

THE CANARD PUSHER

No. 76

July 1993

Published quarterly (Jan., April, July, Oct.) by

RUTAN AIRCRAFT FACTORY, INC.

Building 13 - Airport

1654 Flight Line

Mojave, CA 93501

805-824-2645

U.S. & Canadian subscriptions	\$14.00
Back issues	\$ 3.50
Overseas (Airmail)	\$16.00
Back issues	\$ 4.00

If you are building a RAF design, you must have the following newsletters:

VariViggen (1st Edition), newsletters 1 to 76.
VariViggen (2nd Edition), newsletters 18 to 76.
VariEze (1st Edition), newsletters 10 thru 76.
VariEze (2nd Edition), newsletters 16 thru 76.
Long-EZ, newsletters 24 through 76.
Solitaire, newsletters 37 through 76.
Defiant, newsletters 41 through 76.

A current subscription for future issues is mandatory for builders -- as this is the only formal means to distribute mandatory changes. Reproduction and redistribution of this newsletter is approved and encouraged.

PLEASE NOTE: BUILDER SUPPORT IS ON TUESDAY ONLY FROM 8:00 TO 5:00. When you call on Tuesdays for builder assistance, please give your name, serial number, and nature of the problem. If you are not in an emergency situation, we ask that you write to Mike. However, if you require immediate assistance, Mike will make every effort to return your call between 2:30pm and 4:00pm (our time).

When writing to RAF, send along a stamped, self addressed envelope if you have builder's questions to be answered. Please put your name and address on the back of any photos you send.

BURT'S BIG "5-OH" BIRTHDAY BASH

Sorry if you missed it!! The party on July 10th was organized too late to get it into the last CP. We'll have pictures and information for you next time.

OSHKOSH 1993 TALKS

July 30 - Friday

10:00am - Tent #3 - *Life, the Universe and Everything Else - Part III.*

July 3 - Saturday

8:30am - Design College -

10:00am - Tent #3 - *Tent Talk*

Show - Part III.

11:30am - NASA Tent - *Talk on General Aviation.*

August 1 - Sunday

10:00am - Tent #3 - *RAF Airplane*

Builder Support.

2:30pm - Young Eagles Pavilion -

Recognition of EZ Duck GliderBuilders.

MORE OSHKOSH '93

GET YOUR OSHKOSH '93 BUTTONS AT THE RAF BOOTH THIS YEAR - \$1.00.

Long-EZ builder/flyer, Buzz Talbot of Bolingbrook, IL contacted RAF with this great idea to help us defray costs. He generously offered the use of a button maker which we appreciate very much. Sure is nice to know RAF still has such good friends after all these years.

Bring your pass to the booth and have it made into a lasting keepsake.

VIDEOS OF BURT'S TALKS AT OSHKOSH '93

For those of you who have asked each year for video copies of Burt's talks at Oshkosh, stop by the RAF booth and pick up an order form. Details are being finalized as this CP is being typed.

TRUCK-EZ TESTS - THE LATEST ON DEEP STALL

For several years, we have been trying to obtain information and data on the characteristics of various canard-types at deep stall conditions. Data for the VariEze has been available since the late 70's when NASA conducted rotary-balance wind tunnel tests and concluded that the VariEze has no stable spin modes, i.e., that if forced to any angle of attack and spin rate, it will recover by itself. Also, the small model tests showed normal flat-plate drag at high angles of attack. These data and extensive stall-departure flight tests with N4EZ formed the basis for our confidence in the deep-stall safety of these general aircraft types.

Then, about 5 years ago, several accidents occurred with the Velocity aircraft. We think the problem could have been determined if extensive aft-CG departure testing had been done during development, like we did with the Long-EZ and Defiant. Two very noteworthy results from these Velocity accidents were 1). The descent was a stable, non-rotating condition about 50 to 80 degrees AOA, not recoverable with forward stick or by rocking the wings. 2). The descent was slow enough to allow impact in water without pilot injury.

Rumors were abound about this slow, 1000 ft./min. "parachute-like" descent probably induced by a violent, trapped vortex above the wing. Researching this, we found the rumors were just speculation, that there was no hard data on the descent rate. Even the test pilot who stayed with a Velocity to the ocean instead of using his parachute admitted he had not timed the altimeter nor remembered the rate-of-climb indicator's data. He merely climbed partially out, but feeling the "light breeze" of the descent, elected to ride it down. We have been extremely skeptical that an airplane can descent at this low rate, even with the best possible vortex. To put things in perspective, consider what would be required. The EZs and the Velocity have a "loading" of about 10 lb. per square foot of total planform area (including wings, canard, fuselage strakes and cowl). If all this area acts like a "flat plate" in the descent, the airplane would sink at 50 knots or 5000 ft./min. (flat plate $C_d=1.24$). The very highest C_d we have seen in aerodynamic

research papers on trapped vortex is about 10. Using a C_d of 10 for the entire airplane (very unlikely, of course), the sink rate would be 17 knots or 1800 ft./min. If the airplane could descend flat at 1000 ft./min. (only 9.9 knots), it would have a C_d over 30!!

Our interest in this phenomena certainly was increased after the deep stall accident of a Long-EZ at Kanab (CP 68). Now we had some data, but very poor data. Only a tiny image of the airplane during the last 2.8 seconds on a video tape. This airplane hit the dirt without killing the pilot so we believed it could not have been descending at 5000 ft./min. An attempt to analyze the video resulted in a very rough approximation of 2900 ft./min, which results in a C_d of 3.7. Our surprise, of course, was that forward stick did not recover from the deep stall. The surprise subsided when we later learned that the airplane was being flown with the CG well aft of the FS 103 aft limit.

While the 2900 ft./min. sink estimate seemed to make sense, it was not considered accurate due to the problem of measuring a fuzzy blip on the video. We then made a decision to try to gather full scale data on the Long-EZ. The previous full scale tests done in Florida on the Velocity did not measure drag and lift, only the more important data of recoverability with various airplane modifications.

Then, another Velocity deep stall accident occurred. This one descended inverted, hit land, not water, and killed the pilot. In this accident data was available - good, accurate radar and transponder data. Obtaining this data from the FAA is a story in itself.. Finally, after threatening a media expose about government cover-up, we received the data. This Velocity entered a deep stall at about 7000 ft. and descended at a nearly constant 4400 ft./min. (44 knots) for the entire 90 seconds to impact. Of course, this inverted descent data may not apply to an upright Velocity but, at least, for the first time it represented good data during a deep stall accident.

We proceeded to develop the rig to allow us to measure the Long-EZ. This turned out to be a much more difficult and expensive job than originally thought. It was made possible by the loan from Donald Douglas of Sherman Oaks, CA of his Long-EZ that is accurately built to the plans, without modifications. A 3-axis electronic balance was built to measure lift, drag and pitching moment and an accurate speed indicator was installed in front of an Isuzu truck. These "Truck-EZ" tests can only be done in dead calm winds, so after many delays, we were able to obtain data at 40, 50, 60, 71 & 80 degrees angle of attack.

The data are presented in this newsletter. Note that these are full-scale tests at near the same Reynolds number as flight, so they are much more accurate than the small scale model tests done by NASA in the 70's.

First, let's discuss the lift and drag data. The data show substantial scatter due to the truck riding over bumps in the runway. A line faired through the average of scatter is considered reliable. If we combine the lift and drag resolved to a total reaction that would support the airplane during a stable deep stall descent, we can calculate the sink rate. This data, sink rate vs. angle of attack, is shown. Note that this prediction is very close to the radar data of the Velocity (4400 fpm).

Now, how slow does a Velocity descend upright in the deep stall attitude? We don't know, but we now tend to suspect that it is relatively high, 3500 to 4500 ft./min. We reason that the low damage and pilot survival is related to the fact that the water impact is nose down and the bottom fuselage is curved, this allows a few feet of deceleration at impact which can explain the lack of pilot injury.

How slow does a Long-EZ descend in a deep stall attitude? First of all, our pitching moment data show that it cannot descend at the extremely flat attitude of 70 to 90 degrees angle of attack. The pitch data indicated that if the CG is aft of limit, say F.S. 106, the aircraft may hang up at about 40

to 50 degrees angle of attack. It would then descent at about 5000 feet per minute. Why did the Kanab pilot survive? Possibly the nose-low attitude allowed a couple of feet of "crush and rotate" deceleration that provided adequate protection.

Our concern now is that there are many Long-EZs with extensive modifications that can affect deep stall recovery (long noses, bigger strakes, baggage pods, etc.). While we do not approve these modifications and can't be expected to analyze or test each one, we do feel obliged to encourage everyone to conduct adequate testing to determine the safety of their own modified airplane. Conduct stall tests at the CGs you fly, with adequate altitude for a parachute jump (egress above 8000 ft. AGL). Do not ride it down, even over water.

Another concern is that many of you do not accurately know your CG position. Calculating weight and balance is a pilot's responsibility (FAR 21) for each flight. Be sure you fly within limits (your own test-verified limits for modified airplanes) and check CG when any changes are made.

CP ADVISORIES AND RECOMMENDATIONS

These are for your protection. All that RAF can do is tell you. It is up to you to comply for your safety, as well as any passengers you may take up. Keep your aircraft TOTALLY up to date on all CP advisories and recommendation.

Not everyone who is flying a RAF design receives the CP. If you know of anyone who may not read the CP, make it your business to get involved, lend him (or her) you CPs (or copies of the CPs - we encourage copying the CP). The whole purpose of the CP is to help you fly as safely as possible.

If anyone knows of a condition that may have developed over the years or of any unsafe situation, PLEASE send us a letter detailing the problem. Help us to get the word out.

PROP BOLT TORQUE

Not again, you say? We are all well aware that there have been many admonishments in the CP over the years regarding the critical importance of correctly torquing your prop bolts, and of doing this often, and at regular intervals.

Recently a friend borrowed a wood prop from an EZ builder in a state where the moisture is much higher than it is here in Mojave. This prop was installed, the bolts, were torqued to the recommended value, the bolt heads were safety wired. After only about 30 hours of flight here in the dry desert air of Mojave, this friend discovered that the safety wire had broken and that all six prop bolts were loose enough to be able to turn the washers under the bolt heads with his fingers! What happened? This prop lived for a couple of years in a damp climate. The wood absorbed some of this moisture and swelled a little. After a few weeks in the dry climate of Mojave, the wood lost most of this excess moisture and shrank. The bolts were no longer squeezing the prop between the crush plate and the prop extension flange. The prop began to move just a little, causing the face of the prop to char slightly. The bolts began to unscrew themselves and it literally would not have flown more than a few more minutes before this prop would have come off the airplane.

Wood props, used correctly and properly maintained, are very safe and have an excellent safety record over many years. However, the torque on the prop bolts must be checked regularly. If you have a new prop from a wetter climate than where you live, check the torque every 10 hours for the first 100 hours. Once the prop settles down, you can extend these checks to every 25 hours. Do not omit this simple safety check. It could be extremely costly if you do.

A CROSS COUNTRY TRIP WITH GPS

I recently installed a King KLN-90 GPS in our Long-EZ, N26MS. The installation was simple and, the best news of all, the antenna installation is a piece of cake! (Compared to a Loran antenna.)

The King GPS is, of course, pretty much the top of the line, state-of-the-art with all the bells and

whistles, and it really makes navigating, VFR or IFR, easy. The amount of information available at your finger tips is simply mind boggling.

Our first cross country with the GPS was a couple of weeks ago when we flew back to Anderson, Indiana to attend a wedding of one of Sally's nephews. We departed Mojave early in the morning and climbed directly to 17,500 feet. Breathing oxygen through our cannula AEROX system, we flew to Pittsfield, Ill, non-stop, 1333 nautical miles (1533 statute miles) in 7 hours and 6 minutes at an average speed of 188 knots (215 mph). We burned exactly 48 gallons of gas for an average of 27.7 nmpg (32mpg). Try that in your foreign car - 215mph at 32mpg! Wow, the old Long-EZ is still awful hard to beat. N26MS has over 2030 hours total time and she is nearly 13 years old. Total flight time to Anderson was 8-1/2 hours. Total flight time back to Mojave from Anderson was 10 hours. We flew back at low altitude against a headwind and used 80 gallons coming west compared to 60 gallons going east. What a difference a tailwind can make!

The GPS performed flawlessly, the accuracy was amazing and rain, thunderstorms, lightening and low altitude scud-running (all the while running a CD player) had no effect whatever on its operation. (Our Loran used to drop off the line due to static build-up in bad weather, just when you needed it most!). The King even has a simple moving map mode that is really the way to go when running under the scud in low ceiling and low visibility conditions.

In spite of the military deliberately "dithering" the satellite signals, the GPS works much better than Loran. (We had a King KLN 88 Loran.) It is much more stable, ground speed readout is close to DME for stability, whereas Loran ground speed varies constantly. I believe the military will eventually be forced to quit the "dither" which will give incredible accuracy. I also believe that GPS will be ultimately the primary enroute navigation system. Already GPS is approved for some IFR operations, so if you are in the market for a navigation system, consider GPS over Loran for potentially greater accuracy, much better weather capability, easier installation and better reception in a fiberglass airplane.

If you do decide on a GPS (or Loran), consider this: Pick one with knobs, not buttons! Buttons

are very difficult to use in turbulence, whereas your fingers can grasp and support themselves while turning a knob. For use in an aircraft, a database is a must. I believe a GPS or Loran without an aircraft-type database is of rather limited usefulness.

The GPS antenna works fine inside the fuselage which is a big plus. It does not have to be installed on the outside like a Loran antenna must be. Also, the ground plane is not critical at all. I mounted mine, a small, flat antenna about 2"x3"x5/8", on a bracket mounted on the foreword face of the F22 bulkhead, under the canard. It works great. The GPS reported accuracy of 0.02nm essentially all the way to Indiana and back. The worst accuracy I saw was 0.04nm! See me at Oshkosh '93 for more information

Mike Melvill

NEW STERO INTERCOM

I recently installed a PS Engineering, model PM-2000 stereo intercom and, I must say, it is divine! I have used a Sigtronics stereo intercom since the early days of my VariViggen (1977!). They have worked quite well with the exception of a slow degradation that was not really noticeable until someone who had not been in the airplane for a while noticed how bad it really was.

I had installed a car-type, front loading CD player over a year ago and I was disappointed at the quality of the sound. More than that, the microprocessor in the CD player completely trashed my King Loran so it was either the music or the Loran. I am very pleased to report that the GPS appears to be immune from any interference for the CD player and the stereo sound on our new intercom is spectacular. The PS Engineering stereo intercom has two different modes of listening to the music. You can set it so that the music remains on continually for either or both people, or you can have it fade away each time someone talks in the plane or one transmits out of the plane or the radio receives any transmissions. After the transmission has ended, the music comes back on, not abruptly as in most intercoms (such as the Sigtronic), but ramps up gently to the previously set volume - pretty neat!

The intercom is crystal clear, with a very quiet squelch break. It is voice-acutated but has the best fidelity in the squelch circuit I have ever heard. What with a quality CD player, Bose headsets wired for stereo and the PM 2000 stereo intercom, cruising along on a cross county has taken on a whole new perspective! We literally have as good, or better, a sound system in our Long-EZ than we do in our living room at home!

Mike Melvill

ACCIDENTS AND INCIDENTS

The CP newsletter reports accidents and discusses their conditions and causes, for information purposes, for all operators. We have always investigated accidents in the interest of determining information that we can disseminate to you to prevent recurrence. It should be recognized in our discussion of accident conditions or causes that generally this information is preliminary since it is published before the availability of the FAA accident report.

A California Long-EZ struck a pine tree on short final. The airplane pitched down and crashed. The pilot was killed and the passenger was seriously injured. It was late in the evening and the runway lights were on. The pilot had not flown this airplane at night although he had night experience in certified aircraft.

The NTSB has not yet completed their investigation, but we feel compelled to point out that a night approach over trees to a fairly short runway (3600 ft.) can be very tricky. The "black hole" effect on short final can be very deceptive with little or no visual cues as to altitude. Practice night landings (if you must fly at night!) at airports with clear approaches and long, well lighted runways. Always aim to touchdown about 1/3 of the way down the runway. Do not try to hit the numbers at night.

A VariEze crashed on departure from the Kansas City GIG on June 13, 1993. Since there were a lot of EZ builders and flyers on the field at the time,

a rather extensive investigation was conducted on the spot, not only by FAA/NTSB personnel, but also by several EAA members, all of whom are very familiar with EZs. Tragically, two people died in this accident.

By all accounts, the airplane was refueled some time prior to take-off. The fuel caps on this particular VariEze were not the plans-recommended Brock-type fuel caps. They were the "Thermos" expanding 'O' ring-type. This type of fuel cap requires regular lubrication of the 'O' rings at 25 hour intervals. If this is not done, the 'O' rings will crush and crack and, even though you may have the locking tab down and "locked", the cap in fact will not be locked!

Shortly after take-off, the engine was heard to surge and loose power. The airplane began a 45° bank turn to the left. After completing 90° of the left turn, the nose began to drop and the aircraft impacted in a ploughed field, 30° nose low in a 45° left bank.

The investigators located all airframe parts except for the tip of one blade of the prop and the right fuel cap. The next day, parts of the fuel cap and pieces of the wood prop blade were found near the center line of the runway on the airport. This verified the theory postulated by the investigators that a fuel cap had come off and gone into the prop disc, breaking the prop. The resulting heavy vibration probably caused the pilot to pull the power back. For some reason, he elected to try to turn back to the runway. With little or no thrust, a heavy airplane in a steep bank (which causes high inducted drag) simply got too slow to fly and descended to the ground at a high sink rate.

It is too late for the couple in this VariEze but it is not too late for all of us who fly to learn from this tragedy. If you are flying a RAF design and have not complied with the CP advisories recommending you chain your fuel caps to the filler neck - do not fly again until you have corrected this omission. If the fuel cap on this VariEze had a chain to retain it, this accident would not have occurred. Please check your back issues of the CP for more information about chaining the fuel caps to the filler neck. See CP28, pg. 7&9; CP 31, pg. 5; and CP50, pg. 5&7.

Another lesson we should all learn from this accident is the problem of trying to make a 180° turn back to the runway while low and slow. A landing straight ahead into the wind (which was 15-20 knots that day) even if near the end of the runway, is much more likely to be survivable than a landing with a 15-20 knot tailwind. Think about it. Assume 100 knots airspeed. With 20 knots of headwind, your ground speed would be 80 knots. Downwind, it would be 120 knots! The kinetic energy in a downwind landing, in this case, is 2.25 times as high as it would be in an upwind landing. This could turn a survivable 15 "G" impact into an unlikely-to-survive 34 "G" impact! This assumes that you have not caused a higher sink rate due to the extra drag in the steep turn!

Please read this accident report and never forget the lessons learned. It is much, much better to land long, into the wind, and roll off the end of a runway at slow speed, even if you have to negotiate obstacles, than to land off field, downwind, at high speed.

A California Long-EZ experienced an engine failure while flying level at approximately 10,000 feet. The ensuing emergency, off-field landing, attempted on a California "dry" lake that was not all that dry, resulted in the nose gear collapsing, the nose digging in, and the aircraft flipping over onto its back. The pilot suffered only minor injuries but the aircraft was badly damaged.

An Indiana VariEze departed after refueling. The control tower operator noticed a fire on the wing trailing edge and notified the pilot, suggesting an immediate return for landing. The pilot put the airplane into a high speed dive while returning to the airport to land - and succeeded in putting out the fire. The left aileron, wing trailing edge and engine cowling were slightly damaged by the fire. The fire was caused by the fuel cap being left off during refueling and fuel syphoning out of the fuel tank onto the hot exhaust system.

There were no physical injuries to the pilot, only his pride was hurt. The airplane required considerable repair before it could be flown again.

A California Long-EZ descended into the ocean at cruise speed without any apparent effort to slow down or flare for a minimum speed touch down. The pilot, the sole occupant, was killed. It is uncertain at this time what caused this tragic accident.

Remember, if a water landing is imminent, put down the nose gear and the landing brake. Touch down under control, wings level, at minimum flying speed. Do not attempt to "stall" it in or to touch down on water at high speed. At least one VariEze has conducted a safe, successful water landing with no injuries and only minor damage to wheelpants and lower cowling.

We will report further on this accident as more information becomes available to us.

Editor's note: In the last 2 newsletters, we did not report a single accident or incident. Now, in this newsletter, we are reporting five! I know it is summer and the good flying weather is upon us but, please, don't lower your guard. Conduct thorough preflights, check the weather, and fly carefully. Almost all of the above accidents and incidents would not have happened if it were not for a few moments of carelessness - don't let it happen to you!

FUEL PRICES

Have you noticed the incredible disparity in the price of 100 low lead avgas around the country? Right here in southern California, we have 100LL selling for as little as \$1.64 (at California City) up to \$1.92 (at Mojave) and for \$2.50 (at San Diego Lindburgh). At Pittsfield, IL it is \$1.50 per gallon!

Before you make your annual trip across the country to Oshkosh this year, you might want to call **Fillup Flyer Fuel Finder** who will sell you a list of fuel prices nation wide for a very modest cost. This really is a good idea for those of us who fly across the country a lot. Also, perhaps, it will send a message to those FBOs that charge ridiculous prices. Hopefully, the budget

priced FBOs will reap the rewards of a capitalistic, free enterprise system.

If you have access to a PC, call the computer line at 1-800-955-7900, 3/12/24/9600 baud 8-N-1. If you do not have a computer, call the voice line at 1-800-333-7900.

EPOXY

RAF continues to look at new epoxy resin systems, as time permits. Hexcel has developed a replacement for Safety Poxxy and Safety Poxxy II that contains no MDA and no styrene. This epoxy system looks quite promising since it has reportedly almost identical physical properties to the Safety Poxxy systems. The mix ratio is also the same as Safety Poxxy so the same ratio pumps can be used.

We hope to be able to approve this Hexcel epoxy system soon. Stay tuned.

WANTED

Plans and instructions for the NACA inlet for the Long-EZ. I will pay a reasonable price as well as any copying or shipping costs.

Contact: Lloyd F. Fisher
7130 S. Reed Ct.
Littleton, CO 80123
303-933-7502 (H)
303-971-8826 (W)

SHOPPING

FLUSH, INTERNALLY MOUNTED ANTENNAS

A complete line of antennas, specifically designed for, and flight tested on, composite aircraft. The antennas are tuned for maximum performance and, in general those who have used them so far, report reception is doubled over standard external antennas.

VariEze builder/flyer, Bill Butters, has started a company to develop a full range of buried antennas. These are normally supplied with a

BNC connector built into the actual antenna, but can be supplied without connectors to include enough length of co-ax cable to facilitate easy installation with minimum weight and bulk.

Contact: Bill Butters
Advanced Aircraft Electronics
PO Box 4111
Florissant, MO 63032
1-800-758-8632

CANARD PUSHER DIGEST, 2ND EDITION

Stet Elliott's "Canard Pusher Digest for the Long-EZ" is now in its 2nd Edition. (For a complete description, see CP57). Includes all builder related information from CPs 24-75. The 2nd edition of the Digest has now grown to over 700 pages, and is professionally printed on double sided 8 1/2 x 11" paper from a laser printed master.

Quarterly updates to the Digest are also available. The updates provide additional information from newly published CPs to bring the Digest current. The updates are compatible with either Digest edition.

Note that the Digest is for builders and flyers of the Long-EZ only. It does not support other RAF designs.

CP Digest for the Long-EZ (2nd Edition)
\$75.00
(Overseas orders add \$20.00 for airmail)
Annual Update Subscription (4 updates)
\$25.00
(Overseas orders add \$5.00 for airmail)

CANARD PUSHER NEWSLETTERS "ON DISK"

Stet Elliott has also compiled the text of all the Canard Pusher newsletters in electronic format. The set includes all of the Canard Pusher Newsletters, from the very first one published in May of 1974, to the present. The set of CPs is provided in a text only format which should be 100% compatible with any computer word processor you presently use. It is available for either the IBM or Macintosh platforms. A hard disk is strongly recommended since the set contains over five megabytes of textual information!

This product is ideal for anyone interested in reading about the evolutionary development of RAF's canard designs through the years, or for those builders still plagued with the "I know I read it here somewhere!!" syndrome. With one of the inexpensive text search and retrieval programs, text string searches across the entire set of files are a snap.

CPs on disk costs \$65.00. Specify disk size, (3 1/2" or 5 1/4"), platform (IBM or Mac), and disk capacity.

For either the CP Digest for the Long-EZ, or the CPs on disk, contact:

Stet Elliott
5322 W. Melric Dr.
Santa Ana, CA 92704
(714) 839-8233

VARIEZE INDEX

Lists all plans changes from CP10 through CP68 as well as all suggestions, problems, etc. For any VariEze builder, this is a must. Bill sells it a couple of different ways. You can buy just the printed book for \$20.00 or you can get the book plus a 5-1/4" IBM compatible floppy disc with a delimited ASCII listing of the data base (or optional PFS professional file data file) for \$24.00. Specify which you would want. This index will be updated annually.

Contact: Bill Greer
811 Cooper Square Cir. #240
Arlington, TX 76013

PLEASE NOTE: Those of you who have the first edition, Bill has improved the indexing of several topics and added more cross-indexing. You may find it helpful to get an up-grade.

DEFIANT FLYER

If you are building a Defiant and you are not currently receiving John Steichen's Defiant Flyer, you are missing a bet. This publication is exactly what is required by both builders and flyers. It contains all kinds of helpful information and great articles. Bayard DuPont's

letter on his Ford-powered Defiant in the December issue is a case in point. See CP67, page 2 for information on subscribing to the Defiant Flyer.

Seen at Oshkosh. Beautiful leather seat cushions (also available in various fabrics) for Long-EZ, VariEze and Defiant.

Contact: Diana Davidson
Alexander Aeroplane Co.
900 S. Pine Hill Road
PO Box 909
Griffin, GA 30224
404-228-3901

LONG-EZ PARTS PRICE LIST FROM FEATHER LITE

Main gear strut	\$ 349.00
Nose gear strut	58.00
Engine cowls, pr. (glass)	329.00
Engine cowls, pr. (Kevlar)	480.00
Cowl inlet	48.00
Wheel pants (3.5x5)	150.00
Wheel pants (500x5)	180.00
Above item in Kevlar	215.00
NG 30 cover	21.00
Pre-cut canard cores	160.00
Pre-cut wing & winglets	1199.00
Leading edge fuel strakes w/bulkheads	524.00
Strut cover SC	19.50
Nose wheel cover NB	19.50
Sump blister	19.50
NACA inlet	47.00
3" extended nose gear	70.00

Feather Lite, Inc. is proud to announce another product to re-introduce to EZ builders: The original Space Saver Panel by the late Rusty Foster. This is a bare fiberglass panel with a molded recess for builder installation of an aluminum flat stock electrical panel. \$40.00
Contact Michael Dilley or Larry Lombard (both ex-RAF employees and EZ builders and flyers) at:

Feather Lite, Inc.
PO Box 781
Boonville, CA 95415
707-895-2718

RAF "GOODIES" AVAILABLE

Charms-Long-EZ/VariEze (gold or silver)	6.50
Name patch	1.50
Silhouette patch (no Defiant or Long-EZ)	3.50
3-ship poster (17"x22")	3.75
2 Long-EZs in trail (11"x17")	3.00
Defiant on water (11"x17")	8.00
RAF Chronological poster	15.00
Long-EZ lithograph	10.00
Color photos (EZs, Solitaire, Defiant)	1.25
Night photo by Jim Sugar	5.00
Videos - Building the Rutan Composite	39.00
Go-A-Long-EZ	39.00

NEW FOUR PIPE EXHAUST SYSTEM

Nat Puffer has designed and tested a new exhaust system for his Cozy. He tells us it will fit any pusher, including a VariEze or Long-EZ. There are slip joints at the flanges to prevent cracking and stainless springs are included to retain the exhaust headers into the short slip joints. These exhaust systems can be ordered directly from the manufacturer: Custom Aircraft Supply
1318 Gertrude Street
San Diego, CA 92110
619-276-6954

\$500.00 includes shipping, handling and packaging.

Nat has had good luck with a heat muff wrapped around both #2 and #4 exhaust headers. There may, or may not, be enough room in an EZ cowl to do this.

FOR SALE

AIRCRAFT COVERS

Custom cover for you Long-EZ. This neat design completely covers your prop, canopy and nose and only uses two straps. Made from space-age Evolution 3 material. Reasonable price.

Contact: Tony Brazier
PO Box 6478
Ocala, FL 32678
904-237-1811

NOSE GEAR RATCHET

Dr. Curtis Smith's nose gear crank ratchet is still available at \$38.00 which includes postage and packaging. No need to call, just send check or money order. This little device should be considered a "must" by all Long-EZ and VariEze builder/flyers. Once you have flown with it you will wonder how you ever did without it.
Contact: Curtis Smith
1846 Sextant Dr.
Worden, IL 62097
618-656-5120

NEW PRICE

SIGHT GAUGES

New, improved fuel sight gauges. Use with auto fuel or Avgas. Clear bubble with white background. Retrofit for Long-EZ and VariEze. \$35.00 per set.
Contact: Vance Atkinson
3604 Willomet Court
Bedford, TX 76021-2431
817-354-8064

THE "BEAD BUSTER"™

If you have ever tried to remove a tire from a 500x5 wheel you will understand what a neat tool this is. (Mike purchased one of these tools and wonders how he ever got along without it!) Designed by a Long-EZ builder who became frustrated by this problem, the kit consists of a canvas pouch, a vulcanizing patch kit, cadmium plated fulcrum lever and base, and the heat treated aluminum "Bead Busting" shoe - \$75.00.
Contact: Tom Caughlin
10958 National Blvd. #1
Los Angeles, CA 90064

Prop for 0-320 Long-EZ - Hendrickson w/rain leading edge - drilled for 1/2" bolts. - \$450.00

Long-EZ seat cushions, front & rear - New. Light grey. - \$195.00

Lightweight alternator assy. - 14v, 40 amp. - complete set-up (mount, split ring pulley, belt,

regulator) - for Lyc. without starter/ring gear. - \$195.00.

United International airspeed indicator, 3-1/8" - TAS dual scale, 0-210kts.-for Long-EZ. - \$125.00
Contact: Dick Rutan at Voyager Aircraft
805-824-4608

PLANS CHANGES AND OTHER IMPORTANT MAINTENANCE INFORMATION

ALL RAF DESIGNS - Secure fuel caps to fuel filler necks before next flight..

Since RAF is no longer active in the development of homebuilts, we are not likely to discover many new errors or omissions in the plans. For this reason, we need your help. Please submit any significant plans changes that you may come across as you go through the building process.

RAF RECOMMENDED SUPPLIERS

Aircraft Spruce
PO Box 424
Fullerton, CA 92632
714-870-7551

Wicks Aircraft
410 Pine Street
Highland, IL 62249
618-654-7447

FeatherLite
PO Box 781
Boonville, CA 95415
707-895-2718

Brock Mfg.
11852 Western Ave.
Stanton, CA 90680
714-898-4366

These suppliers are still the only authorized RAF dealers for all your various aircraft materials and components.

RAF recommends the following prop manufacturers:

Bruce Tift
B&T Props
75872 Mosby Creek Rd.
Cottage Grove, OR 97424
503-942-7068

Ted Hendrickson
PO Box 824
Concrete, WA 98237
206-853-8947

HOMEBUILDER RESPONSIBILITY

Reading through Rex Taylor's "Dragonflyer" newsletter #17, we noted an excellent article covering homebuilder responsibility. We would like to reiterate on this because we believe that you, the homebuilder, should be aware of what you are taking on when you build your own aircraft.

The FAA has set up the Experimental Amateur built category (thanks mainly to the EAA) to allow an individual to design, build and fly his own aircraft. The FAA lists that individual as the manufacturer. As the manufacturer, the builder is entirely and totally responsible for that aircraft. The builder has passed judgement on the quality of workmanship and he alone has made the decision that each and every part that he has put into that aircraft is, in his opinion, airworthy.

A lot of builders are under the mistaken impression that the FAA inspector will guarantee that the aircraft is airworthy when he inspects the aircraft and issues an airworthiness certificate. The FAA does not decide your aircraft is airworthy, you do.

For this reason, every builder should become involved with the EAA. Join your local EAA chapter. Attend their monthly meeting, talk with other EZ builders. Many good books are available from EAA. Supplement your plans with a few, such as Tony Bingalis' "Firewall Forward". After you have got something built, get as many people as you can to look over your work. Don't be embarrassed. If someone critiques your work, take a strong look at it. If it is not right, throw it out. Your best assurance of success is to adhere strictly to the plans and to build it from the correct materials. In order to be positive that you are using the correct materials, buy them from only the recommended suppliers.

The same philosophy is also true for engines. Almost daily, we receive calls or letters from builders wanting to substitute some wizz-bang engine for the recommended one. RAF can not ethically recommend an engine we have not installed and tested. For the Long-EZ, we

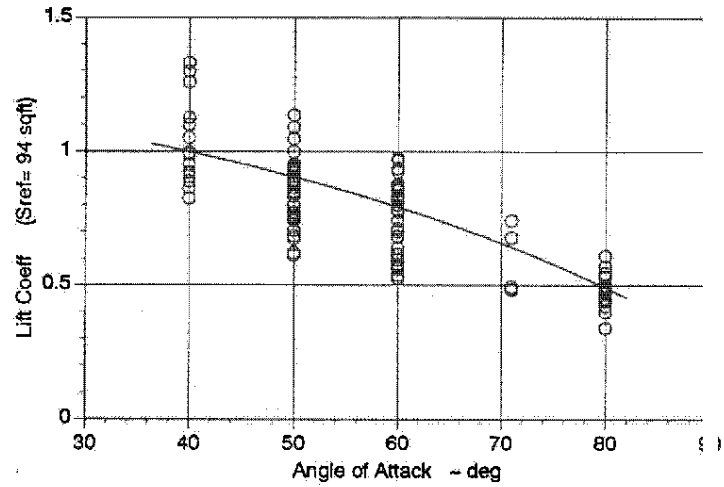
recommend any model of the Lycoming O-235. If you wish to install some other engine please do not call us. We can not help you. As an experimenter, you can, of course, use any engine you want to. You should be aware that you will be involved in redesigning engine mount structure, cooling may not be adequate and you will be testing an unknown when you fly your airplane. You should expect surprises.

If you want a reliable cross country airplane, do yourself a favor and buy a real aircraft engine such as a Continental or Lycoming. These engines have literally millions of hours of field testing on them and have a proven record of reliability.

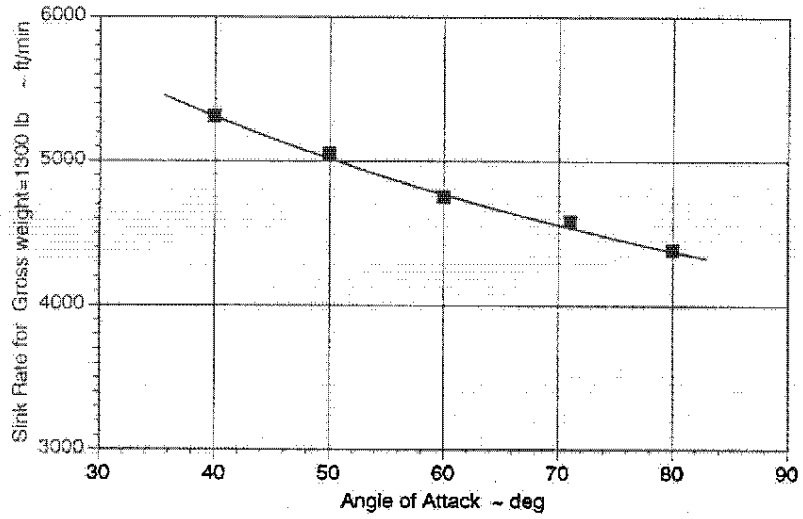
You, the builder, have the sole responsibility to produce a safe, reliable aircraft. Take that responsibility seriously. The bottom line is this: The designer has absolutely no control over what materials, power plants, etc. go into your aircraft. No control of quality of workmanship and no opportunity to inspect work or materials and, therefore, cannot be responsible for your actions. Most designers will do everything in their power to ensure your success with one of their designs, since problems are just plain bad for business. The best advertisement for the designer is an airplane that does what the designer said it would and a builder/pilot who is happy with what he builds.

(ED: Eight and a half years later and these words are still true.)

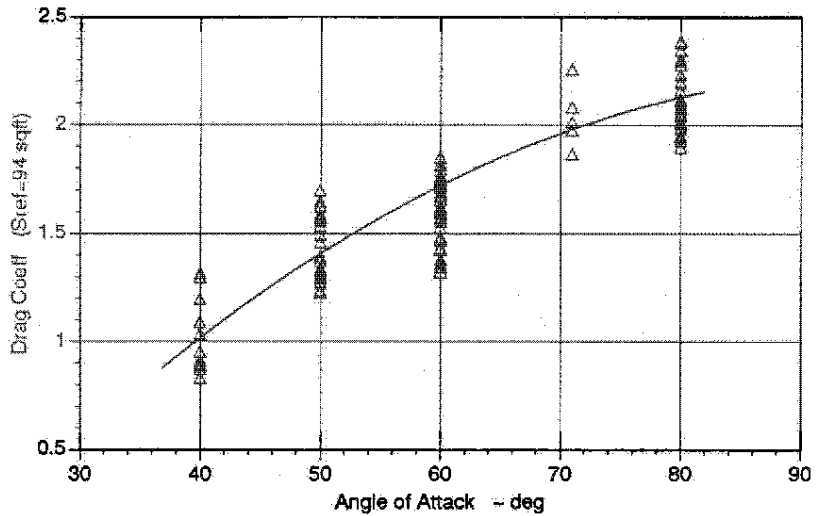
Long Eze Full Scale test
Isuzu truck setup
May 93



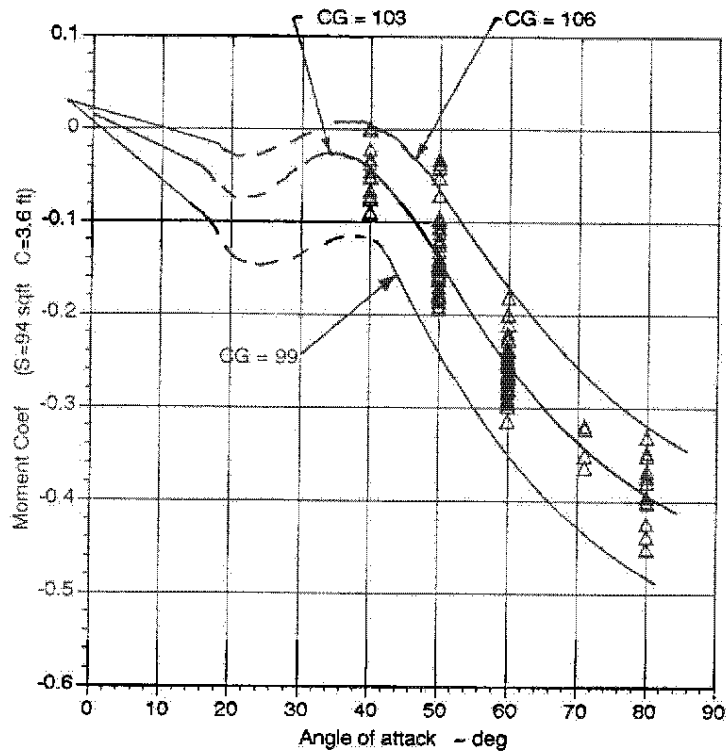
Long Eze Full Scale test
Isuzu truck setup
May 93



Long Eze Full Scale test
Isuzu truck setup
May 93

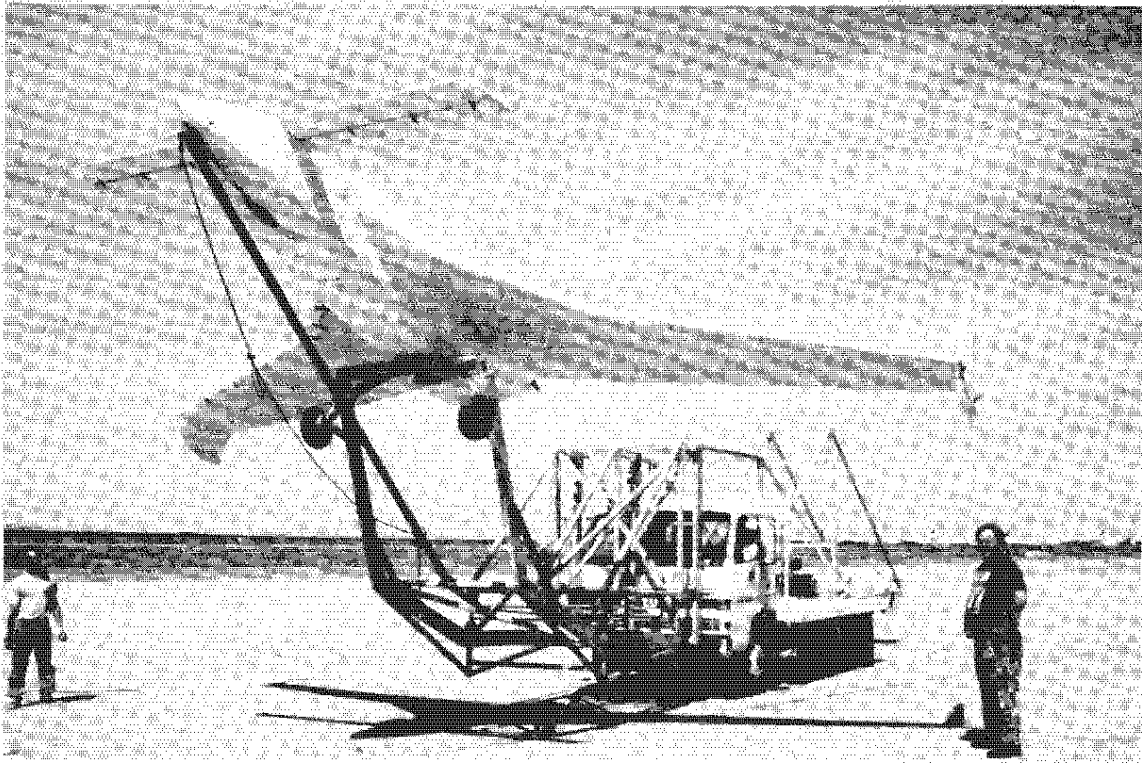


Long Ezé Full Scale test
Isuzu truck setup
May 93



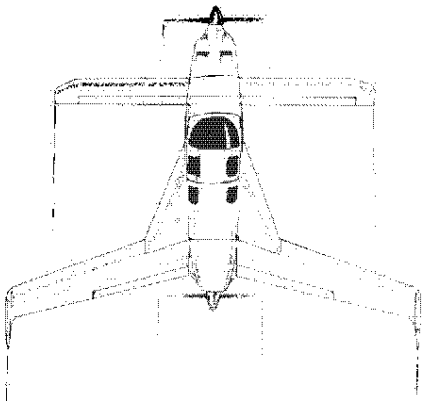
Data Symbols are for aft CG limit F.S.=103
All Data are for zero elevator position.

See pages 2 and 3 in this CP for article "Truck-EZ Test "



Donald Douglas lent us his beautiful plans-built Long-EZ so that we could generate the full scale, angle-of-attack data using this "Truck-EZ" rig. Many thanks, Don.

Rutan Aircraft Factory
Building 13, Mojave Airport
1654 Flight Line
Mojave, CA 93501



first class mail

TO:

July '93

The line which appears above your name lets you know through which Canard Pusher you are paid. If your label says **LAST ISSUE CP 76**, then this is your last issue, and you need to renew.

CP 76