



EXPERIMENTER

The Spirit of Homebuilt Aviation | www.eaa.org

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A Family of Thorps

Scott Ginn's Shiny T-18



» Reno Roundup

» Recapping the Midwest LSA Expo

» Wandering Oshkosh

» Flight Control Centering

Honoring Paul at Oshkosh 2014

We will celebrate Paul's life throughout the fly-in

By Jack J. Pelton

All in the EAA family miss our founder Paul Poberezny and continue to mourn his passing. Loss of a person who had such profound impact on all of aviation is sad, but we can take some small comfort in the fact that Paul was able to spend time at EAA's annual fly-in and convention in Oshkosh just weeks before he died.

Of all the many contributions Paul made to personal aviation the EAA fly-in has the highest profile and continues to touch and influence more people than anything we do. AirVenture is the largest annual aviation event in the world. People who have no idea what EAA is know about Oshkosh. Our event is truly famous on a global scale.

Paul instinctively knew how critical an annual fly-in would be for EAA and to the advancement of homebuilding and all forms of personal and recreational aviation. That's why he organized the first EAA fly-in in 1953 when EAA itself was barely months old.

Paul and Audrey worked tirelessly to organize that first EAA fly-in in Milwaukee doing everything necessary to make it happen. They coordinated details with local airport authorities, helped arrange lodging and food service, and even directed pilots to parking spots after they landed.

Paul and Audrey could have never guessed that their hard work in 1953 would lead to what the world knows simply as Oshkosh. Nobody could have. But Paul did understand before the rest that getting together to swap stories, make friends, and admire each other's airplanes was essential to EAA's very existence and to growth of the association. That's why we will dedicate AirVenture 2014 to the memory of Paul and his lifetime of tremendous achievement.

Plans are beginning to take shape and will include at least one special commemorative event of Paul's life and career each day during Oshkosh.

*On the cover: Scott Ginn's T-18 gleams in the sun.
(Photography by Phil High)*



Several of the celebrations will, of course, involve airplanes in flight. Paul devoted such a significant part of his life in service to his country that it's natural warbirds will be key in the celebration. There will be the traditional "missing man" formation flight, but much more to honor his memory.

Paul's efforts were the key to establishing the sensible rules and freedom to experiment that created the aircraft homebuilding movement, so homebuilders will play a large and essential role in the memorials. Look for some of Paul's airplane designs to be featured, but we won't stop there. It was Paul's understanding of how much imagination and skill reside in each of us that was revolutionary, and that's what we and the homebuilding group will celebrate.

And Paul was a lifelong student of history, particularly aviation history. That's why EAA has a first-class museum, and why antique and classic airplanes are such a huge part of Oshkosh. We owe Paul a big thank-you for helping to ensure that so many important airplanes are preserved. And those milestone airplanes remain in the hands of pilots who are passionate about their preservation and devoted to flying them to Oshkosh for all to see and enjoy and learn to appreciate our aviation heritage.

We will do our best to make sure that no segment of aviation is left out of the celebration of Paul's life at Oshkosh. And there will be some new permanent tangible memorials to Paul's legacy established on the Oshkosh grounds and the EAA campus.

At first I wondered if waiting until Oshkosh next year was too long to memorialize Paul, but the directors and I are convinced it is exactly the right thing to do. Oshkosh is the epitome of what Paul set in motion with the founding of EAA and the first fly-in and convention 60 years ago. There can be no better place and time for all of us to meet at the same airport and remember, and also look ahead while thanking Paul and Audrey for how far we have come. I hope each of you will join me in the celebration of Paul's life next summer at Oshkosh. *EAA*



EAA PUBLICATIONS

Founder: Paul H. Poberezny

Publisher: Jack J. Pelton, EAA

Chairman of the Board

Vice President of Marketing:

Rick Larsen

Editor-in-Chief: J. Mac McClellan

Homebuilding Community Manager:

Charlie Becker

Editor: Mary Jones/EditEtc. LLC

Senior Graphic Designer: Chris Livieri

News Editor: Ric Reynolds

Copy Editor: Colleen Walsh

Multimedia Journalist: Brady Lane

Visual Properties Administrator:

Jason Toney

Contributing Writers: Charlie Becker,

Budd Davisson, Cy Galley, Dan Grunloh,

Tim Kern, Dick Koehler, Ed Kolano,

Earl Luce

European Correspondent: Marino Boric

ADVERTISING

Display

Sue Anderson

Jeff Kaufman

Mailing Address:

P.O. Box 3086, Oshkosh, WI 54903-3086

Phone: 920-426-4800

Fax: 920-426-4828

E-mail: experimenter@eaa.org

Website: www.EAA.org

**Need to change your address or
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We Have Come a Long Way!

Looking back at the original *Experimenter*

By Charlie Becker

Over the last few weeks I've been reading issues of the *Experimenter* newsletters from 1953, the first year of EAA. I wanted to get a sense of the organization at the time Paul (Poberezny) started it; to understand the basic principles that were laid down 60 years ago; to understand the challenges facing the homebuilder back in 1953; to see if they had any inkling of what they were starting.

The first thing that struck me was how much freedom we enjoy in the operation of our homebuilt aircraft today. In the first newsletter, Paul wrote, "The feeling is running 'high' that with a strong organization, enough pressure could be brought to bear in the right places that some sort of limited airworthiness certificate could be issued to time-proven experimental aircraft to enable the owner to carry passengers. It is a goal to work for."

Carry passengers?! Today, not only can we carry passengers, but also there is no limitation on the number of seats we can have in our aircraft. Not only that, but we can fly our aircraft in the national airspace system in instrument conditions with passengers! Really, the only thing we give up by going with an amateur-built aircraft is the ability to carry persons or property for compensation or hire. Quite a difference from the early days.

The very first meeting of EAA featured a talk by a friendly CAA (today's FAA) maintenance inspector on "procedures used by CAA in issuing airworthiness certificates for experimental aircraft." Paul emphasized in several of the early *Experimenter* newsletters that working *with* the CAA was the way to get homebuilts accepted by the authorities and expand the privileges—an approach we still use successfully to this day.

With the evolution of aircraft happening so rapidly in the 1950s, new designs coming on the market made the older, factory-built designs ripe for an extreme makeover. The early homebuilts were made from recycled aircraft

and parts. Paul wrote in the March 1953 newsletter, "I know many of you fellows realize how much value there is in an old fuselage, banged-up tail group, or the scrap pile." These guys didn't let limited funds get in the way of a project. One fellow's plane used "parts from 14 different aircraft." So many of these early homebuilts were built from parts from the scrap bin and unwanted production aircraft.

Paul recognized the value of "welding" together like-minded individuals. In the very first newsletter, he stated, "If we are to have a strong organization we will need a large membership of interested individuals." Think of all that has been accomplished by simply bringing together passionate people under a banner with a common goal.

The knowledge we have today makes the daunting task of building an aircraft so much easier than it was in those early days. It was clear in these early newsletters that although the passion to build was high, the available knowledge resources were hard to come by.

Of course, some things never change. We always think we are going to make more progress than we do. Paul wrote, "Well, spring is here at last, and I thought I would have my ship about ready to go, but I am about a month behind schedule—I guess the winter months are not long enough for the homebuilders." Maybe it was more than dumb luck that the homebuilt movement found its home in a part of the country where we have only six good months of flying weather!

Even in 1953, Paul knew the idea of homebuilt aircraft was here to stay. In the July 1953 newsletter, Paul wrote, "I received a letter which has made me feel that the time and effort put into this organization, the paper, etc., will someday pay off in revolutionizing private aviation."

Paul, you sure got that one right! *EAA*



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Enrollment Open for 2014 EAA Air Academy Camps

The EAA Air Academy is now accepting applications for the summer camps next year, with sessions being held June through August at the EAA Air Academy Lodge in Oshkosh.

The popular aviation camps immerse young people ages 12 to 19 in the fascinating world of flight through a

variety of fun, hands-on activities, including real flight experiences in a Cessna 162 Skycatcher and Bell 47 helicopter. All fees include room and board, programs, and flights.

Learn more about the camps and make a reservation at www.YoungEagles.org/programs/airacademy.

Young Eagles Program Reaches 1.8 Million Milestone

The EAA Young Eagles program has now flown more than 1.8 million people ages 8 to 17 since its founding in 1992. Reaching the latest milestone in early September, the program owes much of its continued success to all of the volunteer pilots across the globe who give these young men and women their first experience with flight.

For many, these flights spark dreams

and lead to further participation in aviation. Nearly 19,000 current pilots took Young Eagles flights.

The program's presenting sponsor is Phillips 66, and the flights are free for youngsters participating in the program.

EAA receives many letters from both parents and former Young Eagles

thanking us for providing an affordable means of exploring aviation. The flight is just the first step in the EAA Young Eagles Flight Plan, which helps guide aspiring aviators on their journey to becoming a certificated pilot.

We thank the countless volunteers for the continued success of this great program and hope to reach the 2 million mark soon!

EAA Declines FAA Exemption for Young Eagles, Eagle Flights Pilots

EAA has notified the FAA that it is declining a partial grant of exemption that would have allowed Young Eagles and Eagle Flights pilots to obtain reimbursement for fuel costs and logging of flight time. While EAA welcomed the time the agency spent considering and formulating the partial exemption, its mandated record-keeping, coordination, and notification requirements would require complete restructuring of the program with enormous time and expense burdens.

Sean Elliott, EAA's vice president of Advocacy and Safety, stated in a letter to John S. Duncan, FAA director of Flight Standards Service, that "EAA sincerely appreciates the substantial efforts of the FAA in reviewing, publishing for comment, analyzing, and finally granting an exemption in response to EAA's

petition dated April 17, 2012. Unfortunately, EAA is unable to accept the exemption because of the severe requirements imposed by the FAA grant."

The FAA's Partial Grant of Exemption 10841 would require EAA to maintain a record of all fuel disbursements under the exemption. The partial exemption would also require notification of all flight operations to the local flight standards district office (FSDO) in advance and provide a copy of the exemption to that FSDO no less than 72 hours prior to each event. Such requirements would end the ability for Young Eagles and Eagle Flights programs to operate in a decentralized and autonomous manner as is now done.

"Meeting this requirement would literally be impossible for EAA with-

out a total restructure of the EF/YE programs and an unaffordable and questionable investment of assets in a brand new chapter monitoring, data gathering, and approval system," Elliott wrote.

EAA also found other aspects of the exemption requirements to be problematic, such as the prohibition on pilots of amateur-built aircraft from claiming the reimbursement even if they met all other requirements.

"EAA believes that the program conversion that would be required to meet the FAA's record-keeping, coordination, and notification requirements would be unaffordable, disruptive, and counterproductive," Elliott added. "Therefore, EAA regretfully will not exercise the privileges of Exemption 10841, and does not intend to renew it."

Lifetime Member Wins Sweepstakes Stearman

EAA is pleased to announce the winner of the grand prize 1943 Boeing Stearman Model 75 biplane in the 2013 EAA aircraft sweepstakes. Ralph Lloyd, EAA Lifetime 777925, of Dunwoody, Georgia, received the call Monday, October 14, that he was the lucky winner after his name was drawn at 5 p.m. CDT in Oshkosh. A retired sales executive with Cessna Aircraft, Lloyd said this latest good fortune will get him back into the cockpit.

Lloyd holds an ATP certificate with glider and seaplane ratings, although he is not current. Among his most memorable flight experiences are a first solo in the T-6 and a first flight in the P-51 Mustang. Lloyd said, "I had entertained some thoughts of getting back into flying with an LSA but had no real plans to fly recreationally or otherwise. This changes that."

Completely refurbished down to the frame by Air Repair Inc. of Cleveland, Mississippi, the Stearman prize plane



was once owned by Curtis Pitts and has a long list of features: 300-hp Jacobs R755 A2M engine, 24-volt electric system, and dual basic instrumentation. Custom leather seats were donated by Oregon Aero, PS Engineering provided the intercom, and Bruce's Custom Covers donated a full-length cover.

Proceeds from the EAA sweepstakes support the organization's programs that educate, engage, and empower people of all ages to take the next step in pursuing their dreams of flight.



49 RVs Set New Formation Flight Record

A group of 49 Van's RV homebuilt aircraft from 17 states and the District of Columbia set a new unofficial Guinness World Record for a civilian formation flight Sunday, October 13, 2013, when it overflew Arrowhead Stadium before the Kansas City Chiefs – Oakland Raiders NFL game.

The standing record of 37 aircraft was set at EAA AirVenture Oshkosh 2009.

The group, called the KC Flight Formation Team, had most of the participating aircraft equipped with smoke oil systems pouring out pink smoke in honor of Breast Cancer Awareness Month. The effort also helped to raise a reported \$30,000 for the University of Kansas Cancer Center and its surgery center at Indian Creek.

The group staged at Lee's Summit Municipal Airport, and it flew a prac-

tice flight on Saturday. The opportunity to even make the flight became available because of the federal budget sequester and elimination of military flyovers.

Team AeroDynamix, the air show formation flight team made up of Van's RVs, recently opened the Bank of America 500 NASCAR race with an 11-ship flyover at the Charlotte Motor Speedway.

Monster Gear for the RANS S-7S

RANS is now offering a "super bush" or "monster" spring gear for the S-7S Courier. Several drop tests were conducted to prove the durability of the oversized gear. Instead of bungees, which rot over time and are no fun to replace, the new gear uses springs, which should last many years. The shock struts are made of streamline tubing, and RANS is looking at some options to reduce the drag of the side frames, along with an optional bolt-on step. The new gear will

retail separately for \$1,995, and for \$1,795 if ordered with the plane.

The Monster gear weighs only four more pounds than the standard gear. RANS predicts a loss of 10 mph with 800-by-6 wheels/tires, and 12 mph with 26-inch bush wheels.

To learn more, visit www.RANS.com/aircraft/itf_articles/itf-13.html or call the RANS sales office at 785-625-6346.

New Edition ASA Glider Flying Handbook

This newly revised soaring resource is the FAA's primary technical manual for the required aeronautical knowledge necessary to operate a glider. It is essential reading for applicants preparing for the exams for private, commercial, or flight instructor pilot certificates with a glider rating, as well as for currently certificated glider pilots who wish to improve their knowledge. Flight instructors will find this handbook a valuable

training aid since it includes detailed coverage of aeronautical decision making, components and systems, aerodynamics, flight instruments, performance limitations, ground operations, flight maneuvers, traffic patterns, emergencies, soaring weather, soaring techniques, and cross-country flight.

This latest edition is illustrated throughout with detailed, full-color

drawings and photographs and includes a comprehensive glossary and index.

Look for the *Glider Flying Handbook* at your local FBO or pilot shop, or buy directly online at www.ASA2Fly.com. It's available in print (ASA-8083-13A) at \$24.95 or as an e-book (ASA-8083-13A-PD) at \$19.95.

D'Shannon Aviation Opens Engine Department

D'Shannon Aviation recently launched an engine department in Mooresville, North Carolina, to service all Continental direct-drive engines, restoring them to standards that meet or exceed factory-new specs. The top of the line rebuild, labeled the "Genesis," incorporates ECI cylinders and approximately 20 percent more new parts than a standard overhaul. It comes with a unique warranty offering an owner comprehensive protec-

tion. The shop also will perform propeller strike inspections as well as component overhaul and airframe service.

While headquarters for D'Shannon will remain in Minnesota, the engine department was strategically placed in Mooresville, which is considered the center of the NASCAR universe. The town has multiple wind tunnels and some of the most extensive

engine facilities and resources in the world. Three-fourths of the staff have been drawn from highly experienced NASCAR personnel who have spent many years in engine development. Mike Moore, an engineer, engine builder, and A&P mechanic, heads D'Shannon's Engine Department.

For more information, visit www.D-Shannon-Aviation.com.

New D2 Pocket Panel Portable EFIS

Dynon recently introduced the D2, a second true attitude indicator that can be used by all pilots. It's the second model to the Pocket Panel product line and adds WiFi connectivity to allow flight data to be sent to popular iPad, smartphone, and tablet aviation applications. A second screen offers a *g*-meter. The D2 retails for \$1,425, while the original D1 has a new lower price of \$1,195.

WiFi connectivity allows attitude and GPS ground speed, altitude, *g*'s, and ground track to be sent from the D2 in real time to an aviation application, which can then show that data on a flight information display. Compatible applications include the WingX Pro7, AOPA FlyQ, BendixKing myWingMan, iHUD Remote, and Air Navigation Pro.

The D2's second page *g*-meter shows a graphical round dial with the current load factor shown by a needle, plus it records the minimum and maximum *g*'s since being last reset by the pilot.

The D1 and D2 both use the same Dynon MEMS-based AHRS technology. Both products are true artificial horizons with accurate pitch and roll and can find the horizon even if turned on in flight. The AHRS sensors also drive a turn-rate indicator

and slip/skid ball. Included is an internal GPS receiver to display GPS ground speed, altitude, vertical speed, and ground track. At only 3 1/2 inches wide, 3 1/4 inches high, and 1 inch thick, the D1 and D2 are truly portable. They feature batteries that will last more than four hours on a charge and come with two portable mounting options. The first is a RAM suction cup mount, and the second is a 3 1/8-inch portable "pinch" mount that allows the D1 or D2 to be easily mounted in an empty existing instrument panel hole.

Accessories included with the D1 and D2 are an AC power adapter, a DC vehicle power adapter, RAM suction cup mount, 3 1/8-inch portable "pinch" mount, internal lithium-ion battery, and external GPS antenna.

For more information about Dynon products, call 425-402-0433, e-mail info@dynonavionics.com, or visit www.DynonAvionics.com.



Briefly Noted

Pilot flies solo round the world in home-built airplane—Calle Hedberg took an eight-month sabbatical from his job in South Africa to fly around the world in a Ravin 500 airplane he built from a kit. Beginning on July 14, Hedberg's flight has taken him through West Africa, Europe, and Canada so far.

180-hp SuperSTOL—Just Aircraft and ULPower are teaming up to build a Just SuperSTOL with a 180-hp UL520i engine. Learn more on ULPower's Facebook page.

Rotax Illustrated Parts Catalog for 912 and 914 series engines—

Rotax has released the latest edition of the 912/914 series *Illustrated Parts Catalog*. All parts assemblies are clearly shown with excellent exploded diagrams. It includes full parts listings for both certified and noncertified versions of both engines.





The Thorp T-18

An iconic homebuilt By Budd Davisson

In that first decade after EAA was formed in 1953, lots of new rag-and-tube airplane designs emerged: the Wittman Tailwind, a blizzard of Stits designs, and baby biplanes such as the Smith Miniplane. Then in 1963, when John Thorp's T-18 arrived on the scene, the

homebuilt world turned an important corner. As the first two-place, all-metal homebuilt for which plans were available, the T-18 set a standard for engineering excellence, building simplicity, and raw performance that still stands today.

The Thorp T-18

There's an obvious reason the T-18 was so well done and so innovative: John Thorp was a longtime, professional aeronautical engineer who happened to like personal airplanes. Although he had a hand in lots of successful Lockheed and Boeing designs, when he wasn't working on those, he was indulging in his passion for designing small, personal aircraft. The list of his small aircraft designs is long and varied and includes aircraft such as the Lockheed Little Dipper, a single-place design for flying infantrymen, and later the now familiar T-211 Sky Scooter. A series of designs for Fletcher aircraft included the little T-14 Defender armed counter-insurgency fighter and the hulking T-15 Ag plane. His T-16 is better known as the Piper Cherokee, and of course, the homebuilt T-18.

Thorp's original goal for the T-18 was to make it as easy to build as possible while making its flying and landing manners such that it wouldn't present a big challenge for the average pilot. It also had to include a huge fun factor. In fact, as originally designed, it was an open-cockpit aircraft, and the cowling had the cylinders exposed à la J-3 Cub. However, the cleanliness of the design meant that even on the then incredibly inexpensive 125-hp Lycoming O-290-G engines, it was going well more

than 150 mph, and the slipstream over the open cockpit was uncomfortable. Also, it's unknown how many, if any, were actually built with the open cowling. What was originally envisioned as a Sunday afternoon burger-chaser quickly became the aerial hot rod to have and set a new standard in homebuilt construction and performance.

It has been estimated that well more than a thousand T-18s have been built since the design's introduction, and although more than half a century old, it is currently enjoying nearly cult status, with many new T-18s being built and old ones being resurrected and restored.

However, no matter how many of any given design have been built, Thorp or otherwise, it is seldom that a measurable percentage of them are registered to one family. In this case, the surname is Ginn. The first names attached to Ginn are Howard (father), Elaine (wife/mother), Scott (first son), and Tony (second son). Between them they own eight Thorps (including a Sky Scooter), two of them scratchbuilt and the rest being rebuilt older aircraft, reclaimed wrecks, or projects waiting for their turn in the workshop. Obviously aviation runs deep in the Ginn family, with Thorps leading the charge.



Scott Ginn's award-winning T-18 was originally built by Ray Henning.

The elder Ginn, Howard, explains the family's aviation interest: "My dad, Earl, retired as executive vice president of Continental Motors where he had worked for 43 years. So, my own life was dominated by the aviation industry. In fact, I started flying at age 16 in a J-3 Cub my dad had bought for \$300."

The T-18 entered the Ginn family after Howard got out of the U.S. Air Force where he flew transports for the Military Air Transport Service. As a civilian he flew right seat as flight-test engineer for various aerospace companies, settling at Edwards Air Force Base in California.

"I discovered the EAA while in college," Howard said. "Then when we moved to California, a neighbor had built a T-18, and the whole Thorp thing just took off from there. At the time, the early '70s, I had no idea it was going to turn into a family affair."

The fact that every member of the Ginn family has at least two Thorps, including mom, says something strong about the T-18's basic design. It must have *something* that attracted the family to it.

The T-18 is an interesting concept in that it is a highly successful crossbreed of industrial-quality design and engineering with a homebuilding mindset. Thorp's personal taste for small airplanes and his close association with the rapidly developing Southern California sport aviation scene gave him an understanding of what the average amateur builder needed. At the same time, when he looked at building a personal airplane, he saw it through the eyes of a professional designer/engineer and brought that to bear on meeting the needs of someone who would be building an airplane in a garage, not a factory. Thorp's goals were very clear:

- structural simplicity/ease of construction
- low cost
- maximum performance with minimal power/operating cost
- flight characteristics that are fun, yet safe and familiar.

Bear in mind this was in 1962 and 1963, when the home-built industry was very much in its infancy. Therefore, much of what Thorp brought to the table was, if not revolutionary, at least a major step forward and paved the way for future experimental amateur-built designers and builders. The most important test of his work is that, when judged against much more modern designs, the T-18 is still a very viable choice for the homebuilder and still meets the modern definitions of the goals for which Thorp aimed.

Thorp's original goal for the T-18 was to make it as easy to build as possible while making its flying and landing manners such that it wouldn't present a big challenge for the average pilot.

Thorp Goal 1: Structural Simplicity/Ease of Construction

What follows is a series of statements about building airplanes with which few will argue. Curves cause complexity. Straight lines are simple. The fewer the parts, the shorter the build time. On a given amount of horsepower, all things being equal, the smaller airplane will be the faster airplane. Weight is the enemy in all regimes of flight. Intersections of less than 90 degrees cause drag. Drag is evil. Everything about the Thorp exemplifies those statements.

Thorp made certain that straight lines and square corners would reign supreme everywhere possible in the T-18. These worked with his "matched-hole tooling" concept to eliminate the need for labor-extensive jigs. These two factors, straight lines and matched-hole tooling, are what make the T-18 deceptively faster to build than most, if not all, high-performance metal airplanes.

Matched-Hole Tooling: An Explanation

Howard explained the matched-hole tooling concept: "When making a part, such as a fuselage skin, because they're flat, you would make the left and right sides at one time by sandwiching them together. That way they are the same shape and the drill hole patterns are the same. While drilling the skins, a thin strip of metal would be inserted between the sheets and drilled at the same time as the skins. That strip, with the holes in it, would serve as a transfer template to put holes in matching parts like stringers, bulkheads, and firewall that exactly mate with those already in the skin. It's imperative to clearly mark the strips so that proper clocking assures that the part will not be drilled upside down or backward. Ask me how I know that.

"Many parts, such as fuselage frames, require bending flanges. Because we drill holes in those while the piece is still flat, close attention is required to make the part exactly per the drawing for the matched-hole system to

The Thorp T-18

work. However, Thorp's plans give very specific dimensions to make that relatively easy to do. Compared to most homebuilt plans, his are so professional that they border on being intimidating.

"The real beauty of the matched-hole system is that all of the parts align when they are clecoed together, and the parts become self-jigging. The presence of the holes made from the transfer templates ensure that there is only one possible way that the components can go together. Thorp referred to this as 'erector set' assembly."

Thorp Goal No. 2: Low Cost

At the time that Thorp launched the T-18 project, the solution for reducing the cost of a homebuilt airplane was the huge supply of military-surplus 125-hp Lycoming O-290-G engines. The "G" was for "GPU," or ground power unit, and they had just come on the market at ridiculously low prices. A fully modified-for-aircraft O-290-G engine could be built for less than \$500, including the cost of the engine. Today, the O-290 series is still a relatively low-cost engine, although reportedly cylinders are getting a little hard to find. The commonly available O-290-D2 variant (Tripacers, etc.) is good for 135 to 140 hp and is a certified engine. With that engine, builders are reporting 160-plus mph cruise, while a 150- to 160-hp O-320 gives 175-plus mph.

Howard said, "My first T-18 was built almost entirely from parts scrounged out of the surplus sales outlet at Edwards Air Force Base, so it was relatively inexpensive. The parts that were specific to the T-18, like the wing extrusion material, came from Merrill Jenkins Supply, but today those as well as the wing fittings, which require some machining, are available from Classic Sport Aircraft."

Thorp Goal No. 3: Maximum Performance with Minimum Power

The key to performance without big motors is twofold: light weight and superior aerodynamics, both of which are present in the T-18. It's easy to forget that all of those 90-degree intersections don't need extra fairings because they're just about as aerodynamically clean as they're going to get. This is one reason for the flat center section and upswept outer panels.

Thorp Goal No. 4: Fun, But Safe and Familiar Flight Characteristics

It's hard to design a small airplane and have it feel "normal" or almost normal. The same thing applies to making it feel sporty but not twitchy. When that combination does occur, it doesn't happen by accident, and



The family Ginn—Mom leading the flight in her Thorp T-211 Skyscooter, Dad and Tony at Nos. 2 and 3, and Scott is No. 4 in his other T-18 (white with blue). Among them, the Ginns own 8 T-18s.

Comparing the T-18 and S-18	T-18	S-18
Length	18'11	19'4
Wing Span ***	20'10	20'10
Cabin Width	38	40
Wing Area (ft sq.)	86	86
Wing Loading at Gross Wt (lb/ft sq.)	18.6	18.6
Empty Weight	925	950
Gross Weight	1,650	1,650
Useful Load	725	700
Velocity never exceed (mph)	210	210
Cruise speed 75% 8,000 feet*	201	201
Max speed at SL (mph)*	210	210
Stall speed (mph)	67/63	62/58
Hp range	125-180	150-180
Fuel capacity	29	29
Fuel capacity (er tanks)	60	60
Range (sm)	590	590
Range (sm) (er tanks)	1,200	1,200
Endurance**	2.6	2.6
Endurance (er tanks)**	6.1	6.1

*For all speeds stated, assume 180 hp.

**For endurance figures, consider 30-minute reserve at 9 gph.

***T-18C/S-18 width with wings stowed in folded position is 7 feet 4 inches (89 inches).

Source: www.T18.net.

T-18/S-18 Sources

Aircraft Spruce
225 Airport Circle
Corona, CA 92880
Phone: 877-477-7823
Website: www.AircraftSpruce.com

Classic Sport Aircraft
19426 Campbell Creek Drive
Springville, CA 93265
Phone/fax: 559-539-2755
E-mail: s18mike@ocsnet.net

Eklund Engineering Inc.
PO Box 1510
Lockeford, CA 95237-1510
Phone: 209-727-0318
E-mail: thorpt18@jps.net

Classic Sport Aircraft is a purveyor of component parts for the T-18 and complete kits for the S-18. Eklund Engineering sells plans for the T-18.

It's easy to forget that all of those 90-degree intersections don't need extra fairings because they're just about as aerodynamically clean as they're going to get.

it doesn't happen often. However, Thorp did it. And so do Dick VanGrunsven and a few other designers who have followed in John's footsteps. It's all in attention to the details. Of course, truly knowing what you're doing obviously helps. In terms of handling characteristics, it's instructive to know that Elaine (Mamma Ginn) took all but a few hours of her flight training and got her private pilot certificate in a T-18. Its speed and high-performance characteristics take it far out of the Cessna 150 category, but obviously it doesn't present challenges so big that they can't be conquered by even a new pilot.

No Airplane Is Perfect: Enter the T-18CW and S-18

In the early '70s, before he retired, Thorp took aim at some of the things even he thought could be improved on his design. This included widening out the narrower-than-normal cockpit (38 inches) and its higher-than-normal stall speed (approximately 65 mph). Numerous changes were made, and between Thorp's changes and those Lu Sunderland developed, the S-18 emerged. The cockpit is bumped out 2 inches for more shoulder room, and the fuselage is 5 inches longer for greater longitudinal stability in the air and directional stability on the ground. In addition, the wing was redesigned to allow folding the wings for trailering or storage. It also got a new airfoil.

Howard has logged in excess of 1,500 hours in his Thorps, traveling all over the country, and he thinks he knows what would make the ideal Thorp.

"I think the ultimate Thorp is the Sunderland S-18," he said. "The wider fuselage is just enough to make it much more comfortable but does not cost any speed. Also, the new airfoil lands 5 knots slower with no loss at cruise, and I like the longer landing gear with the round tail spring. I'd use a 150-hp O-320 that burns auto gas and turns a Catto prop."

He said that combination would give more than a 175-mph cruise speed while burning only 8 gph. As an aside, the owners of 180-hp T-18s with constant-speed props

are reporting that they cruise in the 190- to 200-mph range at 75 percent power.

The younger of Howard's boys, Tony, also built a T-18 and is building another, but it was Scott, the older son, who scored a major coup when he became the proud owner of what is universally recognized as one of the finest pieces of sheet metal work ever done: the T-18 built by Ray Henning.

Although almost everyone who sees the airplane is immediately struck by the incredible polished surface, one has to look past that to the obvious craftsmanship that is displayed. The polished surface hides nothing, so any blemishes, slightly dinged rivets, or mismatched sheet edges will be accentuated. But there are no blemishes or imperfections.

From the formed aluminum nose bowl (reportedly one of only three or four made) to the vaguely retro-appearing open-sided wheelpants, it would be difficult for anyone to find fault with the airplane.

Scott said, "Ray's T-18 is a legend within the Thorp community because of the incredible craftsmanship it represents. It's not just an airplane; it's a work of art! It took Ray 23 years to build, and there's just no way to describe how perfect it is. Unfortunately, once Ray finished building the airplane, he only flew it about 20 hours before his eyesight began to fail and he decided to sell it. No one will ever know how glad I am that he allowed me to buy it. It is an incredible testament to Ray's talents. It shows what can be done when an ordinary guy puts his mind to it."

Scott's comment about an ordinary guy putting his mind to it applies to just about every homebuilt that ever took to the air. If we put our mind to it, just about any of us can do whatever needs to be done. However, it's nice when a designer looks down the road at how challenged some homebuilders will be and designs an airplane with them in mind. Builders of Thorp T-18s know that one of the better brains to ever exist in sport aviation is watching over them every step of the way. And they know he did his best to make their job both easier and more enjoyable. After all, if it's not fun, we're doing it wrong. *EAA*

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



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Reno 2013

A tale of two races By Tim Kern

The 50th Reno National Championship Air Races, in addition to having perfect weather, presented one of the event's most unusual and exciting meetings.

There are six classes of racers at Reno, each with its own rules; and most fly their own specific courses as well, but with the front straight pylons in common so spectators get a good view of each race.

The **Jets** run around the same pylons as the Unlimited Class, as do the fastest (Gold) Sport Class racers. At speeds of more than 500 mph, Jets bring a rare thrill,

but they are so very reliable and surprisingly quiet and are sequestered far from the other aircraft. Since there is so little work done on these machines, they remain the "ghost class" for most spectators.

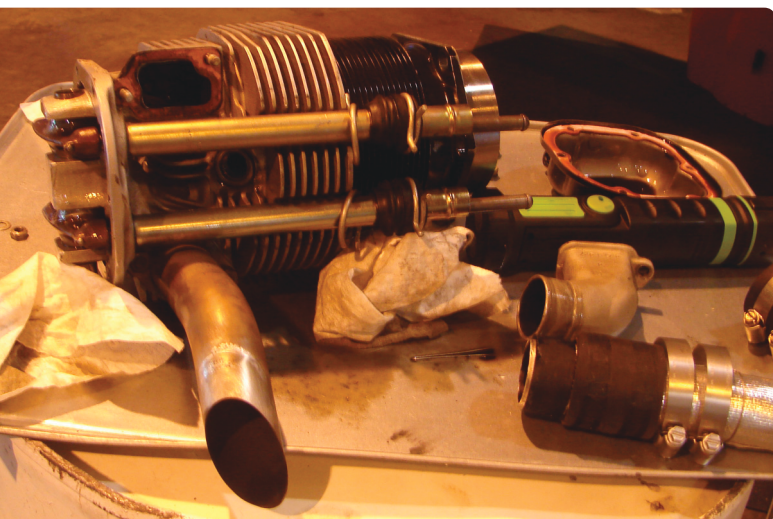
The **Sport Class** racers are known colloquially as "Unlimited Light" because the class rules have opened up in recent years. Race speeds of 400-plus mph have been seen since Jon Sharp took his Nemesis NXT around the course at the still record speed of 409-plus mph in 2008. The 400-mph line was finally crossed by a second machine in 2013, as Jeff LaVelle and his remark-

Biplanes fly low, tight, and fast.

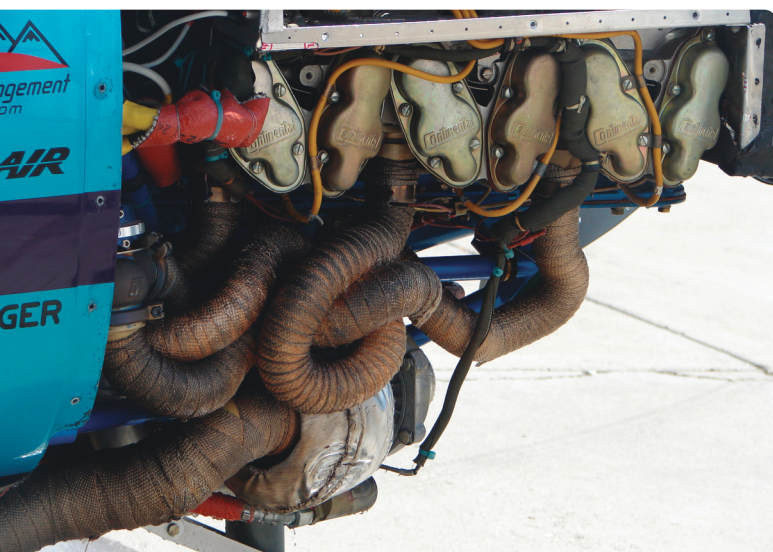




T-6s always put on a close race.



Many a Formula One cylinder got autopsied late at night.



Wrapped turbo exhaust system on Bob Wolstenholme's Sport Class Lancair.

able twin-turbo Glasair III qualified at 403 mph, 12 mph faster than John Parker's big naturally aspirated Thunder Mustang. Last year, Parker ran second all week, keeping his "secret weapon" hidden until Sunday's trophy race. In 2012, LaVelle and Parker started (and finished) 1 and 2, when Parker's then hidden nitrous oxide boost didn't work in the race.

2013 was going to be different; only it wasn't. As the planes came onto the course at the start, everyone expected Parker's engine to unleash another 160 horses and blast him to the front. But as in 2012, the nitrous didn't come on. "We tested, we triple-tested, we even hard-wired the solenoid," Parker said. But the valve didn't open. "The race was extremely bumpy," Parker said. "It was actually difficult to see. You could say that's why I cut a pylon," he laughed. It didn't matter; he finished second on the course and in the standings.

Biplanes have been Tom Aberle's class since he showed up with his radical *Phantom* in 2004. Except for 2007, *Phantom* has won the Biplane Race (including in 2005, when it was flown by Aberle's partner, Andrew Buehler). 2013 was no exception. Qualifying at 259 mph (more than 40 mph faster than the second-place entry), Aberle dominated all his races and won, going away, as usual, lapping the field for the win. At 254 mph, he eclipsed his 5-year-old race record by more than 4 mph.

The **T-6 Class** is always a crowd-pleaser, as these big, loud, flashy machines parade around the pylons in tight formation. Though "strictly stock," these machines are optimized around class rules, and race some 60 mph faster than brand-new ones could go in the 1940s. Winner in 2007 and 2010 (and declared champion in the truncated 2011 season), Dennis Buehn took *Midnight Miss III* to victory, averaging more than 245 mph.

The **International Formula One Class** has been dominated by three airplanes for more than two decades—Jon Sharp's *Nemesis*, the late Gary Hubler's *Mariah*, and David Hoover's (now Steve Senegal's) *Endeavor*. In Reno's history, only 16 racers (all Americans) and only 16 airplanes have ever won Formula One Gold... until 2013.

Once the premier class at Reno (when they were called "Midget Racers") and flown by such luminaries as Art Scholl, Steve Wittman, and Bill Stead, the founder of the Reno Air Races, it's now called the International Formula One Class. The class features small homebuilts powered by old-design O-200 engines. They run more than 250 mph. Four-time winner (and 2011 champion)

Endeavor again qualified on the pole and was heavily favored to win, with Steve Senegal on the stick.

Senegal's only realistic challenger was Swiss Vito Wypraechtger (crew chief and test pilot on Red Bull champion Hannes Arch's team), the only "international" entry, who qualified nine mph slower. (Vito was featured in our 2010 coverage of "rookie school," when he came to Reno and said "...it was like going to church; this is sacred ground.") He bought a fairly competitive, fairly standard Cassutt called *Scarlet Screamer* and started learning. His sponsors provided him with a special "sharkskin" leading edge cover that was supposed to reduce drag; that area was doubled this year.

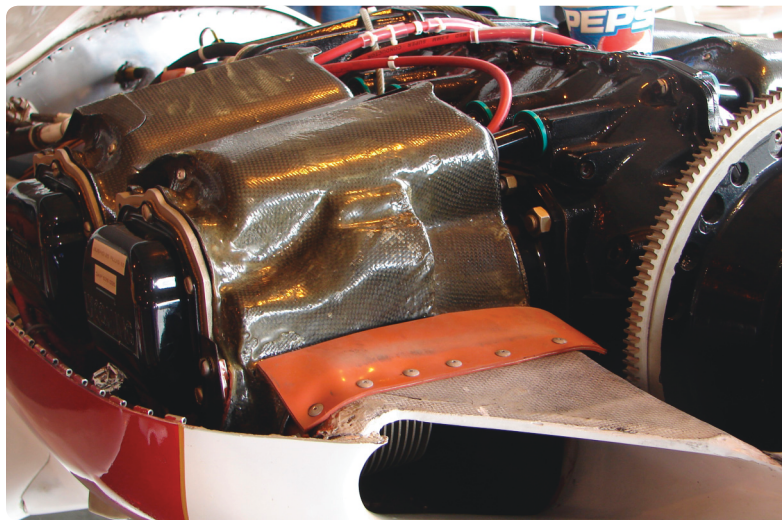
In Reno's history, only 16 racers (all Americans) and only 16 airplanes have ever won Formula One Gold...until 2013.

Last year, we mentioned how Vito directed the team to skip a doable overnight engine change, which would have caused him to start from the back. Rather than wear everyone out and risk an error, he finished second in 2012. Since then, Zivko built a new cooling system; an oil cooler and a new, larger aluminum oil tank were added. Apparently, the Ly-con engine is throwing off more heat, a telltale sign of more power. There's a new propeller with a 68-inch pitch that allows 4150 to 4200 rpm; last year's prop was a 70-inch pitch that limited rpm to "about 4000." Crew chief Raphael Lopez said, "It doesn't sound like a big thing. It's not much, but *everything* is a big thing."

Senegal, as expected, qualified fastest and convincingly won all his heat races. Vito's engine had problems, and he missed a lot of flying and had to start at the back—until he won his final heat race, the first one he even finished.

On Sunday morning, when it mattered most, Senegal got a lousy start and Vito got a great start. The finish was close but historic; for the first time at Reno, the International Formula One Class had an international winner.

The Formula One Class (and Biplanes) use a standing start on the runway, so slower machines often get good starts because of their lower-pitch props. These machines, some of whose designs date back



Under the cowl of Phantom, the world's fastest racing biplane.



Yes, you can race an RV in Sport. Jason Rovey did.



Hoot Gibson's supercharger exploded in there.



Marilyn Newton and Aaron King have covered every year of the Reno Air Races; and this was their 50th year!



Harmon Rockets returned to Reno in 2013. Bob Mills, here.

decades, are not sleek, but they roll fast, turn well, and can take a tight line. Consequently, though their eventual lap speeds are maybe 10 to 15 mph off the winning pace, they're right up front at the start. It was on a wide line, among these quick-turning jackrabbits, that Senegal found himself. And when the green flag dropped, Vito got the best shot and tucked into the low tight line.

Vito stayed on the perfect line, knowing that the faster *Endeavor* would soon shake the traffic and bear down on him; but his early lead proved enough, and he won his first race by nearly half a second.

About Those Unlimiteds

The big, fast Unlimiteds and Warbirds had a small field but were not bereft of talent and speed. In the field were previous Gold winners *Dreadnought*, 232 (which won in 2006 as *September Fury*), *Rare Bear*, and *Strega*. Other contenders were the relatively tiny Yak-11 (with a Corsair engine!) of Sherman Smoot, called *Czech Mate*; and the fast and gorgeous contra-rotating-prop *Precious Metal*. Among pecking-order "also-rans" (and showing how fast this class is) was last year's third-place Gold finisher, *Miss America*.

The finish was close but historic; for the first time at Reno, the International Formula One Class had an international winner.

Strega may have been the fastest machine in the class, but no one could tell. It didn't qualify early or run official practice laps, so it had to start from the back in heat races. In the first heat, Jackson cut a show line and was disqualified. While practicing, a freak occurrence happened: *Strega's* 32-year-old canopy just disintegrated as Jackson was running more than 400 mph. He was shaken, but not injured, and did a masterful job of getting the open-cockpit Mustang back on the ground in one piece. The frame wasn't damaged (and they had a spare!), and overnight, a team that included carbon-meister Andy Chiavetta (designer of the Aerochia) designed and fabricated an H-section carbon "bubble surround," which made up the gap between the old frame and the new Plexiglas.

In the second heat, Jackson had to win to make the Gold Race. He decimated the field, starting at the back

and screaming to victory some 70 seconds ahead of second place. *Strega* was in the Gold, but there were no more races, no more chances to get acquainted with the fastest horse in the stable.

Sunday's Unlimited Race was a nail-biter. With *Voodoo* in front and *Strega* near the back, the rest of the field—*Czech Mate*, *Rare Bear*, *Precious Metal*, *Dreadnought*, *Sawbones*, *Argonaut*, and *Miss America*—was going to see plenty of high-speed action.

From the start, Steve Hinton and *Voodoo* blasted away, with the Yak and the Bearcat pulling away from *Precious*. At the end of Lap 2, *Strega* was third; only Sherman Smoot was between Hinton and Jackson. On Lap 3, *Strega* was second, with *Voodoo* far ahead but in its sights. But that's how it ended: *Voodoo* took its first Gold (and Hinton, his fourth, which includes the championship from 2011). *Strega* and Jackson were second, seven seconds back. Then Smoot and *Czech Mate*, Stewart Dawson in *Rare Bear*, and Thom Richard in *Precious Metal* followed. Brian Sanders steered *Dreadnought* to sixth, *Sawbones* and Curt Brown were seventh, and Brent Hisey and *Miss America* were eighth, about a minute behind *Voodoo*. Flying 232, Shuttle Commander and Colonel Hoot Gibson didn't finish, spectacularly. Along the front straight, the big radial's supercharger let go, sounding a tremendous "Fooffp!" and sending large chunks of hot metal up through the cowlings and against the canopy (which held) and horizontal tail (which sustained a dent). Gibson landed with the engine running, but as he said, "It wasn't happy."

So ended "the race that almost didn't happen" because of delays by the FAA in setting the race course and some squabbles between the Unlimited racers and Reno Air Racing Association. The Unlimiteds definitely *will* happen in 2014, with race dates set for September 10 to 14. But show up four or five days early and you'll understand the drama that surrounds races like these, and have time to pick up some speed, reliability, and safety tips from people who really know what they're talking about. *EAA*

Learn more at www.AirRace.org.

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



Crowd favorite Miss America moved up into Gold.



Voodoo, victorious, taxis in after the Gold race as Steve Hinton waves.



Strega takes off, looking for her next Gold.

Wandering Oshkosh

By Dick Koehler and Earl Luce

Longtime readers of *Experimenter*, the print magazine that EAA published from 1987 until 2004, likely will recall the article that writer Bob Whittier would produce each year after the annual EAA Oshkosh convention. Bob, who penned the “Light Plane Heritage” column in *Experimenter* would literally wander the field at Oshkosh looking for unique ideas that people

developed and used while building or restoring an aircraft.

Unfortunately, Bob is no longer able to attend AirVenture, but we asked veteran homebuilders Dick Koehler (EAA 161427) and Earl Luce (EAA 303169) to follow in Bob’s footsteps. Here’s what they found while “wandering Oshkosh.”

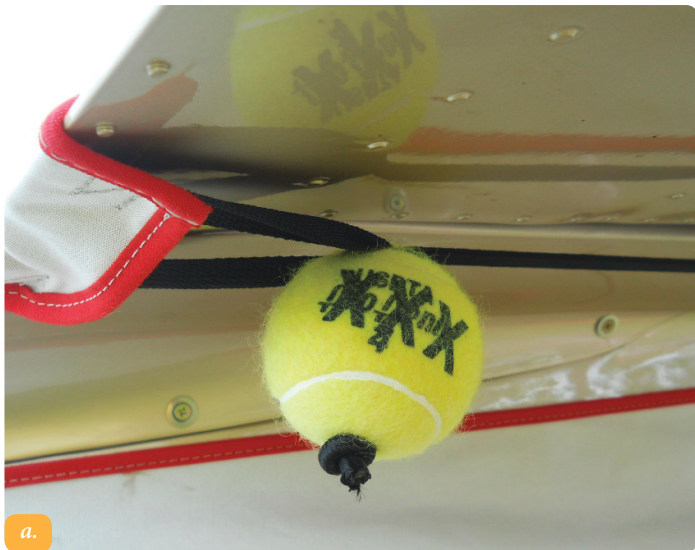


Look at the step on this bushplane. It's a section of angle aluminum with some slip guard added. It is held on with a simple bracket...brilliant!



The builder of this Tailwind added a landing light inside the air scoop on this vintage homebuilt.





This series of photos shows some interesting ways to secure different parts of an aircraft: a) This tennis ball holds wing covers in place; b) a large clip similar to what might be used on a bag of potato chips serves as a gust lock; and c) another gust lock is made from a plastic tube and a small piece of sheet aluminum.

This owner uses a plastic cap to protect the point of his flying wire stabilizer, with a flag to remind him to remove it before flight.



Here are a couple of unique position light ideas: a) a tail light made from a simple No. 1056 tail light (on a Wittman design); b) a wing position light cover made from red plastic that's been heated and wrapped around wood. The light bulb is an automotive light.



This Skylader 600, a light-sport aircraft that looks like a Mooney only smaller, uses this very small, but precisely made, trailing arm nose gear. It has rubber shock donuts about half the size of those on a production Mooney. It appears to be light, simple, and relatively maintenance free, compared to an Oleo-type gear. The Skylader 600 has both a retractable gear and a fixed-gear option, but only the fixed-gear model qualifies as a special light-sport aircraft.



How do you make a V-6 look like a V-12? One way is to mount a custom 3-into-6 exhaust manifold from Titan Aircraft. The custom manifolds make a Honda 3.5-liter V-6 look like a V-12.



One of the problems encountered when trying to make a scaled-down P-51 look like a full-scale one is finding an engine that will mimic the Rolls Royce Merlin V-12. This solution from Titan Aircraft is a converted BMW 735 engine. Even the mounting system simulates that used on the full-size aircraft. The engine is still in development. I bet it sounds great.



Here is another possible solution to the 100LL issue. This Aviat Husky, which was displayed in front of the EAA Innovations Pavilion at EAA AirVenture Oshkosh 2013, is the first dual-fuel aircraft converted to run on both 100LL and compressed natural gas (CNG). CNG has an octane rating of 138 and costs about \$0.85 per gas gallon equivalent (GGE). Besides its low cost, CNG offers significantly lower emissions and lower CHTs compared to 100LL. On the other hand, the tank which holds about 9.2 GGE weighs about 100 pounds with its fairing. The advertised conversion price is estimated to be in the \$12,000 to \$15,000 range!



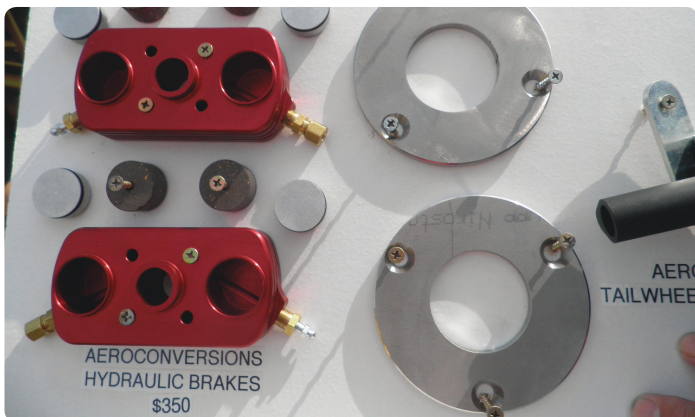
Several vendors came to Oshkosh with new solutions to the FAA mandate for the installation of ADS-B receivers by the year 2020. Bendix King introduced its KT-74 unit, which is billed as a drop-in replacement for the popular KT-76/78 series transponders. In the fine print, Bendix King adds that a new tray with a connector for the GPS input will be required for ADS-B, but at a list price under \$3,000. The competition in this market appears to be significantly lowering the acquisition cost for ADS-B from just a few years ago.



Aircraft Heaters was a new vendor at AirVenture and displayed its line of electric Hornet heaters in a range of sizes to preheat engines and cockpits. These clever and compact units were on display in the outside display area to the west of Building C.



TrickAir has a “furfect” solution for protecting your prop from the elements, though animal rights activities might not approve. TrickAir also produces a line of wheel skis. The skis can be mounted in about 20 minutes.



Here's a new product of note. These are miniature hydraulic brakes produced by Sonex Aircraft's AeroConversions subsidiary. They are designed to convert mechanical brakes to hydraulic brakes on small aircraft. The machining and anodizing is beautiful. The pucks are about one inch in diameter.



This award-winning Lancair 320 was completed by Craig W. Schulze in 2007. It has a clever aft navigation light built into the trailing edge of the rudder. The LED strip is perfectly faired into the rudder.



We believe the smallest wheel fairing seen on the AirVenture flightline belongs to an award-winning Thorp T-18 completed by Ronald Hayes in 1992. The tailwheel fairing is only about three inches in diameter.



This nicely finished Sportsman GS-2 was completed in 2012 by Gordon P. Anderson. The belly pod appears to be in the exhaust stream, requiring a longer exhaust pipe and a protective pad on the pod.



Is it a flying car or a drivable plane? Plane Driven has a plane with a ground power pack that appears to be the back half of a motorcycle. Claimed speeds are 150 mph in the air from the IO-390 aircraft engine and 70-plus mph on the ground from the 50-hp power pack. Useful load is advertised to be 640 pounds while hauling the power pack in the baggage compartment. The plane/car has crossed the United States several times in combination of air and ground travel. Their motto is "Fly above the traffic; drive through weather."



A new approach to headset design was demonstrated by Quiet Technology. The ultralightweight, in-the-ear Halo headset uses hollow earplugs to block out most noise and audio tubes to pipe the sound in through the center of the earplug. Shown here getting a demo are Dick Koehler, Dave Watrous, Bob Koehler, and the Quiet Technology salesman.

Quick and Easy Engine Stand

By Cy Galley

I always cringe when I see an engine lying on an auto tire. That takes up a lot space and is difficult for one person to move, and it can also create expensive damage to the engine.

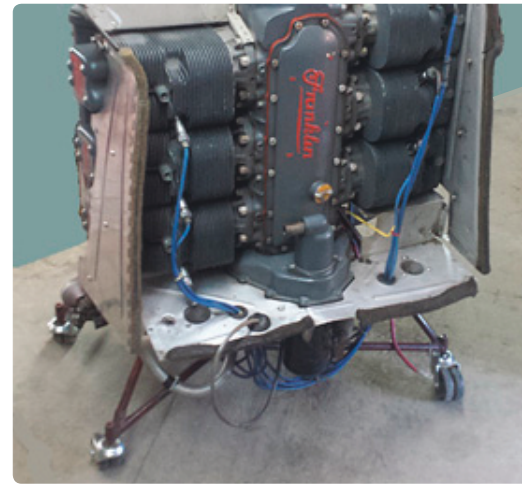
When I saw this trick, I just had to share it with others. Note that with this engine stand, one can have all the baffles on without fear of bending or distorting them. Since you don't have to take them off when moving the engine home for rebuild or repair, the baffles don't get lost either.

So how do you make this engine stand? Well, you already have it on your plane. It is the engine mount bolted to the firewall. Instead of taking the engine off the mount, release the mount from the firewall.

The mount makes a good sturdy vertical stand by placing three firewall ends on the floor. Fortunately, many engine

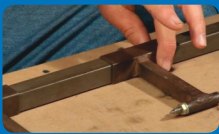
mounts are bolted to the firewall with 3/8-inch bolts. Use these holes to slide in some 3/8-inch stem-type casters as found on office equipment. You then can move the engine around or push it out of the way for ease in working on the other side or for more work room. Push it out of the way for a more pressing project such as a "honey-do" project. Some of these casters have locks to prevent your stand from moving when pulling a cylinder, etc.

The only drawback is that the working height can be a little low. I use a little wheeled seat that automotive mechanics use so that I'm working at a more comfortable level. *EAA*



Homebuilder Hints Videos

Here are four of the nearly 400 Hints for Homebuilders videos that are available online at www.eaa.org/Hints.



Drilling Alignment Jig

Fred Stadler demonstrates use of a simple alignment jig designed by EAA's master craftsman Bauken Noack. This jig is especially useful to ensure precise installation of a wing's drag/anti-drag wires.



Surface Corrosion

Bob Koehler demonstrates how to identify and remove light surface corrosion using a scotch brite pad. Bob is an A&P Mechanic and EAA SportAir Workshop instructor.



The Basics of Stripping and Crimping Wire

In this video, Dick Koehler demonstrates basic techniques of stripping and crimping wire. Dick is a Technical Counselor for Chapter 186, an A&P aircraft mechanic with Inspection Authorization (IA), and SportAir Workshop instructor.



Laying a Bead of Resin Microspheres with a Caulk Gun

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



The start of the show line at Mt. Vernon.

The Midwest LSA Expo 2013

A successful event

By Dan Grunloh

The 5th Annual [Midwest LSA Expo](#), held September 5 to 7 in Mt. Vernon, Illinois, featured good weather and hot deals on some of the latest models of light-sport aircraft (LSA). In previous years the event struggled with high winds that reduced flying or delayed arrivals. The Mt. Vernon expo is building on the success of the longer-running [U.S. Sport Aviation Expo](#), held in Sebring, Florida, in January. Attending a Midwest LSA Expo is a different experience than the typical fly-in or hometown airport open house. Generally there is no air show and little formal flying activity. This year Mt. Vernon had a couple of warbirds on display, including the P-51D *Red Nose* and the Commemorative Air Force's B-25 Mitchell bomber *Maid in the Shade*. They both offered rides.

Many interesting transient aircraft also flew into the event. So many in fact that airport manager Chris Collins said they were parking arriving aircraft in a secondary parking area. The main purpose of an expo is not to

bring in thousands of people but rather to accommodate a smaller number of visitors who are getting close to writing a check for a new airplane. It's a perfect environment because the latest models are displayed so you can try them on for size and go for a flight.

Never Say Never

It's easy for some of us in grassroots aviation to conclude that a modern, fixed-wing LSA is not in our future because of the cost. To get the most out of life, it's better to keep possibilities open. Who can say when one might run into a partnership deal, fractional ownership opportunity, or a used model that is too good to pass up? In general aviation, the lowest-cost flying for a private pilot comes through flying clubs, where up to 10 people own the plane but typically only a few fly it often. An arrangement of that type with a 120-mph LSA would be very tempting.

Every pilot and would-be pilot should have an idea of what their next airplane might be. It could be an ultralight pilot moving up or a private pilot who imagined he would keep his third-class medical forever. It's good to know what fits and works for us should the opportunity arrive, and it's fun to dream. An informal survey of the field shows that high wings and low wings have about an equal share of the market. The low wings have a slight speed advantage and tend to be designed for cross-country comfort. High wings persist in part because it's easier for older pilots to climb into the cockpit. There are models with features such as extra-large doors and folding control sticks to ease entry. The following is a sample of LSA from Mt. Vernon.

The first airplane seen through the gate, the Czech-built **SportCruiser**, stands as testament to the new technology made available with the LSA category. The all-metal low wing flown in from Johnson City, Tennessee, by Jerold Cordell has that modern look that inspired Piper Aircraft to market the airplane as the Piper Sport for a short period of time. In 2011 Piper discontinued the effort, and Czech Sport Aircraft continued marketing an improved aircraft to a more international market. The LTD model displayed at Mt. Vernon had a deluxe cockpit with leather seats that come in a variety of colors and

styles. You can get it with dual Dynon 10-inch SkyView screens and the all-electric Fly Cool air conditioner from U.S. Sport Aircraft. The system requires a larger alternator and adds about 40 pounds. It could be handy while holding position on a taxiway on a hot summer day. **U.S. Sport Aircraft** is also pioneering a fractional ownership plan with aircraft available in four locations. About 30 percent of all SportCruisers are used for training, and it is reported that about 20 flight schools in the United States are using the aircraft.

The **World Aircraft Company** (WAC) of Paris, Tennessee, displayed its Vision LSA, an airplane that is optimized for maximum visibility and ease of entry. The Vision airframe is based on the Spirit LSA designed by MIT-trained aeronautical engineer Max Tedesco from Colombia, South America, that was introduced at EAA AirVenture Oshkosh in 2011. For the Vision, WAC narrowed the instrument panel and brought the sides of the fuselage inward at the engine firewall. Large doors allow for easy entry, and the sides bulge outward, yielding a view downward and forward that can't be appreciated until you climb aboard.

Adjustable seats and a folding control stick mean you barely have to bend a knee to enter the airplane. The



The Czech-built SportCruiser features leather seats.

wing is slightly thicker than the Spirit wing, and it includes vortex generators to give STOL performance. Cruise speed is 110 mph and clean stall with no flaps occurs at 35 mph. The all-metal, monocoque design is manufactured entirely in a 22,000-square-foot facility at the Henry County Airport in Paris, Tennessee. A comprehensive analysis of the Vision Sport at the Mt. Vernon expo can be seen in this [video by Dan Johnson](#). Check out the visibility in the cockpit as shown in the in-flight portion of the video.

Niley Church brought one of the newest designs on the LSA scene to the expo—the Italian-made Trail from [Nando Groppo](#). The tandem high wing features one of the slickest and easiest wing-folding mechanisms ever seen. The all-metal STOL airplane is designed for rough, unimproved runways. It cruises at 110 mph on a 100-hp Rotax 912 and carries enough fuel for a 600-mile range. A couple of other LSA have folding wing capabilities, but the Trail takes it to a new level of speed and convenience. For those who cannot afford to build or rent a full-size hangar, this airplane makes it feasible for an unassisted person to fold the wings after each flight.

The process involves removing two wing pins and disconnecting one aileron pushrod at each wing root.

No tools are required, and safety clips and pins are tethered so you can't drop them behind the seat. It takes about a minute on each side, including the time to walk around the airplane. Meanwhile the wing is fully supported by the hinging mechanism. Then a small release button is pulled on the wingtip that frees up the swivel mechanism. It takes less than a minute to fold both wings [as shown in this video](#). Fuel lines to the wing tanks stay attached.

The list price for the special light-sport aircraft version is \$85,000. An amateur-built kit version is also available, with an estimated build time of 600 hours. The construction is welded steel tube and riveted sheet metal. The aluminum wings and tail have vortex generators for slow flight. More than 90 airplanes have been completed worldwide, most of them from kits. The Groppo Trail is marketed as the Trial in Europe and most of the rest of the world, but in English-speaking countries the name Trail is thought to be more acceptable. Get more information at www.Fly-BuyLSA.com.

That's just three examples out of about 30 new LSA at the expo. The [Arion Lightning](#) had a good show with five airplanes displayed at its exhibit, according to the *Arion Lightning Newsletter*. The Lightning began as an amateur-built composite kit designed especially for the



The Trail LSA from Italy folds its wings quickly and easily.

Jabiru engine. **Zenith Air** brought a high-wing STOL CH 750 and a sleek CH 650 Cruiser powered by a 130-hp, air-cooled **ULPower** engine. A new, six-cylinder, 140-hp ULPower engine was on static display. Currently, there are six-cylinder LSA engines flying in the **Jabiru J230-SP** and Arion Lightning.

RANS showed its **S-19LS Venterra**. Carbon Cub, Allegro, Just Aircraft, and the United States' best-selling LSA, the Flight Design CTLS, were represented, along with many more aircraft. Displays by Quicksilver and Kolb Aircraft provided relief in case any attendees were suffering from sticker shock and wanted to get into aviation at a much lower cost.

But the show wasn't all about fixed-wing aircraft. Greg Gremminger represented **Magni Gyro** with two gyroplanes, including a new, enclosed side-by-side M-24 Orion model.

Too Much of a Good Thing

By all accounts, the 5th Annual Midwest LSA Expo was the best ever, thanks to good weather and hard work by the organizers. Based on past years, the event must have drawn 600 to 1,000 attendees over the three-day event. Early reports indicate sales of about 15 aircraft. It helps to have a fabulous, modern facility such as the **Mt. Vernon Airport** as the location. A superb 6,500-foot runway serves a modern terminal (that once had scheduled airlines) and a large, spacious concrete apron. It's great for gatherings of all kinds of airplanes, including LSA that we view mostly on grass at AirVenture. It's not so great in hot weather when the concrete heats up in the afternoon, though. Of course, I wouldn't suggest Mt. Vernon or Sebring to move operations onto the grass, though it would be easier on humans; you could tie down the airplanes anywhere, and display tents wouldn't need a pair of cinder blocks tied to the corners to hold them down. If you attend a typical LSA expo in sunny weather, don't forget your sunglasses.

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

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



The Zenith CH 650 Cruiser with a four-cylinder ULPower 350iS engine.



ULPower just introduced a line of six-cylinder engines.



The Carbon Cub LSA fitted with tundra tires.



More First Appearances at Oshkosh

2013 Perseverance Award Winners

This month we're bringing you more photos of several of the aircraft that received Perseverance Awards this year for making their first appearance at EAA AirVenture Oshkosh after being completed. This award recognizes the work that every builder invests to complete a homebuilt project. The

award was started by Doc and Buddy Brokaw (now deceased), who built and flew the Brokaw Bullet and wanted to acknowledge the perseverance needed to finish a project like building an airplane. Here are a few of those aircraft, with more to come in future months. ... Mary Jones



RV-7

Kevin Patsey, EAA 583837, completed this RV-7, N221KP, in November 2012 after 12 years. He's logged 60 hours flown.



RV-7A

Stephen Watson, EAA 1047148, of Santa Clarita, California, completed this RV-7A, N660WS, in December 2012 after 5 years of work. It's powered by a 180-hp Lycoming IO-360 engine. Stephen has logged 90 hours in the aircraft.



F1 Rocket

Tony Clinton, EAA 692674, of Port Orange, Florida, completed this F1 Rocket, N914TC, with a Lycoming 260 engine in May 2013 after 7 years of construction. He's logged 50 hours in it.



RV-8

Bruce Brielmaier, EAA 394538, completed this Van's RV-8, N594WR, in November 2012. He's logged 90 hours in it.



RV-10

Joel Gooch, EAA 39001755, of Sumter, South Carolina, completed this RV-10, N55GG, in August 2012 after 3 years and 8 months of construction time. It's powered by a Lycoming O-540-A1D5. Joel says the aircraft has a long list of modifications. He's logged 80 hours in it.



RV-7

David LaSala, EAA 1103996, of Tumwater, Washington, completed this RV-7, N870X, in March 2013 after 4 years of build time. It's powered by a 180-hp Superior IO-360 engine. David has flown the aircraft for 65 hours.



RV-8A

Mark Lewandowski, EAA 550916, of Wilton, California, completed this RV-8A, N9818D, in August 2012 after 6 years of construction. It's powered by a 180-hp Lycoming O-360 A1A. Mark has logged 65 hours in the aircraft.



RV-8A

Ron Moring, EAA 743728, of Lena, Illinois, completed this RV-8A, N868RM, in July 2012. He's logged 100 hours in it. The aircraft is powered by a 180-hp Lycoming O-360 engine.

Flight Control Centering

Avoiding nudging and bumping

By Ed Kolano

Have you ever tried to get a dog to look to its left or right by nudging its head in that direction? The harder you push, the harder the dog resists. As you relax your, er, encouragement, the dog's head moves back to where it was before your hands-on assistance. Fido's head exhibited *positive centering*.

So it is with flight controls. Absolute centering occurs when a displaced control returns to its exact pre-displaced position. If it moves toward its pre-displaced position but doesn't quite get there, it exhibits positive centering. If it were to continue to move away from its pre-displaced position after you relax the force you applied, that's negative centering and the beginning of a bad flying day.

Let's assume for now that the flight control system has no freeplay, so even the tiniest cockpit control movement results in a control surface movement. Okay, here's the setup. You're trimmed for straight-and-level flight at a steady speed. You perform a level turn without changing power, trim, or configuration. To remain level during the turn, you have to pull the stick back a bit. As you roll out back to straight and level, you relax that pull. If your airplane has absolute centering, both the stick and elevator would return exactly to where they were before you started the turn, and the plane would resume its level flight and airspeed. So far, so good.

Now suppose the elevator control system had positive, but not absolute, centering. When you relax your pull, the stick doesn't quite get back to its original position. Since there's no freeplay in this example, that means the elevator also doesn't return to its original deflection. As you reach wings level, there's now more elevator deflection than is necessary for straight-and-level flight, and the plane climbs as it seeks the slower airspeed commanded by the new elevator deflection.

The nose-down analogy is the same. Say you eased the stick forward to lose 100 feet of altitude. Positive, but not absolute, centering leaves the stick a little forward and the elevator a little more trailing edge down than before you nudged the stick forward, resulting in a descent.

So what do you do? At this point, it becomes a trial-and-error guessing game. You nudge the stick a little and see what results. Maybe you nail it, but more likely, you keep nudging forward and back until you get the elevator back to where you want it. Sounds like a lot of work, but it's probably something you do all the time without even thinking about it.

The range of locations the stick can occupy after being displaced is called the centering band. It's identified as a band because the stick can remain at any

position, hands-free, within the band. Because there's no freeplay in this example, the variety of positions the stick can occupy within the centering band means there's a corresponding variety of deflections the elevator can maintain with a hands-free stick within the band.

If this no-freeplay control system exhibited absolute centering, the stick would return to its pre-displaced position and so would the elevator.

Now let's add some control system freeplay or looseness between the stick and the elevator. Remember that freeplay is also a band. It's the range of control stick positions that don't cause a change in elevator deflection. *Slop* is the common slang. So now we're dealing with two bands. In this case, even if the stick centered absolutely, the elevator might not because of the looseness and friction in the linkage. After the example level turn, you still have to play the nudging game, hunting for the correct elevator deflection. Again, this tweaking exercise is something pilots do naturally to achieve level flight. We don't look for stick position; we look for airplane response—a zero vertical speed in this case.

...springs are nifty little gadgets, but they can introduce unintended consequences when added to a flight control system.

If the centering band is contained within the freeplay band, the behavior would be similar to the absolute centering case. The stick would return to the near edge of its centering band. Whether the elevator returns exactly to its original deflection can be affected by control surface balance and system looseness, but the usual culprit is control system friction.

If the freeplay band is contained within the centering band, the stick would return to the edge of its centering band but remain outside the freeplay band when you relax your pull. The elevator would remain at a deflection different from its original deflection, and the plane would be out of trim. Back to that experimental nudging.

Adding centering springs to ensure the stick absolutely centers might not solve the centering problem. Assuming the springs are strong enough to overcome

any control linkage friction, the stick should center absolutely. The springs may not help center the elevator if they're attached near the stick. Any looseness in the linkage between the springs and the elevator would still be subject to system friction. Nudge time.

Attaching those springs near the elevator should help center the elevator, but there's no guarantee the stick would center. The same looseness and friction explanation applies.

By the way, springs are nifty little gadgets, but they can introduce unintended consequences when added to a flight control system. You might solve your stick centering issue but then have to contend with increased stick forces and possible negative effects on the plane's apparent stability.

Centering issues are just as valid for the ailerons and rudder. Positive, but not absolute, centering can result in a hands-free residual roll rate or feet-free residual yaw rate leading to a small sideslip. If the airplane has a strong dihedral effect, this little sideslip could couple into a roll away from the sideslip, making it appear that more aileron deflection is needed, which could increase the sideslip due to adverse yaw leading to more...well, you get the idea. Two-axis nudgifest.

We'd all like absolute centering (and no freeplay), but we don't often get it. Fortunately, flying is a dynamic event, and we expect to be "in the loop" while doing it. We don't think about centering bands. We nudge and bump and continuously tweak the flight controls to make the airplane do what we want. And we probably do these things automatically without ever thinking about the flight control's mechanical characteristics, such as centering. But if you find it difficult to fly with the precision you expect, maybe it's not you. Check out the plane's centering characteristics.

Next time we'll finish the flight control mechanical characteristics discussion with breakout and friction forces. *EAA*

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




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