

# THE CANARD PUSHER

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

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

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

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

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

## RAF ACTIVITY

RAF has been heavily involved in getting the Voyager ready for its first flight and the follow up test flights. We have also been working on the Solitaire engine installation and of course the "big one", the Defiant plans. In our 'spare' time we have been testing the John Roncz designed canard for the Long-EZ. This canard has been installed on Mike's and Sally's Long-EZ and has been flown in seven different configurations. It shows a lot of promise, particularly when it comes to rain trim change. We will have more information at Oshkosh, since we are currently in flight test.

## DEFIANT

The plans were completed and delivered to the printer on July 3rd. We are expecting to receive them back about the 22nd of July. We will mail out all plans that are on order as soon as we receive them and we will have Defiant plans available at Oshkosh.

Fred did all of the drawings for the Defiant plans and they are excellent. The plans are something of a departure from tradition for RAF. Not only were they done by someone other than us here at RAF, but the format we decided on is new for us. The airframe construction plans, Section I consists of a total of 84 pages 24" x 36". These are broken down into 5

segments. Segment A is 3 pages and consists of the contents, the bill of materials, a description and introduction to the Defiant. Segment B is 6 pages containing an up to date education on the use of composites. Segment C is 14 pages and contains 588 photographs showing actual construction methods and details. Segment D is 58 pages and contains all of the drawings and illustrations including all necessary full size templates and jigs. Segment E is 2 pages and contains the information required to finalize the Defiant through white paint.

Section II, which will be available within about one year, will contain all of the information necessary to install both engines, cowlings, props and spinners. In addition there will be details on electrical wiring, main wheel pants and nose gear doors.

The Owners Manual will be available by January 1, 1985. It will contain the normal operating procedures, emergency procedures, weight and balance information, performance charts, maintenance procedures and flight test procedures.

Fred reports that he has had the homebuilt prototype back home in the garage to prepare for the trip to Oshkosh. One of the main reasons was to get the main wheels faired in with wheel pants. He has also installed a transponder and a stereo tape deck and has been working on the nose gear doors, but told us last week that he probably would not have time to get the doors operating to his satisfaction and have them finished in time for the trip.

## VOYAGER

On June 22 1984, early in the morning before the desert warmed up or it became windy, the Voyager taxied out from Hanger 77 and began a series of taxi runs on Mojave's runways 30-12. Each run was made a little faster. Soon daylight was seen between the tires and the runway - the Voyager was airborne! The taxi runs were conducted with the rear engine running, but with the front prop removed. The front prop was installed out on the taxiway, a quick but thorough inspection was made. Dick taxied into position on Mojave's 30. Mike and Doug took off in the Grizzly to fly chase and to document the event on video tape.

The Voyager began to roll. The acceleration was amazing! The Grizzly pulled in low and close on the right wing just as the Voyager rose majestically into the air. It looked incredible. Dick climbed out straight ahead, gently feeling out longitudinal, lateral and directional control and stability. The Grizzly moved underneath looking for discrepancies. Mike called Dick on the company frequency, "You have a major oil leak on the front engine". Dick calmly replied that he was shutting down and securing the front engine. A quick discussion with Burt and it was decided to continue the flight but to remain in the immediate vicinity of the airport.

The air was glass smooth, and the Voyager was an awesome sight to see. The wing tips were bent up like a huge bird. The impression Mike had from the Grizzly chase was that the airplane was sailing across the sky, much like a sail boat on the ocean, a very exciting and satisfying feeling for all of those who worked so hard to reach this point.

After about 40 minutes of getting familiar with this large of an airplane, Dick announced that he was returning to land. Cameras were clicking and video cameras running as he entered left downwind for runway 30. A slight breeze (5 knots) had come up, giving him a slight crosswind from the right. He turned final, the gear was down (it had not been retracted) and floated down to a perfect touchdown.

Of course everyone was elated. The aircraft had performed aerodynamically flawlessly. Burt had predicted how it would fly and once again, he was exactly correct.

The airplane had been under construction in the RAF hanger for 18 months. Dick was pleased with the flying qualities. The pitch stability, its ability to hold a trimmed airspeed is really amazing. The airplane has 6 flights on it at this time for a total of 20 hours. One flight alone accounted for 11 hours. Dick reports that he has flown for hours at a time without touching the control stick. He turns with the rudder and the airplane holds airspeed and altitude all by itself.

So far the flight test data is very encouraging and has backed up Burt's original calculations and predictions almost exactly. A few more flights are needed to really nail down the power requirements and it is a possibility that the Voyager may attempt a closed course distance record between Mojave and Oshkosh during the week of the Oshkosh flyin. This will depend on the weather of course, and also on our ability to get the airplane thoroughly ready for such a flight. We are optimistic at this time, in fact every one involved with the program is pretty much elated by the excellent results of flight testing so far.

We had an "official" press day on July 3, 1984 and as a result, the Voyager was seen in flight on all three major TV networks, as well as on many local TV stations. See Page 9 for more photos of the Voyager.

#### VOYAGER VIP CLUB

The response to our request for comments on the idea of a VIP Club (Voyager Impressive People) has been excellent. Based on this response, a decision has been made to go ahead with the VIP Club idea. A final format or contribution level has not been decided on. Voyager expects to have all the details thrashed out before Oshkosh, 1984. Voyager will have a booth at Oshkosh and anyone interested in the VIP Club can obtain details at the booth or you can write or call:

Voyager Aircraft Inc.  
Hanger 77, Airport,  
Mojave, CA 93501  
(805)824-4790

#### RECORD SETTING EZ'S

July, Friday 13, 1984. Gary Hertzler's VariEze, N99VE with Jeana Yeager at the controls, took off from Bakersfield attempting to break the C1-A closed course record held by Leon Davis in his Dave DA-5. Davis' record was 2262 statute miles. Jeana took off at 6:40 p.m. and flew throughout the night between Meadows Field and Merced Airport. This meant she needed to complete 8 laps to break the record, we were hoping for 9. After 8 laps, she figured she could just get in the 9th and in fact she flew over halfway towards Merced before she decided to play it safe and return to Meadows. The rules say you must land at the airport you took off from for a closed course record. So she will only be credited with 8 laps, a distance of approximately 2424 statute miles. Actual distance flown was almost 2700 miles.

Gary's VariEze was flown back to Mojave and given a thorough preflight which included removing the cowling, changing the oil, tightening the alternator belt and retorquing the prop. One cowling screw was missing. It was replaced using Loc-Tite!

At 11:46 p.m., Gary Hertzler took off from Mojave airport in an attempt to set a back to back record this time the straight line distance record in the C1-A class (maximum gross weight = 1102 lbs). Gary had head winds until almost Alburquerque, where they switched to light tailwinds. He had lots of weather, including thunderstorms. After a nasty experience with a thunderstorm over the Smokie Mountains, he decided to call it a day. He landed with almost two hours worth of fuel on board at Martinsburg, West Virginia, approximately 14 hours and 50 minutes after departing Mojave. The straight line distance measures approximately 2227 statute miles, which easily breaks Al Leshers's 1975 record of 1835 statute miles in his Continental O-200 powered Teal.

The important thing to remember is that these results are provisional, and are pending ratification from the FAI. We are confident of ratification though, because in both cases the barograph functioned correctly and all the turn points and landing points were verified.

We are very proud to have these records back in the "fold" so to speak. For those of you who may not remember, Dick Rutan, flying Burt's Volkswagon powered original prototype EZ, broke the closed course distance recorded during Oshkosh 1975. Leon Davis broke Dick's record and has held it ever since. Thanks to Jeana and Gary, this record once again belongs to a VariEze. Congratulations guys, you did good!!!

#### LONDON TO PARIS POINT TO POINT RECORD

A new World Record was recently set in Europe in a VariEze. The airplane, F-PYIP belonging to Henri Christ was flown from London to Paris at an average speed of 167.7 mph, brake release to touchdown, by Gerard Felzer. His passenger was Alain Souchon. This point to point record has been ratified. Congratulations Gerard, Alain and Henri.

#### IVHC JACKPOT, NEVADA FLYIN

Sally and I flew our Long-EZ N26MS from Tehachapi, California to Jackpot, Nevada direct at 13,500 feet in 3.1 hours, brake release to touchdown. This is approximately 480 nautical miles (552 sm) which gives an average ground speed of 155 knots (178 mph). Total fuel burned was 17.4 gallons which is almost 32 mpg. The direct route from Tehachapi to Jackpot takes you over some pretty spectacular landscape, however it is very desolate with quite long distances between airports. There are dirt roads that would suffice for an emergency landing but you would be faced with a long walk out in many areas.

Jackpot is in the extreme northeast corner of the State of Nevada, only a mile or two south of the Idaho state line. The elevation is 5,200 feet and the airport consists of a good hard surface runway about 5,300 feet long. The Casino/Hotel, Cactus Pete's is a modern facility with very comfortable rooms, swimming pool, tennis courts and a golf course. Of course there is also the gambling casino. All of this is within easy walking distance of where you tie down your airplane.

Twenty four EZs flew in over the three day weekend. Fifteen VariEzes and nine Long-EZs and 1 Vari-Long. They came from all over, Greg CoIn flew his EZ in from Cleveland, Ohio. Byron and Coyla McKean flew up from southern Texas.

This was the second Jackpot flyin and was again organized by Shirl and Dianne Dickey of Salt Lake City, Utah. These folks do a superb job of organizing the flyin. This was the most enjoyable and best organized flyin Sally and I have been to. There were about 50 people who enjoyed the Friday night dinner/show. On Saturday, Shirl had set up three races, standard VariEze, standard Long-EZ and Unlimited EZs, called the Jackpot 120. The race is from Jackpot to Wells airport, about 61 miles south and back, a total distance of 122 miles. An airborne start, similar to Reno air races with the clock being stopped as each airplane crossed the finish line at Jackpot. The Wells airport is the turn pylon with the FBO being the pylon judges to ensure legal turns.

This is a no excuses speed race. The only thing that counts is speed. The fastest airplane wins. Cactus Pete's put up \$800.00 in prize money, which Shirl set up so that the prize money was paid down to fifth place in each race. The winners of each race received a beautiful trophy as well as the money. Second place won a plaque and money. It cost \$10.00 to enter each race and it was worth every penny, even if you did not win! Some knowledge of navigation by pilotage is required, since the race is generally run at fairly low altitude and navigation facilities are essentially useless except possibly for Loran-C!!

The exhilaration of speeding over the hills and ridges looking for every bit of lift from thermals or ridge lift to "surf" on, to pick up every available mile an hour, is

really fun. Dick Kriedel and I were very evenly matched in the Long-EZ race and the lead changed several times on the way to the turn point at Wells. However I managed to beat him in the pylon turn. I was fortunate to win the Long-EZ class as well as the unlimited class, and this of course made a great weekend even better. Rich Clark in his very clean VariEze won the VariEze class for the second year. The results of the 3 races are list below.

On Saturday night, Casino Pete's provided us with a banquet room with a super meal. After the awards were handed out, I gave a short talk on the progress of the Voyager. Rich and Carol Clark presented an excellent slide show of the trip to St. Croix in the Virgin Islands and back in EZ-Go, their trusty VariEze.

On Sunday morning, several EZs departed for the ride home and the rest of us participated or watched as we tried to cut a toilet paper roll as many times as possible after it was tossed from the window of a Cessna. This was a lot harder than it looked but great fun. Jim Heitkotter won with Shirl and I tied for second place.

Start planning now for next years event. This is the neatest flyin around. Shirl and Dianne will be hosting it again over the 4th of July. Sally and I will definitely be there. Here is a list of EZ people that were at Jackpot 1984.

VariEze.	Long-EZ
Rich Clark - 184.92 mph	Mike Melvill - 186.84 mph
Steve Sorensen - 179.78 mph	Dick Kriedel - 184.71 mph
Shirl Dickey - 179.65 mph	Gus Sabo - 177.97 mph
Gerry Gardner - 178.99 mph	Alan Dierkson - 176.54 mph
Bryan Giesler - 171.38 mph	Debbie Iwatate - 172.46 mph

Unlimited	Long-EZ
Mike Melvill - 187.25 mph	Dick Kriedel - 185.91 mph
Dick Kriedel - 185.91 mph	Ken Swain - 185.13 mph
Ken Swain - 185.13 mph	Shirl Dickey - 179.65 mph
Shirl Dickey - 179.65 mph	Wes Gardner - 179.81 mph
Wes Gardner - 179.81 mph	

Dick and Sam Kriedel won Grand Champion for their beautiful Long-EZ. Greg CoIn the Longest Distance Award for coming in from Ohio.

The following list are the names of the folks that flew in. Quite a few builders drove in also.

Shirl and Dianne Dickey	VariEze
Ken and Nancy Swain	VariEze
Steve and Joanne Sorensen	VariEze
Debbie and Ken Iwatate	Long-EZ
Byron and Coyla McKean	VariEze
Gerry and Karen Gardner	VariEze
Al and Karen Dierkson	Long-EZ
Don and Darlene Young	VariEze
Rich and Carol Clark	VariEze
Jim and June Heitkotter	VariEze
Sam and Dick Kriedel	Long-EZ
Larry and Shirley Freeman	VariEze
Bob Scott*	VariEze
Bruce and Bonnie Tiff	Vari-Long
Greg CoIn	VariEze
George Kelley	Long-EZ
Wes and Milly Gardner	VariEze
Gus Sabo*	Long-EZ
Phil Supan*	Long-EZ
John and Eric Sheffles	Long-EZ
Scot Parkinson	Long-EZ
Chuck Parkinson	VariEze
Laughlins*	VariEze
Brian Giesler	VariEze
Mike and Sally Melvill	Long-EZ

Al and Mabel CoIn - drove all the way from San Diego.

\* Please forgive me, I've forgotten your lovely partner's names.

(Note: Mike has been named the "Mojave Flash"!!!)

## CAFE 400 - 1984

RAF was represented this year by Mike and Sally in their Long-EZ, and Gary Hertzler, Richard Wallrath, Steve Sorenson, Bob Beard, Jim Skilling and Sasha Munir in their VariEzes.

The race was exceptionally well organized. The weigh in procedure is now down to a fine art, and although a different course was run than last year, everyone seemed pleased with it.

Mike and Sally had an experimental carburetor on their "Long" for the race and did not have time to get it set up. So on the way up from Mojave they flew a series of speed/power points to determine the speed to fly in the race, when they experienced detonation and extremely high EGT indications. Although they managed to get things under control, the engine did not run smoothly the rest of the trip, nor did it run well during the race. This was a shame, because it had been running quite well and they were hopeful of a good score.

Gary Hertzler had honed his now legendary VariEze (powered by a stock Continental A-80, 80hp) to an even finer peak of efficiency. It is a good thing he did his homework because Gene Sheehan really put in a lot of effort to get his Q-200 ready also. Gary was well prepared and won the two seat experimental category handily with a speed of almost 150 mph at an unbelievable 46 mpg! The Q-200 was faster than Gary's VariEze but only achieved 38 mpg. A Q-2 powered by a Revmaster engine came third at almost the same speed as Gary but with about 41 mpg. This is probably the best comparison between these airplanes. A light weight VariEze with the Continental A-80 engine, and a Q-2 about the same weight with a 70 hp Revmaster. These two should be close in performance and efficiency. Obviously the VariEze is a lower drag airframe because it not only flew slightly faster, but it used considerably less fuel to do the same distance carrying the same payload.

Mike finished in 6th place with a speed of 165 mph at 31.5 mpg which is an improved score over last year. Mike was happy, considering the fact that the engine would not run smoothly at any power or mixture setting and fuel flows were higher than what they had normally been getting. Upon checking the compression when they returned home and they found it to be down to 71/80. This was not good considering that the engine only had 200 hours since new piston rings, and a valve job. The engine returned to running smoothly after the original carburetor was reinstalled, although down on power.

Dick Rutan entered his own Long-EZ in the Exhibition category. This category did not restrict the payload to 200 lbs per seat as the normal category does. Dick loaded his airplane up with 800 lbs of payload! (in fact he believes he could have carried 1000 lbs!). This is equal to a four place aircraft with four 200 lbs people! He took off well before the 2000 foot chalk line and flew the course at 158 mph at 28.3 mpg. He set a score of over 3.6 million, considerably higher than any score ever at the CAFE race. This is the first time that a Long-EZ has been able to show what it can do when not restricted by rules and regulations designed to enable "spam cans" to compete. Dick's score wiped out even the winner of the productions single engines, a 6 place Bonanza which carried a payload of 1200 lbs!

A Long-EZ cannot compete head to head with a VariEze using CAFE 400 rules of fixed payloads, however, when it comes to carrying a tremendous load at a decent speed with excellent miles per gallon, which is after all, what the word "efficiency" means, no airplane currently available can compare with a Long-EZ.

The CAFE race is always a lot of fun and we would encourage EZ pilots to try it next year. Watch for a detailed race analysis in an upcoming Sport Aviation.

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

## No VariEze Plans Changes.

### LONG-EZ PLANS CHANGES

LPC #118 High performance rudder plans, page R-2. Top left hand corner. The sketch shows the hinge attach screws and nutplates to be on the rudder and the rivets to be on the winglet. This is in fact reversed as can be seen in Photos #23 and #24. The hinge should be permanently mounted into the rudder with rivets and the attach screws and nut plates should be in the winglet.

#### Clarification

High performance rudder plans. The dimensions shown are what we used to mount these rudders in 3 different Long-EZs and are correct. The 39" dimension from the top of the rudder down to the "kink" in the rudder trailing edge is a reference dimension. The "kink" in the rudder varies from plane to plane. To lay out the rudders on your winglet, follow the instructions exactly as called out on Page R-1.

### SOLITAIRE PLANS CHANGES

SPC #48 Section I, Page 9-3. The lower right hand corner shows the area that is peel plied for a later 2 ply BID layup. That layup is never called out. The proper time for the layup to be installed is before Step V on Page 9-4. This is the best time to apply this layup. However, if your project has gone past this point this is not a problem, it can be applied at any point after Step IV.

SPC #49 Section I, Page 14-3 - Spoilflap Actuation. Paragraph #6 on the right column should be inserted after the second sentence of the second paragraph. Also the position of the spoilflap handle is not shown on the FS 72 bulkhead as called out in the first chapter. The location is shown in the engine section plans. It is possible to determine the position from the photo on Page 1-1. The important consideration is to allow adequate hand clearance from the longeron. Note that because of the different spacing of the legwell bulkhead, the instrument layout will be different than on the prototype. This is detailed in the engine section.

### Solitaire Builder Hints

Section I, Page 15-1 - Installing the Rear Splash Guard. We had a letter from a builder indicating that the splash guard would rub the wheel at full compression of the rear suspension. The splash guard on the prototype will not rub, however due to possible variations, check this before installing the splash guard. The travel on the rear suspension is 1.3" total. If necessary move the splash guard forward to allow 1.3" vertical clearance on the tire.

### BUILDER HINTS

Paint - Primer paint for composites. Originally RAF recommended Dupont 70S as a primer. This paint has a high percentage of carbon black and gives excellent UV protection, but it is not the best as far as a good base for the more expensive top coats, such as the polyurethanes. We were recommending Dupont 100S as a replacement for 70S, because it also gave good UV protection and much better adhesion to the top coat, but it has now been discontinued. Dupont 131S is the recommended replacement. Any of Duponts top coats, acrylic lacquer, acrylic enamel or polyurethane (Imron) will go well with 131S.

We recommend a urethane paint over lacquer or enamel, simply because the urethanes are tougher, more flexible, and stick on better. We recently painted an airplane using Ditzlers Deltron urethane. It went on well, it looks great and it is reportedly easy to repair.

Whichever top coat you decide to use, (we recommend a good brand name such as Dupont, Ditzler, Sherwin Williams, Sterling etc), we would strongly recommend that you use the particular manufacturer's product from the glass structure out. In other words, you have contoured your airplane with dry micro and have gotten through the feather fill or Sterling contouring step and are ready for primer. Pick out a manufacturer such as Ditzler and use their recommended "system" from the undercoat or primer through to the top coat.

Our research has shown that this procedure will result in adequate ultra violet protection, and it will also give you the builder the best chance of a lasting finish that will not crack or peel. In the past, some builders have mixed manufacturers, such as Dupont primer and Sherwin Williams top coat. Normally this should work alright, but if it does not, you have no recourse to either of the manufacturers.

Final Contouring - When you have contoured your aircraft according to the finishing section, using dry micro, and are ready for the "feather fill", here are a few suggestions.

Feather fill is a polyester product and it has been commonly recommended by RAF for over eight years. Recently we tried a few other similar products, one of them was Sterling primer/filler which does the same job as feather fill and it is a direct substitute. To compare the two materials, feather fill is a polyester and therefore has poor adhesive qualities. It is

mandatory to scratch the surface with 40 grit sand paper to allow for a mechanical bond. Feather fill works best in dry conditions, such as we have here in the desert. Feather fill does not like humidity or moisture and you must not ever wet-sand feather fill. There have been a few cases of airplanes having their finish peel off in quite large pieces. The failure was at the feather fill to glass bond line, and invariably this kind of failure can be traced to moisture, high humidity conditions during application, wet-sanding the feather fill etc.

Sterling primer/filler (U-1761, U-1762) on the other hand, is a urethane product. Urethanes are famous for their adhesive qualities and given a clean surface they will generally stick forever. Sanding the glass is still recommended however, as there is nothing more disappointing than having your beautiful finish peel off! Sterling can be applied in high humidity environments, even in a pouring down rainstorm. Wet sanding is recommended. In other words, the material is essentially impervious to moisture. Sterling is more expensive than feather fill and it does seem to be slightly more prone to having pin holes after final sanding. But these can be filled with more Sterling, or 3M Spot Putty. We at RAF have used Sterling on several aircraft over the past two years and we are generally quite satisfied with it.

Sterling's biggest attribute as far as we at RAF are concerned is the fact that it cures rapidly and can usually be sanded within 45 minutes to an hour.

Recently we tried a new material (to us), Morton's Eliminator. This is a dark gray polyester type material, rather similar to feather fill. Morton's Eliminator has a few special properties that make it quite desirable. It cures quite rapidly, and the cure can be accelerated with heat. It is formulated to provide an absolute moisture or solvent barrier. Any material applied over "eliminator" will not penetrate and get under it and cause it to separate. It is designed to eliminate pin holes. It builds up well and is a good contouring medium. It sands readily once fully cured. We have not finished a complete airplane with it at this time, but we have used it on some glass parts and have been impressed by its performance. We found that the following procedure worked best for us while using Morton's Eliminator. Sand the parts to provide a good scratch for a mechanical bond. Spray a fog coat over the entire part and allow to flash off. Spray a medium cross coat over the part and before it dries, squeegee the wet material using a soft rubber squeegee. Use firm pressure to assure that the material is drawn into every scratch and pin hole. Smooth the surface with the squeegee as much as possible. Allow to flash off for 15 to 20 minutes. Spray a light cross coat over the whole thing, concentrating the spray wherever it obviously needs it, such as a particularly deep scratch or dent. Allow to cure per the instructions on the can. In a 70°F environment it takes 4 hours, 90°F it takes 70 minutes. If you heat it to 150°F, it will cure in 40 minutes. Sand with 180 grit wet or dry. It is now ready for whichever primer and top coat you have decided to use.

Brake Pads - As reported in a previous newsletter, Dick Kriedel and Mike Melville have been trying a new Cleveland brake pad. This is a semi-metallic material and works quite well. Brake effectiveness is increased and brake pad life is extended. It is important however to use the correct break-in procedure for this type of pad or you will not realize its full potential.

Remove your wheel pants and taxi at 40 to 50 knots. Execute three consecutive hard brakings to a stop. Do not allow brakes to cool between brakings. This procedure will glaze the brake pad surface and prevent uneven pad wear and brake disc scoring. This is Cleveland's recommended procedure for the semi-metallic brake pads, Part # 66-56. These pads are available from Aircraft Spruce.

If you are using the regular organic Cleveland brake pads (Part #66-2), an entirely different break-in procedure is called for. Remove the wheel pants and taxi at 25 to 40 knots. Brake to a stop using light pedal effort. Allow the brakes to cool. Repeat this

procedure a minimum of six (6) times. This will generate sufficient heat to cure the resins in the pads, but will not get so hot as to cause carbonization. A single, hard brake application on organic linings can carbonize and prevent attainment of the correct coefficient of friction for the entire life of the linings (which won't be long).

The above information was sent in by Long-EZ builder, Dick Kriedel, who tells us that you can get an informative catalog containing lots of wheel and brake information for \$2 from:

Cleveland Aircraft Wheel and Brake Division,  
Parker Hannifin Corp.  
P.O. Box 158,  
Avon, OH 44011

#### NOSE WHEELS

As we stated once before in CP 34, the nose wheel is prone to being forgotten. After all it is retracted when you are parked and while doing your preflight and when it is extended, you are normally in the front seat and unable to look at it! Get into the habit of extending it and prior to climbing into the seat, use your foot to check the friction damping. It won't take long to "calibrate" your foot and soon you will be aware of how it should feel. If it is loose and swings around with little or no drag, DO NOT FLY. Adjust the friction damper to give 3 to 5 pounds of force required to move it when pushing or pulling at the trailing edge of the tire.

If your airplane has a tendency to turn left or right while taxiing straight ahead on a level taxiway with no wind, you probably have your nose wheel mounted so that the nose wheel itself is not perpendicular to the level ground. We have recently corrected this problem on two Long-EZs by removing the four bolts and the 1/8" aluminum plate from the NG15A casting. Then using a home made "puller", consisting of 4 bolts, lots of washers and a spacer, we were able to pop the NG15A casting loose from the nose gear strut. Local heat such as an industrial heat gun can sometimes help.

We ground away some material at the tip of the nose gear strut, such that we were able to reinstall the nose wheel fork and pivot casting (NG15A) with the wheel itself absolutely perpendicular to the ground, with the aircraft level, sitting on level ground. In both cases this made an immediate and dramatic effect, allowing less use of brakes while taxiing, a shorter take off roll, since little or no braking was required and longer brake pad life.

#### PROPELLER TALES!

Propellers are very important. Check them carefully every flight, and handle them with great caution, they can bite. Check your prop bolt torque regularly. The first check should be done after the first flight on a new prop, then at 10 hours then at 25 hours and thereafter every 25 hours. The recommended torque is between 18 ft/lbs (216 inch pounds) and 22 ft/lbs (264 inch lbs). The proper torque on your prop bolts is very important, if the torque gets much below about 12 to 15 ft/lbs it is possible to loose your prop! Recently we were getting the original VariEze prototype out for a flight. It had not been flown or had the prop torqued in almost one year. All six prop bolts were literally finger tight! There was no measurable torque on any of the bolts.

Once the prop has been in operation for a hundred hours or so, you will seldom find the bolt torque low, except when you have flown from a wet or humid area into a dry climate. Check your prop bolts regularly and save yourself from what could be an embarrassing situation to say the least!

There have been one or two EZ pilots recently who have had their hands or fingers hit by the prop. Hand propping an aircraft engine particularly on an EZ is not difficult, but there is not room for carelessness or lack of concentration. The prop should always be treated like a loaded gun. Be especially careful when

"backing up" the prop, such as is commonly done to clear a flooded engine. This problem appears to be associated with the larger engines (O-320) more than with the standard O-235 engines. However, it can happen and if it does it can cause painful cuts and abrasions and even broken bones and will also result in a broken prop. Be careful. Use good safety procedures and never move an aircraft propeller unless you are ready and in position for it to fire.

#### CARBURETOR FLOATS

RAF has recently received two or three reports from EZ pilots who have experienced problems with floats that become fuel logged and sank in the float bowl. This of course will result in a very over-rich condition and could kill the engine unless the mixture is immediately pulled out to almost idle cut off. RAF has tried to find out what could be causing this problem and we hear rumors that a major AF (Airworthy Directive) is in the pipe line and should be published soon concerning this problem. Apparently the composite floats installed in virtually every Marvel Schebler carburetor is susceptible to this problem and may have to be replaced with a metal float.

Keep a sharp eye out for an unexplained over-rich condition. The engine will generally start to run rough, and may even quit. If this occurs, try leaning the mixture control. If this helps, get back on the ground and pull the carburetor. Have it inspected by a competent carburetor rebuild company. If you have recently noticed you are leaning your mixture more than you used to, suspect that this may be the problem. Do not continue to fly. This can be a very serious problem. The company that owns Marvel Schebler carburetors is:

Facet Aerospace Products Co.  
#1410 Highway, 70 Bypass,  
Jackson, TN 38301  
(901)423-2500

This company has issued a service bulletin #A1-84A. This bulletin says the float must be replaced at the next 100 hour inspection or if any of the following three symptoms are seen.

1. Evidence of a flooding carburetor.
2. Rough running at low throttle settings.
3. Inconsistent engine shut down.

If your engine is doing any of the above, contact your local carburetor dealer. Here in southern California, our dealer is:

Aeromotive Carburetors,  
475-479 Riverside Dr.  
Burbank, CA  
(213)845-7455

Tell them the model of Marvel Schebler carburetor and they have a repair kit which includes two or three gaskets, a clip and pin and a new metal float. For the MA3 carburetor, the repair kit part number is #666915.

#### ACCIDENTS AND INCIDENTS

A northern California VariEze crashed soon after take off. Several eye witnesses observed the canopy open immediately after lift off. The pilot was observed to reach up to the canopy with both hands. The aircraft veered to the left and struck the ground 200 feet left of the runway centerline. The pilot did not survive. The NTSB investigator confirmed that there was no damage to the canopy latches and that they were in the unlocked position. They noted that there was no canopy safety catch.

See CP #40, Page 4 for more information on canopy opening in flight. The biggest point is FLY THE AIRPLANE. You can not possibly get back safely if you don't gather your thoughts and concentrate on flying the airplane.

A Long-EZ was seriously damaged after the engine failed a few moments after take off in Minnesota. The pilot executed a 180° turn and attempted to land on the runway he had just lifted off from. Unfortunately he misjudged his glide landing on the last 1/3 of the runway. A 15

knot tailwind did not help and he rolled off the end, down a slope into a ravine. The nose gear collapsed, the nose dug in and the airplane flipped. The pilot and passenger suffered only minor cuts and bruises. There was no fire and in fact neither of the fuel tanks was even damaged. An FAA/NTSB investigation failed to reveal any clue as to why the engine had quit. The aircraft had had a similar incident occur just a few days prior to this accident. That time the pilot managed to execute a safe landing. A careful examination of the engine, mags and carburetor revealed nothing. The airplane was then successfully tested, and in fact had flown from southern California to Minnesota with no problem at all.

We talked with the pilot this morning and while driving his damaged airplane home, he had plenty of time to try to think of all that had happened and why it had happened. He came up with a theory that certainly could have been the cause. This airplane had the mag switches (two toggle switches) mounted on the left side of the roll over structure. The switches were not covered or protected inside the roll over structure. Two spiral bound note books were stored in the roll over structure. The pilots theory is that possibly one or both books moved against the terminals of the mag switches and possibly shorted the mags to ground. This would certainly cause the engine to quit. This will be investigated further, but it certainly is something to think about. If you have your mag switches installed in your roll over structure, insulate the back of the switches or install a cover over them to prevent anything from coming in contact with the bare terminals.

#### SHOPPING

RAF has a truly remarkable poster of the Defiant available. This photograph was taken by Steve Werner over Koehn Lake. The water was absolutely calm with a perfect reflection of the underside of the Defiant was the result. While trying to get the perfect reflection shot, the Defiant accidentally touched down on the surface of the lake. Steve snapped the picture and the net result is an astonishing photo of the Defiant skimming along on the surface of a mirror smooth lake, with two "rooster tails" of water trailing from the main gear. Fortunately Mike was able to increase power and climb away from this potentially hazardous condition. There was no damage to men or machines. Steve has given RAF permission to use his slide for the production of a really beautiful color poster. This poster is printed on heavy duty paper, 11" x 17", is extremely clear and suitable for framing. This poster is currently available from RAF and we will have it at our booth at Oshkosh. Price is \$8.00

#### Hot Wire Control

Vince Golden still has his excellent and economical hot wire control available. Price is \$12.50. Write to:  
Mike Quinn Electronics,  
2306 American Ave #1  
Haywood, CA 94541

Beautiful custom made desk top models. Defiant - VariEze - Long-EZ are available. Write for quote.

Contact: Rick Santa Maria  
624 N Fifth Street,  
Montebello, CA 90640  
(818)280-6426

#### FOR SALE

Lycoming O-235-C1 zero since major. Set up for Long-EZ with new Brock mount and 6" prop extension. \$4000.00 or equivalent Canadian.

Contact: Phil Carter  
P.O.Box 1356  
Canmore, Alberta  
Canada T0L 0M0

Lycoming O-235, 78 hours since factory remanufacture. Complete with accessories.

Contact: Sam Quinn,  
Box 837  
Estacada, OR 90723  
(503)630-2518

Accessory case for Lycoming O-235 machined for fuel pump. \$175.00

Contact: Dave Petrosino  
(503)296-9404

#### FROM THE BUILDERS

We recently received a letter from a Long-EZ builder, Patrick Colin. Patrick built his Long-EZ, believe it or not on the former US atomic testing ground, ENEWETAK ATOLL in the south western Pacific, Marshall Islands. Construction time was 14 months, and Patrick had to have everything shipped in from 4500 miles away. He says he received excellent service from the approved materials distributors and never made one call or wrote one letter for builder support!!

Soon after completing and test flying N83PC, Patrick was informed that funds for his project on Enewetak had been cut and he had to vacate the atoll. He decided to fly the Long-EZ out and headed for the island of Kwajalein, over 360 nautical miles away over open water. From there he flew via Ponape in the Caroline Islands to Rabual on New Brittain, then finally to Port Moresby in Papua, New Guinea where he landed a new job and is now based. This is about 2500 miles across the water. Quite a trip to break in a new Long-EZ.

Patrick tells us his Long-EZ caused quite a sensation when he arrived from where no airplanes arrive from, the open Pacific. It took four months and the paper work is almost equal in weight to the airplane, but he got his Long-EZ, the first composite aircraft in Papua, New Guinea licensed and has a PNG airworthiness certificate. As soon as Patrick gets his HG radio installed (required) he and his wife Lori, intend to travel extensively in PNG and over into Australia.

They would enjoy hearing from other builders, particularly those in Australia or anywhere in the Western Pacific. Contact Patrick and Lori at:

Motupore Island Research Station,  
P.O.Box 320,  
University of PNG,  
Papau, New Guinea

#### HIGH TIME EZ'S INFORMATION REQUEST.

This request was published in CP 40, page 3. The idea is to try to build a data base of required maintenance items on VariEzes and Long-Ezes. The response to our first request has been disappointing. Please send in your maintenance experience. It could be a big help to present EZ pilots as well as future pilots. The highest time VariEze that we know of is just over 1800 hours. Several more have accumulated over 1000 hrs. At least one Long-Ez is over the 1000 hour mark, with several in the 800 to 900 hour range.

Don't let this slide guys, if you have had an ongoing maintenance problem in any area at all on your EZ, drop us a card and we will assimilate the data and publish it in a future CP.

#### VARIVIGGEN NEWS

We have heard from two Viggen builders this time. Wayne Wilkins reports that his Viggen is rapidly approaching completion, but that although he had high hopes of flying to Oshkosh 1984, it is just too soon. Too bad Wayne, last year we had 3 Viggens at Oshkosh, it would be nice to get a few more all parked in a row.

Arthur Schwartz has repaired his Viggen "Birdie" after his gear failure and subsequent trip off the runway and

says that this year he will be at Oshkosh. He plans to fly in the company of his friend Sid Stiber who will be flying his recently completed Long-EZ. We are looking forward to seeing both aircraft at Oshkosh.

We recently heard second hand, of an incident with a VariViggen in southern California. Charles Cowan reportedly took off with a friend from Rialto airport with the intention of visiting the island airport in the sky on Catalina Island. As he overflew the airport at Corona, he experienced a severe vibration, a loud bang and the engine quit abruptly. He whipped his Viggen around and landed successfully on the Corona runway. The Viggen was not damaged, but the engine was shot. Apparently the cylinder base nuts had worked loose, due to excessive paint on the flanges. One cylinder actually fell off, and the resulting damage essentially destroyed the engine. This is a potentially serious problem and all of us should check all nuts, bolts and screws on our engines for correct torque.

This VariViggen was dismantled and trailered back to the shop, where builder Bill Campbell did a very thorough inspection of the airframe. No damage was found. However, this inspection did turn up a few cracks in the end grain of the composite outboard wing stub spar. These were caused by shrinkage of the spruce. In this case the exposed end grain of the stub spar had no moisture protection at all and the dry desert air had caused the exposed portion of the end grain to shrink and develop several cracks. The fix was to "wick" warm epoxy into these cracks and paint several good wet coats of epoxy over all of the wood that was exposed.

Wood aircraft are subject to changes in humidity and it is very important to protect every bit of wood by coating it with a moisture barrier. In the past this was usually spar varnish or something similar. We believe that the best possible protection is Safe-T-Poxy. All exposed wood surfaces should be coated with a good moisture barrier. Inspect your VariViggen carefully all over for any signs of wood shrinkage or surface cracking. Sand all such surfaces and coat liberally with Safe-T-Poxy.

#### SOLITAIRE NEWS

The current work on the Solitaire has been concentrated on finishing the engine installation section. These should be available two weeks after Oshkosh.

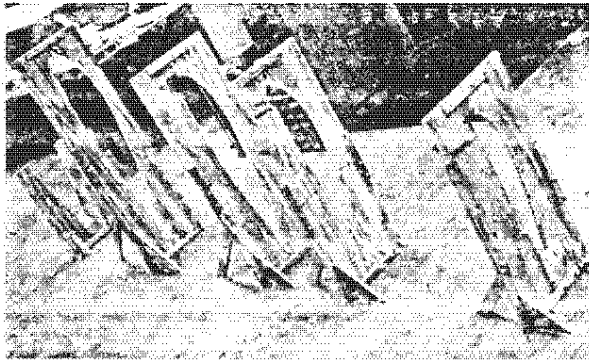
In order to allow photographs of the installation, Number 2 Solitaire has been brought to Mojave from Task Research and an engine is being installed in this fuselage. We are hopeful that a slightly longer propeller will fit into this fuselage than on the prototype, which would improve the propeller efficiency and increase performance. More on this in the next newsletter after we have had a chance to run some tests.

In other Solitaire news the prototype will be at Oshkosh, a chance for east coast and midwest enthusiasts to view this unique sailplane. The Solitaire is of course on display here at Mojave and is demonstrated most weekends.

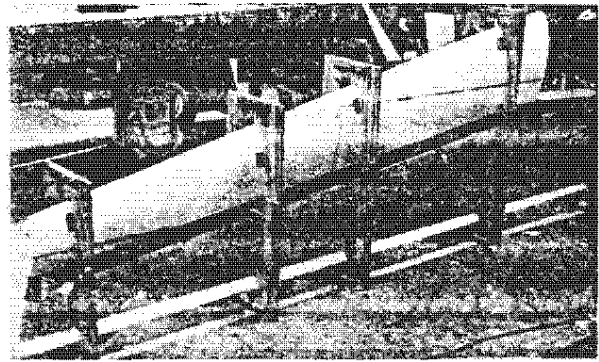
Rutan Aircraft has received several reports on Solitaire projects and is happy to report that several builders are very close to needing the engine section. Herb Abrams from Ohio has sent some pictures of his exceptional shop and work in progress. He had the wings in progress and the bulkheads in the fuselage and is working on the installation of the landing gear. Herb reports he hopes to fly his Solitaire in the fall on tow without the engine. Bob Matheny has his fuselage assembled, main wings complete, control surfaces built and he reports he is working steadily on the project.

We at RAF are extremely excited at the prospect of homebuilt Solitaires starting to show up at the soaring sights around the country, helping people to enjoy the exciting and challenging sport of soaring.

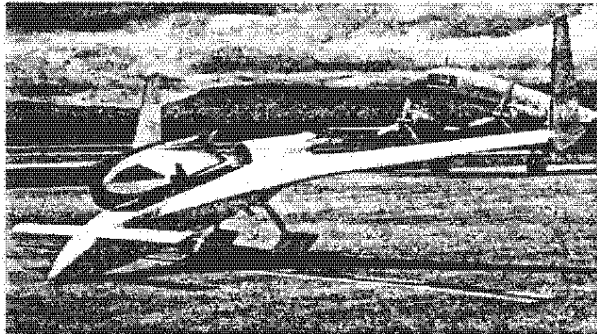




Ralph Van Cleve's Long-EZ wing jig prior to inserting foam cores.



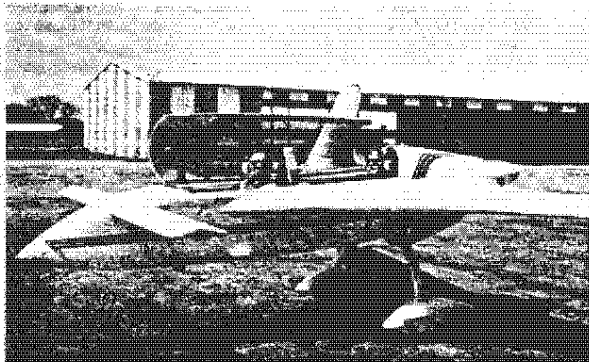
Ralph's left main wing in the jig with the shear web layup complete.



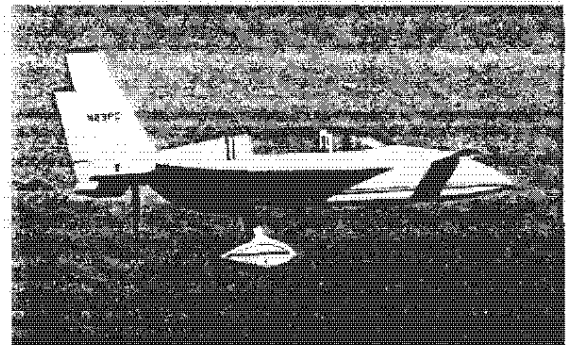
Patrick Colin's beautiful Long-EZ built on the former US atomic proving ground, Enewetak Atoll in the Marshal Islands, South Pacific.



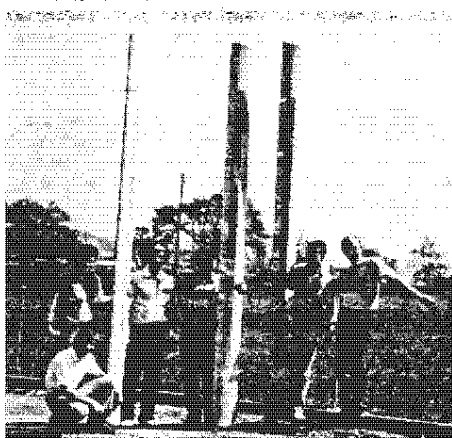
Trish and Sally drove this enormous trailer containing the Solitaire to Oshkosh, 1983. They will be flying this year!!



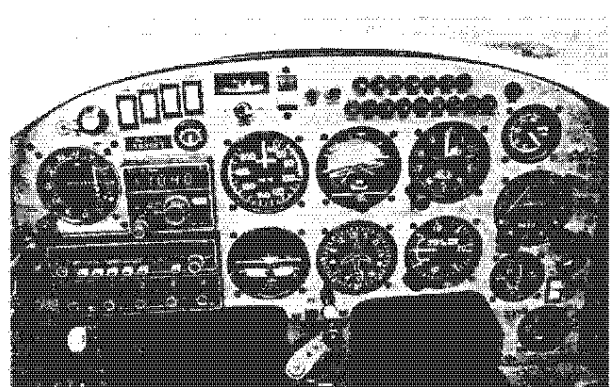
Ferde Grofe being checked out in his brand new Long-EZ by Neil Hunter. It looks great Ferdel!



Ray Poyner in his clean, stock Long-EZ. Ray is from Sun City, Arizona.



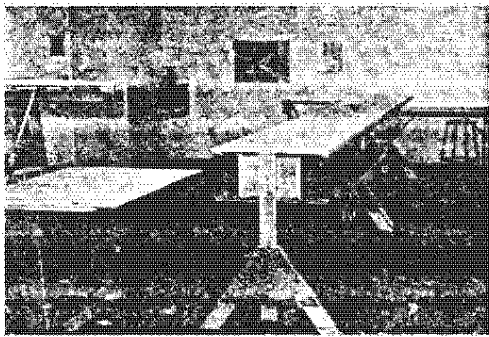
Three smiling Long-EZ builders just after successfully passing their mandatory static load tests in Switzerland. Holding their canards left to right: Peter Froidevaux, Hans J Schmid and Fritz Heer.



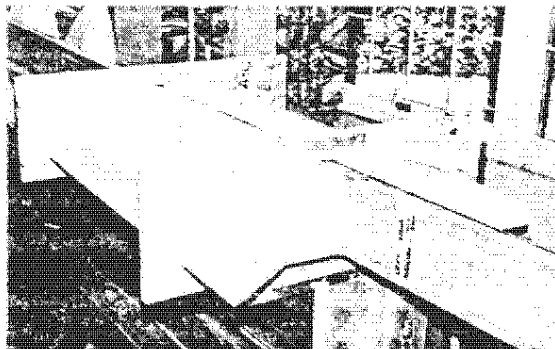
How's this for a pretty panel? Dick and Sam Kreidel's Long-EZ. This is not only a beautiful Long-EZ, it is also the fastest stock 'Long' we have seen. Look for this one at Oshkosh '84.

CP 41 Pg 8

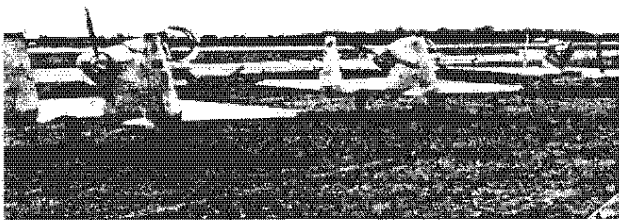




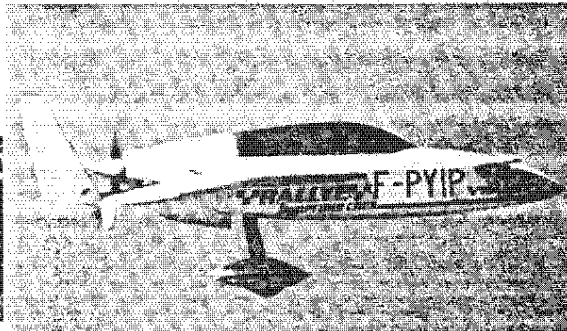
Solitaire builder, Herb Abram's incredibly sanitary workshop! Note the special built pivoting work bench.



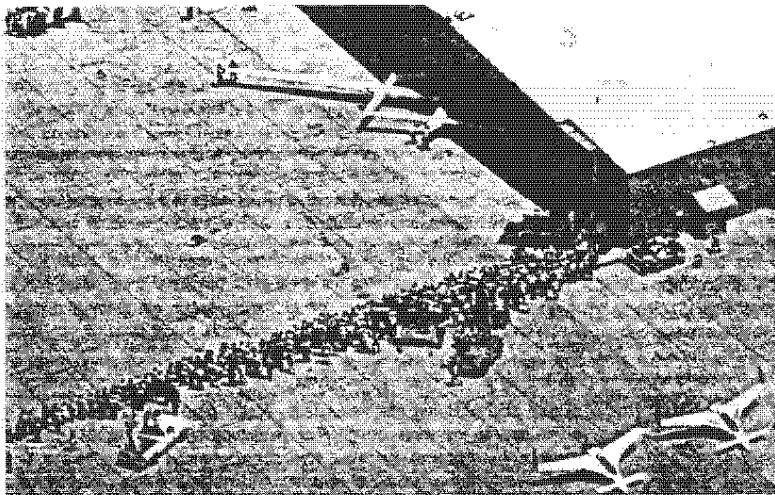
Herb's left main wing, foam cores and prefab spar in the jig.



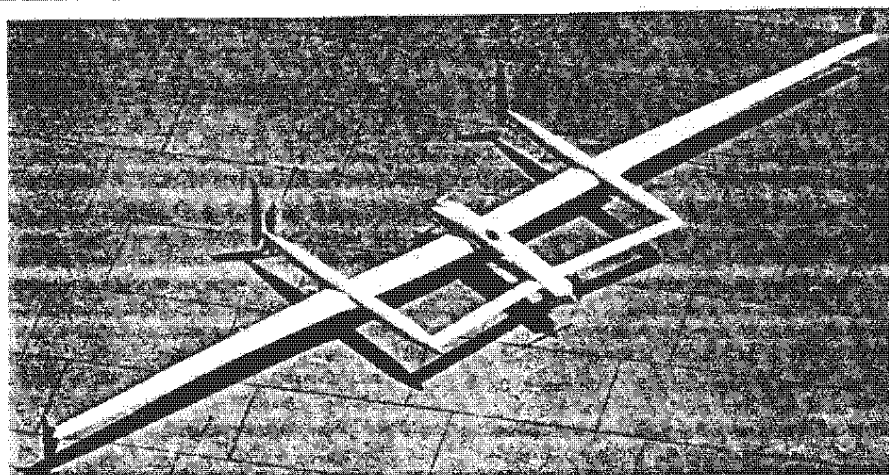
Three, count 'em, three VariViggens together on one airport at Oshkosh, 1983. Len Dobson, Bernard Duneman and Ken Winters.



Record setting French VariEze on its way from London to Paris, at a speed of 167.7 mph. Owned by Henri Christ and flown by Gerard Felzer.



The Voyagers first time into the light of day, on June 2, 1984. The Voyagers 110.8 foot wingspan, means it must be wheeled out of the 80 foot wide door, with the three gear scissors disconnected and the wheels turned to allow it to roll straight out while remaining at a diagonal.



# DEFIANT

## HOMEBUILT FOUR-PLACE TWIN

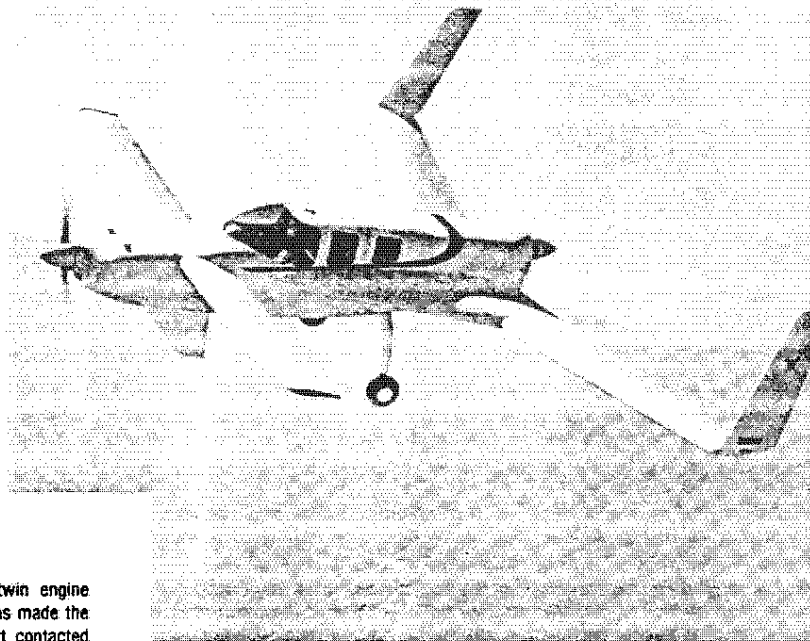


Photo by Don Downie

### INTRODUCTION

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

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

### DESCRIPTION

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

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

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

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

The fuel system consists of a 58-gallon tank with a large sump for each engine. The two systems are independent and require no pilot action for normal operations. Crossfeed is available. The sumps are accurately gauged and are equipped with low level warnings, such that when 45 minutes fuel remains, the pilot not only has a

warning light, but has a gauge that moves full scale for the last 45 minutes of fuel. He can then intelligently plan his options when fuel is low, knowing quantity to within one-third gallon of fuel. The last one-half gallon of fuel can be used in all normal attitudes.

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

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

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

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

### FLYING QUALITIES

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

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

## PERFORMANCE

In general, simplified systems means reduced performance. Not true for the Defiant. Overall performance and efficiency is significantly better than conventional light twins. Data discussed below are for 160 BHP engines. Time-to-climb to 12000 feet is 10.3 minutes with full fuel and four adults and 7.7 minutes with two adults and 400 nm fuel. At maximum cruise speed of 184 knots (75% power), total fuel flow is only 17.8 gal/hr giving a 1.74 nm/lb economy and a range of 1044 nm with reserves. At 55% power (168 knots) total fuel flow is 13.9 gal/hr giving 2.00 nm/lb economy and a range of 1208 nm with reserves. At low cruise (40% power, 150 knots) range can be stretched to over 1300 nm with reserves. At equal loading and speeds, Defiant gets over 50% more miles per gallon than a conventional light weight twin! Holding capability is also impressive. A medium weight Defiant can remain aloft on only 40 thrust horsepower (64 brake hp) for a maximum endurance of over 14 hours. The excellent two-engine climb capability allows cruise altitudes as high as 18000 feet with four adults and full fuel. The prototype has climbed above 28000 feet at light weight, single place. This climb capability is far in excess of similarly equipped aircraft. (Fixed pitch prop and no turbocharger.)

## SINGLE ENGINE CAPABILITY

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

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

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

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

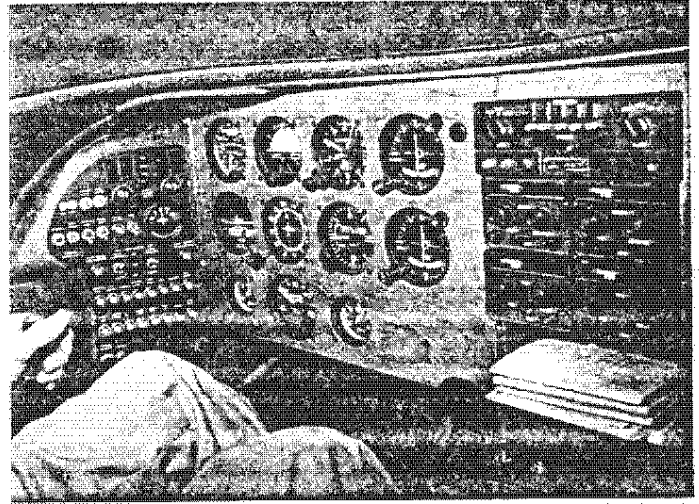
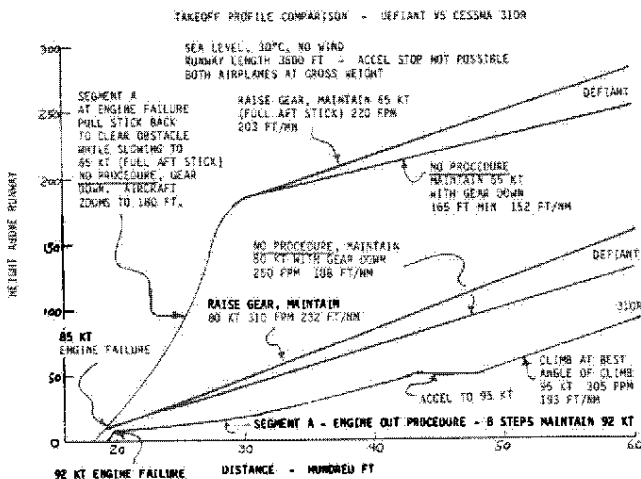


Photo by Don Downie

## SPECIFICATIONS AND PERFORMANCE

(with 160 BHP engines, fixed props)

Engines (2) .....	Lycoming O-320
Seats .....	4
Basic Empty Weight .....	1600 lb.
Equipped Empty Weight .....	1680 lb.
Equipped Useful Load .....	1270 lb.
Gross Weight .....	2950 lb.
Fuel Capacity .....	115 gallons
Span .....	31.4 feet
Wing Area .....	133 ft.
Wing Loading .....	22.2 lb/ft <sup>2</sup>
Power Loading .....	9.2 lbs/hp
Payload with full fuel .....	660 lbs.
Max Cruise (70%) .....	184 knots
Fuel flow at max cruise .....	17.8 gph.
Range at max cruise (45 min reserve) .....	1044 nm
Economy Cruise (55%) .....	168 knots
Fuel flow at economy cruise .....	13.9 gph.
Range at economy cruise (45 min reserve) .....	1208 nm
Climb Rate (2950 lbs) .....	1500 fpm
Climb Rate (2220 lbs) .....	1900 fpm
Single Engine climb (2950 lb) .....	310 fpm
Single Engine service ceiling (2950 lb) .....	6500 ft.
Single Engine climb (2200 lb) .....	550 fpm
Stall Speed (2950 lb) .....	64 knots
Stall Speed (2200 lb) .....	58 knots
Baggage Area Seat Up .....	16.5 cu. in.
Seat Down .....	41 cu. in.

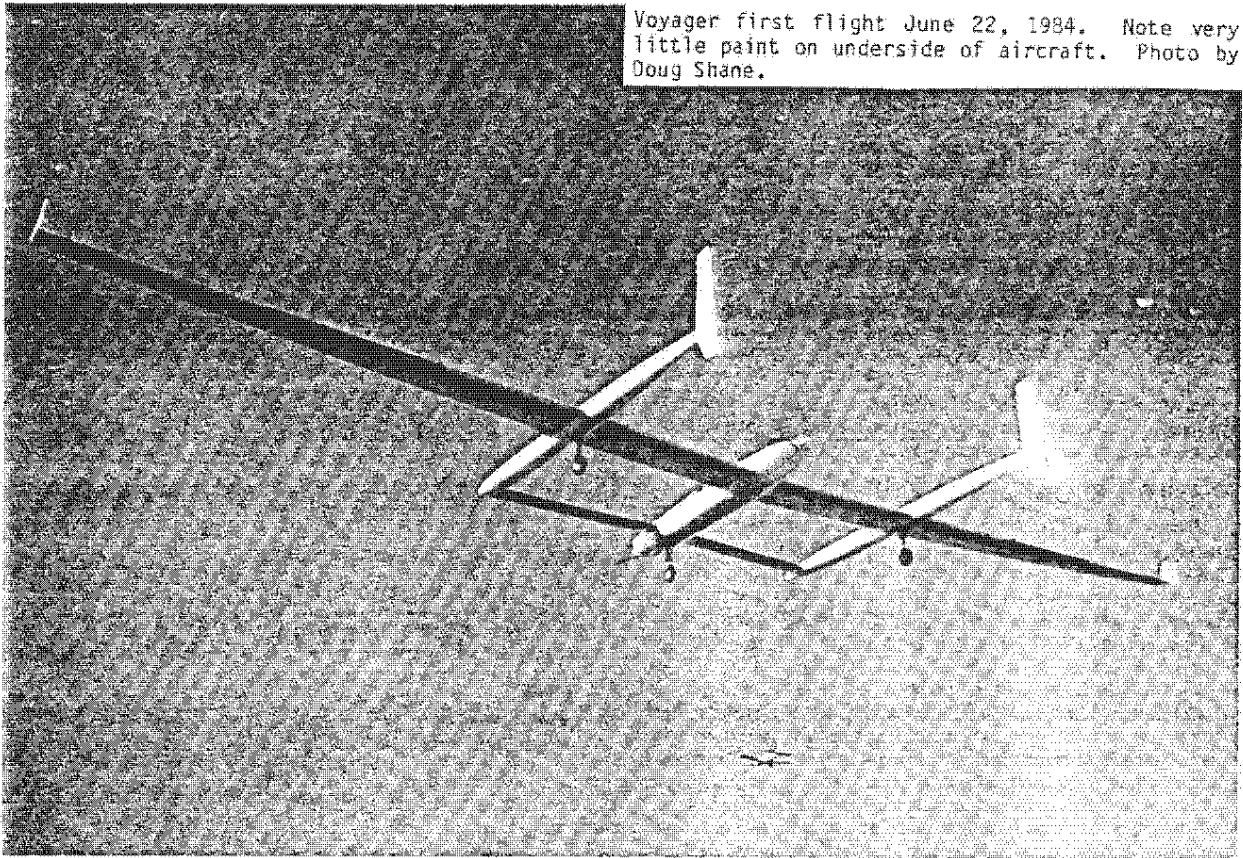
## COST AND TIME TO BUILD THE DEFIANT

The cost of the materials list has not been completed at this time, but we estimate the cost of building the Defiant will be approximately "two Long-Ez's", between \$20,000 and \$30,000. Remember that avionics can cost you as little as \$1,000 or as much as you wish to pay.

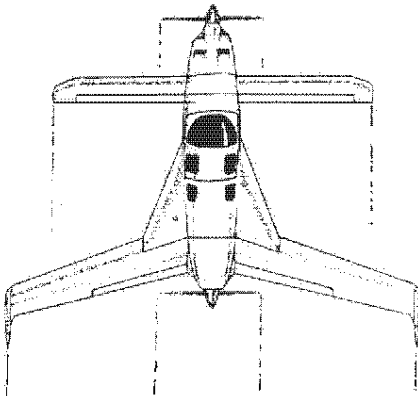
Time to build the Defiant, again will be "two Long-Ez's" as it is the same type of construction, just more. A competent builder can build a Defiant in as little as 2000 man hours. Until the plans are completed, it is difficult to say how many of the parts will be available prefabricated and this would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

	U.S.A.	Overseas
Canard Pusher Newsletter .....	\$ 6.75	\$ 8.75
Defiant Plans - Section 1 .....	\$490.00	\$510.00
Defiant Engine Installation .....	not available at this time	
Defiant Owner's Manual .....	not available at this time	

Voyager first flight June 22, 1984. Note very little paint on underside of aircraft. Photo by Doug Shane.



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



**TO:**

**first class mail**

**July '84**

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**CP 41**