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EAA EXPERIMENTER

SEPTEMBER 2012

Celebrating 50-Year-Old Homebuilts

» **Flight Testing**
Knot What You're Thinking

» **1/3-Scale B-17**
A homebuilt warbird

Chad Jensen

Welcome …
To the "new" *Experimenter*!

Welcome to the new, improved *Experimenter* digital magazine. This is a magazine for homebuilders; we will cover everything from the Mosquito ultralight helicopter to Lancairs. We'll report on amateur-built aircraft and experimental light-sport aircraft as well as ultralights and other light aircraft; it will all fit in this new publication, and we are excited to bring it to you in this new format. EAA has been discussing creating this magazine ever since I joined the staff last fall, and we're happy to now share this first issue with you. Please tell your homebuilding friends about *Experimenter* and encourage them to subscribe. It's free for all. Thank you for your continued support of the world's most dynamic aviation organization.

Many of you reading this may not be aware that EAA has had a Homebuilt Aircraft Council (HAC) for several years. This all-volunteer council was chartered 10 years ago and is a driving force on homebuilt issues. The HAC works directly with me in an advisory role to provide insight on issues that directly affect the experimental amateur-built (E-AB) aircraft community. They also help shape EAA policy as it relates to the homebuilding community regarding safety and governance issues.

For the past few years, the HAC has been understaffed, with only three active members. Over the past year I have worked closely with those three members—Chairman Rick Weiss, Fred Keip, and longtime HAC member Joe Gauthier.

During EAA AirVenture Oshkosh 2012, the HAC wrapped up a six-month search for new members. From the more than 75 applications submitted, four seats were filled. We welcome Gary Baker, Randy Hooper, Keith Phillips, and Dave Prizio.

We have put together a great HAC team with varied backgrounds, but one passion: experimental aircraft. Expect great things from this team in the coming months and years as we work through the toughest issues facing the E-AB community.

To view photos of the members of the Homebuilt Aircraft Council and learn more about their activities, click here.

On the cover: Thomas Bauer flies his Dyke Delta JD-2 into the future. (EAA photo by Jim Koepnick.)

EAA EXPERIMENTER

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Talk to Us!

Welcome again to this first issue of *Experimenter* online magazine. Homebuilders Community Manager Chad Jensen and I are delighted to be working together to bring you this publication, but like any good magazine we'll need to hear from you to know what you like/don't like or wish we'd do to make this magazine the publication you'd like. Can't promise we'll make all your dreams come true, but we'll do the best we can with the resources we have. And EAA has allocated significant resources to make this magazine happen.

To make it easy for you to communicate with us, all you have to do is click here, and it'll automatically open an e-mail message that will show up in Chad's inbox. We'll put that same link in the masthead on this page each month as well. Can't get much easier!

The beauty of an online magazine is that we also can make it easier for finding interesting "stuff" anywhere on the Internet; all you have to do is click on links highlighted in blue text throughout this issue. No need to copy and paste or try to type in confusing web addresses.

Such links can also make a "Letters" page like this more valuable. If you find an interesting discussion online, we invite you to share that with us so we can share it with your fellow members/readers. We'll post the links with a short description of the discussion. Or, introduce us all to an interesting website. For example, have you heard that Burt Rutan has a new website documenting his life and work? Visit www.BurtRutan.com to learn all you want about all things Burt. Yup, that'll keep you busy for a while. (By the way, did I ever tell you I got to fly in Boomerang in 1996? Thanks again, Jack [Cox] and Burt. Sorry, I can't resist mentioning that occasionally.)

Lastly, this magazine is available (free!) for anyone interested in experimental aircraft of any kind—amateur-builts, experimental light-sport aircraft (E-LSA), rotorcraft, and ultralights of all varieties. So help us get the word out and share this issue with anyone you think might find this publication interesting.

Mary Jones
EditEtc. LLC
Contract Editor for EAA *Experimenter*

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AirVenture 2012 a Success

In closing day comments to the aviation and local media, EAA President/CEO Rod Hightower said, "AirVenture 2012 was a real solid event. We had lots of aviation and innovation on showcase this week. Despite struggles in the overall economy, the aviation community knows that Oshkosh is the place to be for not only finding out what's new and available in aviation, but buying the goods and services that they might need in the coming year."

More than 2,500 showplanes registered, including nearly 1,000 homebuilts and close to 1,000 antique, classic and contemporary aircraft. Hightower said, "Including 200 Piper J-3 Cubs to celebrate the 75th anniversary. Thank you Piper Cub owners for making AirVenture special."

Hightower praised the great work of the more than 4,800 volunteers who make the event possible. "I'm very happy with our operational execution, and there were a lot of changes this year," he said. "Volunteers and their staffs did a marvelous job of putting together a wonderful and very solid AirVenture this year."

Numerous exhibitors reported record-breaking sales and high-quality buyers and lots of commercial activity.

Of the nearly 1,000 homebuilders who flew their aircraft to EAA AirVenture Oshkosh 2012, 30 builders went home especially happy, having been rewarded for their workmanship by being recognized for an award. A complete listing of award winners is available here.

Here are some of the major award winners in various categories:

Experimental Amateur-Built Aircraft

Paul Poberezny Founder's Award for Best Classic Homebuilt
Duayne Muhle, Columbus, Nebraska, 1986 Norton Robert R. Christen Eagle II, N32RN

Reserve Grand Champion Kit Built
Wendell Solesbee, Yorba Linda, California, 2012 Lancair Evolution, N7LH

Reserve Grand Champion Plans Built
Michael Finney, Albany, Indiana, 2010 Clipwing J-3 Cub, NX88159

Grand Champion Kit Built
Andy Werback, San Jose, California, 2010 Lancair Legacy, N550AW

Grand Champion Plans Built
Dennis Butler, Houston, Texas, 2009 Cozy III P, N861DB

Rotorcraft

Workmanship Award
Larry Linrud, Velva, North Dakota, Safari, N347LL

Bronze Lindy
Mark Klair, Hernando, Mississippi, Mosquito, N998MK

Silver Lindy
Brent Lavallee, Kitchener, Ontario, RotorWay, C-FOME

Gold Lindy
Nathan Solesbee, Anaheim, California, RotorWay, N62NT

Ultralight/Light Plane

Ultralight Honorable Mention
Sean Sweeney, Reunion, Florida, Demoiselle

Ultralight Reserve Grand Champion
John Steere, Martinsville, Indiana, Bodacious

Flex-Wing Honorable Mention
Keith Sharon, Sturgeon, Missouri, Wasp Wing

Light Sport Honorable Mention
Joseph Maynard, Powell, Ohio, Sorrell Hiperlight, N43594

Light Sport Reserve Grand Champion
Tom and Janet Schuler, Franklin, Wisconsin, Just Aircraft Highlander, N716TJ

We'll present complete reports on many of these award-winning aircraft in upcoming issues of *Experimenter*.

Five EAA Directors Earn Reelection at EAA Annual Meeting

A large turnout of EAA members appeared for the annual meeting of EAA Saturday morning, July 28, at Theater in the Woods.

Five current EAA directors were reelected to Class 1 (three-year) terms on the board by wide margins, including Barry E. Davis, Jack Harrington, David C. Lau, Dan Schwinn, and Alan Shackleton.

The treasurer's report showed generally flat results for the fiscal year that closed on February 29, 2012; generally a break-even year, according to Treasurer Eric Gurley.

An approximate three-percent decline in revenues was largely caused by a decrease in investment income, he said. But the association is in a sound fiscal position to ensure its long-term health and viability.

Near the end of the annual meeting, a number of EAA members spoke during a question-and-answer period.

Longtime EAA Board Member Louie Andrew Retires

After 26 years of continuous service on the EAA Board of Directors, Louie Andrew announced his retirement on August 3, 2012.

"I had planned to retire this year," Andrew said. "It's now time for me to allow the many other talented directors we have on the board to take their turns.

"It has been a great honor for me to serve as a director of EAA," he added. "Without the vision of Paul Poberezny and Tom Poberezny and the hard work of everyone at EAA, we may not have private flying in the future. I am confident that EAA is now in the right place to ensure the future of all of private aviation."

During his last 10 years on the board, Andrew was the chair of the Executive Committee of EAA and vice president of EAA, and over the past year he was chairman of the EAA Board of Directors. He has also served as treasurer of the International Aerobatic Club (IAC), a division of EAA, and had been a member of the IAC Board.

"Louie's long experience on the EAA Board was essential during the leadership transition," said Dan Schwinn, chair of the EAA Governance Committee of the Board. "Louie spent countless hours on the search for a new president and then devoted even more time helping to make the leadership change as smooth as possible."

President Signs Pilot's Bill of Rights

The nation's aviators received expanded due process protection in early August when President Barack Obama signed the Pilot's Bill of Rights (PBOR) text, after it had passed Congress.

"We are very pleased for all aviators now that the Pilot's Bill of Rights has been signed into law," EAA President/CEO Rod Hightower said. "The legislation safeguards the rights of those who fly and improves information availability in a number of areas. We appreciate all the efforts by those in Congress and elsewhere to make this a reality."

The measure was sponsored by Senator Jim Inhofe (R-OK). EAA and AOPA helped craft the issues that became key provisions of the bill and also gathered bipartisan support on Capitol Hill for the measure.

One portion of the PBOR makes significant changes to the enforcement procedures used against pilots by the FAA. Another portion addresses the medical certification process, while the bill also involves improving how the FAA disseminates the information in notices to airmen, or NOTAMs.

EAA Receives Van's RV-1

Van's Aircraft Founder Dick VanGrunsven formally handed over the plane that started it all—the RV-1—to Rod Hightower on AirVenture opening day. The aircraft, restored and donated to the EAA AirVenture Museum by the Friends of the RV-1 Inc., helped kick off the Salute to Van's 40th Anniversary. Van's has requested the airplane be kept airworthy.

FAA Issues Draft Residential Through-the-Fence Policy

The FAA Modernization and Reform Act of 2012 signed into law last February included authorization for GA airports to enter into access agreements with residential property owners adjacent to or near the airport—Residential Through-the-Fence (RTTF). This past week, the FAA published an RTTF revision that complied with the new law and addressed two specific sections for which EAA sought clarification from the FAA Airports Division:

- (2)(B)(iii) To maintain the property for residential, non-commercial use for the duration of the agreement; and
- (2)(B)(v) To prohibit any aircraft refueling from occurring on the property.

EAA successfully fought to ensure that RTTF homeowners would continue to have the same rights as on-airport aircraft owners, including self-fueling and self-maintaining their aircraft, and contracting with any repairman, A&P mechanic, or other aircraft maintenance experts to maintain their aircraft in the safest condition possible.

This win for GA airports was the result of a three-year effort by EAA and the RTTF Airport Working Group. The new policy will allow for single- or multifamily dwellings; duplexes; apartments; primary or secondary residences even when colocated with a hangar, aeronautical facility, or business; hangars that incorporate living quarters for permanent or long-term use; and time-share apartments for variable occupancy of any term to have controlled direct access to the airport for flying.

RV-14 Debuts

AirVenture attendees got a big surprise on opening day when the much-rumored Van's RV-14 led a parade of RVs to open showcase flights prior to the air show.

Ken Scott of Van's described the airplane as a cross between "a big person's RV-7 and a two-place RV-10." It's powered by a Lycoming IO-390 and has 50-gallon fuel capacity. First flight was in April, and the company is "very happy" with the results of the full flight test program, Scott said. See the September issue of EAA Sport Aviation for a flight review of the aircraft.

» For more information, visit www.VansAircraft.com.

Read a flight review of the RV-14 in the September issue of EAA *Sport Aviation*

Sonex Aircraft Adds New Quick-Build Parts

Sonex Aircraft LLC added new prefabricated parts to its popular Sonex and Waiex kits, making the airframe easier and faster to build than ever before. The complete airframe kits and sub-kits now feature matched-hole formed parts. The new parts lists consist of channels, angles, and clips that would traditionally have been made by the builder from preformed sheet aluminum blanks provided in earlier Sonex kits. These pieces not only reduce fabrication work for the builder but also reduce build time and increase building accuracy.

» For more information, visit www.SonexAircraft.com.

AKIA Launches to Address E-AB Safety Issues

The Aircraft Kit Industry Association (AKIA) formally organized during EAA AirVenture Oshkosh 2012. AKIA's mission is to represent aircraft kit manufacturers, designers, suppliers, and supporters with a unified voice in the promotion and safety of the aircraft kit industry.

The 14 charter members formed AKIA after the NTSB issued 16 recommendations regarding experimental amateur-built (E-AB) aircraft safety.

"We don't manufacture aircraft; we make aircraft parts," said Dick VanGrunsven, founder and CEO of Van's Aircraft and AKIA's president. "Our customers buy those parts, and they manufacture the aircraft. But we do have a direct link to E-AB aircraft, and it's time we make our presence known and become proactive in addressing safety issues." NTSB cites the first preflight, Phase 1 flight testing, and transition training for pilots as key areas to address.

Post-AirVenture, AKIA the group invited three prominent figures in aviation to provide guidance and counsel through an Advisory Board. They include: Tom Poberezny, past president of EAA; Frank Christensen, Christen Industries, who revolutionized the kit aircraft business with the introduction of the Eagle aerobatic aircraft kit in 1977; and Dale Klapmeier, CEO of Cirrus Aircraft, who got his start in aircraft kit manufacturing with the VK-30 and has gone on to lead Cirrus Aircraft

Rotax 912 iS Gets ASTM Approval

BRP's new Rotax 912 iS aircraft engine is now certified to ASTM standards, a certification that's necessary for sale of the engine in markets worldwide.

The "i" stands for electronic fuel injection, and along with an automotive-style digital engine control unit, it should deliver 38 to 70 percent better fuel efficiency than comparable competitive engines in the LSA, ultralight, and GA industry, Rotax Director François Tremblay said.

BRP also entered into a long-term contract with TL-elektronic Inc. of the Czech Republic for its glass cockpit engine monitoring system for the Rotax 912 iS. This instrument will be distributed via the Rotax aircraft engine distributor network under the brand name Rotax Integra.

The Integra EFIS and EMS is a multifunctional system that monitors both flight and engine parameters. It integrates all primary flight instruments—altimeter, vertical speed indicator, airspeed indicator, compass, accelerometer, chronometer, turn-indicator with inclinometer, angle of attack indicator, internal air temperature, external air temperature, and more.

» For more information, visit www.TL-elektronic.cz or www.FlyRotax.com.

Glasair Sold to Chinese Investor

Glasair Aviation LLC of Arlington, Washington, has been acquired by China's Jilin Hanxing Group Co. Ltd. (JHG). Feng Tieji represented JHG at EAA AirVenture Oshkosh 2012. Glasair Aviation makes the Glasair, Glastar, and Sportsman lines of kit-built aircraft and has delivered about 3,000 airplane kits around the world.

Tieji said, "The acquisition of Glasair by the Hanxing Group is great news for everybody. China has the largest potential [GA] market in the world, and we're eager to speed up and expand the China market with Glasair."

JHG has established Glasair Aviation USA LLC as the new operating entity for Glasair's kit aircraft. "We would like to leverage the great experience of Glasair, and continue to invest in this great company,

and continue to grow the market in the U.S. and worldwide," Tieji said.

Tieji plans to retain Glasair's U.S. headquarters, management team, and current employees. Glasair's popular Two Weeks to Taxi program will also be retained.

Wicks Aircraft Launches New Website

Wicks Aircraft Supply Co. has introduced a more interactive, customer-friendly website. Improvements include a better search engine and a shopping cart that does not time out. A "Compare Features" tool allows customers to pull up the product pages they wish to compare and view them side by side. Check out the new website at www.WicksAircraft.com.

Cessna to Change Skycatcher Certification

Cessna will transition its Model 162 Skycatcher from the LSA category to the Primary Category under Part 21 of the FARs. With that move, countries that do not currently recognize the LSA category will now certify the Skycatcher. "What they ask for is a [type certificate] and a [production certificate]," said Tracy Leopold, business leader for the Cessna 162. "With LSA we don't have PC."

The European Aviation Safety Association's CS-LSA requirements were included in the transition effort.

With that inclusion, Cessna expects European acceptance of the Skycatcher through a simple validation effort once FAA approvals are complete.

The Skycatcher still qualifies as an LSA in the countries that recognize the category, including the United States. Sport pilot training in the airplane and operation under light-sport rules will continue unchanged.

» For more information, visit www.Cessna.com/single-engine/skycatcher.html.

Continental Goes Diesel

Continental Motors announced an ambitious expansion of its GA diesel engine development and certification program, with the goal of creating turbo diesel engines to cover the entire power range of its current engine line.

"We will certify our first diesel series this year," said Continental Motors President Rhett Ross. "More importantly we will be in production in Q1 of 2013, at an initial rate in excess of 200 engines per year."

The turbo diesel series will initially incorporate three models: the TD220 (160- to 180-hp range); TD300 (200 to 250 hp); and TD450 (300 to 350 hp), with the TD300 first in line for certification and production. The TD300 is scheduled to commence production in Q1 2015, followed by the TD220 in late 2016 or early 2017. Lycoming also will begin certification on a 200-hp and below engine that will operate on unleaded fuels, including 91 octane.

Continental's development of the diesel and unleaded fuel-burning engines is driven by the pressure to move away from 100LL, and the absence of this avgas in many parts of the world.

Quicksilver Under New Ownership

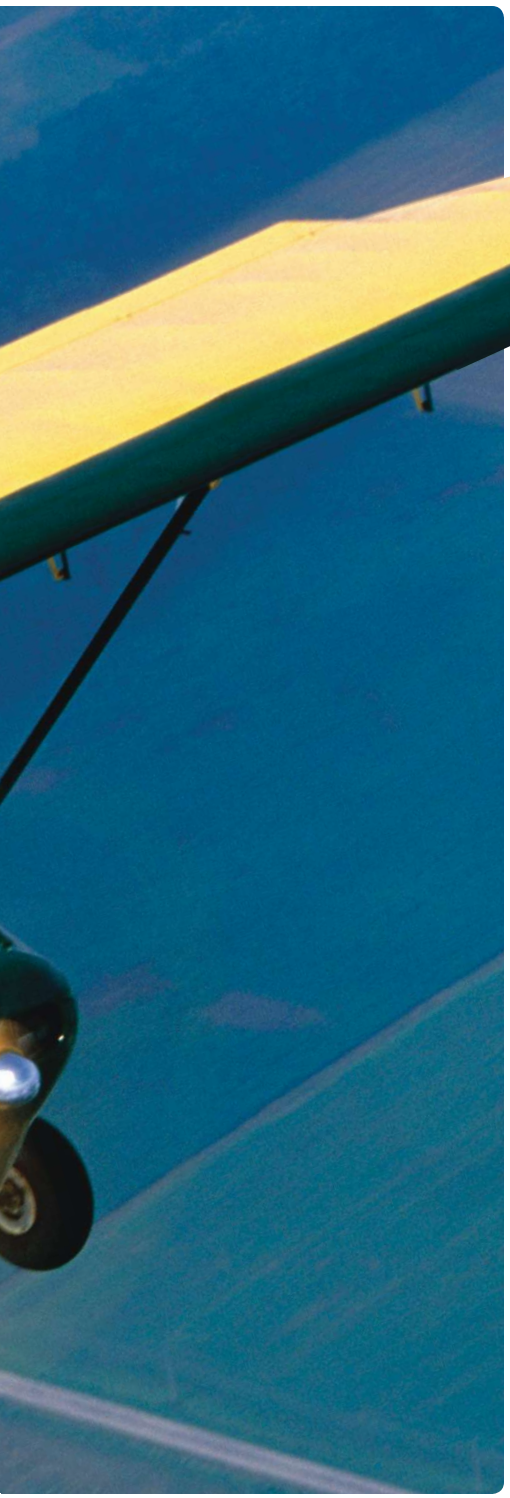
The new owners of Quicksilver Manufacturing, renamed Quicksilver Aeronautics LLC, recently announced plans to take the product line into the light-sport aircraft arena. President Will Escutia and co-owner and Chief Operations Officer Daniel Perez now manage the company.

Quicksilver began as a hang glider manufacturer in the late 1970s, and today, with more than 15,000 aircraft delivered, is one of the kit aircraft industry's most successful companies. Its MX series includes the single-seat Sprint and Sport, two-place Sprint II, Sport II and Sport IIS, while its GT series includes the single-seat GT 400 and two-place GT 500.

Perez said the company plans to introduce several of its models as LSA. Quicksilver plans to certificate the GT 500 and Sport IIS as Primary Category aircraft, which will help sales in Europe. The GT 500 was the first aircraft certificated in the Primary Category 25 years ago.

Celebrating Older Homebuilts

Earl Luce pilots his Wittman Buttercup that he completed in 2001.



50+ YEARS and still flying

By Mary Jones

"You're building a what where?"

Do you tire of people asking that question when you tell them you're building an aircraft in your shop/basement/garage? I'll confess when I first heard about people building their own aircraft many years ago, I looked askance at first, too. But one only has to think about the reality of how airplanes came into existence to understand that building an aircraft in a garage, basement, or home shop is how all the first airplanes came into existence. The Wright brothers, Les Long, Ed Heath, Bernie Pietenpol…even C.G. Taylor, Clyde Cessna, as well as all the other aviation pioneers had no aircraft company to build their aircraft. They had to do it themselves—at home. Only over time did production demands create the need for aircraft factories.

This year at EAA AirVenture Oshkosh 2012, several homebuilts celebrated significant anniversaries. Steve Wittman's Buttercup hit the 75-year mark, while several homebuilts celebrated 50-year anniversaries, including John Dyke's Dyke Delta and Pete Bowers' Fly Baby. While John Thorp was deep into designing his T-18 in 1962, it didn't fly until 1963. Many more homebuilts have passed the 50-year mark, but we'll focus on these more well-known designs.

What was the inspiration for these homebuilders to design the particular aircraft they did? We reviewed the archives of *Sport Aviation* to find out… hoping to inspire today's designers and builders to put their creative energies to work to continue the evolution of homebuilding.

Steve Wittman's Buttercup

An the height of his air racing career in the 1930s, Steve Wittman needed an airplane to ferry parts to various race sites to keep his racers *Buster* and *Bonzo* flying competitively. At the time, he also was the fixed-base operator at the Oshkosh Airport (later to be renamed Wittman Field in his honor), and the airplane helped keep parts in supply there, too. After flying many of the airplanes (Aeroncas, Cubs, Taylorcraft) developed to fly behind the "new" flat-four engines developed by Continental and Lycoming, Steve said, "I just felt they weren't getting the performance they should for the horsepower…each of them was lacking in some respect or another. I accumulated a personal list of features I would like in a personal small airplane, and to get them I had to design my own airplane."

The airplane also served another purpose. By then Steve had designed and patented his leaf spring landing gear. And thinking it was "the best thing since the wheel was invented," he wanted an airplane that could demonstrate the landing gear's capabilities. Thus, he designed and built Buttercup in 1937, first flying it in 1938. The side-by-side, two-place airplane was powered by a C-85 engine, would top out at 150 mph, and had amazingly short takeoff and landing rolls.

Were it not for World War II, Jack wrote in "Buttercup," the impressive design may have gone into production. On a cross-country trip home from Washington, D.C., a chance landing at the Hagerstown, Maryland airport to avoid storms brought the homebuilt to the attention of the owners of Fairchild Aircraft. After thoroughly examining the airplane, Fairchild made an offer to Steve to put the airplane into production, using a Continental A-65 engine. Earnest money was exchanged, a new engine mount was designed…and eventually Steve was asked to modify the airplane into a four-place machine, all of which was rolling along smoothly until an Army Air Corps inspector came to check on the production of Fairchild PT-19s and told Fairchild, "This is a war effort. You make PT-19s, period." The end.

That production hope dashed, Steve used Buttercup as a test bed for his many other innovative ideas over the years. He and his first wife, Dorothy, who was also a pilot, flew Buttercup all over the United States, Mexico, and the Bahamas—and it was their primary transport between their homes in Oshkosh and on the Leeward Air Ranch in Florida—until its fabric grew weary in the early 1960s. By then Steve had designed the faster Tailwind, which he used for most of his travel. Still, Buttercup was brought out occasionally for a cross-country trip. When Steve and his second wife, Paula, perished in the crash of their O&O Special in April 1995, Buttercup went into the Wittman Hangar on EAA's Pioneer Airport.

But…the design now has a second life, thanks to the efforts of Earl Luce of Brockport, New York. A veteran Tailwind builder, Earl also admired the Buttercup. He says he kept Jack Cox's 1989 article about Buttercup at his bedside for years. Finding himself missing the landings he would make at some of the smaller strips he'd landed at before he built the faster Tailwind, Earl decided to tackle replicating Buttercup. While at EAA's annual convention in 1997, Earl took detailed measurements of Buttercup, returned home, and started cutting tubing. Three-and-a-half years later, his Buttercup made its first flight, and he's been flying it regularly since. (It was featured in the April 2003 issue of *Sport Aviation*) Since then, Earl has sold more than 100 sets of plans for Buttercup, and several more examples are nearly ready for flight. You can learn more about Earl's replica Buttercup and a tri-gear version he's currently refining—as well as order plans—at Earl's website, www.LuceAir.com.

Golden Anniversary Homebuilts

The early 1960s was a prolific time for homebuilts. A review of the contents of *Sport Aviation* from 1960 to 1965 offers an incredible list of new homebuilts introduced. Some were successful, others not so much. The inspiration for this surge in new designs very likely was an EAA Design Competition announced in 1957. Organized by Paul Poberezny and Bob Nolinske, then EAA's secretary/treasurer, the competition had an original completion date of the 1960 fly-in. That timeline proved too challenging, so the deadline was extended to 1962. More than 40 designs entered the competition, but by the time the 10th annual EAA fly-in convention began in 1962, only six entries were presented for judging: Pete Bowers' Fly Baby, Eugene Turner's T-40, Leonard Eaves' modified Cougar, Tony Spezio's Tuholer, Leon Tefftt's Contestor, and Joe Lacey's Lacey M-10.

The goals of the competition were to develop an aircraft:

1. for sport flying
2. that was easy and safe to fly
3. that could be taken to and stored in a garage
4. that was especially suited for amateur construction
5. that could be built and operated at moderate cost.

Bowers Fly Baby

In the end, the Bowers Fly Baby won the competition, with the T-40 taking second, followed by the modified Cougar in third place. The Fly Baby enjoys the greatest long-term success; plans are still available (Visit Ron Wanttaja's unofficial Fly Baby website www.BowersFlyBaby.com for more information.)

Interestingly, Bowers had started designing the all-wood Fly Baby in 1951. The idea for the aircraft came from a Class A/B gas model airplane that Bowers had built in 1940, with which he set some model airplane records. One important factor for Bowers was that the aircraft have low-span loading, Writing in "The Fly Baby Story" in the December 1962 issue of *Sport Aviation* and referencing the successful early homebuilts constructed by Les Long and Tom Story, Bowers said, "The 'Wimpy,' 'Little Gee Bee,' and the Storys all got their good performance on low power mainly from a feature well known to the prewar homebuilder… low-span loading…It's not a given area and wing loading that does the job; it's the span that the area is distributed over."

When the EAA Design Competition was announced, Bowers was motivated to complete the design and build the aircraft. In fact, Bowers built the Fly Baby twice—once for the 1960 contest that was postponed and then again after the plane crashed while being flown on a local flight by another pilot. That happened in April 1962 and sent Bowers into a flurry to rebuild the aircraft for the 1962 competition. The story of that effort is fully detailed in Bowers' 1962 article.

Dyke Delta

But not every homebuilder of the time was focusing on the design competition. Other airplanes under development in that same time frame include the Dyke Delta, the Pazmany PL-1, the Thorp T-18, and Volmer Jensen's Sportsman amphibian. Technically, some of these aircraft hadn't yet flown by 1962, but they certainly count among some of the more well-known homebuilts of that era.

Inspired by Alexander Lippisch's delta-wing designs, John Dyke had a goal of creating a delta-wing aircraft that would be trailerable (so it could be stored at home) and easy to construct. He also wanted enough room to transport his then family of four. The airplane had a true, distinctive, double-delta design with folding wings. It was built with 4130 tubing and covered with fiberglass and fabric. The one-plus-three flight deck is

John Thorp's T-18

one of the airplane's unique elements, giving the pilot ample room up front, with a bench seat across the back for three passengers.

Like Bowers, Dyke started by building unpowered models of his proposed delta-wing design. He built a mount for the roof of his car for "wind tunnel testing," which helped determine lift and drag. In the "Evolution of the Dyke Delta", he wrote that the most valuable information he gained from those tests "was the craft's actual neutral center of pressure location." He followed that testing by putting a .049 model airplane engine on the model and repeating the testing. He wrote, "A startling difference was noted in the results—lift was increased by from 35 to 40 percent, the model was exceptionally stable, and the engine thrust did not change the trim because the thrust line was symmetrical with [the] airfoil and center of drag." Dyke began construction of his Delta in September 1960, and the first flight was made on July 22, 1962. Plans for the Dyke Delta are still available from John Dyke, 2840 Old Yellow Spring Road, Fairborn, Ohio 45324.

Thorp T-18

In the same time frame, John Thorp was contemplating developing an all-metal homebuilt. Being an aeronautical engineer at Boeing no doubt increased his familiarity with metal, and he became convinced that an all-metal airplane could be simpler to build than the all-wood aircraft so popular at that time.

Writing in Sport Aviation in February 1962, Thorp said, "Advocates of wooden airplanes have claimed low cost and simplicity. Actually they are only simple by virtue of being unsophisticated…I believe that Joe Kirk's designs appear simple only because of what is not shown. [At the time, Joe Kirk had a published series of articles highlighting easy-to-build wooden designs.]

"I decided to see what I could do with a metal airplane following Kirk's theme…my resulting design, I believe, can be built by an amateur in less time and for less money than any design ever produced for homebuilding regardless of its capability as an airplane."

After making that statement, Thorp set about proving it by publishing a series of articles on how to build his T-18 design in *Sport Aviation*. The articles showed up monthly starting in May 1962. Overall, 14 articles were printed between then and August 1965 when the series concluded. John Thorp first flew his T-18 in 1963.

Originally designed as an open cockpit airplane, the T-18 evolved into having a sliding bubble canopy before the first plans-built model was completed. With a bent wing reminiscent of the popular Corsair World War II fighter, the T-18 went on to become one of the most popular homebuilts of the time, especially after Thorp refined the famed matched-hole tooling concept of building. (A CAFÉ flight test report about the T-18 is available. See also Budd Davisson's article about Lee Walton's restored T-18 in this issue of *Experimenter* on page 18.)

It's clear that the 1960s was a heyday of homebuilding activity, with nearly all designs built entirely from plans. The beginning of aircraft kits was hinted at when folks like Thorp and others began supplying some parts for builders. Realistically, the number of homebuilt aircraft on the FAA registry would never have surpassed 30,000, as it did a few years back, without the advent of aircraft kits. Still, it's hard not to wax a little melancholy when reading about the classic homebuilts celebrating multiyear anniversaries.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You Can't Keep a Good Plane Down

Lee Walton and his recycled Thorp T-18

By: Budd Davisson
Photos by: Tyson Rininger

The Thorp T-18 is just a year short of being 50 years old. Does that make it an antique or a well-experienced but still very current homebuilt design? We opt for the latter since many are still under construction, and plans and partial kits are available from Eklund Engineering, www.ThorpT18.com. The T-18 is just as useful now as it was in 1963; designs such as the T-18 are essentially ageless.

There is another angle to having a homebuilt design being half a century old: Lots of them are being rediscovered as projects or simply abandoned airplanes. Lee Walton's airplane could be considered to be both a project and an abandoned airplane. Lee, a corporate pilot turned software engineer from Houston, Texas, said, "Thorps have been in my family since I was very young. Dad and I built one beginning when I was four and finished it when I was eleven. We flew it all over the country together; it's the airplane I learned to fly in.

Lee Walton and his newly restored T-18.

"When Dad passed away, we sold the airplane to a close friend, Wendell Green, in Fort Worth and made him promise to not change anything, and he didn't. Twenty-two years later, in 2009, I took it to the Sun 'n Fun Fly-In and won Grand Champion Custom Built; that was 29 years after it was built with no changes done to it."

Lee graduated from college with a computer science degree but decided he'd prefer a career in aviation. With that goal, he started flying corporate/charter, but after five years, he discovered that in the corporate aviation world his schedule still wouldn't allow him to engage in the kind of aviation he loved most.

"It wasn't until I switched over to software that I had time to consider owning an airplane," he said, "and the first one that came to mind was a T-18. Wendell still owned Dad's Thorp, but I couldn't bring myself to ask him to sell it to me. However, he knew of a Thorp airframe that had been sitting in the back of a hangar for more than ten years. I looked at it, and even though it was incredibly filthy, it didn't look bad at all.

"The airplane had been a flying airplane, but at one point it had been damaged when it came down in a cornfield. That chewed up the belly and the ailerons, but not enough to make them unairworthy. They were, however, not built straight and had too much Bondo in too many places. I reskinned both outer panels to get them straight, using a parallel-bar jig to hold them square."

John Thorp's Design

John Thorp conceived the T-18 as an economical, easy-to-build, around-the-patch airplane that could be towed home. (By pulling pit-pins, the wing would drop out of the bottom and would be cradled lengthwise along the top of the fuselage, top side down.) However, it's highly unlikely that even one T-18 was built to that concept. The original drawings showed the aircraft with an open cockpit, with a converted, $125-surplus Lycoming O-290-G ground power unit engine driving a fixed-pitch prop. The cylinders were exposed J-3 Cub style.

That was the concept. The realities, however, were quite a bit different.

The first T-18 to fly was Bill Warwick's, which had a 180-hp Lycoming engine and a constant-speed propeller, and that set the norm. The "Sunday morning flyer" had become a fast, sporty, cross-country airplane.

While Lee had the wings of his T-18 apart, he took the opportunity to make a modification aimed at improving its cross-country capabilities. Lee said, "I wanted more fuel, so a friend of mine, Tom Hunter, came up with the idea for F-86-style drop tanks. I thought they looked pretty cool. So he had them made, and I bolted them on. They're semi-permanently attached to a rectangular rail that mounts to the outer panel attach fittings. They only weigh around 5 pounds a piece and hold 6 gallons each. With them in place, I only see a 2- or 3-mph penalty, so they are efficient and really handy.

"The center section was pretty square with only minor damage, but I installed new flap hinges and plumbed it for fuel and replaced the anti-servo tabs on the tail. That's critical on a Thorp's stabilator. Then it was time to tackle the fuselage."

John Thorp's goal of simple construction led him away from curves and toward straight lines, which is one of the things that contributed to the fuselage's somewhat boxy appearance. But it is also one of the things that makes Thorp's "matched hole" tooling process work. In this process, when a line of holes is drilled/punched into a part (rib, frame, etc.), a strip of aluminum is clamped/clecoed to the part and the holes drilled through that at the same time. This strip is then used as a drill guide to ensure that the holes drilled on the matching part are positioned identically. In theory, no jigs are required; the builder drills all the holes in all the parts, and they magically cleco together like Legos. Done correctly that's exactly what happens.

Lee said, "The fuselage was actually pretty good, considering it had landed in a cornfield. I had almost no repairs other than to replace the forward skin and clean up what looked like an antenna farm, one of which was a coat-hanger VOR antenna on the vertical fin. I removed and remounted only what was needed. I did, however, do a lot of updating; it's safe to say that every wire, hose, nut, and bolt has been replaced on this airplane. For one thing, the instrument panel had probably been pretty high quality for a homebuilt in 1975, when the airplane was originally built by Bill Sattler in Nashville. It had ADF/DME and dual navs, which not many homebuilts had at the time. Now, they were just swap-mart material, which was okay.

Lee added F-86-style drop tanks to increase the range of this aircraft.

The tanks hold six gallons of fuel each and Lee says he only sees about a two to three mph loss in speed.

Lee's first flight in a T-18 was in the jump seat of John Shinn's T-18, so he added a jump seat into his airplane. "It's a bit nostalgic."

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

For the latest news of the Thorp community, log on to Lee Walton's newsletter at www.ThorpAirCommand.com. For availability of limited components for the airplane, visit Eklund Engineering's website at www.ThorpT18.com.

» Click here to view a gallery of Lee's restoration photos.

"I bought very little 'new' stuff. Instead I was continually prowling around eBay and Barnstormers and cruising the Sun 'n Fun and AirVenture parts exchanges. I also worked with a salvage outfit that gave me a really good deal on Silver Crown equipment.

"I did a bunch of work on the interior that included building a set of Thorp aluminum tube seats to replace the heavy plywood seats that were in it. The seat upholstery was the only thing I farmed out. I did it in tan leather that had been salvaged out of a Pilatus that was being reupholstered. I installed a jump seat in the baggage compartment, as designed by one of the great Thorp trailblazers, the late John Shinn. There may have been a little nostalgia attached to that decision because my very first ride in an airplane was in the jump seat of his T-18, as a child.

"The engine was unusual in that it's a 180-hp Lycoming O-360-A1G6, which has a rear-facing induction unit. That's really nice because that means no scoop in the bottom of the cowling. I liked that because the cowling was pretty special: It's one of the few that is all aluminum. It even has an aluminum nose bowl.

"The engine and airframe logs both say the total time was around 400 hours. So I pulled a cylinder before starting it to check the cam for rust and generally inspect the inside of the engine. It looked good, so I was ready to go. The Hartzell constant-speed propeller looked good, but I had it overhauled anyway."

So now that he has the airplane in the air, what are his plans for it?

"Originally, I thought I'd sell it," he said, "but while flying it to Oshkosh 2011, I decided I'd keep it. I know it well, and it's just too good of an airplane to sell. I plan on rebuilding more Thorps, but this one I'll keep. Where else can I get an airplane for this price that will cruise an honest 190 mph true at 7,500 feet while burning less than 9 gallons an hour, climb 1,000 feet per minute while in a 150-mph cruise climb? I bring it over the fence at 90 and am on the ground at 70 mph.

"This is a high-performance airplane at a low dollar. More people ought to be building it. Even if building from scratch, with no kits, you won't have much more time invested in it than an RV or something similar, and it'll be much less expensive. I think it's the biggest bang for the homebuilder's buck." And this brings us back to the question of whether the T-18 is an antique or a well-experienced contemporary homebuilt design. We think the latter applies.

Chapter Major Achievement Awards Presented at AirVenture 2012

EAA hosted its annual Chapter Leaders Breakfast and award ceremony gathering Saturday, July 28, in the Founders' Wing of the EAA AirVenture Museum in Oshkosh.

EAA President/CEO Rod Hightower offered some remarks to the leaders, pledging that the organization would support them in their efforts to grow their chapters, attract young members, and engage in their local communities.

"When I see something that works, I am a famous thief of good ideas," he said. One of the things he learned during his 47 Grassroots Pilot Tour stops over the past 18 months was that "There are some great chapters out there."

Awards were presented in three categories: Major Achievement, Web Editor, and Newsletter Editor.

Major Achievement Awards

Robert Baker, EAA Chapter 92, Coto de Caza, California, became a "later-in-life" pilot at the age of 61. He served as the chapter's vice president and is currently the chapter's webmaster and Young Eagles coordinator. During 2011, Robert flew 50 of the chapter's 300 Young Eagles.

Philip Hazen, EAA Chapter 44, Rochester, New York, has served as the chapter president, vice president, and webmaster and has been on the board of directors since 1985. He has also been active in the Young Eagles program since it started in 1992 and currently is the Young Eagles coordinator.

Martin Sutter, EAA Chapter 983, Granbury, Texas, has been active in three chapters. He has served as president and treasurer of EAA Chapter 661; vice president of EAA Chapter 34; and technical counselor,

Chapter award winners include—back, left to right: Martin Sutter, Philip Hazen, Beth Rehm, Gary Piper, and Art Schwedler (representing Rod Hatcher). Front, left to right: Tom Ridderbush (representing Avril Roy-Smith), Rod Crum (representing Martin Sutter), Robert Baker, and Matt Gregg (representing Martin Sutter).

chairman, and food services manager for EAA Chapter 983. He actively assists in fly-in events and offers his advice, encouragement, or hands-on support to anyone in sport aviation.

Web Editor Award

The EAA Chapter Web Editor Awards recognize the commitment and creativity that editors put forth to maintain their chapter's informative and high-quality websites.

Earning first place this year was Rod Hatcher, EAA Chapter 839, Saylorsburg, Pennsylvania. Second place went to Gary Piper, EAA Chapter 863, Lebanon, Tennessee. Gary also serves as newsletter editor and Young Eagles coordinator. The third-place award was presented to Matt Gregg, EAA Chapter 180, Sarasota, Florida.

Newsletter Editor Award

The EAA Newsletter Editor Awards recognize those editors who have shown excellence in their newsletters while focusing on content, layout, appearance, and consistency.

The first-place award went to Beth Rehm, EAA Chapter 932, Wonder Lake, Illinois. Avril Roy-Smith, EAA Chapter 723, Camarillo, California, was named second-place winner. Marty Santic of EAA Chapter 75, Quad Cities, Illinois, was awarded third place.

Editor's Note

Homebuilders often find great motivation from fellow EAA members whom they connect with at local chapter activities. How does your chapter support homebuilders? We'd like to hear about your chapter activities as they relate to homebuilding. Send your news to Experimenter@eaa.org.

Thanks!

First Chapter Eagle Flown

Harry Saint-Germain of Lawrenceville, Georgia, wants to be a pilot. A few months ago, Harry, 20, contacted Duane Huff, a member of EAA Chapter 690 based at Gwinnett County Airport, Briscoe Field (LZU), asking about the Young Eagles program, but Young Eagles is for kids ages 8 to 17.

But Duane told Harry to call back after EAA AirVenture Oshkosh, when EAA's new Eagle Flights program that caters to adults who want to learn how to fly was to be launched.

Harry called back July 31, two days after the convention. Two days later he and Duane took off in Duane's 1947 Aeronca Chief for a 30-minute flight around the area. They overflew local landmarks like the Mall of Georgia and Lake Lanier, and Duane showed Harry how to maneuver the airplane.

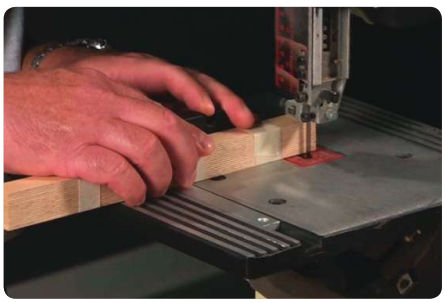
"Harry's grin and his questions throughout the flight let me know that he really enjoyed the flight," Duane said. To learn more, visit the Eagle Flights website, or call 800-557-2376.

Easier Communication

Do you have a problem with wind affecting your voice-actuated intercom?

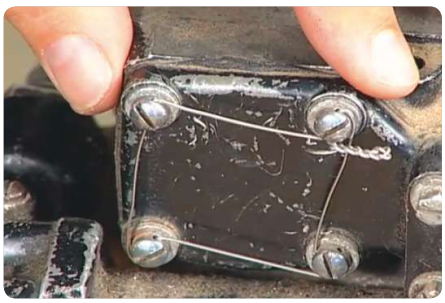
On the Light Sport Aircraft Yahoo group, Ron Hill had a solution for his uncooperative voice-actuated intercom. His mic in the front cockpit, where he sits behind the windshield in his tandem two-place Challenger II, works fine, but his wife's intercom was always being actuated by wind noise locking out Ron's mic. This made conversation between Ron and his wife nearly impossible.

He tried the Oregon Aero MicMuff Mic Cover designed for high noise environments. It has a foam microphone cap and a little vinyl bag cover. But that still wasn't enough to solve the problem. The dynamic wind pressures were very different. His solution was a mini windshield for the mic. He took the bowl of a plastic spoon, trimmed it to size, then inserted it between the cover and the foam over the mic, acoustically covering the front of the mic. This reflected the wind pressure enough that the wind noise was balanced, giving them both had about the same actuation threshold. Ron says this fix has restored marital bliss in his Challenger.



Cutting Plywood Gussets

Wood wings typically have a large amount of thin, small plywood gussets, many the same shape. Timm Bogenhagen from the EAA staff shows you a simple yet speedy way to stack and cut many gusset pieces with one cut. Watch the video.



Safety Wiring

Brian Carpenter, of Rainbow Aviation in Corning, California, demonstrates how to safety multiple fasteners together, watch "Safety Wiring Multiple Fasteners."

In a second related hint, Brian demonstrates safety wiring via the "Single Wire Method." Brian is an A&P/IA, DAR for LSA and experimental amateur-builts, sport pilot instructor examiner, and CFI. Brian also serves as an EAA technical counselor and flight advisor for Chapter 1148.

Jack Bally's B-17

A 1/3-scale wonder

By: Chad Jensen

Many of you have heard or read about Jack Bally and his 1/3-scale B-17 project over the last few years. I first read about him and his rather enthusiastic undertaking in the June 2009 issue of the EAA Experimenter e-newsletter. A few updates have cropped up here and there since, but no one had reported on the project firsthand. With the launch of this new *EAA Experimenter* digital publication, we thought it was time for an in-person update.

Jack and his wife, Carolyn, have created a home in the woods out of a machine shop. "Machine shop" sounds kind of dingy and dirty, but this place is impressive. It's clean, light, and very conducive to building airplanes—something Jack is absolutely passionate about. As I walked into the wide open doors of his shop, I immediately noticed the fuselage of the B-17 hanging in plastic wrap from the rafters. It is more or less finished, just waiting to be lowered and mated to the wings again. It was hoisted up to the rafters shortly after the wings were mated the first time, and the work Jack has been doing since then has been heavily concentrated on the systems in the wings and engine installations.

During my visit in June, Jack was working on the intake system for each engine, but he was able to show me how the landing gear retraction system works, as well as the flaps and ailerons. The level of detail in his work is simply astonishing. I kept wandering off into Detail Land while admiring the work and would forget that I am looking at a real, soon-to-be-flying airplane. There are so few places that Jack had to bend the scale rule on this airplane. Every time he would show me some detail, all I could say was "Wow."

The rivet lines are correct, the size of the cowls are correct—even the stiffeners inside the cowl are correct! The landing gear actuates properly, and the propellers are scale. It's just simply an amazing sight to see all of this in person; pictures just don't do it any justice.

Jack has had many visitors over the years he has been building this airplane, and several of them were former B-17 pilots or crew members. Listening to Jack talk about the visitors is another story; this scale airplane is so accurate that many of his visitors were at a loss for

words and simply stared in amazement at it, oftentimes requiring their own moment of silence. Jack's shop is lined with B-17 posters and memorabilia, so he is surrounded with documentation to help keep the airplane as accurate as possible.

He is building this replica from a set of Don Smith 1/9-scale, radio-controlled (RC) airplane plans. Jack has many, many sets of RC B-17 plans, but the Don Smith plans were deemed to be the most accurate among the collection. He spent some time going over the pages and pages of plans with me, showing me a couple of places where even the most accurate plans had to be massaged a little bit. Fabricating parts from the drawings is something Jack is supremely comfortable with. Some of the more complex parts are some of the most beautifully crafted parts on the airplane…all made right there in Jack's shop.

Having the right tooling is essential to building a scratchbuilt airplane of this magnitude, and Jack has them all: Mill, lathe, planner, jointer, all the big stuff we like to play with. Take, for example, the spinners for the propellers. To make them scale, Jack had to find something that matched the size needed. His outside-of-the-box thinking comes into play here. Rather than looking for some sort of cup-shaped item, he noticed that a part of a home air-conditioner unit had the appropriately sized "bowl" to make into a spinner. However, that bowl wasn't actually a bowl; it was a cylinder with lots of stuff inside of it. "Why not just whack it in half, remove the insides, and toss it in the lathe to match the shape?" Jack said to himself. That's the kind of stuff that hooked me to every word Jack had to say.

The engines on the airplane are four-cylinder, two-stroke Hirth F30s, good for about 85 hp each if they are allowed to turn up to their full-rated rpm of 5500. Jack doesn't plan to turn them that fast, but he plans to run them at an rpm that will net about 60 hp each, giving him 240 hp total to lift an airplane roughly the same size and weight as a Cessna 152. I sort of imagine an angry hornet's nest as the sound this airplane will make as it passes by going full tilt. These engines have provided plenty of head scratching for Jack as he makes

The spinner for the propellers is made from a home air conditioner part, sliced in half, and machined to fit and look to scale.

adjustments to them to fit in a properly scaled cowl. The cylinder heads were turned 45 degrees to allow better clearance, and in doing so they had to be machined slightly to fit. It makes for an interesting look, but still should provide adequate cooling.

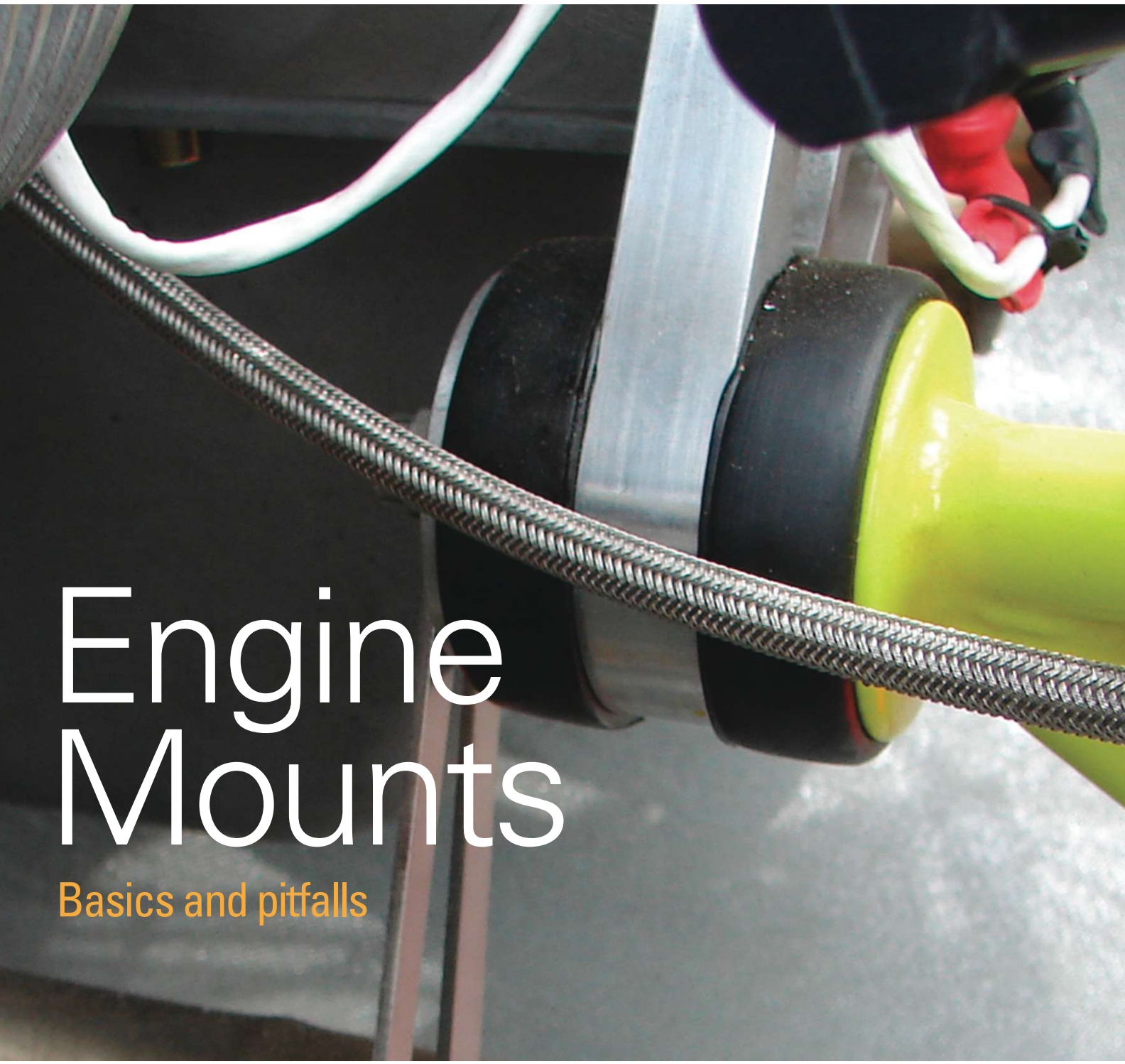
For air to flow properly to the carburetors (eight of them!), a custom intake had to be made, and that is what Jack was designing and testing during my visit. They had to be made so both carbs were getting the same amount of air at all times, but yet provide necessary clearance for the round cowl surrounding them.

From custom intakes to propellers to hand-blown nose bowls, every piece of this airplane is custom made by one man. Jack's documentation and dedication to this project is pure homebuilder. Projects like Jack's are underway and more guys like Jack are out there; we just don't see them very much because they are constantly working away in the shop to bring a special airplane to light someday.

I will visit Jack Bally and his 1/3-scale B-17 project again to provide yet another update on what is turning out to be one of the most fascinating projects any of us will come across.

» Click here for a photo gallery of images with more details of construction.

Each month we'll also feature another member's homebuilt project via a short video. Click here to learn about Steve Dentz's homebuilt Just Aircraft Highlander.

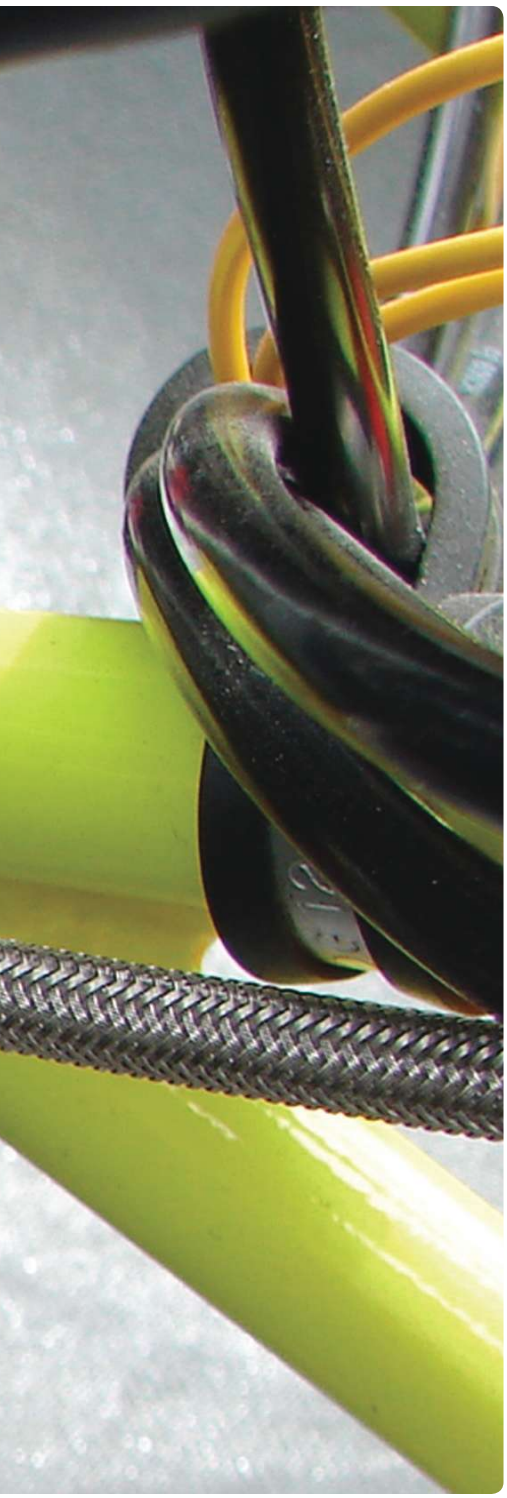


Engine Mounts

Basics and pitfalls

This typical horizontal mount shows a "doughnut" in compression. This mount is being used a UL Power engine powering a Zenair aircraft. Note that "compression" of the mounts means the bolt is in "tension."

A conical mount in a tension application. Note that nut is not yet secured on this display piece seen on a Zenair/Lycoming combination.



By: Tim Kern

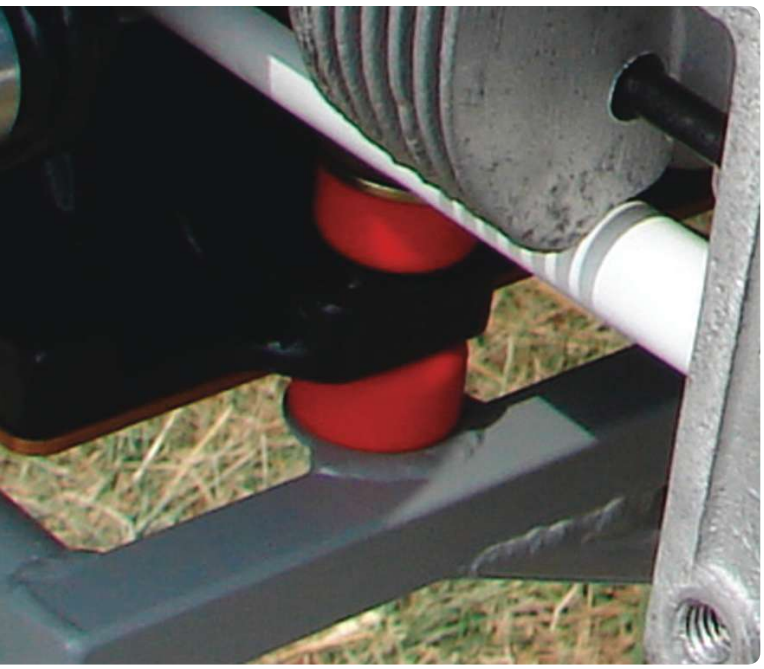
Engine mounts are simple enough in theory. They are the interface between the stiff, lightweight airframe and the solid engine. Engine mounts—the elastic parts—are placed between those two big pieces to isolate the vibrations of the one from the vibrations of the other, and they also keep the natural frequencies of the system from coinciding with the operational frequencies, which could create extremely severe effects.

Because engines are powerful and heavy, these isolators need to be large enough to carry the weight, while being small enough to fit under the cowl. They must be stiff enough to prevent large motions of the engine and be soft enough to provide a pleasant ride. When properly matched to the components and mission, that's the happy result.

Selecting the Mount

In the certificated world, there is no question about which engine mounts to use. The proper mount is listed on the engine's type certificate or a supplemental type certificate. Equivalent parts must meet stringent requirements to ensure they perform exactly as the originally specified parts. The repairman has no choice.

In our experimental world, it's good practice to look at similar configurations (engine, prop, airframe) and use those as the basis for our selection of a mount. While most "close" matches provide good starting points, a radical departure from existing practice should be approached with caution and some solid engineering. As a rule, if you know enough to specify your own radically unusual engine mounts, this article won't stop you; if you don't… then don't do it.



"Doughnuts" may also be used vertically in compression. This example is on the Corvair-powered Panther prototype on display at EAA AirVenture Oshkosh 2012.

There are two basic mounting configurations: tension and shear. Tension mounts ultimately rely on the strength of the threads of the fastener (whether the threads go into structure or are in a nut) that holds the assembly together. Shear mounts depend on the "sideways" strength of the bolt. Envision this: If the nut should fall off but the bolt (if it were to stay in place) would continue to do the job, that's a shear application. An example of an assembly held in place in tension would be a propeller mounting bolt; a wing strut usually mounts in shear.

Traditional mounts of both types are common; they both work, when properly designed, built, and maintained. (The opposite is also true.) Conical mounts, with the narrow ends of the cones facing each other in a cast mount, differ from concentric mounts, which are cylindrical, having the same diameter through their length. Clearly, conical mounts lend themselves well to tension applications; cylindrical mounts work well in shear; a simplified cylindrical mount can also work well in tension, as a "compression donut."

Materials are generally a black polymer that feels like traditional rubber. Other mounts are made of nitrile, silicone, and other materials. Each has its benefits and compromises, and each is understood by the applications engineers at the manufacturers' companies. Some are highly resistant to heat; some are better for their resistance to petrochemicals and ultraviolet (UV) rays; all require proper mount design, assembly, and maintenance.

Some Pitfalls

While most mounts will easily handle the generally smaller engines on our homebuilt aircraft without problems, there are several common mistakes that can shorten the lives of mounts precipitously.

Some fastener basics are ignored by those in a hurry or those who don't know better. The reason is immaterial when your engine falls off. The correct washers are essential, and don't leave them off because your bolt is too short. Retention, whether with safety wire, cotter pins, self-locking fasteners, a chemical locker, or a combination of these, is obviously critical; yet I often see people reuse self-locking nuts or even cotter pins. These things hold your engine on! Think big. Spend a dollar!

Some Tips

As a natural rubber mounting ages, its surface will become covered with a waxy film. This protects against ozone, UV, and some contaminants. Leave it on!
Old mounts may sag. You'll notice this when the spinner doesn't line up with the cowl the way it used to. Mounts also compress over time. When they do, the original spring rate changes, and when the spring rate changes, the performance of the mount changes. When the mount's performance changes, it's usually not for the better.

When you're buying a "new" mount, check the date. For Lord mounts, it's molded into the mount, usually right near the part number, and it's usually difficult

to see. Look for the month and two-digit year of manufacture; the age of some "new" mounts may surprise you. However, if they have been properly stored, they'll retain their new qualities for many years; but check.

Some mechanics swap engine mounts rather than replace them. Remember, though, especially if you have mounts at the rear of the engine, that the bottom forward mount is in compression, as is the top rear on each side. When you swap them around, remember that their "set" is not random. Some engines are the exact reverse, so make sure they're installed correctly.

There is a mount for everything. The trick is to understand which one is the one you need.

Mounts that look alike can have very different performance characteristics. Check the molded-on part number to be sure you are using what you want to be using.

In the certificated world, mounts are usually changed at overhaul time. For our experimental aircraft the annual condition inspection is a great time to check mounts, but you might also consider inspecting them when the airplane is put away for the winter, giving you time to order new ones before flying starts again. In the spring, after the aircraft has sat for a while and time has added to deterioration is another good time to check them. Even if you never run your engine, the engine mounts are carrying the full weight of the engine.

Make sure your mounts are isolated from excessive heat, with proper airflow and/or heat shields. If you notice your mounts getting hard or suddenly shiny, they may be cooked. Replace them. Rubber parts on aircraft that live in very hot, very dry, or very sunny areas tend to deteriorate faster.

Paul Snyder, account manager for aerospace products at Lord Corporation, says that some of the worst things we do to our mounts are done with good intentions. "The efforts we put into the cosmetics of our engine bays can backfire on us," he warns. "Many cleaning fluids strip away the wax coat, and then can permeate the rubber, helping the mount to rapidly deteriorate. Petroleum products—from WD-40 and penetrants, to anti-corrosion fluids, to brake fluids, gasoline, Jet-A, and lubricating oils—none of these should be left on the elastomeric parts of the mounts. If you find them there, wipe them off as quickly as you can. Although gasoline evaporates fairly quickly, some of the penetrating oils can really get in there and stay. That can do damage quickly, and you won't see it." The worst offenders among us are often those who have the most immaculate engine bays. "Some of the engine degreasers are extremely powerful," Snyder notes, "and they can attack the elastomer."

Special thanks to Paul Snyder and Lord Corporation, www.Lord.com.

Tim Kern is a private pilot who lives near Indianapolis, Indiana. He has written for more than 40 different aviation magazines and also provides writing and marketing services to the aviation industry. He was key builder on two aircraft and has earned the title of Certified Aviation Manager from the NBAA

Transitioning to
Experimental or Unfamiliar Airplanes

Learning to fly something "new"

By: Hobie Tomlinson

With the FAA and NTSB recently stressing once again the importance of transition training in reducing the amateur-built accident rate, we felt it would be good to concentrate our first Safety Wire columns in *Experimenter* on Advisory Circular (AC) 90-109, "Airman Transition to Experimental or Unfamiliar Airplanes," which was published by the FAA's Flight Standards Division (AFS-800) on March 30, 2011.

> To read the entire AC, click here.

Let's get down to business with a review of each of the FAA's airplane families with comparable type-certificated (TC'd) examples. We will then address the specifics related to transitioning into each family type. This month, we'll concentrate on the first two families. Over the next two months, we'll cover the remaining families of aircraft.

By way of review, AC 90-109 lists airplane families as follows:

I. Light control forces and/or rapid airplane response:
- a. Experimental examples: RV-8, Pitts S-2SE, Christen Eagle.
- b. Type-certificated examples: Grumman AA-1, Globe Swift, Extra 300.

II. Low inertia and/or high drag:
- a. Experimental examples: RANS S-12, Fly Baby.
- b. Type-certificated examples: Piper J-3 Cub, Aeronca 7AC Champ.

III. High inertia and/or low drag:
- a. Experimental examples: Glasair, Lancair.
- b. Type-certificated examples: Cirrus SR-22, Cessna Columbia, Piper Comanche, Mooney M20.

IV. Nontraditional configuration and/or controls:
- a. Experimental examples: Long EZ, Air Cam, Breezy.
- b. Type-certificated example: Lake Amphibian.

V. Nontraditional and/or Unfamiliar Airplane Systems Operations:
- a. Experimental examples: Wankel- or Rotax-powered aircraft (e.g. Kitfox).
- b. Type-certificated examples: Flight Design CTSW (Rotax-powered), Soloy CE206 (turboprop conversion).

VI. Nontraditional and/or Unfamiliar System Component Maintenance Requirements:
- a. Experimental examples: Folding or removable wing airplanes (i.e. airplanes or gliders that can be trailered).
- b. Type-certificated example: AeroCar, roadable airplanes.

VII. Specialty Airplane – "One-Off" Airplanes:
- a. Experimental examples: Gee Bee R1 Replica, Hughes' H1 Replica (crashed), BD-1 Jet, Aerostar 601P Turbine Conversion.
- b. Type-certificated examples: No TC'd aircraft exist in this category; however, some aircraft may be available that have similar characteristics or systems.


RANS S-12

Transition Training for Family I Airplanes – Light Control Forces and/or Rapid Airplane Response

1. Defined as airplanes with light control forces, coupled with strong control authority, for rapid maneuvering about one or more axes. This group also includes airplanes that have substantial disharmony between two or more axes.

2. Typical accidents involve pilots not maintaining adequate aircraft control during initial climb after takeoff and ending with an inadvertent stall/spin scenario.

3. Transition hazards:
- a. Many experimental airplanes look like type-certificated (TC'd) airplanes but actually have light control forces and/or a very quick maneuvering response. Lightweight and lightly wing-loaded airplanes can have the same quick, light maneuvering response as aerobatic airplanes. The hazard with this family is that without some level of training, the pilot may overcontrol the

airplane, which may manifest itself in any phase of flight. This can result in damage during takeoff and landing, loss of control in flight and/or overstressing the airframe to the point of structural failure.

b. Unfortunately, aircraft with poor stall-handling qualities frequently have these control characteristics. This can prove to be a deadly combination when aggressively maneuvering close to the ground. Before purchasing an experimental airplane, consider the effort expended by the manufacturers of TC'd airplanes to ensure good handling characteristics. Experimental airplanes are not required to have the same good handling characteristics. Transferring conventional GA handling techniques to aircraft with light control forces and/or rapid maneuver response can result in inadvertent stalls, loss of control, or structural failure.

4. Recommended training—Training needs to be designed to teach the required control inputs to prevent overcontrolling airplanes with light controls and quick responses. This training cannot be simulated and needs to occur in an airplane with similar characteristics.

a. Best training is accomplished in the specific airplane with a well-qualified instructor experienced in the specific make and model.
b. Second-best training is in the same model airplane.
c. Third-best training is in an airplane with similar characteristics.

Training for Family II Airplanes – Low Inertia and/or High Drag

1. Defined as airplanes that rapidly lose energy (airspeed and/or altitude) when there is a loss or reduction of power.

2. A typical accident involves pilots misjudging the amount of power required during the landing flare, resulting in a hard landing or nose gear collapse.

3. Transition hazards:

a. Airplanes with less drag require less thrust for the same performance, which increases their efficiency. Although high-drag airplanes have all but disappeared in the modern, production-airplane world, they still exist in surprising numbers in the ranks of short takeoff and landing (STOL) vintage and experimental airplanes.
b. Most pilots don't take their initial training in these types of airplanes. New pilots thus become accustomed to the drag characteristics of the modern TC'd airplanes in which they learned to fly. Many "low and slow" airplanes glide at a lot steeper angle than these pilots are accustomed to, which can cause big problems when transitioning to Family II airplanes.
c. Pilots reducing power for landing expect a glide path like the TC'd airplanes they are used to flying. Instead they get a much steeper approach than expected and find themselves nearing the ground with a low energy state and high descent rate. When the landing flare is attempted from this condition, the airplane will quickly decelerate even further while continuing to maintain its excessive descent rate.
d. Power is the normal method of compensation for the descent characteristics of low-inertia and high-drag airplanes, thus engine reliability becomes critical. Because these airplanes often use non-TC'd engines (which provide more power with a smaller size and lighter weight), engine reliability may suffer. The consequences of an engine failure in these airplanes can be significant.
e. These characteristics surprise a significant number of pilots. Half of the accidents with these type airplanes occur during landing, versus a 30 percent overall landing accident rate for homebuilt aircraft in general. (Half of the pilots in these accidents had less than 12 hours in this type airplane versus 60 hours in airplane type for homebuilt aircraft accidents in general.)
f. Other hazards (besides power management issues)

exist with these airplanes. While all airplanes experience an increase in stall speed with an increase in load factor (i.e. in turns), these airplanes also experience a significant airspeed decrease with an increase in load factor. This trait, coupled with a low cruise speed to stall speed margin, makes these airplanes particularly susceptible to unintentional stalls.

4. Recommended training for this family includes both ground training and flight training.

a. Ground training for airplanes with non-TC'd engines must include any available training on how to operate that specific engine. For example, to minimize the chances of power interruption, operators of two-stroke engines should receive training on avoiding cold seizures and how to manage the engine to maximize reliability. Pilots operating airplanes with propeller-speed reduction units must understand the power modes and rpm ranges to avoid.

b. Flight training recommendations are as follows:
(i) Best training is accomplished in the specific airplane with a well-qualified instructor experienced in the specific make and model.
(ii) Second-best training is in the same model airplane.
(iii) Third-best training is in an airplane with similar characteristics.
(iv) Simulating the drag characteristics of these airplanes is possible using TC'd airplanes such as the Cessna C-150 and maneuvering with 40 degrees of flaps (within placarded limitations, of course). Deceleration upon power loss will be similar, and the steeper descent rates will help prepare the pilots for operating their own airplane. By flying a TC'd airplane in the high-drag configuration, the pilots will experience how quickly speed can decay and how much lower the nose needs to be maintained during approach to keep an adequate approach speed.
(v) Power landings are recommended while using a power-on, controlled approach profile with the power maintained throughout the round-out transition to touchdown. This use of power during landings will approximate the glide angle that the typical pilot is used to flying. Delay training in power-off approaches and landings until the pilot has sufficient experience with the airplane.

5. Transitioning to lower performance airplanes from high-performance airplanes still presents many challenges. Prudent pilots respect the challenges of flying any new type of airplane, regardless whether or not it is a transition from a low-performance airplane to a high-performance airplane or vice versa.

6. Transitioning from a multicrew airplane to a single-pilot airplane also creates its own challenges. Some examples of the challenges associated with transitioning to low-performance airplanes are as follows:

a. The effects of weather are more pronounced in low-performance airplanes.
b. Low-performance airplanes are affected more (as a percentage) by headwinds than typical TC'd airplanes.
c. Turbulence will be more pronounced than in typical TC'd airplanes.
d. The ability to handle crosswind landings will be reduced from that which is available in typical TC'd airplanes.
e. Avionics will probably be less capable than pilots are used to in typical TC'd airplanes.
f. Handling characteristics will be different from typical TC'd airplanes.

The thought for this month is:

"An optimist is a guy who has never had much experience,"

Don Marquis, American philosopher. So, until next month, be sure to Think Right to FliRite!

Hobart C. "Hobie" Tomlinson is the Director of Safety for Heritage Aviation, Inc., in South Burlington, Vermont. He is also a Flight Advisor for EAA Chapter 613. He received the 2012 Spirit of Flight award from the Society of Experimental Test Pilots. He was also named the 2012 National CFI of the year by FAA.

EAA AirVenture
Oshkosh 2012

ELECTRIFYING!

The new ElectraFlyer ULS was on static display only as the pilot was unable to attend AirVenture 2012. This is the sixth year that Randall Fishman's ElectraFlyer company has attended AirVenture, starting with the electric trike in 2006 and the ElectraFlyer C conversion of a single-place, all-metal Moni motor glider into an efficient electric airplane in 2008. The ULS introduced this year qualifies as an ultralight.

Photo by Jim Lawrence

By: Grant Smith

If an *Experimenter* enthusiast were asked to describe EAA AirVenture Oshkosh 2012 in one word, that word would have to be "electric." Electric airplanes, electric weather, and an energized, highly charged, and stimulating "electric" atmosphere were all present in abundance.

The electric atmosphere is easily explained; it is present for most attendees at every AirVenture, or for that matter, any large aviation event. The overall size of the AirVenture exhibit area and the accumulation of diverse ideas from the EAA membership and participating companies expand the horizon of the experience and contribute to the excitement of the event.

The electric weather consisted of typical Midwest thunderstorms that, except for a sizeable Wednesday afternoon downpour, were largely confined to the evening hours when most individuals were tucked snugly into their beds.

Electric aircraft ranged from Dale Kramer's 28-year-old Lazair ultralight with two newly fitted 20-hp Joby 50-volt DC motors to Chris Yates' record-setting, 258-hp, 200-mph, LongESA. Numerous other electric vehicles filled in the gap between those two extremes.

The Aero Innovation Hangar celebrated its fourth consecutive year with "Startup Aviation Day," Wednesday, July 25. The event was associated with the Sikorsky Entrepreneurial Challenge and featured several programs and speakers focused on facilitating startup projects in need of funding to bring new technology and products to the market. The hangar was home to several nascent concepts and housed stimulating displays that helped maintain the excitement of new technology being developed. Projects featured included John McGinnis's low-drag Synergy project, the e-volo electric volocopter VTOL machine, Makerplane open source aircraft design and aviation manufacturing services, Smartplane flight planning and flight execution, Open Airplane aircraft rental options, Makani Power tethered kite airborne wind turbine technology, Engineered Propulsion Systems general aviation diesel engine, Swift Fuels, the Seymour Jet Vest and small jet engines, Sonex electric flight project, the Samson Switchblade, Joe Caravella's roadable aircraft projects, Pat Peebles' unique high-lift fan-wing powered aircraft project, and other flying platform or vertical takeoff projects.

Several activities were held down on the farm in the Ultralight/Light Plane area to highlight the 30th anniversary of "official" ultralight flight that began with the adoption of FAR 103 in 1982. Prior to 1982 all flight in noncertificated aircraft was banned by the Civil Aviation Act. The popularity of hang gliding


Photo by Jim Raeder

The Aerolite 103 is available as an affordable kit or as a completed airplane. It is a true FAR 103 ultralight with a folding wing as well as good performance and handling qualities. No medical, BFR, checkride requirements, or tail wheel endorsements needed, only a few gallons of gas, an open field and a desire to fly.

in light, foot-launched or towed gliders and the addition of lightweight two-cycle engines to those gliders caused the FAA to revise the regulations. Thus the term "ultralight vehicle" was incorporated into FAR 103 to define and control operation of the popular but previously illegal lightweight and limited-performance powered and unpowered aircraft.

Ultralight aircraft in attendance included Terry Raber with his Aerolite 103 and streamline strut fairings, the Lazair electric ultralight, two of Ed Sweeney's twin-engine Hummingbirds circa 1983, and a new design called Bodacius which won the Reserve Grand Champion Ultralight Award. It's a one-off prototype wood-and-fabric high wing with the Oratex prefinished covering system. Keith Sharon brought his Rogallo-winged twin-engine Wasp Wing antique powered hang glider to the show. His father originally built the glider in 1976. It's one of three still in existence.

The Mosquito helicopter and the Butterfly gyrocopter kept the buzz going (literally and figuratively) in the rotorcraft area. The farm was also the home for hot air balloons with evening tethered inflations, weather and other considerations permitting, and a six-balloon sendoff early Saturday morning. Powered parachutes (PPCs), paragliders, and slow ultralights operated early morning and late evening each day, while rotorcraft operated from noon until 3 p.m. Weight-shift control (WSC) trikes and conventional light-sport aircraft operated from the grass strip between these times. The wide variety of aircraft on display and flying is always of interest.

The PlaneDriven PD-2, a 210-hp Glasair Sportsman GS-2 roadable airplane project was flown to KOSH from Florida and then on to Washington State after the show. Most show days, it was driven to a local restaurant after the daily air show to demonstrate its road-handling characteristics and crowd appeal.

The LISA Akoya amphibious aircraft, capable of operating from land, snow, or water, was on static display allowing inspection of the surface-piercing hydrofoil sea legs unique to this stunning 125-knot, two-seat, advanced-technology composite design airplane. LISA is an acronym for Light Innovative Sport Aircraft, and Akoya is a type of pearl. Water operations with the sea wings have verified their functionality and improved rough water capabilities.

Just Aircraft had a significant presence of its product line. Highlander N376CG was the star of the show with its extended air-shock landing gear and high-lift STOL wing, incorporating leading-edge slats and Fowler flaps and enabling exceptional slow flight and STOL.

The e-volo VC2 volocopter (vertical takeoff and landing copter) was one of the stars of the AeroInnovations hangars where the latest in aviation technology was on display. The e-volo VC1 made its first flight in October of 2011.

Photo by Jim Raeder

The celebration of the 30th anniversary of FAR 103 that created the ultralight category brought several original ultralights out for the party. Ed Sweeney added his Gemini twin thrust engines to improve the safety of the original Hummingbird designed by the late Klaus Hill. Ed flew this Hummingbird at Oshkosh 1983 and had fun re-creating that flight again this year.

The importance of engine development to the advancement of aviation is deserving of reinforcement. Steam engines powered the industrial revolution. Steam-powered flight had been attempted but was not successful. Manned flight existed for more than 100 years; on October 15, 1783, a manned, two-person Montgolfier balloon flight took place before the Wright brothers added a gasoline engine to begin the era of powered flight. Aircraft and engine development proceeded hand in hand from that day forward. Reliable radial engines made airliners practical. Development of the flat four did the same for light personal aircraft. The availability of lightweight, high-speed, two-cycle engines empowered the ultralight movement of the 1980s. Today, high-power turbine engines are available for worldwide air commerce and transportation as well as advanced military hardware, and they are making their way into the homebuilt community, too.

The days of inexpensive avgas are gone. The future of 100LL is in question. Modern light aircraft engines of 200 hp and under are being developed to operate on auto gas while larger piston engines are being developed to run on turbine fuel.

Advances in battery technology, high-strength permanent rare earth magnets, and compact electronics have converged to create electric power systems suitable for small aircraft propulsion. These are areas where the experimenters and aviation hardware developers are active, and AirVenture is a venue where those concepts are developed and presented.

It is not possible to adequately cover all aspects of a show the size of AirVenture in an article such as this. The hyperlinks included will help to fill in the details to the extent desired in most cases. However, spending a full week is not adequate to accomplish a complete assessment of all the activities available. That is just one of the reasons so many enthusiasts return year after year to the greatest aviation spectacle on earth.

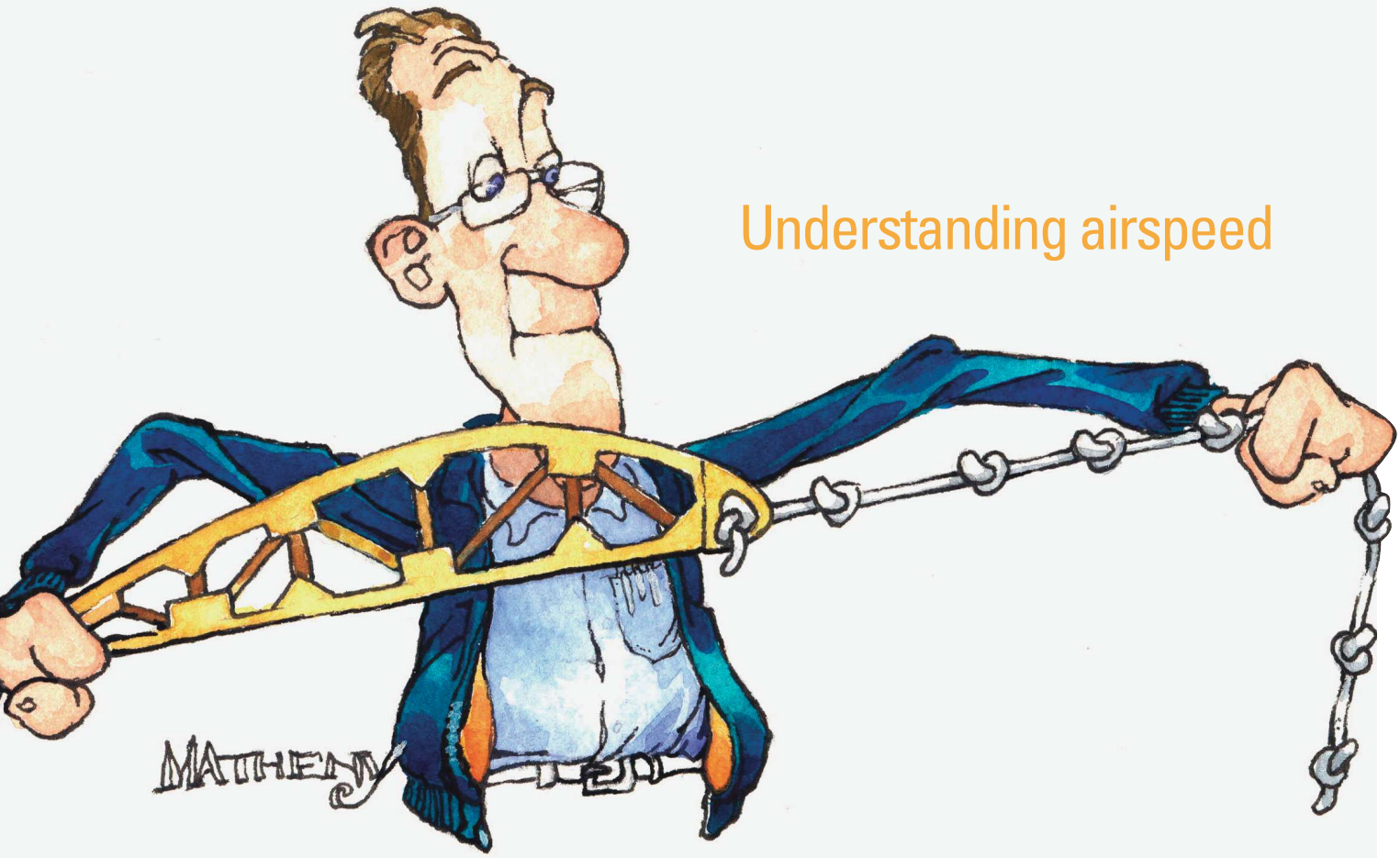
Photo courtesy Sky Cycle

Even easier to store than the Aerolite 103, the Sky Cycle and similar North Wing ATF both offer WSC ultralight flight on a limited budget with unlimited fun factor.

Grant Smith, EAA 19944, attended his first EAA fly-in at Rockford, Illinois, with his Baby Ace, Little Toot, in 1967. He soloed a Cessna 140 in 1959 and has worked as an engineer, professional pilot, and flight instructor. He began hang gliding in 1972 and has worked with flexible wings, powered paragliders and ultralight vehicles, and with the ASTM Light-Sport standards. He has written for several aviation journals.

Knot What You're Thinking

Understanding airspeed



By: Ed Kolano

You're contemplating building, already building, or recently finished building an aircraft. Or maybe you're buying someone else's homebuilt airplane. It doesn't matter; sooner or later you'll get around to testing your aircraft's performance. Essentially, the FAA says the only performance numbers you must determine are your airplane's best climb rate speed, best climb angle speed, and landing configuration stall speed. You'll want and need more performance information than that to fly your plane safely and efficiently, though.

Wait a minute. You already know those answers. All you have to do is read the company's advertisements or check out its promotional literature. Look through any airplane magazine and you'll probably see an ad with speeds listed like this—Cruise: 110 knots, Stall: 32 knots, Rate of Climb: 1,500 fpm. Well, there you go.

Then you notice a flight review of this very airplane in the issue you're reading. You're just having a kismet day! You read the article and notice the author's performance numbers don't match the company's advertised numbers. So you track down another review of that plane in a different magazine, and now you have a third set of performance numbers. Looks like kismet ain't all it's cracked up to be.

You're confused, maybe skeptical, or at least curious. The picture in the ad shows the same N-number airplane as the ones cited in the flight reviews. It's the company's airplane, so how can the cruise, stall, and climb performance numbers be different?

It would be helpful if the folks who wrote flight reviews presented their findings for the same conditions. Sea level/standard day is the most commonly used reference, but any properly specified reference would do for the sake of comparison. How about 8,000 feet density altitude using 75-percent power with the plane loaded to maximum weight at takeoff? Still not perfect—different planes will burn different amounts of fuel during their climbs from different density altitudes of airports—but it's certainly better for comparison. The reader would then have more confidence in published numbers and an independent validation of the manufacturer's claim. And there'd be no math required.

But that's not the real world.

So, it looks like it's up to you to perform *your* own flight tests and calibrations to come up with your airplane's real numbers. Over the next several months we'll talk about how to collect the data you'll need to determine those important airspeeds and the rates and angles that go with them. Then we'll talk about flight control system characteristics, stability and control, and handling qualities. And every now and then, we're going to discuss how you interface with your airplane. Some call this human factors. This historically underrated aspect of aviation has a direct effect on safety and goes a long way toward pilot workload and ultimately the pilot's flying enjoyment.

Knowing what to test is like knowing the strings on a guitar. It's a start, but knowing where the notes are doesn't make you a musician. Learning how to tickle them the right way is the real challenge. Same with airplane testing. Is your airplane ready? Are you, or your test pilot if it's not you? Your airport? Will you have a chase plane? Test conductor? Kneeboard cards or fancy video recorder? Lots of questions that should be answered before that first flight. We'll cover that as well. We're not aiming for rock stardom here, but definitely somewhere beyond garage band.

Since the only FAA-mandated performance numbers that must be determined during your initial flight testing are those three airspeeds mentioned earlier, let's start there. The thing about speed is it comes in several flavors. Comparing indicated airspeed from one source to true airspeed from another doesn't make a lot of sense. The problem is published airspeeds are not always identified as indicated or true, and you can't tell just by looking at them. Okay, quick review:

V_0 – The speed you read from the airspeed indicator. I know that many people call this indicated airspeed, but I don't.

V_I – Indicated airspeed is V_0 after it's been corrected for instrument error. If you connect the airspeed indicator to a benchtop test set, the discrepancy between the accurate test set and the indicator reading is instrument error.

V_C – Calibrated airspeed is V_I after it's been corrected for errors arising from the plumbing of the pitot and static lines. Notice if you replace your airspeed indicator with one that has a different instrument error, your calibration will be off. That's why I prefer

to separate V_0 from V_I. If you (and you should) perform an airspeed calibration test after replacing your airspeed indicator, you can lump instrument and installation errors together and won't have to worry about the V_0/V_I relationship.

V_E – Equivalent airspeed is V_C after it's been corrected for the compressible effects of air being shoved down the pitot tube at high speed. Generally speaking, if you fly less than 200 knots and below 10,000 feet, this error is less than a couple of knots.

V_T – True airspeed is V_E (or V_C for most small airplanes due to insignificant compressibility errors) after it's been corrected for density altitude.

V_G – Ground speed is V_T after it's been corrected for wind.

So, to which airspeed did that advertised 110 knots refer? Or the cruise speed cited in either magazine article? Unless the ad or the author said, you can't know. If the author stated indicated airspeed and was kind enough to include density altitude or at least test-condition pressure altitude and temperature, you could perform the true airspeed conversion yourself. Of course you'd need that information for each source to have three V_T values to compare.

Being a diligent, precise, inquisitive pilot, you did the math, and the three sources still disagree. The answer might be as simple as different reviewers used different power settings or flew at different density altitudes for their cruise speed and climb performance checks. Okay, you should probably check this before doing all that conversion fun.

Now what? Well, you might be out of luck in your comparison quest, but you still might be able to garner cruise performance information equally important to you, you savvy pilot. What if one reviewer used a power setting that resulted in twice the fuel flow as the other? Would an extra 10 knots be worth another $20 per hour to you? That burger will be just as tasty 15 minutes later. Wait a minute. If you pound down a few burgers, guzzle a quart of iced tea, top off your fuel, and pick up a passenger (who also pounded and guzzled), your airplane will be heavier during the return trip. That's going to mean either a slower cruise speed or a higher power setting. Great! More cruise speed data that might not agree with all those other V_T numbers you already have. Oh yeah, center of gravity location also affects performance.

Sold on the importance of flight testing and criticality of having accurate performance charts yet? Plucking solitary performance numbers from company literature or magazine reviews won't help you plan your pre- or post-burger flights. And it won't satisfy the FAA either. A well-planned and executed flight-test program will get you those numbers, and we'll start next time with a detailed discussion of airspeed.

Finally, questions about flight testing? Send 'em in.

Chances are if you're asking a question, many others are wondering the same thing. So ask away and we'll share common questions here in this monthly column. E-mail experimenter@eaa.org; please put "Flight Testing" in the subject line.

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.