

THE CANARD PUSHER

No. 72

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

VariViggen (1st Edition), newsletters 1 to 72.
VariViggen (2nd Edition), newsletters 18 to 72.
VariEze (1st Edition), newsletters 10 thru 72.
VariEze (2nd Edition), newsletters 16 thru 72.
Long-EZ, newsletters 24 through 72.
Solitaire, newsletters 37 through 72.
Defiant, newsletters 41 through 72.

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 TALKS AT OSHKOSH 1992

Saturday, August 1 - 10:00am/11:15am

Life, the Universe & Everything Else,
Part II-Speakers-John Roncz and Burt
Rutan - Rutan Aircraft Factory, Inc.

Sunday, August 2-8:30am/9:45am(Design College)

Tent Talk Show - Moderator: Burt Rutan
with Special guest, John Roncz.

Sunday, August 2 - 10:00am/11:15am

Rutan Homebuilts - VariViggen, VariEze,
Long-EZ, Defiant and Solitaire - Speaker -
Burt Rutan - Rutan Aircraft Factory, Inc.

Monday, August 3 - 10:00am/11:15am

The Latest Developments from Mojave
Speaker - Burt Rutan - Scaled Composites,
Inc.

BURT/RAF WIN LAWSUIT

A VariEze accident reported in CP61 in which two people were fatally injured resulted in a lawsuit being brought against Burt Rutan, Rutan Aircraft Factory and Scaled Composites. Very early in the case, there was a ruling that Scaled Composites, Inc. has no connection with the VariEze design

Testimony which came out during the trial indicated that the builder had constructed his own wing attach mechanisms, including the four taper pins that hold the wing in place...and that the workmanship was not to a high standard. On the morning of the accident, the builder had the wings off his VariEze and in the course of reinstalling them, left out two of the four taper pins. During the ensuing fatal flight, the aircraft was observed doing aerobatics, and subsequently crashed, killing both occupants. Post crash tests revealed that the pilot was intoxicated (by FAR 91 definition). During the course of the trial, RAF presented evidence showing that testing it had done on a stock VariEze...to destruction...proved that the type of failure that had occurred could not have happened even with the two taper pins omitted as long as the aircraft had been operated within its design envelope. Only loads far in excess of the VariEze's design limits could have caused such a failure, Burt and RAF testified...and, in the end, the jury agreed.

The cause of the accident, the jury decided, was negligence on the part of the builder/pilot.

This lawsuit may well turn out to be a legal landmark...one that changes the way suits against homebuilt plans/kit business are defended. Burt Rutan has put the litigious society on notice that if he is sued, there will be no out-of-court, pre-trial settlements; the case will be aggressively defended; and that when he wins, he will go after the costs he has incurred in defending himself.

Burt feels there were many aspects of the trial that will be of interest to EAAers, so he will devote a portion of one of this Oshkosh '92 forums to it. His forum entitled "Mojave Update", set for 10:00am on Monday, August 3, is being changed to "Mojave Update and Liability Issues" and may include Burt's attorney, Lee Horton, if his schedule permits. Burt's forums are always standing room only, so it will be advisable to come early for this one.

FOLLOW-UP ON CP71 DISBOND/DELAM CAUTION

So far, we have received only one letter from a builder with a problem in this area. This aircraft is a Q-2 and, normally, we would not presume to comment on someone else's design but this particular problem could so easily have resulted in an in-flight structural failure that we felt morally obligated to say something about it.

During a landing that the pilot said was not any harder than other landings he had made, the canard (also the landing gear since the main wheels are mounted on the tips of the canard) failed. The top skin just inboard of the fuselage side, buckled and the canard folded. Subsequent sectioning of this area showed a large percentage of the foam had "melted". This builder/pilot suspected that this melting damage was caused by excessive heat from the sun while tied down outside in Florida. He included three photographs of the section of damaged canard.

We at RAF have not seen this canard, only the photos, but we have a different opinion. We believe this damage may have been caused by fuel leaking out of the fuel tank (above the canard) and seeping through tiny pinholes in the top skin

and melting the foam. Styrofoam, be it blue or orange, fabrication billets or floatation billets, will melt when it comes in contact with any fuel, solvent, etc. Put a scrap of foam in a container of fuel and, in a short period of time, the foam will disappear. Pour a little fuel, avgas or mo-gas onto a block of foam and you will be amazed at the damage. The three photos supplied to us by this Q-2 builder/pilot, in our opinion, show classic fuel or solvent damage. One of Scaled's employees who has built a Quickie and a Q-2 informed us that the fuel tank is, in fact, mounted directly over the canard and that he had heard of this type of foam damage before.

All of the RAF designs have a fuel-proof barrier between fuel and Styrofoam. This barrier can be a sandwich panel of glass/PVC foam/glass, or glass/urethane foam/glass, but RAF feels it is absolutely essential to completely protect any Styrofoam core structure from exposure to fuel or any kind of solvent. In some cases, even the fumes of fuel or a solvent such as MEK or acetone can degrade a foam core to the point of causing a possible structural failure.

We have written a letter to this particular Q-2 owner and will be passing this information on to Jack Cox, editor of *Sport Aviation*. We are not criticizing anyone, it's just that this kind of damage is many times invisible and may not easily be spotted in a normal preflight. Any foam core, glass structure, while perfectly safe with an undamaged core, can become prone to catastrophic failure if the foam core is damaged. This kind of hidden damage could cause a serious accident. This is our only reason to bring this to everyone's attention.

To protect yourself from this kind of failure, it is critically important to prevent fuel from coming into contact with a glass structure that has a Styrofoam core. The same goes for any form of solvent, be it MEK, acetone, Prep-Sol, Acrylikleen, or whatever.

To check your structure for possible delamination or dis-bonds, move the airplane into the sun or, at least, to where it is warm. This will cause any disbonded areas to bubble up due to the air or gas in the void heating up and expanding. Carefully tap the entire area using a quarter (25-cent piece). Listen carefully for the telltale "hollow" sound when you tap an area that

is disbonded or delaminated as opposed to the solid "click" sound of normal structure. By carefully tapping and using a felt tip pen to mark the perimeter of the damaged area, you can outline any areas that need repair then you can repair these areas, in most cases, simply by injecting a mixture of epoxy and micro-balloons, using a syringe. You will have to drill a number of small holes (to closely fit the needle) and inject the epoxy mix into one hole until it comes out of adjacent holes. Keep moving the syringe around until forcing it into any hole will make it come out of the holes closest to that one. Now, move the airplane out of the sun into a cooler area. Place some plastic (Visqueen) over the area, cover that with a piece of flexible material (.032 aluminum) and place a lead shot bag on top of that. As soon as the epoxy in the cup has kicked off, remove the lead shot bag, the aluminum and the plastic. Carefully scrape the excess epoxy off the paint using a plastic putty knife. After a full cure, you can carefully polish this area and repaint. Sometimes the visual damage is so little it does not require repainting. Recheck the area by tapping with a quarter to assure that you completely filled all void areas.

KC-GIG, 1992

Three Long-EZs headed East from Mojave - Shanes, Melvills and Kreidels. The flight was via Loran, direct, a distance of 1140 nautical miles over some pretty imposing terrain. All three have oxygen, so the flight was conducted at 17,500 feet. Flight time was 6:50 hours and each used approximately 40 gallons of gas. There was almost 20 knots of tailwind but, even so, the numbers aren't bad - average speed was 168 knots (193mph) and 28nmpg (32mpg). Except for some dodging of thundershowers in the Durango, CO area, the weather was great.

At least 67 aircraft flew in during the weekend in spite of low ceilings and visibilities on Saturday. Several builders/flyers removed their cowlings and were soon surrounded by other builders who asked lots of questions and, hopefully, got helpful answers. This is really a neat format for learning. Gary Hertzler had his very fast, efficient VariEze there and held a well-attended forum on the many mods and clean-ups he had done on his little jewel.

The dinner on Saturday evening was held in the same beautiful facility as it was last year and the featured speaker this year was a local airforce reserve pilot, Lt. Col. Roger Disrud. Roger won the Top Gun competition at the airforce's Gunsmoke competition at Nellis AFB in Nevada and he presented a great slide show and video of all the action. Roger also has restored a J-3 Cub to like-new condition and is a dyed-in-the-wool "little" plane enthusiast.

The trip home was uneventful except for a little more weather to dodge and a much higher fuel burn due to low altitude and high power settings against the normal headwinds.

The KC-GIG is really a fun fly-in and one that will hopefully be held courtesy of Central States group at the Johnson County Industrial airport south of Kansas City for many years to come.

FLY-INS

FALL FESTIVAL OF FLIGHT

September 26 & 27, 1992
New Castle county airport
Wilmington, Delaware

EAA East Coast Fall Festival of Flight "Milestones in Aviation"

Award judging Saturday & Sunday
Forums, Parade of flight, Fly-bys, exhibits,
vendors, aviation celebrities,
Pancake breakfast, fast foods, Saturday dinner,
Mode C waiver & no-radio procedure

For info packet contact:
EAA East Coast Fly-In Corp.
2002 Elnora St.
Wheaton, MD 20902-2706
301-942-3309

SHOPPING

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 of the Digest, see CP57). Includes all builder related information from CPs 24-68.

The 2nd edition has now grown to 654 pages and is professionally printed on double sided paper from a laser printed master.

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

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

CP Digest for the Long-EZ (2nd Edition) \$75.00.
Overseas orders add \$20.00
for airmail, otherwise, it will
be sent via surface vessel
Annual Update Subscription \$25.00.
(4 updates)
Overseas orders add \$5.00 for airmail.

Contact: Stet Elliott
5322 W. Melric Dr.
Santa Ana, CA 92704
714-839-4156

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). Specify which you would want, for \$24.00. This index will be updated annually.

Contact: Bill Greer
8827 Larchwood Dr.
Dallas, TX 75238
214-348-0215

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.

THE AERO ELECTRIC CONNECTION

This is a book published for people who desire a working understanding of aircraft electrical systems and components. It is produced as a periodical publication of chapters on specific topics. For example, issue #1 covers d.c. electrical fundamentals, batteries, engine driven power sources, voltage regulators and grounding. Issue #2 continues over-voltage protection, low voltage warning systems, wiring, wire terminations and circuit protection. This first of a series of simplified wiring diagrams for composite airplane with high capacity alternators was published with issue #2. Issue #3 added diagrams for airplanes with and without starters plus versions using small permanent magnet, dynamo type alternators. A series of do-it-yourself avionics articles and kits are in planning. An entire issue will be devoted to providing a customizable book form wiring diagram for your airplane.

Contact: The AeroElectric Connection
Medicine River Press
6936 Bainbridge Rd.
Wichita, KS 67226-1008
316-685-8617

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

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)	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

FOR SALE

LONG-EZ EXHAUST SYSTEM

All 321 stainless tubing 1-3/4" diameter with 1/4" thick stainless steel flanges. Pipes exit the cowling one above the other, two each side. Fits all Lycoming engines from 0-235 to 0-360 (no heat muff). This is the same exhaust system Dave Ronneberg designed and built and has been flying on his Long-EZ for several years. It is similar to the 4-pipe system Mike Melvill has on his Long-EZ, N26MS, for over 4 years and 600+ trouble-free hours.

Contact: Hal Hunt
6249 Longridge Ave
Van Nuys, CA 91401
818-989-5534

Note: Hal Hunt also makes and sells a neat air intake with filter and carb heat valve that provides filtered carb heat. Contact Hal for details.

NACA FRESH AIR INLET VENT DOORS.

Gene Zabler's neat little vent door is still available for \$7.50 pp. Gene tells us that after 8 years in service some of these little doors are wearing out. If yours is, send an SASE and \$2.00 to Gene and he will ship you a new rubber insert. Gene also manufactures and sells a light weight nose wheel fender (protects your prop from gravel damage) for \$45.00 pp.

Contact: Gene Zabler
48 Robin Hill Drive
Racine, WI 53406
414-886-5315

FLUSH RUDDER BELHORN SPRINGS.

Many builders have had difficulty locating the correct springs called out to be installed in the rudder cables when installing the flush rudder belhorn modification. The springs called out in the plans are available from Century Spring Corp. but this company has a \$25.00 minimum charge! Fortunately, John York, a Long-EZ builder who experienced the same problem, has informed us that he has a supply of these springs and is willing to keep them in stock for a year or two. He will sell the springs for \$1.50 each plus \$1.00 shipping. So send John a check or money order for \$4.00 and he will send you a pair of springs!

Contact: John York
903 W. 24th Street
Lawrence, KS 66046
913-832-2049

NOTE: NEW ADDRESS FOR ORDERING NOSE GEAR RATCHET

Dr. Curtis Smith's nose gear crank ratchet is still available at \$38.00 pp. 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

SIGHT GAUGES

New, improved fuel sight gauges. Use with auto fuel or Avgas. Clear bubble with white background. Retrofit for Long-EZ and VariEze. \$30.00 per set.

Contact: Vance Atkinson
3604 Willomet Court
Bedford, TX 76021-2431
817-354-8064

FEATHER LITE PRODUCTS

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: Larry Lombard or
Mike Dilley at
Feather Lite, Inc.
PO Box 781
Boonville, CA 95415
707-895-2718

EZ flyers can now have a 1/48th scale model of their VariEze or Long-EZ. An existing plastic model kit is used to obtain the fuselage, wings & winglets. Strakes, canard & wheel pants are made from materials of the builders choice. Plans are \$10.00.

Contact: James Plans
Bill James
3424 Wren Ave.
Fort Worth, TX 76133

AIRWOLF FILTER CORP.

After 4 years of design and testing, Airwolf Filter Corp. is proud to release to the homebuilt market their Lycoming remote mount oil filter. This remote mount filter was designed to replace the 4-bolt Lycoming P/N 69510, 68974, or 62815 oil screen housing at the rear of most Lycoming 0-235, 290, 320, 340, 360, 540, and 720 series engines. This adapter allows the user to locate the oil filter to the firewall and is a welcome relief since many Lycoming engine applications are unable to use the current spin-on adapters due to space restrictions. In addition this kit,

including the oil filter, adds less than 4 pounds to the aircraft empty weight.

The AFC remote mount oil filter kit is available in three versions. 1) The basic kit includes only the oil filter adapter and remote oil filter mounting plate and retails for \$495.00. 2) The deluxe kit includes the oil filter adapter, remote oil filter mounting plate, spin-on oil filter, Aeroquip steel braided hose and fittings, AN-8 fitting and bulkhead nuts, Vitron O-rings, Teflon washers and is priced at \$695.00. 3) Remote filter adapter (allowing the homebuilder to use his own oil filter mounting base) for \$395.00.

The entire remote mount filter installation should take only 1 to 2 hours to install in most applications.

The public release of this product will be at Oshkosh 1992 and our booth is 368E in the Fly Market.

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.

PROPS FOR EZ'S AND DEFIANTS

RAF recommends the following prop manufacturers:

Bruce Tiff
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

While we still have not had an opportunity to try one of Performance Propellers (Nogales, Arizona) props, we have now had a chance to see and touch several of them, and to talk with pilots who fly them. We have also received nothing but enthusiastic letters of recommendation for these props. See their ad in *Sport Aviation*.

PLANS CHANGES AND OTHER IMPORTANT MAINTENANCE INFORMATION

THERE ARE NO NEW CHANGES TO ANY AIRCRAFT IN THIS CP.

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.

IMPORTANT REMINDER

Do not omit the required placard for minimum pilot weight. Keep in mind that someone other than you may someday fly your airplane. If that someone is not as heavy as you are, he or she may take-off with an out of CG, aft condition that could cause an accident.

LICENSE AGREEMENTS

RAF continues to receive requests for new license agreements on Long-EZs, Defiants, etc. This is particularly true from foreign countries. Please understand, RAF cannot issue any new license agreements to anyone for any reason. This is final, official and irrevocable.

LONG-EZ OIL COOLING

High oil temperatures continue to be one of the most frequently reported problems from builders/flyers of Long-EZs. As reported in CP 66, page 4, a rather detailed engine and oil cooling test and analysis was conducted by Bill

Freeman. He found that it literally took doubling the size of the oil cooler to keep the temperature of the oil at the desired level. There are three Long-EZs based at Mojave that are owned and flown by employees at Scaled. All three have varying degrees of high operating oil temperatures. These three have all made numerous changes to try to lower operating oil temperatures. Among these changes were: new Vernitherms (thermostat - VERY EXPENSIVE!), different positions of oil cooler in the cowling, various configuration of inlet and outlet ducting to and from the oil cooler, the use of Mobil 1 (an exotic, high temperature synthetic oil), larger flexible hoses between the engine and the oil cooler, etc. None of these changes reduced the operating oil temperature consistently to the 180^o-190^oF that is desirable.

On Mike and Sally's Long-EZ, N26MS, with the oil cooler mounted on the firewall above the centersection spar, the oil temperature would vary from 190^oF to 230^oF depending on the outside air temperature (at similar power settings). Mike put up with this situation for several years because these temperature ranges were within those specified by the engine manufacturer. Recently, a top overhaul was conducted on his engine and after this overhaul, oil temperatures ran at or above 245^oF red line.

Power had to be reduced soon after every take-off due to exceeding the oil temperature red line limit. A new Vernitherm made no perceptible change. Having Bill Freeman's test in mind, Mike installed a new oil cooler essentially twice the size of the stock cooler. This was installed on the lower cowl, left side, similar to the plans call-out. Oil temperature now remains between 180^o and 195^oF even in a maximum power climb to 17,500 feet on a hot summer day. So far, the oil temperature has never gone below 180^oF even at low cruise power at high altitude during the winter due, presumably, to a correctly operating Vernitherm. Nor has the temperature gone higher than 195^oF and this only occurred in a full gross weight, maximum power climb in the middle of summer in the Mojave desert.

Dan Kreigh owns an O-235-L2C powered Long-EZ here at Mojave and until he doubled the size of his oil cooler (by simply installing a second cooler in series) he had tried every one of the options in this article with little or no success.

His oil temperature consistently ran close to or at the red line. The second cooler has eliminated the problem.

This article is aimed at those builders/flyers who may have high oil temperature problems. If your oil temperatures are normal please disregard this recommendation.

AN ELECTRICALLY ACTURATED LANDING BRAKE BY MIKE MELVILL

This question has been asked many times. I remember discussing this with Burt on a number of occasions. The answer was always, "Why mess around with a nice simple, light-weight system that has never given any problems?". I agreed with this argument at that time and never seriously considered such an idea until recently.

Occasionally I heard from builders and flyers who had installed linear actuators but I did not take these seriously until my good friend and colleague, Doug Shane, made this modification to his own Long-EZ here at Mojave. He used a Warner electric linear actuator and told me it was rather easy to install and that it worked very well in flight. Being a gadget freak (my wife, Sally, repeatedly tells me I am) I decided I had to have one! I researched the Warner actuator that Doug used and was at the point of ordering one when another friend, Norm Howell, (also a Long-EZ builder) showed up at Mojave with a data sheet on a different electric linear actuator made by Pittman, one that was much smaller and lighter than the Warner. Also, it reportedly could generate more "push" power than the Warner. Norm wanted to order one for himself and offered to include an order for me. I gave him a check and commenced designing the mounting bracketry and hardpoints.

A couple of weeks later, I had the new actuator in my hands and I could not believe how tiny and how light-weight it was. The electric motor was 28 volts which is compatible with N26MS, my Long-EZ. Only one thing disappointed me about it and that was it did not have integral limit switches to shut the motor off at either end of its travel. Doug's actuator did have these limit switches included in the design which would make it easy to install and wire up. Instead of

integral limit switches, this Pittman actuator was constructed in such a manner as to limit the total travel to 4" at which point the electric motor continues to run but the actuator stops. This occurs at both ends of the travel.

While this is not an ideal system, it will drive the landing brake down and up with at least 100 lbs. of actuating force and will support at least 225 lbs. while extended and static. This actuator takes about 5 seconds to go from one end to the other of its travel (4").

I first removed the manual landing brake actuating mechanism which included the LB-13 handle, the cables, the LB-1 steel weldment, the LB-21 pushrod and the LB-9 plywood gusset. This left the landing brake hinged onto the bottom of the fuselage and the LB-18 brackets remained in place on the landing brake.

The Pittman actuator comes with a 1/4" rod end installed on the end of the actuator and, happily, this rod end fits perfectly in between the two LB-18 brackets mounted on the landing brake. The Pittman actuator fitted without interference through the 1"X2" hole in the floor throughout the travel of the landing brake. This left me with only having to figure out how to mount the motor end of the actuator to the aft face of the front seat bulkhead.

I elected to cut into the aft face of the front seat bulkhead for installation of the mounting hardpoint because this moves the motor end of the actuator forward partially into the bulkhead allowing a little more baggage room on the floor of the rear cockpit. Working on the aft face of the front seat bulkhead is much harder to do and were I to do it again, I may simply cut into the forward face. I removed glass skin and PVC foam and sanded the inside surface of the forward glass skin before flexing in a rather large solid glass insert (1/4"x3"x5"). After cure, I bevelled the foam and glass and laid up 3 plies of BID over this insert and lapping into the bulkhead. The reason I installed such a large insert is simply crash worthiness. I would not want the actuator to penetrate the front seat bulkhead in the event of an off field landing or crash.

I fabricated two small brackets from 1/8"x1"x1" 2023-T3 aluminum angle, bolted them to the top

end mount of the actuator, held the landing brake firmly closed and drilled through these brackets and the insert in the bulkhead. After these brackets were installed, I found I had to make a small adjustment at the lower rod end to adequately snub the landing brake in the up and closed position.

I drilled a hole through the front seat bulkhead and ran two 20 gauge wires through this hole over to the left side and forward to the instrument panel. I mounted a momentary-on DPDT, center off switch on the left side of the panel just above the throttle when it is in the full throttle position. I wired the switch through a 3 amp fuse to the 28V buss. The "sense" of the switch is switch handle up, landing brake up. Switch handle down, landing brake down. With this particular installation, the landing brake is extended or retracted in 4-1/2 seconds while static on the ground.

ADVANTAGES. This is an easy retrofit or initial installation requiring only a couple of evenings of work. It is as light, or lighter, installation than the mechanical system. The main advantage in my opinion was that it allowed me to completely remove the LB-9 plywood bracket. This bracket has been the subject of two MAN/GND call-outs in the CP where the concern was that this plywood bracket may penetrate the front seat bulkhead in an off field landing or crash. I was very happy to be able to remove this LB-9 bracket.

DISADVANTAGES. Cost. This electric actuator is not cheap, none of the suitable actuators are cheap. My installation cost me \$180.00 not including the cost of the original parts which I removed and discarded. Any electrically actuated mechanism may be more complicated and therefore less reliable than a mechanical mechanism. I don't worry too much about an electrical failure or motor failure because the landing brake is not critical to safe flight.

This change that I have made to my own personal Long-EZ is not a RAF or Burt Rutan approved change. As a gadget freak, I liked the idea so I designed it and made the change myself. If any builder/flyer out there is interested in making a similar modification, send a SASE to me at RAF and I will provide the name and address of the

actuator manufacturer. Keep in mind that some manufacturers are very gun-shy of selling you anything that might be used on an airplane so some discretion is required when you purchase one of these.

FLIGHT TEST RESULTS. Testing has shown that the brake can be extended or retracted at any speed below 110 KIAS. Retraction or extension time is approximately 5 seconds. One shortcoming that showed up in flight test was that an appropriate amber warning light is required to warn the pilot anytime the landing brake is not closed. This is a mandatory requirement. I have not flown it often enough at this point to decide if I really prefer it over the manual mechanical system, however, knowing that the LB-9 plywood bracket is no longer installed makes it worth it.

DICK RUTAN FOR CONGRESS

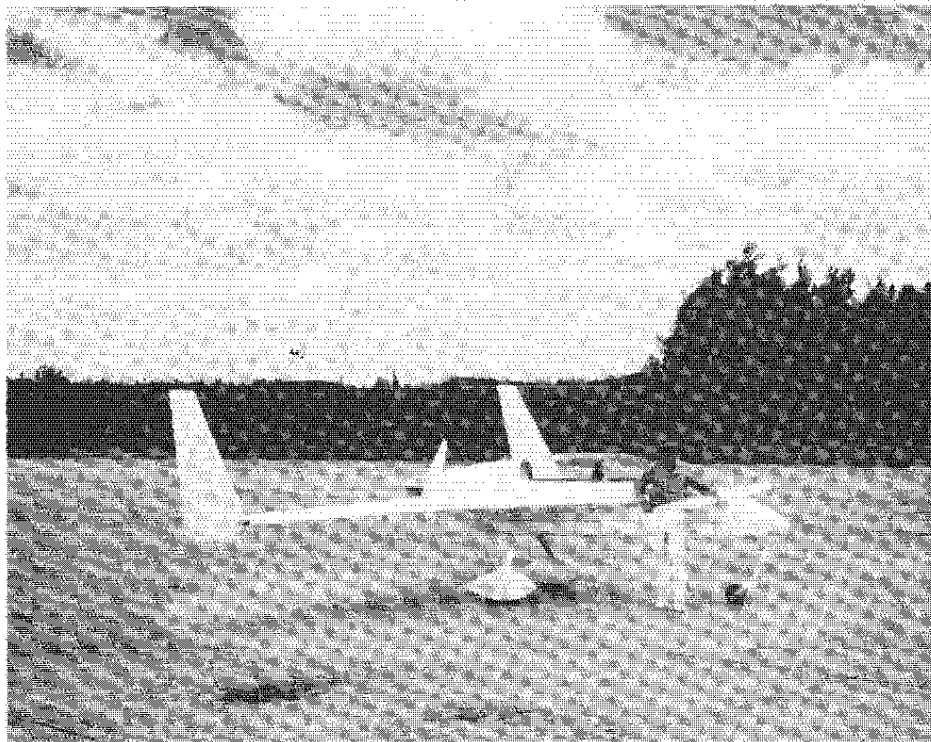
As many of you undoubtedly know, Dick decided to run in the primary election in the 42nd Congressional District, Rancho Cucamonga, CA.. Dick was, in fact, born in this district, and ran against three other candidates for the Republican nomination.

Dick worked very hard, and so did his parents, Mom and Pop Rutan, as well as sister, Nell, and many friends.

Dick won the nomination and is preparing himself for the upcoming General Election in November. He is running against a 30 year veteran and knows this will be a tough battle but, as Dick says, "We need one more fighter pilot and one less lawyer in Congress".

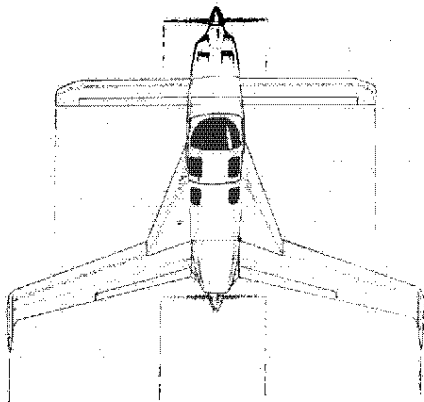
Dick will be a great advocate for general aviation and an enthusiast for the experimental aircraft association

Best of luck, Dick.



Roland Moreau of Canada with his beautiful Long-Ez.

**Rutan Aircraft Factory
Building 13, Mojave Airport
Mojave, CA 93501**



TO:

July '92

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CP 72