

THE CANARD PUSHER

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If you are building a VariViggen from 1st Edition plans you must have newsletter 1 through 45. If you are building from 2nd Edition plans you must have newsletters 18 through 45. If you are building a VariEze from 1st Edition plans you must have newsletters from 10 to 45. If you are building a VariEze from 2nd Edition plans you must have newsletters from 16 through 45. If you are building a Long-EZ you must have newsletters from 24 through 45. If you are building a Solitaire, you must have newsletters from 37 through 45. If you are building a Defiant, you must have newsletters 41 through 45.

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.

RAF will be open Monday through Friday, 8:00 a.m. to 5:00 p.m.. Builder support on the phone will be available only on Tuesdays and Fridays, 8:00 a.m. to 5:00 p.m. RAF will not be open nor will there be any flight demonstrations on Saturdays.

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.

An important letter by Burt Rutan announces items of interest to RAF homebuilders.

The RAF Aircraft - summary of the era.

Rutan Aircraft Factory (RAF) was formed by Burt Rutan in 1969 as a part-time business. Its purpose was the development of a non-conventional research aircraft, the VariViggen.

In July 1974 RAF became a full-time business and moved to a rented WW II barracks building on the Mojave California airport. From that facility the VariEze was developed (two prototypes were built and tested); the manufacturing manuals for the VariViggen and VariEze were marketed, and the special-performance version of the VariViggen was developed. Also, the feasibility study and the design of the skew wing AD-1 were done for NASA.

In March 1977 RAF moved into a new facility on the Mojave airport flight line. After that move the Quickie, Defiant and Long-EZ prototypes were developed, as well as several consulting jobs for NASA and the USAF in support of the AD-1 and general canard aircraft technology.

RAF continued the tasks of marketing and supporting the VariViggen, VariEze and Long-EZ programs. Further research aircraft developments continued, including the STOL Grizzly, the self launching sailplane, Solitaire and testing the NGT jet trainer. The Voyager round-the-world aircraft was designed and built at RAF. It was turned over to Voyager Aircraft Inc. in August 1984.

AIRCRAFT DEVELOPED AT RAF

Name	Model #	Design Started	Construction Started	First Flight	Plans Intro'd
VariViggen	27	Aug 67	Jan 68	May 72	Feb 74
VariViggen SP	32	Jan 75	Jan 75	Jul 75	Nov 75
VariEze - VM	31	Sep 74	Feb 75	May 75	None
VariEze	33	Aug 75	Oct 75	Mar 76	Jul 76
AD-1 (NASA)	35	May 76	Dec 77*	Nov 79	None
Quickie	54	Jun 77	Aug 77	Nov 77	None
Defiant	40	Mar 77	Nov 77	Jun 78	Jun 84
Long-EZ	61	Jan 79	Mar 79	Jun 79	Apr 80
Amsoil Racer	68	Jun 79	Feb 80*	Aug 81	None
Grizzly	72	Mar 80	Dec 80	Jan 82	None
NGT Jet	73	Jan 81	Feb 81*	Sep 81	None
Voyager	76	Jun 80	Jun 82	May 84	None
Solitaire	77	Jun 81	Dec 81	May 82	Aug 83

*Construction not done at RAF.

The Business of Homebuilt Plans

RAF has never entered the homebuilt kit market. From the onset, I have limited RAF's marketing to that of plans and support items. It is easier for me to assure the quality of those items. As you know we have been open and candid about the deficiencies that have been found after plans are out and responsive toward developing improvements to fix the problems and to promptly pass the important information on to you homebuilders in the Canard Pusher. The following table lists some interesting statistics in this area.

Model	VariViggen	VariEze	Long-EZ	Solitaire	Defiant
Year plans introduced	1974	1976	1980	1983	1984
Minor corrections	87	164	110	54	28
Safety related improvements	6	40	7	0	0
Improvements (not safety related)	21	115	114	6	8

Most of the items passed along are routine (simple clarifications or corrections), but some have involved real panics, such as our 9-day program to develop flight test and document the VariEze lateral control system major change in 1977 and our recall of deficient seat belts and 5-month battle with FAA to convince them to issue an AD in 1978.

RAF's early decision to not get into the business of manufacturing parts and kits was based mainly on a desire to stay small and to avoid the responsibility (and thus liability) of assuring that each bolt, wing spar or engine, etc was perfect. Many people told me I was a fool to not fully gain the financial profits of the designs by not marketing kits. However, the plans business for the VariEze and initially the Long-EZ was excellent and with a low overhead, RAF was very successful, paid lots of taxes and built a reasonable cash health.

This success story worked, however, only on those two designs. The others - VariViggen, Grizzly, Solitaire and Defiant have not been viable in the market place. Even though developed and flight tested, the Grizzly was never offered, because it did not seem that the costs of preparing drawings would be recovered. The Solitaire cost several times as much to develop as the Long-EZ and the market was dismally small, resulting in a major drain on RAF's financial security. The Voyager project was done primarily because I decided that this significant accomplishment would be worth more in terms of the feeling of accomplishment by achieving an aviation milestone, than the more obvious financial income to be received by introducing a new homebuilt. I had thought that the Defiant would be a tremendous success for RAF, because of the excitement it generated upon its introduction in 1978 and because I had found it to be my favorite transportation for nearly 1000 hours of very enjoyable flying. However, this did not prove to be the case, since now at the end of its first year of introduction, after its direct costs of printing, mailing and contract support, its income has not even covered the overhead of one of our 4 RAF people.

We, as well as others in the homebuilt market arena are seeing a market that has been declining in the last two years. Long-EZ sales are down to 20% of last years' rate. It is possible that this is due to cost increases but it is also likely that it is due to saturation. Possibly there is a very limited number of people with the persistence to build an airplane and the desire to own an airborne sports car.

Another factor may be the decreased excitement and enthusiasm of the various airshow activities. The new 'starwars' homebuilts are not as unique and exciting as they were in 1976. The Oshkosh flyin, once considered the Mecca for the homebuilder, no longer makes him feel welcome, by curtailing flying activities, charging large fees for participating and not providing protection from the general public. Those put off by this, continue to enjoy their aircraft by activities like the IVHC trips and by gleaming the desired utility from them, however, the promotional aspects of the big airshows has declined.

Where do we go from here?

During my 12 years in the homebuilt business arena, I have found that a continuing business of developing homebuilt aircraft and selling plans in the long-term can be self defeating. As the number of new builders grows each year, the number that require support continuously grows to significant proportions. Plans sold in 1974 still get attention for building assistance and the oldest airplanes still need help with operational problems. During the current declining sales period, with our relatively high overhead, we find ourselves spending more to promote current products and to develop new products than income will cover. Thus our long term ability to provide builder support will be threatened unless we drastically reduce overhead.

Recently we were faced with a decision: (1) To continue with the development and introduction of new homebuilts, expanding RAF as necessary for the new development activities and expanding support requirements. We would thus attempt survival (with growth) in a declining market place, or (2) To significantly curtail our overhead to a level to do only builder support. This allows the remaining cash to be available for a longer period of time to support the current builders. Discontinuing further marketing of plans would change our support requirements from an expanding level to a declining environment.

I have decided to follow the second plan. After today, July 13, 1985, RAF will no longer market homebuilt aircraft plans. This should be no cause for concern by those currently flying or building, since we intend, for the foreseeable future, to continue to provide support. Support, as always, will include answering builders mail (SASE required, as always!) and, on a more limited time basis, providing support on the phone. We will also, as before, respond to any requirement for safety-related modifications or improvements, ie. if future experience uncovers any unsafe characteristics or weakness in the plans-configuration, that will be corrected after the appropriate development and test of the correction. Of course, as before, we may not be able to investigate or comment on modifications or options by others that do not relate to a safety question on the basic configuration.

I plan to finance our continuing support effort via the following methods:

- (1) Use of funds already directed to subsequent support. We have been using a "deferred income" plan directed at future builder support.
- (2) Effective immediately the CP subscription is raised to \$14.00 per year. The old price was less than a break-even level for the newsletter alone.
- (3) Continue our marketing of support items, trinkets and plans that improve the existing designs. Examples are construction video tapes, owner's manuals, tie tacs, photos and rudder mod plans.

We will be at Oshkosh this year, to market the items in (3) above, but primarily to provide builder support. Activities of a nature to promote new plans sales such as our Saturday demos, aerobic airshows, advertising, giving rides etc. will no longer be done.

Even though the RAF expenses are curtailed to a minimum level, Mike and Sally Melvill will not be out of work. I plan to use their extensive talents in aircraft development and test in proprietary areas not related to homebuilts.

RAF will be open Monday through Friday for sales of everything but plans. We will no longer be open on Saturdays. Builder support via telephone will be limited to Tuesdays and Fridays only.

It is a difficult decision, of course, to retreat from the homebuilt plans business, since it has been a tremendous amount of fun working with people who also are having a lot of fun. It was a decision made necessary by the nature of the business and our success in the last two years. Also, I have been spread so thin on time, conducting the other business at Scaled Composites, that I have been unable to meet the schedule I had wanted on the next RAF aircraft.

1985 CAFE 400

Gary Hertzler has done it again!!! Congratulations Gary. In spite of a scoring method change favoring speed more and payload less, Gary and his marvelous little 80 hp VariEze managed to defeat all comers. Not only did he win the experimental, two place category, he had the highest score overall of the 38 finishers. We at RAF are very pleased and proud of all the builder/pilots who flew their RAF designs in this years CAFE 400. When you consider that Gary and his VariEze have won four years in a row and each year the race has been run on a different course and under different rules, Gary and his machine are indeed a special combination - super job Gary, what will you do next year!?!?

EXPERIMENTAL TWO SEAT

	Score	A/C Type	Pilot	W/Seat	Speed	MPG	SW	HP
1	2,112,840	VariEze	Hertzler	400/2	150.5	44.82	1200	80
2	2,094,819	Q-200	Sheehan	400/2	175.5	36.66	1200	100
3	1,967,589	VariEze	Savner	400/2	168.5	36.23	1200	100
4	1,740,903	Q-2	Wallrath	400/2	159.8	34.26	1250	100
5	1,649,410	VariEze	Sorenson	400/2	162.8	31.72	1250	100
6	1,646,266	Glasair RG	Hamilton	400/2	199.3	24.58	1850	180
7	1,558,392	Long-EZ	Ellison	400/2	191.1	24.52	1425	160
8	1,513,212	VariEze	Gardner	400/2	172.9	26.98	1300	115
9	1,460,292	Rand KR2	Alderman	400/2	144.1	32.70	1200	75
10	1,368,148	Yans RV4	VanGrunsven	400/2	178.5	23.44	1500	160
11	1,358,114	Long-EZ	Kelly	400/2	171.4	24.48	1500	160
12	1,297,052	VariEze	McPherson	400/2	138.4	30.56	1210	90
13	1,228,409	Thorp T-18	Brock	400/2	164.9	23.23	1800	180
14	1,134,420	Glasair TD	Spaulding	400/2	161.0	22.12	1570	160
15	1,115,500	Thorp T-18	Leffe	400.2	172.8	19.90	1840	180

We are very sorry to announce that Michael Dille will be leaving RAF for personal reasons. Michael has been with us since October 1981. Michael was one of the builders of the Amsoil Racer before joining RAF. Since coming to RAF, he helped complete the Grizzly, then worked full time on the Solitaire. After Solitaire was flying, he was one the first few pilots to fly the prototype. He worked on the Solitaire plans for the homebuilders and has been the primary Solitaire builder supporter since the plans were put on the market.

Michael has been building a Long-EZ and has been a great help on Long-EZ builder support. He does plan on completing his Long.

We will miss him very much and he will be hard to replace. But we wish him and his lovely family every success in their future. "We love ya guys".

What a day! The morning dawned bright and clear with little wind (we had all been praying to the Mojave wind gods and they were kind!!). About 7:30 a.m. a bunch of volunteers from the Long-EZ Squadrons I and II showed up and started getting ready for the spot landing contest which they had kindly offered to organize. They barely had their white line painted on the runway, when the first airplane, Bruce and Bonnie Tiffit overflew the airfield and announced they were on downwind for the landing. Bruce touched down less than 20 feet beyond the white line and we all began to think that this was too easy! HA!! Not at all, in fact Bruce was the leader for most of the day until finally Bill Oertel of Norco, California landed a scant 8 feet short of the line. The flyin did not really start until 9:00 a.m. but by that time there were 25 EZs tied down on the ramp! After it was all over it turned out that 39 VariEzes and 37 Long-EZs flew in. In addition to this of course there were present on the ramp the 85% scale Starship, the Voyager, the Grizzly, the Solitaire and the Defiant. The Gemini, Dave and Kathy Ganzer's unique push pull twin two place was also on the line. The total count of airplanes was 83! This is the largest number of RAF designs ever assembled on one airport at one time, including Oshkosh!!!

A busy schedule, starting with the spot landing contest, then going into a hands on demonstration of composite construction methods, and the finishing of the composites, followed by lunch and the highlight of the day for most people, when we static loaded three different VariEze/Long-EZ canards. A raffle was held for a brand new multilaminate Great American prop, a number of door prizes were given away and the party started breaking up around 4 p.m.

We did not get an absolute head count but we believe we had over 400 people. The hands on seminar was a standing room only situation. Even more people were jammed into the hangar for the static load testing. The first canard was one that was built by a homebuilder and was rejected due to an extremely dry layup. This canard was mounted in a frame (upside down) in exactly the same manner as it would have been in the aircraft.

Thus the static load test was a valid test of the aluminum attach points as well as the composite structure. With Burt directing proceedings, 25 lb lead shot bags were carefully loaded onto the bottom surface of the canard in the proper order and spacing to simulate airloads. Burt called out the load factor at each 2 g increment. At 10 g there was a loud crack as the top skin, forward of the spar cap failed in compression. The spar cap was still in good shape, so we continued to load shot bags until we were one bag short of a 14 g load on each side, when with a mighty crack, the canard failed catastrophically. All failures were in compression, there was not one tension failure. The attach points (lift tabs) did not fail. At the time of failure, there were 69 bags, each weighing 25 lbs loaded on each side of this canard! The tips were deflected an average of about 11 inches. This was 1725 lbs. on each side, for a total load of 3450 lbs hanging on those little lift tabs!!

A dramatic demonstration that surely made every builder feel good about his or her airplane.

We attempted to fail two more canards, but due to the fact that these had been painted white and were shiny and slick (each was airworthy and had over 800 hours of flying time each), we had difficulty keeping the lead shot bags from slipping off. Both went to 12 g with no sign of failure before the load of lead slipped. Interestingly, one side of one of these canards had been deliberately damaged by Burt using a special damage tolerance testing device. The damage was quite severe, enough to have punched deep dents all over an aluminum wing, but in spite of this, there was no difference in deflection from the damaged side to the good side, even at 12 g!!

WE at RAF had a really great day and we hope everyone who attended our flyin enjoyed it as much as we did. There were many beautiful examples of EZs on the ramp, presenting a golden opportunity to EZ builders and potential builders to look at and talk to the owners.

We would like to thank all the people who made this flyin such an enormous success, in particular Squadron I and II members. Dick Kreidel, David Orr, Lynn Burks, Joe Orrico and especially Joan Richey. There were many others who also helped. Thank you all, shall we do it every year !?!

We still have some flyin T-shirts in stock. After flyin sale - \$5.50!!

The following is a list of the #'s of the EZs that were on the ramp during the flyin. Thanks to David Orr, whose legs were practically worn to stumps in the 105° weather, for tagging each airplane for us.

VariEze	Long-EZ	Odd Ones!		
N57EZ	NB3VE	N141RJ	N25EZ	Starship N2000S
N3LV	N999EB	N169SH	N82CD	Solitaire N81RA
N57LG	N34VE	N5WX	N661ST	Defiant N78RA
N60SD	N84EZ	N6NG	N26MS	Grizzly N80RA
N183W	N999EZ	N67JD	N711QA	Gemini N75DG
N75VE	N999JD	N218EZ	N27CK	Voyager N169VA
N262DB	N39DP	N7VN	N83DF	The Beez N115EZ
N13EZ	N88RB	N252BJ	N731JS	
N78BN	N7824R	N8JE	N83PJ	
N15LL	N42DS	N324VR	N888EZ	
N450EZ	N99CL	N13YV	N38EZ	
N505D	N15433	N379W	N84LZ	
N23RR	N99VE	N79RA	N89PC	
N80WL	N45846	N15NS	N41AN	
N529SK	N45DM	N79YT	N44ZC	
N24RW	N64592	N188P	N102LE	
N83DE	N80681	N515DR	N51EV	
N27RG	N56RH	N600TD	N55LZ	
N33ST	N118SJ			
N139EZ				

If we have missed you, PLEASE let us know.

DEFIANT NEWS

CONGRATULATIONS JOHNNY MURPHY!!!! Johnny flew his brand new Defiant on the evening of June 8, 1985. He was very pleased with the flight, which lasted about an hour. Things were going so well, he even retracted his nose gear, (which is not per plans!). Johnny is the first one to fly a Defiant equipped with constant speed props and he is pleased with the performance. Acceleration during takeoff is noticeably better, climb is better and best of all, the braking effect on final approach as power is reduced and the props go into flat pitch, is quite dramatic, completely eliminating the need for any form of speed brake. Johnny has 3 hours on his Defiant and has put it back into the shop to finish the paint job and all the other little details to prepare it for the trip to Oshkosh.

Frank Yost reports that he is essentially ready for his FAA inspection which will be on the 28th June. He is planning on making his first flight on the 4th of July and is planning on flying into Oshkosh.

N78RA has been undergoing some major rework. It now has an O-360, 180 hp Lycoming hanging on each end, with temporarily installed Hartzel constant speed props. We have placed an order with Hoffmann for two, three bladed, full feathering, constant speed composite props and are hoping to have them installed in time for Oshkosh. We are presently fitting the cowlings, and hooking up engine and prop controls. We anticipate first flight with the O-360s early July.

Fred Keller has had his Defiant layed up during the winter while he did a complete major overhaul on the front engine. This engine was pretty well run out when he first installed it but due to the rush to make Oshkosh it got pressed into service and operated well for over 150 hours. He has it back in the air and all systems are go for Oshkosh 1985. FOUR Defiants on the line!!!!

LONG-EZ CANARD - RONCZ 1145MS

We are pleased to announce the availability of the plans for the new canard. We have these plans in stock, available for immediate shipment. We are also pleased to announce that Ken Brock Mfg. has all the machined

parts and weldments necessary to complete the new canard including the two elevator torque tubes, ready to install available for immediate shipment. Contact Brock for prices. The canard plans sell for \$42.50. This new canard design is an option for Long-EZ only, it is not recommended for the VariEze. The installation of this airfoil on a Long-EZ requires the installation of the vortilons on the leading edges of the main wings. DO NOT try to fly your Long-EZ without first installing the vortilons. The canard plans of course include instructions for the manufacture and installation of vortilons.

PLANS CHANGES.

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

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

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

PLANS CHANGES

VariEze - No plans changes, however if you have the early Rosenhaan wheels, brakes and axles, a mandatory inspection of the axles is necessary before next flight. At least two VariEzes have had cracks in the axle at the flange. See Page. 7

Long-EZ

LPC #121 Long-EZ High Performance Rudder Plans. For new construction only - install the rudder cable conduit in the wing so that the conduit is 1.5" aft of where it is shown on the full sized pattern on Page A-12 of the large 'A' drawings supplied with Section I of the plans.

Defiant

DPC #26 Section I, Page D-32. Aileron Deflection. The ailerons should move up 11° or 1.37" measured at the aileron trailing edge at 8.L. 19.5. They should move down 21° or 2.62" measured at the trailing edge at 8.L. 19.5. This measuring should be done with the control stick hard over against the stop each way, while approximately a 2 lb. force is exerted towards centering the aileron to simulate airloads. Check both ailerons.

DPC #27 Section I, Page D-57, Rudder Deflection. The rudder should travel 20° each side of center (40° total) or 7.1" left and right as measured at the trailing edge at the top or root of the rudder.

DPC #28 Section I, Page D20, Left lower portion of the page. Green foam block. The 16.5" dimension on each end of the foam block should be 17.5".

SOLITAIRE PLANS CHANGES

SPC #55 Engine Section, Page 21. Electrical system materials callout.
Change the lever lock switch SPDT MS25125-A1 to an MS24658-21A (easier to get). Aircraft Spruce has their switches listed by both MS and AN numbers. If ordering from Electric Switch Co, please use MS numbers.
AN3021-7 = MS35058-30
AN3021-2 = MS35058-21

SPC #56 Engine Section Page D-8 and words on Page 7. The length of the hydraulic cylinder with the HF-8 installed should be 23.55 center to center between the pivot points. This requires cutting the HF-8 to 1.5" center of the pivot to the base and cutting enough off the hydraulic cylinder threads to allow the HF-8 to bottom out on the threads. Install the HF-8 with Loctite. Before cutting, extend your cylinder and measure from the center of the base attachment to the start of the threads on the rod in both the extended and retracted positions, add 1.5" to each of these dimensions. Measure the mount from upper to lower pivot points as described on Page 7 of the engine plans. The up distance should be exact and the down can be slightly longer than the closed measurement of the cylinder including the 1.5". CAUTION: Do not cut the threads on the hydraulic cylinder to less than 9/16" and be certain the HF-8 is threaded onto the cylinder shaft fully to the shoulder of the threads.

SPC #57 Engine Section, tow release Page 16, and D-23. When installing the tow release unit into the fuselage of the Solitaire it is necessary to remove the inside skin and core material and layup 3 plies of BID lapping 1.5", 1.0" and .75" onto the inside skin. Taper the edges of the honeycomb with dry micro to avoid air bubbles at the edges.

BUILDER HINTS - Finishing Composite Parts.

We have been using a "new" material for the last year or so which was demonstrated and discussed at the seminar held here at RAF on June 8. This material is an epoxy and is manufactured by Gougeon Brothers Inc. 706 Martin Street, P.O. Box X908, Bay City, Michigan 48706. Phone is 517-684-7286. The epoxy known as "The West System" consists of a one gallon container of resin (part #105-B) and a one quart container of hardner (part # 205-B (fast) or 206-B (slow)). In addition they sell a real neat little pump system, that screws into the tops of the cans, and dispenses the correct ratio of resin to hardner. This mini pump (part #301-B group B) costs less than \$5.00 and is a real time saver. The total cost of a "one gallon" kit with ratio pump is \$55.00 (not including COD or shipping charges). When you consider that you have got 1 1/4 gallons of epoxy and you will mix microspheres (glass bubbles) at a ratio of 200% microspheres to epoxy, by volume. (1 part epoxy - 2 parts microspheres eyeball is close enough). This in effect gives you approximately 2 1/2 gallons of filler material, the price is cheap.

Sand your glass part with 40 grit. We sand, quite vigorously back and forth for about 5 seconds, then sand for a further 5 seconds at 90° to and over your first attempt. This will not destroy the glass structure but will put enough scratches into your glasswork for a good mechanical bond. Vacuum all the dust off the part, and paint a very thin coat of pure West System epoxy all

over the part. You are just trying to moisten the part with pure epoxy. Wipe half of it off with a paper towel if you get it too wet. Now mix up one pump shot of resin and one pump shot of hardner. Add one heaped full small paper cup (3 oz size) and stir until you have a mixture that resembles cake icing. Use a squeegee to spread this "putty" like mixture all over the part. Make sure you get it on thick enough to slightly overfill any low points, depressions or dings, and also to fill the weave in the glass. Using fast (#205-B) hardner, this dry micro mix will cure in 4 to 5 hours as hard as a rock. Using slow (#206-B) it will take 8 to 9 hours. Once cured it sands very nicely, does not gum up the sandpaper and allows the builder to obtain an excellent contour well within the criterion required to paint the part with Sterling, Mortons Eliminator, featherfill or some similar primer/filler. One coat of one of the above, occasionally two coats, will prepare the part for the primer and then the top coat.

We sand the West dry micro with 100 grit. We then paint on Sterling or Morton with a brush on small parts, or spray it on large parts. When this is cured we sand with 220 grit wet or dry, followed by 320 wet or dry. Your contouring is now complete, and should be as good as you can get it. The gray primer, such as Dupont 131S or Ditzler Preet 33 will not change contour, but when sprayed on, provides a base for the final top coat and does contribute some towards ultraviolet protection. The majority of your ultraviolet protection is provided by the final white top coat, such as Dupont's Imron, Ditzler's Durathane or Dupont acrylic enamel.

The use of the finishing method described above will provide you with a low cost, durable and relatively easy to do finish from the purely physical aspects (elbow grease!). West System dry micro is much easier to sand than Safe-T-Poxy dry micro and can be sanded in 4 to 5 hours without gumming up the sandpaper. If Safe-T-Poxy dry micro were used as described above in place of West dry micro, you would probably have a little more durable

surface, but it would be two to three times more work. This is because the Safe-T-Poxy dry micro is so difficult to sand and takes 3 or 4 days to cure to the point where it can be sanded.

We have done a considerable amount of materials testing and evaluation lately and the general concensus is as follows:

Option 1.
Bare glass - West system dry micro - Sterling primer filler with up to 30% microspheres - pure Sterling sprayed on as an undercoat - Sterling 'U' series, polyurethane top coats.

Option 2.
Bare glass - West dry micro - Mortons Eliminator - Corlar 824 S - Imron.

Option 3.
Bare glass - West dry micro - Sterling - Preet 33 - Durethane.

NOTE: Safe-T-Poxy dry micro can be used anywhere we have called out West dry micro - it would probably result in an even tougher, more durable surface. However the extra time and effort may not be worth the small gain.

There really is no "best for everyone" system. Take your choice. If you like Ditzler products, by all means use Option 3. If you like Dupont products use Option 2. There are many other excellent paints and finishes, check around, but try to use the complete company system from the dry micro on out to the top coat where possible. See below for a chart on some of the products we have tried. This is our opinion based on actual hands on testing side by side in the same environment, but is not in any way a scientific test. Use this chart as a guide only, then do your own test.

FILLER MATERIAL	WEIGHT VOLUME	ADHESION	CON-PATI-	EASE OF APPLICATION	TIME TILL SANDABLE	EASE OF SANDING	SHRINKAGE	SANDPAPER GRIT	% OF MICRO TO MIX VOL MATERIAL	
Safe-T-Poxy Dry micro	1	1	1	3	48 hours	4	1	40 - 100	200 -300%	Can be applied up to knife trim time with no sanding or peel ply.
West Dry Micro	2	1	2	3	6 hours	4	1.5	40 - 100	200%	Time consuming to apply if trying to cover the entire airframe.
Mortons Eliminator	3	2	3	2	6 hours	1 in 6hr 3 in 24hr	2	80 - 100 180 - 320*	up to 33%	Tough to mix in the can - very hard when cured.
Featherfill	3	4	3	3	24 hours	2	4	80 - 100	up to 33%	The old standby - possibly improved no new testing.
Poly Lux	3	Seems good no long term testing	3	2	4 hours	2	no long term test	80 - 100 180 - 320*	up to 33%	Only workability testing. No flight time or long term testing to determine aging.
Ever-Coat	3	Seems good no long term testing	3	1	1.5 hours	2	no long term test	80 - 100 180 - 320*	up to 33%	Same comments as above, however excellent workability and fill characteristics.
Sterling	3	1	3	4	2 hours	1 in 2hr 3 in 24hr	2	80 - 100 180 - 320*	up to 50%	Urethane paints are the most dangerous to work with from a health standpoint but they have excellent adhesion and flexibility qualities.
Lite Bondo	4	2	3	3	1 hour	3	2	40-100	0%	Can be used in patch areas where a micro fill came up a little short. Sands in 1 hour. Do not use very much or risk shrinkage cracks.

* no microspheres 1 - Excellent. 2 - Good. 3 - Average. 4 - Poor.

MFG	NAME	TYPE	PRIMER	ADVANTAGE	DISADVANTAGE
Ditzler	Durethane Enamel	Polyurethane Enamel	Preet 33	Wet look, tough longlasting, repairable.	Cost, toxicity, slow cure. Limited choice of colors.
Ditzler	Delstar	Acrylic Enamel	DZL Primer Surfacel - 34 dark gray	Cost medium, lasting medium, tough	Not as long lasting or as shiny as Polyurethane
Ditzler	Deltron	Acrylic Urethane	DZL Primer Surfacel - 34 Dark Gray	Fast Dry, easy to apply. Color selection, cost between Durethane & Delstar.	Not as resistant to chemicals or as high gloss as Durethane.
Dupont	Imron	Polyurethane Enamel	131S	Wet look, long lasting, Tough	Cost, Toxicity, slow cure. Not easily repairable.
Dupont	Centari	Acrylic Enamel	131S	Medium priced Can add urethane	Not as long lasting Tendency to orange peel
Dupont	Lucite	Acrylic Lacquer	131S	Coat, fast drying easy application, repairability.	Shortest life, usually must be rubbed out.
Stets	Aero-Thane	Polyurethane Enamel	131S	Similar to but less expensive than Imron	Slow cure, not easily repairable, toxicity.

JOBS AVAILABLE

Scaled Composites Inc. needs a Mechanical Engineer and a Structural Composites Engineer. There are also openings in the shop for composite fabricators. An electronics background (experience or hobbyist) is desired.

Contact: Herb Iversen, Scaled Composites, Hangar 78 Airport, Mojave, CA 93501

Mariposa America Bandstand 50% Fling

Labor day weekend, August 31st through September 2nd 1985. Picnic at the Tifts hangar, Mariposa/Yosemite Airport. For further information contact:
Marge Tiftt - 209-966-2971
or - 209-966-5794
Further details will be printed in the IVHC newsletter. This should really be a great flyin.

SHOPPING

PREFAB GLASS PARTS

Larry Lombard, owner/builder of VariEze N15LL, one the highest time EZs we know of with over 1200 hours, is now on line and is making Long-EZ main and nose gears and is set up to make Defiant gear.

Larry is working on tooling for Defiant cowlings and fuel strakes and would appreciate hearing from Defiant builders who would be interested in these parts.

He has available tooling for Long-EZ cowlings and wheel pants, VariEze cowlings and wheel pants and can take orders for these parts. We would request however, that if you are ready and need a cowling or a pair of wheel pants, that you contact either Aircraft Spruce and Wicks Aircraft first, since they may still have a few of these parts in stock and we would like to deplete their stock before Larry starts.

Mike Melvill and Michael Dilley flew up to northern California and spent the day with Larry, checking out his equipment and also helped him run the first Long-EZ gear. Larry has built a really nice hanger/shop right on the Boonville airport which is north of San Francisco and west of Ukiah. He has just completed a first class oven in which to cure the gear. All of the equipment worked well and he is now ready to accept orders.

Larry will be handling all of these parts directly and you should contact him at:
P.O.Box 781,
13451 Airport Road,
Boonville, CA 95415
707-895-2718

Larry has a very extensive background in working with composites. He had built several homebuilt aircraft including his own VariEze, and worked here at RAF for two years during which time he helped build the Grizzly and Solitaire. Larry will be working in close conjunction with RAF and we are confident that he will produce high quality parts at reasonable prices.

Aircraft Spruce and Wicks have several new items for sale. The new PR-88 protective hand cream is in stock and sells for \$18.50 per liter. Also available is an excellent line of airconditioned drum sanders and flex disc sanders. Contact these distributors for information and prices.

Please note that the catalogs from Aircraft Spruce and Wicks Aircraft are now \$5.00

Designed and built by Ian Ayton a Long-EZ builder/flyer, is a real neat plastic NACA cooling vent prefabed and ready to install in your canopy frame or in the side of the fuselage or under the baggage strake. This little gem has an adjustable ramp door that opens and closes to give perfect ventilation. It is made of ABS plastic and can be glassed or rivetted into place.

Also designed by Ian, is a little black box that can be wired into your gear/canopy warning system. It will sound your horn in an intermittent manner rather than a continuous blast. At the same time the warning light will blink on and off. You can override the horn but not the blinking light. However, if after about one minute, you have not moved the throttle to recycle the warning system, the horn will again sound. This is a great idea and could save an embarrassing gear up landing. Mike has installed one on his Long-EZ and is very pleased with it.

Contact: Ian Ayton,
4061 Via Pavion,
Palos Verdes Estates
CA 90274
213-375-9269

NEW BARRIER CREAM TESTED

We recently obtained a new product called PR-88. This is a hand cream designed to act as a barrier against virtually anything the homebuilder might work with. We have found it to be absolutely excellent particularly when working on a dirty, greasy engine, or when painting or working with epoxy. We find it works best if you wash your hands quite often, say once per hour, during a

particular job. This also gives you a break and you will find that the work will usually go quicker and better. This barrier cream is the best we have used. It goes on easily and is not sticky and in fact once it had dried, you do not know you have it on. It is available from both Spruce and Wicks.

FOR SALE

Two Lycoming O-360, 180 hp engines, low time.
Contact: Howard Hoenike,
805-366-4912

Continental O-200 engine kit - zero time - needs two cylinders and accessories. \$3500.00 OBO.

Lycoming O-320 B2C - 160 hp conical mount (not dynafocal) - 340 hours total time. Disassembled for inspection - no accessories. As is \$3500.00 OBO.
Contact: Myron Rupprecht
805-259-1644 - evenings.

VariEze nose and main gear struts and some other VariEze parts. Sell outright or trade for Long-EZ parts.
Contact: Bob Andrews
Box 153
Mt. Uniacki, NS.
Canada B0N 1Z0
902-866-2759

Defiant nose gear for sale.
Contact: Haley Haynes
795 Seawind Way,
Port Huéneme, CA 93041

Radair 360 Tranceiver in excellent condition - just overhauled by Terra. Complete with tray, cannon plug, installation, operational manual and maintenance manual. \$375.00

55 amp, 12 volt aircraft alternator and matching voltage regulator. 200 hours since new, includes installation instructions. Made by Motorola/Alcor. Cost 286.35, sell as is for \$85.00

Long-EZ airspeed indicator, excellent condition, graduated for Long-EZ. \$30.00

12 volt electric turn and bank good condition. Made by RC Allen. Sell as is \$65.00

O-2000 fpm vertical speed indicator (rate of climb) works good but glass scratched - as is \$ 35.00

Potter and Brumfield circuit breakers.
5 amp value, cost \$14.00 each, good condition, five c/bs available, as is \$ 5.00 each.

Switch circuit breakers same make as above, good condition, six available, three at 5 amp, three at 10 amp. Cost \$22.00, sell as is for \$7.00 each.

Zoom cockpit light - red or white, cost \$85.00, sell as is \$20.00

Two Cleveland disc brakes, includes discs and brake calipers in serviceable condition (NO wheels) as is \$50.00 for the pair.

Two key type ignition switches, one Gerdes, one Bendix with 'start' position. As is \$10.00 each
Contact: Mike or Sally Melvill at RAF
805-824-2645

Squadron I, the original Long-EZ builders group in the Los Angeles basin has a new address and meeting place. They meet once a month on a weekend, usually a Sunday morning on the Brackett Field airport in La Verne. The new address is: P.O. Box 396, Yorba Linda, CA 92668

WARNING

Non-wood props. Many builders are not aware of the fact that when a new metal prop/engine/aircraft combination is developed, the prop is considered unsafe by the manufacturers of the prop and airframe until an inflight stress survey and vibration survey is conducted. The magnitude of the oscillating stress (a function of the airframe - particularly critical on a pusher) is what effects the fatigue life of a metal prop. The only way we get away with not doing these tests on the Long-EZ and Defiant is because the fatigue characteristics of wood are more forgiving. We have installed metal props on a pusher for the first time - the prototype Defiant will be tested this month with Hartzels. We are warned by Hartzel to not fly more than 20 hours before Hartzel does the stress survey. It is possible that the survey will show high stresses and that a different design blade will be required, so we do not know when (or if) anything but the original wood props would be approved.

CAUTION

VariEzes with old style Rosenhaan wheels, brakes and axles. At least two VariEze flyers have discovered cracked axles. These cracks have occurred in the small radius between the flange and the axles. In one case the crack extended around the axle for over 80° and would almost certainly have failed during the next take off or landing. This is difficult to check for, both wheels must be removed and the flange of the axle should be cleaned and carefully examined for any evidence of a crack. The only remedy is to replace the axles. If you plan on using this design axle for the foreseeable future, we would anticipate that you will need a 4130N steel replacement or at least a 2024T3 aluminum axle with a generous radius (1 1/8" to 1/4") at the flange.

CAUTION

All Lycoming Engines. When checking or cleaning the oil screen, it is critical that the gasket between the oil pressure screen housing and the engine accessory case is oriented correctly. If you should inadvertently install it backwards, you could burst your oil cooler or starve the main and rod bearings of high pressure oil.

Tony Gittes of Guayaquil, Ecuador experienced this problem and went through a lot of time and money trying to figure out what the problem was. Don't let it happen. Pay close attention when you check the screen as to which way the housing and gasket was oriented when you remove it and replace it the same way.

BRAKE LINES

The Nylafloy nylon brake lines which are used on all of the EZs have been generally extremely reliable and on all five of the airplanes here at RAF have performed flawlessly, some of them for more than 10 years. On one occasion we did replace the brake line on the left gear leg of Long-EZ N79RA due to a small blister or bubble that appeared in the nylon line directly opposite the brake disc. At the time we had no insulation on the nylon lines and the heat from the disc heated and softened the nylon line, so that as the brakes were used the pressure blew a small balloon in the line! We replaced the line and insulated them with fiberfrax and silicone and have not experienced any problems. Recently however, we have received two reports of problems with the nylon brake line even though they were insulated. In one case the nylon line blew a balloon and burst causing a loss of brake and a major leak of brake fluid and in the other case, the nylon apparently hardened right at the brass fitting, as though heat was conducted through the fitting into the nylon causing brittleness which due to vibration, broke within 1/4 to 3/8 of the brass elbow.

These are our observations. First of all, the nylon tubing is an excellent, flexible hose, easily capable of handling the pressures required when new and fresh. Sun light is very hard on nylon, the ultraviolet will make it hard and brittle and it then may crack. So keep it out of the sun. When you receive it from the distributor, store it in a black plastic garbage bag until you install it. After it is installed, protect

it from sunlight with black electrical tape or something similar. Once you have wheel pants on then the problem goes away.

Protect it from heat. Radiated heat as well as conducted heat can soften the nylon, and also over a long period of time, can cause it to become brittle. Insulate the nylon tube. We wrap it with fiberfrax and glue the fiberfrax on with silicone. Covering the fiberfrax with a reflective aluminum foil such as Reynolds wrap is an excellent idea.

Route the nylon brake line so that it can not "see" the hot disc. Bring it down the trailing edge of the gear leg then around the inboard face of the gear leg into the brass elbow. Do not run the nylon brake line between the gear leg and the disc, this will definitely cause problems. Also it makes it very difficult to change the brake linings!

Last of all, perhaps it is a good idea to install the nylon brake line onto the trailing edge of the gear inside a piece of plastic line, such as hardware store type vinyl tubing or even soda straws stacked together. This allows for easy replacement of the brake line. This is an option not a mandatory change. We have never done this here at RAF, and when we did have to replace a brake line, we found it to be a simple job, but it did mess up the paint job on the gear leg.

VARIVIGGEN NEWS

Wayne Wilkins of Erie Pennsylvania, reports that he has just about flown off his hours and will be flying to Oshkosh. He would like to invite any Vigen flyers from east of where he is located, to fly into his place on July 28th, where he will hangar your Vigen and then you could join him for a flight to Oshkosh on Monday 29th July. Contact Wayne if you can make it. All Vigen builders and flyers are invited to an evening rap session at one of the University lounges in the dorms on Tuesday 30th July. Contact Wayne at 17 Lakeview Ave, Fairview, PA 16415, 814-474-5412.

Len "Dobbie" Dobson reports that he will once again be flying his Vigen to Oshkosh from Georgetown Texas.

Ken Brock Mfg. has asked us to ask all Vigen builders to let him know their parts requirements. The one part in particular is the MG-4 main gear beam. If you will be needing a pair of these parts, or any prefab metal Vigen parts, please let Ken Brock know as soon as possible. This will be the last run of Vigen metal parts - don't miss the boat. See you all at Oshkosh.

Shopping Items from RAF

	States	Overseas
Large (2" wide and small (1" wide) Belt Buckles. These are made from laminated German silver with a brush finish. (Available for VariEze and Long-EZ)	25.00	27.00
VHS or Beta II Video Tapes		
Part I - Composite Construction - runs 1:36.		
Part II - Go-A-Long-EZ. Covers weight and balance, CG, taxi tests and first flight. Some VariEze and Defiant flying - runs 1:05	59.95 ea	59.95
***** On the tapes, please add the following for postage	or 99.95 set	99.95
	4.00	12.00
EZ Tie Tacs - gold and silver.	6.50	7.50
3 ship poster - 17 x 22 - Defiant, VariEze and VariVigen.	3.75	5.00
2 Long-EZs in trail formation - 11 x 17	3.00	4.25
Defiant - 11 x 17	6.50	8.00
8 x 10 Color Print*	1.25	2.00
Long-EZ Lithograph	10.00	13.00
Rutan Canard Patch - 3" x 4"	2.50	2.50
Rutan Aircraft Name Patch - 3" x 3/4"	1.50	1.50
Silhouette of Aircraft**	3.00	3.00
T-shirts.		
Blue "Laughter Silvered Wings" - (Mens & Womens)	8.00	10.00
White "I fly a nose dragger" - (Mens & Womens)	7.00	9.00
White Polo Shirt with Long-EZ or Defiant logo	14.00	15.00
Composite Homebuilt Aircraft Construction	14.50	16.50

* Available in Long-EZ, Defiant and Solitaire.

** Available in Vari-Eze, Long-EZ, Solitaire & Defiant.

Add state sales tax for California 6%

All prices quoted above are US. funds.

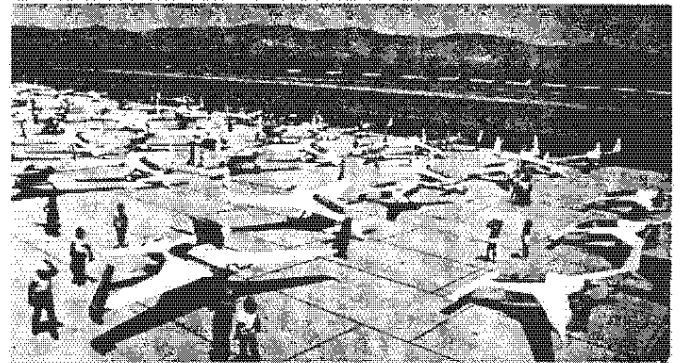
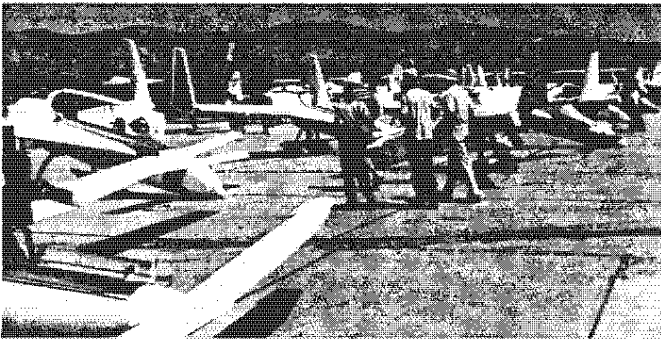
Rutan Aircraft Factory Inc.
Bldg 13, Airport,
Mojave,
CA 93501
805-824-2645



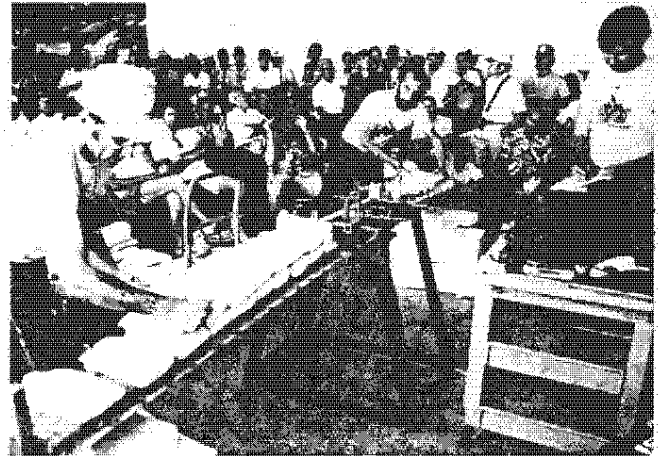
An aerial view of some of the more than 80 RAF types that flew into Mojave - RAF building is the small one on the right, Scaled Composites on the left.



Some very beautiful examples of EZs were parked on the ramp affording "would be" builders an unparalleled opportunity to look and talk to owner/builders. Photos by Doug Shane.



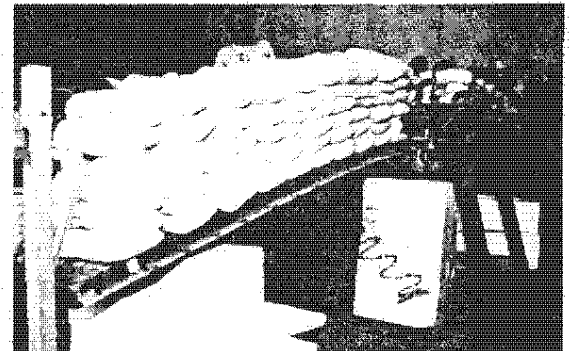
WOW! How about this? Don't ask! The owner/builder designed and built it himself and he is still testing.



About 3.7 g so far. Burt is standing by to make sure we place the bags correctly.



Right at 12 g. At this point there is 3000 lbs of lead shot on the canard - all suspended from the "little aluminum" lift tabs! Deflection at the tip is around 10" on each side - scary!





Don Downie shot this photo, which shows 73 EZs, a Grizzly, a Defiant, a Solitiare and a Gemini.



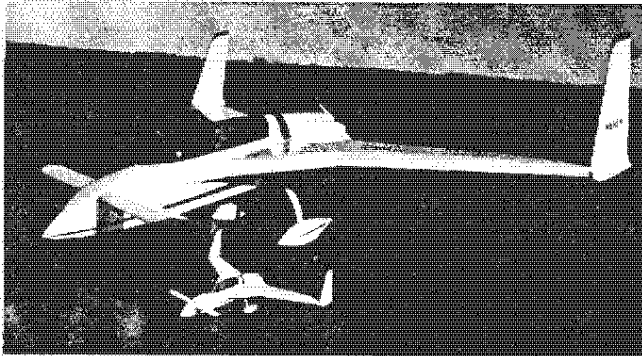
Jeff and Dave Rodrian, two of the reasons their Dad is building a Defiant, inspecting the bottom skin of their canard.



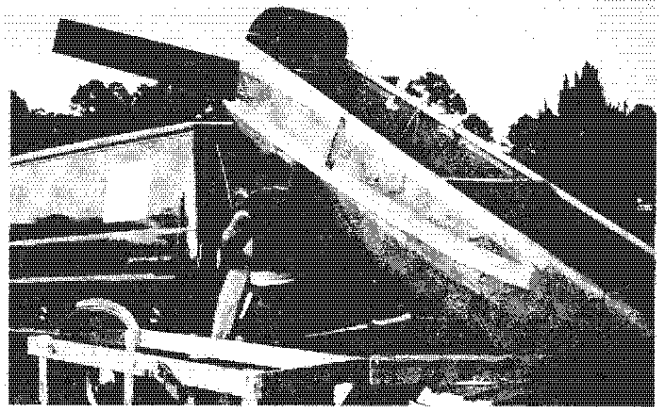
Chris de Brichambant of Ramonville, France (holding under left canard) with his team of young people (average age 23 years) who built this beautiful Long-EZ. This airplane will fly from France, over Spain and West Africa, across the Atlantic to South America and then to Miami, Florida with a possible stop at Oshkosh during the convention. Good Luck Chris.



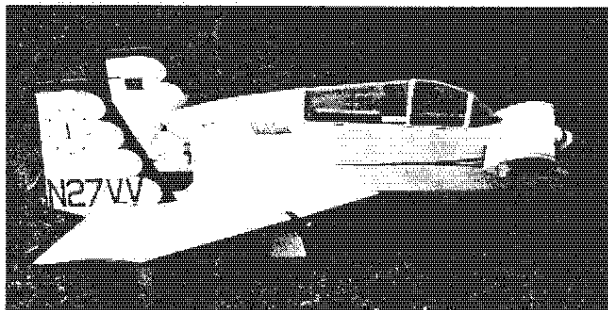
Dr. George Best's Defiant is making good progress - this shot shows the nose gear and nose gear well - fuselage is inverted.



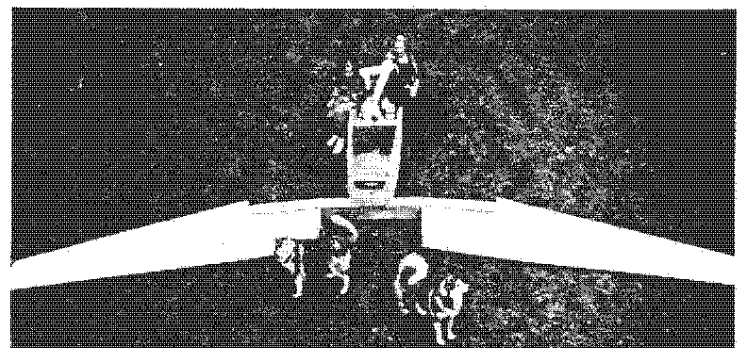
Beau Wold's outstanding Long-EZ in formation with his St. Croix model Long-EZ - neat!



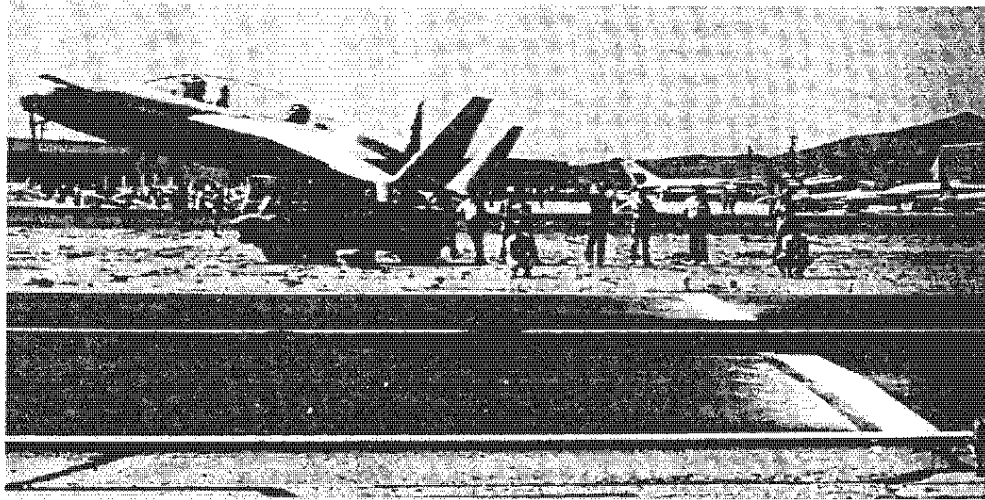
Mike Cardinale, Defiant builder, installing his main gear for the first time.



This incredibly accurate R/C model of Burt's prototype VariViggen was built by Gene de Kook, Canadaigua, NY.



Roland Othün-Girard, Sevres, France, with four helpers, getting an idea of what their Long-EZ will look like.



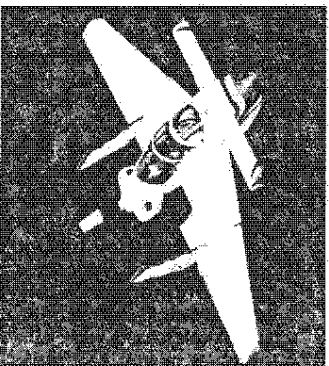
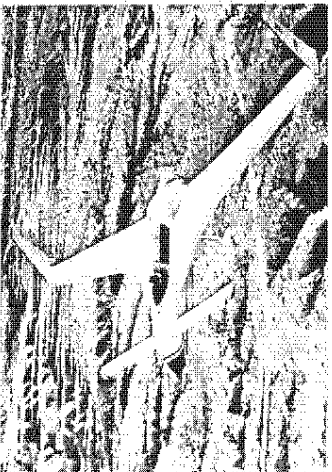
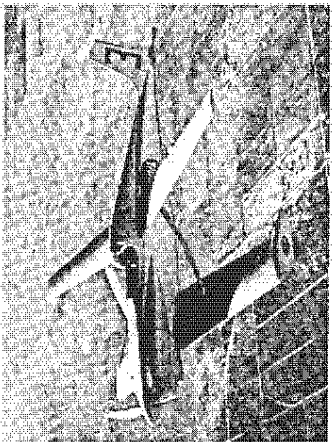
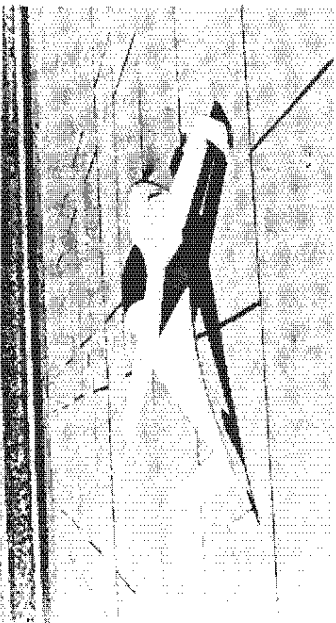
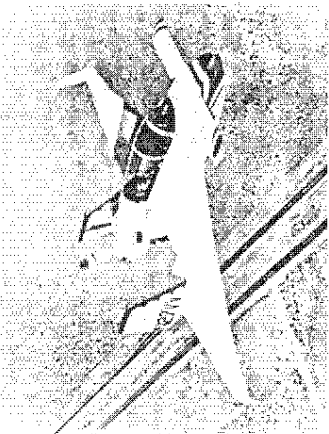
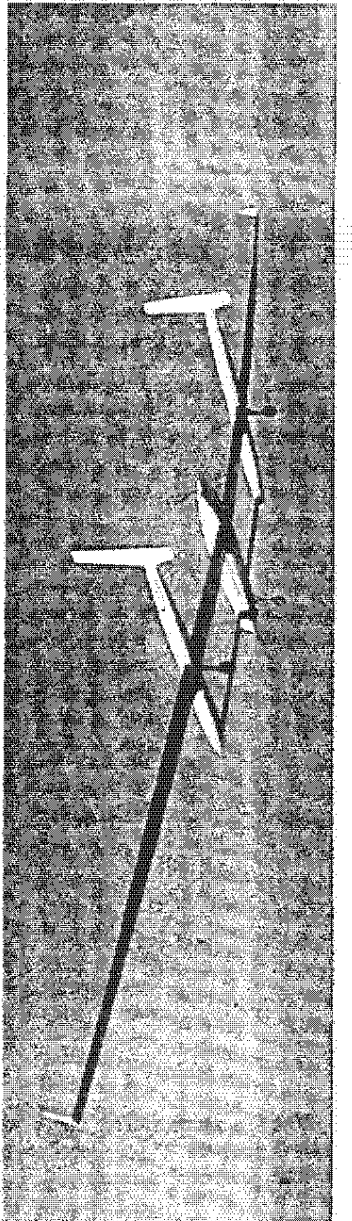
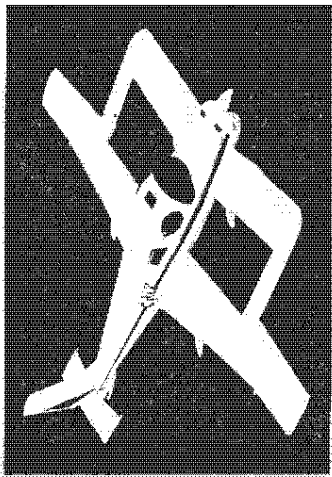
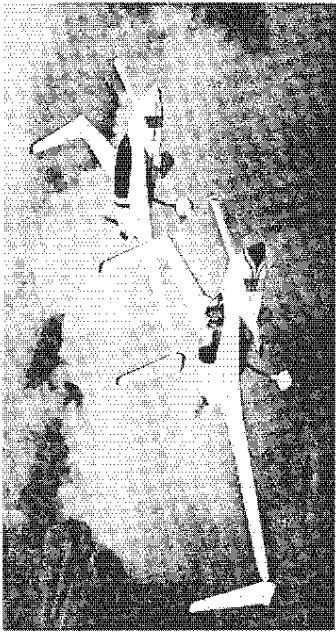
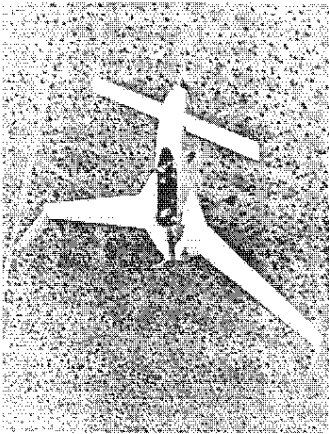
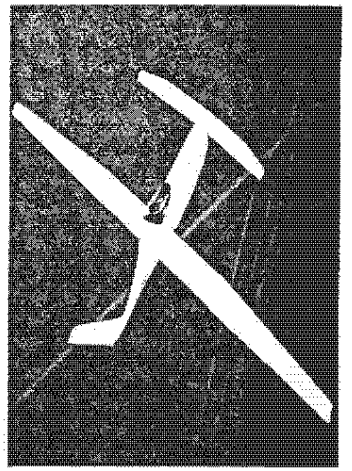
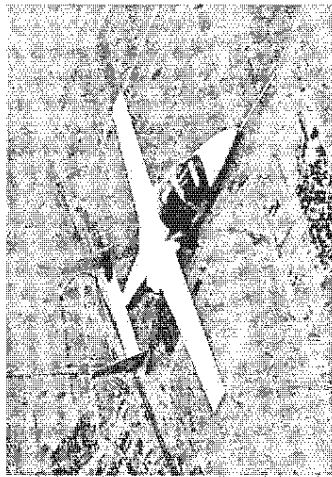
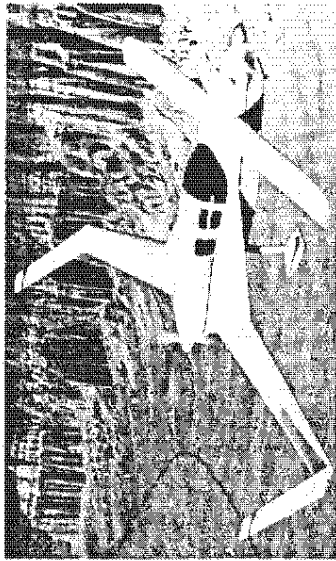
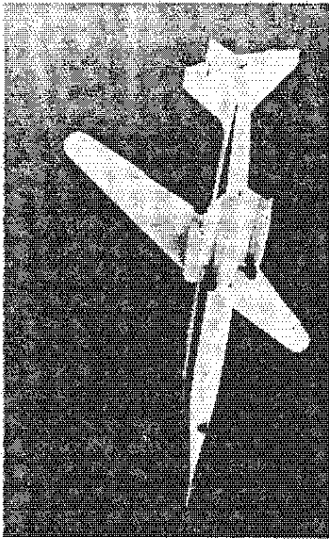
Going for the white line in the spot landing contest!



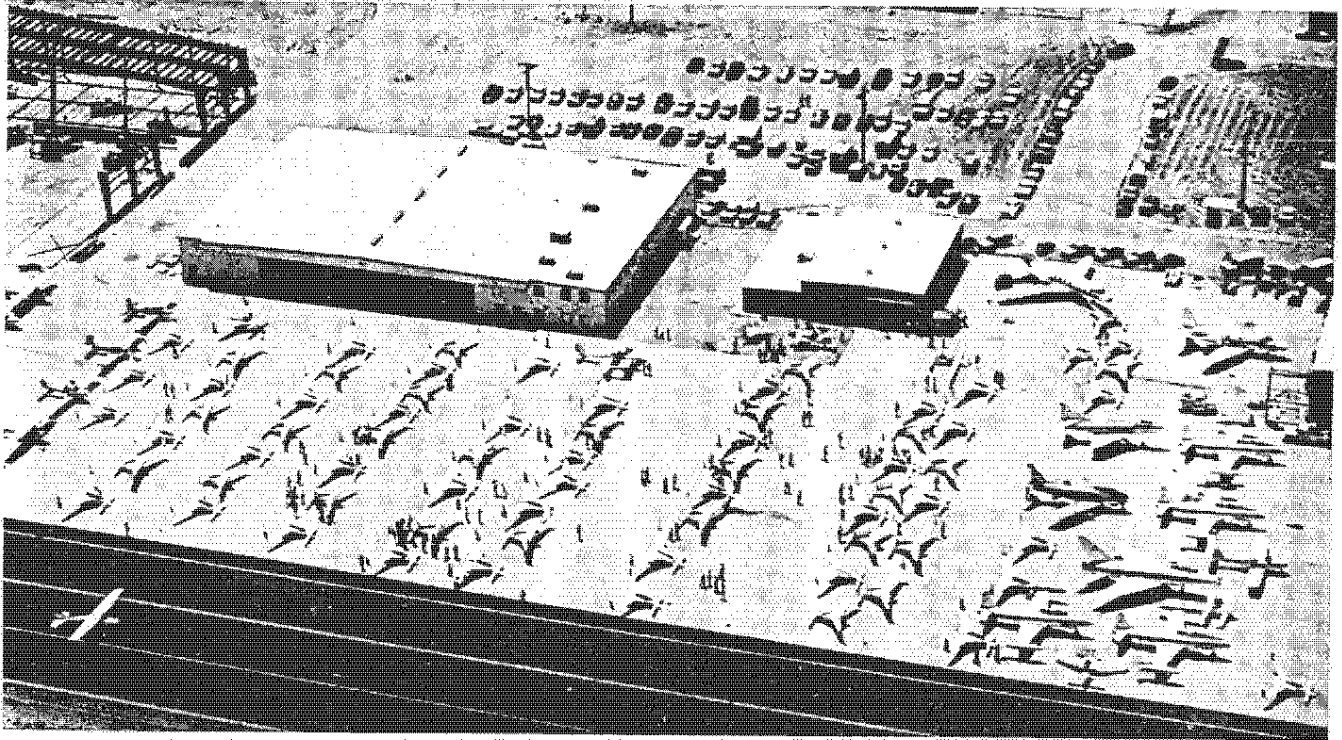
Careful now! Going for about 13 'g'. This rejected homebuilt canard failed at 13.8 'g'.



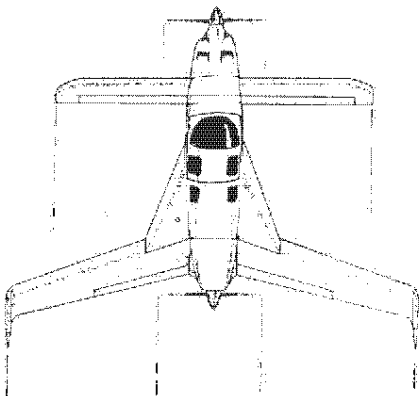
Pat Krause is the "Glorious Pilot" and Lou Faix is the "Lowly Mechanic" in this Long-EZ team - a sign of the times?



Some of the 83 EZs that flew in to the RAF flyin at Mojave on June 8th, 1985 - Photo by Don Downie.



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



TO:

first class mail

July '85

The line which appears above your name lets you know through which Canard Pusher you are paid. If your label says **LAST ISSUE CP 45**, then this is your last issue, and you need to renew.

CP 45