

THE CANARD PUSHER

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If you are building a VariViggen from 1st Edition plans you must have newsletter 1 through 47. If you are building from 2nd Edition plans you must have newsletters 18 through 47. If you are building a VariEze from 1st Edition plans you must have newsletters from 10 to 47. If you are building a VariEze from 2nd Edition plans you must have newsletters from 16 through 47. If you are building a Long-EZ you must have newsletters from 24 through 47. If you are building a Solitaire, you must have newsletters from 37 through 47. If you are building a Defiant, you must have newsletters 41 through 47.

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

PLEASE NOTE: BUILDER SUPPORT IS ON TUESDAY AND FRIDAY FROM 8:00 am to 5:00 pm ONLY. If you have parts that you would like us to see and or would like to drop in, please make it Tuesdays and Fridays if you can. If you need to come up other than those days, please call so that we can be sure to be here.

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.

RAF ACTIVITIES

Since writing CP46 in October of 1985, we have been busy supporting our builders and working on completing the extensive job of installing the Lycoming O-360, 180hp engines and Hoffmann 3-blade, constant speed, feathering propellers on Burt's prototype Defiant, N78RA. This job has taken much longer than we thought it would, mainly because of the fact that RAF is essentially active only two days a week, Tuesdays and Fridays and that the RAF people are now engaged in a very busy schedule working for Composite Prototypes, a division of Scaled Composites, Inc.

We are very happy to report that N78RA has now flown with the new engines and props. Unfortunately, we have not had time to complete a detailed flight test program before this CP goes to press, but initial impressions are quite favorable. Mike made the first flight and reports that acceleration for take-off is impressive, and climb is dramatically improved. Level flight cruise is quiet and very smooth.

SOLITAIRE

The first homebuilt Solitaire has flown! Congratulations to Bob Matheny of San Deigo, CA. Bob has over 5 hours of soaring time on his beautiful Solitaire named 14 BIS BIS, (see photo) and he says he is pleased with the handling qualities so far. He is very pleased with the Solitaire's crosswind landing capability, even in strong, gusty winds with heavy turbulence. GOOD SHOW, BOB! Your Solitaire looks gorgeous!

BUYER BEWARE

Any product that is marketed by another company that appears to copy the structure, aerodynamic design or systems of a RAF homebuilt, may not be the same as our prototypes and may not have been tested and proven to be safe. Just because an aircraft may resemble a RAF product, does not mean that it has our engineering blessing. We have developed, tested and provided appropriate safety related follow up only in the products that we have sold and authorized specific licenses to build.

WHICH DO YOU PREFER, GOING TO WORK OR BUILDING YOUR LONG-EZ????

If you answered the latter and are a good craftsman and work effeciently, we have an exciting job for you. Come to Mojave and challenge yourself while helping build some significant new research aircraft. We are in immediate need of two good bodies to work with Mike Melvill and Bruce Evans.

Immediate openings also for fabricators and also for a structure design engineer and a systems design engineer.

Contact: Mike Melvill at 805-824-2645 or
805-824-4541.

VARIEZE HOMEBUILT PROTOTYPE GOES TO THE SMITHSONIAN in Washington, D.C.

A request from Walter Boyne, curator of the National Air and Space Museum had us scrambling to prepare Burt's N4EZ for the long flight from Mojave to Washington. Doug Shane, a former RAF type, now working for Scaled Composites volunteered to fly her across the country on her last flight and has written an account of his trip. Thanks, Doug.

DOUG'S TRIP - MOJAVE TO WASHINGTON, DC

The first order of business was to get "4EZ" back in shape for flight. After its year-and-a-half of inactivity, a thorough check-up was in order. We decowled it and cleaned all of the screens (oil and fuel), checked all of the linkages for freedom and safety, and replaced all of the Tygothane fuel lines, which had become very discolored (but still flexible) with time (they were 10 years old). We also felt that a cabin heat system of some sort might be appropriate (after all, it was December). The heater consisted of a piece of stainless steel cut from some scrapped muffler heater wrapped around the starboard exhaust stacks (similar to the carburetor air heater). A piece of red two-inch diameter Aeroduct was run from the muff to an aluminum tube which passed through the firewall just below the centersection spar, and joined a piece of 1.5-inch black Aeroduct which ran through the consoles and ended just short of the instrument panel bulkhead. The heat should have come forward into the footwell and at least helped keep my feet pink!

Once again airworthy, it was time to get the pilot proficient. I accumulated about five hours of flying, most of which was spent getting acquainted with cruise speeds, takeoffs and landings, cockpit organization (VariImportant), and airspeed system calibration. I also had the opportunity to "race" Bruce Evans' VariEze. Without wheel pants on 4EZ, Bruce had an estimated 5-6 knot advantage (he had wheel pants). With the pants on 4EZ, there was no measurable speed difference between the two airplanes. Put your pants on!

I packed the airplane the night before. Both main tanks were full of 24 gallons of 80-octane, and the header tank with its 2.5 gallons. The baggage was carefully organized. The flight planning was done. The weather promised to be exceptional. All there was to do was show up at the airport, push it outside, start it, and go.

Fortunately Bruce Evans was there, because as I tried to pull the airplane out of the hangar, I could not budge it. Flat tire! Waaah! With Bruce leading, the cut tube was replaced and the airplane was ready to go within an hour.

VariEze N4EZ made its last takeoff from Mojave Airport into a crystal-clear sunrise and turned southeast. Bruce had decided to fly along, so we flew as a flight of two for about 15 minutes. There are few things as beautiful as the sunrise-light reflected from an airplane in flight: we flew along silently and enjoyed it. Then Bruce said "Adios" and peeled off to return to Mojave.

My first planned stop was Tucumcari, NM, about 750 nm down the road. As the flight progressed, it was obvious that Tucumcari was out of the question. The headwind gods were on duty, and I had to sacrifice sixteen knots to appease them. So Albuquerque was the next target. At ABQ, the sight gauges showed 1 gallon per side, plus the full header tank which I had relegated to VFR reserves. Santa Fe was an obvious point. When still on the mains at Santa Fe, Las Vegas, NM became the goal. I ended up switching to the header while entering the pattern, having never run the mains dry! The numbers went something like this: 672 nm airway distance in 5 hours and 5 minutes for an average groundspeed of 132 kt. The true airspeed at 11500 ft. was 148 kt. The first hour burned 6 gallons; the fuel flow for the cruise segments averaged 4.5 gph at full throttle. The total fuel burn was 23.5 gallons, which (with the headwind effects included) equates to 28.6 nmpg, or 32.9 statute mpg.

The next goal was Kansas City, but my hour-late departure dictated landing at Wichita (a.k.a. the Gateway to Nebraska, according to P. Lert). 4EZ spent the night in the flight-test hangar at Beech Field. The next day I repositioned the airplane to Kansas City to wait out a cold front (and enjoy Mom's cooking).

A cold front in the midwest in the winter makes a very bad situation worse, and this one was no exception. The surface temperature was +2 degrees F. with about an inch of fresh snow all over. Many thanks go to Brad Carter of Kansas City, who shared his hangar with 4EZ and shielded it from the snow. Brad has an extremely well-built Long--a real jewel. Thanks, Brad! After a twenty-minute preheat (for the pilot as well), the Continental started on the second flip. Amazing!

I had several concerns taking off at KC. First was the snow. Although they had plowed most of the runway, there was still some packed snow covering about 60% of the surface. I was concerned about directional control, especially since I had a dragging left brake.

Second was the performance of the engine and systems in the airplane due to the cold. The third was my biggest concern--the canopy. I was afraid it would fog over after I closed it. So I requested a circling overhead departure, to let me evaluate the situation before leaving the pattern. Also, I left the canopy open until the last instant. The takeoff roll was started cautiously, all the while stabbing at the right brake. As soon as the rudders became effective, that concern was overcome. The canopy stayed clear because of (and what a miserable price to pay) the amazing number of cold air leaks in the cockpit.

So it was off to Washington. The first stop was at Louisville, KY, at Bowman Field. I was so miserably cold that I couldn't stand to go any farther. I was also still trying to appease the headwind gods, sacrificing about fifteen knots this trip. The leg required 17 gallons, with an average groundspeed of 132 kt. The cruise TAS was 150 kt at 9500 ft, full throttle. Fuel economy was worse because the mixture control was very stiff in the cold, making leaning difficult, and also because of the lower altitude and higher power settings.

(An interesting story about headwinds: While on a trip with John Roncz from New Orleans to Chicago, we stopped at the Jackson, TN Flight Service Station to check the weather ahead. John marched in and said in his usual

loud, steady voice, "I'd like to order a tailwind!" the FSS-person looked him in the eye and with a perfectly straight face said, "We don't give tailwinds to YANKEES!")

I think the nice people at Kentucky Flying Service were taken somewhat aback at the monstrosity that climbed out of the funny little white plastic airplane. That's probably to be expected since I was wearing electric socks, wool socks, down socks, moon boots (a necessity), long underwear tops and bottoms, blue jeans, sweat pants, sweatshirt, flying suit, jacket, two pairs of gloves, and a wool cap over my David Clarks. Whew! And I was still cold!

After a short lunch and warm-up, it was off on the last flight of 4EZ. The trip to Hyde Field in Clinton, MD, was 427 nm at 145 kt TAS and (I could hardly believe it) a 10-knot tailwind! Upon arriving at Hyde, I made the requisite low approach down the east-west runway, and found a very bumpy ride and lots of surface wind which definitely indicated the north-south runway for landing.

The north-south was 1900 ft long, with a road at the south end (close enough so that you want to bounce the mains off the car roofs as you flare) and powerlines and trees at the north. Careful approach speed management was called for here, and I planted the mains on the numbers at about 65 kt. No problem at all, and with moderate braking, we were stopped by midfield.

It took several minutes before I could pull the mixture control to idle cutoff and end the flying career of such a wonderful airplane. It certainly had its glory; its lines and performance caught the eye of thousands of people, and its siblings have brought thousands of hours of joy to their builders. I developed quite a warm spot in my heart over the 25 or so hours I flew it, and my Long project screams at me even more loudly now to finish it.

The next morning, four craftsmen from the Smithsonian's Silver Hill facility met me at the airport to transport 4EZ to their shop. We had the airplane disassembled and loaded on a trailer within half an hour, and drove the pieces into suburban Maryland. The Eze was parked in a holding area of the display section of the facility next to a Kreider-Reisner biplane, an equally beautiful airplane in its day.

The people of the Silver Hill shop are warm, friendly, interested, and enthusiastic, and welcomed the chance to show what they were working on and what they had completed. To a person, all are true craftsmen who are doing the work they are because they love it and truly care about the significance of the airplanes they tend and restore. Do not go to only the downtown National Air and Space Museum and miss going to Silver Hill!

Many thanks to Mike and Sally for helping me prepare for this trip with work and encouragement, and to Burt for the opportunity and the fine, fine traveling machine, the VariEze.

Oh, by the way, on the return trip, the cabin heat system in the DC-9/MD-80 worked extremely well!

DOUG SHANE

ARE HOMEBUILTS SAFE ?

FAA accident statistics show that per hour flown, a homebuilt is at least three times more dangerous than its general aviation store bought certificated counterpart. We have studied the accident records of these aircraft and have found some specific information that highlights the reasons for this large difference. The reasons are these general categories.

1. Low Flying/Buzzing/Aerobatics

This cause results in a relatively small percentage of accidents for the Cessna, Cherokees etc. We are astounded to see that the vast majority of serious homebuilts accidents fall into this category (3 out of 4 Long-EZ fatal accidents, 7 out of 11 total

accidents/incidents). It seems that the homebuilts are such fun to fly that the pilots take risks that they generally do not take when flying their Cessna 172.

2. Engine/Prop Failure

Engine failures on homebuilts occur much more often than factory-builts, basically because many homebuilders do not apply adequate workmanship in the engine installation. A homebuilder who is not an A and P should get one to inspect his work and better yet, have an FAA designated IA approve the installation as would be required for a certified aircraft.

Note that the 2 categories described are items that you as a homebuilder pilot have complete control of if you fly your aircraft as you would your Cessna and inspect and maintain your power plant as you would your Cessna. Your exposure to the risks of an accident should be as good or probably better than that for the general aviation average. It is a shame that while we see many cases of a homebuilder being spared because he was in a homebuilt (safer stall characteristics and longer glide after engine failure), we still, due to things under his control, find him in a much riskier environment.

DEFIANT NEWS

On January 23, 1986, Defiant N78RA lifted off runway 30 at Mojave and was once again in her element, this time with O-360, 180hp engines and Hoffmann 3-blade, constant speed, feathering props on each end. The weather was far from ideal, but we were not testing a new airframe (aerodynamically) so we decided to go for it. Acceleration was very brisk and initial climb was conducted at reduced power. Once we were above the turbulence level, above 9000msl, we began to appreciate the smooth, quiet operation of these beautiful props. With the RPM's pulled back to 2300, power at 18" manifold pressure, it was very quiet and the airspeed indicator showed that we were really zipping along.

Unfortunately, the props were not yet fully "tweaked" and we were unable to evaluate any meaningful performance, but it was quite obvious that the performance is improved. ~~We have vernier type prop controls installed (rather than the lever type) and we are very pleased with the smooth and accurate control possible. Fidelity is excellent and with the Hoffmann type prop we feel this is important.~~ The wood/fiberglass composite blades have comparatively low mass and low inertia and therefore pitch changes occur very rapidly.

With either prop feathered, engine stopped, the Defiant climbs well even at 10,000msl, but with the aft prop windmilling, (fine pitch) engine at idle, the front engine even at full throttle was unable to do better than 500 ft./min. rate of sink! Obviously, with constant speed props, it will be mandatory to be able to feather the props in case of an in-flight engine problem. Perhaps the most impressive improvement over the fixed pitch props was the excellent sink rate on short final with power at idle or near idle. The blades go flat and act as powerful drag brakes, and the Defiant develops a rate of sink which should greatly improve your ability to fly a comfortable approach into a short field or a field with obstacles.

We have not installed an electronic "synch" control. We have found it very easy to synchronize both props. You can set the same indicated RPM or do it by ear and get the same RPM. Here the vernier prop controls are really nice. At this point we see no reason to install an expensive electric or auto-synch mechanism.

Installing the Hoffmann props has not really been difficult. The problems we have run into, have all been due to our inexperience with constant speed props and prop governors. The small adjustments to prop governors, to low pitch prop stops, etc., that must be done to optimize an installation have been frustrating and time consuming due to our lack of familiarity with these kinds of things.

Hoffmann of Germany has been very helpful and very patient with us during this time. In retrospect, we would have been time and money ahead to have expert assistance in this area and we would strongly recommend that you have an experienced prop installer help with

the installation. In our case, a lot of our problems centered around the fact that we had two completely different engine models, one of which had never had a constant speed prop installed and required considerable work to bring it up to the correct condition.

Identical engine types such as O-360-A1A or whatever, set up to operate constant speed props would have made the job much easier. If you contemplate ever installing constant speed props, be certain that the engines you decide on are capable of operating constant speed props! As an example, an O-360-A4A cannot even be converted to constant speed operation!

Work on the Defiant engine installation plans has been at a standstill due to the available manpower being exclusively devoted to getting N78RA back in the air. As soon as she is back in routine flying order, we will give priority to the engine plans. These plans will consist of 14 or 15 large sheets (same as section 1), but due to the cost of producing such a low volume run of pages this large, these pages will be blue printed from the originals. Accompanying these large pages will be a booklet similar to Section II of the EZ plans, an 11"x17" booklet with words, sketches and lots of photos of both Fred's and Burt's engine installations. We have not come up with a price at this time, nor are we certain when it will be ready to ship, but we will definitely be making these plans available.

The Defiant owners manual is available now and covers all the weight and balance and performance information normally found in an owners manual. These can be obtained from RAF for \$15.00 which includes postage and handling (California residents, please include 6% state tax).

As far as we know, only four Defiants are flying so far, Burt's, Fred's, Johnny Murphy's and Dr. Frank Yost's. We have not heard of any new ones but there are several that are getting close. Rodie Rodewald from Hawaii, Dr. George Best of Phoenix, AZ., and Charlie Gray of Kissimmee, FL., are all in the finishing stages. (All three of these builders have Hoffmann props in hand!). We routinely hear from perhaps as many as 10 builders ~~who are well along with essentially all structure done,~~ then there are probably a dozen who contact us occasionally who are building but not too far along. The only really active Defiant group we know of is the Texas Defiant Group. Charles Sims, 1918 Atlanta, Deer Park, Texas, 77536, 713-476-5406 (home), puts out a regular newsletter containing info from the group's builders. Anyone interested, contact Charles Sims and send him a letter with your status and hints. A group like this can be tremendously beneficial to all those in it since any mistakes made by the first builder to get there are eliminated for those who follow. If you work alone and isolated, you have to make all the mistakes and then suffer the frustrations and extra time required to fix them.

An example of the kind of problem that can be aggravating is the fitting of the canard between the aft face of the front firewall and the forward face of the F.S.57 bulkhead. A number of builders have come to grief here and, really, there is no reason to. You should have your canard built, including the lift tabs before you build the fuselage. This means, obviously, that you can measure the distance from the forward face to the leading edge attach tabs to the aft face of the aft lift tabs. Now, look carefully at Page D-26 and D-25, and you will see that you will have to add to this dimension the thickness of the flanges on the CS-11 flanged bushings (.032x2), plus the thickness of two CS-8 aluminum plates (.063x2). Don't forget the thickness of the CS-8 aluminum plates on the leading edge attach tabs (.032").

Probably the best approach here is to add all these dimensions together for your canard. This may be exactly per plans but is much more likely to be large enough to cause you to move the F.S.57 bulkhead aft of F.S.57 by as much as 1/4" or even 3/8".

If you have already fallen into this trap, the best way out is simply to cut the F.S.57 bulkhead out, throw it away and build a new one. Using a small disk sander (such as a 4" diameter Makita) carefully sand some of the 3 pieces of BID off the fuselage sides, forward and

aft of the F.S.57 bulkhead. Don't try to sand all of it off due to the danger of damaging the inside skin. Don't sand off any of the 8 plies of BID extending aft for 8" from the front firewall at F.S.47 to F.S.55 (see page D-34, top right). Do sand dull from F.S.55 forward about 3" to F.S.52 to allow a 1" per ply overlap of the 3 repair plies of BID that will be required when you install your new F.S.57 bulkhead in the correct position to allow your canard to fit perfectly. Don't forget that these 3 plies of BID lap onto the forward face of the F.S.57 bulkhead which adds 3x.012" of material thickness which will encroach on the space between these two bulkheads where your canard has to fit.

This whole thing sounds quite complicated, but in fact, it is quite simple if you sit down, take your time and study the problem. To sum up, all you have to do is position the F.S.57 bulkhead aft far enough to allow your canard with all attach hardware to fit snugly between the front firewall F.S.47 and bulkhead F.S.57. Simple, HUH?!

Very preliminary performance evaluation of Burt's Defiant with the constant speed, feathering props showed the following:

ALT.	OAT.	RPM	MAN. PRESS.	IAS(kt)	TAS(kt)	TAS(mph)
			(frt.& rear)	(frt.& rear)		
9000	9°C	2300	23"	163	189	217
9000	10°C	2100	23"	157	182	209
8700	12°C	2550	23"	168	195	224

Defiant

Now that we have flown our Defiant, N7BRA, with constant speed, feathering props, we are surprised at the comparative complexity that this change has added to what was such a simple airplane. We consider the constant speed, feathering Defiant to be a more dangerous airplane than the prototype we have flown for the last eight years for the following reasons.

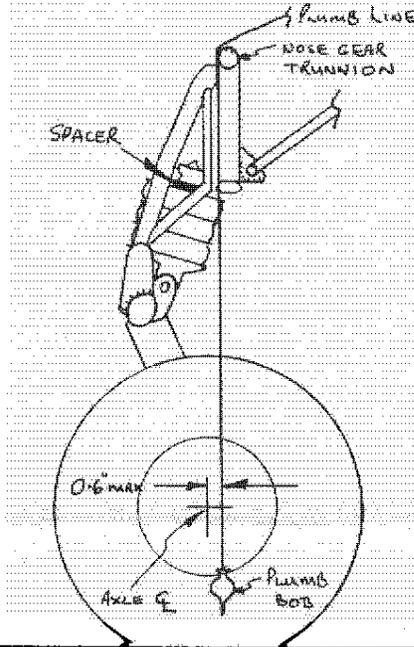
The need to identify and feather the failed or failing engine, considerably increases pilot work load and increases the chance that he will make mistakes. The higher drag at idle, while useful, increases the chance of misjudging the landing flare when power is being manipulated. This could result in a high sink rate touchdown if the pilot gets behind the airplane. For these reasons and with consideration that many Defiant pilots will be marginal experienced multi-engine pilots, we estimate the accident rate may be considerably higher on the constant speed feathering aircraft than it will be on our original, simple, fixed pitch airplane.

Our strong recommendation is that the minimum experience requirement with a Defiant with constant speed, feathering props, be excellent, current proficiency in a standard light twin such as a Duchess, Baron, or Cessna 310. The discussion in the Defiant Owner's Manual relative to the pilot proficiency requirements, does NOT apply to a Defiant with constant speed, feathering props.

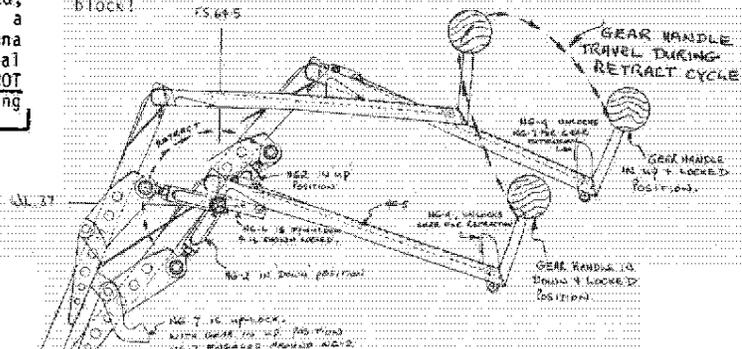
DEFIANT NOSE GEAR

The Defiant nose gear is a Mooney nose gear unit. Mooney has put out a service bulletin (M20-202) which speaks of steering/tracking improvements. We have essentially reiterated that bulletin below.

- 1) Level the aircraft and center the nose wheel.
- 2) Hang a plumb line over and forward of the nose gear trunion (see sketch).
- 3) Measure forward from the aft edge of the plumb line to the axle centerline. This distance should not exceed 0.6", or be less than zero.
- 4) If you have more than 0.6" or less than zero, you will have to add or subtract spacers above the suspension donuts (see sketch), until your axle centerline is within this tolerance.

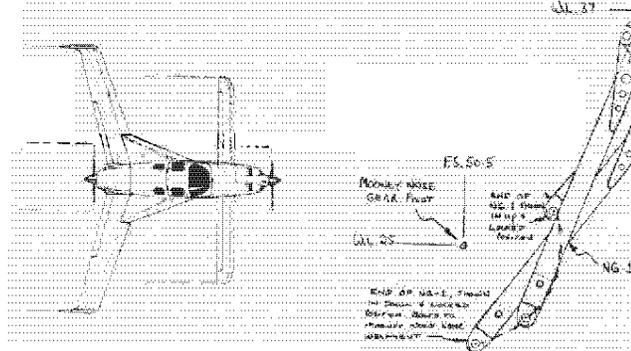


This drawing shows the motion of the Defiant nose gear retraction mechanism. A number of Defiant builders have had difficulty visualizing just exactly how this works. Actually, it is very simple. The NG-2 arm must be swung through an arc of about 190°. The central pivot of this arc is at W.L.37 and F.S.64.5. To do this, the gear handle moves up and forward, then swings back and down, see below. The NG-4 finger operated lever operates the gear down lock NG-6 and also the gear up lock, NG-7. Hopefully this will clarify this area for any builders still having a mental block!



NOTE: DISTANCE BETWEEN PIVOTS (F.S.64.5) AND (F.S.64.5, W.L.37) SHOULD BE APPROXIMATELY 18.4". THIS DIMENSION IS RELATIVELY CRITICAL.

WHEN GEAR DOWN & LOCKED, NG-6 IS SPRUNG AGAINST NG-2 BUSHING. FOLLOWING RET. ON NG-4 FULL NG-6 UP & UNLOCKS NOSE GEAR. HANDLE IS THEN SMOOTHLY LIFTED THROUGH THE ARC SHOWN, WHICH ALLOWS NG-2 BUSHING TO PIVOT THROUGH APPROXIMATELY 190° AT F.S.64.5 AND W.L.37. MOONEY NOSE GEAR PIVOTS AT F.S.50.5. AND W.L.25. THE END OF NG-2 BUSHING IS BOLDED TO FORWARD AXLE BUSH BUSHING. NG-7 IS ACTIVATED BY PULLING DOWN ON NG-4. NG-7 BUSHING ON NG-2 BUSHING TO HOLD GEAR UP & LOCKED. OBSERVE THIS SEQUENCE TO BUREAU DRAW.



"LOMBARD'S" UPDATE

Larry Lombard and Michael Dilley have been turning out EZ cowlings and shipping them as fast as the orders come in. EZ cowlings have always been a bit of a "beast" to install. It seems that they never fit quite right. Michael is building a Long-EZ and he studied the problem. He came up with the theory that the aft rib was stiffening the cowl halves so much torsionally that the cowling could not be forced to fit the shape of your airplane. As a result, the job of installing a cowling has developed rather a bad reputation.

The decision has been made to ship cowlings with the aft rib not installed. The rib will be included but you the builder, will install it. The best method is to completely install the cowling, then flex the prefab rib into the upper and the lower cowl. After it cures, lay up one ply of BID at 45 degrees over the whole rib, lapping onto the cowling 1" all around.

Using this method, the cowling is much easier to install and you get a nice fitting cowling into the bargain. All cowlings shipped by Lombard's since January 1, 1986, have been, and will be, shipped with the aft rib loose and you will install it yourself per the above.

Larry was down here at RAF taking all the measurements on Burt's Defiant necessary to enable them to build cowlings that will fit a homebuilt Defiant using any combination of 150hp, 160hp or 180hp engines with either fixed pitch wood props or constant speed feathering props such as the Hoffmann propellers installed on Burt's Defiant. Due to the almost infinite possibilities of engine/mount/prop extension/prop and spinner, the chances of building one cowling (especially the front cowling) to fair perfectly from the spinner to the firewall are essentially zero. Therefore, Larry and Michael will be supplying the front cowling about 4 to 6 inches short of the spinner. The builder will mount his or her engine/mount/prop extension/prop and spinner, then the cowling will be jugged and mounted. The spinner and prop will be protected with gray tape. Foam blocks will be cut and fitted between the cowl and spinner and carved to a perfect faired fit. Four plies of BID will be layed up to lap onto the cowl. After cure, the cowl will be split, the foam cleaned out and one ply of BID will be layed up on the inside of the cowls to tie things together and, presto! you have a perfect fit, no matter what combination of prop, extension and spinner you may have. The rear cowl does not have the same design constraints and will be shipped ready to install. The only change that may be necessary, depending on your particular engine/prop/spinner combination, would be to trim the trailing edge or shorten the cowling to match to your spinner.

Larry and Michael are also working on a pair of low-drag main wheel pants for the Defiant. These will probably look like something between Burt's prototype and Fred's Defiant.

Last, but not least, Larry and Michael have formed their small company into a corporation. As of now, this corporation will be known as FEATHERLITE PRODUCTS, INC., PO Box 781, 13451 Airport Rd., Boonville, CA 95415. Be sure to write or call for a quote and compare prices and quality with any of the bootlegger outfits. Keep in mind that Larry and Michael are the only RAF approved and recommended manufacturers of prefab glass parts for all of the RAF designs.

INSURANCE FOR EZ'S

This is a subject we at RAF have not addressed before. We believed it was up to each individual. Lately, however, we have been receiving an inordinate number of requests and inquiries. We have done a little investigation into the insurance situation and what we have found is not very good news.

From what we can learn, very few insurance companies will even cover experimental aircraft, particularly composite aircraft. One insurance agent told us that part of the problems have been caused by a very high accident rate of two other composite canard designs (not

RAF airplanes). Most of these accidents were takeoff or landing accidents that resulted in considerable damage to the aircraft involved. Many of these aircraft had full hull coverage and the builders involved put in claims out of all sensible proportion to what it would have realistically cost them to do the repair. The result of this, predictably, has been an unprecedented increase in insurance premiums and, in a lot of cases, it has become very difficult to even obtain insurance. Several major companies now refuse to insure composite homebuilts. Unfortunately, all composites have been lumped together, so those of us who fly EZ's are being penalized even though the EZ's have an excellent safety record.

Many of us who have been flying EZ's for several years now have been shocked by insurance premiums that have doubled or more. We at RAF have been insured through the EAA recommended insurance company, Aviation Insurance, P.O.Box 19267, Greensboro, NC 27419, for a number of years, yet this year, our premiums have almost doubled. We have heard from several builder/flyers who have received quotes of between \$500.00 and \$800.00 a year for liability coverage only! Our approach to this problem has been to request a quotation for liability insurance to cover only the pilot and aircraft and not the passenger. This has dramatically reduced the quoted premium to between \$250.00 and \$300.00 per year depending on pilot experience and time in type.

Full comprehensive or hull coverage on an airplane which you have built yourself is probably a waste of money. Full hull insurance is very expensive. Most companies have a deductible of \$500-\$1000.00. Most accidents that would result in damage to the aircraft requiring an insurance claim probably would be taxiing accidents, brake failure, 'run into the hanger' type accidents. The kind of thing that might require a new canard or wing, at most. Think about that - you built the original, obviously you can build a new one and, probably, at less cost than the deductible!

Some builders have difficulty obtaining even liability insurance coverage for first-flight and first 40 hours of testing. ~~The insurance companies' reasons for this~~ is that the pilot has zero time in type. This leaves our first time builder/pilot with no insurance coverage. This is an added mental burden that the new pilot does not need at a time like this. What other choice does he have? Get a check out in a Long-EZ or VariEze? Who will let him fly their pride and joy from the front seat? Very, very few builder/pilots will do that. No, he has no choice. He goes ahead, he flies his first flight, flies off his 40 hours. Now, he can get liability insurance coverage, because, now he has time in type - ironic, is it not?

If you have any questions, contact Harry Hannish at the EAA headquarters, 414-426-4800. Harry maybe able to help.

This editorial is printed here not to offer solutions, we know of no solutions. It is published in the hope that it will result in some input from you, the reader. If you have any experience, suggestion, or solutions, we would like to hear from you. Write to the Canard Pusher at RAF.

FUEL FLOW INDICATORS

We have used several different brands of fuel flow measuring devices, and obviously for flight testing, they are essential. After flying with one of these gadgets installed and operating for awhile, we have found them to be very valuable, even for simple flight planning on a cross country. For a long time we used an automotive type "compucruise" with an aircraft grade Flo-scan transducer. This worked quite well, when it worked. In 4 years (600 hours) we replaced the electronic "guts" three times. Our main complaint was the flashing display and erratic indication. That is to say the gallons per hour was not stable, the tenths of a gallon continuously ran up and down several tenths. We also tested a 'Fuelguard' fuel flow/fuel used indicator, but it was much worse in the erratic display department and we could not recommend this instrument. Recently, we installed an Alcor fuel flow with the time and fuel

remaining feature. At last, we have an accurate and extremely stable indication of fuel condition. By far the best we have used, the presentation is very good, a clear, large LCD screen shows fuel flow in gph on the left and gallons used on the right. A flip of a switch lets you read time remaining at present power setting on the left, and fuel remaining on the right. You can enter the fuel load very easily using one momentary switch. Back lighting is automatic and comes on as it gets dark. You can dim it as required with a built-in dimmer. The flow transducer is a Flow scan, and is a good one. Each transducer is individually calibrated to the electronic microprocessor and best of all, you can calibrate the instrument yourself to give extremely accurate information over a particular range of flow. You can also set the instrument to read in gallons, lbs/hour or imperial gallons/hour. The instrument is very light and quite small.

We are really happy with our Alcor and heartily recommend it to anyone who would like this kind of information available to them in flight.

FIRE EXTINGUISHERS IN THE COCKPIT

There are now many small Halon fire extinguishers available at very reasonable prices. Halon is the only fire extinguisher that can be used in the case of a fire in the small confines of a cockpit. While electrical fires are not all that common, they do occasionally occur and if one ever happens to you, particularly in flight, without a means to extinguish the fire, you have little chance. A classic example of how a small fire extinguisher can save the day occurred to us here at RAF. We were taxi testing an airplane when a brake line failed and the brake fluid ignited. It was a small fire, but it quite rapidly began to burn the paint on the wheel paint and the paint on the gear leg. If we had not had one of these small fire extinguishers available, we would probably have had to sit by and watch it burn. We were over a mile from the nearest building at the other end of the airport!

Small, easy to mount Halon fire extinguishers are available from many aircraft supply companies including Sporty's Pilot Shop in Cincinnati Ohio. Don't let it happen to you, order one now and mount it in your cockpit where you can easily reach for it anytime. It is very cheap insurance.

OXYGEN AND COLD FEET

Mike and Sally have been doing quite a lot of high altitude, cross country flying in the last 6 months and they have purchased a portable oxygen system. It is an "Aerox" high duration system that uses "oxysaver" (TM) nasal canulas instead of the usual face mask. They are very pleased with this system. It is comfortable to wear, allows normal conversation and, best of all, the 22 cu.ft. aluminum oxygen bottle (4 1/2" dia. x 29" long) will allow two people to remain at 17500' for up to 1 1/2 hours!! The bottle fits into the left strake baggage area where it is convenient for the pilot to observe the pressure gauge. The nasal canulas are so comfortable that after a few minutes, you forget you have them on! You can also eat or drink with no problem. Try that with a face mask!

Using oxygen allows an EZ pilot to take more advantage of tailwinds at altitude, which can result in very cold feet! Outside air temperatures of -10°C are quite common, even in the summer. Mike and Sally recently tried wearing "moon" boots, the common "after-ski" boots available at most K-Mart's, etc. for \$15.00-\$20.00. A pair of wool socks inside a pair of moon boots will allow you to cruise at OATs of -10°C for 2 or 3 hours, without heat, and without any discomfort. TRY 'EM, you'll like 'em!

Contact: Ken Johnson
Aerox Aviation Oxygen Systems, Inc.
PO Box 5343
Hilton Head, SC 29928
1-800-237-6702

ACCIDENTS/INCIDENTS

A California based Long-EZ landed over 100 feet to the right of the runway centerline. Touchdown occurred off the runway, one mainwheel almost two feet lower than the

other down a burm. The airplane hit hard and flipped over, sliding to a stop upside down. There were strong gusty crosswinds at the time, so much so, that an experienced A-36 Bonanza pilot aborted his landing attempt and went to another airport. The pilot suffered neck injuries and the passenger had minor injuries.

This accident was definitely avoidable. You should never commit to land if you cannot comfortably hold the airplane on the extended runway centerline. Go around, go somewhere else, nothing should be important enough to loose your airplane.

An Alabama VariEze took off after a thorough preflight with full tanks. At 400-500 feet AGL, the engine quit with no warning. All attempts to restart failed. The choices for a landing site were bleak, trees or a small road. This pilot chose the road and lowered his nose gear. Just as he was really committed, a truck came over the rise. Trees and utility poles would not allow him to move over far enough, so his left wing hit the truck and broke off. The VariEze was pretty much totally destroyed, although the cockpit remained enough intact that the pilot got out with only a broken leg.

The accident investigators found a mud dauber (wasp-like insect) had built a nest 6" up the fuel tank vent line where it was very difficult to find, even with a thorough preflight. The FAA investigator recommended a screen over the fuel tank vent.

We believe a screen over the vent would reduce the necessary ram pressure to near static pressure. Our recommendation would be redundant vents. Put another 'T' in the vent such as downstream of the top 'T' and run a second vent. Be sure and check both vents for obstructions every 100 hours.

This letter from Rob Cook, VariEze builder, is printed in its entirety. Hopefully, it will prevent anyone else from making the same mistake. Rob was doing a high speed taxi run with the canard installed, but with his main wings still in his garage! NEVER attempt a high speed taxi run unless you are mentally and physically and mechanically prepared to fly.

"Dear Mike,
First, thank you for your help and understanding. Feel free to publish the following account of my accident any way you see fit.

If you don't believe that the little canard on the front end of your VariEze produces all that much lift, listen to this! I've been taxi testing my VariEze for about two months. At the Concord, California airport it's easier to taxi to the other side to see friends, get advice, etc. than it is to drive around on the surface streets. I've taxied at indicated speeds up to 60 mph and found the airplane easy to handle throughout the speed range. These tests were done with and without the canard installed. The main wings are in the final finishing stage and the airplane has only been taxied once with them on.

On August 16, at 6:30 pm I lined up on 19 right and pushed the throttle to the firewall. The acceleration was brisk to say the least! I was indicating 60 mph in about three hundred feet. I pulled the throttle back half way and made sure I wasn't still accelerating. Everything was stable. I eased back on the stick and the nose came up slowly. The airplane was rolling straight but the nose kept coming higher. Pushing the stick forward resulted in no gain except in angle of attack. The throttle was off by now.

I remember thinking "Why am I going through this? I'm going to end up in the grass and be really embarrassed!" I was pressing full force on the brakes but to no avail. At 15° angle of attack the prop started to contact the ground. I could hear it. The resulting torque transfer to the ground caused the airplane to start turning sharply to the left. I saw the tower and at the same time heard them dispatch the fire truck.

By now I was just along for the ride. The tires couldn't resist the turn and airplane flipped. I remember seeing the tower roll inverted. The first thing to hit was the left wheel. The gear had enough spring to throw me into one more roll, this time landing inverted. The canopy shattered, the headrest collapsed

forward, and the slide began. Thank God I didn't have my seatbelt on! I was conscious for the whole hundred foot ride. When everything stopped, I turned off the master and mag switches and start talking to myself. Just wanted to be sure that I stayed awake!

I was laying upside down on the back of my neck and bleeding pretty good. The fire truck was there immediately and I was pulled out and taken to the hospital. Three hours of surgery and six days in hospital is mighty expensive learning. It took two more hours and two more days to have me back to being pretty again!!

Well, it been three months and I'm back full time on the airplane again. It's in much better shape than I was. It's going to need a new canopy, right upper wing attach fitting, prop (the old one will make a nice sixteen inch clock), and what the hell, I knew I'd end up with the Long-EZ gear in the long run anyway. Oh, I almost forgot, the canard snapped five inches outboard of the spar on the under surface, it's already repaired and looks as good as new.

The FAA, bless their hearts, didn't call it an accident ... no intent to fly. Even though this has been written in a light vein, I think the message is pretty loud and clear. THINK, and after you've given an idea a thorough brainstorming, try it out on someone whose judgement you trust. And then be careful. The only reason I can give for still being alive is that it just wasn't my turn.

Sincerely,
Rob Cook"

RAF DESIGN CLUBS AND GROUPS

International VariEze Hospitality Club
Don and Bernadette Shupe
2531 College Lane
La Verne, CA 91750
714-593-1197

This one is a must for all EZ pilots/builders and their spouses. A super newsletter four times a year and super flyins and flyouts several times a year - only \$10.00 for US and Canada and \$12.00 for overseas.

Long-EZ Squadron I
Russell Harris
13211 Chestnut Street,
Westminster, CA 92683

Strictly for Long-EZ builders, you must own plans and possess a RAF serial number. Excellent newsletter 4 times a year, \$12.00 a year.

Long-EZ Squadron II
David Orr
1451 Berwick St
Los Angeles, CA 90049

Similar to Squadron I, in fact a spin-off as a result of too many members. Both of these groups have a very high rate of completed airplanes.

Dayton DUCKS - (Dayton United Canard Klub!)
7313 Dabel Court
Dayton, Oh 45490
513-435-0882

The "DUCKS" have been in operation for several years and have a substantial list of members building and flying EZs.

EZ Builders of Florida
Charlie Gray
2314 St Croix
Kissimmee, FL 32741
305-847-7070

Open to EZs, Defiants and most other composite designs. Good newsletter and flyins.

Central States Association,
Arnie Ash
Rural Route #5,
Davenport, IO 52806
319-386-5245

Open to all RAF designs. A new organization - good newsletter.

Atlantic Coast EZ Squadron (ACES)

O.N. Pete Petree,
RT 6 Box 99-B
Laurinburg, NC 28352
919-276-7186

A new organization to exchange ideas, for all EZ types.

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.

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

PLANS CHANGES

NO VARIEZE CHANGES

LONG-EZ PLANS CHANGES

LPC #126 Vortilons on the leading edges of each main wing are mandatory - see this CP, Page 15.

NO DEFIANT CHANGES

SOLITAIRE PLANS CHANGE:

SPC # 58 Section 1, page A-20

The wheel forks are attached to the SLG-9 tube (rear) and the SLG-3 tube (front) by drilling a #12 hole aligned along the butt line, through the casting and the steel tube. An appropriate AN3 bolt and MS21042-3 nut are then installed.

SPC # 59 Engine installation plans.

Note: Hydraulic jack oil should be used in the electro-hydraulic engine extension system. Do not use brake fluid. Hydraulic jack oil is obtainable from any auto parts store.

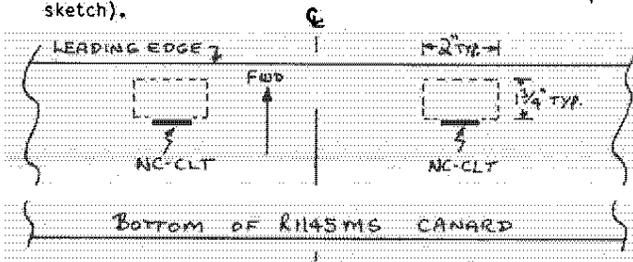
NOTE: Please report any plans errors that you find to RAF so that we can keep all of the builders as up-to-date as possible.

LONG-EZ R1145MS CANARD UPDATE

IMPORTANT for all builders of the R1145MS canard: If you bought NC-CLT aluminum lift tabs from Ken Brock. These are the "retrofit" lift tabs and should have been used only by builders planning on replacing an existing, already mounted canard. For some unknown reason, a few builders building this canard as new construction have managed to use this lift tab. It is best recognized by the fact that it was blank at the attach point. It did have 3 holes at the top, exactly as the original CLT lift tab did, but it does not have a hole at the lower, rounded end. If you have used the CLT original lift tab which did have a pilot hole drilled in the rounded end, you are OK. If you have used the blank lift tab from Brock, Part #NC-CLT, it must be replaced. **DO NOT FLY WITH THIS LIFT TAB.** This tab was incorrectly manufactured from 2024-O aluminum which is dead soft. The correct material is 2024-T3 aluminum which is heat treated and much harder, with a much higher bearing load capability.

Ken Brock has mailed out registered letters to all known purchasers of part #NC-CLT warning of the incorrect material and offering to replace them with the correct material. Do not ignore this situation, even if you have installed them and are ready to fly, ground the airplane until they have been removed and replaced.

This is really not such a traumatic job as it appears! We have done it ourselves several times. Using a Dremel saw, carefully cut through the bottom skin in front of each lift tab (don't try to cut through the spar cap!!). Remove a skin patch approximately 2" wide by 1 3/4" forward of and centered about each lift tab. (See sketch).



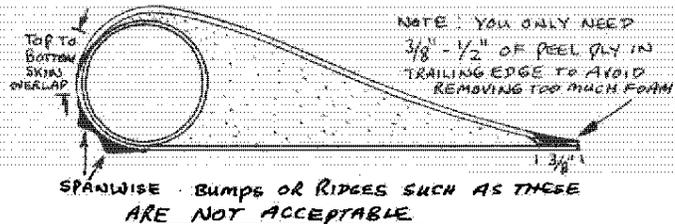
Now dig out enough foam to be able to see the heads of the three AN-4 bolts that anchor the NC-CLT lift tabs to the shear web. Using a dull chisel or even a screw driver and a small hammer, chip away enough micro so that you can fit a 7/16" box-end wrench on each bolt head. Remove these bolts and give the lift tabs a sharp tap forward and they will pop off. Send them back to Brock in exchange for the "real" ones. Sand the aft face of the new lift tabs with 320 grit and sand the face of the shear web. Smear a thin layer of flox onto the shear web and re-install the three AN-4 bolts. Carve a block of blue foam to fit as closely as possible into each of the holes and micro them into place. (Pour-in-place X-40 can also be used). Sand the foam to match the bottom contour, and carefully sand the bottom skin completely dull a minimum of 3" each side of each hole and about 1" forward of each hole. Layup 3 plies of UNO spanwise. Across the repair area, the largest ply goes on first. Since most, if not all of this repair is inside the fuselage very little fairing is necessary. Do not be intimidated by this repair, it is quite easy and can be done in a surprisingly short time.

We have received several more reports from builders who have completed and flown the R1145MS canard and without exception, all have reported no rain trim change. One builder, though, has reported a "flat spot" or area of low response when he pushes the nose down (elevator trailing edge up). He has adequate nose down authority, but has to push forward more than what he feels is normal for good nose down response. We have looked at his canard quite carefully and have not found any obvious difference.

We have noticed a slightly "softer" nose down response when compared directly with the original GU canard, but no "flat spot" or area of almost no response. We would

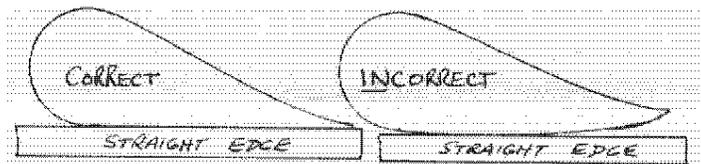
appreciate hearing from all builders who are flying the new canard. Please report your opinion of the flying qualities, control authority, any rotation speed differences, any stall speed difference, and of course behaviour in the rain. Comparisons with your original canard would be useful, too.

When you build your R1145MS canard, areas to be as accurate as possible with that are sometimes ignored, are the shape of the canard "cove" or trailing edge and the elevator leading edge. These two define the "slot" shape, which is quite critical and should be given your best attention. The lower half of the leading edge of the elevator should be a section of a circle, and smooth. There should be no spanwise bumps or ridges. (see sketch).



ELEVATOR SHAPE

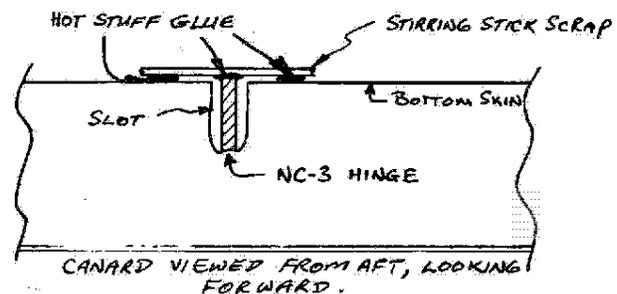
We have had this in many CPs in the past, but surprisingly, we still find builders out there with the bottoms of their elevators convex or curved. No matter which canard you have, you must have perfectly flat bottoms on your elevators. Lay a machinists 6" scale or other known straight edge chordwise across the elevator bottom. There should be contact from the tangent point of the elevator torque tube to the trailing edge as shown in the correct example below.



If your elevators are not flat or look like the INCORRECT example, your elevator will try to float trailing edge down in flight. As a result you will find yourself pushing forward on the stick at cruise speed, and probably will not have enough trim authority to trim off this force. This is normal at very high speeds, but should not be true at cruise speeds.

R1145MS CANARD

Several builders have reported not being able to get the full 15° of elevator trailing edge up travel. This is very important to assure adequate nose down authority at aft limit CG. The best way to assure that this does not happen to you is to follow the plans as far as jiggling the elevators into position with the NC-3 hinges inserted into the slots in the canard. Do not pour in the wet flox yet! Using scraps of wood stirring sticks (tongue depressors) and Hot Stuff glue, temporarily tack each NC-3 to the canard bottom skin as shown.



Use Hot Shot to kick the Hot Stuff off. (If you don't have a bottle of the thick Hot Stuff and Hot Shot, you really are missing a very handy jiggling tool). You should now have the NC-3 elevator hinges temporarily bonded into position, with the elevators mounted to

them. Carefully break off the elevator jigs . This should let you swing the elevators on their pivot pins. Using an angle finder (Sears or Pro-line) check the full available elevator travel. If you find you are unable to get the full 15° of elevator trailing edge up-travel, break the Hot Stuff glue joints, and repeat the procedure, this time shimming the  jigs off the canard bottom skin with pieces of tongue depressors. This will move the elevators down relative to the canard, allowing more travel in the trailing edge up direction (nose down command). Once you have a full 15° or even 16° to allow for finish, re-bondo the  jigs to the canard and elevators. Break off the Hot Stuff-ed scraps and pour in the wet flox to lock the NC-3s in place. Do not pour flox into these slots until you are absolutely confident that you have the full 15° of travel. Removing these NC-3s after the flox cures is virtually impossible.

WELDMENTS FOR THE R1145MS CANARD

Paul Green from Ken Brock Mfg. would like all builders of the new R1145MS canard to know that when Brock made the first run of NC-12A weldments (pitch control bellhorn in elevators), the #12 drilled hole called out in the plans, was inadvertently drilled as a #2 hole (almost 1/4" instead of 3/16"). Brock has available a small steel bushing, part #NC12B which can be pressed into this oversized hole and will then give you the correct size #12 hole.

The NC-13 bushing called out on page C-2 is now available from Ken Brock Mfg. Due to a mixup when Paul Green talked to Mike Melvill, Brock has been shipping CS-13 bushings, which are not quite long enough. Several builders have run into this problem, it causes the pivot point at the NC-12A weldments to be too tight. Contact Brock (Paul) for the correct length part #NC-13.

Judge King, Long-EZ N350JK has just completed his new R1145MS canard, which he retro-fitted to his Long-EZ. He has an easy way to transfer the existing 1/4" diameter holes in the F-22 bulkhead to the aft face of the new undrilled NC-CLT aluminum lift tabs.

1. ~~Fit your new canard per plans, be sure the water line is level with the top longeron level (correct incidence).~~
2. Remove the canard and paint a thin film of oil around the hole in the F-22 bulkhead. Spray a coat of any color paint on top of this oil film about 2" diameter around the 1/4" holes.
3. Obtain some foam tape with sticky on both sides (1/8" thick 3M double stick foam tape works great). Stick this on the aft face of the NC-CLT lift tab centered roughly over the area where the hole will be.
4. Install the canard and clamp the NC-CLT lift tabs firmly against the F-22. Remove the canard. The paint will now be on the sticky surface of the foam tape and a perfect impression of the 1/4" diameter hole will be clearly visible.
5. Now make a drill guide out of 1 1/2" x 1 1/2" piece of 1/8" aluminum scrap. Drill a 1/4" diameter hole through it. Lay it on the foam tape, exactly centering the guide hole over the paint impression location of the hole. Clamp this drill guide to the NC-CLT using two small 'C' clamps.
6. Drill through the drill guide, through the foam tape and through the NC-CLT, both left and right and presto! You have a perfectly matched canard to F-22 bulkhead.

VORTILONS FOR LONG-EZs

Due to the wide variety of workmanship, flying characteristics can vary considerably from one airplane to another, even though they may have been built from the same plans. We have been confident up until now that Long-EZs were pretty much immune from a main wing stall, if they were operated within the normal limitation of gross weight and CG. Recently we were surprised to learn of a stock Long-EZ that experienced a main wing stall. Admittedly this aircraft had been loaded to well over normal gross weight, but the fact that it occurred at all has led us to make the following change a mandatory one for all Long-EZs, regardless of which canard is installed.

All Long-EZs must have three vortilons installed as shown on the leading edge of each main wing. We have conducted rather extensive testing of vortilons and they definitely do add to the stall margin of a swept wing.

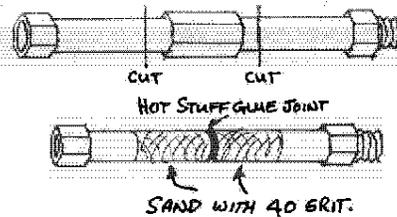
They have always been required when using the new R1145MS canard, they are now required even if you have the original GU canard installed.

Probably the best way to install vortilons is to make them with a small flange on each side. Finish them through final paint (using your trim color is a neat idea) then glue them to the finished wing in the appropriate position using a small amount of clear RTV silicone.

We have included full scale patterns for each vortilon, as well as a plan view and front view showing the positions at which each vortilon should be installed. The main design requirements are that the vortilons are mounted so that they are vertical, relative to the aircraft in level flight, and that they are mounted parallel to B.L.O or the centerline. They do not cant outboard or inboard. The vortilon itself should be made from a six ply BID solid glass layup. The flanges can be two plies of BID on each side of each vortilon.

BUILDER HINTS

Lycoming oil dip stick too long? Well, you can buy a shorter one or you can cut it down yourself. First you must determine how much shorter yours needs to be. For a Long-EZ, a VariEze or even a Defiant, you will probably need to shorten it around 3". Use a pin punch to drive the retaining pin out of the yellow dip stick screw-on cap. Pull the dip stick out of this cap. Cut 3" off the cap end of the dip stick (or whatever dimension will work for you), note that the end that was inserted into the cap is machined down to approximately 3/16 (.1875). This will have to be done to your new shorter dip stick and will require the use of a lathe. Press the dip stick back into the cap, drill a #40 size hole through the dip stick using the cap as a drill guide, and drive the old pin back into place. Pean the cap to prevent the retaining pin from vibrating out. Now, using the short (3") piece of dip stick as a guide, cut the proper length out of the middle of the plastic dip stick tube using a fine tooth hacksaw.



Use Hot Stuff instant glue (or similar Crazy Glue, etc) to join the two pieces together. Hot Shot or Zip Kicker makes this job easy. Now sand at least two inches each side of the joint very thoroughly with 40 grit sand paper. Cut a piece of BID glass 4" x 16", wet it out with epoxy then wrap it around the plastic tube, centered over the joint. Roll the tube using all 16" of BID. Now wrap peel ply over the wet glass layup and pull it tight. Allow this to cure, remove the peel ply and paint it black with high temp spray paint. Screw the tube back into the engine and safety the lower end. Screw in the dip stick and you are done. We have used this method on all of the Lycoming powered airplanes we have built here at RAF over the past 10 years with no problems at all.

MAIN GEAR ATTACH ON EZs

Every 100 hours or once per year, you should check your main gear attachment points for any movement. The best way to do this is to lift the wheels, one at a time, clear of the ground, supporting the wing on a piece of foam to spread the load. Get into the rear cockpit and put your hand on the attach point. Have a friend push and pull the wheel in a fore and aft motion. You should not feel any movement at the attach point. If you feel movement, you may have a problem developing. If there is significant movement, you will have to go in and see what it is. It probably will be the bolt holes in the aluminum extrusions, elongating and allowing the bolt to move. This is much more likely to occur in a VariEze than a Long-EZ. Best repair is to ream the holes out to a larger size, press in a steel bushing and bolt the gear back in place.

VARIEZES WITH THE ORIGINAL ROSENHAAN AXLES

We requested that anyone who would want us to try to get Brock to manufacture a set of steel axles to replace the aluminum ones that have been cracking, to contact us. To our surprise everyone, without exception who contacted us did find cracks in the axles. Yet we only received three requests for Brock to manufacture replacements. The results?

No axles will be made. You are on your own. We suggest you take your best existing axle to a local machine shop and have them make you an identical set from solid 4130N steel. We recommend a more generous radius between the flange and the axle, at least a 3/8" radius would be good and would not interfere with anything. NOTE: Three builders have found an AN4 axle attach bolt broken!! Check you axles and attach bolts soon. The other option is to trade up to Cleveland 500 x 5 wheel and brakes. We have heard from a number of VariEze pilots who have done this.

DELAMINATIONS

Repairing small areas of delaminated skin, can best be done by drilling several small holes around the effected area and injecting epoxy into one or all these holes until it comes out of the rest of the holes. Cover the area with Saran wrap, a flat board and a heavy weight. Allow to cure. One of the problems with this type of repair is finding a hypodermic syringe. Try this: go to a sporting goods store, buy a cheap plastic repair kit for a leaking basketball.

Drain the tube of glue, wash it out thoroughly with water, dry it and fill it with epoxy. Make your repair and throw it away. Works great. Best way to check for a suspected delamination is to tap the area with a quarter. You will hear a solid clear ringing sound if it is a good layup, but as you cross over a delaminated area, it will sound hollow.

MORE THOUGHTS ON COOLING

Cooling is a rather controversial subject, certainly one that has caused more consternation than most. We have done a lot of testing recently using several different VariEZes and Long-EZs.

This is a brief summary of what we found: If you only have one CHT probe, install it on the most forward cylinder, cylinder #4 on a Lycoming, cylinder #1 on a Continental. In a normal EZ per plans engine installation, the forward two cylinders will invariably run hotter than the aft two. We have consistently found the most forward cylinder running as much as 100°F hotter than the most aft cylinder.

If you have a four probe CHT system, one you can rely on, that has been calibrated and is known to be accurate, you can experiment with "ramps" on the floor of the lower cowl, as shown in CP42, page 3. The deflector ramps will dramatically change the cooling pattern of your engine, depending on the shape, size and position of these ramps. It would be difficult and maybe even foolhardy to try this without good instrumentation.

The way the cooling in an EZ cowl works is apparently not the way it works in a Cessna 150. For example, in an EZ, ram (male) scoop or NACA flush scoop, the high velocity cooling air enters the cowl and most of this air runs up the slope of the lower cowl, hits the aft vertical baffle, and squirts up through the fins of the two aft cylinders.

Since most of the incoming air has gone, at high speed, through the aft two cylinders, in most cases overcooling these two cylinders, the forward two cylinders do not get enough cooling air, so it follows that they run too hot. This is the way it is, at least, on the several EZs we have closely examined.

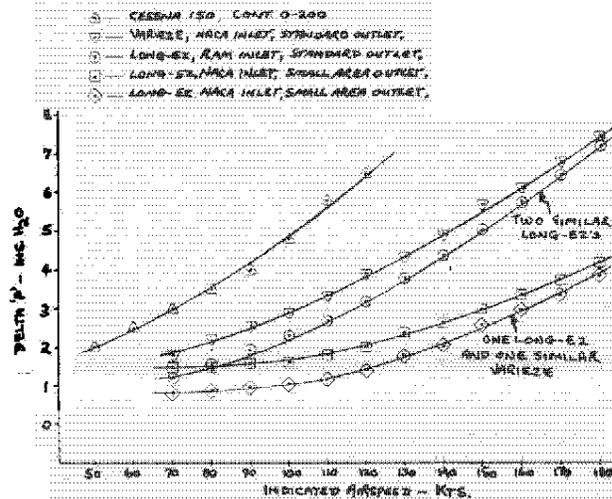
If you accept the above scenario, it follows that a ramp or several ramps installed on the lower cowl, positioned and shaped to deflect the high-speed, incoming, cooling air and cause it to go up and through the forward two cylinders, should do the trick. In all cases we have tested, we have been able to reverse the hottest and coldest cylinders! This is pretty significant and what it tells you is that with some experimenting, you can get all four cylinders running within just a few degrees

of each other. Everyone who has seriously tried this has reported the same results. This has included some real skeptics.

In the last two weeks, we have tested 6 EZs, two VariEZes and 4 Long-EZs, using a water manometer. We used a stock Cessna 150 as a kind of "baseline". We found that a standard ram inlet EZ compares very closely to an EZ equipped with a flush NACA inlet, provided both have well-built, close fitting baffling and both have the same size, stock cooling outlet. Changing the size of the outlet will change the pressure drop across the cylinders.

Of course, there is a lot more to cooling than the pressure drop across the cylinders. "Blockage", or the resistance to the flow of cooling air caused by the baffled engine is a big driver. Very poor baffling or no baffling at all, obviously will result in a very low pressure drop. Very tight baffling forcing the incoming high pressure air to slow way down will obviously result in a large pressure drop. This differential is called the delta 'p' and is measured in inches of water.

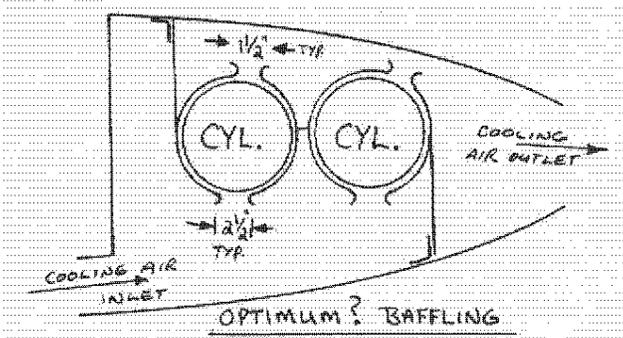
Lycoming says that for a Lycoming O-235 engine, you need a delta 'p' of about 4" of water. The curves shown below are the results of our recent tests.



Note that the two Long-EZs with the lowest delta 'p' across the cylinders (only 3" delta 'p' at 160), do in fact, have good cooling. Both are well equipped with 4 probe calibrated CHT gauges. What does this prove? Only that if the baffling is excellent, tight with absolutely no leaks, the cylinders will cool acceptably even with only 3" of water delta 'p', also, note that both of these Longs have smaller than normal cooling air outlets.

The temperatures on the above airplanes are measured at the bayonet cylinder head fitting on the Lycomings and on the top spark plugs on the Continentals. One of the Lycoming engines is really well instrumented, with probes on all four cylinders at the bayonet fittings, and on the bottom spark plugs as well as on the top spark plugs. The results of this test are as follows: Maximum power setting (mixture slightly rich for the climb) results in the bayonet probes averaging 360° - 380° F. Bottom spark plugs average 400° - 420°F. Top spark plugs average 440° - 460°F. At 10,000 feet, OAT = +10°, in level flight at maximum continuous power, (mixture leaned to best power max. EGT), the bayonet probes average 330° - 350°F. The bottom plugs average 360° - 380°F and the top plugs average 430° - 450°F. In spite of an average difference of 70° - 100°F from the bottom to the top of each cylinder, this is probably about as good as you can do and is quite acceptable, according to Lycoming.

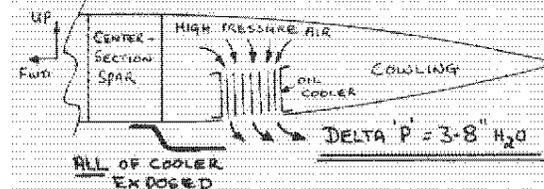
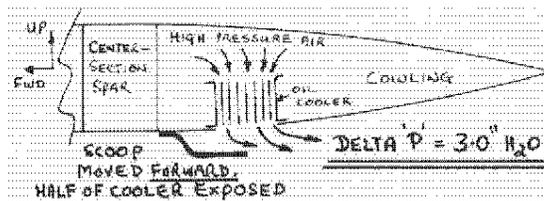
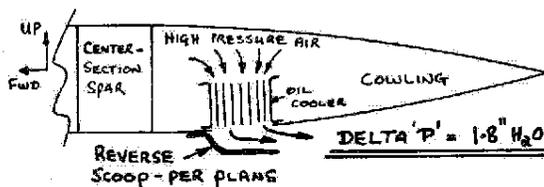
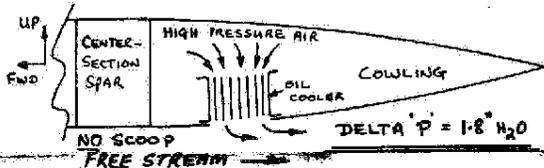
The optimum baffling for an EZ engine is probably not possible due to the mechanical difficulty of building it, but you can come close. For a Lycoming O-235 or Continental O-200, try to baffle as close to the sketch below as you can - (NEXT PAGE)



OIL TEMPERATURE PROBLEMS

Dick Rutan has been doing a lot of cooling related testing on the Voyager and during his test for optimum oil cooling, he discovered an interesting method to improve cooling air flow through an oil cooler. Using the Voyager water manometer, Dick found that with an oil cooler mounted on the inside of a cowling, such as a Long-EZ does, where the cooler is in the high pressure plenum of the cowl, and vented to the free stream, the following delta 'P' measurements were true.

With NO reverse scoop over the oil cooler (you can see the cooler from outside) the pressure differential was 1.8" of water. He installed a reverse scoop per plans, still 1.8" of water delta 'P'. He moved the reverse scoop forward, exposing half of the oil cooler - 3"H₂O delta 'P'. A dramatic improvement to say the least. Next he moved it forward enough to expose the whole of the oil cooler - 3.8" H₂O Delta 'P', and much cooler oil temperatures. If you are having oil temperature problems in your EZ, try this neat trick



We would like to thank Dick and the Voyager program for this very helpful hint and also for his help and use of his instrumentation for the previous article on engine cooling.

VARIIZE 0-200 OIL TEMPERATURES

Most VariEzes powered by the 0-200 Continental engines, by all reports, have oil temperatures that, if anything, run on the cold side. However, every once in a while we hear from a builder/flyer with high oil temperature problems!

This has been a puzzle and no one has resolved it 'til now. How could some EZs run cold and others run hot? The answer maybe in the oil temperature gauge. If you use a Westach or Westberg oil temperature gauge and you have had low oil temperatures, (maybe you have even wrapped the oil tank with an insulating cover?). Check your oil temperature by some independant means, a different gauge or even a candy thermometer. At the very least, you should calibrate your gauge against a known value.

Our experience here at RAF has been that in 3 different VariEzes using Westberg gauges, showing low oil temps all 3, in fact, have high oil temperatures. One had such high oil temps, the oil pressure would run at the minimum value of 30 psi!

The key is that if ever you see low oil pressure, check your oil temperature even if your gauge says it is OK. This is particularly true if you are using the Westach or Westberg temperature gages which in our experience over a number of years, have proven to be erratic and without frequent calibration, not to be relied on.

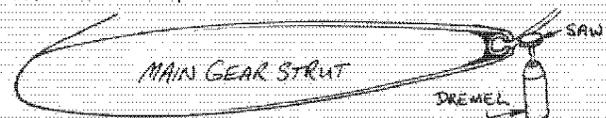
CAUTION - BRAKE FAILURE

We have used NYLON NYLAFLOW brake lines in all of the RAF designs so far with very low required maintenance. There are a few points that require care and if you do sloppy work here, you may set yourself up for a potential brake failure. If this occurs after a period of hard braking, it is even possible to have a brake fire. This could have serious consequences, so do not take this lightly.

First of all, NYLON lines must never be stored where they get exposed to direct sunlight. An excellent idea would be to store your roll of brake line in a black plastic bag until you are ready to install it. After it is installed, paint it with black or silver paint. Do not roll it out into the sunlight without wheel pants or paint to protect it.

Heat can soften the Nylaflow and allow it to expand under pressure, and possibly even burst if the heat is excessive. For this reason, it is very important to route the brake lines as far as possible from the brake disc. Keep in mind that under heavy braking the disc can get very, very hot. This heat radiates toward the gear leg, (which must be insulated with several layers of fiberfrax siliconed to the strut) and if the brake line passes between the strut and the disc, you have set yourself up for a potential disaster. The brake line must pass inboard of the strut, which keeps the strut between the disc and the brake line. In addition we strongly recommend insulating the brake line with fiberfrax. We cut a long narrow strip, perhaps 5/8" wide, applied silicone to the fiberfrax and wound it around and around the brake line until it was covered from where it appeared out of the trailing edge of the strut to the nut on the fitting on the caliper. A little tape will hold it in place, slip a piece of heat shrink tubing over the whole thing and shrink it down onto the fiberfrax. We also wrap this in aluminum foil, which of course helps by reflecting any radiated heat.

If you have not taken any of the above measures and have been operating your airplane for any length of time, the chances are that you may already have caused heat damage to the nylon line. Repeated heat applications to a sample piece of Nylaflow have shown that it causes embrittlement. It becomes stiff and when you try to bend it, it may break. If you have this problem you should replace the brake lines. This is not as hard as it may sound. We have done it a few times ourselves. Use a dremel with a small saw, 3/8" - 1/2" diameter, cut through the glass into the brake line at the trailing edge, full length from fuselage to wheel. Grab one end of the brake line and pull it out through the saw cut. Install a new piece by opening the saw cut and carefully working it in full length of each gear leg. Layup a thin ply of hobby store glass or one ply of B10 to retain it in the trailing edge of the gear and you have it. The whole operation can be done in an hour!



We have recently installed "Nyloseal" nylon tubing in two of our aircraft for brake lines and, so far, it looks very good. We only have a few hundred hours of test time at this point, but we are pleased with its performance. All of the above precautions were, of course observed. One of the best ideas to avoid heat problems associated with heavy braking, is to cut vent holes in the highest point in the wheel pants (aircraft parked nose down). This allows trapped hot air to rise out of the wheel pant, drawing in cold air to cool the hot disc.

For new construction, a good suggestion would be to install a hardware store type plastic tube into the trailing edge, such that the brake lines may be slipped through for easy removal if it should ever become necessary. You would need to find a plastic tube with about a 3/16" to 1/4" I.D. The stiff type of hardware store plastic tube would be best.

CAUTION: CONTROL SYSTEM STIFFNESS

We have previously warned builders to ensure absolute freedom from stiffness in the pitch control system. This is very important and must be corrected if it exists in your EZ. We never have particularly addressed lateral (roll) control system stiffness. While not quite as important as pitch, tight bearings in the aileron control system really spoils the nice flying qualities inherent in an EZ. Conscientious attention to detail here will pay dividends. Long-EZs and VariEZes have similar lateral control systems, the main difference being that the CS-132L belhorn in a Long-EZ is mounted inside the wing root, and the same part (CS-132) in a VariEze hangs out in the breeze, inboard of the wing root, close to the bottom cowling.

Both of these areas can be troublesome. In the Long-EZ, you must assure that the end of CS-132L cannot contact the bottom of the wing. Even if you have to dish the skin locally, you cannot accept any rubbing here. In fact, it would be best to have at least 1/4" of clearance. The VariEze though, needs even more clearance between the lower end of CS-132 belhorn and the bottom cowling, because the cowling will tend to flex up in flight and could cause a rubbing interference, or even worse. For example, if your CS-132 belhorn just barely clears the bottom cowl while at rest on the ground, it is possible that in flight the cowl could move up enough to seriously interfere with lateral control of the aircraft! The answer is a streamlined blister on the bottom cowl which will give the required clearance and will stiffen the bottom cowl.

Lubricate all bushings and bearings in the control system and do not fly until you have the control system working nice and free with no tight spots or stiffness anywhere within the full range of control stick movement.

CAUTION

Long-EZ electric fuel boost pump. Be sure to use the proper pump with a maximum of 6 to 8 psi. A float type carburetor cannot handle the high pressure pumps found on fuel injected engines. A 15 to 28 psi pump will flood a normal carburetted engine and shut it down. This has already caused one Long-EZ to land short of the runway! The small square shaped 'facet' electric pumps sold by Wicks, Aircraft Spruce and Brock are all fine and are set to limit below 6 psi.

CAUTION

Breather hose must be clear! This is critical, do not allow the breather hose to kink or fold onto itself. Keep all curves as smooth as possible and for bends use the largest radius possible. Do not neglect to insert a "stretched" spring into the breather hose per CP31, Page 4. This will help to eliminate any tendency for the hose to "fold" or kink when it is hot. The "stretched" spring consists of 5/8" O.D. screen door type spring (hardware store quality), which you will stretch until it yields and takes a set with the coils about 1/2" apart.

If your breather hose kinks or becomes clogged in some way, the build up of pressure inside the crankcase will blow the main seal (behind the prop) out and will

rapidly pump most, if not all of your oil overboard. Oil temperature will rise and the engine will seize if you continue to fly. Even at idle, the engine might seize!

PROP DAMAGE

Pusher aircraft are probably more prone to prop damage generally speaking, than tractor aircraft. As the builder/pilot and mechanic on your own EZ, you should be aware of this and should pay particular attention when you have been working on the engine, or inside the cowling. Leaving a small wrench on top of the engine can really ruin your day! When it comes out, it will really do a number on your prop. Before buttoning up the cowl, always do a very careful inspection for loose washers, nuts, bolts, even clipped ends of safety wire. All should be removed before starting the engine. Be sure not to leave a wrench or nuts or bolts on the wings or centersection/strake area -(don't laugh, it happens.) Unless you have a spare prop, the result can be a 6 to 8 week period of waiting for a new prop!

One other thing, if you see damage to your prop, a small gouge or nick, do not assume that it was thrown up by the gear. It may have been, but in our experience if there is a gash in the prop, it almost certainly was caused by something coming out of the cowl. A screw, camloc, washer, whatever. Remove the cowl and carefully inspect the whole engine. Look for missing rocker cover screws or exhaust nuts. Almost without exception, when this has happened to us, we have found a place where something came loose. Be very conscientious about cleanup and tidyness in your engine compartment. Be sure and use new lock washers everytime you remove the exhaust system. Check your rocker cover screws for tightness, and safety wire any bolt or screw that you have any doubts about. Above all, don't be careless about laying tools on top of the engine. Be careful and you will get excellent utility and life out of your props.

"PLANE" EFFICIENCY

We recently received a summary of the results of all 6 CAFE events, plus several of the LBF and DULLES air races. All have been sorted and computed using the CAFE formulas (speed)^{1.25} x (MPG) x (payload)^{.75} and are arranged in order starting with the highest CAFE score. The results are most interesting. The highest ever CAFE score was achieved by Dick Rutan in his own Long-EZ. Dick loaded his airplane with 3 people(!) and proved, once and for all, that when it comes down to which aircraft can carry the most payload at the highest speed using the least amount of fuel (which is after all what efficiency means, doesn't it ?), the Long-EZ can't be beaten. Second highest CAFE score was put up by Gary Hertzler's incredible little 80hp VariEze, followed by Gene Sheehan's Q-200.

We have not seen these results printed anywhere else and we thought you might be interested.

SUN 60 RACE at the 1986 Sun-N-Fun flyin on Wednesday, March 19th, 1986. This is an all out speed race of approximately 60 miles. Originally conceived as a race for Rutan EZs, the Sun 60 Race this year will be open to experimental homebuilt aircraft of any horsepower, with a class for Rutan designed aircraft and a class for Glassairs. There is no handicap, you simply race against the clock. Entries are limited to 35 aircraft, the entry fee is \$10.00 and trophies will be awarded. For more information and an entry blank, send a self addressed, stamped envelope or call:

Charlie Gray,
2314 Saint Croix St
Kissimmee, FL 32741
305-847-7070

FLY-IN 1986

What promises to be a super fun flyin is being organized by Long-EZ builder/flyer, Buzz Talbot, 222 Sunshine Drive, Bolingbrook, IL 60439. 312-759-1124. This EZ autumn adventure will be over the Columbus day weekend of October 10-13, 1986, at the Rough River Dam State Resort in Falls of Rough, Kentucky.

Should be great. Contact Buzz for more details.

SHOPPING AT RAF

The following items are available from RAF. Of course, all the additional plans (meaning, engine installation, owner's manuals, speed brake etc) are also available.

Moldless Composite Construction Book \$14.50
VHS and Beta Tapes
Moldless Construction 59.95*
Weight and Balance 59.95*
Both tapes bought as set 99.95*
* Plus \$4.00 postage
Gold and Silver VariEze and Long-EZ tie tacs . . . 6.50
Books:
The Complete Guide to Rutan Aircraft
by Don & Julia Downie 13.95
Canard - a Revolution in Flight
by Andy Lennon 17.95
T-Shirts:
Blue - Long-EZ logo with "Laughter
silvered wings" - small, medium, large, Xlarge 8.00
White Polo shirts - Long-EZ logo with "RAF" . . 14.00
Caps - blue with white front and any aircraft
patch of your choice 7.00
Patches- VariEze, Long-EZ, Defiant, Solitaire . . . 3.00
Rutan Aircraft patch 3.00
Aircraft name patches 1.50
Some assorted belt buckles, mainly VariEze and
Defiant and Solitaire 25.00
Posters:
Long-EZ two ship 2.00
Defiant on Water 8.00
3-ship Defiant, VariEze and VariViggen 2.75
8 x 10 color Long-EZ 1.25
8 x 10 color Defiant 1.25

SHOPPING

Audio/visual warning system similar to that used and recommended by Mike Melvill in his Long-EZ, N26MS. This device gives a warning of a battery charge malfunction, low oil pressure, canopy unlocked or gear up by attracting the pilots attention to a flashing light and a loud buzzer. Pressing a defeat button will silence the buzzer for approximately one minute.

Control unit is .64" x 3.25" and is panel-mounted. Comes complete with oil pressure sender, three micro switches, gear-and-canopy-warning buzzer and simple installation manual. \$139.50 (CA residents add \$8.37 tax). Ian Ayton. Ayton and Co., 4061 Via Pavion, Palos Verdes Estates, CA 90274. 213-375-9269.

Escort 110 Nav/Comm. Like new condition. Includes mounting tray, plug and installation and repair manual. This radio has a built-in intercom system. \$385.00 complete.

NACA cabin vent doors, bi-directional, light weight. Will fit VariEzes and Long-EZs. EZ to install. \$6.50 each.

Light weight nose wheel fenders for all EZ's. Constructed of fiberglass and aluminum. Ready to paint and install. \$37.50
Contact: Gene Zabler
48 Robin Hill Drive
Racine, WI 53406

ATTENTION DEFIANT PLANS OWNERS

KEN BROCK MFG. reports that they now have over two-thirds of all the Defiant prefab metal parts on the shelf, ready to ship, with more parts being completed every day. Only 50 sets of these parts have been produced. If you have a set of Defiant plans or contemplate ever building one, don't wait, with only 50 sets of parts they may not be there if you delay too long.

ATTENTION SOLITAIRE PLANS OWNERS

KEN BROCK MFG. now reports that they have 100 sets of all the prefab metal parts required to complete a Solitaire. BROCK will be offering these parts for a limited time only at discount prices. If you contemplate building your Solitaire, do not delay, these parts must be moved. They need the shelf space.
Contact: Ken Brock Mfg., 11852 Western Ave., Stanton, CA 90680 714-898-4366

Rusty Foster has a new, improved design for his well-known "Space Saver" panel. This panel is pre-wired and includes 20 circuits. All switches (rocker type) are rated at 20 amps - 14 volts, and the appropriate circuit breakers are installed and wired. A wiring diagram suitable for a Long-EZ or VariEze is included.
Contact: Rusty Foster (Foster's Modular Design Co),
PO Box 1569
Portola, CA 96122

Debbie Iwatate (Long-EZ builder/flyer) has updated and improved her forward mounted brake plans to include several cosmetic and functional changes that she incorporated into her beautiful Long-EZ. She has put this collection of neat ideas into one very attractive booklet which she has available for \$20.00. Debbie has done a super job on this little book.
Contact: Debbie Iwatate
400 South 41st Ave.
West Richland, WA 99352

PR-88 Barrier Cream is still the best we have ever tried. We use it every day at RAF and a can goes an amazingly long way. Available from WICKS AIRCRAFT and AIRCRAFT SPRUCE.

Aircraft Spruce also has Ian Ayton's audio/visual warning system and pre-moulded NACA air scoops for sale.

FOR SALE

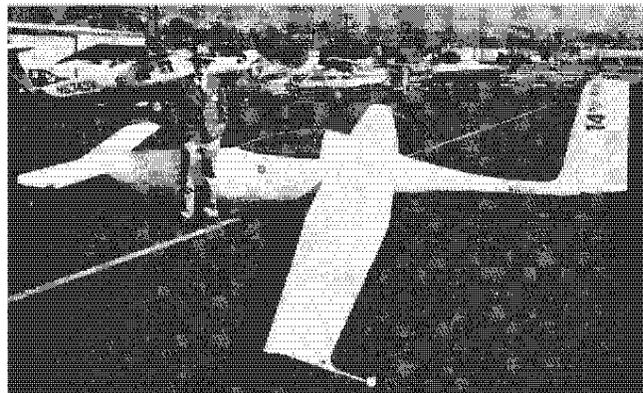
Lycoming O-235-L2C 118hp. 190 hours since new. Complete with all accessories including a 6" prop extension, B&T prop, and spinner. For Long-EZ. \$5000.00. (Engine only - \$4700.00)
Contact: George Kelley
213-596-3051

Lycoming O-235-C1. 80 hours since major overhaul. Includes starter, generator, and carburetor. Make offer.
Contact: Guy Selman
113 Earl Hall Ave
San Ysidro, CA 92073
619-428-4211

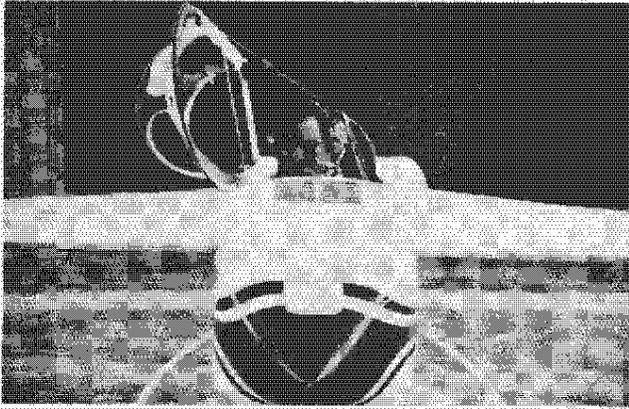
Brand new Great American prop for 100 hp VariEze.
Contact: David Robertson
513-231-7122

Rolls Royce O-200, 100 hp engines (Continental O-200 built in England by Rolls Royce). Two complete engines presently disassembled, will sell as is or will assemble.
Contact: Paul Martin
Ottawa Muni Airport,
Ottawa, KS 66067
913-242-5310

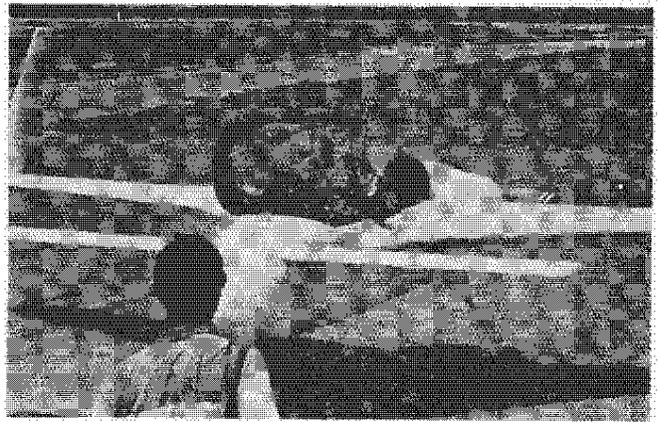
Vernon Voelzke would like to contact nearby Defiant builders.
Contact: Vernon Voelzke
105 Gilley Ave S.
Brookings, SD 57006
605-692-2813 - Home
605-692-6145 - Office



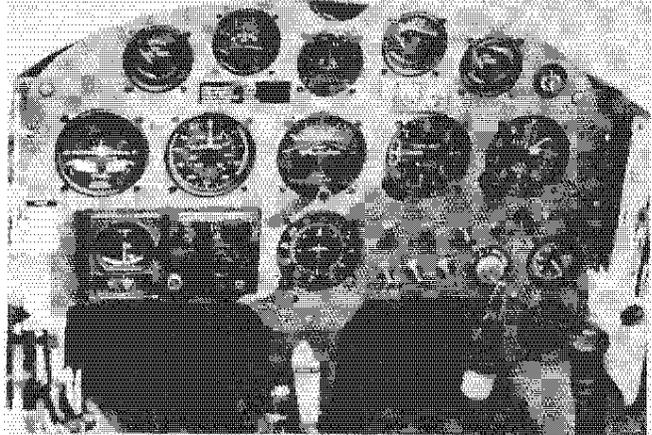
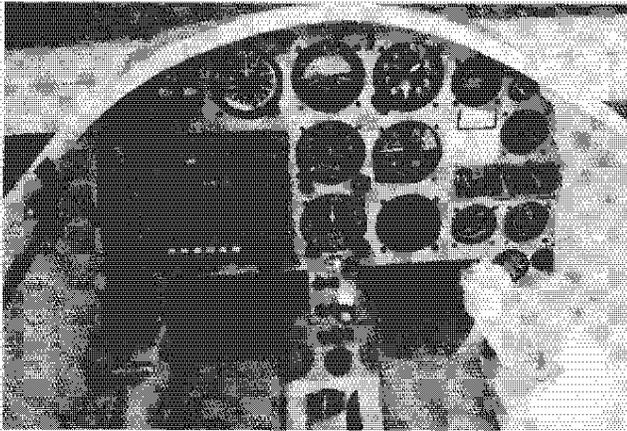
Bob Matheny - First homebuilt Solitaire to fly!



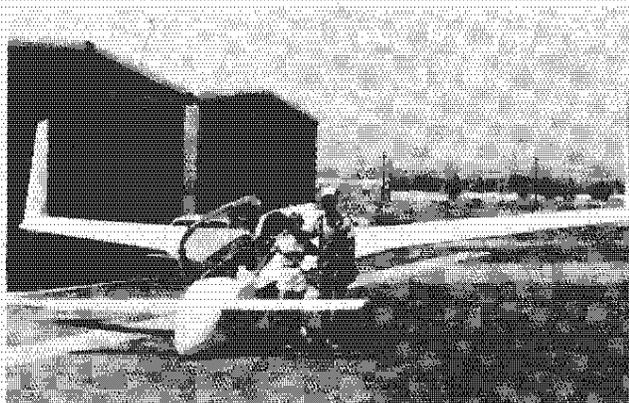
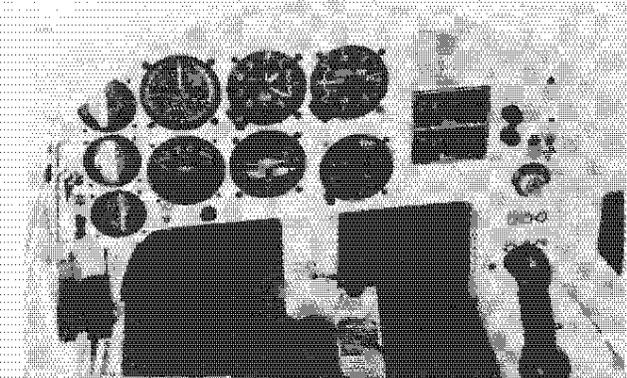
Burt Rutan taxis out for his last flight in his favorite airplane - N4EZ. His words upon landing, "Best airplane this company ever built!!"



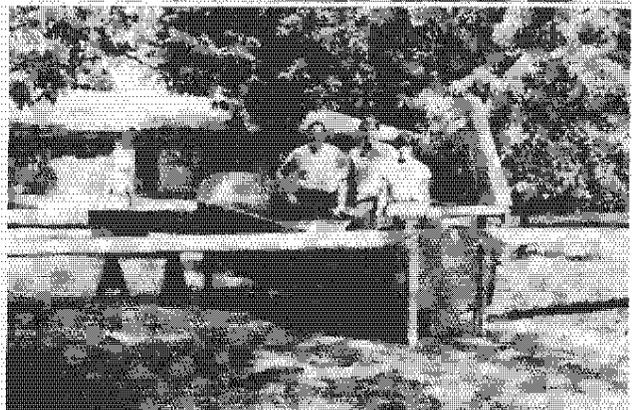
This one says it all - Wayne Litherland immediately after his first flight!



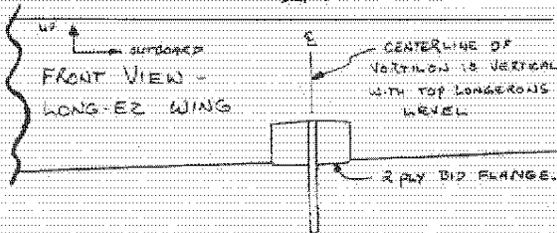
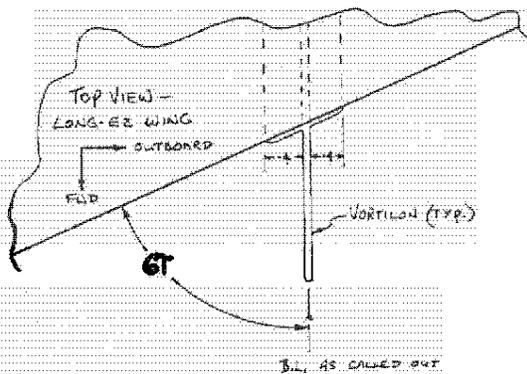
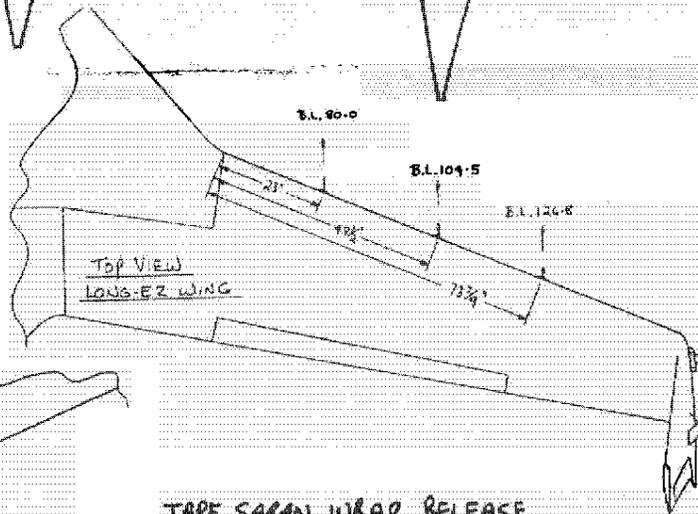
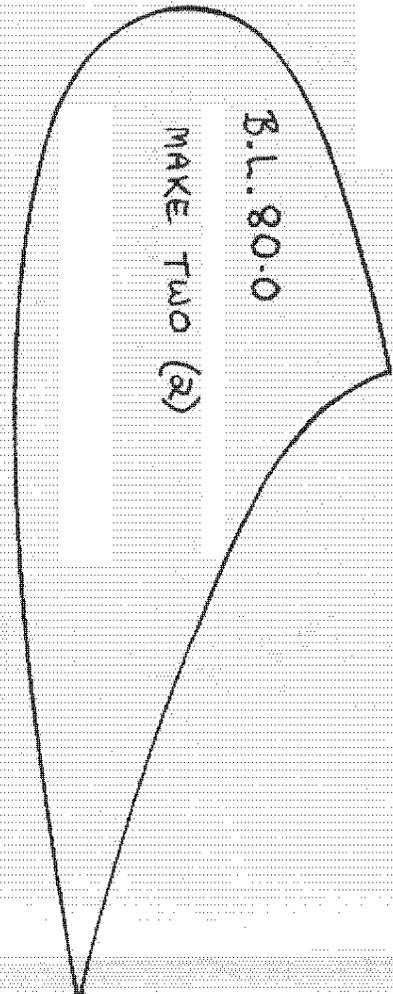
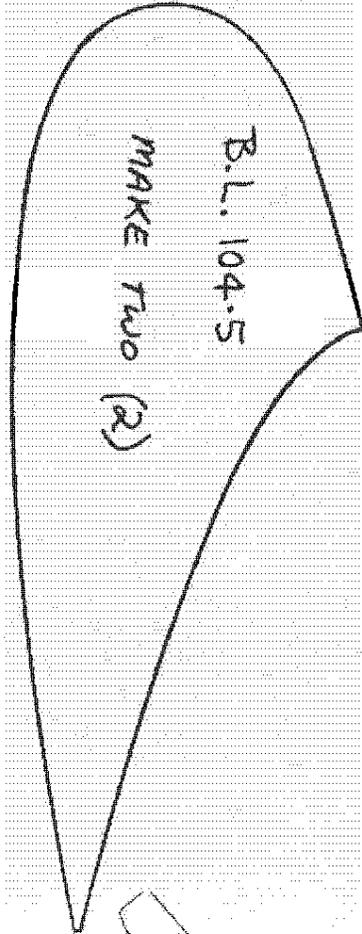
Four beautiful instrument panels to wet your appetites!



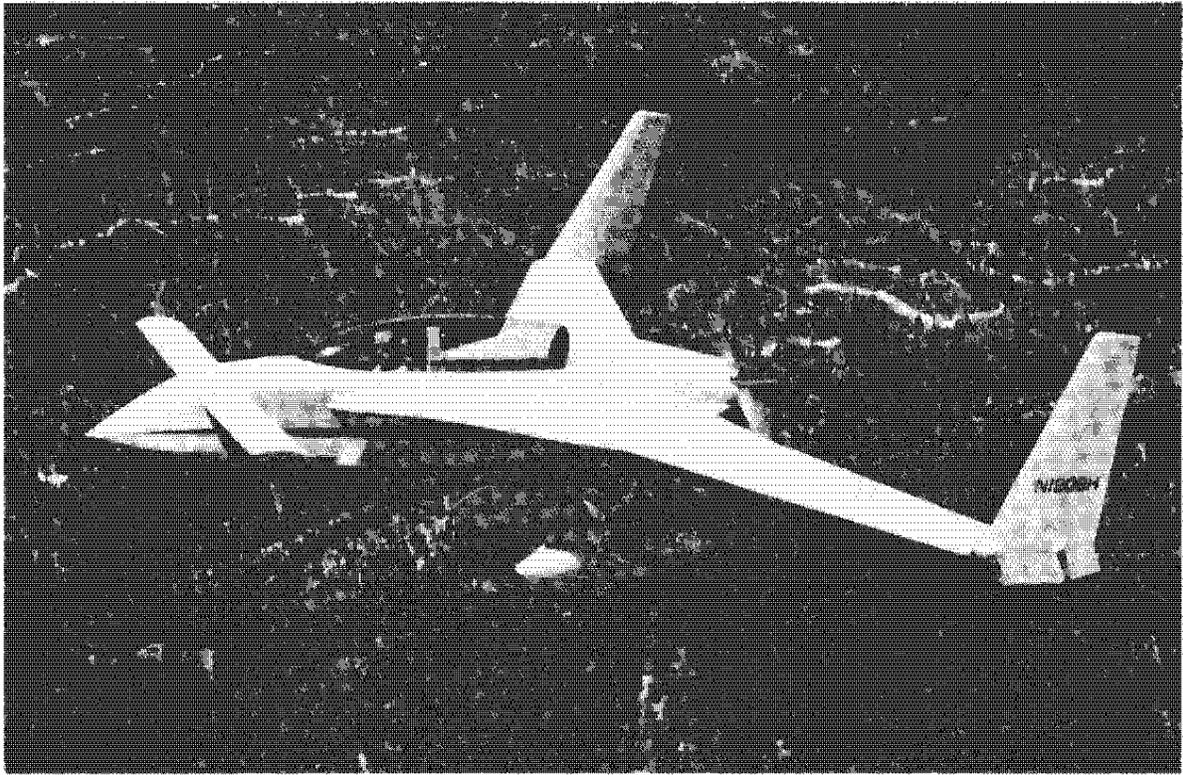
Mark and Brenda Rogers - locals here at Mojave after Marx's successful first flight - they recently were transferred to Lubbock, Texas - the Long-EZ performed flawlessly on its first cross country.



The Weitzel family with their partially completed Defiant. They also have two flying VariEzes which they use to blow away the cobwebs between building sessions!

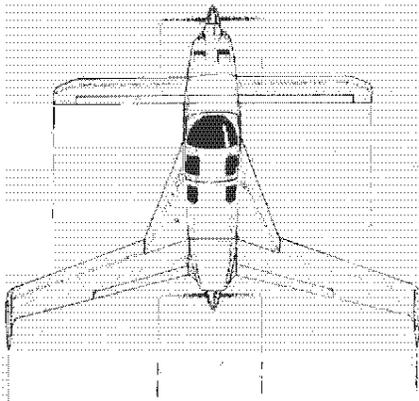


TAPE SARAN WRAP RELEASE AROUND LEADING EDGE OF WING. LAYUP 2 PLYS OF BID @ 45°, EACH SIDE OF EACH VORTILON. LAP 0-4" ONTO WING. POP OFF AFTER CURE. TRIM, FILL AND PAINT. ATTACH TO WING LEADING EDGE WITH RTV SILICONE. ALLOW TO CURE AT LEAST 24 HRS BEFORE FLIGHT.



Jerry Bugni of Boise Idaho, flies his sharp looking Long-EZ over the wooded countryside of Idaho.

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



TO:

first class mail

January '86

The line which appears above your name lets you know through which Canard Pusher you are paid. If your label says **LAST ISSUE CP 47**, then this is your last issue, and you need to renew.

CP 47