of E-AB aircraft.

Photography by Jason Toney

EAA Volunteer Advisory Committee Members Named

EAA has announced its first EAA Volunteer Advisory Committee (VAC), comprised of 11 appointed members selected for their past volunteer leadership as well as their commitment to help improve the EAA volunteer experience.

This committee is charged with representing and promoting the interest of EAA volunteers through recruitment, training, support, appreciation, and proper recognition, and has the Board of Directors' full support.
The first appointed VAC members include:

Ken Decker, EAA 52084, of Ottawa, Ohio
Tim Fox, EAA Lifetime 335031, of Fort Wayne, Indiana
Dennis Hasha, EAA 227907, of Tuscumbia, Alabama
Ginny Largent, EAA 575325, of Stephens City, Virginia
Rich Largent, EAA 512497, of Stephens City, Virginia
Dave Mercer, EAA 379378, of Vancouver, Washington
Joe Norris, EAA Lifetime 113615, of Oshkosh, Wisconsin
John Nowicki, EAA 116894, of West Chicago, Illinois
Bonnie Parnall, EAA Lifetime 30554, of Oshkosh, Wisconsin
Barbara Rapchak, EAA 638323, of Crystal Lake, Illinois
Alan White, EAA Lifetime 60137, of Superior, Wisconsin.

The committee's overarching responsibility will be to develop a best-in-class volunteer program. Among its charges are to:

- Research and recommend volunteer management policies and procedures.
- Research and recommend ongoing training for volunteers.
- Support volunteer recruitment and management.
- Assess and recommend recognition and appreciation programs that celebrate volunteer contributions and successes.
- Oversee the production of the volunteer newsletter, *Along the Flightline*, and support other communication channels to ensure volunteers are informed.

The committee will also seek to discover and implement other opportunities that support and enhance the EAA volunteer experience—both during AirVenture and throughout the year.

To serve on the committee one must be an EAA member in good standing with at least three years of experience as an EAA volunteer. Committee members may serve a maximum of five consecutive years.

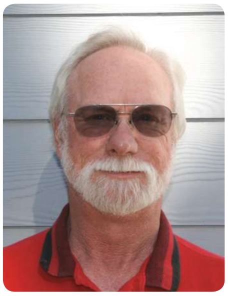
If you have any questions about the Volunteer Advisory Committee or any other questions regarding EAA volunteerism, contact Janine Diana at 920-426-6843 or *jdiana@eaa.org*.

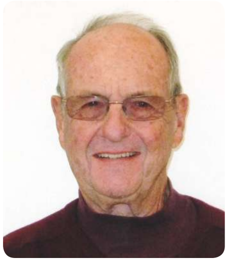

Ken Decker


Tim Fox


Dennis Hasha


Ginny Largent


Rich Largent


Dave Mercer


Joe Norris


John Nowicki


Bonnie Parnall


Barbara Rapchak


Alan White

EAA Hall of Fame Inductees

EAA inducted five new members into the Sport Aviation Hall of Fame during its annual induction dinner held in the museum's Founders' Wing in Oshkosh on November 15, 2012.

Inductees include (click on names for special video bios) Wes Schmid (Homebuilders), Clyde Smith Jr. (Vintage), Taras Kiceniuk (Ultralight), Giles Henderson (Aerobatic), and Preston "Pete" Parish (Warbirds). EAA congratulates our new hall of famers and thanks them for their many contributions to EAA and to aviation.

An active EAA member since 1956, Wes Schmid, EAA 3113, was involved in the preparation of *Experimenter* and redesigning the *Sport Aviation* magazine in 1958. He also prepared EAA's advertising programs and developed a variety of special publications such as data books, how-to manuals, brochures, and other educational and promotional materials.

In 1959, EAA Founder Paul Poberezny appointed Wes to the position of forums chairman, which he held until 2009. During those years, the forums grew from the one tent at the Rockford, Illinois, fly-in convention to the 11 buildings currently used at AirVenture in Oshkosh, Wisconsin. He continues to volunteer with the forums operations to this day. More than 500 educational forums are scheduled during AirVenture, some of which include aviation's most knowledgeable designers, builders, and engineers.

Wes had been a member of the EAA Board of Directors for 33 years, serving as the association's secretary. He is co-author of the *Golden Age of Air Racing*, which has been considered the bible for pre-World War II air racing fans. It won the Clifford W. Henderson Achievement Award in 1992.

Wes has owned a Meyer Little Toot and is a co-builder of a scratchbuilt Steen Skybolt.

Owner and founder of Icarus Engineering since 1971, Taras Kiceniuk Jr. of Los Angeles, California, has designed and built several ultralight gliders over the decades, a few of which broke world records and have been held in high honor.

In 1971, Taras created the Icarus II biplane glider that set the world duration flight record of one hour and 11 minutes. Two years later, his Icarus V set the world duration record for high-performance hang gliders at two hours and 30 minutes. Additionally, in 1975, Taras' Icarus HPA-1 became the first powered plane to make unassisted flights in the United States.

As the chief engineer on the Gossamer Albatross project for human-powered flight across the English Channel, Taras was awarded a medal in 1979 by England's Prince Charles for his work. More recently, Taras was project director for Reginator, a manufacturer of electric- and wind-powered hybrid aircraft, from 2007 to 2009 and demonstrated the first atmospheric energy-gathering flight on May 31, 2007.

Also credited for several patented product designs and engineering positions with companies like General Motors, Taras holds three private pilot ratings: glider, single-engine land, and instrument.

SportAir Workshops to Implement New Model in 2013

Since first offering courses in the early 2000s, EAA's SportAir Workshops have been traveling around the country to help educate homebuilders. The workshops provide the guidance to increase confidence and skills for attendees to take home and put to use.

In 2013, starting with the workshops slated for EAA AirVenture Oshkosh in January, eight to twelve strategically located regional sites will be established around the country, allowing courses to be offered on a more regular basis. These regional facilities should also lead to expanding both the frequency and course offerings throughout the year. The TIG welding course will continue to be held exclusively at Atlanta Aerospace Composites, Griffin, Georgia.

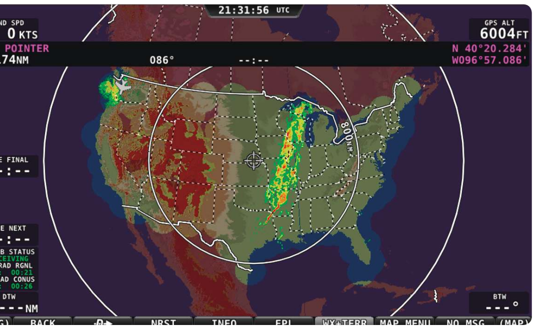
Each regional location will be equipped to offer fabric covering, sheet metal, and composites instruction as well as electrical systems and avionics courses. As EAA SportAir Workshops evolve, workshop attendees can expect to see expanded course offerings, more advanced skills workshops, improved quality, and other enhancements.

EAA will provide more information soon, including selected regional locations and course schedules/offerings. EAA

Dynon Announces SkyView Version 5.0, Featuring ADS-B Weather, Traffic, and TFRs

Dynon Avionics has released Version 5.0 software for the SkyView Integrated Glass Panel system, making good on its Oshkosh promise to deliver ADS-B-based traffic and weather for SkyView this fall. Version 5.0 is a free upgrade for all existing SkyView owners.

When coupled with the recently released SV-ADSB-470 UAT Band Traffic and Weather Receiver ($995), SkyView Version 5.0 allows U.S. customers to receive ADS-B-based weather. All information displayed is free, with no monthly subscriptions, based on the FAA's ADS-B broadcast in the United States. Weather is displayed graphically and textually on SkyView, and includes NEXRAD radar, METARs, and TAFs. Weather graphics are clear and easy to understand, even with terrain displayed, thanks to SkyView smart map layering system.



Additionally, when paired with the ADS-B "Out" capable SV-XPNDR-26X Mode-S Transponder, an SV-ADSB-470-equipped SkyView system receives a full traffic portrait from the FAA ADS-B system. This portrait is tailor-made for the SkyView-equipped aircraft and includes all ADS-B and radar targets that the FAA can detect. In contrast, other portable/receive-only ADS-B solutions only receive "partial" traffic when another ADS-B "Out" equipped aircraft happens to be nearby, drastically reducing their traffic-sensing capabilities.

Other major feature additions to SkyView Version 5.0 include: automatic ALT/GND mode for the SV-XPNDR-26X, single display reversionary mode for multidisplay systems, a new screen swap button, which swaps entire contents of the displays, and improvements to airspace depictions. For a full list of all the additions, please see the *SkyView User Manual* available from the Dynon website at www.DynonAvionics.com/docs/support_documentation.html.

Customers can download SkyView Version 5.0 for free from www.DynonAvionics.com/docs/support_software_SkyView.html.

For more information about Dynon products, please contact Dynon at 425-402-0433 or *info@DynonAvionics.com*.

Flight Design Celebrates 25 Years

Flight Design GmbH has been designing and manufacturing aircraft for 25 years. To mark this milestone, the company is offering a special "Jubilee" series of its models with unique features and value pricing.

"It has been an exciting 25 years where we brought interesting new airplanes to markets around the world," said Flight Design CEO Matthias Betsch. "For this anniversary we have a special model created expressly for our worldwide dealership partners and their customers."

Flight Design will build the special Jubilee edition in a limited series of 25 airplanes. The specially constructed airplanes offer a personal touch, a unique equipment list, and special pricing. The Jubilee treatment can be applied to any of several models in production, including CTLSi, CTSLi (Supralight), or MCi.

To ensure quality and desirability, only 25 Jubilee airplane models will be manufactured. Standard features will include: Rotax 912iS engine; Dynon SkyView avionics, dual 10-inch displays (for LSA/EASA 1,320-pound/600-kilogram CTLSi and MCi) or dual 7-inch displays for CTLSi at 1,040 pounds/472.5 kilograms, or single 10-inch display for CTSLi; Dynon autopilot; 8.33-kilohertz communications radio with Mode S transponder; Garmin 796/795 GPS; electric stabilator trim; two upgraded Bose A20 Active Noise Reduction (ANR) headsets; input capability for mobile phone and music; special two-tone leather interior, including leather instrument panel and carpeting similar to the interior in Flight Design's new four-seat C4 mock-up as seen at air shows; and a special 25th anniversary theme exterior design painted on aircraft (not decals) with 25th anniversary commemorative logo.

The program is available effective immediately until the 25th Jubilee airplane is built with delivery occurring from February to June 2013 at the rate of five airplanes per month. For more information, visit www.FlightDesign.de.

New Aviator Light Pen Sheds Light Where You Need It

When you need to write and there is no light available, or when you don't want to lose all your night vision, or when you don't want to disturb those around you, the old solution was to write blind and try to decipher it later or hold a flashlight in your "spare hand." Technology presents a better solution, and Wicks Aircraft Supply has it: a pen with a lighted tip.

This ballpoint pen writes with standard black ink, right where its own light is shining, allowing you to see and write in otherwise pitch-darkness. It is also possible to use this pen without turning on the light, to save the long-life batteries for when you need them. It is also useful as a micro-flashlight.

The wait is over. The Wicks part number is WF14101B, and the Aviator Light Pen is available immediately, priced at $9.99. Have a look.

AeroLEDs Upgrades AeroSun for Landing/Taxi/Recognition

AeroLEDs has introduced an upgraded version of its AeroSun for use in experimental amateur-built aircraft and light-sport aircraft. It is designed for wing mounting in aluminum and composite aircraft for landing, taxi, and recognition purposes. It has built-in wigwag and pulsing modes in addition to its standard steady beam.

Each AeroSun uses one-fourth the power of a 100-watt halogen bulb while producing an equal amount of light. The LED has a life of 50,000 hours, meaning it can be on at all times and will never have to be replaced. It will outlast halogen, tungsten, and HID lights.

AeroSuns are completely sealed and will operate in temperatures ranging from -55°C to +70°C. They are 2.25 inches high, 5 inches wide, and 1.5 inches deep and weigh only 8 ounces.

The upgrade from the previous model includes an increase from eight to twelve LEDs within the same size mount, which provide a 50-percent increase in the amount of light emitted. The new units feature four bezel mount positions in addition to two side mounting ports.

The AeroSun is protected against overheating with a built-in protection circuit. It is also sheltered against lightning, voltage spikes, reverse voltage, and under voltage conditions. AeroSuns sell for $325.

For more information, visit www.AeroLEDs.com or call 208-850-3294.

Nominations Sought For EAA Homebuilders and Ultralight Hall of Fame

EAA is seeking nominees for induction into the 2013 Hall of Fame. The Hall of Fame provides permanent recognition for the designers, builders, educators, pioneers, record-setters and others who made a substantial impact on the Homebuilding and Ultralight movements. Induction ceremonies will take place in the fall of 2013 at the EAA Aviation Center in Oshkosh, Wisconsin. The nomination deadline is March 1.

Nomination forms and more information can be found at: http://www.eaa.org/homebuilders/programs/hof.asp and http://www.eaa.org/ultralights/hof.asp. EAA

The Second Time Around...

Andy Werback's legacy of perfection

By Budd Davisson

The Lancair Legacy is made for guys like Andy Werback of Sebastopol, California. It's fast, it's slick, and it's just begging to have a detail freak with a thirst for speed jump into its innards and create the ultimate go-fast machine. However, Andy's Legacy RG is not just a machine; it's a delightfully insane combination of art, science, and hypercraftsmanship with just a pinch of black magic and sex appeal tossed in for flavor.

Andy's Legacy is an unreal airplane, but Andy himself is an interesting study. For one thing, you don't expect to find such an interesting combination of traits and experiences in one personal package. Some of his interests come in from left field, but his penchant for the technical side of aviation can be partially understood because of his upbringing.

He said, "Dad was a Navy vet who became an aerospace engineering professional and for quite a while practiced his trade for the Navy at Naval Air Weapons Station China Lake, where they invent and test all sorts of new ideas. I

Photography by Chris Luvara

Andy and Sam's Lancair Legacy was named kit-built grand champion at EAA AirVenture Oshkosh 2012.

watched what he did in his job, and from the beginning, I knew I liked tech stuff and airplanes."

After earning a degree in electrical engineering, Andy wound up as a biomedical engineer at the University of California (UC), Davis.

"I retired recently, but for many years I worked as a firmware (software) developer and integration/test engineer on radar warning systems for Navy and Air Force tactical aircraft," Andy explained. "We did a lot of flight testing on the F/A-18, for example. The great part was doing software that tied together all the hardware—radar receivers, computers, displays, interfaces, and so on—on some really fantastic jet aircraft."

That certainly sounds like a logical transition into homebuilding airplanes, doesn't it? *Not!* Part of the time, when talking to Andy, it's hard to keep from feeling as if you're talking to someone whose level of technical understanding extends far over the horizon from the rest of us. Then he'll say something that brings him back to Earth in a very low tech sort of way.

He continued, "I started flying while I was at UC Davis, but I had started sky diving several years before that. For a long, long time I had a lot more takeoffs than I did landings: My jumps outnumbered my flying hours by quite a bit.

"I found learning to fly to be exciting even though we were flying C-150s and 172s. In fact, with only 85 hours, I took a 172 on a cross-country from California to Chicago and back. Then I bought a 182, which was a lot faster, and it got me places quicker. But something was missing. By the time I began to understand what was missing, I got too busy with life and quit flying for 18 years." Sounds familiar, doesn't it?

"I love building stuff. Almost anything: houses, furniture, you name it," he said. "So, during the period that I wasn't flying, I gave some thought to building an airplane. The first step in that direction came in 2002, when I went to Oshkosh for the first time, not knowing exactly what I'd find. One thing I found was that the event rekindled the urge to get back into flying. But there wasn't much challenge to it, and the thoughts of building an airplane kept nagging at me. So I started reading dad's engineering books and looking at composite construction, à la Burt Rutan.

"I found a lot of the information in the books to be fascinating. I especially liked understanding the way things were fabricated and found the technology of the 1950s and '60s to be incredible. The upshot of all of this was that the building bug bit me hard, and in 2004 I bought a Lancair Legacy kit, the fixed-gear version. At the time it seemed like a huge but doable challenge. Of course, it helped that Reid-Hillview airport, where I was building, had lots of Lancairs based on it, so there was a lot of applicable knowledge floating around."

It would be easy to say that this is the beginning of the end of his story—that he got his airplane, worked on his airplane, and finished it. Then he took it to Oshkosh and other fly-ins. But that's not the story because this was only his *first* Legacy kit. And this is where it gets interesting.

Andy explained, "When I started on the fixed-gear airplane, I went to the Lancair factory for their Builder Assist program, which was incredible. You are presented with boxes and piles of parts and one or two weeks to do a lot of basic assembly. But everything went well and I now have more than 300 hours on that airplane. Oh, and it took me two years to build."

Let's back up and read that last line again. That's right: His first airplane project was a 200-mph, fairly sophisticated airplane, and it took him only two years to build it! It should be mentioned that he had a regular day job and wasn't an "airplane hermit" coming out of his workshop only when he discovered his groceries were running low. He actually had a life outside of his airplane building. Still…two years? Seems incredible, doesn't it?

"I really like to build. In fact, I like to build more than I like flying. However, once I started flying the airplane I felt it wasn't nearly fast enough. Yes, it was much, much faster than my old 182, but I was certain that, if I were to do it again, it would be faster."

So, here he is: His airplane is a beautiful piece of work and cruises right at 200 mph. But he's not satisfied. So, what's the logical decision at that point? Build another Legacy. Only make this one better. And faster! To him, that meant learning more about what he was doing. This, even though he had just built an airplane in two years, a feat most mere mortals consider impossible. So, he then did something slightly incredible.

He said, "Before I finished the fixed-gear airplane I took early retirement. And although I didn't need the money, I felt as if I needed more education, so I got a job with an A&P/IA as an apprentice mechanic. I figured the only way I was going to learn about airplanes was to immerse myself in them.

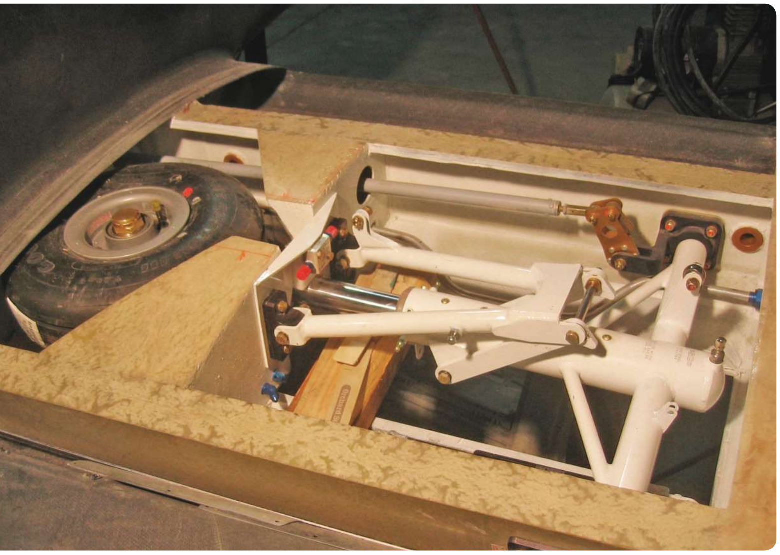
"I worked with him for 3 years and got my A&P. As they say, a license to learn. Now I could time a magneto, work on an engine, and do just about everything to every part of the airplane. I wanted to fill in the gaps in my knowledge and this did just that. Plus, now I knew a lot of people who could answer my questions!"

Now he was in the process of becoming a well-rounded builder/mechanic (the two skills are often not found in the same individual), and he was still flying a 200-mph airplane that he thought should be faster. So, he bought another Legacy kit and built another Legacy.

"I found a Legacy kit that hadn't even been unpacked, even though it was 8 years old. But I could only work on it after work hours. So I'd finish working on other airplanes all day and start working on my airplane every night. I

Landing gear details. In the course of building this Legacy, Andy earned his airframe and powerplant certificate to help him learn more about building and maintaining aircraft.

Andy and Sam's nicely detailed cockpit.



Landing gear retract system in the lower side of the wing.

Sam, Andy's wife, brushes some shavings out of the wing interior. She was hands on throughout the project .

Engine mount on the firewall.

knew that if I wanted to fly it, I had to finish it first. And because I'm no 30-year-old, that meant bearing down on it.

"The first week after the kit arrived was like Christmas. But this time I had to run a careful inventory and check every part against the current inventory list; because being an older kit, some stuff hadn't been updated, and I didn't want to build out-of-date parts into my airplane."

Because this was going to be his ultimate traveling machine, Andy wanted to get the project jump-started and once again relied on the factory for that initial push.

"I took the kit to the Lancair build shop and spent another intense week there. It was 10 hours a day working on the kit with the build center guys looking over my shoulder. We closed out the wing, built the tail, and fit the center section to the fuselage. At the end of the week, I had something that looked like an airplane rather than piles of miscellaneous pieces. What I trailered home was like the empty husk of a cicada: It had the form but absolutely nothing was inside of it, which was fine with me because I wanted to do all the systems and detail work."

If you were to ask Andy if he considers himself to be a perfectionist, he'll argue that he's not. He will, however, freely admit that he has a very clear picture in his mind as to how parts are supposed to fit together and what kinds of tolerances he likes to work to.

He said, "The first thing I did, as I started assembling the basic airframe, was to fit all the components together and start working on how well they transitioned from one to the other. It just seemed natural that there should be absolutely zero discontinuity where one component attached to another, like where the wings hit the center section or how the center section flows into the fuselage. This airplane is just one big beautiful curve and invites a builder to try to make it appear to be made of one piece by eliminating gaps, joints, and mismatches. That's not being a perfectionist; that's just recognizing how something is supposed to go together and doing it. To do anything else, when something is shaped the way the Legacy is, is sacrilege.

"When you're building something like this, you develop all sorts of tricks on how to sand straight and keep gaps even and at a minimum. Fortunately, there were a lot of other guys on the airport doing similar things, so I picked up many ideas from them and developed others on my own. I learned, for instance, that one way to make a perfect 1/16-inch gap was to fold sandpaper around a wide putty knife and use that as the sanding block in the gap."
Right from the beginning Andy practiced the "weight is the enemy" mindset that, when trying to build a flawless

composite form, isn't easy because the temptation to use fillers to get perfection goes the opposite direction.

"You do your level best to make sure the primary surfaces are as straight and as matched as possible so very little filler is needed. Then you try hard to sand as much of it off as possible," he said.

"One of the keys to building light is to build the airplane from the inside to the outside. It's easy to add weight by treating the inside the same as the outside, with the same attention to detail, and part of that detail is to not add what isn't needed. For instance, I was tempted to fancy up the baggage compartment with a floorboard kit (5 pounds), but instead I made it as plain, but as well done, as I could. No matter what you do to the airplane that adds anything, it adds weight and reduces performance. Another option I had was to use the Legacy RG adjustable pedal kit; but the Legacy FG rudder bars were much lighter, so I used them. Every single ounce counts. Making these choices is one of the most difficult parts of homebuilding an airplane."

The underlying purpose of building airplanes, as defined by EAA's mission statement, is education and recreation, and no one can build an airplane without learning how to solve problems.

Andy said, "For an engine I was having a 310-hp Continental IO-550N built. At least that's what I thought I was doing. But the engine wasn't showing up. I'd call and there was always a new excuse. Finally, I went down to the engine builder and invited myself to be part of the process. They'd already done the machining, but if I hadn't gone down there and done the assembly myself, I still wouldn't have it. I'm not an engine guy by nature, but with them looking over my shoulder, I spent a week finishing up the engine and getting it on the test stand. They didn't give me a 'do it yourself' discount. But at least I got my motor and that's all that's important.

"When it came time for the prop, I went with an MT composite three-blade. It was a little more expensive, but it saved 25 to 30 pounds in one chunk, and that's a lot."

Even though this was his second Legacy, Andy will readily admit that some things were harder than others, and he was still learning his way around the airplane.

He said, "Although the hydraulics were the toughest thing for me, fitting the canopy was by far the most tedious. You're fitting a carbon-fiber frame to a carbon frame, and it's…well…it's tedious. A little sanding here, a little more filling and sanding there.

"The retractable landing gear was nerve-racking because it had to be so precise. You can shim it on installation, but it's better to have the alignment right from the beginning. I had to make a drill jig to guarantee drilling 90 degrees. It's the kind of thing where you measure a half dozen times, take a deep breath, and drill. That's one of those areas where there's just no substitute for going slowly and carefully."

For the interior Andy decided to use real leather, which can be heavy if applied via traditional methods, so he compensated by lightening up the way it was mounted.

Andy concentrates on the canopy installation.

Photography courtesy Andy Werback

"The seats are Oregon Aero cushions that I had upholstered, but I stitched the other panels myself to make them match. I had a friend help me make cardboard backing for the side and back panels that are just velcroed in place. They are quite light, partially because I left them open in the back. There are lots more details I could have added, but unnecessary details are unnecessary weight. So…"

Avionics is an area that some homebuilders shy away from, but not Andy Werback.

"I did all the installation and wiring myself, which includes the NavWorx ADS-B system. As I was getting ready to put it all in, I became concerned about heat rise behind the panel, so I added a couple of cooling fans, including one for the EFIS. I also installed an autopilot that has two-axis coupling since I intend on flying it IFR eventually."

When it came to paint, Andy knew that a good paint job is composed of three critical processes: the pre-painting surface preparation, the actual spraying of the paint, and the post-painting surface work. He was comfortable with the first portion of the process, but not doing the actual painting and finishing because he knew a good painter is part technician, part magician, and all experience.

"I did all the surface prep, starting with 120 to 150 grit and gradually working my way up to 400 grit. I treated the white WLS epoxy high-build primer as if it were a finish coat, getting it as perfect as it could possibly be. That way, when Juan Solario at T&P Aero Refinishing in Salinas shot the color, it would also be perfect.

"We put on the scheme designed by Don Barnes (www.CellarIdeas.com is his business; www.LancairLegacy.com is his builder's log—highly recommended) using Sherwin-Williams Acry Glo high-gloss urethane with a clear coat."

Time to Go Flying!

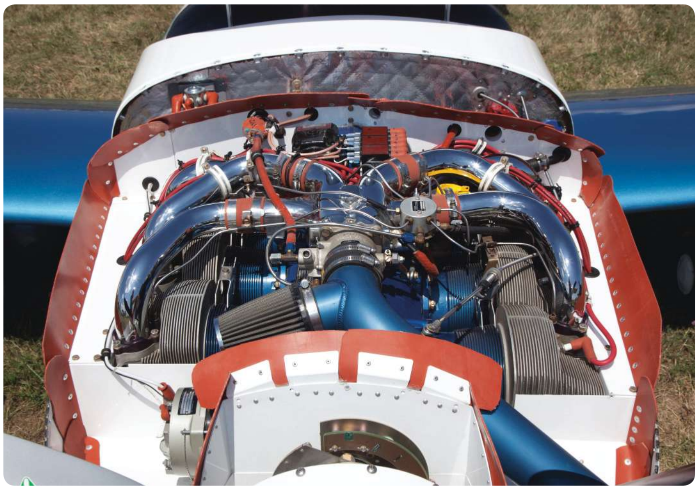
And then the day came where there were no more parts to install; nothing to be aligned; no tiny nitpicking detail to be finished. The Legacy was ready to fly, and Andy wisely decided he needed a professional to do the initial hops: Even though he had the Legacy FG time, he was still basically a 182, fixed-gear pilot.

"Pete Zaccagnino, a longtime test pilot, came in to do the test hops and some of the flight tests to verify the POH numbers. I'm positive I would have been over my head in that environment, and indeed, he did have a slight problem on the second flight, when the gear wouldn't come up.

"When I got ready to fly it, I cut right to the bottom line and went up to the Lancair factory. When I picked up the first Legacy at the factory, I took six hours of transition training in their RG. Then when I got ready to go in the RG, I went back up and took another 4 hours of dual, and I'm really glad I did. Even with 300 hours of Legacy FG time, my first flight in the (factory) RG airplane felt incredibly fast, and the landing was close to being sensory overload. Between monitoring the engine gauges and flying the airplane, I really needed to speed up my brain. Even though I expected it, it was still a surprise.

"I wanted more speed and performance, and I definitely got it. It climbs like a bandit, and I'm seeing a cruise at 10,000 feet of 210 knots true airspeed at 13 gph. That's really fast! I'm flying short final at 100 knots and touching down right at 75 knots. Which is also fast, but as I get more time in the airplane, that doesn't seem as fast as it first did!

With safety important to Andy and Sam, they installed a four-point shoulder harness.



When Andy's 310-hp Continental IO-550N wasn't coming together quickly enough, Andy assisted the engine builder to finish the project.

"It's really exciting to be the owner of any airplane. However, when it's something like this, it's doubly so. It's amazing to think of going somewhere 500 miles away and know you can make it in two hours. And, of course, to win grand champion kit-built award just makes it all that much better."

There are some things Andy doesn't mention about building the EAA AirVenture Oshkosh 2012 award winner. First, he had the airplane at Oshkosh 2011 (and won a Bronze Lindy) and listened carefully to what the judges had to say about his airplane. From the minute he started building the airplane, he placed great credence on the advice of others on how to build a safe, good-looking airplane. So, he took the judges' comments to heart, took his airplane home, and reworked it. And he won the Gold next time around.

Andy's story is one of determined self-education and the pursuit of doing things right. It is also one from which others can learn.

"Even though I had a lot of friends over to help with the big pieces and to cast their eyes on what I was doing, looking for errors, building an airplane is basically a lonely pursuit. You spend hours and hours by yourself attending to details that you know for a fact no one will ever see or appreciate because they're buried far down inside the airplane. But you do those with the same care that you do items that are right there in the public's eye. That's simply the right way to do things. And before anything else, it's got to be safe and reliable.

"Also, there are times when the immensity of what you're doing threatens to overwhelm you, and doubt sets in. Those periods can kill a project, but as long as you keep moving and keep doing little bits at a time and never stop, the doubt is erased by the progress being made. Progress is addictive. Once you taste a little, you want more. And before long, you're racing down the runway in your very own creation, and it absolutely never gets better than that."

P.S. Did we mention that he took two years to build this Legacy, too? Oh, yeah, forgot…and while building the Legacys, he also bought a barely started Skybolt and finished it. Something about wanting to learn welding is his explanation. That's almost depressing! EAA

» Andy describes his building experiences in this short video.

Budd Davisson is an aeronautical engineer, has flown more than 300 different aircraft types, and published four books and more than 4,000 articles. He is editor-in-chief of *Flight Journal* magazine and a flight instructor primarily in Pitts/tailwheel aircraft. Visit him at *www.Airbum.com.*

Andy and Sam enjoying their grand champion award.

Photography by Jim Raeder

Barracuda!

Jeff Weisel and his updated Barracuda.

They say every good fisherman is born with patience.

I waited 30 years to catch my Barracuda.

By Jeffrey W. Weisel

It was the late 1970s when I first became aware of the Barracuda. I was living in Los Angeles, California, and kept my old Tri-Pacer tied down at Whiteman Airport near Burbank. Peter Garrison was also a resident of the airport. Pete, a writer for *Flying* magazine, was well-known among people in the flying community; he kept his homebuilt, Melmoth, based there. Melmoth was Pete's own design and was built to fly anywhere in the world, holding enough fuel to leapfrog across the planet. Pete wrote extensively about aviation, and I read everything I could get my hands on related to flying. One of his articles had to do with experimental aircraft, and this particular write-up included the Barracuda.

The Barracuda was described as a fast, fighter-like aircraft, capable of high-speed cross-country flights while also able

to perform limited aerobatics. Pete stated that when boredom set in on those long flights, all you had to do to liven up the journey were a few loops and a roll. This sounded to me like the perfect plane. When I saw the pictures, I fell in love with its beautiful design, Corsair-like wings, and gull-winged canopy.

Pete went on to say the plane was designed and built by Geoffrey Siers. Geoffrey was a Royal Air Force pilot and aeronautical engineer; he flew Spitfires, Mosquitoes, and many of the early British jet fighters before immigrating to the United States and going to work for Boeing. The Barracuda was an attempt to re-create the building techniques and flying characteristics of those classic warbirds. It seems that he succeeded beyond his wildest dreams.

Over the years I read everything I could get my hands on about this fabled plane, but I never saw one. Constructed primarily of wood, Geoffrey only sold plans for the plane, as this was the pre-kit era. Since this was a complex aircraft to build, not many were completed. Geoffrey was a regular at EAA Oshkosh, where he encouraged builders, answered questions, and gave advice. The Barracuda graced the cover of *Sport Aviation* in January 1976 and won the Best New Design Award at the convention the same year.

Time passed, but I never forgot about this seductive aircraft. Occasionally I would see examples of the Barracuda over the Internet but never in person; they were just too few and far between. One night in 2007 while sitting at my computer, browsing through aircraft for sale on eBay and enjoying a glass of wine, I had one of the biggest surprises of my life. The prototype Barracuda was up for auction!

My world came to a momentary stop; here it was, the Barracuda built by Geoffrey Siers who still owned it. They say alcohol and eBay don't mix, but I took another sip and started bidding. A few days later the auction ended, and I was the highest bidder, but not high enough to hit the reserve price. A conversation between Geoff and I followed, and soon I was on a flight to Seattle, Washington, to see the plane and talk about how we could put a sale together.

I had a cold that morning, and by the time I arrived in Seattle, I was quite ill. Nonetheless we drove to Puyallup Airpark, about an hour away, and I had my first encounter with the plane I had dreamed about for so many years. My first impression was "Wow!" The Barracuda was not at all like other small homebuilts I had seen. The Barracuda is 24 feet long and has a wingspan of 25 feet. It's more the size of a Cherokee. I walked around and listened to Geoff describe the plane; he even showed me the saw he used to cut the materials to build the plane 32 years ago. We agreed to fly the next day. We drove to his home, and his lovely French wife, Genevieve, served me a wonderful bowl of homemade onion soup and a few glasses of Burgundy. They arranged for me to stay at a comfortable inn on Gig Harbor.

I did not emerge from my room for two days; I had one of the worst colds of my life! Staying in bed, watching TV, and feeling sorry for myself, I had no thoughts about the Barracuda. On the day I was to fly back to Arizona, I reluctantly agreed to go for a short flight in the Barracuda. It may have been short, but it was memorable.

We climbed in, buckled up, and taxied to the end of the runway. At the time, the plane did not have toe brakes, so tight turns were difficult. Run-up was routine, and soon we were rocketing down the runway. At 65 mph indicated, just a slight bit of back pressure sent us into the air. The

A new paint job and new windows gave the Barracuda an updated look.

Photography courtesy Jeff Weisel

gear came up and we were climbing at 2,000 fpm. I had the controls; they were light as a feather.

At altitude Geoff took over and demonstrated the plane's flying characteristics. I was still not well and urged him to be gentle with me. It's funny, but the most memorable thing about the flight was not how fast we went, how easily the plane turned, or how stable it was. The thing I remember most about that flight was how slow Geoff was able to fly. With full flaps, he was able to get the plane down to 45 mph indicated; this was the last number on the airspeed indicator, so it could have flown even slower! Not bad for a fighter-like plane that looks like it will eat you up. Geoff later told me he taught his son Richard to fly in the Barracuda.

Back in the pattern we slowed to 115 mph and lowered the flaps to about 15 degrees. Slowing to 90, we extended the gear and made ready to land. Geoff let me do the honors. I had about 2,500 hours of logged flight time but only two hours of stick time in an Aeronca years ago. The Barracuda had a stick, so this was going to be interesting. After a bit of overcontrolling, I was able to put the plane down gently on its tricycle gear. We taxied back, took off, and tried it again. It just got easier.

After the flight we drove back to SeaTac, and I was soon back in Arizona, recovering from my cold and contemplating my next move. Geoff and I talked at length on the phone and came to an agreement. I was now the new owner of the plane I had craved for more than 30 years.

Two weeks later I was back in Seattle. I was given a thorough checkout in the Barracuda, and early the next day I was ready to head back to Arizona. It was obviously a bittersweet moment; the Barracuda had been a large part of Geoff's life. We said our good-byes and shed some tears, and I was off to Prescott, Arizona (PRC).

The plane easily climbed to 14,000 feet, giving me a majestic view of the Cascades. After two fuel stops and about six hours of flight time, I was back at PRC.

After about 20 hours of flying I decided to overhaul the engine. The Lycoming 540 is now fuel injected and puts out 300 hp. I replaced the prop with a three-bladed MT. The original paint was showing its age, so I decided to repaint it and replace the windows as well.

I flew the plane for about 20 hours more and had a minor landing gear mishap. While fixing the gear I decided to replace the steam gauges with a Dynon SkyView system. I fabricated a new panel and settled on two 7-inch screens, one for engine monitoring and one for the flight instruments. I also installed the Dynon GPS and autopilot systems. Bob Archer antennas were glued into the fuselage, and Ray Allen supplied the new stick grips. All the hydraulic hoses were replaced, the oil cooler was repositioned to the right side of the cowl, and a NACA scoop was fabricated to direct air through it. The oil temp now runs 20 degrees cooler. Toe brakes were installed, replacing the original breaker bar, and two new NACA scoops bring cool air into the cockpit. The plane is now thoroughly modernized and ready for another 30 years of safe flight.

People often ask me about performance. I start by saying that this is a large plane with a fat wing and a wing area of 128 square feet. That makes it a pussycat to fly, especially at slow speeds; however, it still gets up and goes. I generally run the engine at 21 inches and 2200 rpm. That gives me a ground speed of about 180 knots burning about 12 gallons per hour. If I want to go faster, all I

Jeff added fuel injection to the Lycoming 540 powering the Barracuda. It puts out 300 hp.

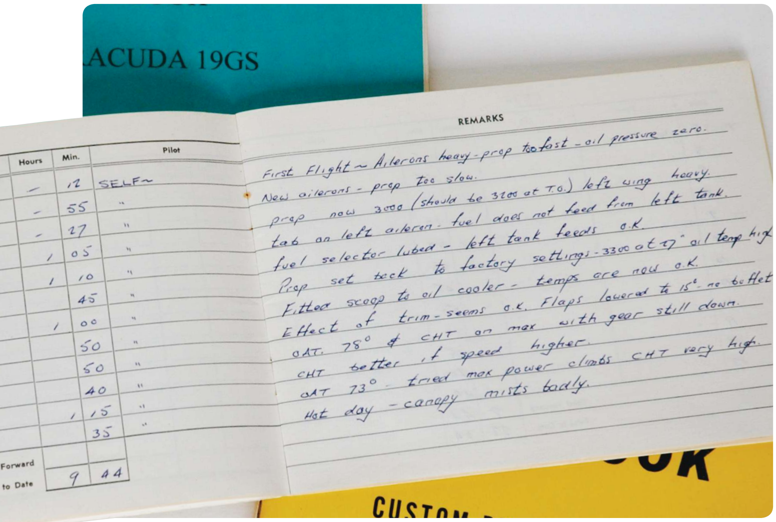
Seating for two and a generous baggage area make the Barracuda a suitable traveling machine.

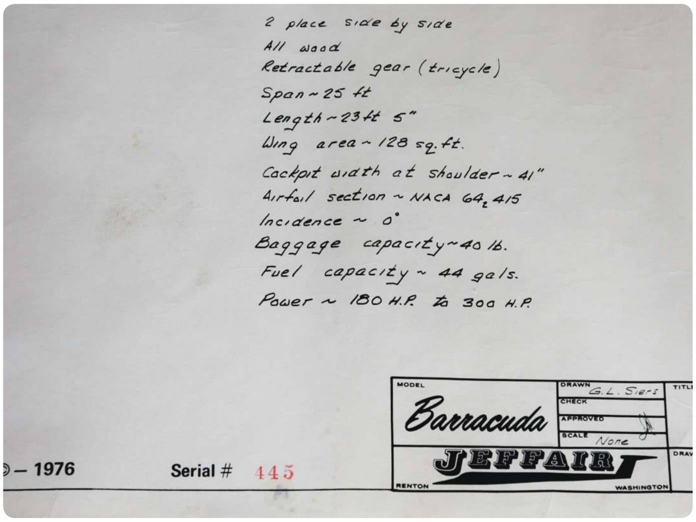
have to do is burn more fuel. Landing is easy. I do not let the airspeed get below 75 knots, slowing down over the fence. With flaps and gear down, the speed bleeds off fast in the flair.

The Barracuda was designed to hold 44 gallons of fuel, which equates to about three hours in the air, but that is pushing the envelope. My longest legs have been no more than two hours and 45 minutes, which takes me more than 500 nautical miles.

Owning and flying this plane have simply been a joy. Everywhere I go it draws a crowd. Some time ago I took off behind a friend's Baron. I quickly caught up to him in the climb and told him to look out his left window. As I sped past him I did a roll. That's what this plane was made for—and just how Peter Garrison described it so many years ago.

My long wait was well worth it. I have finally caught the elusive Barracuda. EAA





Barracuda designer Geoffrey Siers with his Barracuda on the cover of the January 1976 issue of Sport Aviation. *The Barracuda was named Best New Design at Oshkosh '75.*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The Airplanes of the EAA Homebuilt Aircraft Council

What they've built or are building

What better way to get to know the members of EAA's Homebuilt Aircraft Council than to see photos of the airplanes they've built or are building? Here, in their own words, the council members share their building experiences.

Gary Baker, Medina, Ohio

My first airplane project was a Pedal Eagle that I built about 20 years ago for my first son, Brian. At the time, a company offered precut pieces of wood and hardware, so this was one of the first kit airplanes. Not having worked with wood previously, it took me approximately 100 hours to build it. The plane is covered with decals, also offered by a company at the time. I believe the company was Aviation Products, which still sells the products. Incidentally, Brian proposed to his now wife, Amy, while flying on the Zeppelin at EAA AirVenture Oshkosh 2011. It was Amy's birthday and also her first visit to anything aviation.

Currently, I'm building an RV-6. I started this odyssey back in 1996, but did not make great strides in the progress until 2008, when I moved the project about 15 miles closer to home. I am currently working on the engine installation. You can read all about my project on my building blog.

Gary's son Brian in the Christen Eagle Pedal Plane.

Gary works on an access panel for the RV-6.

Joe Gauthier, Cromwell, Connecticut

My first homebuilt was a Bede BD-4. It was built in my basement between January 1969 and 1973. I made it's maiden flight on July 3,1973. There were very few homebuilts around our area at that time, and I made many trips to the FBO's maintenance shop to see airplanes undergoing maintenance just to see "how things were done." There were no Bingelis books or the Internet. I learned a lot with that airplane. I flew it for 425 hours before selling it in 1977 to start my Thorp.

Between 1977 and 1980 a group of us built a Davis DA2A, which we flew for well more than 1,200 hours until it was sold in 2010...more than 30 years with a string of partners. A good airplane, just it was not getting used so we found it a new home. A Thorp T-18 was just a stack of aluminum in my shop during that time period.

Then I built a Lancair 235, which first flew in 1992. The Lancair did close to 200 mph on only 118 hp. I flew Lancair more than 225 hours over the next few years and then sold it to a pilot in California.

Finally, in 1995 I got to finish the Thorp I had set it aside to build the Davis in 1977. Today, the completed Thorp sits in my hangar with a bit under 700 hours flight time. I still love my Thorp and doubt I'll ever sell it as long as I can fly it.

There were a few other interruptions that caused the Thorp to be delayed so long, A Christen Eagle that needed fabric and paint, a Smith Miniplane that also needed major upgrades and recovering. A Taylorcraft and Cessna 140 rebuild, and some engine work on the Ranger engine on our Fairchild PT-19. I've been busy for many years, made possible in great part to a very understanding wife.

My latest project is a story of a few guys getting together to finish an RV-6A that was started by an EAAer whose family donated the partial kit to us on his passing.

This project was born when one of EAA Chapter 166's members acquired a partially built kit and suggested to another Chapter 166 builder that he should take the lead for building the airplane. Larry Gagnon was the leader, having built another -6 and a Kitfox previously. Preston Kavanagh, Tim Dale, myself, and a few others pitched in with the construction.

In October of 2008, I took the airplane up on its first flight and pronounced, "All is well," upon landing. It's powered by a 180-hp Lycoming and the standard metal Sensenich prop many builders use. Handling is typical of an RV-6 with no bad habits at all.

N58Y has been flown to the Sun 'n Fun International Fly-In and Expo in Lakeland, Florida, and also EAA AirVenture Oshkosh, both memorable trips. "The Project," as the airplane is referred to, now has just more than 300 hours on the Hobbs meter, and everybody enjoys flying it and sharing it with family and friends.

This is a great example of the benefit of chapters, in that Chapter EAA 166 brought this bunch together and the airplane is the result. Sharing the costs and the benefits through joint ownership is a great way for some with limited resources to participate in this great adventure called homebuilding.

The RV-6 built by members of EAA Chapter 166.

Joe's Thorp T-18.

Randy Hooper, Nashville, Tennessee

This is my RV-8, which I completed in March 2009. With a travel time of about three hours from Nashville, I have flown it to EAA AirVenture Oshkosh the past four years.

In our area, we are fortunate to have a Saturday breakfast within 30 minutes flying time almost every week. My wife, Malinda, and I are part of the regular crowd.

Building and flying the completed project is satisfying, but when it inspires someone else to build, that is one of the greatest compliments.

I have another RV-8 under construction in my crowded home shop. It's nice to still be able to attract family members out for a needed hand. With kit improvements and fewer personal distractions this project is moving much faster than the last one.

Randy and his RV-8.

Working on the second RV-8.

Fred Keip, Franksville, Wisconsin

N99FK is my Sonerai IIL that I started building in 1977 and flew for the first time in 1986. It has a 2180-cc Great Plains VW engine with a Sterba prop, and it cruises at 130-plus mph. I've flown it to Sun 'n Fun three times, and it's been to AirVenture Oshkosh 20 times (the last time in 2008). It currently has 1,330 hours on the Hobbs meter and is great fun to fly.

"First Wing Install Final" is a photo of my current project, a Wag-Aero Wag-a-Bond Traveler. I started this project in 1998, and it's currently at the "90 percent done, 90 percent to go" stage. It is a scratchbuilt (plans-built) airplane and is nearly ready for cover. The engine will be a converted Lycoming O-290-G with a Sensenich wood prop. Hopefully, it will be done on "Tuesday."

Fred has been flying this Sonerai IIL since 1986.

Fred is currently building a Wag-a-Bond.

Keith Phillips, Port Orange, Florida

My first aircraft was a modified Nesmith Cougar that I finished in 1966. I flew it to Oshkosh in 1970...the first year the fly-in was held there. I currently have the aircraft apart and am rebuilding it.

Next, I began work on an SX-300. I finished this aircraft in June 1998, and it now has 1,400 hours on the airframe. It's a great machine designed by Ed Swearingen. Ed built about 50 some kits in 1985 and discontinued them when Lloyd's of London cancelled his insurance. There are 30 of these flying. It's a fast (240-plus knots) aircraft with good flying qualities. We have an SX-300 type club group that holds two formal meetings per year. Our last get together was in early October in Fredricksberg, Texas. We also flew five of these aircraft to Alaska in 2007, 2009, and 2011 and are planning another trip to Alaska next June.

I've also built a Pitts Model 12, whichI finished this plane in 2002. This is a kit from Jim Kimball Enterprises of Zellwood Florida. Curtiss Pitts designed this aircraft around the Russian nine-cylinder engine that is used in numerous trainer and aerobatic aircraft. Mine is the 14PF version, which produces 400-hp. It's basically a Pitts on steroids. It's a great machine, too, and fun to fly. I've flown it to EAA Oshkosh AirVenture twice.

Keith's Pitts Model 12 and SX-300 in formation.

Dave Prizio, Tustin, California

I am based in southern California at Chino Airport (KCNO). I currently fly a Glasair Sportsman that my friend Ed Zaleski and I built in 2006. We finished it in early July and flew it to EAA AirVenture Oshkosh that year with the Phase I flight test just barely complete. The project went together very quickly, largely because we had built a GlaStar four years previously. The Sportsman has a Lycoming 180-hp engine with Power Flow exhaust and a Hartzell constant-speed prop to cruise at up to 139 knots. We have flown it to Alaska, Oshkosh, and the Idaho backcountry, plus many locations in California.

Ed and I also built a Texas Sport Cub, which we finished in 2008. This is the kit version of the Legend Cub. This plane is light-sport eligible. It sports a 120-hp Jabiru engine and a Sensenich fixed-pitch prop. Cruise at 75 percent power is 85 knots, so long trips are something of a challenge. On the other hand it will land at 30 knots, so it doesn't need much of a runway. This was our first experience with fabric covering, but we got great results and had a lot of fun learning.

At this time we are helping another friend build an RV-8, which he hopes to fly to AirVenture next year. Now if I can just figure out how to get my extra-large body into the backseat of an RV-8.

The Texas Sport Cub that Dave and Ed built.

Dave flies this Glasair Sportsman that he build with Ed Zaleski.

Rick Weiss, Daytona Beach, Florida

This is my Kitfox that took almost 15 years to build. I was working a lot back then and got to the project when I could. I have about 1,800 to 2,000 hours in it. That's more than most pilots in Kitfoxs, but I added a lot of modifications to it as I went along. I even had to completely redo the instrument panel as the first one didn't perform the way I planned. I did the whole project, covering, painting, you name it. The paint was supposed to be a combination of N1, the FAA's Gulfstream IV, that I flew for many years, and the tail is representative of Delta Air Lines. I flew for Delta Connection for seven years after I "retired."

I enjoy making parts from the plans. I still enjoy the detail fabrication method versus writing a check. Now I'm working on an RV-7A. It will be powered by a YIO-390 Thunderbolt engine. I'm busy assembling parts; at the moment I'm working on the dreaded canopy installation, lots of cutting and drilling of holes. EAA

The canopy for the RV-7A that Rick is currently building.

Rick's Kitfox Model IV.

Video of the Month

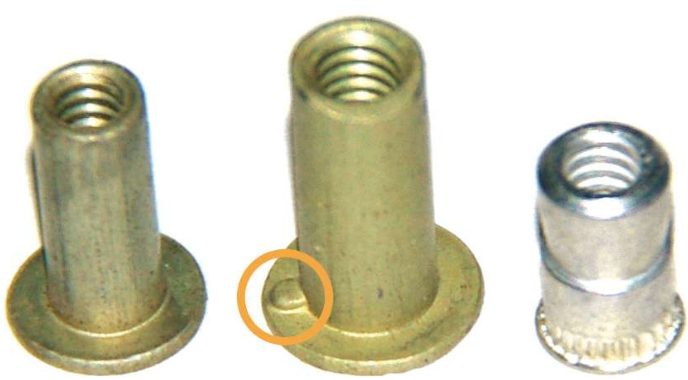
Robert Dalzell purchased this Corbin Baby Ace in 2010 after it was damaged in a landing accident. He restored it over a period of about 8 months. He says it's a pleasant plane to fly...handles like a Cub, but doesn't have the glide of a Cub.

Blind Fastener Tips

By Cy Galley

There are two popular brands of blind fasteners: Rivnuts and Nutserts. They are made of aluminum and set like a pop rivet from one side, providing threads to fasten or hold an item like a fairing or access panel. They work fine for a season or two, and then, instead of being able to remove the machine screw, you'll find the body of the fastener turns with the screw. You can't get the screw out.

When this happens, you might be able to drill the head of the machine screw off. This can be a laborious and frustrating experience, teaching you many new unprintable words. Even the Rivnuts with a keyway are not immune to this problem. Many builders just swear off using them by using steel nutplates if at all possible. But why does such a neat little fastener give us such problems, and how can the problem of the body spinning be reduced?


Rivnut Rivnut with key Nutsert

My SWAG is dissimilar metal corrosion between the aluminum structure and the machine screw. This corrosion locks the machine screw to the body so that the body turns instead of the screw. The torque of turning out the screw is greater than the grip of the body to the structure.

We can increase this grip of the body in several ways. Make sure to file the notch so it seats if the body has a keyway. Or, placing a drop of epoxy or red Loctite on the outside of the body before setting will help. Use a reamer or step drill so the hole is clean and round.

To combat the corrosion, use a wax like Boeshield, candle wax, or an anti-seize on the screw. Use one of these every time you remove and replace the screw.

Finally, we can minimize the corrosion by selecting a machine screw that doesn't react as much with aluminum. How many times do you see stainless steel screws used with nice shiny stainless Tinnerman recessed washers to hold on a fairing? It sure looks nice, but there is a higher voltage potential between the aluminum and stainless steel than with cad-plated screws. This difference is like battery acid and creates galvanic corrosion, and the corrosion causes the screw to bind, which creates the problem.

The choice is yours. EAA

Hints for Homebuilders Videos

Composite fairings

Almost every project requires making some special composite fairings. In this episode, composite specialist Wally Anderson demonstrates how to fabricate a quick and easy composite fairing.

Soldering Tips-Holding Wires

Holding two wires together for soldering can be a challenge, especially if they are under your instrument panel. Mitch Zehr from the EAA aircraft maintenance staff shows how to use the plastic top from a spray can to help make it easier.

Experimental Aviation
Part 2: Identifying ways to stop fatal accidents

By Stephen L. Richey

In the first article in this series, we discussed why experimental aviation is uniquely positioned to lead the rest of the aviation world by example, if we so choose to commit ourselves. The actual design application of such a decision—whether part of a community-wide effort or not—is grounded in some very solid science and engineering.

The next step, now that we know some of the problems we face, is to identify ways to go about stopping these problems from sending more of us "west." The best way to remember how to do this is for me to CREEP you out. That is:

- **C**ontainer
- **R**estraints
- **E**nergy absorption
- **E**vacuation
- **P**ost-crash concerns.

Dick Rutan's record-setting Long EZ-B.

The best way to think about safety in your cockpit is to think about an egg inside one of those cardboard cartons at the grocery store. If you drop the carton on the ground, the cardboard crushes pretty readily, and the egg breaks, resulting in a need for a cleanup in aisle six.

We will look at the first of these points in this article and the rest in following installments.

The "container" here is the volume within your aircraft's cockpit. The best way to think about safety in your cockpit is to think about an egg inside one of those cardboard cartons at the grocery store. If you drop the carton on the ground, the cardboard crushes pretty readily, and the egg breaks, resulting in a need for a cleanup in aisle six. Now, if you place an egg in the center of a plastic bottle filled with shredded cardboard and drop it on the floor, the egg is much less likely to break. One of the major reasons for this is because the "passenger" in the bottle is not directly exposed to a sufficient decrease in the volume of the cabin or forced to directly impact the sides of the container. The same holds true for your aircraft.

Ideally, you want no more than a 10-percent reduction in the volume of your cockpit in the event of a crash. This means you want the frame protecting you to stay as close as possible to the way it was originally, in all directions. Loss of volume can happen in several ways. The engine may be shoved back into the cockpit, or up and back. The risk of this can be minimized by designing the structures in the cockpit to keep the engine in its place. The use of a slanted "A" pillar at the sides of the windshield (as seen in cars) is not always standard in light aircraft. This is one of the main components to keep the engine from moving upward and should be included in all aircraft.

In fact, short of the wing spar, this pillar should be among the most robust structures in an aircraft. Assuming a frontal impact at the lower side of the engine compartment, you want to have structures in place that are going to keep the engine out of the cockpit for a few reasons, the most obvious being that if the engine tears loose, it is likely to take the firewall and anything attached to it (such as the instrument panel) with it. While not having such a pillar may offer a major improvement in forward visibility especially in a taildragger, it also is an almost sure way to increase the severity of injury especially to the front-seat occupants' legs.

Secondly, if the engine does break loose, you have probably just created a fuel leak in most aircraft. (The few of us who spend the extra cash for lines fitted with quick disconnects like the ones that the military uses on its helicopters are spared that problem.) Having the engine mount designed to absorb energy in a manageable way by controlled ductile or frangible failure modes but still transmit any remaining energy around the cockpit in as straight as a direction as possible without causing failure of the cockpit structure is the most ideal option here.

A good example of this is to relate how I fell off the roof of my parents' house as a kid. (Explains a lot, right?)

While we are on the topic of engine mounts, another related design point to consider is your firewall. In what seems kind of counterintuitive to most when it is first mentioned, a longer deceleration path is often a better choice, assuming all other factors (velocity, impact angle, the type of surface impacted) are equal. The reason for this is that a longer slide across the ground gives more time for the energy to be expended.

A good example of this is to relate how I fell off the roof of my parents' house as a kid. (Explains a lot, right?) I actually did this not once but twice, both in the name of aeronautical science while trying to figure out how those funny-looking planes designed by a guy with those epic sideburns could fly. I had seen photos of Burt Rutan's airplanes in a school library book about some air show in Wisconsin. Instead of just simply looking it up or asking someone, I called the local airport and found someone with one of those planes. He made copies of the basic plans for me, and I made a series of scale replicas and proceeded to throw them off the roof. I learned a lot from those experiments, including that my parents' Doberman could jump high enough to pose a hazard to small aircraft on approach to landing.

One of the other lessons was that I possess a maximum lift coefficient (CL_{max}) roughly equivalent to that of an ice-covered brick. That is to say not even close to sufficient to have a decent glide ratio. Once, I impacted a concrete sidewalk, breaking some ribs and giving myself two black eyes. The second time, I landed on a wicker seat. That time I escaped with just some bruises because I had a greater distance over which to slow down and change my potential energy into work done. In this case I did that by turning that seat into splinters.

How does this all relate to your firewall in a crash? If the bottom edge of the firewall is either canted forward or vertically oriented and the skin of the nose and belly are torn away, the firewall can dig in much like a soccer player's cleats (this is referred to in the crash safety community as "plowing") and cause the aircraft to come to a more abrupt stop, exposing the passengers and crew to more extreme impact forces. Taking the firewall and angling the bottom edge back at least 20 to 30 degrees can help to minimize this risk. In the design I am currently working on for a light-sport aircraft, this angle is approximately 45 degrees.

For those designs with a canopy, a roll bar is needed to keep the pilot's and passengers' heads from contacting the ground in the event that an aircraft winds up on its back. Ideally, there should be one of these structures in front of and behind the heads of the occupants. If you have a four-seat aircraft, there should also be a roll bar immediately behind the front seats as well, with the aft bar placed at the back of the rear seats. Even among non-canopy-equipped aircraft, such structures built into the frame can serve a vital purpose by keeping the roof from caving in should the aircraft wind up on its back. Few things express the phrase "splitting headache" quite so dramatically as what often happens when someone's head and the ground or another object get into a debate over the claim to the same bit of cabin space.

I actually did this not once but twice, both in the name of aeronautical science while trying to figure out how those funny-looking planes designed by a guy with those epic sideburns could fly.

Now, I can hear the groans from a subset of builders/owners of canopy-equipped aircraft. Some will argue that this will take away from the World War II fighterlike mystique of their plane or otherwise ruin the look they are hoping to achieve. To these folks, I suggest you ask your spouse or kids what is more important to them—you looking "cool" or you being around for as many holidays, anniversaries, birthdays, and weddings as you can be?

In our next installment, we will look at why restraints are important and how their benefits can be maximized. Until then, fly safely. EAA

Stephen Richey is an aviation safety researcher who has been involved with flying starting with his time as a "junior hangar bum" with a local EAA chapter as a child in Indiana in 1988. He has logged about 700 hours thus far including times in ultralights and as a student pilot in light singles. His current project is the design of a new composite homebuilt known as the Praetorian.


EAA
THE SPIRIT OF AVIATION
"As a first-time builder, I never would have considered building if it weren't for the EAA Technical Counselor program. There is tons of information online, but having someone inspect your work in person, or demonstrate a technique in front of you, is priceless."
Caleb Ihrig, EAA 1036996
Scratch building a Bearhawk
Bearhawk
To find a Technical Counselor near you, visit EAA.org/techcounselors.
Not an EAA member? Join today by calling 800-564-6322 or visit EAA.org/join.

Every station along a propeller has a distinctive airfoil, which must be maintained throughout the life of the propeller.

Pick a Prop

What's best for your aircraft?

By Tim Kern

Somewhere near the end of a build/rebuild/restoration project, or whenever an airplane changes hands, the question of "What's the best prop?" should come up. It's easier to answer if the theory is clear.

A propeller is the link between an airplane's engine and the air, just as the transmission and tires link your car's engine to the road. The right-sized tires and right gear ratio will give a car its best performance; the right prop will allow the best use of your airplane's engine. Also remember that like tires, a propeller is a wear item, so frequent inspections are prudent.

For propeller choice, the aircraft's mission, the runways it uses, and pilot preference all come into play. Because constant-speed propellers are more complicated, heavier, and more expensive than fixed-pitch or ground-adjustable props, and because they function quite differently, we'll stick with the simpler designs. Fixed-pitch and adjustable-pitch props are much more common among builders, and they present a vastly wider range of choices.

Two Factors – Diameter and Pitch – Dominate Most Discussions

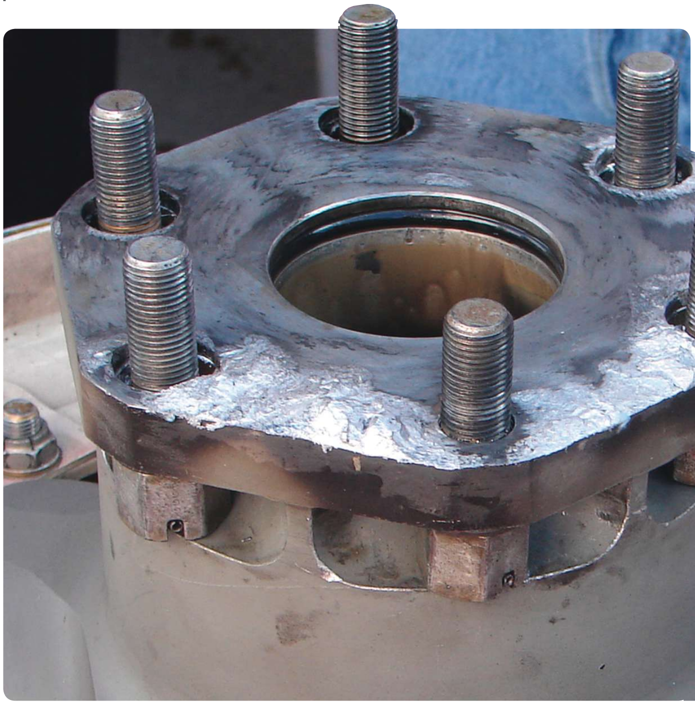
A prop's diameter is governed by the engine's operating rpm (or more precisely, by the prop hub's rpm) and the ground clearance available. General wisdom says that within those two parameters, "Bigger is better." General wisdom applies…generally. Larger-diameter props are heavier; not just because of the diameter, but also because strength and rigidity are more difficult to achieve, thus the longer the prop. Longer props are more expensive and more subject to damage from ground strikes, and they limit rpm (and sometimes horsepower available).

Aircraft speed and mission also play significant roles in propeller diameter choice. For example, pick two aircraft with the same engine, say, a Piper Super Cub and an RV-6, each running a Lycoming 180. The Super Cub prop may be as long as 82 inches for short takeoff and landing flights and slow speed capability, while the RV-6 will turn a 72-inch-diameter prop to achieve high cruise and top speeds.

"Pitch" refers to the distance the propeller would travel in a single revolution. (The term "airscrew" was often used in the early days of flight.) An airplane's propeller, in real life, has various pitches along its length, from hub to tip; "pitch" is an effective value only, and its measurement differs even among manufacturers and sometimes among their various products. Still, any published pitch number can be useful when you're staying in a given manufacturer's product line.

Prop Materials

There's a third really important factor: the material of which the prop is constructed. Wood, the choice for decades, has a lot of advantages: It is light, relatively durable, resistant to fatigue, inexpensive, and available in endless shapes. Plus, if you have a prop strike with a wood prop it basically acts as a "fuse" and turns to splinters, minimizing internal engine damage. The main downsides to a wood propeller are more frequent maintenance (frequent bolt torque checks) and often lower performance than a metal or composite prop. (To maintain the rigidity necessary, a wood prop usually needs a heftier chord than would be optimum.) Of course, the lower the airspeed, the less the performance difference is.



A loose metal prop will destroy itself and damage the hub

Even a tough all-composite prop will be ruined when it hits something solid.

When a prop is even slightly loose, it can "burn" as it rubs against the hub causing the prop to become less efficient.

Photography courtesy Sensenich Propeller and by Tim Kern

Metal props, I've often said, are the "anti-wood." They are heavy, need to be carefully designed and manufactured to resist fatigue, are relatively expensive, and are quite finite in model availability. And—opposite the wood prop's property—if you have a significant prop strike with a metal propeller, you quite likely will have internal engine damage. However, metal props do last longer, resist weather and erosion better, and do not require as much attention as wood.

This wood-core composite prop failed when it was over-revved at more than 400 mph. No propeller would survive this.

"Composites," admittedly a large family, try to capture the best of both wood and metal: They are light, resistant to fatigue and erosion, have good life in the elements, can be made in more optimal shapes, require little inspection and maintenance…and are expensive. Field repairs are seldom needed but *never* recommended. Composite prop blades also lend themselves particularly well to use in adjustable hubs in which pitch can be changed by the airplane owner, at will.

How to Pick a Prop?

The easiest way to start choosing your prop is to look at similar airplane/engine combinations that fly similar missions. If you're building a kit airplane, the manufacturer will have some good ideas, based on your choice of engine and your likeliest flying scenario.

Your prop's diameter must be small enough that at full rpm the tips of your prop blades won't be going supersonic. For very fast airplanes, the forward speed of the airplane is a factor; but for most of us, a simpler calculation will suffice. An easy rule of thumb that includes a safety factor: Your top rpm times your prop's diameter in inches should not exceed 212,000. (Example: A top hub rpm of 3300 will allow a prop diameter of about 64 inches--212,000 divided by 3300 = 64.24)

More sophisticated formulas exist, but this is really all you'll need to get into the right ballpark. (Who lives that

An off-ramp excursion, even into soft earth, will often lead to a written-off prop. This one might be salvageable, but only the manufacturer will be able to tell.

Photography courtesy Jeffrey Lo and by Tim Kern close to the edge, and who has different prop choices available to compensate for, say, temperature and humidity? Yeah, some racers do. Are you a racer?)

Ground clearance, particularly in a tricycle-gear airplane, can also be a factor. The minimum clearance from the hub center to the ground must be measured with the nose suspension at full compression and front tire flat—plus don't forget a little more clearance to clear a bump, hangar door track, or fuel filler!

If you live at a high-altitude airport with a short runway and you carry a lot of luggage, "flat" pitch (a smaller pitch dimension allows more revolutions for less forward motion, effectively simulating a "low" gear ratio in your car) is the only way to go. If all you do is run laps at the Reno Air Racers, where you have a mile-long runway and top speed is paramount, you'll probably run the highest pitch your engine will pull.

Even in the certificated world with its FAA-limited choices, many aircraft owners have "cruise," "standard," "climb," and sometimes even "seaplane" props to consider. (Note: the pilot's operating handbook usually lists performance for only the standard prop, so when you buy any used airplane, even if it's certificated, it's important to know which prop you're getting!)

A Note on Using Two-Stroke Props on Four-Stroke Engines

Even among props of nominally identical pitch and diameter, the blade design matters. Consider that a two-stroke engine makes its power in a relatively narrow, high-rpm band. In order to make good power, it needs to rev up. A four-stroke aircraft engine has a wide torque curve; it produces useful power over a wider range of rpm. Prop designers know this and design two-stroke propellers to be efficient only in their top rpm range. (If they made props that pulled hard at lower revs, the engine would never be able to climb up into its sweet spot!) A typical mistake is to put such a two-stroke design on a four-stroke engine. Although (other factors optimized) it will perform okay at

Care and Feeding of Propellers

All Props

- If you use self-locking nuts to mount your propeller, use them once only.
- Do not use any lube on the bolt threads, unless the prop manufacturer specifically calls for it; lubes can drastically change the tension in the bolt, at any given torque setting!
- Check your prop mounting bolts for any kind of wear, damage, or corrosion; at least during every annual inspection. (Check your hub while you're there!)
- Always follow the prop manufacturer's instructions and specifications. All manufacturers are happy to offer advice on the care and maintenance of their products.
- Use only approved finishes, paints, finishing procedures, etc.

Wood Props

Be sure your prop plate is of sufficient thickness that it does not distort, and that it is of sufficient diameter to cover the prop's hub. A general rule of thumb for thickness is a minimum of 1/4 inch (steel) or 3/8 inch (aluminum).

- Check the torque on the propeller bolts regularly. But "check" does not mean "tighten them some more."
- Protect the propeller from the elements. Keep the airplane indoors, or at least use a good propeller cover whenever you're not flying.
- Even with leading-edge protection, avoid flying in rain. Consider von Richthofen's account: "The rain fell in streams. Sometimes it hailed. Afterwards, the propeller had the most extraordinary aspect. The blades looked like saws."

Metal Props

Never reuse the prop bolt washers. These have a specific amount of "squish" designed into them, and the value will change after their first use. *Any* little nick needs to be (ad)dressed.

A buildup of weld and a filing down to duplicate the original shape are not endorsed by any prop manufacturer. This is done only for "museum restoration" projects, where the prop will never be flown again. (No matter how good it looks, don't use a prop you don't know!)

If the propeller is painted, any exposed metal should be touched up with paint to prevent corrosion.

Adjustable-Pitch Props

Getting the pitch the same on every blade is critical. Unless the prop has a self-indexing design (e.g., Sensenich), be ultracareful when setting it up. Then after you've torqued and checked everything, check it one more time.

Composites can deteriorate in UV light. Keep your blades covered when you're not flying.

full throttle (full rpm), it will be disappointing at lower rpm; cruise performance will suffer.

Buying Used

A lot of good deals exist on used props, but there is no way a nonexpert can look at a pretty prop and tell if he's getting a cherry or a lemon. Before you buy a used propeller from other than a reputable prop shop, have the manufacturer check it out. It's better to be disappointed on the ground than to lose a blade in flight.

A lot of metal props migrate to experimentals from certificated aircraft. Sometimes, they are great deals; sometimes, they are cut down because of tip damage. Some seem to be great deals but might not be. Other times, these are lovely to look at, but they contain hidden flaws (like nonairworthy repairs). Know what you're buying, and if you have any doubts, take the prop to a reputable shop before you buy it.

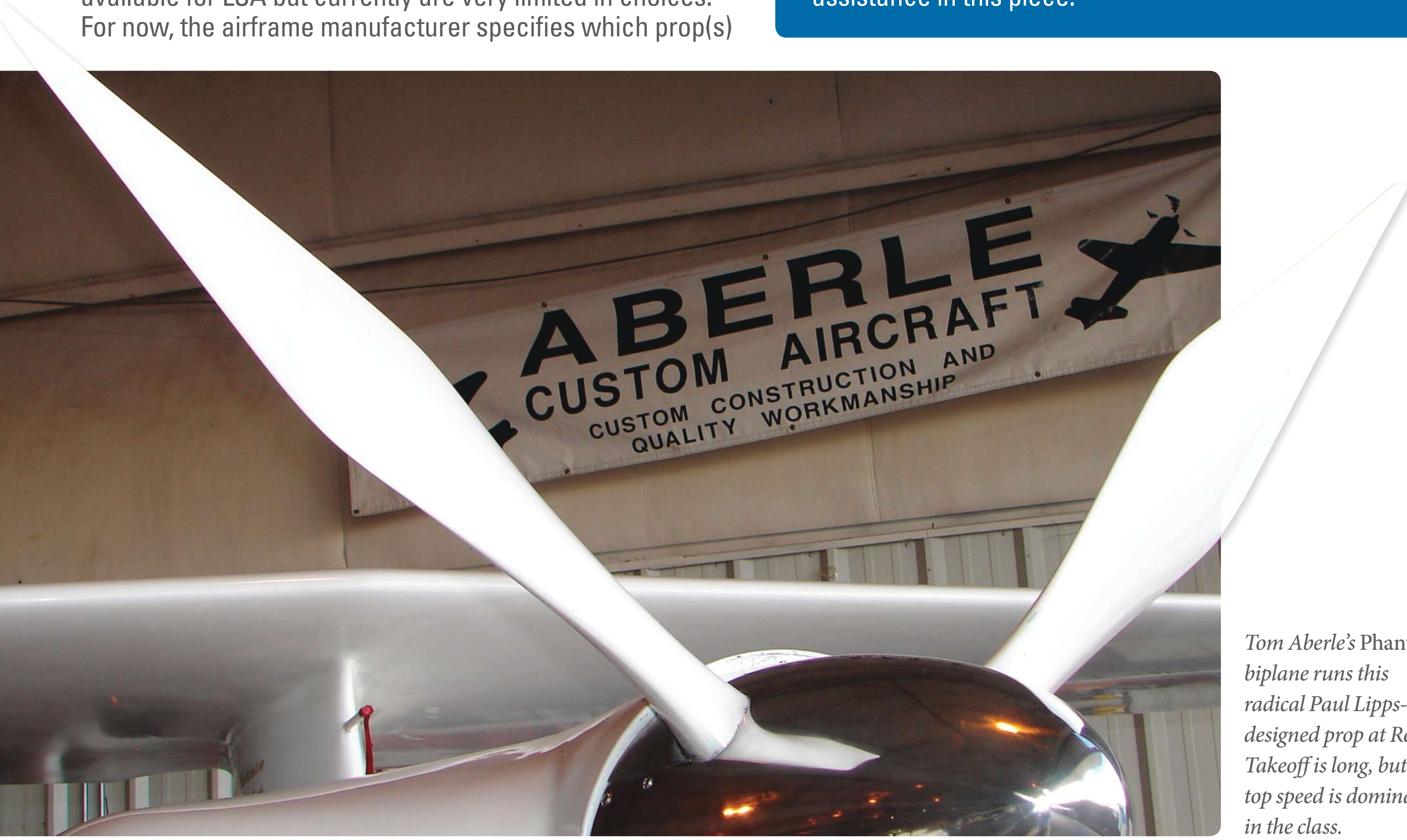
Light-sport aircraft are another area of misunderstanding. As these machines age and get re-propped for better performance, the older props are showing up on the market. Likewise, many prop manufacturers will claim they're selling "LSA-certificated" props. *There's no such thing as "LSA-certificated."* ASTM *compliant* propellers are becoming available for LSA but currently are very limited in choices. For now, the airframe manufacturer specifies which prop(s) are acceptable on their LSA; that satisfies the FAA. But don't believe that there is any "certification" involved.

Balance

Prop balance is critical to safe and pleasant flight. The prop is in "static" balance when it balances evenly around its hub. "Dynamic" balance, where the entire rotating system (engine, propeller, and spinner) is balanced, is often overlooked. "Aerodynamic" balance, where each blade pulls equally at any given rpm and angle of attack, is controlled in manufacture.

Above all, remember that your prop is one of the most critical elements in a safe flight and probably the most important component forward of the firewall (with the exception of the motor mount). If you think something is not right, check it out; use both your brain and your instinct. A prop failure in flight can easily be fatal. EAA

Tim Kern is a private pilot and has written for more than 40 different aviation magazines. He was a key builder on two aircraft projects and has earned the title of Certified Aviation Manager from the NBAA. Thanks to Sensenich Propeller for technical assistance in this piece.



Tom Aberle's Phantom *biplane runs this radical Paul Lipps-designed prop at Reno. Takeoff is long, but its top speed is dominant in the class.*

Photography by Tim Kern

Pilot's view of the ultralight runway at AirVenture. A new road is coming to the lower left corner in this photo.

Changes Coming to the 'Fun Zone'

By Dan Grunloh

One year ago, I wrote an editorial predicting many changes to come in the year 2012 and making the argument that we should consider the notion that, basically, change is good. At the time I had no clue as to the many changes that were to occur at EAA. It was merely a philosophical argument illustrated by a famous quotation from a classic science fiction film. Change is good, I said, because "the sleeper must awaken." Now there is news about changes coming to the ultralight/light plane and rotorcraft area at EAA AirVenture Oshkosh. The changes are big, and some are coming this year. A few of us will no longer have that favorite shade tree, camping spot, or airplane tiedown spot that we may have used "down on the Farm" for many years.

Briefly, the immediate site changes are triggered by a new security fence and 24-foot-wide patrol road being placed along the southwest boundary of the convention site. We live there for one week per year, but for the other 51 weeks Wittman Field is an active airport and has a defense contractor on the field. A wide swath taken out of the already too small ultralight campground (used by pilots and volunteers) will necessitate the creation of another camping space, possibly near the ultralight barn. The runway itself won't move, but almost anything else could be shifted. Watch for future announcements.

More change will be coming in the following years and will include new roads and pathways making it much easier for people to get to the "fun zone" on the south end of the convention site. We expect a facelift and expansion of our area with new facilities and services comparable to the rest of the convention site.

Photography by Dan Grunloh

The members of the EAA Ultralight/Light Plane Council gathered for this photo before the 2012 Hall of Fame ceremonies. Left to right, they are: Scott Severen, Dan Grunloh, Jim House, Carla Larsh, and John Hovan.

We started 30 years ago with ultralights "down on the Farm" among the horses and cows at Ollie's farm, but we have added light planes, light-sport aircraft (LSA), balloons, and electric aircraft. This year we will have more charging stations for electric aircraft, and more actual electric flight than, well, anywhere! Our area is the zone of excitement, youth appeal, and future growth. The cows and horses are gone. We have turbine helicopters now, and the folks who plan signage at the convention site feel we need a new name. I'm pulling for the "Fun Flying Zone."

New Members Added to Ultralight & Light-Sport Council

Scott Severen and I have been invited to become members of the EAA Ultralight & Light-Sport Aircraft Council. The council members, led by Carla Larsh, are volunteers who meet and provide feedback and advice to EAA on issues related to ultralights and LSA, and to help with planning for the ultralight area at the convention. Scott brings a tremendous amount of expertise to the group, thanks to his extensive involvement in the ultralight and light-sport industry since it began in the early 1980s. The Ultralight Council, along with other EAA advisory councils and various boards of directors, gathered at Oshkosh for several days of meetings in November.

In the first session of the first day, EAA Founder Paul Poberezny paid a surprise visit to our conference room and sat down for a conversation with our small group. Now 91, he sets a standard for the rest of us. He continues to stay involved, working and inspiring others. Paul said the key to success is focusing on the people side of aviation and that EAA Board Chairman Jack Pelton will be a good person to guide EAA through the next transition. Later that morning Jack also visited the council, and I came away with the feeling that here was a person that people would be willing to work for and with. It's clear he hasn't forgotten his roots in sport aviation. He and his dad built a wood and fabric Fisher FP-101 back in California (30 years ago), and he flew it. Later he became CEO of Cessna, and now retired, is an EAA volunteer.

During our two-day conference the Ultralight Council met with Timm Bogenhagen, Chad Jensen, Sean Elliott, Mary Jones, Mac McClellan, museum staff, and many others. Our meetings were a steady stream of issues and discussions, thanks to the organizing skills of Carla Larsh.

We were joined by Lee Crevier, the AirVenture ultralight chairman, to take a look at the long-term plans for the convention site, including new roads and buildings and the possible expansion or relocation of our runway to better accommodate LSA. The southeast corner of the site (the ultralight area) will become one of four major "nodes" created by new roads.

The council had an interesting meeting with EAA Vice President of AirVenture Features and Attractions Jim DiMatteo. Jim is head of a "dream team" of air show experts tasked with reviewing the entire AirVenture experience from the ground activities to the flying components. We talked to him about getting ultralights and LSA into the afternoon showcase prior to the air show, as had been done many years ago. We were not disappointed. He said ultralights and LSA have terrific appeal to the youth and also to sponsors oriented to that demographic. This retired Navy Top Gun pilot with 5,000 hours in fighters says we have the fun and excitement that will best appeal to the youth. He wants to have a "pit area" at air show center where all types of aircraft including ultralights, LSA, and rotorcraft can be featured and demonstrated right "on the 50-yard line," as he put it. Jim was the international director of Red Bull Air Race for six years and knows what it takes to make a great show and how to make it happen. Watch for it at AirVenture 2013.

Taras Kiceniuk Jr. – Technology Innovator

EAA Hall of Fame recipient Taras Kiceniuk Jr. set the hang gliding world buzzing in 1971 when he began flying his Icarus II rigid-wing biplane hang glider. It outperformed the Rogallo wings of the time by a huge margin. Despite phenomenal performance, rigid-wing hang gliders never made it into the mainstream. However, the Icarus opened a door that made ultralights possible. The Rogallo wings were not suitable for motorizing due to their poor performance.

In 1975, John Moody put an engine on an Icarus-inspired design developed by Larry Mauro, called the Easy Riser, and the ultralight movement was born. Taras later served as chief engineer on the Gossamer Albatross project for human-powered flight across the English Channel. For his contributions to ultralight aviation, he was inducted into the EAA Hall of Fame in a ceremony held November 15, 2012. There is a short video about his award—also check out the

Taras Kiceniuk with the RG-2 research vehicle built to study regenerative electric flight.

list of previous winners. In a short acceptance speech he said we might not have had ultralights if it were not for the EAA. (Many of the early innovators were EAA members.)

Taras is a certificated private pilot with instrument and glider ratings, but it's clear that his first love is soaring. He has given lectures on dynamic soaring, and you can read some of his technical articles at www.IcarusEngineering.com. Prior to the award ceremony he told of his experience soaring in a Piper PA-12 Super Cruiser with the prop stopped in wave lift over California. Always at the leading edge of technology, his latest interest is electric flight with regenerative capability. He thinks it could revolutionize the sport of soaring. An electric regenerative motorglider could recharge its batteries during a descent, or simply hold a steady altitude in lift, and thus store up enough energy to reach more distant thermals. It's not hard to imagine an electric sailplane parked in wave lift charging its batteries for a long-distance flight.

Sebring 2013 Windup

Who wouldn't jump at the chance to go to Florida in January to attend the U.S. Sport Aviation Expo in Sebring instead of staying in Illinois and shoveling snow? The 9th annual expo will be even bigger than in the past, now featuring a new manufacturer showcase, a big-name twilight air show, and more daily activities. It will be an opportunity to gain more knowledge about the tremendous range of technology available in the U.S. market. We thought there were lots of models during the ultralight boom when anybody with a two-car garage could start a business. Now it's the entire world bringing in their best hardware.

With the introduction of lower-priced models like the Tecnam P92 Echo Classic Light, the price pressure is downward. I plan to check out the new Sam LS, which is expected to be shown there for the first time. It can be flown open cockpit, similar to my old friend's Ercoupe. We would slide the canopy back and enjoy a pleasant open-air afternoon cruise. Watch for more news and photos from the Sebring Expo at www.EAA.org and on the EAA Facebook page. Please send your comments and suggestions for this column to dgrunloh@illicom.net. EAA

Dan Grunloh, EAA 173888, is a retired scientist who began flying ultralights and light planes in 1982. He won the 2002 and 2004 U.S. National Microlight Championships in a trike and flew with the U.S. World Team in two FAI World Microlight Championships.

SAM LS designer Thierry Zibi with the recently completed SAM-LS prototype expected to be displayed at the U.S. Sport Aviation Expo in Sebring Florida.

Photography courtesy Haim Aviation

Airspeed Calibration
Ground course data reduction

By Ed Kolano

You've finished flying your airspeed calibration ground course flight tests and collected the necessary data. Now we'll turn that raw data into a plot of calibrated airspeed (V_C) versus observed airspeed (V_O) for your airplane's operator's manual.

During each of your test runs, you recorded your V_O, pressure altitude (PA), outside air temperature (OAT), and the elapsed time (ET) required to fly between your start and end checkpoints. You also made a note of your airplane's external configuration for the test series. A stickler for documentation, knowing you will spot-check on another flight, you calculated your airplane's weight before and after the test flight and made an estimate of its average weight during the test.

Get out your calculator, pencil, and paper; fun with numbers awaits. Figure 1 is a suggested data grid with flight test and postflight data filled in, which we'll use to work through the data reduction process. The entries in the left six columns come directly from the test flight. The right six columns contain the results of postflight calculations. We'll use the 120-knot V_O data (first two data rows on the grid) during our data reduction explanation.

Ground Speed

Calculate your ground speed for each run the same way you probably do it during cross-country flying. By knowing the course length, 7,890 feet in our example,

Photography by BW Brock

and the ET for test run, you can calculate the ground speed by dividing the distance traveled by the time it took to travel that distance.

$$V_G = 0.5925 \times \frac{\text{CourseLength}}{\text{ET}}$$

In this equation, course length is in feet, ET is in seconds, and 0.5925 is a correction factor to have the ground speed (V_G) in knots. (Use 0.6818 for V_G in statute mph.)

Plugging our sample data from the first data row in the grid into this equation, we get

$$V_G = 0.5925 \times \frac{7890}{40.0} = 116.87$$

Repeat this V_G calculation for every test run, and enter the results in the ground speed column.

Let's talk about wind for a minute. Comparing the ET and V_G for the first set of reciprocal heading runs, you'll note a difference of 3.1 seconds and about 10 knots. That's because there was a steady 5-knot wind during the test—a direct headwind during the first run and a direct tailwind during the reciprocal run. Had this 5-knot wind been a direct crosswind, the actual distance traveled during the run would have been longer than the 7,890 feet, because the airplane would have drifted downwind. Although you could calculate the drift angle and actual distance, it's not necessary. If you test only when the wind is 5 knots or less, the worst-case error in your ground speed calculation will be less than a quarter of a knot for the typical homebuilt airplane flying the course length recommended in the November "Flight Test Techniques."

Okay, you now have a V_G of 116.87 and 126.69 for your first run pair. Averaging these speeds removes any wind effect.

$$\text{Average } V_G = \frac{V_{G1} + V_{G2}}{2} = \frac{116.87 + 126.69}{2} = 121.78$$

The next trick is to think backwards. When you compute your ground speed during cross-country planning, you apply the forecast wind to your planned true airspeed to determine your expected ground speed. During your airspeed calibration data reduction so far, you removed the wind by averaging V_{G1} and V_{G2}, so your calculated average V_G is also your calculated average true airspeed (V_T).

We'll assume your airspeed calibration test flight did not occur above 10,000 feet pressure altitude or at an airspeed faster than 200 knots, so we can ignore the compressibility effects on your airspeed indication. Now all you have to do is convert V_T to V_C, but there's a minor inconvenience. You have to know the ambient air temperature, but your OAT gauge provides total air temperature. Converting total air temperature to ambient air temperature requires you to know your calibrated airspeed, which is what you're trying to find out. Fortunately, most of us don't have to worry about this circular argument, because the airspeed error created by using OAT instead of ambient temperature is typically less than half a knot below 10,000 feet pressure altitude up to 200 knots.

You can determine V_C by using the table in Figure 2, along with some math. Or you can bypass the table, but the math is slightly more complicated. We'll present both methods.

Test Data						Calculated Data			
Gear Position	Flap Position	Elapsed Time (sec)	Observed Airspeed (kt)	Pressure Altitude (ft)	OAT (deg C)	Ground Speed (kt)	Avg Gnd Speed (kt)	Vc (table) (kt)	Vc (eqn) (kt)
Up	0	40.0	120	1200	10	116.87			
Up	0	36.9	120	1200	10	126.69	121.78	120.20	120.21
Up	0	35.1	140	1250	10	133.18			
Up	0	32.9	140	1250	10	142.09	137.64	135.74	135.74
Up	0	30.4	162	1200	10	153.78			
Up	0	28.5	162	1200	11	164.03	158.90	156.57	156.58
Up	0	48.0	100	1200	11	97.39			
Up	0	43.6	100	1200	11	107.22	102.31	100.80	100.81
Up	0	56.5	85	1250	12	82.74			
Up	0	50.3	85	1250	11	92.94	87.84	86.47	86.48

Course Length (ft) = 7890

Average Weight (lb) = 1475

Figure 1

Table Look-Up Method

The table in Figure 2 lists pressure altitudes and their corresponding pressures. Use the pressure (P) that corresponds with the pressure altitude during your test run along with the V_T (ground speed in Figure 1) and OAT to calculate V_C with the following equation.

$$V_C = 0.369 \times V_G \times \sqrt{\frac{P}{OAT + 273.15}}$$

P is in pounds/square foot as presented in Figure 2, OAT is in degrees centigrade, V_G and V_C are in knots, and 0.369 includes the necessary standard sea level values of pressure and temperature to simplify the equation. Using data from our example grid and Figure 2, the equation looks like this.

$$V_C = 0.369 \times 121.78 \times \sqrt{\frac{2026.12}{10 + 273.15}} = 120.21$$

Notice the V_C (table) values are slightly different from the V_C (eqn) values in Figure 1. This discrepancy is caused by the interpolation of P from the table in Figure 2 for the example calculation. The V_C (eqn) in Figure 1 was calculated using a standard atmosphere table, which is more accurate than simple interpolation of Figure 2. When you consider that 0.01 knot represents a difference of about 1 foot per minute or less than three airplane lengths after an hour of flying, it's probably not worth worrying about.

Equation-Only Method

If you don't have access to standard atmosphere tables, dislike interpolating, or would prefer to do the entire data reduction with your calculator, here's how.

$$V_C = \frac{16.976 \times V_G}{\sqrt{OAT + 273.15}} \times \left(1 - 6.8756 \times 10^{-6} \times PA\right)^{2.628}$$

Again, V_G and V_C are in knots, and OAT is in degrees centigrade. PA is in feet, just as you recorded it on your data grid. The numerical values account for the necessary standard sea level values of pressure, temperature, density, temperature lapse rate, and a bunch of other constants to simplify the equation. Plugging in the data from our example grid, we have

$$V_C = \frac{16.976 \times 121.78}{\sqrt{10 + 273.15}} \times \left(1 - 6.8756 \times 10^{-6} \times 1200\right)^{2.628} = 120.21$$

By comparing the calculated values of V_C (table) and V_C (eqn) in Figure 1, you can see either way works fine.

Repeat the entire data reduction procedure for your remaining test data pairs, and your data grid should look like Figure 1. Of course, your table probably won't have two V_C columns, unless you decided to use both methods. Now it's time to turn your data grid into something more pilot friendly.

A Picture's Worth 10^3 Words

Remember, the reason for going through all this trouble is to produce a reference that will show you what your calibrated airspeed is when your airspeed indicator reads *any* observed airspeed. Your data grid provides that correlation for several speeds, but a plot of V_C versus V_O will show you that information for every airspeed.

Get out a piece of graph paper and draw horizontal and vertical axes. Label the horizontal axis "Observed Airspeed" and the vertical axis "Calibrated Airspeed." Next, plot the

Pressure Altitude (ft)	Pressure (lb/sq-ft)
0	2116.22
500	2078.26
1000	2040.85
1500	2003.99
2000	1967.68
2500	1931.89
3000	1896.64
3500	1861.91
4000	1827.70
4500	1793.99
5000	1760.79
5500	1728.09
6000	1695.89
6500	1664.17
7000	1632.93
7500	1602.17
8000	1571.89
8500	1542.06
9000	1512.70
9500	1483.79
10000	1455.33

Figure 2

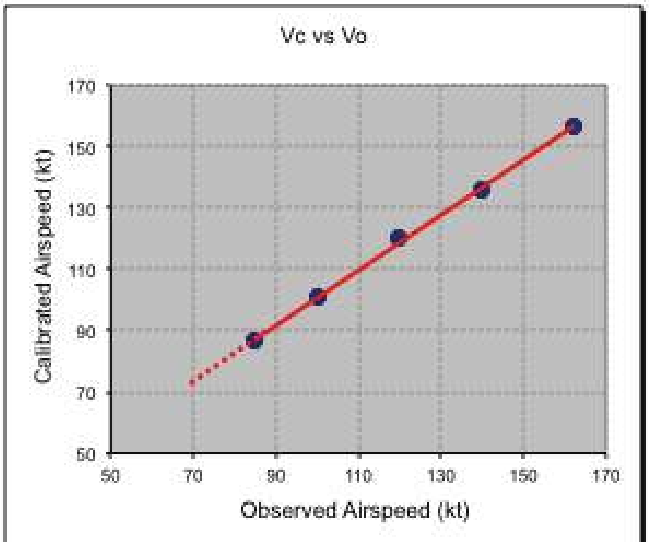


Figure 3

corresponding pairs of V_0 and V_C. Fair a line through the data points you just plotted as shown in Figure 3.

If your line fits the data points well, you can extend it with a dashed line to show the predicted V_0/V_C correlation at speeds slower than your slowest tested airspeed. Remember, however, this is only an extrapolation, and the difference between V_0 and V_C generally gets bigger at slower airspeeds. Don't rely on this extrapolation as a safe indication of how much faster than stall speed you are flying. Your stall speed testing will provide the observed stall speeds for different configurations, weights, and center of gravity locations.

Don't forget to perform the same data reduction for those airspeeds you spot-checked with your airplane at a different weight. You can plot these data on your V_0/V_C graph to see how close they are to your original weight line. If your spot-checked data points plot significantly above or below the line, you can fly another full airspeed calibration test at the second weight. Plot this line on the same graph, and don't forget to clearly label which is which. You can also plot lines for different configurations on the same graph, if it's not too cluttered.

You now have a handy plot for your operator's manual for cross-country planning and in-flight reference. Remember, if you modify your airplane externally, you may have to fly another airspeed calibration if the modification affects the airflow near the static ports of your pitot-static system. It's a good idea to perform a spot check of a few airspeeds after the modification. If the spot-checked data points don't fall on the line, fly another complete airspeed calibration.

A Few Words About Judgment

During your test flights you exercised good piloting judgment concerning test site selection, minimum test altitude, emergency action preparation, etc. During the data reduction you should exercise good engineering judgment. For example, if you noted on your test data card that your airspeed varied 5 knots during a particular timing run, throw away that data. If some data points seem to be well off the faired line, go back to your data card to see why. Perhaps you were not as confident in your timing on this run or not as steady at the start of the timing as you were for the other runs. "Quality" notes on your test cards can be very useful after the flight to help explain data that don't seem to fit.

The more data you collect during the flight, the more confidence you'll have in your results. Fly at least five or six airspeeds during your test. More is better. The speeds you select should cover the entire airspeed range for that configuration. The test speeds don't have to be exact, but they should be close to your target speed. For example, if your plan calls for a 130-knot test run, but you find yourself stabilized at 126 knots as you approach the start checkpoint, that's okay. Remember, you'll fair a line through these points anyway, and there's no good reason to abort an otherwise good setup just because you're off a few knots. Just make sure you fly the reciprocal heading run at the same speed as the first. What you should not do is start the run at 126 knots and try to "make it up" by ending the run at 134 knots. The goal is a rock-steady airspeed for the entire run. Make a note of any potentially interfering events that occur during the run because that information may come in handy after the flight to explain apparent data anomalies.

That's it. The data reduction may seem a bit cumbersome at first, but you'll master it in no time. This month we started with elapsed time, observed airspeed pressure altitude, and outside air temperature. We removed the wind effects by averaging reciprocal heading runs, then turned that true airspeed into calibrated airspeed with the aid of an altitude table and a calculator. Finally, we created a useful plot of calibrated versus observed airspeed. Not a bad day's work. EAA

» Questions about flight testing for Ed? Send an e-mail to *Experimenter@eaa.org* with the words Flight Testing in the subject line, and we'll forward your questions to him.

Ed Kolano, EAA 336809, is a former Marine who's been flying since 1975 and testing airplanes since 1985. He considers himself extremely fortunate to have performed flight tests in a variety of airplanes ranging from ultralights to 787s.

Hal Bryan works with a cleco. Hal is EAA's Online Community Manager.

We're Building an Airplane!

And if we can, you can, too

By Hal Bryan

"We're building an airplane."

It feels really good just to say that.

"Big deal," I'm sure many of you are saying. If you're reading this, there's a good chance that you've built one or several airplanes yourself. In fact, I can all but guarantee that anybody reading this has more experience building airplanes than I do.

Now, when it comes to aviation, I'm not usually the dumbest guy in the room. I'm a second-generation pilot and I've been flying my entire life. I first took the controls of an airplane when I was four and spent ten years of my childhood living on a private airstrip. I'm a student of aviation history, and while nobody would accuse me of being an especially high-time pilot, I've been lucky enough to fly a pretty large and diverse number of aircraft.

But that's enough about how great I am.

My generation saw the dawn of the personal computer age, so I spent a lot more of my childhood tinkering with virtual tools than I did with the real thing. Growing up, if there was real, hands-on work to be done on the family airplane, there was a great possibility that after a few minutes of looking over someone's shoulder, I'd see that my time might be better spent fixing my dad's computer. That's not necessarily a bad thing; I like to think that he appreciates my technical skill set as much as I do his knowledge of important things like wrenches and engines, not to mention the fact that my childhood geekdom led me into an unorthodox and very satisfying series of careers. Granted, I know how to use the basics: hammers, drills, and screwdrivers, but not really for anything more challenging than the sort of furniture you have to assemble yourself.

In addition to my general inexperience with tools, I'm also an impatient, procrastinating perfectionist, which is a spectacularly bad combination of traits. This means that if you want a lousy job started late and done hastily, but never actually finished since it won't live up to my impossibly high standards, I'm your man.

In spite of, or maybe specifically because of these traits, I've always looked at *real* builders and restorers with a certain sense of awe. I'm an enthusiastic spectator, and as an EAA staffer, an unabashed advocate for the real "doers." I can speak their language to a degree—I can order dinner but will never pass as a native—and for some reason, I'm always an honorary member of that nebulous group defined as those who "get it." Still, I sometimes glance nervously over my shoulder, wondering if someone is going to call me out and remind me that I have no business here.

When I've visited projects in progress, admired, or even flown someone's finished aircraft, I've come away with a tremendous appreciation for the work that went into it, but I've always left with an unspoken and slightly depressing "But…I could never…"

In addition to being a little depressing, that's also frustrating, and as it turns out, completely wrong.

When I found out that EAA staff would have the opportunity to build an airplane, a Zenith CH 750, I was stoked. In fact, I was a little surprised at how excited I was until it hit me: I'd be working on a project that was essentially guaranteed to succeed. Led by experienced staff builders with as many as 30 people working on it at various times, not to mention the stellar support from Sebastien Heintz and everyone else at Zenith, this airplane will be finished and flown, period. And more to the point, this will happen with or without me, and there's almost nothing I can do to screw it up. My only obligation is to show up, get my hands dirty (figuratively speaking), and learn. In short, given the combination of this support and the fact that the CH 750 must be one of the simplest kits out there, it feels as if all of us working on this project are absolutely spoiled rotten. But really, it just comes down to a bunch of EAA members helping each other out, which I think is exactly what Paul Poberezny had in mind at that first meeting 60 years ago this month.

Jeff Benedict (left) and Timm Bogenhagen check a measurement. Jeff is Visual Display Coordinator for EAA's Marketing group while Timm serves as EAA's Ultralight/Lightplane Community Manager and is also a Member Products Specialist.

Brian Huth (back to camera), Matt Smith and Hal fit two parts together. Brian is one of EAA's IT Network Administrators and Matt is a Database Administrator.

With just a handful of build sessions behind me so far, I've already learned a lot. For example, I've learned that a cleco, a temporary fastener used to hold two parts together before they're permanently attached with a rivet, is the unsung hero of every sheet metal build. I've learned that deburring, the process of removing sharp edges from metal parts and cleaning the area around a newly drilled hole, is surprisingly easy, and also very important—a lesson that came at the cost of just a couple of drops of blood (mine, luckily). I've learned that rivets can be "pulled" by hand using a big squeeze-handled tool, and immediately thereafter learned that I like pulling them with a pneumatic rivet gun quite a bit more. I've learned that understanding the 51-percent rule is one thing, but actually feeling it in your wrists and elbows is another.

I've measured, marked, punched, trimmed, drilled, clecoed, deburred, and riveted. I've broken drill bits, drilled holes the wrong size and in the wrong place, and pulled a rivet or two that needed to be drilled out and redone. I've made some mistakes, but I've done a lot more right than I've done wrong. My respect for those who build airplanes has only increased as I've begun learning the single most important lesson of this project: I can actually do this.

There are more people out there like me. I'm sure of it. People who could be builders but just don't know it, or may not yet believe it. Granted, none of them are going to be as wonderfully spoiled as we are, with a great workspace, all the tools we could possibly need, and more hands than we know what to do with, but a tremendous amount of support is as close as their nearest EAA chapter. It's just a matter of finding them, and taking a little time to show them that everything they've ever thought about their ability to build an airplane is probably wrong.

EAA's mission statement is to grow participation in aviation, which means, in large part, that we want to help make more pilots. It seems to me that one of the best ways to make more pilots is to make more builders. Most people already get the idea that building an airplane can easily be more affordable than buying one. It's up to all of us to help them understand that it's not just affordable; it's also accessible.

After all, I'm doing it. EAA

Building Your Homebuilt Using the New FAA Major Portion Checklist

Why should you care about this bureaucratic subject?

By Joe Gauthier

Why should you care about the FAA's newest (in 2009) major portion rule checklist? The answer is both simple and complex. (How about that for polar opposites?) An amateur aircraft builder is required to build 51 percent, or the major portion, of an aircraft for recreation or education. The rules that allow amateurs to build their own plane require that it be solely for educational or recreational purposes. Only a carefully measured amount of commercial assistance is allowed.

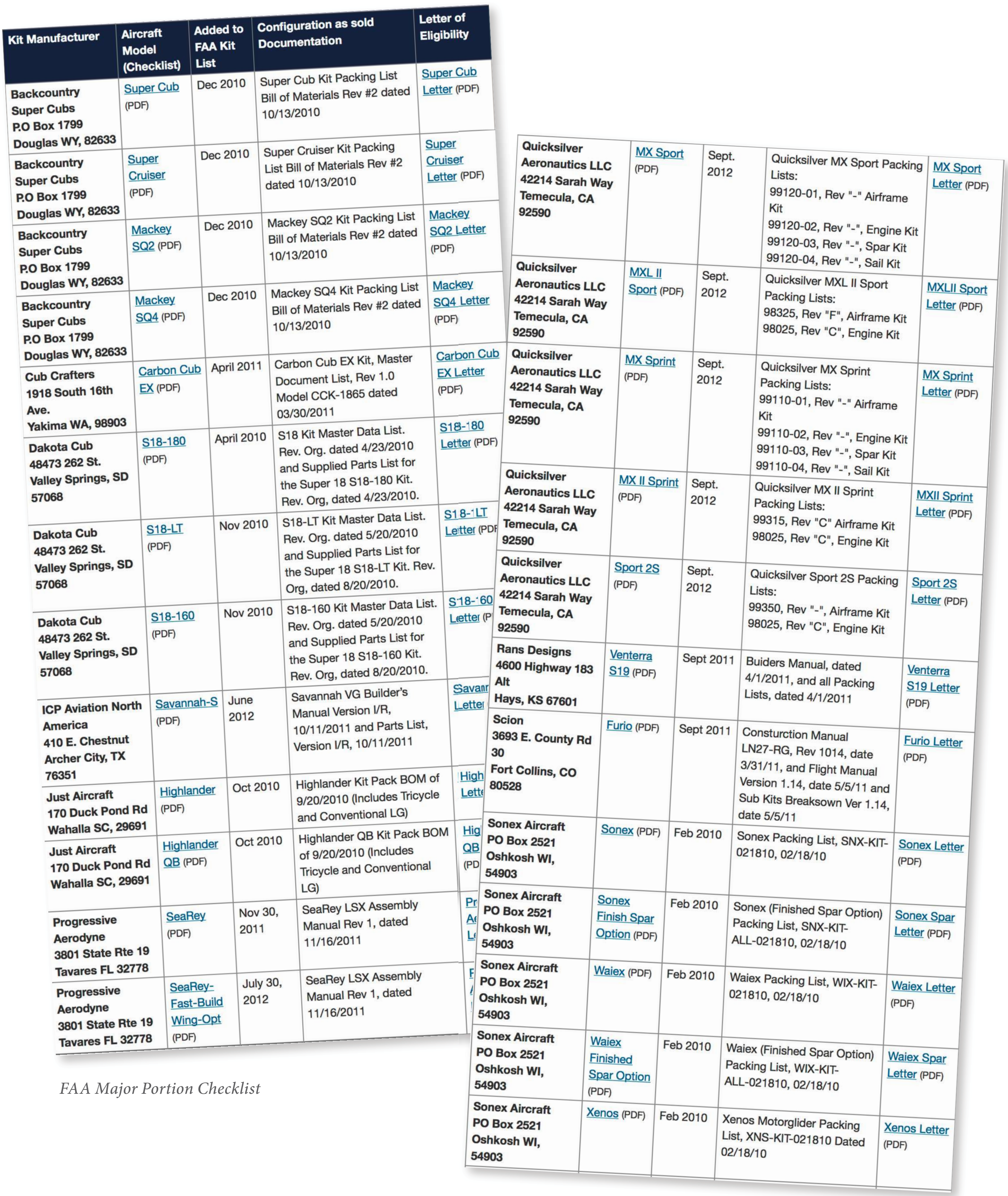
Fortunately we have kit companies that make it possible for many to build their own aircraft by providing kits that meet the FAA rules, so you don't have to worry about it. Or do you? By the way, it's okay to use prefab wheels, brakes, nuts and bolts engines, avionics, paint, upholstery, etc. No one, not even the FAA, requires the builder to mine for ore, cast metal parts, or build such things as engines, instruments, wheels, tires, brakes, cosmetics, and interior goodies. However, if you wish, you have the freedom to do it all.

About the Checklist

We've used checklists to determine compliance with major portion assessments by the amateur and the FAA since early in the 1970s. The checklist came into existence in the mid-1970s right after the Christen Eagle showed up as a "very" complete kit. People came to believe that the Eagle kit was far too complete to be certificated as an amateur-built aircraft. An FAA/industry working group was formed, and it developed the checklist; associated techniques were added to the homebuilders list of required knowledge. Also, new terms were added to our vocabulary, such as "tasks" and "compensation," which we'll explain shortly. In 1996 the FAA produced an advisory circular (AC) on the subject of commercial assistance; it became AC 20-139. Since that time, that AC has been incorporated into the AC on homebuilt aircraft, AC 20-27. You should get to know them as part of your education into the world of homebuilt aircraft.

The early checklist could be found on FAA Form 8000.38. It was used successfully for years, right through the Van's, Lancair, Kitfox, and Glasair, etc. era with little fuss and fanfare. It worked, and life was good. The checklist was used by the FAA for evaluating kits to be added to the FAA's List of Eligible Kits and further used by field personnel, when needed, to establish major portion questions when (not if) those issues arose.

So why did we get a new checklist in 2009? Connect those dots directly to the FAA's concern about and attention to commercial assistance shops (sometimes known as professional builders) that had been going on for a couple years, and you would be very close to understanding the reason why the FAA became pressured into doing something. Yes, the checklist resulted from blatant abuse by professional shops and individual builders who recognized there was money to be made building aircraft for those who had the money, but neither the time nor skills to build. This nefarious activity was moving forward very quickly until homebuilt aircraft performance and design sophistication was noticed by the general aviation manufacturers. They realized there was performance available in homebuilt aircraft that standard-category airplanes couldn't deliver. The perception of safety in homebuilt aircraft reached levels that were also attractive. This dramatic upturn in commercial activity, and the pressure manufacturers felt by competing interests, worried the FAA, and it took intense



Kit Manufacturer	Aircraft Model (Checklist)	Added to FAA Kit List	Configuration as sold Documentation	Letter of Eligibility
Backcountry Super Cubs P.O Box 1799 Douglas WY, 82633	Super Cub (PDF)	Dec 2010	Super Cub Kit Packing List Bill of Materials Rev #2 dated 10/13/2010	Super Cub Letter (PDF)
Backcountry Super Cubs P.O Box 1799 Douglas WY, 82633	Super Cruiser (PDF)	Dec 2010	Super Cruiser Kit Packing List Bill of Materials Rev #2 dated 10/13/2010	Super Cruiser Letter (PDF)
Backcountry Super Cubs P.O Box 1799 Douglas WY, 82633	Mackey SQ2 (PDF)	Dec 2010	Mackey SQ2 Kit Packing List Bill of Materials Rev #2 dated 10/13/2010	Mackey SQ2 Letter (PDF)
Backcountry Super Cubs P.O Box 1799 Douglas WY, 82633	Mackey SQ4 (PDF)	Dec 2010	Mackey SQ4 Kit Packing List Bill of Materials Rev #2 dated 10/13/2010	Mackey SQ4 Letter (PDF)
Cub Crafters 1918 South 16th Ave. Yakima WA, 98903	Carbon Cub EX (PDF)	April 2011	Carbon Cub EX Kit, Master Document List, Rev 1.0 Model CCK-1865 dated 03/30/2011	Carbon Cub EX Letter (PDF)
Dakota Cub 48473 262 St. Valley Springs, SD 57068	S18-180 (PDF)	April 2010	S18 Kit Master Data List. Rev. Org. dated 4/23/2010 and Supplied Parts List for the Super 18 S18-180 Kit. Rev. Org, dated 4/23/2010.	S18-180 Letter (PDF)
Dakota Cub 48473 262 St. Valley Springs, SD 57068	S18-LT (PDF)	Nov 2010	S18-LT Kit Master Data List. Rev. Org. dated 5/20/2010 and Supplied Parts List for the Super 18 S18-LT Kit. Rev. Org, dated 8/20/2010.	S18-LT Letter (PDF
Dakota Cub 48473 262 St. Valley Springs, SD 57068	S18-160 (PDF)	Nov 2010	S18-160 Kit Master Data List. Rev. Org. dated 5/20/2010 and Supplied Parts List for the Super 18 S18-160 Kit. Rev. Org, dated 8/20/2010.	S18-160 Letter (P
ICP Aviation North America 410 E. Chestnut Archer City, TX 76351	Savannah-S (PDF)	June 2012	Savannah VG Builder's Manual Version I/R, 10/11/2011 and Parts List, Version I/R, 10/11/2011	Savann Letter
Just Aircraft 170 Duck Pond Rd Wahalla SC, 29691	Highlander (PDF)	Oct 2010	Highlander Kit Pack BOM of 9/20/2010 (Includes Tricycle and Conventional LG)	High Lette
Just Aircraft 170 Duck Pond Rd Wahalla SC, 29691	Highlander QB (PDF)	Oct 2010	Highlander QB Kit Pack BOM of 9/20/2010 (Includes Tricycle and Conventional LG)	Hig QB (PD
Progressive Aerodyne 3801 State Rte 19 Tavares FL 32778	SeaRey (PDF)	Nov 30, 2011	SeaRey LSX Assembly Manual Rev 1, dated 11/16/2011	Pr Ae L
Progressive Aerodyne 3801 State Rte 19 Tavares FL 32778	SeaRey-Fast-Build Wing-Opt (PDF)	July 30, 2012	SeaRey LSX Assembly Manual Rev 1, dated 11/16/2011	F

Quicksilver Aeronautics LLC 42214 Sarah Way Temecula, CA 92590	MX Sport (PDF)	Sept. 2012	Quicksilver MX Sport Packing Lists: 99120-01, Rev "-" Airframe Kit 99120-02, Rev "-", Engine Kit 99120-03, Rev "-", Spar Kit 99120-04, Rev "-", Sail Kit	MX Sport Letter (PDF)
Quicksilver Aeronautics LLC 42214 Sarah Way Temecula, CA 92590	MXL II Sport (PDF)	Sept. 2012	Quicksilver MXL II Sport Packing Lists: 98325, Rev "F", Airframe Kit 98025, Rev "C", Engine Kit	MXLII Sport Letter (PDF)
Quicksilver Aeronautics LLC 42214 Sarah Way Temecula, CA 92590	MX Sprint (PDF)	Sept. 2012	Quicksilver MX Sprint Packing Lists: 99110-01, Rev "-" Airframe Kit 99110-02, Rev "-", Engine Kit 99110-03, Rev "-", Spar Kit 99110-04, Rev "-", Sail Kit	MX Sprint Letter (PDF)
Quicksilver Aeronautics LLC 42214 Sarah Way Temecula, CA 92590	MX II Sprint (PDF)	Sept. 2012	Quicksilver MX II Sprint Packing Lists: 99315, Rev "C" Airframe Kit 98025, Rev "C", Engine Kit	MXII Sprint Letter (PDF)
Quicksilver Aeronautics LLC 42214 Sarah Way Temecula, CA 92590	Sport 2S (PDF)	Sept. 2012	Quicksilver Sport 2S Packing Lists: 99350, Rev "-", Airframe Kit 98025, Rev "C", Engine Kit	Sport 2S Letter (PDF)
Rans Designs 4600 Highway 183 Alt Hays, KS 67601	Venterra S19 (PDF)	Sept 2011	Buiders Manual, dated 4/1/2011, and all Packing Lists, dated 4/1/2011	Venterra S19 Letter (PDF)
Scion 3693 E. County Rd 30 Fort Collins, CO 80528	Furio (PDF)	Sept 2011	Consturction Manual LN27-RG, Rev 1014, date 3/31/11, and Flight Manual Version 1.14, date 5/5/11 and Sub Kits Breaksown Ver 1.14, date 5/5/11	Furio Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Sonex (PDF)	Feb 2010	Sonex Packing List, SNX-KIT-021810, 02/18/10	Sonex Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Sonex Finish Spar Option (PDF)	Feb 2010	Sonex (Finished Spar Option) Packing List, SNX-KIT-ALL-021810, 02/18/10	Sonex Spar Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Waiex (PDF)	Feb 2010	Waiex Packing List, WIX-KIT-021810, 02/18/10	Waiex Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Waiex Finished Spar Option (PDF)	Feb 2010	Waiex (Finished Spar Option) Packing List, WIX-KIT-ALL-021810, 02/18/10	Waiex Spar Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Xenos (PDF)	Feb 2010	Xenos Motorglider Packing List, XNS-KIT-021810 Dated 02/18/10	Xenos Letter (PDF)

FAA Major Portion Checklist

Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Xenos Finished Spar Option (PDF)	Feb 2010	Xenos Motorglider (Finished Spar Option Packing List, XNS-KIT-ALL-021810, 02/18/10	Xenos Spar Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Onex – No Options (PDF)	Feb 2012	Onex Pack List, ONX-KIT-112911, 11/29/11	Onex Letter (PDF)
Sonex Aircraft PO Box 2521 Oshkosh WI, 54903	Onex Finish Spar; and Machined Angle Option (PDF)	Feb 2012	Onex (Finished Spar and Machined Angle Option) Pack List, ONX-KIT-ALL-112911, 11/29/11	Onex Letter (PDF)
Supermarine Aircraft LLC 365 FM 2807 Hgr 7 Cisco, TX 76437	Spitfire MK26B (PDF)	Jan 2012	Supermarine Spitfire Builder's Manual, Version A, dated 1/11/2012 and Parts List, Version A, dated 1/11/2012	Supermarine Spitfire MK26B Letter (PDF)
Team Tango 1990 SW 19th Ave Williston FL, 32696	Tango 2 (PDF)	Aug 2010	Covers two variants, Tango 2 and Tango 2 Er (Ext Range) Tango 2 Builder's Manual, Ver 1.1, 4/20/10 and Tango 2 Parts List Ver 1.1, 5/25/10	Tango 2 Letter (PDF)
Team Tango 1990 SW 19th Ave Williston FL, 32696	Foxtrot (PDF)	Aug 2010	Covers two variants, Foxtrot and Foxtrot ER (Ext Range) Foxtro 4 Builder's Manual, Ver 1.1, 5/20/10 and Foxtrot Parts List Ver 1.1, 5/25/10	Foxtrot Letter (PDF)
Van's Aircraft 14401 NE Keil Rd. Aurora OR, 97002	RV-12 (PDF)	Aug 2010	RV-12 Builder's Manual, Set 4, RV-12 Parts Index, 7/24/2009	RV-12 Letter (PDF)
Zenith Aircraft PO Box 650 Mexico MO, 65265	STOL 750 (PDF)	May 2010	Drawings: Edition 1 Rev 1, 1/29/10, Parts List, Airframe Pack List 2/1/10, Finishing Pack List 2/1/10	STOL 750 Letter (PDF)
Zenith Aircraft PO Box 650 Mexico MO, 65265	CH650B (PDF)	May 2011	Drawings: CH650 Drawings: Edition 2, 8/9/2010, Airframe Pack List 8/9/2010, Finishing Pack List 8/9/2010	CH650B Letter (PDF)

interest in the work that some of these pros were doing that appeared to compromise the major portion rule in FAR 21.191(g), the 51-percent rule, as it has become to be known.

Because of the relationship that the FAA, EAA, and industry have, they all got together to resolve the growing concern. We're pleased that they decided to enlist industry and associations, as well as other individuals, to search for a suitable solution. An Aviation Rulemaking Committee (ARC) was formed in 2006, and it completed its work in 2008. The results of the ARC activities were reported to EAA members, and yet more new terms entered our vocabulary.

The ARC members proposed a revised checklist. While some members wanted to stay with the old checklist, others believed that adding tasks to the process would provide benefits in that it would allow additional detail and finer division of task assignment. The new checklist also promised to get rid of the dual checks that some FAA representatives were using. We welcomed the committee's proposal for an expanded checklist. The FAA accepted the new checklist with the added tasks, elimination of dual checks, more detail, and the expansion to four columns of items. This was believed by many to be a big improvement.

The FAA and some members of the group believed this detail could help manage the abuses of professional builders by making it easier and more reliable to measure the amount of work that a builder could contract with a professional and remain compliant with the 51-percent rule.

The ARC soon realized that a grandfathering, or a prior policy plan, needed to be brought into the activities, and it set about devising methods so that folks who had spent years constructing their aircraft would not be regulated out of existence by the imposition of the new rules being put into place. We believe the provisions that were made to accommodate those concerns have been resolved.

The new checklist is now in use by the FAA, and the FAA website has numerous listings of popular kit airplanes, along with the evaluations performed by the FAA's National Kit Evaluation Team (NKET). Many of the previously encountered problems became much clearer when viewing a completed evaluation.

Before we go any further, it would be good if you take a look at the new checklist here.

The New Terms

What are tasks? For this use, "task" is the term used on both the old and new checklists to characterize the work operations and components involved. It was recognized early on that using parts count or time spent would result in larger issues than the term task. The ARC discussed it and recommended its continuation.

What is compensation? Paying someone for services, goods, or cash for completing tasks on the list is commercial assistance.

What is not commercial assistance? Paying someone to help arrange the shop, set up workstations, or provide tools and training (as long as the training doesn't result in a finished part for the airplane) is not commercial assistance.

How does the homebuilder work through this maze? As we said previously, when the FAA interacts with the general public it produces an AC (20-27G in this case), which has plain language and easy to follow flowcharts. The AC also has examples of many concepts involved and is also available on the FAA.gov website here.

The 2009 Checklist Job Aid is also available on the FAA website. It's there to guide individuals through the steps and procedures involved with amateurs building aircraft for education or recreational purposes.

Who Uses the Checklist?

Who uses the Amateur-Built Fabrication and Assembly Checklist (2009) Job Aid? When does the FAA use it? The NKET, a team of FAA specialists from around the country who travel to kit producers' facilities, uses the checklist to perform initial kit evaluations.

What other uses are there for the checklist? When either commercial assistance or significant changes have occurred in the fabrication and assembly of approved kits, the checklist becomes invaluable. Also, any kit that has never been evaluated by the FAA will be evaluated in the field at the time of certification, using the 2009 checklist. The checklist is also used when someone is building a kit that has never been evaluated or is making significant changes to a kit that has previously been approved by either the old checklist or the new one.

When does an amateur builder need to use the new checklist? An amateur builder should use it when he is planning to work on a nonevaluated kit or when contemplating using commercial assistance on either an evaluated or a nonevaluated kit. The amateur builder also should think about using the checklist when considering changes to an approved kit. It could very well be that more work will be done by the amateur, but it also could be that the changes will simplify and reduce work. In any event, your designated airworthiness representative or other FAA representative may want to see the checklist as proof you are in compliance with the major portion rule before they issue the certificate of airworthiness, without which you may only have a nice piece of artwork and not a legal-to-fly aircraft.

Thankfully, the FAA.gov website has an abundance of information on this and other subjects of concern to all amateur builders. We're fortunate to have ready access to this information, and all are encouraged to seek out this information and start to understand what it means to all of us who build our own aircraft.

EAA presented a webinar on the subject of using the checklist, and you can view it here. I'm certain you will be much better educated and informed after seeing it. EAA

Joe Gauthier is a member of the EAA Homebuilt Aircraft Council and an FAA designated airworthiness representative.