THE CANARD PUSHER

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If you are building a VariViggen from 1st Edition plans you must have newsletter 1 through 38. If you are building from 2nd Edition plans you must have newsletters 18 through 38. If you are building a VariEze from 1st Edition plans you must have newsletters from 10 to 38. If you are building a VariEze from 2nd Edition plans you must have newsletters from 16 through 38. If you are building a Long-EZ you must have newsletters from 24 through 38. If you are building a Solitaire, you must have newsletter from 37 to current.

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

The RAF hangar is located on the west end of the flight line at the Mojave Airport, Mojave, Ca. approximately 80 miles north of Los Angeles. You are welcome to come by and see our aircraft or to bring in any parts for our comments. We are normally open from 8:00 to 12:00 and 1:00 to 5:00 on Monday through Friday and 9:00 to 3:00 on Saturday. Closed on Sunday

If you are planning a trip to see us, please call first to assure that someone will be here to assist you, since occasionally we are gone to flyins. When arriving at Mojave by car turn east at the Carl's Jr. restaurant to find the airport.

When writing to RAF send a stamped, self addressed envelope along if you have any questions. If you are placing an order, it's best to keep it separate from a request for an answer to a builder question. Mark the outside of your envelope "builder questions". This will speed up your reply.

NEWSLETTER SUBSCRIPTION - YOU DO NOT HAVE TO WORRY ABOUT A CP NUMBER ANYMORE!!!!!

Well here we go again. The newsletter mailing list has out grown the program that was written for it a few years ago. Jeff Hiner, Burt's son has been very busy these last few months and has come up with a new program for us to use on the Apple. He promises me that we have bunches of space. It is so fast (takes 4 to 6 seconds to look up a name) that we can even look you up and check on your subscription when you call on the phone. You will be pleased to hear that you do not have to bother with a subscription number, the program deals with everything alphabetically.

RAF ACTIVITY

Since Oshkosh, RAF has been to the Soaring Society of America's Homebuilders Workshop at the Tehachapi, California gliderport and also to the San Diego flyin held at Brown Field where Solitaire was awarded "Best Sailplane" and "Best New Design". Fred Keller brought his Defiant to Mojave after Oshkosh and a full flight envelope was done on the aircraft. Mike Melvill has been busy as one of the test pilots on Burt's new Starship project. Work continues on finishing up the Owners Manual and Engine installation for the Solitaire.

DEFIANT

Perhaps the biggest news of the week at Oshkosh was Burt's announcement, making the Defiant available to the homebuilders. Almost two years ago Burt had asked Fred Keller of Anchorage, Alaska if he would like to build a homebuilt prototype of Burt's own Defiant. Fred agreed. Fred and his wife, Sharon flew their absolutely beautiful Defiant from Anchorage to Oshkosh. It was without a doubt one of the most popular aircraft on the flight line. Fred's achievement of completing an airplane the size and complexity of the Defiant, in the time he did is incredible, especially when you stop and consider that he was not only building virtually every single part himself, he was also keeping accurate records, drawings and photographs of his progress, in order to be able to put together plans for the homebuilder. The Defiant plans will be marketed by RAF in exactly the same way as the Long-EZ and Solitaire plans. RAF will supply the plans and normal builder support. Any support requiring interpretation of the plans will be handled by Fred Keller, either by phone or by mail. We intend to have Defiant plans available by March of 1984. We are excited about this program and feel that this will fill a very real need for those homebuilders who require a four place and will also provide these builders with the safety of two engines without the inherent dangers associated with "normal" twins.
According to the FAA, a pilot will require a private pilots license to fly his or her own Defiant. A multi engine rating is not mandatory, although common sense would call for at least a center line thrust rating, which could be obtained in ones own Defiant.

STARSHIP I

Burt's latest design, a large business aircraft powered by two PT-6 turbo-prop engines and looking like a gigantic Long-EZ, recently has been making the headlines. This aircraft was designed by Burt for Beechcraft of Wichita, Kansas. The proof of concept prototype is an 85% scale demonstrator and was built next door at Burt's new company, Scaled Composites. Unlike most proof of concept aircraft, this one has the workmanship and surface contour etc of a grand champion! Started in January 1983 and first flight (pilot - Dick Rutan) was in August 1983. It has been flown almost daily since then and has over 100 flight hours already. Beech made their dramatic anouncement of the Starship I at Dallas, Texas at the NBAA's week long convention. Mike Melvill, one of the project test pilots, flew it to Dallas and demonstrated it at Love Field.

The Starship I was undoubtedly the major attraction at NBAA, and we wish Beechcraft much success with this, the most ambitious and most advanced business aircraft to come along in many years. We understand that Beech will be building and certificating the full scale Starship I as a composite aircraft. It is larger than their Super King Air 200.

Although the Starship is not for us homebuilders, sooner or later some of the technology that Burt has developed to produce the 85% scale demonstrator, will eventually filter down to the homebuilder and we will benefit from that. Much of its structure is moldless, using the hotwire core technique. It is 100% composite, about half carbon fiber and half fiberglass (BID, UND and Safe-T-Poxy). Most of Scaled's personnel are EAA types with composite homebuilding experience. There is a rumor circulating that the Starship I (the 85% scale demonstrator) may be on the flight line at Oshkosh 1984 and may even fly an airshow there. Stay tuned!! We do not have any technical information about Starship, any questions must be addressed to Beech Aircraft.

OSHKOSH 1983

This year the Solitaire plans were introduced at Oshkosh with Solitaire in the final configuration on the flight line. Sally and Trisha volunteered to drive the RAF van towing the 30 foot sailplane trailer with Solitaire onboard. They took off from Mojave early in the week in order to be at Oshkosh in time to set up the RAF booth and get the Solitaire set up on the flight line. They drove 2130 miles and both agreed that it was a fun trip. Mike Melvill and Michael Dilley flew Long-EZ, N26MS. Their trip was flown in one day with one stop for lunch at North Platte, Nebraska and a change of pilots. The second leg was flown in almost continuous rain and poor visibility, in fact a very circitous route had to be flown to make it into Oshkosh late in the evening. The Long-EZ performed well and the flight time for the 1700 mile trip was nine and a half hours, an average ground speed of 158 nautical miles per hour (182 mph). The route was Mojave direct Provo, Utah, direct Oshkosh. Burt flew in the next day in his Defiant with one stop at Laramie, Wyoming for fuel and lunch.

Picking the best Rutan Design this year was quite a challenge with 87 of Burt's designs present on the flight line. After much discussion, we were proud to announce that Don Prestin and Don Shaw, both of Santa Rosa, California with their virtually identical VariEzes were judged to win the Designers Award in a dead heat! Anyone who saw these two EZs would have to agree, the attention to detail was absolutely outstanding. Congratulations to both Dons and also to Bud McHolland for winning the Outstanding Workmanship award for his VariEze, N12XP.

The Solitaire was flown several times in the fly bys. The Defiant, the Long-EZ and the Solitaire were flown in an unusual 3-ship display during the evening 'showcase' fly bys. Dick Rutan flew Mike's Long-EZ to open the 1983 Oshkosh airshow and flew his usual super airshow aerobatic routine for the first half of the week with Mike Melvill flying the routine for the rest of the week.

Oshkosh this year was not as big or as busy as in previous years, yet was plagued with accidents and incidents. Fortunately the only incident involving a Rutan design was when Ken Swain lost power in his VariEze on his way back into Oshkosh from Fond du Lac after the LBF race. See Ken's letter in this newsletter. We are happy to report that Ken was not injured in the forced landing, although his Varieze was substantially damaged.

Michael Dilley and Trisha drove Solitaire back to Mojave while Sally and Mike flew their Long-EZ to Jackson Hole, Wyoming for a two day hiking vacation. Due to a heavy schedule at his new company, Scaled Composites, Burt had to return home at mid-week.

SOLITAIRE NEWS

SSA Homebuilder Workshop - Labor Day weekend is the Soaring Society of America's annual Homebuilders Workshop. This west coast version of the sailplane homebuilders "Oshkosh" was held at Fantasy Haven glider port in Tehachapi. We flew the Solitaire from Mojave over the ridge to the Tehachapi glider port on Friday afternoon. After landing we decided to try out the gravel runway for take off. The Solitaire had no problems getting off although it took about 900 feet of runway. Climb out was adequate and we were at pattern altitude on down wind opposite the numbers. This was a hot September afternoon, off a gravel runway at 4000 feet elevation.

Saturday morning, Burt gave a presentation on the Solitaire and brought along John Roncz the designer of the airfoils used on the Solitaire. The talk was informative and left plenty of time for a question and answer discussion. There was a slide show presentation which dealt mainly with the construction techniques. After the presentation, Burt and John had to fly back to Mojave in the Grizzly. Michael Dilley and Trisha Palmer spent the rest of the weekend talking to the builders and showing off the Solitaire prototype. Later on Saturday, RAF in conjunction with Dave Lund of SSA put on a hands on workshop, showing both the hotwiring and fiberglass layup techniques used in the Solitaire.

Solitaire flew on Saturday at 1pm, demonstrating the self launch take off capability of the KFM engine. It was about 100° with a density altitude of 7000 feet. The Solitaire was able to get off the gravel runway, climb out and go soaring with the other sailplanes. The nice thing about the Solitaire was, that there was a about a 40 minute wait for a tow plane, (this of course happened during the best time of the day for thermaling) but the Solitaire was able to taxi out and take off

The following aircraft were at Oshkosh, 1983

One Of a Kind

Dan Mortenson	Amsoil Racer	
Nat Puffer	Cozy	
RAF	Solitaire	

Defiant

Burt Rutan	CA	N79RA
Fred Keller	AK	N39199

VariViggen

Ken Winters	OK	N31WW
Leonard Dobson	TX	N73LD
Bernard Duneman	MN	N33VV

VariEze

Ron Atkinson	IN	N3LV
Jim Bair	IA	N101MW
John Benjamin	PA	N40EZ
Roy Blaha	FL	N16PR
Dave Boldenow	IL	N203DB
Bob Boyd	ID	N98RD
Ed Braze	CA	N490EK
Bill Brin	CA	N9113A
Leonard Brown	NY	N9329A
Bill Butters	MO	N235LB
Dale Collins	FL	N224DC
Greg Coln	OH	N281
Robert Evans	WY	N46EA
Jack Fehling	FL	N444EZ
Harold Ferguson	NC	N2286A
John Fowler	IO	N82JF
John Frilling	IL	N28JF
Wes Gardner	CA	N13WM
John Good	TN	N66EZ
Ralph Hallenborg	CA	N141RJ
Jim Heitkotter	CA	N139EZ
Delmar Hoagland	IL	N1335D
Larry Hoepfinger	TN	N7RH
John Jackson	MS	N2VE
Don Jones	TN	N300DJ
Elvin Kime	MO	N80EK
Roger Klemm	CO	N29ST
Clarence Langerud	TX	N91CL
John Levy	CA	N729BB
Wally Loewen	CA	N80WL
Bud McHolland	WY	N12XP
Byron McKean	TX	N57EZ
Robert de Malignon	AZ	N77AX
Michael Marker	NM	N22ZC
Gerry Mason	MI	N27GM
Ron Menzie	AR	N718RM
David Morgan	OH	N68M
Richard Pattschull	IO	N83RP
Martin Pavlovich	WI	N810TC
Frank Poplawski	TX	N60P
Curtis Poulton	OH	N79CP
Don Prestin	CA	N39DP
Gary Price	MA	N110NA
Daniel Quinton	MI	N10D
Robert Ream	IN	N79BR
Robert Rutledge	IL	N28RR
Don Shaw	CA	N420S
Garth Shearing	Canada	CGHYP
Don Shupe	CA	N39EZ
R.M. Sims	AZ	N4229G
Stephan Sorenson	CA	N118SJ
Shan Stewart	IL	N429T
Rivers Stone	SC	N37S
Ken Swain	NE	N4ZZ
Marc Tillia	Brazil	N32448T
Earl Wilson	CA	N999EB
Fred Wimberly	VA	N99FW
Bob Woodall	MD	N301RW

Long-EZS

Paul Adrien	NH	N46AA
James Brandt	AL	N103JR
Ken Clunis	CA	N345KJ
David Domeier	CT	N26JD
Diel/Corley	CA	N82CD
Darwin Esh	WI	N98CD
Charlie Gray	FL	N211LE
Tom Garrison	TX	N158TG
Neil Hunter	FL	N141NH
Bill Hinckley	VA	N55LZ
Jim Hightower	MS	N234LE
Carlin Johnston	TX	N82CJ
Judge King	MN	N350JK
Ron Lueck	FL	N1177N
Lee/Andrich	CA	N373JH
Robert La Bonte	NH	N369R
Mike Melvill	CA	N26MS
Herb Sanders	TN	N81HM
George Scott	TX	N468DS
Frank Tifft	CA	N307EZ
Tom Williams	CA	N8EZ
Williams/Cortner	NM	N95JV
Joe Yasecko	FL	N305Y

totally unaided with no wait. Later Saturday afternoon RAF gave another demonstration of building techniques.

Sunday was basically a repeat of Saturday with Solitaire flying in the morning and afternoon. The first flight was at 9 am before much thermal activity had started. Because the Solitaire is so inexpensive to run, it is possible to go out and make an early morning flight just to be in smooth air over a beautiful mountain, just for the view and also to 'sniff' out the thermal activity.

Sunday afternoon, Solitaire was able to show off some of its themaling ability and actually gathered a crowd when other sailplanes saw it doing well in an area of the valley that none of the other sailplanes had tried. All landings were made with the engine folded away because it is easier to make an approach with the very powerful spoilflaps than using the throttle for glide path control.

The SSA had composite introduction kits on hand from Aircraft Spruce for sale, the idea being that people could not only watch a demonstration of the techniques but could do their own 'hands on' layups with an experienced person to help them get started with the right techniques. To demonstrate the hot wire cutting, we had members of the audience do the cutting with the RAF crew watching. This was to demonstrate the speed with which someone can be taught to use the hot wire cutting method. The parts, by the way, came out great!

Monday saw more Solitaire flying for the people who had attended the seminars and did not get to watch the Solitaire fly. This was a pleasant event where most of the people are on a first name basis. By power plane standards it was a miniature event but the enthuiasm was evident on the faces of the people who were there. Anyone interested in sailplane homebuilding would be well advised to attend this event.

The RAF crew would like to thank the operators of the Fantasy Haven gliderport for their hospitality.

The Solitaire Program

The Solitaire program has been moving along at a rapid pace since the last newsletter. The Solitaire put on showcase flybys at Oshkosh about every other day of the convention, more about that in the Oshkosh section. The prototype has been to the SSA Homebuilders Workshop at Tehachapi, to the Brown Field flyin in San Diego and had lots of hours and several more pilots checked out in the prototype here at Mojave.

Deliveries

Task Research has started shipping Solitaire kits! They have set up with two sets of fuselage shell molds and have been pulling parts. We have seen the spars and they look very nice. The seat pan is a real beauty, having built the original in place with pour-in-place foam, then glass and finally digging out the foam, I can appreciate the way this part fits and how easy it is to install. Task Research was leaving for the Eloy, Arizona flyin at the date of this writing with the number 002 Solitaire. They had the bulkheads fitted and the shells trimmed but not bonded. They were going to the flyin to show the ease of assembly of the prefabricated parts.

Ken Brock Mfg. is a little behind Task on parts availability. They should be able to ship all the Solitaire airframe parts starting about mid-November. This should not slow down the builders very much since there are very few Brock parts in the first few chapters of the plans.

The Owners Manual is almost written and should go to the printers in a week or two. We have a small amount of flight test data left to acquire before we finish up.

The Solitaire prototype has 160 flights now and we are more than pleased with the entire design. The KFM engine has not failed to start or given us any trouble since we installed it. Flying the Solitaire is fast becoming the primary sport here at RAF.

Brown Field Flyin

RAF attended the Brown Field flyin in San Diego. This is an exmilitary airport right on the border between Mexico and the USA. It has long runways and lots of room for aircraft and people. The event was well organized but unfortunately the weather stopped many people from showing up. The L.A. basin and the Tehachapi mountains were socked in so very few aircraft showed up from out of town. It rained some but the field was open all day.

Michael Dilley and Trisha Palmer drove the trusty RAF van down to Brown Field with the Solitaire in tow (in the trailer) on Friday. Once there, we found lots of activity setting up for the flyin. We left the Solitaire in the trailer overnight.

The next morning was set up time for the Solitaire and a booth to display the Solitaire plans. Solitaire was flown on Sunday twice mainly to demonstrate the take off and climb capability. It was not possible to demonstrate the soaring capability since Brown Field is a control tower and there are usually four or five aircraft in the pattern at one time. We did however, fold the engine in and out and restart in the air, time after time. We were able to do high speed passes down the runway then pull up, extend and restart the engine.

There was a small airshow, with a great aerobatic sailplane demonstration which finished with two loops that were so close to the ground, they probably had to mow the lawn before he could perform! Overall, the flyin was dissapointing because of the weather. It was well organized and hopefully next year the weather will be kinder.

The Solitaire was entered in the aircraft judging and won awards for both Best Sailplane and Best New Design. We hope to be able to return next year.

IVHC Flyin to Ruth, California

As one of the highlights of the year, this flyin was just plain super. Ruth is a working ranch in the northern California coastal range. The runway is hard surface, roughly parallel to the river and down in the bottom of a steep, deep valley. This makes for some interesting approaches, especially from the south. The 'normal' approach is to drop down into the river valley 3 or 4 miles from the runway. Follow the river, getting lower and lower, until you come around the last bend in the river and there is the runway, right in front of you. It sounds a little difficult but none of the 14 VariEzes and Long-EZs had any difficulty.

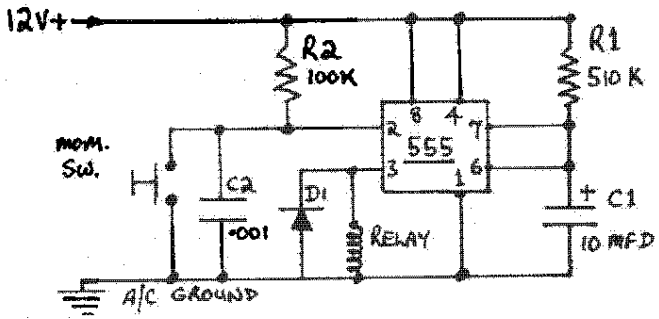
Barbara Wilson did the organizing for this one and she deserves a standing ovation. Not only did Barabara do the work, but she drove 7 hours so that we would have all the popcorn etc that we needed! It was a really outstanding weekend with lots of good food, friendship and lots of "hangar flying". Most every one went bicycling, hiking, horseback riding, swimming, jogging and flying. We all flew to Shelter Cove on Sunday, right on the coast, where we had brunch and did a little beach combing.

Some 'brave' souls even went swimming. Anyone who flies an EZ and is not a member of this group, should get with the program and join up!! The IVHC will be organizing a trip to the Baja peninsular over the Christmas/New Year period, so stay tuned. The following people flew into Ruth to make a fabulous weekend.

Earl and Barbara Wilson	CA	VariEze
Chuck and Joan Richey	CA	VariEze
Wes and Millie Gardner	CA	VariEze
Jerry and Karen Gardner	CA	VariEze
Bill and Julie Lermer	CA	VariEze
Les Faus and Joanne	CA	VariEze
Don and Darlene Young	CA	VariEze
Jim and June Highkotter	CA	VariEze
Joe Moore	CA	VariEze
Steve Sorenson & family	CA	VariEze
Shirl and Diane Dickey	UT	VariEze
Bruce and Bonnie Tifft	CA	Mod. Long-EZ
Mike and Sally Melvill	CA	Long-EZ
Bob Pugh	CA	Long-EZ
Bob and Joan Hansen	CA	C-172/Long-EZ
Chris de Brichambant	France	Long-EZ builder

BUILDER HINTS

The following was sent in by Tom Williams.
"One of these days, in the confusion that can happen when landing, one of us less than perfect pilots could hit that gear warning DEFEAT switch and then ignore the gear warning light (if you have one). That's likely to ruin more than one day fixing your nose. I have designed an electronic circuit which will DEFEAT the DEFEAT in 60 seconds. The relay shown in the circuit is the same one shown in the plans. The timer chip and all of the other components are available at Radio Shack or just about any electronics supply store. The 60 seconds can be varied by changing the values but I believe you will find the 60 seconds just about perfect; longer might not give time enough to get your gear down on final and shorter will drive you up the wall in a long glide".



Side Consoles

Make and fit all side consoles. Do not permanently install them yet. Make your plywood parts CS109 and CS118 and glue them to the side of the fuselage with 5 minute in the apropriate positions, using the side console for location. After the 5 minute cures, layup 1 ply of BID on each side of SC109 and SC118 (fore and aft) and lap onto the fuselage side at least 0.5". Allow to cure. Now make CS108 and CS118 (phenolic bearings) and bolt these into place. Install all of the pitch/roll control system from the front stick to aft of the firewall. Also install the fuel valve and all fuel lines. Also install conduits for electric wiring. Do all of this before the side consoles are finally epoxied and glassed into position.

Front Seat Bulkhead Location

For shorter pilots, Mike Melvill moved his front seat bulkhead forward 2". He did not change the angle nor anything else. The landing brake is installed 2" forward of plans. In other words, it is still related to the front seat bulkhead per the plans. The landing brake handle position and right side stick controller were not changed. This resulted in an excellent fit for Mike (5'9" tall) and also for Sally (5'4" tall) and gave them a larger rear cockpit and helped the aft cg problem, since they used a starter and alternator. The landing brake, positioned 2" further forward, works great with zero pitch trim change.

Pitch Trim - VariEze and Long-EZ

While most VariEzes and Long-EZs have a rather mild pitch trim change in rain, some are less mild than others. Try this: scuff sand your canard using 500 wet or dry (wet). Sand only in a chord wise direction, until you have a uniform dull look. Ken Clunis did this to his with surprisingly good results.

Shimmy Damper - VariEze and Long-EZ

If your nose wheel shimmy damper is not holding consistently, check to see if the phenolic "piston" is tight in its vertical hole. If so, ream the hole about .005" oversize to allow a nice free fit on the phenolic "piston". Reassemble, being certain to use the heavy duty spring called out in CP 30, page 4 and this problem should be solved.

Fuel Leaks into Outboard Wings - VariEze and Long-EZ

We have now had reports from three different flyers, that they have had small pin hole leaks in the outboard ribs of their fuel tanks, and that fuel had somehow seeped into the outboard wings. Small pin holes in the root rib of the outboard wings have allowed fuel to attack the styrofoam in the wings. This is a serious situation, since the wing structure requires the foam core for buckling support of the wing skins.

The solution of course, is to be positive that your fuel tanks do not leak and any fuel stains observed near the wing would require removal of that wing and carefull checking for any loss of foam structure. Fuel will instantly melt styrofoam and will find its way through the smallest pin holes if its allowed to. If this happens, a repair requires removing all of the melted foam, and cutting back into good foam. Then a block of foam must be cut and fitted, then microe'd into this void. A possible alternative would be to use "pour-in -place" Liquid X foam or equivalent. Sand the foam to the original shape and do a standard fiberglass repair.

Carb Heat Muff

Aircraft Spruce sell an excellent little carb heat muff. A simple tube that can be slid onto the Brock exhaust system, right side, forward header and clamped in place with two worm gear clamps. Ken Clunis turned this in and it is easy to do and works great.

Cutting BID Tapes

Try rolling the BID cloth into a 1" diameter roll at 45° to the selvage edge, having previously carefully straightened the fibers. Now use a large sharp pair of shears to cut off 2" wide rolls. Presto! Your 2" wide tapes are ready to use and even rolled up for you.

Aluminum Corrosion

Out here in the desert corrosion is not a problem. Some builders however, do live in highly corrosive environments. Rodie Rodewald is one. On the north shore of Oahu Island in Hawaii, where the biggest surf in the world breaks is where Rodie keeps his VariEze and Long-EZ. The air is literally heavy with salt spray all the time and Rodie has found exposed aluminum parts, not anodized, will corrode. He strongly recommends anodizing and insists that it is easy and fun to do. All you need:

1 gallon plastic jug cut off to make a bucket.
1 gallon of battery acid (H2SO4) at a specific gravity of 1.10.
A lead plate a little larger than the parts to be anodized.
12 volt battery charger (6 amps is best).
Pure, soft aluminum wire.
Trisodium phosphate (TSP) available at hardware stores, diluted .80 ounces per gallon of water.

Cleanliness is very important to success. He used wooden tongs and chop sticks to handle all parts after cleaning and proceeded in the following way:

Degrease all parts to be anodized.
Heat TSP to boiling, cool to just under boiling, immerse parts 3 minutes.
Water rinse avoiding touching the parts.

To anodize:
- Positive lead to parts.
- Negative lead to lead plate. Use the aluminum wire. A good contact is the secret to success.
- Immerse in acid.
- Gas bubbles evolving from the lead plate proves that anodizing is occurring.
- Leave parts in the anodize process 25 to 30 minutes.
- Water rinse.
- Boil parts for 10 minutes in tap water to seal the anodizing.

The only caution note is to be careful with the acid. It is not a strong acid, but acid is acid and can burn, therefore use personal protection of skin and clothing and in event of an acid spill, wash thorougly in baking soda and water.

Spark Plugs for Hard Starting Engines- VariEze and Long

Bill Price, a VariEze flyer with over 450 hours on his VariEze, reports that for 400 hours his engine was a real beast to start, particularly while hot. He switched to platinum plugs and reports that his engine is now pure pleasure to start, idles smoother and runs better. Platinum plugs are quite expensive, but last a long time. Mike Melvill had REM40E massive electrode plugs in his Long-EZ engine, an O-235-L2C (as called for by Lycoming) and found that every 10 to 15 hours the bottom plugs would lead foul. Instead of platinum (which may have worked), Mike used Champions REM37BY (extended tip) and the problem disappeared. In fact, the plugs were not cleaned for 260 hours, with no problems.

Prop Damage - VariEze and Long-EZ

Remember, flying a pusher airplane, anything that comes off the airplane might possibly go through the prop. This includes cowling screws, loose pieces of safety wire, nuts and washers left loose in the cowling, even wrenches inadvertantly left in cowling! Be carefull. Be conceintious about working on your airplane. You are the qualified mechanic doing maintenance on the airplane and it is absolutely your responsibility to do the best work you can. A cowling screw or a fuel cap going through the prop, can cause sufficient damage to the wooden prop, that you may have to land and wait for a replacement prop.

Engine Alignment - VariEze and Long-EZ.

The engine should be mounted with the crankshaft center line right on B.L. 0 looking down at a plan view. There is no side to side offset. Looking at a side view, the engine is mounted with down thrust. That is to say, the prop flange is higher than the magneto end of the engine. Ideally this is a 2° angle. Plus or minus 1° will be okay. When you install your engine mount, do not assume that the four forward tubes are square and true. Clamp the mount to the aluminum extrusions and measure from the firewall back to the flanges (conical mount) or to the donuts (dynafocal) and do not drill in the mount until you have it positioned correctly.

Prop Bolts - VariEze and Long-EZ.

If you are using a standard Brock prop extension with threaded drive lugs and crush plate, and a prop that is approximately 3 3/4" thick at the hub, (Ted's, B&T etc) you will need 6 prop bolts. AN6H-51A will work fine and are much cheaper than the AN76 prop bolts.

Worm Gear in Nose Gear Mechanism - VariEze, Long-EZ and VariViggen

If you buy the worm gear from Boston Gear, it will not be a solid gear, but will have holes in the hub area. This can still be used, but must have the holes filled first. We simply used flox. See sketch.

If you would prefer a solid gear as shown in the plans, the only source we are aware of is from Ken Brock Mfg. Brock also sells this gear for VariViggen builders, for the main gear retract mechanism.

Front Control Stick - Long-EZ

Be certain that the lower bolt in the control stick can not catch on the rudder conduit at full left aileron deflection. Check this carefully before next flight. One builder had this occur in flight. He got quite a scare before he forced the stick right and tore the conduit off the fuselage side.

Sticking Fuel Valve - VariEze and Long-EZ

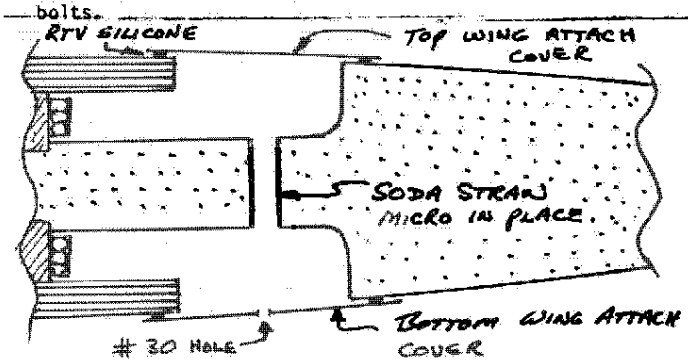
Hank Ashmore has found an excellent replacement for a VariEze/Long-EZ fuel valve. It is a Gerdes products fuel selector valve, and is found on Beech Musketeers, Sundowners, Sierras etc. It is a perfect match for the EZ valve and does not stick. Hank found his at an aircaft salvage yard and paid $20.00 for it. Unfortunately they cost around $125.00 new!! We are not advocating that everyone should run out and get one, but for those flyers with a particularly nasty sticking valve problem, it may be an alternative worth considering.

Corner Tapes - VariEze and Long-EZ

Installation of BID corner tapes, such as in corners between fuselage sides and bulkheads can be a time consuming job. Try this: spread out a piece of aluminum foil (such as Reynolds). Layup the BID cloth, usually two plies, large enough to cut all the tapes you are going to need, onto the foil. Squeegee this layup out to a good layup. Now cut your 2" wide tapes out of this layup, cut through the glass and aluminum foil. Sand and paint a coat of epoxy onto the area to be layed up over, then with your fingers, bend the aluminum foil to form the "tape" into an angle to fit into the corner. Carefully position it and lightly squeegee or stipple it into place. Peel the aluminum foil off, stipple to eliminate any small air bubbles, peel ply the edges and presto, a perfect tape. Really works well.

Wing Fitting Ventilation - Long-EZ

The outboard main wing attach fitting recesses in the wings should be ventilated to avoid an accumulation of condensation. Drill a #30 hole in the bottom cover. Remove the top cover and drill a hole in the lowest point of the recess such that it will break into the recess underneath the wing. This hole should allow a soda straw to slip through. Work a little micro into this hole and slip a soda straw through. Allow to cure. Now carefully cut the soda straw flush with the bottom of the recess. Silicone the top cover back on. This will allow the two covered areas to "breathe" and eliminate condensation, which could corrode the wing bolts.



SECTION B-B, pg. 19-12

BUILDER SUPPORT

Builder support at RAF lately has been handled by Michael Dilley, since Mike Melvill had been involved in the very busy flight testing of Burt's new design, the Beech Starship I. Michael came to RAF over two years ago and has been involved in the finishing stages of the Grizzly, all phases of construction of the Solitaire, including the writing of the plans and of course he flies Solitaire. A few months ago, he started building his own Long-EZ at home, and of course he regularly demonstrates the prototype Long-EZ and gives the builder rides on Saturdays. In addition Michael was a primary builder of the Amsoil Racer. He has previously owned a Taylorcraft and a BD-4. Michael is doing sterling work handling almost all builder support including VariEze, Long-EZ and Solitaire. Thanks Michael, we could not do it without you!

PLANS CHANGES.

We at RAF, of course, cannot enforce a mandatory change, as FAA can on a type-certified aircraft. The regulations allowing amateur-built experimental aircraft recognize that the homebuilder is the aircraft manufacturer and, that the aircraft does not need to conform to certification requirements. This allows experimentation by the homebuilder, giving him the freedom to develop new ideas. FAA achieves their goal of providing adequate public safety by restricting the homebuilder to unpopulated areas and to solo flight until his aircraft is proven safe.

It is the homebuilder's responsibility to maintain, inspect and modify his aircraft as he desires. However, we at RAF feel that part of our job is to provide information to the homebuilder in the form of recommendations that, in our opinion, are required for him to achieve a satisfactory level of flight safety.

Category	Definition
MAN-GRD	Mandatory, ground the aircraft Do not fly until the change has been accomplished.
MAN-XXHR	Mandatory, accomplish the change at next convenient maintenance interval or within XX flight hours whichever comes first.
DES	Desired - strongly recommended but not requiring grounding of the aircraft.
OPT	Optional - does not effect flight safety.
OBS	Obsoleted by a later change.
MEO	Minor error or omission.

No VariEze or Long-EZ plans changes this newsletter.

SOLITAIRE PLANS CHANGES

SPC #15 MEO Section I, Page 2-2. Add to the Spruce and Wicks parts list:
2 each K3000-3 nutplates
2 each K3000-4 nutplates
1 each spruce - 3/4 x 3/4 x 48"

SPC #16 MEO Section I, Page 6-1, Step I. Sentence 9, delete the "and SRH-8 inserts" and add "install two K3000-3 nutplates onto SRH-10".
Sentence 11 should read "Wipe a thin coat of wax onto two AN4 bolts and two AN3 bolts". Change the SRH-8 in the next sentence to SRH-10.

SPC #17 MEO Page A-7. WL21 on jig 58 and jig 105 should be WL20.

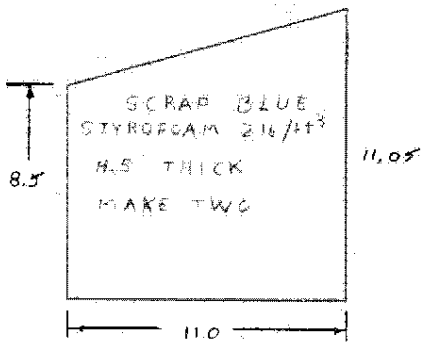
SPC #18 MEO Section I, Page 8-1, Step I. The elevator cores should be cut to 34" x 4.2 x 7.0.

SPC #19 MEO Page A-21, Section J-J. SSF-3 pivot bolt water line is 24.5 not 25.5 as called out.

SPC #20 MEO Section I, Page 18-3, Figure 18-8. Canopy latch does not shown wood inset into the canopy frame as called out in the instructions. The wood is 1/4" birch plywood.

SPC #21 MEO Section I, Page 5-1, Figure 5-6. Install the pitot tube on the right fuselage half at the water line and fuselage station not the left half as shown. We recently moved the position of the tow hook and had to reposition the pitot tube to make it work.

SPC #22 MEO We forgot to build the fairing block between B.L. 82.5 and B.L. 93.5 on the wings at the trailing edge. This should be installed in Chapter 19 after the ailerons and spoilflaps are working. Use a block of scrap blue styrofoam and cut it as shown.



Remove the wings from the aircraft and disassemble the two SCS-11Us from each wing along with the SCS-110A and SCS 109. Slide the SCS-211 tube inboard under the spoilflap. This leaves the area between the spoilflap and the aileron clean. Tape the trailing edge of the wing and the edges of the spoilflap and aileron. Bondo the ailerons into position with the aileron to wing assembly jig on Page A-17. Fit the foam block against the vertical shear web and between the aileron and spoilflap. Five minute the block in place and using a sanding board sand the top side of the foam to shape. This shape is basically a straight line between the aileron and spoilflap at any fuselage station. When the top is to contour, renew the tape around the edge of the foam and slurry the foam. Peel ply the last 1/2" of the trailing edge and layup 2 plies of UND at ± 45° lapping onto the taped area of the wing spoilflap and aileron. Knife trim on all the edges when ready. Turn the wing over, gray tape the wing, spoilflap and aileron and sand the foam to shape on the bottom. Pull the peel ply along the trailing edge, renew the tape edges and layup the bottom skin with 2 plies of UND at ± 45°. Fill the joggle at the trailing edge with micro, cover with peel ply and squeegee to contour. Knife trim at the edge of the foam all around when ready.

Remove the fairing block from the wing and reinstall all the hardware to activate the aileron. Remove the jig fixture to allow the aileron to move. Dig out the foam enough to allow the belcrank mechanism to operate througout its range with adequate clearance. Do not remove all the foam. It is acceptable to remove all the foam down to the glass skin in areas where necessary. Remove the foam 0.5" on the ends to make a rib in this area. Slurry the foam and layup 1 ply of BID inside, lapping as necessary to allow it to follow the contour. Be sure and leave lots of room for the SCS 211 control tube. Knife trim all around when ready.

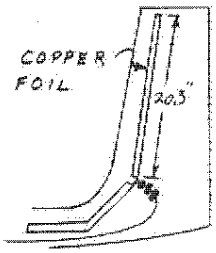
Fit the fairing back in place and be certain you have 1/16" clearance between the aileron and spoilflap. Sand as necessary. Micro the fairing in place, use fairly dry micro and be certain none drips onto the controls. After cure sand 1" onto the wings and the fairing for bond and apply 1 ply tape of BID at 45° lapping 1" onto each part top and bottom. These should also lap onto the fairing above the aileron and the hinge line below. Peel ply the edges for transition.

SPC #23 Section I, Page 2-2. Add to Spruce and Wicks parts list -
Styrofoam, blue 2 lb/ft$_3$ 4 x 24 x 48 - 1 each

SOLITAIRE BUILDER HINTS

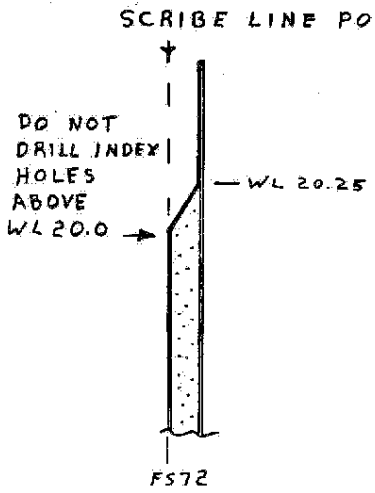
Builder Hint #1
Solitaire Com Antenna - The best place for the comm antenna on a Solitaire is in the vertical stablizer. The antenna is available from Radio Systems Technology, 10985 Grass Valley Ave, Grass Valley, CA 94945. The

cost is $15.00 unasembled or $25.00 assembled with BNC connectors. This is the same antenna that is used on the Long-EZ and has been extremely successful. The antenna uses copper foil with RG58U lead-in wire. It does not require a ground plane. To install the antenna, cut two strips of copper foil 20.3" long. Remove the protective backing and stick the foil to the inside of the vertical tail on the right fuselage half as shown and leave about 1/8" between them. Do not tape down the last 1" where the 1/8" gap is yet. Solder the center lead of the lead-in wire to the upper foil proctecting the fuselage from excessive heat and the braided outside wire to the lower foil, with the three ferrite balums on the wire as shown. These are spaced the same distance apart as they are thick. Stick down the last 1" of foil and be certain they don't touch or short out. Layup a 1" wide ply of IBD +45° over the foil and onto the lead-in wire to attach the ferrite balums in place. Use a 2" x 2" BID patch spaced 8" apart to hold the lead-in in place. Run the lead-in down to the static line and beside it foreward to the instrument panel. This antenna should be installed in the same step as the static system Page 5-1, Step II.

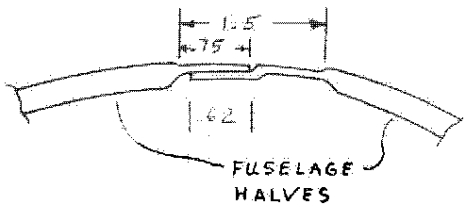


RG 58U
LEAD IN WIRE

Builder Hint #2
When installing the bulkheads into the fuselage, note that F.S. 72 has a glass to glass area, do not drill nail holes to index the bulkhead in this area because the bulkhead is not on the scribe line at this point.



Builder Hint #3
When trimming the fuselage halves for assembly, the overlap joggle on the half should be trimmed to 5/8" as shown. When the two fuselage halves are fitted together the width of the total joggle should be 1.5"



CAUTION - Long-EZ

Note that the engine section of the plans, Section IIL updates Section I of the plans. Do not do any work in the area of engine mount installation, brake master cyclinder installation or anything aft of the firewall until you have Section IIL in hand. Also - do not install the aluminum engine mount extrusions until you have the engine mount at hand and can clamp it to the extrusions while they cure in place. This assures a perfect match of engine mount to extrusions.

CAUTION

Several builders have been leak checking their fuel tanks by pressurizing them, or pulling a vacuum on the tanks so strongly that they cracked their tanks. Be careful! The only safe way to leak check your fuel tanks, is to plumb an altimeter into the vent line and suck or blow an altitude change of a maximum of 1500 feet. Use your mouth to do this. Do not use a vacuum pump. There is an awful lot of square inches of surface area inside your tank, and even a relatively small change in atmospheric pressure per square inch, can put hundreds of pounds of force on your tank.

CAUTION - There is a product being sold that supposedly can be used in a liquid form and painted on in place of the recommended firewall. RAF does not approve the use of this material on a VariEze or Long-EZ. While this material is fire proof, it has virtually no insulating qualities. This means the cockpit side of your firewall bulkhead can be almost as hot as the engine side during a fire. The spontaneous flash point of the epoxy system is only about 850°F, so it is possible to have a fire inside the cockpit area, even though the fire did not burn through. The insulating qualities of the fiberfrax is required to keep the temperature on the cockpit side of the firewall bulkhead below the flash point of the epoxy.

LONG -EZ CLUBS

Arnie Ash, RR #5, Davenport, IO, 52806, would like to form a Long-EZ group interested in construction etc. Anyone in Quad Cities area of Iowa/Illinois, contact Arnie.

Sunbelt Long-EZ Club.
Contact: Pete Petrie or Jim Hooks,
(919)739-3302

Long-EZ Squadron 2

Squadron 2, the Long-EZ builders/flyers club, is going strong at Santa Monica Airport and now has 30 builder members. They meet at Santa Monica Airport at Claire Walter's Flight Academy on the 2nd Wednesday of every month at 7:30 pm. Squadron 2 has aims similar to those of Squadron 1. It is a builder's support club to provide assistance by builders to builders. Those who have a Rutan registration number are welcome to join. Anyone considering a Long-EZ project is welcome to come visit as a guest. Long-EZ Squadron 2
3021 Airport Ave.
Santa Monica, CA 90405
(213)398-5652 or 454-9877

Scaled needs a Composite Designer

Capabilities required are emphasis on the type of structures used on the Long-EZ rather than the big industry autoclave composites. Ability to do stress and strain analysis, draw structural drawings and then assist in building, are all required.
Contact: Herb Iversen
Hanger 78,
Mojave, CA 93501

FOR SALE

Continental O-200, 1500 hours total time. Running fine when removed from a Cessna 150. No prop strike. $2000 with generator and Slick mags.
Contact: Aircraft Salvage and Parts,
12000 South Prarie
Hawthorne, CA 90250 (213) 973-5153

Lycoming O-235 C1B. 187 hours since major. Bendix mags. Log books $3500
Contact: Max Lopez
811 North High Street,
East Haven, CT 06512
(203)469-0726

Lycoming O-320 -D3G 160 hp. Log book. $3000
Contact: Alan McPherson
P.O.Box 703
San Jose, CA 95106
(408)292-4332

Lycoming O-290-G Converted to -D, 30 hours since major. MA3-SPA carb, mechanical fuel pump, Slick mags,shielded harness and prop flange reinforcement. $2800.
Contact: Jack Huffman
15737 E avd Y-4
Llano, CA 93544
(805)944-4790

Continental C90-16F, 400 hours total time since new with all accessories. $3000
Contact: Jay Warren
(916)622-4115

Lycoming O-235-L2C, brand new, $8300
Contact: Pat Saffron
(216)254-4683

Task Research Fuel Strake Sale!

50 Sets Only, Order by Mail only.
No Phone Orders, No exceptions!
Sale starts November 1, 1983.

~~Regular Price - 16 pcs. $984.00~~
Sale Price - 16 pcs. 884.00

50% deposits required with place of order. No orders will be taken before November 1.

WANTED - VariEze Nosegear strut and fittings. Also parts for landing brake, ailerons, controls etc.
Contact: Tom Wilson
2643 Any Ct,
Duluth, GA 30136
(404)476-3264

SHOPPING

Aircraft Spruce now has in stock the electric cockpit heaters as tested by Mike Melvill in N26MS. Also a substitute for the now extinct Disston Abrader, a handy little tool for sanding and filing glass and foam. Also a new type of spray-lat for protecting plexiglass canopies. We tried it and it works great.

Plans for the NACA flush inlet, for Long-EZ and VariEze. $20.00 for a set of drawings.
Contact: Tim Gehres,
105 Apple Blossom Ct
Orlando, FL 32806
(305)275-7897

Harold "Mule" Ferguson made a video tape of Oshkosh 1983. Lots of EZs $43.00 in VHS or Beta.
Contact: Mule Ferguson
(919)921-3019

A 3D display, processing and plotting program for Apple II graphics. $75.00 with program and documentation, as seen at Oshkosh at the RAF booth.
Contact: Turtle Software
8526 Calmada
Whittier, CA 90605

Aero Record - This is a builders logbook which covers all current requirements for record keeping during construction and can be used as an engine, airframe, propeller log book after the aircraft is flying. The logbook is in ring binder form and new pages can be added as needed. The book was designed by a homebuilder who also happens to work for the FAA inspecting aircraft. This book has been set up so you fill in the blanks and all the information the FAA wants to see is there.
Contact: Aero Record,
6854 Antiqua Way
Sacramento, CA 95831

Progam for the TRS-80 "pocket computer". This program performs the functions of an owner's manual and all calculations, cg, etc. for preflight and flight operations for a Long-EZ.
Contact: Bob Hansen
(213)341-9477

OVERSEAS BUILDERS

For builders in the UK, Graham Singleton has smoked clear canopies for 140 pounds. Also one set of Lycoming Long-EZ cowlings in Kevlar for 180 pounds.
Contact: Graham Singleton
Millthorpe Lane
Holmesfield, Sheffield
England.

European Builders - Dane Kurth has lots of EZ materials in stock, PVC foam, urethane and styrofoam. Fiberglass, UND and BID. Dane can translate plans into German. Also, one Continental C-90 engine. Regular orders to the USA.
Contact: Dane Kurth-Rowe
CH 3292 Busswil
Switzerland
032-842289

VARIVIGGEN NEWS

For the first time there were 3 VariViggens present at Oshkosh. Bernard Duneman from Minnesota flew his SP wing version with a forward sliding front canopy of his own design in. Ken Winters from Oklahoma flew his 180 hp, SP wing version with the spectacular paint job in and Len Dobson flew his standard composite wing 180 hp model in from Texas. To cap it all, these three Viggens flew a three ship fly by in the Oshkosh pattern, what a sight. My own Viggen, N27MS was left at Mojave this year, it was the first Oshkosh since 1978 that she did not fly in. Arthur Schwartz had intended flying his Viggen in, but unfortunately he had a freak accident with it and damaged it severly enough that there was no way to make it.
Arthur reports that on landing, the rod-end bearing on the right main strut (MG34) failed. This allowed the trailing link gear to collapse enough to lock up the right wheel. This dragged the airplane off the runway, where the left main gear and nose gear were torn off. Arthur was shaken up and sustained a few bruises, but otherwise was unhurt. I have since heard from Frank Stites, who recently visited Arthur, that he is repairing his Viggen. Arthur, by the way has over 250 hours on his Viggen.

Frank Stites has completed his Viggen and it looks beautiful. He has the SP wings and a Lycoming O-320 (160 hp) engine and it is ready for first flight. Frank's Viggen weight 1004 lbs. empty. It should be quite a performer!

The Viggen Club list has continued to grow and I believe has made a large contribution to the Viggen builders. I have received copies of quite a few interesting letters that some of the listed builders have written to each other. This is an excellent method of transmitting ideas, short cuts, builder hints and flying info. I strongly encourage anyone building a Viggen to send their name, address and phone number to me at RAF and it will be included on the list. The list is sent out to all on it, each newsletter time.

VariViggen project for sale,
Contact: W.K. Armstrong, jr.
16114 Bougainvilla,
Friendswood, TX 77546
(713)482-0265

LORAN C IN AN EZ?

At Oshkosh this year there was much talk about Loran C in the fiberglass airplanes. There were even a couple of forums on the subject. It is quite obvious to me at least, that there is much confusion amoung even the so called experts. We at RAF, do not have a Loran C in any of our airplanes, but we do receive quite a lot of mail on the subject. Much of this mail is contradictory and even more confusing. Some builders report success by as simple a means as using one rudder cable for an antenna (insulated at the root of course). While this has worked for one or two people, it has been a dismal failure for others. It seems to be a function of how close you live and fly to a strong signal.

The antenna called out in CP 37, page 3 still seems to be the best so far. The big thing appears to be that a ground plane of some kind is required. The larger the ground plane, the better the performance. How to do the ground plane is the trick. Several competent radio specialists are working on this problem and we will report on it as we hear the results. One of the problems, as called out in CP 37, page 3 is electrical interference and anything you can do to shield every wire and any electrical noise source is going to help. For this reason, a Loran C in a VariEze with no electrical system (no starter, no alternator) just a battery and a Nav/Comm with a solar panel to trickle charge the battery, will sometimes work reasonably well, particularly in the vicinity of strong signals. However this may break up and drop the signal in other parts of the country. Obviously the Loran C is the way to go and the sooner someone comes up with a good workable solution to the problem, the better.

Anyone who has a Loran C that works well even on extended cross countries, please let us know and we will try to keep everyone reading the Canard Pusher informed.

PROPELLERS FOR LONG-EZS

Since last newsletter, we have flight tested 7 different props from four different manufacturers. Most of these props work well, keeping in mind that on an airplane as clean as a Long-EZ, any prop is a compromise. After all, we stall at 51 knots and we can indicate 165 knots at sea level. That is a very large speed range for a fixed pitch prop to handle. So, in order to get acceptable take off and climb performance, we have recommended that a minimum of 2400 rpm static should be available. This is done on a gravel free patch of taxiway, brakes locked, full throttle and mixture leaned to best power (max. rpm). Our experience has shown that if you don't have at least 2350 rpm static your take off run will be excessive, particularly at gross weights and even more so at high density airports.

Now at the other end of the scale, if we have our 2400 rpm static, obviously, with a fixed pitch prop, we will be able to over rev the engine at high speed, particlarly at low altitude. Our criterion here has been to accept a full throttle, best power mixture at 7500 feet (MSL) in level flight with 2900 rpm as our optimum goal. This is 100 rpm over the engine manufacturers red line, but we use a very lightweight prop, and out static thrust is half what these same engines see in the factory airplanes they are installed in. We have been running these engines at high rpm and low manifold pressure for a long time, with no problems. So, the optimum prop would be one that turned 2400 rpm static and 2900 rpm at full throttle at 8000 feet. This is a difficult design goal for the prop maker and each one is different. Also each individual Long-EZ is different and a prop that may work perfectly on Mike's Long-EZ may not be as good on your own Long-EZ.

With all of this in mind, and with no intention to try to recommend one manufacturer's prop over another, we present a summary of the results of the tests of these different props. All test were done on N26MS. Choose a prop for your airplane based on your expected flying conditions. If you are based at a short field, or high density airport, you would not choose the same prop as a person who was based at an 9000 feet long runway at sea level who would fly mostly high speed cross country to similar airports. Probably the best bet is to have two props!

Manufacturer	Size	Static RPM	RPM at max power at 7500' MSL
Hendrickson	62" x 66"	2360	2900
B & T	63" x 67"	2300	2920
Sensenich	64" x 72"	2150	2860
Grt American	62" x 62"	2520	2925

There is only a 3 mph true airspeed difference in these four props at the top end. The fastest props turn the highest rpm generally, the best take off performance comes from the prop turning the highest static rpm. All of these props are of excellent quality, but vary considerably in blade design and method of measuring pitch. Leading edges also vary, some have solid polyurethane leading edges which withstand rain erosion very well, others have epoxy leading edges, while others have a wrap of kevlar. All will hold up quite well in rain, if you throttle back to 2400 rpm or so to keep the tip speed down.

Ted's Propellers,
9917 Airport Way,
Snohomish, WA 98290
(206)568-6792

B & T Propellers,
8746 Ventura Ave.
Ventura, CA 93001
(805)649-2721

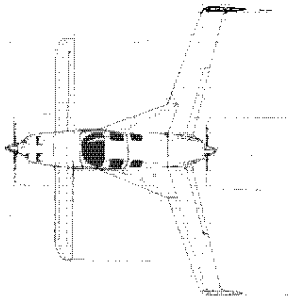
Great American Props
1180 Pike Lane #5,
Oceano, CA 93445
(805)481-9054

John Benjamin Propellers
P.O.Box 216
East Petersburg, PA 17520
(717)569-2687
(Made by Sensenich)

NOTE FROM B & T PROPELLERS

"First of all, let us say many thanks to all of our patient customers. A variety of circumstances during this last year have definitely thrown our prop order list way out of kilter. Since getting so far behind on the orders, we've simply been trying to make propellers for the builders that have notified us that they are close to completion on their airplanes. Knowing many of the orders were from builders who were far from being finished and requiring a prop, we bypassed these in order to get the builders flying that had completed airplanes. Consequently, many of you that ordered a long time ago have not received your props or heard from us lately. We definitely felt an explanation was due all of you and wanted to let you know what is happening. Therefore, we would like to ask you to call or drop us a note when you feel you are getting close to completion so that we can get your prop ready. We apologize for any inconvenience and appreciate greatly the cooperation and understanding all of you have extended to us. Beginning in January, we will be making the props on a full-time basis and should be able to get caught up on our back log in addition to getting back to a decent delivery schedule. Thanks again!

Bruce and Bonnie Tifft."



The following is a letter from Ken Swain on his incident at Oshkosh, 1983. We have printed the letter in its entirity as may be it will help someone in a similar situation one day.

"On August 2, 1983 my VariEze N4ZZ suffered a total power loss over Lake Winnebago and was substantially damaged in the ensuing off airport landing. Since it happened at the EAA Convention, there were a lot of stories that were semi-correct floating about. I would like to give the complete one to C.P. for dissemination along with my personal analysis of the apparent causes. Also, while I in no way consider myself the world's most experienced pilot, I do believe that my recurrent emergency training as an active duty, current Air Force pilot gives me a perspective on emergencies not held by the average private sportsman pilot. Hopefully some of the low time EZ drivers can get some food for thought from my actions.

THE FACTS: The flight before the ill fated one was the Oshkosh 500. During the race I noticed that the fuel flow would occasionally drift up from the set 6.4 gph to 9.5 gph. Since additional leaning had no effect I concluded that my Compucruise had swallowed a few bad electrons and would have to be looked at after the Convention. Each drift up episode lasted only 15-20 seconds. I completed the race, bought 9.5 gallons of gas, and 2 hours later took off in a flight of 10 race aircraft to return to the Convention as the beginning of the pre-airshow. We were on downwind, over land, within landing distance of the field when we were sent to a VFR holding pattern over Lake Winnebago. Five to ten minutes later we were cleared for approach and we headed for the field. I soon reduced power to idle to slow to gear lowering speed, got the gear down, then left power back until I hit pattern speed. When I advanced the throttle there was no repsonse. Tach showed windmilling RPM and all temperatures and pressures were in the green. My position was approximately 1 1/2 to 2 miles from shore over the lake at 1000 ft agl at 100 mph. I immediately initiated a turn towards the closest land while switching to the header tank. I then raised the gear and slowed to best glide for my aircraft. While cycling mags, mixture, and throttle I made my first of two terse unanswered radio calls: " 4ZZ has lost power over the lake and is attempting to reach the shoreline just south of Oshkosh". By this time I was 1 mile from shore and the prop had stopped. A cornfield was the only area that wasn't wet, hard (trees, houses, wires) or full of people that was clearly within my small energy envelope.

I kept my eyes on it while I made my last airborne call: "Hey people, listen up. 4ZZ has lost power over the lake and is headed for the shoreline just south of Oshkosh". There was a strip of grass running through the field so I decided to try for it. I cleared the 75 ft. tall trees at the shoreline by about 20 feet, lowered my gear again and made a left turn to line up with the length of the cornfield. Just prior to touchdown I slowed to between 50 and 55 mph indicated, a speed I have often flown during flight tests. As I touched down it turned out the ground beneath the grass was not level and the grass to my left was taller. The left main then failed tortionally, pulling the nose left, causing the aircraft to enter the corn. The nose was now pointing 45° to the left of the motion vector. The aircraft wound up on the nose and right main gear. The monentum continued the rollover on the right canard tip and wing tip. The canopy shattered as I hit the ground inverted. The aircraft came to rest on the rollover structure and the remains of the rudder tips. The nose of the aircraft was pointing 90° to the left of the direction of landing. I was about 100-150 yards from the lake, hanging in the straps, trapped in the wreck. I dug my head set out of the dirt where the front of the cockpit used to be and got off one call to Johnny Murphy who was circling overhead, to let him know I was ok. Then I smelled gas so I shut off the master.

AIRCRAFT DAMAGE: Besides the rudders and canopy, the main gear strut is failed tortionally on the left and right sides. The right gear attach is 100% intact. The left tabs and attach are intact but the pad layup has separated from the strut on the front half. The motor mount failed in tension at the first welds at each bottom corner; the aluminum extrusions are intact. Wings are intact. The right strake tank is separated from the spar all the way around and leaking freely. The left tank appears to have held, with minor fill cracks. Compression damage done to the inboard rib of the right aileron by the cowling are intact. Seat belts and attach are 100% intact. The forward fuselage sides and top will have to be completely rebuilt from just infront of the instrument panel forward. Nose gear, strut and box are intact. F28 is broken in two places. F22 broke in 6 places. The top right longeron is crushed. The canard lift tabs are twisted and the outer left of the right tip will have to be replaced. The possibility of damage exists in the canard center spar but I have yet to strip the cover off the canard center to inspect it.

POST CRASH INVESTIGATION: When the wreck was pulled off the trailer used to get it back from the cornfield, the engine started on the fourth blade and ran strong. After shutdown a small but steady stream of fuel ran from the carburetor. Tapping on the bowl eventually made it stop. Later, with representatives of both the FAA and NTSB present, the fuel system and carburetor were disassembled and inspected. There was some sand in the VA-6 fuel filter. There were a few infintesimal slivers of teflon tape and a small amount of fine sand in the carburetor bowl. Less than 200 gallons of gas had been run through the system since cleaning at annual on June 30. The needle valve was clean and free and the float was undamaged. There was extensive fuel staining of my brand new ram air elbow.

MY ANALYSIS OF THE CAUSE: First, I totally rule out carb ice. I have 800 hours experience with my Lycoming and have only had it ice a couple of times in the most severe carb ice conditions. What I believe happened was this: One of the four F80's that I bought fuel from after my annual passed some sand along with the fuel. Some of that sand eventually made it through the filter and was intermittantly preventing my needle valve from closing completely. The teflon tape shreds could also have done it but there were only 3 of them and there were lots of grains of sand, 300 to 400 grains. Under pressure from the fuel pump the bowl would then overflow out the atmospheric vent, into the elbow. I believe the high fuel flows I noted during the race were grains of sand in the process of passing the needle valve. Since the power setting was high, the engine just ran a bit rich for a short while. The worst case would be to experience a needle valve clog at the moment of quickly reducing power to idle. The engine would then flood since fuel pump out put is proportional to prop rpm, not power demand. It would be so loaded up that it could take quite a while to clear, certainly more than the 15-20 seconds of windmilling prop time that I had.

Other support for this view: The stream of gas from the carb after shutdown and the fuel stains on the elbow where 2 hours earlier there were none. Also, at the completion of the Oshkosh 500, Gene Sheehan looked at my exhaust stakes and commented on how lean I must have been running the race since they were almost white on the inside. After the crash and at most 10 to 15 minutes of flight, they were heavily caked with black soot.

MY ANALYSIS OF MY INFLIGHT ACTIONS: In retrospect, I feel I did a few things wrong and a bunch of things right handling the inflight portion of my emergency. My biggest mistake was not turning off the master before impact. I should have. My biggest correct action was not even a concious one. Both the military and FAA part 121 operations require seat belts and shoulder harness to be worn by flight crew for all takoffs and landings. My habit is to always keep them both on. I loosen, but never remove, the harness only once in a great while at high altitude cruise. Had I not had a tight seat belt and shoulder harness, I would be dead! Instead I walked away from a pretty spectacular crash literally without a scratch.

Other "right actions": My immediate turn towards shore at the first hint of trouble. 2. My immediate raising of the gear. 3. My immediate switch to the header tank which 4. allowed the rapid, and correct, decision that the engine wasn't coming back; this prevented me from wasting precious energy/altitude on keeping the prop windmilling. 5. My rapid attaining of best glide speed for my airplane as determined by flight test. 6. I picked out the only field that I was certain I could make and never let it out of my sight. Remember, I cleared the trees by only 20 feet from almost 2 miles away. Had I omitted any one of the above actions, I probably would have hit the trees or lake. Cornfields are rough on airplanes, but not nearly as rough as trees or water at high speed.

Some additional right actions: I devoted my full attention toward stabilizing the situation before giving any thought to a radio call. I also got the aircraft as slow as I had been able to demonstrate good control in flight test before touchdown. Another very important action was the relowering of the nose gear before touch down. Judging from the damage to the gear doors and paint abrasion on the strut, grass drag (=slow down help) on the strut was significant. Had it not been down, I probably would have gone over at 50 mph vs. 20 mph.

My last correct decision was to leave my seat belt buckled when the 160 lb. fireman said "OK, unbuckle the belt". About 15 people had lifted the airplane, still inverted, about 5 feet off the ground. I said to him, "Are you ready to have 215 lb. come tumbling down on your head as soon as I open it?"

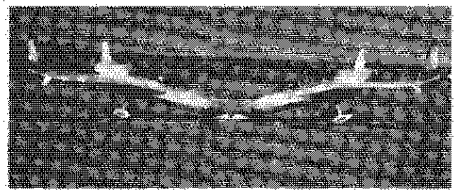
He said, "Wait a minute", and got another fireman to help. I could just see me surviving the crash unscathed only to break my neck in the rescue!

SOME FINAL THOUGHTS: Thanks Burt, for designing a super strong airframe and especially a super strong rollover structure. Without it I would have been severly injured or worse. The TV newsman asked if I was scared. I told him that I was too busy doing my job, flying the airplane, to be scared. Every military flight manual I've ever used has virtually the same basic instructions for handling any emergency:

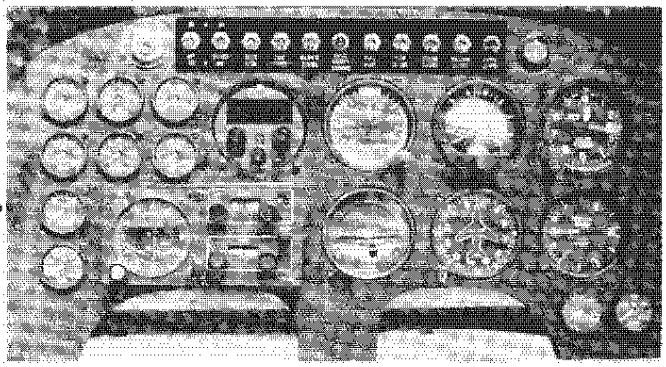
1. Maintain aircraft control
2. Analyze the situation
3. Take corrective action.

Nowhere does it say to wring your hands, go berzerk yelling for help on the radio, or to contemplate your navel. The only person who can help you out of your hard spot is you, and you won't be any good whatsoever to you if you don't keep a calm, clear mind and concentrate on the business at hand.

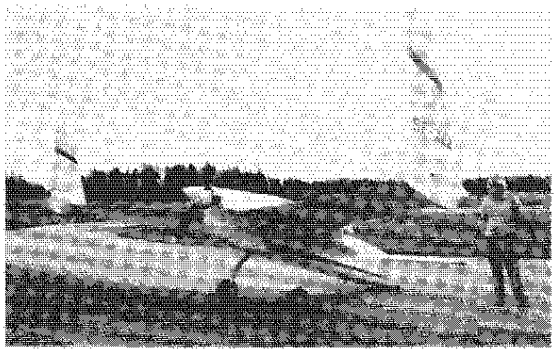
Ken Swain"



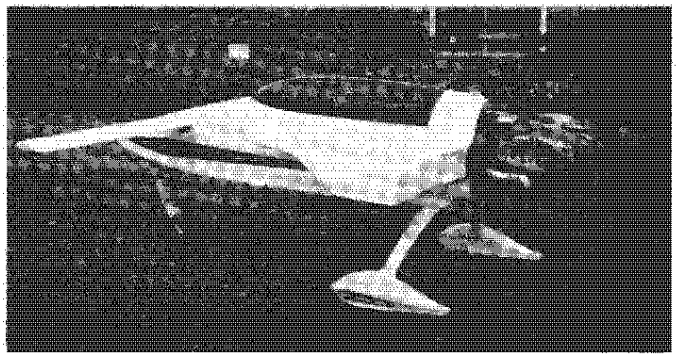
Twins! Co-winners of the Designers Award at Oshkosh, 1983. Don Prestin and Don Shaw, both of Santa Rosa, CA. Congratulations!



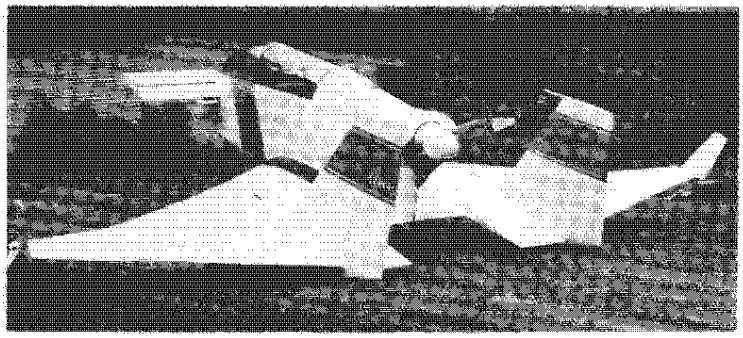
Herb Sanders shows what can be put on a Long-EZ panel. 1 1/2" instruments are: EGT, oil pressure, tachometer CHT, oil temp, manifold pressure, fuel pressure, OAT. Transponder is an RT887 & Nav Comm is an RT563A. Herb sells these miniature engine instruments by B & D.



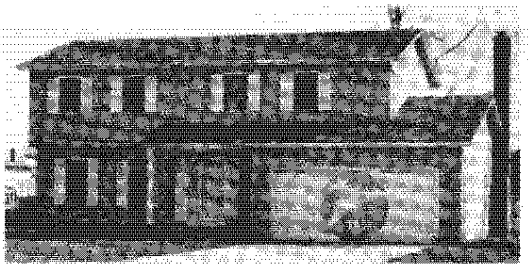
Stig Sall, proud owner/builder of the first Long-EZ to fly in Sweden.



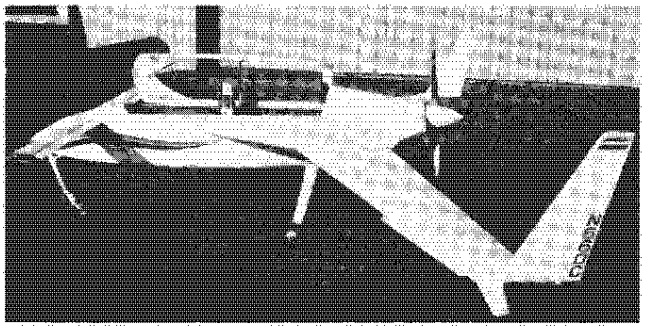
Don Foreman's beautiful Long-EZ ready to go to the airport. This is the first Long to fly in England and it has a Rolls Royce Continental O-240 130 hp engine!



VariViggen. Frank Stites has it ready to take to the airport. Looks great!



Now this is going too far! Steve Palun, Amherst, OH. Wonder what he is building?



Newest VariEze to fly, Jimmy Cox, Fort Smith, Arkansas

The Wayne Woolway family in the now classic pose, first flight around the yard. Good looking workmanship.

DEFIANT

HOMEBUILT FOUR-PLACE TWIN

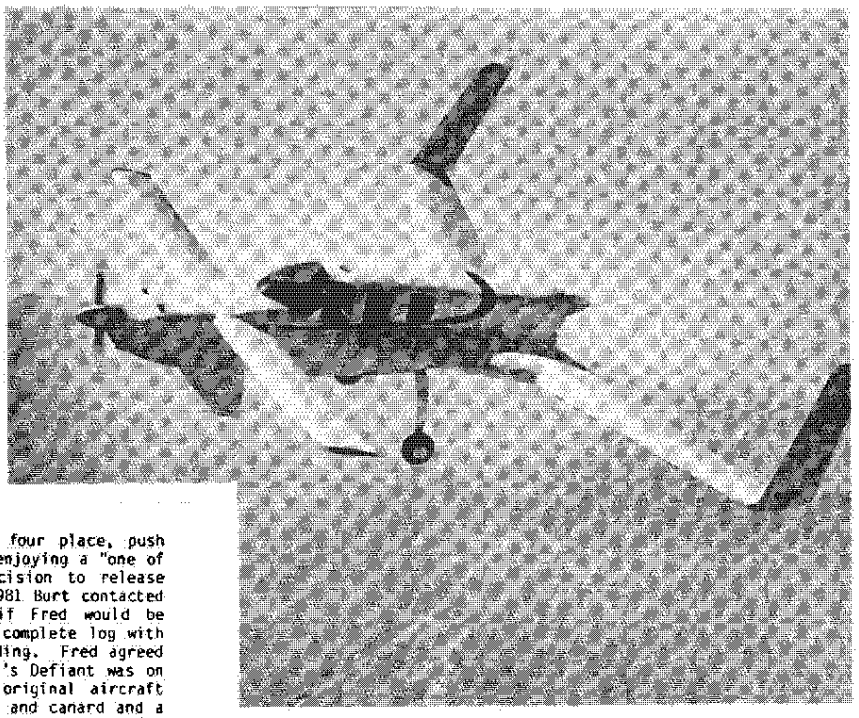


Photo by Don Downie

Introduction

For some time you have been reading about the four place, push pull twin engine Defiant. After five years of enjoying a "one of a kind" aircraft, Burt Rutan has made the decision to release Defiant drawings to the homebuilder. In late 1981 Burt contacted Fred Keller of Anchorage, Alaska and asked if Fred would be interested in building a Defiant and keeping a complete log with updated drawings and photographs as he was building. Fred agreed and at the EAA convention in Oshkosh 1983, Fred's Defiant was on display. Some changes have been made to the original aircraft such as, an increase in span on both main wings and canard and a revised aileron for lighter control forces. The back seat folds forward for a 'station wagon' effect that allows two people to use the baggage area for sleeping. The canopy opening has been improved for easier entry. The fuselage has been changed to allow more head room for the back seat passengers.

Fred Keller is now completing the detailed plans for the Defiant. These will be available from RAF in March 1984. The builder support will be from Fred for plans interpretation, and from RAF for general 'how to' on the construction.

Description

The Defiant is a four place, canard-type twin with two 4 cylinder Lycoming engines. Engine power can be 150, 160 or 180 horsepower per engine. It's canard configuration provides several important benefits as compared to conventional twins; (1) Packaging is considerably more efficient - it has a standard-size cabin in an airframe whose whetted area is only 60% that of a conventional light twin. (2) The smaller airframe also has reduced structural load paths allowing a structure much lighter than a conventional twin while having better durability and a higher 'g' capability. (3) The tandem wings allow natural aerodynamic angle-of-attack limiting, thus, the airplane is stall resistant. (4) The tandem wings, using winglets for directional stability provide a 30% reduction in induced drag compared to a conventional aircraft with the same span loading. (5) Flight control systems are simpler and lighter. Elevators are only two feet from the control sticks and they provide a flap effect without having separate flaps, thus, at low speed the canard has a deflected full span slotted flap, yet the pilot has no flap control to adjust.

The rudder is only one foot from the pilot's rudder pedals. It is designed to provide control, yet have no effect on stability. Ailerons on the aft wing are controlled from their inboard end such that the entire wing and vertical fin assembly is built without any moving parts.

The small chord elevators and ailerons allow control forces compatible with a side-arm control stick. This allows more precise, less fatiguing control and provides improved use of primary instrument panel space.

Instead of the complex electrical system with one buss and battery tied to two alternators, the Defiant has two simple separate electrical systems, each with its own battery and alternator. IFR avionics are split to both systems so that no single failure can effect essential equipment. Both engines can be started simultaneously. The two systems can be tied together to run all equipment from one alternator in the event of a failure. Also, a low battery can be charged by the other engine without ground electrical equipment. Thus, the electricals are much like conventional fuel systems, i.e., completely independent but with "crossfeed' available in an emergency.

The fuel system consists of a 58-gallon tank with a large sump for each engine. The two systems are independent and require no pilot action for normal operations. Crossfeed is available. The sumps are accurately gauged and are equipped with low level warnings, such that when 45 minutes fuel remain the pilot not only has a warning light, but has a gauge that moves full scale for the last 45 minutes fuel. He can then intelligently plan his options when fuel is low, knowing quantity to within 1/3 gallon of fuel. The last one half gallon of fuel can be used in all normal attitudes.

While appearing small outside, the Defiant is quite roomy inside. It has a cockpit width at the elbows of 46 inches (43 inches at rear seats). Knee and leg room for the backseats is a full eight inches more than current light twins. The Defiant has a large baggage area aft of the back seat and even larger if the back seat is layed flat. Two six foot people could use this area to sleep in. The unique semi-supine seats provide a significant advantage in comfort over conventional seats. With a conventional seat, the upright pilot carries all his weight on the buttocks and small portion of the thigh. The Defiant's seat is reclined a full seven degrees more and armrests and headrests are provided for all seats. Thus the body weight is distributed over the lumbar, forearms, thighs and head, rather than being concentrated in the tailbone area. In general, a person who normally finds himself fatigued after a two to three hour flight, will be comfortable even twice that long in a well supported reclining seat.

The side arm controller and throttle system places the pilot's arm in a more natural position while flying and frees his lap area so he can use an airline type lunch tray for maps, approach plates, computers or lunch. Space efficiency and panel visibility is considerably increased when the control wheels are eliminated.

The aircraft is very basic in its systems. It will never require maintenance nor have an AD issued on its flaps, retractable main gear, cowl flaps, governors, hydraulic system, oleos, stall warning, nor emergency gear extension system, since these were eliminated in the basic design. The remaining systems (flight controls, power plant installation, electrical system, fuel system, etc) are all very basic and simple compared to the conventional light twin. This saves weight, reduces maintenance and increases availability and reliability.

Visibility, particularly in the pattern, is superior to current light twins. The canard wing is at approximately the same height as the nacelles on a Seneca II. Forward downward visibility is adequate over the canard during normal climb, approach and landing flare. Absence of a wing above or below the cockpit area results in a welcome improvement in visibility over conventional aircraft.

Flying Qualities

Flying qualities are conventional with the following exceptions: (1) Spiral stability is positive and speed stability is high, such that the aircraft flies "hands off" indefinitely once trimmed, even in turbulence. (2) There are no pitch or roll trim changes due to configuration or power. Once trimmed at approach speed it will hold that speed hands off during power changes and landing gear extension. The airplane is very stiff in yaw with high damping. Yaw oscillations damp in one to two cycles after a side slip release, as compared to three to six cycles for a conventional light twin. Roll rate is excellent. Adverse yaw is low enough that all normal maneuvering can be done with "feet-off-pedals" resulting in less than one-half-ball yaw excursions.

The Defiant is a very stable IFR platform with a very solid "big airplane" feel. It holds a desired approach speed with less attention than a conventional light twin.

Performance

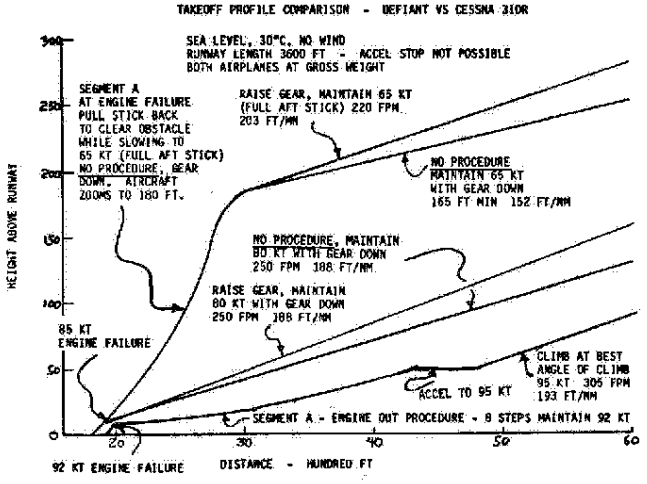
In general, simplified systems means reduced performance. Not true for the Defiant. Overall performance and efficiency is significantly better than conventional light twins. Data discussed below are for 160 BHP engines. Time-to-climb to 12,000 feet is 10.3 minutes with full fuel and four adults and 7.7 minutes with two adults and 400 nm fuel. At maximum cruise speed of 184 knots (75% power), total fuel flow is only 17.8 gal/hr giving a 1.74 nm/lb economy and a range of 1044 nm with reserves. At 55% power (168 knots) total fuel flow is 13.9 gal/hr giving 2.00 nm/lb economy and a range of 1208 nm with reserves. At low cruise (40% power, 150 knots) range can be stretched to over 1300 nm with reserves. At equal loading and speeds, Defiant gets over 50 % more miles per gallon than a conventional light twin! Holding capability is also impressive. At medium weight Defiant can remain aloft on only 40 thrust horse power (64 brake hp) for a maximum endurance of over 14 hours. The excellent two-engine climb capability allows cruise altitudes as high as 18,000 feet with 4 adults and full fuel. The prototype has climbed above 28,000 feet at light weight, single place. This climb capability is far in excess of similarly equipped light aircraft. (Fixed pitch prop and no turbocharger).

Single Engine Capability

In contrast to all other light twins, in which after engine failure a many-step procedure must be accurately followed during which aircraft control and airspeed control are critical, the Defiant makes no demands on the pilot to follow procedures. He can even use any excess airspeed over the minimum full-aft-stick speed to zoom over an obstacle. Once over the obstacle he can maintain aft stick and climb away (single engine) or accelerate without altitude loss to best climb speed. This unique capability is best shown by comparing the Defiant's takeoff profile with that of a conventional light twin (figure I). Both airplanes are at maximum gross weight. Both aircraft experience failure of the critical engine at 10 foot height. Neither aircraft can land and stop in the remaining runway, so they must continue the take off. The conventional twin pilot must immediately do the following: (1) raise gear (2) identify failed engine (3) retard throttle on failed engine (4) cutoff mixture on failed engine, (5) feather failed engine, (6) bank five degrees toward operative engine, (7) carefully raise flaps, (8) Maintain 82 KIAS to 50 foot altitude. After 50 feet (accel-go procedure) he accels to best angle of climb speed (95 knots) and thus, does the best he can do to clear any obstacles. Height-distance profile for this is shown as the lower line in Figure I. Note that even though his eventual climb gradient is adequate (193 feet per nautical mile) the 310 is nearly 4500 feet from brake release before reaching the 50 foot height, and that unless airspeed control and procedures are accurate he will likely crash during this climb segment.

The 310 is one of the best light twins to perform this profile. The "light-light" twin types will either have less performance or will strike the ground during segment A.

The other lines on Figure 1 represent the performance obtained by the Defiant for several conditions. The lower lines are obtained if the pilot elects to fly at the best single engine rate-of-climb speed. Note that if the pilot does nothing but maintain airspeed he will clear the 50-ft obstacle at 3300 feet, even with the gear down.



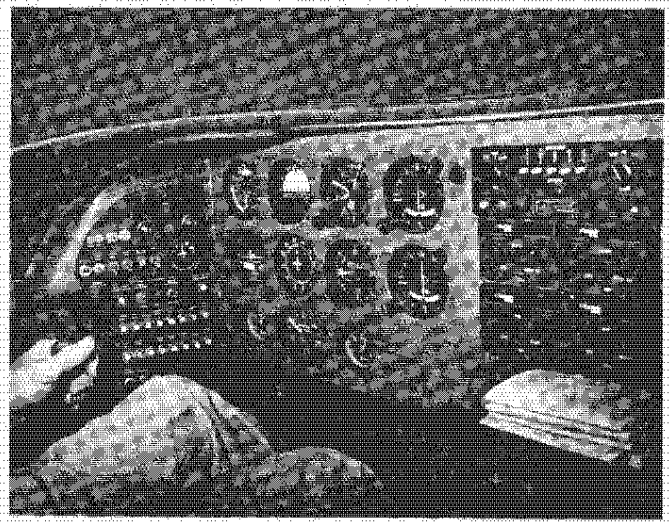


Photo by Don Downie

The upper lines on Figure 1 indicate an even more interesting capability of the Defiant. Suppose a tall obstacle exists at the end of the runway. The Defiant pilot can pull back the stick to zoom over the obstacle, even slowing to his minimum speed of 65 knots. After clearing the obstacle he can merely hold the stick aft and safely climb away even if he leaves the gear down (no procedure). If any conventional light twin attempts this, an accident will result, since, they cannot climb when near min control speed or stall speed. If desired, a standard rate turn can be initiated following an engine failure during lift off at gross weight.

Specifications and Performance (with 160 BHP engines, fixed Props).

Engines (2)	Lycoming O-320
Seats	4
Basic Empty Weight	1600 lb.
Equipped Empty Weight	1680 lb.
Equipped useful Load	1270 lb.
Gross Weight	2950 lb.
Fuel Capacity	115 gallons
Span	31.4 feet
Wing Area	133 ft.^{2}
Wing Loading	22.2 lb/ft^2
Power Loading	9.2 lbs/hp
Payload with full fuel	660 lbs.
Max Cruise (70%)	184 knots
Fuel flow at max cruise	17.8 gph.
Range at max cruise(45 min reserve)	1044 nm
Economy Cruise (55%)	168 knots
Fuel flow at economy cruise	13.9 gph.
Range at economy cruise (45 min reserve)	1208 nm
Climb Rate (2950 lbs)	1500 fpm
Climb Rate (2220 lbs)	1900 fpm
Single Engine climb (2950 lb)	310 fpm
Single engine service ceiling (2950 lb)	6500 ft.
Single Engine Climb (2200 lb)	550 fpm
Stall Speed (2950 lb)	64 knots
Stall Speed (2200 lb)	58 knots

Cost and Time to Build the Defiant

The cost of the materials list has not been completed at this time, but we estimate the cost of building the Defiant will be approximately "two Long-EZs", between $20,000 and $30,000. Remember that avionics can cost you as little as $1000 or as much as you wish to pay.

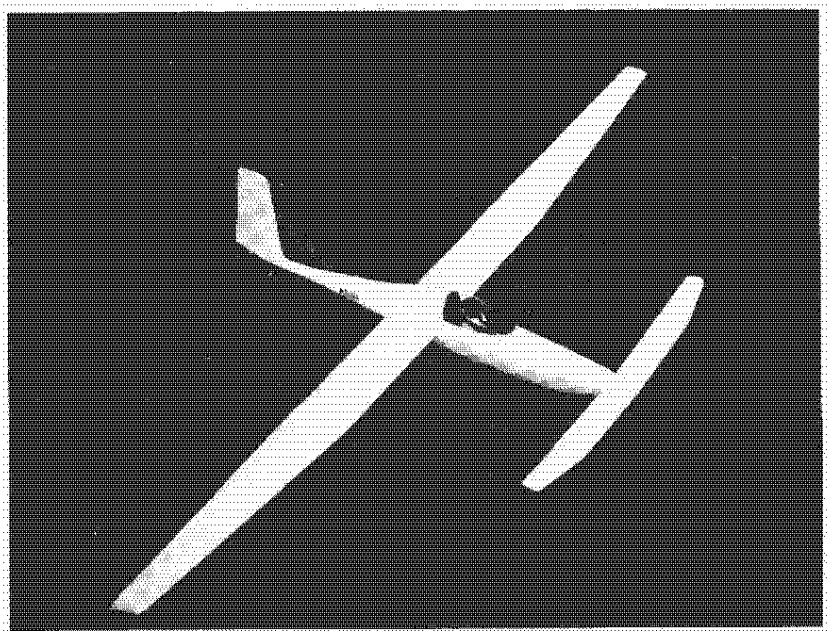
Time to build the Defiant, again will be "two Long-EZs" as it is the same type of construction, just more. A competent builder can build a Defiant in as little as 2000 man hours. Until the plans are completed, it is difficult to say how many of the parts will be available prefabricated and this would make a difference to the time to build.

	U.S.A.	Overseas
Canard Pusher Newsletter	$ 6.75	$ 8.75
Defiant Plans - Section I	$490.00	$510.00

Defiant Engine Installation . . not available at this time.
Defiant Owners Manual . . . . . not available at this time.

SOLITAIRE —

A Self-Launching Sailplane



THE PROBLEM

For a long time soaring has been an exclusive sport requiring a special license and training. Soaring in a glider of enough performance to allow the average pilot to feel the true thrill of 'engineless' flight has been expensive enough to severely limit the number of people who enter the sport. The current interest in ultralight and light sport aircraft has reached an all-time high.

THE CHALLENGE

The Soaring Society of America recognized the problem. Other segments of homebuilt aircraft were experiencing great interest and activity on the part of designers and the general public. The sailplane market was not getting its share of the attention. To correct this, the SSA issued a challenge in the form of a contest. Develop a self-launching sailplane capable of take off and the ability to climb to altitude without the use of a tow plane. The new design could be flown without the special license required of a sailplane pilot, just a private pilot's license. The aircraft must be easy to fly, as well as quick and easy to build. Strict rules were set up and an actual structural test of the finished aircraft was required. The Solitaire was designed around these goals and achieved these and more.

THE WINNER

At the flyoff held in Tehachapi, California, on September 6, 1982, the judges studied the entries, flew the SOLITAIRE and unanimously declared it the winner.

WHAT

The SOLITAIRE is a single-place self-launching sailplane that is fitted with an engine package that folds into the nose of the aircraft after it pulls the SOLITAIRE to soaring altitude. With the engine folded, it has a L/D of 32 to 1 giving it true soaring capability. The engine can be deployed and restarted inflight using its electric starter. The canard concept results in high resistance to inadvertant stalls and spins. Its 'spoilflap' descent control system has been acclaimed as "excellent" by all evaluators, providing crisp, variable glide path control without trim upsets. Unlike conventional sailplanes the pilot sits within the allowable cg range.

HOW

The SOLITAIRE uses the proven materials and methods pioneered by Burt Rutan and used in the VariEze and Long-EZ, two of the most successful aircraft ever designed for the homebuilder. The wings are special uni-directional fiberglass cloth and epoxy resin. They are built using the moldless composite technique developed in the VariEze and consist of prefabricated 'S' glass spars and a solid foam wing core. The fuselage comes as two prefabricated halves. The bulkheads are available prefab and the wooden fixtures and templates will be available premanufactured. The canopy comes installed in the frame and the turtle deck is available prefabricated. All of the metal parts and complete landing gear components are available premachined. The pre-molded parts are of aerospace quality. Construction consists of prepreg fiberglass skins with a honeycomb core and an adhesive film to bond them together. These parts are then vacuum bagged and cured in an oven. In short, this aircraft will have more prefabricated parts than any previous design from Rutan Aircraft Factory. Of the available prefabricated parts, the builder can buy all or as few parts as he wishes. We estimate that an average builder, purchasing **all** the available parts could build the aircraft in 400 hours at a cost of between $7000 and $9000. When the quality of the parts and the ease of building is considered the value of the SOLITAIRE becomes apparent.

SUPPORT

Rutan Aircraft Factory support has been a key factor in the history of success with homebuilt aircraft. When you buy plans, you become one of a family of builders. Rutan Aircraft prides itself on its builder support program. We will answer questions either by phone or in writing. Builders are also welcome to bring parts to Mojave for inspections and advice. The quarterly newsletter is mandatory when you are building, as it provides continuing builder hints, ideas and plan updates.

ALL RAW MATERIALS.

Near Los Angeles.
AIRCRAFT SPRUCE
201 W. Truslow, Box 424,
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(619) 870-7551
Catalog $4

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WICKS AIRCRAFT
410 Pine Street,
Highland, IL 62249
(618) 654-7447
Catalog $3

ALL PREFAB MACHINE PARTS.
KEN BROCK MANUFACTURING
11852 Western Ave., Stanton, CA 90680
(714) 898-4366
Catalog $3

PREFAB FUSELAGE, CANOPY, TURTLE DECK, WING SPARS, SEAT PAN.
TASK RESEARCH
848 East Santa Maria, Santa Paula, CA 93060
(805) 525-4545

SPECIFICATIONS
SOLITAIRE - RAF Model 77-6

Empty Weight	380 lbs.	Fuel	5 gal. premixed @ 40:1
Gross Weight	620 lbs.	L/D	32/1 at 50 knots
Total Wing Area	102.44 ft.²	Min. Sink	150 ft./mn @ 40 knots (approx.)
Span	41.75 ft.	Descent Control	Spoilflaps usable to V_{ne}
Wing Loading	6.05 lbs./ft.²	Min. Flying Speed	32 knots
Engine	KFM 107E	V_{ne}	115 knots
BHP	23 at 6000 RPM	CG	unaffected by pilot weight

SOLITAIRE DOCUMENTATION

Canard Pusher Newsletter published quarterly.
One year's subscription ..... $ 6.75
Section I - Manufacturing Manual $225.00

This is the complete education and construction manual for building the entire SOLITAIRE except for the engine installation. This manual consists of a spiral bound book 11″ × 17″ together with a set of 23″ × 33″ drawings, which include all necessary full-size templates, jigs and cross sections.

Rutan Aircraft Factory, Inc.
BUILDING 13, MOJAVE AIRPORT
MOJAVE, CALIFORNIA 93501
TELEPHONE (805) 824-2645

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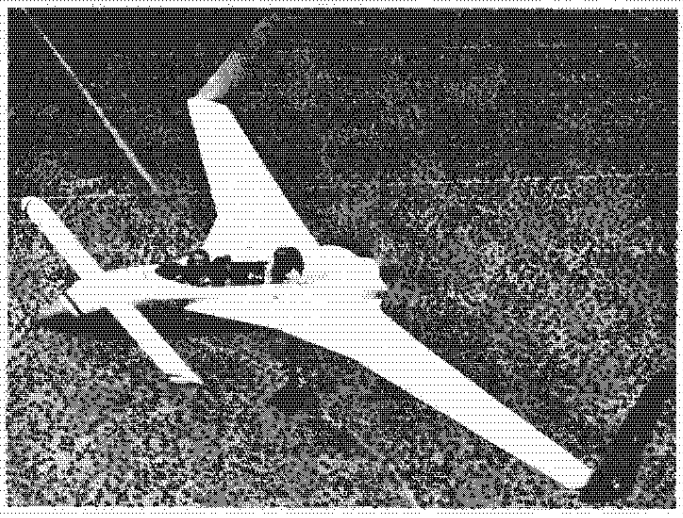
LONG-EZ

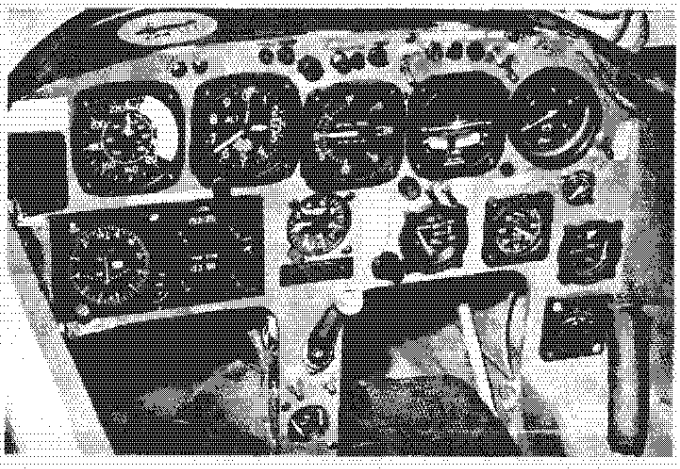
FAST

EFFICIENT

HIGH UTILITY

LONG RANGE





THE AIRPLANE

The Long-EZ is a small, high-performance, high utility homebuilt sportplane. While recommended mainly for day-VFR operation, competent pilots can also equip it for night and IFR flying. The recommended power plant is any model of the O-235 Lycoming. Note that a mechanical fuel pump is required. It has an alternator-powered electrical system and can be equipped with electric engine starter. Its cockpit layout is designed to complement pilot work load, with throttle, mixture, carb heat, pitch trim and landing brake controls on the left console and side-stick controller on the right console. Seating provides correct armrest, lumbar, thigh, and headrest support allowing "recliner-chair" comfort not found in conventional aircraft seats. This allows long, fatigue-free flights. The inboard portion of the large wingstrakes are used as baggage areas, accessible from the front and rear cockpit. These, combined with special suitcases and three other storage areas, provide nearly 10 cubic feet of baggage room.

The airframe structure is a sandwich of high-strength fiberglass facings with a core of rigid closed cell foam. Extensive use is made of the new type R45 PV core foam (poly vinyl). The facings are laid up directly over the shaped core, thus expensive tooling is not required. Flying surfaces are full-core, reducing complexity, increasing contour stability, and improving corrosion resistance. As compared to conventional metal and wood, composite sandwich structure offers less construction time, more uniform stresses, improved fatigue life, better environmental resistance, and increased surface durability.

TRAVELING MACHINE

At last, an airplane that is specifically developed for efficient, high speed, long range traveling with room for two adults and plenty of baggage. Fuel allowance with two adults is 41 gallons. Single place, you can carry 52 gallons. If you're in a hurry, you can cruise at 75% power at 8000 feet at 189 mph (164 kts) burning 6.6 gallons per hour. This will take two of you from Los Angeles to Seattle or Chicago to Daytona Beach non-stop (965 miles) in 5.1 hours with one hour fuel reserve. If you're not in a hurry, you can cruise "economy" at 12,000 feet at 146 mph (127 kts), burning only 3.6 gallons per hour. This will take two of you from New York to Dallas non-stop (1430 miles) in 9.8 hours with a 1.5 hour fuel reserve. Single place, using the entire 52 gallon fuel capacity, stretches the maximum range and endurance to over 2400 miles and 23 hours!!

UNUSUAL EFFICIENCY

The Long-EZ uses the very latest aerodynamic technology, combining winglets, a high aspect-ratio wing with Eppler airfoils optimized for efficient cruise, and a configuration with far less wetted area than conventional airplanes. As a demonstration of its efficiency, our prototype with a large rear-seat fuel tank flew over 4800 miles, setting a world's distance record, and landing with enough fuel to surpass 5000 miles. At that, its capability was not taxed — its initial climb rate was over 600 ft/mn! At light weight, it climbed to 27,000 ft. in still air — an altitude unheard of, for a fixed-pitch, non-turbocharged airplane. Our Long-EZ is so efficient, the engine can be shut down while at 5 foot altitude over the numbers at only 120 knots, then it can pull up, fly a 360 degree pattern and land on the same runway — completely without power! Its power-off glide angle is only 3.7 degrees — thus a belly mounted drag device (landing brake) is used for landings.

SUPERB FLYING QUALITIES

Development of the Long-EZ included flight testing of many refinements to optimize flying qualities. It is a very solid, stable airplane that has responsive ailerons, good turbulence response, excellent "hands-off" stability and docile stall characteristics. It resists stall or spin even when maneuvered sharply to full aft stick. Flight tests show the prototype to be free from stall departures and spins for all type of entries, including tailslides. Climb is excellent, even at the full-aft-stick speed. Trim changes due to power, gear retraction or landing brake are all very small. Its wide cg range allows a large range of pilots or passengers weighing up to 250 lbs.

The Long-EZ's approach and landing speed are 75 mph (65 kts) and 60 mph (52 kts) at normal landing weights. The approach and landing are docile and conventional. Forward visibility is excellent even during a "full stall" touchdown — a considerable improvement over our earlier VariEze.

THE HOMEBUILDER SUPPORT

The plans are a literal education in using the materials and is a detailed step-by-step guide to construction using an illustrated format not common in aircraft plans. The Rutan newsletter, the "Canard Pusher" published since 1974, updates plans, provides building hints, etc. Complete Owners Manual provides all necessary information for initial testing and for normal emergency operations. You may call, write or bring parts in for inspection at any time.

THE TEST PROGRAM

The test program was probably the most extensive and successful ever conducted on a homebuilt. It included basic flight tests for flying qualities, performance and systems, spin and dive test to FAR Part 23 requirements, static load test and landing gear drop test exceeding Part 23 criteria, environmental/thermal tests on structural materials/components, manufacturing methods testing and many others.

COST AND BUILDING TIME

The complete package of raw materials available from the two distributors listed, including all fiberglass, epoxies, foams, fillers, sheet metal, tubing, hardware, controls system materials, plumbing, tires, wheels and brakes cost about $3600. Any of these items can be purchased separately. We strongly recommend that you get the distributors' catalogs to familiarize yourself with the materials. A complete bill-of-materials is in the plans.

Many other prefab parts ranging from main gear, nose gear, propellers, cowlings, canopies and welded engine mounts to small aluminum brackets and bushings can be purchased from the listed distributors. All those prefab parts cost approximately $3000 — and using them, the competent builder can build a Long-EZ in as little as 1000 man-hours. The budget-minded builder may elect to build most of these prefab parts himself, using the drawings in the plans. His building time would exceed 1500 hours and he would save most of the above costs of the prefab items. Contact the distributors for their catalogs showing available prefab parts. These are also listed in the plans bill-of-materials.

Engine costs vary widely. Our prototype has an O-235 Lycoming, that had 1400 hours when purchased, for $1,500. It has 600 hours to overhaul and will be worth then, about what we paid, thus this is a very economical way to go. Newly overhauled or new engines can cost from $3000 to $6000. Engine accessories, such as instruments, prop extensions, etc. cost about $500 to $700.

In summary the total cost can run from $6000 for a basic airplane with a ¾ runout engine and owner-built prefab parts, to $14,000 for everything available purchased and a zero-time engine. IFR avionics can add from $2,000 to $15,000 to those numbers, with many options available.

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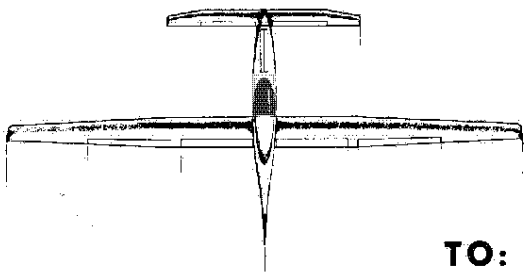

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October '83

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