EAA
Sport Aviation
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Vol.64 No.3 | March 2015

No SPEED Limit
The women who race at Reno

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A father-son project comes home

Safety by the Numbers
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Women in Aviation: We Need More of Them

BY JACK J. PELTON

THE HISTORY OF WOMEN in aviation is unusual compared to other male-dominated activities because women were involved almost from the beginning.

For example, in 1906, just three years after the Wright brothers' first successful powered flights, E. Lilian Todd designed and built an aircraft. In 1908 Frenchwoman Therese Peltier was the first woman to pilot an airplane. And in 1910 American Blanche Stuart Scott was the first woman to solo an airplane.

The list of female firsts in aviation goes on, and the historic events occurred very early in the history of flight. Women were obviously interested in aviation, and at least some were supported and encouraged to participate.

March is Women's History Month, and we mark the occasion in this issue with an article about female pilots who race at Reno, and another about women who do their flying at the grassroots level. It is important, even vital, to note the success of women who fly.

But somewhere between Blanche's first solo in 1910 and now we lost momentum. Though women have flown everything from ultralights to the space shuttle, their numbers in our ranks remain far too small.

In the United States about 6 percent of all active certificated pilots are female. And that percentage has changed little over the decades. In fact, when the active pilot population peaked in the mid-1980s the share of women was about 6 percent, and it's essentially the same today with a quarter million fewer pilots.

Certainly some of the blame for the small number of female pilots can be placed on outdated attitudes from guys. For too long flying and all things aviation was an all boys club. Even when women weren't actively excluded they too often were not welcomed.

I'm happy to say that the actual barriers to women in aviation have largely been torn down. But we haven't been able to create the critical mass necessary to make girls and women feel welcome. We all want and need to have people around us who we can relate to, who can be examples, and who can inspire us. With too few women in aviation those role models are too often missing.

However, our annual convention at Oshkosh is an example of success in welcoming and including women and girls. When I first started attending the convention decades ago there just weren't many girls and women there. But that has changed. We don't know absolute numbers, but my guess is that at least a third or more of the people at Oshkosh are female. And that's great.

I believe there are two major reasons so many more women come to Oshkosh. One, and perhaps most important, is at the individual level. More of you, the guys, have encouraged your wives, daughters, and girlfriends to come to Oshkosh. That is essential. The other big reason for change is that as a group EAA has created activities and opportunities to include women and girls, to make them part of the overall experience.

PHOTOGRAPHY BY JASON TONEY

Another change has come from the aviation industry, which has actively set goals and succeeded in hiring more women. Now there are women as part of the teams of nearly all exhibitors at the show. They are leading by example.

Welcoming women and expanding the diversity of all who participate in aviation is a major objective for EAA leadership. We simply can't grow, or even survive, as an old white guys club.

That's one of the reasons our Young Eagles program is so successful and vital for the future. Nearly half of the youngsters who participate are girls. EAA's Women Soar program offers an aviation day camp at Oshkosh for girls and includes female-specific activities during the convention.

And EAA will continue to develop programs to involve and include woman and girls, and I know they will help. But the most effective outreach must come from each of us guys who fly. When we are attentive to the interest, concerns, and even worries of the girls and women in our lives about all things aviation we make progress. Inclusion must be continuous, not just annual events or even monthly meetings.

It's right to celebrate the history of women in aviation, but it is essential for flying's future to do what it takes to make girls and women an everyday part of the personal aviation world we all love. EAA

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FEATURES

DEPARTMENTS

ON THE COVER: Tyson V. Rininger photographed Vicky Benzing, EAA Lifetime 529264, with her Lancair Legacy *Lucky Girl*. Vicky raced both *Lucky Girl* and the L-39C Albatros *Reality Czech* in the 2014 National Championship Air Races.

For more on many of the topics in this issue, visit *www.EAA.org/sportaviation*.
To view and submit aviation events, visit *www.EAA.org/calendar*.

PHOTOGRAPHY BY **MACH POINT ONE AVIATION PHOTOGRAPHY**

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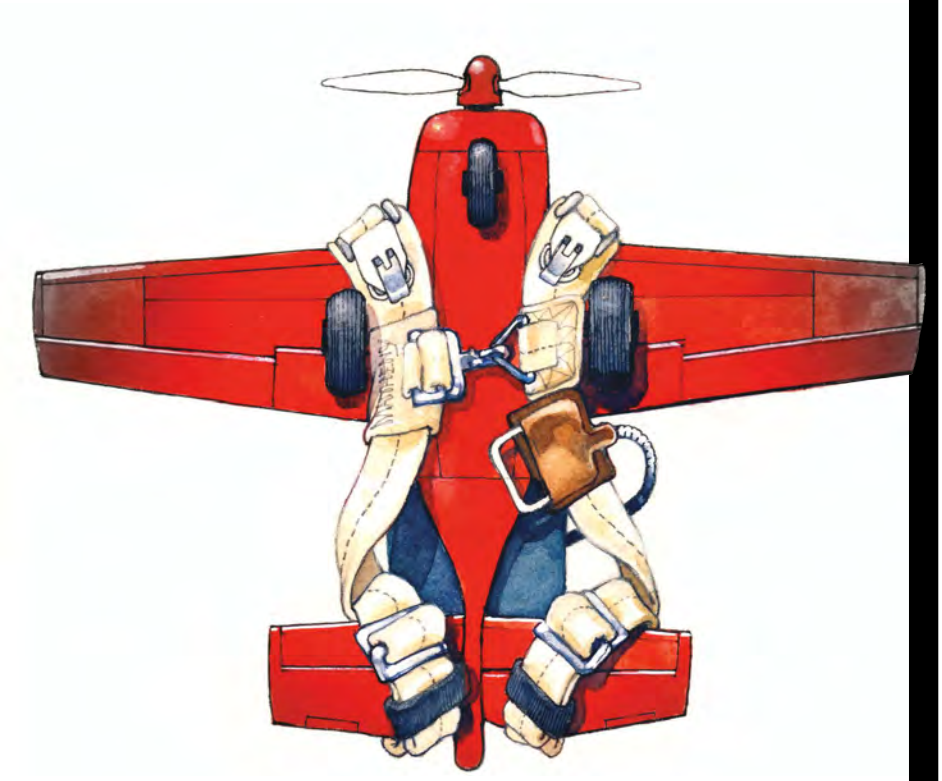

CHUTES DO SAVE LIVES

DAVE, I AM IN YOUR camp on small aircraft BRS utilization (Light Flight, January). You have presented a cogent argument for this kind of flying safety, and, like you, those who argue against BRS measures have not yet pulled broken pilots and passengers from a wrecked airplane. The penalties of added airframe weight and cost are far overcome by the safety factor of the airframe parachute and family peace of mind. My life was saved by a parachute during World War II deep over Germany. I spent six years investigating aircraft accidents and know what happens to pilots and others when the accident is severe.

The BRS industry still needs continued R&D to make the systems lighter, deployment positive, economic modification for a number of different aircraft, and much attention to public safety programs that engineers and manufacturers will respond to.

–
Ray Matheny, EAA 120123
Lindon, Utah

Though Dave and Ray share the same last name, they are not related.—Ed.

The Photo Did It

I THOROUGHLY ENJOYED Brady Lane's article (Dream Build Fly, January) on Alaskan bush flying, but the photo of Steve Davidson resting against the Super Cub's tundra tire is what really made the article. The photo not only captures the beauty and remoteness of the severe Alaskan landscape, but it also illustrates some exceptional piloting skill.

I can't say I have ever seen a photo that has inspired me to write a letter to the editor before. Nor have I seen one that inspired me to renew my membership either. The check is in the mail. Well done.

–
Hugh Tyler, EAA 666855
Chico, California

Crab Cakes and Artillery

LOVED LANE'S ARTICLE on Tangier Island (Flying Lessons, January). It has been 25 years since I have quit flying, but Tangier was one of my favorites. One thing Lane did not mention, maybe it does not exist anymore, is the right-hand pattern to keep you out of the naval artillery range on the west side of the island.

–
Jim Ott, EAA 1073554
Vineland, New Jersey

We don't know for sure what the Navy does in the restricted area R-6609, but it's still there, barely a mile west of the island, so you do need to stay on the east side of the runway.—Ed.

ILLUSTRATION BY **DAVE MATHENY** PHOTOGRAPHY BY **BRADY LANE**


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MICHIGANDERS FEAR WATER, TOO

I ENJOYED READING Jeff Skiles' article "The Long Gray Line" (Contrails, January). However, as a Michigan pilot I must disagree with his assessment that in contrast to Wisconsin pilots we, Michigan pilots, do not have a similar aversion to flying over Lake Michigan. Not only do I not fly over Lake Michigan in a single-engine plane, an organization I sometimes have the pleasure of flying for, Wings of Mercy, prohibits single-engine planes from flying over Lake Michigan or any of the Great Lakes when on a Wings mission. Yes, there are pilots who fly single-engine planes over Lake Michigan. But I seriously doubt there is a statistically significant difference between Michigan and Wisconsin pilots as to those who do and do not fly single-engine planes over Lake Michigan.


JEFF SKILES
The Long Gray Line

Fred Honhart, EAA 763469
Laingsburg, Michigan

SUBMISSIONS

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ADS-B and Oshkosh

ONE THING I HAVEN'T heard mentioned, but I am sure it has crossed many minds, is the effect the non-compliance of GA aircraft owners/pilots that can't afford ADS-B "out" will have on future AirVenture Oshkosh attendance via aircraft, which is, generally speaking, one of the main purposes.

Since I have been a part of aviation starting at 13 years old, back in 1954, one of the oldest criticisms I have head for years is "GA flying is for the wealthy," which is not necessarily true. If the affordability of ADS-B "out" is not dealt with, these critics of GA may be spot on for a surprising number of GA owner/pilots.

Charlie Calkins, EAA 1053565
Holland, Michigan

The airspace over Oshkosh does not require aircraft to be equipped with either a Mode C transponder now or ADS-B "out" after the end of 2019, so non-equipped airplanes can still fly in for AirVenture. However, there are many areas along common routes into Oshkosh that will require ADS-B, or pilots will need to fly significant detours to avoid that regulated airspace. So ADS-B is not a direct issue at Oshkosh, but is a vital concern nonetheless.—Ed.

Spatial Disorientation Is Very Real

AS A LONGTIME READER of *Sport Aviation* I enjoyed Mac's article on spatial disorientation (What Went Wrong, January), a topic I found difficult to accept as a student at the USAF School of Aerospace Medicine in 1961. It seemed incredible to me that I would not be able to determine my orientation by the seat of my pants until I investigated just such an incident as a young flight surgeon.

The case of spatial disorientation occurred on a night formation training flight for four F-100s flying in echelon formation over the desolate western end of the Grand Canyon on a moonless night. Given the absence of any ground population and therefore no visible light from the ground, the horizon was difficult to determine. Each F-100 had a tiny light on the top of the fuselage aft of the cockpit to assist in maintaining formation. The No. 3 plane called to the No. 4 plane and was heard to say, "Bill, you are flying upside down." The reply from Capt. Bill, in an incredulous tone, was "I'm upside down now?" This was immediately followed by his peeling off and diving vertically into the Grand Canyon area, and his flight mates witnessed a bright explosion. EAA

Carl J. Canzanelli, EAA 459828
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EAA Efforts Bring Progress on Sleep Apnea Policy

More local control for individual pilots and their AMEs

MORE THAN A YEAR of EAA work on the FAA's sleep apnea policy has brought considerable revisions to the original draft that would have forced costly sleep studies on pilots, even if they had shown no symptoms.

The FAA's latest proposed sleep apnea draft policy includes significant improvements over the initial policy announced in November 2013. EAA's Aeromedical Advisory Council criticized that proposal, and the U.S. House of Representatives introduced legislation that would have required such a policy to submit to a full rulemaking process.

The FAA's new proposed policy will not require a sleep study unless a pilot reports symptoms associated with sleep apnea to his or her aviation medical examiner. Other changes include:

- No longer requiring a sleep study solely because a pilot has a body mass index (BMI) over 40, unless sleep apnea-associated symptoms are reported.
- Pilots requiring additional screening for sleep apnea will be issued a medical certificate at the time of the exam if no other disqualifying factors are present. A pilot will then have three months to have the screening completed, during which time they may continue to fly.
- If a sleep evaluation does not indicate sleep apnea, no further action will be required.
- Pilots who are diagnosed with sleep apnea can send documentation of effective treatment to the FAA Aerospace Medical Certification Division or regional flight surgeon to receive a special issuance medical certificate to replace a previously issued regular medical certificate.

It's important for pilots to be forthcoming with their AMEs if they do have sleep apnea symptoms, not simply because it's required to do so. As EAA continues to push for aeromedical reform, we are telling regulators, the Administration, and Congress that pilots are responsible to self-certify their fitness prior to every flight. Reporting and addressing disqualifying conditions by those who have them are essential to our overall goal of wider freedoms for pilot medical certification.

EPA DENIES PETITION DEMANDING IMMEDIATE ENDANGERMENT FINDING FOR LEADED AVGAS

IN LATE JANUARY, the Environmental Protection Agency (EPA) denied another petition by environmental groups asking the agency to immediately determine that leaded avgas poses a threat to public health. The agency stated that it continues to investigate the extent to which those emissions may pose a hazard to public health. It has been monitoring emissions at 17 major GA airports and found levels to be below the National Ambient Air Quality Standards (NAAQS) for lead at 15 of them.

The EPA indicated that under its new timetable, the agency plans to issue a

PHOTOGRAPHY BY **JASON TONEY**

notice of proposed rulemaking in 2017 with a possible final determination some time in 2018. That timing coincides with the work schedule of the Piston Aviation Fuels Initiative (PAFI) that plans to have completed testing on one or more alternative unleaded aviation fuels by the end of 2018.

The aviation and petroleum industries are working closely with the FAA to identify one or more replacements for leaded avgas through PAFI. EAA is an active member of this group, which has recently seen four candidate fuels selected for first-phase testing at the FAA Technical Center in New Jersey. The initial evaluation of fuel properties and material compatibility impact is expected to be completed by the end of this year. At that time, one or more of the fuels will continue into full-scale engine and aircraft testing designed to prove the capability of the fuel and generate data necessary for transition of the existing fleet of aircraft and engines to any new fuel.

NEW GA CAUCUS LEADERSHIP PLAYS IMPORTANT ROLE IN GA ISSUES

SIGNIFICANT MEMBERSHIP changes within both the U.S. House of Representatives and Senate necessitate the appointment of new leadership for the General Aviation Caucuses in both houses for the 114th Congress. Caucuses serve an important role in networking and communicating issues of importance concerning a particular constituency or interest area among members of Congress and their staffs. Membership in the GA Caucuses is among the largest of all caucuses, with more than half of House members participating.

Each caucus is co-chaired in bipartisan fashion by a leader from each party. In the Senate, John Boozman, R-Arizona, and Joe Manchin, D-West Virginia, have stepped forward to take the reins. In the House, EAA member (and co-founder of the caucus) Sam Graves, R-Missouri, is returning in his leadership role and will be joined by Marc Veasey, D-Texas. Each of these leaders recognize the importance of general aviation to the economic and social fabric of their home states, as well as the utility of GA in serving remote communities and providing critical emergency services.

The GA caucuses will play a particularly important role in the 114th Congress as EAA and other aviation organizations work to advance issues of significant importance to our community. Topping the list is aeromedical reform, where EAA is working closely with House and Senate members to develop and advance new bills designed to bring relief from unnecessary and burdensome medical requirements. 2015 is also an FAA reauthorization year, which always presents both opportunities and threats to GA. The caucuses will be important for communicating those issues that we support and those that are of concern to recreational aviators nationwide. We are grateful to the new and returning leaders for their interest and concern for general aviation and look forward to working with them in the months and years ahead.


Sen. John Boozman


Sen. Joe Manchin


Rep. Sam Graves


Rep. Marc Veasey

WHAT DOES RESTRICTED CATEGORY HAVE TO DO WITH EXPERIMENTAL?

BY SEAN ELLIOTT, EAA VICE PRESIDENT OF ADVOCACY AND SAFETY

RECENTLY YOU may have noticed an EAA news story describing how we worked with FAA policymakers to clarify training and testing allowances in restricted category aircraft. The issue was whether or not the rule (91.313) allowed the aircraft to be operated for the purpose of training and testing of flight crews. Paragraph (a)(1) states that "no person may operate a restricted category aircraft other than for the special purpose for which the certificate was issued." There is additional language in 91.313 that allows and specifies flight crew member training for the special purpose for which the aircraft is designated. When looking at all of 91.313, there was some question as to if an initial type rating or recurrent proficiency training met that definition.

EAA emphasized that initial and recurrent type training is absolutely akin to the special purpose of those operations, as well as a critical safety factor. These aircraft are, in many cases, highly modified, so any quality training program must include the actual machine as it sits, ready to perform its mission. The result of the interaction with our colleagues at the FAA was an understanding that there is a significant safety element to training and testing in these aircraft. This has been taking place for decades and the issues with the wording in the rule need to be resolved.

This issue has another dimension that is an important motivation for EAA's intervention. Experimental exhibition aircraft have nearly the same opening language in the rule that states, "No person may operate an experimental aircraft other than for which the certificate was issued." Allowing such a bad precedent within restricted category aircraft could have a detrimental effect on experimental exhibition certificated aircraft in the same harmful way. Ensuring training and testing to the highest quality and safest standard is universal, no matter the category of aircraft!

Loss of Control–Our Continuing Nemesis

BY CHARLIE PRECOURT, SAFETY COMMITTEE CHAIRMAN, EAA BOARD OF DIRECTORS

IT IS PRETTY CLEAR FROM numerous studies on aviation safety that the continuing number one cause of fatal accidents is loss of control in flight. Most recently, the General Aviation Joint Steering Committee released a detailed report on this topic. The GAJSC includes FAA and industry representatives who formed a Loss of Control Working Group that examined accidents from 2001 to 2010. Their results showed 40 percent of fatal accidents (1,259 for the period) were due to loss of control (see figure). They recommended a prioritized list of 34 safety enhancements such as installation of angle of attack systems, improved transition training, emphasis on aeronautical decision-making, and updating airman certification standards. A link to their free full report is available at *www.EAA.org/sportaviation*.

There are a few truisms about loss of control that are worth emphasizing. First, each aircraft will *behave differently* when near the edge of the control envelope and in the post-stall regime. Even airframes of the same design can be different, particularly for amateur-built aircraft where slight differences in airfoil shape or other builder inconsistencies can dramatically affect control behavior. Some designs exhibit a very benign stall with clear warning and recover easily with minimum altitude loss. Others will stall suddenly without warning and take several hundred feet to recover. The F-4 fighter required use of the drag chute to recover if you flew too high an angle of attack. These differences highlight the importance of transition training; you cannot depend on the new aircraft you fly to behave like the last one you flew.

Second, loss of control will only result in a fatal accident if you have insufficient altitude to recover. For a lot of general aviation aircraft this means once you're in the traffic pattern you have little to no room to recover from stall and loss of control. This emphasizes the importance of learning the aircraft's behavior at altitude, figuring out what the warning cues are, as well as the recovery inputs and altitude loss required to regain control.

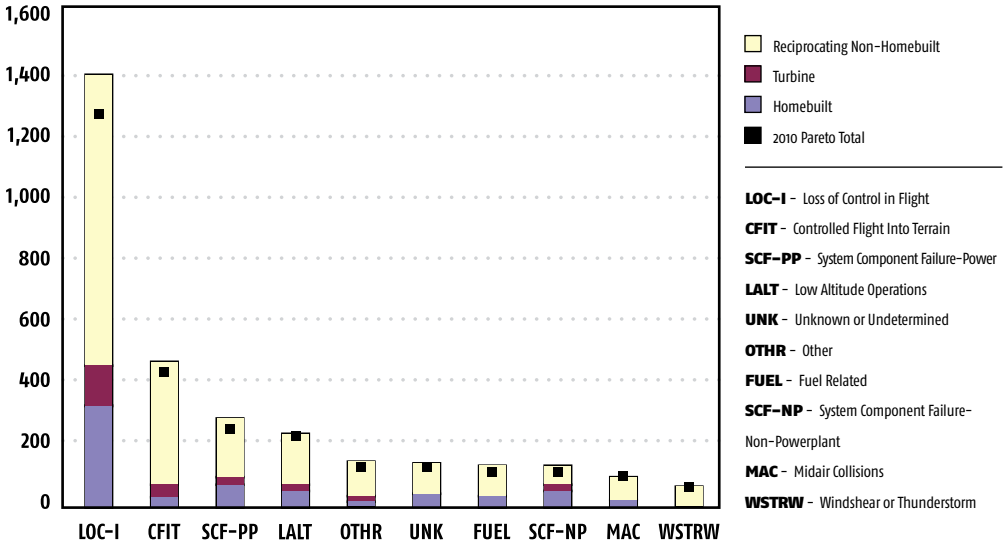
Another truism is that the warning cues won't help us if we are too task-saturated to notice them. Control stick shakers or airframe buffeting, airspeed indication, angle of attack indication, and warning horns have all gone unnoticed by a task-saturated pilot. This truism reveals the insidious nature of loss of control—if you were expecting it, you wouldn't let it happen.

Several examples from flight-test experience illustrate how different aircraft can be. The F-4 required us to "unload for control," there was no *g*-break like in a traditional stall, so we had to hold near zero *g* until the airspeed recovered, often losing a few *thousand* feet in the process. The T-37 stalled a lot like the C-172, but in a spin it would not recover unless you sequenced the recovery controls precisely: stick full back, rudder opposite, stick full forward one turn later. If you missed that sequence, it stayed in the spin.

The Schleicher ASK 21 glider was for me the most interesting example of how insidious a loss of control can be. The glider was in use at the USAF Academy as an advanced soaring trainer. It was ideal for aerobatic and spin training as well as team competitions, being a tandem seat, long-wing, high-performance sailplane. Like a lot of gliders it would not spin

GAJSC PARETO 2001–2011

Source: NTSB Aviation Accident/Incident Database. Note: 66 percent and 5 percent of fatal accidents have been finalized for 2010 and 2011 respectively.



with center of gravity (CG) near the forward limit. But it had the unique capability to add small lead weights at the base of the vertical tail to move the CG aft when two heavier guys were in the front. Unfortunately this also changed the mass properties such that in a spin, the inertial moment was greater than for a solo or lighter weight crew at the same CG, dramatically changing the spin characteristics between configurations. This coupled with a few other unique characteristics led to a fatal stall/spin accident at the Academy, requiring a full post-stall test program at the Air Force Flight Test Center to clear the aircraft for further training.

One of the unique characteristics that contributed to the accident was the stall warning. There was mild airframe buffet that began only 2-3 knots above the stall, and the nose drop at stall was only 2-3 degrees, a very mild stall but with subtle indications. Another contributing characteristic was the aircraft's ability to fly controllably at very high sideslip, but at a certain point the aerodynamic side loads on the rudder would force it to "lock out" and require the pilot to push opposite pedal to bring the rudder back. Finally, the aircraft, due to this rudder characteristic, was shown to spin without rudder input from the pilot. At stall, pulling the stick aft and moving the aileron opposite to the wing drop that generally follows stall generates enough adverse yaw sideslip (uncoordinated input) to "blow" the rudder surface in the pro-spin direction, resulting in a very easy "stick only" spin entry. Only proper rudder coordination would prevent this.

The accident aircraft was flown dual for a ridge soaring orientation flight, with a lightweight passenger in the front seat and instructor in the back. The instructor was flying close to a ridge using the updraft off the ridge to hold altitude, with perhaps 200 feet of altitude above the ridge off his right, and 1,000 feet or more above the valley floor off his left. What is known is the aircraft entered a stall/spin from this position and impacted the ground, resulting in one fatality. The actual sequence that led to the stall/spin is not clear, but one scenario developed during the flight test is the instructor was perhaps distracted while watching the ridge line and got below stall speed and reacted to a small nose drop and roll off to the right toward the ridge. He may have pulled back and rolled left to "avoid the ridge," resulting in the "no rudder" spin described. He also may have been distracted enough to miss the warning signs of stall/spin and had insufficient altitude to recover.

Coming out of the test program we published some recommended changes to the POH to cover the characteristics in more detail. We also built a specialized training program for the aircraft for the Academy pilots to use. (Find a link to the full report at *www.EAA.org/sportaviation*.) The project re-emphasized how important it is to recognize how different aircraft designs can be, and to train to handle the unique characteristics every airplane has that can bite you.

Fly safe out there! EAA

Arsenal of Democracy

WWII tribute to take flight in D.C.

ONE OF THE MOST DIVERSE arrays of World War II warbirds will fly above Washington, D.C., on May 8—the 70th anniversary of Victory in Europe (V-E) Day—in what's being billed as the Arsenal of Democracy: World War II Victory Capitol Flyover.

It's the highlight of a three-day celebration in our nation's capital and will follow a solemn ceremony for veterans at the National World War II Memorial. The vast assortment of WWII warbirds will fly in historically sequenced warbird formations representing the war's major battles, from Pearl Harbor through the final air assault on Japan. A missing man formation accompanied by taps will conclude the event.

Approximately two dozen different types of vintage military aircraft are expected to participate in the flyover, including the B-29 Superfortress *FIFI* from the Commemorative Air Force, plus planes from Texas Flying Legends, Fighter Factory, and Fagen Fighters including P-40 Warhawk, P-39 Airacobra, P-38 Lightning, P-51 Mustang, P-47 Thunderbolt, FG-1D Corsair, B-25 Mitchell, and B-17 bomber.

The event will also honor the home front as millions of American men and women helped ramp up production from less than 6,000 aircraft in 1939 to the peak output of 9,000 per month in March 1944. Along with the flyover, Arsenal of Democracy events will include a gala dinner on May 7 at the Smithsonian National Air and Space Museum featuring combat heroes sharing their personal stories of experiences in the European and Pacific theaters.

11TH SEBRING EXPO OVERCOMES WEATHER, TRAGEDY

THE 2015 U.S. SPORT Aviation Expo at Sebring Regional Airport in Florida overcame early weather challenges to finish strong in its 11th annual event held January 14-17.

Sebring, the go-to show for light aircraft shoppers, adopted the tagline The Affordable Aircraft Expo and expanded its focus to include a wide variety of aircraft including light-sport aircraft, homebuilts, refurbished production aircraft, and ultralights.

EAA's busy exhibit featured both the One Week Wonder Zenith CH 750 Cruzer built at EAA AirVenture Oshkosh 2014 as well as a Piper Cub representing the 2015 EAA Aircraft Sweepstakes grand prize J-3, "The Perfect Cub." Also present were representatives from EAA Insurance Solutions, EAA membership benefits, and fuselage building and rivet board activities.

Nearly 140 exhibitors, including 40 first-timers, covered the 21.5-acre exhibit area. Aviators Hot Line sponsored the Expo's first Aircraft Sales Lot, and the nearby homebuilt parking area for private aircraft owners/builders was nearly full every day.

Unfortunately, the joy of the event was shattered on Friday morning when an Aero Adventure Aventura crashed during the Exhibitors Showcase, taking the lives of Dennis Day and Jason Spinks. The staffs of the Expo and the Sebring Airport Authority extend their deepest sympathy to the victims' families, friends, and colleagues. The National Transportation Safety Board continues to investigate the accident.

Next year's event is scheduled for January 20-23, 2016.

For more information and direct links to Flightline stories, visit *www.EAA.org/sportaviation*.

PHOTOGRAPHY BY **LEEANN ABRAMS** AND **JIM KOEPNICK**

NEW PS ENGINEERING AUDIO PANEL DESIGNED FOR HOMEBUILTS

PS ENGINEERING HAS tailored its latest and most capable audio panel to suit the requirements of homebuilt airplanes and other experimentals. The new PDA360EX retains the advanced features of PS Engineering's audio panel but to save money leaves out capabilities experimental airplanes won't use.

IntelliAudio is a new feature PS Engineering introduced last year. The technology allows pilots to listen to two radios at once but to "position" the sound using stereo headphones so one radio is audibly dominate while the other is still audible in the background.

The PDA360EX also has PS Engineering's IntelliVox voice-sensing technology on the intercom. IntelliVox uses digital electronics to recognize when you are speaking into the microphone and opens the circuit automatically. The system is smart enough to reject non-vocal noise to keep the intercom quiet when nobody is talking.

The audio panel also has Bluetooth capability so you can wirelessly connect personal electronics to your headset and intercom, and features a USB charger outlet.

The PDA360EX is priced at $2,095.

SOLAR IMPULSE WORLD FLIGHT ROUTE UNVEILED

THE WORLD-FLIGHT route of Solar Impulse 2 (Si2) will include 12 planned stops, according to Swiss co-founders and pilots Bertrand Piccard and André Borschberg. Si2 is the world's first solar-powered plane able to fly day and night. It was set to depart Abu Dhabi in late February or early March and return by late July or early August 2015, with a total distance estimated at 35,000 kilometers.

Stops include Muscat, Oman; Ahmedabad and Varanasi, India; Mandalay, Myanmar; and Chongqing and Nanjing, China. After crossing the Pacific Ocean via Hawaii, Si2 will fly across the continental United States stopping in three locations, including Phoenix and New York City at JFK. A location in the Midwest will be decided dependent on weather conditions.

After crossing the Atlantic, the final legs include a stopover in Southern Europe or North Africa before arriving back in Abu Dhabi.

DOCUMENTARY TO CHRONICLE BURT RUTAN, NEW AIRPLANE PROJECT

AVIATION LEGEND Burt Rutan, designer of homebuilt aircraft like the Long-EZ as well as Voyager and SpaceShipOne, is building a new airplane. AntennaFILMS, which created an award-winning television documentary about SpaceShipOne, is in production on a feature-length documentary on the designer's legacy and contributions to aviation, and the film will include extensive coverage of the new project.

"Burt is building a really cool plane in his garage," said Scott B, co-director on the project and partner at antennaFILMS. "I can't reveal much about the plane, but it will be a game changer. It'll do things no plane has ever done before."

To support the documentary, the filmmakers launched a Kickstarter fundraising effort to help with filming as he finishes and test-flies the new plane. Their goal is to raise $80,000 for this stage of the production.

Scott describes Rutan as "one of the greatest innovators of our time who helped revolutionize the aviation and aerospace industry, and whose accomplishments and story will inspire young engineers and airplane enthusiasts for years to come."

Scott and co-director Sandy Guthrie shared a Peabody Award for Excellence and a Cine Golden Eagle Award for their 2004 Discovery Channel documentary *Black Sky: The Race for Space* documenting Burt and his team winning the $10 million Ansari X Prize with SpaceShipOne.

BRIEFLY NOTED...

// **LIGHTSPEED AVIATION'S** flagship Zulu PFX received its first firmware upgrade earlier this year providing 10 percent improved battery life, ability to capture a streaming quiet noise cancellation profile for later retrieval, and minor bug fixes.

// **HARTZELL PROPELLER INC.** has received a supplemental type certificate (STC) from the FAA for the company's new lightweight Scimitar swept-tip aluminum prop for all Cessna 172RG Cutlass aircraft. The two-blade propeller is made of lightweight carbon fiber and has an all composite spinner assembly. Kit pricing for the new prop, spinner, and STC is $9,500.

// **BEARHAWK AIRCRAFT** debuted the first quick-build example of its new light-sport aircraft at the U.S. Sport Aviation Expo. The Bearhawk LSA has an empty weight of 818 pounds including starter and full electrical system, and has 322 pounds of useful load with full fuel (30 gallons). It cruises at 118 mph at 75 percent power sipping 6 gph. Construction is similar to other Bearhawk aircraft, with fuselage and tail surfaces of welded 4130 chromoly frames covered in fabric. EAA

PHOTOGRAPHY COURTESY OF **JEAN REVILLARD/REZO.CH**

J. MAC MCCLELLAN
COMMENTARY / LEFT SEAT

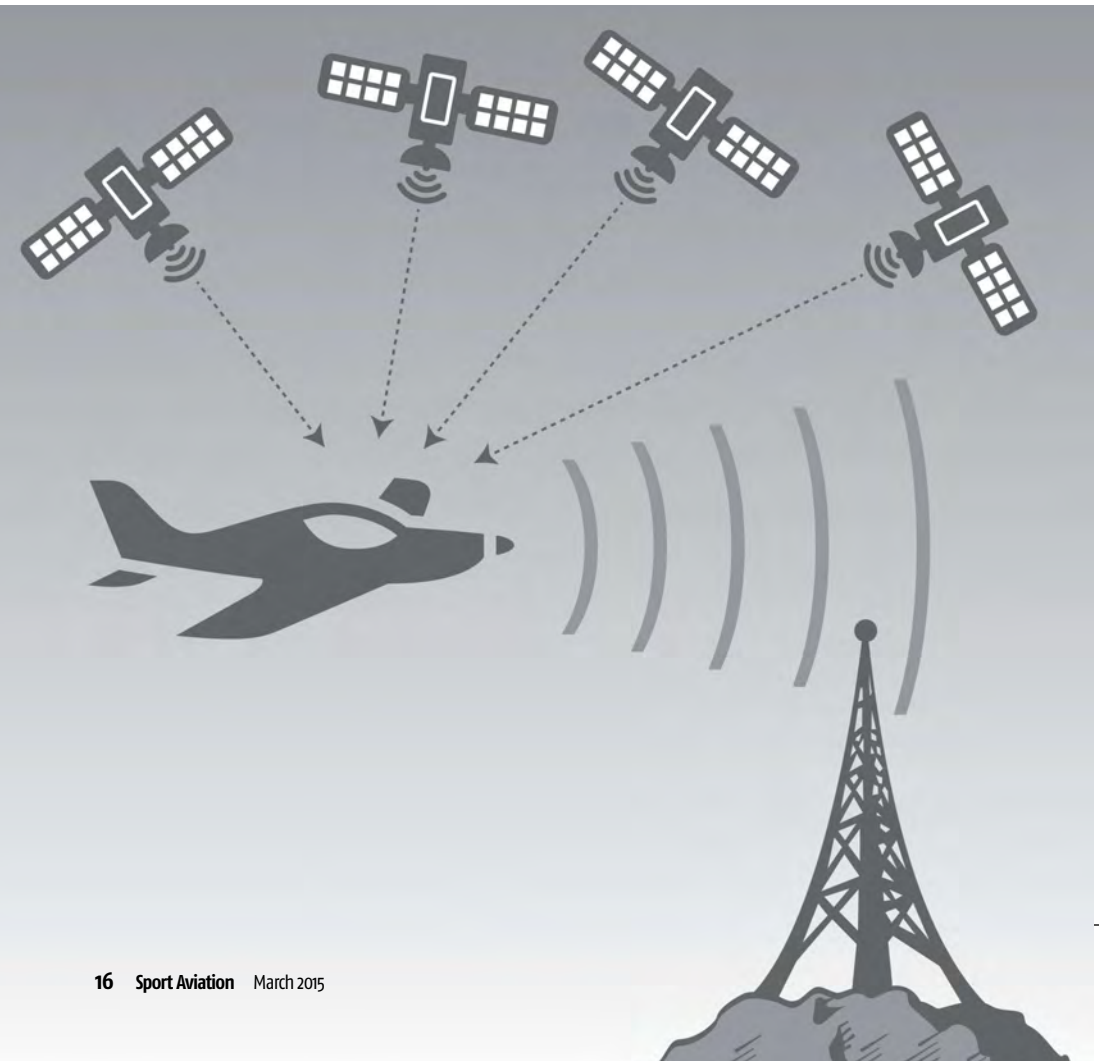
The FAA Checks My ADS-B. I Pass.

J. MAC MCCLELLAN

LAST SUMMER I COMPLIED with the 2020 ADS-B "out" mandate. A couple weeks ago the FAA ran a free in-flight test of my equipment on a regular trip, and I passed with flying colors.

In many respects, my airplane is a poster child for complying with the ADS-B rule. I already had a fully approved WAAS-aided GPS navigator installed, and a Mode S transponder with extended squitter, so the essential ingredients of ADS-B have been there for several years.

The Garmin GNS 530W navigator had been wired to the GTX 330ES transponder during the initial installation in order to receive traffic information service (TIS) from controller's radar. TIS was an FAA plan to send up to Mode S transponders a dynamic picture of the traffic on the radar. With TIS, pilots could see the same traffic picture as the controller.



TIS worked okay, but the equipment was only installed at terminal control radar sites, and not many of those. The FAA tossed TIS over the side when it developed its ADS-B mandate because traffic display is an inherent component of ADS-B.

The GPS and the transponder are wired together on an electronic bus similar to the connection between your computer and printer. This bus can carry position information from the GPS to the transponder, which then broadcasts the information over the extended squitter feature. Voilà. I already had a WAAS-aided GPS position source and a transmitter that are the key hardware components of ADS-B.

What had been missing until early last year was the software needed to format all of the required ADS-B data in the GPS and also in the transponder. Garmin had to jump through a long series of hoops to prove to the FAA that both components, and the updated software, met the requirements.

But ADS-B certification is a two-step process so Garmin also had to prove that the equipment would perform properly if specific installation instructions were followed. The GPS and transponder had to pass all tests on the bench, and then a second certification was awarded to describe exactly how the equipment must be installed in each airplane.

The reason for the two levels of certification is the FAA treats ADS-B as a major alteration of the airplane requiring STC level of supporting data. That ADS-B approval is in the same regulatory category

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as installing a different engine, for example. Form 337s must be filed with the FAA describing the installation exactly as you would for a major change in the airframe structure or basic systems. What the STC and Form 337 process does is re-certify the airplane to meet a new standard.

It may sound crazy to treat an avionics installation as a major alteration, but there is a precedent. For example, all "complex" avionics systems such as RNAV, LORAN-C, GPS, electronic flight instrument displays, autopilots, etc. require STC level documentation and Form 337 filing to be approved, particularly for IFR flight.

In one way the draconian attitude toward approving GPS systems works in an airplane owner's favor when it comes to complying with the ADS-B "out" rule. If a WAAS-aided GPS has already survived the certification wringer to qualify for IFR navigation—and there is an STC to install it in your airplane—it has also met the requirements for an ADS-B position source.

To certify that the GNS 530W and GTX 330ES transponder already in my airplane met the ADS-B "out" requirement the radio shop had to apply another STC—the one Garmin obtained to cover many models of standard production airplanes.

Mayday Avionics—the shop I use in Grand Rapids, Michigan—had been through this before. It traced the wires to be sure they matched the installation STC. It installed the latest software in both the GPS and transponder, and then it used new special testing equipment to be sure the ADS-B "out" broadcast was functioning properly.

Most importantly—at least in terms of being legal—Mayday handed me a big binder of paperwork that included Form 337s for the major alterations, a pilot's operating manual, emergency procedures, and directions for continuing maintenance of the equipment. Not a single wire or piece of hardware was changed, but to comply with the requirements for this major alteration—really an addition to the airplane type certificate—Mayday experts had to make sure everything matched the STC exactly.

Every "i" had been dotted, every "t" crossed, and the system had been tested on the ground, but how was my ADS-B functioning in actual flight? I asked a couple of controllers if they could tell using their equipment and the answer was no. The internal monitors in the GPS and transponder designed to alert of a problem showed everything was fine. But was it?

Because anybody who invests in meeting the ADS-B requirement wants to be sure the system is working, the FAA has created a compliance monitoring program. Actually, the network of more than 500 ground stations is monitoring your ADS-B signal at all times so the FAA network knows who you are and if the system is working. But the free compliance check records your ADS-B signal during an actual flight and e-mails you a report of how the system performed.

You can look at *www.FAA.gov* under NextGen ADS-B to find the spot where the FAA offers to check your equipment and send the e-mail. Include in your e-mail the make and model of the avionics that make up your ADS-B "out" system including the position source and transmitter models—in my case those are GNS 530W and GTX 330ES. I also included in the e-mail that I was flying from Muskegon to Battle Creek, IFR, the following day, but I don't think you need to alert the FAA of your plans because ADS-B is always monitored.

In a couple days I received an e-mail from the FAA with an extremely extensive "compliance report" and a guide on how to read the report attached. A very helpful person at the FAA also took the time to add to the e-mail, "Everything looks okay."

A fundamental element of the ADS-B "out" message is the unique ICAO identification number that is assigned to your registration. The FAA's computer network took that number, linked it to its aircraft registration database, and instantly knew everything about me. The report included the exact type of airplane and its serial number, my mailing address, and all other data the FAA has on me and my airplane.

ADS-B operates on the ground, as well as in flight, so aircraft position can be tracked on the airport surface; however, only major airports have complete surface coverage. Neither Muskegon nor Battle Creek have it so my system couldn't be checked on the ground, even though it was broadcasting.

The report shows that it took 28 minutes and 11 seconds to fly from Muskegon to Battle Creek, including flying the ILS approach. During that time the ADS-B system broadcast 8,827 reports of which 2,329 were processed by the FAA network.

The ADS-B standards require a report of position, velocity, integrity, and so on at least once each second. My IFR trip lasted only 1,691 seconds so you can see my ADS-B system was overachieving. You can also see why WAAS-aided GPS is essential. Standard GPS without WAAS performs a position calculation only once each second. With WAAS a position is established six or eight or more times per second. Rapid position fixing is essential to determine vertical and horizontal velocities in the same way that checkpoints close together on a chart give you a more accurate calculation of groundspeed and course.

The ground network knew, of course, that my system was broadcasting on the 1090 MHz transponder frequency instead of the optional UAT frequency. It also knew I had only a single antenna instead of the top and bottom antenna "diversity system" some countries or operations require. It knew my airplane was "light," less than 15,500 pounds, and the four-digit transponder code I had been assigned for the flight.

The good news is that none of the required elements of the thousands of ADS-B reports during my short flight were missing. Every "integrity & accuracy" check was also perfect. The same perfect results were reported for "kinematics" and "other checks."

The position accuracy report is impressive. A full 100 percent of the horizontal position accuracy reports were better than 10 meters. The horizontal velocity error was less than 3 meters per second. And the geometric velocity—vertical speed—accuracy was better than 45 meters per second at all times.

The demonstrated integrity of the system was great, better than one in 10 million. And the "system design assurance" checked at better than one in 100,000 reports. The

ground network was able to fully validate 99.2 percent of all of the 2,329 message broadcasts it processed during the flight. And several other performance categories all checked essentially perfect.

I have been writing about ADS-B and NextGen for more than 20 years, and I must say that I'm very impressed to see actual performance of such precision and reliability even in a GA level system. Clearly, ADS-B will make a much more precise, efficient, and potentially safer IFR traffic network. Whether such precise surveillance is necessary or even helpful for VFR flying is another discussion.

The FAA is finding that many ADS-B systems, 40 percent or more in some cases, are not checking okay. Some of those that don't check out are unapproved systems installed in homebuilts that broadcast invalid signals. And there is equipment installed on some airliners that doesn't meet the current rule. But most problems in certified systems are caused by improper programming during installation.

Of course none of the performance checked on my system has anything to do with ADS-B "in," which includes subscription-free weather, traffic, and much more. That is called flight information service-broadcast (FIS-B) and is only sent up on the universal access transceiver (UAT) frequency. Airplanes that fly below 18,000 feet can install UAT "out" to meet the 2020 rule, and any airplane can have FIS-B capability including using a portable receiver.

It's crucial to understand that ADS-B approval is a multi-level process. The WAAS-based position sensor must be approved, and the UAT or 1090 MHz transponder must be approved individually. And then, finally, the exact combination must be approved for installation in each specific airplane type. And all of it is a "major alteration" to the airplane type.

There are a few systems that combine the position sensor and transmitter in a single unit, which can simplify installation and approval. So far those systems use the UAT frequency, but I expect a transponder with its own GPS position sensor will be developed before long. It looks to me like only combined systems can reduce the cost of the equipment, and more importantly the cost of earning installation certification. We must have lower-cost options for basic airplanes.

But, after all of the equipment installation, wiring checks, and endless paperwork, it was gratifying to get the FAA report that my ADS-B performed perfectly. I guess I'm officially now flying in NextGen. EAA

J. Mac McClellan, EAA 747337, has been a pilot for more than 40 years holds an ATP certificate, and owns a Beechcraft Baron. To contact Mac, e-mail *mac@eaa.org*.

A JOURNEY THROUGH TIME – WITH RIMOWA

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LANE WALLACE

It Was Never About the Plane

BY LANE WALLACE

I NEVER MEANT TO write an aviation column.

"Flying Lessons" is actually the name of a book manuscript I wrote back in the mid-1990s. I'd been a pilot for about 10 years, and I'd realized that the real lessons airplanes had taught me had very little to do with power settings, stick and rudder techniques, or the laws of physics. Not that I hadn't learned anything about those skills or topics. But it began to dawn on me that buried in that concrete learning were lessons of a bigger sort, with implications far beyond the simple act of safely piloting a plane.

Mastering crosswind landings, for example, was really a lesson in facing and overcoming fear. Flying over the same stretch of landscape in all the seasons of the year could illustrate some important things about the trade-offs of novelty and intimacy. A rough-running engine, or letting someone else fly your airplane, had a whole lot to teach about the importance and fragility of trust.

Buried in my flight experiences, in fact, were reminders or illustrations of some of the most important lessons all of us need to master in order to live a fulfilling life without regrets. Things like being honest with yourself. The need to embrace your strengths while respecting your limitations.

PHOTOGRAPHY COURTESY OF **LANE WALLACE**

The importance of overcoming fear and living in the moment. The power of passion, confidence, and community. The benefits of stretching into the unknown and unpredictable world of adventure. Perspective. Beauty. Determination.

Perhaps I'm just a "big picture" kind of girl. But intrigued by the seemingly parallel flying and life lessons that a flight experience could impart, I started writing a manuscript about it. At the time, I was making a living writing books and video scripts for clients, and writing freelance features for various aviation magazines. But my "Flying Lessons" manuscript was written in a very different voice. I wrote it first person, from the heart, about my own experiences and my own learning. I now write and speak often about the importance and power of every person's authentic inner "voice." But when I look back to see when, exactly, I brought my own authentic voice into the world...it was when I wrote that manuscript.

Imagine, then, my disappointment when the manuscript didn't sell.

After a couple of years, I finally, dejectedly, put it away in a drawer. And there it stayed until 1999, when a mutual friend connected me with J. Mac McClellan, who was, at that time, the editor in chief of *Flying* magazine. He asked me if I owned my own airplane. I did—I'd bought my Cheetah a whole two weeks earlier. But he went on to say that he didn't really need another feature writer at that time. I thought about my unsold manuscript. I figured I had nothing to lose, so I took a bold leap.

"To be honest," I told him, "what I'd really like to do is be able to write first person, in my own voice, about the people, passion, adventure, and learning that I think make flying worthwhile." And before he could say no, I added that I had a writing sample that would show him what I was talking about.

I suppose Mac figured he had nothing to lose, as well, because he agreed to look at the sample. I sent him a chapter called "Lost Communication," which talked about the painful canyons of silence I'd witnessed between many fathers and sons, and how I'd sometimes seen airplanes bridge that gap. When Mac got the sample, he called and said, "If that's the kind of writing you want to do, I have a place for you. I'd like to offer you a column."

That's how it happened. And after struggling for several weeks to come up with a perfect, catchy name for this new column (you'd be surprised at how hard title creation can be), Mac suggested I just use the title of the manuscript the writing sample had come from. Which is how the column ended up being called "Flying Lessons."

After an introductory column on the price and gifts of adventure, the story about fathers, sons, and airplanes became not just my second published column ("Like Father Like Son," *Flying*, June 1999), but also probably my all-time best-received and best-remembered column. I still occasionally get letters about it. But for me, the best part about all those letters was realizing that what had seemed important and powerful to me had resonated with others, as well. I wasn't the only one who was moved by certain aviation experiences. There were kindred spirits out there, even if I'd never met them.

That was 16 years ago. And if the road to getting that column was a bit circuitous, the roads my column led to were 100 times as broad. The mandate was simple: Go fly your airplane. Fly other planes. Explore. Experience. Learn. Meet people and learn their stories. And then bring back and share all the stories worth telling.

In pursuit of that mandate, I've not only flown my own airplane all over this continent, but aircraft on four other continents, as well. I've found myself stranded in shorts and tennis shoes on a glacier at 11,000 feet up in the Alps, and diving through the cabin of a PBY Catalina wreck in a South Pacific lagoon. I've encountered rebel fighters in the Congo, and flies aggressive enough to

give those rebels a run for their money in the Australian Outback. Truth is, you can fit an awful lot of adventure into 16 years, when it's your job to go looking for it.

But just as flying, for me, was never about the plane, all those travels and explorations were never just about adventure for adventure's sake. All of it—the flying and all the adventures I pursued with it—were about three different goals.

The first was about the rewards of exploration: about broadening the range of experiences I could have in the short time I had to enjoy and explore this planet. The second was the learning: about better understanding the various cultures and landscapes of the world, and learning more about myself and this thing called life in the process. And the third was a desire to live as fully, with as much enthusiasm and gusto, as possible. Actively exploring everything that life and the world could show and teach me made me feel alive. Exquisitely, intensely, joyfully alive.

What's more, the fact that I was pursuing all those things with an eye toward, "is there something in here—some joy, some learning, some interesting trait of humanity—that would make this story worth sharing with others?"...infused the experiences with a level of purpose that helped counter even the uncomfortable times.

For make no mistake about it—there most certainly *were* uncomfortable times. Adventure, as I wrote in my very first column, is lots of wonderful things. It's exciting to think about beforehand, great to talk about after the fact, fun, scary, and exhilarating all at the same time, and almost always educational. But it's also very rarely comfortable. In every single one of the adventures I've pursued over the past 16 years, there was at least one moment where I wondered what had possessed me to think this was a good idea, combined with a fervent wish to be back in my own comfortable home and bed.

If I stuck with it, it's because the richness of the experiences and the learning kept outweighing that discomfort. (Much like why most pilots keep flying, despite the discomfort, price, and hassles involved.) That, and the people I met along the way: in the adventures themselves, in the talks I gave around the country, and through the responses of readers who wrote back.

Given how distinct the tastes of individual humans are, maybe I shouldn't have been surprised at how differently stories resonated with different readers, but I was. I could never fully predict which columns—and which aspects of different columns—would prompt readers to respond. I even got a letter once from a man who said he finally understood why his infidelity was hurting his marriage after reading a column I'd written about how an intermittent stumbling engine had made me distrust my Cheetah. Go figure.

But all the responses—the heartbreaking, the moving, the funny, and, yes, even the critical—were gifts that reminded me, constantly, of the family of pilots and readers out there to whom I was connected. And for the past 16 years, I have known, without question, that I was, and continue to be, a very lucky woman.

Of course, one of the big lessons my airplane and all those years of adventure taught me is that life is found in movement. Forward movement, to be exact. Keep an airplane still, or in one place, and the life within it dies.

In the course of all the movement and changes over those 16 years, I also realized that the stories of adventure worth exploring and sharing went far beyond the simple act of flight. I even started a blog (associated with my website) to write about some of those bigger adventures, questions, and issues. In trying to inspire people to pursue more adventurous and passion-infused paths in life, I probably talk more about the challenges of personal and professional adventure than physical feats on land, sea, or in the air. But I still use airplanes and physical adventure to illustrate important life lessons that, not surprisingly, apply to *all* adventures.

And yet, as the Greek philosopher Heraclitus once wrote, everything changes. And the winds of change are blowing again. So with this last entry, I am wrapping up my 16-year run, and retiring my "Flying Lessons" column. The adventures and writing will continue, to be sure. Just not in these pages.

But I wish to leave you with one last story, about my very first adventure. I was 19, and I'd gone to live in New Zealand by myself for a while. In the course of a solo backpacking journey along the coast there, I came across a sight that, to this day, remains the most beautiful I've ever witnessed. It was a pristine cove, with a white sand beach surrounded by tropical greenery and waterfalls, touching a glimmering sea that stretched to the horizon in eye-watering shades of turquoise, teal, and cobalt blue. "Oh, my!" I exclaimed. "That's the most beautiful..." I stopped, realizing there was nobody to share the experience with. And the scene lost just a little bit of its beauty because of that.

For the past 16 years, everyone who's read my column has given me the gift of a copilot and company to share every single one of my adventures. And from the depths of my heart, I want to thank you for coming along. EAA

Lane Wallace, EAA 650945, has been an aviation columnist, editor, and author for more than 20 years. More of her writing can be found at *www.LaneWallace.com* and at *www.TheAtlantic.com/Lane-Wallace*.

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LYCOMING

MIKE BUSCH
COMMENTARY / SAVVY AVIATOR

150-Year-Old Technology

Most of us are still flying (and driving) behind powerplant technology that dates from the 19th century

THE ORIGINAL FOUR-STROKE Otto-cycle internal-combustion engine was patented in 1862 by a Frenchman named Alphonse Beau de Rochas. More scientist than engineer, de Rochas never actually built an operational engine. The first working prototype was built by a German engineer named Nikolaus A. Otto, who was ultimately rewarded for his efforts by winning a gold medal at the Paris Exposition in 1867 and having the four-stroke cycle named after him.

The first practical Otto-cycle engines were built by another, better known German engineer named Gottlieb Daimler, who together with his lifelong business partner Wilhelm Maybach built a one-cylinder automobile engine in 1885 and a two-cylinder engine in the now-classic "V" configuration in 1889. Daimler died in 1900, and in 1926 his company Daimler Motors Corporation merged with Benz & Co.—founded by two-stroke engine pioneer Karl Benz—to create Daimler-Benz AG.

The basic power-generating component of an internal-combustion engine is the cylinder assembly, whose major components are a cylinder, a piston, and a pair of valves or ports (intake and exhaust). Each up or down movement of the piston within the cylinder is termed a "stroke."

SUCK, SQUEEZE, BANG, AND BLOW

An Otto-cycle engine employs an operating cycle composed of four strokes, with each successive stroke associated with a different phase of the cycle. The four phases are usually referred to as intake, compression, power, and exhaust—or colloquially, suck, squeeze, bang, and blow.

Suck: During the intake stroke, the piston moves away from the cylinder head with the intake valve open, creating a partial vacuum that sucks a combustible mixture (in our case, air containing atomized gasoline droplets) into the cylinder.

Squeeze: During the compression stroke, the piston moves toward the cylinder head with both valves closed, compressing the air-fuel charge into a much smaller volume, increasing its pressure and temperature, and making it more capable of combustion. The difference in volume of air-fuel charge between the start of the compression stroke (piston all the way down) and the end of the compression stroke (piston all the way up) is termed the "compression ratio." Most aircraft engines have very conservative compression ratios (between 7-to-1 and 8.5-to-1); automotive engines usually have

THE FOUR-STROKE OTTO CYCLE

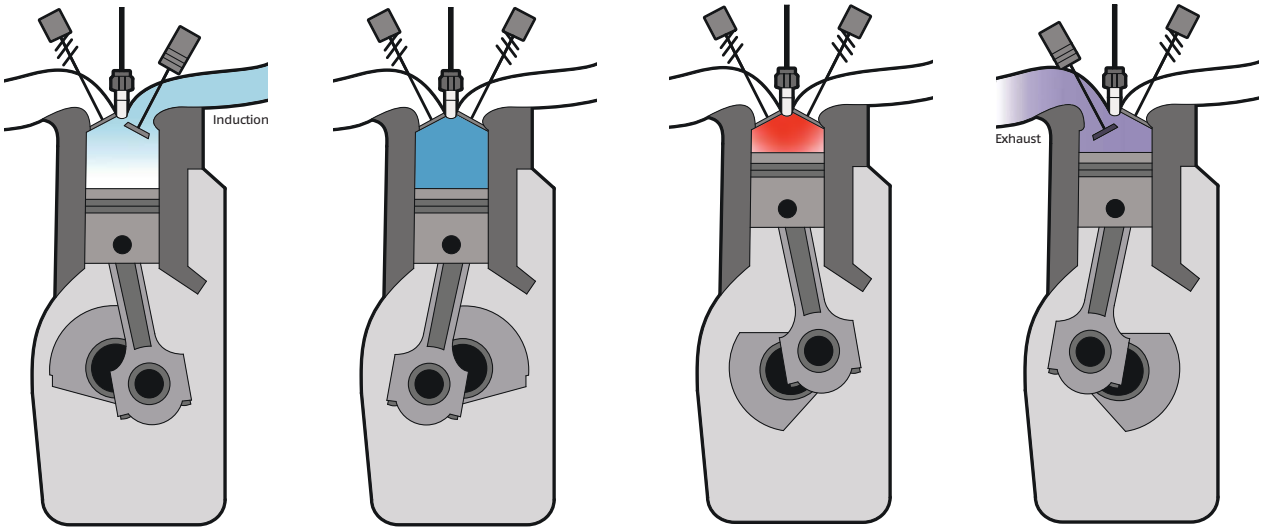


ILLUSTRATION BY **CHRIS LIVIERI**

compression ratios between 8-to-1 and 10-to-1, racing engines up to 12-to-1, and diesel engines 14-to-1 or more. The greater the compression ratio, the more efficient the engine at converting chemical energy into mechanical energy. (Piston aircraft engines aren't particularly efficient.)

Bang: During the power stroke, the air-fuel charge is ignited by an electrical spark (or by the heat of compression in diesel engines). Both valves remain closed, so the rapidly increasing pressure of the burning air-fuel charge drives the piston forcefully away from the cylinder head, converting chemical energy to mechanical energy. As the piston moves down in the cylinder and the volume of the air-fuel charge increases, its pressure and temperature decrease.

Blow: During the exhaust stroke, the piston moves toward the cylinder head with the exhaust valve open, allowing what remains of the spent air-fuel charge to exit the cylinder and be expelled through the exhaust system. Because piston aircraft engines are not very efficient, substantial energy remains in the exhaust gas as it exits the cylinder. In a normally aspirated engine, this energy is simply wasted; in a turbocharged engine, some of the energy is used to spin a compressor and raise the pressure of the engine's induction air, allowing the engine to produce more power (especially at altitude).

THE MORE, THE MERRIER, ER, SMOOTHER

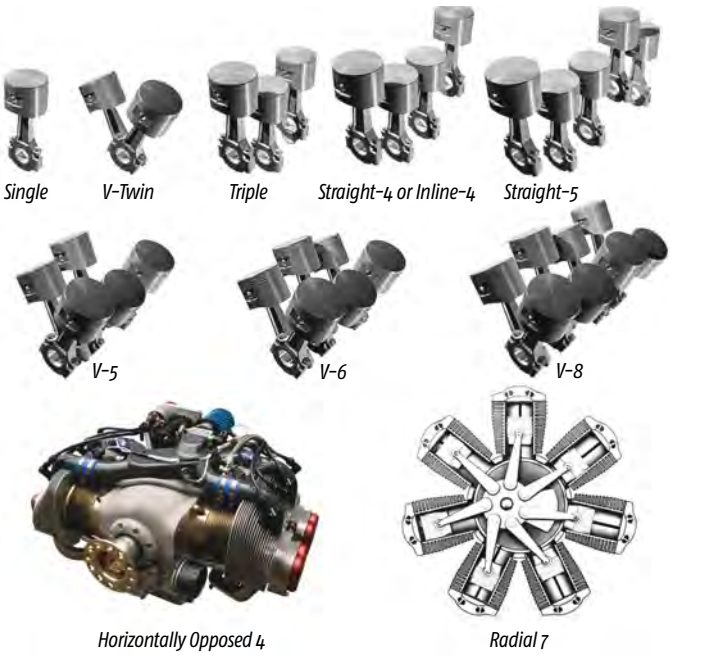
While the Otto cycle defines what's going on within a single-cylinder assembly, most piston engines have more than one cylinder. That's because a fundamental limitation of the Otto cycle is that it only produces power 25 percent of the time. Consequently, the one-cylinder Otto-cycle engines commonly used on lawn mowers and small motorcycles tend to leave a lot to be desired in the smoothness and vibration departments.

The obvious solution is to have four cylinders arranged so that one is always in its power stroke at any given time; this approach results in a much smoother-running engine with far less vibration. Even greater smoothness is possible by adding additional cylinders and sequencing them so that one power stroke begins before the previous one finishes.

Numerous cylinder arrangements have been tried. Most automotive engines use either in-line (straight) or V-type layouts (for compactness), while most aircraft engines use either horizontally opposed or radial layouts (for improved air cooling). The most common configurations in piston-powered GA engines are four or six cylinders horizontally opposed.

PRESSURE AND VOLUME

Although the four-stroke Otto cycle is conceptually simple, what actually takes place inside the cylinder during each cycle is remarkably complex, as are the critical



ENGINE LAYOUTS

Otto-cycle engines commonly have four or more cylinders arranged so that at least one is in its power stroke at any given time.

timing relationships of piston position, pressure, temperature, valve opening and closing, and ignition. The more you understand about the combustion event and timing relationships, the better job you will be able to do of managing your powerplant, optimizing your power and mixture settings, and troubleshooting any engine problems that may arise. With that in mind, let's explore the Otto cycle a bit more deeply.

An excellent tool for visualizing what goes on during the Otto cycle is a "P-V diagram" that plots combustion chamber pressure and volume. Look at the figure below and let's work through the four strokes of the Otto cycle:

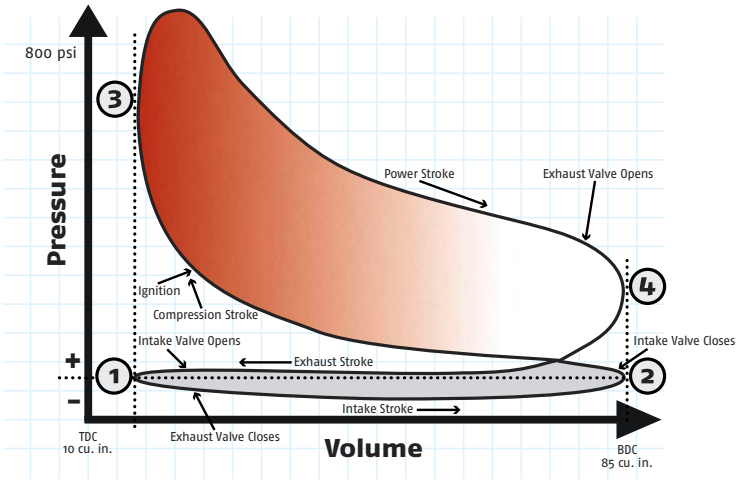
Suck: Beginning at point (1) on the diagram, the piston starts at the top of its travel ("top dead center" or TDC) and moves to the bottom of its travel ("bottom dead center" or BDC). The intake valve is fully open, the exhaust valve closes, and the descending piston creates suction that draws the air-fuel charge into the cylinder.

Squeeze: At point (2), the piston reverses direction and moves from BDC to TDC. The intake valve closes, and the air-fuel charge is compressed—for example, from a volume of 85 cubic inches to 10 cubic inches (a compression ratio of 8.5-to-1)—causing the pressure and temperature in the combustion chamber to rise accordingly. As the piston approaches TDC—typically 20 degrees to 24 degrees of crankshaft rotation before it gets there—the ignition system fires the spark plugs, and the air-fuel charge starts to burn, causing the pressure and temperature to increase even faster.

Bang: At point (3), the piston reaches TDC and reverses direction again, moving toward BDC. Meantime, the combustion of the air-fuel charge accelerates, reaching a maximum pressure and temperature at about 15 degrees to 20 degrees of crankshaft rotation after TDC. This is the point of peak internal combustion pressure (ICP), which is typically 800 psi in a normally aspirated engine and as much as 1,000 psi in a turbocharged engine. This high pressure pushes the piston down toward BDC rather forcefully: 800 psi pressing on a 5-1/4-inch piston produces more than 17,000 pounds of force. As the piston descends and the air-fuel charge expands, its pressure and temperature drop considerably as chemical energy is converted to mechanical energy. Shortly before the piston reaches BDC, the exhaust valve starts to open. Since the pressure in the cylinder is still considerably greater than outside ambient, exhaust gas starts flowing out the exhaust valve into the exhaust system in a process termed "blowdown."

Blow: At point (4), the piston reaches BDC and reverses direction once more, moving toward TDC. As the piston rises, it compresses the remaining fuel-air charge and forces it out the exhaust valve. Shortly before the piston reaches TDC, the intake valve starts to open, so that it can be fully open by the time the piston reaches point (1) and reverses direction to start the intake stroke. The brief period during which both intake and exhaust valves are open here is known as the "valve overlap interval."

Because of their low compression ratios, spark-ignition piston aircraft engines are unusually inefficient as Otto-cycle engines go. They typically convert only about one-third of the fuel's chemical energy to mechanical energy, and waste about one-half of it out the exhaust and the remaining one-sixth in radiated energy from cylinder fins and oil cooler. The EPA-mandated move to unleaded avgas won't help this one bit. Diesel engines with their much higher compression ratios represent our best hope for more efficient piston aircraft engines in the future. EAA



The P-V diagram plots pressure and volume of the Otto cycle.

Mike Busch, EAA 740170, was the 2008 National Aviation Maintenance Technician of the Year, and has been a pilot for 44 years, logging more than 7,000 hours. He's a CFI and A&P/IA. E-mail him at *mike.busch@savvyaviator.com*. Mike also hosts free online presentations as part of EAA's webinar series on the first Wednesday of each month. For a schedule visit *www.EAA.org/webinars*.

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DAVE MATHENY
COMMENTARY / LIGHT FLIGHT

The Agony of Groundsickness

When you just have to have some airtime

SOMETIMES IT SEEMS like you can't bear being chained to the Earth for one more minute and you just have to get some air between you and the ground. This is a common complaint at this time of year, at least in the Northern Hemisphere, where tens of thousands of pilots who would otherwise be flying are kept ground-bound by cold, rain, snow, fog, and anything else that holds us down. Runways and taxiways are choked with snow, and even the thought of driving to the airport makes you cringe as you imagine clammy fingers of cold creeping down the back of your neck.

The medical term for the condition is *infirmitas terram*, or it could be if modern medicine ever gets around to recognizing the condition. What you need is to overcome gravity, to go on wings and feel the soft, supple support of air.

SUBSTITUTION QUASI-SOLUTION

We who fly, but who *can't* fly, know the malady well. As soon as the diagnosis is made, the important thing is to deploy the first remedy that's likely to come to hand—reading. (You're doing that now. It's helping, right? Of course it is.)

The kind of flying I usually do is ultralight and very light aircraft, which means that reading about that sort of flying only makes things worse. I have to be careful not to get too close to home, so to speak, so I focus my reading and web surfing on other kinds of flying, such as flying in combat or piloting a spacecraft. I just finished rereading, for example, Tom Wolfe's iconic *The Right Stuff*, which discusses the early history of the manned space-flight program in cheerful, tongue-in-cheek terms, and is not even slightly about light flight. I'm also currently reading histories of World War II and Vietnam flying. After that I'll probably immerse myself in Ernest K. Gann's books about flying in the 1930s and '40s.

I can't say enough good things about YouTube videos as a remedy. Just avoid the potential trap of the kind of video that promises death and destruction, usually with misspellings and lots of exclamation points ("wrost landig crash ever!!!!!"), and go for the genuinely entertaining and educational. Lately I've been mining World War II training films. Try typing in "Flight Characteristics of the North American P-51 Mustang: How to Fly the P-51 Fighter," and sit back for half an hour of sheer bliss as actors in uniform discuss the P-51's handling. That will lead you to other WWII-era gems. (Quite a few of the actors in these films would later become at least moderately famous, including Lee J. Cobb, Craig Stevens, and Burgess Meredith, plus some guy called Ronald Reagan.) Do not miss "Uncrating and Assembly of the P-47 Thunderbolt Fighter—1944," in which a crew of 50 men take a P-47 out of a box and put it together with only hand tools, and not many of those. A few minutes of this stuff and

ILLUSTRATION BY **DAVE MATHENY**

you're in a world where knowing these things is vital to the war effort and your part in taking the fight to Hitler and Tojo. Buy bonds!

SORT OF REAL, SORT OF NOT

And then, of course, there are flight simulators. It happens that my stick-and-throttle-quadrant combination is malfunctioning right now, but by the time you read this I'll be back in the virtual sky, most likely shooting down enemy fighters. I am not a bloodthirsty guy, so the standard first-person-shooter computer games don't make my day. After you've massacred the first dozen zombies, the fun seems to leak out of the whole enterprise. But to pilot a P-51 and go after a faceless enemy in a Focke-Wulf 190 or a Zero, matching your skills against his—and it would be his; the Luftwaffe and the Empire of Japan didn't put women in fighters—takes skill and experience. A real understanding of the weights, speeds, and aerodynamics required is needed to win. I love it that the simulated aircraft behave in much the way their real counterparts do, too; the P-47 just lumbers around the sky like a school bus, while the P-51 and Fw 190 are wonderfully nimble. But that's a story for another time.

Flight sims are wonderful, they are a delight, but they are to real flying as, approximately, having a Facebook friend is to having a real friend. That sounds harsh, I know, and I have managed to make it through many winters partly by flying on the computer.

REAL, YES, BUT IN THE SO-WHAT ZONE

Flying commercially doesn't really do the job. There is almost nothing in the inside of an airliner that says "airplane" except the view outside. And while I find looking through that cramped little porthole always fascinating, it doesn't help much. Airline travel is meant to be sterile, bland, boring. An uneventful flight is a good flight. (Well, that's true for us, too, but we like to be aware of our surroundings and a lot more hands-on.) The last time I flew commercially, what struck me about my fellow passengers was that they all seemed either dead or asleep, with the awake ones all scowly. Probably they were unhappy about not getting their carry-on luggage (their monstrously bulky carry-on luggage) into a nearby overhead compartment. None of them seemed to be aware of the awe-inspiring fact of flight.

A few minutes of this stuff and you're in a world where knowing these things is vital to the war effort and your part in taking the fight to Hitler and Tojo. Buy bonds!

DAVE MATHENY

Hey, people, you're doing 500 miles an hour. This is a miracle, what's happening here.

"Flying" for us fliers means having the controls, at least for a while. So, if you are fortunate enough to have a friend who has a nice, warm aircraft and who will let you take the controls at times, that could work beautifully. In fact, that's such a good substitute that you could cure groundsickness entirely.

HEY, YOU, GET OFFA MY CLOUD

If you are fortunate enough to have a heated hangar, going to the aircraft and working on it would be a terrific solution to the problem—almost as good, in its own way, as actually flying. Truthfully, I'm only guessing about that. My hangar is not heated, so all I can do is fantasize about what it would be like. I have never known there to be a time when whatever flying machine I have owned did not need work, even if just a good cleaning. Closing my eyes and dreaming—I am removing and replacing the tach, and all four of the screws on the face go easily into place, and the screwdriver does not slip and skid across the freshly painted instrument panel, leaving a ragged track. Now I'm running the Shop-Vac under the seat and the rudder pedals, long overdue. *Wait! What was that heavy clink, as if something was swallowed up? That was major, like a nut. That can't be good.*

Or, if you can take the cold and just want to go sit in the flying machine, the one caution I have is not to give in to taking off into the soup if it's instrument conditions and you're not an instrument-rated pilot (and current, and actually proficient at flying in IMC).

One cold, foggy, miserable day I drove to the airport—ignoring the clammy fingers—and just sat in the Ercoupe I had at the time. I started the engine and let it warm up. With zero-zero conditions there was no chance that I would fly, and I was not flirting with the idea of taxiing to the runway and having a little look-see. It was just good to sit there and look over the cowling as the engine rumbled along. After a couple of minutes I stood on the brakes and ran it up to 1800 rpm, then eased the throttle back, and pulled the mixture to idle cutoff.

Shutting everything down and climbing out, I caught sight of the prop. It had a thick jacket of ice from the hub to about halfway out, where it tapered off, leaving the outer portions of both blades clean. The inner portions had been moving slowly enough that ice had formed, while the tips had been doing close to 400 mph, fast enough to remain ice-free, at least in those conditions. The Ercoupe flies at considerably less than that. I could imagine what the wings would have looked like after a few minutes, if I had been foolish enough to take off.

Groundsickness. Somehow we'll beat this thing. We always do. Spring is not far away. EAA

Dave Matheny, EAA 184186, is a private pilot and an FAA ground instructor. He has been flying light aircraft, including ultralights, for 30 years. He accepts commissions for his art and can be reached at *DaveMatheny3000@yahoo.com*.

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BRADY LANE
COMMENTARY / DREAM BUILD FLY

Abigail and her sister Eliana explore the Vintage camping area at Oshkosh 2013.

The Gift

BY BRADY LANE

THE HEADSET COVERED the entire side of Abigail's face and squished her little cheeks together. Her eyes scanned nervously back and forth.

After a few minutes taxiing around Oshkosh's north ramp, her expression turned to a more relaxed, yet still reserved, smile. Success! I taxied back to the hangar and pulled the mixture.

A friend suggested that I taxi Abigail, my daughter, around the airport a time or two before taking her on her first flight so she could get familiar with the cockpit and all the strange sounds she'd encounter. According to Abigail, the strangest sound was coming from our headsets and the invisible people inside them.

Abigail's smile stopped when the engine did. "Sky," she said pointing up. I took my headset off, but she held hers in place with two hands. "Up," she insisted. She's always been one to know what she wants. I smiled, consoled her, and promised we would go up in the sky another time. Even as a toddler, she knew airplanes were intended for the sky.

I'm still intrigued how she knew we didn't fly. She couldn't see anything out the window and had no way of knowing what flying felt like, except maybe from her dreams and imagination, which I now realize are powerful influences.

Her disappointment didn't last long, and if anything, that first daddy-daughter non-flight only helped fan the flame of what was already inside her.

For me, it was a reminder of a great truth: Aviation is a gift. It cannot be earned, deserved, or bought. It is shared.

Homer Tangney—a high school history teacher in the 1930s—gave one of his students a gift that forever changed his life, and in turn, those of countless others. That student was Paul Poberezny, and the gift took the physical form of a battered Waco glider, but at its core was a unique personal invitation to experience aviation.

PHOTOGRAPHY BY **BRADY LANE**

Training can be bought and certificates earned, but aviation itself is a gift that is passed on in a uniquely personal way.

Even during mass training efforts, like in World War II, training was individual to individual. The torch was passed person to person, instructor to student, one at a time.

The money and time we invest in flying and training doesn't buy us aviation, it is merely our attempt to be good stewards of the gift we've already been given.

Gifts also demand to be given, hence the nature of anyone who enjoys aviation. Our joy increases when we share with others. If we truly enjoy something, we cannot help but share it. In aviation, you can do this whether you fly or not. Abigail's interest and passion for the sky is proof.

Abigail longs for the sky more than anybody I know. When an aircraft flies over our house at mealtime, she's the first to hear it. She presses her face against the dining room window and scans the sky.

I'd like to think my wife and I have been intentional about sharing aviation with her, but we haven't. We've simply welcomed aviation into our lives. The aviation community is family friendly and teaches values that develop good citizens, so we've decided to include our family in as much aviation goodness as we can.

Each summer, we camp at AirVenture even though our house is just a mile from the airport. We eat dinner at our campsite as ultralights fly overhead and have met other families from across the globe. Our neighbors last summer were from Australia. They brought our girls aviation souvenirs each day from their tour of the grounds. (Thank you, exhibitors, for bringing plenty of swag to Oshkosh!)

A couple years ago, Abigail and I fell asleep under a star-filled sky watching Disney's debut of *Planes* at the Fly-In Theater. Abigail fought valiantly to stay awake past her bedtime, but simply couldn't make it to the end of the film. We both must have had too much fun earlier in the day. When we woke to the credits playing, it immediately became our excuse to buy the DVD.

"Dusty" puzzles are now Abigail's favorite. We were working on one last week when she corrected me: "That's not his feet, Dad; that's his landing gear," she said.

Each Tuesday night, when I get ready to work on our Bearhawk, Abigail and her sisters argue over whose plane it is. This only matters because it

determines who gets to select the color. As of now, if it is Abigail's aircraft, it will be black stripes with purple polka dots. If you see a Bearhawk fly into Oshkosh in 20 years with that paint scheme, you'll know who won.

Abigail is a little builder herself. She can build an impressive "condor" paper airplane that can fly all the way across the living room. And she may be the only 3-year-old who can tell you how a paper airplane's dihedral affects its flight characteristics. Earlier this week, she assembled a military jet from Legos that now sits on her dresser as a trophy of accomplishment. My wife also regularly sends me photos from snack time of airplanes made out of goldfish, pretzel sticks, and apple slices. Abigail can make an airplane out of anything.

Abigail has still not left the ground in an aircraft, but the gift of aviation seems to already be hers. And to be honest, whether she becomes a pilot or not is not my goal. My aim is to share a gift with her that she can find joy in, be grateful for, become a good steward of, and eventually give to others, for in that she will find the greatest joy.

Whether you cook pancakes at your local airport on Saturdays, write articles for your chapter newsletter, fly Young Eagles, coordinate build projects, camp at Oshkosh with your family, volunteer as a technical counselor, park aircraft at a fly-in, or teach history in your local high school, you have the opportunity and privilege of sharing a gift that people have been dreaming about for all of history.

Abigail takes to the sky at the Brown Arch.

Thank you to all who have shared the gift with me these past seven years.

Tomorrow Abigail turns 4 and she wants only one thing for her birthday: This time, we're going up. EAA

Brady Lane, EAA 808095, is a multimedia journalist for EAA and a private pilot who is scratchbuilding a Bearhawk. Contact Brady at *blane@eaa.org*.

Eliana and Abigail Lane try on an ultralight at Oshkosh 2013.

PHOTOGRAPHY BY **BRADY LANE**

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Apollo 13

BY LAURAN PAINE JR.

WE WERE SITTING IN a corner booth at Elmer's Restaurant in King City, Oregon. It was midmorning. Around us, at the various tables, people were eating breakfast. Some had finished and were sitting contentedly with their fingers crooked through coffee cup handles, sipping. The air was full of morning talk, the kind where you're just starting your day, planning something, or looking forward to something. Friendly talk; good talk.

I was there at the invite of my RV-8 buddy, Nel, who is barely worth two cents. I know this because I once tried to sell him on a street corner, and two cents was the high bid. But he said, "You gotta meet this guy. He was an engineer on Apollo 13. Talk about experimental aviation, those guys were at the tip of the experimental spear."

"This guy" was Larry McAlister, now 85 years old. He was very welcoming, humble, polite, sharp as a tack, and still with a twinkle in his eye. He's also the closest I've ever been to Apollo 13.

You all know of Apollo 13, the explosion in the spacecraft, the suspense of the aftermath, the reconfigured, risky re-entry. It gripped the nation (and was later immortalized in a movie with Tom Hanks). Larry, sitting quietly before me in the booth, led the team that designed and built the backup computer that was largely responsible for getting the astronauts home safely. Apollo was built with a whole lot of talent and spirit of adventure. Larry was right in the middle of all that. It was an honor to meet him.

Of note, as we talked, Larry tended to deflect individual credit by mentioning again and again that it was a wonderful team effort. Larry was in California; Grumman built the Lunar Module in New York; the Command Center was in Houston. That kind of team effort: huge.

Larry's team was responsible for building the AEA (Abort Electronics Assembly) and DEDA (Data Entry and Display Assembly) for the AGS (Abort Guidance System). (Hey, this was NASA; you *knew* some acronyms were coming!) In 1970, computers were large and slow by today's standards, and memory was small. Yet, given the small confines of the spacecraft, they were to assemble devices that not only worked but could only be a little larger than a shoebox. This was their charge—and challenge. And they were still using slide rules. They had to create, assemble, and test everything, over and over again. It *had* to work.

As you might imagine, there were no naysayers on Larry's team; they *would* complete the assigned task, whatever it took. Larry once discovered a small device that had been left out of their planning, which caused a delay. He cried that night. These people *lived* the job. Larry's team ended up doing it right, and as it turns out, we're glad they did.

To do it all, Larry arranged for engineers, manufacturing personnel, and quality control personnel to all be in a room just a few feet from where the computer was being assembled. They dubbed that room the "Tiger Tank" to honor the dedication of all who worked there. Twelve-hour days, seven days a week were the norm. That sort of work schedule, no matter how committed the workers, brought out both good humor and tempers. And some divorces. Monumental accomplishments are seldom achieved without some pain.

Friday afternoon was stress-relief day: a three-martini lunch at a nearby Chinese restaurant. A martini with the appetizer; a martini with lunch; a martini with dessert.

Larry McAlister

PHOTOGRAPHY COURTESY OF **LAURAN PAINE JR.**

Nobody called the Tiger Tank on Friday afternoon. They were not available.

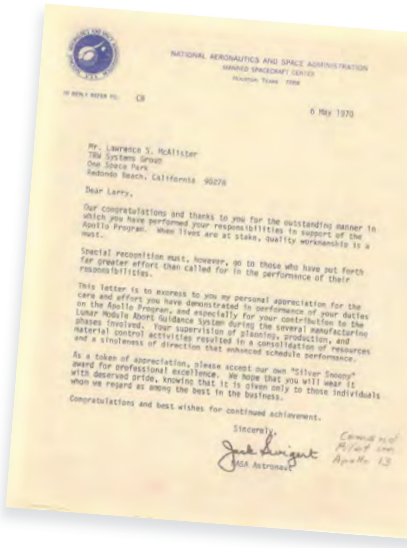
To this day Larry waxes poetic about Mary Quint (later Rush), who was secretary at the Tiger Tank. He said, "She kept that band of strong personality achievers on an even keel. I don't know how she did it, but she did. It's hard to imagine what it would have been like had she not been there." After he said all that he closed his eyes, shook his head, and softly said, "Whew! That was something how she did that."

Ever heard the term unsung hero? Mary Quint was one. Monumental accomplishments are seldom achieved without unsung heroes.

Why all the dedication? They were young and inspired with "landing a man on the moon in this decade." That's why. Personally, I sometimes miss that single-minded pursuit of a cause. I prefer explorative zeal to political quagmire. But that's just me talking.

Larry's journey to NASA is, in itself, a journey of dedication. He was born in Oklahoma. His father was a physician, his mother an accomplished pianist. It was expected in the family that Larry and his siblings would do well. Plus there was always music in the house. That's a nice combination: good parenting and music. His brother became a physician and his sister an opera singer. Larry always loved aviation and built many model airplanes. He graduated from the University of Oklahoma with a degree in mechanical engineering. Afterward he entered the U.S. Army and served in ordnance. After his military service, he went to work for TRW, which had the contract that eventually led him to NASA.

Of note, Larry is on the Dawes Rolls in Oklahoma for being part Cherokee Indian. That's a big deal in Oklahoma. Is Larry the first Cherokee Indian to be involved in putting a man on the moon? Don't know. But it's a nice thought.



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

6 May 1970

Mr. Lawrence S. McAllister
TRW Systems Group
One Space Park
Redondo Beach, California 90278

Dear Larry,

Our congratulations and thanks to you for the outstanding manner in which you have performed your responsibilities in support of the Apollo Program. When lives are at stake, quality workmanship is a must.

Special recognition must, however, go to those who have put forth far greater effort than called for in the performance of their responsibilities.

This letter is to express to you my personal appreciation for the care and effort you have demonstrated in performance of your duties on the Apollo Program, and especially for your contribution to the Lunar Module Abort Guidance System during the several manufacturing phases involved. Your supervision of planning, production, and material control activities resulted in a consolidation of resources and a singleness of direction that enhanced schedule performance.

As a token of appreciation, please accept our own "Silver Snoopy" award for professional excellence. We hope that you will wear it with deserved pride, knowing that it is given only to those individuals whom we regard as among the best in the business.

Congratulations and best wishes for continued achievement.

Sincerely,

Jack Lousma
NASA Astronaut

Command Pilot
Apollo 13

Back in Elmer's Restaurant, we were still talking about his experiences. I was enthralled with the many stories about the Apollo program, involving pride, effort, and brainpower, coming from this gentleman before me.

About this time an older lady got up from a nearby table and walked over. We glanced up and she said, "I don't mean to eavesdrop, but I couldn't help but overhear some of your conversation. My husband, now passed,

was one of the original 52 astronauts selected. Your conversation brought back a lot of memories from those times. They were exciting times."

Wow—out of the blue, wonderfully so. Connections! Then, almost as quickly as she appeared, she turned to leave, saying, "I don't want to keep you. I just wanted to share." Larry looked up at her and softly said, "Bless you."

The nice young waiter was standing by the table while the above exchange took place. His mother lives in the Pacific Pointe Retirement Inn, the same place Larry and his wife, Pat, live, so he knows Larry. The waiter said, "I didn't know you were a famous man." Of course Larry doesn't see himself as that—he's too humble—which is why he doesn't go around talking about it unless you drag it out of him, which Nel and I were doing. That's not to say he's not proud of his work with the Apollo program. He is.

I asked Larry of the explosion in the spacecraft. An oxygen tank exploded in the CSM (Command Service Module). (You remember the immortal line: "Houston, we have a problem.") It was determined the astronauts, to conserve power, oxygen, and water, should relocate to the Lunar Module, where the AGS was. Larry said, "Boy, that was all hands on deck. Very tense. There was fear. You have a lot of great minds working together, but you just never know about some things. I kept thinking of the MTBF (mean time between failures). We calculated all that stuff. It wasn't pretty, but it all worked out. I'll never forget it." Between the AEA, the DEDA, and the great leadership at the Command Center, a potential tragedy was averted. And Larry and his team were a big part of it.

For his work, Larry was given a commendation by Jack Swigert, the command pilot of Apollo 13. He also received the Silver Snoopy pin (a big deal at NASA!) for his contributions. That honor is bestowed upon only 1 percent of those individuals regarded as among the best in the business. The letter of commendation and the Silver Snoopy are currently on display at the Kansas Cosmosphere and Space Center in Hutchinson, Kansas. All this for the gentle and unassuming man sitting across from me at Elmer's Restaurant.

Larry went on to work for TRW for 30 years. He mentioned that he later designed the oil pump for the Bomarc missile. I asked, half-jokingly, "Did it work?"

"Yes, it did. I designed it," he said. He wasn't boasting; it was pride.

A few days later we called Larry with a question, but we couldn't get a hold of him. He was at choir practice! "The Singing Engineer of Apollo 13." I like it.

Was space travel experimental aviation? Yes, in a big way. And it still is. Larry is but one of us, only on a bigger scale. The whole world was watching. EAA

Lauran Paine Jr., EAA 582274, is a retired military pilot and retired airline pilot. He built and flies an RV-8 and has owned a Stearman and a Champ. Learn more about Lauran at his website, *www.ThunderBumper.com*.

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Flight of the Fairchild

The 2014 EAA Sweepstakes airplane has a new home

BY JEFF SKILES

WITH A PUSH OF the starter button the propeller spins briskly as if the starter motor wishes to register on the tachometer with its efforts alone. Eight blades go by in a blur, and I throw the oversized magneto switch to both. The Ranger comes to life with a thunderous roar before settling to a muttering rumble as the throaty exhaust of the smooth-running inline-six engine announces the presence of something entirely unique on the ramp. Nothing sounds like a Ranger!

The mission today is a simple one: to deliver this airplane to its new home in Indiana. The EAA Sweepstakes Fairchild 24 will leave Oshkosh after 15 years of repose in the hangars bordering Pioneer Airport. This is a good development for such a noble aircraft; it deserves to return to the air.

Lou Frejlach and Marge Poeschl lovingly restored the Sweepstakes Fairchild in the 1990s and with only 12 hours showing on the tachometer since its makeover, they then donated it to the EAA AirVenture Museum. Here it has been displayed to the delight of visitors at Pioneer Airport, but now the Fairchild will fly once again. As beautiful as this ship is, it was designed for flight, and it's time the Fairchild returned to its calling.

ALOFT ONCE AGAIN

As I taxi to the runway the massive gear yields a very smooth ride. The pilot sits a bit like one would ride in a golf cart—rear end flat on the floor with your legs out in front of you. The position is only problematic on taxi. With a steerable tail wheel one might be inclined to use full rudder to make a taxi turn, but that pushes the opposite side rudder so close to you that it's almost impossible to stay off the brake. This often causes a confusing moment wondering why it won't turn left until you realize that you have the right

PHOTOGRAPHY BY **JASON TONEY**

brake locked. I view it as a problem that will eventually work itself out as the new owner adjusts to this old aircraft.

These aerial conveyances from the 1930s are like that. No two of them fly exactly the same, even when they are of identical make and model. They have individual and varied personalities that demand the pilot conform to their way of thinking. Not a problem really as long as the owner realizes that this is a partnership of plane and pilot that sometimes requires cajoling and at other times a firm hand.

TAKING WING

The Ranger's rumble turns to a roar as I feed in the power, and then becomes a snarl as the propeller winds up pulling the Fairchild eagerly forward. Tracking the runway centerline is easy. The long, narrow snout gives a commanding view ahead even with the tail wheel on the ground. The elevator is immediately effective, and the tail comes up in response to the massive chrome control sticks. Already it feels light on its wheels, and earlier than you can imagine the Fairchild is in the air, Carbon Cub-like performance from the 1930s.

As the Ranger claws for the sky I bring the throttle back to 25 inches of manifold pressure and concentrate as I try to decipher the confusing tachometer gauge. The readings wrap more than 360 degrees around the instrument. The Ranger is either at 500 rpm or 2500 rpm depending on your viewpoint. I'll guess the latter and bring it back to 2400. This at least has the needle pointed straight down on the gauge.

The Fairchild has a wood blade variable-pitch propeller, not a constant-speed prop like most of us are used to. Without a prop governor the pilot must continue to adjust the rpm manually as the prop winds up with increased speed.

ON COURSE

Lake Winnebago looms close under the left wing as I say goodbye to Oshkosh. The Fairchild settles on course for the western suburbs of Chicago as I follow a dogleg route around the Class B airspace. I might have wished for Florida or Maine, California would have been a grand adventure, but, alas a short two and a half-hour flight to Indiana will be my last experience with this aerial thoroughbred.

The feel of the Fairchild's controls are at once both sensitive and stable, a delight to fly. I don't commonly like to fly aircraft with control sticks. It just doesn't seem as natural to me as a yoke. The Fairchild is the exception however. The chromed control sticks topped by a walnut ball command light control pressures, and the highly sensitive—little movement, lots of effect—trim crank on the ceiling is more repositioned than turned. Why aren't more stabilizer trims like this?

The door handles and window cranks found in aircraft of this era came from the finest automobiles Detroit had to offer. Those used on the Fairchild were from the new 1937 Chryslers. There is no need to crank open the windows on this cold day, but summertime flying with your elbow hanging in the breeze can be pure joy.

Many of the instruments on the panel have the Fairchild winged horse logo etched on the glass, and in the metal castings for the rudders. The plethora of entry steps also bear the mark. There is no question that you are flying a Fairchild.

ASSEMBLY MANUAL?

Airplanes I have flown from this era often have, shall we say, limited documentation. If you are lucky, they come with a few thin pages euphemistically referred to as an operating and assembly manual with heavy emphasis on assembly. I don't know if airplanes were dropped on your front doorstep in a box back then, but I have never thought of "assembly" as part of my preflight responsibilities.

With these old airplanes you work with what you have, and it's best to carry a healthy suspicion for anything you might read or hear about the type in general. Each individual aircraft often evolves in mysterious fashion.

The manual only contains the most general information about flight anyway. In 1937, performance charts were still a long, long way in the future. My manual states that the Fairchild was "assembled" with 30-gallon gas tanks but is completely silent on how much gas the Ranger throbbing up ahead might devour at any power setting. It pays to be conservative while one becomes acquainted with such aircraft.

Weight and balance is an interesting computation in airplanes of the 1930s. The manufacturer would publish a gross weight as well as forward and aft CG limits, but then the manual often would be silent on how to calculate anything useful from this information. A cursory reference may be made to the datum point that was used, commonly the firewall or the leading edge of the upper or lower wing, but the rest is left to you. Well, you and a tape measure. You normally cannot see the gas tank location so you take a guess as to where it might be and measure for the arm. The seated position of the passengers and any cargo is a little easier to visualize, but how do you figure the center of weight for all that oil in the Ranger's long snout? A little educated guesswork and longhand calculation can lead to a somewhat unscientific conclusion, but that's as good as it gets.

THE ARISTOCRAT

This is an early model Fairchild built in 1937. Only 25 Ranger-powered Fairchild 24s left the factory in that year compared to 100-some Warner-powered versions. The Ranger inline six-cylinder engine boasted anywhere between 145 and 200 hp depending on the Fairchild's model year. The Warner Super Scarab seven-cylinder radials were of either 145 or 165 hp. Interestingly, the Ranger-powered versions were less than 30 percent of total Fairchild production even though Ranger Engines was a division of Fairchild.

Both engine options led to an aircraft with a very distinctive appearance. Nobody ever confuses a Fairchild with any other aircraft. From 1932 until the last Fairchild 24 was assembled from leftover parts in 1948 more than 2,200 aircraft would be built.

TIME TRAVEL

As the Fairchild rounds Chicago I set course for Indiana, and not for the first time reflect on how inside this aircraft it is 1937, yet outside those glass windows it is 2014. Sometimes progress has brought little.

The Wright brothers first flew in 1903, yet only 34 years later this comparatively luxurious aircraft was available for anyone with the purse to afford such magnificence. The Fairchild was comfortable, reliable transportation whisking pilot and passengers to their destinations at 120 miles an hour. It had heat for the winter and roll-down windows to enjoy the warmth of summer. The plane could land and take off virtually anywhere, and could do it all with style. It would seem the years since have merely delivered incremental improvement on the Fairchild's wondrous form.

COMING TO EARTH

Landing is where the Fairchild truly excels. There are only two notches of flaps that are deployed by a big chrome bar between the seats. These are split flaps providing more drag than lift, and the second notch brings forth the most magnificent aerodynamic howling sound that is best appreciated with the window open on a summer's eve.

Approaches should be made with the airplane at 60 knots or less because it will float forever. The airplane looks bit like a sophisticated Fieseler Storch, and it flies like one, too. With the speed properly controlled an easy flare can bring forth the most satisfying landings, but don't make the mistake of thinking it is all over merely because all three wheels are on the ground. The Fairchild is still doing what it does naturally—flying. The gear will continue to splay out as it slowly settles on those long struts.

GOODBYE, FAIRCHILD

My destination looms on the horizon, and it is time to say goodbye to this wondrous machine. I had at one time thought of being there when they drew the winner's name, with a check in hand to deliver an offer and make this airplane mine, so much do I think of the Fairchild. But today, one last landing will close out the 10.5 hours of flying time carefully noted in my logbook next to N16902.

Officially the time was spent in test flights and photo/video shoots for its sweepstakes role, but every moment was spent in amazement at the capabilities of this fine, old aircraft. The new owners await, and two better people could not have been selected. John and Marsha Fulton, EAA Lifetime 32139, have been to every EAA convention since it moved to Oshkosh and several in Rockford as well. They are true EAAers in the mold of Paul Poberezny and the early members who built this organization.

The Fairchild has found a new home with two people who will care for, appreciate, and most importantly fly this 77-year-old grand dame of flight. No more could the Fairchild hope for, no less does it deserve. EAA

Jeff Skiles, EAA Lifetime 336120, is an ATP and CFII-ME who has been flying as an airline and light airplane pilot for 38 years. He has owned a Cessna 140 and a Waco YOC and currently flies a Cessna 185. Jeff can be reached at *JeffreyBSkiles@gmail.com*.


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GRASSROOTS AVIATORS INSPIRING OTHERS

BY SPARKY BARNES SARGENT

THERE ARE TIMES when we find ourselves inspired by those who have the discipline and passion to achieve lofty goals—whether it be a first solo, cross-country, aerobatic maneuver, building a biplane, or soaring tens of thousands of feet above the ground.

Sarah Arnold and her beloved Piper Vagabond (N222SK) that she has owned for 20 years.

PHOTOGRAPHY COURTESY OF **SARAH ARNOLD**

Their stories can awaken and energize us to be aware of, and sometimes create, our own opportunities to do remarkable things. The women highlighted in this article are just a few of those in aviation today who have met and surpassed their own challenges with zestful enthusiasm. Whether they fly tailwheel, nosewheel, airplane, sailplane, or biplane, they are dedicated pilots who thrive from experiencing and sharing the freedom and adventure of flight.


Teri Chastain


Mary Jo Rado


Sarah Arnold

Catherine Cavagnaro

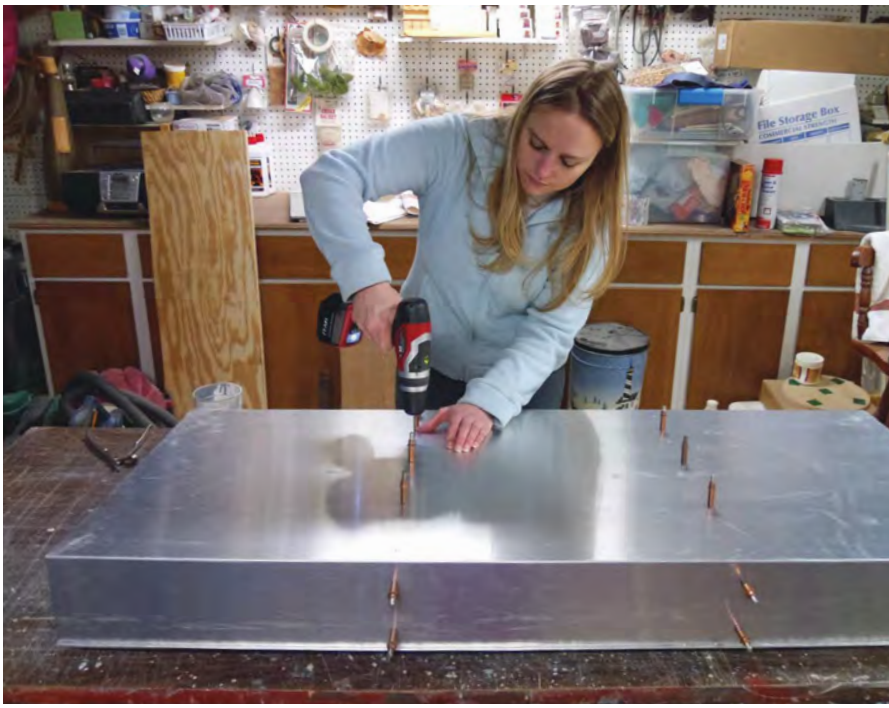
PHOTOGRAPHY BY **SPARKY BARNES SARGENT** AND **JACK HAIGHT** / COURTESY OF **TERI CHASTAIN** AND **SARAH ARNOLD**

BUILDING HER OWN BIPLANE

TERI CHASTAIN, EAA 851577, is the third generation of the flying Chastain family of St. Louis, Missouri. Based at Creve Coeur Airport, she soloed at age 26 in an Aeronca Champ, and earned her private in 2007 in a Cessna 140. In 2008, Teri flew her father, Terry Chastain, to AirVenture in their rare 1952 Rawdon T-1.

"I always wanted to fly, and the opportunity came up where it wasn't that expensive," Teri says, "so it was a perfect time!" She's logged more than 500 hours, all in tailwheel aircraft. She enjoys taking friends and family up for rides, and says, "The Champ's slow and pretty much flies itself. The 140 was a little squirrelly when I first started with it, and transitioning to the T-1 was pretty easy—except for the landings on concrete."

One lesson Teri has learned about flying is the importance of a thorough preflight. "Always make sure your airplane is ready to fly before you go up," she says, "and know your surroundings. At Creve Coeur, there are always people flying, and it's not a control tower airport, so you need to keep your head on a swivel looking for traffic."



Teri works on building the center section fuel tank.

Her late father transitioned her to Waco flying, and Teri enjoys open-cockpit flying so much that she's well into the process of building her own Hatz biplane. "It's a neat feeling to have shared flying and working on different airplanes with Dad. While we were finishing the Waco YKS-7, I went ahead and made a jig and started building my Hatz ribs in my basement," Teri says, "then Dad started helping me with my Hatz. Now that he is gone, my uncle will be helping me finish it."

Teri with her plansbuilt Hatz Classic biplane project.

She explains that she was inspired to build the Hatz Classic and install a 165-hp Warner on it because "my father and I always loved Wacos, and my dad has restored so many of them. They are beautiful and fun-flying airplanes. The Hatz is like a baby Waco, and an open-cockpit airplane with a radial engine was a must!"

Teri has been learning a lot while building her biplane. "There is so much involved in an airplane that I truly as a pilot never thought about. When I first got the plans, it was very overwhelming to me. I luckily have had the best teachers and mentors with my father, Terry Chastain, and my uncle, Phil Chastain," she says. "Right now I am working on the fuel lines with Uncle Phil, and it's a challenge getting them to form with the struts to look nice."

Reflecting on the building process, Teri shares, "It is a great experience, and a huge feeling of accomplishment. You get to decide exactly how your airplane will look, and it's also a great way to really understand and know your airplane. I enjoy building and am learning a lot every day. After the Hatz is complete, I want to be able to fly it to Oshkosh with Uncle Phil."

As for her other aviation aspirations, Teri might consider working toward her A&P when her Hatz is completed. "I also want to get my seaplane rating, just for fun, and then continue to other ratings," she says. "I plan on continuing to improve my aviation skills and knowledge."

PHOTOGRAPHY COURTESY OF **TERI CHASTAIN**

MIXING AEROBATICS AND MATHEMATICS

AS A CHILD, Catherine Cavagnaro "never, ever imagined that flying an airplane could be in the cards for me, because it just wasn't affordable." Later, when she was working on her Ph.D. in mathematics, she went out to study at the airport terminal, just to see planes take off and land.

"I think if you want something badly enough, you'll find a way to do it," Catherine says. She started taking flying lessons about three months after her first son was born, and after acquiring tenure as a professor. To help make her flight training more affordable, she bought a 1973 Piper PA-28-140 Cherokee. She earned her private in 2000, and the following year, her instrument rating, commercial, and CFI. She earned her CFI-I just after her second son was born, and since then has added commercial single-engine seaplane, ATP single-engine, multiengine commercial, and glider ratings. She's also added endorsements for tailwheel, high performance, and high altitude.

Catherine and Wilbur, *her Cessna 152 Aerobat in which she teaches aerobatics and spins.*

Two role models personally inspired her. One was Guinness world record holder Evelyn Bryan Johnson, who was the longtime manager of the Morristown airport in Tennessee. "Meeting her was a neat experience," Catherine shares. "She learned to fly when she was 35, and taught me that even with a late start, one can make a difference. I started flying when I was 34."

Catherine's upside-down view of the earth from her Cessna 152 Aerobat.

Her other role model and mentor was renowned aviation author and flight instructor Bill Kershner, from whom she took aerobatic lessons. "Bill inspired me to combine mathematics and aviation, by asking me to figure out the mathematics for various flight maneuvers. I learned a lot that way," Catherine says, adding, "I like to portray aviation as not just a kick in the pants—which of course it is, it's awesome! But it's also incredibly interesting as a science."

She discovered that she thoroughly enjoyed aerobatics, and spins in particular. After several attempts in 2006, Catherine "performed a 60-turn spin from 14,000 feet, with recovery at 2,500 feet MSL."

Catherine, EAA 658960, has logged more than 3,300 hours since her first lesson in 1999. When she isn't teaching mathematics at Sewanee—The University of the South, she's usually teaching students at her Ace Aerobatic School at the Franklin County Airport (KUOS) in Sewanee, Tennessee. She offers spin and aerobatic training in her Cessna 152 Aerobat (affectionately known as *Wilbur*) and regularly gives FAA safety seminars.

She has recently been promoting safety awareness by writing and publishing articles in aviation magazines about the technical aspects of flying. She also uses an onboard camera to create videos of in-flight aerodynamics. "One video was recorded from the tail during a 20-turn spin with tufting covering the wings," she says, "and you can see positively that the inside wing during a spin is completely stalled. As pilots, we need to be forever learning, and I believe every type of training can increase proficiency and add a tool to the box that might come in handy someday."

Catherine hopes that more women take up flying, elaborating, "Pilots form a wonderful community that I've always found encouraging toward women. Many women I know love a challenge, and flying offers just that!"

PHOTOGRAPHY COURTESY OF **CATHERINE CAVAGNERO**

SHARING THE JOY OF SOARING

WHEN SARAH ARNOLD, EAA 547473, was a child, she and her brother knew a pilot who had a J-3 Cub. "Whenever we'd see him drag it out of the hangar at the airstrip near our house, we'd just go running down to the field. When I was 13, my 'Uncle' Leroy took me flying in a Piper PA-11. I was on top of the world for a month after that!"

Sarah soon began flying in a QuickSilver ultralight and then transitioned to airplanes while flying from that emerald-green grass runway in British Columbia. When she was 16, a bright yellow 1948 Piper PA-17 Vagabond flew into the Okanagan Valley and right into her heart. "I loved flying that plane, and I had saved money from working," she says, "so 'Uncle' Leroy and I went in halves on it and bought it in 1996."

She earned her private on her 17th birthday and in 1997 flew the Vagabond south to Portland Community College in Oregon, where she enrolled in the A&P program. She also earned her instrument rating and commercial certificate. By late 1999, 20-year-old Sarah completed A&P school and went to work for Columbia Helicopters in its engine accessory overhaul department.

She moved to Tennessee a few years later, and as soon as she had the opportunity, she flew her Vagabond solo from Canada to east Tennessee. When she landed at Dayton, she "had $1.70 in my pocket, my 12-gallon gas tank was almost empty, and it was almost dark. But it was an awesome experience!"

In early 2003, she discovered soaring at Chilhowee Gliderport in Benton, Tennessee. The next year, 24-year-old Sarah bought the Chilhowee Gliderport operation, and today it's still going strong. To date, Sarah has logged 5,350 hours total, including 3,100 in gliders, and has also earned her IA. Flight instruction is one of her primary services, and Sarah enjoys tailoring lessons to each student's needs. Chilhowee Gliderport also hosts special soaring events and championship meets and races.

Sarah with 14-year-old soaring student Gage Cahill, just after his first solo at Chilhowee Gliderport in July 2014.

Reflecting on her aviation career, Sarah shares: "Running a gliderport takes copious amounts of time and energy, and I sometimes find my passion flagging, the joy forgotten. I crave the glorious solitude of the sky; those secret sunlit spaces which still my soul. So I keep a piece of aviation just for me. Competition soaring restores the romance of flight and reinvigorates my desire to share the joy of aviating with everyone."

In 2005, Sarah set U.S. and New Mexico records for out-and-return distances of nearly 300 miles. In 2008, Sarah flew a Grob 102 to an altitude of 30,835 feet, completing the requirements for her Diamond Badge. In 2011, she set 11 Tennessee and three U.S. records, and was the 2011 Sports Class and Club Class National Champion. In early 2013, she competed with the U.S. Team in the World Gliding Championships in Argentina, and she brought home the bronze medal from the 7th FAI Women's World Gliding Championships in France.

Flying has taught her that "no matter the situation, there is always something you can do to improve the outcome. This is true both in the cockpit and in life," she says. "Life is precious and short. If flying is something you truly desire, then don't wait. Begin the process now and you will find a way to make your dream come true."

Joy McKee provides shade for Sarah Arnold during the Women's World Gliding Championships in Issoudun, France, July 2013.

PHOTOGRAPHY COURTESY OF **SARAH ARNOLD**

AN ARTIST'S VIEW OF FLYING

PRIVATE PILOT AND ART teacher Mary Jo Rado, EAA 1014942, always wanted to fly, but says she "didn't know it was possible. It seemed out of reach. When I met my late husband, David, he encouraged me to give it a shot. His buddy, Joe Bostic, was an amazing flight instructor, constantly challenging me. Twenty-five years later, I still hear his voice when I'm flying!"

After earning her private, she bought a 1948 Ercoupe Model E in 1992. "It was in London, Kentucky, and I had never flown one—and my husband wasn't a pilot. We bought it sight unseen and flew it to Ocean City, Maryland, so I could make my first cross-country flight as a licensed pilot. We had no idea what we were doing," she says, chuckling, "but we were younger, and we had a lot of adventures with it. Flying is always an adventure!"

Mary Jo and her Ercoupe, with its annual nearly completed, in her hangar at Corona (KAJO), California, 2014.

Mary Jo has learned to expect the unexpected. "I've made it a point to practice emergency procedures and always be aware of where I could land, and that has paid off. One time I had an engine [problem] and made a perfect off-field landing just 10 miles shy of the Grand Canyon airport. That was a rush; I'm jazzed when I can deal with an issue well! We took the airplane apart in the national forest and towed it out behind a minivan—*that* was fun," she reflects good-naturedly. "We had the engine redone and pickled, then we started stripping paint and making just a little bit of progress on the airframe through the years."

She and her husband did a lot of the restoration themselves, until he passed away in 2004. "Finishing the Ercoupe was the last thing on his 'to do' list, and having that list kept me together," Mary Jo reflects. "I towed the project out to EAA Chapter 1 at Flabob, where we were members, and they put everything back together. Jan Johnson did the fabric, the wings were finished in 2006, and the rest of the plane was finalized in 2010."

By the time her Ercoupe was ready to fly again, Mary Jo hadn't flown in a few years. "It took a good instructor to help me get my courage back," she says, adding, "I kept the panel as simple as possible during the restoration, and now I fly with an iPad and ForeFlight—but I still like paper sectionals."

She draws a few parallels between flying and art, expressing that "cross-country flights allow me time to think through artistic dilemmas. My earlier work was based on aerial landscapes; I took pictures while flying and then created collagraphs [prints made from a collage of materials] based on the mood of the flight. I'm interested in our desire to impose geometry on alluvial fans and river canyons."

To date, Mary Jo has logged just less than 300 hours, and she says that so far, "The best flight I've had was flying all the way across the Chesapeake Bay and landing on Kentmorr Airpark's grass strip. Another great flight was in 2012, when I flew from my home in Costa Mesa, California, to AirVenture. I just made it a leisurely trip, and spread it out over four days. My Ercoupe flies great—it's really sweet, and it's like a buddy now." EAA

Mary Jo and her niece, Emma, at General Fox Airfield in Lancaster, California.

Sparky Barnes Sargent, EAA 499838, holds a commercial glider certificate with private single-engine land and sea ratings, and she personally restored her 1948 Piper Vagabond.

PHOTOGRAPHY COURTESY OF **MARY JO RADO**

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A BOY AND HIS
Eagle

RECONNECTING WITH A FAMILY AIRPLANE

BY MARK CIAGLIA

KELLY OPENED the hangar doors, and immediately I saw the polished spinner poking out. Slowly revealed was the rest of the Christen Eagle, a plane I had not seen for almost 22 years.

PHOTOGRAPHY BY **MACH POINT ONE AVIATION PHOTOGRAPHY**

TO UNDERSTAND HOW I got to this point standing in a hangar in Santa Paula, California, we have to rewind nearly 30 years.

There I was sitting at our kitchen table, a boy who just started kindergarten, hearing my father and mother discussing the idea of building an airplane. A catalog of many kit-built planes had floated around the house for a few months. The book always seemed to be left open to a page with a black and white photo of a beautiful biplane with an eagle painted on the side and feathers on the wings. I sat anxiously next to my dad while he made a phone call to Christen Industries in Hollister, California, which resulted in a large crate being delivered. I never knew a single phone call could alter one's life so profoundly.

Years passed that culminated with countless hours sitting next to my dad in our basement, first riveting sheet metal together, then the overwhelming smell of glue, spruce, mahogany, and fiberglass. As a 5-year-old in love with airplanes, flying, and anything aviation, I didn't think I truly comprehended the fact that before my eyes an airplane was taking form.

Then it happened. The day a large yellow freight truck backed up our driveway, the deliveryman opened the gate, and there it was, the crate holding the fuselage. Now I realized that, yes, we are building an airplane! My mother realized she had to park outside for the next several years. It didn't matter; she saw the bond between my father and me becoming stronger than the tightness of the drag and anti-drag wires.

On weekends, I always got up early and spent hours with my dad building our dream. I learned about woodworking, sheet metal work, and covering, all to the sounds of Jerry Lee Lewis, Dion and the Belmonts, and the Mamas and the Papas. What 9-year-old knew all those songs? I did, because I passed up bike rides, baseball games, and sleepovers with my friends. I was building an airplane, something that was way cooler.

Mark spent his childhood working with his dad on the Christen Eagle II.

One of the most memorable days was Christmas morning in 1998. Everyone in the neighborhood knew we were building an airplane. People would drive by, slowing down when they saw wings hanging on the wall of our garage and an airplane fuselage in the garage. On that beautiful Christmas morning, life was breathed into the Lycoming IEO-360. We rolled the plane out after opening presents and having breakfast. We hammered a 4-foot steel stake into the semi-frozen ground of a mild Chicago winter and tied the Eagle down. My dad climbed in and yelled, "Clear!" for the first time from the cockpit, turned the key, and after a few revolutions of the propeller, the engine roared to life and so did all of our neighbors. People were coming out in their pajamas to see it for real.

PHOTOGRAPHY COURTESY OF **MARK CIAGLIA**

Cheers and claps were barely heard over the roar of the Lycoming. It was the best Christmas gift of all.

Our many trips to Oshkosh, meticulously looking over all the completed Eagles, gazing at the Eagles Aerobatic Team, and learning to stitch culminated in a nearly completed plane. It had taken over our house: living room, basement, garage, dining room, and shed. A paint booth was formed in the garage. My dad always wanted to deviate from the traditional white and rainbow color of the traditional tapered Eagle scheme and design an eye-catching black scheme. Dreams came to fruition and a color scheme was developed.

However, those colors would not be sprayed from my dad's paint gun. Health and financial problems forced my dad to sell our dream. The toughest day for me was seeing a part of our family hauled away in a long trailer to Oklahoma.

I was a freshman in high school and wanted nothing more than to be old enough to take flying lessons at the local airport and begin my flying adventures. My adventures would likely take place in a Cessna 152 and 172; nothing against them, but they weren't a Christen Eagle. I vowed to myself that no matter what, one day I would buy the Eagle back.

High school transitioned into several years of education that kept me away from the airport. Training to become a surgeon takes many sacrifices, and flying was one of them.

I moved to Houston, Texas, to begin my surgical practice and found myself one night in 2010 waiting to operate and randomly searching the Internet for the individual who originally purchased the Eagle. A phone call the following morning enlightened me to the fact that the Eagle flew shortly after we sold it, traveled around the United States, won awards, and was sold once again. The hunt began.

Several months later, a 30-minute conversation with a very like-minded and similarly aged 30-year-old airplane nut led me to the current owner of the Eagle. He was excited to hear the origins of the plane he had recently bought. We exchanged numbers, and I ended the call by saying, "If you ever plan to sell, call me and the check would be in the mail."

A friendship began. I would periodically receive text messages, photos, and e-mails about the Eagle and the current owner, letting me know it was in good hands. I never thought it would happen, and then it did. A Friday afternoon, January 24, 2014, at 4:12 p.m. I got a text message. Nothing unusual for a busy surgeon, but this was a text that changed my life forever.

"Hi Mark. I discussed selling the Eagle with my partner and we would be willing to sell. It's good to go." My heart pounded.

Over the next few weeks, I arranged a pre-buy, settled on price, and made plans to go out there. One problem: I didn't even have a tailwheel endorsement. I had recently gotten back into flying (being a surgeon is better than a poor college student) but had spent many hours in a 172 because that is what I knew. Living in Houston, I realized one of the premier aerobatics and flight schools was just a 45-minute flight away. A quick phone call and my first tailwheel lesson was scheduled. Ten hours later I had a tailwheel endorsement. One problem: This was in no way adequate preparation for the Eagle. So jumping into *EAA Sport Aviation*, *Sport Aerobatics*, and the Internet led me to Scottsdale, Arizona, and the wonderful experience and instruction of Budd Davisson.

PHOTOGRAPHY BY **MACH POINT ONE AVIATION PHOTOGRAPHY**

PHOTOGRAPHY BY **MACH POINT ONE AVIATION PHOTOGRAPHY**

For those of you who don't know Budd, and I can't image that there are many, he is an instructor like no other. He takes low-time pilots like me, puts them in his Pitts S-2A, and teaches them the art of flying. Halfway through the training, I was still overwhelmed and thought I was in way over my head; most people would probably say the same. The high-performance airplanes require hundreds of hours of flight time.

People may think 700 hours in a 172 translates into competency in a Pitts—no way. The advantage I had was I was a clean slate with no bad habits to unlearn. The disadvantage was time. Surgeons usually don't have the luxury of taking a week off at a time, so my time with Budd was split between two weekends. It gave me some time to absorb what I learned before heading out to Arizona once again for what I hoped would be my high-performance tailwheel endorsement. Halfway through my second trip and after high-speed taxis, touch-and-goes, and eventually full-stop landings, Budd eloquently stated, "You officially don't suck anymore." Budd's style quickly made me confident with a stick and rudder at 90 mph over the numbers. The last day there, he signed the logbook and said I was ready.

Heading home, I was so excited to tell my wife, mom, and sister that I was ready for the Eagle. Unfortunately, my dad passed away in 2001 from a heart attack; he would never live to see the Eagle part of our family once again.

I flew to Los Angeles with a small backpack, remembering the luggage compartment of the Eagle was tiny. In Santa Paula, Kelly Vogel, the proud current owner of the Eagle, met me at the gate. There was a party at the airport celebrating the *Sport Aviation* cover story of the Questair, a gorgeous plane based at Santa Paula airport, built by Jerry Mercer and his team ("Questair Venture Adventure," March 2014).

After we chatted for a while, Kelly asked if I wanted to see the Eagle. You bet! There it was. The smells, thoughts, and emotions were all there wrapped in the 19-foot 11-inch wingspan. I just wish my dad could have been there.

I couldn't sleep that night, knowing the following day we were going flying. Kelly and I plotted the course back to Houston and made the trip. The first time sitting in the rear seat, lined up on the runway at beautiful Santa Paula, Lycoming humming and the throttle slowly advanced, brought a 21-year-old dream come true. It flew just like I had imagined. Budd prepared me well, and the flight was perfect.

We landed after many stops at my Eagle's new home, David Wayne Hooks airport of North Houston. The control tower was excited as I was landing, seeing such a beautiful plane being kept at this corporate and overflowing Cessna and Piper airport. Kelly and I were met by family and friends and doused in bottles of champagne.

The circle of emotion was completed a few weeks later when my mom and sister were able to visit over the Fourth of July holiday, and they too were reunited with an old friend. My mom was able to connect with a piece of my dad. The plane was a living tribute to his passion. My sister, Mary Alice, had similar thoughts, although there was some passion in her eyes as she stared at the seemingly countless stitches she and I did on the covering. She and my father had a different bond with the airplane. She was daddy's little girl. Standing there I could see the rush of memories flooding back to her as tears began to flow.

There it was, all those years and all those stitches! Through all the ups and downs of life, one piece, this airplane became a solid rock for my family. Never could I have imagined that a dream would come true that I secretly said to myself, out of anger and sadness, as I watched the Eagle be carried away some 20 years ago: "One day I will buy it back!"

Since then I have had hours of enjoyment flying the Eagle and living my dream of aviation. Actually, I've been living Dad's dream as well. That's something not many sons can say, but I'm certain many wish they could. I'm one of the few lucky ones.

I think of him every time I strap it on and extend that left arm, hearing his passion growl down the runway. We did good! EAA

Dr. Mark Ciaglia, EAA 588212, is a practicing hand surgeon in North Houston, Texas. He has been a private pilot since age 17 and owns a Christen Eagle II. He can be reached at *drciaglia@hotmail.com*.

Left: *Mark's wife and daughter welcomed the newest addition to their family.*

Below: *Mark's mom's first flight in the Eagle.*

PHOTOGRAPHY COURTESY OF **MARK CIAGLIA**

SPEED/SORORITY

The women who race at Reno BY KAREN MORSS

PHOTOGRAPHY BY **TIM O'BRIEN**

EVERY SEPTEMBER FOR the past 51 years a group of pilots has gathered in the high desert of Reno, Nevada, to compete in the National Championship Air Races (NCAR). They come from all over the country, and the world, to fly with the best of the best. They fly their airplanes in or trailer them, setting up camp in the pits of the six racing classes. Crews arrive with ground support and team supplies. Tech inspections, practice sessions, and qualifying races round out the activities that start the week. As you might imagine, it's pretty much a life-changing experience to race at Reno.

Air racing has been a tradition for female pilots from the very earliest days of aviation. Women account for about 6 percent of the registered pilots in the United States today (approximately 39,600), but only 28 women have raced at Reno.

In 2014 the field of 104 pilots included five extraordinary women racing in the Biplane, Sport, and Jet Classes. The crowds definitely appreciate what these women bring to air racing: skill, professionalism, competitiveness, and compassion. It was heartwarming to see the children's faces when they approached an airplane and realized the pilot was a woman. You could actually see inspiration fill the air. Meet the women who are changing the face of air racing in their own unique way.

CASEY Erickson

CASEY ERICKSON'S INTEREST in flying began when she was just a girl visiting her grandfather's avionics shop, Pabas Radio, at the local airport. Although she doesn't remember, her mom recalled that Casey always said she would be a pilot when she grew up.

"I remember looking at the small little Cessnas and Pipers taking off and thinking they were off to China and India and going to exotic places like that—each and every one of them," she said. "I mean, what else would you use an airplane for?"

While in her 20s, Casey moved to Seattle, a city that was completely foreign to her, and decided that she "needed to do something and flying was it."

Casey said she has always been something of a race historian and thought of racing as something "cool and exotic." For her, the possibility of racing alongside famous pilots was a draw as was the novelty of Reno.

"I think I wanted a new challenge in aviation," she said. "Racing at Reno certainly looked to be challenging, and some really fun flying."

Casey, EAA 815630, describes the races as flying "50 feet off the ground with your hair on fire."

"It is an indescribable, adrenaline-filled experience, in which we know that one mistake could cost us our life," she said.

Casey also described the complex relationship between racers in Reno, which she said can sometimes get heated.

"The competition between pilots is one of camaraderie on the ground and pure rivals once in the air," she said. "Sometimes the rivalries do spill over to the ground after races. Fortunately, most of the time we can talk through it and learn from mistakes, which only makes us better as a group and as individual pilots."

Learning from the experiences of others is something Casey has been doing for years. Roscoe Turner—three-time winner of the Thompson Trophy in the 1930s—has been a continued inspiration to her due in part to the challenges his generation of racers overcame.

"The race pilots back then were truly on the cutting edge of aviation flying aircraft that were on the edge, and were not near as safe as the aircraft we fly today," she said. "Their understanding of airfoils and aerodynamics was much more rudimentary than ours today. In many ways, it was the pioneering efforts by the race pilots...that gave us the knowledge we needed during the battles of WWII."

Although many of the challenges surrounding flying have been resolved, Casey said there are still some hurdles aspiring pilots have to face. One concern she mentioned in particular is the cost, but her advice is to "just go do it."

"Pay the extra money to train with someone who loves to fly, and has a passion for sharing that knowledge with you," she said. "It literally might save your life some day."

PHOTOGRAPHY BY **NAOMI WEST** AND **TIM O'BRIEN**

COLLEEN Keller

COLLEEN KELLER DOESN'T come from a family of pilots or even aviation enthusiasts, but she has had a passion for flying since the early 1990s.

"I had to figure it out for myself," she said. "My first job out of college put me on an aircraft carrier observing flight deck operations for the U.S. Navy off the coast of San Diego. I absolutely loved the pilot culture."

Although she was too old to enter the Navy pilot training program, Colleen was able to obtain her pilot certificate through the flying club at Naval Air Station North Island where she completed training in 1993. A little more than 10 years later, in 2005, she took her first trip to NCAR with a friend and discovered the joys of racing.

"Air racing was much more than simply looking at big engines and watching planes fly the course," she said. "It was friendships—renewed each year in September—that brought me back year after year."

Colleen describes the week of formation and race clinics, which are held at Pylon Racing School in June, as able to "turn rookies into race pilots." While the training is beneficial, it is merely the precursor to the main event two months later.

"The week at the Races in September is like icing on the cake," she said.

But, according to Colleen, the "icing" can be dangerous.

"It's easy to be distracted by something you see or hear, or glancing too long at your engine instruments," she said. "Try to relax, keep a light grip on the stick, remember to breathe. The plane can sense my tension."

Colleen, EAA 759828, and her fellow racers may have had an added distraction last year following the death of Lee Behel two days before the public portion of the races began.

"I have been thinking about him a lot, and I'd say he was inspirational...more like a father figure to me," she said of Lee. "[He was] a calming voice on the radio and someone who I felt would always know what to do."

Although she recently lost hers, Colleen stressed the importance of a mentor for young aviators.

"Don't just go for a ride with them. Spend time with them, learn about their airplane, learn about the airport culture, and become involved in flying organizations," she said. "You will find that people want to help you succeed."

Colleen also said success for her came from making a decision to put flying first, which sometimes involves giving up things like nice clothes or a fancy car.

"The sacrifices you make early will begin to pay dividends as more opportunities come your way," she said.

PHOTOGRAPHY BY **BILL RUSS** AND **KEN CORDELIA**

MARILYN Dash

MARILYN DASH STARTED on her path to NCAR while volunteering at the Hiller Aviation Museum shortly after its opening. While there she met museum founder Stanley Hiller Jr. whose simple question gave her a push toward becoming a pilot.

"[He] looked me in the eye and asked me, 'Why aren't you a pilot,'" she said. "I responded...'I'll do it someday.' He then said, 'Today is someday!'"

The next day Marilyn signed up for her first flying lesson and within a year made her first trip to NCAR.

"From that first day I was hooked and have always wanted to be a race pilot," she said.

In 2004 Marilyn got her first opportunity to race in Reno and said that, for her, the experience starts at home.

"You put together a crew and a group of people who help you get there every year," she said. "There are people who are your cheerleaders and your coaches, and you need all of them."

Luckily, Marilyn had a group of fellow aviators to keep her motivated from the beginning.

"When I first started racing, we had eight racers at my airport," she said. "They became my racing family and were always there for me."

Once the crew is assembled and the preparations are complete, the flying, which Marilyn calls the fun part, can begin.

"It is the most exhilarating 20 minutes of your life," she said. "You are flying 200 mph in a 600-pound aircraft, 50 feet off the ground. There isn't time to sneeze."

In addition to the adrenaline-inducing aspects of racing in Reno, Marilyn said the aviation community is an incentive for young people to get involved.

"The people you meet, the adventures you create for yourself, and the opportunities are worth every heartache and headache," she said. "It's hard, it's exhausting, it's expensive, it's frustrating at times—and it's worth it."

PHOTOGRAPHY BY **NAOMI WEST** AND **ANTHONY TAYLOR**

PHOTOGRAPHY BY **TIM O'BRIEN**

JESSY Panzer

LIKE MANY PILOTS, Jessy Panzer's interest in aviation started at home when she was a young girl. Her father, who was a corporate pilot, sparked her interest, but his death in an airplane accident when she was 7 years old almost destroyed it.

"I was afraid to fly for a few years," she said. "After some time, my curiosity of why my dad loved flying so much, and my desire to learn... overcame my fear, and I felt compelled to learn to fly."

Once she conquered her fear, Jessy "jumped right in with both feet" by applying to Embry-Riddle Aeronautical University where she was accepted and subsequently enrolled.

"When I went for my first flight lesson I had the craziest feeling of fear, excitement, and bittersweetness that all gave way to excitement and drive to excel," she said. "I loved flying so much!"

Jessy, EAA 641360, said that although her father was the man behind her interest in flying, it was Harry Barr who introduced her to the NCAR.

"I have attended the Reno Air Races all but two years [since 2000] and had just last year thought to myself that it was about time to get up there and really race this time," she said.

The decision to race in 2014 was due in part to a recommendation from Vicky Benzing, who Jessy said is a source of encouragement.

"Vicky Benzing has been a wonderful inspiration and mentor to me," she said. "It is so special to be able to know another woman in this field who is as passionate, talented, gracious, successful, and smart as I aspire to be."

Jessy's advice for young women, or men, interested in aviation is to keep at it and come in with a good mindset.

"There are people in this community that will come out of the woodwork to help a young person along if they see that the young person has the desire, willingness, and good attitude to learn and be grateful for every opportunity," she said. "The people in aviation really are the best and most special groups of people on the planet."

PHOTOGRAPHY BY **D. RAMEY LOGAN** AND **TIM O'BRIEN**

VICKY Benzing

FOR VICKY BENZING the flying bug started to take hold when a friend asked her to go sky diving while she was in college.

"I got hooked on [it] and really wanted to learn to fly," she said.

Her uncle, Ernie Swinn, was also part of the inspiration and provided an introduction to racing.

"I idolized him," she said. "Over the years I attended the races a handful of times, but it never occurred to me that I could race."

That changed when Vicky received an e-mail from Lee Behel—who she says was her greatest mentor—inviting her to "come on up and play in my world."

"I learned so much from him and will forever miss him," she said.

Vicky, EAA Lifetime 529264, also named Al "Papa" Goss as a source of support.

"[He] was always there with an encouraging word or a smack on the head when I needed it," she said.

Vicky likens the relationship between racing pilots to a family dynamic in which everyone has each other's best interest in mind and is willing to share their knowledge.

"There are tricks that are 'racing secrets' for each person, but funny enough, everyone shares them with each other so they are not really secrets," she said.

If you can find someone who is willing to share their secrets and teach you to fly, Vicky's advice is to go for it.

"Learning to fly will change your life," she said.

The 52nd National Championship Air Races will take place September 16-20, 2015, at Stead Airport in Reno, Nevada. For more information, please visit www.AirRace.org. EAA

Karen Morss is a private pilot, orchardist, children's book author, and artist. She started and ran a flight school for five years and holds a city-to-city speed record set in her Katana. She has crewed for her husband, Dave Morss, for the past 20 years at the NCAR. Visit her websites, *www.Lemon-Ladies.com* and *www.Flying-Poodles.com*.

PHOTOGRAPHY BY **TYSON RININGER** AND **CLARK COOK**

AMATEUR-BUILT

ACCIDENT REPORT: 2014

BY RON WANTTAJA

WAS 2013 *THE* YEAR?

ABOUT A YEAR AGO, people in the homebuilding world were pretty excited. The preliminary statistics showed a significant downturn in experimental amateur-built (E-AB) accidents in 2013. Was it real? Was the safety of our sport improving?

The official number of "amateur-built" accidents was 222 in 2012, and it dropped to 164 in 2013. "Amateur-built" is in quotes because the official figures include dozens of aircraft that aren't E-AB, such as LSA and ultralights. They also exclude some obvious E-AB cases.

But I saw the same drop in my own figures—from 213 in 2012, to 151 in 2013.

Those of you who have read my previous years' articles know what I'm going to say next: We need to take the long view, not just compare one year to the previous. Figure 1 shows the number of accidents for each of the past five years. There does appear to be a downward trend; in fact, 2013 has the fewest number of homebuilt accidents over the 16-year period covered by my database.

BROTHER, CAN YOU SPARE A RIVET?

What happened? Typically, it's a drop in flying hours due to the economic situation. But it may go deeper than that. The world is just recovering from a major economic downturn. Did this affect kit *starts*, not just pilots' ability to afford to fly?

Typically, 1,200-1,300 new E-AB aircraft are added to the rolls each year (based on yearly samples of the FAA registration database and the FAA's list of deregistered aircraft). See Figure 2 for a summary of new homebuilts since 2000.

The downturn started in 2007. Two years later—about the time that some of the airplane kits bought in 2007 might be getting done—we started seeing a drop in homebuilt completions.

Discretionary expenditures would have been the first casualty of the recession. Typical homebuilt construction times range from two to five years, thus an airplane kit *not* purchased in 2008 wouldn't show up on the registry in 2013. The decrease continued from 2009 through 2013; in fact, 2013 saw the lowest number of new homebuilts since I started keeping track.

Now, about 19 percent of all homebuilt accidents occur during their test period; about 50 percent of accidents happen in the first 200 hours. A reduction in the number of new E-ABs would have a disproportionate effect on the overall accident rate.

However, probably not as much of an effect as we're seeing. There were roughly 50 fewer accidents in 2013 as 2012, and the observed reduction in production wouldn't account for that. Some of the decrease might be attributable to the weather, instead. The first and last quarters of 2012 recorded 74 homebuilt accidents, but the same two quarters in storm-bedeviled 2013 saw 27 fewer. One interesting change in 2013 was in pilot judgment-related accidents. As Figure 3 shows, fuel exhaustion and carb ice accidents both dropped from seven in 2012 to just one in 2013, and maneuvering at low altitude from nine to three.

A LOOK AT BUILDER ERROR

One of the causes that dropped quite a bit in 2013 is builder error—accidents directly traced to a mistake made by the person(s) who built the aircraft. It's basically the "defining error" as far as homebuilding is concerned; the one accident cause that's rare among factory-built aircraft.

Builder error has an interesting history over time. As shown in Figure 4, it dropped by almost 75 percent from 1998 to 2005, but popped up again since then. It went back down in 2013, like everything else, but we'll see how 2014 comes out.

SYSTEMS AFFECTED

The key issue is "What systems are builders having the most trouble on?" Figure 5 gives the answer. The engine, fuel system,

and controls each contribute about a quarter of the builder error cases. According to the NTSB database, what kinds of errors were made?

Engine
"Improper valve adjustments and failure to follow the manufacturer's instructions, which resulted in a loose rocker arm and a loss of engine power."

"Failure of the ignition power supply as a result of the improper installation of the electronic control unit."

"Failure of an oil hose due to improper installation of the hose."

Fuel System
"Partial blockage of the fuel pump chambers as a result of the misalignment of the fuel pump front cover."

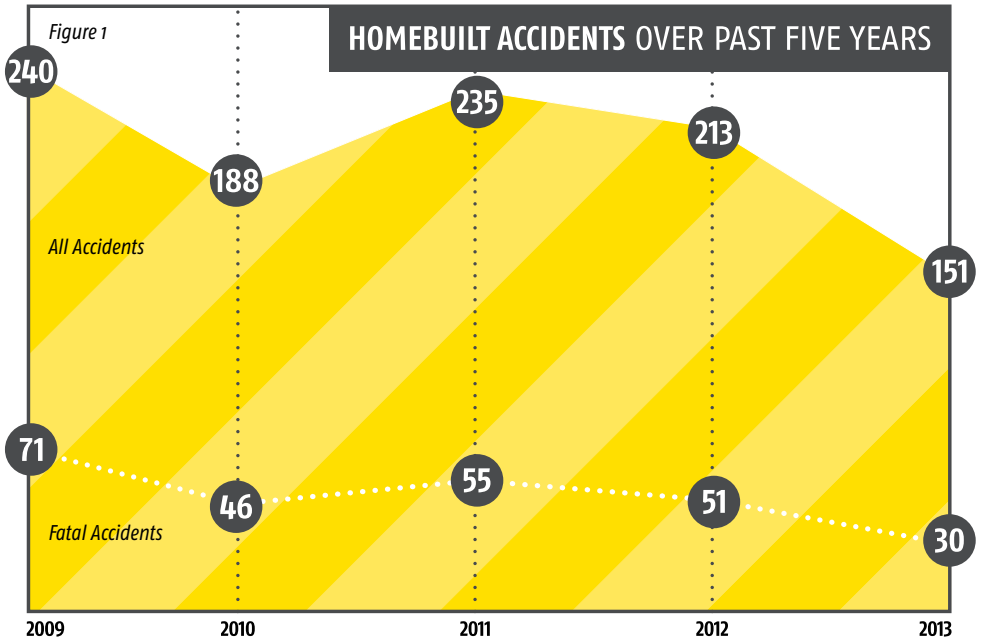
"Failure to install a fuel compartment vent in the right wing, affecting the total available fuel capacity, and resulting in the loss of engine power due to fuel starvation."

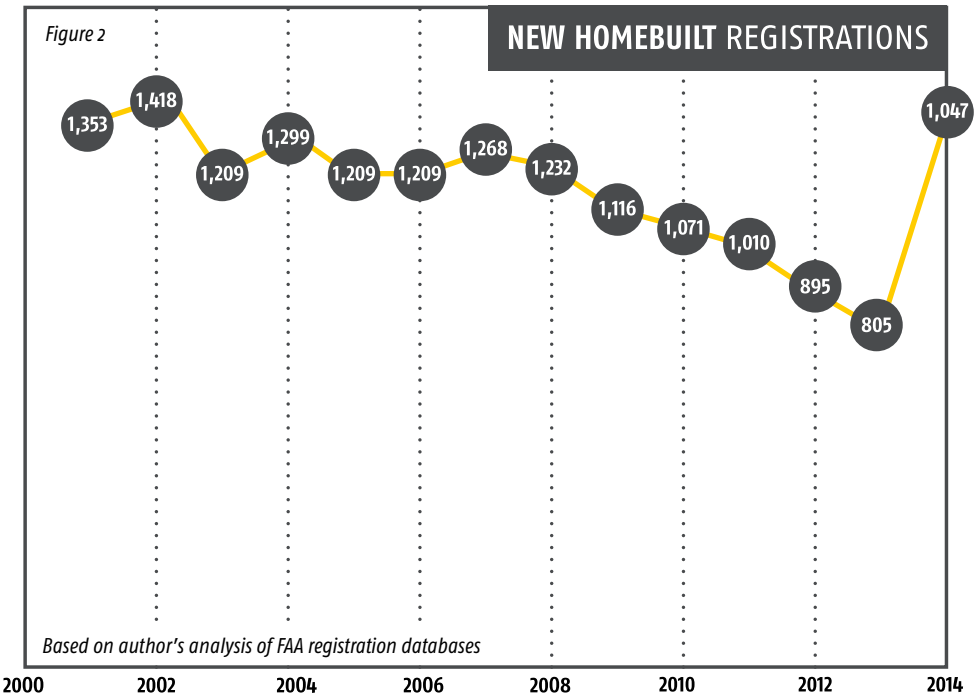
"Misrouting of the fuel lines close to the exhaust pipes."

Controls
"Inadequate installation of the aileron control pushrods to the control stick assembly, resulting in the ailerons deflecting in a direction opposite of the input applied."

"Improper installation of a rudder control cable Nicopress sleeve."

"Aileron control system failure during climb due to an improper welded installation."





Other portions of the aircraft were involved in the 5 to 10 percent range.

Now for some good news. Builder error accidents tend to be more survivable. The overall fatality rate for homebuilt accidents is about 25.1 percent, but the fatality ratio for builder error is about 21.3 percent.

But as Figure 6 illustrates, it depends on what system was affected. More than 60 percent of the accidents involving builder error on the basic airframe were fatal. To balance this, though, the total number of airframe builder error cases was low—about one accident per year.

WHAT KINDS OF MISTAKES?

It's good to know what part of the airplane is affected, but knowing what kinds of mistakes were made is even better. Breaking builder error events into categories is difficult; there's a lot of overlap. Here are the categories I use, and the logic behind them.

Installation errors occur if the plan or kit directions are not followed, for the aircraft itself or for specific components.

Workmanship basically refers to compliance with AC 43-13—using appropriate hardware, safety-wiring, etc. This is closely related to installation, of course, but is mostly used to refer to errors involving standard practices (not using a lock nut, forgetting to safety a clevis bolt, etc.).

ILLUSTRATION BY CHRIS LIVIERI

Design Implementation refers to work required to be done, but is not necessarily defined in the aircraft plans. An example might be the construction of a carburetor heat system that isn't adequate for flight.

Setup is the basic adjustment of (mostly) added equipment: setting up the carburetor, establishing the pitch angle for ground-adjustable propellers or rotors, etc.

Design Changes are deliberate departures from what the aircraft designer specified. Inadequate Materials is related to design changes, but refers to the use of material that does not meet the design requirements.

Finally, **CG or Weight** refers to cases where the builder did not adequately establish the center of gravity during construction, or the aircraft is overweight to a degree significant enough to cause an accident.

The results can be seen in Figure 7. Two closely related categories, installation and workmanship, are involved in almost half the total builder error accidents. You can see examples of these in the previous section, such as the improper installation of the oil line and the bad Nicopress fitting.

Design implementation, with almost 20 percent of the total, comes in third. Previous examples include the case of the fuel lines misrouted too close to the exhaust and the failure to install a fuel tank vent.

Setup errors (about 15 percent of the total) would include the case above involving the incorrect valve adjustment. A little more than one in 10 builder error accidents (11 percent) were attributed to design changes, such as the substitution of a larger engine than recommended. Inadequate materials and CG/weight issues were quite a bit lower.

The fatality ratio for most of these cases was below the overall homebuilt average. However, accidents involving inadequate materials had higher fatality ratios, but the overall number of occurrences was low.

SUMMARY

A lot of times when you tell someone you're building your own aircraft, the response is, "How do you know a wing won't come off?" Builder error is the first fear in the layman's mind.

About 5.3 percent of E-AB accidents are directly due to mistakes made by the builder. A typical year sees roughly 12 builder-error events. Remember, though, we are building and operating some fairly complex machines. There are going to be failures. At least builder error has a slightly lower fatality rate than E-ABs overall.

It's great that 2013 had a much lower number of E-AB accidents, but the preliminary figures for

Figure 3

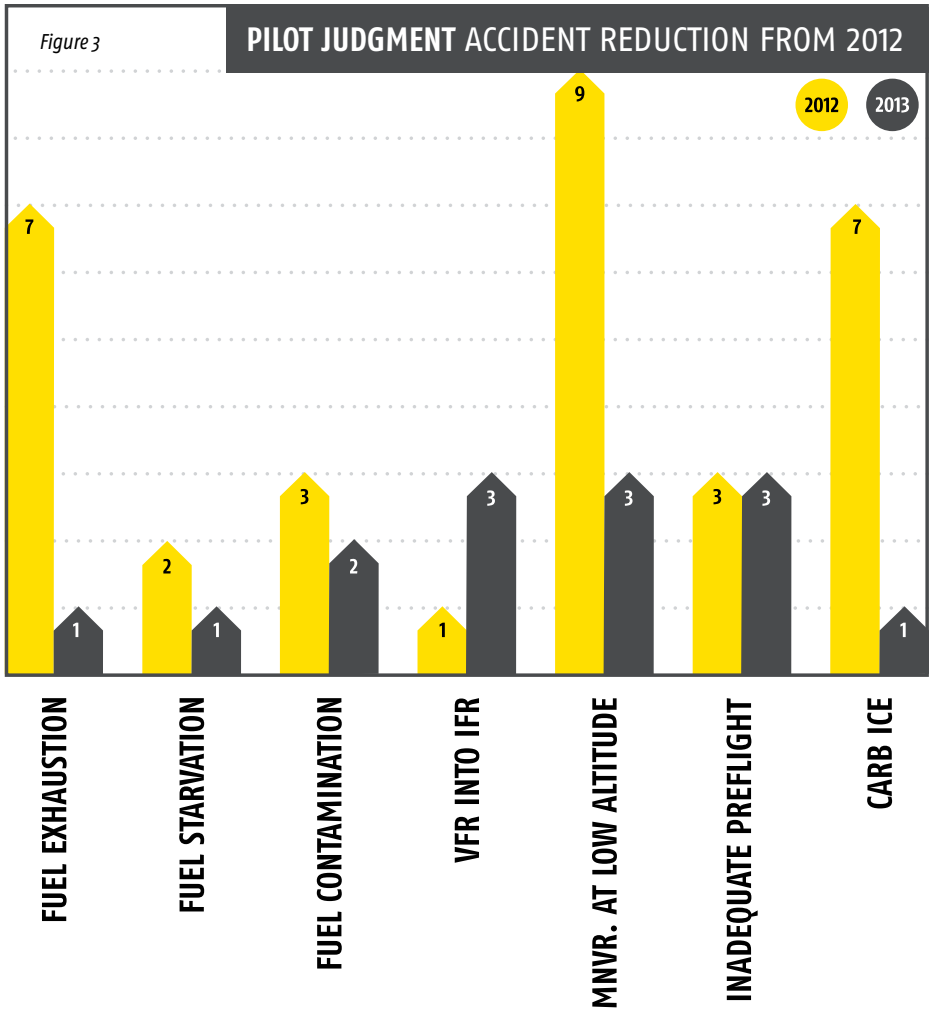
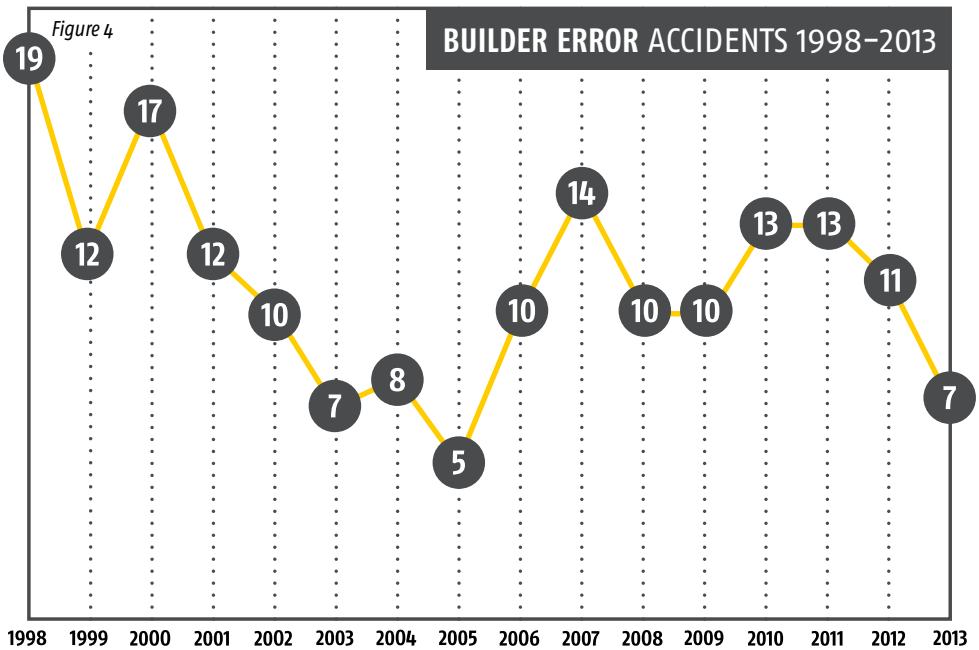


Figure 4



2014 show it was probably temporary relief. It pays to recall that we're looking at random occurrences. Rates are going to vary. Some years are naturally going to see more accidents, and some less, even when there are external factors in play.

For a heartening thought, note that the annual number of E-AB accidents has stayed roughly between 200 and 230 for the past 16 years. By my analysis of the FAA Registry, we added an average of 1,150 newly completed homebuilts to the FAA rolls each year in that period.

That's a lot of new homebuilts. Even with more than 11,000 homebuilts removed from the registry since 1998 (8,800 in the past five years), there are still thousands more E-ABs on the rolls. Yet the number of accidents each year has remained about the same. Not a bad situation, really. EAA

Ron Wanttaja, EAA 275698, is the author of two aviation books, *Kit Airplane Construction* and *Airplane Ownership*, as well as two young-adult historical novels and numerous magazine articles. He owns a 1982 Bowers Fly Baby and maintains a web page for devotees of the design at *www.BowersFlyBaby.com*.

PROCESS

Basic source of the data is the downloadable NTSB accident databases. The accidents flagged by the NTSB as "homebuilt" are cross-referenced with the FAA registration database to determine the actual certification status of the aircraft. Those certificated in other than E-AB are eliminated, as are unregistered or foreign-registered aircraft. The "Purpose of Flight" entry in the accident database is used to weed out air show, racing, and other uses not typical of personal E-AB operations.

In addition, the remainder of that year's accidents are examined to find E-AB aircraft that were not labeled as "homebuilt" by the NTSB but certificated as such by the FAA. There were seven such cases in 2013.

Thus, totals presented here do not exactly match the official tally.

After the E-AB aircraft have been identified, the NTSB data is examined to determine the cause of the accident. The NTSB narrative report is used to determine the first major event (the "initiator") of each accident. This conclusion may differ from the NTSB's final probable cause ruling. For example, if the engine fails and the pilot stalls during an attempted forced landing, NTSB probable cause will be pilot error. As amateur-built aircraft have a greater tendency toward mechanical issues, tracking the initiators rather than NTSB probable cause results in better understanding of hardware problems.

The initiators are tracked in 51 separate categories. Where more than one factor is involved, the subsidiary factors are also recorded.

The accidents are maintained in a database currently covering 16 years (1998 to 2013, inclusive).

The statistics on homebuilt fleet size and the number of new homebuilts each year were based on a download of the FAA registration database at the beginning of each year, and the historical list of deregistered aircraft included in most-recent databases. The year 2013 saw 4,900 homebuilts deregistered, yet the overall number of homebuilts decreased by only 4,095. Thus, 805 new homebuilts must have been added to the rolls.

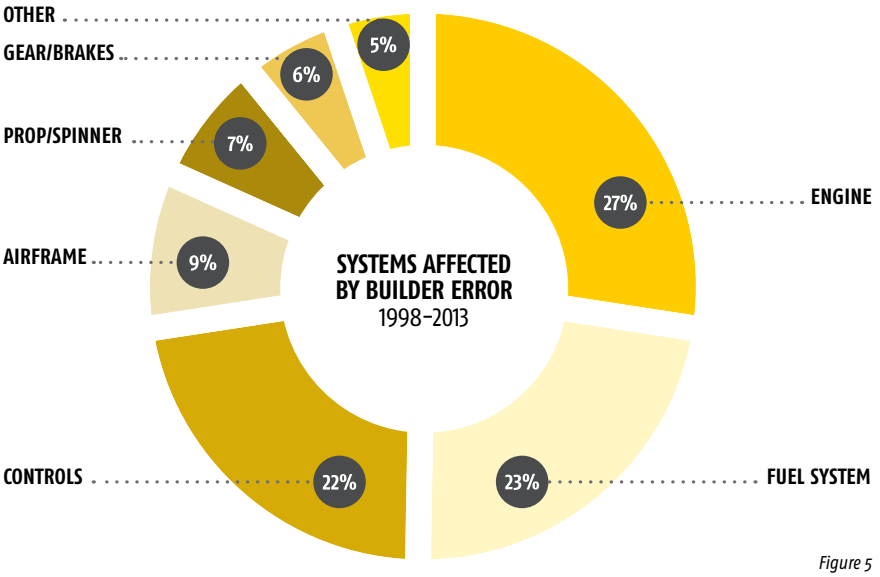
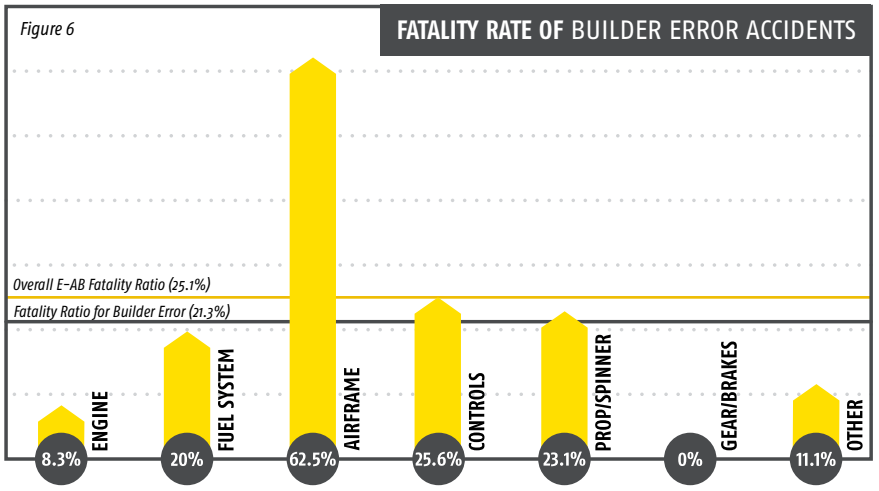


Figure 5



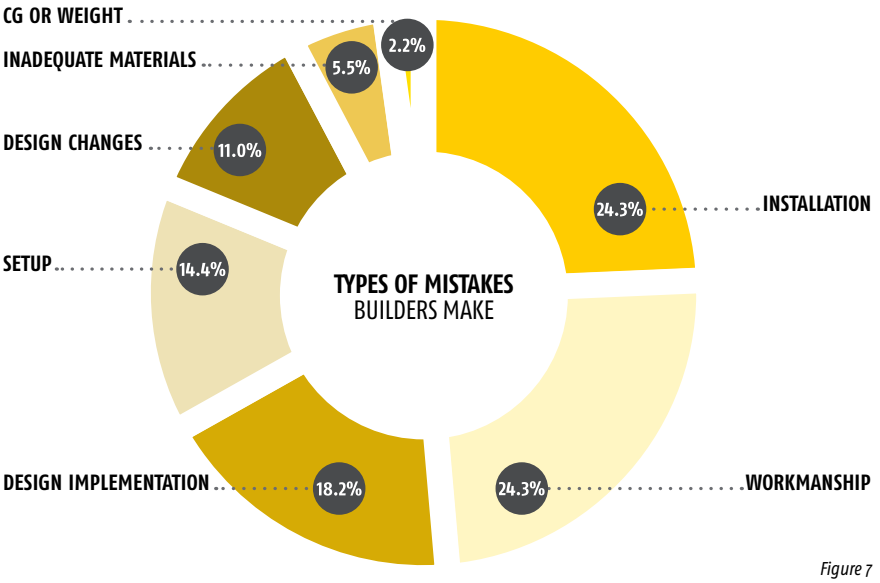


Figure 7

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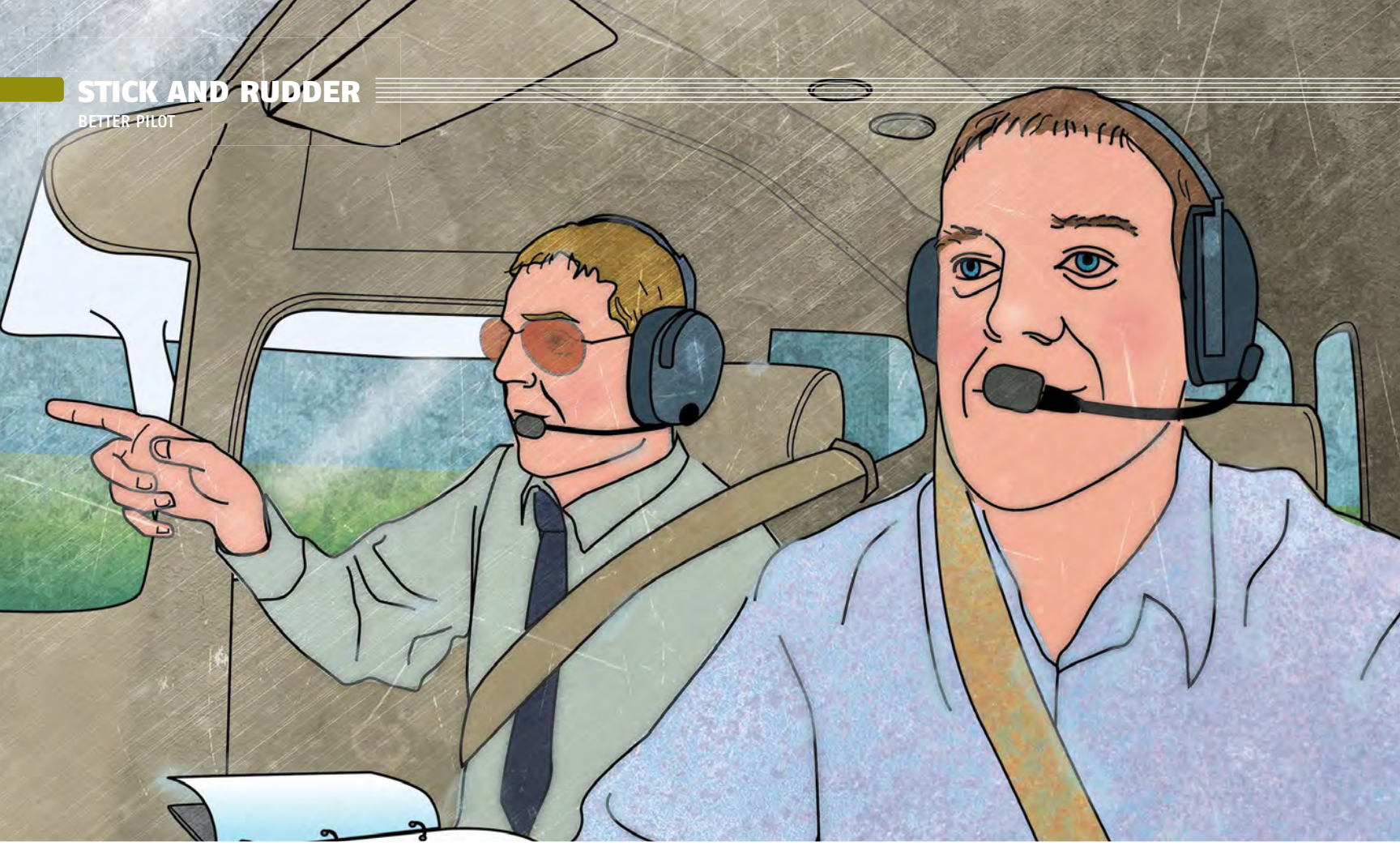

More Than a Numbers Game

Getting the most from your flight review

BY ROBERT N. ROSSIER

LIKE DEATH AND TAXES, flight reviews are almost impossible to avoid. Every 24 months, unless we've earned a new certificate or passed an FAA flight check, the FARs require us to undergo a flight review. Generally we greet these with about as much enthusiasm as a trip to the dentist. After all, it isn't much fun, and it costs us money. But with a slight attitude adjustment, we may find we can get more for our money, and maybe even enjoy the process.

The purpose of a flight review is—in a word—safety. More than just convincing a flight instructor that we're competent to operate an aircraft, the flight review is an opportunity to hone skills, fill in knowledge gaps, and fine-tune our abilities to deal with surprises in flight. So let's look at how we can get the most out of our flight review.

EXPECTATIONS

Per FAR 61.56, a flight review consists of a minimum of one hour of ground school and one hour of flight instruction. The instructor will require us to demonstrate those maneuvers and procedures that, in his or her opinion, are necessary to evaluate our skills. In years past, the flight review was viewed more as a pass-or-fail event, and so the pucker factor was right up there with taking a checkride. More recently, many instructors (and the FAA) have begun to view the flight review more as an opportunity to get pilots in the aircraft with an instructor for some dual instruction. Either way, our goal should be to get as much out of the experience as possible, and to improve safety through refinement of skills and knowledge.

One practical way to view flight reviews is through the lens of the numbers game: see how pilots get into trouble, and focus on prevention. Accident statistics might suggest we

ILLUSTRATION BY GARY COX

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It's Not Rocket Science

"I knew I wanted to be a rocket scientist from the moment I watched John Glenn pilot the "Friendship 7" spacecraft on the first manned orbital mission of the United States, back in 1962. 14 years later I did realize my dream of becoming a rocket scientist and in 1978, a member of EAA.

I've owned many Ford vehicles throughout the years, but none that provides as much fun as my 2014 Mustang. I took delivery last month at Grapevine Ford, in Grapevine, Texas. The people there were fantastic and the process was great. They installed the stripe with my "moniker" on the car. I love my new Mustang and apparently so does everyone else. I've received hundreds of comments and thumbs up from total strangers. It's incredible!

I've learned that it doesn't take a rocket scientist to take advantage of the EAA – Ford Partner Recognition Program!"

Craig W. EAA #165239

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focus on takeoffs and landings, maneuvering flight, fuel management, and weather-related scenarios like VFR into IMC. Oftentimes, instructors will tailor the content of a flight review to an individual's flying environment: the type of airplane flown, and the environment in which he or she flies. The flight review for a pilot who flies a Cub around the patch on sunny Sundays should be different from the one for the pilot who flies a pressurized Baron on business trips halfway across the country.

Regardless of what and how we fly, three critical aspects should be part of the flight review: aviation knowledge, aircraft familiarity, and flying skills and procedures. Each aspect is important, and for each we can take steps to make the flight review more meaningful and valuable. The key step in getting a good flight review is establishing the expectations with the instructor, and doing our homework in advance.

AVIATION KNOWLEDGE

There is plenty to know in the world of aviation, and much is easily forgotten if we don't apply it on a regular basis. Among such topics are regulations, weather, airport markings, and airspace. Aircraft performance and flight planning are also among the often forgotten items that come to light after it's too late to rectify a problem. These are all topics we can review on our own, and if we do our homework, we'll have more time to focus on areas where our instructor can really help.

THE AIRCRAFT

Aircraft systems knowledge is key to flight safety. It's important to know how the systems work, what to watch for, and how to troubleshoot when something goes wrong. For example, what might leaking hydraulic oil suggest for a landing gear system, and how do we lower the gear if the primary system fails? We should also know what maintenance issues plague the make and model aircraft we fly, and how to prevent them.

When it comes to limits and airspeeds, the important numbers to remember are those not shown on the indicators and placards. We don't have to look too hard to find the flap operating speed, but how about V_X or V_A for the aircraft when lightly loaded? These are also topics we can review on our own, and if we demonstrate a mastery of these items to the instructor, we'll quickly move on to the more valuable aspects of the review.

Modern cockpit technology can be overwhelming, and a poor understanding of these systems can put us in real jeopardy if we rely on them to get out of a tight bind. Here again, we should be able to learn the systems on our own, but an experienced instructor can provide tips and insights that are tremendously helpful.

FLYING SKILLS AND PROCEDURES

The final aspect of a flight review is flying skills and procedures. If we know our weak points, we can let our instructor know in advance so we can sharpen up our skills. But a number of items will likely be part of the plan.

One practical way to view flight reviews is through the lens of the numbers game: see how pilots get into trouble, and focus on prevention.

Accident statistics suggest we spend some time in the takeoff and landing department. Here it's good to focus on the more edgy techniques, like crosswinds, or short- and soft-field takeoffs and landings. A good instructor will focus on collision avoidance, altitude and speed control, use of checklists, and proper procedures. But other skills to consider include dead-stick landings, precision landings, and abnormal conditions. For an aircraft with electric flaps, for example, it's good to practice no-flap landings.

A surprising number of pilots experience fuel exhaustion, either due to poor planning or poor procedures, so our flight review might touch on fuel management. Here an instructor might point out concerns and offer useful operating tips and procedures.

A good flight review will also focus on abnormal operations. For example, we might be asked to work through the process for dealing with an electrical system anomaly. Here we need to concern ourselves with what's critical given our situation, and sort through issues like load shedding, or when and when not to reset a circuit breaker.

The most challenging aspect of a true emergency might be that it catches us off guard, and we must act quickly or decisively. The goal of the flight review is to reset or recalibrate our emergency responses. Such scenarios might include an engine or cockpit fire, a power loss on departure, or an engine-out landing.

Another place we should focus attention is on the skills and procedures we don't usually need, but might. If our normal environment is VFR flight and nontowered airports, we might want to focus some training time on operation in high-traffic-density areas and at controlled airports. When it comes to life-saving skills, flight by reference to instruments is perhaps the most critical skill to build.

Sometimes the immediate value of training maneuvers or skills might not be readily apparent, but all those drills are practiced for a reason, and each has a lesson to teach us. For example, some pilots don't like steep turns, and don't see the value since they don't typically use them. But that's precisely the point. A steep turn is a skill we might need at the drop of a hat to avoid a collision at relatively low altitude, so having the skills to properly coordinate the turn and avoid a stall, spin, and the ground can be of primary importance.

As part of our preparation for a flight review, we should review our goals and objectives with the instructor to make certain it covers the full spectrum of our needs. The FARs may set minimum standards for flight training and ground training, but flying is more than a numbers game. We need to be ready for whatever comes our way. And like a trip to the dentist, a flight review might reveal areas where additional attention is warranted. Flight reviews might seem like more of an annoyance than something to look forward to, but with a focus on building skills and enhancing safety, we can actually have some fun. EAA

Robert N. Rossier, EAA 472091, has been flying for more than 30 years and has worked as a flight instructor, commercial pilot, chief pilot, and FAA flight check airman.


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How Much Is Enough?

BY J. MAC MCCLELLAN

WE HUMANS ARE terrible monitors. And we are at our least effective when assigned the task of looking constantly for something that almost never happens.

Countless studies over the years have shown that people simply can't maintain a high level of alertness when their attention is almost never rewarded by discovering danger, or at least something new. Whether it's a sentry on guard for an enemy that never shows, or a pilot staring, or at least monitoring, a gauge that never moves, boredom and routine quickly rob us of the ability to spot a problem if it ever does occur.

Airplane designers and certification authorities struggle with this issue constantly. Flashing yellow and red lights have been wired to critical gauges to alert pilots to a problem in system performance. We have also tried loud horns, bells, klaxons, and more recently spoken vocal alerts to raise attention to an important issue.

Years ago the concept of a master caution and master warning light system evolved. All warning lights in the cockpit were connected to a big, really bright flashing yellow and red light directly in front of the pilot. An exceedance on any gauge or system warning light would trigger the master light, forcing the pilot to press the master light to cancel the flashing and then look to see what individual system warning triggered the master.

Creation of the glass cockpit made the engine indicating and crew alerting system (EICAS) possible so whatever the warning or alert issue was it could be spelled out in plain language on the cockpit displays. We typically just call this CAS now for crew alerting system, and the messages are ranked on the screen in the order of criticality. Different colors highlight the level of urgency with red being the most dire.

CAS messages can be linked to aural alerts. And in many systems now if you click on a CAS message the system automatically calls up the abnormal or emergency checklist to deal with the problem. Instead of trying to remember what a steady, or a flashing, warning light means, pilots now can just read the message.

All of these advances in pilot alerting and warning have helped. Newer systems are automated so pilots don't need to regularly monitor a gauge for proper performance because if there is a deviation the system will trigger master warnings or cautions and post a CAS message. But none of us are capable of continuous awareness no matter how elaborate and effective a warning system may be.

Though advanced gauging and warning systems first appeared in jets, now much of the technology has become available in personal airplanes. And for the same reason—glass displays. Once you have a glass display you can show any kind of graphic, or alert, or message that you can think of. We are no longer limited to dials and warning lights.

An airplane that was in that transition from gauges to electronic CAS alerts was the Lancair LC42, which is also known as the Columbia and then Cessna Corvalis 350. The airplane is a very fast all-composite fixed-gear single with a 310-hp Continental engine. It evolved from the Lancair kit designs into a standard category production airplane.

The first LC42s were built in 2003 on the cusp of the piston airplane transition into the glass cockpit era. Avidyne's glass primary flight display (PFD) and multifunction display (MFD) pioneered the transition to the glass displays.

Though the Avidyne equipment has enormous capability to show all primary flight information and all system data—plus moving maps, all nav data, and so on—certification was demanding, as it should be during transition to new technology.

To remove some certification complication the builders of the LC42 opted to retain the original round dial engine and system gauges on the left side of the instrument panel even though the big Avidyne displays also showed system and engine data in much more detail. So some airplanes left the factory with complete dual "steam gauge" engine and system instruments, and

complete electronic display of the same and even more data. A pilot in these airplanes could see critical information, engine oil pressure for example, in several places, including on a dedicated round gauge right in front of him.

So whether you believe round dials with brightly colored needles or color-coded graphic displays on an MFD are the best possible way to monitor systems performance, these airplanes had you covered. It was truly an airplane with belt and suspender engine and system gauges.

But none of this instrumentation was enough to save a 968-hour instrument-rated commercial pilot from disaster. The pilot even had 290 hours flying that airplane.

The weather was 800 feet overcast with 7 miles' visibility when the pilot and a private pilot-rated passenger departed for about an hourlong flight across North Carolina. Thunderstorms and turbulence were not an issue, nor was icing forecast. It was a routine IFR flight for a capable airplane like the Lancair/Columbia.

The pilot climbed as cleared to 5,000 feet and about 16 minutes after takeoff called controllers declaring an emergency. The pilot reported "low fuel pressure...the engine's quitting." The controller immediately vectored the pilot toward the nearest airport. The pilot couldn't maintain altitude and soon reported "smoke in the cockpit" and that the engine was "barely" producing power.

Witnesses saw the LC42 descend out of the clouds flying low but level. They reported the engine was sputtering and changing sound erratically. The airplane crashed in a residential wooded area with the first impact being a 50-foot-tall tree. Impact killed the occupants, but there was also a post-crash fire.

Though there was severe thermal damage to the cockpit area, flash memory chips located in the Avidyne displays survived. NTSB investigators were able to read the chips and learn exactly what happened to cause the engine failure.

Memory chips are embedded in most flat glass systems and are there primarily to help diagnose problems with the avionics themselves. But the chips record a host of data as it is shown on the displays so investigators can know what the pilot was seeing.

Since the engine clearly failed, engine system data was of immediate interest to investigators. The memory chips recorded engine rpm, manifold pressure, cylinder head and exhaust gas temperature, fuel flow, and oil pressure.

Investigators found in the recorded data that about eight minutes after takeoff the engine oil pressure began a steady decline from normal. Ten minutes after takeoff the memory showed the airplane leveling at 5,000 feet where a decrease in fuel flow and a rise in EGT clearly showed the pilot was leaning the engine for cruise. The memory chips also showed the oil pressure continued to drop during and after the leaning process.

About 12 seconds after the indications of leaning, the oil pressure dropped out of the bottom of the "green arc," which occurs at 30 psi. Two minutes and 16 seconds later the oil pressure dropped into the red, falling below 10 psi. Three minutes and 32 seconds later the EGT and rpm dropped to zero, indicating the engine had failed. The engine continued

to operate for six minutes after the oil pressure dropped out of the normal limits, and nearly 3.5 minutes after the pressure was below the minimum allowable.

During these minutes the pilot could have seen the oil pressure on the round dial just to the left of the PFD. Also, the oil pressure was displayed on the MFD and PFD. If the pilot had selected the engine page on the MFD for leaning, which would be logical to see the expanded EGT vertical tape display, oil pressure and other information would have been prominent and large on that page. When the oil pressure dropped below 10 psi, the reading on the glass displays would have turned red.

The NTSB couldn't determine why the oil pressure failed, but the failure was massive. Four of the six connecting rods broke, and one was flung through the engine case, departing the airplane during the final descent. There was so much damage from the oil starvation distress plus the post-crash fire investigators just couldn't find a reason for the steady drop in oil pressure over several minutes.

But, of course, the more important question for all of us is why didn't the pilot notice the oil pressure problem in the minutes before the engine began to fail? If the pressure decay had been seen reasonably soon, several minutes would have been available to take action and possibly get to a runway.

The fact that the pilot would have had to look closely at engine gauges to lean the mixture just as the oil pressure was at the bottom of the green means the pilot was looking, but not seeing. Multiple displays of oil pressure plus advanced gauging and color change alerting just didn't get the pilot's attention in time.

The NTSB probable cause of the accident is "the pilot's failure to detect multiple indications and cues in the cockpit of the steady loss of oil pressure, which resulted in catastrophic engine failure over terrain unsuitable for landing. Also causal was the loss of internal engine lubrication for reasons that could not be determined during post-accident examinations due to post-crash fire damage."

Could something like this happen to you or me? Yes is the only honest answer. When we look at something hundreds or thousands of times and see nothing but normal, it's really hard to comprehend what we are looking at if there ever is a problem.

This article is based solely on the official final NTSB report of the accident and is intended to bring readers' attention to the issues raised in the report. It is not intended to judge or reach any definitive conclusions about the ability or capacity of any person, living or dead, or any aircraft or accessory. EAA

J. Mac McClellan, EAA 747337, has been a pilot for more than 40 years, holds an ATP certificate, and owns a Beechcraft Baron. To contact Mac, e-mail *mac@eaa.org*.

Flying Bird

Pilot Sees a Change in Color Acuity

Kappa, Illinois resident David M. is a private pilot airplane single-engine land, he also has an instrument rating. David owns a turbocharged Piper Malibu. He uses his plane for business and pleasure. He also found his plane helpful to visit his daughter in college. What used to be a 5-hour drive is now a 40 minute flight.

David owns a printing company and uses his plane to fly customers in and to go visit them as well. He's been in the printing business since 1989. His company does on demand digital printing. POD is a business process in which copies of a book (or other document) are not printed until an order has been received, allowing books or other printed materials to be printed singly, or in small quantities.

David got his start in aviation over 18 years ago. He had a pair of nephews that both started taking flying lessons so it got him interested. David went ahead and took the plunge. He received his private certificate in 1996 and then he received his instrument rating right after in '97. David has accumulated 1,250 hours of total flight time as of 2015. He also likes to target shoot. Long-range rifles are his preferred equipment. Lastly, he does bird watching so he needs his vision to be crisp and clear.

We caught up with David recently asked about a success with Claroxan and here's what he had to say:

"I noticed Claroxan in an aviation magazine a good while back, maybe in 2005 and I decided to order some. Once I took the product I sensed the results right away. I really noticed color acuity when I bird watched. That was the first thing I saw change. I clearly observed cardinals were much more pronounced as well as indigo buntings. I'm talking clarity up to about a quarter-mile!

I don't know what it would be like without Claroxan. I'm 65 now and I figure my vision is going down hill a bit, but it wouldn't be as bad if I didn't have Claroxan. The long-range vision benefits are superior to other products out there. I even turned a buddy on to it. He loved it."

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Aviation professionals trust Claroxan to support and maintain healthy eyesight.*

Gregory Jones

"Claroxan definitely works and has made a marked improvement in my vision. My right eye is weaker than my left eye and before taking Claroxan my Snellen Chart reading was 20/40 unaided. Now, when I am well rested, I am reading at 20/25."**

Roger Johnson

"I started using Claroxan for peace of mind. I take my flight physical every six months to renew my first class medical and continue to receive 20/20 on the vision portion, which astounds my examiner. He asks me how I do it and I say, 'In addition to a healthy lifestyle, I take Claroxan daily.' "*

Ben Watson

*"I use Claroxan to keep flying recreationally. My eyesight is really important to me and my long-range visual acuity and sharpness continues to stay strong."**

Robert Eleazer

*"Flying is a major part of my life. But my vision was getting worse and worse. So I decided to try Claroxan. I've been using Claroxan for about five years now. I've turned the big 6-0 and my eyes are in fantastic shape."**

After the Prop Departs

Flying instinctively

BY PABLO C. BRANCO, EAA 1058055; DELRAY BEACH, FLORIDA

LAST WEEK I EXPERIENCED an in-flight engine failure. It resulted from a catastrophic failure of the crankshaft, which caused the propeller to separate from the engine. It was the second flight of the day as I was giving rides in the Piper Cub to some friends that were in town.

The morning flight was uneventful. Despite the fact I had stepped on our dog's poop before climbing aboard, this 20-minute-or-so joyride was as great as a Cub flight can be. Open window, 1,000 feet AGL, blue skies with mild Florida fall kind of weather. We came back, landed, and I was obviously rushed into the cleanup of the puppy's mess. My bad!

Another friend showed up, and obviously another ride was in order. The takeoff path pointed directly toward the Everglades, and I kept climbing on that westerly heading until we were through 800 feet, then a right turn to the north.

It didn't take too long. It really felt like I was pushed from a boat into the sea. It was like the whole world around me just shut down. The airplane vibrated very intensely for two or three seconds before giving way to extreme quiet. Even though we had Bose headsets on, it suddenly felt like someone shut the door of a soundproof room, blocking some very loud music that was outside. And I felt alone.

I instinctively knew and visually assured that I had a very landable field off my left wing. All I could verbalize to my passenger was, "Eduard, the engine has quit. We're going to this field here on the left."

From there on, I am unable to describe much of what I did, and I couldn't time it. My mind was racing. Back to my glider days, I was just instinctively judging my glide ratio, looking to where the wind was, hitting my marks to base leg, then final. I could almost hear Mr. Bob Hoover saying, "Money in the bank—taking it out!" while I slipped it into the landing in an attempt to drag the excess energy in the form of airspeed off.

I had no idea the propeller had broken off the airplane; I didn't even notice the oil

ILLUSTRATION BY **MATT BELLISLE**

spillage over the windshield. I didn't look at my instrument panel, not even once. I did not shut down the mags or the fuel selector. I needed 101 percent of all I had to fly that airplane, stick and rudder, to put it on the ground safely.

The field I landed on was very soft, loose sand. But you only know that when your tires make contact with the ground. Until that very second, I was unsure of what would happen once it touched down and was trying to prepare for it.

I chose to wheel it in, so I did with about two-thirds of the total field length available remaining—a little less than I wanted. I kept the tail high, eased on the brakes, let the tail sit slowly to a stop about 300 feet down the dirt. It was a smooth arrival, and when we stopped, Eduard let me know he was okay up front. Mags off, fuel off, door open, and I was out of the airplane.

"Wow, the prop is gone!" I was left with a sheared crankshaft and a dead engine. When twisting its way off the airplane, the propeller struck the engine cowling and ripped off one of the pins that holds the bottom and top pieces together, and that was it for damage. We were both in perfect shape, and I still had my Cub in one piece. Well, with a hurting engine, but one piece.

I've had partial power losses in the past, both on single-engines and twins. I've also had to shut down one engine of a Citation Mustang I used to fly. I got away with all of those. But when something as severe as a crankshaft breaking happens at less than 1,000 feet off the ground while still climbing, it gets your attention.

I never fly an airplane without checking around for landing areas, no matter how high I am. Because of that, I knew the field was there, and I had a lot of confidence that it was landable.

But most important was instinctive flying. I've always been an advocate for the raw stick and rudder flying skills, now more than ever. I don't think anything else could have helped me out of that situation—no fancy instruments, not the most expensive devices, no parachute, nothing. My only chance was to put all I had into simply flying the aircraft as well as I possibly could.

Do not underestimate the importance of great flying education. Go as deep as you can to the most primitive kind of flying. There is invaluable knowledge in the most primitive crafts, like my Piper Cub. Start it with your hands, and cover up all the gauges. Learn to fly on a tricycle gear, but get yourself a tailwheel endorsement to get your feet alive and working. Learn how to slip, and then how to slip aggressively.

Rank your pilot education very high on your priority list, and on your budget, too, because it will pay off. Anything and everything you do to engage yourself in the roots of flying will feed directly into your ability to fly with instinct. I can guarantee it will also be the most fun. Plus, it may very well save your life. EAA

SUBMISSIONS

SHARE YOUR CLOSE CALL so we can all learn from the experience—send your story to *editorial@eaa.org*.

Open-Cockpit Flying in an RV

Van's RV-7

BY GARY LUDEKE, EAA 199851; CRESWELL, OREGON

FOR MANY YEARS, one of our family cars was always a convertible. A warm, sunny day always brought out my desire to take a road trip sitting out in the open with an unimpeded view of the sky and that refreshing wind-in-the-face feeling. About three years ago I traded my Corvette convertible for a fastback-style high-performance touring car that I really love. However, those sunny days were still bringing out that urge to be out in the open.

In 2001 I completed an RV-6A. That is, if one really ever "completes" an experimental airplane. I've flown it more than 1,200 hours to date and intend to keep flying it until the time comes for me to hang up my headset for good.

During this past summer I started to wonder what it would be like to fly the RV in an open-cockpit configuration. The plane has a sliding canopy so, when it is removed, the windscreen remains in place. This also retains the rollover protection, which is incorporated into the windscreen frame. I took the canopy off, which is accomplished quite easily by simply removing two bolts. I tried envisioning the altered airflow pattern that would occur and, particularly, how the airflow across the horizontal and vertical tail surfaces might change. If nothing else, I could picture an enormous increase in drag due to the big "hole" in the airframe. I also just didn't care for how the airplane looked without a canopy.

I decided to mock up an extension of the fuselage skin to cover the baggage compartment using poster board. To seal the baggage compartment behind the seats, I used a vertical sheet with holes cut into it for the shoulder harnesses to pass though. With the mockup in place, the RV looked really cool to me, and I could picture the airflow across the cockpit flowing much more smoothly. I decided to proceed with building the extension out of aluminum. I figured it would be fun to try, and I wouldn't be out a lot of money if I finished it and either didn't trust it or just didn't like it.

I used 2024-T3 by 0.32-inch aluminum from Van's Aircraft. I started with a 6-foot by 2-foot sheet, which was cut to make the

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fuselage skin extension. The vertical sheet behind the seats and all internal bracing and related hardware came from the scrap box in my hangar. When fabrication and installation were completed, I did some high-speed taxi testing and found nothing unusual. I made a couple of trips around the traffic pattern and, other than the wind and a little noise, the plane felt the same.

I wanted to take a trip in the RV the next day with my wife, so I removed the modification and put the slider canopy back on. I was confident enough in the installation that I took the parts to our local automotive paint shop and had them paint the parts. The shop matched the white paint on the fuselage perfectly, and I had them paint the vertical piece flat black to reduce reflected glare on the windscreen.

After letting the paint cure for a couple of weeks, and with our rainy season about to get into full swing, I again removed the canopy and put the finished parts back on the plane to take a few pictures. Although it was chilly and quite bumpy, I made another couple of trips around the pattern and then removed the parts and reinstalled the canopy.

I will probably not fly it again as an open-cockpit airplane until the warmer drier weather comes back next May or June. At that time I will perform a comprehensive flight-test program on the open-cockpit configuration before I will take any passengers out for a ride. I particularly want to investigate slow flight and stall behavior in all configurations as well as full slips in both directions to verify that there are no adverse flight characteristics due to changed airflow over the empennage.

From my few short flights to date I think the primary use of the open-cockpit configuration will be to introduce Young Eagles to the thrill of open-cockpit flying. I can also see using the airplane for occasional flower-bombing contests and glare-free air-to-air and air-to-ground photography. As far as the wind in the cockpit goes, it seems to be comparable to what one would feel in an open car at the same speed. Faster than 100 knots the wind on the back of the neck starts getting pretty strong. I was pleased to see that, even at 120 knots, my Lightspeed active noise-canceling headsets perform well.

The completed installation weighs 6 pounds, and the sliding canopy weighs 25 pounds, so in the open-cockpit configuration, the airplane is 19 pounds lighter. I will always use a helper to remove and reinstall the canopy to help prevent doing expensive damage to it or to the airframe. It's also convenient to use a helper to install and remove the conversion parts, but not essential. Using a helper the change to either configuration can be comfortably made in about 20 minutes.

E-mail Gary at *Arrow76r@centurytel.net*.

SOUTH AFRICA *SLING 2*

FOR THE LAST 18 YEARS I have been responsible for bringing over the South African camping group to EAA AirVenture Oshkosh, which has become a great part of my life, so I thought the color scheme should reflect it. The Sling 2 is called *Spirit of Oshkosh*—Oshkosh is all about homebuilt planes, the skills needed to do it, a huge range of affordable, exciting options, and the camaraderie and support of fellow homebuilders. This is the stable where my airplane comes from, and so for me, it is the *Spirit of Oshkosh*.

The project took four and a half years and was primarily built in my garage at home. It was finally assembled at Bundu Aviation where the engine installation and final wiring were done with the help of Philip Cronje and his team.

The secret to homebuilding is to treat each small task as a project on its own—that way you start something, you build it, and you get the satisfaction of finishing it, whether it's something as small as constructing a seat or as big as building a wing. Then you don't get overwhelmed by such a huge and seemingly impossible project. My trips to Oshkosh also gave me a lot of inspiration—I always came back home fired up and ready to retackle the project!

Many thanks to the EAA guys I worked with here in South Africa, including Chalky Stobbart, Monty Jefferies, and Philip Cronje.

Neil Bowden, EAA 565560; Johannesburg, South Africa

SOUTH DAKOTA *DAKOTA HAWK*

I ORDERED THE PLANS for my Dakota Hawk, serial No. 69, in the summer of 2008. At that time Gene and Darlene Hansen were in the process of selling the Fisher Flying Products company and only had plans, fuel tanks, and windshields for sale. I purchased all three items and started working. I finished the fuselage sides and horizontal tail structures in my unheated garage that fall. During the winter I worked on the ribs, half-ribs, tip bows, and metal fittings in my basement. EAA Technical Counselors Rick Alter and Allen Weis checked my workmanship.

Over the course of the next three years I worked in my garage during the warm weather and in the corner of a flying buddy's factory during the winter. Designated Airworthiness Representative William Kyle came to do the final inspection of N369DH in October 2013, and the first flight was from Byker Aviation's grass field on October 27, 2013. The 40 hours of flight testing were completed and a few rigging changes made during the first year.

Thanks go to my supportive wife, Christi; to Pete Larsen; to Dan and Myron from Byker Aviation; to EAA Chapter 1295; to the new owner of Fisher Flying Products; and to my many RC flying friends. Together they kept my spirits up and my nose to the grindstone during the five-year building process.

David Larsen, EAA 134389; Alcester, South Dakota
E-mail: *ama307470@yahoo.com*; Technical Counselors: Richard Alter and Allen Weis

CALIFORNIA *VAN'S RV-7*

I MADE THE ATTEMPT to build an RV-6 in about 1997 (I ended up with the vertical stab as hangar art), but I was unable to complete it. The pre-punched concept from Van's caught my eye, and in October 2007 the first slow-build kit was ordered with an RV-7 in mind. The first flight was in November 2011. Although it was a slow-build kit, I was able to work on it without too many disruptions. I kept the RV as close to a stock RV-7 as I could. It is set up for VFR day and night.

The RV is powered by a carbureted Lycoming O-360-A1A, with Hartzell constant-speed prop. Inside I have a Dynon D180 (EFIS with engine data) along with Dynon AP74 autopilot interface coupled to Garmin GNC 300XL GPS/comm, King KT-76A transponder, Flightcom 403 intercom, analog airspeed, rate of climb, turn coordinator, and airspeed. I installed Whelen strobes and Duckworks landing lights. I finished the interior with a Classic Aero interior including side panels and carpet. I tried to keep it light, and it ended up at 1,121 pounds empty weight.

I took transition training from Mike Seager in Oregon to figure out the RV-7 handling, which I think is an absolute must prior to trying it on your own. I was able to conduct the first flight myself as the RV series has well-known flight characteristics, and I was actively flying at the time. I finished the transition training about one month before the first flight, so I was pretty fresh. I would not attempt the first flight at my experience level in a truly unknown aircraft and without thorough transition training.

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E-mail: *baskaggs@gmail.com*

CANADA *DE HAVILLAND DH60M GIPSY MOTH REPLICA*

SOME 20 YEARS AGO while flying into a remote airport in British Columbia, Canada, I came across scant remains of a de Havilland Gipsy Moth, circa 1929. It followed me home shortly after and sat in a shed. After a disastrous shop/garage fire in August 2005, a number of my other projects were destroyed and the possibility of making an airplane out of the Gipsy remains became an obsession. After collecting some drawings and more parts from related de Havilland aircraft, construction started in late 2006.

Because early Gipsy upright engines are very rare, I chose to take the more common inverted Gipsy Major 1C rated at 142 hp from the wartime Tiger Moth and convert it to run in the upright position appropriate to the airplane. This change, and the fact so many parts were being made new, meant that this project was to be a replica, not a restoration, and was built under the more liberal rules in the E-AB category.

After eight years and 4,500 shop hours the project was complete. I kept the avionics to a bare minimum with an Icom portable using a comm antenna hidden in the fin with aluminum ground plane hidden in the stabilizer. Instruments include a tach, British P8 compass, Reid & Sigrist turn and bank along with airspeed, oil temp, and oil pressure gauges.

The aircraft is built to resemble a de Havilland DH60M Gipsy Moth as much as possible. Safety equipment other than the shoulder and lap belts includes soft crash pads on the top of the instrument panels. Fuel capacity is 23 gallons in a top wing tank. I even modified a set of Yamaha motorcycle wheels to duplicate the original high-pressure skinny wheels. With final tweaking and paperwork approved, the first flight occurred on October 12, 2014. My wife, Hedy, was present and congratulated me at the successful completion of the "nonevent." EAA

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Looking to the Future

Top seven innovations we have to look forward to

BY MARK PHELPS

WHAT'S COMING NEXT for people who build, restore, and fly their own airplanes? There's some exciting new technology that looks as though it's just over the horizon, and I'd like to offer some of my views on how it might play out in the long run. So, here's my list of the top seven innovations that I believe will have the most profound and lasting impact on future flying.

Number 7: Diesel engines with electronic controls. Okay, it's really two technologies, but the thrust of upcoming powerplant development incorporates both. Diesel is important because the production and delivery of avgas, leaded or not, will always be a problem. 100LL (low lead) has to be refined in separate batches from every other type of petroleum product. It's been described as a "boutique" fuel, and the costs associated with it reflect that description. Major oil companies are polite, but they realize there will never be a profit in manufacturing avgas—and continue to hope they can at least break even as they keep the piston fleet going.

Safely processing and delivering any form of aviation fuel is much more complex than auto fuel, and Jet A (which diesel engines can use) is the most widely available. Piston engines that can operate on jet fuel will eliminate that problem, and in parts of the world where avgas isn't available at any price (China, for example), any future for piston-powered aircraft virtually demands that they operate on Jet A. Electronic computer control of engine operation is part of that mix, as well. Microprocessors are far better at mixing air and fuel—and combining propeller pitch—than even the most expert human.

Number 6: Hydrophobic skin coatings. Since airframe ice is the prime deterrent to winter flying, I admit I'm still frustrated by lack of progress with this innovation. Every few years, it seems, news comes out of a research lab that a new form of paint or other coating is under development and capable of shedding moisture like a duck's feathers. For light aircraft (or heavies even more so), this could be a huge step forward in anti-icing protection. If super-cooled water droplets rolled off the surface of an airplane as promised by this technology, then it would seem that the danger of airframe icing would be severely limited. Since aviation is only one of countless areas where this form of "waterproofing" would be welcome, I can only imagine that the limitations continue to stymie final application of this type of coating. But maybe in the next few years?

Number 5: Simulator technology. The FAA recently tried to upgrade the amount of instrument flying time allowable on approved training devices both for the initial rating and recurrent experience. The proposal was shot down, but may resurface, which would be a really good thing. I expect even more realism and utility from simulators as displays and processors continue to improve. Two caveats, however: We need to retune the training process to accommodate the use of simulators, focusing on developing and reinforcing procedures; and as a follow-on, we should invest more actual flight time in the training process on those parts of real-world flying that simulators can never replicate, unusual attitude recovery being one of the most important. Let's ramp up that sector of the training process to fill in the flight time that we do not need to use for repetitive procedures best accomplished in the simulators.

Number 4: OnStar for pilots. If you can contact a live service expert from the driver's seat of your Buick to find the nearest Starbucks, why can't that technology be used for pilots of light airplanes? I understand the danger that pilots may use such a system as a crutch for their own lack of planning. But when you consider that one of the reasons the airlines have such a solid safety record is that pilots have extensive resources available to them while en route, it begs the question of why single pilots cannot have at least some of that resource available, too.

Sometimes it can be as simple as helping look up a frequency or providing advice on an alternate airport, and at other times, it could involve emergency intervention—including contacting experts and patching them through to the pilot, as was the case when ATC talked down a King Air passenger (a non-current single-engine pilot) whose pilot had collapsed at the controls. Through a lashed-up phone link, an experienced King

Air pilot was able to provide step-by-step directions to the passenger, who landed safely. Why not make this more of an established nationwide system?

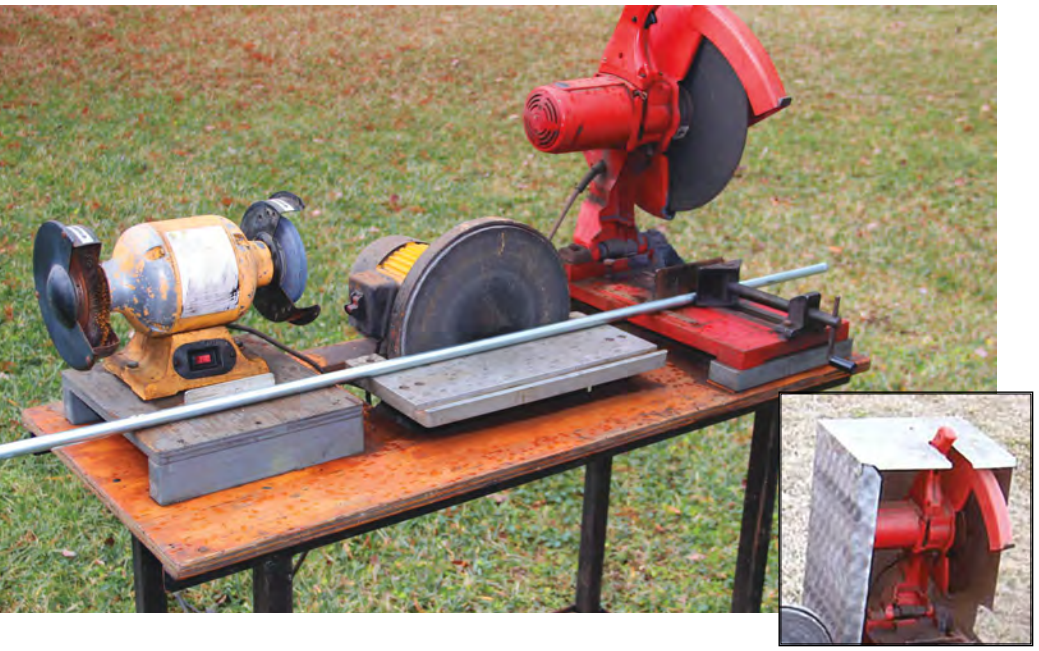
Number 3: Improved weather depiction. Weather information in the cockpit is one of the greatest advances for flying light airplanes in the past two decades, and I expect it to get even better. And it's not just for instrument pilots. Advances in predictive weather hold promise of foretelling not only thunderstorms and icing conditions, but also fog and lowering ceilings, the bane of VFR flying. Part of the capability in predictive weather analysis will come from onboard weather radars in airliners and business jets that scan the atmosphere for moisture and instability, then record the actual weather that results. Over time, this data will enable forecasters to predict when conditions are likely to foreshadow bad weather.

Number 2: Future-proof avionics. Several years ago, I wondered if there would come a day when airplanes would be built with GPS receivers, attitude reference sensors (ADAHRS), and engine monitors all connecting to removable processors and screens (aka, portable computers and/or tablets) that could be attached to the panel with Velcro. And now it's happening.

I know a Sonex builder whose "instruments" consist of a pair of iPad minis connected to the sensors via Wi-Fi. The best part of this is that as processors and displays improve, they can seamlessly replace the old-tech ones, you know, from six months ago. And even if the permanently installed sensors improve, it's possible they could be updated with new "cards" just like upgrading a computer's RAM.

Number 1: Affordable ADS-B. I first wrote for *Sport Aviation* back in the late 1980s, the days of the first mandate for Mode C transponders. Pilots were up in arms over the expense of equipping their airplanes for the few times they might fly into a terminal control area, or TCA (now known as Class B airspace). One of the ways EAA members responded was to use their ingenuity to devise less expensive transponders. I see the coming ADS-B mandate (set for 2020) as a similar situation, and already, information on affordable solutions are showing up in the pages of *Sport Aviation* and on the EAA website. This is innovation in its best form: keeping flying safe and affordable. EAA

Mark Phelps, EAA 139610, is an aviation writer living in New Jersey. He is the former editor of EAA's *Vintage Airplane* magazine.



Steel Tubing Workstation

BY WILLIAM WYNNE, EAA 331351; ORANGE PARK, FLORIDA

I PERSONALLY FIND WELDING very rewarding. It requires an investment of money and time, but the skill pays a huge return on this investment. With the right instruction, anyone can learn how to weld, and I encourage all homebuilders to give it a try.

A tool I have kept in my hangar for many years looks well worn because it gets a lot of use. Basically, it is the three tools used most in cutting and fitting steel tubing on one mobile cart.

The tools are a 14-inch Milwaukee cut-off saw with an abrasive metal disc, a 12-inch direct drive disc sander with a 40-grit self-adhesive pad, and a 6-inch grinder with one grinding wheel and one wire wheel. The abrasive wheel has rounded profiles, one half for 1/2-inch and 5/8-inch tubes and the other half for 3/4-inch and up. The wire wheel is for general cleaning and a little deburring.

I have a spark suppressor built of scrap aluminum attached to the saw. Since the blade is an abrasive wheel, a shower of sparks is common, and the suppressor becomes useful for containing them. The bench was made from scrap plywood and old angle iron. Fabricating the table itself is a good welding tune-up project.

In operation, I cut the tubes to length with the saw, which is capable of severing a 3/4-inch 0.049-inch wall 4130 tube in one to two seconds. The saw is also good for making angle cuts to 45 degrees.

Step 2 in the process is the disc sander. This is very good for rapid deburring or for quickly sanding 45-degree cuts to 60 or more degrees. The very coarse 40-grit paper works quickly, lasts longer, and runs cooler than finer paper.

Last stop is the grinding wheel, where the angled cuts are radiused to allow the cut tube to lay down on another round tube. Practice makes the process quick and accurate. Most diagonal tubes in a fuselage have different angles on each end, with each having some radius on them. When I am on a roll with this tool I can make such a tube in two to three minutes that fits so close that you cannot stick a 1/16-inch welding rod anywhere in the joint.

One of the key things about the setup is that the saw table, the sander bed, and the grinder pedestal are all the same height. This way, when you have a long piece of tubing in the saw it is supported level by the other tools.

Because the tool is mobile you can bring it right up to the location of the work. In many shops, the fuselage jig is 20 feet away from the tools, so the builder walks several miles in the process of fitting 30 tubes. Getting closer eliminates the commute. Also, I have often found that I can study the fit of a tube, mark it with a silver grease pencil or a silver marker, and then walk 20 feet to the other side of the fuselage table to get to a grinder, only to find upon my return 55 seconds later that something was lost in translation or motion, and—argh—it's too short! Having the tools two feet away, on the same side of the table, will not only save the walking, but also do a lot for the accuracy of your fitting.

There are a lot of ways to fit tubing, from machining each independently on a mill to having computer-numerically-controlled (CNC) equipment do it for you.

The work station is a practical and efficient solution between extremes. It has served me through a whole lot of production. If you have had your eye on a steel tube homebuilt, but thought it would be too hard to build, think again. Proper training, practice, and a tool like this can put that plane within your grasp.

PHOTOGRAPHY COURTESY OF **GRACE ELLEN WYNNE**

BETTER HOLE SAWS

BY STEVE CARRUTHERS, EAA 399354; CHARLOTTE HALL, MARYLAND

WHEN YOU HAVE TO drill large diameter holes, your options are a bit limited. I've discovered that the new DeWalt "impact ready" hole saws are much better than most hole saws for the light gauge materials that we use in building airplanes. They have finer teeth than most hole saws and are made of thinner material so they do not grab your work and use less power to cut than the more conventional hole saw. I have used them on everything from 0.016-inch 2024 aluminum to 0.125-inch 4130 steel to Lexan all with great results: nice clean holes or spacers all without the grabbing normally associated with hole saws in thin materials. They come in sizes from 3/4 inch to 1-1/2 inch, and the part numbers are as follows:

D180012IR	3/4 inch
D180014IR	7/8 inch
D180016IR	1 inch
D180018IR	1-1/8 inch
D180020IR	1-1/4 inch
D180022IR	1-3/8 inch
D180024IR	1-1/2 inch

Editor's note: I purchased a few of these to test out and was impressed by the cuts. You might have to order online as our Lowe's and Menards did not stock the hole saws. EAA

PHOTOGRAPHY BY **JASON TONEY** AND **STEVE CARRUTHERS**

GOT A HINT?

SEND YOUR TIPS to *cbecker@eaa.org*.

Eliminating Three-Dimensional Guesswork

Locating odd-shaped holes in space

BY BUDD DAVISSON

SOME OF THE SCARIEST, potentially traumatic, and certainly most frustrating moments in building almost anything is cutting holes in a structure where something is supposed to go without knowing exactly where that hole is supposed to be located or what the shape should be. It might be flying wires entering sheet metal or trying for a tight fit around a gear leg. It could even be something as mundane as getting floorboards to fit tightly, with all the aeronautical stuff that comes up through them doing so in a tight, professional manner.

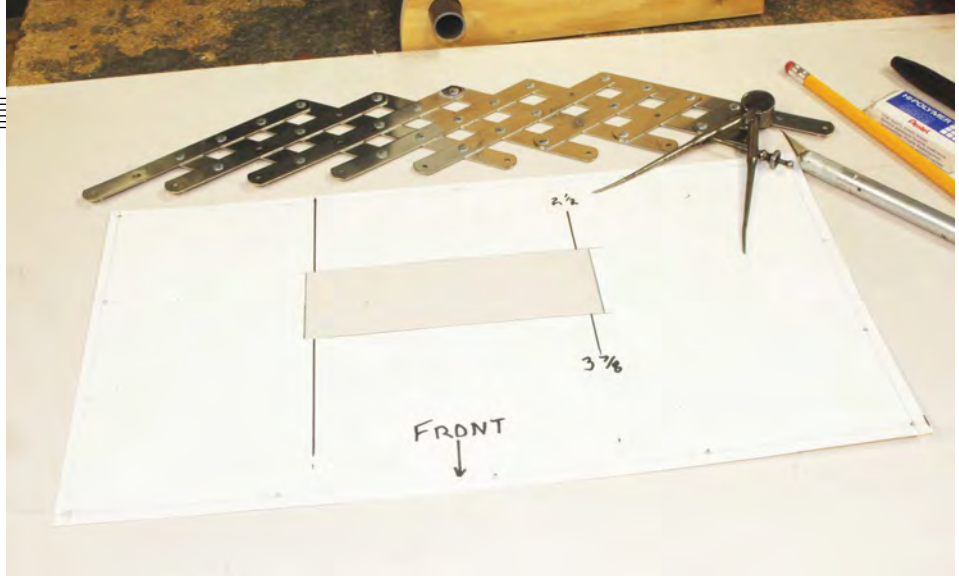
When complex shapes are involved, it's tough getting things to go together with no obvious gaps. Far too often we make an educated guess, cut a tiny, exploratory hole, which is seldom in the right place, and enlarge it to fit, creating gaps in the process.

The foregoing problems have bedeviled the builders of everything since the beginning of time, whether they were building boats, carriages, cars, or airplanes. Virtually everyone reading this has faced the same "How do I get this to fit?" question at some point in their lives,

OUR DEMONSTRATION DUMMY

This represents two fuselage frames, fore and aft. Note the marks on the forward frame: Those match marks on the rear frame indicating where the outer edge of the tubing is located, left and right. See the silver mark on the right tube. The poster board strip on the front frame is trimmed to give us the exact width of the metal that's required to cover the frame. Note the dimensions marked on the piece in the middle: Those locate the hole in the fore and aft direction. And remember, when cutting the initial opening we definitely don't need to be exact.

PHOTOGRAPHY COURTESY OF **BUDD DAVISSON**



The rivet/screw pattern is hole-punched in the basic template. Also notice that the center hole is bigger than the tubing to provide plenty of clearance. A note on using the hole-spacing fan: Divide the distance between the two outer most screw/rivet hole locations by the number of rivets/screws minus one (that's the number of spaces needed). That will yield a dimension that is almost never even and is difficult to measure accurately. Set a divider as close to that dimension as possible and use it to approximately set the fan. Then expand or contract the fan a little to make the corner holes line up. You may have to skip one or two "teeth" to get the number of spaces desired.

and every single one of you has come up with some sort of solution, some more complex than others.

What brought this up was looking at a photo of Rick Hansen's award-winning Hatz. A question was asked of how he located the holes in the metal ahead of the windshield where the center section/cabane tie rods go through. Obviously, he had a technique worth sharing (see sidebar on Page 96).

There are a lot of guys who can take a tape measure, lay out a few lines, and have the hole wind up exactly where it's supposed to be. Some of us, however, simply can't make that work. Fortunately, there is an admittedly crude method that works every time and lets almost any of us fit stuff together with zero gap, if that's what we're looking for.

Basically, a poster board template is made up that consists of a whole bunch of little templates stuck together. The little templates indicate where the edges of two components fit together and clearly delineate the edges of the hole. If doing something like a floorboard, for instance, cut 6-inch-wide strips of poster board a couple feet long and cut the outline of the sides of the fuselage into those strips. They are easier to handle than a big piece. Plus, you can get really accurate in determining the exact shape needed for the edges to fit. All of those are taped together and then joined together with a bigger sheet in the middle. A similar process can be used in locating holes and their required shapes.

If trying to position a hole in the middle of a sheet, in the first step we can be as crude and inexact as we want because it doesn't matter. We just whack a big hole in the poster board that we know will include the general area where we want the hole. We trim and fit the outer edges of the big piece to the structure, including punching holes for Clecos, and Cleco the big sheet to the frame. Then, we cut as many smaller template pieces as it takes to snuggle up to the edges of the component that's coming through the sheet metal.

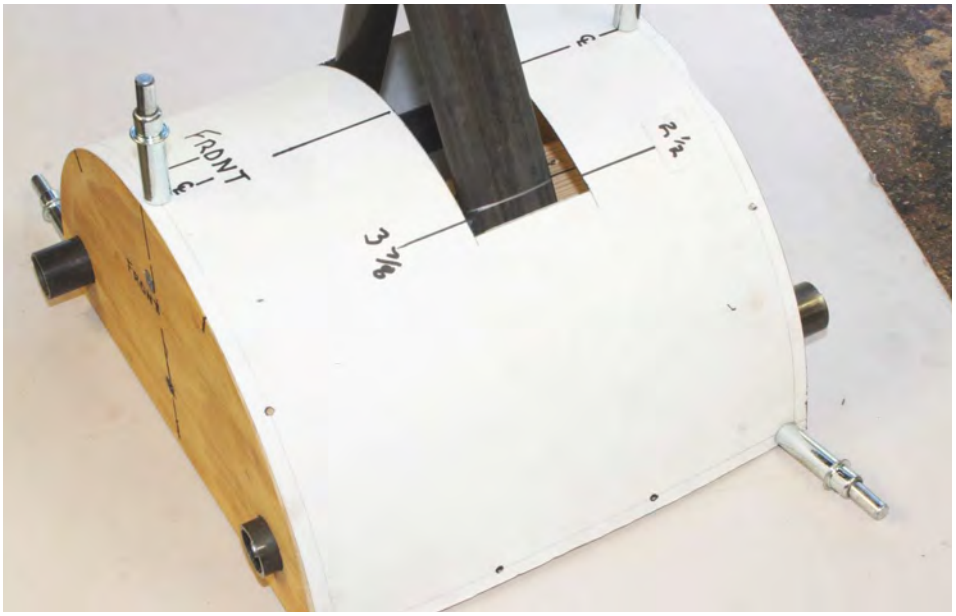
The odder the shape of the hole, the more smaller pieces will be taped together to form the template for the hole. If it's a round hole, that'll be a single template. Each of the pieces is big enough to overlap the edges of the big hole in the template where they are then taped in place. So, in essence,

we have a smaller, multi-piece template, with a component-sized hole in it, that's floating in the middle of a much larger template and, when the two are taped together, the hole is located exactly where it should be in the sheet metal. This method can be adapted to almost any kind of building situation.

Not having an airplane handy, a little dummy was built to illustrate the process. It demonstrates solving a hole-location and shape problem that you're not likely to ever encounter in real life and is fairly complex. The tube on the left is round; the one on the right is streamlined. Plus the triangle isn't centered so everything is uneven. Follow the photos and, hopefully, they'll make sense. EAA

Budd Davisson, EAA 22483, is an aeronautical engineer, has flown more than 300 different types, and has 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 on *www.AirBum.com*.

The size of the main hole is unimportant because it's going to be bridged by smaller templates that conform exactly to the tubing. This is where being sloppy is required.



PHOTOGRAPHY COURTESY OF **BUDD DAVISSON**

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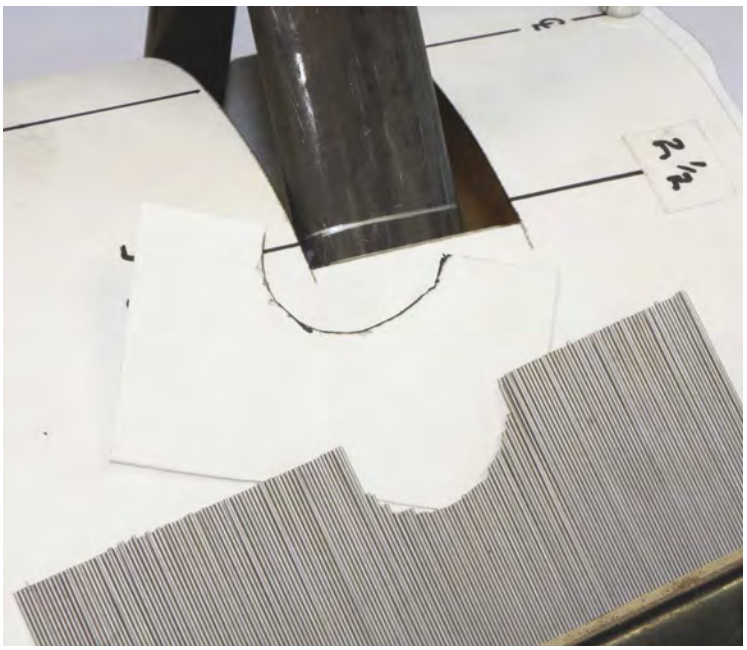
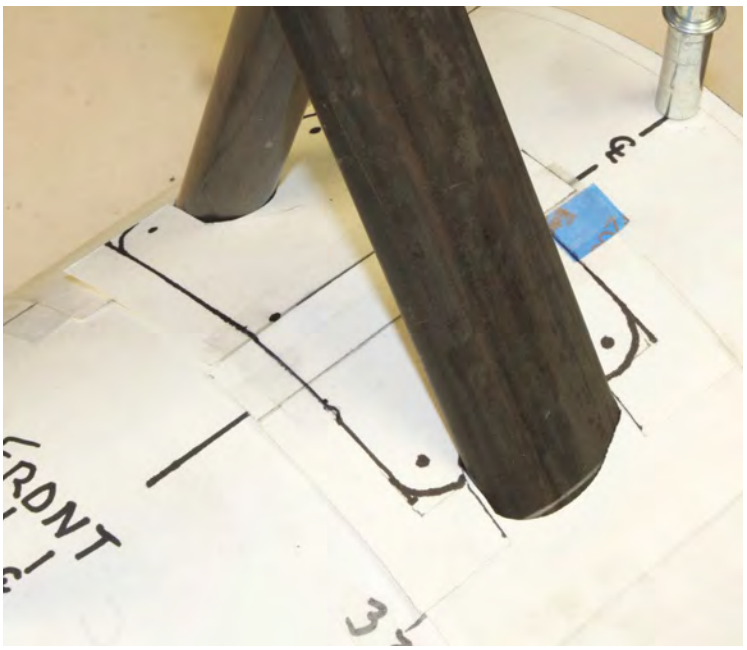
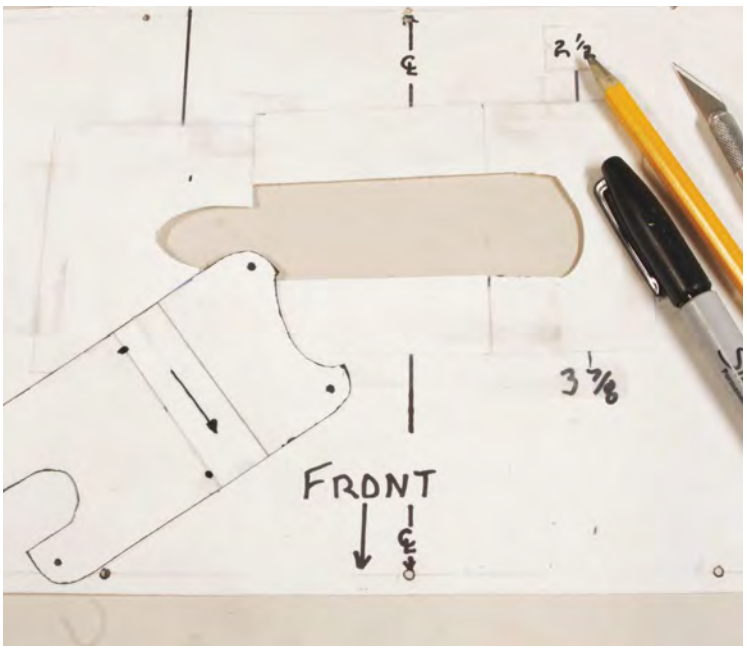


Using a contour gauge is not cheating! How can it be, when Harbor Freight has them for five bucks? But, it's not required. You have to fiddle with the gauge a little because you are using it at an angle to the surface and the tines want to ride up the surface, but it at least gives a close approximation that can be fine-tuned on the template with an X-Acto knife. In this case, templates were generated for the inside and outside of both tubes, so four were taped together.



Every situation will be different concerning how the metal is to be installed and removed. Here it's assumed that the tubing is fixed in place and the covering metal could come down from above, so a cover plate was needed between. If the tubing was bolted in place, the tubes could just be threaded through the holes with no cover required. Or splitting the panel may be required. Every one is different. Don't build something that can't be installed.

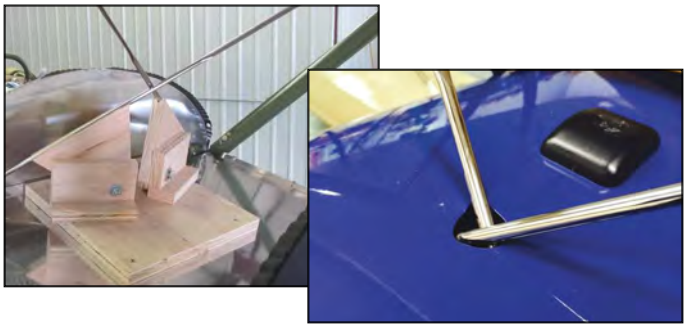


The finished template for both the main panel and the cover plate. In this case the cover overlaps the panel, but any number of possibilities exist. It could even be fitted flush with joiner plates underneath, countersunk screws, and nut plates. To be practical, the edges of the holes should be cut back 1/16 inch to 3/32 inch to make installation easier and prevent metal to metal contact.

THE RICK HANSEN METHOD OF LOCATING HOLES IN SPACE

Rick Hansen had to get his center section/cabane tie rods from inside the fuselage to outside, and he wanted the holes in the sheet metal to be as exact as possible, while at the same time taking into account that the tie rods have a small amount of movement.

He mounted a plywood base with a few small screws, then made up the fixtures shown that give him adjustment in all three dimensions. The triangular pieces have grooves in their upper edges, and he located everything so the tie rods would nestle in the grooves. He tightened everything down, removed the rods, and substituted wooden dowels that had their ends contoured to match the inside surface of the metal. He dabbed a little paint on their ends, slid them into place against the metal, and had marks exactly where the holes had to go.



PHOTOGRAPHY COURTESY OF **BUDD DAVISSON**

King Solomon's Secret Treasure: FOUND

Ancient beauty trapped in mines for centuries is finally released and available to the public!

King Solomon was one of the wealthiest rulers of the ancient world. His vast empire included hoards of gold, priceless gemstones and rare works of art. For centuries, fortune hunters and historians dedicated their lives to the search for his fabled mines and lost treasure. But as it turns out, those mines hid a prize more beautiful and exotic than any precious metal: chrysocolla.

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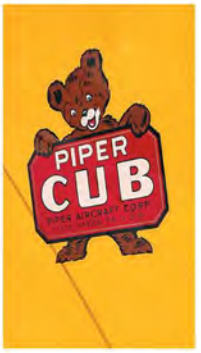

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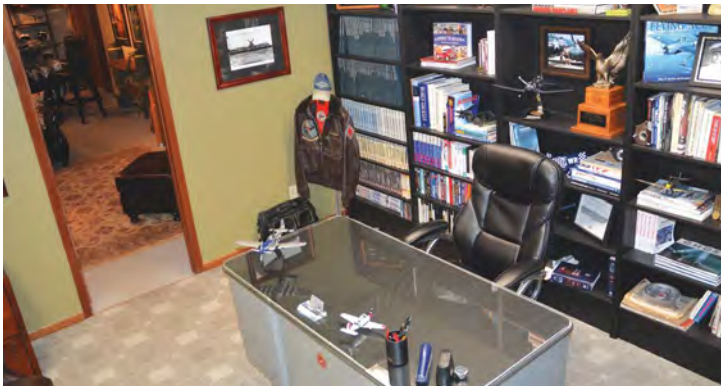
Want to change your address or need other assistance? EAA's Membership Services staff is available to assist you Monday through Friday from 8 a.m. to 6 p.m. and on Saturdays from 8 a.m. to 4 p.m. (Central time). Call 800-564-6322 (800-JOIN-EAA), e-mail *membership@eaa.org*, or visit *www.EAA.org/membership*.

CALLING ALL AVIATRIXES

Women who are pilots, want to be pilots, or work in the aviation industry are invited to participate in WomenVenture events at EAA AirVenture Oshkosh 2015 on Wednesday, July 22. The day begins with the Women in Aviation breakfast at 8 a.m. The group photo is at 11 a.m. on Boeing Plaza, followed by the Power Lunch at Theater in the Woods. Visit www.*EAA.org/womenventure* for more information.

PHOTOGRAPHY BY **MELODY WOLLANGK**



EXCLUSIVE PARKING
PILOT CAVE

Pilot: Jim, EAA 278434, and Cathy Read, EAA 592396
Location: Porter County Regional Airport (VPZ), Valparaiso, Indiana

AFTER 10 GREAT YEARS, Jim and Cathy Read decided to close the Indiana Aviation Museum and divest themselves of most of the aircraft, antiquities, and the large hangar.

Enter Steve, EAA 548884, and Diane Buchelt, EAA 1030905. Steve had flown some of the museum aircraft and his wife, Diane, was a professional interior designer. Both were close friends of Jim and Cathy, and grateful to be associated with the "Aviation Fantasy Camp."

"Jim and Cathy are generous people," Steve explained. "We wanted to give back to them after they had given to so many." Steve started with the R-2800 Pratt & Whitney engine leaning forlornly in the corner. It had been used as a display engine in the museum but now lacked purpose. "The perfect bar-height round glass-topped table!" Steve thought.

Former museum volunteers came forward once again to begin the process of refurbishing the space for a new purpose. Carpet was pulled and discarded, the walls spackled and re-taped, sanded, and painted.

Once cleaned out, it was time to design. Diane went to work envisioning in her mind something she called "A Quonset hut meets Ralph Lauren." Pieces of World War II memorabilia were used to make furniture and display around the hangar. The practice bombs were used to make shelves and an additional glass-topped table in the main hangar. A JATO (jet-assisted takeoff) canister was used to make a round wood-topped table in the office. Mustang and Corsair tires became the base of an end table. Memorabilia was used throughout, including Jim's personal items like a picture of his Marine squadron and leather flight jacket from the U.S. Marines Fighting Squadron VMA-121 Wolf Raiders. Every piece reflects the depth of Jim and Cathy's rich aviation adventures over the years.

The hangar is now home to a few pristine aircraft: their Beechcraft T-34 Mentor, de Havilland DHC-1 Chipmunk in RCAF colors, Cirrus SR22 GTS, and a Van's RV-4. EAA

Do you have an interesting pilot cave? Send a snapshot to *editorial@eaa.org* to share your aviation space with fellow *EAA Sport Aviation* readers.

PHOTOGRAPHY COURTESY OF **JIM AND CATHY READ**

SUN 'n FUN®
International Fly-In & Expo

Tuesday: *Unlimited Aerobatic*
The Breitling Jet Team makes their U.S. debut, followed by Patty Wagstaff, Mike Goulian, Rob Holland and Melissa Pemberton

Wednesday: *Warbirds*
The Texas Flying Legends, Lee Lauderback in Crazy Horse, Greg Colyer and CAF Redtail

Thursday: *Formation*
Team AeroShell, AeroStars, GEICO Skytypers, Tiger Team and The 4CE

Friday, Saturday, Sunday:
U.S.A.F. Thunderbirds, The Breitling Jet Team, *Kyle Franklin, Matt Younkin, Will Allen, Manfred Radius, Jim Peitz, Jack Links Jet Waco, Gene Soucy, David Martin and return appearances from previous days*

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APRIL 21-26

Visit **sun-n-fun.org** for tickets & event details

LIKE US!

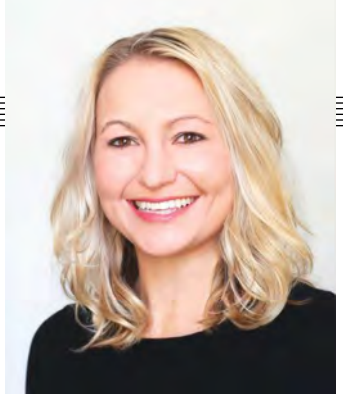
Earplug Alert

Harrier returning for AirVenture 2015

A U.S. MARINE CORPS AV-8B Harrier jump jet will perform Level III aerial demonstrations at EAA AirVenture Oshkosh 2015, one of only nine Harrier performances this year. Always a popular item in the afternoon air shows, exact performance dates have yet to be determined, but the specific Harrier flying at Wittman Regional Airport will be from either Marine Corps Air Station Cherry Point or Marine Corps Air Station Yuma.

The demonstration consists of an 8-10 minute display of the aircraft's abilities, including a 90-degree climbing turn, a high-speed pass over the runway, and a vertical landing in front of the crowd. According to the Marine Corps, many of the maneuvers demonstrated at the air show represent those executed in Operations Iraqi and Enduring Freedom as well as in operations conducted at sea aboard naval vessels.

With the capability to operate both in day and night, the Harrier is used in combat for engaging surface and air targets, escorting helicopters, and conducting deep air support.



Name: Erin Brueggen, EAA 1159418
Position: Executive Administrator, Vintage Aircraft Association

WHO'S WHO AT HQ

What did you do prior to working for EAA? I was a stay at home mom and photographer. Previous to that, I was an office manager at an industrial office, worked in the offices at a regional airport, served as a flightline technician, held a position in aircraft maintenance, and served as a right seat safety pilot for a charter service.

How long have you been a pilot? Fifteen years, with private certificate and instrument, commercial, and high performance/complex ratings.

If you could own any airplane, what would it be? An AirCam from Lockwood Aircraft. Ever since I had the opportunity to fly in one, I fell in love. The aircraft allows you to enjoy the elements of nature. Growing up with ridges and valleys and loving the outdoors, I thought this aircraft would be ideal to fly low and slow to take advantage of the landscape. Also, I would be able to bring two of my passions together and take some incredible photos from the sky.

Most memorable EAA experience? When I was a sophomore in high school, my dad brought me over to EAA to find resources on colleges for me to attend for aviation management and flight operations. Little did I know, I would settle in Oshkosh and end up working at the place where I found information to start my aviation career.

What is the most unique airplane you've flown? Mitsubishi MU-2. The aircraft is compact, fast, and performs extremely well.

WOMEN SOAR *YOU SOAR* REGISTRATION OPENS

REGISTRATION IS OPEN for EAA's Women Soar *You Soar* day camp program, which will allow 100 high school age girls to discover more about aviation and all its possibilities from aviators, engineers, and leaders during EAA AirVenture Oshkosh 2015. The program will take place July 19-22.

Women Soar *You Soar* welcomes both enrollees as well as female mentors from the aviation and aerospace fields. The program's unique 4-to-1 attendees-to-mentors ratio provides a tremendous opportunity for young women to discover all the possibilities within the world of flight. They can ask questions of women who are already noteworthy and established in the field.

Activities over the four-day session for girls entering grades nine through 12 in fall 2015 include flight simulators, workshops, sessions with aviation personalities, and insider access during the AirVenture air shows.

Cost is $75 per participant and is in a day-camp format, with accommodations not included. More information and registration materials are now available at *www.EAA.org/WomenSoar*. The program also welcomes additional female mentors from all walks of the aviation and aerospace community who want to give back to the next generation.

Women Soar *You Soar* is supported by Embry-Riddle Aeronautical University, Women in Aviation International, International Society of Transport Aircraft Trading, and Jerry and Lori Fussell.

AIRVENTURE TO COMMEMORATE 70TH ANNIVERSARY OF WORLD WAR II VICTORY

SOME OF HISTORY'S MOST iconic airplanes will be highlighted at EAA AirVenture Oshkosh 2015 during EAA's 70th anniversary commemoration of the Allied victories in World War II.

Victory in Europe Day (V-E Day) on May 8, 1945, marked Germany's unconditional surrender to the Allies, and on Friday, July 24, the afternoon air show will feature a tribute to air power in Europe, launched by a special Battle of Britain 75th anniversary performance. EAA is currently pursuing a number of representative aircraft examples from the European theater of operations.

Victory over Japan Day (V-J Day)—on September 2, 1945, in the United States—will be honored in Wednesday and Saturday air shows beginning with the return of the Commemorative Air Force's Tora! Tora! Tora! air show recalling the December 7, 1941, attack on Pearl Harbor.

Other aircraft used in key Pacific battles will also be represented during the Wednesday and Saturday performances, including those flown in Doolittle's Raid, the Battle of Midway, and subsequent island-hopping campaigns.

The V-J Day commemorative air shows will culminate with participation by the world's only flying B-29, the CAF's *FIFI*. In addition, the Wichita, Kansas-based restoration team for the B-29 *Doc* hopes to bring that airplane to Oshkosh this year.

Other activities commemorating the 70th anniversary of the end of World War II will be announced as they are confirmed.

PHOTOGRAPHY BY **DEKEVIN THORNTON** AND **MELODY WOLLANGK**

GENE KRANZ TO SPEAK AT OSH LIFETIME MEMBER DINNER

GENE KRANZ, LEAD FLIGHT director of Apollo 13, will be the featured speaker for the annual First Wing and Lifetime Member Dinner on July 21 during EAA AirVenture Oshkosh 2015. Kranz and several Apollo 13 crew members will attend the convention this summer in honor of the mission's 45th anniversary.

The annual dinner is a special benefit for First Wing and Lifetime members. Attendees will hear exclusive stories from Kranz and have the opportunity to purchase a signed copy of his book, *Failure Is Not an Option*.

To learn more about EAA Lifetime membership, or to register for the dinner, e-mail EAA membership services at or call 800-843-3612.

30,000 YOUTHS HAVE ENROLLED IN SPORTY'S COURSE WITH EAA YOUNG EAGLES

EAA AND SPORTY'S PILOT SHOP are doing their part to build the next generation of aviation, as more than 30,000 young people have enrolled in Sporty's Online Learn to Fly Course as a follow-up to their EAA Young Eagles flight.

The Sporty's course, which was first offered to all Young Eagles without charge in 2009, allows young people to take the FAA sport, recreational, and private pilot ground school courses at no charge. The course is a next step for the more than 70,000 Young Eagles flown each year by EAA member volunteer pilots. Since the Young Eagles program launched in July 1992, more than 1.9 million young people have been flown.

Young Eagles receive information on how to register and begin the Sporty's Online Learn to Fly Course immediately after their flights. The instructions and login information allow young people to start discovering more right away.

Dalton Melvin (left) of Portland, Oregon, began volunteering with the Young Eagles program after having received an Eagle Flight from EAA member Tom Louris (right) in his Cherokee 160.

Growing **our** community one **flight** at a time.

More than just introductory flights for adults, EAA's Eagle Flights™ program is the beginning point of a relationship between an EAA member-pilot and someone who only needs the right opportunity to get started. As an Eagle Flights mentor pilot, you play a leading role in supporting EAA's mission to grow participation in aviation and preserving the joys of flight for future generations.

Become an Eagle Flights mentor pilot today!

EAA Eagle Flights®

Visit **EAA.org/EagleFlights** for more information and to order Eagle Flights materials.

EAA Eagle Flights™ is sponsored by SENNHEISER

AIRVENTURE TO HOST WORLD-RECORD SKY DIVING ATTEMPTS

A WORLD RECORD sky dive attempt will be part of EAA AirVenture Oshkosh 2015, with an international team of top sky divers aiming to make history at the World's Greatest Aviation Celebration.

The Skydiving Hall of Fame based in Fredericksburg, Virginia, will organize the 108-person jump team for the record attempts sanctioned by the Fédération Aéronautique Internationale (FAI), which is the official organization that maintains the world's aviation-related records. The teams will practice and prepare with record attempts at Skydive Chicago in Ottawa, Illinois, before the scheduled record attempts on July 22 and 24 at Oshkosh (weather and conditions permitting).

The Skydiving Hall of Fame team, known as the Eagles, will jump from as high as 20,000 feet from its Short SC.7 Skyvan and de Havilland DHC-6 Twin Otters to begin their record attempts. Any record would then be confirmed by FAI and its U.S. representative, the National Aeronautic Association (NAA).

WANTED: GREAT EAA VOLUNTEERS TO RECOGNIZE

NOMINATIONS ARE NOW open and encouraged to recognize great EAA volunteers at this year's Volunteer Park ceremony on Sunday, July 19—the day before EAA AirVenture Oshkosh 2015's opening day. We will add names to the Volunteer Park recognition bricks alongside 2013's honorees: Paul and Audrey Poberezny, and Jack and Rose Pelton.

Making a nomination is simple. Just go to the online application form at *www.EAA.org/sportaviation* and complete it before May 31. It's a great opportunity for EAA volunteers to recognize one of their own who has gone "above and beyond" for many years. And it's just not for Oshkosh volunteers. If there's someone special who has meant a lot to your EAA chapter or the entire organization, they are welcome to be nominated as well.

EAA's Volunteer Advisory Committee will review the nominations and make its recommendation by mid-June, so 2015's honorees can be invited to Oshkosh for the July 19 recognition program. EAA

PHOTOGRAPHY BY **ANDREY VESELOV**

LEAVE YOUR LEGACY

Leave a lasting legacy of your name, or your loved ones through these exclusive EAA tribute products.

Memorial Wall
Honor the memory of a person whose support and passion for aviation positively impacted your life by placing their engraved name on this wall. Make your contribution by April 10, 2015 for inclusion in our AirVenture 2015 ceremony.

Visit EAA.org/memorial to learn more.

Brown Arch
Purchase your brick by June 8, 2015 and have it placed for AirVenture 2015 to leave your mark at the Gateway to Aviation.

Visit AirVenture.org/arch to learn more.

Compass Hill
Become part of the timeless tribute to The Spirit of Aviation and those who support it by purchasing a brick at the summit or entry plaza of this monument. With your contribution by June 8, 2015, your brick will be installed by AirVenture 2015.

Visit EAA.org/compasshill to learn more.

Autumn Blaze Maple Trees
Own a piece of the AirVenture grounds by dedicating a beautiful Autumn Blaze maple tree to your family, friends, or loved ones with a special plaque.

Visit EAA.org/beautification to learn more.

EAA
THE SPIRIT OF AVIATION

Not Your Typical
Summer Camp

Unforgettable aviation memories and new friends await young people ages 12-19 at the EAA Air Academy, a series of weeklong summer camps designed to introduce young people to the world of flight. Campers are engaged through a variety of fun, hands-on activities and real flight experiences while staying at the EAA Air Academy Lodge in Oshkosh, Wisconsin.

Register for a 2015 EAA Air Academy Camp today!

EAA Air Academy

For more information, dates, or to register, visit **EAA.org/AirAcademy** or call 920-426-6817.

All fees include expert instruction, materials, meals, flight experiences, and lodging in the EAA Air Academy Lodge.

Gone West

Not alone into the sunset but into the company of friends who have gone before them.

ALABAMA
Chris Delionback (EAA 345500), Hoover

ARIZONA
James Welsh (EAA 566160), Queen Creek

ARKANSAS
Bernard Bakken (EAA 525128), Yellville
Harry Hauser (EAA 1146546), Rogers
Robert Smedley (EAA 584382), Hot Springs
G. "Bob" Smith (EAA 720381), North Little Rock

CALIFORNIA
John Bradbury (EAA 1038932), Hayward
Donald Erbe (EAA 51129), Carlsbad
Donald Fischer (EAA 15069), Sherman Oaks
Arthur Froehlich (EAA 20063), Moreno Valley
Irvin Ketelsen (EAA 15462), Santa Rosa
Harold Lansing (EAA 1008316), Auburn
Donald Rockwell (EAA 16569), San Carlos
Roger Schaufele (EAA 522719), Santa Ana

FLORIDA
Philip Arthur (EAA 550780), Maitland
Max Norman (EAA 200555), Lake Wales
William Smathers (EAA 143184), Milton
Charles Smith (EAA 359742), Cape Haze

GEORGIA
Richard Haney (EAA 586166), Carrollton
Steve Johnson (EAA 455381), Kennesaw

ILLINOIS
Robert Bierma (EAA 1060339), Springfield
Clarence Hess (EAA 100700), Lockport
Stanley Jewula Sr. (EAA 1038765), Monee
Winston "Ole" Oleson (EAA 4582), Elsah
Gerald Scheffler (EAA 1005988), Joliet

INDIANA
Kathryn Culley (EAA 9025815), Mount Vernon
Robert Wathen (EAA 741271), Kokomo

KANSAS
Bobbie Bradford (EAA 573816), Topeka
Robert Keifer (EAA 1107702), Valley Center
LeRoy Witt (EAA 9746), Wichita

LOUISIANA
Robert "Don" Walton (EAA 152634), Converse

MASSACHUSETTS
Robert Barker (EAA 766199), Wenham
Charles "Jack" Hinckley (EAA 54684), Hardwick

MISSOURI
William Peet (EAA 818597), Lee's Summit

NEBRASKA
John Haeberle (EAA 1114298), Kearney

NEVADA
Norman Hibbard (EAA 952150), Carson City

NEW HAMPSHIRE
Ronald Brown (EAA 203437), Lebanon

NEW YORK
Christian Gothgen (EAA 1018800), Snyder
Donald Hobel (EAA 137166), North Tonawanda
Walter Weber (EAA 388041), Buffalo

NORTH CAROLINA
Kenneth Phillips (EAA 546156), Hudson
Brian Waldron (EAA 826216), Farmville
Thomas "William" White (EAA 1059937), Mocksville

NORTH DAKOTA
Stanley Pope (EAA 483333), Bowman

OHIO
Gary Ford (EAA 1087597), Berkey
Walter Rasor (EAA 9334), Tipp City

OREGON
Richard Hansen (EAA 476795), Redmond
Laird Smith (EAA 27133), Hillsboro

PENNSYLVANIA
Donald O'Connell (EAA 127792), East Stroudsburg
Allen Velette (EAA 42217), New Castle

SOUTH CAROLINA
William Davis (EAA 309397), Greenville

TENNESSEE
John "Bob" Scarborough (EAA 146469), Winchester

TEXAS
Jim Hail (EAA 286603), Crawford
Jerry Nelson (EAA 75598), Benbrook
Kenneth Richardson (EAA 1029489), Victoria
Jack Threadgill (EAA 510068), Bryan

WASHINGTON
Jim Moss (EAA 477508), Buckley
William Petty (EAA 1586), Olympia
Lorin "Lorry" Wilkinson (EAA 12611), Olympia

WISCONSIN
Jan Christie (EAA 332), Hazelhurst
Robert Doxtator (EAA 730419), Gresham
Jack Jerred (EAA 100927), Monona
Donald Jowett (EAA 87501), Oshkosh
James Maroney (EAA 203921), Brookfield
Martin Mielke (EAA 168833), New Berlin
Robert Resheske (EAA 53587), Sturtevant
Dan Tuchscherer (EAA 36320), Oshkosh
David Vergiels (EAA 729320), Crivitz

BELGIUM
Hugo Teugels (EAA 1107408), Antwerp

CANADA
Harold Armstrong (EAA 9942), Calgary, Alberta
Leon Gratton (EAA 110589), Vernon, British Columbia

PUERTO RICO
Anthony MacDonald (EAA 1042664), Culebra

UNITED KINGDOM
Antony Pearce (EAA 254120), Byfleet, Surrey, England

From First Flight to Founder

Women in Aviation International's Peggy Chabrian

BY KELLY NELSON, EAA 787745, WOMEN IN AVIATION INTERNATIONAL

DR. PEGGY CHABRIAN, EAA 123064, was majoring in elementary education and waiting tables when one of the restaurant regulars—an EAA member—invited her to the airport for a flight in his 1946 Ercoupe. "The flight lasted less than 30 minutes, but it certainly changed my life," she said.

Today Peggy is the founder and president of Women in Aviation International (WAI), a membership organization dedicated to connecting and engaging women in the aviation and aerospace industries. In March 2015, WAI will host its 26th annual International Women in Aviation Conference, helping members make meaningful networking and mentoring connections and recognizing the contributions of women to aviation throughout history. And it all traces back to that first flight.

Several months after that first flight Peggy began taking flying lessons. She attended a seminar presented by none other than Bill Kershner, author of several highly regarded flight-training manuals and a pilot known for his interest in spins.

"He talked about his aerobatic school and spin training," Peggy said. "A few weeks later I was at his school and started taking aerobatic lessons with only six hours of logged flight time."

It was Bill who told her about the aviation degree program at Middle Tennessee State University. Peggy enrolled the next fall and went on to complete a Bachelor of Science in aviation management and Master of Education in aerospace education. She later added a doctoral degree in higher education administration at the University of Tennessee at Knoxville. While working on that degree she logged time as a CFI and ran a ground school in three states.

On the invitation of the Ercoupe pilot, Peggy also began attending meetings of EAA Chapter 150 in Chattanooga, Tennessee, serving as its newsletter editor, secretary, and eventually president over the years. As her career moved her around the country she continued her involvement with EAA, participating in other chapters in the various locations she has called home. As a faculty member at Georgia State University, and later at Embry-Riddle Aeronautical University, and ultimately as dean of Parks College of St. Louis University, Peggy was always bringing groups of students to Oshkosh as part of a class. She had also organized several aviation workshops for elementary and secondary teachers and coordinated aviation camps for kids. As the organization was looking to begin an outreach program for youth in the early '90s, she was invited to serve as an EAA board member, a position she held for 16 years. She met her husband, Jerry, during this time while he was also serving on the Young Eagles advisory committee and as a member of the Sun 'n Fun board of directors.

And while Peggy was working to help grow EAA, EAA did its part to help her grow WAI. Before there was an organization, there was an annual conference. Paul Poberezny was a keynote speaker at the second annual conference in 1991, and a few years later when the organization was coming together, Peggy asked for Paul's advice.

"I asked him, if he were to start EAA all over again, what would he do the same and what would he do differently?" she said. "We sat and talked for well over an hour. He shared a lot of ideas and suggestions, but most of all, lessons he had learned over the years." One point he stressed was the importance of chapters, she said. As a result, WAI started a chapter program that today has more than 90 chapters participating worldwide.

The EAA/WAI relationship has remained strong over the years with mutual sponsor participation at AirVenture and the Women in Aviation Conference, and collaboration on AirVenture events like WomenVenture and Women Soar.

All of this is possible, of course, because an EAA member offered a young waitress a flight one day in Tennessee.

PHOTOGRAPHY COURTESY OF PAULA GRUBB

CHAPTER VIDEO MAGAZINE

Get a behind-the-scenes tour of Aircraft Spruce & Specialty with the Irwin family in the March issue of EAA's Chapter Video Magazine. This month's video also includes an in-depth look at the Calidus AutoGyro kit aircraft, the 400th Hints for Homebuilders video, and an Oshkosh update from Charlie Becker, EAA's director of communities and homebuilt community manager. A link to download this month's video was e-mailed to chapter leaders on March 1. If you are a chapter leader and did not receive the e-mail, please contact EAA at *chapters@eaa.org*. EAA's Chapter Video Magazine is proudly sponsored by Dynon Avionics.

WELCOME, NEW LIFETIME MEMBERS

Marion Burton (EAA 7556), Little Rock, Arkansas
Timothy Busch (EAA 172771), Atkins, Iowa
Allyn Caruso (EAA 341584), Standish, Maine
Scott Coile (EAA 1163267), Fayetteville, Georgia
Susan Coile (EAA 1163268), Fayetteville, Georgia
Monroe Collier (EAA 444948), Winter Haven, Florida
Hector Cornelio (EAA 459251), Houston, Texas
Todd Cramer (EAA 70406), Parker, Arizona
David Cupp (EAA 467154), West Chester, Pennsylvania
Andre Durocher (EAA 279477), Gatineau, Québec, Canada
Reynaldo Fernandez (EAA 787281), Garland, Texas
Harrison Ford (EAA 546164), Santa Monica, California
Edward Gregory (EAA 67466), Groveland, California
Mike Hall (EAA 190899), Derby, Kansas
Eric Heigis (EAA 1054908), Washington, D.C.
James Ivey (EAA 281532), Clint, Texas
Richard James (EAA 477328), Centreville, Maryland
Gary Kelson (EAA 220636), Novato, California
Robert Klase (EAA 1080581), Huntsville, Alabama
Currie Lee (EAA 92567), Prescott, Arizona
Edgar Moghis (EAA 284083), San Carlos, California
Mary O'Connor (EAA 1162255), Anchorage, Alaska
Dan Owens (EAA 74573), Marietta, Georgia
Daniel Paternoster (EAA 459748), Fowlerville, Michigan
Deborah Reiff (EAA 1161697), Fort Atkinson, Wisconsin
Robert Reiff (EAA 197258), Fort Atkinson, Wisconsin
Martin Rice (EAA 1142974), Zionsville, Indiana
Susan Robyn (EAA 1163273), Prescott, Arizona
Divyank Turakhia (EAA 1162421), Los Angeles, California
Denise Waters (EAA 301765), New York, New York
Gary Wold (EAA 128980), Onalaska, Wisconsin
Jeffrey Wood (EAA 999468), Miami, Florida

B-17 VETERAN RECEIVES HONORARY B-17 TYPE RATING

ODBERT "BERT" CORNWELL, EAA 27879, of DeLand, Florida, was one of the founders of EAA chapters 288 in Daytona Beach and 635 in DeLand. He is a veteran of World War II who was both a pilot and flight engineer in B-17s and B-24s, but mostly B-29s.

When Chapter 635 welcomed EAA's B-17 *Aluminum Overcast* to DeLand Municipal Airport for a tour stop, Bert, 92, was given an opportunity to accompany a promotional B-17 flight.

EAA volunteer B-17 pilot Shawn Knickerbocker, an FAA military competency examiner, spoke with Bert about his military flying experience. "As our conversation continued throughout the flight and the day, I realized that Bert never received a B-17 civilian type rating," he said. Bert hasn't flown as a pilot in command since 2007.

Bert proudly shared his U.S. Army Air Corps flight records after the flight was over. Seeing Bert's service, Shawn was compelled to honor Bert's military accomplishments with an honorary B-17 type rating at age 92!

Bert recalled the advice he received from EAA Founder Paul Poberezny when he asked how to start a chapter. "Paul told me the first thing to do is find a place to meet, then provide something to eat, and create a newsletter," he said. Bert served as the Chapter 288 newsletter editor for many years as well as president. He was also an EAA technical counselor for Chapter 635, and still attends as many meetings as he can.

He had the dream to build a Pietenpol since he was 14 years old, and later in life started a project. He finished the fuselage, 34 wing ribs, and tail section, but had to abandon it when his wife of 70 years, June, became ill. She passed away about a year ago.

Bert visited Oshkosh twice, first in 1971 when he and one of his students at Embry-Riddle flew up in the Piper Cub the student won in the EAA sweepstakes in 1970. They flew two-hour legs, alternating every stop. The other Oshkosh visit was in 1976 with June.

Bert Cornwell aboard Aluminum Overcast.

He also worked for a time in Akron, Ohio, on Goodyear blimp engines, and even has logged time in ZP3 models. "I've flown a bunch of stuff, but that was the biggest thing I ever flew," he said. EAA

PHOTOGRAPHY COURTESY OF **SHAWN KNICKERBOCKER**

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Visit **EAA.org/Shop** or call toll-free 800-564-6322 to order.

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Pre-order your mug **before April 30** for the special price of $19.95.*

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EAA.org/Shop | *Pre-ordered mugs will be shipped in May 2015.


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Member Benefits Spotlight

MEMBERSHIP IN EAA makes aviation more fun, economical, and accessible. Below are free and discounted programs offered exclusively to EAA members. Join, renew, or ask questions by visiting *www.EAA.org/join* or calling 800-564-6322 (800-JOIN-EAA).

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Sport Aire Perfection

In March 1965, Woody Horstmeyer's homebuilt "perfect specimen" of a Sport Aire, powered by a Lycoming O-235-C1, was featured on the cover of *Sport Aviation*. Inside the issue, Hugh Beckham, EAA 10060, discussed his homebuilt Taylor Monoplane *Fifinella*, the first to fly in the United States. "There must be some special significance to the fact that I found my first gray hair on the same day of *Fifinella*'s first flight," Hugh said. "After 1,285 days of building I guess a guy is entitled to a gray hair or two."

In addition, the magazine urged members to bring fun flying to local children and schools. Teacher Jack Cushman suggested sharing homebuilt or chapter projects, displaying sketches or plans, teaching about engines, and suggesting airports to visit or arranging a field trip. "If you plan carefully and follow your checklist faithfully, you will have a satisfying aviation experience with some future flyers—the children in your neighborhood school," Jack said.

INSIDE THE ISSUE

Highlights from March 1965

PG. 10

1964 AC Flight Rally winner Ed Lesher planned to compete in the 1965 competition in his original design, the Nomad. Competitors were scored on piloting skill and aircraft capabilities; the grand prize winner received $300.

PG. 45

Pat Rogers, copilot, and Jean Bonar, pilot, participated in a Bonanza in the 1964 All-Women Transcontinental Air Race, or "Powder Puff Derby," as it was commonly called. The race stretched from Fresno, California, to Atlantic City, New Jersey.

PG. 48

A member donated parts from a 1912 one-off Curtiss-type biplane to the EAA Air Education Museum. EAA Founder Paul Poberezny, center, tried it on for size upon receipt.

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