



2008 LIGHT SPORT & ROTORCRAFT BUYER'S GUIDE

100+ Aircraft · Ready to Fly and Super Fast Build · Helos and Gyros!

KITPLANES®

DREAM IT. BUILD IT. FLY IT.



Bird of Praise

ROTORWAY'S NEW A600 TALON

- Supercharged Performance
- Surprising Fuel Economy
- Fail-safe FADEC
- Who Needs Airports?

February 2008

HAPPY IN THE HANGAR

Make Your Spouse Your Building Partner

HARNESSING THE SUN

Solar Power For Your Workshop

GET YOUR ANTENNA UP!

Our Avionics Expert Offers Aerial Advice

Today's Composite Trick:
Remove Twist By Adding
Heat. (Seriously!)

\$4.99US \$5.99FOR



0 74820 08883 8

+ INTENSE ENGINE CARE UNIT

why wait until your engine is on the sick bed?

EDM 930

At a stunning 6x5 - inches the EDM 930 combines innovation, dependability and design with **MUST KNOW INFORMATION ABOUT YOUR ENGINE** and yet managing it all at your fingertips.

Functions included: Tachometer/Hobbs, Manifold Air Press, 4, 6, 7, 8, or 9 EGT/CHT, Oil Temp, Oil Press, Fuel Quantity electronics, Fuel Press, OAT/Carb. Temp, Volts/Amps, Differential EGT, Shock cooling, GPH, Fuel remaining, Endurance, Required to GPS waypoint, Fuel used and Percent of Horse Power.

Additional functions available:

Fuel Quantity probes Capacitance or Resistance, TIT, TIT-2, CDT, Volts/Amps-2

Find out more at : WWW.jpitech.com/930



J.P. Instruments Inc.

Toll Free:

800.345.4574

International: 714.557-3805

Fax 714-557-3984



The EDM 930 Records over 40 Functions at a user specified sampling rate for up to 500 hours. JPI's FREE download AND PLOTTING software allows you to analyze your data in the comfort of your own home.

Download your **FREE** copy at:
www.jpitech.com
www.jpinstrumens.com

J.P. Instruments Inc., PO BOX 7033, Huntington Beach, CA 92648

CONTENTS

February 2008 | Volume 25, Number 2



KITPLANES

THE INDEPENDENT VOICE FOR HOMEBUILT AVIATION



On the cover: Richard VanderMeulen photographed RotorWay's A600 Talon near the factory in Chandler, Arizona.

ANNUAL DIRECTORY, PART 3

- 27 2008 LSA AND ROTORCRAFT DIRECTORIES**
This year's installment covers 55 LSAs and 46 rotorcraft from 59 companies; compiled by Julia Downie.

FLIGHT REPORTS

- 8 ROTORWAY'S TALON**
Although it may resemble its predecessor, this new helo represents a significant evolutionary leap; by Steve Whitson.

BUILDER SPOTLIGHT

- 21 A GREAT COMPROMISE**
With a few simple steps and periodic reality checks, your marriage can survive the build; by Susan Brunner.
- 42 ALL ABOUT AVIONICS**
Part 9: Airborne antennas. Mistakes with your RF radiator can undermine good, hard work elsewhere; by Stein Bruch.
- 49 BUILD YOUR SKILLS: COMPOSITES**
Part 10: Repair of a twisted tail and more; by Bob Fritz.
- 68 COMPLETIONS**
Builders share their successes.

SHOP TALK

- 53 THE HOME MACHINIST**
Part 11: The boring head and the traveling rest; by Bob Fritz.
- 70 AERO 'LECTRICS**
Sunshine comes through my solar panel today; by Jim Weir.

DESIGNER'S NOTEBOOK

- 60 WIND TUNNEL**
Testing longitudinal stability; by Barnaby Wainfan.

EXPLORING

- 2 AROUND THE PATCH**
Going inside-out; by Marc Cook.
- 6 WHAT'S NEW**
New strobes, a smart servo and more; edited by Mary Bernard.
- 16 LY-CON O-RING TRICK**
Ly-Con makes a case for O-ringing engine crankcases leak free; by Tom Wilson.
- 26 PRODUCT REVIEW: LIGHTSPEED HEADSET**
Is the ANR Zulu headset good enough—quiet, cool, comfortable enough—to unseat Bose at the top of the class? By Jack Cowell.
- 72 LIGHT STUFF**
Back to the basics: our "new" aircraft; by Dave Martin.

KIT BITS

- 4 CONTRIBUTORS**
- 5 LETTERS**
- 64 LIST OF ADVERTISERS**
- 65 BUILDERS' MARKETPLACE**
- 75 THE CLASSIFIED BUILDER**
- 80 KIT STUFF**
Drawing on experience; by cartoonist Robrucha.

AROUND the Patch

BY MARC COOK



Going inside-out.

Building and maintaining an airplane is a series of monumental steps separated by a long train of mundanities. Make great strides only to be held back or derailed by some seemingly picayune detail that requires more than its fair share of your time and consideration. Stuff happens.

And so it is with my Glastar Sportsman. Since early 2006, when I began using it for more than local test flights and general goofing-off near home, I have been ever so slightly annoyed by its com-radio performance. While it's hard to fault the features of the Garmin SL30 that is my primary com radio—an Icom handheld is the backup—I've long felt that the overall performance was suffering at the hands, er, make that ears of the antenna. Symptoms: Often, flying in the desert Southwest, I would lose communication with air-traffic control when other airplanes at my altitude wouldn't; twice I had what sounded like serious p-static encounters—loud “white noise” static overcoming the receiver; and my TruTrak autopilot would invariably do a mild pitch-up when I transmitted in the lower third of the com band. For the most part, the system worked, but I recently grew weary of having to open the SL30's squelch to keep in touch with ATC.



No better way to spend a weekend than running extra coax cable down the wingstrut, through the ribs... Wait, can I hear the options again?

Like many who own composite (or, in the case of the Sportsman, partly composite) aircraft, I followed the herd and used an internal copper-foil dipole antenna bonded to the inside of the vertical stabilizer. In truth, I had good luck with such a setup in my Pulsar, but it was totally composite; the Glastar has an aluminum rudder and horizontal tail group very near this internal antenna. Attempting to fix the autopilot-interference problem, I relocated the coax runs in the cabin. They originally came down the ship's centerline behind the panel, right under the autopilot-servo plate, and then back to the tail. Several hours of work to move the cables away did nothing to help the RF interference issue. Hmmm.

Finally, I found myself drilling through the top of my wing and installing an R. A. Miller com antenna. In fact, as a big fan of symmetry, I mounted two, as far inboard as I could get them without running afoul of the fuel tanks or flap-actua-

tion hardware. The bases ended up one bay inboard from where the top of the strut enters the wing, making it a natural to run the coax down the strut.

In the interests of science, I flew with the right seat removed and all the old coax accessible while in flight. I wanted to see if there was any measurable difference. Turns out, there was.

The SL30 has a cool signal strength display you can watch in flight. I tuned to an automated terminal (ATIS) transmission some 40 n.m. away. Heading straight at the station, the tail antenna posted 43 on the display; the center antenna about the same. The new wing-top antenna gave a 65. Facing directly away from the station, the tail antenna dipped to 40 and the signal was noticeably weak. The stick antenna on the wing was dramatically better. Same deal after testing transmit strength with a Flight Service Station—the external antenna provided the best transmit signal. So far so good. For the final test, I engaged the autopilot and tried transmitting briefly on a number of low frequencies in the com band. No pitching artifacts. Nothing. Brilliant!

Bear in mind, this is one data point. It's possible the antennas were improperly installed—the copper tape in the tail was done before I began the project—or there was something wrong with the feedlines that I managed to work around with the new installation. Hard to say, except that I won't be going back to the old way any time soon.

And the Survey Says...

Spend a moment, if you would, to take our new online survey. This is a full questionnaire, the likes of which we haven't done since 2002. Your responses will help us improve our content: We can't give you what you want unless we know what that is! Find the survey at www.kitplanes.com/survey.htm. †

Marc Cook has been in aviation journalism for 19 years and in magazine work for 25. He is a 3900-hour instrument-rated, multi-engine pilot with experience in nearly 150 types. He's completed two kit aircraft, an Aero Designs Pulsar XP and a Glastar Sportsman 2+2.

Leistung

[PERFORMANCE]



PERFORMANCE • INGENUITY • RELIABILITY

Our XP Series is now international.

Superior Air Parts, Inc., now a division of Thielert AG of Germany, brings a new level of manufacturing expertise to the aviation industry. Thielert precision parts and state of the art machining have long been associated with the performance racing industry and are well known in the Formula 1, GT Series and Indy Racing League. Reliability and performance factors developed in this high-stress engine environment have transferred enhanced technology to our new breed of piston aircraft engines. Superior's XP Series of engines present the best performance and reliability available in today's experimental aviation industry. Plus, you have the option of building it yourself at Superior's Engine Build School.

SUPERIOR
AIR PARTS, INC.



AMERICAN INGENUITY • GERMAN TECHNOLOGY

www.xp-series.com

800-277-5168

CONTRIBUTORS



SUSAN BRUNNER

Susan spent seven years with her husband building their Lancair IV-P. Her administrative expertise was invaluable for Internet searches and acquisition of parts during the build process. Her AutoCAD skills and education as a draftsman made designing the nose gear landing light and the paint scheme easier. She was co-writer and presenter of the 2007 Golden West EAA forum "Can Building Your Plane Be a Family Affair?" Her story begins on Page 21.

STEVE WHITSON

Rotorhead Whitson, most recently a stalwart at *Private Pilot* magazine, put his piloting skills to the test at the RotorWay factory in Chandler, Arizona. Although it had been awhile since he'd seen action in a RotorWay, Steve acquitted himself well in the company's new A600 Talon. His flight review begins on Page 8.



TOM WILSON

KITPLANES® newcomer Wilson has more than 25 years' experience writing about high-performance technical matters, mainly in the automotive realm—we'll forgive him for now. His aviation experience started as a line-boy while in high school but now includes flying a raggedy 540-powered Starduster Too. He hopes to eventually afford avgas. (Don't we all?) His story, which includes some great on-site photography, begins on Page 16.

BACK ISSUES:

Call 800/622-1065

WEB SITE INFORMATION:

General homebuilt aircraft information, back issue availability, online directories ordering info, plus a KITPLANES® article index and selected articles can be found at www.kitplanes.com.

Unsolicited manuscripts:

Are welcome on an exclusive basis, but none can be acknowledged or returned unless accompanied by a stamped, self-addressed envelope. No responsibility is assumed for loss or damage to unsolicited material.

KITPLANES® (ISSN 0891-1851) is published monthly by Aviation Publishing Group, LLC, an affiliate of Belvoir Publications, 800 Connecticut Avenue, Norwalk, CT 06854-1631, Robert Englander, Chairman and CEO; Timothy H. Cole, Exec. Vice Pres./Editorial Director; Philip L. Penny, COO; Greg King, Exec. Vice Pres./Marketing Dir.; Marvin J. Cweibler, Senior Vice Pres., Marketing Operations; Ron Goldberg, CFO; Tom Canfield, Vice Pres., Circulation; Michael N. Pollett, Sr. Vice Pres., General Counsel.

Periodicals postage paid at Norwalk, CT, and at additional mailing offices. Copyright ©2008 Aviation Publishing Group, LLC. All rights reserved. Reproduction in whole or in part is strictly prohibited. Printed in USA. Revenue Canada GST Account #128044658. Canada Publishing Agreement #40016479.

Subscriptions: One year (12 issues) is \$29.95 U.S. \$41.95 in U.S. funds in Canada, includes GST. \$41.95 in U.S. funds for Foreign Surface Mail or \$57.95 in U.S. funds for Foreign Air Mail. Single copy price \$4.99 U.S., \$5.99 Canadian.

POSTMASTER: Please send address changes and subscription inquiries to:

KITPLANES®, P.O. Box 420235, Palm Coast, FL 32142-0235 or call 800/622-1065.

KITPLANES® is a registered trademark of Aviation Publishing Group, LLC.

EDITORIAL

Editor-in-Chief Marc Cook
editorial@kitplanes.com

Managing Editor Mary Bernard
Art Director Suzanne Stackle

Senior Editor Dave Higdon

Contributing Editors Ken Armstrong, Walter Atkinson, Stein Bruch, Dan Checkoway, Cory Emberson, Bob Fritz, Geoffrey Jones, Tim Kern, Howard Levy, Rick Lindstrom, Dave Martin, Dick Starks, Barnaby Wainfan, Jim Weir, Ed Wischmeyer

Webmaster/Data Manager Julia Downie
Cartoonist Robrucha

ADVERTISING

Publisher/Ad Director Cindy Pedersen
cindy@kitplanes.com

Sr. Advertising Manager Chuck Preston
chuck@kitplanes.com

BUSINESS OFFICE

531 Encinitas Blvd., Suite 105, Encinitas, CA 92024
Main Number: 760/436-4747, Fax 760/436-4644
Editorial: 562/608-8251

PRODUCTION & CLASSIFIED ADVERTISING

Production Manager Marsha Blessing
717/433-7985 ads@kitplanes.com

CIRCULATION

Circulation Director Lisa Evans
Circulation Manager Laura McMann

SUBSCRIPTION DEPARTMENT

800/622-1065; 386/447-6318
www.kitplanes.com/cs
Box 420235, Palm Coast, FL 32142-0235
For Canada: Box 7820 STN Main, London, ON N5Y5W1

BACK ISSUES

P.O. Box 420235, Palm Coast, FL 32142-0235
800/622-1065
www.kitplanes.com

QUALITY REPRINTS AVAILABLE

Minimum Order: 500
Contact Mona Kornfeld, 203/857-3143



**CHANGE OF ADDRESS?
MISSING ISSUE?
SUBSCRIPTION QUESTION?**

**Visit www.kitplanes.com/cs.
Or call 800/622-1065
from the U.S. and Canada.**

**Foreign, call 386/447-6318
or fax 203/857-3103.**

LETTERS



EDITORIAL@KITPLANES.COM

Shopmaster Shop Talk

Dear Bob Fritz: I have the opportunity to purchase a Shopmaster Lathe/Mill combination similar to yours, but a 1998 model which has never been used for about half the price. Grizzly also makes a similar model. The main difference seems to be smaller motors, $3/4$ horsepower. In your June article you stated that “you don’t want a wimpy half or three-quarter horsepower motor.” Should I consider purchasing this unit or hold out for the new model, which is over my budget? I have an old 6-inch Craftsman lathe which I use quite a bit, but it is pretty worn out. I would like to have the versatility of a mill.

TONY JURCAN

Bob Fritz responds: “1998? Never used? Try it out. But the lubricants are likely to be caked or dried, so do a careful check to see that things move that should, and things stay steady if they should. If everything works, the travel is smooth and the quill extends all the way (about 3 to 4 inches), and you can fit the collets in the quill, buy it. Shopmaster has a reputation of inconsistent manufacture. For instance, on mine, only the collet that came with it would fit; it had an extra-narrow indexing groove and key. I had to use a file to reduce the key. You can always upgrade the motors for about \$100 each, though you probably won’t need to.”

Tool Post Question, Answer

The KITPLANES® articles (Home Machinist) in the issues were great. I bought a Shopsmith, and the toolpost is not very good as you said in your article. Question: April 2007 issue, Page 50, shows an upgraded toolpost, which you said was a good upgrade. What model is it and where can I buy it?

RICK BRISTOL

Bob Fritz responds: “That toolpost is from Enco (www.useenco.com). Just go there, do a search for P/N 505-2253 and/or Page 366 and you’ll see it. There are two types, piston and wedge. Either is fine for the home machinist. They added a caveat that the T nut might have to be machined, but I found that I could strip out the parts from the old one and fit them right onto the new one.”

Help for the FEW

With regards to the recently featured article about Legendary Aircraft TF-51: For those who are building or considering building a Legendary Aircraft (formerly Fighter Escort Wings) P-51, there is a builders forum hosted at the Matronics web site, www.matronics.com. Check out the site and join the forum for info from those who are either working on or have completed their projects.

DARREN HENLEY

Gonna Go Fishing and Catch Me a Trout

I don’t see Fisher Flying Products in your recent kit aircraft directory issue. Did I just miss it?

MARK NAVRATIL

Fisher is still with us, but has decided to sell only as plans. As you probably noticed, the company was included in the January issue.—Ed.

Fractionally Incorrect

I saw Marc Cook’s write-up on the PS Engineering PMA9000EX. He said that the front-panel jack is a 3.5mm ($1/8$ inch), but the unit I looked at and PS Engineering’s own web site say it’s a 2.5mm ($3/32$ inch) jack. What’s up with that?

JOE RAMONA

Call it a matter of seeing what you want to see. When I looked at the photos recently and at the device at Oshkosh, it sure seemed like a 3.5mm jack. But the new unit inputs music from a USB stick through this port, and so it needs to have four conductors; that, says PS Engineering’s Mark Scheuer, meant keeping the smaller jack. Good news is that the company sells an audio patch cord with one small and one large plug, so you can plug your iPod right in.—Ed.

Save 51% Now!

The FAA and EAA are currently reviewing the “51% rule” and rewriting instructions to enforce it in a way that can impact your business. Efforts to make the rules more sane and safe have been ignored. What is needed at this time is political and economic pressure to get their attention. Please check out www.buildersassistance.com and send a message to the EAA and your elected officials to help turn the tide. Pass this information on to everyone you know in the Experimental aircraft community. These rules, on average, are reviewed every 15 to 20 years. The opportunity now presents itself. Generating a large number of letters is one key to success.

LEN FOX

For more on test pilot Fox’s philosophy on how the Experimental/Amateur-Built rules ought to work, check out his “Unusual Attitude” essay in our September 2006 issue.—Ed. †



NEW STROBE LIGHTS

Kuntzleman Electronics has announced some additions to its line of anti-collision strobe and LED position lights. The round tail light with strobe (TL-STR) weighs 4 ounces, mounts vertically or horizontally in a 2- or 1.4-inch hole (depending on whether it's on center or a diagonal centered hole) and requires a separate strobe driver. The price is \$90. A round tail light with LED (TL-LED) weighs 2.6 ounces, with an exposed height of 1.4 inches. No center hole is needed for mounting, and it draws 0.3 amps at 14 VDC. The price is \$90. The round combo tail light with LED and strobe weighs 4 ounces, can be mounted much the same as the round tail light with strobe, and requires a separate strobe driver. The price is \$130.

For more information, call 610/326-9068, or visit the web at www.KEstrokes.com. A direct link can be found at www.kitplanes.com.

MICRO BELTSANDER

Prox-Tech, the North American distributor for Proxxon tools, announced that it is now offering a new micro belt sander. With a sanding belt located flush on the left side, the sander allows surfaces to be sanded "right down to the corner," the company says. A fine adjustment for the rollers also prevents the belt from running off the side. A spring clamping system eases the replacement of belts without tools, and the sander is packed in a sturdy plastic carrying case with five each of 120-grit and 240-grit belts.

The sanding belt measures approximately 1.5 by 10.5 inches, with a sanding surface of approximately 2.3 by 1.5 inches. Belt speed is 525 fpm, and the sander weighs 1.54 pounds.

The price is \$155. For more information, call 828/326-0326 or visit the web at www.proxxon.com/us. A direct link can be found at www.kitplanes.com.



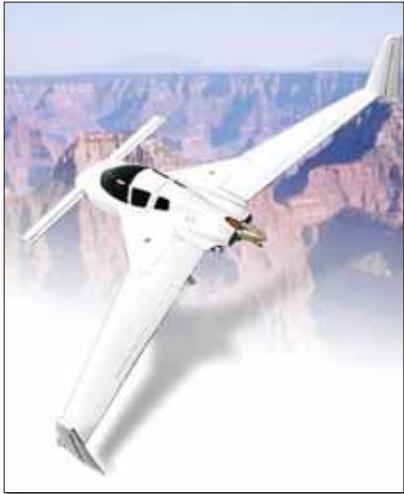
SMART SERVO CONTROLLER

TCW Technologies' Safety-Trim offers an electronic speed control system for standard electric servos found on many homebuilts. It can replace other controllers and relay modules with an electronic solution that may resolve issues such as runaway trim or failure-to-operate conditions. The unit also simplifies trim switch wiring, especially for pilot and copilot switches, the company says.

Features include: a reverse function switch that allows the pilot to recover from a stuck or failed trim switch, short-circuit-proof design, one-axis, two-axis or two-speed preset models, and servo travel limited to 3 seconds per trim switch actuation. This unit is for Experimental aircraft only and has not been TSO'd.

Prices range from \$285-\$445. For more information, call 610/390-7195 or visit the web at www.tcwtech.com. A direct link can be found at www.kitplanes.com.

To submit a press release on a homebuilt-related product, e-mail a detailed description and high-resolution photograph to editorial@kitplanes.com. Mailing address is KITPLANES®, New Products, 203 Argonne Ave, Suite B105, Long Beach, CA 90803. Visit www.kitplanes.com/freeinfo.asp for information on "What's New" items and advertised products. Select the issue in which the item appeared, and then select the categories of information or individual advertisers you're interested in. You'll receive an e-mail.



COZY MODEL

Aircraft Spruce now offers a 1:32 scale model replica of the Cozy Mark IV Experimental aircraft. Manufactured from composite resins, the model is sure to hold its shape, and starting from a CNC-machined master copy developed from plans ensures adherence to the specifications of the original design. Production

copies were cast in special tooling and are hand-finished for accuracy.

The model features a retractable nosegear, painted propeller and night lights. No assembly is required. The wingspan is 10.5 inches, and the model stands 3.6 inches high, perfect for any shelf or desktop.

The price is \$95. For more information, call 877/477-7823, or visit the web at www.aircraftspruce.com. A direct link can be found at www.kitplanes.com.



TAILDRAGGER OPTION FOR FOX

Rollison Light Sport Aircraft has recently announced that the Eurofox SLSA is now available as a taildragger. Previously it had only been available in the U.S. and Canada in a trigrar configuration, though the taildragger has been available in Europe for many years. The 2007 version features a redesigned composite main landing gear with wide-spaced wheels to help crosswind landings and takeoffs, also enhancing ground handling.

The company says that as taildraggers go, the forward visibility is very good, and with the clear polycarbonate doors, the side visibility is exceptional. The Eurofox also features a dual toe brake system and larger, heavier duty tires, which allow the plane to fly into some areas others may not be able to access. The wings may also be folded for storage or transport.

For more information and pricing, call 812/384-4972, or visit the web at www.eurofox-usa.com. A direct link can be found at www.kitplanes.com. †

Got An Opinion?

Take Our Exclusive
Online Survey



As KITPLANES® enters its 25th year of publishing we're interested in what you think. And we have a simple way for you to express your thoughts.

How? Visit us online at www.kitplanes.com/survey/2007.htm and take our online reader survey! From now to February 15 we'll be asking for:

- YOUR INPUT
- YOUR OPINIONS
- YOUR COMMENTS
- YOUR IDEAS

We have lots of questions and only you have the answers. Questions like:

- What kind of aircraft are you building or have you begun building?
- What can we do to help you make more informed purchasing decisions?
- What three factors are the most important considerations in your avionics or instrument selection?

Help us continue to make KITPLANES® the nation's leading magazine for the serious builder. Thanks in advance for your assistance!

[WWW.KITPLANES.COM/
SURVEY/2007.HTM](http://WWW.KITPLANES.COM/SURVEY/2007.HTM)



FLIGHT REVIEW



ROTORWAY'S TALON

Although it may resemble its predecessor, this new helo represents a significant evolutionary leap.

BY STEVE WHITSON



With a flourish, RotorWay announced a new helicopter last summer to replace the venerable—and consistently popular—Exec 162F that had been the company's mainstay for years. The new ship, called the A600 Talon, features a number of improvements to the basic 162F design—the short list includes

a larger cabin, revised tailrotor power system, new instrumentation and a host of smaller changes to improve the ship's utility. While the Talon looks much like the 162F, they can almost be called two different helicopters.

The Talon is the latest iteration in a series of helicopters that goes back to 1961, when B.J. Schram put a 40-horsepower motorcycle engine into a frame

and got off the ground vertically...sort of. It took six years, but in 1967 the Scorpion became the company's first production kit. It could be built by the owner, and it actually flew. Over the years RotorWay has taken the basic design, improved it, simplified the building process and extended the life of all of the critical components. With more than 1600 kits sold, and more than 700

flying, RotorWay's line is a genuine success story.

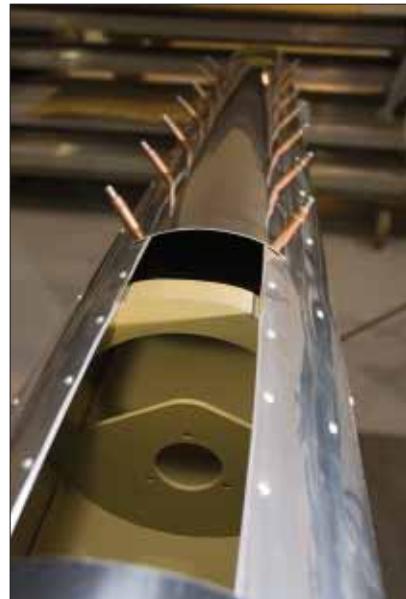
Over the last 40-plus years, RotorWay has been at the forefront of many aviation advances. The company's engineers incorporated elastomeric bearings in the main blades, which damped vibration and made the life of the blades much longer. They gave up on the available engines and built their own, incorporating a FADEC (fully automatic digital electronic control) system in 1994, before NASA started the research for just such a system.

The Talon's FADEC is the latest improvement and is best described as a closed loop system. The new engine—a very distant cousin of the venerable Volkswagen flat-four—has sensors that monitor all key engine parameters including the four EGTs and CHTs, coolant temperature, manifold and atmospheric pressures, oil pressure and temperature, and some others I forgot. These data are input to the computer, which in turn controls the ignition dwell and timing

as well as the amount of fuel inserted into the cylinders. Unlike common aircraft fuel-injection systems, which squirt fuel into the intake ports even when the valve is closed, the RotorWay's is more like a modern car's: Its electronic injectors are pulsed to meter fuel. The fuel-rail pressure remains constant, but the duration of injector opening determines fuel flow. Moreover, for extra safety, the Talon has two FADEC systems operating at all times—one is the main system, which is more "intelligent" and capable, and another "piggyback" system that is up to running the engine alone but has fewer inputs and creates a less fine load/fuel map; the standby FADEC's system also has fixed ignition timing.

This FADEC system is doubly important to RotorWay given that the company allows, recommends actually, that a high quality 92 octane automotive gas. Company president Grant Norwitz explained that auto fuels aren't controlled like their aviation counterparts, so while the sign on the pump may say 92 octane, it could be much lower. The company's research has shown that some fuels can be as much as 10 points below their advertised rating, which can cause various levels of detonation. Detonation, we all know, is bad news for any engine. With RotorWay's FADEC system, the CPU will alter the timing to accommodate low-octane fuel. The pilot will note a decrease in performance, but there will be no catastrophic failure.

Power from the engine gets to the blades through a transmission, via a set of belts, and thence to the main-rotor shaft. In this secondary drive, the Talon uses a cog belt instead of the oil-bath-enclosed chain on previous models. While we're talking about the transmission, the clutch assembly is now activated by a hydraulic ram that gets its power from the engine oil pressure. However, there's sufficient tension for the clutch to stay engaged without any oil pressure. The main rotor can be easily disconnected for engine work, and there's a mechanical complement in the clutch for autorotations. There is also a shaft drive for the tailrotor instead of the series of belts on previous models.



One of the improvements made in the Talon is the use of a shaft drive for the tailrotor. You can see the guides that the shaft will fit through in this unfinished tailboom.

Revised On the Outside, Too

As one approaches the Talon, the most striking exterior change is apparent. The ship stands 4 inches higher, with skids that are further apart and longer. This wider and longer coupling will make for safer landings, with much less of a chance of excessive rolling. It's subtle, but the stance of the ship on the ground now makes the angle of the main-rotor mast much closer to vertical. As the instructors and their students departed RotorWay's school, the Talon lifted off in a noticeably flatter attitude without the rocking we've seen.

Climbing in through the wide doors (no changes there), two things are striking, especially to those with experience in RotorWays. One, your butt will love the new leather-covered seats; two, your eyes will be drawn to the instrument panel. No longer is it covered with steam gauges; the Talon has entered the 21st century with a glass display manufactured by MGL Avionics of South Africa. The pilot can set the screen to many different scenarios, showing the engine and flight parameters desired as well as the GPS output. Also, perhaps a small thing, they've installed inertial



Grant Norwitz, the new majority stock owner and CEO, stands in front of RotorWay's new 44,000 square foot factory. Along with making many improvements to the ship, the new management team has established overseas partnerships with an eye on certification.

seat belts, which will contribute to comfort and safety.

The instrument display is coupled to the FADEC, so any difficulty noted by the computer will automatically show up, giving the pilot definitive data to make the land/continue decision. Later, if the pilot desires more information and/or assistance, the last 900 hours of flight data can be downloaded to a PC and transmitted to the RotorWay factory. There, the experts will diagnose and, if the computer is hooked up to the engine, adjust the CPU via the Internet—just what you need when you're stuck in the Australian outback.

Building the Helicopter

The documentation supplied with any aircraft kit is of vital importance. RotorWay provides builder's books, blue-



The main-rotor blades are built, balanced and painted at the factory. Once installed, they should require only minimal on-ship tracking and a fine balancing.

prints and DVDs (a little over 10 hours total for the series) to make the project about as easy as possible to build. We read the books, examined the prints and watched the DVDs. They are all correlated to each other, and the DVD tells you what to assemble for the segment under construction. Having a DVD, in lieu of just written documentation, is a

real plus. It's one thing to say, "File the bushing and make sure it's square to the fuselage" and quite another to read that and then watch the DVD, where the bushing is filed and then checked for square by installing a bolt and examining for a gap between the bolt's head and the filed bushing's side.

We also liked having a video to assist in the visual identification of the various components. A part may have the most distinctive name imaginable, such as "left engine cover," but a picture of it makes for a lot more peace of mind. Given that many, if not most, of RotorWay's customers are new to the building process, some of the videos may be a little overdone in their detail and simplicity for the accomplished builder. But the engineers know there are a lot of non-pilot customers who won't have much of a background in aviation, building or even mechanical aptitude. Thus little things like a demonstration of hitting a piece of wood with a hammer to drive in the landing-gear plugs seem pretty basic. Better too much information than not enough, we always say.

Prior to shipment, the engine is run-in on a dynamometer, the main blades are balanced, the tailboom is finished except for inspection panels, and the fuselage frame is completely welded. What the builder is doing is assembling the components. Even the fiberglass body panels, which are laid up by hand, are complete and need only be assembled to the fuselage. Nuts, bolts and sundry items are packaged in transparent



The RotorWay engine comes with an optional supercharger, and is seen here being assembled by Carl Kelley. Horizontally opposed and liquid cooled, it contains one of the first FADECs in aviation.

shrink-wrapped packages to be opened only when needed for the specific sub-assembly being built. Aircraft-specific tools, such as Cleco pliers (and sufficient Clecoes) are supplied. They say the only things not supplied are the paint and avionics. Even with all this, the ship still qualifies under the "51% rule" for builder maintenance, and as with any helicopter, periodic maintenance is vitally important. Incidentally, the company estimates the average build time to run between 450 and 600 hours.

What's in the Box?

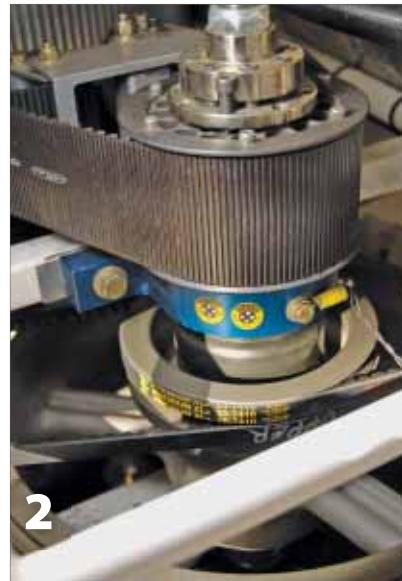
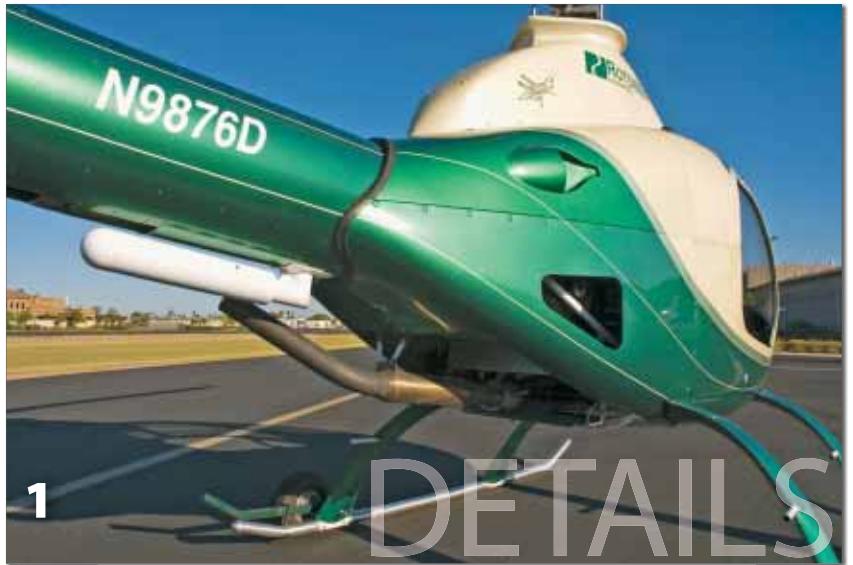
The kit can be purchased as a unit, but many customers prefer RotorWay's four-step program. This allows the builder to save space, and not have to find room for all the crates. The first shipment includes all the documentation, i.e., manuals, blueprints and templates, and the videos. Hardware-wise there's the airframe, tailboom, landing gear, ground handling wheels, engine mount, fins, cyclic, collective, pedals, fuel tanks and heat shields. The second group has the rotor system, main shaft assembly, and most of the fuselage components. The third shipment comprises the main and tailrotor drive assemblies, the fan, oil and water cooling systems, hydraulic tensioner, fuel pumps, tailrotor, digital display, engine and flight instruments. Lastly, there are the rotor blades, engine and FADEC system.

—S.W.

Learning to Fly

I recall a fellow at my home airport trying to teach himself how to fly his RotorWay. At the time I was flying a Hughes 269 some 5 hours a day, so I was fairly proficient. The maneuverings of his ship made me hide behind a thick concrete wall. To avoid these problems, RotorWay has developed a three-phase training program, which is conducted at the company's flight school, located at Stellar Airpark, in Chandler, Arizona. The first phase is attended when the customer's helicopter is about 90% complete, and it covers hovering and ground operations as well as what to look for during the final rigging of the aircraft.

This brought up the dreadful thought of a new engine being pounded at high power settings for hours at a time—especially in Arizona. Norwitz said that wasn't a problem, because the engine is liquid cooled and engineered for just that operating environment. He went



1. The Talon's proprietary four-cylinder engine is well cooled. The white tube under the tailboom is movable ballast, which can be placed on the nose of the landing skids. 2. RotorWay's original main-rotor drive was a chain in an oil bath. This has been changed to a cog belt, i.e., one with teeth. 3. A concession to the pilot's comfort, the seats in the Talon have been redesigned to look and feel like a race car's. 4. Gone are the steam gauges of yesterday. There's now a glass display that can be set by the pilot to show the engine data, flight parameters and GPS output.



A600 TALON

Price with engine	\$94,700
Estimated completed price	\$96,000 - \$110,000
Estimated build time.....	450 - 600 hours
Number flying (at press time)	1 (plus 700 162Fs)
Powerplant.....	RotorWay RI 600N, 147 hp
Powerplant options.....	RotorWay RI 600S supercharged

AIRFRAME

Disk span.....	25 ft
Disk area	491 sq ft
Fuel capacity.....	17 gal
Maximum gross weight	1500 lb
Typical empty weight.....	965 lb
Typical useful load.....	535 lb
Full-fuel payload	436 lb
Seating capacity.....	2
Cabin width	44 in

PERFORMANCE

Cruise speed	100 mph (87 kt) TAS, 8.0 gph
Maximum rate of climb	1000 fpm
Hover in ground effect	6000 ft
Hover out of ground effect.....	4000 ft
Service ceiling	10,000 ft

Specifications are manufacturer's estimates and are based on the configuration of the demonstrator aircraft. As they say, your mileage may vary.



The part that makes the ship go in the correct direction is the swash plate. It can be seen here with the two rods going from it to the blades.

on to say that he had been assisting in some engine research and hovered the ship for about 2 hours nonstop with an air temperature of 107° F.

The second phase of training comes after the student is proficient at hovering and introduces him/her to landings, takeoffs, cross-country and pattern work. The last phase is a final check-ride for the Private Rotorcraft license. If desired, supplemental training can take the student to the Commercial rating.

The Company

RotorWay has gone through a series of owners in its history. It started with B.J. Schram, was improved under Stretch Wolter and John Netherwood, and became an employee-owned company in 1996. In 2007, the company was sold to Norwitz and a group of deep-pocket international associates. This wasn't an impulse buy; Norwitz had run the company for a year prior to purchase, had been associated with it for two years prior to that, and he built his own RotorWay in 2003.

The intent of this group is to take the company to the next level, as its members are fond of saying. Immediately, this would mean an increase in

90-Day Money-Back Guarantee!

- ✓ Complete Digital Engine & Aircraft System Display
- ✓ Enhanced TFT Color Display for sunlight viewing
- ✓ Remarkable Data Recording: .33 second to 6 minute Intervals. Store over 3,330 hours at 30 second intervals! (Download via the USB)
- ✓ Upload New Features & Updates via the USB Port to keep your Instrument from becoming obsolete



Electronics International Inc.

Call Toll Free (877) 318-6060 or Visit www.Buy-Ei.com

Got the fuel & traffic blues?

turn a 45min commute into a 15min flight!



The **HELICYCLE™**
Turbine Powered

Low Maintenance,
Low operating costs,
& Performance longevity

go to Hellicycle.com
&

Order our \$10 video package today!

Eagle R&D LTD CO. PH (208) 466-4120

2512 Caldwell Blvd. Nampa, Idaho USA 83651

production from its present two ships a week and more sales overseas. A plant has been established in Cape Town, South Africa, where kits will be assembled and the helicopters sold that way. The countries that allow the sale of a pre-built Experimental aircraft include India, China, Brazil, Peru and others.

International trade is not for the faint of heart, so RotorWay has established development partners who are assisting in the process. Augusta Westland is cooperating, and has provided a great deal of assistance in development, partnering, quality control, R&D and establishing the South African subsidiary. Also on board is the Denel Company, a major manufacturer of helicopters for the South African military.

The owners have already made some large steps in expanding the company. The factory has moved about 3 miles away from its former location into an environmentally controlled, 44,000 square foot building. A nationwide dealership network is being established, which will provide parts, builder assistance and sales. The first dealership has been given to Ed DeRossi in upstate New York. DeRossi is enthused about the possibilities. He has his own RotorWay and does builder assistance for those who live in his area.

As for media reports on the certification of the helicopter, Norwitz, and those of you who followed the travails of Cirrus' and Lancair's certification process, know this is a number of years away. In the meantime, the company focuses on the Talon, which has seen a modest price increase from the 162F. The complete kit—less radios, paint, freight and flight training—costs \$94,700 including the engine and FADEC. Options include a cargo container, lights and something called AICS (altitude induction compensation system, a supercharger) for \$5000.

Our Flight

For comic relief, one of the pilots, John O'Neill, opted to see if I had improved any in the last few years since I had been



at RotorWay. We lifted off and flew to an abandoned military field just a few miles to the south. The visibility in the Talon is excellent, and with the doors off you have the feeling of flight without any support. The trick is to use the spinning rotor disk, which appears as a blur ahead, as your reference mark for turns and level flight. The controls are quick and, like most, I overcorrected, though I didn't think a 60° bank was too bad.

O'Neill did an autorotation, and the descent rate was brisk but certainly nothing that would upset a passenger. Trying to hover, I immediately remembered how old and slow I was becoming. Flying a helicopter is primarily balance and feel, so I was all over the place for the first few minutes. Once I stopped manhandling the cyclic, the ship stayed in one place, though admittedly a fairly large place.

The throttle is mechanically coupled to the collective, so raising the collective increases the throttle and vice versa. Some small input was required, but for the most part it was minimal. The tailrotor controls were sharp and definite. Because most of my time was in a

Hughes 269, I consciously compared the two. The only real difference I noted was the lightness of the RotorWay, something like the difference between a sports car and a minivan.

Payload and range have always been an issue with helicopters. Their less than stellar miles-per-gallon numbers make for a regular trade-off between what you can carry and how far you can go. As for the Talon's performance, it will haul a couple of 200-pounders, plus about 30 pounds of baggage and will stay in the air for almost 2 hours, providing you're at cruise speed. How fast? Normal cruise is listed as 87 knots true, with 100 KTAS as the top speed. That's within 10 knots of the Robinson R-22, which will burn more fuel per hour.

So it seems as though RotorWay is on a strong forward march, improving the ship, expanding production capability and looking ahead to enticing more fixed-wing pilots into the fold. †

For more information, call 480/961-1001, or visit the web at www.rotorway.com. A direct link can be found at www.kitplanes.com.

DYNON AVIONICS

Affordable Glass Cockpit Avionics



On board
SpaceShipOne
and thousands
of other aircraft!

Electronic Flight Information Systems



EFIS-D10A
\$2200

EFIS-D100
\$2400

Engine Monitoring Systems



EMS-D10
\$1700

EMS-D120
\$2000

Combined EFIS & EMS



FlightDEK-D180
\$3200

What's New?



New EFIS Symbology - Free

Pilots can now set the EFIS to either display Dynon's popular Classic EFIS presentation or our new Modern style. The Modern style incorporates new airspeed and altitude tapes, trend indicators, a graphical VSI, winds, digital heading readout, plus a CDI and glide slope. Other enhancements include altitude alerter, field elevation memory, lower airspeed thresholds, GPS ground track and a Tach/MAP info item.

New EMS Features - Free

All EMS units now are equipped with data logging, % power, peak condition detection, fuel tank fill autodetect, an analog fuel flow dial and the ability to set a minimum red line for tach and oil temperature on engines with such minimums like the Rotax.



Heated AOA/Pitot - \$450

Dynon is shipping the heated version of its popular AOA/Pitot design. This all-new design intelligently manages power to regulate temperature and outputs a warning signal anytime the system is not activated or functioning properly.



HS34 HSI Expansion Module - \$650

Now available in both the vertical and horizontal mounting configurations, the HS34 expands the type and number of navigation signal inputs to the HSI function on any of Dynon's EFIS products. Multiple nav devices like the Garmin SL30, GNS430/530 or other popular GPS devices can be connected simultaneously to permit the pilot to actively select the best one for each segment of the flight. This module additionally provides dedicated controls, system-wide synthesized voice alerts, automatic screen dimming, a barometer adjust knob, and more.

All Products Back in Stock !

With production capacity doubled over the past year, Dynon is in a better position than ever to meet the growing demands of the market.

Bi-Directional DSAB - Free

Connect multiple Dynon systems together to share display screens, alarms and controls.



DYNON AVIONICS

www.dynonavionics.com

(425) 402-0433



Looking like it grew there, a line of O-ring material snakes its way along the case sealing surface. Pioneered by noted engine house Ly-Con, the new procedure promises to end chronic weeping of Continental and Lycoming case parting lines.

CASE CLOSED

Ly-Con makes a case for O-ringing engine crankcases leak-free.

BY TOM WILSON



Key to the O-ring procedure is Ly-Con's spanking-new Haas VF6 CNC machining center. Repeatable to 0.0002-inch and faster than Darryl Greenmyer, the 10,000-rpm, 20-horsepower Haas unit and its computer controls are the only way to handle the variables in 60 years of Continental and Lycoming production.

No one likes oil leaks, and after decades of snotty-nosed flat motors California engine shop Ly-Con is doing something about it. Taking a cue from everything from various round motor pieces to numerous flat-engine cover plates and accessory parts, Ly-Con has developed a system for O-ringing Lycoming and Continental crankcases.

Probably the most appreciative will be Ly-Con's helicopter customers. Ly-Con owner Ken Tunnell says no matter how well his shop seals the vertically mounted engines, about half of them end up leaking along the case parting line. The problem is so well-known by the chopper crowd that most commercial operators slather JB Weld or other Band-Aids around the case parting line before installing an overhauled engine in the airframe. "It's going to start leaking in 300 to 500 hours," they explain as they spread the unsightly stuff.

Fixed-wing fliers also commonly suffer from engines whose case halves perpetually weep between the starter and alternator, but at a lesser rate than the helo drivers. Still, at least 10% of the flat engines out there are busy oiling everything firewall forward—and, eventually, several items aft—and wouldn't we love to get rid of that mess? Come overhaul time, everyone would appreciate a guaranteed leak-free job, hence the new O-ring procedure.

Thread of a Chance

Both Continental and Lycoming seal their cases using a combination of Hylo-mar brand sealant and a length of silk thread laid between the case parting flanges. It's a time-honored system typical of pre-war powerplants, and it does keep the cases from oozing oil faster than the operator can pour it in. But it isn't forgiving of imperfections along the case parting line and definitely isn't foolproof. Furthermore, in this age of seamless perfection in airframes, even a wisping discoloration along the case parting lines isn't to be tolerated as it was back in granddad's day.



Ly-Con's Cure

Ly-Con's solution involves grooving one of the crankcase flanges and fitting it with a length of O-ring material. The depth and shape of the O-ring groove have been carefully developed to provide the right amount of O-ring crush, along with a dovetail shape to hold the O-ring in place during engine assembly. No adhesive is used, installation is generally foolproof, and the finished engine doesn't leak.

At the time of our visit, Ly-Con had fitted several of its high-visibility airshow customers' engines with the O-ring cases and accumulated hundreds of hard-core aerobatic and ferry hours of leak-free operation. "Not a drop," Tunnell said with a smile when we asked if there had been any unwanted oil.

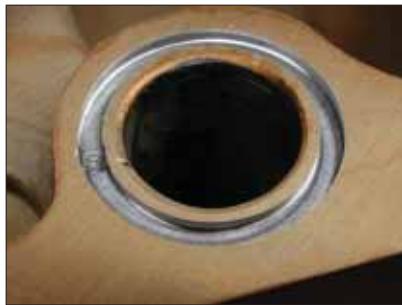
While a long overdue freedom from

leaks, or even alleviating the fear of leaks, are the O-ring's most immediate advantages, there are others. Engine assembly is also eased, as fitting the O-ring is less demanding of the technician's skill than deciding on how much sealant to apply to the case halves, remembering if one or both sides of the case get glued and laying the thread without accidentally getting it too close to the bolt holes.

Even better, the O-ring could very well save the four-digit expense and consumption of precious case life by avoiding align boring at the next overhaul. The traditional string-sealing

leaks, or even alleviating the fear of leaks, are the O-ring's most immediate advantages, there are others. Engine assembly is also eased, as fitting the O-ring is less demanding of the technician's skill than deciding on how much sealant to apply to the case halves, remembering if one or both sides of the case get glued and laying the thread without accidentally getting it too close to the bolt holes.

Even better, the O-ring could very well save the four-digit expense and consumption of precious case life by avoiding align boring at the next overhaul. The traditional string-sealing



Besides the parting flanges, several O-ring grooves are cut around through-bolt and stud holes. The semi-circles in the groove perimeter at 9 o'clock are where the undercutting ball-cutter enters and exits the work.

Machining a case begins by setting the case half in the Haas machine and having the pen draw the tool path. It takes only seconds to mark the line.

method demands flat, imperfection-free mating flanges—the same flanges that often lightly fret during use. Such distress to the case mating flanges, however shallow, requires case machining to restore an effective sealing area with the string method. This means milling the case flanges, which in turn typically requires align boring the crankshaft and cam bores to maintain round bearing saddles. This is a large price to pay for simply sealing the case, and can be completely avoided with the O-ring, because light fretting distress along the case parting line (not to be confused with fretting around the main bearing saddles) will not compromise the O-ring's sealing capability. The case may be re-used without milling and subsequent align boring.

Why So Long in the Making?

If O-ringing the case halves is so beneficial, and seemingly easy to execute, how come it hasn't been around for years?



While the new Haas machine offers every trick, including diagrams of the tool path, sometimes good old farm-yard expediency gives the fastest, truest information. Noting that in the old days Continental and Lycoming "must have drilled these bolt holes by hand," Ly-Con machinists have fitted one of the Haas machine's tool bays with a Pilot Razor Point pen. Running the pen before the cutter instantly shows any conflicts between the software and reality, as this trace over the edge illustrates.



At the OEM level, the answer likely involves the staggering traditionalism of the aviation world, along with the costs associated with making such a change in the certified arena.

In the rebuild aftermarket, the answer again resides in the certification paper storm, plus the need to accommodate a huge number of Lycoming and Continental case variations. After 60 years

Case Sealing: Two Choices

Just so everyone is clear on how both the stock thread and Ly-Con's O-ring methods work, we asked Ly-Con to give us a quick rundown of how the two methods are employed.

Because smooth, flat case flanges are a must when sealing with the stock string method, the parting flats of the case are machined flat and cleaned of any oil or particulates. Both case half flanges are lightly coated with aviation grade Hylomar. This is a moderately sticky blue adhesive that cleans up with acetone.

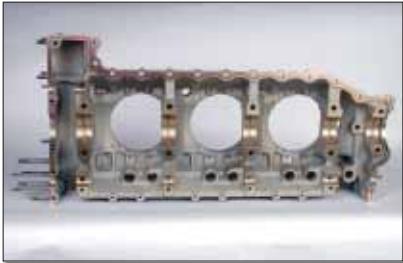
An acid brush's bristles are trimmed to about $\frac{3}{8}$ inch to apply the Hylomar. This allows spackling the glue in a daubing motion (not brushed) without the brush bristles splaying and leaving voids in the glue. Immediately after the sealant is applied, the thread is laid down, and it is drawn around the inside of the bolt holes.

The thread ends are trimmed to extend about $\frac{1}{8}$ inch past the case parting line. This string tail is left in place and doesn't seem to matter even when the crankshaft seal is installed. The thread can't shift out of position once the case halves are joined, so pushing in the seals doesn't upset the thread.

Ly-Con showed us the single-thread installation detailed in Lycoming literature. However, they often install a double thread on Experimental engines, as it seems to offer better leak protection. As for the thread, it's Grade D silk thread in 00 gauge (about 0.020 inch in diameter). Continental even has a part number for the stuff.

Assembling an engine with O-ringed flanges is arguably less fuss than it is with the stock string method (Ly-Con techs make both procedures look easy). With the case ready for assembly, the O-ring material is pressed into the case groove. Slightly stretching the rubber narrows it, helping it get down into its groove as the tech runs his finger along the work. Once pressed into the groove the rubber relaxes to its larger, at-rest diameter and is captured by the tighter groove top, holding it in place. This makes handling the case a breeze, as the O-ring stays snug in its groove. And with no sealant involved there's no time rush, either.

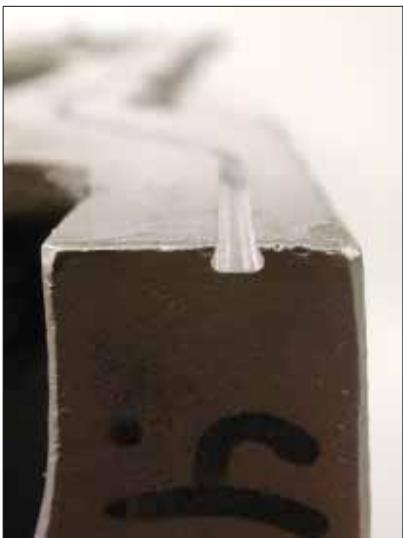
A short tail of O-ring material is left when laying the rubber in the groove. Once the case halves are joined, the excess O-ring is razored flush, completing the job. —T.W.



Some of the O-ring paths are both aesthetically pleasing as well as rather long, such as with this Continental IO-520 casting.



Two cutters, both rather small, are used to form the O-ring groove. The straight cutter (top) sets the groove depth and its width at the top. The ball cutter follows, bell the bottom of the groove and giving the O-ring material a place to nest during assembly. Each cutter definitely costs more than a dime.



Viewed edge on, the O-ring groove's distinct big-bottom profile is easy to see. Ly-Con found this shape necessary to hold the O-ring rubber in place during engine assembly. Without it, the O-ring falls out before the case halves can be joined.

VENI. VIDI. VICI.

THE VELOCITY TXL
253 KTAS CRUISE @ 65%
+ 1300 NM RANGE



Fortune favors the fast.

SEBASTIAN, FL 772.589.1860

WWW.VELOCITYAIRCRAFT.COM

The new A600 Talon
RotorWay Helicopter

extraordinary.



Forty years after introducing the Scorpion, RotorWay is proud to introduce the New A600 Talon. With features ranging from digital navigation to a wider footprint for extended stability, it's just what RotorWay's family of owners asked for -- and just what they have come to expect.

www.rotorway.com

ROTORWAY
INTERNATIONAL
Built with Craftsmanship and Pride since 1967.

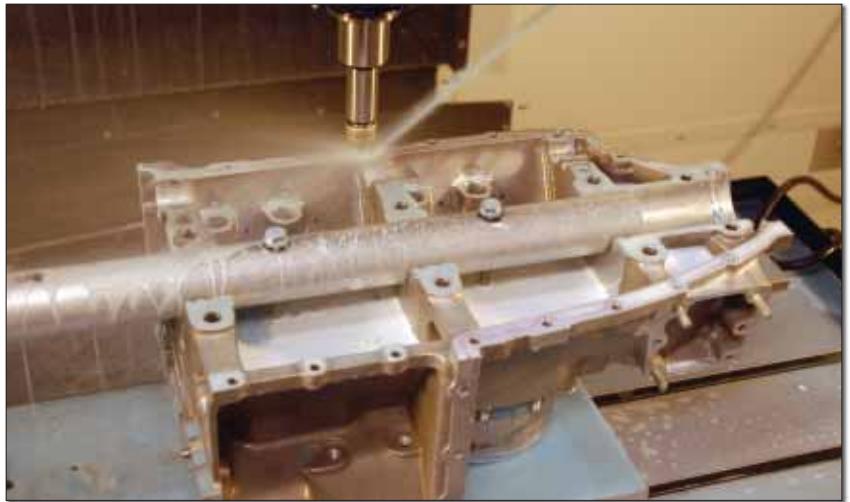
Case Closed *continued*

of production, who knows how many times the case flange shape or bolt-hole position have changed in the flat engine universe. Given manual machining, it would be impossible to develop techniques or tooling to accelerate the grooving process, thus relegating the O-ring grooving to a tedious custom process with every case.

With CNC machining, however, the ability to automate the process via software, plus the incredible speed afforded by today's powerful CNC machining centers, make handling the numerous case variations possible. The trick is having the financial stones to step up to a CNC machining center. It's a big, six-figure step for aviation engine shops, but one Ly-Con recently made to compete with exclusives such as case O-ring grooving, along with building speed into its burgeoning cylinder porting business (of which more in a later article).

At press time the case O-ring modification was available for Experimental engines, but by the time you read this Ly-Con calculates it will have FAA approval for certificated engines via a Process Specification; that is a format

Because the cutting takes only seconds, by far the biggest time consumer of the O-ring process is setting the work in and out of the CNC machine. Gary Fisher, Ly-Con's head man in the CNC department, did the heavy lifting for the camera this time.



With the tool path verified, the coolant gushes on, and the straight cutter sires its way through the aluminum. The straight cutter makes two trips through the case, as the tool is so small it would break if a full-depth cut were attempted. The ball cutter follows the straight cutter—it makes two passes as well—and that's it for the machining.



available to licensed repair stations such as Ly-Con. The company is also working on an STC for the O-ring, though that will take a bit longer. In the meantime, Ly-Con already has a process patent pending on the procedure.

Ly-Con has developed the O-ring for all of the popular Continental and Lycoming engines. Pricing was preliminarily set at \$648 for a four-cylinder case and \$972 for a six-cylinder

Once grooved, Ly-Con stamps the case with its program number. This speeds identification of the software used should the case return for a subsequent overhaul and require re-machining.

case. It is worth noting that once the case has been grooved for the O-ring, the only expense at future overhauls will be the negligible cost of the new O-ring material.

Of course, the standard glue-and-string sealing method is still available at no extra charge, so we now have a choice in case sealing. We're also looking forward to other machining improvements as Ly-Con explores the capabilities of its new CNC equipment. The company is already working toward running the majority of its cylinder head porting jobs through the machine. We'll just have to wait and see what surprises they come up with after that. †



For more information call Ly-Con at 559/651-1070 or visit the web at www.lycon.com. Direct links can be found at www.kitplanes.com.



A GREAT COMPROMISE

With a few simple steps and periodic reality checks, your marriage can survive the build process.

BY SUSAN BRUNNER

Thinking of building a plane? Well, there are a lot more things to consider than just what design it will be. Myriad questions come to mind: Do you think you can spend all your waking hours working on your project and studying your manuals? What consideration have you given to splitting your time between your job and the plane? How many hours each day do you expect to work on your project? And, finally, perhaps the most important one: Have you wondered about the strength of your marriage and

whether it will survive your decision to build an airplane?

In recent discussions with numerous builders (those interviewed were men), it was interesting to learn that the main decision discussed between the builder and his spouse was whether to build the plane. Once the wife gave her approval, begrudgingly or not, the builder felt he had free reign to spend as many hours working on his airplane as he wanted. In fact, the spouses interviewed frequently referred to the aircraft as “his mistress.” Builders acknowledged that once given approval, they often forgot that they had

Paul Bricker voices his opinion on his wife, Joyce’s, ideas on how best to lay in the baffling on their Lancair ES.



“Here, honey, let me give you a hand.” Ed and Janie Smith make work fun while inspecting the engine compartment prior to buckling up their Lancair IV-P.



to spend time with the wife and family to nurture those relationships.

Based on a survey of builders who had completed projects, and the wives who supported them, it was clear that communicating was extremely important in making the process smoother for the benefit of the relationship. Each step in the decision-making process should be clearly discussed so that both parties

Doug Pitzer gives tips to his wife and fellow pilot, Patti, as she works to remove the cowling on their Cozy Mark IV.

understand the commitment each of them will have to make to reach the goal of a flying aircraft.

There seems to be a consistent thread from both the builder and his spouse on three main areas of concern: One, there must be a realistic time commitment regarding the building process (i.e., how many hours will be set aside each day or week to devote to the project). Two, there must be a flexible financial budget for both the plane and the family. And third, there must be a proper balance of time and energy between the family and the project.

Time: It Can Consume You

The time commitment may seem like an obvious issue, but what builders have stated is that the project seems to be all consuming. The goal of completing the airplane and turning a bunch of parts into an airworthy craft weighed heavily on their minds. Are you going to spend two days each week working on your project? Are you going to work on it after you get off work each day? Are you going to spend your weekends building? You need to set goals and stick to them. Before you set goals, you should take the time to make sure your partner agrees with your ideas. Mark Beattie and his wife, Liz, are building an RV-6. They planned on completing their plane in five years, working mostly on weekends, and are now in their seventh year of building. "I try to remember it's the journey, not the destination," Liz said.

The time spent studying manuals and shopping for parts should be included in your budget for building. Does the manual say it will take 2000 hours to complete the project? Regardless of what the manual or the company says about the time required to build, it will vary with every individual. Do you have previous experience in building, or are you a novice with a learning curve to include in your time budget? Every single builder queried said it took more time to build the project than the kit companies advertised. In some cases, they stated it



The Smiths look at the glass cockpit avionics installation nearing completion in their Lancair IV-P. They are getting close to finishing the project and look forward to their first flight.



Doug Pitzer plays Superman for his wife, Patti, when removing the cowling from their Cozy Mark IV. Patti was hands-on throughout the building process.



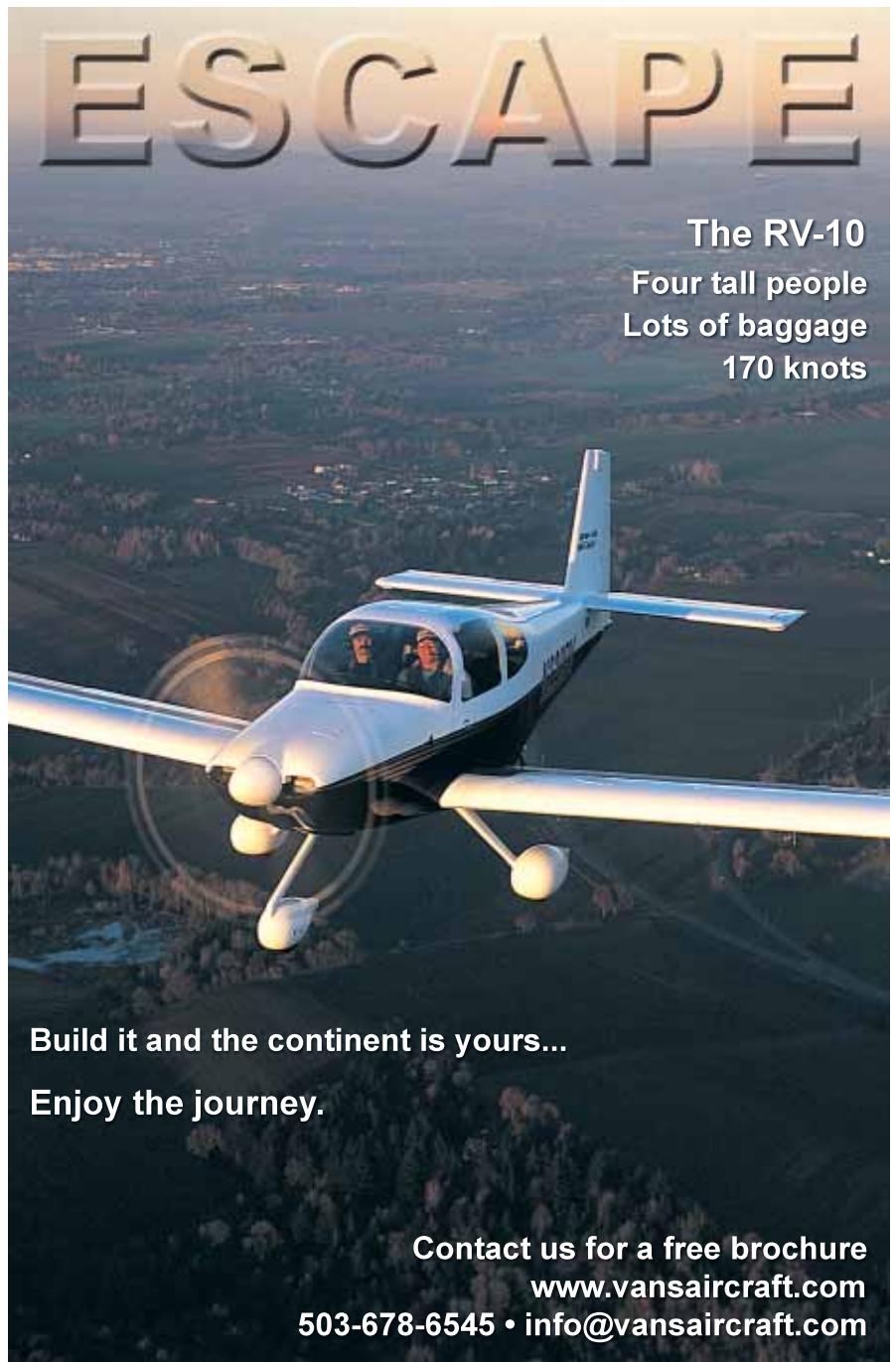
Joyce Bricker is dressed and ready to go flying, but Paul needs to get a few more things done on his Lancair ES before they head out for the day.

took nearly twice what was advertised. Others said it took nearly three times the company's estimate. That will make a huge difference when you are setting your goal for completing your plane. Ed Smith of Chesapeake, Virginia, is building a Lancair IV-P. His advice is to "not look at the project as a 'whole' but instead as many small, incremental steps. That way, you feel a sense of accomplishment along the way." To save yourself time and effort while working on your plane, use the knowledge of others such as forums for your particular type of aircraft, other builders in your area, and the company's technical support to make your build progress more smoothly. By virtue of their experience, these resources can significantly reduce the number of hours that you spend building.

Finances

Setting a budget is another issue that needs to be addressed with your spouse. How much money are you planning to set aside for the project each month? Have you factored in hangar rent, builder's insurance, tools necessary to complete the project, avionics, interior work and paint? What about the engine and propeller? Will you have enough funds in the household coffers if you experience a family emergency? Every builder stated that it was more expensive to build their plane than they originally believed it would be. During the years required to complete the plane, costs on nearly everything required will undoubtedly rise, and avionics will have changed considerably (both in technology and expense). Janie and Ed Smith of Chesapeake, Virginia, said that "In the past six years, technology has made major strides in avionics and glass panels, and we feel that such an airplane as we were building deserved the latest and greatest technology."

Tom Gourley, who's building a Lancair Legacy, reported that while working on his panel, he purchased wire, wire terminals, connectors, connector pins, circuit breakers, switches, coax, coax connectors, indicator lights, laser-cut aluminum, powder-coating and silk



ESCAPE

The RV-10
Four tall people
Lots of baggage
170 knots

Build it and the continent is yours...
Enjoy the journey.

Contact us for a free brochure
www.vansaircraft.com
503-678-6545 • info@vansaircraft.com

The MAXWELL Propulsion System



RECENT UPGRADES
Electrical System
Prop • Exhaust

- Factory Direct 2.5 L Subaru Engine
- Cockpit Adjustable Prop
- Accessories for a Complete System

Reliable • Complete • Modular

Maxwell Propulsion
19132 59th Drive NE
Arlington, WA 98223-7821
360-474-8118
www.maxwellpropulsion.com



KITPLANES BOOKSTORE

Construction of
Tubular Steel Fuselages



by Vex Aviation

Airplane Rigging

Rigging problems can frustrate the most experienced A&P. This manual discusses various rigging geometries and methods used during and after construction to increase the performance and controllability of any airplane in any phase of flight.

\$29.95 book or e-Book

Construction of Steel Tube Fuselages

Assists the builder to produce a tubular steel airframe as good as from the factory in such a way that expansion and contraction occur symmetrically with no distortion and without the need for elaborate welding jigs.

\$34.95 book or e-Book

**FREE
SHIPPING**

on US orders over
\$50

**400+ Titles to help
You Do It Right**

www.KITPLANESbooks.com

800 780-4115

A Great Compromise *continued*

screening, which topped \$2000. This did not include any of the instrumentation, nor did it include the wiring and other electrical items mounted in the airframe, such as solenoids, trim servos, stick grips, taxi and landing lights, nav lights, strobe lights and a heated pitot tube. When you are in the midst of building a specific section of your plane you will have to pick up parts or obtain tools necessary to continue your work. Estimate these expenses when contemplating your budget.

Family Life

Speaking of your family, how much time do you plan to spend with your wife and children? Several builders said they got so focused on finishing their airplane that they sometimes forgot they were married! Of course, there were others who remembered they were married and expected support from their wives during the build process. What type of support are you going to ask of your spouse? Do you expect her to take over all the household and garden tasks, bill paying, child rearing and holiday preparations? Or do you expect her to be more hands-

on and spend weekends alongside you in the garage or hangar?

One builder, who is also an astute engineer, said that he thought his children would “wait” to grow up until he finished his work. Unfortunately, they did not. Time marches on, your project gets further down the road to completion, and before you know it, your children are grown and gone. Don’t forget them along way, and try to include them in your project. Have the little ones use magnets to pick up dropped nuts and bolts and put them in cups. Invite your child’s Cub Scout or Girl Scout troop to your work area and introduce them to the aircraft and the build process. They may even earn a badge!

A good way to manage your time commitment to both your project and your family is to talk with your spouse about commitments such as birthday parties and holidays. Set aside the time in your build process to attend these functions, and do not start an area of work that will run over into the family obligation.

Most importantly, be sure to spend some quality time with your wife. This may help to assure that she will still be by your side when you complete your life goal of building a beautiful aircraft.



Mark Beattie, President of EAA Chapter 494, and his wife, Liz, work together to set rivets on the wingspar of their RV-6.



Patti Pitzer has been Doug's building partner and fellow pilot since the inception of their Cozy project. Friends frequently call on her for assistance when they hit stumbling blocks.

Talk about the trips you plan on taking together when the plane is airworthy. Post pictures of the places you want to go in the hangar. Let her plan vacations so that she has something to look forward to with you if she is the keeper of the house during your build process.

Take the time to enjoy a date night each week. While you are on your date, talk about other things besides the airplane. Save that for the other six days. Let her choose what she wants to do on date night, and go with no complaints! Make that evening all about her, and remind yourself why you married her and why you want to share your dreams with this wonderful woman. She is there to support you in reaching your goals, so be supportive and encourage her dreams. She will be the one taking up the slack at home, which will allow you more time to work. Appreciate her for all she is doing for you while you are building, and verbalize your thanks.

Share the build process with your spouse in whatever manner works best for your relationship. Revisit your agreements several times during the years it takes to complete your plane to ensure you are still on track. With these plans laid out before you begin building, you should have no problem coming out of this journey with an airworthy aircraft for your whole family to enjoy, a sense of great accomplishment for what you have achieved, and your wife both proud and happy by your side. ✚

Experimental & Light Sport (E-LSA)

- models from 950 to 3500 MTOW
- basic and ultra-quick-build options
- floats: straight and amphibious



www.murphyair.com (604) 792-5855

Chilliwack, British Columbia, Canada



YOUR SPORT PILOT Rx

sonex aircraft LLC
(Ludusfugapam HCl 200mg)

If your flying lacks "Sport"
ask your doctor if Sonex
may be right for you*



*Side effects may include: increased adrenaline production and heart rate, constantly changing attitude and sore facial muscles from smiling. Most patients have reported fighter pilot fantasies and the ability to draw a crowd at every airport. If any of these symptoms occur, call your friends immediately, as this may indicate a seriously satisfying flight condition.

Get Your Fix at: www.SonexAircraft.com/Rx

or call: 920.231.8297

THE WORLD'S BEST TUBE BEADER!



Meets MILSPEC MS33660D
and SAE AS5131 Standards

The ATS Pro Beading Tool Kit is only tool you'll ever need to form hose beads in aluminum, copper, and steel lines up to 1" in diameter.

Based on a popular WWII vintage tool, our ATS Pro Beading Kit features the same simplicity of design and ease of use that has made it an industry favorite for over five decades.

Each ATS Pro Beading tool is vacuum cast, precisely machined, and hand assembled to ensure the ultimate in quality. We then test it to make sure that all beads meet or exceed accepted standards.

We invite you to try the world's best Beading Tool absolutely risk-free for 30 days, and if you don't agree that it's the best beading tool you've ever used, send it back for a complete refund, including your shipping cost. And if you do agree that it's a keeper, then rest assured that your investment is fully protected by our ATS Pro Lifetime warranty.

The ATS Pro Beading Tool Kit is the best hand beading tool money can buy... We guarantee it!



AIRCRAFT TOOL SUPPLY

Serving the needs of everyone from the homebuilder to the aircraft maintenance professional since 1974.

www.aircraft-tool.com

P. O. Box 370
Oscoda, MI 48750
Toll Free: 800-248-0638
Fax: 989-739-1448

Is LightSpeed's new ANR headset good enough—*quiet, cool, comfortable enough*—to unseat Bose from the top of the class?

BY JACK COWELL



It's almost a given that the Bose Headset X is at or near the top of every pilot's wish list, in large part because the \$1000 noise-canceler is comfortable, quiet and sleek. Now comes the LightSpeed Zulu, a clear shot across the Bose bow. So here's the question: Can the \$850 Zulu's performance earn it best-in-class status?

Although LightSpeed claims that the Zulu is the quietest headset on the market, there's more to beating the Bose than just noise reduction. Along with quietness we also weighed comfort, audio fidelity and the headset's feature complement.

This was a subjective pilot test, conducted in two different cockpits: a pressurized Lancair IV and a 2-year-old Columbia 400. The Columbia had a jack setup, combining Bose's unique single connection and the two-plug industry standard in the same jack, so we could have two headsets connected at the same time, swapping them in seconds. It was as close as you could get to back-to-back using one pair of ears.

LightSpeed's Zulu uses full-coverage magnesium ear cups because this lightweight metal is claimed to be a better sound barrier than plastic—10 times better than any plastic at passively blocking noise, according to LightSpeed. The manufacturer also claims that the technical result of this cup/seal combination is the best passive noise reduction combination you can buy.

Compared to the Bose X, we noticed a significant reduction in cockpit noise in passive mode, which is only marginally important because most headsets will be powered at all times. When the ANR system (active noise reduction) was turned on, the Zulus got even better. How much? The techies say the combined passive/active noise reduction is about 8 decibels better than anyone else. Regardless, in our subjective testing, the Zulus were more than a match for the Bose Headset X, though it's not a runaway victory: "very good" versus "even better."

Both the Zulus and Bose's X are extremely light—13 ounces for the Zulu and 12 ounces for the Bose X. Both have low head-clamping pressure, too. In 2-hour flights, they both felt comfortable and unobtrusive. Call the comfort contest a tie.

The Zulu's audio quality was extraordinary. Supposedly, LightSpeed's engineers spent significant development time and dollars on sound fidelity. While ATC's calls won't be made or broken by this, we sure noticed it when listening to music. If cockpit music isn't your thing, this will not be a significant measure. But if you've opted for satellite-delivered music along with your invaluable new in-cock-

pit weather, you will notice the difference. As one iPod-listening teenager asked, "Do we have to leave these in the plane?" The superiority is hard to quantify. It's like trying to assess the difference among in-home speakers in an audio component store—you know which you like better, but to articulate why you use adjectives like "richer" and "fuller" and "purer."

New models always have the advantage in features. After all, the competition is already out there, so you know exactly where you can outgun them. Because the Bose X doesn't have a cell-phone interface, much less Zulu's Bluetooth wireless capability, the features area is a no-contest. So what? Well, when it's expedient to call ATC for a clearance in some remote location instead of trying to contact them by radio on the ground, or if you have cell-phone-delivered Nexrad weather, this is not only a valuable convenience but a real-world safety feature.

The icing on the cake is the Zulu's "FRC" capability. The initials stand for front row center, and when it's engaged and you're listening to music, it has a live concert quality. Gimmicky in an aviation headset? Depends. How important is in-cockpit entertainment to you?

So, better than the Bose X? We say the Zulu is as good or better in every category, and when you add the fuller feature set to the slightly (by \$145) lower price, the gap widens. It's not a slam-dunk, but it sure looks like Bose has serious competition. Bring it on! ✚

2008

Light Sport Aircraft and Rotorcraft Directories

COMPILED BY JULIA DOWNIE

Here we are, roughly two and a half years since the Light Sport Aircraft and Sport Pilot rules went into effect, and the industry continues to grow, albeit at a modest pace rather than the explosive rate pundits were calling for. The big news, of course, was an announcement in the summer of 2007 that Cessna and Cirrus would join the SLSA (ready to fly) fray. Neither of these designs is listed here because they're not yet certified. What we are not seeing is the emergence of the ELSA super-duper, nearly instant-build aircraft derived from SLSA designs. (Remember that to kit an ELSA a company must first certify and produce one conforming SLSA.) Just eight of the 55 designs presented here were offered as ELSAs in late 2007. A note about this year's LSA Directory: Three manufacturers or distributors failed to respond to repeated requests for current product information and so are not listed in this year's directory. Also, because all of the aircraft in the first part of this directory are, by definition, LSAs, they are not tagged with the LSA logo. Please report errors and omissions to editorial@kitplanes.com.

Key to the Directory Codes

Not applicable	n.a.
Information was not provided	n.p.
Retractable gear	R
Composite	C
Metal	M
Wood	W
Tubing	T
Fabric	F
Meets the parameters of the Light Sport Aircraft rule	

A&P Aviation Elitar-Sigma

Top Speed, mph	124
Cruise, mph	106
Stall, mph	44
Range, s.m.	n.p.
Rate of Climb, fpm	1181
Takeoff/Landing Distance, ft.	330/328
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	17
Empty Weight, lb.	772
Gross Weight, lb.	1320
Length, ft.	20.3
Wingspan, ft.	32.2
Wing Area, sq. ft.	117.3
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	C, M, F
Country of Mfr.	Russia
FAA Office	Farmingdale MIDO
No. LSAs Certified	1
SLSA Cost	\$90,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
	www.vvv-avia.ru
	631/588-7771



Adventure Sport Aircraft Voyageur II

Top Speed, mph	90
Cruise, mph	56
Stall, mph	n.p.
Range, s.m.	290
Rate of Climb, fpm	400
Takeoff/Landing Distance, ft.	262/165
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	18
Empty Weight, lb.	460
Gross Weight, lb.	1040
Length, ft.	9.8
Wingspan, ft.	33.2
Wing Area, sq. ft.	167
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	C, F, M
Country of Mfr.	USA
FAA Office	Riverside FSDO
No. LSAs Certified	9
SLSA Cost	\$38,671
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
	www.adventuresportaircraft.com
	877/835-9464



Air Creation USA GTE 912

Top Speed, mph	62
Cruise, mph	47
Stall, mph	32
Range, s.m.	200
Rate of Climb, fpm	800
Takeoff/Landing Distance, ft.	100/135
Engine Used/HP	HKS 700E/60

Fuel Capacity, gal.	15
Empty Weight, lb.	420
Gross Weight, lb.	992
Length, ft.	8.8
Wingspan, ft.	32.5
Wing Area, sq. ft.	187
No. of Seats	2T
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Scottsdale MIDO
No. LSAs Certified	1
SLSA Cost	\$59,900
ELSA Cost	\$41,900 (98% complete)
ELSA Build Time, hrs.	n.p.
	www.aircreation.net
	623/824-5499



Air Creation USA Tanarg

Top Speed, mph	98
Cruise, mph	65
Stall, mph	39
Range, s.m.	300
Rate of Climb, fpm	1500
Takeoff/Landing Distance, ft.	135/147
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	17
Empty Weight, lb.	520
Gross Weight, lb.	992
Length, ft.	10
Wingspan, ft.	32.5
Wing Area, sq. ft.	160
No. of Seats	2T
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Scottsdale MIDO
No. LSAs Certified	1
SLSA Cost	\$89,900
ELSA Cost	\$72,900 (98% complete)
ELSA Build Time, hrs.	n.p.
	www.aircreation.net
	623/824-5499





Aircraft Manufacturing and Development	
Zodiac CH601 XL	
Top Speed, mph	138
Cruise, mph	130
Stall, mph	44
Range, s.m.	950
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	550/500
Engine Used/HP	Continental O-200/100

Fuel Capacity, gal.	30
Empty Weight, lb.	770
Gross Weight, lb.	1320
Length, ft.	20
Wingspan, ft.	27
Wing Area, sq. ft.	132
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Atlanta MIDO
No. LSAs Certified	46
SLSA Cost	\$84,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.newplane.com	
478/374-2759	



Aircraft Manufacturing and Development	
Zodiac CH601 XLi (IFR)	
Top Speed, mph	138
Cruise, mph	130
Stall, mph	44
Range, s.m.	950
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	550/500
Engine Used/HP	Continental O-200/100

Fuel Capacity, gal.	30
Empty Weight, lb.	800
Gross Weight, lb.	1320
Length, ft.	20
Wingspan, ft.	27
Wing Area, sq. ft.	132
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Atlanta MIDO
No. LSAs Certified	29
SLSA Cost	\$99,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.newplane.com	
478/374-2759	



American Legend Aircraft	
Legend Cub	
Top Speed, mph	106
Cruise, mph	95
Stall, mph	38
Range, s.m.	360
Rate of Climb, fpm	700
Takeoff/Landing Distance, ft.	210/205
Engine Used/HP	Continental O-200/100

Fuel Capacity, gal.	22
Empty Weight, lb.	830
Gross Weight, lb.	1320
Length, ft.	22.4
Wingspan, ft.	35.5
Wing Area, sq. ft.	178.5
No. of Seats	2
Cabin Width	29
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Fort Worth, MIDO
No. LSAs Certified	115
SLSA Cost	\$91,785
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.legend.aero.com	
903/885-7000	



Apollo North America, Inc.	
Delta Jet AS-III	
Top Speed, mph	99
Cruise, mph	75
Stall, mph	40
Range, s.m.	285
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	300/500
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	14.5
Empty Weight, lb.	535
Gross Weight, lb.	1042
Length, ft.	12
Wingspan, ft.	32
Wing Area, sq. ft.	134
No. of Seats	2T
Cabin Width, in.	23
Landing Gear	trigear

Bldg. Materials	C, F, T
Country of Mfr.	USA
FAA Office	Orlando FSDO
No. LSAs Certified	6
SLSA Cost	\$44,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.tampabay.aerosport.com	
813/782-5691	



Apollo North America, Inc.	
Fox	
Top Speed, mph	132
Cruise, mph	115
Stall, mph	40
Range, s.m.	700
Rate of Climb, fpm	1300
Takeoff/Landing Distance, ft.	175/300
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	15.5
Empty Weight, lb.	715
Gross Weight, lb.	1265
Length, ft.	19
Wingspan, ft.	30
Wing Area, sq. ft.	122.7
No. of Seats	2
Cabin Width, in.	44
Landing Gear	tri or tail

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Orlando FSDO
No. LSAs Certified	2
SLSA Cost	\$62,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.tampabay.aerosport.com	
813/782-5691	



CubCrafters, Inc.	
Sport Cub S2	
Top Speed, mph	122
Cruise, mph	103
Stall, mph	35
Range, s.m.	450
Rate of Climb, fpm	790
Takeoff/Landing Distance, ft.	415/245
Engine Used/HP	Continental O-200A/100

Fuel Capacity, gal.	25
Empty Weight, lb.	848
Gross Weight, lb.	1320
Length, ft.	23.3
Wingspan, ft.	34.2
Wing Area, sq. ft.	179
No. of Seats	2
Cabin Width, in.	30
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Seattle MIDO
No. LSAs Certified	52
SLSA Cost	\$119,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.cubcrafters.com	
509/248-9491	



Eagle Aviation LLC	
EA-100 S-LSA	
Top Speed, mph	138
Cruise, mph	120
Stall, mph	40
Range, s.m.	420
Rate of Climb, fpm	750
Takeoff/Landing Distance, ft.	400/350
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	20
Empty Weight, lb.	700
Gross Weight, lb.	1320
Length, ft.	20.8
Wingspan, ft.	28.5
Wing Area, sq. ft.	135
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Minnesota MIDO
No. LSAs Certified	1
SLSA Cost	\$88,995
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.eaglesportplane.com	
920/968-7527	



Evekto America	
SportStar	
Top Speed, mph	115
Cruise, mph	110
Stall, mph	39
Range, s.m.	810
Rate of Climb, fpm	840
Takeoff/Landing Distance, ft.	560/540
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	31.1
Empty Weight, lb.	668
Gross Weight, lb.	1268
Length, ft.	19.8
Wingspan, ft.	28.3
Wing Area, sq. ft.	114
No. of Seats	2
Cabin Width, in.	46.5
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Czech Republic
FAA Office	San Antonio MIDO
No. LSAs Certified	35
SLSA Cost	\$102,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.evektoamerica.com	
830/896-8910	

Fantasy Air USA
Allegro 2007

Top Speed, mph	138
Cruise, mph	120
Stall, mph	40
Range, s.m.	410
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	490/340
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	17
Empty Weight, lb.	622
Gross Weight, lb.	1320
Length, ft.	21
Wingspan, ft.	35.2
Wing Area, sq. ft.	122
No. of Seats	2
Cabin Width, in.	46
Landing Gear	trigear

Bldg. Materials	C, M
Country of Mfr.	Czech Republic
FAA Office	Greensboro FSDO
No. LSAs Certified	71
SLSA Cost	\$73,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.fantasyairusa.com	
919/775-2224	



FK Lightplanes USA
FK-9 Mark IV

Top Speed, mph	120
Cruise, mph	105
Stall, mph	39
Range, s.m.	500
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	328/375
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	16
Empty Weight, lb.	636
Gross Weight, lb.	1250
Length, ft.	19.5
Wingspan, ft.	29.8
Wing Area, sq. ft.	112
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	C, T
Country of Mfr.	Germany/Poland
FAA Office	Orlando MIDO
No. LSAs Certified	3
SLSA Cost	\$98,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.fk-lightplanesusa.com	
954/965-6000	



Flight Design USA/Flightstar
CTS W

Top Speed, mph	138
Cruise, mph	124
Stall, mph	45
Range, s.m.	1150
Rate of Climb, fpm	885
Takeoff/Landing Distance, ft.	407/500
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	34
Empty Weight, lb.	682
Gross Weight, lb.	1320
Length, ft.	20.3
Wingspan, ft.	28
Wing Area, sq. ft.	107
No. of Seats	2
Cabin Width, in.	48
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Germany/Ukraine
FAA Office	Oklahoma City MIDO
No. LSAs Certified	214
SLSA Cost	\$101,390
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.flightdesignusa.com	
860/963-7272	



Gobosh Aviation
G-700 S

Top Speed, mph	134
Cruise, mph	122
Stall, mph	51
Range, s.m.	460
Rate of Climb, fpm	850
Takeoff/Landing Distance, ft.	380/656
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	20
Empty Weight, lb.	800
Gross Weight, lb.	1320
Length, ft.	20.5
Wingspan, ft.	27.3
Wing Area, sq. ft.	122
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Poland
FAA Office	Des Moines FSDO
No. LSAs Certified	7
SLSA Cost	\$106,950
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.gobosh.aero	
877/463-5957	



Higher Class Aviation
Sport Hornet

Top Speed, mph	138
Cruise, mph	109
Stall, mph	46
Range, s.m.	400
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	400/285
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	20
Empty Weight, lb.	638
Gross Weight, lb.	1320
Length, ft.	20
Wingspan, ft.	30
Wing Area, sq. ft.	153
No. of Seats	21
Cabin Width, in.	30
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	6
SLSA Cost	\$50,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.spothornet.com	
866/974-9222	



IndUS Aviation
T211 Thorpedo

Top Speed, mph	132
Cruise, mph	115
Stall, mph	52
Range, s.m.	500
Rate of Climb, fpm	1020
Takeoff/Landing Distance, ft.	350/400
Engine Used/HP	Jabiru 3300/120

Fuel Capacity, gal.	22
Empty Weight, lb.	725
Gross Weight, lb.	1270
Length, ft.	19.3
Wingspan, ft.	25
Wing Area, sq. ft.	115
No. of Seats	2
Cabin Width, in.	40
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Dallas/Forth Worth MIDO
No. LSAs Certified	16
SLSA Cost	\$95,990
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.indusav.com	
214/337-6387	



Infinity Power Parachutes
Commander SE 582

Top Speed, mph	32
Cruise, mph	32
Stall, mph	n.a.
Range, s.m.	n.p.
Rate of Climb, fpm	800
Takeoff/Landing Distance, ft.	300/300
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	15
Empty Weight, lb.	400
Gross Weight, lb.	1250
Length, ft.	10
Wingspan, ft.	n.p.
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	n.a.

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Detroit MIDO
No. LSAs Certified	1
SLSA Cost	\$32,295
ELSA Cost	n.p.
ELSA Build Time, hrs.	n.p.
www.infinitypowerchutes.com	
269/659-9113	



Jabiru USA Sport Aircraft, LLC
Jabiru J170

Top Speed, mph	132
Cruise, mph	118
Stall, mph	51
Range, s.m.	1370
Rate of Climb, fpm	700
Takeoff/Landing Distance, ft.	459/492
Engine Used/HP	Jabiru 2200/85

Fuel Capacity, gal.	35
Empty Weight, lb.	638
Gross Weight, lb.	1200
Length, ft.	18.1
Wingspan, ft.	31.6
Wing Area, sq. ft.	100
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	USA
FAA Office	Atlanta MIDO
No. LSAs Certified	4
SLSA Cost	\$84,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.usjabiru.com	
931/680-2800	





Jabiru USA Sport Aircraft, LLC Jabiru J250

Top Speed, mph	138
Cruise, mph	132
Stall, mph	51
Range, s.m.	1040
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	600/600
Engine Used/HP	Jabiru 3300/120

Fuel Capacity, gal.	36
Empty Weight, lb.	780
Gross Weight, lb.	1320
Length, ft.	21.5
Wingspan, ft.	30
Wing Area, sq. ft.	120
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	USA
FAA Office	Atlanta MIDO
No. LSAs Certified	48
SLSA Cost	\$96,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.usjabiru.com	
931/680-2800	



Just Aircraft Highlander

Top Speed, mph	115
Cruise, mph	105
Stall, mph	27
Range, s.m.	550
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	300/300
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	26
Empty Weight, lb.	610
Gross Weight, lb.	1320
Length, ft.	19
Wingspan, ft.	31.5
Wing Area, sq. ft.	121
No. of Seats	2
Cabin Width, in.	44
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	South Carolina FSDO
No. LSAs Certified	45
SLSA Cost	\$94,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.justaircraft.com	
864/718-0320	



Kappa Aircraft KP-5 ASA

Top Speed, mph	138
Cruise, mph	125
Stall, mph	38
Range, s.m.	630
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	452/495
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	17
Empty Weight, lb.	695
Gross Weight, lb.	1278
Length, ft.	23.6
Wingspan, ft.	32.5
Wing Area, sq. ft.	128
No. of Seats	2
Cabin Width, in.	47.2
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Czech Republic
FAA Office	Harrisburg MIDO
No. LSAs Certified	6
SLSA Cost	\$105,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.kappaaircraft.com	
570/839-6450	



LSA Aero, Inc. Colyaer Freedom S100

Top Speed, mph	138
Cruise, mph	112
Stall, mph	50
Range, s.m.	680
Rate of Climb, fpm	984
Takeoff/Landing Distance, ft.	480/375
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	32
Empty Weight, lb.	919
Gross Weight, lb.	1430
Length, ft.	19.1
Wingspan, ft.	40.6
Wing Area, sq. ft.	129
No. of Seats	2
Cabin Width, in.	46
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Spain
FAA Office	Memphis FSDO
No. LSAs Certified	1
SLSA Cost	\$117,406
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.lsa-aero.com	
866/336-9857	



LSA America, Inc. Mystique

Top Speed, mph	138
Cruise, mph	120
Stall, mph	45
Range, s.m.	1000
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	600/600
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	30
Empty Weight, lb.	570
Gross Weight, lb.	1320
Length, ft.	20.5
Wingspan, ft.	25.5
Wing Area, sq. ft.	108
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Czech Republic
FAA Office	Greensboro FSDO
No. LSAs Certified	2
SLSA Cost	\$79,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.LSAmerica.com	
919/776-8606	



LSA America, Inc. Skyboy

Top Speed, mph	105
Cruise, mph	90
Stall, mph	42
Range, s.m.	385
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	330/480
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	15
Empty Weight, lb.	770
Gross Weight, lb.	1320
Length, ft.	21
Wingspan, ft.	30
Wing Area, sq. ft.	138
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	C, F, T
Country of Mfr.	Czech Republic
FAA Office	Greensboro FSDO
No. LSAs Certified	54
SLSA Cost	\$57,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.LSAmerica.com	
919/776-8606	



LSA-Gliders LLC TeST TST-14M Bonus

Top Speed, mph	127
Cruise, mph	60
Stall, mph	43
Aspect Ratio	23.9:1
L/D	40:1
Minimum Sink, fpm	130
Engine Used/HP	Rotax 503 UL SCDI/50

Fuel Capacity, gal.	5
Empty Weight, lb.	671
Gross Weight, lb.	1146
Length, ft.	27.1
Wingspan, ft.	56
Wing Area, sq. ft.	130.3
No. of Seats	2
Cabin Width, in.	25.2
Landing Gear	monowheel

Bldg. Materials	C
Country of Mfr.	Czech Republic
FAA Office	Chicago MIDO
No. LSAs Certified	1
SLSA Cost	€35,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.lsa-gliders.com	
608/219-5459	



Luscombe Silvaire Aircraft Company Model SLSA-8

Top Speed, mph	135
Cruise, mph	125
Stall, mph	48
Range, s.m.	500
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	600/500
Engine Used/HP	Continental O-200A/100

Fuel Capacity, gal.	30
Empty Weight, lb.	870
Gross Weight, lb.	1320
Length, ft.	20
Wingspan, ft.	35
Wing Area, sq. ft.	140
No. of Seats	2
Cabin Width, in.	39
Landing Gear	tailwheel

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	1
SLSA Cost	\$89,700
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.luscombe-silvaire.com	
951/682-5385	

Pacific Aerosystem, Inc.
Sky Arrow

Top Speed, mph	120
Cruise, mph	100
Stall, mph	50
Range, s.m.	367
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	470/360
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	18
Empty Weight, lb.	840
Gross Weight, lb.	1320
Length, ft.	24.8
Wingspan, ft.	31.5
Wing Area, sq. ft.	145
No. of Seats	2T
Cabin Width, in.	28
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Italy
FAA Office	San Diego FSDO
No. LSAs Certified	21
SLSA Cost	\$75,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.skyarrowusa.com	
800/844-1441	



Powrachute LLC
AirWolf 912 ULS

Top Speed, mph	36
Cruise, mph	36
Stall, mph	n.a.
Range, s.m.	126
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	300/200
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	15
Empty Weight, lb.	460
Gross Weight, lb.	1150
Length, ft.	10
Wingspan, ft.	32
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Dupage FSDO
No. LSAs Certified	60
SLSA Cost	\$32,700
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.powrachute.com	
574/286-9670	



Powrachute LLC
Pegasus (Ready-to-Fly)

Top Speed, mph	34
Cruise, mph	34
Stall, mph	n.a.
Range, s.m.	40
Rate of Climb, fpm	700
Takeoff/Landing Distance, ft.	300/100
Engine Used/HP	Rotax 582/65

Fuel Capacity, gal.	15
Empty Weight, lb.	396
Gross Weight, lb.	1150
Length, ft.	10.5
Wingspan, ft.	38
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Dupage FSDO
No. LSAs Certified	300
SLSA Cost	\$21,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.powrachute.com	
574/286-9670	



Precision Windsports, Inc.
XT-912/XT-912 Outback

Top Speed, mph	93
Cruise, mph	70/65
Stall, mph	39
Range, s.m.	400
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	1000/1000
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	18.5
Empty Weight, lb.	487/482
Gross Weight, lb.	992
Length, ft.	9
Wingspan, ft.	34
Wing Area, sq. ft.	161
No. of Seats	2T
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	C, F, T
Country of Mfr.	Australia
FAA Office	San Francisco FSDO
No. LSAs Certified	3
SLSA Cost	\$43,901/\$42,479
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.precisionwindsports.com	
434/851-6804	



RANS Designs Inc.
S-7LS Courier

Top Speed, mph	130
Cruise, mph	118
Stall, mph	41
Range, s.m.	220
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	325/375
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	18
Empty Weight, lb.	700
Gross Weight, lb.	1232
Length, ft.	23.3
Wingspan, ft.	29.3
Wing Area, sq. ft.	147
No. of Seats	2
Cabin Width, in.	30
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Wichita FSDO
No. LSAs Certified	10
SLSA Cost	\$85,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.rans.com	
785/625-6346	



Remos Aircraft Inc.
G-3

Top Speed, mph	138
Cruise, mph	130
Stall, mph	45
Range, s.m.	646
Rate of Climb, fpm	1350
Takeoff/Landing Distance, ft.	330/590
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	22
Empty Weight, lb.	625
Gross Weight, lb.	1320
Length, ft.	21.3
Wingspan, ft.	32.2
Wing Area, sq. ft.	131
No. of Seats	2
Cabin Width, in.	46.8
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Germany
FAA Office	Vandalia MIDO
No. LSAs Certified	29
SLSA Cost	\$109,500
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.remos.com	
888/838-9879	



Rollison Light Sport Aircraft, Inc.
EuroFox

Top Speed, mph	132
Cruise, mph	115
Stall, mph	40
Range, s.m.	320
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	260/285
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	22.5
Empty Weight, lb.	644
Gross Weight, lb.	1232
Length, ft.	18.8
Wingspan, ft.	27.8
Wing Area, sq. ft.	123.8
No. of Seats	2
Cabin Width, in.	44.1
Landing Gear	tri or tail

Bldg. Materials	F, T
Country of Mfr.	Czech Republic
FAA Office	Vandalia MIDO
No. LSAs Certified	26
SLSA Cost	\$59,950
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.eurofox-usa.com	
812/384-4972	



Savage Aircraft Sales
Savage

Top Speed, mph	109
Cruise, mph	90
Stall, mph	38
Range, s.m.	480
Rate of Climb, fpm	864
Takeoff/Landing Distance, ft.	295/623
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	18
Empty Weight, lb.	645
Gross Weight, lb.	1232
Length, ft.	21
Wingspan, ft.	30.6
Wing Area, sq. ft.	153
No. of Seats	2T
Cabin Width, in.	30
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	Czech Republic
FAA Office	Orlando FSDO
No. LSAs Certified	12
SLSA Cost	\$70,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.savageaircraftsales.com	
920/726-5260	





Six Chuter, Inc.	
Legend XT	
Top Speed, mph	28
Cruise, mph	28
Stall, mph	n.a.
Range, s.m.	75
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	200/100
Engine Used/HP	Rotax 582/65

Fuel Capacity, gal.	12
Empty Weight, lb.	375
Gross Weight, lb.	1000
Length, ft.	10
Wingspan, ft.	39
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, M, T
Country of Mfr.	USA
FAA Office	Spokane FSDO
No. LSAs Certified	5
SLSA Cost	\$21,995
ELSA Cost	\$18,995
ELSA Build Time, hrs.	n.p.
www.sixchuter.com	
509/966-8211	



Skykits USA Corporation	
Rampage	
Top Speed, mph	135
Cruise, mph	120
Stall, mph	35
Range, s.m.	490
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	110/n.p.
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	21
Empty Weight, lb.	630
Gross Weight, lb.	1234
Length, ft.	23
Wingspan, ft.	26.3
Wing Area, sq. ft.	n.p.
No. of Seats	2
Cabin Width, in.	46
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	1
SLSA Cost	\$98,995
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.skykits.com	
403/601-8700	



Skykits USA Corporation	
Savannah	
Top Speed, mph	110
Cruise, mph	96
Stall, mph	32
Range, s.m.	380
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	90/160
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	21
Empty Weight, lb.	650
Gross Weight, lb.	1234
Length, ft.	21.3
Wingspan, ft.	29.3
Wing Area, sq. ft.	139.5
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	3
SLSA Cost	\$56,995
ELSA Cost	\$46,995
ELSA Build Time, hrs.	250
www.skykits.com	
403/601-8700	



Skykits USA Corporation	
Savannah ADV	
Top Speed, mph	125
Cruise, mph	115
Stall, mph	36
Range, s.m.	460
Rate of Climb, fpm	1390
Takeoff/Landing Distance, ft.	250/175
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	21
Empty Weight, lb.	650
Gross Weight, lb.	1234
Length, ft.	21.3
Wingspan, ft.	26.3
Wing Area, sq. ft.	101.2
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	2
SLSA Cost	\$82,995
ELSA Cost	\$59,495
ELSA Build Time, hrs.	230
www.skykits.com	
403/601-8700	



Skykits USA Corporation	
Savannah VG	
Top Speed, mph	115
Cruise, mph	105
Stall, mph	32
Range, s.m.	420
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	90/150
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	21
Empty Weight, lb.	640
Gross Weight, lb.	1234
Length, ft.	21.3
Wingspan, ft.	29.5
Wing Area, sq. ft.	128
No. of Seats	2
Cabin Width, in.	29.5
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Los Angeles MIDO
No. LSAs Certified	4
SLSA Cost	\$70,995
ELSA Cost	\$46,995
ELSA Build Time, hrs.	250
www.skykits.com	
403/601-8700	



Soaring Concepts, Inc.	
Sky Trek	
Top Speed, mph	34
Cruise, mph	34
Stall, mph	n.a.
Range, s.m.	85
Rate of Climb, fpm	700
Takeoff/Landing Distance, ft.	300/200
Engine Used/HP	Rotax 582/65

Fuel Capacity, gal.	11
Empty Weight, lb.	386
Gross Weight, lb.	1000
Length, ft.	10
Wingspan, ft.	32
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	Dupage FSDO
No. LSAs Certified	30
SLSA Cost	\$17,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.soaringconcepts.com	
269/467-9572	



Sport Aircraft Works	
Mermaid	
Top Speed, mph	132
Cruise, mph	115
Stall, mph	32
Range, s.m.	670
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	325/500
Engine Used/HP	Jabiru 3300/120

Fuel Capacity, gal.	30
Empty Weight, lb.	836
Gross Weight, lb.	1430
Length, ft.	24
Wingspan, ft.	33.2
Wing Area, sq. ft.	134
No. of Seats	2
Cabin Width, in.	46
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Czech Republic
FAA Office	Orlando FSDO
No. LSAs Certified	2
SLSA Cost	\$91,000
ELSA Cost	\$45,500 (99% complete)
ELSA Build Time, hrs.	300
www.sportaircraftworks.com	
772/223-8915	



Sport Aircraft Works	
SportCruiser	
Top Speed, mph	138
Cruise, mph	138
Stall, mph	29
Range, s.m.	640
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	360/400
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	30
Empty Weight, lb.	727
Gross Weight, lb.	1320
Length, ft.	21.1
Wingspan, ft.	28.8
Wing Area, sq. ft.	141.5
No. of Seats	2
Cabin Width, in.	46.5
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Czech Republic
FAA Office	Orlando FSDO
No. LSAs Certified	38
SLSA Cost	\$79,500
ELSA Cost	\$34,500 (98% complete)
ELSA Build Time, hrs.	300
www.sportaircraftworks.com	
772/223-8915	

SportairUSA, LLC
Sting Sport

Top Speed, mph	138
Cruise, mph	121
Stall, mph	49
Range, s.m.	520
Rate of Climb, fpm	810
Takeoff/Landing Distance, ft.	490/390
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	21.5
Empty Weight, lb.	780
Gross Weight, lb.	1320
Length, ft.	20.3
Wingspan, ft.	28.3
Wing Area, sq. ft.	121.5
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	C
Country of Mfr.	Czech Republic
FAA Office	Oklahoma City MDO
No. LSAs Certified	64
SLSA Cost	\$99,000
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.sportair.aero	
501/228-7777	



Sportsplanes.com
Breezer

Top Speed, mph	138
Cruise, mph	120
Stall, mph	40
Range, s.m.	570
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	350/426
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	17
Empty Weight, lb.	655
Gross Weight, lb.	1320
Length, ft.	21
Wingspan, ft.	29
Wing Area, sq. ft.	n.p.
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Germany
FAA Office	Orlando FSDO
No. LSAs Certified	1
SLSA Cost	\$112,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.sportsplanes.com	
801/420-6176	



Sportsplanes.com
Bushcaddy

Top Speed, mph	95
Cruise, mph	85
Stall, mph	32
Range, s.m.	490
Rate of Climb, fpm	850
Takeoff/Landing Distance, ft.	200/350
Engine Used/HP	Rotax/80

Fuel Capacity, gal.	30
Empty Weight, lb.	680
Gross Weight, lb.	1320
Length, ft.	22
Wingspan, ft.	32
Wing Area, sq. ft.	168
No. of Seats	2
Cabin Width, in.	44
Landing Gear	tri/tail

Bldg. Materials	M
Country of Mfr.	USA
FAA Office	Seattle MDO
No. LSAs Certified	1
SLSA Cost	\$89,500
ELSA Cost	\$22,365 (50% complete)
ELSA Build Time, hrs.	1000
www.sportsplanes.com	
801/420-6176	



Sportsplanes.com
C42

Top Speed, mph	138
Cruise, mph	110
Stall, mph	38
Range, s.m.	490
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	410/575
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	17.5
Empty Weight, lb.	593
Gross Weight, lb.	1141
Length, ft.	19.5
Wingspan, ft.	31
Wing Area, sq. ft.	n.p.
No. of Seats	2
Cabin Width, in.	40
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Germany
FAA Office	Orlando FSDO
No. LSAs Certified	1
SLSA Cost	\$79,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.sportsplanes.com	
801/420-6176	



Sportsplanes.com
Skylark DV-1

Top Speed, mph	179
Cruise, mph	135
Stall, mph	42
Range, s.m.	600
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	500/530
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	24
Empty Weight, lb.	653
Gross Weight, lb.	1320
Length, ft.	21.6
Wingspan, ft.	26
Wing Area, sq. ft.	101
No. of Seats	2
Cabin Width, in.	42
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Czech Republic
FAA Office	Orlando FSDO
No. LSAs Certified	3
SLSA Cost	\$110,950
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.sportsplanes.com	
801/420-6176	



Summit Powered Parachutes
Summit II PPC

Top Speed, mph	32
Cruise, mph	32
Stall, mph	n.p.
Range, s.m.	n.p.
Rate of Climb, fpm	600
Takeoff/Landing Distance, ft.	150/75
Engine Used/HP	Rotax 582/65

Fuel Capacity, gal.	14
Empty Weight, lb.	310
Gross Weight, lb.	900
Length, ft.	10.3
Wingspan, ft.	n.a.
Wing Area, sq. ft.	500
No. of Seats	2
Cabin Width, in.	n.a.
Landing Gear	trigear

Bldg. Materials	F, T
Country of Mfr.	Canada
FAA Office	DAR
No. LSAs Certified	1
SLSA Cost	\$16,900
ELSA Cost	\$15,950
ELSA Build Time, hrs.	50
www.summitppc.com	
250/503-1033	



Taylorcraft Aviation
Sport

Top Speed, mph	117
Cruise, mph	115
Stall, mph	43
Range, s.m.	750
Rate of Climb, fpm	775
Takeoff/Landing Distance, ft.	345/375
Engine Used/HP	Continental O-200/100

Fuel Capacity, gal.	42
Empty Weight, lb.	890
Gross Weight, lb.	1320
Length, ft.	22.1
Wingspan, ft.	36
Wing Area, sq. ft.	183.6
No. of Seats	2
Cabin Width, in.	39
Landing Gear	tailwheel

Bldg. Materials	F, T
Country of Mfr.	USA
FAA Office	San Antonio FSDO
No. LSAs Certified	1
SLSA Cost	\$89,995
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.taylorcraft.com	
956/986-0700	



Tecnam Aircraft
Bravo

Top Speed, mph	138
Cruise, mph	136
Stall, mph	44
Range, s.m.	677
Rate of Climb, fpm	1100
Takeoff/Landing Distance, ft.	400/394
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	26.3
Empty Weight, lb.	730
Gross Weight, lb.	1320
Length, ft.	21
Wingspan, ft.	27.5
Wing Area, sq. ft.	118.4
No. of Seats	2
Cabin Width, in.	44
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Italy
FAA Office	Atlanta FSDO
No. LSAs Certified	27
SLSA Cost	\$99,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.tecnamaircraft.com	
770/309-4155	





Tecnam Aircraft	
Echo Super	
Top Speed, mph	136
Cruise, mph	131
Stall, mph	39
Range, s.m.	590
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	388/328
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	23.8
Empty Weight, lb.	710
Gross Weight, lb.	1320
Length, ft.	21
Wingspan, ft.	28.5
Wing Area, sq. ft.	129
No. of Seats	2
Cabin Width, in.	46
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Italy
FAA Office	Atlanta FSDO
No. LSAs Certified	14
SLSA Cost	\$95,900
ELSA Cost	n.p.
ELSA Build Time, hrs.	n.p.
www.tecnamaircraft.com	
770/309-4155	



Tecnam Aircraft	
Sierra	
Top Speed, mph	138
Cruise, mph	134
Stall, mph	44
Range, s.m.	661
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	460/394
Engine Used/HP	Rotax 912S/100

Fuel Capacity, gal.	26.3
Empty Weight, lb.	740
Gross Weight, lb.	1320
Length, ft.	21.6
Wingspan, ft.	28.1
Wing Area, sq. ft.	123.8
No. of Seats	2
Cabin Width, in.	43
Landing Gear	trigear

Bldg. Materials	M
Country of Mfr.	Italy
FAA Office	Atlanta FSDO
No. LSAs Certified	31
SLSA Cost	\$101,900
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.tecnamaircraft.com	
770/309-4155	



Urban Air USA	
Lambda VFM 13/15	
Top Speed, mph	125
Cruise, mph	115
Stall, mph	39
Aspect Ratio	17.4:1
L/D	30:1
Minimum Sink, fpm	210
Engine Used/HP	Rotax 912/80

Fuel Capacity, gal.	26.4
Empty Weight, lb.	628
Gross Weight, lb.	1278
Length, ft.	20.6
Wingspan, ft.	49
Wing Area, sq. ft.	138
No. of Seats	2
Cabin Width, in.	41.7
Landing Gear	tailwheel

Bldg. Materials	C
Country of Mfr.	Czech Republic
FAA Office	Los Angeles FSDO
No. LSAs Certified	2
SLSA Cost	\$97,597
ELSA Cost	n.a.
ELSA Build Time, hrs.	n.a.
www.urbanairusa.com	
321/960-3438	

2008 Rotocraft Directory



Air Command International, Inc.	
Commander Elite 503	
Cruise, mph	55
Stall, mph	n.a.
Range, s.m.	240
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	250/20
Engine Used	Rotax 503
HP/HP Range	52/40-72

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	278/590
Length, ft.	10.8
Disk Span, ft.	n.p.
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	19
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	50
No. Completed & Flown	101
Kit Cost	\$18,000
Estimated Completed Cost	\$18K - \$21K
Quickbuild/Plans Available	N/N
www.aircommand.com	
903/527-3335	
LSA LEGAL	



Air Command International, Inc.	
Commander Elite 582	
Cruise, mph	65
Stall, mph	n.a.
Range, s.m.	240
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	100/20
Engine Used	Rotax 582
HP/HP Range	67/40-72

Fuel Capacity, gal.	9
Empty/Gross Weight, lb.	275/750
Length, ft.	10.8
Disk Span, ft.	n.p.
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	19
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	50
No. Completed & Flown	101
Kit Cost	\$20,280
Estimated Completed Cost	\$21K - \$23K
Quickbuild/Plans Available	N/N
www.aircommand.com	
903/527-3335	
LSA LEGAL	



Air Command International, Inc.	
Commander Elite Single-Place EJ22	
Cruise, mph	65
Stall, mph	n.p.
Range, s.m.	240
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	200/20
Engine Used	Hirth 3203
HP/HP Range	65/40-72

Fuel Capacity, gal.	9
Empty/Gross Weight, lb.	275/750
Length, ft.	10.8
Disk Span, ft.	n.p.
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	19
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	40
No. Completed & Flown	101
Kit Cost	\$17,500
Estimated Completed Cost	\$15K - \$25K
Quickbuild/Plans Available	N/N
www.aircommand.com	
903/527-3335	
LSA LEGAL	

Air Command International, Inc. Commander Elite Tandem EJ22

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	n.p.
Rate of Climb, fpm	1200
Takeoff/Landing Distance, ft.	100/20
Engine Used	Hirth F-30
HP/HP Range	140/140-180

Fuel Capacity, gal.	10
Empty/Gross Weight, lb.	490/1155
Length, ft.	13.5
Disk Span, ft.	n.p.
Disk Area, sq. ft.	n.p.
No. of Seats	2T
Cockpit Width, in.	19
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	100
No. Completed & Flown	101
Kit Cost	\$22,475
Estimated Completed Cost	\$30K - \$50K
Quickbuild/Plans Available	N/N

www.aircommand.com
903/527-3335



Aircraft Designs, Inc. Bumble Bee

Cruise, mph	40
Stall, mph	n.a.
Range, s.m.	70
Rate of Climb, fpm	1500
Takeoff/Landing Distance, ft.	n.p.
Engine Used	Rotax 447
HP/HP Range	40

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	213/500
Length, ft.	10
Disk Span, ft.	23
Disk Area, sq. ft.	415
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	400
No. Completed & Flown	15
Kit Cost	n.p.
Estimated Completed Cost	\$2K - \$3K
Quickbuild/Plans Available	N/\$250

www.aircraftdesigns.com
831/621-8760



Aircraft Designs, Inc. Sportster

Cruise, mph	75
Stall, mph	n.p.
Range, s.m.	170
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	700/n.p.
Engine Used	Lycoming O-320
HP/HP Range	150/130-160

Fuel Capacity, gal.	17
Empty/Gross Weight, lb.	650/1100
Length, ft.	12
Disk Span, ft.	28
Disk Area, sq. ft.	616
No. of Seats	2
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	1500
No. Completed & Flown	67
Kit Cost	n.p.
Estimated Completed Cost	\$6K - \$25K
Quickbuild/Plans Available	N/\$535

www.aircraftdesigns.com
831/621-8760



American Sportscopter, Inc. UltraSport 254

Cruise, mph	63
Stall, mph	n.a.
Range, s.m.	90
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	n.p.
Engine Used	Hirth 2703
HP/HP Range	55

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	252/525
Length, ft.	19.1
Disk Span, ft.	21
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	31
Landing Gear	skids
Bldg. Materials	C

Beginner Build Time, hrs.	200
No. Completed & Flown	60
Kit Cost	\$35,000
Estimated Completed Cost	\$35K
Quickbuild/Plans Available	N/N

www.ultrasport.rotor.com
757/872-8778



American Sportscopter, Inc. UltraSport 331H

Cruise, mph	65
Stall, mph	n.a.
Range, s.m.	190
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	n.a.
Engine Used	Hirth H-32
HP/HP Range	65

Fuel Capacity, gal.	10
Empty/Gross Weight, lb.	330/650
Length, ft.	19.8
Disk Span, ft.	21
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	31
Landing Gear	skids
Bldg. Materials	C

Beginner Build Time, hrs.	200
No. Completed & Flown	70
Kit Cost	\$38,000
Estimated Completed Cost	\$38K
Quickbuild/Plans Available	N/N

www.ultrasport.rotor.com
757/872-8778



American Sportscopter, Inc. UltraSport 496H Hornet

Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	280
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Hirth H-30
HP/HP Range	115/95-120

Fuel Capacity, gal.	16
Empty/Gross Weight, lb.	575/1180
Length, ft.	19.8
Disk Span, ft.	23
Disk Area, sq. ft.	415
No. of Seats	2
Cockpit Width, in.	48
Landing Gear	skids
Bldg. Materials	C

Beginner Build Time, hrs.	350
No. Completed & Flown	70
Kit Cost	\$68,000
Estimated Completed Cost	\$68K
Quickbuild/Plans Available	N/N

www.ultrasport.rotor.com
757/872-8778



Barnett Rotorcraft Barnett J4B-2

Cruise, mph	93
Stall, mph	n.a.
Range, s.m.	230
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	300/0
Engine Used	Continental O-200
HP/HP Range	100/100-200

Fuel Capacity, gal.	17
Empty/Gross Weight, lb.	512/1085
Length, ft.	13.7
Disk Span, ft.	27.3
Disk Area, sq. ft.	586
No. of Seats	2
Cockpit Width, in.	24
Landing Gear	trigear
Bldg. Materials	F, T

Beginner Build Time, hrs.	500
No. Completed & Flown	187
Kit Cost	\$8000
Estimated Completed Cost	\$15K - \$30K
Quickbuild/Plans Available	Y/\$195

www.barnettrotorcraft.com
530/742-7416



Barnett Rotorcraft BRC540 Coupe

Cruise, mph	110
Stall, mph	n.a.
Range, s.m.	210
Rate of Climb, fpm	800
Takeoff/Landing Distance, ft.	300/0
Engine Used	Lycoming O-360
HP/HP Range	180/100-200

Fuel Capacity, gal.	17.5
Empty/Gross Weight, lb.	625/1248
Length, ft.	14.5
Disk Span, ft.	29
Disk Area, sq. ft.	679
No. of Seats	2
Cockpit Width, in.	44
Landing Gear	trigear
Bldg. Materials	C, F, T

Beginner Build Time, hrs.	400
No. Completed & Flown	8
Kit Cost	\$36,972
Estimated Completed Cost	\$30K - \$50K
Quickbuild/Plans Available	Y/\$210

www.barnettrotorcraft.com
530/742-7416





CHR Safari	
Cruise, mph	85
Stall, mph	n.a.
Range, s.m.	290
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	n.p.
Engine Used	Lycoming O-320
HP/HP Range	160/160-180

Fuel Capacity, gal.	28
Empty/Gross Weight, lb.	1000/1500
Length, ft.	30
Disk Span, ft.	26
Disk Area, sq. ft.	530
No. of Seats	2
Cockpit Width, in.	48
Landing Gear	skids
Bldg. Materials	M, T

Beginner Build Time, hrs.	700
No. Completed & Flown	130
Kit Cost	\$74,400
Estimated Completed Cost	\$85K - \$110K
Quickbuild/Plans Available	Y/\$150

www.acehelicopter.com
850/482-4141



Eagle R&D Helicycle	
Cruise, mph	95
Stall, mph	n.a.
Range, s.m.	180
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	0/0
Engine Used	Solar Turbine
HP/HP Range	90 (de-rated)

Fuel Capacity, gal.	21
Empty/Gross Weight, lb.	500/850
Length, ft.	20.9
Disk Span, ft.	21
Disk Area, sq. ft.	340
No. of Seats	1
Cockpit Width, in.	28
Landing Gear	skids
Bldg. Materials	C

Beginner Build Time, hrs.	400
No. Completed & Flown	38
Kit Cost	\$36,500
Estimated Completed Cost	\$37K - \$40K
Quickbuild/Plans Available	N/N

www.helicycle.com
208/466-4120



Groen Brothers Aviation's American Autogyro SparrowHawk Gyroplane	
Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	230
Rate of Climb, fpm	650
Takeoff/Landing Distance, ft.	500/30
Engine Used	Subaru EJ-25
HP/HP Range	165

Fuel Capacity, gal.	23
Empty/Gross Weight, lb.	900/1500
Length, ft.	12.3
Disk Span, ft.	30.1
Disk Area, sq. ft.	707
No. of Seats	2
Cockpit Width, in.	44
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	500
No. Completed & Flown	32
Kit Cost	\$46,129
Estimated Completed Cost	\$46K - \$60K
Quickbuild/Plans Available	N/N

www.americanautogyro.com
801/973-0177



Gyro-Kopp-Ters Midnight Hawk	
Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	170
Rate of Climb, fpm	600
Takeoff/Landing Distance, ft.	100/50
Engine Used	Subaru EA-82 SPFI
HP/HP Range	92

Fuel Capacity, gal.	16
Empty/Gross Weight, lb.	510/810
Length, ft.	12.3
Disk Span, ft.	25
Disk Area, sq. ft.	n.p.
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	M, T

Beginner Build Time, hrs.	60
No. Completed & Flown	11
Kit Cost	\$10,500
Estimated Completed Cost	\$11K - \$14K
Quickbuild/Plans Available	Y/N

www.gyro-kopp-ters.com
386/752-9116



Gyro-Kopp-Ters Twin Eagle	
Cruise, mph	55
Stall, mph	n.a.
Range, s.m.	170
Rate of Climb, fpm	800
Takeoff/Landing Distance, ft.	100/50
Engine Used	Subaru EJ-22 MPFI
HP/HP Range	130

Fuel Capacity, gal.	16
Empty/Gross Weight, lb.	750/1210
Length, ft.	14.8
Disk Span, ft.	28
Disk Area, sq. ft.	n.p.
No. of Seats	2T
Cockpit Width, in.	30
Landing Gear	trigear
Bldg. Materials	M, T

Beginner Build Time, hrs.	120
No. Completed & Flown	2
Kit Cost	\$15,500
Estimated Completed Cost	\$16K - \$20K
Quickbuild/Plans Available	N/N

www.gyro-kopp-ters.com
386/752-9116



Helo Werks, Inc. HX-1 Wasp	
Cruise, mph	81
Stall, mph	n.a.
Range, s.m.	123
Rate of Climb, fpm	1225
Takeoff/Landing Distance, ft.	0/0
Engine Used	Air Research JFS-100
HP/HP Range	100/100-125

Fuel Capacity, gal.	20
Empty/Gross Weight, lb.	675/1250
Length, ft.	19
Disk Span, ft.	23
Disk Area, sq. ft.	415
No. of Seats	2
Cockpit Width, in.	49
Landing Gear	skid
Bldg. Materials	C, T

Beginner Build Time, hrs.	350
No. Completed & Flown	1
Kit Cost	\$81,000
Estimated Completed Cost	\$81K - \$100K
Quickbuild/Plans Available	N/N

www.helowerks.com
757/342-6982



Innovator Technologies Mosquito Air	
Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	60
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Compact Radial
HP/HP Range	60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	253/530
Length, ft.	20
Disk Span, ft.	18
Disk Area, sq. ft.	254
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	skids
Bldg. Materials	C, M

Beginner Build Time, hrs.	300
No. Completed & Flown	15
Kit Cost	\$23,000
Estimated Completed Cost	\$23K - \$29K
Quickbuild/Plans Available	N/N

www.innovatortech.ca
403/669-3101



Innovator Technologies Mosquito XE	
Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	160
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Compact Radial
HP/HP Range	60

Fuel Capacity, gal.	12
Empty/Gross Weight, lb.	296/610
Length, ft.	22
Disk Span, ft.	19.5
Disk Area, sq. ft.	299
No. of Seats	1
Cockpit Width, in.	28
Landing Gear	skids
Bldg. Materials	C, M

Beginner Build Time, hrs.	250
No. Completed & Flown	12
Kit Cost	\$27,500
Estimated Completed Cost	\$28K - \$32K
Quickbuild/Plans Available	N/N

www.innovatortech.ca
403/669-3101

Innovator Technologies
Mosquito XEL

Cruise, mph	65
Stall, mph	n.a.
Range, s.m.	60
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Compact Radial
HP/HP Range	60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	312/585
Length, ft.	22
Disk Span, ft.	19.5
Disk Area, sq. ft.	299
No. of Seats	1
Cockpit Width, in.	28
Landing Gear	skids
Bldg. Materials	C, M

Beginner Build Time, hrs.	250
No. Completed & Flown	6
Kit Cost	\$28,500
Estimated Completed Cost	\$29K - \$37K
Quickbuild/Plans Available	N/N
www.innovatortech.ca	
403/669-3101	



Little Wing Autogyro, Inc.
LW-3

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	300
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	500/20
Engine Used	Rotec Radial
HP/HP Range	50/50-115

Fuel Capacity, gal.	10
Empty/Gross Weight, lb.	575/1100
Length, ft.	18
Disk Span, ft.	27
Disk Area, sq. ft.	572.5
No. of Seats	1
Cockpit Width, in.	26
Landing Gear	tailwheel
Bldg. Materials	F, M, T

Beginner Build Time, hrs.	1000
No. Completed & Flown	10
Kit Cost	\$25,000
Estimated Completed Cost	\$10K - \$40K
Quickbuild/Plans Available	N/\$175
www.littlewingautogyro.com	
501/470-7444	



Little Wing Autogyro, Inc.
LW-4

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	510
Rate of Climb, fpm	600
Takeoff/Landing Distance, ft.	300/10
Engine Used	Rotax 912S
HP/HP Range	100/90-150

Fuel Capacity, gal.	13.5
Empty/Gross Weight, lb.	450/1100
Length, ft.	18
Disk Span, ft.	27
Disk Area, sq. ft.	572.5
No. of Seats	2
Cockpit Width, in.	26
Landing Gear	tailwheel
Bldg. Materials	F, M, T

Beginner Build Time, hrs.	1000
No. Completed & Flown	2
Kit Cost	\$35,000
Estimated Completed Cost	\$35K - \$75K
Quickbuild/Plans Available	N/\$175
www.littlewingautogyro.com	
501/470-7444	



Little Wing Autogyro, Inc.
LW-5

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	200
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	300/20
Engine Used	Rotax 914
HP/HP Range	115/50-115

Fuel Capacity, gal.	25
Empty/Gross Weight, lb.	550/1100
Length, ft.	16
Disk Span, ft.	n.p.
Disk Area, sq. ft.	572.5
No. of Seats	1
Cockpit Width, in.	26
Landing Gear	tailwheel
Bldg. Materials	M, F, T

Beginner Build Time, hrs.	1000
No. Completed & Flown	2
Kit Cost	\$35,000
Estimated Completed Cost	\$35K - \$75K
Quickbuild/Plans Available	N/\$175
www.littlewingautogyro.com	
501/470-7444	



www.andair.co.uk

Andair LTD
Unit 15 The Tanneries
Havant
Hampshire
PO9 1JB
ENGLAND

Tel +44(0) 239 247 3945
Fax +44(0) 239 247 3946
email:- info@andair.co.uk

ORDER ONLINE
RV LOCKING FUEL CAPS NOW SHIPPING
CUSTOM ENGRAVING AVAILABLE

Andair LTD. Manufacturers of World Class Fuel Equipment



Oil / Air Separator
OS850

Easily dismantled for inspection / cleaning
Upper outlet can be rotated through 360° to aid fitting
Vortex swirl separation
O-ring seals
Light weight (180g - 6.4oz)
Mounting lugs on the base of the unit
Can be used in conjunction with the
CT850 Condensation Trap.



Gascolator
GAS375

Machined from Aluminium and anodised for protection
PTFE coated 70 micron stainless steel mesh
O-ring seals - Can be used on high pressure fuel systems
Available in 3 sizes up to 1/2"
Interchangeable fittings
Acceptable for use with Diesel and Jet A1



Fuel Selector
FS20x7

Firm detent at each tank position
Clearly labelled fascia plate
Super smooth action
Positive stop for the OFF position (button must be raised)
Interchangeable fittings
Extension upgrade available
Duplex models available for fuel return lines



Magni USA, LLC	
M-14	
Cruise, mph	90
Stall, mph	n.a.
Range, s.m.	240
Rate of Climb, fpm	950
Takeoff/Landing Distance, ft.	230/25
Engine Used	Rotax 912S
HP/HP Range	100

Fuel Capacity, gal.	12
Empty/Gross Weight, lb.	547/1212
Length, ft.	13
Disk Span, ft.	28
Disk Area, sq. ft.	615
No. of Seats	2T
Cockpit Width, in.	20
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	300
No. Completed & Flown	100
Kit Cost	\$64,000
Estimated Completed Cost	\$65K - \$67K
Quickbuild/Plans Available	N/N

www.magnigyro.com
573/883-3541



Magni USA, LLC	
M-16/M-22	
Cruise, mph	90
Stall, mph	n.a.
Range, s.m.	690
Rate of Climb, fpm	950
Takeoff/Landing Distance, ft.	230/25
Engine Used	Rotax 914
HP/HP Range	115

Fuel Capacity, gal.	19
Empty/Gross Weight, lb.	595/1212
Length, ft.	15.3
Disk Span, ft.	28
Disk Area, sq. ft.	615
No. of Seats	2T
Cockpit Width, in.	21
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	300
No. Completed & Flown	450
Kit Cost	\$70,000
Estimated Completed Cost	\$72K - \$73K
Quickbuild/Plans Available	N/N

www.magnigyro.com
573/883-3541



Magni USA, LLC	
M-18	
Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	640
Rate of Climb, fpm	650
Takeoff/Landing Distance, ft.	150/25
Engine Used	Rotax 582
HP/HP Range	65

Fuel Capacity, gal.	9
Empty/Gross Weight, lb.	368/771
Length, ft.	14.8
Disk Span, ft.	24
Disk Area, sq. ft.	452
No. of Seats	1
Cockpit Width, in.	19
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	250
No. Completed & Flown	40
Kit Cost	\$36,400
Estimated Completed Cost	\$37K - \$38K
Quickbuild/Plans Available	N/N

www.magnigyro.com
573/883-3541



Raven RotorCraft Inc.	
Raven Lite	
Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	290
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	150/50
Engine Used	Raven V-Twin
HP/HP Range	55/45-65

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	254/504
Length, ft.	15
Disk Span, ft.	23
Disk Area, sq. ft.	414
No. of Seats	1
Cockpit Width, in.	24
Landing Gear	tailwheel
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	100
No. Completed & Flown	1
Kit Cost	\$9995
Estimated Completed Cost	\$14K - \$15K
Quickbuild/Plans Available	N/N

www.raven-rotor.com
303/440-6234



RotorWay International	
A600 Talon	
Cruise, mph	100
Stall, mph	n.a.
Range, s.m.	200
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	RI 600S
HP/HP Range	167/147-167

Fuel Capacity, gal.	17
Empty/Gross Weight, lb.	965/1500
Length, ft.	29.5
Disk Span, ft.	25
Disk Area, sq. ft.	491
No. of Seats	2
Cockpit Width, in.	44
Landing Gear	skids
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	600
No. Completed & Flown	1
Kit Cost	\$97,700
Estimated Completed Cost	\$105K - \$110K
Quickbuild/Plans Available	N/N

www.rotorway.com
480/961-1001



Sport Copter, Inc.	
Lightning	
Cruise, mph	50
Stall, mph	n.a.
Range, s.m.	130
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	200/0
Engine Used	Rotax 503
HP/HP Range	50/30-70

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	252/600
Length, ft.	11
Disk Span, ft.	23
Disk Area, sq. ft.	415.4
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	60
No. Completed & Flown	68
Kit Cost	\$18,392
Estimated Completed Cost	\$27K - \$29K
Quickbuild/Plans Available	N/N

www.sportcopter.com
503/543-7000



Sport Copter, Inc.	
Vortex	
Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	100
Rate of Climb, fpm	700
Takeoff/Landing Distance, ft.	50/0
Engine Used	Rotax 582
HP/HP Range	65/65-115

Fuel Capacity, gal.	8.5
Empty/Gross Weight, lb.	420/760
Length, ft.	12
Disk Span, ft.	25
Disk Area, sq. ft.	490.8
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	tri with tail
Bldg. Materials	C, M, T, W

Beginner Build Time, hrs.	160
No. Completed & Flown	174
Kit Cost	\$24,926
Estimated Completed Cost	\$24K - \$26K
Quickbuild/Plans Available	N/N

www.sportcopter.com
503/543-7000



Star Bee Gyros	
Gyrobee	
Cruise, mph	55
Stall, mph	n.a.
Range, s.m.	75
Rate of Climb, fpm	600
Takeoff/Landing Distance, ft.	400/50
Engine Used	MZ 202
HP/HP Range	55/40-60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	254/485
Length, ft.	12
Disk Span, ft.	22
Disk Area, sq. ft.	490
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	150
No. Completed & Flown	40
Kit Cost	\$13,495
Estimated Completed Cost	\$10K - \$18K
Quickbuild/Plans Available	N/N

www.starbeegyros.com
803/663-1052



**The Butterfly, L.L.C.
Emperor Butterfly**

Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	140
Rate of Climb, fpm	500
Takeoff/Landing Distance, ft.	500/50
Engine Used	Rotax 503
HP/HP Range	50

Fuel Capacity, gal.	7.4
Empty/Gross Weight, lb.	280/530
Length, ft.	11.1
Disk Span, ft.	23
Disk Area, sq. ft.	415
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	75
No. Completed & Flown	4
Kit Cost	\$14,395
Estimated Completed Cost	\$15K - \$16K
Quickbuild/Plans Available	N/N

www.thebutterflyllc.com
940/433-2007



**The Butterfly, L.L.C.
Golden Butterfly**

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	70
Rate of Climb, fpm	1500
Takeoff/Landing Distance, ft.	500/30
Engine Used	Subaru 2.5
HP/HP Range	190

Fuel Capacity, gal.	15
Empty/Gross Weight, lb.	895/1330
Length, ft.	17.4
Disk Span, ft.	31
Disk Area, sq. ft.	755
No. of Seats	2T
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	300
No. Completed & Flown	2
Kit Cost	\$34,995
Estimated Completed Cost	\$36K - \$38K
Quickbuild/Plans Available	N/N

www.thebutterflyllc.com
940/433-2007



**The Butterfly, L.L.C.
Monarch Butterfly**

Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	200
Rate of Climb, fpm	850
Takeoff/Landing Distance, ft.	200/0
Engine Used	Rotax 582
HP/HP Range	65

Fuel Capacity, gal.	7.5
Empty/Gross Weight, lb.	350/630
Length, ft.	11.1
Disk Span, ft.	24
Disk Area, sq. ft.	452
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	100
No. Completed & Flown	14
Kit Cost	\$17,495
Estimated Completed Cost	\$19K - \$23K
Quickbuild/Plans Available	N/N

www.thebutterflyllc.com
940/433-2007



**The Butterfly, L.L.C.
Super Sky Cycle**

Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	150
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	200/0
Engine Used	Rotax 912S
HP/HP Range	100

Fuel Capacity, gal.	13.5
Empty/Gross Weight, lb.	600/900
Length, ft.	14.6
Disk Span, ft.	26
Disk Area, sq. ft.	531
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	200
No. Completed & Flown	1
Kit Cost	\$39,195
Estimated Completed Cost	\$41K - \$44K
Quickbuild/Plans Available	N/N

www.thebutterflyllc.com
940/433-2007



Aviation Group
IN PRINT, AUDIO AND ONLINE!

From getting your up-to-date, GA news to taking a monthly IFR quiz, to finding out the best oil to use in your plane, to getting your hands dirty or building your own plane *Belvoir Aviation* is your headquarters for the authoritative information you want and need.



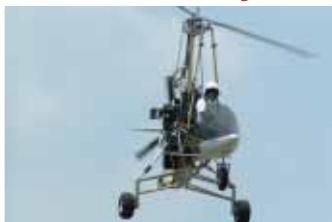
**Light Plane
Maintenance**



Pilot's Audio Update

BELKIT46H

To Find Out More Visit Us on the Web at www.belvoir.com/aviation



The Butterfly, L.L.C. Turbo Golden

Cruise, mph	75
Stall, mph	n.a.
Range, s.m.	60
Rate of Climb, fpm	1500
Takeoff/Landing Distance, ft.	500/30
Engine Used	Subaru 2.5 Turbo
HP/HP Range	300

Fuel Capacity, gal.	15
Empty/Gross Weight, lb.	1050/1850
Length, ft.	17.4
Disk Span, ft.	31
Disk Area, sq. ft.	755
No. of Seats	2T
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	300
No. Completed & Flown	1
Kit Cost	\$44,995
Estimated Completed Cost	\$46K - \$47K
Quickbuild/Plans Available	N/N

www.thebutterflyllc.com
940/433-2007



Vertical Aviation Technologies Hummingbird 260L

Cruise, mph	90
Stall, mph	n.a.
Range, s.m.	375
Rate of Climb, fpm	1250
Takeoff/Landing Distance, ft.	0/0
Engine Used	Lycoming VO-435
HP/HP Range	265

Fuel Capacity, gal.	57
Empty/Gross Weight, lb.	1750/2700
Length, ft.	30
Disk Span, ft.	33
Disk Area, sq. ft.	855
No. of Seats	4
Cockpit Width, in.	60
Landing Gear	quadricycle
Bldg. Materials	C, M

Beginner Build Time, hrs.	800
No. Completed & Flown	19
Kit Cost	\$138,600
Estimated Completed Cost	\$170K - \$180K
Quickbuild/Plans Available	N/N

www.vertical-aviation.com
407/322-9488



Vortech, Inc. A/W 95 Helicopter

Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	90
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Rotax 503
HP/HP Range	50/50-75

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	272/500
Length, ft.	15
Disk Span, ft.	19.5
Disk Area, sq. ft.	298
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	skids
Bldg. Materials	T

Beginner Build Time, hrs.	250
No. Completed & Flown	7
Kit Cost	\$22,995
Estimated Completed Cost	\$24K - \$26K
Quickbuild/Plans Available	N/\$108

www.prismz.com/helio
410/668-2757



Vortech, Inc. G-1

Cruise, mph	50
Stall, mph	n.a.
Range, s.m.	90
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	0/0
Engine Used	Kawasaki 440
HP/HP Range	42/42-55

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	150/420
Length, ft.	12
Disk Span, ft.	12
Disk Area, sq. ft.	113
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	T

Beginner Build Time, hrs.	150
No. Completed & Flown	14
Kit Cost	\$16,995
Estimated Completed Cost	\$18K - \$19K
Quickbuild/Plans Available	N/\$34.95

www.prismz.com/helio
410/668-2757



Vortech, Inc. Hot Rod Helicopter

Cruise, mph	90
Stall, mph	n.a.
Range, s.m.	210
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Subaru EJ2
HP/HP Range	165

Fuel Capacity, gal.	18.5
Empty/Gross Weight, lb.	1000/1350
Length, ft.	20
Disk Span, ft.	25
Disk Area, sq. ft.	491
No. of Seats	1
Cockpit Width, in.	n.p.
Landing Gear	skids
Bldg. Materials	C, T

Beginner Build Time, hrs.	600
No. Completed & Flown	2
Kit Cost	n.p.
Estimated Completed Cost	n.p.
Quickbuild/Plans Available	N/\$233 - \$245

www.prismz.com/helio
410/668-2757



Vortech, Inc. Kestrel Jet Helicopter

Cruise, mph	55
Stall, mph	n.a.
Range, s.m.	20
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	G8-2-20 jets (2)
HP/HP Range	36/36-60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	170/425
Length, ft.	12
Disk Span, ft.	25
Disk Area, sq. ft.	491
No. of Seats	1
Cockpit Width, in.	22
Landing Gear	skids
Bldg. Materials	M, T

Beginner Build Time, hrs.	250
No. Completed & Flown	9
Kit Cost	\$15,995
Estimated Completed Cost	\$17K - \$18K
Quickbuild/Plans Available	N/\$26.95

www.prismz.com/helio
410/668-2757



Vortech, Inc. New Choppy

Cruise, mph	65
Stall, mph	n.a.
Range, s.m.	120
Rate of Climb, fpm	950
Takeoff/Landing Distance, ft.	0/0
Engine Used	Hirth 3203
HP/HP Range	65/55-75

Fuel Capacity, gal.	6
Empty/Gross Weight, lb.	285/630
Length, ft.	15
Disk Span, ft.	21
Disk Area, sq. ft.	346
No. of Seats	1
Cockpit Width, in.	23
Landing Gear	skids
Bldg. Materials	T

Beginner Build Time, hrs.	250
No. Completed & Flown	5
Kit Cost	\$29,995
Estimated Completed Cost	\$31K - \$33K
Quickbuild/Plans Available	N/\$58

www.prismz.com/helio
410/668-2757



Vortech, Inc. New Choppy Ultralight

Cruise, mph	55
Stall, mph	n.a.
Range, s.m.	120
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	0/0
Engine Used	Rotax 503
HP/HP Range	48/45-60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	254/500
Length, ft.	15
Disk Span, ft.	21
Disk Area, sq. ft.	346
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	skids
Bldg. Materials	T

Beginner Build Time, hrs.	200
No. Completed & Flown	4
Kit Cost	\$22,995
Estimated Completed Cost	\$24K - \$25K
Quickbuild/Plans Available	N/\$52 - \$58

www.prismz.com/helio
410/668-2757



**Vortech, Inc.
Shadow**

Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	170
Rate of Climb, fpm	1500
Takeoff/Landing Distance, ft.	100/25
Engine Used	Lycoming O-360
HP/HP Range	150/150-230

Fuel Capacity, gal.	12
Empty/Gross Weight, lb.	750/1290
Length, ft.	13
Disk Span, ft.	29
Disk Area, sq. ft.	660
No. of Seats	2
Cockpit Width, in.	48
Landing Gear	trigear
Bldg. Materials	C, M, T

Beginner Build Time, hrs.	350
No. Completed & Flown	6
Kit Cost	\$19,995
Estimated Completed Cost	\$28K - \$33K
Quickbuild/Plans Available	N/N

www.prismz.com/helio
410/668-2757



**Vortech, Inc.
Skylark Helicopter**

Cruise, mph	70
Stall, mph	n.a.
Range, s.m.	120
Rate of Climb, fpm	1000
Takeoff/Landing Distance, ft.	0/0
Engine Used	Hirth 3503
HP/HP Range	70

Fuel Capacity, gal.	8
Empty/Gross Weight, lb.	350/700
Length, ft.	17.5
Disk Span, ft.	19
Disk Area, sq. ft.	283
No. of Seats	1
Cockpit Width, in.	26
Landing Gear	skids
Bldg. Materials	T

Beginner Build Time, hrs.	350
No. Completed & Flown	6
Kit Cost	\$31,795
Estimated Completed Cost	\$33K - \$34K
Quickbuild/Plans Available	N/\$81

www.prismz.com/helio
410/668-2757



**Vortech, Inc.
Sparrow**

Cruise, mph	60
Stall, mph	n.a.
Range, s.m.	90
Rate of Climb, fpm	900
Takeoff/Landing Distance, ft.	100/50
Engine Used	Rotax 503
HP/HP Range	50/50-60

Fuel Capacity, gal.	5
Empty/Gross Weight, lb.	254/500
Length, ft.	9
Disk Span, ft.	23
Disk Area, sq. ft.	415
No. of Seats	1
Cockpit Width, in.	n.a.
Landing Gear	trigear
Bldg. Materials	C, T

Beginner Build Time, hrs.	150
No. Completed & Flown	6
Kit Cost	\$3795 (partial)
Estimated Completed Cost	\$9K - \$11K
Quickbuild/Plans Available	N/N

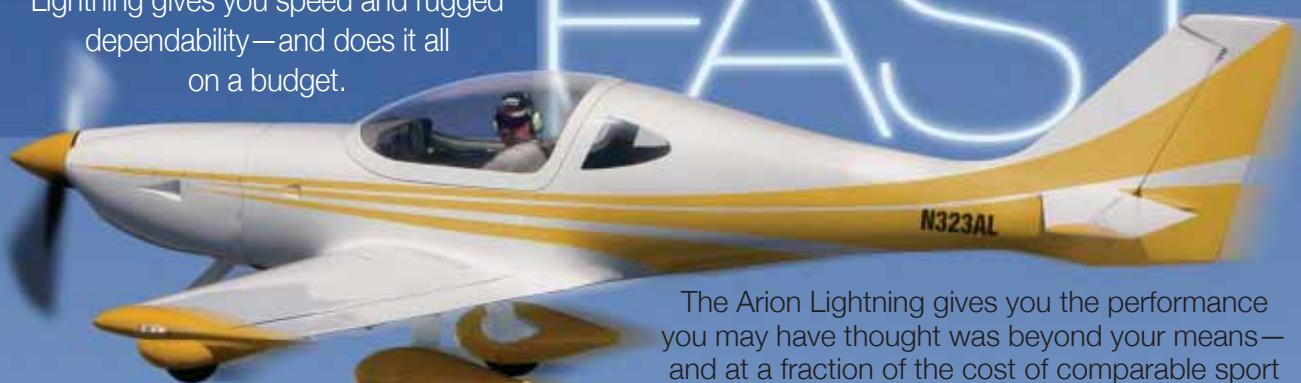
www.prismz.com/helio
410/668-2757



Please report any errors or omissions to editorial@kitplanes.com.

LIGHTNING FAST

Sleek, sporty, and strong, the Arion Lightning gives you speed and rugged dependability—and does it all on a budget.



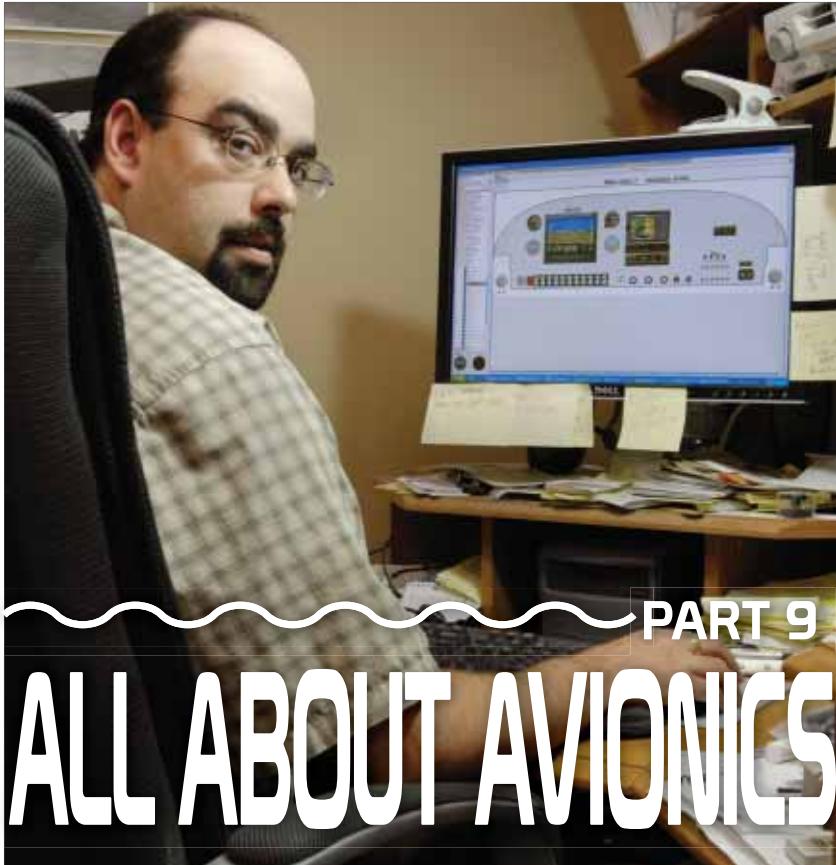
Lightning

The Arion Lightning gives you the performance you may have thought was beyond your means—and at a fraction of the cost of comparable sport aircraft. Contact Arion Aircraft today and see how smart and easy owning a Lightning can be. Arion Lightning—American made.

A R I O N

A I R C R A F T

Arion Aircraft, LLC • 2842 Hwy. 231 N. • Shelbyville, TN 37160 • 931-680-1781 • www.flylightning.net



What? I'm designing a panel. I let the guys in the shop worry about the antennas.



Sure you can install GPS and XM antennas internally under plexiglass or fiberglass, but we like them outside. The added aerodynamic drag is too small to measure.

Airborne antennas: Mistakes with your RF radiator can undermine good, hard work elsewhere.

BY STEIN BRUCH

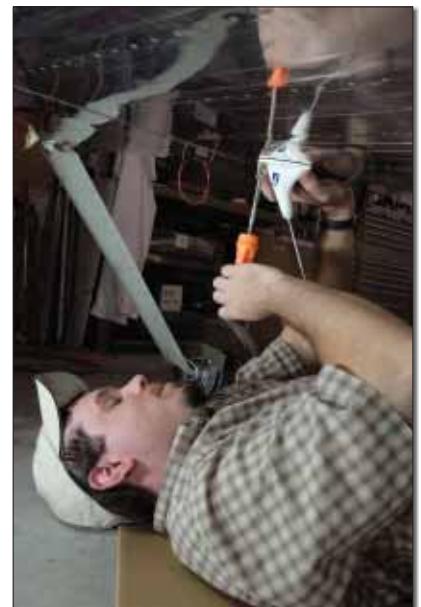
So far in this series, we've talked about GPSes, nav/coms, EFISes and many other components for your homebuilt. What we have not yet discussed is one of the final steps in getting them working. Most pieces of avionics equipment either send or receive some sort of radio-frequency (RF) signal. That means you'll be required to install some sort of antenna for each specific unit that requires one, and it's here that we see well-meaning builders and shops (who really should know better) make some pretty rookie mistakes that compromise the quality and utility of the installation.

Antennas aren't elegant, rarely pretty (unless you're an RF engineer), and

when many of us builders are trying to eke out every last bit of speed from our planes we think of the added carbuncles as wasted knots! Like me, you may not relish the thought of adding seemingly unnecessary protuberances to your plane, but to ensure that your new and expensive radios and such work to their best ability, we can't avoid using antennas to do the job.

Practice, Not Theory

We decided not to get into the complex electrical bits and bytes—or, for that matter, theoretical antenna design. But there are a few things you should understand about the various antennas you'll be working with. First is size. The lower



For metal airplanes, external antennas have proven to perform best. A bottom-mounted bent-whip antenna is fine for low-wing airplanes. Be sure to keep coax runs short and away from electrically sensitive equipment.



The straight-whip external antenna is a natural for high-wing airplanes.



Budget-conscious builders can opt for a standard stainless-steel whip antenna for about half the cost of the fiberglass models. It lacks a BNC connector—you terminate the coax with ring terminals—which can make it slightly more likely to leak RF into electronics.



The Bob Archer wingtip antenna has proven very effective for VOR/LOC/ILS functions. A good connection with the ship's ground plane—a bit of scuffing would help here—is important.



The copper-foil antenna is popular with builders of composite airplanes. Our experience at SteinAir is mixed; some work great, other installations don't. This installation is compromised by the shape of the fuselage, forcing it to curve at the ends.

the radio frequency, the longer its wavelength, so the larger the antenna will be. Antennas require a ground plane, which can be either conductive parts of the airplane—the metal wing or fuselage, for example—or a mirror-image portion of the antenna in a design called a dipole. Generally speaking, antennas for aircraft are of two types, either a quarter-wave element using a secondary ground plane or a half-wave dipole that provides its own ground plane. The dipole antenna is the one typically used under the skin in composite, wood or fabric airplanes, or in select ways in metal aircraft. For the aircraft com frequency band, a half-wave dipole will be about 43 inches long, while a quarter-wave “stick” antenna can be about half that. (In practice, the commercially available external antennas are slightly longer.)

The other frequencies we care about include the marker beacon at 75 MHz, transponder and distance measuring equipment (DME) at around 1000 MHz, and GPS at 1575 MHz for the L1 channel and 1227 for the L2 channel. Of

these, only the transponder and DME antennas have to send and receive—the transponder receives on 1030 MHz and transmits on 1090, while the DME uses one of 126 channels between 1025 and 1150 MHz—and the high frequencies in use permit small (less than 3 inch) stub antennas to work well.

You can read up on antenna design and theory all you want, but for aircraft half the battle is finding a suitable position on the airframe. Like real estate, antenna performance and capability (read value and usability) are as much a function of location as anything else. When addressing location it brings us

to perhaps one of the most discussed issues with antennas: internal versus external antennas. Unfortunately, like almost everything else in aviation there is no simple, works-every-time answer. A number of variables must be considered when looking at whether you can hide an antenna. First, when we talk about internal or external antennas, we usually are discussing completely different types of antennas. Typically external antennas are the standard sticks hanging out in the air any number of places on the plane. Internal antennas are normally of a construction that is physically unlike external antennas.

Internal antennas are most commonly purchased from a company that specializes in these products. The two most popular manufacturers are AAE

(Advanced Aircraft Electronics) and Sportcraft (also known by the inventor, Bob Archer). The AAE antennas are available in several configurations and are meant primarily to be installed in composite airframes. One advantage of the AAE antennas over the do-it-yourself versions we'll talk about later is that they come pre-terminated with female BNC connectors, which is easier for builders who fear the soldering iron. Many builders of composite aircraft have installed these antennas with success for various avionics components, but they are mainly used for nav and com. AAE's com antennas are a long thin strip (approximately 1 inch x 43 inches), manufactured with a proprietary process. The antennas are typically installed in the aft fuselage area of composite or fabric-covered airframes, and AAE doesn't recommend its antennas for metal aircraft. That being said, care must be taken with the installation. Our experience has shown that placing them



High-frequency antennas, like this transponder stub, can be small, but still keep them clean. This one is obviously in the exhaust path and is suffering from some surface corrosion.



Check your equipment for internal splitters. Some nav radios need separate inputs for VOR and ILS/LOC, while others (like the Garmin SL30) perform the function internally.

anywhere near a strobe power supply or wiring can result in "strobe squeal" when receiving or transmitting. Likewise, AAE specifically recommends its antennas not be installed close to any metal structure.

Sportcraft antennas by Bob Archer are significantly different from the AAE antennas in that they are made of aluminum and are designed specifically for installation in certain areas of an airframe (mainly a wingtip or tail cap). The Sportcraft antennas are typically installed in a wingtip for either nav or com radios. Sportcraft also manufactures a wingtip marker beacon antenna. The Sportcraft wingtip antennas are designed to be mounted either vertically for com radios or horizontally for nav radios. (The transmitting signal for VHF nav is horizontally polarized, while ground transceivers for the com band are vertically oriented.)

Herein lies the only difficulty we've found with these antennas. Because most wingtips are rather shallow in vertical dimension, it's difficult to install the com antennas with as much vertical polarity as they should have. Our experience has shown that in aircraft like RVs, the com wingtip antenna does work, but it is greatly degraded in performance compared to externally mounted com antennas. Experience with nav antennas

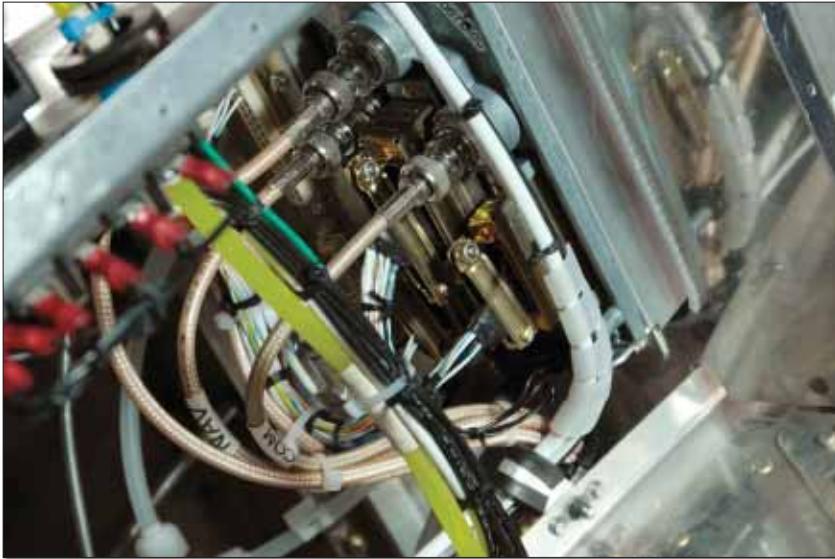


Blade-style transponder antennas have been popular for decades; we can't see much performance difference between them and the cheaper stubbie.

mounted horizontally in the wingtips of aircraft such as RVs has shown very good performance characteristics for VOR, LOC and GS (all are received through the same antenna). The marker beacon antennas also show good performance in the wingtip. Overall, we really like the wingtip nav antennas but not the com antennas.

DIY Antennas

In addition to purchasing internal antennas from companies such as those mentioned above, there are various



The back of this Garmin box depicts the builder's proper use of coax cable termination, marking and routing.

alternatives for making and installing your own antennas. Someone like our own DIY maven Jim Weir is much more qualified than I am to explain the details of doing so, and you can purchase both an antenna kit as well as a detailed explanation of how to build your own copper foil antennas (antenna reference text: RST-8020) from RST Engineering. This reference is definitely worth reading.

Our experience with copper foil antennas has been mixed. Some installations in certain aircraft have worked pretty darned well, but our overall experience with aircraft other than basic composite (read fiberglass only, not carbon fiber) has been that the copper foil antennas for VHF com post poorer results in aircraft such as RVs than external antennas. I have seen copper foil antennas installed on gear legs, windshields, wheelpants, wingtips, and horizontal and vertical stabs, and while most of the locations work a little bit, they rarely approach the performance of external antennas. I make that statement with one exception—marker beacons. Almost anything will work for a marker beacon antenna, even an old coat hanger stuck out in the wingtip (yes, I've actually seen that done). This is one antenna that should almost universally be installed in a wingtip or some-



This crimped BNC connector highlights the importance of using the correct tools. The person who crimped this connector used improper tooling, which resulted in the coax being over crimped, breaking the shielding wires.

where else hidden.

The last type of internal antenna is basically mounting an antenna designed for the outside of the airplane inside or under something. Again, we see mixed results. Many of you have successfully installed a GPS antenna under your cowling forward of the firewall with favorable results. That being said, with the new generation of WAAS GPSes and their associated antennas, this isn't necessarily the best approach. First, GPS antennas are very low profile and are physically small, so drag penalties just aren't that bad. Second, most of the WAAS GPSes require a minimum length of coax cable to perform correctly (normally between 7 and 20 feet), so if you mount it within inches of the actual

"THE Challenger TEAM"



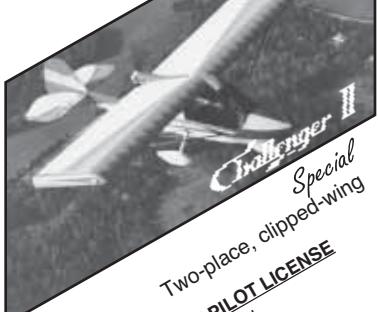
Challenger
Single-place Ultralight



Challenger II
Two-place



Challenger
Special
Single-place, clipped-wing



Challenger II
Special
Two-place, clipped-wing

QUALIFIES FOR SPORT PILOT LICENSE
Action-packed video (VHS) and Information Package \$10

Celebrating 22 years building Challengers!

QUAD CITY
Aircraft Corp.

P.O. Box 370, Moline, IL 61266-0370
(309) 764-3515
Fax: (309) 762-3920

www.quadcitychallenger.com

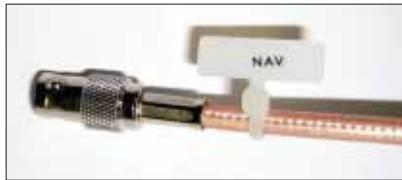
box, you now have to find something to do with all that extra coax, and extra loops of antenna cable wound up near other avionics boxes is never preferred! Our recommendation is to install the GPS (and other satellite antennas) externally as the manufacturer suggests.

Another popular antenna to “hide” is the transponder antenna. Again, it may work OK hidden under the cowl between the exhaust stacks, but an intermittent or “shadowed” transponder signal isn’t something you want when flying IFR. The transponder antenna is another small one that just isn’t that big of a deal, so again we recommend that it be cleanly installed on the bottom of the aircraft as per the manufacturer.

Overall, we like the internal nav antennas, but not many others. Even at that, the internal nav antennas (as well as com) always will have somewhat degraded performance compared to external antennas. This mainly refers to metal and some fabric aircraft, as pure composite aircraft really don’t degrade the performance of internal antennas like the tube fuselage of a Cub or the metal wing of an RV.

The Three Rules of Stein

Whichever way you decide to go, it matters little if the antennas and associated cabling are not done properly. Improper installation of coax cables, termination and connectors can make a perfectly good physical antenna installation



Behold, the properly crimped female BNC connector. Note that the wide part of the shield crimp faces away from the connector.



This poorly soldered BNC Termination has resulted in the shielding being almost entirely broken away from the connector. This inevitably results in lower performance or even failure of the radio or antenna.

completely useless. There are several rules to follow when installing antenna cables and connectors.

Rule Number One: Thou shall not use cheap twist-on or push-on BNC/TNC connectors you bought at your local hobby store or cheap surplus television coax cable. Spend the extra few dollars for good aircraft-quality cable and connectors (crimp or solder) from a reputable source as well as the proper tooling for each connector. Poorly assembled connectors and coaxial cables are responsible for the majority of noisy radio transmissions and receptions. If the manufacturer recommends RG-400/142 coax (which most now specifically require), then that is what you need to use. It’s also important to use connectors rated for RG-400/142 cable. They are not universally interchangeable with old RG-58 connectors, as the center conductor for the newer cable is slightly larger. Take the time to install the connectors properly. Even one tiny stray hair of a wire from the shielding touching somewhere it’s not supposed to can completely ruin the performance of an



This screw-type BNC connector is an acceptable piece of equipment if properly assembled. In this example the user applied excess solder on the center pin where crimping is preferred. The excess solder contacted some of the shielding wires, rendering this connector inoperative.

antenna. Be sure to test your finished coaxial cables with an ohmmeter to ensure the connections are made properly and there are no shorts between the shield and the center con-

ductor. Check your antenna leads without them connected to either the radio or the antenna, as internal characteristics of both can throw off the reading of your multimeter.

Rule Number Two: Thou shall not place unnecessary connections or joints in your antenna leads. Every time you splice a coax cable there is an opportunity to introduce external interference into your antenna line. Multiple connectors can and will change the characteristics of your coax as well. Many of you already know I’m not a fan of



When routing antenna wires throughout the airframe it’s important to keep them separate from other electrical components and wires.

THE RIGHT STUFF



THE RIGHT PRICE



Everything you need
to build and
fly your homebuilt
aircraft.

PERFORMANCE REVIEWS
BUILDER'S TIPS
SHOWS & RACES

DESIGN YOUR DREAM MACHINE
ADD THE ULTIMATE IN
AVIONICS AND ENGINES



For faster service and the lowest subscription rate
www.kitplanes.com or call 800-622-1065

KITPLANES

The World's Number One Homebuilt Aircraft Magazine

wingroot connectors for antenna leads. I know the argument: “It’ll be easier if I need to remove the wings.” Well, if you have an aircraft with removable wings and have an antenna installed in the wing, this argument makes sense. If you have an RV, Lancair or other similar aircraft and you’re removing the wings after the plane is finished, it’s likely due to something bad. My point is that even though it may take a few more minutes to install when building the plane, the overall performance of the antenna lead will be inherently better.

Rule Number Three: Thou shall not install any antennas or coax cables on or very near noisy electrical items or wires such as strobes, P-leads, alternator wires, magnetos, fuel pumps or flap motors. It’s wise to try and run your antenna leads separate from noisy wires. If you are able to run the coax cables via a completely different route through the airframe, separate from most of the other electrical bundles, then you’ll greatly reduce the chances of having an alternator whine, strobe squeal or landing-gear moan in your avionics.

Likewise, it’s important to try and keep the physical antennas themselves far away from noisy items. This isn’t always possible, but try your best. It’s also important to keep the antennas themselves separated by a certain distance. Most manufacturers recommend 36 to 48 inches of separation for com antennas (check your specific unit).

By following these three rules, you’ll have a much larger likelihood of a nice, quiet avionics installation. Proper coax cable, correct terminations and keeping antennas away from noisy items will help you keep the RFI (radio frequency interference) and EMI (electromagnetic interference) gremlins away. There is no reason to have a noisy airplane if you take the time to install the antennas properly and treat them as a system instead of an individual component, the system being connectors, cabling, termination, routing and physical installation of the antenna.



This is a good right-angle crimp job: You want them all to be neat, clean and electrically sound.

RFI and EMI, Not Your Friends

Speaking of RFI and EMI, sometimes there are glitches and gremlins that are really hard to fix or find. Despite your best attempts, you might still end up with some weird things happening on your panel. Many times this isn’t the fault of your actual antenna or coax installation, but instead may stem from physical limitations of some components in your panel. Occasionally, radios will just leak a tiny bit of RFI, and certain components are susceptible to this. It’s not uncommon to see an LED indicator or analog gauge flicker or jump when your radio is transmitting. This is something we seek to avoid, and while it’s not easy, there are ways to work on this issue.

First, ensure that all power, ground and signal wires are not routed in, near, around or next to your radio wires and antenna leads. Second, you may need to twist and/or shield the actual power/ground/signal leads as well. Third, you can try wrapping the offending item (instrument or gauge) with something called mu-metal (a fancy tinfoil-type magnetic shielding) and grounding it. Some of our Experimental products are manufactured in plastic cases without good case grounding, which makes them especially sensitive to RFI and EMI. Lastly, you can experiment with ferrite beads/chokes around the power/ground wires of the offending instrument.

If you spend the time, effort and few extra dollars to ensure that your antennas are installed properly, as well as using good components in the installation of the entire system, you’ll be treated to a wonderfully quiet airplane—at least electrically!

If you have specific questions for author Stein Bruch, or have certain projects you’d like us to cover, email us at editorial@kitplanes.com with “About Avionics” in the subject line. ✚

CONTACTS

Advanced Aircraft Electronics
800/758-8632
www.advancedaircraft.com

Comant Antennas
714/870-2420
www.comant.com

R. A. Miller Industries
www.rami.com

RST Engineering
www.rst-engr.com

**Sportcraft/Bob Archer
Antennas**
21818 Ocean Ave.
Torrance, CA 90503
310/316-8796



COMPOSITES

Part 10: Repair of a twisted tail and more.

BY BOB FRITZ

I love working with aluminum. Having said that, fiberglass has its advantages, not the least of which is the invisibility of repairs. Sure, it's sticky, slimy and can leave you scratching like a dog after an all-day possum hunt in the deep woods of southern Georgia, but for minimizing the *aw-shucks* factor, it's hard to beat.

How much so is illustrated by my current project—building a Jabiru J250 LSA. [Expect to see a full series on this project later this year.—Ed.] The kit maker says that the rear of the fuselage is molded around the horizontal stabilizer, so all I need to do is align it perpendicularly to the long axis of the fuselage, and then shift it laterally so that the same amount of stabilizer is on the left as is on the right. Seems simple enough...but whoa! Either this hangar is falling over or that horizontal stabilizer is, er, not quite horizontal.

The first thing to do is make sure that the fuselage is level, and the best place to check it is right across the wing supports. The manual advised that the bottom of the doorsills is the point for checking for level. However, in that I would prefer to have flying surfaces parallel to flying surfaces, it seemed silly to select the doorsills. After all, I



It's only 1.5 degrees low on the left, but that's 2 inches lower than the right.

like to fly wings level, not doorsills level.

As it turned out, though, my preferred reference agreed with theirs. A bit of scrounging and a long carpenter's level allowed a confirmation of two things: 1. The fuselage is level. 2. The level is level. Digital levels are really fun, but they can be wrong. You must check them periodically for correct reading, and if they're not telling true, recalibrate them. The

instructions for doing so are not exactly simple, but it's absolutely vital to do this or you'll be wrong to several decimal places.

How to Fix It

With the wing attach points and door sills confirmed to be level—and therefore the horizontal stabilizer confirmed not to be—the procedure for correcting this had to be determined. The kit maker suggested that it simply be twisted to straight, temporarily locked down with sheetmetal screws and glassed in place. That brute-force approach didn't appeal to me, nor did the potential of inducing residual loads. Thinking about it for a while, I suspected that when the system sat outside in the hot sun, the residual load would simply cause the tail to wind right back to out of alignment.

But a second realization presented itself: I might take advantage of those loads and the susceptibility to heat by twisting it past level, and then applying a heat gun. If I could support it in just the right position while it cooled, I might get it straight and with no stresses built in.

Carefully placed alignment marks were made, and then supports were positioned under the left end with weights on the right end. This induced a twist in the opposite direction, and, when it had



Step one: Is the fuselage level, and do all the tools agree? Steel machinists' blocks on the wing-attach points make a platform for a long spirit level. Digital levels can be out of calibration, so a cross-check is in order.

gone past zero by 0.5°, clamps and then sheetmetal screws were added to guarantee I'd get back to this position.

Bondo might cover a few screws, but nothing was going to hide the C clamps, so epoxy/flox would have to be added between the joining surfaces. This required that all of the hardware be pulled off followed by a wipe down with acetone.

The stabilizer is removed by sliding it out sideways. Therefore, adding a coat of epoxy or floc would not be possible without smearing it down half the stabilizer. It was necessary to pry the gaps

open enough to paint some straight epoxy on the mating surfaces, add some epoxy/flox, and screw it together. Put it on the supports, add the weights and check that it's back to 0.5°. Good.

The criticality of this procedure had me frequently confirming that the fuselage was still level. With all of it looking good, and with a silent prayer to the gods of fiberglass, I started carefully painting around the interfacing surfaces with a heat gun. Now, this isn't your mother's hairdryer; this will take graffiti off a New York City subway station, so careful use is the order of the day. My technique was to heat the tail cone and its flanges while avoiding the stabilizer as much as possible. The last thing I needed was to turn the once-straight stabilizer into a Z shape. Doing it evenly, and not excessively, was controlled by placing my hand on the tail after applying a bit of heat. Bringing it up to a bit too hot to keep my hand on it seemed about right.

Now came the hard part: leaving it alone. I worried that the torque I'd placed on it might be too much, and I'd



That little table on the left has a stack of wood under it, while that round, white container on the top right end is a 20-pound stack of welding rod. The level on the right says that it's low 0.5° on the right.



With epoxy-flox in the joint and sheet-metal screws holding it down, the straps and clamps are there to get that last bit of shape conformance.



With all that torque, it's time for the heat gun to let the entire tail cone twist the other way.



come back the next morning to find it twisted the other way. It worked, though. It was at 0.4° the other way when I first checked it the next morning. Knocking out the blocks and taking the weight off let it snap back to 0.0° .

The finishing touch was not anticipated; the gaps between the fuselage flange and the stabilizer disappeared under the pressure of the straps and the heat gun! Just add the required fiberglass strips, and it's done.

Air in the Wing, Not Under It

The next repair required the direct involvement of the manufacturer. The left wing showed what looked like a delamination in the upper surface. Unlike a tube-and-fabric aircraft, the wingskin carries a significant portion of the load, so an obvious defect like this is not something to ignore.

Now, this is not a panic situation, but it's not one to just paint over either. A careful examination top and bottom on both wings showed a similar blemish on the lower surface of the right wing. After a bit more data gathering, it appeared that what we had was a defect in the mold that caused a dry spot. We probably could have ignored it but preferred not to.

It should be stressed at this point that this is not something to undertake without direct involvement from the manufacturer. It may belabor the obvious, but a misdiagnosis of the situation could lead to a solution that is not effective, so it is imperative that an expert evaluation be made to assure that this is the proper fix for your flaw.

But how to repair it? The concept was fairly simple: Put epoxy where it should be. Getting the epoxy below the surface without tearing up the whole wing was the problem. However, just as your doctor doesn't have to saw off a piece of your arm to give you a medication, the fix could be injected. And that's what we decided to do. A visit

It worked! There are no weights or supports other than the epoxy, and all of the surfaces are cool. Just glass over the interface and move on.



To get epoxy into the area, we have to first get access to it by piercing the skin with a small punch.

to our local veterinarian supply store was necessary to obtain a syringe and a large-gauge needle. Fiberglass covered in a gelcoat, however, is a bit tougher than a horse's hide, so another method was needed to get entry to the zone to be treated.

A very small drill bit was considered, but in that we were aiming for a mid-layer, sufficient depth-control made that a dicey proposition. But an awl, or in our case, a trammel-point, was just right for punching through the first layer while giving a feel for the cavity below.

At first we tried a single injection point. That was not terribly successful, as it was not possible to determine if we were spreading the epoxy laterally. A lot of holes would let us keep trying until we found the void. The extra holes had the additional benefit that they not only allowed air to escape, they also bled epoxy, showing that the entire area was being filled.

Frequent wiping to show the extent of coverage left us feeling pretty confident that we'd really solved the problem. All that was needed now was to finish the area as part of the pre-paint operations.

Now before any of you aluminum builders get to smugly thinking that this sort of thing doesn't happen to metal airplanes, I'd like to point out that when I started my RV-6, I was cautioned that first-time builders usually built between 1.2 and 1.5 airplanes. The stuff to the right of the decimal place was in a pile in the corner. I was right on target, too.

But that's another saga. †



Under thumb pressure, the area is distorted and wrinkled. This indicates a delamination, which, in a load-bearing area, is not desirable.

A large hypodermic needle and syringe were obtained from a veterinary supply house. The trick is to inject epoxy and see it come out the adjacent holes.



All that's needed now is some finishing work with Bondo and some sanding.



The Home Machinist

Part 11: The boring head and the traveling rest.

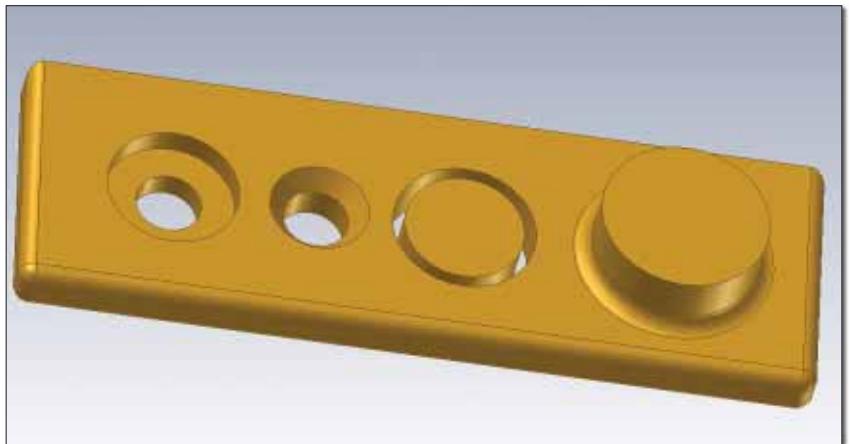
BY BOB FRITZ

The boring head. No, that's not a poorly decorated toilet on a yacht; it's a neat little tool for making big holes, internal grooves and odd sizes of holes with the milling machine when a drill bit is not available. What? You don't have a 1 1/32-inch drill bit?

If you've been a regular reader of this series, you're thinking that there's something familiar about this tool, and you're right. It was mentioned way back in Part 4 (July 2007, KITPLANES®, Page 54). At that time I mentioned that it was a favorite tool of mine, but I didn't demonstrate or expand on that statement. Now let's take a closer look.

The boring head is simple enough. It holds a sharp cutting tool in a way that allows you to install it in a milling head and then spin the cutting edge in circles. This is not the same thing as what's commonly known as a circle-cutter. The circle-cutter has a drill bit in the center with a lathe bit mounted parallel to the drill bit, offset whatever distance you choose. The technical name for this is trepanning, because it removes the core material in one piece. It's a great tool for knocking out 3-inch-diameter holes in a thin instrument panel, but it won't do a counterbore, and it's limited to about a 1-inch minimum hole. Although the lower limit for a boring head is the size of the cutting tool, the realistic minimum is on the order of one-half inch.

Take a close look at the head and its



From the left we have a counterbore, a countersink, a trepan and a spot face. You can see that the core of the trepan would simply fall out now that it's been cut through. You'd use a boring head, a counterbore tool, a trepanning tool and an endmill to cut these.



That tapered shank at the right fits in the mill. The head holds the tool; the fat screw at the 5:30 position fine-tunes the diameter of the cut.

operation is pretty obvious. What's not so obvious is that you have to work your way out to your size, first drilling a starter hole and then cutting larger and larger circles. Even less obvious is that this benign little tool has to be kept on a short leash. As your circle gets larger, you have to slow it down—a lot.

You'll remember from earlier articles that the measure of cutting speed is surface feet per minute not rpm; SFPM is the speed of the tool over the material. To keep the SFPM to a reasonable level, you have to slow down as the hole gets larger. If the diameter of a circle doubles, the distance around the circle doubles. (Don't confuse that with the area of circle, which is 3.14 times the radius squared. That goes up a lot faster with an increase in diameter.)

As an example, let's say you drilled a starting hole at 0.375 inch and want to enlarge it to 1.5 inch. That's four times the diameter, so it's four times the circumference. A check in the books (it's quicker than doing the math) says that



You can test a setting by cutting on a bit of PVC.



Want a really big hole? Put the cutting tool in this way, clamp down the set screw, fine-tune the diameter, crank the rpm way down, and have at it.



Here's the tool retracted for a nice small hole. That hole on-center can be used for even smaller diameter cuts. Your only limit is the size of the boring bar.

5000 rpm is appropriate for 500 SFPM (appropriate for aluminum) on a 0.375-inch hole.

OK, time to apply some good sense. That might work for drilling a 0.375-inch hole under ideal conditions, but not for us. For this tool in aluminum, 250 rpm is a good starting point because of all the extension and the unbalanced mass. You'd have to cut it back to about a quarter of that, i.e., 75 rpm, by the time you got to your final 1.5-inch size to maintain your SFPM. However, we cut it way down to begin with because of the mass and balance factors, so you can probably leave the speed a bit higher.

Additionally, you must recognize that the cutting edge is out on a long, slim support; it'll chatter or even break the tool if you go too fast. Just to confuse the issue, I should point out that one of the recommended cures for a poor surface finish is to speed up the rpm. Obviously, this is a skilled and experience-intensive hobby.

Getting the size you want is fairly straightforward in that the boring head has a calibrated dial on the side. Measure the hole you just cut, and dial in the amount of increase in 0.001-inch increments. Tighten up the setscrews and have another go. Again, there's a lot of



The traveling rest gets its name because it travels in the X direction with the cutting tool, and supplies a "rest" to resist any motion of the material in the Y and Z directions.

extension here, so don't try to take quarter-inch-deep cuts; 0.010 inch at a time is usually safe.

It's for these reasons that I recommend that you practice a bit with this tool by cutting a few circles in something soft such as PVC. Wood usually leaves too many splinters, so plastics are better. Lest you feel that this is a wimp's way, commercial shops frequently use stabilized plastics to test tool paths, feeds, speeds and the sequence of the operations before cutting into expensive materials.

The Traveling Rest

The traveling rest is not a self-contradiction; it's a can't-do-it-without-it accessory that lets you turn a long, skinny rod into a skinnier one of a consistent diameter. First off, steel bends. To cut steel on a lathe, or any other material for that matter, you have to shove a sharp edge against the surface of a spinning material. If the material you're cutting has a lot of cross-section to resist the shove, you're OK. But if it's relatively skinny, it's going to move away from the tool. As the point of contact moves farther from the supported end of the material, the material will move even farther out of

Automated Engine Monitoring...

...of up to 29 parameters with 62 alarms. From RPM to peak-detection leaning, the EIS does it all. Includes graphical and digital displays, customizable screens, and alarms with external warning light. Models for **all** engines up to 9-cylinders. Find out why the EIS is the choice of thousands of pilots.



Actual Size 6"W x 2.75"H x 2.5"D

All-cylinder EGT/CHT analyzer functions for 4, 6 or 9 cylinder engines.

\$473 2-stroke
\$553 2-cyl 4-stroke
\$995 4-cylinder

Prices include probes.

Grand Rapids Technologies, Inc.
3133 Madison Ave SE, Grand Rapids, MI 49548
616 245-7700 Fax 616 245-7707
www.GRTavionics.com

FIND-A-PLANE

Quickly and Easily

- Search over 700 Homebuilt Aircraft Designs Online
- Kits, plans, rotorcraft, ultralights, seaplanes, jets
- Select by price, weight, speed, materials, etc.
- Save & print favorites - \$7.00 for 7 days

Kitplanes.com/aircraftdirectory

IN-FLIGHT or GROUND

- Postively the lightest, toughest, most efficient, quietest and smoothest running prop available!
- Unique pitch adjustment design, no protractor needed.
- Number one selling prop in the world.
- Blades individually replaceable.
- 2, 3, or 6 blade configuration.
- Low drag hub.
- www.ivoprop.com

ADJUSTABLE PITCH

- Constant speed electronic governor.
- Carbon/graphite fibre composite blades with stainless steel leading edges.
- Readily reassembles from 3-blade to 2-blade configuration and one spare blade.
- Beautiful, high gloss finish.
- 30 day moneyback guarantee
- Ivoprop@pacbell.net

CALL 1-800-FOR PROP
(562) 602-1451 • Fax (562) 602-1374
15903 Lakewood Blvd. #103 Bellflower, CA 90706

Jabiru The Ultimate Sport Plane.

Jabiru J-170 and J-250 Light Sport Aircraft kits and factory complete, all composite, 85hp or 120hp models

Western USA Jabiru Pacific (559) 431-1701 jabirupacific.com	Eastern USA Jabiru USA Flight Center (800) JABIRU1 usjabiru.com	Southern USA Suncoast Sportplanes (813) 779-2324 suncoastjabiru.com	Canada Jabiru Canada (1) 613 347-3155 jabirucanada.com
--	---	---	--

its relaxed position. What we have to do is support the material so that it doesn't go where it wants to.

"Oh come now," you're saying. "Steel won't flex that much."

To illustrate my assertion, I set up a 3/4-inch steel rod in the lathe, extended it about 5 inches beyond the jaws, and took a cut 0.005 inch deep. The song of the harmonic was not quite as loud as my neighbor's oversped Bonanza on takeoff, and the surface finish was, well, interesting. Then I set up the traveling rest and voila: silence and chips that could be used on a Heavy Metal Shirley Temple doll. Obviously, cutting takes a lot of force to bend that length/diameter of steel.

So what's going on? A moment's cogitation will reveal that your cutting tool



To illustrate the use of the traveling rest, I made a cut without it. Only 0.005 inch into the material was enough to generate a harmonic chatter on a 3/4-inch steel rod.

is being pushed horizontally into the material, and, because the material is rotating, it wants to climb up onto the

tool. As a result, we need something to brace the material in two directions. The traveling rest, with its two bronze points, is just the ticket.

Mounting it is simple enough: Loosen the locks, back out the two points, position it as close as possible to being opposite the cutting tool, and then clamp it onto the cross-slide. Now screw the two points in until they lightly touch the material. I say "lightly" because we don't want to shove the material toward us, just prevent it from moving away from the tool. "Points" is not a very accurate description. The tips are cylindrical for obvious reasons, but cylindrical-adjustable-load-bearing-surfaces is a bit unwieldy, so I'll stick with points.

While it's as obvious as dawn trying



Without the traveling rest, these nice, continuous chips are not possible. They're draped over the toolpost just for illustration purposes.



It can be seen here that the traveling rest is positioned right against the material and moves in the X direction with the cutting tool.



With the traveling rest attached to the cross-slide, you obviously cannot use the cross-slide (the wheel below my wrist) for repositioning of the cutting tool.

to sneak past a rooster, I'll point out that metal-on-metal needs lubrication. A finger-dab of axle grease works just fine. Just don't use too much or you'll wear it when you turn on the lathe. And resist the temptation to reapply the old grease—it can get hot.

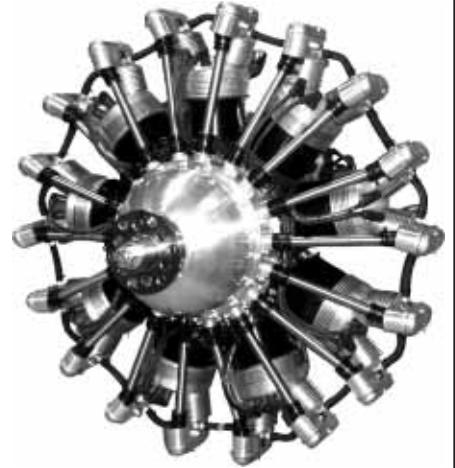
Prior to using a steady rest, you've probably used the cross-slide for adjusting the depth of the cut. What's not so obvious is that it won't work here; you'll move the cutting tool in at the same time you back away with the points. The solution is simple: Turn the compound slide around so that it goes straight into the material, and take your readings from its dial. The other "Oh, yeah, now I see how it works" revelation is that with every cut you have to add a bit of grease and readjust the points.

On my machine I'm not able to position the points directly opposite the cutting tool; they lead the tool by about half an inch. This means that the points are not supporting the material for the last of the cut, thereby allowing diameter control to go to garbage. In this instance, though, I wanted to cut off the material to a 4-inch length and then turn down the end so it could be threaded, so it was no problem. Just plan ahead. Other ways of stabilizing material that extends well

Rotec's R2800 Now Has a Bigger Brother



R2800
7 Cylinder 110HP



R3600
9 Cylinder 150HP

For more Info: www.RotecRadialEngines.com



Website: www.acehelicopter.com

email: info@acehelicopter.com

Phone: 1-850-482-4141



Available in Standard & Quick Build models

Lycoming Engine
Gear & Shaft Driven
Dual Controls
4130 Chromoly Steel
160 & 180 Hp models



Info Pack & Video \$35.00
Construction Prints & Manual \$150.00
Plus Shipping

beyond the chuck include the steady rest, live centers and dead centers. We'll tackle those next month.

FAQs

In closing, I'd like to address a couple of issues brought up by readers. Several of you have written asking why I seem to love three-in-one machines. I don't. When I bought mine it was the best option for the available space. I was building in a two-car garage that had even less wall space than a single-car garage, because I shared it with one car, three "person" doors and one garage door. Would I buy it again now that I have more space? No. I'd get a good desktop milling machine and a nice lathe. Why? It's easier to jump from one machine to the other or leave a machine set up for additional work.

Secondly, I was taken to task for suggesting that cutting tools could be disposed of rather than resharpened. The writer was rather vehement in extolling the use of a greenstone wheel, a sort of precision grinding wheel that works on extremely hard material. Although a greenstone wheel is a very good way to touch up a dull tool, you have to have a lot of dull tools to make it cost effective. And even though it doesn't require a lot of space, it does require a bit of skill.

Further, as I said at the top of this piece, this is a beginner's class, and we have to take our time. As the physicist John Archibald Wheeler noted, "Time is what prevents everything from happening at once."

Editor's note: If you have specific questions for author Bob Fritz, or if you have certain projects you'd like us to cover, email us at editorial@kitplanes.com with "Home Machinist" in the subject line. †

Look at the circumferential line that the arrows are indicating. During the cut I backed off the horizontal bronze point. That let this 0.75-inch steel bar move laterally, and the diameter of the cut changed. A lot of force is involved.



Just a little wheel-bearing grease works well to minimize wear.



WIND TUNNEL



BY BARNABY WAINFAN

Testing longitudinal stability.

Many factors can affect the longitudinal flying qualities of an airplane. Sometimes they can combine to make precise longitudinal control difficult. If the problem is severe enough, the airplane must be modified to improve its longitudinal behavior before it can be considered acceptable for normal operations.

Taming the longitudinal flying qualities of an airplane is not always a simple task because so many different aspects of the configuration can cause the problem. A common mistake is to immediately modify the airplane based on an assumption about what is wrong. Sometimes this works and sometimes it doesn't. Often, this "throwing darts at the problem" approach works by getting the right answer for the wrong reason.

For example, it is quite common to assume pitch sensitivity is caused by the center of gravity (CG) being too far aft. This assumption leads people to try to fix the problem by ballasting or moving heavy components such as the battery forward to move the CG forward.

If the problem is not primarily CG related, and is really primarily a control-system problem, it will take a large CG movement to do any good, and moving the CG forward might not help at all. Even when such assumption-based efforts are apparently successful, the solution reached is not as good as it could have been if the real problem had been attacked directly. It might not, for example, have been necessary to make the airplane carry the weight of the ballast if another solution to the control difficulties could have been found.

Modifying an airplane inevitably affects more of the machine than it initially appears to. It also affects the entire flight envelope, not just the flight regime where the modification is needed. It is desirable to keep modifications simple and to modify as little as possible to get the needed improvement in flying qualities.

The key to arriving at an effective fix is knowledge.

To fix a problem properly, we must first find out what is really causing the trouble. It is wise to do some technical detective work to isolate the factors that are actually causing the problem before making changes to the airplane. Jumping



In a constant-altitude turn, bank angle and load factors are directly related; proper flight testing requires you to accurately maintain altitude and measure bank angle to achieve good test data.

directly to changing things before doing proper diagnostic tests can lead to furious attempts to cure a disease the patient doesn't have.

What to Look For

The first goal of a flight-test program to diagnose a longitudinal control problem is to determine if the problem is related to the basic stability of the airplane or to the control system. There are two basic hypotheses we must decide between.

Hypothesis 1: The airplane lacks longitudinal stability. The static margin is too small (or negative), and this lack of stability is what is making the plane difficult to fly.

Hypothesis 2: The control system is giving the pilot poor feedback. Some combination of the elevator-hinge-moment characteristics and the mechanics of the stick and control linkages is causing the feel transmitted from the elevators to the pilot to be unsatisfactory.

Or, both hypotheses are true, and the airplane suffers from both a lack of stability *and* a control-system problem.

Assuming that the longitudinal flying qualities of the unmodified airplane are sufficiently manageable that a skilled pilot can fly it safely, flight testing can help pinpoint the cause of the flying-qualities deficiency.

Ideally, the test flights should be performed by an experienced test pilot. If one is not available, then it is wise to prepare yourself carefully before flying the tests.

Flight testing, particularly tests that explore controllability problems, is inherently hazardous. It should be done very carefully, with safety being of primary concern at all times. Remember that you are dealing with an airplane that has some bad habits. Don't invite it to bite you. A parachute and a way to quickly exit the airplane in an emergency are musts.

Barnaby Wainfan's day job is in aerodynamic design for Northrop Grumman's Advanced Design organization where he is a principal engineer. A private pilot with single engine and glider ratings, Barnaby has been involved in the design of unconventional airplanes including canards, joined wings, flying wings and some too strange to fall into any known category.

Before performing tests in an airplane with a suspected problem, it would be wise to practice them in a well-understood and well-behaved airplane to get some experience performing the tests in a low-risk environment.

During the early diagnostic tests the airplane should be loaded to the forward portion of the CG envelope. Airspeeds should be kept in the middle of the speed range. Don't get close to the stall, but keep the airspeed well below maximum speed. If anything about the way the airplane is flying begins to feel uncomfortable, unusual, or there is any indication that control might be lost if matters are pressed, don't push it. Land and think about the problem while sitting safely on the ground.

Make out test cards that call out in detail the test to be performed on any specific flight. Stick to the card and don't ad lib additional tests. Impromptu additions to a test plan are a common cause of accidents that could have been prevented if the test had been better thought out. It is natural to think, "That's interesting; what if I try..." during a test, but it can also get you in real trouble if you are nibbling at the edge of a major problem. If something comes to mind while you are airborne, make a note of the idea and add it to a future test card after you have had time to think about how to approach it gradually and safely.

The Tests

There are several tests that explore the longitudinal characteristics of the airplane. They all give somewhat different information, and more than one will likely be necessary to gain a full understanding of the situation.

This is important: All flight testing for stability requires calm, stable air. If it is even slightly gusty or turbulent, wait for another day. It will be virtually impossible to collect meaningful information in rough air. Repeat all measurements several times to help eliminate errors caused by turbulence or imperfect pilot technique.

Elevator to Trim (10% Static Margin)

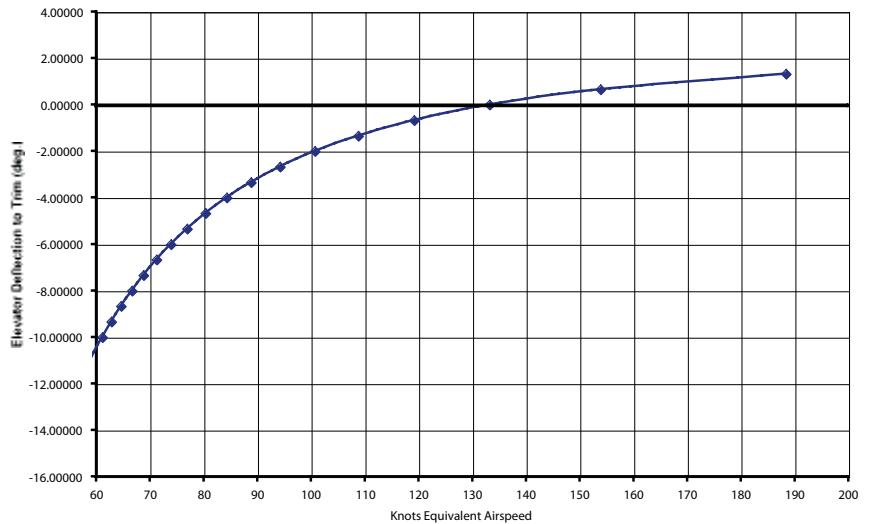


Figure 1.

Test 1: Stick Force Per G

Stick force per G is one of the dominant parameters affecting longitudinal controllability of an airplane. Accordingly, it is one of the first quantities we should measure to try to characterize the pitch behavior of the airplane.

To perform this test we need to be able to determine the load factor (G level) and stick force in flight. There are two choices for load-factor determination. By far the better choice is a G-meter, which measures load factor directly. If this is not available, then a way of measuring and holding bank angle (i.e., a gyro horizon) will also work. In a constant-altitude turn, the load factor is equal to $(1/\cosine(\text{bank angle}))$. See Table 1 (below).

Table 1	
Bank Angle °	Load Factor (G)
0	1.0
10	1.02
20	1.06
30	1.15
40	1.31
50	1.56
60	2.0
70	2.92
80	5.76

The pilot can set a load factor by flying at a constant bank angle and altitude. This must be done relatively precisely, because the load factor increases quite rapidly as bank angle increases above 60°. In fact, 60° is a good bank angle to use in testing for stick force per G because it gives a load factor of exactly 2 G.

Stick force measurements should also be quantitative. If possible, rig up a way to attach a spring scale so that it pulls on the stick at the same point that the pilot's hand would grip the stick. If this is not possible, then the pilot must estimate the stick force. A skilled and experienced test pilot can estimate stick force quite accurately, but this is at best an approximate method for most of us.

To measure stick force per G, first trim the airplane in 1-G level flight at constant airspeed. Next, roll the airplane into a turn and stabilize the airspeed, altitude and load factor without retrimming the airplane. Measure and record the stick force and the load factor. To fully characterize the airplane, this test should be performed at several CG positions and airspeeds. Start with the CG at the front of its range and move it aft slowly.

Warning: Aft-CG testing can be risky,

particularly if the CG is inadvertently moved back too far. An airplane that is well-mannered and friendly at forward CG can turn nasty when the CG is further aft. Keep the CG increments small, and be alert for any developing controllability problems. If things even begin to get uncomfortable, do not move the CG aft any further.

Do not ever fly the airplane, even for testing purposes, with the CG aft of the aft limit set by the manufacturer or designer. If you do not know the aft CG limit of the airplane, get some technical assistance from someone who can help you determine a safe aft limit. Do not stall the airplane during these tests.

If at any time the airplane requires a push rather than a pull to hold it at a constant load factor higher than 1 G, when trimmed for 1-G flight, this is an indication of instability and potentially dangerous flying qualities. Should this condition appear, keep the load factor down, discontinue the test, and land as soon as possible.

Usually, such a reversed stick force per G gradient indicates that the airplane has a negative (unstable) static margin. In some cases similar behavior can be caused by control surface hinge moment characteristics. In either case, the airplane should not be pushed to a higher load factor, nor should it be flown with the CG further aft than the position at which the reversed stick-force gradient first appeared until the problem has been fully diagnosed.

Data Analysis

Once load factor and stick force have been determined, the stick force per G of the airplane can then be calculated from: $\text{Stick force per G} = \text{Stick Force} / (N-1)$ where N is the load factor in the turn. The reason the denominator is (N-1) rather than N is that the maneuver started with the airplane trimmed at a load factor of 1.0 (1-G level flight). The stick force measured was the stick force necessary to produce the additional load factor above 1.0.

MIL F-8785C, which is the MIL

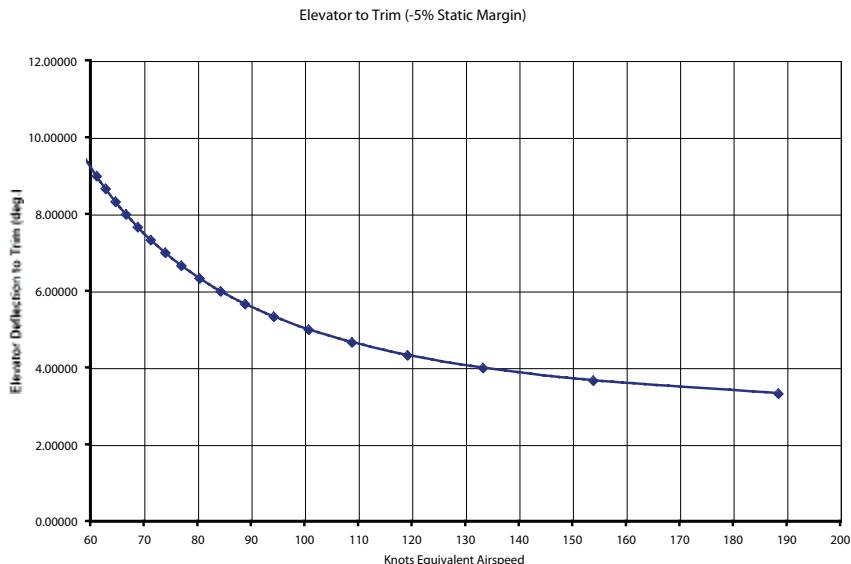


Figure 2.

SPEC for airplane flying qualities, calls out the following as the minimum acceptable stick force per G in maneuvering flight for airplanes with sticks: Min stick force per G = $12 / (N-1)$ or 3 pounds per G, whichever is greater; N is the limit load factor of the airplane.

For an airplane with a 6-G limit load this criterion gives 4.2 pounds of stick force per G as the minimum acceptable level. The limit for acceptable stick force per G applies to the entire flight envelope of the airplane.

Test 2: Stick Deflection Per G

If the airplane has an acceptable stick force per G, but still feels pitch-sensitive, then the problem may lie in the amount of stick deflection required to maneuver the airplane in pitch. A stick with very little fore and aft movement will feel sensitive even if the force the pilot is exerting to move the elevators is acceptable. The procedure to test for this is similar to the stick-force-per-G test. The only difference is that the change in stick position between the trimmed 1-G case and the stick position in the stabilized turn is the parameter that should be measured.

If the stick movement per G is very small, a change in the stick-to-elevator gearing may help eliminate the sensitive feel. The combination of acceptable

stick force per G but unacceptably small stick travel per G is rare in airplanes where the stick is mechanically linked directly to the elevators, because a reasonable amount of stick travel is usually required to keep stick force per G low enough to be acceptable. On airplanes with powered control systems, the relationship between stick travel and elevator deflection can be changed at will, and this problem can occur.

Test 3: Trim Characteristics

The next piece of data we want to get is the relationship between elevator position and trimmed airspeed. To perform this test, we must be able to measure the deflection of the elevator in flight; doing this directly can be difficult. It is much easier to measure stick position instead of elevator position. By measuring elevator and stick position on the ground for a number of deflections, it is possible to convert the stick position data measured in the air to elevator position. Cable stretch and control-system slop may introduce some inaccuracy in translating from stick position to elevator position, but it is not usually serious enough to invalidate the test. It is a good idea to check for control-system slop while taking the stick and elevator position measurements on the ground. If there is enough slop in the control system

to seriously affect the accuracy of your conversion of data from stick to elevator position, then there is enough slop to be part of the flying-qualities problem you are chasing.

The test procedure is to trim the airplane in level 1-G flight and record the airspeed and the elevator (or stick) position. Repeat this process for a number of airspeeds, ranging from the normal approach speed of the airplane to cruise speed. The results should be plotted to produce a curve of elevator deflection versus trimmed airspeed. (Note: On an airplane with a trimmable horizontal tail, the position of the trimmable portion of the tail must also be recorded and plotted.) The sign convention for elevator deflections is that a positive elevator deflection is a trailing-edge down deflection. (This seems backward to me, but that is the universally used convention. I have been told that it arises from the fact that deflecting the elevator down adds lift to the control surface, and the sign of a control-surface deflection is determined by how it affects the lift of the surface.)

Two sample trim curves are plotted in Figures 1 and 2. The plot in Figure 1 is for an airplane with a static margin of 10%. This is a comfortably stable airplane. Note that as airspeed increases, the trim elevator deflection becomes more positive (trailing-edge down).

The plot in Figure 2 is for an airplane with a static margin of -5%, which is unstable. The situation we saw for the stable airplane is now reversed. As airspeed increases, the elevator deflection to trim is becoming more negative (trailing-edge up). If the airplane were neutrally stable, we would see little or no change in elevator deflection to trim over a wide range of airspeed.

By performing this test at several CG positions, it is possible to determine where the stick-fixed neutral point of the airplane is. This is the CG at which the airplane is neutrally stable if the pilot holds the stick and does not let the elevators float. In general, the normal operating aft CG limit of an airplane is

several percent mean aerodynamic chord (MAC) forward of the neutral point. Do not try to fly the airplane with the CG at or behind the neutral point. It should be possible to determine the neutral point by extrapolating from data taken with the CG at several stable (more forward) positions.

The value of this test is that it helps us to differentiate between a hinge-moment problem and a static margin problem, and also helps to define the aerodynamic aft CG limit without having to actually fly the airplane with the CG at the aft limit.

If the airplane has a very low stick force per G, but the trim curve shows a strong stable trend in trim elevator deflection as a function of airspeed, then the airplane has enough static margin, and the problem resides in either

the hinge-moment characteristics of the elevator or the control linkages.

If, on the other hand, the trim curve shows that there is little change in trim elevator position with airspeed or shows an unstable variation of elevator position with airspeed, then the airplane lacks static margin, and the problem lies in the fact that the CG is not far enough forward of the aerodynamic center (AC) of the airplane. If the airplane has a variable-incidence tailplane for trim, then the curve of tailplane incidence for trim can be used in a similar manner to the elevator trim curve we have just discussed.

Next month, we will discuss some additional tests that can help explore longitudinal flying qualities, and begin a look at how to interpret the data we have gathered. †

BACK ISSUES

AVAILABLE — ORDER NOW

- ❑ January 2008 Plansbuilt Buyer's Guide, Sequoia Falco Review, Fill Fiberglass Pinholes With Ease
- ❑ December 2007 2008 Kit Buyer's Guide, Corsario Amphib, Aero Lectricker Jim Weir
- ❑ November 2007 Vans RV12, Velocity's Turbocharged TXL, A Clean Machine
- ❑ October 2007 Van's RV8 Flight Review, IFR GPS Rules & Requirements, Aircraft Handling Dissected
- ❑ September 2007 Lancair's Turbine Screamer, Reduce Your Risk When You Sell, Wag-Aero Super Sport
- ❑ August 2007 Cozy MK IV Review, Toxo Sportster SLSA, Are You Smart Buying Used Avionics
- ❑ July 2007 Legendary Mustang, Sonex Walex, Autopilots Galore
- ❑ June 2007 Thorp T-18 Review, Backup Strategies for your Cockpit, Cockpit Automation is Coming!
- ❑ May 2007 Floats & Amphibs Special, SeaRey Flight Review, Your EFIS Resource
- ❑ April 2007 Ravn 500 Flight Review, Avionics Advice From the Pros, Become a Home Machinist
- ❑ March 2007 2007 Engine Buyer's Guide, The Kitfox Reborn, Hatz Biplane on Amphib Floats
- ❑ February 2007 2007 LSA Buyer's Guide, Jabiru!, American Legend Club, Light-Sport Report
- ❑ January 2007 2007 Plansbuilt Buyer's Guide, RANS S-12, High Drama at Reno, Jabiru Engine
- ❑ December 2006 2007 KIT Buyer's Guide, 20 Years of the Glasair III, Builder Skills Courses
- ❑ November 2006 Oshkosh '06, Pietenpol Aircamper, A Pitts 12 You Just Won't Believe, ANR Headsets
- ❑ October 2006 Comp Air B 5552 Flight Review, Tech Talk for Gearheads, Avid Flyer Designer Dean Wilson
- ❑ September 2006 Homebuilt Safety Trends, Buyers Guide to Headsets, Safari Builder Survey, Sportsman Engine Build
- ❑ August 2006 18-Day Sportsman Part 1, Buying Used: Kitfox, Alternative Engines
- ❑ July 2006 Sun 'n Fun 2006, Aventuraall Flight Review, Darryl Murphy
- ❑ June 2006 Titan T-51, Land a Pitts!, What's Next for 100LL Fuel?, Modern O2 Systems, Economy Headsets
- ❑ May 2006 Van's RV-9A, Tips to Fly (and Buy) More Efficiently, Hazard Avoidance Hardware
- ❑ April 2006 Zenith STOL, Loehle 5151, Mustang and P-40, Annual Engine Directory
- ❑ March 2006 ViperJet II Flight Review, Earl Hibler's Glasair II-and-a-half, Lance Neibauer
- ❑ February 2006 AviPro Bearhawk Flight Review, Fisher Flying Dakota Hawk and Tiger Moth, Flying EFIS Safely, All about Escrow
- ❑ January 2006 2006 Plansbuilt Guide, F1 Rocket Evo, New Garmin 396, What's Happened at Reno?
- ❑ December 2005 2006 KIT Buyer's Guide, Excalibur 11 Flight Review, Turbine Moose, Reader Choice Awards
- ❑ November 2005 Backcountry Fun, Oshkosh 2005, Sky Ranger II, Scratch Prevention & Removal, Partially Built Kits
- ❑ October 2005 Lancair Super ES vs. Columbia 350, Pipestrel Sinus, Sonex Builder Survey, Eggenfellner Subarus

KITPLANES

No issues available prior to 2004.

Order online @ www.kitplanes.com
Or Call 1-800-622-1065

Name _____
Address _____
City _____
State _____ Zip _____
Total \$ Enclosed _____
VISA/MC # _____
Expiration Date _____
Signature _____
Phone # _____

Send to: Kitplanes Back Issues
P.O.Box 420235
Palm Coast, FL 32142-0235
or Fax to: 203-857-3103
\$9.50 per issue. Includes shipping and handling.

List of Advertisers

Please tell them you saw their ad in KITPLANES Magazine.

KITPLANES® *interactive makes it quick and easy for you to receive instant information about products or services directly from our advertisers' web site.*

➔ Go to: www.kitplanes.com/links for a virtual shopping tour via links to their web sites.

➔ Call the phone numbers listed below and be sure to tell them you saw their ad in KITPLANES Magazine.

Advertiser	page #	telephone	Advertiser	page #	telephone
Advanced Flight Systems, Inc.	59	503-263-0037	Superior Airparts	3	800-277-5168
AeroFlash Signal	73	800-322-2052	Supermarine Aircraft Pty Ltd	74	See Advertisement
Aircraft Spruce & Specialty CV4		877-4SPRUCE	Van's Aircraft	23	503-678-6545
Aircraft Tool Supply Co.	25	800-248-0638	Velocity Aircraft	19	772-589-1860
Andair Ltd.	37	See Advertisement	Wag Aero	73	800-558-6868
Arion Aircraft, LLC	41	931-680-1781	Zenith Aircraft Co. CV3		573-581-9000
Canadian Home Rotors, Inc.	57	850-482-4141	Builders' Marketplace		
Dynon Avionics	15	425-402-0433	Aerox Aviation Oxygen Systems	66	800-237-6902
Eagle R & D	13	208-461-2567	Aircraft Industries (Sky Ox)	66	616-663-8502
Electronics International	13	541-318-6060	Airflow Performance	67	See Advertisement
Grand Rapids Technology	55	616-583-8000	American Sportscopter International Inc.	65	757-872-8778
Hpower, Ltd	63	860-875-8185	Audio Pilot's Update	67	See Advertisement
Ivo Prop	55	800-FOR PROP	Becker Avionics	66	954-450-3137
J P Instruments CV2		714-557-5434	Eggenfellner Advanced Aircraft, Inc.	66	386-566-2616
Jabiru Pacific	55	See Advertisement	Electro Air	65	248-666-3002
Kitplanes Bookstore	24	800-780-4115	Flight Grip	66	800-204-7625
Kitplanes.com Directory	55	See Advertisement	Great Plains Aircraft	65	402-493-6507
Lockwood Aviation	74	800-LA-ROTAX	Grove Aircraft	65	888-GEARLEG
Maxwell Propulsion System, Inc.	25	360-474-8118	INFINITY Aerospace	67	See Advertisement
Murphy Aircraft	25	604-792-5855	Light Plane Maintenance	66	See Advertisement
Progressive Aerodyne, Inc.	59	407-292-3700	Microair Avionics PTY Ltd	66	See Advertisement
Quad City Ultralights	45	309-764-3515	Miracle Antenna	65	866-311-6511
Rollison Airplane Co. Inc.	59	812-384-4972	Mountain High Equipment	65	800-468-8185
Rotec Radial Engines	57	See Advertisement	Mustang Aeronautics	66	248-649-6818
Rotorway International	19	480-961-1001	National Aircraft Finance Co	65	800-999-3712
Sonex, LTD	25	920-231-8297	Schweiss Bifold Doors	66	507-426-8273
SportFlyingShop.com	63	1-877-8FLYING	UMA Instruments	65	800-842-5578
			Vistas	65	410-668-5635

COMPLETIONS

BUILDERS SHARE THEIR SUCCESSES



Jeff Roberts' Europa

I jump-started my kit in 2002 at FlightCrafters for two weeks. (Thanks to Bob Berube for the help and taking all my calls!) I then brought it home for four more years of garage recreation. Lots of small mods, but it has the standard 912S with the standard Warp Drive ground-adjustable prop set at 21°. I built it as light and clean as I could, and it seems to have paid dividends. I'm seeing 130 knots at 4500 feet and 5400 rpm, burning 4.5 gph of auto fuel. Wow! It's an incredible plane in the air, on pavement or on grass. Running a small business, building a new home, and trying to find time to fly off the 40 hours was tough, but as of October 2006, I have 50 hours and am looking forward to many cross-countries. Thanks to my wife, Karen, for watching me bobbing around in the garage for four years and for the nickname Gold Rush. Thanks to Mike Bowden for that first flight, to Steve Wright for his composite advice, and to the Europa forum and Rocket Man for all their help and encouragement. To build an airplane is to accomplish and make new friends! As life slows down a bit, I feel another project will be waiting.

SMYRNA, TENNESSEE
JEFF@RMMM.NET



Guy Sisson's Sky Ranger

My kit was purchased from Sky Ranger dealers Bob and Gayle Schutte of Arcade, New York. The project took 18 months to complete. I used the 100-horsepower Rotax 912. The prop is a three-blade IvoProp. My profession is painting cars, so I chose to paint the entire plane with Sherwin Williams two-stage base/clear system (fabric and all). This seems to seal the fabric really well, takes away the transparent look and gives the appearance of solid skin, not to mention allowing you to wash and wax with ease. I installed a BRS parachute, Icom A-200 transceiver, AmeriKing ELT, and a PS Engineering intercom. The Sky Ranger is a wonderful flying airplane. I fly whenever I can.

DELEVAN, NEW YORK
GUYSISSON@YAHOO.COM



Bill Futrell's Kolb MK III Xtra

After an extensive look at several different models as far as construction and the way they were built, I decided on the Kolb. The building went pretty smooth even if it was my first attempt at building a plane. With my wife's help and support, we completed it with no problem. I used analog gauges because that is what I have been used to. It has a BRS system and an 80-horsepower Rotax 912 engine. It is a great flying plane, and I would recommend the kit to anyone who wants a good flying plane that flies much like a GA aircraft. I am now living in Florida, and we have good flying weather all year long down here. The people at the The New Kolb factory were super throughout the building and could not have been better. What a great bunch of guys to work with.

BROOKSVILLE, FLORIDA ✚

Submissions to "Completions" should include a typed, double-spaced description (a few paragraphs only—250 words maximum) of the project and the finished aircraft. Also include a good color photograph (prints or 35mm slides are acceptable) of the aircraft that we may keep. Please include a daytime phone number where we can contact you if necessary. Also indicate whether we may publish your address in case other builders would like to contact you. Send submissions to: Completions, c/o KITPLANES® Magazine, 203 Argonne Ave., Suite B105, Long Beach, CA 90803. Digital submissions are also acceptable. Send text and photos to editorial@kitplanes.com with a subject line of "Completions." Photos must be high-resolution—300 dpi at a 3 x 5 print size is the minimum requirement.

BACK ISSUES

AVAILABLE — ORDER NOW

- ❑ December 2007 2008 Kit Buyer's Guide, Corsario Amphib, Aero Lectricker Jim Weir
- ❑ November 2007 Vans RV12, Velocity's Turbocharged TXL, A Clean Machine
- ❑ October 2007 Van's RV8 Flight Review, IFR GPS Rules & Requirements, Aircraft Handling Dissected
- ❑ September 2007 Lancair's Turbine Screamer, Reduce Your Risk When You Sell, Wag-Aero Super Sport
- ❑ August 2007 Cozy MK IV Review, Toxo Sportster SLSA, Are You Smart Buying Used Avionics
- ❑ July 2007 Legendary Mustang, Sonex Walex, Autopilots Galore
- ❑ June 2007 Thorp T-18 Review, Backup Strategies for your Cockpit, Cockpit Automation is Coming!
- ❑ May 2007 Floats & Amphibs Special, SeaRey Flight Review, Your EFIS Resource
- ❑ April 2007 Ravin 500 Flight Review, Avionics Advice From the Pros, Become a Home Machinist
- ❑ March 2007 2007 Engine Buyer's Guide, The Kitfox Reborn, Hatz Biplane on Amphib Floats
- ❑ February 2007 2007 LSA Buyer's Guide, Jabiru!, American Legend Club, Light-Sport Report
- ❑ January 2007 2007 Plansbuilt Buyer's Guide, RANS S-12, High Drama at Reno, Jabiru Engine
- ❑ December 2006 2007 KIT Buyer's Guide, 20 Years of the Glasair III, Builder Skills Courses
- ❑ November 2006 Oshkosh '06, Pietenpol Aircamper, A Pitts 12 You Just Won't Believe, ANR Headsets
- ❑ October 2006 Comp Air B S552 Flight Review, Tech Talk for Gearheads, Avid Flyer Designer Dean Wilson
- ❑ September 2006 Homebuilt Safety Trends, Buyers Guide to Headsets, Safari Builder Survey, Sportsman Engine Build
- ❑ August 2006 18-Day Sportsman Part 1, Buying Used: Kitfox, Alternative Engines
- ❑ July 2006 Sun 'n Fun 2006, Adventurall Flight Review, Darryl Murphy
- ❑ June 2006 Titan T-51, Land a Pitts!, What's Next for 100LL Fuel?, Modern O2 Systems, Economy Headsets
- ❑ May 2006 Van's RV-9A, Tips to Fly (and Buy) More Efficiently, Hazard Avoidance Hardware
- ❑ April 2006 Zenith STOL, Loehle 5151, Mustang and P-40, Annual Engine Directory
- ❑ March 2006 ViperJet II Flight Review, Earl Hibler's Glasair II-and-a-half, Lance Neilbauer AviPro Bearhawk Flight Review, Fisher Flying Dakota Hawk and Tiger Moth, Flying EFIS Safely, All about Escrow
- ❑ January 2006 2006 Plansbuilt Guide, F1 Rocket Evo, New Garmin 396, What's Happened at Reno?
- ❑ December 2005 2006 KIT Buyer's Guide, Excalibur 11 Flight Review, Turbine Moose, Reader Choice Awards
- ❑ November 2005 Backcountry Fun, OshKosh 2005, Sky Ranger II, Scratch Prevention & Removal, Partially Built Kits
- ❑ October 2005 Lancair Super ES vs. Columbia 350, Pipestrel Sinus, Sonex Builder Survey, Eggenfellner Subaru
- ❑ September 2005 Just Aircraft Escapade and Highlander, Quicksilver, GT 500 Primary, Corvair Engines for Aircraft

KITPLANES

No issues available prior to 2004.

Order online @ www.kitplanes.com
Or Call 1-800-622-1065

Name _____
Address _____
City _____
State _____ Zip _____
Total \$ Enclosed _____
VISA/MC # _____
Expiration Date _____
Signature _____
Phone # _____

Send to: Kitplanes Back Issues
P.O.Box 420235
Palm Coast, FL 32142-0235
or Fax to: 203-857-3103
\$9.50 per issue. Includes shipping and handling.

List of Advertisers

Please tell them you saw their ad in KITPLANES Magazine.

KITPLANES® *interactive makes it quick and easy for you to receive instant information about products or services directly from our advertisers' web site.*

➔ Go to: www.kitplanes.com/links for a virtual shopping tour via links to their web sites.

➔ Call the phone numbers listed below and be sure to tell them you saw their ad in KITPLANES Magazine.

Advertiser	page #	telephone	Advertiser	page #	telephone
AeroFlash Signal	56	800-322-2052	Teledyne Mattituck Services, Inc	CV2	800-624-6680
Aircraft Spruce & Specialty	CV4	877-45PRUCE	Van's Aircraft	29	503-678-6545
Aircraft Tool Supply Co.	57	800-248-0638	Vertical Power	19	505-715-6172
Andair Ltd.	37	See Advertisement	Wicks Aircraft	17	800-221-9425
Canadian Home Rotors, Inc.	23	850-482-4141	Zenith Aircraft Co.	CV3	573-581-9000
Builders' Marketplace					
Dynon Avionics	5	425-402-0433	Aerov Aviation Oxygen Systems	65	800-237-6902
Electronics International	13	541-318-6060	Airflow Performance	66	See Advertisement
Grand Rapids Technology	61	616-245-7700	Ameritech/American Propeller	65	800-292-7767
Hpower, ltd	57	860-875-8185	AV Flash	67	See Advertisement
Ivo Prop	61	800-FOR PROP	Aviation Consumer	66	See Advertisement
Jabiru Pacific	61	See Advertisement	Eggenfellner Advanced Aircraft, Inc.	65	386-566-2616
Kitfox Aircraft LLC.	57	208-337-5111	Electro Air	65	248-666-3002
Kitplanes Bookstore	22	800-780-4115	Flight Grip	65	800-204-7625
Kitplanes.com Directory	67	See Advertisement	Great Plains Aircraft	65	402-493-6507
Lockwood Aviation	69	800-LA-ROTA	Grove Aircraft	66	888-GEARLEG
Precision Airmotive	23	360-651-8282	INFINITY Aerospace	66	See Advertisement
Rollison Airplane Co. Inc.	58	812-384-4972	Innovator Technologies Inc.	66	403-689-3101
Rotec Radial Engines	19	See Advertisement	Microair Avionics PTY Ltd	67	See Advertisement
Rotorway International	13	480-961-1001	Miracle Antenna	66	866-311-6511
Sky Raider LLC	58	208-465-7116	Mountain High Equipment	66	800-468-8185
Sonex, LTD	55	920-231-8297	Mustang Aeronautics	65	248-649-6818
SportFlyingShop.com	55	1-877-8FLYING	National Aircraft Finance Co	66	800-999-3712
Superior Airparts	3	800-277-5168	P C Avionics	65	530-626-9722
Supermarine Aircraft Pty Ltd	69	See Advertisement	Schweiss Bifold Doors	66	507-426-8273
			Sevtec	65	734-913-6700

CUSTOMIZE OUR GRIP FOR YOUR AIRCRAFT

Easy Installation

Comfortable:

Rocker (shown) or push button trigger style

Thumb Switches: Push Button, Toggle & 4-Way Trim

Fit to 5/8" thru 1-1/8" sticks

Next day shipping for virtually any configuration you desire.



Flight Grip, LLC

812 Jacquelyn St. 800-204-7625
Milton-Freewater, 541-938-4533
Oregon 97862 Fax: 541-938-7242

Engines | Propellers | Governors



All your homebuilt needs in one location!

800.292.7767

americanpropeller.com | eagleengines.com

High Quality & Affordable Propeller Service and Parts for Experimental Aircraft, Inc. 20781 Lawrence Drive, Trask, CA 95062, USA

aerox

Aviation Oxygen Systems

FastBuild Built-In Kits for complete Custom Installations



Celebrating 25 YEARS as the

WORLD LEADER

In High-Duration Oxygen Systems

Phone (800) 237-6902 • www.aerox.com

NEW! MOLDED FIBERGLASS DESIGN ON THE WEBSITE



FLY

on a cushion of air At 30mph over water 3 place, with 18 hp, 4 cycle engine. Quick build low cost polyester composite construction. Four other low noise, efficient designs 8 to 120hp.

INFO PKG 8 TO 120HP----- \$8
30 MIN VIDEO AND INFO ----- \$18
ph: 1-(360)794-7505
sevtec@aol.com
http://members.aol.com/sevtec/sevskmr.html

SEVTEC
P O BOX 846
MONROE WA 98272



electroair

Direct Fire Ignition Systems

The Jeff Rose Electronic Ignition

Email sales@electroair.net
Web www.electroair.net
Toll free 866 494 3002
Office 248 666 3002
Fax 248 666 1390

High energy spark reduces fuel consumption and increases HP; high res. signal eliminates timing error. Kits available for 4 & 6 cyl engines: Lycoming, TCM, and more.

Eggenfellner Aircraft Inc.



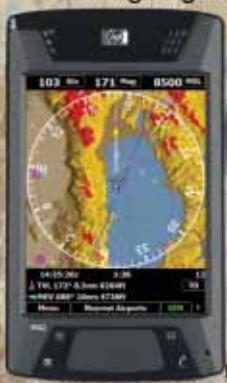
Modern Firewall-Forward Powerplants For Experimental Sport Aircraft

www.eggenfellneraircraft.com (386) 566-2616

E6/200, E61/220 Turbocharged

MountainScope

+ PC or PocketPC
+ GPS
= Cutting-edge moving map



Features weather, traffic, hi-res terrain, familiar chart colors & symbols, and high responsiveness

PCAvionics Technology Solutions for Aviation

For more info or a demo CD, visit www.pcaivonics.com or call 530-626-9722

VW BASED ENGINES FOR SPORT AIRCRAFT



Lightweight Flywheel Drive

- 80 hp
- 21800cc
- 149.5 lbs.

- Bed mounted • 40 amps •
- Single/Dual Ignition • Electric Start •
- Mechanical Fuel Pump •

GREAT PLAINS AIRCRAFT

PO Box 222 • Bennington, NE 68007

402-493-6507

Catalog: \$4.00 US • \$8.00 Overseas

Web Catalog: www.gpsc.com

"The Best All-Metal Airplane A Person Can Build"

MUSTANG II Two Place
3D Years Proven Reliability 350+ Flying
Full IFR capability
Plans \$185
Airframe Kit under \$8,600

Single Seater also Available

Fast/Simple Construction with Expanded Kits
Info Pack \$10 Video \$15 Overseas \$35 add \$5
Mustang Aeronautics, Inc.
1470 Temple City, Dept. KP, Troy MI 48084
Phone 248-649-6818 Fax 248-649-0098
www.mustangaero.com

THE MOSQUITO ULTRALIGHT HELICOPTER
THE ULTIMATE ULTRALIGHT!!

www.innovatortech.ca
 mosquito@innovatortech.ca
 (403) 669-3101



Open Frame (Ultralight Mosquito)
 Enclosed with Skids (Homebuilt Mosquito XE)
 Enclosed with Floats (Ultralight Mosquito XEL)

INNOVATOR TECHNOLOGIES
 Box 17, Site 17, RR5
 Calgary, Alberta, Canada, T2P 2G6

Military Style Stick Grip



- ∞ Comfortable, ergonomic design
- ∞ Right and Left hand models
- ∞ Tactile response switches
- ∞ Up to 13 functions in six switches
- ∞ Customizable switch configurations
- ∞ Fits stick diameters from 5/8" to 1-3/8"
- ∞ Comes custom wired for only \$175
- ∞ Fighter heritage, Top Gun attitude
- ∞ Increased safety by having functions at your fingertips

See website for HOS information & order form:
www.InfinityAerospace.com
 OR - Send a long SASE to:
INFINITY Aerospace
 P. O. Box 12275, Dept. KP
 El Cajon, CA 92022

Smoothie BRICKWALL
Noise Filter-Power Conditioner



- *Eliminate all electrical noise from audio-radio
- *Protect vital gear from damaging power spikes
- *Prevent problems and risky in-flight failures
- *Best filtering-regulation technology available

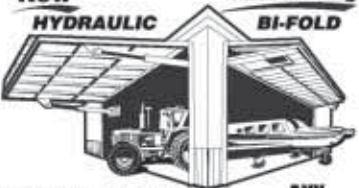
Smoothie is the standard 'must-have' noise-filter/power conditioner/regulator for pure, clean trouble-free power. Build it in or retrofit it now.

Miracle Antenna
www.miracleantenna.com toll-free 866-311-6511

New *Lose No Headroom*

BI-FOLD DOORS

New **HYDRAULIC** Fast Moving **BI-FOLD**



"New Lift Strap"
 • Auto Latches & Remotes
 • We Install
 • Save \$\$\$

ANY SIZE DOOR!

800-746-8273

Schweiss visit us at bifold.com

Aircraft Financing
NAFCO makes it happen!



Call today!
 800.999.3712
www.airloans.com



A Pilot Bancshares, Inc. Company

LANDING GEAR

Your Complete Source for:
 Wheels
 Brakes &
 Landing Gear



Factory Direct

Grove www.groveaircraft.com
 1800 Joe Crosson Dr
 El Cajon, CA 92020
 Aircraft Landing Gear Systems (619) 562-1268

HOW DO YOU KNOW WHICH AVIATION EQUIPMENT IS BEST?

Before you buy any gear, find out how it stacks up against its competition with

The Aviation Consumer
www.aviationconsumer.com

Portable Oxygen Systems

The MH light-weight portable XCP Cross Country Pilot™ System is a breakthrough in aviation oxygen. Rugged and easy to use with high duration for 1-6 persons.



Complete carry-on O₂ systems start at \$445.00

MH
 Aviation Oxygen Systems
 MOUNTAIN HIGH
 Equipment & Supply Company

Portable and Built-In Oxygen Equipment and Supplies.
 800-468-8185 • 541-923-4100
 Fax: 541-923-4141 • www.MHoxigen.com • sales@mhoxigen.com

BE ORIGINAL



AIRFLOW PERFORMANCE
 THE TRUE BLACK AND GOLD

Aircraft Multi-point Fuel Injection

- Operates all engines from 65 to 800 HP
- Applications for V6/V8 engines
- Manual Mixture Control
- Bolt on Kits for Lycoming Engines
- No Carburetor heat required
- Instant throttle response
- All Mechanical, No Electronics
- Increases mid-range HP
- Approved for Aerobatic use
- Compatible with all Fuels
- Precise Fuel Metering under all conditions

111 Airflow Drive
 Spartanburg, SC 29306
 (864) 576-4512
 (864) 576-0201 (Fax)
www.airflowperformance.com
 Email: airflow2@bellsouth.net



Portable Oxygen Systems

The MH light-weight portable XCP Cross Country Pilot™ System is a breakthrough in aviation oxygen. Rugged and easy to use with high duration for 1-6 persons.



Complete carry-on O₂ systems start at \$445.00



Portable and Built-In Oxygen Equipment and Supplies.

800-468-8185 • 541-923-4100

Fax: 541-923-4141 • www.MHoxigen.com • sales@mhoxigen.com

VW BASED REDUCTION DRIVE ENGINES



2180cc - 103HP • 68-96" Props
300 - 500+ lbs. of Static Thrust
Multiple Drive Ratios
Air or Air/Water Cooled

GREAT PLAINS AIRCRAFT

PO Box 222 • Bennington, NE 68007

402-493-6507

Catalog: \$4.00 US • \$8.00 Overseas

Web Catalog: www.gpasc.com

Aircraft Financing NAFCO makes it happen!



Call today!
800.999.3712

www.airloans.com



A Pilot Bancshares, Inc. Company

Homebuilt HELICOPTERS 2 for 1 Special



- Fly from your backyard!
- Kits available!
- No license needed

Jet powered
Kestrel

Gas engine powered
G-1

G-1 and Kestrel Plans:
Only \$25.99
(Add \$4 post. Foreign add \$5)
Helicopter Catalog FREE with your order
(For Catalog only, send \$10)

24-HOUR ORDERLINE!
1-410-663-8022

VORTECK, INC. • PO Box 511-KP • Fallston, MD 21047 • USA



Visit Vorteck's World of Homebuilt Helicopters at
www.prismz.com/helio

The Two Seat UltraSport 496

- Experimental or Ultralight Trainer Kits
- Aerospace quality components
- Unlimited life composite rotor blades
- Excellent autorotation
- Floor mounted cyclic available



Kits and insurance now available!
Dealers wanted!

☐☐ INFO PACKET \$5 -- VIDEO & INFO PACKET \$30 ☐☐

TRUE ULTRALIGHT ULTRASPORT 254 ALSO AVAILABLE

American Sportscopter International Inc.

Hanger 21A Airport/P.O. BOX 14608, Newport News, VA 23608

Ph: 757-872-8778 Fax: 757-872-8771

www.ultrasport.rotor.com • asi@asiicopter.com



electroair
Direct Fire Ignition Systems

High energy spark

reduces fuel

consumption

and increases

HP; high res.

signal eliminates

timing error.

Kits available for

4 & 6 cyl engines:

Lycoming,

TCM, and more.

The Jeff Rose Electronic Ignition

Email sales@electroair.net

Web

www.electroair.net

Toll free

866 494 3002

Office

248 666 3002

Fax

248 666 1390

Smoothie BRICKWALL Noise Filter-Power Conditioner



- **Eliminate** all electrical noise from audio-radio
- **Protect** vital gear from damaging power spikes
- **Prevent** problems and risky in-flight failures
- **Best** filtering-regulation technology available

Smoothie is the standard 'must-have' noise-filter/power conditioner/regulator for pure, clean trouble-free power. Build it in or retrofit it now.

Miracle Antenna

www.miracleantenna.com toll-free 866-311-6511

LANDING GEAR



Your Complete Source for:
Wheels
Brakes & Landing Gear

Factory Direct

MasterCard VISA

Grove

www.groveaircraft.com

1800 Joe Crosson Dr

El Cajon, CA 92020

(619) 562-1268

Aircraft Landing Gear Systems



GREAT GAUGES FOR
SMALL SPACES



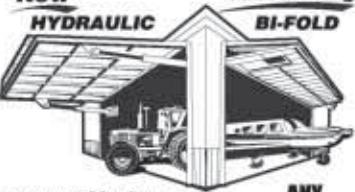
UMA, Inc.
800-842-5578

Made in USA
www.umainstruments.com

New **Lose No Headroom**

BI-FOLD DOORS

New HYDRAULIC **Fast Moving BI-FOLD**



"New Lift Strap"
• Auto Latches & Remotes
• We Install
• Save \$\$\$

ANY SIZE DOOR!

800-746-8273

Schweiss visit us at bifold.com

"The Best All-Metal Airplane A Person Can Build"

MUSTANG II Two Place

30 Years Proven Reliability
350+ Flying

• Full IFR capability
• Plans \$195
• Airframe Kit under \$8,600

Fast/Simple Construction with Expanded Kits

Info Pack \$10 Video \$75 Overseas \$85 Add \$5

Mustang Aeronautics, Inc.
1470 Temple City, Dept. KP, Troy MI 48064
Phone 248-649-6818 Fax 248-649-0098
www.mustangaero.com

T2000SFL TRANSPONDER COMBO KIT

TSO Approved (C74c Class 1A)
2 1/4" Standard Instrument Hole
Mode A & C Operation
Backlit Dual Line LCD Display
Encoder Altitude can be Displayed
Assigned ALTITUDE with H/LO Alerts



Ph: +61 7 4155 3048
Fax: +61 7 4155 3049
sales@microair.com.au
www.microair.com.au

Portable Oxygen Systems
Bookmark This Useful Website

www.skyox.com

Sun-N-Fun Booth B-62

www.skyox.com
or call 800-253-0800

AFFORDABLE QUALITY since 1956!



2 1/4"

COM • NAV • ADF • XPDR modes C & S
Small • Lightweight • TSO'd • 2-year Warranty

BECKER AVIONICS INTERNATIONAL
we bring you home

beckerusa.com
954-450-3137
877-562-3253

Eggenfellner Aircraft Inc.

Modern Firewall-Forward Powerplants
For Experimental Sport Aircraft



www.eggenfellneraircraft.com
(386) 566-2616

E6/200, E61/200 Turbocharged

For more than 25 years,
Light Plane Maintenance
has shown owners
how to slash down time
and save **BIG** money
on maintenance.

Put
Light Plane Maintenance
to work for you!

Come visit us
at
www.lightplane-maintenance.com

CUSTOMIZE OUR GRIP FOR YOUR AIRCRAFT

Easy Installation
Comfortable
Rocker (shown) or push button trigger style
Thumb Switches: Push Button, Toggle & 4-Way Trim
Fit to 5/8" thru 1-1/8" sticks

Next day shipping for virtually any configuration you desire.



Flight Grip, LLC

812 Jacquelyn St. 800-204-7625
Milton-Freewater, Oregon 97862 541-938-0533
Fax: 541-938-7242

aerox

Aviation Oxygen Systems

FastBuild Built-In Kits
for complete
Custom Installations



Celebrating
25 YEARS
as the
WORLD LEADER
in High-Duration Oxygen Systems

Phone (800) 237-6902 • www.aerox.com



BE ORIGINAL



Aircraft Multi-point Fuel Injection

- Operates all engines from 65 to 800 HP
- Applications for V6/V8 engines
- Manual Mixture Control
- Bolt on Kits for Lycoming Engines
- No Carburetor heat required
- Instant throttle response
- All Mechanical, No Electronics
- Increases mid-range HP
- Approved for Aerobatic use
- Compatible with all Fuels
- Precise Fuel Metering under all conditions

111 Airflow Drive
 Spartanburg, SC 29306
 (864) 576-4512
 (864) 576-0201 (Fax)
 www.airflowperformance.com
 Email: airflow2@bellsouth.net



Military Style Stick Grip



- ∞ Comfortable, ergonomic design
- ∞ Right and Left hand models
- ∞ Tactile response switches
- ∞ Up to 13 functions in six switches
- ∞ Customizable switch configurations
- ∞ Fits stick diameters from 5/8" to 1-3/8"
- ∞ Comes custom wired for only \$175
- ∞ Fighter heritage, Top Gun attitude
- ∞ Increased safety by having functions at your fingertips

See website for HOS information & order form:
www.InfinityAerospace.com
 OR - Send a long SASE to:
INFINITY Aerospace
 P. O. Box 12275, Dept. KP
 El Cajon, CA 92022

Pilot's Audio Update

The monthly audio program

Now on CD!

Turn your ground time into "FLIGHT TIME"

6 months for only \$57.00 plus the Bonus CD **Acing The BFR FREE** with your paid subscription

Call (800) 424-7887 or email us at customer_service@belvoir.com to start your subscription today!

24KPA

The Independent Voice for Homebuilt Aviation



KITPLANES SUBSCRIBER ALERT!

Several of our KITPLANES subscribers have received what appear to be "renewal notices" from a company known as Magazine Billing Services, Publisher's Billing Services, or other similar names. Addresses for these firms include San Luis Obispo, CA, Salt Lake City, UT, and Margate, FL.

These firms have **NOT** been authorized by us to sell subscriptions or renewals for KITPLANES and we cannot guarantee that any orders or payments sent to them will be forwarded to us.

KITPLANES does **NOT** offer a subscription term of more than 2 years. If you see an offer for 3 years or more, or a specific offer for 3 years for \$73.50 or 3 years for \$89, please understand this is NOT an authorized offer. Any offer you receive that does not bear our company logo and corporate or Customer Service address or 800 numbers should not be considered approved by us.

The only authorized information for KITPLANES is:

Toll free at 1-800-622-1065 • www.kitplanes.com/cs

Our Florida Customer Service Center:

386-447-6318 • PO Box 420235, Palm Coast, FL 32142

Or our corporate offices at:

Belvoir Media Group, LLC
 Aviation Publishing Group
 800 Connecticut Ave, Norwalk, CT 06854

Should you have any questions at all about mail that you have received, please contact us at our website, www.kitplanes.com/cs or to speak to a Customer Service representative, please call us toll free at 1-800-622-1065.

COMPLETIONS

BUILDERS SHARE THEIR SUCCESSES



John Lawton's Europa XS

Construction of N245E began on October 2, 2003, and was completed on April 20, 2006, with a total build time of 2249.5 hours. Cost to build was just under \$65K. Inspection occurred on July 1, 2006, and the first flight was made from TN89 on July 7. Handling is crisp but stable, with a real “fighter-like” feel. A Jabiru 3300 provides climb rates in excess of 1500 fpm and a typical cruise of 142 knots at about 5-gph burn. The prop is a Sensenich carbon two-blade ground adjustable. Engine monitoring is provided by a Grand Rapids EIS with graphical display. Other features include a Garmin 250XL GPSCOM, Garmin transponder and XM plumbed into a Flightcom intercom. Many thanks to Europa Aircraft for an excellent kit and ongoing support during the build, and to Suncoast Sportplanes for its fine firewall-forward package. I'd also like to thank Europa Guru Neville Eyre for his ongoing input, *Matronics.com* for hosting the Europa forum, and the Europa family of builders for their support and encouragement. Thanks also to Fred Dey and Sequatchie Composites, LLC for their guidance during the finish and painting stage, and to everyone else who helped make my lifelong dream come true. Lastly, I would like to give special thanks to my lovely wife and copilot, Susan, for her unwavering patience and support throughout the build. The Europa is a fine touring aircraft and is truly a delight to fly. Bang for the buck, it's hard to beat the Europa XS!

WHITWELL, TENNESSEE
THRMLSEEKER@AOL.COM



Jim Fillman's Pulsar

N623JF took to the skies on August 3, 2005, after 2600 hours of building time crammed into nine years. Building houses or airplanes, my motto is, “I may be slow but I'm not fast.” The firewall-aft kit came from Aero Designs as a Pulsar 2 just before the design was sold to Skystar. The firewall-forward package from Skystar, along with a few of their modifications, qualifies my plane as a model 2.75. Performance behind the 100-horsepower Rotax 912S and Ivo in-flight-adjustable prop is 150 mph burning 5 gph of auto premium. With more than 200 hours logged in the first 16 months, this is no hangar queen. Building was lots of fun, especially the panel and wiring, but the surface preparation almost did me in. The zillion pinholes were filled with PolyFiber's SuperFil and UV Smooth Prime. Sikkens two- and three-stage paint was applied by master automobile (but first-time airplane) painter Al Ernst. The purple stripe and the registration number are in honor of my bride, Susan, who encouraged me to fulfill my dream. Photos throughout the building process can be seen at PictureTrail.com/pulsar. A great debt of gratitude goes to two pilot friends, Jack Scheider and John Ferris, who devoted countless hours of hands-on assistance and support. The online Pulsar builder support groups was also always there to help. Thank you Mark Brown for designing such a beautiful aircraft. Keep an eye out at all the local fly-ins (and some not so local). I plan to make them all.

AUSTIN, TEXAS
PULSAR@AUSTIN.RR.COM

Submissions to “Completions” should include a typed, double-spaced description (a few paragraphs only—250 words maximum) of the project and the finished aircraft. Also include a good color photograph (prints or 35mm slides are acceptable) of the aircraft that we may keep. Please include a daytime phone number where we can contact you if necessary. Also indicate whether we may publish your address in case other builders would like to contact you. Send submissions to: *Completions*, c/o KITPLANES® Magazine, 203 Argonne Ave., Suite B105, Long Beach, CA 90803. Digital submissions are also acceptable. Send text and photos to editorial@kitplanes.com with a subject line of “Completions.” Photos must be high-resolution—300 dpi at a 3 x 5 print size is the minimum requirement.

COMPLETIONS



Jeffry Larson's Sonex

I purchased Sonex No. 206 from a builder in Canada with 27 hours on the Hobbs and a Jabiru 2200 TD, center stick. After import via trailer and U.S. registration, a veteran Sonex pilot flew off the remaining hours and took my instructor for an introduction. After slightly over 2 hours of dual, I was cleared to solo and have logged 30 hours since. It's a great stable taildragger, and I miss my Kitfox Lite less every day, especially when it's windy, which doesn't seem to bother the Sonex. Many thanks to Sonex and a spectacular community of Sonex folks.

TRACY, CALIFORNIA
JEFFRYL@US.IBM.COM

Randy Pflanze's F1 Rocket

The first flight of N417G occurred in May 2006. After flying for about a year, it went to the paint shop to get a new look. This is my third Experimental completion, having previously completed a Long-EZ and an RV-6. Performance is spectacular with a 260-horsepower Lycoming IO-540. I can easily cruise at 200 KTAS at 10,000 feet, sipping about 10.5 gph through a tuned Airflow Performance fuel-injection system. Many thanks to Mark Frederick at Team Rocket for supporting such a wonderful kit. The entire story of the build process, from setting up shop to getting the airplane painted, can be found on the Internet at www.pflanze-aviation.com.

INDIANAPOLIS, INDIANA
FLROCKET@COMCAST.NET



Dave Ulma's UltraCruiser

I've had about 6 hours of dual in J-3 and J-5 cubs and about 2 hours solo. I finally flew my scratch-built UltraCruiser in August 2006. I can tell you that after many months of personal doubt about my flying ability, I did it! Like others on their first flight, I was nervous. The morning of my first flight, I taxied around for awhile and then lined

up with Runway 27 Brodhead, prayed for a minute, and then firewalled it. After flying Cubs with slow and muscled responses on the stick, this plane moved with me. It felt not like a barge in the sky, but like a sports car. As I left the ground, I remembered my friend Ted Davis saying, "Release some back pressure as you rotate," and I could tell the plane wanted to leap off the grass. So I let the stick come forward just a bit. I proceeded to make normal, albeit exciting, circuits. I did stay a bit hot on speed with the 40-horsepower Hummel engine but generally kept it at 70 around the patch. I never left the pattern. On one landing I actually was down before I realized it; the smooth landing caught me off guard. I've found that the UltraCruiser flies and lands much more easily than did the Cubs I flew, and the plane makes me look like I have more experience than I really do.

AVIATOR@TICON.NET

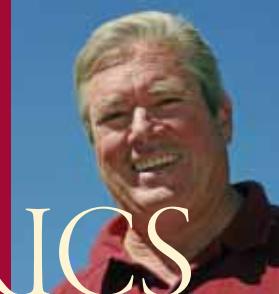
Lou and Suzanne Bello's GlaStar

Our GlaStar kit arrived in a big box on June 16, 1998, in Colorado Springs, Colorado. After eight years and a move to Georgia, N638B first flew on June 6, 2006. The first flight was an experience of a lifetime. The airplane flew hands off with level wings needing only a slight right rudder input. Empty weight is 1312 pounds, typically seeing a TAS of 160 mph with 75% power at a density altitude of 5000 feet. Our TMX O-360 A1A engine swings a 72-inch Aero Composite constant-speed prop. The instrument panel is VFR with a Grand Rapids EFIS and EIS. The door is a joint effort by my wife, Suzanne, our son Scott and Evans Graphics Arts Productions of Thomson, Georgia. Many thanks to my friend Cecil Oglesby, who graciously gave me several hours of flying time in his GlaStar prior to my first flight in N638B, and to all the folks on our GlaStar.net web site for their invaluable help during the long build cycle.



LINCOLNTON, GEORGIA
LOUB123@NU-Z.NET ✈

AERO'LECTRICS



BY JIM WEIR

Sunshine comes softly through my solar panel today.

Where is Donovan when you really need him to rewrite a lyric? Here's another chapter in the saga of the off-grid hangar, this time it's Part 1 of a two-part treatise on keeping the battery up to charge with a solar array. As we have said several times in this series of columns, keeping that \$150 chunk of lead batting its best isn't easy, but it certainly isn't rocket science either. As you probably know, letting a lead-acid battery sit around without any exercise is a sure ticket for sulfation of the plates, which leads to premature demise of the battery.

But solar panels are somewhat expensive, right? No, not for a simple task like this one. The Harbor Freight #44768 normally sells for \$20, most of the time on sale for \$15, and I bought a whole bunch of them when they went on super sale a couple of years ago for \$9 a pop. True, they put out a maximum of only a watt and a half (a maximum on a bright summer's day of about 100 mA at 13.6 volts), but that is more than enough to keep the battery topped off on sunny days. Even if the weather turns poop (that's a technical aviation term, you'll get used to it) for a few days, we know for certain that the sun will eventually shine and fire up our little battery charger.

But how do solar cells work? Back in the early 1900s, Einstein postulated that when a light beam hit a conductor, it had enough energy in the beam to "knock" an electron out of an atom's shell. This electron (or several thousand trillion of them) was then free to wander about the metal, and if an external circuit were supplied to it, the electron was happy to use up its excess energy doing useful work in that external circuit. In practice, that "metal" is actually a silicon diode junction that is exposed to the sun's light beam. A pretty smart old geezer named Coulomb figured out that for our 100 mA of current to flow, about 6,200,000,000,000,000 (62 with 14



This is how the array looks when it's mounted on the hangar side roof.



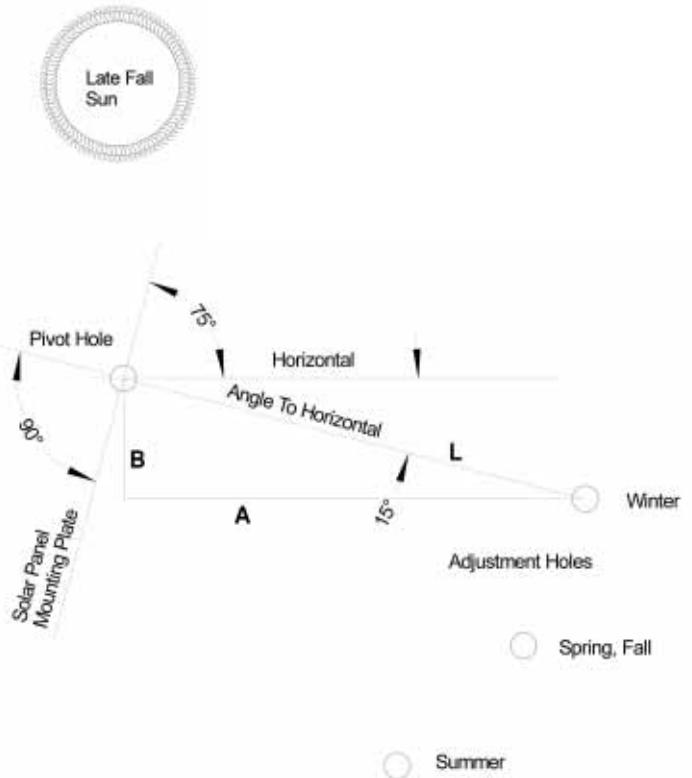
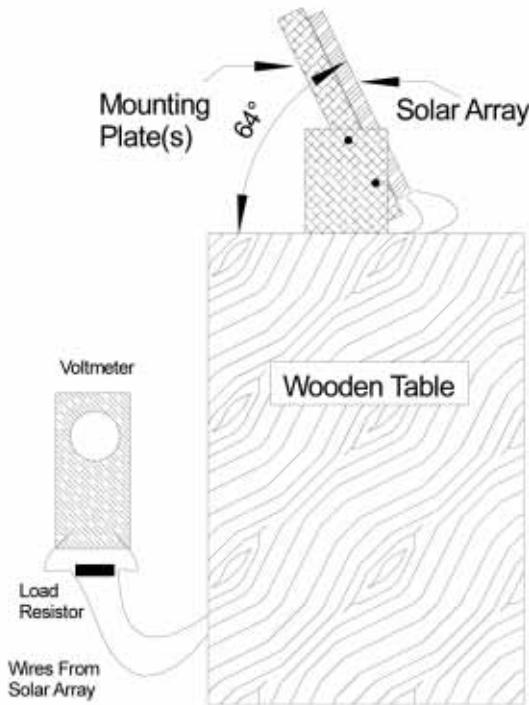
The inside back detail of the mounting bracket.

zeroes, or in good math form, 6.2×10^{15} , or in good spreadsheet form 6.2E15) electrons had to be flowing each second for a current of 100 mA to be recorded. While that's a lot of electrons, the sun is providing a pretty steady stream of photons in the beam for this to happen.

What that means, though, is that the solar panel has to be pointing directly at the sun to get the maximum amount of sunbeam photons to hit the electrons in the silicon. As we all know, the sun travels a path from the Tropic of Cancer at the summer solstice through the equator to the Tropic of Capricorn at the winter solstice, hitting these two points on June 21 and December 21 approximately. Both of these tropical lines lie above and below the equator at about 23° of latitude. The Tropic of Cancer ticks just below the bottom of the Florida Keys, so anywhere in the continental United States, the sun is always lower in the sky than directly overhead. The further north you live, the further south the sun appears during the whole year. (One of the high points in my life was playing softball at 2 a.m. without lights

Jim Weir began acquiring Aero'LECTRICS expertise in 1959, fixing Narco Superbomers in exchange for flight hours. A commercial pilot, CFI and A&P/LA, Jim has owned and restored four single-engine Cessnas. These days, he runs RST Engineering and teaches electronics at Sierra College. Ask him questions at rec.aviation.homebuilt or visit his site at www.rst-engr.com/kitplanes.

The particulars of the solar array.



The solar panel angle calculations.

in Anchorage on June 21, and it was just as bright as day.)

With this movement of apparent direction of the sun (and no I won't debate whether it is the sun moving or the earth precessing on its axis; that argument was done by monks dancing on the head of a pin in the 11th century) all year long, the solar panel is going to have to be adjustable relative to the horizon to grab maximum solar power when the sun dips further and further south as winter approaches.

A fellow by the name of C. R. Landau has done a lot of work figuring out exactly what the angle of the solar panel should be, and his findings are available at www.macslab.com/optsolar.html. In a nutshell, in the winter (mid-October to the end of February) the panel should be tilted about $((\text{latitude} \times 0.9) + 29)$ degrees relative to the horizon. In the spring and fall (end of February to mid-April and mid-August to mid-October, respectively) the panels should be tilted

about (latitude - 2.5) degrees, and in the summer they should be tilted about (winter angle - 52.5) degrees.

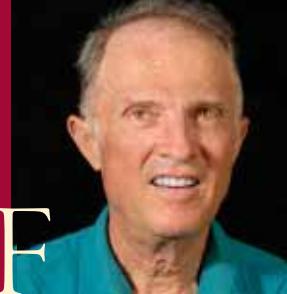
Too much math? Not a big deal. I've created an Excel spreadsheet where all you do is enter your latitude and the calculations are done for you. You can find it at www.rstengineering.com/kitplanes.

So what sort of a mechanism should we make for this solar panel movement? The easiest that I could come up with is a two-part U-shaped aluminum mechanism that both holds the solar panel in place and provides three adjustment holes—winter, summer and spring/fall. It requires about 50¢ worth of 5052H32 aluminum plus paint plus a few #4-40 pieces of hardware. A full set of plans and a bend drawing to make the solar panel pivot brackets that I've installed at the hangar can be found at the RST Engineering web site listed above.

How much power can we get out of this thing? I took the data on October 20, 2007, and the spreadsheet shows

that with the sunlight falling at noon on this late fall date, we could get a maximum amount of power at an output of 12.7 volts. That's not going to work too well with a battery that I want to charge up to 13.6 volts, so we'll have to put our thinking cap on for next month's design of a battery charger that will take the output of the solar panel and maximize the charge into the battery while not overcharging it, which is every bit as bad as letting it sit idle.

Therefore, next month's column will be about the trade-offs between a couple of different battery charger styles, one the traditional analog charger and the other a switching type device. We'll discuss the pros and cons of each and then come to a decision on the best compromise between the two. I promise, because I want this one to be permanent in my hangar, I'll do a PC board design and let the first of you who want a board to have one at my cost. Stay tuned. This is going to be fun. ✚



Back to the basics: our “new” aircraft.

This adventure began one Saturday when a neighbor mentioned that a Lazair ultralight was up for auction on eBay—and that he and another neighbor were interested in bidding on it. I’m not normally impulsive, but I blurted out, “Do you want another partner?” They did, and I placed our maximum bid after the seller responded immediately to several questions we had. Twelve hours later, we were the new owners of a late-model Lazair III, the last of the twin-engine, single-seat ultralights produced in the 1980s by Ultraflight Sales of Ontario, Canada. The purchase included a serviceable enclosed trailer.

What’s a Lazair?

As you can see, the Lazair is unusual. In the early 1980s during the ultralight boom, I wrote magazine evaluations of many of the 60+ ultralights I flew, and the Lazair was a favorite. I built two Lazair IIs and was the San Diego dealer for several years.

Designer Dale Kramer was still a teenager when he began planning the Lazair. Originally, it was powered by a pair of 5.5-horsepower Pioneer chainsaw engines. He was in his early 20s when he and his wife, Linda, displayed their company’s Lazairs at Oshkosh ’81. Based on my published articles, Kramer agreed to check me out in one of his 11-hp demonstrators, and it flew exceptionally well. I ordered a kit,



New Lazair owners (l to r), Ernie Moreno, Dave Martin and Mike Pongracz, inspect their purchase.

Dave Martin, who served as editor of this magazine for 17 years, began aviation journalism evaluating ultralights in the early '80s. A former CFI (airplanes, gliders, instruments), he's flown more than 160 aircraft types plus 60 ultralights (including a single-seat, no-basket hot air balloon). Now living at a residential airpark in Oregon, he flies his Spacewalker II homebuilt as a Sport Pilot.

thinking it would make a good low-cost motorglider.

Before my order was delivered, the company changed to using a pair of 9-hp Rotax 185 engines for enough power to fly on floats the company designed. My Lazair II was the first California-built Lazair to fly. I built it in a single-car garage in 28 days of spare time. The 18-hp Lazair II flew even better than the lower-powered original, and the Lazair floats worked great too.

Design Details

The Lazair is based on a large all-metal wing (144 square feet). The leading-edge D-cell came factory-built and includes the spar to which the builder riveted high-density painted foam ribs with aluminum capstrips.

Originally, Lazair wings were covered with transparent Mylar, but later models used translucent Tedlar, another Dow plastic that was made for greenhouses and had much more UV resistance. Using special double-stick and wide single-stick tape, the builder attached the plastic to the wings and tail surfaces and heat-shrank it tight.

My first version, like the originals, lacked rudder pedals and used an ingenious mixing arrangement to couple ailerons and ruddervators (like the *Wright Flyer*, early Ercoupes and modern jet fighters). Elegant in its simplicity, the second model incorporated rudder pedals and a mechanical switch to choose between separate or coupled ARI (aileron/rudder interconnect) mode. You could switch modes in the air.

Lazairs through the Model II version used an overhead-pivoted stick that minimized parts and worked perfectly but confused some pilots. The overhead stick moves in the conventional directions, but the pilot’s wrist turns opposite from normal. The Lazair pilot operating manual points out this difference, and Kramer checked for reverse sensing



Touchdown attitude requires only a little flare for a feather-soft landing.

before letting pilots fly by running at a wingtip and moving it up or down while the pilot taxied. If the pilot moved the stick correctly without hesitation, he or she had a handle on bank control.

The wheels were close to the pilot and lacked wheelpants. Some of us wore leather gloves and used our hands as wheelbrakes to help turn when taxiing or to shorten landing rollout. The system gave new meaning to the term handbrakes; heat sensors in the “brakes” warned of excessive braking. The tailwheels did not swivel, and ground steering was with differential power, “handbrakes” or with rudder and aileron control.

What appears to be a nosewheel is in fact a rotary skid. Lazairs were designed as taildraggers, but on early ones the CG was just behind the wheels, so at the start of the takeoff roll, engine thrust could put the “nosewheel” on the ground briefly.

Flying Back Then

Every Lazair I sampled flew beautifully. The ultralight empty weight limit is 254 pounds, and my first one weighed less than 200 pounds. The second one totaled 210 pounds empty. With me aboard, idle-power stall speed was 18 mph. Cruise at 25 mph was pleasant, and I could climb with one engine out and soar in moderate lift with both engines off, restarting with the pull cords to motor back to the airport.

I routinely shut down both engines on short final to shorten the landing roll. The Lazair glides well, and no big sink rate results from doing this if you approach at 30 to 35 mph.

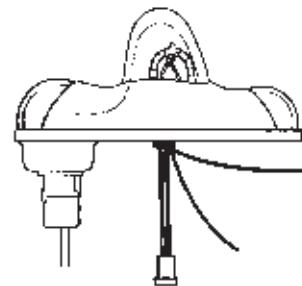
Model III Changes

Despite selling hundreds of kits, the Kramers decided to modify the Lazair to incorporate comments by potential customers. As a result, the Model III moved the wheels farther apart and forward (too far away from the pilot for the “handbrake” option), added mechanical toebrakes and wheelpants, larger pushrods to the ailerons and ruddervators, and pivoted the stick at the bottom. All of this added control system beefiness but also increased build time, cost and weight. (With a 5-pound instrument pod, our Lazair III weighs 231 pounds empty.)

None of these changes saved Ultraflight Sales from the demise of the ultralight industry in the mid to late '80s, and by about 1987, the last Lazair kits were out the door. But now there are active Lazair groups in Canada and a few in the U.S. Engine parts remain available. Finding Tedlar in reasonably small quantities if we need it may be a problem, however.

Getting Ours Ready

My partners—Ernie Moreno and Mike Pongracz—drove from northwest Oregon to Petaluma, California, for our



NAV/STROBE/POSITION LIGHTS Kit #156-0049

Includes:

- 1 Red Lens Assembly
- 1 Green Lens Assembly
- 2 Power Supplies
- (2) Single or double flash, 28V
- (Single available)



Division of Mottish & Murray Inc.

Distributor & OEM Inquiries Welcome

1-800-322-2052 Ext. 101
1715 W. Carroll Ave • Chicago, IL 60612
Local & Intern'l Phone (312) 733-3613 Ext. 101
Fax (312) 733-0197

www.aeroflash.com

KITS!

**QUICK BUILD SPORT TRAINER KITS.
HAVE YOUR NOSTALGIC J-3 REPLICIA
IN NO TIME!**



FREE CATALOG!

FREE CATALOG!

INCLUDES A FREE SET OF SPORT TRAINER DRAWINGS WITH THE PURCHASE OF A QUICK BUILD KIT!

FREE BROCHURE!

WAG-AERO

1-800-558-6868
www.wagaero.com
store.wagaero.com

KIT68

the legend lives on



Mk 26

Fully engineered fast build kits.

Incredibly affordable to build and fly. 80% and the NEW 90% reproduction Spitfire.

6+ / -4 g
V6 260hp
All aluminum
2 Seater



Engine Packages (Firewall Forward)



We are now selling our V6 260hp naturally aspirated and 320hp Supercharged engine packages. These packages will suit a variety of aircraft. Engine Prices start from \$45,000 AUD



For sales call Mike or Geoff
P + 61 07 3202 9619 F + 61 07 3202 9219
sales@supermarineaircraft.com
www.supermarineaircraft.com

Authorized Kodiak Service Center For:



AIRCRAFT ENGINES

Engines, Parts,
& Related Accessories.

Serving the industry
for over 10 years

250+ page catalog

1-800-LA-ROTAX

(1-800-527-6829) Orders

Phone: (863)655-5100

Fax: (863)655-6225

e-mail: lockwood@digital.net

www.lockwood-aviation.com

Lockwood Aviation Supply, Inc.

Master Service Center 1998/99

Lockwood Aviation Repair, Inc.

Specializing in the repair
and overhaul of

ROTAX Aircraft Engines

FAA Repair Station #L2DR339H

(863)655-6229

LIGHT STUFF



"Cranking No. 2." A pull cord starts the 9-hp Rotax 185.

purchase. This Lazair had not flown in more than 8 years but was stored in its trailer inside a hangar. It appeared to be in remarkably good condition. Especially important, the Tedlar was intact and still flexible (not brittle like Mylar becomes).

Moreno, our group's engine expert, ordered Tillotson carb kits. He cleaned and overhauled the carbs as I cleaned and overhauled the fuel tank innards, and we all inspected the entire aircraft. We installed new fuel tubing, filters and checkvalves, removed the out-of-date ballistic chute, and replaced one tire and wheel with a new spare set. After filing the points in both engines, we got them running. Using my model airplane optical tachometer, we adjusted low- and high-speed mixture, getting adequate and similar power out of both engines (near 2200 and 5600 rpm respectively).

Flying Now

My ultralight logbook said my most recent Lazair flight was in August of '85. With the "new" one, taxiing with the swiveling tailwheels and toebrakes was a challenge at first. Surprisingly, the brakes allow full-power runup of both engines without moving. Now, however, I've become proficient at differential power bursts to taxi straight or turn.

Wearing the same gear I used for the first flight of my first Lazair (Navy Nomex flightsuit, boots and leather jacket) added to the nostalgia. My Vertex Standard handheld radio tuned to the local airport CTAF provided communication with airport traffic and the assembled ground crew. The only instrument aboard was a Hall floating-disk airspeed indicator.

Rudders became effective almost immediately with the fistful of tiny throttles against the stops. Holding the stick neutral, I felt the tail rise, and about 2 seconds later the Lazair was flying for the first time in many years. Lazairs do not need to be rotated for takeoff; they levitate level and then assume a climbing attitude without stick pressure. I climbed at 22 mph indicated, cruised at 25 to 30, and glided at about 35. On my second takeoff, I extended both arms to show hands-off climb stability.

With an altimeter installed on the next flight, I verified single-engine performance, which was close to level at full power rather than a climb seen in the lighter models. Power-at-idle stall is at about 20 mph. These numbers will be higher for pilots of more normal or greater weight. At my weight, VMC (minimum controllable velocity with the critical left engine off or at idle) is below stall speed. This means there is rudder authority as slow as I can fly.

On landings, little flare is needed for a soft touchdown, and a sideslip takes care of moderate crosswinds. For greater crosswinds on a reasonably wide runway, I would land angled into the wind and use crosswind taxi techniques upon touchdown.

What's Next?

I plan to use ancient techniques to help my partners get in the air comfortably. They have both flown ultralights, so the transition should be easy. But I'll use handheld radios as I did to instruct ultralight students before there were two-seat ultralight trainers. Incidentally, about the time you read this, legal two-seat ultralight trainers will be history. I can imagine single-seat ultralight training reverting to one-way instructions from a ground-based instructor—the method we used in the early 1980s. It worked.

In the meantime, I'm reliving my, er, middle age. †

Aircraft Design/Services

BUILDER Assist and Wiring. Composite construction—Glasair, Express, Lancair and Canard at any stage. Aircraft and instrument panel wiring. Neat and reliable. Reasonable rate. **541-968-9328.**

Aircraft for Sale: Kits

AIRCRAFT DIRECTORY ONLINE — the most up-to-date, comprehensive database of over 700 designs including: kits, plans, rotorcraft, 'chutes, and trikes. Instant information in an easy to use searchable format with photos, design specs and e-mail and web links. **www.kitplanes.com/aircraftdirectory.** For a printed edition, call **800-622-1065** and order the most recent Dec., Jan. & Feb. back issues.

BEARHAWK FOUR-PLACE STOL



140-155 mph, Four 200 lb people w/baggage and 50 gal. 160-260 hp, 1100-1300 pounds useful. Huge baggage doors, easy ground handling. Big guys fit fine. Quick-build/Components available.

AVIPRO AIRCRAFT, LTD
Ph: 602-971-3768
www.bearhawkaircraft.com

SOUTH LAKE LAND SPORT AVIATION SPORT PILOT TRAINING CENTER home of the **RV-9 ELSA**, located at X49, 4 1/2 miles SW of Sun 'n Fun. Sport Pilot training in **RANS S6ES** and **S12XL**. Taking deposits for **RANS S-19 ELSA** kits. Builder assist and **DAR** available (airplane, trike and powered parachutes). Jay Kurtz, Lakeland, FL **863-701-0000**, www.liteplane.com liteplane@bigfoot.com

TANGO II-two seats, 200 mph cruise on 180 hp, 8 GPH, guaranteed. Up to 2100-mile range, 800 pound useful load. Stalls at 65 mph, operates off grass drips, fixed gear. Fast build kit, \$27,750. Build Center optional. teamtango.com **352-528-0982.**

BD-MICRO TECHNOLOGIES, INC. The BD-5 People. FLIGHTLINE Series, enhanced BD-5 kits - complete & predrilled for quick assembly. BD-5J Microjet, BD-5T Turboprop, BD-5B. 68-page info/catalog: \$20 US, \$25 Int'l. **www.bd-micro.com; 541-444-1343.**

MURPHY REBEL kits, only \$17,515 USD. See this rugged, roomy, aluminum STOL at Brampton, ON. A great LSA with a R-912. **Bob Patterson, 9-9, 7 days 905-457-5238.**

Aircraft Parts/Services

TODD S CANOPIES — Supplier of canopies and windows for kit and plans built aircraft. Custom jobs welcome. **954-579-0874.** Website: **www.toddscanopies.com**

LOEHLE AERO COATINGS

* Designed For All Types Of Aircraft
* Metal, Fabric Covered, & Composite
* From Ultralights To Jet Fighters!

THE MOST ADVANCED SYSTEM ON THE MARKET TODAY!

380 Shippmans Creek Rd. Wartrace, TN 37183 USA
Ph: 931-857-3419 • Fax: 931-857-3908
www.loehle.com • email: paint2@loehle.com

PROPELLER Speed Reduction Unit-2.17:1 and 2.85:1 ratio's 6 pinion planetary gears heavy duty precision built units ready to bolt on Subaru's and Rotary's. javlakeca@yahoo.ca www.gappsru.com Fax: **604-820-9113**, Ph: **604-820-9088**

COMBO LED STROBE SYSTEM

Two STROBE and LED position light heads, STROBE driver, wire, plugs, & mounting hardware. The power draw for entire system is 2 1/2 Amps. \$388.

KUNTZLEMAN ELECTRONICS, Inc.
Phone: 610-326-9068 or www.KEstrobes.com

Throw Out Your Phillips Head Screws Replace Them with Torx ® equivalent 100 degree flat head machine screws 4-40x1/2, 6-32x1/2, 8-32x5/8, 10-32x3/4. Also many sizes of hex socket cap screws, stainless and alloy. Order online at **www.microfasteners.com**. Call **1-800-892-6917** or email info@microfasteners.com for free catalog.

BELLCRANK BEARINGS MS20218-1 & 2, BCP4W10, BC4W10, & BC5W11 NEW and TRACEABLE. E-mail: romamach@aol.com Aircraft bearings in stock. Call for quote **815-325-8894.**

WINDSHIELDS — WINDOWS — CANOPIES for experimental and certified aircraft. Custom jobs welcome. Half-price replacement warranty covers damage during installation for six months after purchase. **AIRPLANE PLASTICS, 9785 Julie Ct., Tipp City, OH 45371. 937-669-2677. Fax: 937-669-2777.**

DISC BRAKES, WHEELS, TIRES. Chromoly Axles for Challenger, Pulsar, Sonex! **Tracy O Brien Aircraft Specialties, Ph: 360-748-4089. www.tracyobrien.com Email: tracy@localaccess.com**

Aircraft Plans

11 WOODEN designs, single & 2-seaters, s.b.s. & tandem, fixed & retract. gear. Color catalog \$25 USD. **Sylvia Littner, 432 Hamel, St. Eustache, Quebec, J7P-4M3 Canada. Ph: 450-974-7001 Email: slittner@videotron.ca**

BEARHAWK UTILITY/STOL

Build from plans, metal wing, tube fuselage. Four 200 lb people w/baggage and 55 gal. fuel, 140-155 mph. Plans, \$285, data sheet, \$2.00. Quickbuild kit and components available.

R&B AIRCRAFT
Dept K, 2079 Breckinridge Mill Rd.
Fincastle, VA 24090
Ph: 540-473-3661 • www.bearhawkaircraft.com

www.beajonultralights.com Complete plans BJ-2, Mach 07, Flybike, Minimac, Viewmaster, Hardnose, Windward, with handbook "How to Build Ultralights." \$40.

PAZMANY PL-2 - 2-place, all metal, plans \$425. **PAZMANY PL-1** - 2-place, all metal, plans \$425. (for information see our website). **PAZMANY PL-4** - Single-place, all metal, plans \$375. **PAZMANY PL-9 Stork** - 2-place stall (fieseler Storch, 3/4 replica) welded tube fuselage, aluminum wing and empennage. Fabric covered. Super detailed plans (700 sq. ft.) \$550. PDF info pack \$9 available at website. Air Mail & Insurance all plans: US \$20, Canada \$35, foreign \$80. PL-9 Video \$30, mail US \$3, foreign \$6. **PAZMANY AIRCRAFT CORPORATION, (new address) PO Box 60577, San Diego, CA 92166 www.pazmany.com Email: info@pazmany.com Phone: 619-224-7330 Fax: 619-224-7358**

SONERAI SERIES of Sport Aircraft. Sonerai I, midwing, single place, Sonerai II Original (LSA optional) mid wing or low wing or Sonerai II Stretch two place tandem low wing. II and II Stretch have optional nose gear. 4130 steel fuselage, fabric covering, and all aluminum foldable or removable wings. Rugged aluminum landing gear. Powered by dependable, inexpensive VW based power plant. Plans built with many pre-fab parts available. Video/DVD and Info Pack \$14.95. Plans \$124.95 plus freight. **Great Plains Aircraft, PO Box 222, Bennington, NE 68007. www.sonerai.com 402-493-6507.**

PLANS - KITS - PARTS



2/3 Mustang



F12 Cruiser

and 10 other all wood designs

Info Packs \$10/ea + \$3 Postage
HIPEC Covering System - no ribstitching, no taping.
Lo cost — Lo labor — proven

www.falconaravia.com

Email: sales@falconaravia.com
FALCONAR AVIA INC. Ph: 780-465-2024

"Scratch Building Basics" Terrific 2 DVD set demonstrates basic techniques, tools for building a metal aircraft from plans. \$39.00 Free shipping. **HomebuiltHELP 9186 County K Brussels, WI 54204.** Details: **www.HomebuiltHELP.com**

FLYING-FLEA MICA original french plans, ultimate wings allow unbelievable STOL, increased flight-speed although reduced engine. Ultralight 103 / 2-seater VW / Flying-Boat 3-seater. Still quicker, cheaper built. **Descathamica, 413 Ruben Torres #1 Brownsville, TX 78520. Descathamica@gmail.com**

CASSUTT Sport/Racer plans, parts, kits. OR-65 Owl Race plans. **National Aeronautics Co. 303-940-8442. 5611 Kendall Ct #4, Arvada, CO 80002 Cassutt.lornet.com cassutts@aol.com**

AIRCRAFT DIRECTORY ONLINE — the most up-to-date, comprehensive database of over 700 designs including: kits, plans, rotorcraft, 'chutes, and trikes. Instant information in an easy to use searchable format with photos, design specs and e-mail and web links. **www.kitplanes.com/aircraftdirectory.** For a printed edition, call **800-622-1065** and order the most recent Dec., Jan. & Feb. back issues.

BEARHAWK PATROL (BUSH/AERO BAT)



Build from plans, all metal wing, 4130 tube fus. & tail. Tandem (2 place) cabin for (2) 300lb people, plus baggage & 55 gal. fuel. Plans \$260.00, info pack \$4.00.

R&B AIRCRAFT

Dept K, 2079 Breckinridge Mill Rd.
Fincastle, VA 24090
Ph: 540-473-3661
[HTTP://bearhawkpatrol.tripod.com](http://bearhawkpatrol.tripod.com)

EASY Eagle 1 LSA optional Bi-Plane. An affordable single place VW powered fun aircraft. Plans built for \$10,000 or less. Many pre-fab parts available. Plans \$65.00 plus shipping, includes wing construction DVD. www.easyeagle1.com. Info pack \$4.00. **Great Plains Aircraft, PO Box 222, Bennington, NE 68007. 402-493-6507.**

"GP-4" MORE SPEED, LESS MONEY!



240 MPH cruise on 200 HP. All wood, 2-Place, Oshkosh Grand Champion. Full builder support. Info Pak \$15 (\$18 overseas). Plans \$385 (\$430 overseas).

OSPREY AIRCRAFT

3741 El Ricon Way, Sacramento, CA 95864
Email: gp-4@juno.com

WWW.VOLKSPLANE.COM - VP-1 PLANS with FREE Lightplane Designers Handbook \$64. Includes VP Pilots Handbook, International Builders photos, Flight reports.

FAMOUS COZY MARK IV



Most popular 4-place plans-built. Famous for highest speed, performance, economy, best safety & builder support, lowest cost, & EZ build. Send \$22.95 for Info Pack/DVD, \$14.95 for just the Cozy Mark IV DVD. \$20 for CD with newsletters #4 to #63 & \$500 for Plans.

AIRCRAFT SPRUCE

225 Airport Circle, Corona, CA 92880-2527
Ph: 877-4-Spruce or 951-372-9555
www.cozyaircraft.com • www.aircraftspruce.com

Aircraft Wanted

PROJECTS/PARTS needed by Cornerstone Ministry (501c3 non-profit Christian foundation), teaching the Bible and serving since 1968. We pick up and provide all documentation. Your donation is deeply appreciated. **800-633-4369. planekit@aol.com <http://www.donateyourplane.com>**

Avionics, Instruments

GPS, HEADSETS, AVIONICS sales, installations & service. Best prices on Garmin, S-Tec, Bendix/King, Bose, Lightspeed, JPI. **Gulf Coast Avionics 800-474-9714 Lakeland, FL.** Shop on-line www.GCA.aero



"Must be a Leer Jet!"

**G-METER • VOLTMETER • CLOCK
FLIGHT TIMER • STOPWATCH**



GT-50
Just \$159!

- **FIVE FUNCTIONS in a 2 1/4" Instrument!**
- Instantaneous G Readings to +/- 9' G's •
- Saves Max and Min G's • 12 or 24 Hour Clock •
- Automatically Records Flight Time •

FLIGHT DATA SYSTEMS

346 Keokuk Street, Petaluma, CA 94952
Ph: 831-325-3131 • www.fdatasystems.com

Books and Manuals

AERONAUTICAL ENGINEERING BOOKS:

Over 90 titles in stock, personally reviewed and recommended for airplane design. WWW.DARCORP.COM is your one-stop, on-line shop for new and hard-to-find aeronautical engineering books! DARcorporation, 1440 Wakarusa Drive, Ste 500, Lawrence, Kansas 66049, 785-832-0434, info@darcorp.com

GPS MANUALS — Pilot-friendly manuals are now available for the new **Lowrance 2000c and 600c** handheld receivers. Our task-oriented manuals are simplified directions that lead you step-by-step through all the GPS operations. Includes descriptions of all pages. In addition to the above, our library includes: The Garmin GNS 430, GNS 430W, GNS 480, GNS 530, GNS 530W, G1000, GPSmap 295, 196, 296, 396 and 496, Bendix/King's KLN 89B/94, KLN 90B, and KLN 900. IFR models \$44.95. Hand holds \$39.95. Add \$6.00 for S&H. Other than U.S. add \$6 more. **ZD Publishing, Inc. PO Box 3487, Wichita, KS 67201, 888-310-3134. (In Kansas 316-371-3134) www.zdpublishing.com**

NEW - COMPOSITE TECHNIQUES

Two new books for the homebuilder by Zeke Smith: One, is a new edition for the beginner; the second book applies the technology to real structures.

**FOR THE DETAILED STORY ON BOTH, SEE
www.aeronautpress.com**

NEW! Practical Stress Analysis for Design Engineers — Deluxe hardbound edition, 474 illustrations and drawings, 685 pages. Solutions based on "real" aircraft structure. A simplified, easy-to-understand reference book — contains no complex mathematics. Aircraft designers and experimenters can master the principles and fundamentals of stress analysis. Price \$98. Satisfaction Guaranteed. **Lake City Publishing Company, Tel: 208-772-7721, www.psa1.com**

Engines, Parts, Services

26 YEARS FLIGHT-PROVEN reduction drives for 4.3L V-6 and 350 V-8 Chevy small block engines. **Belted Air Power, 1408 Western Ave., Las Vegas, NV 89102, Ph/fax: 702-384-8006.**

ENGINES STARTING AT \$200-GUARANTEED. Kawasaki, Rotax, Hirth, and most other brands. BEST reduction drives, carburetors, and exhausts. Top-notch service from our friendly staff. **J-Bird, 210 Main St., Kewaskum, WI 53040, 262-626-2611.**

VESTA INC. ENGINES/PSRU LS2 V8 engines 300-450HP, Honda V6 engines 180-300HP, Honda 2.4L engines 100-150HP, Viper V-10 and diesel engine development. **www.VestaV8.com 908-238-9522.**

HIRTH AIRCRAFT ENGINES

15 thru 110 hp. 1000 hour rated TBO. One year warranty. Sales, service, and parts. Highest power to weight ratio in the industry. BlueMax 2-cycle aviation oil. Contact:

RECREATIONAL POWER ENGINEERING
5479 East County Rd. 38, Tiffin, Ohio 44883
Tel: 800-583-3306 • Fax: 419-585-6004.
Visit us on the web at www.recpower.com

GESCHWENDER PSRU - BUSINESS FOR SALE - Manufacture PSRU for V6 & V8 Chevy engines - chain drive; 2:1 ratio; constant speed or fixed pitch prop inventory, drawings, contacts all included. **www.alternate-airpower.com**
worden@owt.com

STRATUS 2000 INC.

Specializing in the Subaru Ea81 100+ HP engine: 2.2 to 1 Belt Drive w/ prop extension, dual Bing carb kit, Alternator kit, Cam grind, mounts, stainless steel muffler.

STRATUS 2000 INC.
5145 SE 3 Rd St., Corvallis, OR 97333
Tel: 541-754-4114 • Email: mjt@camano.net
www.stratus2000.homestead.com

ROTARY Engine Conversion Products! Engine controllers, PSRUs, engine monitors, apex seals, overhaul kits, "How To" books, DVDs. **Real World Solutions 386-935-2973, www.rotaryaviation.com**

REVMASER ENGINES FOR SPORT AIRCRAFT. Proven reliability since 1968. Complete units 75-120 HP, Die cast RevFlow injector carb 30-42mm. Engine parts available. **REVMASER AVIATION 760-244-3074, www.revmasteraviation.com**

TIRED OF ROTAX PRICES?



15-235hp • 2/3/5/7 cylinders
internal reduction or cog belt • 4 stroke reliability
electric start • alternator • dual ignition

VERNER ENGINES FLYDIVER, LLC

Sales & Service: 360-490-6268
Sales@FlyDiver.com • www.FlyDiver.com

GearedDrives.com - f/wf packages including engine mount for RV-10 now available-spur gear PSRU w/automatic centrifugal clutch-superior performance- **936-827-5126.**

NEW GENUINE LYCOMING EXPERIMENTAL

New genuine Lycoming experimental engines: 16 models to choose, 160-300HP, roller technology included, no cores required, balanced and dyno tested.

G&N AIRCRAFT, INC

800-348-6504 • www.gnaircraft.com

RV-6, RV-7, RV-8, RV-9, RV-10, CH801, AND GLASTAR ENGINE PACKAGE.
WWW.EGGENFELLNERAIRCRAFT.COM
386-566-2616

LIGHT AIRCRAFT ENGINES. New, used, rebuilt 4 to 135 HP engines, redrives, exhausts in stock. C.D.I. conversions all Rotax \$275. Complete engines and crankshaft rebuild center, genuine Rotax parts all in stock, quick turnaround. Our 26th year. **Airscrew Performance 623-842-3902.**

ROTAX® AIRCRAFT ENGINES

Easy ordering - Fast Shipping - Expert Advice - Fair Price
New and Used Engines and Parts. Our commitment to Customer Satisfaction and Technical Expertise guarantees premier service to EVERY customer.

WWW.RTX-AV-ENGINES.ca

Info@rtx-av-engines.ca
1-866-418-4164 Toll Free

GEO/SUZUKI Reduction Drive Kits for 1.0/1.3L - 62 to 115 hp. **Manual** "Converting the Geo/Suzuki for Homebuilt Aircraft" 3 Cyl \$49.95, 4 Cyl \$99.95 + \$8 s/h. **Raven ReDrives Inc., 1025 Rosewood Ave., #100, Boulder, CO 80304. Ph: 303-440-6234. www.raven-rotor.com**

KAWASAKI PACKAGE—SAVE 50% on engine, re-drive, carb, & exhaust. 0-time-64 lbs-40 hp J-Bird, **262-626-2611.**

Helicopters/Rotorcraft

HOMEBUILT HELICOPTER



Complete Lonestar Helicopter construction and assembly manual, owners manual, flight demonstration SVCD (plays in standard DVD player), partial machining drawings, photo gallery, and general information package all on CD. See website for details.

WWW.REDBACKAVIATION.COM

Experimental Helo magazine. Dedicated to all experimental and personal helicopters world wide. Published 6 times/yr, full color. Subscribe or renew (\$35/yr for US subscriptions, add for international.) check, MO, V/MC or PayPal. More info online, call, or email. **760-377-4478; eh@iwvisp.com; www.experimentalhelo.com**

Sky Twister Helicopter the Builder. Who demands the ultimate in Ultralight Flight! Plans \$125.00. Video & Info pkg \$30.00. (Shipping in U.S. included.) **Ben Showers Aero 1040 Skyview Drive, Milton, PA 17847. PH: 570-742-4080. E-mail: trikewings@hotmail.com**

ROTORDYNE High performance bonded aluminum rotor blades: Proven Reliability, Advanced Airfoil Design, Custom Fit Service, Worldwide Delivery. Call Rotordyne Aero L.L.C. **www.rotordyne.com 805-239-9714.**

Homebuilders Supplies

TERMINALTOWN—Wiring supplies: mil-spec terminals, tefzel wire, crimpers, heat shrink, fuse blocks & cable ties. Terminal, connector and fuse block kits. Online catalog—secure ordering. **www.terminaltown.com**

AIRCRAFT DIRECTORY ONLINE — the most up-to-date, comprehensive database of over 700 designs including: kits, plans, rotorcraft, 'chutes, and trikes. Instant information in an easy to use searchable format with photos, design specs and e-mail and web links. **www.kitplanes.com/aircraftdirectory.** For a printed edition, call **800-622-1065** and order the most recent Dec., Jan. & Feb. back issues.

Instruction/Schools

CALIFORNIA SPORT AVIATION — America's leader in top quality Sport Pilot training. DAR, SPE, SPFIE, LSRMA. Aircraft dealer. **californiasportaviation.com 916-488-2FLY**

Light Sport Aircraft

LEARN ALL ABOUT LIGHT-SPORT AND ULTRALIGHT AIRCRAFT from the world's oldest and largest magazine dedicated to light-sport and ultralight aviation. In publication 31 years. Send for your free information today. **Light Sport and Ultralight Flying, PO Box 6009, K-1 Chattanooga, TN 37401. Phone: 423-629-5375. Website: www.ultralightflying.com.**

SEA Eagle Float Systems—Technological breakthrough allows Floats LSA to build custom floats to fit aircraft displacements from 600 through 1430 pounds and beyond! See us at Sebring in January. **www.floatsLSA.com e-mail: gary@floatslsa.com. 800-537-7849.**

Miscellaneous

HELP WITH YOUR HOMEBUILT



Nothing beats watching over someone's shoulder to learn!
How-to construction DVD's: Electrical Wiring 101,
Metalworking 101, Licensing a homebuilt,
ROTAX © engine repair, more! Previews at website:

HomebuiltHELP.com

9186 County K, Brussels, WI 54204
www.HomebuiltHELP.com

HI-TECH FOAMS. Seat foam, sit for hours, unsurpassed comfort and impact safety. Noise and vibration foams for experimental and general aviation aircraft. All products meet FAR 25.853 and FAR 25.855 burn specifications. Many kit drawings and seat packages available. Send SASE to: **Hi-Tech Foams, 3710 Airpark Rd., Lincoln, NE 68524, 402-470-2346, www.seatfoam.com**

FORGET FAA REGULATIONS

Build a **boat** using proven plans, full size patterns & kits. Send \$9.95 for NEW catalog CD of over 300 designs for power, sail, & row.

GLEN-L

9152 Rosecrans Ave/KP, Bellflower, CA 90706
Toll Free: 888-700-5007 • **www.Glen-L.com/offer8**

Propellers, Services

PRINCE P-TIP Carbon Fiber Anti-vortex design, automatic pitch control, increased efficiency and noise reduction. Avid, BD-4, BD-5, Cozy, Defiant, Glasair, Glastar, Kitfox, Lancair, Long/Vari-Eze, **RV's, Sonex, T-18, UAV/RPV, Velocity, Zenith.** Continental, Jabiru, Lycoming, Rotax, Subaru, Volkswagon. 2-Blade, Multi-Blade, Scale, Wind Tunnel, Custom. Computer designed for all configurations. Repair and Overhaul. Worldwide Exporting. **Prince Aircraft Co., PO Box 2669-H, 6774 Providence St., Whitehouse, OH 43571. Phone: 419-877-5557; Fax: 419-877-5564; E-mail: propellers@aol.com Website: http://www.princeaircraft.com All major credit cards accepted.**

SENENICH WOOD PROPELLERS

Designs for Continental, Lycoming, Rotax 912+, Jabiru, VW & most others. Competitive prices. 65+ years of quality and experience.

SENENICH WOOD PROPELLER CO., INC.

2008 Wood Court, Plant City, FL 33567
Ph: 813-752-3711 • **www.senenichprop.com**

VESTA PROPELLERS: 150-800 HP, hydraulic, electric, Two, three, and four bladed hubs. Full feathering and Beta reverse options. **www.VestaV8.com 908-238-9522.**

Aymar-DeMuth Propellers—Computer generated designs since 1968. Best climb and best fuel economy possible. Maple or composite props with steel edge protection. Very smooth and quiet. Discount extensions and crush plates. Call or write: **410-461-4329, PO Box 853, Ellicott City, MD 21041-0853.**

GSC SYSTEMS - Propelling the world since 1984. Best quality Eastern Maple Hardwood, available in fixed pitch, ground adjustable 2- and 3-blade, 2-blade mechanical in-flight adjustable and **now** available props for PPG market. Diameters range from 36"-72" with option for leading edge protection on all models. Outstanding customer service. **#8 2440 B 14th Avenue, Vernon, BC V1T-8C1. 250-549-3772 ph, 250-275-8441 fax. www.ultralightprops.com; email: info@ultralightprops.com**

PROPS INC. Quality & Performance for all Homebuilt, Kitbuilt airplanes. Computer designed and Hand Crafted. **www.propsinc.net 354 SE 2nd St. Newport, OR 97365. 541-265-3032.**

Ivoprop. Inflight or ground-adjustable. Carbon/graphite fiber composite blades with stainless steel leading edges. Number 2, 3- or 6-blade. No.1 selling prop in the world. Constant speed electronic governor. Readily reassembles from 3-blade into 2-blade configuration and one spare blade. Beautiful high-gloss finish. Unique pitch adjustment, no tractor needed. Low drag hub. 30-day money back guarantee. **Ivoprop Corp., PMB #330, 15903 Lakewood Blvd., #103, Bellflower, CA 90706.** Call: **800-FOR-PROP** or **562-602-1451.** Fax: **562-602-1374.** Website: **Ivoprop.com** E-mail: **Ivoprop@pacbell.net**

Real Estate

RIVER Fly-In Condominium, Merritt Island Airport, Florida. Perconstruction Reservations, Ultimate Heaven on Earth for Pilots and Boaters, www.riverflyin.com 321-636-6631. wasim_us@yahoo.com

Tools

AFFORDABLE CNC MILLS & LATHES



Syil America offers quality Machines, Tooling, Software, and Technical Support. Special Deals: Super X2 and Super X3 CNC Mills
U2 CNC Mill & Surface Grinders
C6 CNC Lathes

SYIL AMERICA
syilamerica.com • 888-594-1097

METAL Aircraft Builders: New 18" deep riveting yokes. Go to www.lowdermfg.com or call **559-292-6629** for details.

PLANS for 2"X72" metal belt grinder. No welding, milling, lathe, required. Easy, low cost build. 15 pages CAD, 27-page manual \$25. www.midwestknifemakers.com

METAL forming equipment and machines, Welding supplies, and Handtools for Aircraft Metalwork. See our incredible Air Power Hammers - they shrink, stretch, curve flanges, turn edges, and more. Complete product line on our website at: www.tinmantech.com **530-292-3506** (CA).

Ultralight Aircraft

LEGAL EAGLE ULTRALIGHT



A part 103 legal Ultralight with the popular Better Half VW. \$2,000-\$5,000 depending on scrounging ability. Kits being shipped. Plans \$50, eng. plans \$20, videos \$25 ea., prop hubs \$150, info \$5 (eng. or plane). Check/m.o.:

L. E. MILHOLLAND
PO Box 747-K, Brookshire, TX 77423
Ph: 281-375-5453 • Cell: 281-785-3777
leonard@lemilholland.com • www.betterhalfvw.com

FALCON EAST, HEADQUARTERS for FALCONS, XP, UL, new used, parts, owner's assistance. **845-528-8940. www.aerofalcon.com**

Video Tapes & DVDs

CHALLENGER VIDEO, \$10. Exciting 45-minute VHS video of Quad City Ultralight's Challenger II and Challenger II Special. We will also include a complete information package with prices. Send \$12 to **QCU Aircraft Corp., PO Box 370, Moline, IL 61266-0370.** Web page: www.quadcitychallenger.com Or call: **309-764-3515.** Fax: **309-762-3920.** We accept Visa/MC.

RV Rudder Workshop - Watch and learn as the rudder from a popular RV aircraft kit is built and explained. A beginner's lesson in riveting. Next best thing to attending a metal workshop! DVD \$32 **HomebuiltHELP.com 920-825-7731.**

AIRFRAME CONSTRUCTION TECHNIQUES: 4130 Steel Tube Fuselage. This DVD video focuses on modern welding and construction techniques, \$45. To view previews or to place an order, visit: www.jumprunenterprises.com

TRAINING videos and DVDs for rent. Sporty's and King Schools available. Private, instrument, CFI, plus A&P, and entertainment titles! www.justplanevideos.com **601-544-0668.**

25+ METALWORKING DVDs including: Air Hammer Operations (2Hrs. \$60); Advanced Techniques for the English Wheel (2-dvd set / 2+Hrs. \$65 / Learn to form a polished skin from 2024T3); Aluminum Gas Welding 2.1 "The Difficult" (Covers welding, brazing, and soldering, and 5052 and 6061 alloys); 4130 Airframe Construction, Shaping Wheel Pants, Fairings & Reverses, Basic Aluminum Damage Repair. Historical aviation metalworking videos & more. See our website for details www.tinmantech.com **530-292-3506.**

KITPLANES®



To place your online ad, log on to www.kitplanes.com

Advertising Deadlines

ISSUE: Apr '08	AD CLOSE: Jan 02, 2008	ON SALE: Mar 04, 2008
ISSUE: May '08	AD CLOSE: Jan 30, 2008	ON SALE: Apr 01, 2008
ISSUE: June '08	AD CLOSE: Mar 05, 2008	ON SALE: May 06, 2008

To place your ad in *Kitplanes* magazine, phone: **717-982-0744** or email: ads@kitplanes.com Fax: **717-427-1525**

Classified Line Ad

Rate/word: 1 time 6 times 12 times
\$1.25 \$1.15 \$1.00
20 word minimum per ad.

Classified Box Ad

4 word heading, 25 words of copy, plus your company name, address, and up to 3 contact numbers.
1 time \$94 • 3 times @ \$89 ea.
6 times @ \$84 ea.
12 times @ \$73 ea.

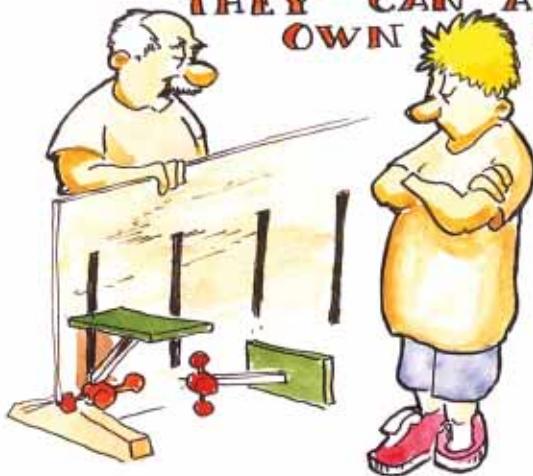
Classified Photo Box Ad Includes

4 word heading, 1" x 2 1/8" B/W photo, 25 words of copy, plus your company name, address, and up to 3 contact numbers.
1 time \$188 • 3 times @ \$177 ea.
6 times @ \$167 ea.
12 times @ \$146 ea.
Digital Photo Specifications:
1200 dpi resolution for B/W, Tiff and EPS formats accepted.

Subscriptions:

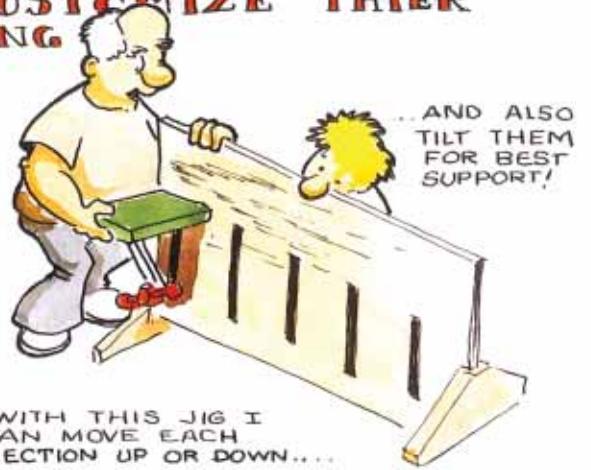
Ph: 800-622-1065 (US & Canada) • 386-447-6318 (International) • Fax: 386-447-2321

A LOT OF DESIGNERS FORGET THAT THEY CAN ALSO CUSTOMIZE THEIR OWN SEATING

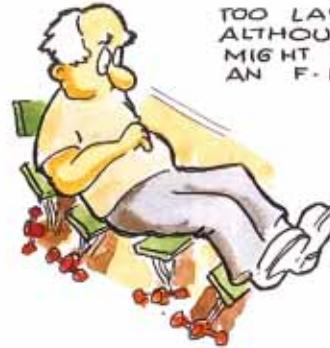


NOPE.. TOO STRAIGHT!

TOO COMPACT AND TIGHT!



WITH THIS JIG I CAN MOVE EACH SECTION UP OR DOWN....



TOO LAYED OUT... ALTHOUGH IT MIGHT WORK FOR AN F-16!

BUT PUSH THIS OUT. RAISE THIS UP. STRETCH THIS.. PERFECT!

IT LOOKS LIKE PAPPY FINALLY FOUND THE RIGHT COMBINATION!



ROBRUCHA

Easy To **Build**

Simple, All-Metal Construction

Easy To **Fly**

Superb Handling, Slow Stall Speeds

Easy To **Own**

Inexpensive To Operate

2-Place
STOL CH 701
"Sport-Pilot Ready"



4-Place
STOL CH 801



2-Place
Zodiac XL
"Sport-Pilot Ready"

Photo by Bonnie Kratz

Whether you're looking for incredible short-field performance or for a sporty, cross-country cruiser, Zenith Aircraft Company offers kits that are perfect for the first-time or experienced builder. All-metal designs, simple construction techniques, easy-to-follow photo assembly guides, and top-notch technical support are just a few of the reasons that there are thousands of completed Zenith Aircraft kits flying all over the world.

Check out our website for complete performance specs, pricing, and builder resources.

Information Kit: \$15
Demonstration Video: \$20
(Overseas Airmail add \$10)



**Demonstration Video
Now Available On DVD**

Zenith Aircraft Company

Mexico Airport, P.O. Box 650, Mexico, Missouri 65265 USA

Tel: 573-581-9000

Kit Planes For The World™

www.zenithair.com

AIRCRAFT SPRUCE

Everything you need from one dependable source!



Composite Materials



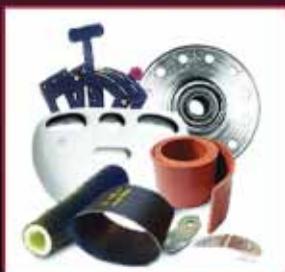
Wood Products



Tubing / Sheet / Angle



AN / MS Hardware



Airframe Parts



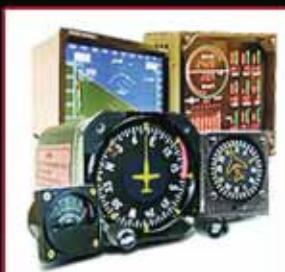
Wheels / Brakes / Tires



Engine Parts



Polyfiber / PTI Paints



Instruments



Batteries / Chargers



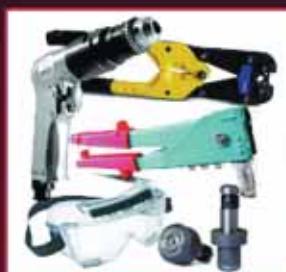
Strobes / Wire / Beakers



Avionics/GPS



Headsets / Intercoms



Tools



Pilot Supplies



Books / DVDs

ORDER
ONLINE

www.aircraftspruce.com

CALL TOLL
FREE

1-877-4-SPRUCE

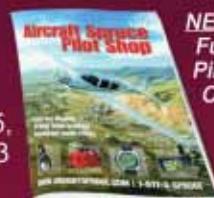


FREE 750pg.
Parts Catalog

Aircraft Spruce West
225 Airport Circle,
Corona Ca. 92880
Ph: (951) 372-9555
Fax: (951) 372-0555

Aircraft Spruce East
452 Dividend Dr.,
Peachtree City, GA 30269
Ph: (770) 487-2310

Aircraft Spruce Canada
1760 Meyerside Dr., Unit 5,
Mississauga, ON, L5T 1A3
Ph: 1-877-795-2278



NEW FREE
Full Color
Pilot Shop
Catalog!

email: info@aircraftspruce.com