

THE CANARD PUSHER

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If you are building a VariViggen from 1st Edition plans you must have newsletter 1 through 44. If you are building from 2nd Edition plans you must have newsletters 18 through 44. If you are building a VariEze from 1st Edition plans you must have newsletters from 10 to 44. If you are building a VariEze from 2nd Edition plans you must have newsletters from 16 through 44. If you are building a Long-EZ you must have newsletters from 24 through 44. If you are building a Solitaire, you must have newsletters from 37 through 44.

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

Much work has been done on building and testing the new Roncz canard for the Long-EZ and getting the plans ready to go to the printer. We are pleased to tell you that they are at the printer and should be available in four weeks.

Mike and Sally flew the Defiant to Sun n' Fun in Florida. A complete annual inspection was required before leaving on this over 5000 mile round trip.

We have checked out a couple of pilots in the Solitaire, and we have had old Grizzly out several times in the last few weeks.

RAF FLYIN - MOJAVE 1985

RAF will be hosting an EZ flyin here at RAF, Mojave California on JUNE 8, 1985. A special day, all RAF airplane builders, flyers or interested persons are welcome. Drive in or fly in and enjoy the company of others with a common interest. For those who will be flying in, we are having a spot landing contest between 9 am and 11 am. There will be a white chalk line across the active runway with judges with a portable radio. If you wish to try your luck for an accuracy landing, give a call on downwind (on Unicom 122.8) stating that you are in the contest. Give your type, color and N number. Your arrival landing will your only attempt, make it good!!

Taxi to RAF, which is near the west end of the ramp. Bring tie down ropes, there are lots of hard points in the cement ramp.

We will have a hands on demo after lunch of some of the new techniques used to build the new R1145MS canard, a new material for finishing and of course all the RAF staff will be here to have fun and answer any questions.

In the past, we have had a couple of these flyins for Burt's birthday. This flyin is a combination of Burt's day and a get together of EZ builder/flyers, a fun flyin, some pattern flying, buddy rides, hanger flying and whatever else makes you happy!! We will have hot dogs, soft drinks and sandwiches available at the hanger, or bring a picnic lunch. There is plenty of parking for cars and planes.

Come and join in the fun on June 8, 1985. There is no group in the world like the EZ builder/flyers, you are all great!!

SUN 'N FUN

Sally and Mike departed Mojave at 6:15 am on Sunday morning, 17 March. Light to moderate headwinds were experienced all the way to Elk City, Oklahoma where we stopped for lunch and to have a new vacuum pump installed. This first leg was 940 nm (1081sm) and it took 5.4 hours, an average ground speed of 174 knots (200 mph). 74 gallons of gas was used for an average of 13.7 gph. From Elk City we flew to Muscle Shoals, Alabama, 590 nm (679sm) in 3.4 hours for an average ground speed of 173 knots. This leg used 46 gallons for an average burn of 13.5 gph.

At Muscle Shoals we spent the night at the home of Frank Yost, a Defiant builder who has also completed and flies a Long-EZ. We drove to the location where he is building his Defiant and were very impressed with his progress. His Defiant is on the gear, the canopy and turtledeck are mounted. The fuel strakes are complete, the wings are mounted with both engines mounted. Still to do are winglets and canard. A couple of Long-EZ builders have been helping with the project and it certainly looked like Frank will make it to Oshkosh 1985. The next morning we took off and climbed to 13,500 where we found a 51 knot tailwind! The first tailwind since leaving California. We flew to Lakeland in 2.5 hours, a distance of 520 nm, averaging 208 knots ground speed. We arrived in the middle of the afternoon airshow, due to the time change and no notam at flight service (!), so we drove over to visit Johnny Murphy in Merrit Island. He was not home, so we headed back to Lakeland, landing at Bartow, to wait and lay on the ramp eating chips!! After the airshow we flew into Lakeland and parked amidst about 30 VariEzes and Long-EZs. We stayed all week and talked with lots of EZ and Defiant builders. This was the first major flyin that there were more Long-EZs than VariEzes. It was difficult to get an accurate count, due to many of the EZs coming and going (the Bahamas, Key West etc!) during the week, but we estimated at least 40 EZs flew in during the week.

One of the highlights was the Sun 50 Race, originally started by Dick Rutan as an EZ race. This year it was run by Charlie Gray and was open to all comers. Six Glasairs, six Long-EZs, two VariEzes, one Brokaw Bullet and one Dragonfly started the race. The start was right off the main runway at Lakeland and Charlie and his assistants flagged each airplane off at 20 second intervals. As soon as the last one broke ground, Charlie jumped into the Defiant and we headed for the finish line at Winterhaven airport. We got there in plenty of time and the first airplane across the line was a Glasair, 180 hp with constant speed and retractable gear. Surprisingly the next airplane was Herb Sanders in his Long-EZ. Dr. Brokaw in his Bullet got lost so he came in 15th. This race was held over a 60 nm course. The winning time was over 210 mph the slowest time was 113 mph, the Dragonfly. Not bad, from a standing start with a VW engine. A good time was had by all, no one had any serious problems and it was exciting to be at the finish line.

During the week we met lots of old friends and made new ones. We managed to visit Johnny Murphy's Defiant project and he really is going at it. His Defiant was upside down and he was finishing the bottom. His wings were ready for primer as were his winglets and canard. Both engines have been mounted and most of the plumbing and wiring was complete. Workmanship is excellent, and we are really looking forward to seeing this one at Oshkosh '85. Look for a few surprises, Johnny hardly

ever builds exactly to the plans and this one is no exception!!!

We also were able to make it over to Orlando, where Charlie Gray is building two Defiants! Charlie and his son Marshall are doing excellent work and are going great guns. Both fuselages are on the gear. All four wings, winglets and two canards are done, and centersection spars are mounted. It won't be to long and one or both of these will be flying.

The EZ Dinner was really super. About 120 people enjoyed excellent food, listened to much hanger flying and Charlie handed out over \$600.00 worth of door prizes. Race results were announced and all participants will be getting a copy of the results.

Place	Aircraft	Pilot	Speed	Time
1	Glasair-180-RG	Bob Gauinsky	210.15	19:42
2	Long-EZ -160	Herb Sanders	192.11	21:33
3	Glasair-160-RG	Don Conover	189.30	21:52
4	Glasair-160-RG	John Murphy	188.30	21:58
5	Glasair-160-TD	Robin Young	188.18	22:00
6	Long-EZ-160	Marty Ellison	187.49	22:05
7	Glasair-160-TD	James Cline	186.32	22:13
8	Glasair-160RG	Ray Ward	184.16	22:29
9	Long-EZ-125	S McCaskle	176.17	23:30
10	VariEze-100	Tim Gehres	172.83	25:16
11	Long-EZ-115	Jim Rutland	172.14	24:03
12	VariEze-100	Jack Fehling	168.84	24:31
13	Long-EZ-115	Beau Wold	162.86	25:25
14	Long-EZ-115	Robert Prior	153.05	27:03
15	Bullet	Bubby Brokaw	144.35	28:41
16	Dragonfly	Gary Konrad	113.42	36:30

We left on Saturday and flew all day long into strong headwinds. We spent the night at Fort Stockton, Texas (an excellent overnight/stop over incidentally) and made it back to Mojave around noon on Sunday. We covered 2050 nm (2359 sm) in 11.3 hours at 181 knots average ground speed, and averaged 13.6 gph going to Lakeland, coming back we flew 2010 nm (2313 sm) in 13.4 hours, for 150 knot average at 15.0 gph due to headwinds and low altitude flying. The Defiant performed great, what a fabulous cross country airplane! Thank you Burt, for letting us use your baby!

LONG-EZ CANARD UPDATE

Since the last newsletter, we have built yet another canard! This one was built to proof the plans and to test the final hinge pivot location called out by John Roncz. This canard was mounted on N26MS and flight tested throughout the Long-EZ envelope, including flight in varying degrees of rain at speeds from 60 knots to 150 knots in 10 knot increments. The trim change at any speed is negligible, although the "stall" speed, or more correctly the minimum speed or full aft stick speed is higher in rain than in dry air by anywhere from 2 to 10 knots, depending on rain intensity.

This new canard is the final plans built configuration and uses a completely new method of hinging the elevators to the canard. All new hinges and Brock parts will be required. Ken Brock will have these parts available by June 8, 1985 (the RAF EZ Flyin, Mojave). There are a few parts that can be used from the original plans built GU canard, but most of the metal parts are new and different. There are only two hinges on each side of the canard that are visible outside the fuselage and these hinges are essentially flush with the bottom of the canard.

The new canards primary design goal was to have no trim change when flying into or out of rain. We are satisfied that we have accomplished that. The trim change is essentially non existent at least on the two Long-EZs we have tested here at RAF. In addition we have measured a small increase in top speed and a small decrease in minimum speed, on the order of 1 1/2 to 2 knots depending on the individual airplane.

With the installation of this new canard airfoil, we have found that vortilons are mandatory on the leading edges of the main wings. With higher lift performance on the canard, we are driving the main wing to and even beyond it's critical angle safely. All of this information is covered very thoroughly in the plans, and there are also lots of photos of the canard under

construction. The plans should be back to us by the first week in June and we are currently planning on introducing them at the RAF EZ Flyin on June 8th. Price will be \$42.50 per set. Ken Brock has promised to have several sets of prefab metal parts available here at the RAF EZ Flyin. We do not have prices on the metal parts as yet.

We are very pleased with this new airfoil, and it accomplishes our goal but we do not consider it to be a mandatory change or addition to a Long-EZ. If you are happy with your present canard or if you have built and installed the original canard on your as yet untested Long-EZ, you do not have to build the new canard. It is an option, and can be retrofitted at any time. If you are uncomfortable with your present rain trim change, or if you like the idea of the latest airfoil with flush hinges and curled up wing tips, by all means build one and install it. If you do, please let us know how it performs on your Long-EZ compared to the original.

Once again, this new R1145MS airfoil is too powerful for the VariEze and is not recommended.

Mike and Sally's Long - N26MS - is in the shop for a few changes and a face lift. This airplane has 925 hours and is over 4 years old. We are installing new upholstery, and will be repainting the whole airplane. While it is down, we are doing a few things to it that we have always wanted to do, but have never got around to. We are installing a Loran-C, we chose a Micro Logic 6500. We are also installing an F-TEC ST-1A engine monitor meter. This promises to be a really neat multiple engine functions gauge as well as a great panel space saver.

In addition, we have modified the trailing edge of the cowling, by extending it aft about 3" towards the prop. The goal here is (hopefully) a lower drag cowl with improved cooling. We have also moved our brake master cylinders up into the nose. This modification has been done by many builders, using several different methods. The advantages are better access to firewall area, mags etc, and for cg, weight on the aft end moved into the nose is better.

All of the above are now in work. This is quite a major undertaking, requiring a new instrument panel. Oh yes, we are completely rewiring the entire airplane! Please don't call on any of these mods. We will thoroughly flight test all mods and report on the results in the next newsletter. We anticipate flying in about 6 weeks time.

VARI-EZE/LONG-EZ ROLLOVER/HEADREST

We have received a letter from Andrew Detroit of the FAA concerning the forced landing/crash of a Long-EZ that he investigated. This crash involved a Long-EZ that lost power after takeoff. The pilot made a successful 180° turn, landed long and left the runway. The nose gear collapsed, the nose dug in and the aircraft flipped inverted with enough forward velocity to break the canard in half and rip one wing off at the end of the centersection spar. The rollover/headrest was broken off. The pilot and passenger received minor head cuts, scratches and bruises.

This letter has been distributed to the various FAA offices and in some cases redistributed with some inaccuracies. This has caused some consternation among the local FAA and among groups and individual Long-EZ builders.

We have spoken to the FAA in Chicago and they have agreed with us that obviously the pilots head rest is not, nor was it ever intended to be strong enough to resist the forces imposed in an inverted crash with any appreciable forward speed. It is a roll over structure, and has proven that it will remain intact in the event that one of these aircraft should roll over with little or no forward speed. This was in fact the case, when Ken Swain flipped his EZ in a corn field near Oshkosh after an engine failure. His aircraft ended up resting on the rollover structure (canopy broken), the firewall and two broken winglets. He was not injured, but had to wait for others to lift the aircraft to get out. The rollover has provided this protection in at least two other cases, one example is in CP #14.

However, the rollover structure is obviously not designed to handle an inverted landing! This structure is also a head rest and doubles as a map case/storage area. It will not protect you should you strike the ground inverted or roll over with any significant speed or impact energy.

We of course object to Mr. Detroit's inference that the rollover should have (or could have) provided protection in an earlier Minnesota Long-Ez accident that was not survivable, regardless of the head rest. (See CP #31).

Design loads for an "adequate" roll over protection are difficult to define. Obviously, a second landing gear on the top could protect for 10 ft/sec drop at full landing speed and just as obvious a very heavy structure would be snapped off by a hole or curb at only 10 mph. RAF does not have a specific recommendation in this area and we will not be reinforcing our headrests. The decision to do this rests with each individual homebuilt manufacturer. RAF will continue to strive to openly pass along all information to help you in your building decisions. You may for example want to change references of "rollover structure" to "headrest" if you feel this is more appropriate.

DEFIANT NEWS

Burt's Defiant, N78RA now has well over 900 hours of flight time, much of it being test flying but most has been actual utility exposure in cross country trips from Alaska to the Bahamas. She has seen some hard tests of character, such as a 1260-lb cabin load to challenge her class in CAFE '82, altitudes over 28,000 feet, a flight of over 15 hours, considerable IFR operations including icing, heavy rain and the "Mojave rotor" turbulence.

This experience is unsurpassed in the homebuilt area as far as being able to support the new builders with actual flight data. However, it has all been attained with our "basic vanilla" configuration with fixed-pitch wood props. Now, however, many of the initial builders have decided to equip their aircraft with constant speed props, thus getting into an area untested by us. The Defiant Owners Manual, Edition One, covers the fixed pitch prop configuration. In order to support those desiring information on the acceptability of a constant speed prop installation, we have begun an update modification of N78RA.

We will be installing a 180 hp (O-360-AIA) Lycoming on each end with constant speed props. We are also redoing the instrument panel and the interior, so for Oshkosh 1985, look for a really super Defiant. Test data on the constant speed prop flights will be available this summer and will be passed along via the CP newsletter.

We hear from quite a number of Defiant builders and it is astonishing how rapidly these airplanes are going together. Rodie Rodewald in Hawaii, is moving on his, almost all structure is done, and he is installing zero time O-360 (180 hp) with Hoffmann constant speed props. He won't make Oshkosh this year but does intend to use his Defiant to "commute" back and forth between Hawaii and the mainland!

Don Foreman in England, a VariEze as well as a Long-EZ builder is also going great guns. His fuselage is done, and is on the gear with centersection installed. His will almost certainly be the first European Defiant.

What we need is photos of Defiant projects to display in the CP. Johnny Murphy, Frank Yost and Charlie Gray have sent us a few otherwise we have not had much feed back. Send photos - PLEASE.

Defiant Prototype Engines, Props and Equipment For Sale

Included here is an engine that dates to Burt's original work in Aviation. The front Defiant engine had 1375 hours when Burt bought it in 1968 for the VariViggen. It spent 600+ hours pushing the original Viggen (airframe is now in the EAA museum) then after an overhaul 900+ hours pulling the Defiant. Both engines are running fine, but, for liability reasons, RAF will insist that the buyer agree to overhaul before use.

Items and Descriptions

1. 160 hp O-320-AZA converted to high compression pistons and 1/2" valves (not approved for certified aircraft). Total time 3441 hours, 905 STOH, (Defiant front engine) complete with generator, 2 mags, carb, heat muff, starter (12v).
2. 160 hp O-320-EZD converted similar to Item 1. Total time 2830 hours, 980 STOH. (Defiant rear engine) complete with alternator, 2 mags, carb, new vacuum pump, starter (12v).
3. Two exhaust systems for Items 1 and 2, shortened to fit Defiant.
4. Two wood props for 160 BHP Defiant.
5. Two 8" prop extensions.
6. Two Brock spinners with added front plates.

RAF will accept sealed bids on individual items, or the lot, until June 8 - Pickup if you can at our June 8 Flyin.

WARNING

We have recently learned that some Long-EZ operators have been attempting to overextend the intended capability of the aircraft by installing larger engines than the O-235 and/or by attempting overweight operation. These practices are hazardous and cannot safely be conducted on the aircraft. A re-design to allow this operation would not be just a simple replacement or beef up of a few components.

A major development for adequate airframe/propulsion mounting/landing gear/brakes would be required, as well as wing area increase to meet reasonable energy limits for forced landing. In short, you would be talking about a new aircraft and a new test program.

~~Overweight operation will definitely result in structural problems with landing gear, brakes and possibly airframe.~~

LIGHTNING STRIKES ON FIBERGLASS AIRCRAFT

We recently received information from NASA and from Andy Plummer of Lightning Technologies Inc, a recognized expert in this field, regarding lightning strikes on fiberglass aircraft. At this point in time there is not one single documented case of a fiberglass sailplane being struck by lightning. This is surprising, especially in Europe, where sailplanes do fly in the clouds. There is no documented evidence of any EZ or composite type having been struck and damaged. There is however, one documented case of an all wood sailplane which was struck, with catastrophic results. There are many case of radomes, glass tail fins, etc on airlines being struck with damage from insignificant to quite considerable.

The expert opinion from both NASA and Mr. Plummer, is that it could happen and if it did, it may be possible to suffer catastrophic damage. Mr. Plummer states, "I am firmly convinced that fiberglass aircraft are just as likely to receive a lightning strike as a metal aircraft of the same size". The consensus of opinion is to stay well away from thunderstorms or cloud formations that may generate lightning.

VORTILONS

We noticed that almost all of the VariEzes at Sun n'Fun had vortilons installed on their wing leading edges, some even installed them over the cuffs! During some of the bull sessions, we talked to the builder/pilots and all agreed that the vortilons are well worth having. Slow speed stability, visibility over the nose for take off and landing were greatly improved. If you have not already installed them on your VariEze, do it, you will like 'em. We believe it is better to remove any existing wing cuffs before you install the vortilons,

and the vortilons are definitely superior to the cuffs and are lower drag. We are even starting to notice a few Long-EZs with vortilons. Yes, they will improve visibility over the nose and lateral stability a little (with the standard canard) but we did not feel they were warranted until we flew the new R1145MS canard. As we mentioned, if you install the new canard on a Long-EZ, the vortilons are mandatory. They are not an option. The new canard with no vortilons can drive the main wing to such a high angle of attack that the main wing can stall before the canard does.

Vortilons are impressive little devices, but keep in mind that they only work on a swept wing. It would not help to put them on your canard for example. Any straight wing with no sweep will not benefit from vortilons.

PREFABRICATED GLASS PARTS

Task Research Inc. is no longer an approved RAF manufacturer/distributor. Due to a contractual disagreement, RAF has exercised our option and cancelled all of our contracts with Task Research. We have placed all of our tooling with a new company.

Aircraft Spruce and Wicks Aircraft still have many items such as cowlings, wheel pants, nose gear boxes, strut covers and sump blisters in stock. If you need any of these parts, contact Spruce or Wicks. If you are unable to get the parts you need, contact RAF and we will place your name and requirement on a priority list. The Long-EZ and Defiant main gear struts are not available at this time and it will be June 1, 1985 before our new supplier will be on line and producing gear. If you are to the point where you will be needing a main gear (or Long-EZ nose gear) strut, call us at RAF and we will place you on the priority list. Do let us know your requirements, it will help a great deal to know what the demand is. Our new supplier is an EZ builder himself and a very experienced man, who has worked with composites for years. We are confident that he can do the job, and we feel certain that anyone receiving one of his parts, be it cowlings or landing gear struts, will be pleased with the workmanship.

A major change over such as this, is always upsetting and can cause delays. Please bear with us on this one. Give us a month or two to get our new supplier up to speed. We would really appreciate it if you could try to work around, for example, the main gear. You can in fact go on and build winglets, main wings and centersections. You do not absolutely have to have a main gear until you have essentially completed construction.

RAF will work with you as a go between and will do our best to accommodate those of you who simply have to have a particular part. For the time being we ask your patience. Just as soon as the new supplier is up to speed, we will announce his name, phone number etc and you will work directly with him.

FOR SALE

Lycoming D-235-L2C, 1240 hours total, disassembled - \$2650.00 as is. Includes logs, rebuilt mags, carb and rebuild kit.

Contact: Joe Heapy
213-947-3889 - work
213-895-7943 - home

Continental O-200, 160 hours since major. Removed from a VariEze, ready to go. Includes stainless exhaust system, 10 amp alternator, prop extension, oil separator, mount, baffles and carb heat. We are building a Defiant and donating the EZ airframe.

Contact: John Steichen
960 86th Street,
Downers Grove, IL 60515

Lycoming D-320-E20, many other parts.

Contact: Ed Rolita
813-639-7157

Solitaire Engine KFM 107E, new in the factory carton, never used. \$1000.00

Contact: James Baldwin
1465 Valparaiso Ave,
Menlo Park, CA 94025
415-853-1444

Defiant Builders - Piper Apache, good condition, can be flown home and used for parts, engines mounts, props etc.

Contact: Rex
602-466-9244

Flight Research mufflers for Continental O-200. Never used. Stainless steel with heat muff. Cost \$325.00, will sell for \$150.00 or best offer.

Contact: Phil
818-352-0326

Electric heater for VariEze or Long-EZ \$90.00

Contact: Dave Petrosino
907-235-7517

Great American prop, 56 x 68 for O-200 VariEze - \$165.00

Contact: Dave Dingerson
303-696-1096

SHOPPING

Aircraft Spruce is pleased to announce that they are now open on Saturday mornings from 9 am to 12 pm. This is a convenience for builders who are visiting Los Angeles or for those who live there. Due to personal limitations, they do ask that you call in your order during the week for pickup at the "will call" desk on Saturday.

Great American Props has made a video tape which covers how to install a wood prop and many other related items. A \$25.00 deposit is all that is required to be able to see this informative tape. You pay the postage and your deposit will be refunded when you return the tape.

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

Ken Brock Manufacturing reports that they are now on line with Defiant prefab metal parts. Ken also has the "S" glass roving wetting wheels (see Page D-58) available. These are well made and run dead true and include the knife edge wipes. Ken is currently working on the prefab metal parts required for the new R1145MS canard. He will have these available around June 1, '85.

VOR/LOC/GS ANTENNA

We recently tested one of these simple, light weight antennas (part #AD-1) on the Long-EZ and found it to be excellent. The distance from the VOR for usable navigation is increased and our left/right needle does not fluctuate as it used to. This antenna is installed exactly like the plans. It is essentially a copper foil antenna with a small "black box" with BNC connector in the center. Inside the "black box" are state of the art, micro electronics that allows better reception characteristics over the standard kit antenna.

Contact: Antennas Dynamics Inc.
1251 W Sepulveda Blvd, Suite #268
Torrance, CA 90502
213-534-1090, Ext - 22

Jackpot Flyin and EZ Races

This was the best flyin of 1984. Mark it on your calendar now. July 5, 6 and 7th, 1985 at Jackpot, Nevada. Cactus Pete's Resort Casino is the place to stay or camping is available. EZ races with prize money will be held on 6th July. A ribbon cutting contest, spot landing contest on the 5th July, a dinner show at Cactus Pete's, and an Awards Banquet on the 6th July.

Contact Shirli Dickey for details. Do it now, because there will be a lot of EZs flying in to this one. Shirli and Diane Dickey are the organizers and last year their flyin was the best and most fun flyin we attended.

Contact: Shirli Dickey
1646 Allegheny Drive
Murray, UT 84123
801-974-7527 - work
801-268-3360 - home

Solitaire Enthusiasts - a motor glider mountain soaring rendezvous will be held in Sun Valley, Idaho on August 3-18, 1985. The Friedman Memorial Airport at Hailey, Idaho is the site. Call Bob Moore 509-967-3733 if you plan to be there.

PLANS CHANGES.

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

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

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

No VariEze Plans Changes

No Long-EZ Plans Changes

DEFIANT PLANS CHANGES

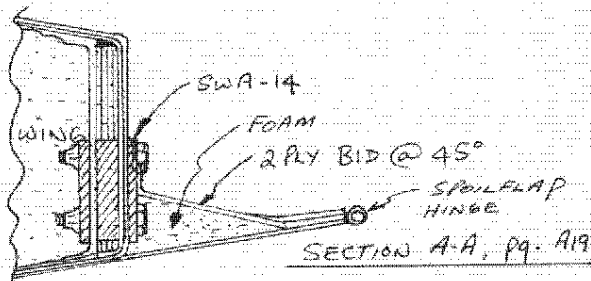
- DPC #24 Bill of materials and Section I, Page D-37. 16 bolts AN6-16A are not correct (used to attach main gear) 16 bolts AN6-11A are what is required.
- DPC #2 Section I, Page D-26 and D-48. Aileron to control stick hookup. The 3/32" dia control cables that run down each side of the fuselage from the C-17 fittings at the left and right control sticks to the C-27 weldment aft of the rear firewall, should not cross each other on the left side, but should cross each other on the right side. This is important in order to get the aileron "sense" to be correct with both control sticks.

SOLITAIRE PLANS CHANGES

- SPC #52 Section I, Page 18-2 and 18-3. The bottom righthand paragraph on Page 18-2 calls out the distance 3.5" aft of center to align the SCL-2. This should be .35" as shown on view C-C on Page 18-3. When aligning the canopy latch start by positioning the SCL-3 over the plywood insert in the canopy frame and position the SCL-2 as required based on the fuselage station of the plywood insert. This may move the latch assembly slightly forward or aft of F.S. 88.5. On Figure 18-9 the plywood insert is shown as extended to the canopy frame it is in fact flush mounted into the frame. This has the effect of moving the SCL-4 handle outboard slightly.
- SPC #53 Engine Section, Page 21 - Parts list. Under miscellaneous. 1 each flow control valve #3944. We have found a smaller slightly less

expensive flow control valve. This is a Parker Fluid Power Manatrol Division, Elyria, Ohio, 44035. This can be purchased through Northern Hydraulics Inc., 800-533-5545, 801 East Cliff Road, Burnsville, Mn 55337, Item #2055. Also remove the two AN912-3 reducers and add two AN912-1 reducers. This is installed in the same position as the original.

- SPC #54 Section I, Page 12-1, Step 11 - Wing Attach. The upper skin on the spoil flap attach area must be removed for 2 1/2" to allow the SWA-14 to be bolted onto the lift tab. Then install a foam block with wet micro and replace the two plies of BID at 45° lapping onto the SWA-14 after careful sanding.



SOLITAIRE NEWS

SSA Convention - The SSA held it's annual convention in San Diego last month. This convention serves as an annual membership meeting and a chance for the various suppliers to the industry to show off their wares. Bob Matheny brought his nearly complete Solitaire to the convention hall to display. This is a tremendous effort and shows a great deal of concern for the sport of Soaring and the SSA membership.

Our hats are off to Bob and our thanks. Bob's Solitaire displayed the kind of craftsmanship he can be proud of. Bob by the way looks like he may be the first homebuilt Solitaire to fly.

Don Wemple and Bob Matheny also organized a Solitaire discussion group during the convention to discuss Solitaire news building progress and an alternate engine retraction system being developed by one of the Solitaire builders, Herb Abrams. This was a very informative meeting and although the number of Solitaire builders is not large the enthusiasm they have shown certainly is. On the final day of the convention the Soaring Society had lined up with the Torrey Pines Glider club to check out pilots with winch ratings on the winch launch at Torrey Pines. Torrey Pines glider port is located on top of the cliffs overlooking the Pacific ocean and is a truly unique location for slope soaring. While the gliders were being launched a motor glider came soaring by, no wait in line, no worry about the complexities of winch launch. It was hard not seeing a Solitaire take off under its own power and work that lift. The San Diego builders should have a great time when their projects become airborne.

Herb Abrams, a Solitaire builder from Ohio was recently out to California to attend the SSA convention and before returning home stopped by Mojave and went for a check out in the prototype Solitaire. His report on how the flight went and what its like to fly the Solitaire follows.

SOLITAIRE FLIGHT REPORT FROM A BUILDERS VIEWPOINT

I will admit what macho airmen will not, that is, building my own Solitaire is sort of like building a dream. The dream is of a sleek, professional looking sailplane which will provide:

1. Convenience and ease of handling
 2. Self launching and reasonable cruising ability for independence of operation and cross country return.
 3. Safety of operation, spin resistant.
 4. Reasonable performance.
 5. Reasonable cost.
 6. Latest material and construction technology.
- Now Solitaire builders, I have flown the Solitaire. It

is more than I expected. It was great. The only question I had in my mind was would the ride in rough air be sea-sickness inducing. The answer to that one and others regarding forward visibility, pitch sensitivity, and ease of spiralling is a resounding "not evident".

Solitaire is easy to fly, self launching, is immensely less stressful and more satisfying than airplane tow, glide path, and speed control and landing is easy and precise with the spoiflaps, taxiing and ground handling is a breeze and the engine operation is flawless. I was even able to extend and start the engine during the landing rollout! Yes, the prototype Solitaire I flew had rather marginal rate of climb but the new KFM engines produce more power, the just issued engine installation plans provide a few more inches of propeller and a longer prop engine installation I am developing, all promise to improve the climb rate. In addition, I am sure our Solitaire builders' airplanes with the improvements already incorporated in the plans, and perhaps some of their own, will perform even better than the prototype. In a word Solitaire does all it is intended to do and in an easy way to make soaring safer and more convenient for us sport soaring enthusiasts.

Mike Dilley provided briefing on switch operations, those for the engine operation and fuel level and showed me how to position the propeller for retract. All uncomplicated. Mike described runway locations and suggested practice areas. My biggest problem was shivering from cold and probably anticipation. Taxiing is normal and easy if one lets the wing stay on the ground while traveling downwind. Into the wind holding the wing level with aileron was no problem. I got carried away with trying to turn into the low wing like riding a bicycle to make it come up. This only cause much flopping around and diverted by attention from obstructions like landing lights.

The takeoff was uneventful. I pointed the nose down the runway and opened the throttle. Remember this is at my choice, not the tow-pilot's. There was no problem with engine or canard obstructing vision. The airplane gained speed in reasonable time and eased off with slight back pressure. The climb to 250 feet engine out rope break turn back altitude is less stressful than an airplane tow! This is what I was looking for. Rate of climb was low and therefore back pressure on the stick had to be carefully modulated to obtain the best rate of climb, sink occurs if too slow. This is normal pilotage. Pitch control is light and quick but not out of the ordinary and presented no problems.

The airplane flies like you would expect a self-powered sailplane to fly. The engine makes noise but 60-70 knot cruise was easily attained. Turns, both shallow and steep, with power on, are exactly like any sailplane except less adverse yaw was evident. The canard makes a good angle of bank with the horizon reference. The controls are all light and well coordinated. Rough air surprise. The airplane bumps but does not produce any disagreeable air-sickness inducing motions that I had feared because of the flexible wing. The airplane rode like a short wheelbase car, sort of short-coupled. Pitch control was no problem. It was not any more sensitive than the Pegasus I have been flying. In a word, I was delighted.

I climbed to the cloud base using every ump and with careful trying of recommended climb speeds. The airplane type rate-of-climb, not compensated or sensitive, combined with equal number of very strong down drafts, made any climb rate observations meaningless. But climb performance was not a factor to me because I had spent the past four months engineering a long prop (46 inch) engine installation to provide the thrust required for a comfortable climb rate.

Sailplane flight was very enjoyable, but shutting down the engine and stowing it the first time really is interesting and exciting. The engine stopped smoothly with the prop close to vertical. I started retracting the engine and saw the prop touch the side, so reversed the switch, the engine came back up, a touch on the starter switch centered the prop, and then the engine retracted. The motion is one that is almost anti-climatic. The silence was deafening. But then what. I was just flying in a beautiful sailplane. Well, just as I dreamed, here was soaring flight - - just as planned and that is what the Solitaire is all about. Turns, slow flight, stalls, all easy, gently and pleasant. Steep turns required some aileron to hold it

from rolling in, but very little rudder was required. It tried cruising at speeds up to 100 knots. Solitaire flies like a 32.1 sailplane as advertised.

Power off flight started about 2500 feet agl so with zero sink for awhile, approximately 15 minutes before I had to enter the pattern, I was able to try stalls and turns as much as I desired. The winds were 20 knots gusting to 30. Recommended air speed was about 60-65 knots. When I am in a new sailplane and uptight, I tend to fly faster, so approach was about 70 knots with no trouble maintaining constant speed. I opened the spoiflaps about halfway opposite the numbers after having opened them full while at higher altitude and flew a normal base leg a final. The spoiflaps are a real joy. The nose pitches down slightly and the lift/slowing sensation can really be felt. As instructed, I maintained the glide path nose down attitude to flair altitude then slight back pressure to level out and sink onto the runway. Opening the spoiflaps full at the same time and glueing it on. Easier than landing an ASW-19 or a Pegasus. Then to show how much I was in control during the rollout, I extended the engine, started it and continued the roll. Fantastic. This is what the dream and the promise is. What more can I ask for. I flew through another but shorter flight, but because the fuel level started to blink, I had to cut it short. All of my impressions were reinforced however.

I was asked if I was happy I bought the kit and my answer was most certainly. I know the prototype aircraft I flew will not be as good as mine! My doors will close with engine up and will fit better with the engine stowed. How could I not be excited as I had flown the airplane and it had done all it was planned to do and with none of the problems I had worried about, such as funny rough air ride, difficult pitch control etc. All of the negative observations I had heard had not manifested themselves.

I am more excited and anxious to finish my Solitaire and start enjoying it. Afterall, this sailplane is the first of the line and improvements are sure to emerge.

I cannot thank the Rutan and Solitaire staff and engineers enough for the opportunity to fly the Solitaire. They have been most cooperative, patient and helpful to me. Mike Melvill and Mike Dilley are terrific people. We Solitaire builders and other Rutan builders as well, owe them a debt of gratitude. Designing, testing and producing plans for innovative aircraft take a lot of talent and resources. They deserve all the support we in the soaring sport can give them.

Herb Abrams"

Engine Plans

Solitaire engine plans have been shipped to all builders that have ordered them. Anyone wishing engine plans may order them from RAF at a cost of \$25.00. These plans cover the engine installation of a KFM direct drive engine in the Solitaire. These plans cover all aspects of the engine installation except the exhaust system. The prototype has an exhaust system that was manufactured by a company that is now out of business. We are looking for a new company to build these and hope to have a place to buy them that we can announce in the next newsletter.

SOLITAIRE BUILDER HINT

Some of the lift tab pockets and tabs do not fit together as they should. If you have bought yours from Ken Brock Mfg, fit your lift tabs into the pockets SWA-13 assembly and install the SWA-17 lift tab pins. These should allow a slight amount of vertical movement in the lift tabs but no play in the holes that the lift tab pins go through. If your lift tabs SWA-10 and SWA-15 do not fit into the SWA-13 you can file the end to remove any interference. Be sure to remove any sanding scratches and if the lift tab holes do not line up well or fit well you can open them up to 5/16 by drilling and reaming with the lift tabs in the pocket. Ken Brock is in the process of correcting the problem on these lift tabs.

BUILDER HINTS

DEFIANT - Installing the canard into the fuselage is one of the few really critical areas in that very careful dimensional control is required. The dimension between your bulkhead F.S. 57 and the forward firewall at F.S. 47 a theoretical dimension of 10 inches, can easily shrink due to builder tolerance, glass plies building up on the firewall etc. Pay very close attention when you build your lift tabs or attach tabs on your canard. The dimension you end up with between your F.S.57 and F.S.47 bulkheads is the reference dimension you need to use when building the attach tabs on your canard. **Very important:** Do not forget to factor in the thickness of TWO .063" thick CS-8 plates, TWO CS-11 flanged bushings (.032" thick flanges) and one CS-9 plate (.032 thick). If you neglect to do this you will have a difficult repair problem. The canard, with attach tabs plus ALL hardware (CS-8, CS-9 and CS-11) should be an easy SLIP fit between F.S. 57 and F.S. 47. Before you build the attach tabs, study the drawing on Page D-26 and read these words until you are really sure you know what you are about to try to do. A mistake here will cost you a lot of time. If you think it through and do it right, it will be easy.

A possible suggestion would be to install Bulkhead F.S. 57 with its forward face at F.S. 57.1. This additional 0.1" of space should make it easier to fit the canard lift tabs plus metal hardware. If your canard then is slightly too small, you would have to build up the face of bulkhead F.S. 57.1 with a few plies of BID glass as required to obtain a nice fit with no play or excess space.

DEFIANT - When you make your DWA-4 and DWA-8 plywood hard points for the wings, you should first make a cardboard template of your own centersection spar jig in the corresponding area. This cardboard jig will then tell you just exactly how much you need to bend the plywood laminate. Fred used 0.5" and it worked great for him. Due to builder tolerances it is possible that you may require 0.6" or even 0.7" on your parts.

DEFIANT - The front firewall will have to be notched at the bottom in the center in order to allow the nose gear to turn left and right for nose wheel steering. This cut out is not shown on the full size bulkhead drawing on Page . We suggest that you install the nose gear, and then notch out the firewall as required to allow full steering movement. Do not cut out any more than what is required, since this is a potential leak in the pressure cowling. A piece of neoprene engine baffling material rivetted to the firewall above the gear cut out, so it hangs down over the cut out area, will seal against the lower cowling for adequate cooling.

LONG-EZ/DEFIANT - The mechanical fuel pump has two large threaded holes (fuel in and fuel out) as well as a third smaller threaded hole or vent. This vent port should be vented overboard. If a diaphragm ruptures, gas may run out of this vent. A hose should be run from this vent hole through the bottom cowling, so any venting fuel will not spill inside the cowling.

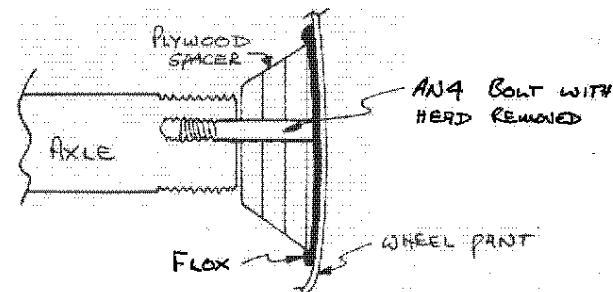
VARIEZE AND LONG-EZ - Nose wheel pivot. Remove the aluminum collar that retains the nose wheel fork. Drop the complete wheel/fork assembly out of the NG15A casting. Check for wear in the bronze bushings. We found quite a lot of wear on a Long-EZ with 900+ hours, and a couple of builders have reported wear in these bushings that warranted replacement. You can obtain replacement bushings from any bearing supply house. We installed longer bushings this time, for more bearing area and hopefully longer life. These were Dillite bronze flanged bushings, part # FF-838-3, obtained locally in Mojave at the King Bearing store. These bushings were 1" long. We cut them down to 3/4" long to leave space between them as a grease pocket. We also bought (from the same source) two Torrington thrust races parts #TRA-1220. These are essentially large, flat, thin steel washers. They are 1/32" thick and have an I.D. of .752 and an O.D. of 1.240.

We installed one of these between the aluminum fork casting and the bottom flanged bushing and one between the top flanged bushing and the aluminum retaining collar. Obviously this takes up more space than is available, so we miked the two Torrington washers, and faced that amount of material off the bottom of the

aluminum retaining collar. We applied a generous coat of grease on all moving parts and reassembled the fork to the NG15A casting. We then carefully adjusted our friction "shimmy" damper until we had approximately 5 lbs of side force required to turn the wheel. When we tested this set up, we found that the nosewheel pivoted very smoothly, and nose wheel steering now required much less braking effort. At least 5 local EZ flyers have done this modification to date, and all have reported a big improvement. We are pleased with the results of this mod, and have found that we can increase the friction damping force, without making it harder to steer, thus dramatically decreasing the likelihood of shimmy or flutter on the nose wheel.

LONG-EZ - Wheel Pants. We received this idea from a builder. When installing wheel pants on the Long-EZ do not assume that the scribe mark for the axle hole is correct. Cut out the strut hole and tire cutout. Mount the inside wheel pant half onto the aluminum bracket bending as required to position the wheel pant to fit the tire. Fit the outside wheel pant half to the inside sanding edges as necessary.

Drill and tap the axle for a 1/4 x 28 bolt (AN-4) off center to avoid the cotterpin. Cut the head off an AN-4 bolt and thread it into the axle. Build the wood spacer as shown in the wheel pant instructions. Drill a 1/4" hole in the center of it and slip it onto the headless bolt which is sticking out the end of the axle.



Fit the outside wheel pant in place checking to be certain the thickness of the spacer block is correct. Apply flox to the end of the spacer block, sand the contact area of the outside wheel pant and tape the wheel pant halves together. Allow this to cure. After cure back drill the 1/4" hole using the wood block as a guide and countersink for the AN509 machine screw. Remove and discard the headless bolt.

We have had a couple of complaints on fitting the large wheel pants on the Long-EZ. It seems after careful inspection that the left wheel pant is not exactly the same as the right wheel pant. To understand how this could have happened it is necessary to understand how the wheel pants were made.

As most of you are aware the 500 x 5 aircraft tires were not originally approved for the Long-EZ, only the low profile Lamb tires were and they fit the VariEze wheel pants. Then Mike and Sally's Long-EZ, N26MS had aircraft tires installed, tested and approved for use on the Long-EZ by RAF. There were no wheel pants designed to fit these tires, so Mike made his own by carving blocks of foam and using the moldless composite method.

These were hand carved using only the eyeball to judge the shape. After they were finished and flying, the results could be judged by the speed increase in the aircraft by 10 knots. Everyone who saw these wheel pants wanted a set and after much convincing, Mike pulled the wheel pants off N26MS and molds were pulled directly from these. In this case the builders got exactly what they asked for. Most builders just fit the wheel pants on and look for the speed increase, all of them that we have talked to, got it. Do not however, get your micrometer out and measure side to side on your wheel pants, you will be disappointed. Instead install them and you will be pleased.

SOLITAIRE KITS

Solitaire essential kits are now in stock and immediately available at both Wicks Aircraft and Spruce Aircraft. Contact them for current prices.

INDUCTION AIR FILTER AD

In January 1985, the FAA put out an Airworthiness Directive #84-26-02 concerning induction air filters. This AD covers almost every civil airplane in the US including homebuilts.

Any induction air filter should be changed at least every 500 hours. This is good practice and all builder/pilots should comply with this. If you are uncertain of how long the filter has been in use, it should be changed within the next 100 hours.

ACCIDENTS

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

A Florida Long-EZ was substantially damaged when it struck two power lines while flying level at approximately 140 knots, between two islands. The lower power line removed the main gear entirely, including the attach fittings, some lower fuselage structure and some of the prop. The upper power line cut the upper left winglet off just above the standard rudder. This piece was recovered by fishermen and measured 37" at the leading edge and 27" at the trailing edge. The pilot reported that the impact felt like light turbulence!!

The aircraft was put into an immediate climb. The pilot managed to fly at 600 feet using nearly full right aileron and full right rudder, for a distance of 4 miles over saw grass and trees to a power plant. A 1500 foot strip of rock and dirt was chosen (all that was available) and a normal off field landing was executed. The pilot was not aware that the main gear had been torn off, so he put down the nose gear and speed brake. The Long-EZ was damaged in the crash landing, but both people on board suffered only bruising from the seat belts and shoulder harnesses. The aircraft was losing altitude and thrust even though the engine was developing good power, due to prop damage. The pilot did a really excellent job in keeping his cool and flying the airplane.

A Connecticut Long-EZ with only 9 hours since new landed short of the runway due to running out of gas and was substantially damaged. With the pilot/builders permission we are printing his report below in the hope that a problem like this can be avoided in the future by other EZ pilots.

"Don Eckbert and I (Richard Marr) built Long-EZ N49EZ over a three year period. It flew for the first time in early March of this year at the hands of Norman Rossignol, a 350 hour VariEze pilot.

The plane had about 9 hours on it when I took it up on the morning of March 19. After about 90 minutes of flight, I noted that the gas in my right tank was getting low. I decided to do a little more sight seeing before heading toward Waterbury-Oxford Airport for a refill. I did not switch to the left tank, reasoning that I should have the airport in sight before doing so, in case I had a water problem.

When I did head for the airport, I forgot about my mental note to switch tanks. As I turned base, the engine quit. I immediately switched tanks but the engine did not restart. The prop had stopped windmilling, we do not have electric start, and I was too low to gain the necessary airspeed to windmill it. I was also too low to make it to runway 36. I hit the slope leading to the runway. The impact destroyed the nose, removed the main landing gear, broke the engine oil pan, prop, carb etc. I got a broken sternum and a squashed vertebra.

I had made two pilot errors. I forgot to manage my fuel and I flew the pattern too low. Another ten feet of altitude and I would have made it to the grassy area in front of the runway without incident.

In all other ways, the Long-EZ is an incredible design. I believe the impact absorbing nature of the composite saved my life. I would not have walked away if it were a conventional aluminum two seater.

The plane is insured so that repair money will not be a problem. My injuries are healing rapidly. My biggest regret is that my partner Don, had little more than an hour in it before the accident. A few years from now (after a Defiant) he will look back on this and laugh. For now, he is contemplating murder.

Thanks again for an incredible design. Richard Marr"

HOT DOGGING EZs - Is the Thrill Worth It?

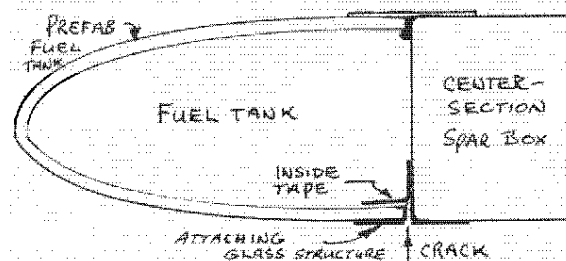
We have received comments and complaints about pilots flying their EZs at low altitude, over beaches, over ski slopes etc. LISTEN UP GUYS!! It may be fun to buzz when you are in your EZ. You really do feel like you have the world by the tail and nothing can happen to you. No denying it, any airplane that is this small, maneuverable and responsive, will tend to build your confidence. The Long-EZ's flying qualities give the pilot the sense that he is "a part of the airplane" and that he can make the combination fit in the smallest areas with ease. The thrill of this capability has made many of us do dangerous flying.

This must stop. The majority of EZ builder/flyers fly by the rules but some of you are putting us all in jeopardy.

We recently reviewed the data and have found that in seven of the eleven Long-EZ accidents, buzzing was either the primary cause, (like the Florida one discussed in this CP) or a contributing cause. In general, the offender is the one with the loss, but if an EZ is involved in an accident on a crowded beach or ski slope, we are all out of business, no more experimental aircraft flying.

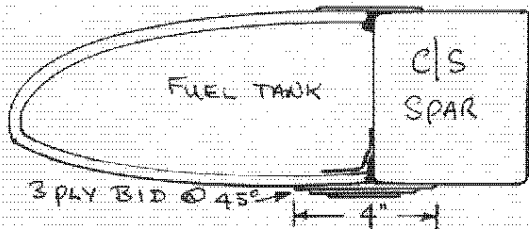
VARI-EZE MANDATORY INSPECTION

Before next flight, carefully inspect the lower surface of the fuel tank/centersection area, particularly near the wing attach fitting. We have recently found cracks in the bottom skin running inboard from the wing fitting towards the fuselage, on two VariEzes. We believe the probable cause is over exuberant sanding on the structure before finishing. This cuts most of the way through the glass that ties the bottom of the fuel tank to the bottom of the centersection spar. The centersection spar is designed to handle all bending loads as well as all torsional loads. The fuel tanks take the torsional loads normally, if this glass layup is cut (by sanding), then the centersection picks up the torsion and opens a crack as shown.



If you have evidence of a crack, have someone lift up on the wing tip. This will apply a bending as well as a torsional load and should open the crack, if it is there. If you have any cracks, remove all finish down to the glass for 2" either side of the crack for its full length. Use a strong light to carefully examine the glass structure of the centersection. Look for white fracture lines. There should not be any. If there are, ground the airplane and contact RAF.

Sand the glass thoroughly for a structural bond 4" wide for the length of the crack, and layup 3 plies of 810 at 45° across the crack. (Fill the crack or any void with micro first).



If you do not repair a crack like this, you will soon have fuel leaking. This repair should be done before next flight.

CLUBS

Lew Nixon is building a Solitaire and he would like to hear from other Solitaire builders, particularly from the Dallas area.

Contact: Lew Nixon,
7746 Alto Karo Drive
Dallas, TX 75248
214-239-6323

Ken Cooley is interested in getting together all Long-EZ builders in north Florida and south Georgia to exchange information and experiences. His hangar is located on the south end of the runway on Hallars Airpark, Green Cove Springs, Florida (Jacksonville sectional). Contact Ken if you are interested. Groups of builders, like Ken is trying to do, have sprung up all over the place, and are really working out well. The moral support as well as the experience available from other builders who may have already done what you are trying to do, is invaluable.

Contact: Ken Cooley
P.O.Box 1346,
Orange Park, FL 32067
904-282-1920

VARIVIGGEN AND VARIEZE PLANS CANCELLED

As of May 1, 1985 the VariViggen and VariEze plans will no longer be available. The sales for these two plans sets over the past few years have been very low and the current printings have been depleted. We do not feel that the sales justify the expense of reordering.

RAF will continue to provide builder support for those who are currently building either of these aircraft. The supplementary plans, such as engine installation, finishing and electrical system, etc, will continue to be available until we run out of stock.

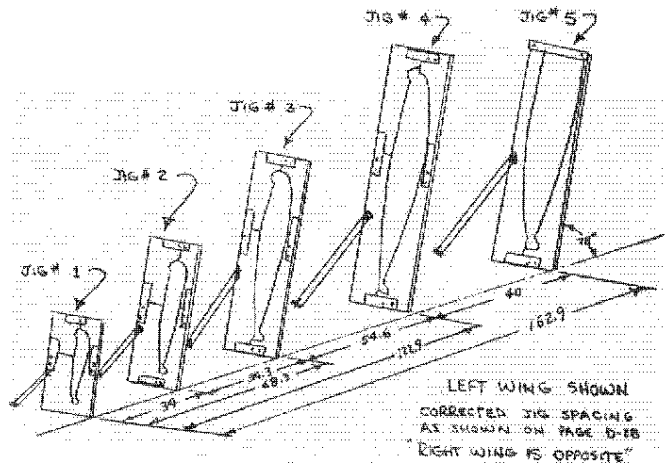
The Long-EZ, Defiant and Solitaire will of course still be available and we will be supporting these programs just as we have done in the past.

VARIVIGGEN NEWS

The only Viggen builders we have heard from this time is George Craig who dropped by Mojave on his way to Arizona and we saw Wayne Wilkins and Frank Stites and Frank's wife at Sun n' Fun.

Frank flew his new Viggen down from the frozen north to display at Sun n' Fun. It was great to see a Viggen once more on the line. The last time a Viggen was at Sun 'n Fun, as far as we know, was in 1978 when Sally and I flew N27MS in from Indiana. Frank had had his cowling support tube (across the aft cowling, under the spinner) crack and fall into the prop, damaging the leading edge of one blade.

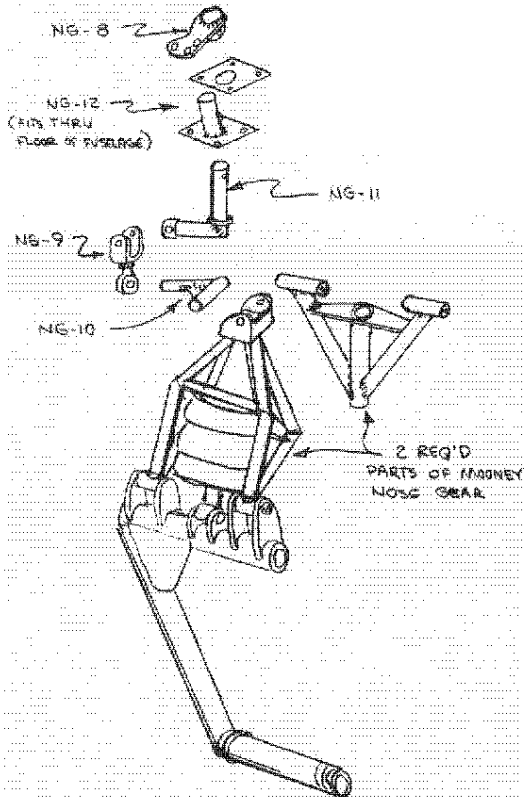
Wayne Wilkins had intended to fly in but had an unfortunate incident just prior to departing Pennsylvania. He pulled his chocks and set them up on the inboard wing. He then climbed in, started her up and began to taxi. One of the chocks slipped aft and into the prop, breaking it. This is a real easy thing to do - be careful - it can ruin your whole day.



DEFIANT PLANS CLARIFICATIONS

The above sketch is correct and the dimensions shown should be corrected in your Section I of the plans. Use this sketch for reference.

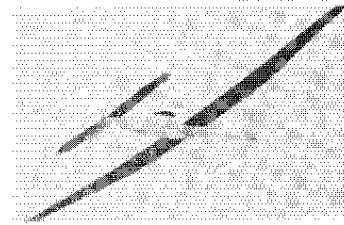
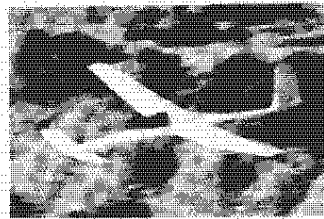
Several builders have had some difficulty interpreting how the rudder to nosewheel steering is connected. This sketch should be helpful in visualizing how this is done. The rudders drive NG-8 through RUD-18 pushrod.



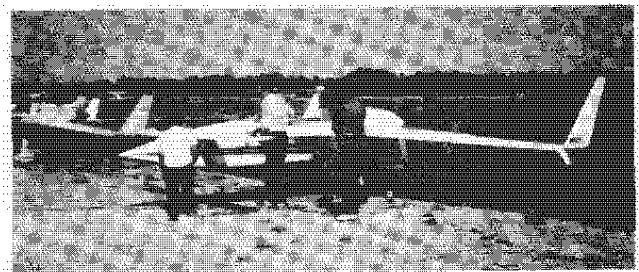
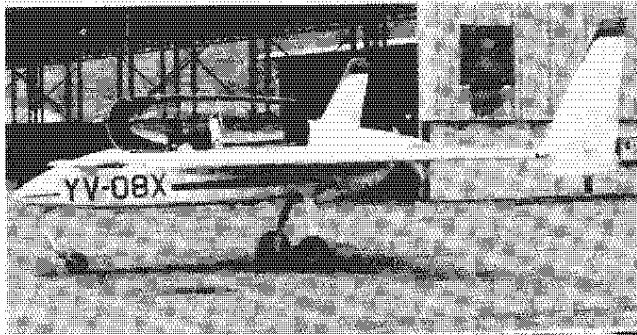
NG-8 is bolted to NG-11 which pivots in NG-12 (A-8-C). The 'U' shaped NG-9 bolts to the welded collar end of NG-11. The HM-5 rod end hang down vertically from NG-9. This rod end bolts into the end of NG-10 (the threaded end, or left end as shown on D-41). The spacer NG-10A, slips into NG-10, and this NG-10 assembly is bolted between the vertical "ears" on the top of the Mooney nose gear. The bolt through these "ears" and the NG-10 with NG-10A spacer is oriented fore and aft or parallel to the butt line. This bolt is torqued up tight onto the NG-10A spacer and the NG-10 pivots on the NG-10A spacer when the gear is retracted. This little steering mechanism is designed so that when the nose gear is down and locked, you have positive nose wheel steering. When the nose gear is retracted, the steering is on center and disabled, allowing the pilot to use full left or right rudder pedal travel without moving the nosewheel side to side in its retracted position.



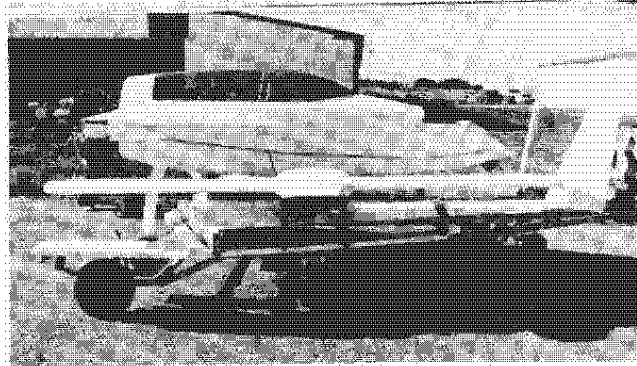
Dr. Julio Moron, of Caracas, Venezuela has completed and flown the first homebuilt of any kind ever in Venezuela. Note how carefully the precious parts are wrapped and loaded on the flat bed truck for the two hour trek to the airport. YV-08X is an absolutely stock Long-EZ and flies straight, true and fast. Congratulations, Dr. Moron!



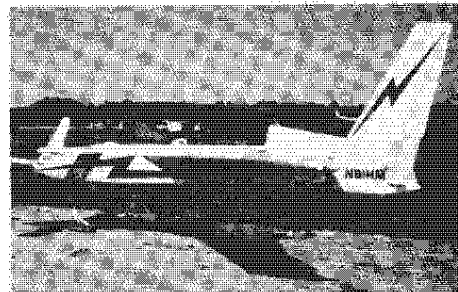
Paul Hington and Steve Morganelli are the builder and flyers of this scratch built R/C model of the Solitaire. This Solitaire has a 120" wingspan, 590 square inches of wing area, (including canard) and weighs 5 lbs. It flies just like a real Solitaire. At full aft stick, she won't stall!!



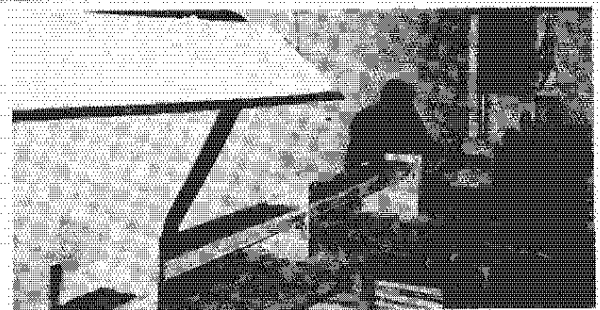
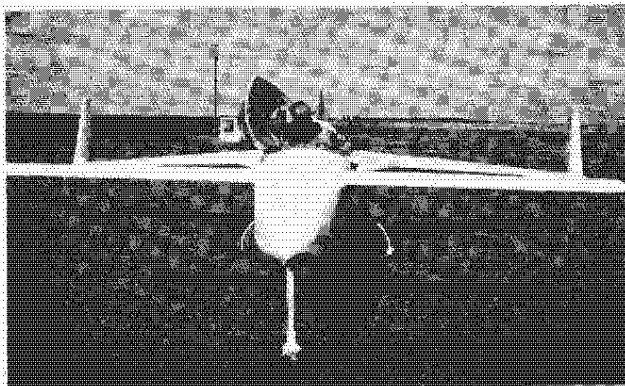
Tim Genres and his wife preparing to start in the Sun 50 Race. This is a high time VariEze, highly modified for racing, and is the prototype for the flush NACA inlet a lot of us use on our EZs today.



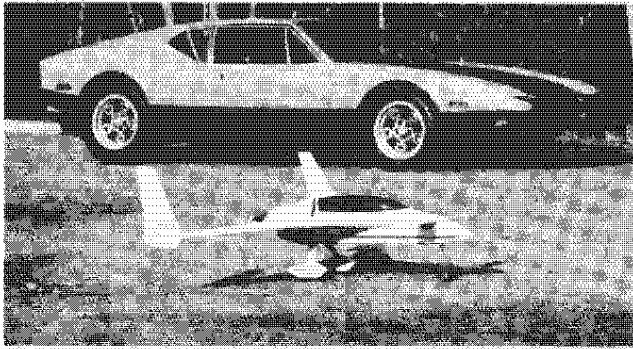
How about this nifty trailer? C-GSPA, a Canadian built VariEze on its way to the Bow Island Airport. Jim Wallwork built and flight test this beautiful example.



Speed demon Herb Sanders prepares to taxi to the start line for the Sun 50 Race. Herb beat five of the six Glasairs including three with retractable gear and constant speed props!



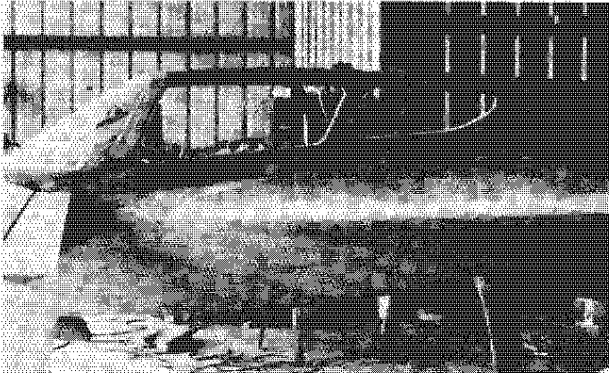
Talk about a super sanitary workshop! This is Kjeld Petersen of Tønder, Norway building his canard for the Solitaire.



Ron Southern of Glen Ellen, California, recently completed this example of St. Croix's 1/75 scale model of a Long-EZ. Beautiful!



Frank Yost, co-builder Tim Crawford (both have completed Long-EZs) and Sally, looking over Frank's Defiant.



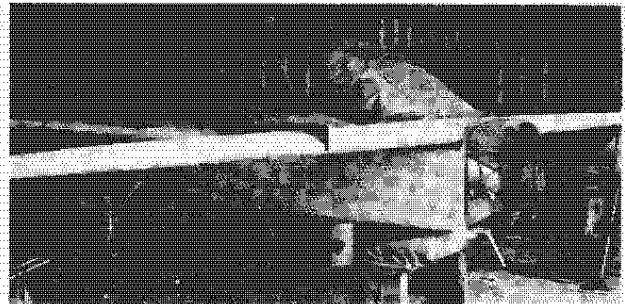
Johnny Murphy's unconventional Defiant! This example features a fixed Cessna 177 windshield. Workmanship is impeccable.



Frank Yost's Defiant is in the finishing stage. Essentially all parts are complete. Hopefully he will make Oshkosh '85.



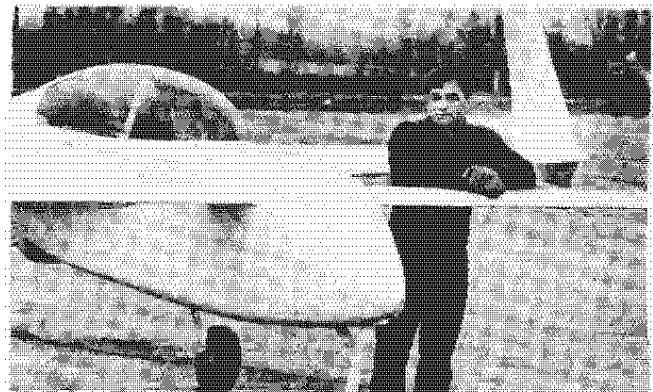
Jo and Chuck Moore of San Diego, California are moving right along. This shot shows the right wing jugged in position prior to drilling the wing attach fittings to mount the wing



All structure is complete and ready for primer. Both engines are mounted and Johnny is working on cowlings. This shot shows canard being mounted - not incidence level black.



Jim Glindermann of Frankston, Australia has got his Long-EZ close to completion in spite of an allergic reaction to the epoxy!



Marty Martindale of Anchorage, Alaska recently completed his Long-EZ. Marty was one of the group of EZ folks who helped Mike and Sally when they had engine problems in Alaska. Thanks Marty.

DEFIANT

HOME BUILT 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 airplane" feel. It holds a desired approach speed with less attention than a conventional light twin.

PERFORMANCE

In general, simplified systems means reduced performance. Not true for the Defiant. Overall performance and efficiency is significantly better than conventional light twins. Data discussed below are for 160 BHP engines. Time-to-climb to 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.

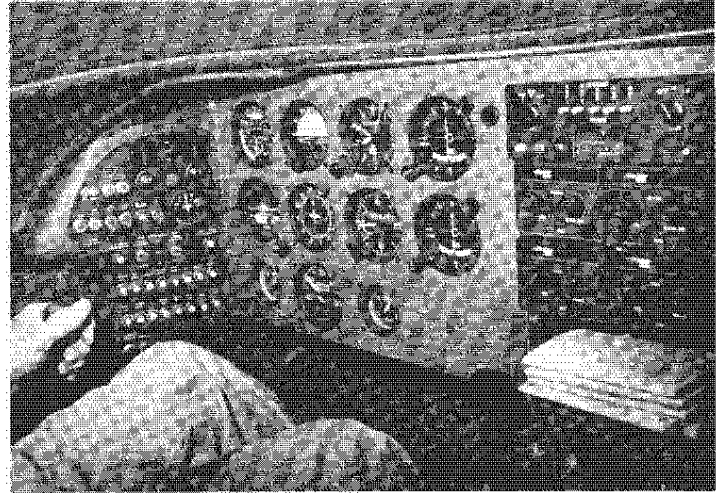


Photo by Don Downie

SPECIFICATIONS AND PERFORMANCE

(with 160 BHP engines, fixed props)

Engines (2)	Lycoming O-320
Seats	4
Basic Empty Weight	1600 lbs.
Equipped Empty Weight	1680 lbs.
Equipped Useful Load	1270 lbs.
Gross Weight	2950 lbs.
Fuel Capacity	115 gallons
Wing Span	31.4 feet
Wing Area	133 ft.
Wing Loading	22.2 lb ² /ft ²
Canard Span	24 ft.
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 lbs.)	310 fpm
Single Engine service ceiling (2950 lbs.)	6500 ft.
Single Engine climb (2200 lbs.)	550 fpm
Stall Speed (2950 lbs.)	64 knots
Stall Speed (2200 lbs.)	58 knots
Baggage Area Seat Up	16.5 cu. ft.
Seat Down	41 cu. ft.
Take off roll at sea level (2950 lbs.)	1480 ft.
Take off roll at sea level (2220 lbs.)	950 ft.
Take off roll at 5000 ft. Density altitude (2950 lbs.)	2500 ft.
Take off roll at 5000 ft. Density altitude (2220 lbs.)	1960 ft.

COST AND TIME TO BUILD THE DEFIANT

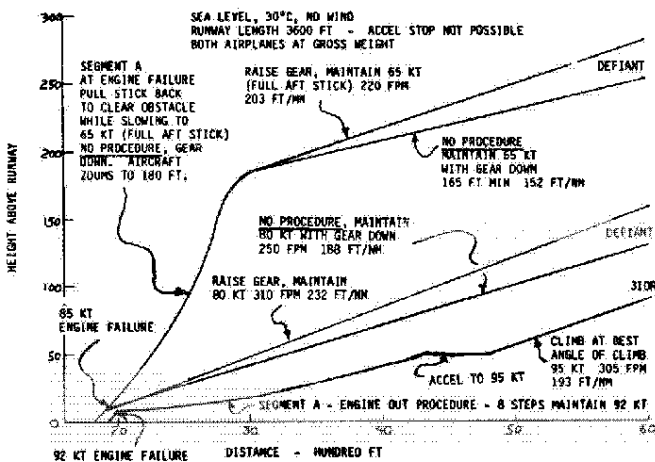
The cost of the materials list has not been completed at this time, but we estimate the cost of building the Defiant will be approximately "two Long-Ezs", between \$20,000 and \$30,000. Remember that avionics can cost you as little as \$1,000 or as much as you wish to pay.

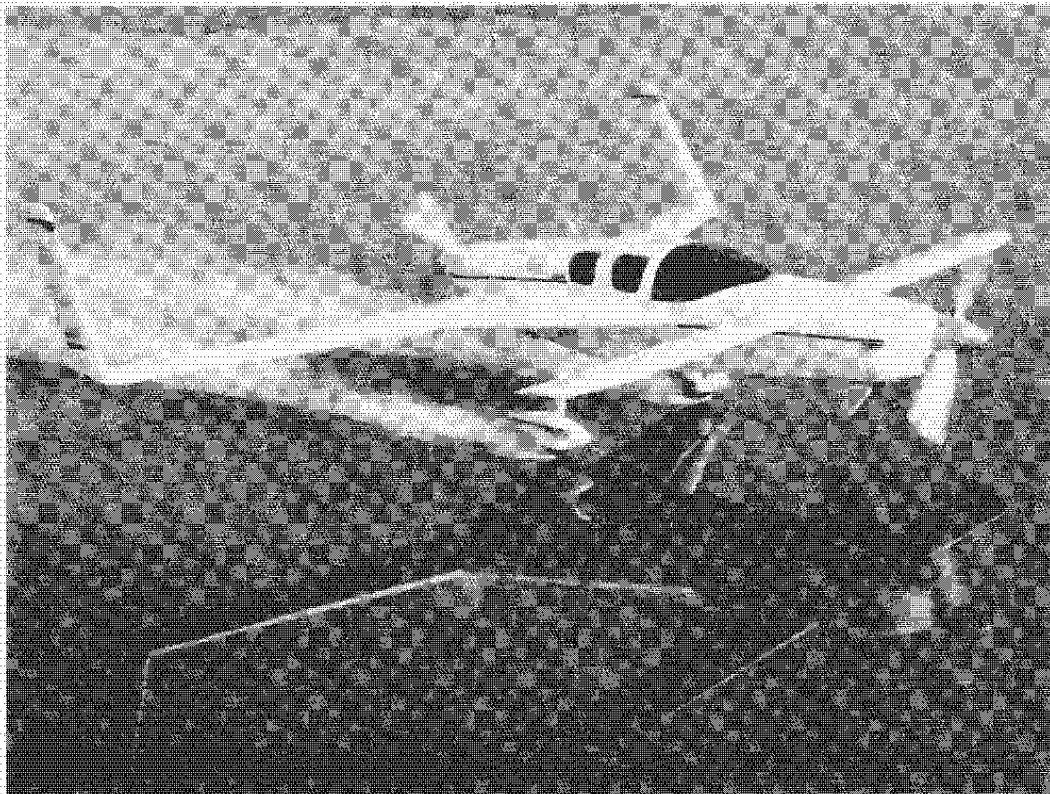
Time to build the Defiant, again will be "two Long-Ezs" as it is the same type of construction, just more. A competent builder can build a Defiant in as little as 2000 man hours. Until the plans are completed, it is difficult to say how many of the parts will be available prefabricated and this would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

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

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

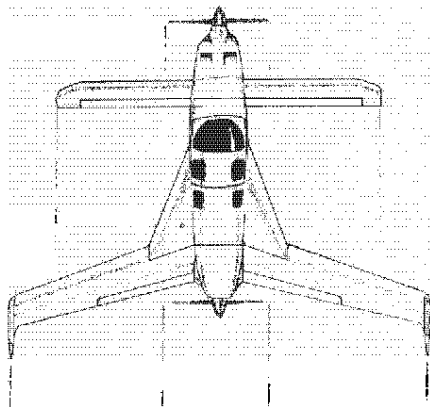
TAKEOFF PROFILE COMPARISON - DEFIANT VS CESSNA 310R





This amazing photograph was taken by Steve Werner. Mike was flying formation with the photo plane over an absolutely glassy water lake. The object was to try to get a reflection photo. The Defiant accidentally touched down on the surface of the lake and Steve snapped the photo. We did not do this deliberately, nor would we recommend anyone try to do this. We feel very lucky to have got away with this, the lake was several feet deep! We have had this photo made into a beautiful 11 x 17 color poster which is available from RAF for \$8.00.

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



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April '85

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