EAA EXPERIMENTER
The Spirit of Homebuilt Aviation | www.eaa.org
Vol.2 No.6 | June 2013

The Zenith 750 CruZer

Not everyone is STOL-aholic

Cool Stuff for Homebuilders «

Our finds at Sun 'n Fun

Installing an Alternative Engine «

What to consider

Coffee and Doughnuts With Your Directors

By Jack Pelton

Every summer at Oshkosh we host The World's Greatest Aviation Celebration. Our AirVenture Oshkosh has grown beyond the wildest dream any EAAer could have had 60 years ago. But our big aviation festival is still the annual convention for EAA, and a key element of the convention is the annual meeting of the membership.

However, I'm willing to wager that you have never been to the annual meeting of the EAA membership, because very few have. The meeting has been, well, pretty dry and boring. It has been held on Saturday morning the past many years and has been perfunctory.

There were brief reports on the association's financial status, the names of directors elected were announced, and changes or adjustments to the bylaws were approved. Routine is a word that comes to mind to describe what happened at the membership meeting.

Last year was a little different. A few hundred people, instead of a few dozen, attended, and several members addressed the leadership with comments and complaints. Chalet tents that were new to the flightline generated the most comments, and they were uniformly negative. And your directors listened. The chalets are gone.

Though none of us on the board of directors relishes listening to unhappy members, last year's meeting was an eye-opener. The comments from those who spoke at the meeting made it clear we have not done a good enough job communicating with members.

So this year the annual meeting of the membership will be held on Wednesday morning at 8:30 at the Theater in the Woods. We directors believe holding the meeting mid-week will provide the greatest opportunity for members to attend, because by Saturday many of you who came early for the start of Oshkosh, or even before the opening weekend, are heading home.

We on the board also learned last year that the annual meeting can and must be a two-way exchange of information and ideas. Of course, we still need to handle the procedural matters of electing directors, accepting minutes of the last meeting, presenting the financial report, and so on. But the other directors and I will make less formal presentations to bring you up to date on what your association is doing, what our goals are, and frankly, what really big challenges we face.

EAA is progressing through a time of transition. Our founder Paul Poberezny and his son Tom served EAA tirelessly for decades, and we all thank them for their vision and hard work. EAA and AirVenture reflect the thumbprint of their legacy.

The other important transition is building an association that is responsive to members' needs and addressing the critical issues that personal aviation faces today. It is imperative that EAAers and all who love the freedom and challenge that can only be found in personal aviation work to find ways to protect our freedom of flight along with igniting the enthusiasm we all have for all things aviation with the next generation.

These and other topics are what my fellow directors and EAA leaders and I want to talk to you about at the annual membership meeting. There won't be time to hear from everyone, but there will be a dialogue between members and the leadership. And, just like last year's complaints about the flightline chalets, your board will listen. We will also have the annual financial report in the August issue of *Sport Aviation* (available on the AirVenture grounds) so you will have a chance to review the numbers before the meeting.

So please come by the Theater in the Woods on Wednesday, July 31, at 8:30 a.m. I'll make sure we have the coffeepot on, and if you get there early enough, there will probably be a doughnut left.

See you in Oshkosh soon, and don't miss the annual meeting. I promise it will be worth your time. EAA

On the cover: The new Zenith 750 CruZer. (Photography by Notley Hawkins)

Photography by Jason Toney

EAA EXPERIMENTER

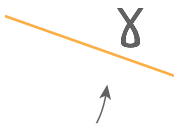
Vol.2 No.6 / June 2013 | A publication of the Experimental Aircraft Association

Contents

Features

Departments

Columns



Your 'New' Community Manager

Happy to be working for homebuilders

By Charlie Becker

Technically, I'm the "new guy" at EAA. It is funny to say that since I previously worked at EAA for 13 years (1999-2012). During that time I had many opportunities to improve EAA's homebuilding offerings (see sidebar listing), but it was never the main focus of my "job description." So when EAA approached me about returning as the homebuilt community manager, I couldn't turn it down. How could I pass up the chance to devote my energies to serving the homebuilt movement? Thankfully my wife, Theresa, was willing to move back to the frozen tundra; without her support, I wouldn't be writing this intro.

To me, homebuilding is what EAA is all about. Don't get me wrong; I really enjoy the history of warbirds, I'm a fan of ultralights, I've owned several different vintage aircraft, and it's fun to do some light aerobatics. But to be able to build your own aircraft—to innovate, create, and bring one more aircraft into this world is something truly special. It is an activity that Paul Poberezny and EAA grew from nothing more than a group of builders in Milwaukee into a worldwide movement.

For those who don't know me, let me fill you in on a few details. Fourteen years ago I turned my aircraft building hobby into my career by coming to work for EAA. I'm a private pilot with 600-plus hours in my logbook. I've been to every Oshkosh since 1994, and I've served as a chapter officer for more than 10 years (Chapter 186 in Manassas, Virginia, and Chapter 252 in Oshkosh). I've owned a number of different aircraft over the years, mostly older taildraggers because they are affordable and fun to fly. I own and fly, along with a couple of other guys, a Sonex that we built and for which I hold the repairman certificate. I'm an EAA technical counselor and FAA Safety Team representative. My current project is what I call a Pirate Cub. Basically, it is a scratchbuilt knockoff of a Super Cub. Paul Poberezny has been storing it for me since last summer, but I'm now ready to start working on it again. (www.Facebook.com/PirateCub).

I'm here to work on your behalf, so feel free to contact me at cbecker@eaa.org. I'm always looking for new Hints for Homebuilders, interesting projects to feature, and ideas to develop. Together, we can continue to grow EAA and the homebuilt movement!

Some of my previous work at EAA

- Developed the *Hints for Homebuilders* video series
- Established the *Webinars* series
- Produced the Amateur-Built Certification Kit
- Created online Aviation Calendar of Events
- Managed workshops, forums, and Homebuilders HQ at EAA AirVenture Oshkosh from 1999 to 2012
- Directed *TIG Welding: Chromoly* video
- Edited *Sheet Metal Building Basics* book
- Introduced and organized SportAir Workshops EAA

Get **hands-on**.

Get the skills you need from the experts you trust.
For workshop dates, locations and costs,
visit **SportAir.org** or call 1-800-967-5746.

EAA SportAir Workshops

EAA SportAir Workshops are supported by Aircraft Spruce & Specialty Company and Poly-Fiber Aircraft Coatings

Privilege Versus Rights

I want to adamantly take exception to Rick Weiss' comment that our freedom to fly is not in the Constitution and is a privilege granted by the government.

We the People have the *rights*; what we grant to the federal government is the authority to regulate that right for the safety of all. The federal government *does not grant rights*!

These freedoms are assured in the Constitution, and we need to stop thinking of the federal government as an all-powerful possessor and grantor of human rights.

Wayne Schneider
EAA 1080832

Thanks to My DAR

I had my Zenith CH 750 inspected recently by Dale Gauger, who is listed on EAA's designated airworthiness representative (DAR) website. Dale came across to the western edge of Wisconsin to inspect my airplane. He was on time, very experienced, very professional, very thorough, very easy to work with, and friendly. I could not ask for a better experience. I highly recommend him to anybody.

Rick George
EAA 139662

The Fuel Flow Was Helpful

I want to thank you for the great, comprehensive article Dave Prizio wrote on fuel flow testing [in the April issue, page 45]. This is just the kind of information a new builder like me needs to fly safe.

Peter Zabriskie
EAA 470533

Loved the PL-4A Article

I really enjoy the monthly *Experimenter* e-magazine, and the May issue is especially good. I was pleased to see the article about the Pazmany PL-4. My dad and I were "Paz" fans back in the heyday of homebuilding before kit planes had evolved. We enjoyed studying Pazmany's technical material and appreciated the well-engineered PL-2 and PL-4 designs. Dad had corresponded with Paz over some engineering calculations/assumptions and had several letters filed away with calculations that had been shared.

Thanks again for an interesting, nicely produced magazine.

David Duganne
EAA 1106981

PUBLICATIONS STAFF

Founder: Paul H. Poberezny
Publisher: Jack J. Pelton, EAA Chairman of the Board
Vice President of Marketing: Rick Larsen
Editor-in-Chief: J. Mac McClellan
Homebuilding Community Manager: Charlie Becker
Editor: Mary Jones/EditEtc. LLC
Graphic Designer: Chris Livieri
News Editor: Ric Reynolds
Copy Editor: Colleen Walsh
Multimedia Journalist: Brady Lane
Visual Properties Administrator: Jason Toney
Contributing Writers: Budd Davisson, Cy Galley, Dan Grunloh, Dave Higdon, Randy Hooper, Ed Kolano, Pat Panzera
European Correspondent: Marino Boric

ADVERTISING

Display
Sue Anderson
Jeff Kaufman

Mailing Address:
P.O. Box 3086, Oshkosh, WI 54903-3086
Phone: 920-426-4800
Fax: 920-426-4828
E-mail: experimenter@eaa.org
Website: www.EAA.org

Need to change your address or have other membership questions? Call 800-564-6322 (800-JOIN EAA).

Better coverage. Better rates.

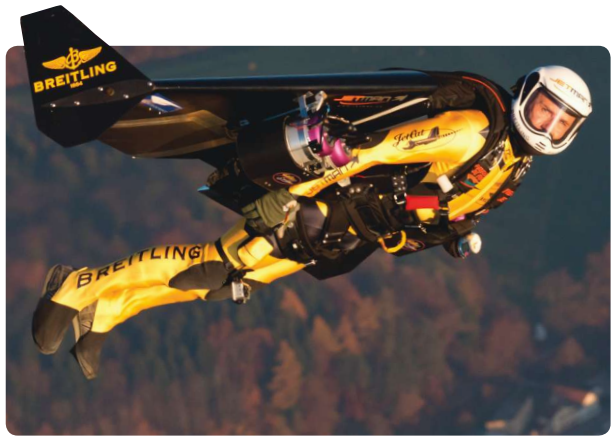
Our rates are lower. Same coverage. Same great service. Plus, EAA members still get all the extra benefits like zero deductibles. But most importantly, when you purchase your aircraft insurance through EAA, you help support EAA programs that grow participation in aviation.

Visit **EAALowerRates.com** or call us toll-free at 866-647-4322 for a quote.

EAA THE SPIRIT OF AVIATION Aircraft Insurance

Standard Category | Vintage | Aerobatics | LSA | Homebuilts | Warbirds | Sea Planes | Powered Parachutes & Trikes | Gliders | Helicopters

Administered by Falcon Insurance, Inc.



AirVenture Activity Increases
Headline events announced

With EAA AirVenture Oshkosh less than 60 days away, activity to prepare the grounds and finalize the headline events is increasing rapidly. In the past month, EAA has confirmed the following new activities:

1. The band *Chicago* will again perform the opening night concert on July 29.
2. Two night air shows will be held—on Wednesday and Saturday evenings.
3. Yves "Jetman" Rossy, the world's first jet-powered man, will make his first public U.S. flights.
4. A special preview screening of the Disney movie *Planes* will occur on Friday night at the Fly-In Theater.
5. EAA has established a new location to showcase new ideas, technologies, and products that advance aviation. Called the Innovations Pavilion, it will be located right in the middle of the show on Celebration Way. Aerospace innovators and entrepreneurs will display their designs and inventions in this gallery.
6. Art Nalls will bring the world's only privately owned flying BAE Sea Harrier F/A2 back to AirVenture Oshkosh 2013.

These highlights, along with thousands of your privately owned aircraft—homebuilts, antiques, classics, contemporaries, warbirds, ultralights, and light planes—show that AirVenture Oshkosh is truly the place to be for any aviation enthusiast. Finalize your plans to attend, July 29 to August 4. Visit www.AirVenture.org to learn more.

Two Striving to Be Youngest Solo Circumnavigators

Over the next couple of months, two young EAA members hope to break the world record for the youngest person ever to make a solo flight around the world—and promote youth involvement in aviation in the process.

Twenty-year-old Jack Wiegand is already well into his trip after departing from California's Fresno Yosemite International Airport (FAT) on May 2.

Wiegand plans to fly his family's Mooney Ovation2 GX approximately 21,000 nautical miles over the course of his trip, crossing three oceans and visiting 14 countries. The flight is expected to take approximately 36 days and will include 24 scheduled stops. Wiegand hopes to conclude his trip on June 6, landing at his starting point in Fresno.

Track his progress in real time here.

Nineteen-year-old Ryan Campbell, EAA 1001585, an Australia native and former Young Eagle, began planning his solo trip right after earning his commercial pilot certificate two years ago. He has since partnered with World Youth International and Teen World Flight to support his trip.

Campbell will depart for his journey in a Cessna 182T on June 30, and his travel stops coincide with EAA AirVenture 2013. He will land in Appleton, Wisconsin, on July 25 and make a short hop down to Oshkosh the following Monday, July 29.

Campbell estimates his circumnavigation will take approximately 200 flight hours, span 23,000 nautical miles, and take him to 25 destinations in 15 different countries. Learn more about Campbell and his upcoming trip on the Teen World Flight website.


Ryan Campbell


Jack Wiegand

Chapter to Finish Fallen Member's Plane

A special project is occurring at the EAA Chapter 79 hangar on Spokane, Washington's Felts Field. About a dozen chapter members are working to complete construction on the RV-8 owned by a fellow member, U.S. Air Force Captain Tyler Voss, who was tragically killed along with two other airmen when their KC-135 Stratotanker crashed on May 3 in Kyrgyzstan.

Voss, who was 27, joined the chapter about two years ago after acquiring his airplane from another owner. He was feverishly working to finish his new panel and other upgrades at the time he was deployed earlier this year.

Chapter member Marian Heale wrote in the May edition of The EAA Chapter 79 newsletter:

"On his last day in the country he gave his life for, Tyler was working on his RV-8 at the EAA hangar. He spoke to (chapter member) Vance Simons, who had become a friend since he is also building an airplane in the hangar, and they saw each other often. Tyler said his goal had been to finish refurbishing his RV-8 before deployment; but duty called, and he would be leaving the next day. Vance said, 'Well, at least you're leaving for a good cause—to fight for your country.' They agreed, wished each other good luck, and Tyler said he would see Vance in two months."

Unfortunately that day never came. Voss died when his Stratotanker crashed near Chon-Aryk, Kyrgyzstan, shortly after takeoff on a refueling mission in support of Operation Enduring Freedom.

Chapter President Jack Hohner became friends with Voss when he joined the chapter. "I got to know him when he started working on the airplane in our chapter hangar," he said. "Always had a smile on his face, was well liked by everyone." Chapter 79 is a very active chapter with about 120 members.

After the crash, chapter members decided to volunteer their time to finish Voss' airplane as a tribute to the fallen warrior. "We had more people come forward willing to help out than can be accommodated," Hohner said. He estimated about 40 hours of work left to complete the airplane, which, when done, will be flown back to his hometown in Texas to be given to his family.

EAAer Wins in Valdez STOL Competition

Congratulations to Frank Knapp, EAA 1111767, of Palmer, Alaska, winner of the Alternate Bush Class (Experimental) in the 2013 STOL competition at the Valdez May Day Fly-In and Air Show in Alaska.

Knapp and his yellow Cub X modified aircraft registered a 58-foot takeoff, 54-foot landing in his first set, and 58 and 56, respectively, in the second. Along with easily winning his class, Knapp's performance was tops for the entire competition.

Knapp wrote on the SuperCub.com forum, "It was great. After a year of testing and going in small circles (300 hours), I thought it would be comfortable. It's funny what happens with a little pressure! Setting on the ground for a couple seconds after the first landing, I woke to the fact I was really there; it all happened with muscle memory—no one was really flying!"

EAA Remembers Frank Beagle

EAA was saddened to learn of the passing of Frank "WOOF" Beagle, who died in his sleep on May 12, 2013. Frank was the voice of ultralights, having been the announcer "down on the farm" in the Ultralight/Light Plane area for 30 years. He started announcing in the late 1980s to provide information for those watching the daily flying activities. His deep, gravelly voice and hearty laugh were his signature.

Frank was also a member of the board of directors of the original EAA Ultralight Council established in the early 1980s and served as the emcee for several ultralight safety seminars in various states in the Midwest for many years each spring.

EAA extends its deepest sympathy to Frank's family and many friends. EAA

Quicksilver Aircraft Northeast Covers New England

Chris Hatin and Quicksilver Northeast's Quicksilver Sprint II.

Quicksilver Aeronautics has named Quicksilver Aircraft Northeast as the company's distributor in the northeast United States. Quicksilver Northeast is owned and operated by Chris Hatin at Harris Airport (8NK3) in Fort Ann, New York.

Recently Quicksilver Aircraft Northeast finished its Quicksilver Sprint II, powered by an HKS 700T. Hatin reports that the Sprint II is an excellent trainer, with a remarkably slow stall—less than 25 mph—and offers great fuel economy at less than 3 gallons per hour.

"As our representative in the northeastern territory of the country, Chris has demonstrated a gracious attitude about customer service," Quicksilver Sales Manager Todd Ellefson said. "He's also been innovative about equipping our amateur-built kits; we're very pleased to have Chris on our team."

Contact Quicksilver Aircraft Northeast at 518-796-0732, or e-mail info@quicksilverne.com. Visit Quicksilver Aircraft Northeast's website at www.QuicksilverNE.com.

Alternative Engine Round-Up—June 7 to 9

CONTACT! Magazine's Alternative Engine Round-Up, normally held at the airport in Jean, Nevada, has outgrown its home and has moved to Marysville, California, and it will be held in conjunction with the Golden West Regional Fly-In & Airshow which takes place June 7 to 9, 2013, at the Yuba County Airport (MYV). The 10th annual Alternative Engine Round-Up will be on Saturday, June 8 only.

New Rotax Revised Service Instruction

Rotax has issued Revised Service Instruction SI-912-020/914-022 R7 Revision 7, covering running modifications on the Rotax engine type 912/914 series. This service instruction lists the latest modifications that have been made to Rotax four-stroke engines and components.

The document is for informational purposes only, and there are no requirements for action or component replacement. Of note in Revision 7 is a change in the way that fuel pumps are provided as spare parts. The new fuel pumps will be supplied as bare fuel pumps with no fuel lines or fittings attached. Fittings or fuel line assemblies are available as individual spare parts to accommodate any style of fuel line connection to the fuel pump.

Also of note is the introduction of new style cylinder heads. Cylinder heads on newly produced engines, and soon the supply of replacement cylinder heads, will be changed to the same new casting design used on the 912iS fuel-injected engine.

Aircraft OEMs are encouraged to carefully review this entire document to see whether any of the changes will affect their engine installations.

For more information, visit www.Rotax-Owner.com.

Wicks Stocking 4130 Tubing

In the wake of the recent news that Dillsburg Aeroplane Works, the major American supplier of seamless 4130 aircraft tubing, is going out of business, Wicks Aircraft and Motorsports announced that it is now stocked full of 4130 tubing. Scott Wicks said, "In recent months we stocked up on bulk inventory to keep our prices low. We offer discounts on multiple lengths and can ship most orders same day. Also, all of our tubing is stored inside in a climate-controlled warehouse."

For more information, visit www.WicksAircraft.com.

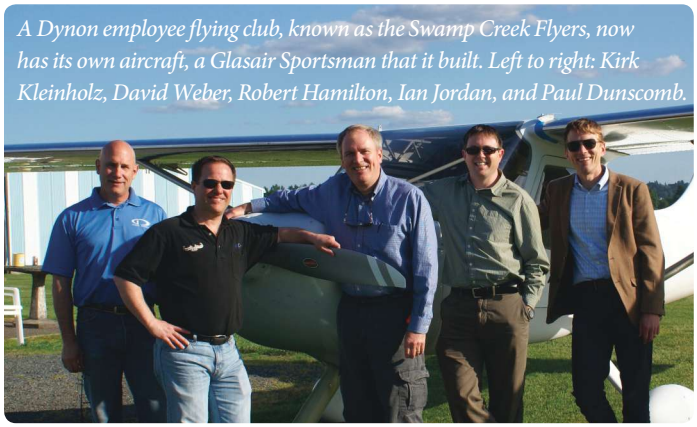
Dynon Employees Launch Flying Club With Glasair Sportsman

Seven employees at Dynon Avionics have created a flying club. Working for one of the leaders in avionics for home-built and light-sport aircraft, the employees pooled their resources and built a Glasair Sportsman in two weeks via Glasair's Two Weeks to Taxi program.

Ian Jordan, who headed up the construction group, said, "The build time was shared by all, and it served as a great bonding experience for us. We all have considerable knowledge of what is in the airframe and a high level of respect for taking care of it. It's really an ideal way to start a flying club."

As soon as the Phase 1 flight testing was completed, the club members started lining up for checkout rides, and the group is now active with its new, self-built Sportsman. "Everyone is very enthusiastic about the plane and the club," said Robert Hamilton, president of Dynon. "They're all eager to get on the schedule and log time in the aircraft. Other Dynon employees helped on the build, and it was a good educational experience. There are a lot of smiles in the shop these days. The big question now is who gets to fly it out to AirVenture this summer."

For more information about the Sportsman, visit www.GlasairAviation.com. For more information on Dynon glass panels, visit www.DynonAvionics.com.



A Dynon employee flying club, known as the Swamp Creek Flyers, now has its own aircraft, a Glasair Sportsman that it built. Left to right: Kirk Kleinholz, David Weber, Robert Hamilton, Ian Jordan, and Paul Dunscomb.

Making Perfect Takeoffs and Landings in Light Airplanes

ASA is now offering Ron Fowler's text, *Making Perfect Takeoffs and Landings in Light Airplanes*. The book teaches pilots how to develop total awareness for the situation, the airplane, and self—and to convert that awareness into perfect takeoffs and landings.

The detailed yet easy-to-follow steps in this book ensure pilots have the knowledge they need to go beyond rote-learned reactions and develop excellent flying skills. Each chapter defines a specific takeoff or landing situation and the set of characteristics unique to it, allowing pilots to master techniques key to normal takeoffs and landings, crosswind procedures, short- and soft-field operations, night procedures, critical landing situations, slips, tailwheel operations, and more.

Available as an e-book or softcover book, *Making Perfect Takeoffs and Landings* can be found at your local pilot shop or by visiting www.ASA2Fly.com.

Glasair Goes Online With New Website

The GlasairAviation.com website has gone through a transformation and significant upgrade. The website was made considerably more user-friendly, with added social media links and new photographs. By clicking on the YouTube link, consumers will be taken to a series of videos on the popular Two Weeks to Taxi program and additional clips on the Glasair III.

"We've incorporated a wide range of suggestions from our customers," said Nigel Mott, president of Glasair. "It's amazing how websites have evolved and how we've been able to refine the content and product accessibility in the site."

Visit www.GlasairAviation.com to see and learn more.

SeaRey Chooses Vertical Power VP-X for Power Distribution

Progressive Aerodyne Inc., manufacturer of the amphibious SeaRey light-sport aircraft, has chosen the Vertical Power VP-X electronic circuit breaker system for its secondary power distribution system. The VP-X will be included in all of the "Elite" versions of the SeaRey special light-sport aircraft. The VP-X integrates with the Advanced Flight Systems EFIS, allowing pilots to monitor the status of individual electrical devices and manage the entire electrical system right from the EFIS.

The VP-X replaces 80-year-old thermal breaker technology, mechanical relays, and various modules with modern solid-state electronic circuit breakers. The VP-X can detect short circuits, overcurrent conditions, and open-circuit faults. For example, the VP-X can detect a burned-out landing light or disable the starter circuit while the engine is running.

"We are using the VP-X on all of our 'Elite'-equipped SeaRey aircraft as a modern alternative to the traditional method of mechanical circuit breakers and complicated wiring," said Adam Yang, CEO of Progressive Aerodyne Inc. "We like that the electrical system information is right in front of the pilot on the EFIS, and it really cleans up the rest of the instrument panel since we no longer have mechanical circuit breakers in this version.

Learn more about the SeaRey at www.SeaRey.com. For more information about Vertical Power, visit www.VerticalPower.com.

Team Mini-Max Offering Free Plans

Team Mini-Max is now offering plans sets for its eight models of Mini-Max aircraft for free. Team Mini-Max officials said, "By offering them at no cost, we hope many more pilots and potential pilots will be able to achieve their dream to fly! And we hope they will come to Team Mini-Max when they're ready to buy a kit, sub-kit, parts, or materials.

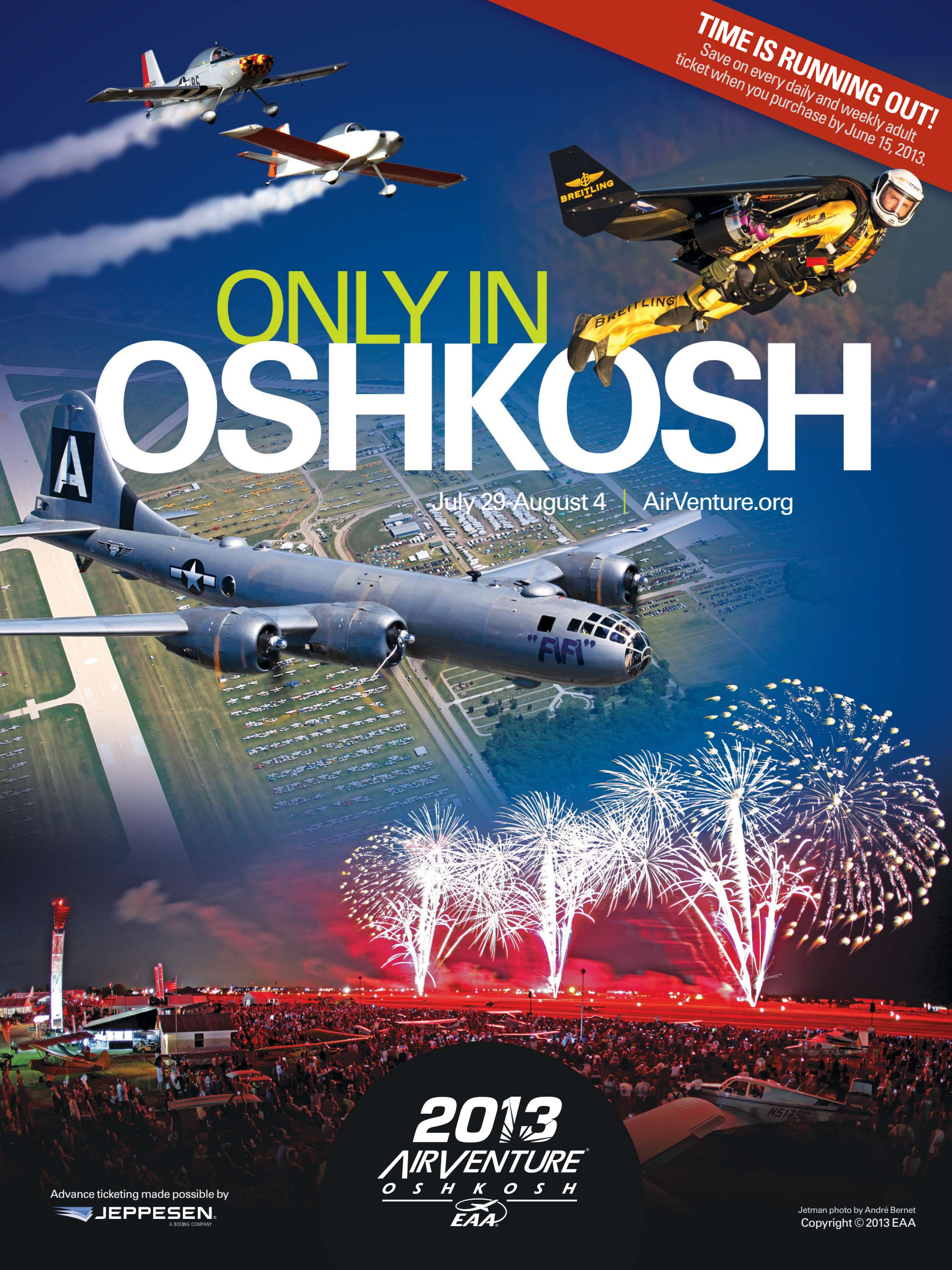
The plans will be downloadable in high-resolution Adobe Acrobat (PDF) format. If a builder does not have a large format printer or a blueprint shop nearby, we can ship printed sheets for a nominal cost ($95, including shipping and handling). The price includes approximately 28 sheets printed 24 by 36 inches. For a link to the plans, visit www.TeamMini-Max.com/plans/.

Continental Motors Extends TBO to 400 Hours

Continental Motors Inc. has increased time between overhauls (TBO) to 400 hours on Gold Standard factory-produced engines. The majority of engine models manufactured after February 2012 will see TBOs increase by 200 hours with frequent fliers receiving up to 400 hours.

In 2012, Continental Motors introduced its Gold Standard factory-rebuilt and new engines. These engines incorporate improvements in technology and manufacturing processes that have allowed Continental to increase the TBO. The increased TBO benefits nearly all Continental Motors factory-produced engines beginning in February 2012, as designated by Serial Number 1006000 and higher. Nearly all models will receive the benefit of a 200-hour increase over the existing TBO. Aircraft owners who fly 40 hours per month will receive up to 400 hours.

Complete details on the new extended TBO are included in Service Information Letter (SIL) 98-9B. Additional information is available at www.ContinentalMotors.aero/TBOExtension or by calling Customer Service at 800-326-0089 or 251-436-8292.


TIME IS RUNNING OUT!
Save on every daily and weekly adult ticket when you purchase by June 15, 2013.
BREITLING
BREITLING
ONLY IN
OSHKOSH
July 29-August 4 | AirVenture.org
"FIFI"
2013
AIRVENTURE
OSHKOSH
EAA
Advance ticketing made possible by
JEPPESEN
A BOEING COMPANY
Jetman photo by André Bernet
Copyright © 2013 EAA

The Zenith 750 CruZer

Not everyone is a STOL-aholic

By Budd Davisson

It has been said that Steve Wittman, through his air racers and his Tailwind homebuilt, proved conclusively that square corners could be made to go fast. Since Chris Heintz and his sons introduced the STOL CH 701 in 1986 and the STOL CH 750 in 2009, they have proved the same thing in reverse. They have shown that square corners and straight lines can be made to go incredibly slow (30 mph with 100-foot takeoff runs) with their 700 series of short takeoff and landing (STOL) aircraft. And now, Zenith President Sebastien Heintz is proving something equally as important: that he listened to homebuilders. At the Sun 'n Fun International Fly-In & Expo in April, Zenith introduced the CH 750 CruZer, a not-quite-STOL version of the CH 750 that, as the name implies, places more emphasis on going places than leaping off in impossibly short distances.

Sebastien said, "It's no secret that the STOL CH 750 was centered around two basic features. First, we wanted a larger-than-normal cabin [to fit average Americans]. Second, we wanted to provide the ultimate in off-airport, backyard capabilities through slow speeds and extremely short takeoff and landings. We did that by combining high-lift airfoil wings with high-lift devices."

Photography by Steve Schulte

Heintz and company are well known for favoring airfoil sections that offer high lift and excellent slow flight and gentle stall characteristics. The STOL CH 750 was built around a modified NACA 650-18 airfoil (with a fixed leading edge slat) with a fatter-than-normal thickness—17 percent. This gives lift but works against high speeds which is okay with the Heintz crew, because even in their low-wing designs, the emphasis is on safety, not high-speed capabilities. They know that a lot of homebuilders are low-time pilots, and they design aircraft that cater expressly to the needs of that pilot niche, which is one of the reasons tricycle landing gear are standard. They also are known for designing aircraft that are easy to build, and that's where the new CruZer fits nicely into the Zenith 700 series.

"An important part of the STOL 750's short-field capabilities are the wing's fixed leading-edge slats," Sebastien said. "We made them fixed, which is much less complex than movable, but that produces higher drag. On the CruZer, we eliminated the slats entirely because we recognized that only about 30 percent of the CH 750s built were ever landed off airport. Yes, many are flying out of tiny backyard runways, but we know that there are far more based on normal airports. And those owners aren't interested in landing anywhere except on established runways. So, they don't need to be able to get off the ground in 100 feet, but they do want to go faster than the 100-mph cruise speed that the 750 was giving them; so airframe drag was an issue."

The CruZer shares the same firewall as the STOL CH 750 and the low-wing CH 650, making a wide series of engines available to power the new design. But the CruZer has a new tail that departs from the usual Zenith single-piece vertical surface by featuring a traditional rudder/vertical stabilizer unit. Also, the horizontal stabilizer/elevator surface is symmetrical in cross section in contrast to the asymmetrical, down-lifting surface on the STOL birds.

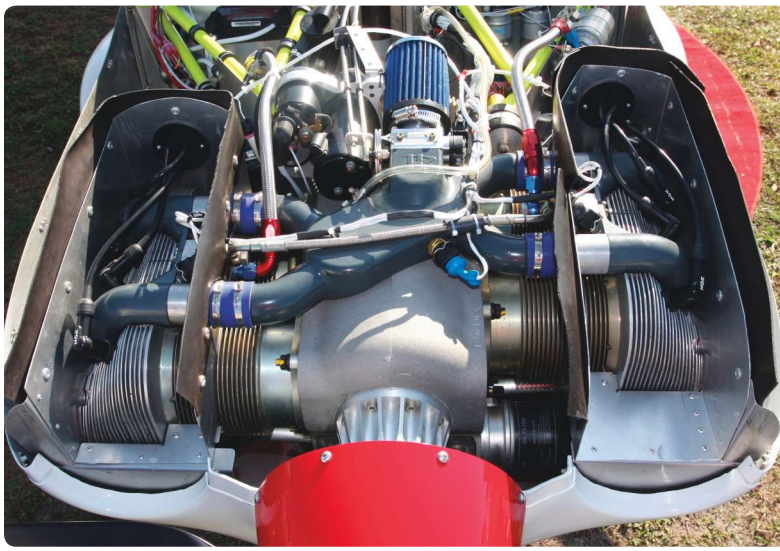
Although Sebastien said that the fuselage is basically a 750 fuselage, the many modifications such as the tail and the wider, more conventional instrument panel come close to making the CruZer a new design. It still maintains the 42-inch cabin width, which makes

The CruZer shares genes with the short-field-oriented CH 750 STOL and is perfectly happy on grass, but it cruises 18 mph faster than the STOL 750.

it nearly 3 inches wider than a Cessna 172. It's actually the same width as that of a late model Cessna 182, but optional bulged doors add even more shoulder width.

"Besides the removing of the slats," Sebastien said, "the most obvious visual change is that we replaced the fat wheels and tires with 5.00-by-5 and wheelpants; that alone produced around a 7-mph increase in cruise speed. However, if a builder wants, he can go with larger wheels and tires."

Because Zenith envisioned the CruZer as a cruiser, weight wasn't as much of an issue, so they gave up a few pounds in the engine compartment in favor of some bigger, more traditional engines. At the same time, they designed the firewall forward with enough flexibility that a builder could use state-of-the-art engines as they appear on the market. As displayed



A direct drive, thoroughly traditional engine, the 130-hp ULPower UL350iS incorporates the latest in electronic ignition and FADEC control.

ULPower's UL350iS Engine

Traditional done modern

ULPower's approach to building an airplane engine is to *not* invent a new wheel but to improve upon a proven, traditional one. Its UL350iS is totally traditional in lay-out—four-cylinder opposed (it also has a six-cylinder version) and direct drive, which is a major departure from some current approaches to getting power out of small packages.

By far, the biggest problem in getting power out of small displacement engines is…well…they're small and an engine is basically nothing more than an air pump. You suck air in, give it more energy via fuel and heat, and spit it back out again. In the process, it converts some of that energy to rotary motion through a series of monkey-motion machinery that hasn't changed in a century or two and isn't likely to. To oversimplify: the more air that's pumped through, the more power that is generated.

There are only two ways to increase power output: Either turn the engine faster so more air/fuel is cycled through or increase the size of the pump. Bigger pumps are heavier. Faster turning pumps run into the propeller tip speed limitation; the diameter/efficiency of the prop comes down when the rpm goes past a certain point and pretty much hits an efficiency wall at 0.92 to 0.95 Mach. There is, however, one other part of the equation that can be worked for more power: Overall efficiency of the compressor can be improved in the form of better airflow, more efficient combustion, less friction, and lighter components. This appears to be the route ULPower has gone in designing a vaguely old-fashioned engine for the new millennium.

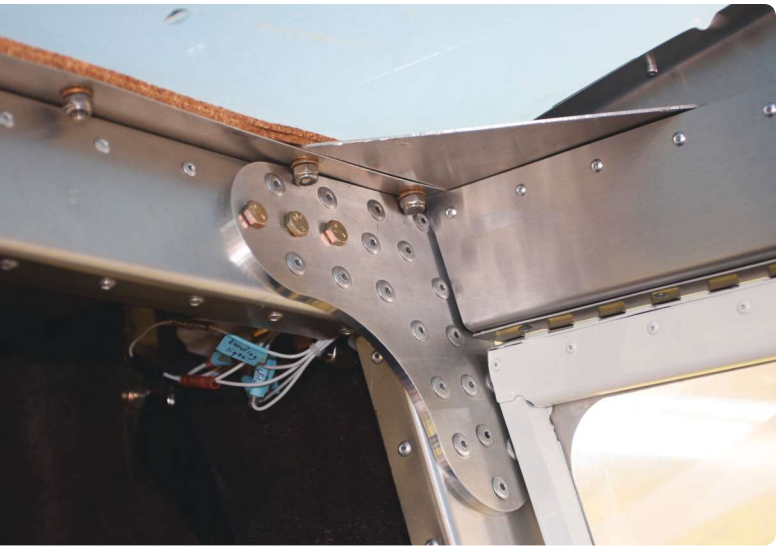
Its little 172-pound package gets its maximum power (130 hp) at 3300 rpm, which works against swinging a larger diameter, more efficient prop. However, the horsepower/torque curves appear to cross at 120 hp and about 2650 rpm, which is a sweet spot for a bigger prop. It should be noted that ULPower's literature contradicts itself a little in that the curves show the foregoing, but their spec tables say the torque peaks at 2400. This, however, is misleading because the torque curve is marvelously flat from about 2350 rpm to about 2600 rpm. It's not perfectly flat, but close enough for government work. The torque probably does peak at 2400 rpm, but it tapers off only slightly to 2600 rpm. Not enough to worry about. So a bigger prop will work just fine at a number of different rpms and the thrust/horsepower will benefit.

The engine has left things like mixture controls and magnetos in the dust, has gone completely electronic in all areas, and is FADEC controlled. Outwardly it appears to be a very well-produced package, and Sebastien said it runs as good as it looks. Being direct drive and totally electronic, it is a simple, straightforward piece of propulsion with very little to go wrong. However, only time will tell if it will escape the unpredictable demons that seem attracted to aircraft engines in general.

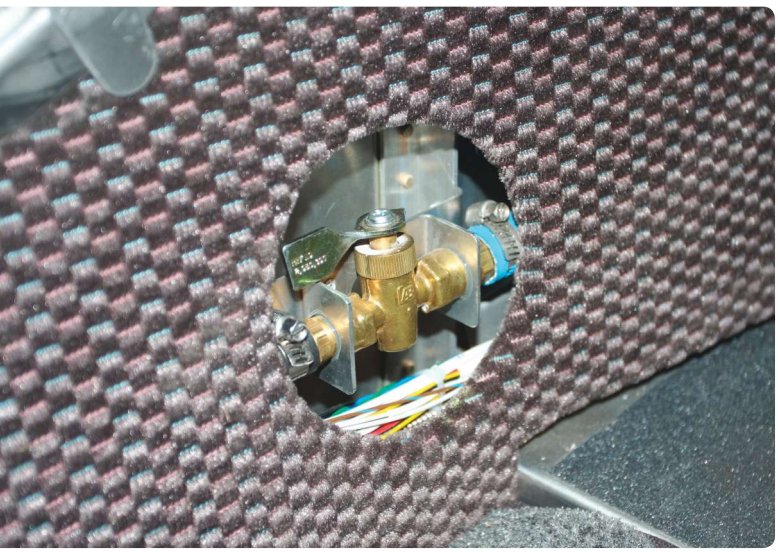
For more information, e-mail Info@ulpower.net or visit www.ULPower.net.

Photography by Budd Davisson

The console mounts pilot/co-pilot heater controls.



The CruZer uses aircraft-grade pulled rivets throughout.



The fuel valve is recessed in the left cockpit panel.

at Sun 'n Fun 2013, the CruZer was powered by UL-Power's new 130-hp UL350iS 3.5-liter engine (214 cubic inches). This engine is one of a new breed of slightly larger displacement, flat-four, air-cooled light aircraft engines that are traditional in layout, including eliminating a reduction drive unit and going direct drive. At the same time, they are state of the art in design, manufacturing, and operation; it's FADEC equipped, among other things. (See the sidebar for details.) Besides the ULPower engine, a builder has plenty of engine options available.

Sebastien said, "We set the cowling and engine compartment up so that the older, very available, and often less expensive Continental O-200 and Lycoming O-235 engines will both fit, and we make motor mounts for those and other engines. The UL engine only weighs 172 pounds whereas the O-235 weighs nearly 300 pounds installed, which is why there is so much room behind the UL 350iS. We have a long mount for that engine and short ones for the others."

As with all Zenith designs, the aircraft is available in every form from plans to a quick-build kit. Constructed of flat-sheet aluminum, with very few complex parts, the aircraft is ready made for the scratchbuilder. However, if a builder decides to move up to any of the kits, the building time plummets, courtesy of Zenith's huge CNC flatbed routers. The computer-controlled routers roam around over a flat sheet, putting the holes in the parts so they all matched. Sebastien said the 400-hour build time they quote to build from a quick-build kit is a realistic estimate, but variations will be introduced both by builder experience and the degree of finish. The more complex the paint and interior, the more time will be required. And unfortunately, the more the aircraft will weigh.

So how much less STOL and how much more of a cruiser is the CruZer? Sebastien said, "Where the STOL is off the ground in 100 feet and requires a 500-foot runway to safely take off and land with good margins, the CruZer gets off in 275 feet and needs 220 feet to land."

That's still very strong STOL performance, but Sebastien said, "In the CruZer, the average low-time pilot would be very safe flying off of 750- to 1,000-foot runways, assuming reasonable approaches. This would provide him with lots of safety margin. At the same time, however, he would have nearly 20 percent more cruise performance at the same fuel burn. It's a much more efficient airplane for those who really don't care about having the absolute ultimate in off-airport performance."

It's one of the unfortunate facts of life that nothing is free, and nowhere is this truer than in airplane performance. However, Zenith's new CruZer looks as if it'll scratch a couple of itches at the same time: It has a reasonable cruise speed with a low fuel burn yet it still has very respectable short-field performance. All of this is from easy-to-build straight lines and square corners.

For more information, visit www.Zenithair.com. EAA

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.

The much wider-than-normal cockpit has a "Y" control stick so both seats have control with minimal obstruction.

The ailerons droop with the flaps for more lift with less drag.

Photography by Budd Davisson

Sun 'n Fun 2013

"Alice's Restaurant"—you can get anything you want…need…

By Dave Higdon

"Spring Break for Pilots." After 38 fly-ins, pilots and builders know the Sun 'n Fun International Fly-In & Expo in Lakeland, Florida, serves as "spring planting for aviation business." Each spring the fly-in is a distinctive mile marker on the year's business calendar as the place where many companies choose to debut new products and services.

A little new of nearly everything in aviation debuted at Lakeland this past April—new aircraft designs, revised existing models, airframe and powerplant advances, plus a smattering of new avionics. Some of these items are suitable for use in experimental, and in some cases, certificated aircraft.

Meet the Wega

Every time someone makes news flying between the northern and southern hemispheres it starts me wondering: Did the fuel swirl entering the pick-up tube reverse rotation when crossing the equator? Would that transition threaten fuel flow?

Apparently not, as pilots for Brazil's Wega Aircraft can attest The presence of two immaculately finished Wega

Photography by Marino Boric

homebuilts served as a graphic testament to the two-place design's successful passage and demonstrated cross-country capabilities. The pilots averaged 189 knots on their 4,400-mile trip to Lakeland from Palhoça in Brazil's Santa Catarina state.

If the profile of these airplanes strikes you as familiar, check out photos of Stelio Frati's 1955 design, the Falco. While the lines are similar, differences do exist.

Those differences work mostly to a builder's advantage. For example, the Falco is predominantly an all-wood kit consisting of hundreds of component parts. Wega Aircraft created an all-carbon-fiber kit with construction centered on final assembly of two major structures: the Wega's smooth one-piece wing and the curvaceous carbon-fiber fuselage.

Wega Aircraft tapped Superior for its EX-360 engine, and MT Propellers for a three-blade, composite, constant-speed prop. Cabin access comes through a pair of clam-shell-style doors, rather than the Falco's sliding canopy.

The Falco cockpit spans 40 inches, roomy for its size; the Wega cockpit space spans 44 inches. The result is an aircraft with a 190-knot cruise potential—165 at economy cruise—about 15 knots better than the Falco. With 57 gallons of fuel to feed the 180-hp, four-cylinder engine, the Wega can fly about 1,200 miles.

Company founder Jocelito Carlos Wilder confirmed the company's plans to market a "complete kit" to the U.S. market, with "complete" translating to a standard spinner-to-tailcone package created to leverage better pricing than builders could get buying individual components.

And yes, that means complete in the best sense: carbon-fiber airframe to glass-cockpit avionics and firewall forward with engine, prop, and all the hardware. Unfortunately, as of this writing, the company remained unable to quote a price for its complete kit. But their thinking was that the basic airframe kit would go for about $40,000 with the fully complete kit coming in at about $100,000.

They plan to nail down pricing by EAA AirVenture Oshkosh 2013, when these folks from southern Brazil will be ready to escape the southern hemisphere winter. Learn more at www.AeroWega.com.

Spark of Smarts—E-Mag Electronic Ignition

E-Mag's P-114 electronic ignition has been available for a while, but it's the new Series 200 that attracted attention at Sun 'n Fun.

Designed for certification (and ultimately use on certificated aircraft), the Series 200 (and the 114) tackle the issue of redundancy differently than the other certificated options—the older Unison Lasar Ignition and other experimental systems. In the Lasar system's case, ship's power runs the system; should that power fail, a pair of conventional magnetos take over, with magneto-level performance.

In the case of other options, keeping a mechanical magneto served as the redundancy option. Mount two and your engine will enjoy all the benefits of: a) total redundancy, b) dual ignition (plus 12 to 15 percent power), and c) the seamless advance curve and spark power available from an all-electronic system.

The new six-cylinder Series 200 and the Series 114 run on the power of a miniature three-phase brushless alternator integral to the unit. With each unit running on self-generated electrical power, there's no need for mechanical mag backup or ship's power. The system needs ship's power only to power the system at engine start. After that, the internal alternator takes over and produces the needed power as long as the engine continues to turn. The E-Mag

packages can spark the engine without tapping any external electrical power.

The company also helped ensure the E-Mag's reliability by providing a drive connection that doesn't penetrate the electronics side, so a leaking oil seal can't doom the circuitry. Learn more at www.EmagAir.com.

The *In*-side Scoop on ADS-B

For years several friends have questioned the value of automatic dependent surveillance–broadcast (ADS-B) In and its promises of free weather and traffic services. As one pilot pointedly put it, "That stuff is already in my panel."

He recently began to understand his minority position concerning weather datalink and traffic-avoidance hardware. Most aircraft (and thus most pilots) lack both because most of their aircraft fall into the realm of older models, including many experimental designs.

Typically, costs hold up the investment into this equipment; the airframe's value is often less than the cost of installing standalone traffic and weather hardware, not to mention the running costs of datalink subscriptions.

Hence the enthusiasm of many pilots for the explosion in ADS-B In products available for use with a variety of display options. Sagetech's Clarity SV (synthetic vision) stood out as something new in ADS-B In receivers, thanks to its ability to receive both ADS-B Out frequencies: 978 megahertz and 1,090 megahertz with Extended Squitter (1090ES). The importance of receiving both cannot be overstated in today's environment.

ADS-B Out users may opt for a 978 universal access transceiver to satisfy both Out and In needs for flying at or below FL180—18,000 MSL. Users also enjoy an all-altitudes option, a Mode S transponder variation called "1090ES." The "ES" means "extended squitter"—the carrier of ADS-B Out data.

These two frequencies are received and retransmitted by any of the hundreds of ADS-B ground stations scattered across the country; however, not all yet participate with both frequencies, so an ADS-B In user may see some traffic but not all. Further, the weather and relayed traffic promised under ADS-B *requires* 978 megahertz reception in the aircraft.

Clarity SV covers both frequencies, gets all the flight information service–broadcast (FIS-B) weather, and uses the data to provide synthetic vision driven by GPS position data from an integral receiver, with an attitude heading reference system (AHRS) to keep accurate the image perspective of the SVS function.

Clarity SV and the base Clarity (without SVS and AHRS) both play through a tablet—iPads only as of this writing—using a wireless link, so your tablet becomes a weather and flight-data system suitable for experimental and certificated aircraft. Learn more at www.SagetechCorp.com.

GoFlight iPad Mounting System

The need for a display to work with ADS-B In receivers such as Clarity's highlights the value of a cockpit mount for iPads and other tablets used in the cockpit. MyGoFlight answers the need with a clever system that mounts in a 2.5- or 3.5-inch instrument opening in the panel. Remove any blanks or plugs, bring the mount in

from the back side, install and tighten four small bolts, and you're ready to snap and twist on the appropriate holder for full-size or mini iPads and tighten it all at the angle you desire.

An extension is also available that can add to the angles and rotation options. Best of all, this system is pretty universal and a snap for anyone with the skills to build a plane.

A MyGoFlight iPad mount, coupled with the upcoming iPad Mini mounting case and the Clarity SV, can make for a powerful weather, traffic, and standby instrument system. To learn more, visit www.mygoflight.com/aviation.

Heads-Up: HUD Comes to Experimental Aviation

Another way to see your attitude, whether standby or main system, comes from fledgling avionics maker P.A.T. Avionics. The company brought something new to Sun 'n Fun—an honest heads-up display, or HUD. HUD-like systems have been attempted before for light general aviation but failed to catch on.

This one may break that pattern.

P.A.T. Avionics' G-HULP is billed by the company as the first heads-up display designed and developed for sport aircraft, from sailplanes to experimentals to light-sport aircraft.

This G-HULP delivers the information you'd expect to see on a primary flight display, formatted as on most PFD screens. A projector under the glareshield and a collector on the glareshield work together through a control cluster installed in the panel. This modular system can be installed and wired to the solid-state attitude and air-data sensors of PFD products such as those from Aspen, Dynon, and Garmin.

But another option exists, one excellently executed for sailplanes and light experimental aircraft—a standalone, solid-state sensor package to supply attitude and air data to the G-HULP system independent of any aircraft systems or electrical power.

According to the company, G-HULP can run for hours on a small battery, or for as long as an electrical system supplies power in installations with an electrical system.

Pricing starts at about $5,000 for a system that works with installed sensors, $6,000 for the G-HULP package with its own independent air- and attitude-data sensors. To learn more, visit www.patavionics.com/index.php/en.

For the Yokers in the Crowd

The new iPro Navigator mount from ForPilotsOnly is now available for the iPad mini, complete with a cover that protects the screen from sunlight and thus overheating, and it allows some writing-pad-like use.

To use the articulating clipboard, the cover pivots into the down position on a pair of stainless-steel pins, allowing the pilot to scribble clearances and notes somewhere other than the palm of the other hand. And when mounted on a yoke, this puts the tool holding the tablet directly in front of the pilot, much like an approach plate holder.

Don't want or need the clipboard for this flight? Slide it upward and off and put it away; reverse the removal process to return it to its stowed or useful positions.

Should turbulence, a hard landing, or other movement in the cockpit put significant force on the clipboard—snap! It comes off, safely and replaceable. For more information, visit www.ForPilotsOnly.com. EAA

Photography by Dave Higdon

2013 EAA Sweepstakes

Win a Stearman.

Enter for a chance to own a piece of history, a 1943 Stearman, fully-restored by Air Repair, Inc.

As an EAA member, you are automatically entered. New, Renewing and Rejoining members get 50 entries, AutoPilot members get 100 entries and Lifetime Members get 250 entries.* Not a member yet? Visit **EAA.org/join**.

Plus, when you choose to donate with your 2013 Sweepstakes entry, you are helping support EAA programs that grow participation in aviation. No purchase is necessary and membership action or donation will not increase your odds to win.

Second Prize: 2012 Can-Am Spyder and Trailer

Hit the road in style on the Can-Am Spyder RT-S. This sleek roadster offers the excitement and fun of a motorcycle along with greater safety and stability.

Special thanks to **Rotax** for the generous donation of the Can-Am Spyder and Trailer.

ROTAX AIRCRAFT ENGINES | BRP

For complete Official Rules, prize descriptions, or to enter the 2013 EAA Sweepstakes, visit **EAA.org/sweepstakes**

EAA THE SPIRIT OF AVIATION

AIR REPAIR, INC.

A special thank you to **Air Repair, Inc.**

*EAA Members (determined as of September 20, 2013) will be entered automatically as follows: New Members – 50 entries; Renewing Members – 50 entries; Rejoining Members – 50 entries; Automatic Renewal ("AutoPilot") Members – 100 entries; Lifetime Members – 250 entries. Trial Members do not receive automatic entries. ****A purchase or contribution will not improve your chances of winning.** EAA encourages you to make a donation with your entry. All donations support EAA's mission to grow the next generation of aviators. For complete Official Rules by which all entrants are bound see http://www.eaa.org/sweepstakes/official_rules.asp.

Splicing a Broken Cap Strip
A simple jig

By Cy Galley

Have you ever had to splice a broken cap strip on an existing rib? You need accuracy for a good glue joint when you scarf in the repair piece. Here is a simple jig that is easy to make from a simple U-shaped aluminum extrusion available from a local hardware or lumber store. It is also very small, so it will fit inside your wing.

Select the width of your extrusion to fit your rib cap strip; they come in 1/4-inch, 3/8-inch, 1/2-inch, and 3/4-inch widths. I believe they are sold to protect edges of plywood.

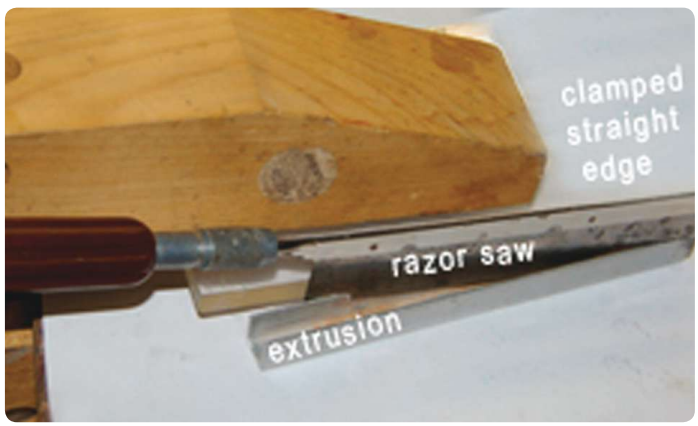
The other thing that makes this jig work so well is the X-Acto Razor Saw. As the 3/8 inch inside is actually 1/2 inch on the outside, it is easy to get a 1-to-10 scarf by making a mark on one side, then measuring up 5 inches and making a mark on the other side. You must adjust your marks for other width extrusions, of course.

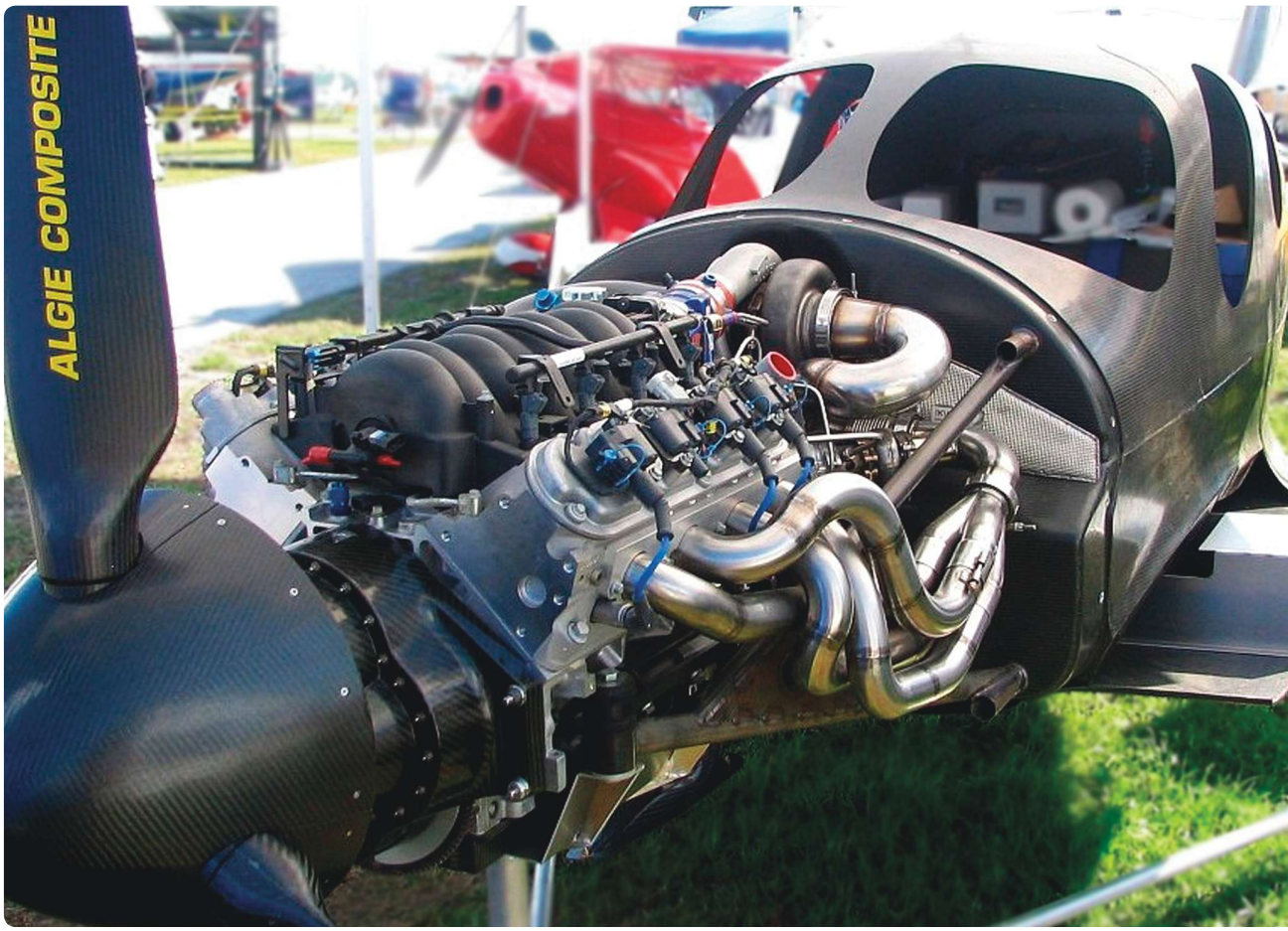
Clamp about a 3/8-inch-thick straight edge between the two marks. Use the clamped straight edge to guide the cut perpendicular to the extrusion. The razor saw will easily cut the aluminum extrusion. Note: I blocked up the far side so the guide didn't twist or slide off.

Clamp your wooden cap strip material in the channel and saw your replacement. Scarf the damaged end on the old cap strip, also using the channel. The new piece should be a good fit without gaps. If it doesn't clamp both the new and the old together, then run the saw down between the two until there isn't a gap.

There are several sizes of razor saws. I only included two in the photo. As one goes up in channel sizes, the saw has to get longer to span from guide slot to guide slot. In that case, the dovetail saw shown on top in the accompanying photo might do the job. However, use a hacksaw to saw the guide slots in the aluminum extrusion.

Advisory Circular 43.13-1B requires an overlapping gusset on both sides as a finish, which is also a good idea on a homebuilt.EAA





David Algie's LP1, an all-carbon fiber kitplane project, sports a 300-hp one-off 5.7L all-aluminum Chevrolet LS7 installation.

Installing an Alternative Engine
Things to consider

By Patrick Panzera

So you're considering an alternative engine for your homebuilt because none of the proven options appeal to you. You are set on the idea of something new and different and are willing to pioneer the installation. Good for you! If the status quo was good enough for you, you'd be flying a Cessna 172 and not reading *Experimenter*.

First, it's imperative that you research the company offering the engine you are considering buying. Far too many people have been stung by plunking down a hefty deposit, receiving nothing in return except broken promises from unscrupulous individuals. But assuming you're past that point, you trust the manufacturer, you're certain that you have accurate information on weight and power specifications, and we all agree that it's potentially a good match for your airframe, let's consider the mechanical issues of the physical installation. I apologize in advance to my pusher friends (and pylon or nacelle-mounted engine users) as this guide is written more for the traditional tractor installation than anything else.

Photography by Pat Panzera

Support

How open-minded is the airframe designer to making changes? Okay, so this isn't a *mechanical* consideration, but it's a really important factor as some plans providers or kit manufacturers will essentially disown you for straying from their design by not installing one of the engines they support. While this is the case for a few experimental aircraft offerings, there are many other designers who will actually work with you to see that you're successful, so choose your airframe carefully.

Weight

Is the weight a good match for the airframe? If the weight of the proposed engine differs from the one specified for your project, all is not lost. There may be some wiggle room as long as you don't exceed the designer's maximum structural limit for the firewall forward (FWF) installation. For example, if the specifications state that the maximum limit is 200 pounds, and the engine they recommend is 165 pounds, there should be no reason that you can't safely install a 200-pound FWF package. But you will have to consider how you'll keep the empty center of gravity (CG) where it should be. If your FWF package weighs more than what's installed in the prototype, you may have to add ballast aft of the CG, or move something that's normally located in front of the CG to behind the CG, such as a battery or radiator. And keep in mind that the farther away from the CG that you place the weight, the less of it you have to use.

Can an engine be too light? Although that's not usually a problem, in some instances the alternative engine you are considering may actually be lighter than the one the plane was designed to fly with. Again, CG being a very important issue, something will need to be done. The easiest solution is to add weight in front of the CG. The Adam A-500 carried a brick of tungsten attached to its nose gear, and I've seen a Dragonfly with a bag of tire chains stored in front of the rudder pedals. But if we are going through the time and expense of installing an alternative engine that has an added benefit of being lighter than what's specified, should we throw that benefit away by adding weight? Maybe consider moving the engine forward. This will, of course, mean that a new or modified cowl will be in order, and the appearance will be changed; but like everything else in aviation, it's just another compromise.

Thrust Line

Is your proposed engine shaped similarly to the prototypes? Can it be easily installed with the thrust line in the same location? Most auto conversions use a propeller

Many auto conversions, like this antique Ford engine, are not supported by a manufacturer and are, for the most part, one-off creations by the builder.

speed reduction unit (PSRU) that can affect the location of the prop's centerline as related to the engine's crankshaft. A horizontally opposed engine such as a Volkswagen, Corvair, or Subaru will have the crank located in the same general location as a certified engine. Although the VW and Corvair don't normally use a PSRU, the Subaru usually does, but not always. While belt drives will offset the crank centerline (typically above the crank), many geared drives are available that have zero offset. And many of the geared redrives that have offset allow for installing the gearbox in an "up" or "down" position.

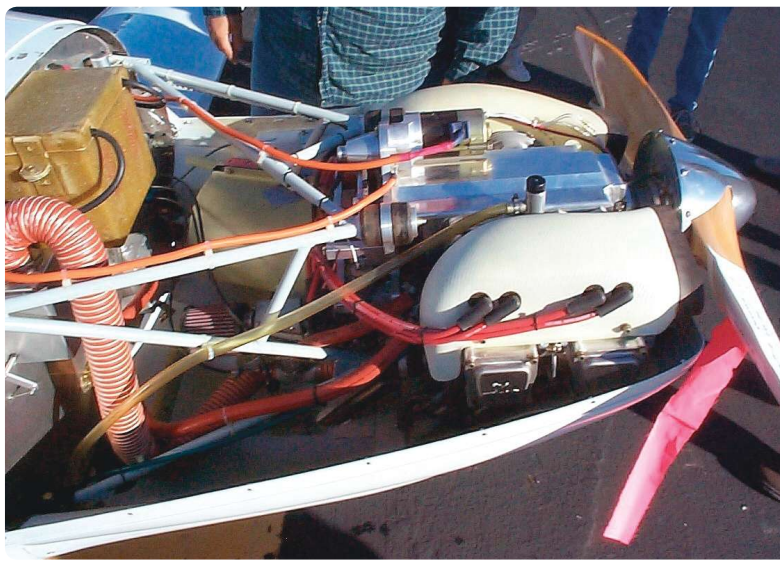
Can the thrust line be moved? Like the FWF weight, many designs have some wiggle room for deviation. It's entirely possible that your chosen airframe can handle the thrust line being moved a little without negatively affecting the pitching moment caused by throttle changes. One way to take the guesswork out of the what-ifs of moving the thrust line is to model it in X-Plane, a dynamic, affordable, and accurate computer flight simulator that allows you to design virtually any shape and size of aircraft and test-fly it, netting accurate results. Visit www.X-Plane.com.

Odds are good that your chosen airframe has already been modeled, so all you have to do is tweak it a little and check the results. But there are physical concerns with moving the thrust line as well, particularly when it is moved down, and that includes propeller clearance from the ground or the front tire, as well as the overall aesthetics. Consider the interference during a hard landing or a flat tire, or even while rolling over uneven ground. And of course, consider aesthetics. A spinner located too high or too low as related to the cowl can wreck the lines of an otherwise beautiful aircraft.

Engine Mounts

Engine mounts are all about triangles. It's not very likely the engine you've selected will have mounting points that will match the engine mount that came with your kit or is outlined in your plans. So before you order your engine, talk with the supplier. Many engine companies have scaled, measured drawings referencing mounting points and prop station in three-axis. If you're prepared to build your mount yourself, or at least make the parts and have an expert weld them together for you, you will need to mock the engine either in front of the firewall or firewall mock-up. Then it's just a matter of connecting points.

Take cues from the specified mount design; you want your bracing members to be in tension, not compression if it can be helped. Don't forget about propeller rotation, and be sure to properly brace against torque. Consider thrust-line offset as related to the direction the engine operates; your new engine may spin the prop opposite of the prototype,



Above—This Dragonfly appears to have an extended nose but it's so well blended it's difficult to tell for sure. Below—With the cowl off, we can see that the very lightweight 2200-cc Jabiru had to be pushed rather far forward for CG concerns.

and where down and left may be specified, you might have to cant it to the right.

Pay careful attention to the nose gear strut (if it's a nose dragger) and main gear attachments if so included. Many engine mounts are complicated with landing gear attachments that may become an issue; any changes to the geometry to accommodate the engine may compromise the strength of the gear, or in the case of a nose gear strut that's not part of the engine mount, it may simply be in the way of the engine mount tubes or an engine accessory or component.

Can the engine provider help with the mount? Many engine manufacturers will assist with the design and fabrication of an engine mount for your airframe, especially if it's a popular design. They will have a vested interest in your

Photography by Pat Panzera

project as it can mean potential new business from word-of-mouth advertising if you're successful. But even though this has the prospect of being a symbiotic relationship between you and the engine builder, don't expect any favors or preferential treatment. There are countless projects out there that got off to a good start and have yet to fly. An engine supplier can't bank on your enthusiasm while waiting for you to finish, so be prepared to pay a reasonable fee for your engine mount if you go this route.

Cooling

Now the *real* fun begins. How does your proposed engine get cooled? If it's air-cooled, you are 90 percent there. (With 90 percent still to go!) Considerations are updraft or downdraft, inlet size, shape, and spacing (same for the outlet), baffles (size, shape, construction materials, pressure plenum, seals, cylinder movement, cable and wire routing), and delta P—ensuring a good pressure drop from the inlet to the outlet across the engine.

If it's water-cooled, you have several issues ahead of you; the most obvious is where will the radiator be located. A few of the most common locations are:

1. Up front; either side of the spinner.
2. In back; up high, against the firewall but with enough space between to move the air through with minimal restriction.
3. On the side, or both sides of the cowl, supplied with air by additional scoops on the outside of the cowl to bring air in, or from the traditional inlets and vented by louvers to the outside of the cowl.
4. Under the engine; laid nearly flat against the inside of the cowl.
5. And then there are the belly scoops, some are mounted under the passenger compartment with the radiator at a slight angle or toward the rear with the radiator mounted vertical inside the fuselage in a more traditional P-51 orientation. With the scoop, the inlet has to be far enough below the belly of the plane to ensure uninterrupted airflow. There may be an airflow separation along the curved surface of the belly that's not evident without some tuft-testing.

So I'm a plumber now? Once you've considered all the possible locations of the radiator and how to pass air through it efficiently, the next consideration is routing water to and from it. But before that you really have to consider CG again, as the radiator full of coolant will have a fairly significant weight contribution, as will the full coolant lines. The farther away from the water pump that the radiator is located, the more issues can arise. If the radiator is inside the cowl, traditional-length radiator hoses might be used. The longer the run, however, the heavier the installation becomes, and that's why so many builders have opted to use (properly sized) aluminum tubing wherever they can. This can be a double-edged sword, though, as the lightness of the aluminum and its ability to wick away heat

Although not the final version, one would hope that your cowl would be a better match for the airframe and powerplant than this one is.

Ed Anderson went against the status quo when installing his 13B Mazda Wankel rotary engine in an RV-6A with the "spark plugs up." PSRU is by Real World Solutions.

is a benefit. Lastly, mounting points, bends, and transitions (and attachments) to flexible lines can become points of failure—at a minimum, maintenance issues.

Oil Cooling

Another radiator? While not all alternative engines have remote oil coolers, a lot of builders add them anyhow. Like the radiator, it's all about location, location, location. To work efficiently the oil cooler needs a supply of cool air and a way to move that air through it freely. They do, however, add another layer of complexity and add additional points of failure. But in many cases, an oil cooler makes all the difference with helping get and keep engine operating temperatures under control. In some cases, water-to-oil heat exchangers have been used to help control the oil temperatures in applications where ducting cooling air to an oil cooler wasn't practical.

Exhausting Stuff

Now it's time to remove the spent air/fuel mixture. The exhaust system can be nearly as difficult to create as the cooling system. There are nearly as many theories and ideas about the proper way to manage exhaust (without causing restrictions) as there are engines, but most will agree that straight exhaust, following the shortest path to the slipstream, is the most efficient and cost effective. But talk with the engine supplier as there may be some easily overlooked subtleties. The Viking 110, for example, has a single opening in the bottom of the engine onto which the exhaust system attaches. The exhaust runners are cast into the head itself. Is it in the way of your nose gear strut or bracing?

The rotary engine has some of the hottest and loudest exhaust of almost any engine and has been known to destroy a muffler in a matter of hours. Turbocharged engines can be the easiest to provide an exhaust system for and usually don't need a muffler; but the heat of the turbo itself has to be managed, and getting cool air to blow over the intercooler can be an issue, if one's installed.

And then there are exhaust augmenters—equal-length runs. Should it be wrapped or ceramic coated? Mandrel

bent? What about heat muffs? Stainless steel, high-carbon steel, mild steel, or Inconel? Are slip joints or ball joints necessary for expansion and contraction? How about structural support?

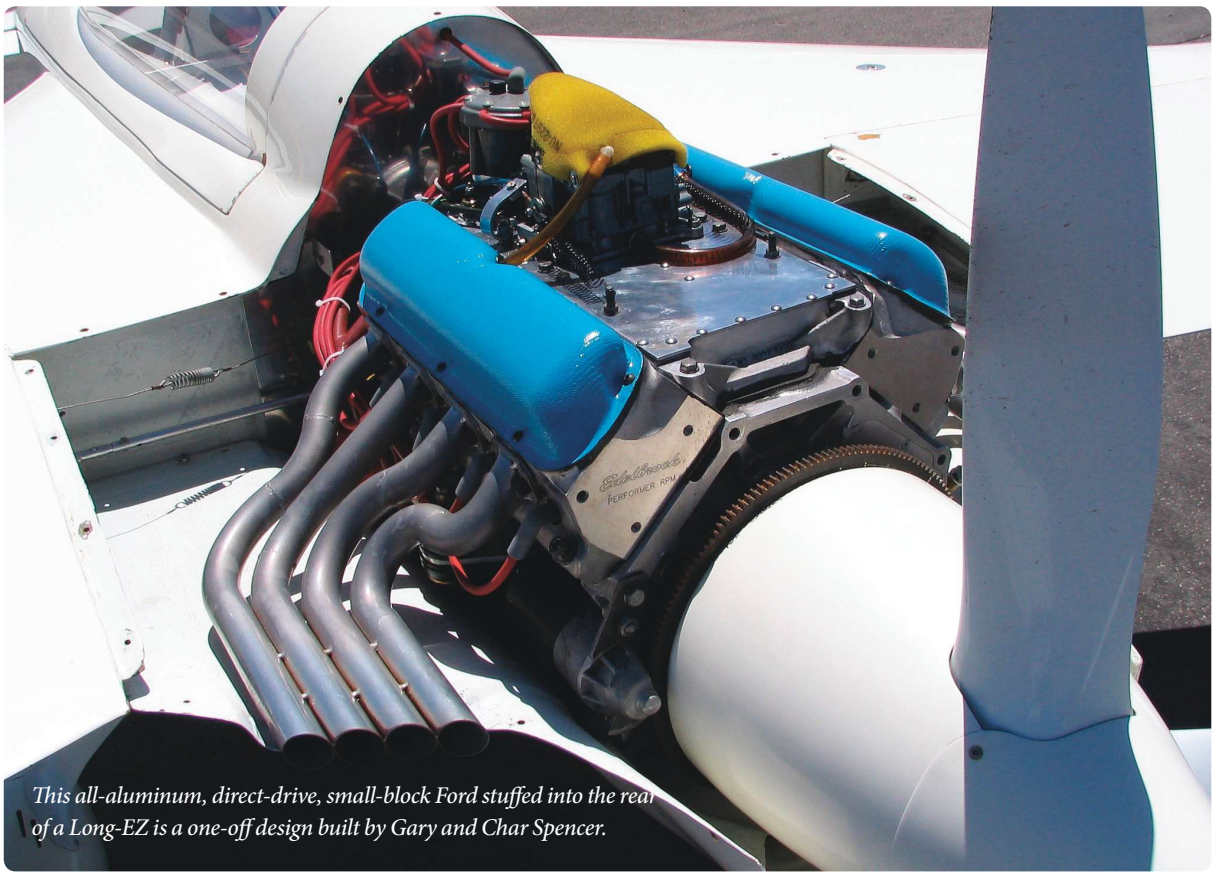
Cowling…Keeping It All Under Wraps

The importance of a properly fitted and functioning cowl can't be expressed enough. Its functions are many as it protects the engine from the elements, directs the flow of air around and through the engine compartment and its accessories, provides for induction air (allowing for ram air, and/or alternate air and carb heat) as well as an exhaust system outlet, blends the spinner to the airframe, must be structurally robust yet lightweight, has to resist harsh chemicals and heat, must offer easy access to preflight items such as the oil dipstick, and has to look good, being the "face" of the airplane. And it has to do all this without adding drag or other airflow-related anomalies.

Why Are We Building a Plane?

When we are done and ready to meet up with an FAA inspector or a designated airworthiness representative, we present a notarized statement that says we built our aircraft for our "education or recreation." For those of us who are truly in it for the education as well as the recreational part (both before and after first flight), may I recommend that you continue your education by way of two books by Tony Bingelis—*Firewall Forward* and *Tony Bingelis on Engines*. Each book goes into far greater detail than what I've done here and covers a broader scope of issues. Learning the nuances of installing an engine in a homebuilt aircraft is of great value to any builder, whether following the plans to the letter or charting unknown courses, or even being the caretaker of a plane you didn't build. Both books are available from the EAA bookstore, accessible online or by phone. Visit www.ShopEAA.com or call 800-564-6322.EAA

In addition to being the past editor of *Experimenter* e-newsletter, the current editor and publisher of *CONTACT!* Magazine, and a regular contributor to *KITPLANES*, Patrick Panzera is an experienced homebuilder, EAA technical counselor, AirVenture forums presenter, and an instrument-rated private pilot.



This all-aluminum, direct-drive, small-block Ford stuffed into the rear of a Long-EZ is a one-off design built by Gary and Char Spencer.

Photography by Pat Panzera

Aerotrek instrument panel with Funkwerk radio and transponder in upper right corner of photo.

What Was New in Paradise City

By Dan Grunloh

The ultralight and light plane area of the Sun 'n Fun International Fly-In & Expo in Lakeland, Florida, acquired its name "Paradise City" more than 30 years ago because it truly was a paradise for ultralight enthusiasts from the northern states still waiting for warm weather to return. You could get a taste of the coming summer flying fun for one week in April by traveling to Florida.

It was no different this year. While we were flying in T-shirts at Lakeland-Linder Airport, our friends up north experienced torrential rains, flooding, and up to two feet of snow. Our biggest worry was if we remembered to put on enough sunscreen.

Sun 'n Fun 2013 had very few FAR 103 ultralights not associated with a vendor. Perhaps the extreme weather, the economy, and distance to travel to Florida discouraged them. The few notables were John Moody, the "Father of Ultralights," in his 35-year-old Easy Riser that started it all, and Randall Fishman in his state-of-the-art, carbon-fiber ElectraFlyer ULS electric-powered motorglider.

Paradise City also has been the place where new products and airplanes are first introduced. New this year was the shifting of the LSA Mall into Paradise City with a major change in the roads and improvements on the runway. The changes were so new that directional road signs had not yet been erected. The move brought many familiar and new vendors into the area. Dan Johnson, president of the Light Aircraft Manufacturers Association (LAMA), declared the new Paradise City a "home run hit" on his website ByDanJohnson.com. During the nearly continuous run-

Photography courtesy of Dan Grunloh

way operations, which must have taxed the volunteers, a lot of young and old folks could be seen going out for airplane rides.

New Avionics

Funkwerk Avionics USA displayed its line of German-built, lightweight compact radios and transponders. The ATR833-OLED model and its companion transponder with brilliant LED displays are now standard on the Aerotrek 220/240 light-sport aircraft. The radio with 100 channel memory fits in a 2.25-inch round instrument panel cutout, includes a built-in voice-activated intercom for up to four headsets, and features dual-watch technology to allow monitoring of the active and a standby frequency. The radio weighs 1 pound 9 ounces and is 6.3 inches in length. Allow an additional 2 inches for connectors.

The TRT800H transponder is an FAA-certified Class 1 Mode S transponder approved for VFR and IFR flight, and best of all it includes an integrated altitude encoder that greatly reduces the installation cost. It can operate in either Mode A/C or Mode S. Even if you don't need Mode S, it can still help because it has a better resolution. It reads out altitude in 25-foot increments instead of 100-foot increments. Funkwerk Avionics USA is in the Rollison Airplane Company family. See their other aviation products at www.AirplaneGear.com. For examples of how these units can be incorporated into an economical instrument panel, look to www.Aerotrek.aero. The folding wing Aerotrek 220/240 was the third best-selling light-sport aircraft (LSA) in the United States last year with 80 aircraft in the United States and about 400 worldwide. At least five Aerotreks were on display at Sun 'n Fun.

Belite Aircraft also introduced new instruments for the light side of aviation, including an innovative airspeed indicator, an all-in-one gauge, and a lightweight altimeter. Most of James Weibe's digital gauges weigh only 40 grams, fit in a standard 2.25-inch cutout, and can run on a range of 8 to 14 volts. The digital LCD altimeter does everything you would expect from a standard aviation altimeter and a whole lot more in a package the fraction of its size and weight. Watching the numbers change on the little 2.5-ounce unit as you raise and lower it in your hand is quite convincing. See more of their products at Belite Aircraft.

New Fabric Covering Method

Another innovation from Belite Aircraft is a new fabric covering method that saves weight and time

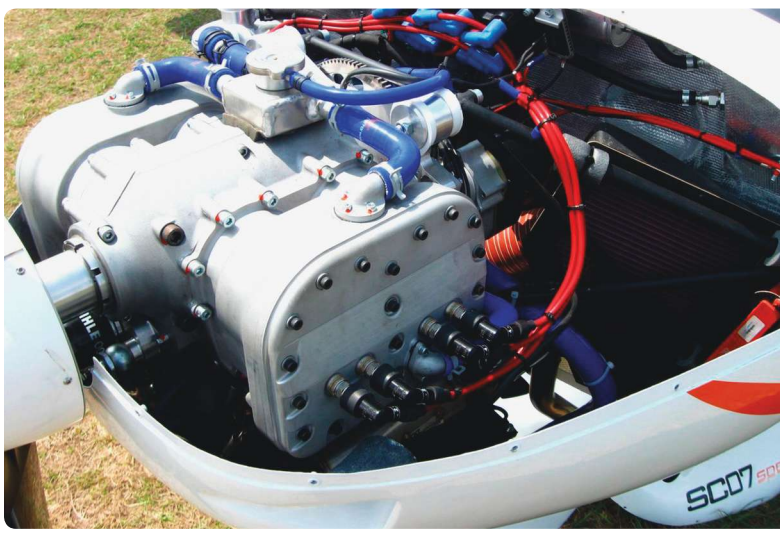
James Weibe (behind the wing of the aircraft), president of Belite, prepares to fly the Belite UltraCub.

The B.O.T. Speed Cruiser with D-Motor will be used to train disabled military veterans.

yet produces an attractive finished aircraft. The new Belite UltraCub has a new aluminum fuselage and was powered (very successfully) with a Scott Casler ½ VW engine. The airplane is covered with conventional Dacron and Oracal 951 film. The film is similar to that used for vinyl adhesive lettering such as the N numbers on airplanes and decorations on racing cars. The high-tech PVC film comes in rolls in more than 90 colors and can conform to compound surfaces. The procedure is to first cover the airframe with fabric using the Stewart system, shrink the fabric, and then overlay the peel-and-stick colored film directly on the fabric. It's fast and easy and there is no need for any spraying or painting. The weight of the finished product is equal to a very light spray-painted covering, yet it gives a high-gloss finish. The film is not fuel proof, so extra protection is needed near the fuel tank where spills could occur. See more pictures of the finished product on the Belite Flickr page.

A New Engine

Renegade Light Sport displayed a prototype Belgium D-Motor running on a test stand and the production version mounted in a Polish-built B.O.T. Aircraft Speed Cruiser. The water-cooled, direct-drive, opposed four-cylinder engine is a flathead or L-head design. Side-mounted valves reduce the parts count and the cost. The result is a narrow profile and simplified installation. Designers have taken an old concept and updated it with electronic ignition and fuel injection. The all-up, ready-to-run weight is 138 pounds including exhaust, and the cost is less than a Rotax 912 series engine and much less than the fuel-injected Rotax. The demo engine on the test stand started easily and ran quietly and very smoothly right up to cruise rpm. Redline rpm



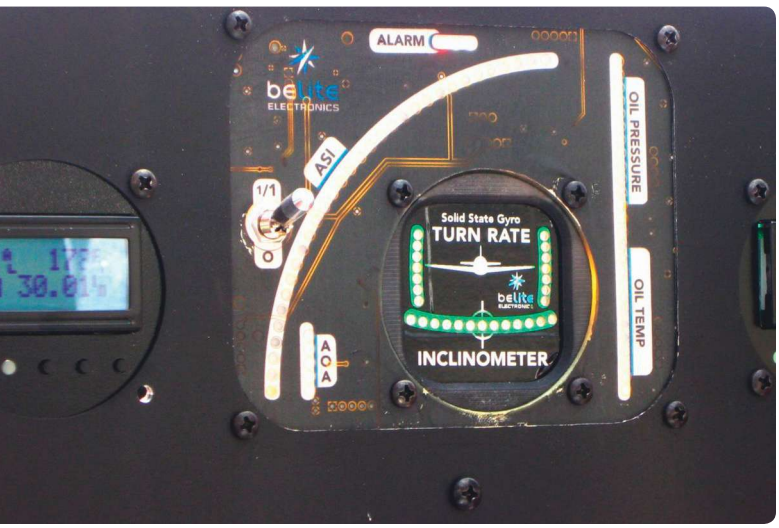
Simple, clean installation of the 95-hp, liquid-cooled D-Motor.

Photography courtesy of Dan Grunloh

M-Squared Breese special light-sport aircraft (S-LSA) heading for takeoff with a young passenger.

is 3,000. The cylinders are "oversquare" with a bore larger than the stroke. It was originally rated at 80 hp, but with more testing and a slight increase in the stroke, the production version is said to produce 95 hp.

It has dual ignition but a single computer and crank sensor. Mike McKenzie of Renegade Light Sport said they can easily add as much redundancy as you want. The D-Motor will be certified under the ASTM rules and will have a 2,000-hour overhaul. It burns premium auto fuel and can use 100LL avgas, but in the current configuration the oxygen sensor will be damaged. The engine will run fine without it once it has been set up and tuned. A six-cylinder version is coming next that will produce 135 hp and weigh less than 180 pounds. Watch this video of "Doc" Bailey of Renegade Light Sport talking about the D-Motor. The B.O.T. Aircraft Speed Cruiser at Sun 'n Fun was modified with hand controls for the training of disabled pilots.



The Belite SuperCub's instrument panel with the new all-in-one gauge and digital altimeter.

New Training Methods

The cost, the complexity, and the lack of appropriate training aircraft are major factors discouraging newcomers to FAR 103 ultralights. The situation is especially bad in the fast-growing field of powered paragliders (PPGs) with attached wheels for landing gear. The Trike Buggy Bullet can be attached to any PPG and totally eliminates any running for takeoffs and landings. It weighs 130 pounds ready-to-fly, and the wing comes in a bag. The trike can be mounted on your rear bumper for vacation travel. If you haven't kept up with the technology, watch the climb performance and maneuverability of the Green Eagle four-

cycle powered PPG. It can even run on propane. The controls and operations are different from a standard powered parachute (PPC), and under current regulations you cannot take dual instruction in a wheeled PPG under the training exemptions available. Read "FAA Prohibits Wheeled Powered Paragliders." You can fly them under FAR 103, but you must be able to run in order to take dual instruction.

Paul Czarnecki of PlanetPPG, a large, full-service flight school based in Cape Coral, Florida, has come up with a solution. He uses winch towing in gradual steps to instruct for the wheeled PPGs. The training starts with short tows without the engine running until the student is flying a few feet off the ground for the full length of the field. Only then is the engine started. The frequency of damage to equipment has dropped off dramatically since PlanetPPG began winch towing. Paul strongly urges newcomers not to buy any equipment until they have completed their training. He said, "Eighty percent of the students who come to our school who have already bought a PPG got inappropriate or unsafe equipment, or they got ripped off." Paul's flight school rents PPGs to students and has a variety of models available. You can try out everything and then buy what's best for you.

Paul says he does more tandem foot-launches than anyone else in the country, and he made several tandem flights at Paradise City, a first for the event. It takes an athlete to pick up a two-place PPG and shepherd the student in front to a successful launch.

The lack of wheeled PPG trainers keeps a lot of people out of the sport. The use of ground towing for ultralight training reflects a mood expressed by one of our veteran ultralight instructors at Sun 'n Fun who is also a retired airline pilot. He said we need to find a way to train new ultralight pilots that does not involve the FAA. He mentioned more ground training, penguin planes, and simulators. EAA

» Please send your comments and suggestions to dgrunloh@illicom.net.

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.

The Trike Buggy Bullet can be attached to any PPG.

Photography courtesy of Dan Grunloh

OAS (knots)	CAS (knots)	PA1 (feet)	PA2 (feet)	Alt Chg (feet)	Time (sec)	ROC (ft.min)	OAT (deg C)	Avg PA (feet)	Avg DA (feet)	TAS (knots)	FPA (deg)	Remarks
75	75	2500	2500	0		0	8	2500	2256	78	0.0	
70	70	2500	2520	20	30	40	8	2510	2269	72	0.3	
81	81	2600	2520	-80	30	-160	8	2560	2330	84	-1.1	
66	66	2600	2580	-20	30	-40	8	2590	2367	68	-0.3	-3 knots for 4-5 sec
85	85	2500	2380	-120	30	-240	8	2440	2182	88	-1.5	
61	61	2400	2320	-80	30	-160	8	2360	2083	63	-1.4	stall warn nibble
92	92	2300	2080	-220	30	-440	9	2190	1992	95	-2.6	
99	99	2000	1640	-360	30	-720	9	1820	1535	101	-4.0	

Flight Test Data	**Post-Flight Calculated Values**
OAS = Observed airspeed	CAS = Calibrated airspeed
PA1 = Start timing pressure altitude	Alt Chg = Timed altitude change
PA2 = End timing pressure altitude	ROC = Calculated rate of climb
Time = Time for altitude change	Avg PA = Average pressure altitude
OAT = Outside air temperature	Avg DA = Average density altitude
Remarks = well, remarks	TAS = True airspeed
	FPA = Vertcal flight path angle

Figure 1

Flight Path Stability Data Reduction

Crunching the numbers

By Ed Kolano

Last month we covered the flight path stability flight test technique. Now we'll explain how to take the raw data you recorded during testing and turn them into a flight path stability curve for your airplane.

The curve shows how changing your airspeed affects your vertical flight path angle, which is useful to know on final approach. During each test, you recorded the test airspeed, start-timing and stop-timing pressure altitudes, elapsed time, outside air temperature (OAT), and possibly some remarks. Figure 1 shows our sample completed data reduction worksheet. So, how did we get there?

Here's the data reduction dance card. You recorded how long it took to go from one pressure altitude (29.92, remember?) to another. That gives you the vertical flight path rate. You also recorded OAT, which you'll use along with pressure altitude to determine density altitude. Density altitude and calibrated airspeed are needed to determine true airspeed. You recorded observed or indicated airspeed, so you'll have to go back to your airspeed calibration test work to convert the airspeed you read from the airspeed indicator to calibrated airspeed. For simplicity, we're going to assume a perfect correlation between the two and treat observed airspeed as calibrated.

Altitude Change

During your flight test you noted the pressure altitude when you started timing (PA1) and when you stopped timing (PA2). Subtract PA1 from PA2, and enter this altitude change in the "Alt Chg" column of your worksheet. We'll use the 85-knot test point for the example calculations.

Alt Chg = PA2 – PA1
Alt Chg = 2380 – 2500 = -120 feet

Rate of Climb

Once you've determined the altitude change for each test event, calculate the average rate of climb (ROC) by dividing the altitude change by the elapsed time for that change.

$$ROC = \frac{\text{Alt Chg}}{\text{Time}}$$

$$ROC = \frac{-120 \text{ feet}}{30 \text{ sec}} \times 60 \frac{\text{sec}}{\text{min}} = -240 \frac{\text{feet}}{\text{min}}$$

We multiplied by 60 to convert the ROC to feet per minute. Enter this value in the ROC column of the worksheet.

Average Pressure Altitude

You'll need a pressure altitude for further calculations, but your test spanned an altitude block. Because the altitude block was limited to 500 feet or less in the test procedure, we can use the average pressure altitude without suffering a significant error. This assumption is further supported by the fact that the largest altitude block measured during our example test was only 360 feet, and the OAT only changed one degree throughout the testing.

Average pressure altitude is the halfway point between the start and end altitudes during each test.

$$\text{Avg PA} = \frac{PA1 + PA2}{2}$$

$$\text{Avg PA} = \frac{2500 + 2380}{2} = 2440 \text{ feet}$$

Perform this calculation for each test, and enter the average pressure altitude in the "Avg PA" column of the worksheet.

Average Density Altitude

Not too long ago I'd tell you to get out your whizwheel for the density altitude determination. These days, get out whatever electronic thingie does it for you. You might have even recorded density altitude directly from some gizmo in your cockpit during testing. If not, you can use one of the density altitude charts readily available in a variety of aviation publications or the Internet. For you hardcore number crunchers:

$$DA = 145422.1563 \times 1 - \left[\frac{288.15}{OAT + 273.15} \times \left(1 - 6.8756 \times 10^{-6} \times \text{Avg PA}\right)^{5.2559}\right]^{0.23497}$$

$$DA = 145422.1563 \times 1 - \left[\frac{288.15}{8 + 273.15} \times \left(1 - 6.8756 \times 10^{-6} \times 2440\right)^{5.2559}\right]^{0.23497} = 2182 \text{ feet}$$

The numbers include standard atmospheric values and conversions that allow you to plug in OAT in degrees Centigrade and average pressure altitude in feet. However you determine density altitude, enter it in the worksheet under the "Avg DA" column.

True Airspeed

Now you have density altitude and calibrated airspeed, so use whatever gizmo or equation you're comfortable with to determine the true airspeed for each test point. Enter the true airspeed for each test point in the TAS column of the worksheet. For our example, 85-knot point, the density altitude of 2,182 feet and calibrated airspeed of 85 knots translates to a true airspeed of 88 knots.

Flight Path Angle

Figure 2 shows how the relationship between an airplane's true airspeed and vertical speed determines its flight path angle, γ. Recalling basic trigonometry,

$$\sin \gamma = \frac{ROC}{TAS}$$

ROC, on our worksheet, is listed in feet per minute, while TAS is shown in knots; so a conversion to the same units is necessary.

$$\frac{\text{nautical miles}}{\text{hour}} \times \frac{6076 \frac{\text{feet}}{\text{nautical mile}}}{60 \frac{\text{minutes}}{\text{hour}}}$$

Now, both ROC and TAS are in feet per minute. If your airspeed indicator is marked in statute miles per hour, just substitute 5280 for 6076 in the equation. Back to the flight path angle calculation:

$$\sin \gamma = \frac{ROC}{TAS} \times \frac{60}{6076}$$

$$\sin \gamma = \frac{-240}{88} \times \frac{60}{6076} = -0.0269$$

We now know what the sine of the flight path angle is, but we need to convert that to degrees. Using a trigonmetry table or inexpensive calculator,

$$\sin \gamma = -0.0269$$

$$FPA = \sin^{-1}(-0.0269) = -1.54 \text{ degrees}$$

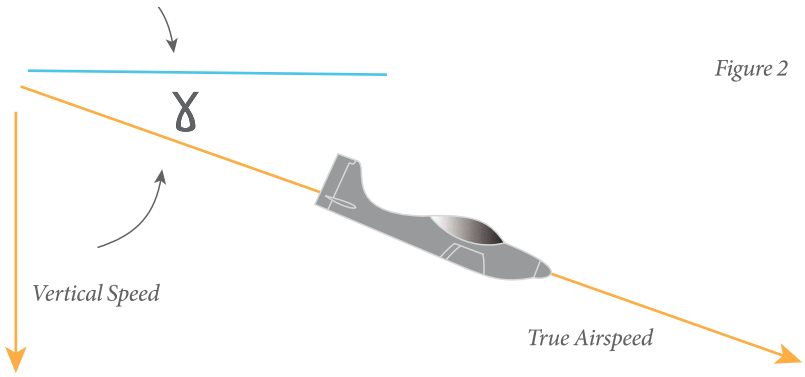


Figure 2

The flight path angle is a negative number because we were descending during the 85-knot test speed as shown by the negative numbers in the Alt Chg and ROC columns of the worksheet. Enter the flight path angle in the FPA column.

The Plot

With the worksheet complete, you can now construct the flight path stability plot. Figure 3 shows the plot of airspeed versus flight path angle from our example data. Notice we used observed airspeed despite the fact that true airspeed was used for the flight path angle calculation. We did this because observed airspeed is what you see in the cockpit, and that's more useful to you on final approach than calibrated or true airspeed.

After plotting the individual data points, fair a smooth curve among the points. See how the curve fills in for the missing data? You also can see that testing at a fairly evenly spaced set of airspeeds makes for an easier curve fit and helps show any outliers. In our example, the pilot wandered outside the airspeed tolerance during the 66-knot test. Making a note of deviations like this immediately following that run can help explain a point that doesn't fall on the curve.

While airspeed control and timing deviations are obvious "noteworthy" events, don't discount remarking if a run just didn't feel right. Maybe you felt you made too many pitch attitude adjustments even if the airspeed remained within tolerance. It's a lot easier to make sense of the data after the flight if you have good notes rather than trying to remember on which of the dozen test points that anomaly occurred. Having plenty of other points that do fall on the curve allows you to disregard an outlier, or regard it with less confidence than the others when fitting the curve.

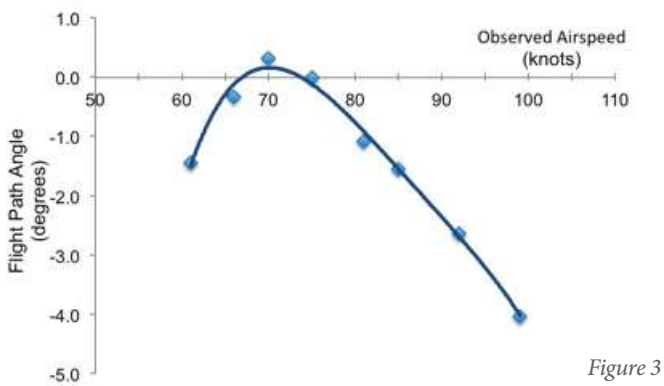


Figure 3

Remember, it's the character or shape of the curve that shows you how sensitive the flight path angle is to airspeed deviations. For example, let's say you normally fly the final approach at 75 knots but use 70 knots for short field approaches. That puts you at the peak of the curve where any airspeed deviation ultimately results in a steeper flight path angle. Any flight path angle corrections in this case will require a power adjustment. Good to know, huh?

We started the test with the airplane in level flight at the final approach speed of 75 knots. We did this for convenience to remain within the 500-foot altitude band and to minimize power changes. Had we started at 75 knots on a 3-degree flight path angle, the numbers would be different, but the shape of the curve would be the same. We'd also have had to add power to climb back into the test altitude block between tests, increasing the likelihood of contaminating the data by not having the power identical from run to run. For our example airplane, we could simply slide the curve down until the 75-knot point is even with, say, the 3-degree flight path angle. This will still show the flight path angle sensitivity to airspeed deviations and now the resulting flight path angle for a variety of airspeed deviations after you're established on that 3-degree approach.

Finally, remember that this curve only applies to the tested configuration. If you sometimes use half flaps, test that way as well. Same goes for other configurations that can affect performance such as open cowl flaps (although not likely) or flying your Cub with the hatch open.

That's it. For the past three months we talked about why flight path stability is important, how it affects the way you fly your airplane on final approach, how to perform the flight test, and how to turn that flight test data into your airplane's flight path stability curve. Next month we will tackle a different subject. EAA

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.

Randy Hooper, left, talks about transition training with fellow Homebuilt Aircraft Council member Joe Gauthier.

Offering Training in Your Experimental Amateur-Built Aircraft

How to obtain a Letter of Deviation Authority

By Randy Hooper

A better trained pilot is a safer pilot, so it's no surprise that the EAA, along with the FAA and National Transportation Safety Board (NTSB), recommend that all builders and subsequent owners of experimental aircraft receive transition training before their first solo flight. However, transition training can be difficult to find or simply unavailable for a specific model of aircraft. The main reason for this is the FAA's dim view of using experimental aircraft for compensation or hire.

FAR 91.319 makes this pretty clear:
"(a) No person may operate an aircraft that has an experimental certificate -----

Other than the purpose for which the certificate was issued; or
Carrying persons or property for compensation or hire."

Recognizing that forcing instructors to provide their aircraft for free could cut down on the available training, the FAA provides a solution through a Letter of Deviation Authority (LODA). Reading ahead in FAR 91.319, paragraph (h), permits the FAA to issue a LODA to an applicant for the purpose of flight training, circumventing the "no compensation or hire" requirement. Once the LODA is issued, it permits the applicant to provide flight training for hire in that experimental aircraft.

However, transition training can be difficult to find or simply unavailable for a specific model of aircraft.

So, to provide training in an experimental amateur-built (E-AB) aircraft for compensation, you will need a LODA. How do you get one? This is how I did it.

First, I did some Internet research. It was surprising how little information is available, so I moved on to more traditional resources. I placed a call to my local FAA Flight Standards District Office (FSDO), and we discussed my intentions for getting a LODA. Since it's a relatively uncommon procedure, the office needed to do some research first. As it turns out, there are fewer than 100 training LODAs across the country! When the FSDO promptly got back to me, it directed me to Flight Standards Information Management Systems (FSIMS) 8900.1, Volume 3, Chapter 11, Section 1.

That document completely outlines the requirements for requesting a LODA in Paragraph 3-293 C. It talks about the application package that you must submit to the local FSDO which must include a letter containing:

1. The name and address of the applicant.
2. The name and contact information of the person responsible for the operation.
3. Details of the type of training.
4. The specific aircraft make(s) and model(s) to be used.
5. A copy of the airworthiness certificate for the aircraft to be used.
6. The aircraft's FAA issued operating limitations

And a training program containing:

1. description of each type of audiovisual aid, mock-up, chart, aircraft component, and other special training aids used in any associated ground training (if applicable).
2. description of each flight simulator or flight training device (FTD) used in any associated training (if applicable).
3. A description of any special equipment used for each phase of training.
4. The qualifications and ratings for each instructor providing flight training or ground training.

The prerequisites for persons receiving ground and flight training include:

1. Minimum pilot certificate
2. Ratings
3. Endorsements (e.g., tailwheel, high performance, complex)
4. Training experience
5. Knowledge requirements
6. A description of each unit of instruction, including the objectives, standards, and planned time for completion.
7. The expected accomplishments and the standards for each stage of training.

The training program documentation was the most time-consuming part of the application, but it's important because the inspector will use it to determine if the training meets its objectives. Since my objective is transition training in an RV-8, I used Van's transition training program as a guide. My application was very straightforward, but be sure to read through the full six-page FSIMS document to check for any special cases that may apply to you.

After preparing the application package, I delivered it to the Nashville FSDO. Other than the required condition inspection within the past 100 hours, there is no aircraft inspection required, and I incurred very little expense during the process. In just over two weeks I had my authorization in hand.

I can't say enough about the cooperation of the FSDO personnel and their help. If you decide to apply for a training LODA, I hope you have the same rewarding experience that I did! EAA

Randy Hooper, EAA 438870, is a Lifetime EAA member and serves on the Homebuilt Aircraft Council.

ShopEAA.com for a sneak peek at **AirVenture 2013 merchandise!**

EAA
THE SPIRIT OF AVIATION

ShopEAA.com | 800-564-6322

Your EAA merchandise purchase supports EAA programs that grow participation in aviation.