THE CANARD PUSHER

No. 33 July 1982

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If you are building a VariViggen from 1st Edition plans you must have newsletter 1 through 33. If you are building from 2nd Edition plans you must have newsletters 18 through 33. If you are building a VariEze from 1st Edition plans you must have newsletters from 10 to 33. If you are building a VariEze from 2nd Edition plans you must have newsletters from 16 through 33. If you are building a Long-EZ you must have newsletters from 24 through 33.

A current subscription for future issues is mandatory for builders, as this 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 4:00 on Saturday. Closed 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.

Please note that RAF is closed during the year on the following holidays:

New Year's Day	January 1.	
Memorial Day	May 30	3 day weekend.
Independence Day	July 4.	3 day weekend.
Labor Day	Sept 6	3 day weekend.
Thanksgiving	Nov. 25	
Christmas Day	Dec 25	3 day weekend.

RAF will be open during Oshkosh. On the 1st and 7th of August we will run the videos and the prototype will be here. There will be no flying. Builders please note that there will be no one to answer builder questions during that two weeks.

RAF ACTIVITY

Since the last newsletter has involved flight testing of our new Solitaire self launching sailplane, development of aero tow capability with the Grizzly, competing in the 1982 Cafe (Competion in Aircraft Fuel Efficiency) race, homebuilder support, various technical lectures and presentations and several aerodynamic and structural consulting jobs.

OSHKOSH 1982

The world's largest airshow and convention, the EAA flyin at Oshkosh Wisconsin, July 31 through August 9th, should prove to be an interesting one this year as several new RAF-designed aircraft plan to make their debut: the new Solitaire sailplane, the STOL Grizzly, the Amsoil Biplane Racer, and the NASA skew wing AD-1. Demonstrations are planned by the Solitaire being towed by the Grizzly as well as Long-EZ flight demonstrations. In addition, Long-EZ's and VariEze's are expected to race in the LBF Oshkosh 500 race. The arrival of the NASA skew wing AD-1 is significant in that although the aircraft was completed in 1979, Oshkosh 1982 represents the first public showing of the AD-1 and flight demonstrations are planned. Old time readers of the Canard Pusher will recall that the AD-1 began as an unsolicited proposal by RAF to NASA in late 1975. The aircraft was designed by RAF in 1976- 1977 and built by Ames Industrial Corp. in 1978/1979. RAF had hoped to also unveil the small twin engine jet trainer demonstrator, the Fairchild NGT. However, since source selection for the Air Force trainer competion has not yet been made, the NGT will remain at RAF awaiting the possibility of additional flight testing.
FLASH - As we are going to print it has been announed that Fairchild Republic has won the Air Force trainer competition!

Discussion and technical presentations by RAF at this years Oshkosh event are listed below.

Date	Time	Place	Subject
Aug 1. Sun	3:00pm	Tent #2	Long-EZ
Aug 3. Tues	3:00pm	Tent #2	Solitaire
Aug 4 Wed	3:00pm	Tent #2	Grizzly
Aug 5 Thurs	10:30am	Tent #1	Aerodyanmic Features of the Tandem Wing.

SOLITAIRE COMPLETES SELF-LAUNCHING AND AERO TOW FLIGHT TESTS.

The new Solitaire has exceeded its design goals on performance and has proven to have flying qualities that represent a significant improvement over currently-available sailplanes. The Solitaire is the first high-performance sailplane that exhibits true stall-proof flying qualities, allowing slow thermalling flight and return to airport after rope break without the high risk of stall or departure. The visibility is excellent with the canard providing pitch and roll attitude reference. The wing "spoilflaps" have proved to be very effective for flight path control and result in a very minor pitch trim change. The directional stability and tow qualities are excellent and do not result in the tricky aero tow characteristics normally found on the very small conventional sailplanes.

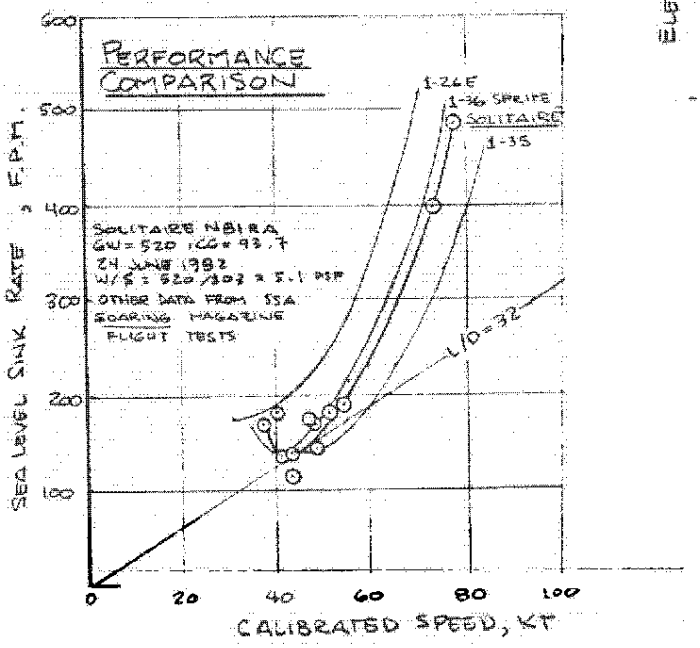
As shown by the accompaning graph, the static pitch stability of the aircraft is quite high, resulting in a relatively large elevator travel with speed and a minimum trimmed "full aft stick" speed of 34 knots. During powered flight the thrust trim change due to the high mounted propeller is minor due to the 4 degree propeller thrust angle. Initial testing indicated an apparent over-sensitivity during flight in turbulence and during tow plane wake transitions. This was traced to a combination of incorrect gearing in the pitch control system and excessive control system friction. Improvement of those items has resulted in satisfactory longitudinal flying qualities. Continuous flight in tow plane wake is possible without overcontrol tendencies. The initial configuration proved to have inadequate roll rate to allow rapid thermal side step manuveuring. The roll rate was similar to the larger open-class sailplanes. By the time you read this newsletter, the roll rate should have been improved by a modification to the ailerons increasing their span, deflection and chord. Directional stability and control is excellent as is the nose gear steering of the bicycle-wheel configuration. Unlike most sailplanes the Solitaire can be taxiied or towed to the active runway without ground handling requirements.

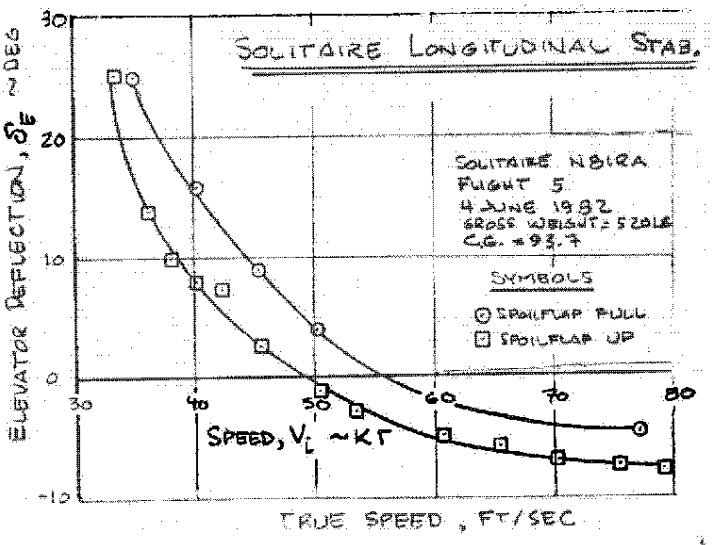
The accompanying figures show the measured soaring performance of the Solitaire, conducted in still air by timing descents through 300 to 500 foot altitude bands. As shown in the comparison, the Solitaire performance lies between the 1-36 and the 15 meter 1-35 sailplanes. This is exceptional performance for its 12.5 m wing span. The minimum sink rate at sea level of 135 fpm should allow thermalling capability even in the relatively weak Midwest soaring conditions.

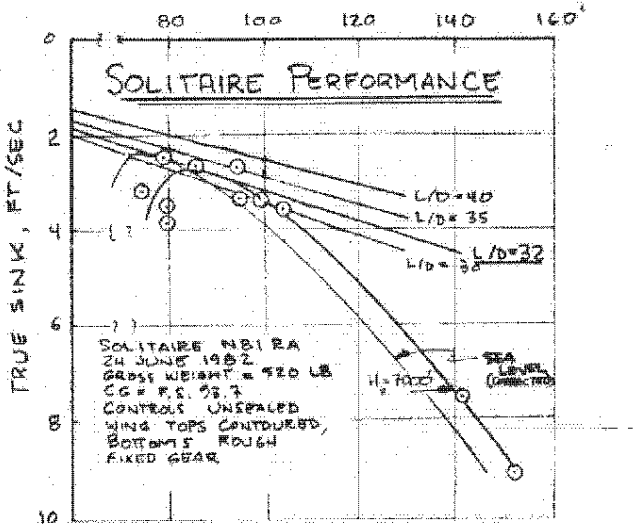
The development of the motorized self-launch capability is being conducted using two general power concepts. After evaluation of both has been done, one will be selected for the plans configuration. The first involves a fixed, single cylinder, two cycle, seventeen horsepower engine with carburetor and exhaust system mounted in the forward fuselage. A row of three V belts connects the engine to a retractable boom which houses the top bearing pulley, flange, and 42 inch propeller. This is the configuration that was used for the initial flight tests. Following those tests the aero tow development was conducted. The aircraft was initially towed with a Super Cub and then the Grizzly. Aero tows

have been satisfactorily conducted in strong gusty winds to 30 knots and crosswinds as high as 15 knots.
The second propulsion concept considered involves a light weight (18 lbs), two cylinder, two cycle engine with a direct-drive propeller that is retracted on a boom. The engine, carburetor, exhaust system and propeller installation in its entirety is extended from the fuselage for self-launch. This system is undergoing ground testing and should be flying soon.

We at RAF are looking forward to our entry in the Soaring Society of America's homebuilt sailplane competition to be held September 4-6 at Fantasy Haven Airport in Tehachapi, California. The goal of the competition is to promote soaring by the availability of a low-cost homebuilt sailplane.







EZ's SWEEP THE CAFE FUEL EFFICIENCY 1982 COMPETITION!

The prestigious Competition in Aircraft Fuel Efficiency race held this year at Santa Rosa, California, served as a dramatic demonstration of high efficiency and utility of the RAF homebuilts. As shown in the adjacent tables and charts the EZ's swept the first four places in the two-seat experimental category. Dick's Long-EZ, carrying three people (a total of 600 lb payload) placed first, above all other experimental aircraft. The RAF Defiant, carrying an impressive 1200 lbs payload (six people) placed second in the Experimental category. Mooney's noted designer Roy LoPresti flying a Mooney 201 with (five seats occupied), won the production single category and edged out the Long-EZ's Cafe score by approximately 3%. Overall placings are shown in the adjacent table.

The impressive lineup of over 50 airplanes ranged from single seat Quickies to the high performance Piper Aerostar. The planned 400 mile race course was shortened due to a thunderstorm at the third turn point which was the top of 10,560 ft Mount Lassen. We would have expected the EZ's to score even higher had the Mount Lassen turn point been included due to the excellent high altitude efficiency of the EZ's.
The race was accident-free, the only incident being a tailwheel failure of a Q2 on landing and a Q2 which experienced engine failure on initial climb but landed safely.

The officials , headed by Dr. Brien Seeley, should be commended for the thorough and professional way in which the competition was run. The enormous job of handling the weighing, impounding, timing, and payload determination of that large a group of dissimilar aircraft is no minor task. The weighings this year were accurately measured and averaged by sophisticated equipment. Thus, the suspected inaccuracies of last year that may have disorted some of the results (particularly on the lighter aircraft) probably did not occur. The CAFE score this year was computed as CAFE = MPG x MPH X payload. Last year's equation was CAFE = MPG X MPH x $\sqrt{\text{payload}}$. We calculated scores using last year's formula and this year's data to assess the results that would have occured if the 1981 formula had been used. The adjacent table shows that the result would have been Gary Hertzler's VariEze placing first overall, with this year's winner (the Mooney) placing sixth.

In order to visualize the relative efficiency, a graph of miles-per-gallon versus miles-per-hour is shown for the two and three place experimentals. Note that the Long-EZ's performance was close to the handbook data for continuous cruise (at the 3000 ft average race altitude) even though the CAFE course required extra fuel and time for takeoff, climb and winds aloft. The two-seat experimental winner, Gary Hertzler, flew an A-80 Continental powered VariEze. He prepared for the race by gathering extensive fuel flow data and conducting a technical computer analysis to optimize his speed and climb/descent strategy. Gary capped off a successful race weekend with a spectacular non-stop flight back to his home in Phoenix.

In developing a formula to assess aircraft efficiency, the question always arises of how much importance to place on speed. The CAFE 1981 and 1982 formulae place equal importance on miles-per-gallon and miles-per-hour by multipling their values together. A solution to the question of speed's degree of importance has been proposed by Don Crawford and, as a result, "Honorable Mention" prizes were awarded this year based on his analyses. The winners were determined by constructing "first echelon" and "second echelon" surveys of efficiency, in which equal award is given to the best

slower (but high mpg)aircraft and the best faster (but lower mpg) aircraft. The first echelon represents a group of first place winners and the second echelon represents a group of second place winners. The Crawford "first echelon" went to the VariEze, Mooney 201, Defiant and Bonanza. The "second echelon" prizes went to the Long-EZ, Twin Comanche and Glasair.

In general, twin-engine aircraft are less efficient than single engine aircraft, thus the CAFE prizes are separated to group the twin-engine aircraft together and allow them to compete against each other. Their places and scores are shown in the adjacent table. It is interesting to note that even though the RAF Defiant is a twin engine aircraft it was surpassed only by the Mooney 201 and Long-EZ in the overall CAFE scores.

Each year as we participate in the CAFE efficiency contest we learn new and better ways to improve aircraft performance. This year Peter Garrison, the Flying magazine writer who entered his long-range Melmoth, had prepared a complete computer program to analyze the entire race course and to assess the effects of different climb and descent stategies. We expect the refinements done for this prestigious competition may result in the improvement of general aviation efficiencies. We would not be surprised if someone was able to score in excess of 3 million during the next CAFE competition.

CAFE 400 - 1982

EXPERIMENTAL CATEGORY : TWO SEATS.

#	Score	Aircraft Type	Pilot	Payload /Seats	Speed	MPG
1	2217637	VariEze	Hertzler	400/2	137.6	40.29
2	2124503	VariEze	Lombard	400/2	154.4	32.77
3	1919920	VariEze	Clark	368/2	167.2	31.24
4	1919121	Long-EZ	Melvill	400/2	161.4	29.73
5	1651272	Q-2 Revmaster	Keller	393/2	134.8	31.17
6	1511226	Glasair	Hamilton	400/2	185.8	20.36
7	1472959	RV-4	Van Grunsven	400/2	175.6	20.96
8	1445499	Q-2 Rotorway	Komko	391/2	128.6	28.76
9	1097003	Mustang II	Beadle	331/2	163.5	20.28

EXPERIMENTAL CATEGORY: THREE OR MORE SEATS.

#	Score	Aircraft Type	Pilot	Payload /Seats	Speed	MPG
1	2680991	Long-EZ	Rutan	600/3	160.9	27.77
2	2510034	Rutan Defiant	Rutan	1200/6	176.9	11.82
3	2002316	Melmoth	Garrison	600/3	178.8	18.67
4	1269350	Turbo BD4	Phillips	557/4	150.4	15.16

ALL EXPERIMENTALS.

#	Score	Aircraft Type	Pilot	Payload /Seats	Speed	MPG.
1	2680991	Long-EZ	Rutan	600/3	160.9	27.77
2	2510034	Rutan Defiant	Rutan	1200/6	176.9	11.82
3	2217637	VariEze	Hertzler	400/2	137.6	40.29
4	2024503	VariEze	Lombard	400/2	154.4	32.77
5	2002316	Melmoth	Garrison	600/3	178.8	18.67
6	1919920	VariEze	Clark	368/2	167.2	31.24
7	1919121	Long-EZ	Melvill	400/2	161.4	29.73
8	1651272	Q-2 Revmaster	Keller	393/2	134.8	31.17
9	1511226	Glasair	Hamilton	400/2	185.8	20.36
10	1472959	RV-4	Van Grunsven	400/2	175.6	20.96
11	1445499	Q-2 Rotorway	Komko	391/2	128.6	28.76
12	1269350	Turbo BD-4	Phillips	557/4	150.4	15.16
13	1124428	Quickie	Hartman	156/1	110.1	65.40
14	1097003	Mustang II	Beadle	331/2	163.5	20.28
15	1013427	Quickie	Turner	187/1	106.1	51.17
16	767300	RV-3	Richter	200/1	173.4	22.13

OVERAL CAFE 400 PLACINGS USING THE 1981 CAFE 250 EQUATION

#	Aircraft	Pilot	#	Aircraft	Pilot
1	VariEze	Hertzler	11	Mooney 231	Minor
2	Long-EZ	Rutan	12	Quickie	Turner
3	VariEze	Lombard	13	RV-4	Van Grunsven
4	VariEze	Clark	14	Debonair	Reese
5	Long-EZ	Melvill	15	Bonanza	Smith
6	Mooney 201	LoPresti	16	Q-2	Komko
7	Quickie	Hartman	17	Defiant	Rutan
8	Q-2	Keller	18	Mooney 231	Jewett
9	Melmoth	Garrison	19	Twin Comanche	Bradshaw
10	Glasair	Hamilton	20	Bonanza	Smith
			21	Mustang II	Beadle

CAFE 400 1982 OVERALL SCORES.

#	Score	Aircraft Type	Pilot	Payload /Seats	Speed	MPG
1	2768919	Mooney 201	LoPresti	851/5	164.2	19.82
2	2680991	Long-EZ	Rutan	600/3	160.9	27.77
3	2510034	Rutan Defiant	Rutan	1200/6	176.9	11.82
4	2477223	Bonanza A-36	Smith	1141/6	154.8	14.02
5	2217637	VariEze	Hertzler	400/2	137.6	40.29
6	2083655	Mooney 231	Minor	767/4	144.0	18.85
7	2052560	Beech Debonair	Reese	780/4	180.0	14.62
8	2024503	VariEze	Lombard	400/2	154.4	32.77
9	2018940	Twin Comanche	Bradshaw	936/5	181.6	11.88
10	2002316	Melmoth	Garrison	600/3	178.8	18.67
11	1968341	Piper Lance	Munir	1156/6	156.5	10.88
12	1919920	VariEze	Clark	368/2	167.2	31.24
13	1919121	Long-EZ	Melvill	400/2	161.4	29.73
14	1903088	Cessna 210	Hodges	1038/6	164.9	11.11
15	1842252	Cessna 310L	Kelter	1200/6	178.8	8.59
16	1780363	Piper Seneca	Parker	1196/7	172.8	8.61
17	1715613	Mooney 231	Jewett	668/4	151.4	16.95
18	1651272	Q-2 Revmaster	Keller	393/2	134.8	31.17
19	1559834	Bonanza V-35	Smith	665/6	206.7	11.34
20	1511226	Glasair	Hamilton	400/2	185.8	20.36
21	1472959	RV-4	Van Grunsven	400/2	175.6	20.96
22	1445499	Q-2 Rotorway	Komko	391/2	128.6	28.76
23	1429283	Cessna 182	Parmer	762/4	131.2	14.31
24	1418156	Piper Aerostar	Ballantyne	1064/6	185.6	7.19
25	1410479	Piper Archer	Powell	766/4	133.4	13.81
26	1394377	Partenavia P1	Slovak	975/6	157.7	9.07
27	1373327	Piper Aztec	Spongberg	1160/6	160.5	7.38
28	1365373	Comanche 180	Stuart	701/4	134.6	14.48
29	1366436	Cessna 310R	Reames	1000/5	151.8	8.93
30	1297926	Cessna 177-B	Hunt	677/4	133.5	14.35
31	1275115	Cessna 182RG	Peckham	800/4	156.3	10.20
32	1269350	Turbo BD-4	Phillips	557/4	150.4	15.16
33	1258616	Bonanza M-35	Thomas	601/4	167.9	12.49
34	1183163	Meyers 200D	Hallstrom	508/4	172.4	13.51
35	1171016	Rockwell 112	Workman	577/4	133.7	15.18
36	1165102	Cessna 177 Card.	Vlakancic	704/4	135.0	12.25
37	1124428	Quickie	Hartman	156/1	110.1	65.40
38	1097003	Mustang II	Beadle	331/2	163.5	20.28
39	1013427	Quickie	Turner	187/1	106.1	51.17
40	931356	Piper PA-20	Githens	624/4	110.8	13.47
41	870728	Bellanca 1419-2	Guymon	562/4	141.3	10.97
42	865417	Mooney 231	Morgan	521/4	154.5	10.75
43	862691	Apache	Von Waldegg	681/4	130.3	9.72
44	850964	Avcon Cessna	Newkirk	557/4	103.0	14.83
45	767300	RV-3	Richter	200/1	173.4	22.13
46	697400	Piper PA Pacer	Huffman	548/4	102.3	12.45
47	596625	Luscombe BE	Mathews	322/2	93.9	19.73

WATSONVILLE 1982

Sally and I flew N26MS into the Watsonville Flyin on Saturday May 30. The coast was socked in with typical low clouds, but we found a hole south of Salinas, and were pleasantly surprised to find ourselves alone in the pattern. Previous years, the Watsonville pattern has been much like Oshkosh first day. There were a lot of airplanes already parked on the flight line. After parking with the VariEzes, we counted 23 VariEzes and 2 Long-EZs on the line. We then nearly ate ourselves silly with giant sized strawberries and artichoke hearts while watching a super airshow. a real Jenny doing loops, spins, etc. was unforgettable. Unfortunately,we had to be back that evening so we had to leave right after the airshow. We had a good tailwind and got back to our home base of Tehachapi (exactly 200 nm or 230 sm) in one hour flat!

Ams/Oil Rutan Racer

Dan Mortensen of Duluth recently broke the world speed record in the C-1-B Class for the National Aeronautics Association 3 kilometer course. He flew the Ams/Oil Rutan, a racing biplane owned by Ams/Oil . Mortensen recorded an average speed of 234.62 mph, breaking the old record of 227.24 mph set 16 years ago. At the 1982 Sun 'N Fun EAA flyin in Lakeland, Florida, the Ams/Oil Racer won prominence of its own by being named the "Best Original Design".

Neal Johnson, Long-EZ builder #986, has worked up an excellent plans change/builder hint summary, itemized in Chapter order. It is well presented and covers CP #24 through CP 32. Neal plans to update this summary as required. This should prove to be a very handy aid to anyone building the Long-EZ.
Contact: Neal Johnson, P.O.Box 51, Monroe, LA 71201
Price is $7.50 to cover cost and postage.

VARIEZE HOSPITALITY FLYIN

Taos, New Mexico. What can you say about such a magnificent place?? Twenty two VariEze's, two Long-EZ's and one VariViggen flew in to Toas, New Mexico on July 2 and 3rd, with a total of 56 people. The weather was beautiful, cooler than usual. Charles and Joan Richey did a super job of organizing food, river trips, hiking and making everyone feel relaxed. By noon Saturday the whole crew had arrived and the "stories" started over lunch at the airport. How about one body being overheard on the radio asking "how do I run this gizmo, which button do I push now?", also a group, which shall remain nameless, getting lost and making a detour into Colorado!!! Up to the Condos to relax those tired flying muscles in the jaccuzi with beer, wine or Koolaid. The Condos are at 9,300' amongst the most beautiful pine and aspen trees with a stream running right by the front door. Steaks cooked on the barbeque came next, and more tall tales.

On Sunday, some folks slept in, others went on the river trip, some into town. Charlie, the gentleman who runs the condos, took the rest of us up the mountain to 11,500' in his four wheeler. You go up 2,200 feet in two and a half miles. We walked up to 12,000' to the most spectuacular view ever, with wild flowers everywhere. We then braved it and walked down the mountain. More jaccuzi and supper in town. Monday morning saw everyone leaving and really wanting to stay. Thank you Charles and Joan Richey for making possible such a super weekend.

The following people drove or flew in:

Bruce and Bonnie Tifft	CA	115EZ	VE
Gary Hertzler	AZ	99VE	VE
John and Mary Jackson	MS	2 VE	VE
Steve and JoAnne Sorenson	CA	118ST	VE
Dave and Marlene Werner	CO	8037T	VE
Mary Ann and Les Faus	CA	14533	VE
Mike and Pam Guthrie	CO	249MG	VE
Earl and Barbsts Wilson	CA	999EB	VE
Mike DeHate	CA	322EZ	VE
Tom and Joan Nussbaum	TX	81TN	VE
Bob and Joan Hansen	CA	7LZ	LE
Joan and Charles Richey	NM	13EZ	VE
Shirl and Diane Dickey	UT	60SD	VE
Joe Lawyer	AZ	9039J	VE
Jo Alexander & Sheryl Summer	NM	257 B	VE
Bill and Julie Lermer	CA	51820	VE
Ken Forrest	CA	84ST	VE
Roman & John Wasilewski	CA	24RW	VE
Bruce and Mary Muirhead	CO	?	VE
Bill Rutan & Micki Lanerty	UT	?	VE
Mike Melvill	CA	27MS	VV
Sally and Keith Melvill	CA	26MS	LE
Ken and Nancy Swain	CA	4ZZ	VE
Bruce and Sharon Tuttle	UT	?	VE
Will Thorn	MA	Cessna 310	
Norm Sanford	CO	Cessna 182	
Harry and Kathy Bawcom	AZ	Cessna 152	
Ken and Mary Strong	CO	Cessna 182	
Bill and Marilyn Schnieder	CO	drove	
Ken Roebuck	NM	drove	
Dave and Beverly Nelson	UT	drove	
Jim and Jamie Morewood	UT	drove	

Michael and I disagree on the number of VariEzes that are listed. He says that I have left someone off, but he is not sure who! Let me know if I have.

IVHC OSHKOSH BANQUET

Don't forget, this year the banquet will be held on Sunday, August 1st at 7:00 pm for cocktails and 8:00 pm for dinner. It will be held at Butch's Anchor Inn. Pay at the door. This banquet is open to anyone flying an EZ or members of the IVHC.

IVHC is hosting an "EZ" Flyin in conjuction with the Kerrville, Texas southwest regional flyin on September 17, 18, and 19th. They will have a banquet on Friday night and are expecting a large turnout. Last year 13 VariEzes flew in. This year why not fly in and hear some real Texas tall tales!

VariEze Help

William Rice is willing to show his VariEze and even give a back seat ride to any EZ builders in the northern California area. Bill has over 300 hours on N103B. Contact: Bill Rice, 1156 Ridgewood Drive, Eureka, CA 95501

A First Flight by Charlie Gray of Florida

"Here I am at 35,000 ft dead heading home from Boston to Miami on June 6th, 1982. Exactly 1 year 3 months after two kits arrived at my workshop, triple 5 Long-EZ made its first flight. I cannot describe the sensation, in word form, as I pulled back on the stick and was airborn for the first time. It's just terrific - there were no trim changes required, it just flew and flew great. After once around the pattern and a smooth landing I taxied back for a kiss from my wife and hand shake from friends, I took off again for the second flight, this time for about one hour.'

I was able to test low speed (59 mph) stall or nod and high speed of about 170 mph at 1500 ft, 87 degrees, 2850 rpm, for a true of about 177 mph. No spinner and pants. That's with 108 hp, O-235-C2 engine and 25 lbs in nose for center of first flight cg box. I even found some rain to fly through with no problem except small nose down pitch change. About 500 fpm, easy trim out.

It seems so inadequate to just say thanks - the superb plans, followed by CP newsletters and unbelievable builder support. The job being done by RAF is second to none in the home builder industry. It has been a joy to work on this project and I join with you all at RAF as a member of a very pround group of EZ flyers. We are looking forward to many happy hours of flying.

So Much Thanks,
Charlie Gray".

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 a next convenient maintenance interval or within XX flight hours whichever comes first.
DES	Desired - strongly recommended but not requiring grounding of the aircraft.
OPT	Optional - does not effect flight safety.
OBS	Obsoleted by a later change.
MEO	Minor error or omission.

LPC #102 MEO
Section 1, page 21-4, Step 6. Strike the 5th, 6th and 7th sentances. Substitute the following: "Glass the inside with one ply of BID. Flox in place holding with nails. (Section F-F)".
Page 21-4 Step 7. After "halfway down O.D.", Insert "lapping 1" onto the forward face of the centersection spar".

VariEze and
Long-EZ MEO
Owners Manual appendix three add "CAUTION friction in the pitch system can seriously degrade flying qualities" Also, add ditching procedure shown on next page.

EMERGENCY PROCEDURES.
Ditching in water.

Actual ditching has not been experienced to test the following proceedure. However, this should provide the best chance for success. Wear your life jacket for overwater flying. On descent, bend safety catch away but do not open canopy. Extend the nose gear. Touchdown should be planned at minimum speed, landing into the wind. Land on the back side of a swell, or parallel to the swells. The aircraft or major components of the airframe should float and support occupants and equipment due to the large amounts of structural closed cell foam.

CAUTION ! CONTROL SYSTEM FRICTION
The presence of friction in the pitch controls of an EZ will reuslt in serious degradation in flying qualities. Mike recently installed a different shape canard tip and when reinstalling the elevators one of the pivot bolts was adjusted to bind an elevator. Sally and Mike both flew the aircraft with friction and reported PIO tendencies and over-control difficulty. Adjusting out the bind immediately returned the excellent pitch control and smooth flying qualities.

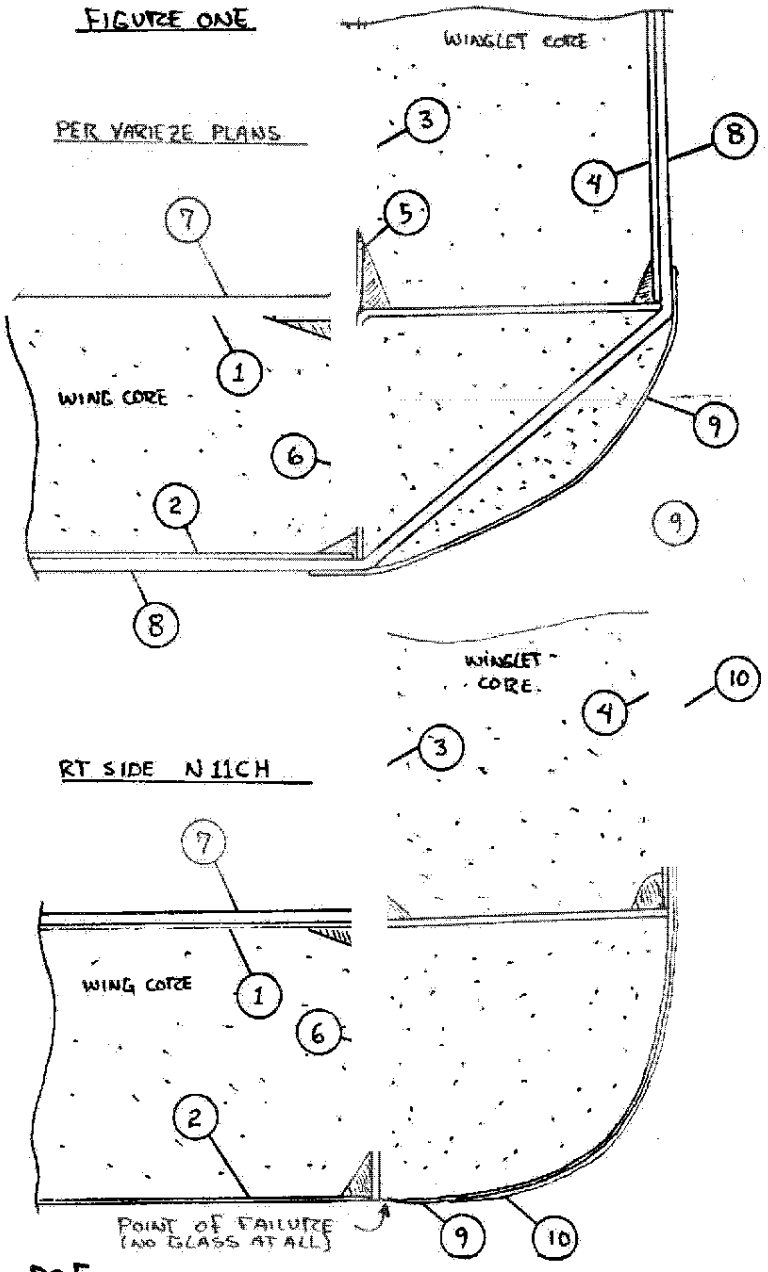
ACCIDENT - Inflight airframe failure.

The thought of an airplane coming apart in the air brings chills to most aviators and certainly to aircraft designers. Despite many horror stories related to severe weather, drastic overspeed in dives, and even airframe flutter (unbalanced elevators), we had yet to hear of an inflight failure of a Rutan design - until June 21st when the caller described a winglet ripping off a VariEze at 200 + mph during an airport buzz job. Within two hours Mike Melvill and Dick Rutan were airborne in the Defiant for a non-stop flight to Dallas, Texas to investigate. What they found, though, did not lead to grounding or flight restrictions of other VariEzes. The cause was tantamount to leaving the wing attach bolts off your Cessna and expecting the fairing strip to hold the wing on. Their report follows:
An aerobatic pilot witness standing nearby described what happened when the winglet came off. The aircraft yawed, rolled, and pitched up 90 degrees. The calculated 13-g loads did not fail the wings but twisted the fuselage enough to shed most of the plexiglass from the canopy frame. The aircraft impacted inverted on the prop and top cowling, then it slammed down, shearing the pilot's rollover structure, the top of the instrument panel and impacted the canard/fuselage fairing. It then bounced back into the air, rolled left to upright, and struck the ground upright, failing the main gear (pulled brackets and major glass structure from the fuselage). The aircraft came to rest 90 feet from the initial impact point at a heading of 110 degrees right of flight path. The nose gear was retracted. The right winglet was located about 1900 feet short of the wreckage. Parts of the plexiglass canopy were found 1000 feet short. With the exception of the right winglet and rudder assembly, and parts of the plexiglass canopy, the wreckage was essentially complete and in one spot. Although it had sustained major damage, the airplane was located in a small area, not over 20' x 30'.

The right winglet failed inward during the high speed low pass. Sample sections were cut out of the winglet-root/wingtip. Skin coupons were burned out and the number of plies were counted. The type of glass and fiber orientation were determined.

Figure I shows the VariEze design structure and the structure found on the wreckage of N11CH. The major tension layup (#8) that was ommitted was, without question, the primary weakness which allowed the winglet to fold inward and fail at high speed. The winglets lift inward and, at high speed (with zero sideslip) have an inward bending moment that is equal to that attained in a 15 degree sideslip at the maneuvering speed. Note that with layup #8 ommitted, and with layup # 9 not extending to the lower skin, the only structure opposing the bending was the foam core acting through rib #6 to the bottom skin. It is conservatively estimated that the structural strength of the winglet-to-wing joint of N11CH was less than 1/20 of what it should have been. It is very surprising that it did not fail sooner.
The incredible thing that was not answered was how the builder could have ommitted the primary structure and why it had not been noticed. Even after the final paint job, it was obvious that the #6 rib could be seen on the surface.

This aircraft throughout showed evidence of poor workmanship. Poor workmanship in itself had not precipitated structural failure with these construction materials. Prior to this accident the VariEze type had amassed approximately 150,000 hours flying without inflight airframe failure, even though many of the aircraft have relatively poor workmanship. The omission of important primary structure was clearly the cause of the structural failure.



ANOTHER PROP INCIDENT

Ray Johnson from the San Francisco Bay area, flew his VariEze to Las Vegas, where it was parked in the desert sun for 5 days. He then took off and headed south at 12,500 ft. About 20 miles north of Apple Valley airport, a horrendous vibration set in. Ray throttled back, pulled the mixture to idle cut off and pulled the nose up to slow down. When the engine stopped turning, the vibration went away. Ray glided in to a landing at Apple Valley. Other than the Cessna that pulled out in front of Ray on final, causing him to have to land off to one side of the runway, it was uneventful. Ray's prop was still on the airplane, 5 bolts had sheared, one was bent but still holding and the spinner retained the prop.

This is a classic case of flying from a moist ocean climate to a dry desert climate. The wood prop shrinks just a little bit, the bolts no longer have the correct torque, so the prop starts to move and in literally seconds, the bolt holes and drive lug holes become elongated, and the bolts break off at the drive lug due to fatigue.

Check your prop bolt torque, it should be between 18 ft/lbs (216 inch/lbs) and 20 ft/lbs (240 inch/lbs). With a new prop, you should check the torque after one flight. Then again after 10 hours, then at 25 hours, and thereafter every 25 hours.

NOSE WHEEL SHIMMY/FAILURE

We have heard of three more nose wheel fork failures. This is a part of our airplanes we seldom see; it is retracted when parked and we are usually in the seat when the gear is extended. Do not neglect to check your nose wheel during your preflight. Pay particular attention to the friction damper. You should grab the tire as far aft as possible and swing the fork left and right. It should take 2 to 4 lbs. of force to do this. If you are not certain how much 2 to 4 lbs is, use a spring scale to calibrate yourself. If you have less than 2 lbs., it is possible for the nose wheel to shimmy. This shimmy or flutter instantly goes divergent and in only a fraction of a second the fork will fail, due to side loads. The nose wheel/fork, can then bounce back and go through the prop. The nose wheel fork is designed with more than enough integrity to take the maximum expected landing loads and has been tested to over 80% above the FAR Part 23 requirement without failure (see CP #18). This type of failure caused by shimmy generally occurs with very little load on the nose wheel, usually at the very moment of a nose wheel touch down, or even at the moment of nose wheel lift off during a take off. The new shimmy damper spring called out in CP 30, page 4, MUST be installed and correctly adjusted. Also check to see you have no ovalizing or bending of the NG17 steel tube and that the thick-wall (0.125+ wall) NG17 is installed.

LONG-EZ PROPELLER UPDATE

We have been testing a few different props on the Long-EZ, and we are finding the best all around performance for the O-235 Lycoming to be a 62" dia. x 66" pitch. This is a larger diameter than the maximum diameter called out on the back page of the plans, however, we have several hundred hours on two of these props, on N79RA and N26MS and we have not encountered any problems. These props are available with the urethane "rain proof" leading edge from the following two companies:

Ted's Custom Prop's.	B & T Props,
9917 Airport Way,	8746 Ventura Ave.
Snohomish, WA 98290	Ventura, CA 93001
206-568-6792	805-649-2721

We have had one each of these props on test for over a year, and both perform flawlessly and are very close in performance. Be sure to get your prop order in at least three months prior to your estimated first flight date. Don't let yourself be caught with a finished airplane and no prop to fly with.

CP 33 P96

BUILDER HINTS.

Terry Crow suggests an insulated box to keep your epoxy pump and epoxy warm. Build it out of styrofoam. (bead board ok). Glue it together with epoxy, make hinges out of BID, epoxy them on. Leave them dry at the hinge line. Terry keeps his at 85 degrees + 3 degrees with a cheap fish tank heater in a plastic bottle filled with water. Parts cost $8.00 and one hour of time. Terry also suggests that if you have not used your pump for a week or more that you discard the first squirt, as the ratio can be off.

Christopher Brichamban suggests you try sticking a 1/4" wide strip of masking tape along the cut lines on your BID. Cut down the center of the 1/4" wide masking tape, carry it to the plane and lay it up. The masking tape comes off quite easily and this allows you to maintain the shape of the BID between the cutting table and the plane.

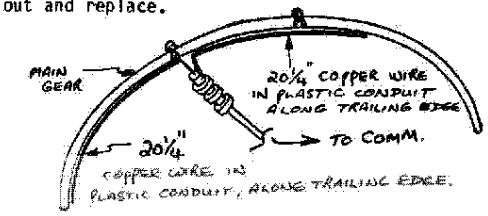
Dan Wicklund says a 20 gallon styrofoam ice chest (24" x 14" x 14") makes a great storage area for keeping resin, hardner etc at 85 degrees. Use a 40 watt light bulb and a dimmer switch, run the chord through the drain hole and set the whole works on 2 scrap 2" x 4" s to keep it up off the floor.

Nat Puffer suggests a good place for a DME or transponder antenna is in the leading edge of the wing root. Simply hollow the wing leading edge out a little deeper, see Page 19-13 Section F-F. Do this similar to Section E-E on page 19-14, and mount the antenna in the void.

Installation of side consoles. Make all of the side consoles and fit them, but do not install them at this time. Install all the fuel lines, wiring, rudder cable conduits, relief tubes, the control system in it's entirety, the landing brake and the pitch trim system, before you glue the side consoles in permantely.

VariEze Comm Antenna

This has been an ongoing problem, and several different antennas have been tried, some have been successful, but not on every airplane. The comm antenna on a Long-EZ is in the vertical winglet. Unfortunately the winglets on a VariEze are just not big enough. Mike DeHate has an excellent radio. We recently talked to him from over 100 nm away and he sounded as though he was on our wing. He has the following antenna: He cut an ordinary piece of house wiring to 20 1/4" long, and pulled two strands of copper wire out of this piece. These were inserted into a conduit which was installed on the trailing edge of the main gear. The center conductor of the RG58AU coax cable is soldered to the 20 1/4"length of copper wire that goes down the gear leg. The shield is soldered to the 20 1/4"length of copper wire that goes through the fuselage. Three ferrite beads are installed over the conduit per the sketch below. The beauty of this arrangement is that if it should break it is easy to pull out and replace.



Moldless vs Prefab shells for Homebuilt Construction.

We often get requests to provide molded shells of the Long-EZ to make it "easier to build". Our experience with molded shells has indicated that the full-core moldless structures provide more reliable structures without compromising building time. The most meaningful demonstration of this though, is actual homebuilder experience. Johnny Murphy, who has built four different moldless aircraft, recently completed a molded Glasair. His comments on relative simplicity are printed in the Spring '82 issue of Sportsman Pilot magazine. Sportsman Pilot is a quarterly with very quick response publishing of current homebuilt news. Each issue has a wealth of the latest happenings in the experimental world. Subscriptions are $7.50 a year, Box 485, Hales Corners, WI 53130.

SHOPPING

Engines

Norm Bender
Box 30343
Memphis, TN 38130
901-794-0032
Contact Norm for Long-EZ O-235-L2C, new or factory remanufactured engines. Norm says that a Lycoming price increase is imminent!

Dick Waters,
1325 W. Washington St.
Orlando, FL 32805
305-422-0188
Dick has rear cases to bolt on Cessna 152 engines that will accommodate mechanical fuel pumps and oil cooler. These cases are available outright or exchange.

Memphis Aircraft Power Services,
3734 Winchester Road,
International Airport, Hangar #5,
Memphis, TN 38116
901-345-2850
Bob Norville, has several O-235-L2C engines.

David Hoffman Products,
1009 Old Mill Road,
Auburn, AL 36830
205-821-8942
Dave has very light weight cockpit lights for $12.50 each. Includes postage, or these lights can be bought from Aircraft Spruce, same price.

Bob Arthur,
23718 Soresina,
Laguna Hills, CA 92653
213-922-2078 (Work)
714-837-4071 (Home)
VariEze main gear and nose gear struts. Bob also has other VariEze parts.

C. Willwerth,
215 Froman Drive,
Summerville, SC 29483
VariEze original main gear strut, sell or trade for Long-EZ main gear.

Phil Supan,
1401 Market Street,
Santa Clara, CA 95050
Phil has a limited number of switches suitable for the warning system in a VariEze or Long-EZ Phil will send them out post paid for $1.00 each.

WANTED:

Pre-fab fuel tanks for VariEze
Contact: T.W.Tyner,
Box 11625
Houston, TX 77293
713-695-9262 (Work)
713-446-5720 (Home)

O'Products, manufacturer of engine protective plug kits for Beech and Piper, are now offering similar kits for the homebuilder. Kits are presently available for the Long-EZ and can be custom made for the VariEze. Long-EZ kits for aircraft either with or without a prop extension are being produced. They may also be ordered for either the "male" or "female" inlets.
The 'A' kit (for aircraft with prop extension) is priced at $89.95 and includes three plugs and storage bag.
The 'B' kit (for aircraft with 6" prop extension) is priced at $124.95 and includes five plugs and storage bag.
The storage bag fits snugly into the space behind the passenger's head and is available separately for $24.95 in red, blue and yellow naugahyde. Add $10.00 to kit or bag price for special color bag. For further information, or to order contact: Patrick O'Brien,
O'Products Homebuilt Division,
269 Marjori Ave.
Thousand Oaks, CA 91320
(805)499-7369

Aircraft Spruce is now stocking the AOA oil analysis kits for $8.95. The David Hoffman cockpit lights are in stock for $12.50 each. They are changing to Latex gloves instead of vinyl, same price and they will also be stocking cotton liners for the Latex gloves.

VARIVIGGEN NEWS

As promised in the last newsletter, all those who requested to be put on a list to talk to and help other Viggen builders, should by now have a copy of the list. Any other builders who would like to have their name, address and phone number put on the list, let us know. The list will only be mailed to those who are on the list. The sole purpose of this list is for mutual aid, both moral and technical among the Viggen builders.

Ken Winter who had his Viggen at Oshkosh last year in grey primer has been working hard getting it completely finished for this year. It is really looking fabulous, as Ken and Kay have really put a paint job on it. In Kay's words "it gives our Viggen a commanding appearance". Look for this beauty at Oshkosh '82.

Len Dobson is planning on being at Oshkosh, so we should have at least 3 on the flight line. Unfortunately Bernard Duneman had a gear failure. The left main gear folded up after a normal landing, and Bernard is now having to do some fairly major repairs. It is not certain if he will make Oshkosh.

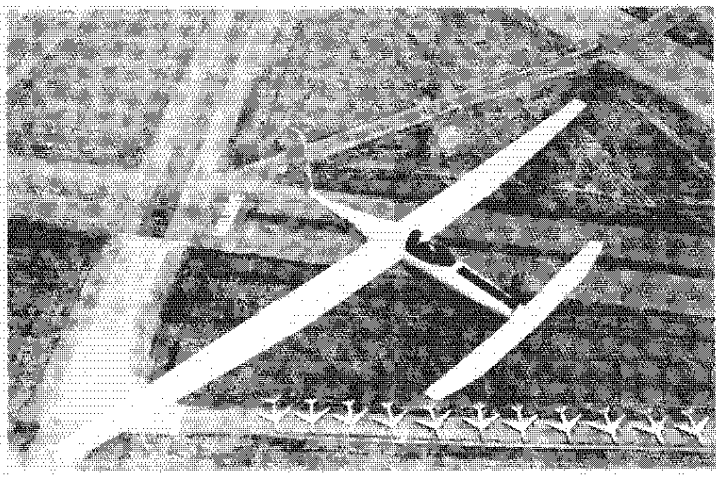
Bernard's failure was caused by the MG4 beam collapsing and allowing the gear to fold. It turns out that the Brock-supplied MG4s were fabricated out of 1018 steel, and this material is too soft. This is what was called out to Brock and at the time it was thought that 1018 would be more than sufficient, however, based on what happened to Bernard as well as Len Dobson, we feel that the MG4s should be fabricated from 4130N steel, and heat treated to 150,000 psi. The MG4 on my Viggen N27MS are fabricated from 4130 and heat treated and with 530 plus hours, and over 600 landings there has not been any problem. In view of the above, we are recommending that any builder or flyer who has the Brock fabricated MG4s, should contact Brock and exchange the original 1018 steel MG4s for 4130 heat treated parts. This is a mandatory change and must be complied with before next flight.

N27MS flew to the Taos Hospitality Club Flyin, a distance of 636 nm (732sm), with Sally flying our Long-EZ in loose formation. Our true airspeed at 11,500 ft was 138 kts (159 mph) and the Viggen (180 hp Lyc.) burned 7.8 gph. Our ground speed going east was 150 kts. (173 mph) and coming back, fluctuated between 109 kts (123 mph) and 131 kts (150 mph). I was happy with the Viggen's high density altitude performance, we landed at Flagstaff, AZ (7000 ft elevation), Taos NM (7100 ft elevation) and Winslow, AZ (5000 ft elevation) and had no problems. I was solo in the airplane; had I been two place, I would have been more concerned. Any aircraft is affected by density altitude. My technique is to lean for best power and lift the nose wheel as soon as possible, then hold an attitude that keeps the nose wheel off and accelerate on the mains to about 90/95 kts. or at least 5 kts above best rate of climb speed. Then I pull it off and climb to at least 100 feet before retracting the gear. The gear is draggiest in transit and I find I lose most of my 5 knot excess speed and even a little altitude during the time that the gear is in transit. Of course, this only applies to high density altitude operations; the airplane is very normal at sea level and climbs quite rapidly. The SP wing makes a big difference and anyone planning to do most of their flying at high altitude airports, should seriously consider the SP wing.

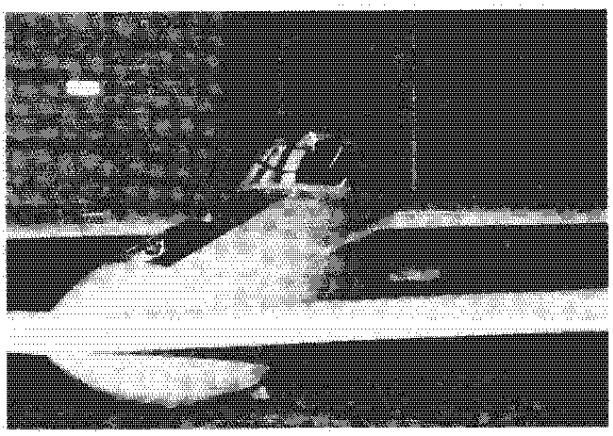
Propellers: N27MS seems to perform best all around with a Ted's 69 x 69. This gives reasonable cruise, and still allows a good rate of climb. I also have a Ted's 70 x 70, which works well at sea level or thereabouts, but it is not a good choice to fly in and out of airports like Flagstaff, Aspen, Taos etc.

Viggen Plans Changes.

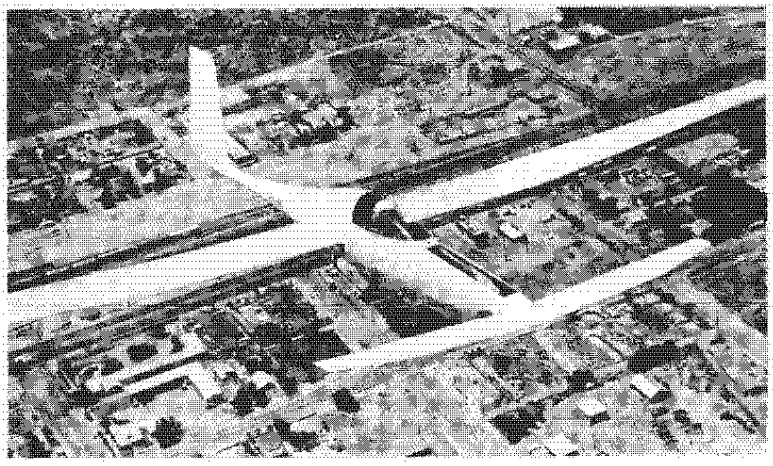
MAN-GRD. MG4 beams, fabricated by Brock must be replaced by 4130 steel heated treated parts.

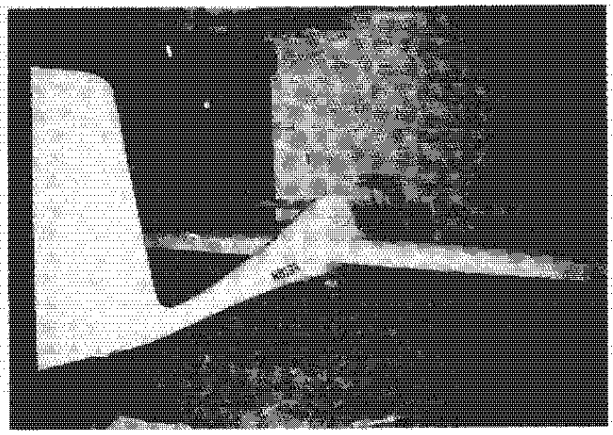


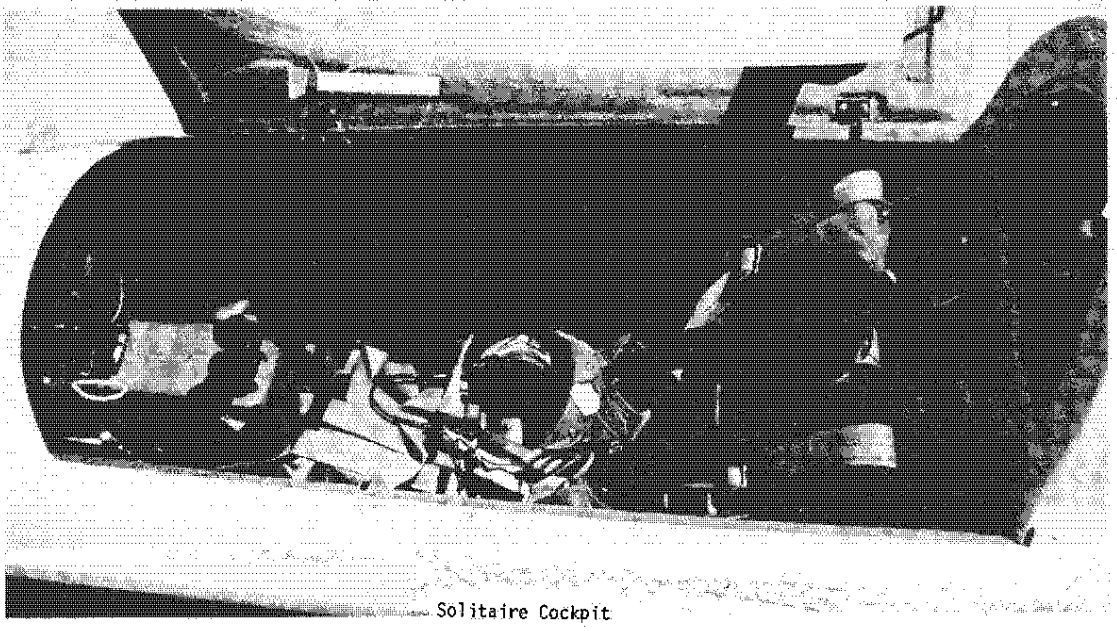
Solitaire joined up in formation under power (above) and soaring with the prop folded away (below). Mike reports that formation flying is actually easier without power, using the spoil-flaps for speed control.



The Solitaire nose - note the coincident fuselage nose and canard leading edge - an arrangement that eliminates interference drag.



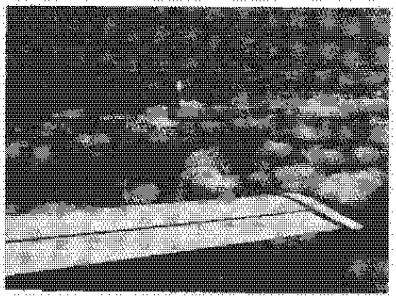


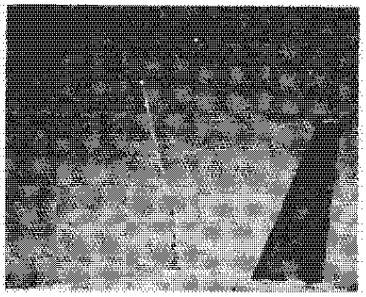


Solitaire Cockpit

EZ's can be built in a living room if you have a "perfect marriage and a window in the right place".
Chick Tonelis.

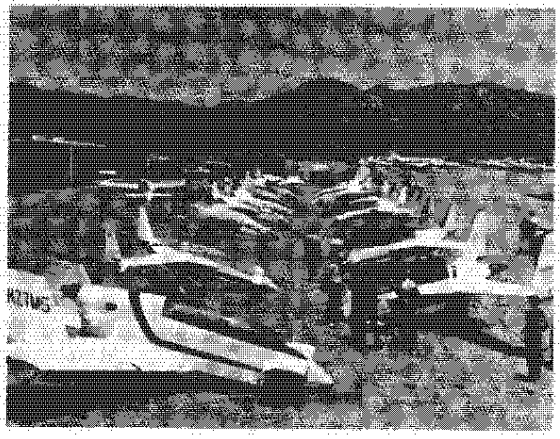
An informal static load test of a reject canard loaded at the Miami seminar. Sixteen men wrestle for room while Mike measures the bulge of everyones feet! A non-catastropic failure occurred near a hinge fitting at about 11.5 -g.



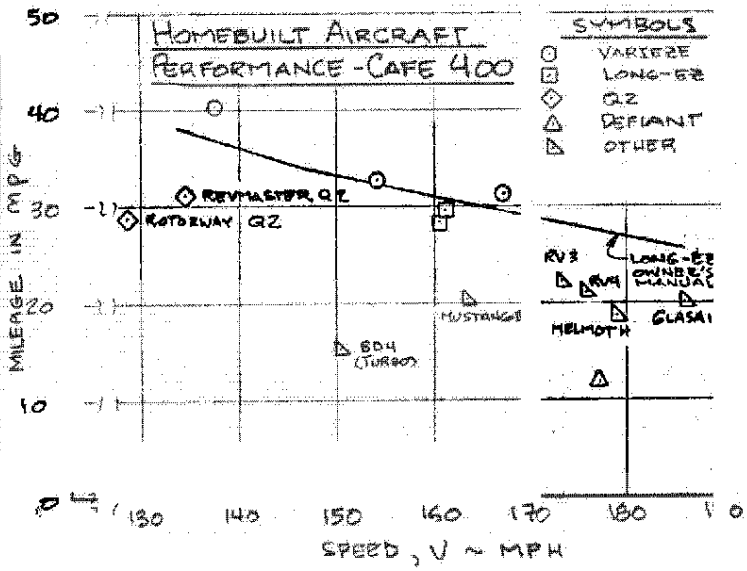


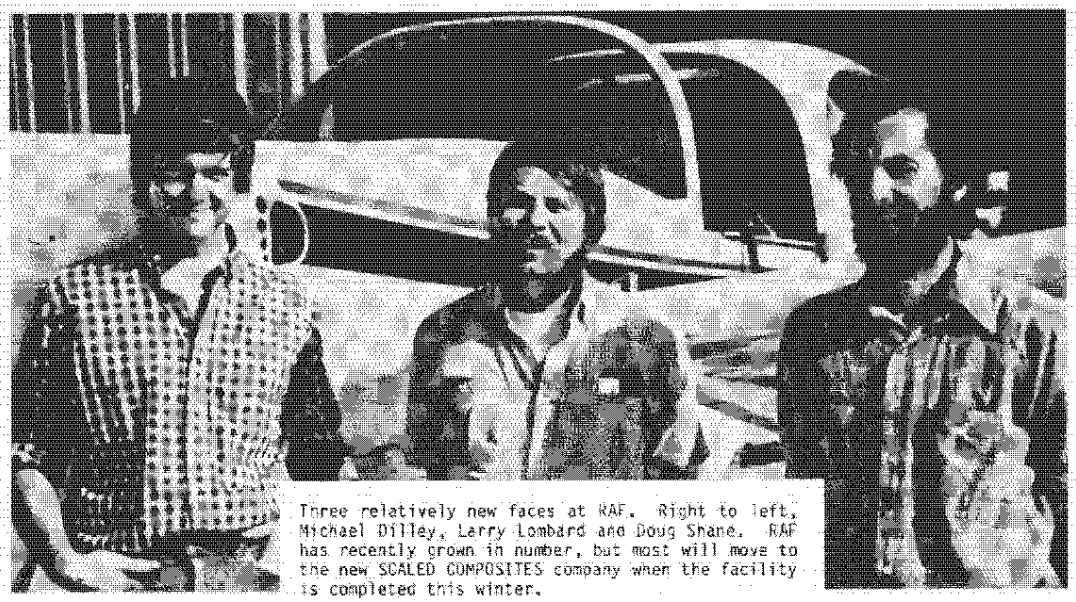
Space Shuttle launch from two different EZs.

Snug as a bug in a Grizzly. Sally, Pat and Teddy check out the Griz sleeping area.



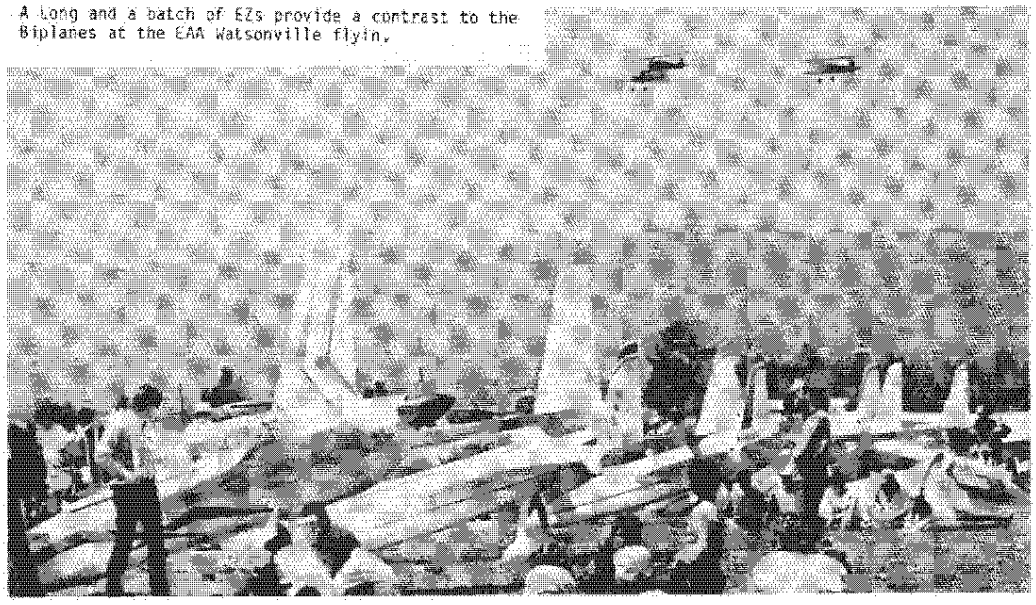
The lineup of Canard-Pushers at the VariEze Hospitality Club's Taos, New Mexico, Flyin.





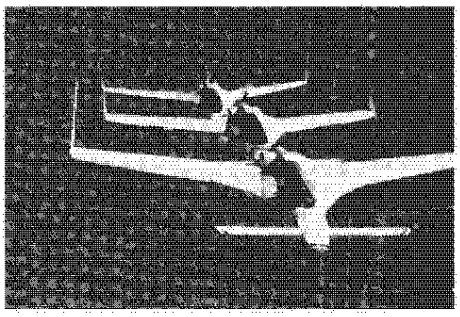
Three relatively new faces at RAF. Right to left, Michael Dilley, Larry Lombard and Doug Shane. RAF has recently grown in number, but most will move to the new SCALED COMPOSITES company when the facility is completed this winter.

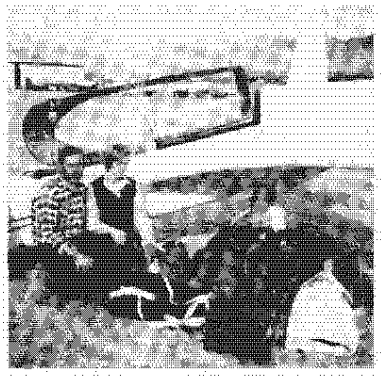
A Long and a batch of EZs provide a contrast to the Biplanes at the EAA Watsonville flyin.

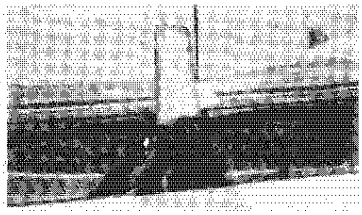


Brief Long-EZ specifications/performance.
Engine — Lycoming O-235 108 hp.

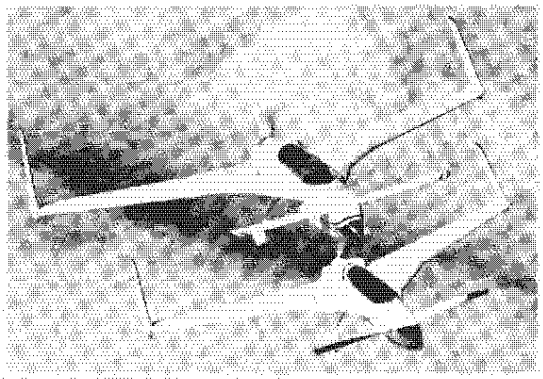
Span	26.1 ft.	Takeoff solo/gross	600/950 ft
Area	94.8 sq. ft.	Climb solo/gross	1750/1250 fpm
Empty Basic	750 lb.	Cruise 75% 8000 ft.	186 mph
Empty Equipped	800 lb.	Cruise 40% 12000 ft.	146 mph
Solo Weight	1000 lb.	Top Speed — Sea Level	193 mph
Gross Weight	1425 lb.	Max range* 75% (solo/2 place)	1380/1150 mi
Max. Fuel	52 gal.	Max range* 40% (solo/2 place)	2070/1690 mi
Cabin L/W/H	100/23/37"	Ceiling (solo/gross)	27000/22000 ft
		Landing distance (solo/gross)	450/680 ft
		*40 minute reserve	







This amount of baggage fits nicely in the Long-EZ baggage area. Baggage is accessible in-flight.



LONG-EZ DOCUMENTATION

SECTION I — MANUFACTURING MANUAL — This is the complete education manual for composite materials and methods, also, the complete plans and construction manual for the entire Long-EZ except engine installation and landing-brake. The manual consists of a 180-page, bound 11" x 17" book plus 14 larger full size drawings. It includes many photos, over 800 drawings and illustrations, and over 65,000 words. The builder is led step-by-step through the entire construction of the airplane, including electrical system, fuel system and finishing procedures. The manual identifies sources for all materials and all prefabricated components. A video tape is available covering all aspects of building the moldless fiberglass/foam sandwich construction. The tape covers the latest methods used to obtain the optimum weight, strongest fiberglass layups. This presentation will help both the first-time and experienced builder attain quality aircraft workmanship.

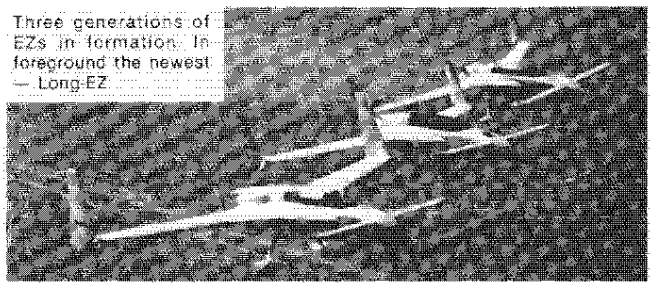
SECTION II — ENGINE INSTALLATION — This is a set of drawings and construction for the complete engine installation, including mount, baffles, instrumentation, electricals, fuel, exhaust and induction systems, carb heat box and muff, cowling installation, prop and spinner.

OWNERS MANUAL — This is the required operations handbook and checklists, including normal and emergency operation, detailed flying qualities and performance charts, maintenance, maiden flight procedure, and pilot checkout, etc.

A video tape is also available which covers the weight and balance procedures, taxiing tests and first flight.

LANDING BRAKE — Complete full size drawings for the landing brake device. This is the large drag plate that extends from the bottom of the fuselage for landing approach.

Check items desired.		Price, includes first class mail to U.S. & Canada	Overseas Airmail — U.S Funds
○	Rutan Aircraft Information Package — complete data and photos of all Rutan designs.	$ 8.00	$ 9.00
○	"Canard Pusher" newsletter Published quarterly. One year subscription. Approx. 10,000 words per issue.	6.75	8.75
○	Long-EZ plans. Section I	198.50	212.50
○	Section IIL Lycoming	21.50	23.50
○	Long-EZ Owners Manual	9.00	10.50
○	Long-EZ Landing Brake	10.00	11.00
○	6% Sales Tax, if Calif. order. Newsletter not taxable.		



Three generations of EZs in formation. In foreground the newest — Long-EZ.

The following are RAF-authorized distributors of Long-EZ materials and components. Contact the distributors at the addresses below for their catalogues and description of items.

ALL RAW MATERIALS AND PREFAB FIBERGLASS PARTS

Near Los Angeles
AIRCRAFT SPRUCE
201 W. Truslow, Box 424
Fullerton, CA 92632
(714) 870-7551
Catalog $4

Near St. Louis
WICKS AIRCRAFT
401 Pine Street
Highland, IL 62249
(618) 654-7447
Catalog $3

Prefab machine parts such as, control system parts and welded parts, fue caps, engine mount, rudder pedals and exhaust systems.

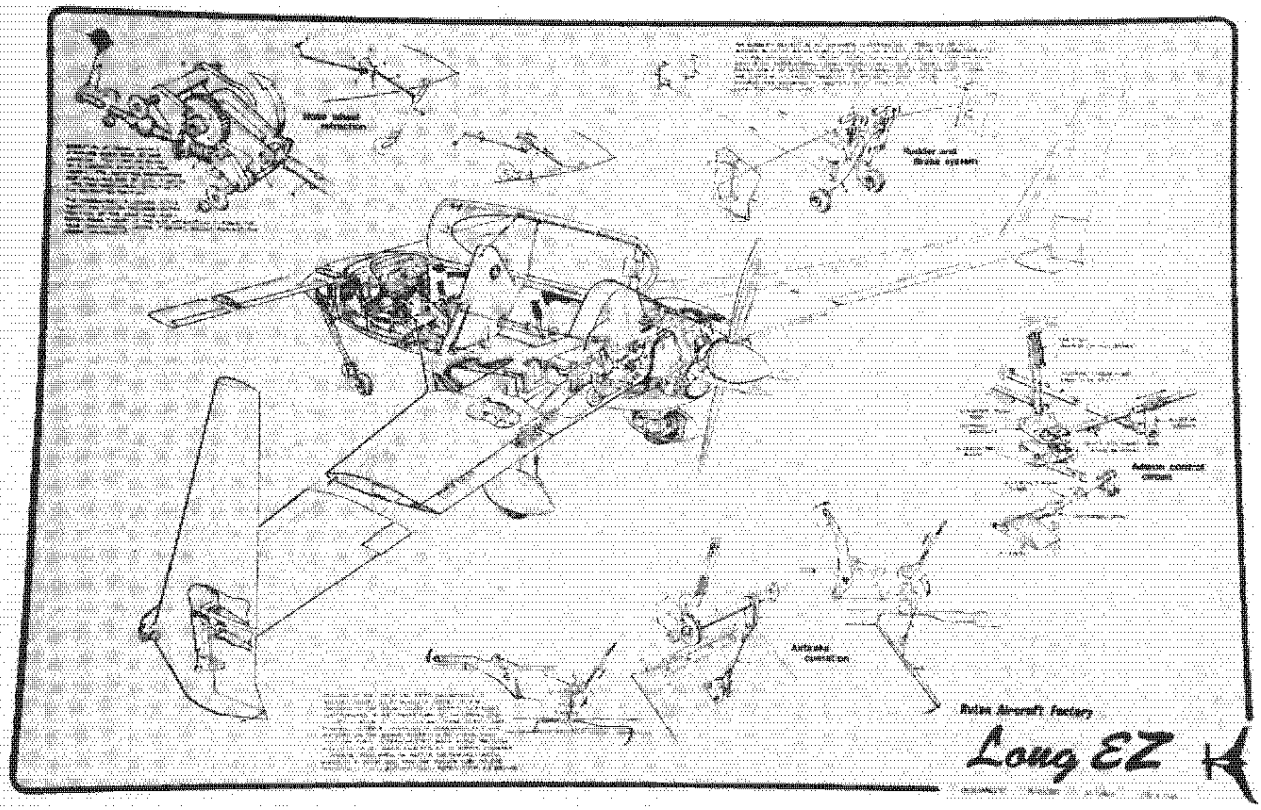
KEN BROCK MANUFACTURING
11852 Western Avenue
Stanton, CA 90680
(714) 898-4366
Catalog $3

Main and nose gear, fuel strakes, fuselage bulkheads.

TASK RESEARCH INC.
848 East Santa Maria
Santa Paula, CA 93060
(805) 525-4545

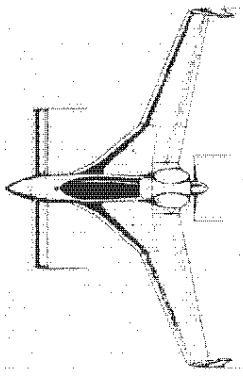
Canopies are available from **RUTAN AIRCRAFT.**

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



RAF has recently had noted artist Jim Newman draw a complete illustrated cutaway of the Long-EZ. The result is not only a fine frameable work of art, but is also a technically accurate reference. Lithographs of this drawing in 20" x 30" size may be available at Oshkosh. Price is $10.00 which includes postage.

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



first class mail

TO:

The line which appears above your name on your label contains two numbers. The first number is your subscription number. **PLEASE INCLUDE THIS NUMBER WITH ALL RENEWALS,** and state that you are a renewal. The second number is the last newsletter issue which you will receive. If your label says **LAST ISSUE -CP 33** then this is your last issue and you need to renew.

July '82

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