EAA EXPERIMENTER
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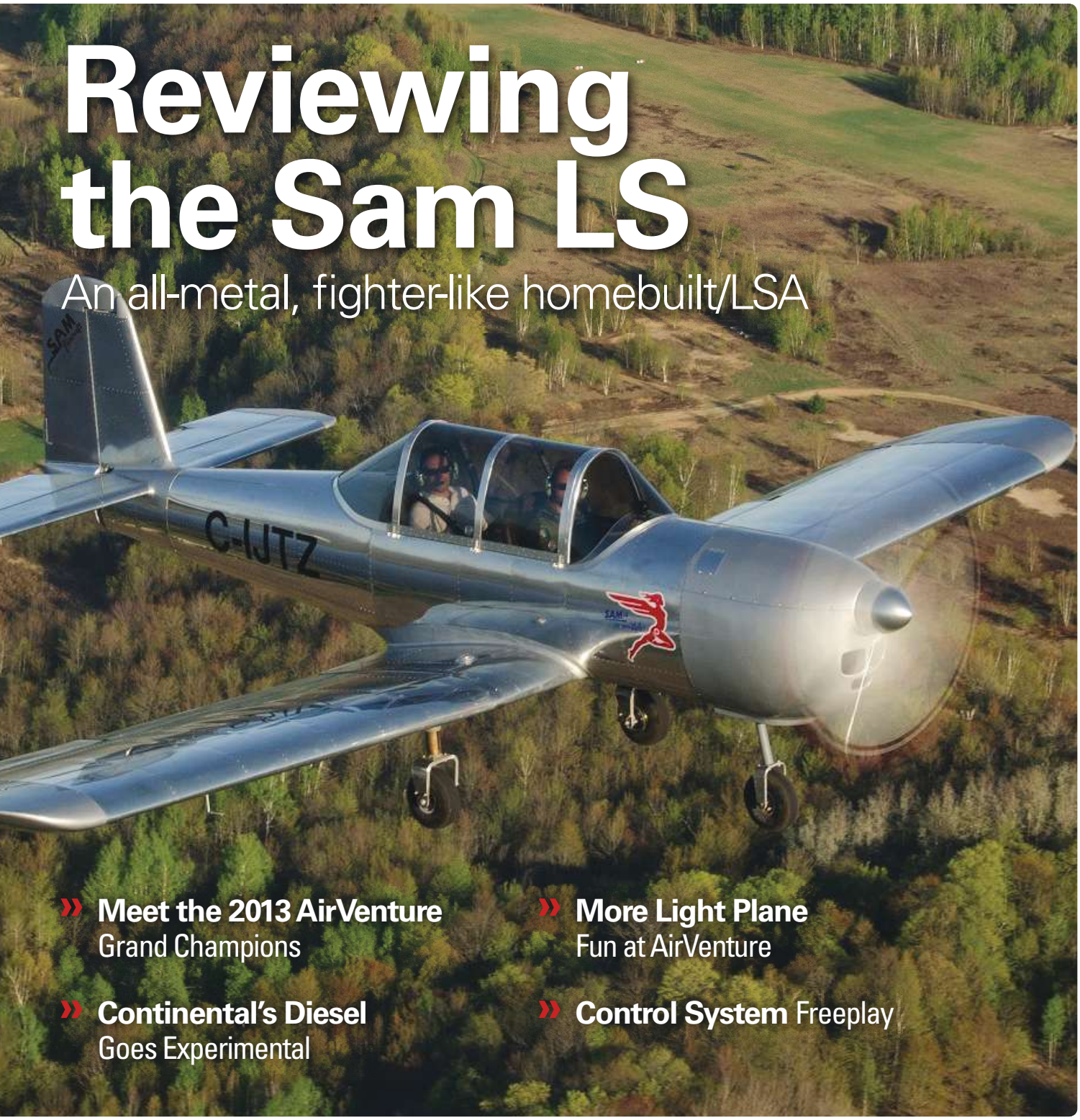
Reviewing the Sam LS

An all-metal, fighter-like homebuilt/LSA



Thank You, Paul Poberezny

By Jack Pelton

It was a very sad day on August 22 when EAA Founder Paul Poberezny passed away. Paul was nearly 92 years old and had been able to spend at least some time touring the AirVenture Oshkosh grounds in his famous VW "Red One" not long before he died.

Paul's family and all of us in the EAA family can draw at least some comfort from the fact that he lived a very long and remarkable life. Paul was vibrant and involved with the aviation people he loved almost to the very end.

I won't dwell on the history of Paul's life because the highlights are covered later in this issue beginning on Page 48. I would add that Paul's contribution to his country and to all of aviation are the best of the greatest generation, and he was the epitome of all that implies.

What I do want us all to think about is the title Paul earned and so richly deserved—EAA founder. The founder of anything is unique, and can never be replaced or duplicated. Paul's contribution as EAA founder will live on as long as people participate in all segments of aviation.

A founder is someone who lays the foundation for others to build on. A founder has an initial vision and can articulate it. A founder persuades others to join in the effort. And a founder sets the tone for others to follow.

Paul was an unusual founder in many ways, not the least of which was his longevity. Many founders last only a short time, but Paul remained the personification of EAA for 60 years. He saw the organization he founded grow beyond any early expectation. He was there as EAA expanded to attract people interested in all forms of private aviation and from all parts of the country and around the world.

Like most founders, Paul didn't realize that he had founded anything in the early days of EAA. He and the other early EAAers were pursuing their aviation interests and inviting anyone to join them. It was only after years had passed and the association had grown that there was time to look back and realize those small, early organizational steps were actually the foundation of something that would help carry personal aviation forward.

Even though he didn't realize it at the time, Paul did have the unique skills to found an organization, and he had the essential ability to lay the groundwork to make EAA last. Paul was our original leader, but what made him a founder was creating a structure that would allow EAA to grow and attract new people to share our aviation passion long into the future.

With Paul gone, and many of the very early EAAers also passing on, it is time for all of us to recognize what Paul and the other EAA pioneers have done. They created a firm foundation. And now it falls to all of us to build on that foundation and carry EAA forward into a future fraught with change and new challenges we can't predict.

Paul was an evangelist for all things aviation, but his core theology was people more than airplanes. He was fond of saying that airplanes bring us together, but friendship keeps us together. He welcomed all, saw opportunity in everyone and everything that flies, and remained an optimist to the end.

As leader of EAA's board of directors I can tell you that each director shares Paul's passion for aviation, we welcome all with an interest in flight, and we are prepared to do everything in our power to preserve the freedom to fly and attract as many people as possible to join us.

Paul laid a firm foundation those 60 years ago. We will honor his memory by building on that foundation to move EAA forward and to make it vibrant and relevant for generations to come. Thank you, Paul, from every EAAer. EAA

On the cover: The Sam LS in flight.
(Photography by Jean-Pierre Bonin)

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Gonk!??... and Freedom

Special things about Paul

By Charlie Becker, EAA Homebuilding Community Manager

Last month I shared with you my thoughts about Paul's Aeroplane Factory. I signed off with the word "GONK." Several people have asked the meaning of this term, so I thought I would share with you its origin and meaning. It gives you a little insight into the personal side of Paul Poberezny. I had the privilege of being "GONKED" by Paul many times.

On page 216 from the book *Poberezny: The Story Begins*... comes the explanation for GONK: "...It all started one day when Paul picked up the little boy to greet him. Tommy (Tom Poberezny) squeezed his dad's nose and said, 'GONK!' pretending it was a toy air horn; it was great fun! As the game continued, GONK! grew to mean many things; its use quickly began to encompass everything from 'hello' to 'goodbye'—as long as the word or action had a pleasant meaning. GONK! can still be heard to this day; Paul uses it regularly when he is among friends. Even the Oshkosh Tower has been known to say it over the aircraft radio after 'Red One' touches down in an airplane. (Paul's radio call sign is 'Red One'; Audrey's is 'Diamond One.') If you have ever been 'GONKED!' then you'll know what we mean. It's another of Paul's special trademarks—a four-letter word with class!"

So you see that GONK! is an expression of joy and goodwill toward the person you are GONKING. So when I signed off my column with GONK! I was telling Paul in his own words that we love him, we miss him, we thank him for his good deeds, and we will see him again when our time comes. All this rolled into one little word. GONK! to you.

Freedom

On the back cover of this issue is a reprint of a poster that you'll find hanging in many of the offices around EAA HQ. Paul had them made up in 1988 and continued to hand them out to members and staff when they visited his office. I wanted to share this with our *Experimenter* readers as I find the words just as relevant today as when Paul wrote them back in 1988. Paul's belief in the freedom to build, to dream, to fly is the very essence of EAA. I encourage you to print this out and put it up in your shop in honor of our founder, Paul H. Poberezny. EAA

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AirVenture Awards Aplenty

Monnett leads parade of award recipients

John Monnett, Sonex Aircraft founder, was presented with the Freedom of Flight Award during the annual membership meeting at EAA AirVenture Oshkosh by Chairman Jack Pelton. It is the organization's highest honor, bestowed annually to an individual whose contributions to aviation closely mirror the integrity, entrepreneurship, and innovative activities of EAA members.

Monnett has dedicated his life to making "fun flight" affordable and accessible to everyone.

The first airplane he marketed, the Sonerai, cost $1,200 in the 1970s and is still considered one of the best values in aviation.

Help Build a Plane in Seven Days at AirVenture 2014

At EAA AirVenture Oshkosh 2014, visitors will build and finish a Zenith CH 750 in seven days. Charlie Becker, EAA director of communities and homebuilt community manager, announced the project during this year's convention.

"We plan to have a riveting booth where people can pull one rivet on the project," he said. "And with about 7,000 rivets in the airplane, that's about 7,000 different people who can be a part of this."

The homebuilding project will likely occur on EAA's main street—Celebration Way—for maximum exposure and to show just how much easier kits are to build today. People will be able to watch the project transform from parts to a plane, while talking to "homebuilding ambassadors" who can speak about the building process and answer questions.

"The goal is to show people that with the kits today anyone who has the desire and who knows which end of the screwdriver to use can learn the skills they need to build an aircraft," Becker said.

Type Club Coalition Welcomes Sonex CEO

EAA is pleased to announce that Sonex CEO Jeremy Monnett is joining American Bonanza Society President Tom Turner as co-chair of the Type Club Coalition (TCC). The TCC brings type clubs, owners, and operators of experimental and certificated aircraft together to share best practices, exchange information, and improve safety.

"I recognize that for years there has been a perception that experimental amateur-built (E-AB) safety does not match the record of the GA fleet," Monnett said. "My main goals in co-leading the TCC are twofold: to increase fleet safety in general and to counter the incorrect assumption that E-AB aircraft are not as inherently safe as type-certificated aircraft.

"I hope to build on Sonex's recent transition training experience and bring a workable program of safety enhancements to TCC members."

The TCC is leading the effort to unite individual type clubs, E-AB owners and builders groups, and other aviation communities. The coalition will help its members establish checklists and standard operating procedure documents, create networks of CFI LODA holders available for transition training, and encourage pilot proficiency for all types. The TCC expects to publish its first example and guidance materials in September.

EAA encourages all type clubs—or groups of owners of types that do not have a club—to be a part of the TCC. Interested parties may apply by e-mailing govt@eaa.org or by calling EAA advocacy and safety at 920-426-6522.

AirVenture Dates Set Through 2020

Next year's AirVenture, the 62nd annual EAA fly-in convention at Wittman Regional Airport in Oshkosh, Wisconsin, will be held July 28 to August 3, but some subtle changes to the schedule have been made for future years to make sure the convention does not spill into August.

Rick Larsen, EAA's vice president of marketing and communications, said, "We realize that the dates of EAA AirVenture affect yearly schedules for the entire aviation community as well as events throughout Wisconsin and the Midwest, so we want to secure these future dates to minimize conflicts."

The dates for EAA AirVenture Oshkosh through 2020 are:

- 2014 – July 28 to August 3
- 2015 – July 20 to 26*
- 2016 – July 25 to 31
- 2017 – July 24 to 30
- 2018 – July 23 to 29
- 2019 – July 22 to 28*
- 2020 – July 20 to 26*

(*change from previous schedule format).

Breezy Co-Creator Carl Unger Passes Away

Carl Unger and his son, Rob, standing.

Carl Unger, whose unique Breezy aircraft provided thousands of flights to people over the past half-century, passed away Tuesday, September 24, at his home in Oak Lawn, Illinois. He was 82.

The Breezy is one of the most universally recognized aircraft to emerge from EAA and the homebuilt movement. Carl's famous red and white prototype first appeared at the 1965 Rockford EAA fly-in convention, where it created a sensation when he gave people rides from morning until night. He always appeared donning his distinctive red vest.

The prototype Breezy was designed and built by Carl, Charles Roloff, and Bob Liposky, who used a set of Piper PA-12 wings and a factory-new Continental C-90-8 engine with a special pusher crank. After 25 years of flying it, Carl, EAA 25215, flew the airplane to EAA's Pioneer Airport in Oshkosh one last time in October 1990 before retiring the famous homebuilt to the EAA AirVenture Museum.

A celebration of the Breezy design's 50th anniversary is planned for EAA AirVenture Oshkosh 2014. Since 1965, more than 1,000 sets of plans have been sold. Thousands of people donned goggles and received a free ride with Carl in his Breezy, including an FAA administrator, Sen. Barry Goldwater, actor Cliff Robertson, and an entire Concorde crew.

EAA Founder Paul Poberezny once said, "The Breezy has been one of the most popular airplanes [at Oshkosh] over the years, and Carl has given thousands of people rides at his own expense for many years. I give him a lot of credit for getting people excited about flying."

Dorothy Hilbert Award

Carla Larsh, longtime volunteer in the Ultralights area, member of the Ultralight & Light-Sport Aircraft Council, and EAA director, received the Dorothy Hilbert Volunteer Award, which recognizes an exemplary female AirVenture volunteer. EAA

Zenith Aircraft Announces Factory Workshops for October, November, December

Every month, Zenith Aircraft hosts a two-day workshop for people who want to learn about the basics involved in building a metal aircraft. Naturally the focus is on Zenith aircraft models, and some people attend to build the rudder for the complete kit they are ordering. Others just want to sample the types of work involved in aircraft construction.

The workshop in October is set for the 10th and 11th, and the November event will happen on the 14th and 15th; December is set for the 12th and 13th. The cost is $375 for those wishing to own the rudder they will build, and $175 for those who just want the experience of working on a rudder. All workshops occur in the Mexico, Missouri factory and include factory tours, demo flights, and meals.

"People come for a wide range of reasons," said Sebastien Heintz, president of Zenith. "They all leave knowing they've learned something, accomplished something, and had fun doing it. Some of them will never build an airplane, some will build someone else's design, and many will leave a deposit behind for one of our complete kits."

During the workshops, the builders are exposed to:

- reading and understanding blueprints (plans and manuals)
- principles of sheet-metal construction
- advantages of working with sheet metal
- metal aircraft building and assembly techniques and tips
- measuring, drilling, and riveting (assembling the Zenair kit)
- tools, workshop, and skills required to build an all-metal aircraft
- hints and shortcuts in assembling a kit
- metal kit aircraft maintenance and corrosion protection
- advantages of building, owning, and flying a Zenair aircraft.

The Zenith Workshops are open to anyone; however, space is limited and they tend to fill up quickly. For more information, visit www.ZenithAir.com.

Rotax Publication Index Available

Rotax has released an updated master list of available documentation for all Rotax aircraft engines, both two- and four-stroke. All owners/operators should check this updated list for any information that might affect their engines and ensure they meet compliance with any requirements for continued airworthiness.

Actual PDF copies of the listed material can be downloaded from the Rotax-Owner website under the "Support/Bulletins" section. Visit www.Rotax-Owner.com for a complete listing.

California Power Systems Launches New Website

California Power Systems (CPS) launched a redesigned website in mid-July. CPS identified some areas that needed improvement and believes it addressed those concerns and incorporated the solutions into its new design. The website uses a variety of new web standard techniques that are more intuitive and more user friendly, including many new features, such as improved product search and navigation.

CPS has been the Western U.S. Regional Rotax Service Center since 1981. It offers Rotax engines, parts, and other light-sport aircraft products to aviators around the world. In addition to engine and parts sales from the Corona, California facility, CPS also maintains a maintenance shop and a Rotax engine training facility at the nearby Chino (CNO) Airport.

For more information or to request your free copy of the CPS parts catalog, contact California Power Systems at 1-800-AIRWOLF or visit its website at www.CPS-Parts.com.

ASA Announces 2014 Test Preps

ASA's 2014 Test Prep books for pilots and fast-track test guides for mechanics are available and shipping now. Prepare for your FAA knowledge exam using these time-proven study guides. Pass your test and know what is essential to become a safe, competent pilot or mechanic.

New to the 2014 line of Test Preps and Fast-Track Test Guides this year is the addition of free online testing and authorization. Inside each book is a code that will grant you access to Prepware Online, allowing you to take practice exams and obtain your endorsement to take the actual FAA Knowledge Exam. Test Preps include the Computer Testing Supplement with the same FAA legends, figures, and full-color charts issued at the testing center to help you become familiar with all available information before you take your official test. Fast-Track Test Guides include all necessary FAA figures right next to the question and explanation.

ASA keeps up with changes in the FAA Knowledge Exams with a free e-mail subscription service and updates. ASA Test Preps and Fast-Track Test Guides are only part of its complete line of test preparation products. Our 2014 Prepware CD-ROM, Software Download, Online Prepware, and new Prepware School products will be coming soon.

Order your 2014 Test Preps and Test Guides today at www.ASA2Fly.com.

Online Courses Offer Advanced Aviation Education for Free

If you're interested in airplanes and wish you knew more about aerodynamics, air traffic control, space policy, satellite engineering, or airline management, you can study all of those topics and more for free at the Massachusetts Institute of Technology, via its OpenCourseware website.

Each course features a syllabus, readings, video lectures, and projects that you can complete at your own pace. The courses don't include any instructor support, classroom interaction, or certification, so learners must be self-motivated. If you prefer more structure, MIT also offers MOOCs, or massive online open courses, together with Harvard at the EdX website. These courses run on a schedule and offer active discussion forums, and students can receive a certificate when they complete all the course work.

Aviation-related courses at EdX include Introduction to Aerodynamics, which started in September, and Flight Vehicle Aerodynamics, starting in January. Students can choose to simply audit the courses, or complete all the homework assignments and exams to earn a Certificate of Mastery. The prerequisites for Intro Aerodynamics include a familiarity with vector calculus, differential equations, and control volume analysis; so if you're starting from familiarity with the *Pilot's Handbook of Aeronautical Knowledge*, it may be tough going—but there's nothing to lose if you fail, and no limit on how many times you can retake the course.

To learn more, visit www.EdX.org.

The 2013 AirVenture Grand Champion Hon

A Lancair Legacy and Hatz Classic

By David Gustafson

Photography by Russ Munson

Jay Sabot's Lancair Legacy

mebuilts

Jay Sabot's Grand Champion Lancair Legacy

It took an entire decade of tinkering, tweaking, and fine-tuning, but Jay Sabot finally managed to win the coveted Gold Lindy Trophy with his Lancair Legacy. His aerial sports car is a masterpiece in craftsmanship, reflecting a commitment to precision and quality that many dream about, but few actually achieve.

The action began in 2003, the day after Thanksgiving, when Jay visited a man who became a close friend, Jabe Luttrell, who was already deep into his own Lancair Legacy project. It wasn't Jay's first contact with a Lancair. He visited the Oshkosh Fly-In for the first time in 1993 and be-

came enamored with the Lancair 360. At that time, it was out of his reach financially.

He picked up his private pilot certificate soon after that trip to Oshkosh, and with a gift from his parents, he went on to get his IFR rating.

Jay went back to EAA AirVenture Oshkosh in 2003 and was still fascinated with the scope of the Lancair program and the performance of the aircraft. He enjoyed a demo flight in a Lancair IV-P but preferred the sporty feel of the 360. So, after he had listened to Jabe's impressions of the Legacy, he made a quick decision. The following Monday, he called the Lancair factory and ordered kit S/N 247. He was on his way.

Ordering the kit was part of a natural progression. Growing up in Roslyn, New York, Jay began refining his mechanical aptitude at an early age. Encouraged by his father, he succeeded in dismantling and reassembling items around the house, such as the family vacuum cleaner. He moved onto model airplanes and got into radio-controlled flying. Not long after that he started rebuilding cars and assembling fancy engines to go with them.

When it came time for college, Jay started a pre-med curriculum at Vanderbilt University, wanting to follow in his father's footsteps as a physician. He graduated with a bachelor's degree in psychology, but then gave into his fascination with all things mechanical and earned another bachelor's, this time in engineering. Soon after, he picked up an MBA degree. With the high-tech jobs that followed, his financial reach was extended, and when he sold his house in 2003, he knew he could pursue his dream of building a Lancair. By 2011, Jay figured he'd tied up $260,000 in the project, which was roughly $60,000 more than he'd originally anticipated, and that became a significant challenge.

When Jay started his Legacy in 2004, he was working as a consultant on a project for IBM. He reasoned that he could leave his home in Connecticut one week a month, fly out to the West Coast, and work for IBM from 4 a.m. until noon Pacific time; 7 a.m. to 3 p.m. Eastern. After putting in a full day for IBM, he would then visit the Lancair factory and participate in its builders program until 8:30 p.m., at which time he'd drive to his motel, crash until 3 a.m., and then start another day. That was not an easy schedule to keep, but he did it from March through June of 2004. He made enough progress and established a high enough level of quality with his project that Lancair asked him if he would allow the company to bring his project, at Lancair's expense, to AirVenture and put it on display.

Jay Sabot (left) accepts his airworthiness certificate from designated airworthiness representative Joe Gauthier. Joe was also the technical counselor for Jay's project.

Photography courtesy of Jay Sabot

After AirVenture, Jay was free to truck it the rest of the way to the East Coast. What a deal!

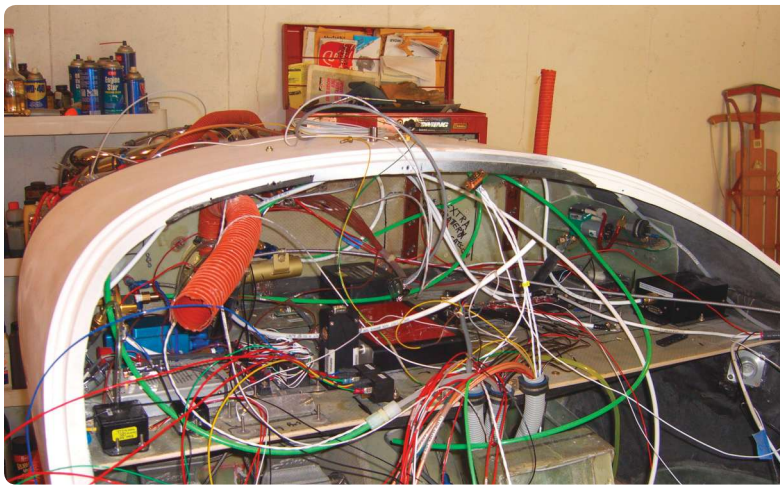
Back home, he was part of an active EAA chapter and had begun to network with a group of fellow Lancair builders; he found himself working beside a lot of new-found friends. Jabe was one of the first. Scott Denham worked beside Jay during his first week at the factory. Joe Gauthier, his designated airworthiness representative, pitched in, and Bruce Staubley, who owns Simsbury Precision Products, built a lot of the parts and pieces that went into the aircraft. Jay's EAA chapter was a source of tremendous support, and the Oxford Flying Club, which he'd joined after getting his private certificate, was also there to help.

And so the work proceeded. Sometimes there were periods of weeks or months when nothing got done; other times, when the work fascinated him, he'd still be working after 12 hours. He faced some difficult hours trying to work inside the limited space of the tail cone and forward of the instrument panel, especially after the panel had been installed. Like all composite aircraft, there were countless hours involved in sanding and other types of bodywork. Jay spaced out the sanding over the entire program, delivering an airframe that the painter lauded as far more finished than most. Just staying focused over the long haul was a challenge.

Of course, there were times when the work was highly gratifying. For Jay, an electrical engineer, the wiring was fun. Tying in the mess of spaghetti aft of the firewall and forward of the panel, as well as running wires out the wing and through the fuselage, provided him with hours of challenge and reward. Mounting the instrument panel with all its components in place represented a big step toward completion. On the other hand, getting all the avionics components properly calibrated and working together, i.e., the Chelton EFIS, autopilot, AOA, and GPS, took a long time and a lot of phone calls and led to some head-shaking frustration. There were other learning curves; recognizing aircraft construction standards (i.e., having a bolt protrude beyond the nut two threads) took time to learn, and Jay leaned on his friends for a lot of those procedures.

To make sure that everything in the panel was convenient to reach while flying, he built several mock-ups before having SteinAir put the pieces together in a bolt-in unit. He decided he would add nothing that might distract from performance. That meant keeping the weight down and leaving out things such as air conditioning. He did add some fairings to reduce drag, covering the attach points where the wings and horizontal stabilizer join the fuselage. He covered the cutouts that were in place to allow access to the hinges on the rudder and elevator.

Though his friend Jabe had opted for a Continental 550N with full authority digital engine control (FADEC), Continental had dropped its support of that program, so Jay went to Corona Aircraft Engines in California to build up a more souped-up 550, incorporating ECI cylinders, precision balancing, polished ports, and changing the pistons from 8-to-1 to 10-to-1. On the dyno, similar engines get a roaring 370 hp, about 60 more stallions than a stock 550! Perhaps because of his earlier work with engines, he baffled the engine and cowled it in, escaping any kind of cooling problems. He's proud of the fact that he has low CHT and EGT readings all the time.



Jay, an electrical engineer, said the wiring was fun, even if it was a mass of "spaghetti."

Jay works on the fuselage in the primer stage.

With the help of Jabe and Bruce, Jay designed his own throttle quadrant. By creating channels in the throttle lever, he was able to build micro switches into the handle at the top of the throttle, allowing him to control flap position and speed brakes with his thumb during his approaches. It meant he could keep his left hand on the stick and his right hand on the throttle through the entire approach. He installed micro switches in the canopy channels that enabled a green light and oral alert message to ensure that the canopy is always locked down securely.

Once he had hooked up his wires, routed the fuel system, and run his links to the engine, he decided to have a party. In September 2008, he invited 70 of his closest friends from EAA, his flying club, and other aviation associates to a "first run" party in his backyard. Firing up the engine for the first time was an accomplishment he wanted to share, and probably there was something in him that just wanted to show people he was making progress and had every intention of completing the project. Though he was setting himself up for a possible embarrassment, the engine fired up and ran beautifully.

Just about a year later, August 7, 2009, he got his certificate of airworthiness. There was no party on the day of the first flight. Though he agonized over his decision, he made the right one by turning over the initial flight and all of the Phase One flight testing to Joe Gauthier. Joe took it up for the first time on August 14, 2009. Phase One went well with only one minor issue involving the right brake, which made Jay very happy that the aircraft was in experienced hands. Jay wisely decided to do some transition training before flying the Legacy himself and considers it one of the best investments he ever made.

The final touch was the paint scheme. With the help of Scheme Designers, Jay spent four-and-a-half months designing, amending, and finalizing the paint scheme before turning the aircraft over to Ed's Aircraft Refinishing for the stunning application of lines and checks.

It was time to show it off. He flew it to AirVenture 2011 and came home with a Bronze Lindy. He went back in 2012, with a dozen improvements, but went home with nothing. In 2013, after another dozen refinements, he won Reserve Grand Champion at the Sun 'n Fun International Fly-In and Expo and four months later took the Gold Lindy at AirVenture. The award validated Jay's pursuit of perfection.

No Cirrus, Cessna, Piper or Beech has ever left the factory with the level of quality and finish found in Jay's Lancair Legacy. It's a real credit to the art and craftsmanship of homebuilding.

Author's Note: Jay kept an extensive photographic history of the project, which is available online; visit www.Lancair-N26XY.com.

Jay and his grand champion kit-built Lancair Legacy.

Photography by Russ Munson

Jeff and John Hanson's Grand Champion Hatz Classic Homebuilt

It was a father/son team from Minnesota who won the Gold Lindy designating their Hatz Classic open-cockpit biplane as the Grand Champion plans-built aircraft at EAA AirVenture Oshkosh 2013.

What an incredible bonding experience it must have been to have a homebuilt aircraft as a central focus in their lives for the 10 years that went into its construction. They finished it in 2009, and Jeff Hanson, the son, flew it to AirVenture in 2013 and entered the aircraft judging on what could almost be called a whim. He called his dad, John, a few days later and said, "Five guys have already signed off on this thing." Another few days went by, and he told his dad there were 17 sets of initials on the "Judge Me" sign hanging on his prop. "Guess what?" he said when he called his dad a day later with a Gold Lindy in his hands. The measure of the builders' surprise may exceed the sense of satisfaction they enjoyed in receiving the award.

Today Jeff is 42; his dad is 74. John grew up in an aviation environment (his father started working at the Rochester airport when John was 3), got his private ticket in 1957 at age 18, and went on to earn a commercial and IFR ratings. John, whose roots with EAA go back to Rockford, Illinois, in 1966—his EAA number is 26876—built a single-seat Rose Parakeet biplane between 1969 and 1978. He still has it and often flies formation with Jeff, who in turn fills the front seat of the Hatz with his son who is now 13. The two aircraft are pretty closely matched in performance, which makes formation flying easy.

The idea for building the Hatz began to take shape in 1997 when John spotted an article on Billy Dawson's Hatz Classic in *EAA Sport Aviation*. For a while, he'd been thinking about building a second airplane and began discussing the possibility of a joint venture with Jeff. Jeff, who picked up his private certificate in 2001, shared his dad's enthusiasm for all things that fly.

There was no doubt that the project was going to be another biplane. Jeff showed some positive interest in the article, and in the spring of 1998 the two men went to the National Biplane Association Fly-In in Bartlesville, Oklahoma, and managed to each get a ride in a Hatz. That experience converted the talk into action.

Later that summer, at AirVenture, they had some discussions with Billy Dawson, who had built several Hatz biplanes, always adding to the basic original CB-1 design until he came up with a version he called the Hatz Classic. It was influenced by Dawson's love of Wacos and featured a number of significant changes from the original CB-1, such as push tubes in place of cables, aluminum ailerons, and a larger engine. There were no plans for the Classic, just Dawson's prototype, but Dawson's friend, Jeff Shoemake, agreed to reverse engineer the aircraft and develop some plans and eventually kits. Jeff and John signed up for a set. They were 12th in line. (Perhaps ten times that number have been issued since then.)

In July of 1999, wing drawings arrived and the work began. They ordered wood from Wicks and began working on a set of wings. Since Jeff had the room for the four wing panels, the work started in his basement. In one of the few deviations from the plans, Jeff discarded the aluminum ailerons in favor of wood and fabric, but that was after making an attempt to bend and rivet aluminum. Meanwhile,

John (left) and Jeff Hanson.

On the left, the Rose Parakeet John built from 1969 to 1978, and the Hatz Classic. They often fly the airplanes in formation as the biplanes match up well performance-wise.

Jeff worked on the wings at his home.

Thirty miles away, John welded the fuselage. They worked on installing the engine together.

The Hatz is flown solo from the back seat, so it's home to a full set of traditional gauges.

John tackled some of the wing fittings that were initially sketched out on some sheets of 8.5 by 11 inch paper. Not long after, drawings appeared for the fuselage. Steel tube was purchased from a source in Pennsylvania that has since gone out of business. Thereafter, all the components were ordered from Aircraft Spruce. "I'd phone in an order on Monday and it would arrive on Thursday," said John. "It was like having Christmas 52 weeks a year." Since Jeff was busy with the wings, John began welding the fuselage at his home, 30 miles away from Jeff. Typically, they'd get together at least one day a week to work on the wings or fuselage, and then they'd spend the rest of the week working in their own shops. There were lots of phone calls between the two workshops.

It took about four years to complete the collection of CAD plans. At times they sat around waiting for the next group of drawings. Since the designer was in no rush, they were under no pressure to produce parts. Consequently they took their time and put quality ahead of quantity, never dreaming they were on the way to a Grand Champion award. "The amazing part is that in the end all the parts fit together perfectly," John said. Of course, in those days, Jeff had a day job, working in the refrigeration business. John had retired from his position with IBM as a printed circuit card designer.

As work progressed on the wings and the fuselage, Jeff trucked the wings over to his dad's place several times to make sure everything fit and the flying wires were the right length. Both were impressed with how easily all of the parts went together. John found the 23-gallon aluminum fuel tank a real challenge given its size and the need for TIG welding skills. It fits into the center section of the upper wing and feeds by gravity straight into the engine. John had experienced gas welding with the Rose Parakeet replica and truly enjoyed welding the steel tube fuselage.

Jeff was intrigued with the woodworking challenges and got his greatest satisfaction out of piecing the wings together. They both found running wires for the electrical system, which took some time and head-scratching and noted that each of the systems—electrical, fuel, control rigging—required a lot of thought and trials. However, the two men seemed to complement each other and often found that a good night's sleep would produce a lot of solutions to the problems they confronted. In the ten years of working together, there was never a serious disagreement or argument. For those truly baffling moments, when two minds couldn't get around the solution, they called in some of the members of EAA Chapter 100 or tech counselor, Walter Mount (who was in his 90s and recently passed away at age 100).

Photography courtesy of Jeff Hanson

They devoted a year and a half to fabric, having ordered what they needed from Poly-Fiber. They were fastidious about gluing, stitching, and taping over the stitches. Both of them enjoyed the process.

They hung a 150-hp Lycoming O-320-A2B engine on the front end, which is the typical installation for a Hatz Classic. In keeping with the biplane tradition, they forwent anything associated with modern glass cockpits and installed round gauges for flight and engine monitoring. The front panel only has airspeed, altimeter, and turn/bank instruments. The rear panel, used for solo and pilot-in-command, has a full complement of gauges. They were careful, however, to avoid anything not deemed absolutely necessary. Having used that philosophy throughout the construction process, they wound up meeting the empty weight specification.

In June 2009, they ran out of things to tweak and tinker. With a certificate of airworthiness on board, John took the active runway on June 9 for the first flight. Jeff followed him in a chase plane. Aside from a minor engine cooling issue, everything in their Hatz Classic was in harmony. "It's a very well-designed aircraft," John said, who noted that throughout the Phase One flight test program, "It flew just about perfect." Jeff made the third flight and they traded off thereafter. Since they'd both logged considerable time in John's Rose Parakeet, they felt they had enough time in a "similar type" to be able to handle the Hatz without any problems. There were no transition training issues.

John's observations: "It's a great airplane. You lift off at 40 mph and cruise at 105. It's got short-field capability and handles a lot like a PA-12 Cruiser. Stall is gentle and straightforward. It's not a cross-country airplane, and being in Minnesota, it definitely has a limited season."

Jeff's thoughts: "It's a lot like owning a classic car. It's great to just hop in and go cruising. It turns heads wherever you go because it looks like something out of the 1930s. It's a great plane to give rides in. People really appreciate it." Jeff agrees with his dad that Minnesota winters really put a crimp in the flying schedule.

There's some talk about building a cover for the front cockpit, which might extend the temperature range for a little bit. John admits that the goal was to keep the project as close to the plans as possible and keep an eye on weight. Both admit that they enjoyed the experience of working with a variety of materials such as wood, steel, aluminum, fiberglass, and they actually had fun stringing wires, tubes, and cables.

Though the Grand Champion award was a pleasant surprise and though they have enjoyed every minute of the 207 hours they'd logged in the Classic as of September 2013, both would likely admit that the best part of the total experience was the teamwork, the hours of studying and discussing the plans together, and the years of communicating with each other about a thousand problems big and small that eventually led to the finest example of a Hatz Classic on the planet. They built an airplane together. The memories are priceless.

We should all be so lucky. EAA

John and Jeff's grand champion plans-built Hatz Classic biplane.

Homebuilder's Headquarters serves all the homebuilders who bring their aircraft to AirVenture, and it's a great source of information for those involved in the building process ... or thinking of building. Like many other areas at AirVenture, it's volunteers who keep the area alive. Here's some of the highlights from this year's activities in the Homebuilders area.

The Homebuilder's Hangar provides a great place for builders to learn about various aspects of the homebuilding process. Here, volunteers Dick and Bob Koehler, "stars" of the Hints for Homebuilders video series, hold a session on how to properly perform a compression check and time magnetos.

Numerous workshops help builders and would-be builders learn the skills needed to build an aircraft. These gents are mastering the art of rib stitching for a fabric-covered aircraft.

The Homebuilders Welcome Wagon transports homebuilt pilots to Camp Schoeller after they've unloaded their aircraft.

It's these volunteers who help arriving pilots find a place to park their aircraft in the homebuilt parking area. Thanks for your service!

Photography by Jim Raeder and Mary Jones

The builder of this RV-7A shared his thoughts about the cost of this 210-hp IO-390 engine by covering his plenum with the image of dollar bills.

Tom (left) and Ken Flaglor pose with the Flaglor High Tow biplane that Ken first built and flew in 1957. Grandson Tom restored the aircraft in 2011. It was parked in the Round Engine Corral in the Vintage Area, but it's definitely a vintage homebuilt.

Homebuilders gathered at their Headquarters to check out one of the budget builds that was on display outside the building.

Lowell Farrand received the 2013 Tony Bingelis Award honoring his dedication and involvement in the homebuilding community. A member of Chapter 132 in Elkhart, Indiana, Lowell is a technical counselor and flight advisor for the chapter. He also co-designed and flew the first powered parachute in the United States.

Sonex Founder John Monnett with the Spirit of Flight Award that the Society of Experimental Test Pilots honored him with at EAA AirVenture Oshkosh 2013.

The helpful volunteers from Homebuilder's Headquarters support all homebuilders' needs while at Oshkosh, everything from registration to the homebuilt campground. If you have a need at Oshkosh, these are the folks to see. Thank you to all the homebuilt volunteers!

The Sam LS

From dream to reality

By Tim Kern

Author's Note: I have followed this project for years and—full disclosure—have written some press releases for the company, but I have refrained from making any qualitative judgments in this piece, restraining my writing to the information as presented by the company and the test pilot.

French pilot Thierry Zibi always loved the look of the Golden Age of Aviation military trainers. One day he started thinking, "What if they had the resources then that we have now?" In 2007, he decided to find out. Modern materials, engines, props, and avionics, he figured, would make a simple machine not only safe and fun to fly; they would yield a truly practical, comfortable, economical, and easy-to-build machine. So, why not give it a try?

A particularly appealing design of the era, the Ryan ST, was the practical inspiration for the overall look and proportion of Thierry's design. Modernizing this design for manufacture, making it accommodate modern-size pilots, and powering it with a modern engine would be Thierry and his engineers' task.

Interestingly, the tandem seating of the original ST created a huge and comfortable cockpit and allowed a streamlined and efficient fuselage. More on that later.

Thierry's plan included three configurations: a light-sport aircraft (LSA)-qualified model with a 28-foot, 6-inch wingspan; a cross-country (CC) model with a shorter (25.3-foot), higher-speed wing for speedier cross-country dashes; and

Photography by Jean-Pierre Bonin


SAM

a STOL version with a longer (31.8-foot) wing to allow slower flight and shorter takeoffs and landings. (The CC model is not LSA eligible because the clean stall speed will be a bit higher than authorized.)

Using Solidworks computer design software, Thierry and his team kept ease of construction, strength, weight, and cost in mind at each step. Thierry said, "We chose to design the aircraft on Solidworks for precision: Parts are CNC pre-drilled, and pre-bent with matched holes. It allows us precision repeatability and therefore offers ease of construction for the builder."

The framed, monocoque hybrid is built with 4130 chromoly tubing and aluminum (plus some composite materials for the cowl, tail cone, and fairings). Using common materials and building techniques, plus planning for maintenance, inspection, and repair, the Sam LS can be worked on at any shop.

Maintenance and inspection holes are built in throughout the aircraft. A comprehensive look at everything you usually need to see or adjust in the airframe requires very little disassembly. Portholes and inspection access, plus an easily removable tail cone, armrest, instrument panel, and floorboard, allow a thorough check or easy adjustment of virtually all the controls and main attachment points for the structure and controls.

Up front, the cowling is easy to remove, and the spinner is a balanced Sensenich unit that is matched to the two-blade composite prop and covers the pitch key access. That key allows auto-indexing of pitch changes in just moments, and without protractors or other special tools.

Well-known techniques, common tools, transferable skills, and no magic are required to build the Sam. As the plans took shape and Thierry focused on serving his market, he moved to Canada and set up his factory just west of Montreal.

Flying the Sam is the object, however. Thierry wanted to make this airplane very much a primary trainer, with predictable, mellow handling. A big rudder, linear controls, elevator and ailerons connected by push-pull tubes, and a steerable nose wheel (a tailwheel model is planned) are all designed to make handling in the air and on the ground as friendly as possible. A die-hard classic aviator can fly the Sam without the side-hinged and removable canopy, enjoying as much fresh air as he'd like.

The vintage look envelops all-modern technology. Electric flaps and trim, a 10-inch Dynon (plus an optional 7-inch unit in the rear cockpit—the primary pilot sits up front), Matco disc brakes, and a Rotax engine up front that turns a Sensenich auto-indexing composite ground-adjustable prop are all mated with 21st-century control balance and aerodynamics.

The flight envelope is LSA all the way: 1,320 pounds gross weight, 125-mph top cruise, with a 49-mph clean stall (42 with flaps), and a better-than-average 500-plus mile range courtesy of the 22-gallon fuel tank. With full fuel and configured as an LSA, there are still 358 pounds of useful load available.

The Ryan ST shown here was the inspiration for the Sam LS design, and it's named after Thierry's son, Sam.

Photography courtesy of Sam Aircraft

The structure of the Sam has been designed for a gross weight of 1,450 pounds, so homebuilders of any of the experimental versions can run full fuel and have 488 pounds left for fun.

Although the Sam LS is flying with the 100-hp Rotax 912S, it can accept engines from 80 to 130 hp, so a budget- or performance-minded builder of an experimental has a lot of engine choices. The options include the 80-hp Rotax 912 or turbocharged 914, the Jabiru four- or six-cylinder engines, the Continental O-200, VW, RevMaster, and UL Power four-cylinder engines; in fact, any proper horsepower unit up to 250 total installed pounds can work. Currently Sam Aircraft supports the Rotax installations and soon will support the ULPower line of engine as well.

Unlike some special light-sport aircraft (S-LSA) manufacturers, Thierry encourages the building of experimental amateur-built versions. The Sam is approved in Canada as an advanced ultralight in kit and ready-to-fly formats. For the pure experimental market, Thierry also offers several levels of kits, from 51 percent (including finished spars, weldments, and tested fuel tanks) to more basic kits that still include all the welded components.

Phased building is encouraged. "Save the engine and propeller until last," Thierry said, for convenience, logistics, and economics, and to keep pace with your increasing building skills. There is no price penalty for buying subkits; the only increase in cost might come from receiving multiple shipments.

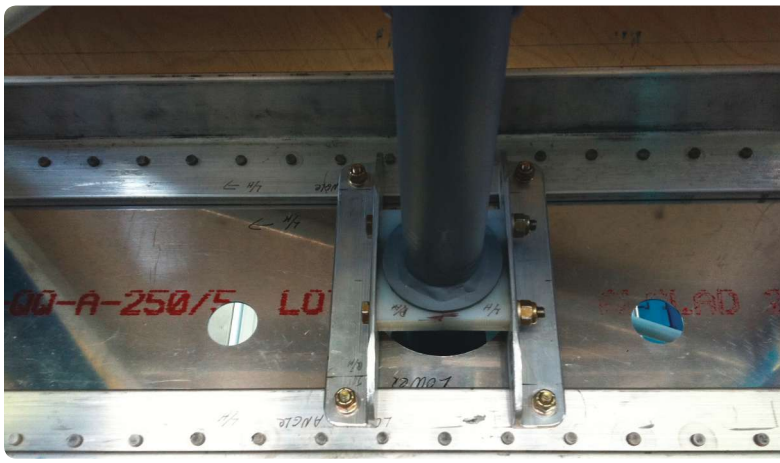
Proof in the Flying

The Sam's first flight on February 26, 2013, was a predictable event. "Everything was as we planned it," Thierry said. "Now we will go and examine the data."

The flight program was essentially complete by the beginning of May. Test pilot Rafael Langumier flew a series of 22 missions that encompassed 31 hours, expanded the flight envelope to the edges, and was able to confirm a level-flight top speed of 125 mph, a fully loaded climb rate of 900 fpm, and a gentle stall, with plenty of rudder authority all the way. Thierry said, "We did the spin testing at forward and mid CG, and we have done all the required test flights and received the approval by Transport Canada under the Advanced Ultralight (AULA) rule, which has a weight limit of 1,232 pounds in Canada."

After most of the flight envelope had been explored, Thierry flew with the canopy off. "It was my first open-cockpit experience," he said, "and it was exhilarating beyond my imagination!" All the Sam configurations can be flown without the canopy.

Digital and analog instruments provide primary and backup information in a neat arrangement on the panel.



The main control torque tube attachment.

The Sam is stressed + or -7.9*g* ultimate at the LSA gross weight of 1,320 pounds, and basic (positive-*g*) aerobatic maneuvers (chandelles, lazy eights, and banks of 60 degrees or less) are design-approved for both the LSA and CC models. In the experimental version, the Sam can gross up to 1,450 pounds.

Ease of build, inspection, repair, and ownership are designed in. The cowl comes off quickly for detailed inspection. Wheels and brakes are right out there in the airstream (and a parking brake is optional), and the master cylinders are right at hand in the cockpit. Control continuity is easy to check visually in addition to operationally where you move the controls and watch the panels.

The composite fuel tanks are tough and factory tested. It's easy to get under the floor; the canopy is a cinch to remove for access, or even for flight; and window panels are easily replaced.

Pilot and passenger comfort are enhanced by fixed rudder pedals and two movable seats, with enough travel to accommodate most pilots. On the LSA version, cabin heat is

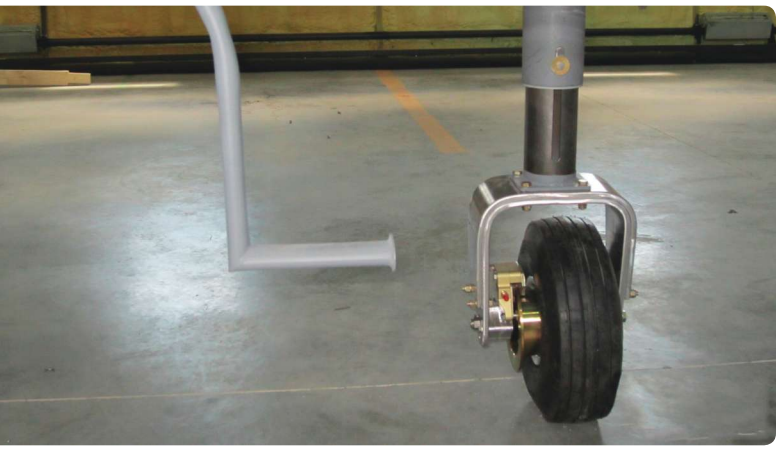
courtesy of a classic heat muff; it is possible (though not official) on experimental versions to use coolant or even oil heat courtesy of the Rotax engine.

About That Tandem Cockpit

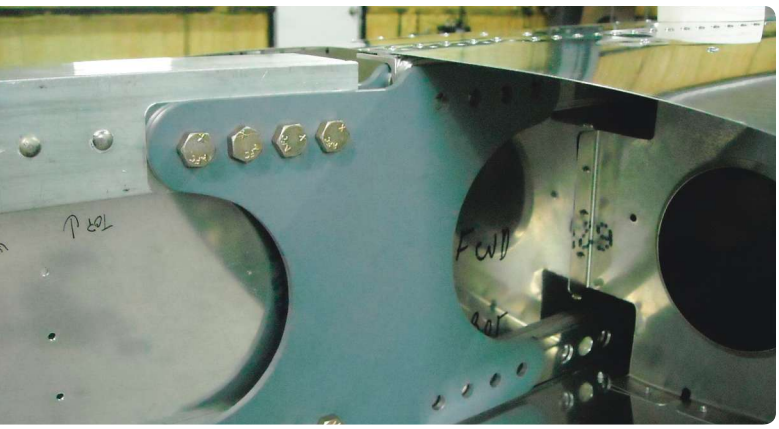
Everybody knows that most people want to sit side by side in an airplane, but the tandem cockpit has some advantages, particularly in comfort and efficiency.

First, efficiency: Not only does the cross section of a tandem cockpit allow a smaller fuselage frontal area, the added length of the fuselage can permit better ballistics and a proper taper to the tail. As for comfort, a relatively narrow fuselage is quite wide for a single person. (There is a minimum: The Rotax engine is 22.7 inches wide, after all; and it needs a little clearance.)

To have shoulder room equivalent to that in the Sam, a side-by-side cockpit would have to be 52 inches wide—about the same as the very large Diamond DA50 or Zenair STOL CH 850, all of which use big engines and carry at least twice as many people. (Note: A King Air 350's cabin—not cockpit—is 54 inches wide, including the aisle!)



The Sam's robust landing gear and step. The gear can be encased in wheel pants for a sleeker look and a bit more airspeed.



Construction of the Sam is simple and classic. Shown here are the wing attachment points. [Note: this was a fit-up only; washers are installed in actual assembly.]

The cockpit layout is classic: center stick; the throttle, choke, and "mags" are on the left; the right side provides the perch for the trim position indicator; and on the floor on the right is the fuel tank selector valve. Aircraft systems and power information and typical primary flight display information are displayed front and center, on the 10-inch Dynon screen. Standby instruments— airspeed, altimeter, vertical speed, and turn coordinator—flank the Dynon, with the radio just below it.

But ultimately for an airplane, it's about the flying, and for that, I rely on experts. Test pilot Rafael Langumier started his description of the walk-around (preflight) with this: "Starting from the cockpit, counterclockwise, the pilot can check everything easily. The hinges, rods, and connections are easy to check. The landing gear is very simple, and the fuel quantity can be checked visually and verified on the Dynon." Access to the engine oil reservoir also is easy, without the need to remove the upper engine cowling.

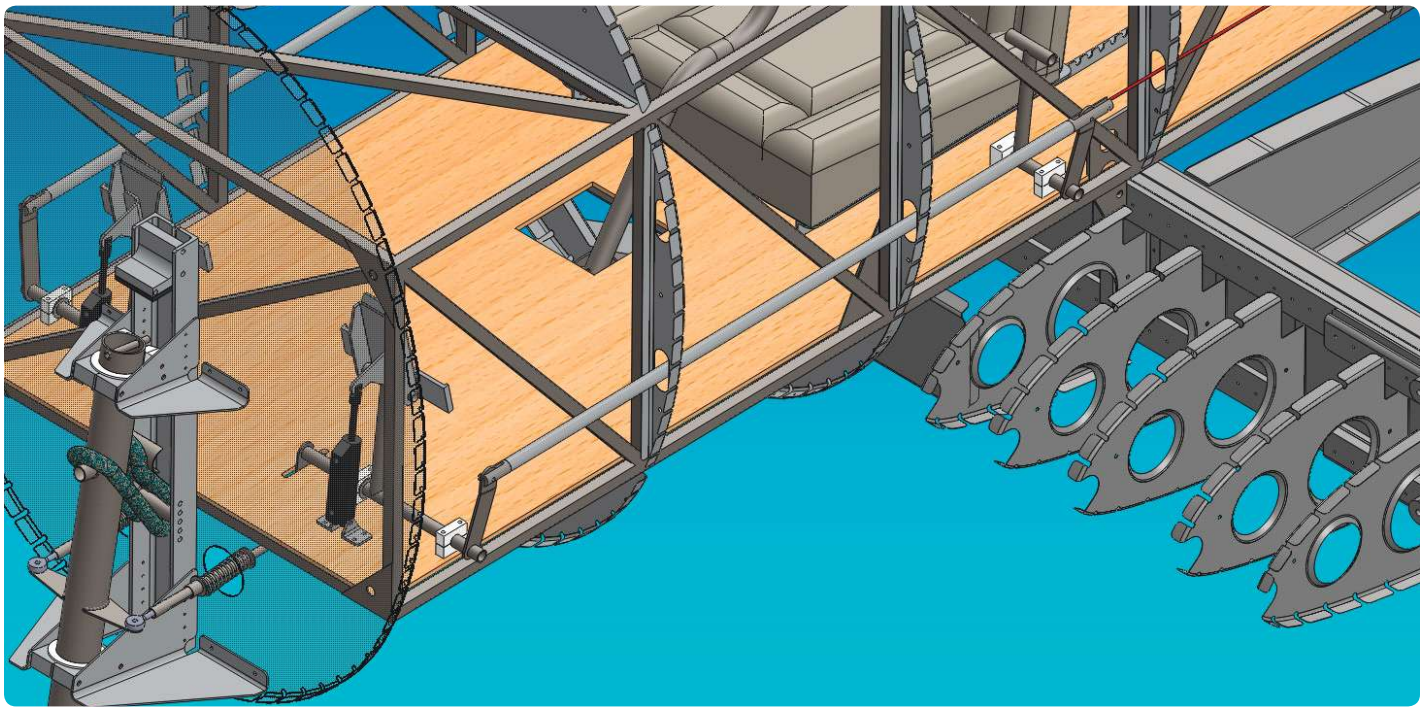
Rafael also likes "the easy access to the cockpit provided by a step in front of the left wing." He said, "With my chute and my helmet I can be seated without contortions. Every control falls to hand in a comfortable and natural position so that the pilot can keep his right hand on the yoke and play with the Dynon or switches with the left hand, even during critical phases of flight (like the approach)."

Rafael next went through the flight envelope, starting with normal phases of flight such as takeoff, climb, cruise, descent, approach, and landing. Takeoff on a cool windless day, without flaps, calls for rotation at 47 mph, and the Sam breaks ground at 53 mph; the takeoff run is under 400 feet. Rafael said, "I didn't find any difficulties in flying the Sam. The rudder needs a little pressure during the climb, but it disappears as speed increases, until in cruise, you don't need rudder pressure to keep the ball centered."

Stick forces, he said, are similar to what "we should find on certified aircraft. For example, controlling the Sam on the lateral axis requires two pounds of pressure. For the pitch control, about three to four pounds are necessary. This gives the Sam a good control on the roll; the pitch control gives the pilot the ability to maintain altitude easily, and the electric trim is helpful so that the pilot can fly hands-off." Roll rate is demonstrated at 18 degrees/second.

Rafael conducted stalls and steep turn stalls. He said, "The Sam stalls without buffet warning; but the nose drops when

Photography courtesy of Sam Aircraft



Thierry and his engineers used SolidWorks to design the entire aircraft. This image shows the forward fuselage.

the stall occurs, and the pilot can exit from the stall using conventional technique (by reducing angle of attack). No tendency was felt to roll or enter a spin, even when I did stalls in accelerated turns." Clean stall at LSA gross is right at 49 mph (and 45 mph at AULA weight); with the full 35 degrees of flaps, it is a slow 42 mph. (For reference, at a landing speed of 60 mph and with Rafael on the stick, landing distance was 350 feet.)

He performed some intentional "rookie mistakes," too, to see what the airplane would do. Rafael said, "I also tried to keep the stick full aft; the Sam's nose would drop, then oscillate above and below the horizon, regaining speed and stalling again without dangerous tendencies."

As for yaw, he said, "During a steady turn at 30 degrees of bank, the Sam had a tendency to stay established in the turn or to decrease the bank angle, which is known as 'divergent spiral stability.'"

Rafael took the flight envelope to VNE (155 mph) and said, "No flutter was felt." Overall, the tests showed "…longitudinal stability that results in a proportional stick displacement and force versus speed increase/decrease."

As for general accommodations, Rafael said, "The cabin comfort is good. Not so noisy, and the cabin heating system is very efficient. The knob installed on the right side of the panel opens the orifice on the floor, and hot air entered the cockpit quickly." Rafael also called the Sam "docile and versatile."

The manuals—pilot's operating handbook and the aircraft maintenance manual—are done.

The finished, fully loaded, ready-to-fly airplane is $131,000 (FOB Lachute); early orders get some nice options at no charge. The ultrafast-build kit is $33,440. The standard kits, which include everything but the engine, instrumentation, avionics, emergency locator transmitter, painting, and primer, come in at $23,200. Options, of course, can pick that number back up. Order the whole Sam airframe kit, or as many subkits as you like in 2013, and take a 20 percent discount. Delivery slots are still available for most subkits, for delivery in early 2014. (Complete kit orders—regularly $29,000—now are on special at $23,200, with priority delivery.)

Options include an additional (7-inch) Dynon panel for the rear cockpit, larger (6-inch) wheels, leather interior, wheelpants, stainless-steel exhaust, marker lights, parking brake, two-axis Dynon autopilot, and a BRS ballistic all-airframe parachute. The long-wing option will be available in 2014; the cross-country wing is scheduled for the following year.

Learn more at: www.Sam-Aircraft.com. EAA

Tim Kern is a private pilot and has written for more than 50 different aviation magazines. He was a key builder on two aircraft projects and has earned the title of Certified Aviation Manager from the NBAA.

Winging It
Using dry ice and drift pins

By Cy Galley, EAA Lifetime 71015, Rock Island, IL

It is cold. You are shivering. You need to attach a cantilevered wing on the fuselage of your plane. The wing is heavy and awkward. You are by yourself. What to do?

I used an engine hoist as shown in the photo. It made a nice, steady platform to carefully position all the bolt holes at one time without damage. Rather than force and damage anything when it got too cold to work, I blocked it up and returned to it the next day. The blocking circled in the picture secured the wing even if the borrowed hoist would leak hydraulic fluid. The carpet was a convenient place to lay tools without damaging the new paint.

The next day, I had a good supply of drift pins and a couple of 9/16 bolts that I ground to bullet points to precisely line up the holes. I also stopped at the package good store and got some dry ice to shrink the bolts. The smaller diameters of the bolts at 40° F. below zero made them easier to slide in dry—no lubricants. When the bolts warmed up, a snug fit was ensured. Hammering the bolts in could easily damage the fittings as they are aluminum. EAA

Homebuilder Hints Videos

Here are four of the 328 homebuilt videos currently available for members to view.

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

Laying a Bead of Resin Microspheres with a Caulk Gun
Mark Forss of EAA's SportAir Workshops demonstrates three simple techniques for installing a bead of resin microsphere mixture for constructing joints and fillets in composite work, and demonstrates how to construct a "production bead layer."

Masking Surfaces for Painting
Bob Koehler shows different products to use when masking off areas prior to painting. Bob is an A&P Mechanic and EAA SportAir Workshop instructor.

Propeller Erosion Tape
Dick Koehler explains how special 3M tape can be used to protect the leading edge of propellers from erosion and demonstrates how to apply the tape.

Photography by Cy Galley

First Appearances at Oshkosh

2013 Perseverance Award Winners

During EAA AirVenture Oshkosh 2013, EAA roving photographer Jim Raeder captured photos of several of the aircraft that received Perseverance Awards this year. This award recognizes that work that each and every builder invests to complete a homebuilt project. The award was started by Doc and Buddy Brokaw (now deceased), who built and flew the Brokaw Bullet and wanted to acknowledge the perseverance needed to finish a project like building an airplane. Here are a few of those aircraft, with more to come in future months. If nothing else, you'll observe some different methods of securing a canopy cover! … Mary Jones

Vans RV-7, C-GMIY

Steve Hurlbut, EAA 653020, of Cold Lake, Alberta, Canada, completed this RV-7, C-GMIY, in August 2006 after two years of building. It's powered by a TMX-O-360, and Steve has logged 530 hours in it.

Vans RV-9A, C-GKEL

Robert Schauber, EAA 778799, of Cambridge, Ontario, Canada, completed this RV-9A, C-GKEL, in September 2012 after 12 years of building. It's powered by a Lycoming O-235, and Robert has logged 65 hours in it.

Photography by Jim Raeder

RV-9A, C-EMNO

Terry Manders, EAA 394768, of Summerland, British Columbia, completed this RV-9A, C-EMNO, in September 2012 after six years of work. It's powered by an O-320 and Terry has logged 88 hours in it.

Lancair 320, C-GFAB

Patrick Hildebrand, EAA 265978, of Edmonton, Alberta, Canada, completed this Lancair 320, C-GFAB, in July 2011 after seven years of building. It's powered by an IO-320, and Patrick has logged 70 hours in it.

Vans RV-8, N555KG

Karl Gashler, EAA 881671, of Goodyear, Arizona, completed this RV-8, N555KG, in September 2012 after two years of building. It's powered by an AeroSport IO-375 engine, and Karl has logged 110 hours in it.

RV-8, N861MM

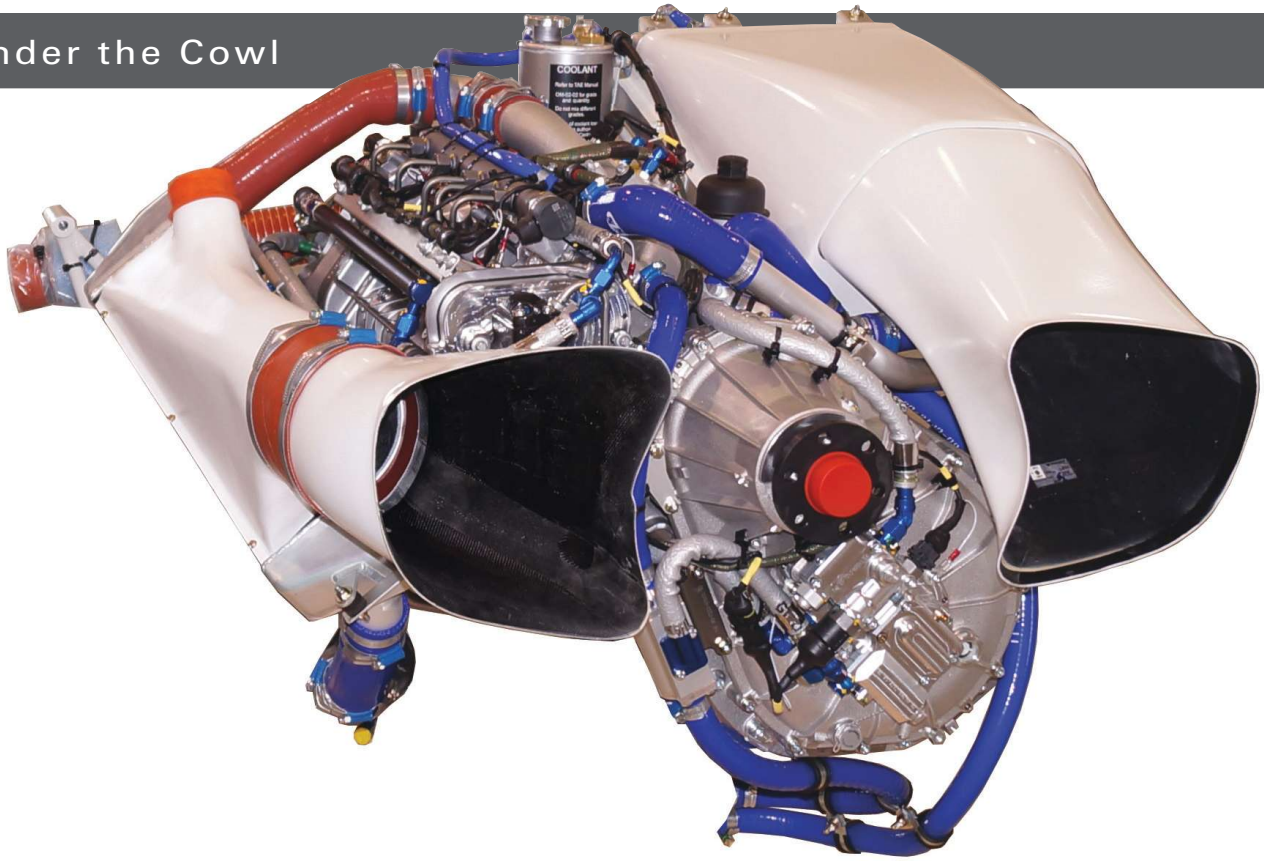
Matthew Giordano, EAA 665412, of Wilmington, Delaware, took 10 years to complete his RV-8, N861MM. It's powered by an O-360-A1A. He completed it in 2012 and has logged 135 hours.

RV-7A, C-GVJC

Daryl Larson, EAA 536984, of Killam, Alberta, Canada, completed this RV-7A, C-GVJC, in December 2012 after two years of building. It's powered by a 180 hp engine, and Daryl has logged 50 hours in it.

RV-12, N616T

Randy and Cat Marx, EAA 838483 of Clinton, Arkansas, completed this RV-12, N616T, in May 2012 after 18 months of building. It's powered by a Rotax 912ULS, and they've logged 95 hours in the aircraft. EAA



The Centurion 2.0 Engine

Continental's diesel engine goes experimental

By Marino Boric

EAA AirVenture Oshkosh 2013 offered lots of news for pilots interested in engines and especially for experimental builders. Several new engines were presented; some of them were the usual dream projects, others were promising newcomers, and one manufacturer got a new home.

The Centurion diesel engine falls into that last category now that it's become a Continental product. What we saw in the Continental booth during AirVenture was not the long-awaited flat four/six-cylinder based on the French SMA diesel engine. Surprisingly, Continental showed a water-cooled, in-line, four-cylinder diesel engine called the Centurion that should be available to the homebuilding community.

Centurion…hmm, you already have heard that name, but what is it exactly? Here is a short story about the newest engine in the Continental portfolio.

On July 22 just a week prior to AirVenture, Continental Motors Group, a division of the Chinese AVIC International Holding Corporation, announced the acquisition of the diesel aircraft engine and manufacturing assets of the former Thielert Aircraft Engines GmbH "to enhance its capabilities in general aviation piston aircraft engine technology." The acquisition added the German-manufactured Centurion line of electronically controlled Jet-A (diesel/kerosene) piston engines built by Technify Motors GmbH to the Continental portfolio of GA piston engines. Technify Motors products are now listed as Continental Centurion engines and include the certified Centurion 2.0 series of 135- and 155-hp Jet-A engines and the certified (but not yet produced) 350-hp Centurion 4.0 engine.

For most aircraft owners, the Centurion line of engines is an almost unknown product. Despite the fact that more than 3,500 engines have been produced and well more

Photography courtesy of Marino Boric

than 2,600 aircraft have been equipped with them, it is difficult to spot them on the local airfield. Diesel engines were practically unknown in the GA world a decade ago; in the past they were too heavy and not powerful enough for aircraft use. Additionally, the conservative aviation world was reluctant to accept new engine types because avgas was cheap and the infrastructure for any "new" fuel wasn't established. Having the engine manufacturer in Germany was an additional handicap.

In the meantime a lot has changed, and the demand for engines that can be operated on fuels found all over the world has increased. Many aircraft manufacturers have started looking for more fuel-efficient engines, and even conservative aircraft owners have started accepting the new technology that is similar to engines in their modern cars. One unknown factor helped Centurion diesel engines to be widely used: The military all around the world started shifting from multi-fuel use to a single fuel because their other aircraft, boats, and land vehicles were already using a diesel fuel and similar Jet A. This in part explains why a large number of Centurion engines were installed in military UAVs.

The Birth of TAE

Fourteen years ago, German Frank Thielert had a good idea. As an experienced mechanic whose company had manufactured parts and engines for racing cars and preproduction prototypes since 1989, Thielert wanted to revolutionize the world of aircraft engines with low-consumption diesel engines that are based on car powerplants.

In 1999, Thielert Aircraft Engines (TAE) was established in Saxony/Germany and later integrated into the Thielert Group. TAE focused on the development of aviation diesel engines. The biggest advantage of the diesel engine per TAE is the possibility of using different, commonly used fuels such as automotive diesel and aviation jet fuels. From the beginning, Thielert's core idea about the development of new and innovative engines was based on the wide use of existing engine parts and experience gained in serial car engine production. Since the company had plenty of experience in car engine tuning and adaptation, it seemed natural to Thielert to take a modern German car diesel engine and adapt it for aviation use.

The Birth of the Centurion 1.7

The Thielert designers quickly focused on the Mercedes-Benz OM688 automotive engine used in the compact A-class cars of Mercedes-Benz. This was a modern, water-cooled, turbo diesel engine with intercooler and common rail, a high-pressure fuel injection technique. This engine featured 1.7-liter (103-cubic-inch) displacement and delivered 100 kilowatts (kW) or 136 hp. Thielert saw a big advantage in the use of a turbocharged engine primarily because it was able to keep a nominal (sea-level) power up to 6,500-foot altitudes. The OM688 engine was chosen, among other reasons, because its motor block was cast aluminum and thus lightweight. At that time, other manufacturers such as VW used heavier cast iron engine blocks. This Centurion 1.7 engine was first flown in 2000, and 1,500 were produced until 2006.

Many market observers were surprised with the speed at which TAE adapted the car engine for aviation purposes. The Centurion 1.7 engine's maiden flight was made in September 2000, on board a Valentin Taifun motorglider just a year after the company's founding. In early 2002 it received the European Aviation Safety Agency (EASA) type certificate (TC), and a year later it earned an FAA TC.

FADEC

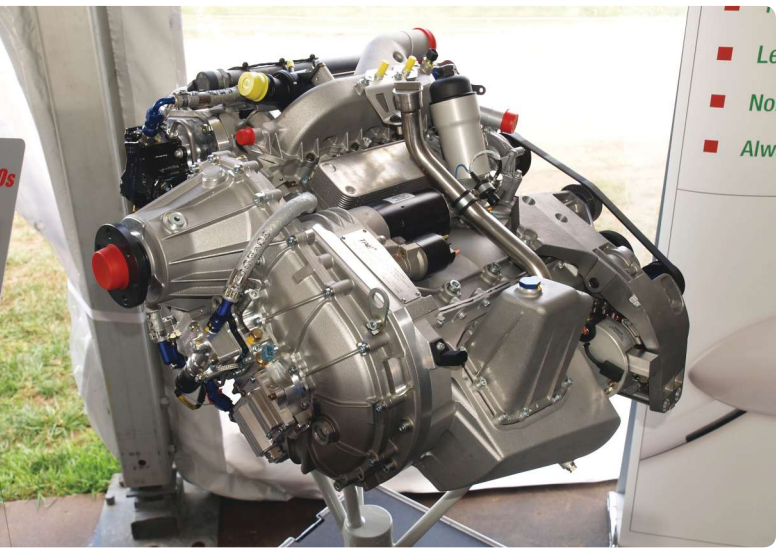
For monitoring and control of the engine, Thielert developed a full authority digital engine control (FADEC) system. All engine parameters are controlled by two fully independent systems. The system regulates the high-pressure valves, common rail pressure, turbocharger, and constant-speed propeller's pitch. Furthermore, the FADEC is logging more than 30 internal and external engine parameters that can be read and processed electronically on board or on the ground with a laptop.

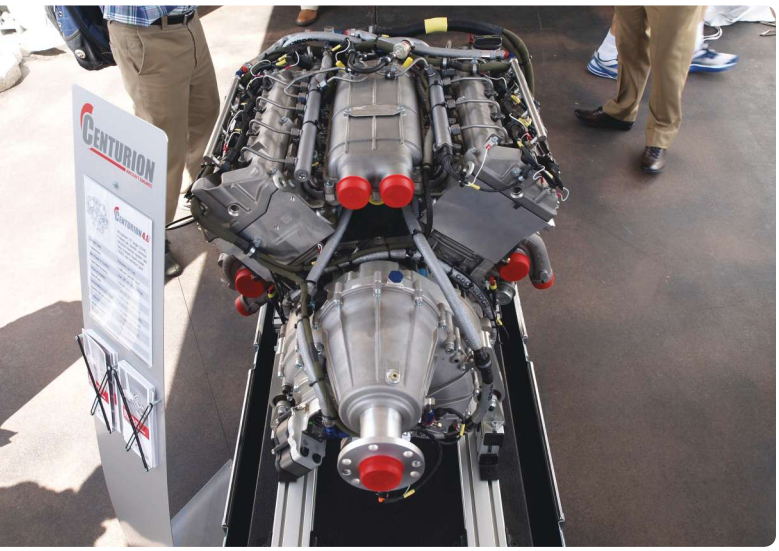
Single Control Lever

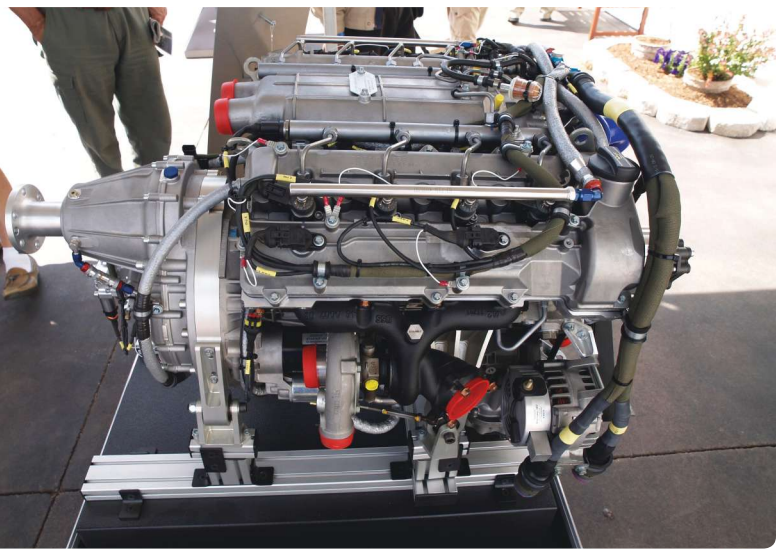
The introduction of the FADEC system allowed for the use of a single control lever for the first time in a serial production piston aircraft. This single lever controls the throttle, mixture, and propeller pitch. This system reduces pilot's cockpit workload, especially in multiengine aircraft.

Reduction Gear

The former car engine can't be installed in an aircraft without a propeller speed reduction unit (PSRU) to reduce the relatively high engine rpm of approximately 3900 rpm to 2300 prop revolutions per minute for efficient and quiet propeller operation. "It should not be so difficult," thought the TAE developers, so they designed and manufactured the necessary reduction gear with a reduction ratio of 1.69-to-1 because nothing similar was on the market. The reduction gear was fitted with torsion/vibration dampeners and a clutch that allows starting







the engine without a propeller rotation. This seemingly "easy"-looking task turned out later in practice to be a major engine problem.

When the gearbox started creating problems, the inspection interval was lowered from 300 to 150 hours and the PSRU change was due at 300 hours. This increased the maintenance costs of first Centurions drastically. Meanwhile the engine TBO was 1,200 hours, gearbox inspection rose to 300 hours, and its exchange to 600 hours. With the recently announced bi-mass flywheel, the PSRU problems should disappear completely, and the TBO of the gearbox probably will rise. With the latest acquisition by Continental, the maintenance and spare parts supply should drastically improve worldwide.

The Birth of the Centurion 2.0

The first 1.7 engines suffered thermally, because with their 135 hp, they were at least 20 hp weaker than the gasoline engines that they replaced in Cessnas and Pipers. These engines were regularly used at almost full power with the consequence of more frequent heat-related problems with cylinder heads and gaskets. These issues were resolved after switching production from the 1.7- to 2.0-liter engine in 2006. As Mercedes introduced the next A-class generation of cars powered by diesel engines, the engine displacement of the OM640 increased from 1.7 to 2.0 liters. Lesson learned. In the automotive industry, the product lifetime is much shorter than in aviation. The new Mercedes engine was more powerful but heavier because the engine was cast iron instead of cast aluminum. To keep weight down, Thielert designed and manufactured its own aluminum 2.0 engine block in 2006 that is still in use. Dimensions of the Centurion 2.0 and 1.7 are nearly identical and the install kits are compatible; so the 1.7 at the end of its life can be replaced with a 2.0. The Centurion 2.0 is rated to 101 kW or 135 hp/101 kW but is EASA/FAA certified for 155 hp/116 kW.

Thielert Bankruptcy and Restart

In 2006 Thielert announced the purchase of Superior Air Parts, an important strategic decision for conquering the U.S. market and building a servicing network. That liaison lasted only until the Thielert bankruptcy in 2008.

In 2008 TAE went into bankruptcy, and Thielert CEO Frank Thielert lost control of the company he founded. Since then, the company has been administered by a court-appointed asset manager, Bruno Kubler, who managed to bring some new order to the company, and

Photography by Marino Boric

the quality of the engine improved. 2008 was crucial for Thielert because in that year Thielert and Diamond Aircraft definitively "divorced." Prior to that, Diamond was using only Thielert diesel engines. Shortly after that disunion, Diamond started its own engine production based on the same Mercedes car engine, but that is another story.

By mid-2008 Cessna was planning to install the Centurion 2.0 engine in the new Skyhawk 172S. Those plans were suspended after the TAE bankruptcy. Certified installations of Centurion 2.0 engines are now available for the Cessna 172, Piper PA-28, Diamond DA40 TDI, and DA42 Twin Star, and recently the French-made Robin DR400 Ecoflyer Remorqueur, equipped with the Centurion 2.0, just obtained certification for towing operations. The Centurion 4.0 eight-cylinder engine is offered as an assembly kit and is certified for different models of Cessna 206. During EAA AirVenture Oshkosh 2013, the German company Flight Design announced that it will use the Continental Centurion 2.0 diesel engine in its new C4 four-seat project.

According to the recent manufacturer's statement, the annual utilization of each Centurion engine is over 250 hours; that is nearly three times higher than the overall average in GA. The users of Centurion engines reported more than 3.5 million cumulative flying hours to TAE by the end of 2012.

The financial situation of TAE stabilized significantly in 2009 after General Atomics ordered engines for UAV production.

The Centurion 2.0 is a four-stroke diesel engine with four in-line cylinders, each with four valves. It is turbocharged and equipped with common rail direct injection. Like modern car engines, it is liquid-cooled, has a completely electronic engine and propeller control unit, a wet-sump oil system, as well as a reduction gearbox with a ratio of i = 1.69:1. The Centurion 2.0 is certified by EASA and FAA and is offered as a preassembled firewall-forward kit. Time between replacement is 1,200 hours. Continental is currently working with several kit manufacturers who anticipate using the Centurion 2.0 and 2.0s engine. Airplane builders interested in using the engine should call their kit manufacturer. Pricing has not been established, however once a kit is available, pricing will be confirmed.

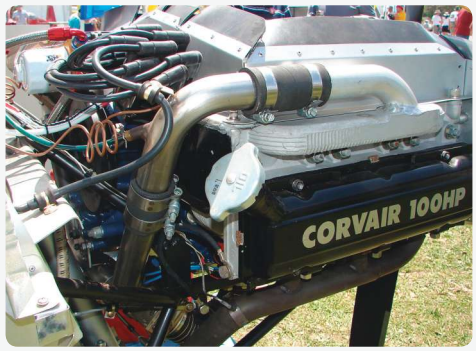
According to Continental, the Centurion 4.0 is currently in design and review and not available at this time. As originally designed, the engine is V-arrangement with eight cylinders, each with four valves. It is twin-turbocharged and equipped with common rail direct injection. In addition, it is liquid-cooled, has a completely electronic engine and propeller control unit, a wet sump oil system, as well as a reduction gearbox with a ratio of i = 1.69:1. Dependent on the airframe, the Centurion 4.0 can deliver up to 350 hp.

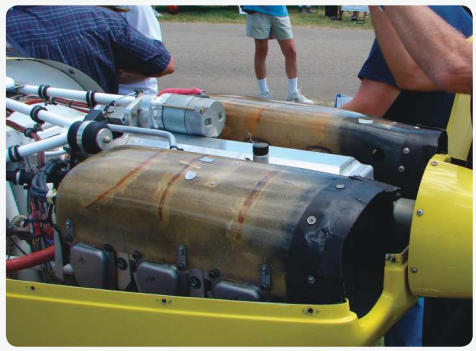
For more information, visit this website. EAA

Correction to the September Issue

In the September issue's Under the Cowl column we inadvertently ran a photo of a Jabiru engine in conjunction with copy describing the Corvair engine. This photos show a Corvair engine; the controversial Corvair automobile is celebrating its 50th anniversary this year. Corvair aero conversions have been around nearly as long. New parts for the opposed air-cooled sixes are still manufactured, and there is a large contingent of worthy supporters and developers who have made these engines both affordable and bulletproof, and who continue to support them with a high level of expertise and experience. Corvair owners are part of a tight family, encouraging seminars and hands-on participation, reflective of the roots of EAA. www.FlyCorvair.com

This is a Jabiru engine. The lightweight Australian Jabiru's 2200 four-cylinder ($15,500) and 3300 six-cylinder ($19,900) billet-machined, direct-drive, carbureted four-strokes continue to permeate the LSA and experimental markets, in their respective 85- and 120-hp sizes. www.USJabiru.com





Dennis Carley flying the Aerolite 103.

More Light Plane Fun at AirVenture 2013

Continuing our review of vendors

By Dan Grunloh

I have a pilot friend who sometimes calls me on the radio when we're flying side-by-side on a cross-country flight. He remarks that we are lucky to be living in a time when flight is possible, and we have the freedom to do it. The same can be said about flying from the Ultralight/Light Plane runway at EAA AirVenture Oshkosh.

The air strip and pattern is intimidating to pilots flying into Oshkosh for the first time who are accustomed to 2,000-foot-long runways with no obstacles. From either direction there is a 45-degree turn at low altitude just before landing, with trees close to your wingtips. After a few landings, everybody catches on and finds out what they can really do. It is one of the most fun, challenging, and addicting forms of light plane flying. One week of flying down here in the Fun Zone, mixing it up with aircraft flying anywhere from 38 to 80 mph, is like a college education in speed management and judgment of distance and spacing with other airplanes.

It takes only five minutes to fly around the circuit, and most pilots want to land and take off as often as possible. When the traffic is light, you can shoot up to 10 landings in an hour. In that time, you will take off and land in front of and behind almost everyone else in the pattern and view the other landings and takeoffs from a unique vantage point. From the 300-foot pattern altitude, the other side of Lake Winnebago is visible to

the east and the entire AirVenture grounds are laid out below. With perfect weather and a cool breeze in the cockpit, why would anyone want to land? The truth is that landing is the most fun thing in aviation and that is what the spectators come to see. Takeoffs are great, too, but the airplane does all the work while the pilot sits quietly waiting for something to go wrong. Landings are more interactive.

This year, Aeroprakt A20 Vista pilot Dennis Long of Oakland, Tennessee, made a compilation video of flying at the Ultralight/Light Plane Runway. The amateur video includes lots of takeoffs and landings. This is what draws spectators to our runway. The second half of the video is all in-flight views from the wing, the tail, and under the belly of this aircraft. The footage (at the 6:00 minute mark) captures the intricacies of the final approach and landing from both directions. If you've never flown here, this is your film. Check out his video Oshkosh Flying 2013 HD.

If you haven't already seen it, read my "Light Plane World" column in the September 2013 issue of *EAA Experimenter*. It covers some of the top stories and interesting airplanes from the Fun Flying Zone at AirVenture 2103. Read about the latest electric airplanes flown this year, a fabulous flying antique, and the Revo trike invasion. With 130 ultralights and light planes on display, there was plenty to see. Here's more news from the Ultralight/Light Plane area.

Just Aircraft Highlander SuperSTOL

Few airplanes have done more to attract newcomers to grassroots STOL flying than Troy Woodland's Highlander SuperSTOL. First seen at AirVenture in 2012, it captures the true essence of flight. During slow flight near the ground (as when landing and taking off), the magic that is flight becomes magnified in the eyes of the viewer. A short takeoff is expected from the STOL plane, but during the landing, time seems to stand still. With flaps and slats deployed, it floats as if there is no gravity and settles down with surprising gentleness. The main gear is on long-travel shocks, and there is a shock absorber on the tail wheel. Both the original Highlander design and the new SuperSTOL were flown all week at AirVenture. To fully understand the capability of the landing gear, watch this video…sure to make you smile.

Highlanders are amateur-built kits, and Troy said he is not anticipating going the special light-sport aircraft (S-LSA) route. The current airframe kit is very economical at $36,650. Troy claims a complete aircraft with tundra tires, wing tanks, and 100-hp Rotax engine

Overhead view of the Ultralight/Light Plane area.

Troy Woodlawn and the Highlander SuperSTOL

Custom showplane version of a Kolb Firestar.

Photography by Dan Grunloh

can be built for $65,000 plus paint and avionics. Just Aircraft can supply engine mounts and cowlings for Rotax and Jabiru engines. The Highlander cruises at 110 mph with a VNE of 130 mph and has a load capacity of 705 pounds.

Quicksilver Sport LSA

Quicksilver Aircraft has made several announcements in recent months that indicate that under the new ownership and management of Will Escutia and Dan Perez, the company is moving forward. Last November, Quicksilver added five models to the FAA list of approved 51-percent amateur-built kits, giving Quicksilver seven models now listed. At AirVenture it revealed that the open-cockpit, side-by-side Sport 2S model has completed the S-LSA process. By year's end it hopes to add the two-place tandem GT 500. Both will be available as S-LSA or as experimental light-sport aircraft (E-LSA) kits. The price for a ready-to-fly Quicksilver Sport 2S S-LSA is $39,995.

A little Mini-Max called Dusty.

Quicksilver EMG

Meanwhile, Quicksilver has launched a partnership with Ident LLC of Jacksonville, Florida, a manned and unmanned aerial intelligence services company. It deploys a variety of aircraft, large and small, for wide-area surveillance, rapid response, and other missions traditionally assigned to expensive aircraft. Its version of the GT 500, called the "Mosquito," will include extras such as GPS flight controls and advanced imaging systems. The Quicksilver GT 500 models have already logged more than 7,600 hours in various contract programs for NASA, the Department of Homeland Security, the Department of Defense, and other agencies, according to Quicksilver Aircraft. Watch for one overhead someday.

Quicksilver also has teamed up with Brian Carpenter of Rainbow Aviation to develop an electric aircraft called the Quicksilver EMG. The initial version will be a towable primary glider-style airframe with GT 400 wings that can have twin plug-in electric motors with self-contained batteries.

More Light Plane Exhibitors

There were more than 20 commercial exhibitors in the Fun Fly Zone. Starting last month, we have thus far mentioned the Greenwing eSpyder, Quad City Challenger, Earthstar eGull, Revo trikes, Just Aircraft Highlander, and Quicksilver.

David Cooper was on hand to represent Team Mini-Max with a copy of the AeroMax laser-cut kit airplane. The newly engineered, all-wood design was inspired by Wayne Ison's Airbike. Also at its booth was a cute little Mini-Max with its windshield painted to look like "Dusty" in the new Disney movie *Planes*. You got to love it! All the plans for the Team airplanes (seven models) are available free of charge as PDF downloads from its website. The company hopes people will download the plans, start building, and then be motivated to buy parts and kit components.

Kolb Aircraft exhibited a beautiful one-off version of its venerable Firestar. It had a slightly different pod with a sharper nose and a windshield that gave it a

more modern look. Combined with the droop wingtips from the Mark III, wheelpants, and a very smart trim scheme, it looked fast and sporty even while standing still. Kolb produces seven different models, including the Firestar SS (side-by-side) introduced in 2011 and the ultralight Firefly. The Kolb Firefly ultralight known as *Fifi* was flown regularly all week.

Leonard Milholland said the media seems to ignore one of the most successful plans-built ultralights of all time, the Legal Eagle. Examples like Joe Spencer's *Putt Putt* and Scott Johnson's *Silver Slug* are regular visitors to AirVenture. They fly all week proving that four-stroke power can perform in this weight-limited category. Nearly 4,000 sets of Legal Eagle plans have been sold. The cost can be low if you are a good scrounger, but even buying a ready-built engine, the Legal Eagle and Better Half VW engine provide an economical solution for builders. Product support is available, there is an excellent community of builders, and Leonard gives forums on the airplane and engine at AirVenture. EAA recently conducted a webinar on the Legal Eagle. It's available for viewing here.

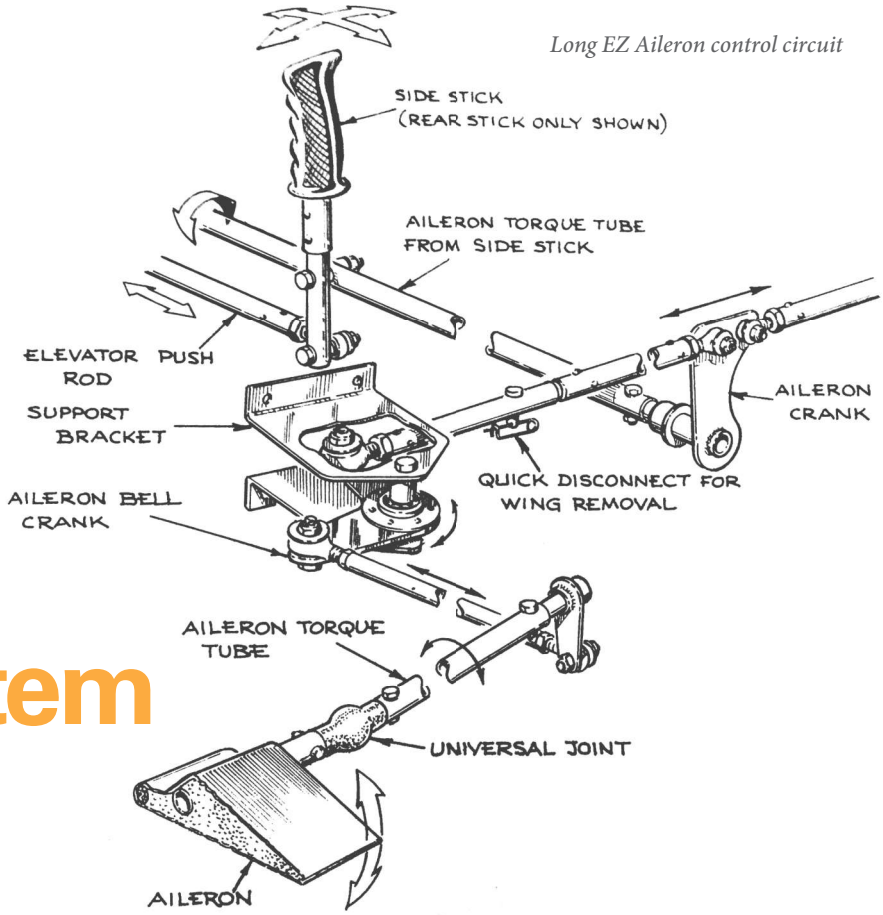
Dennis Carley, the new owner of the Aerolite 103 designed by Terry Raber, was on hand to demonstrate the abilities of this classic design. It's available only as a complete, ready-to-fly ultralight. The cost is $16,500 with electric flaps, electric start, four-point harness, and basic instrumentation. Watch Dan Johnson's interview with Dennis. Other vendors not yet mentioned include the amazing Belite UltraCub by James Weibe, the folks at Titan Aircraft, and the M-Squared Breese by Paul Mather. Paul estimates he gave more than 90 rides during AirVenture.

Please send your comments and suggestions about this column to dgrunloh@illicom.net. EAA

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

Pilot's view of the ultralight runway during a flyby.

Photography by Dan Grunloh



Long EZ Aileron control circuit

Control System Freeplay
Got slop?

By Ed Kolano

Got slop? You know, that tiny but annoying flight control system nuisance that renders your surgical flying precision to butcher shop cleaving? Let's talk about that, where it comes from, and how it affects your flying. Then we'll examine some other flight control bad boys and their contribution toward making an airplane harder to fly than it has to be.

First, a demonstration. Pick up a pen and prepare to write. Notice how you're holding the pen between your thumb and at least one opposing finger? Draw a circle. Now move your thumb a tiny distance away from the pen, and draw an identical circle while maintaining that tiny gap. See the problem? That tiny gap is freeplay. You've probably already compared the two circles. Now compare your sense of control using each technique. Compare your frustration level between the two efforts. All together: Freeplay is bad.

In the pen exercise, you had to move your fingers across the gap before the pen moved in the direction you wanted. The same thing happens in an airplane. You have to move the control stick or pedals across the freeplay band before the control surface moves.

Control system freeplay usually comes from looseness in the system. Worn components, loose cables, perhaps elongated holes in bell cranks, and a variety of other loose connections allow one component to move a short distance before moving the other. Even new, "tight" airplanes can have freeplay. The more linkage connections there are, the more opportunities there are for those tiny gaps. And they combine.

Let's turn your arms into push-pull rods. Form an okay sign with your thumb and index finger. Now do the same with your other hand, but have that thumb and index finger meet in the circle formed by the okay sign of your other hand. I know, I know, but just get in touch with your silly self and bear with me. Your fingers should now form a loose chain link. Hold your arms in front of you so your forearms are horizontal. Let's say the elevator is connected to your left elbow, and the control stick to your right. As you move your control stick, notice your elevator doesn't move until

Illustration courtesy of Rutan Aircraft Factory

your right-hand component of the link traverses the gap. Move your stick the other way. Again, your right-hand fingers must move across the gap before you get any elevator deflection. Control system freeplay is that simple; it's how far you have to move the cockpit control before it moves the control surface.

Freeplay is always described as a band because you usually don't know whether the control is at one end of the band, the other end, or somewhere in between until you move the control. Let's say the stick is at the forward end of the freeplay band. Any forward movement of the stick from here will deflect the elevator trailing edge down. To deflect the elevator trailing edge up, you would first have had to move the stick all the way through the freeplay band. If the stick is somewhere in the middle of the band, you'll have to move it through the remaining freeplay in either direction to change the elevator's deflection.

An airplane with an appreciable freeplay band, as you can imagine (or maybe have already experienced), can be difficult to fly precisely. For example, formation flight requires the pilot to make continual, small corrections to remain in position. Doing this in a plane with too much freeplay can tire a pilot in short order. Freeplay causes increased pilot workload, and precision suffers.

Once the control is outside the freeplay band, the connection feels solid. You feel the force caused by the air load on the deflected control surface. As you relax the force you're applying to the cockpit control, that air load restores the control surface to its trimmed deflection. The chain link stays tight because the system is outside the freeplay band. Try it with your arm model.

Freeplay exists only near the control's trimmed position. Once you deflect the control surface, you're pulling (or pushing) in one direction, and the air load is pushing (or pulling) in the opposite direction. That's why it feels solid outside the band, and you can make precise, tiny adjustments to the cockpit control and consequently the control surface.

Some pilots intentionally fly out of trim to take advantage of the fact that freeplay exists only when the control is near its trimmed position. They might use a little nose-down trim and maintain a compensating slight pull on the stick so they can make small elevator deflections without having to traverse the freeplay band. The Navy's Blue Angels used this trick when they flew the A-4 Skyhawk, and there's no arguing about their precision.

Most of us don't fly formation aerobatics, but we still want to fly as precisely as conditions require without resorting to flying off-trim. Not knowing how far to move the cockpit control to achieve the desired result can lead to frustration and precision difficulty. So, the next time you're having a hard time making small pitch, roll, or yaw adjustments, check for freeplay before blaming your own skills.

To check for freeplay in the pitch control system, start with the airplane trimmed for hands-free flight at a steady airspeed. Then slowly ease the stick back until the plane's nose just begins to move upward. Note the stick position, then slowly move the stick forward until the plane's nose just begins to lower. Note that stick position. The difference between the two noted stick positions is the pitch control system freeplay band. It works the same way for roll and yaw.

When you perform this test, keep in mind you're looking for the first small change in pitch attitude. Because you're moving the stick slowly, the airplane's pitch attitude change will likewise be small. You'll have to make sure you keep your head still. Any up or down movement of your head (your eyes, really) will change the perspective of the plane's nose against the horizon and appear to be that pitch change you're looking for. You'll also need calm air to spot the tiny change in pitch.

What we described so far is more correctly called *position freeplay* because we're talking about the range of stick positions that do not cause a change in pitch attitude. Notice control stick force doesn't enter the picture when talking about position freeplay. An airplane might have springs in its control system that require you to exert a force on the stick to move it. You'd still ignore the force and measure position freeplay the same way.

Force freeplay is simply what's commonly referred to as the slop in the stick. It's that (hopefully) small band where it takes virtually no force to move the stick…a dead band, if you will. We'll talk more about control system forces in the coming months.

Next time we'll tackle control system centering. Stay tuned. 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.

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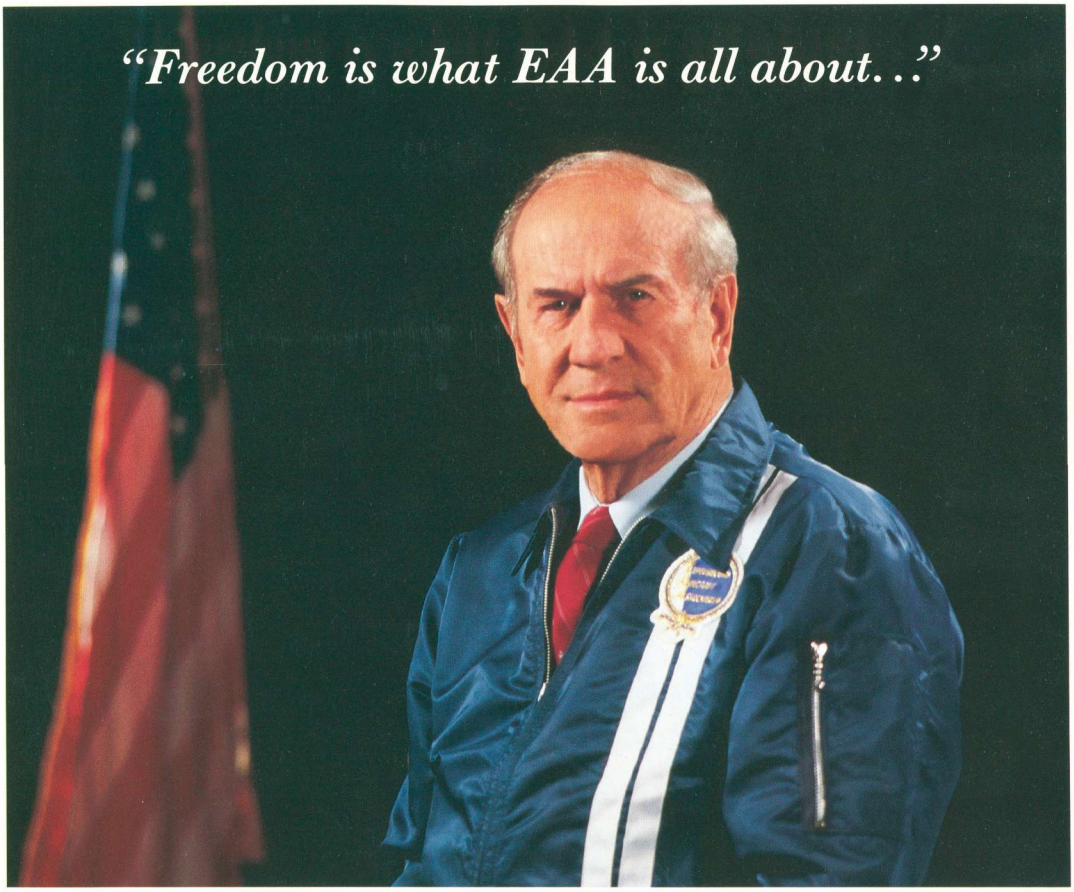

Paul H. Poberezny
Founder and Chairman
Experimental Aircraft Association

"Freedom to create and build...to dream...to fly."

"Freedom is something that is often taken for granted...until it is lost. Freedom is a precious gift that has been given to us by our forefathers and by all who served — and died — in wars fought in its name. Yet, there are those who would chip away, erode and destroy this most basic human right. Restrict our ingenuity and inventiveness. Take away our ability to move freely across our borders...to dull our senses and blur our view from the top.

"For more than 35 years, EAA has carried this banner of personal freedom. We have perservered...and won many battles along the way. I believe that, in some small way, we have made a difference. 125,000 EAA members, speaking with a strong and unified voice, help keep the flame of freedom burning brightly. However, many challenges remain. We need your help to fuel that fire...to build stronger representation in governmental affairs, continue vigorous activities at the local level — through EAA's strong Chapter network — and further develop youth programs so that the aviation challenges of the future can be met with skill, talent and knowledge.

"The price of Freedom is measured not in time but in commitment. Join us. ***Freedom is what EAA is all about.***"

Written by Paul in 1988.