

# THE CANARD PUSHER

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If you are building a VariViggen from 1st edition plans you must have newsletter 1 through 27. If you are building a VariViggen from 2nd Edition plans you must have newsletter 18 through 27. If you are building a VariEze from the 1st edition plans, you must have newsletter 10 through 27. If you are building a VariEze from 2nd edition plans you must have newsletter 16 through 27. If you are building a Long-EZ from 1st edition plans you must have newsletter 24 through 27.

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

The RAF hangar is located on the west end of the flight line at the Mojave Airport, Mojave, Ca. approximately 80 miles north of Los Angeles. You are welcome to come by and see our aircraft or to bring in any parts for our comments. We are normally open from 8:00 to 12:00 and 1:00 to 5:00 on Monday through Friday and 9:00 to 4:00 Saturday. Closed Sunday.

If you are planning a trip so see us, please call first to assure that someone will be here to assist you, since occasionally we are gone to flyins. Saturday demos - Every Saturday (except when gone to airshows) RAF conducts a demo at our shop at the Mojave Airport. We start the presentation/discussion at 10 am each Saturday with flight demos of our experimental aircraft at approximately noon (weather permitting).

Bring any of your parts for inspection. We are located near the west end of the flight line at the Mojave Airport about 2 hours drive north of Los Angeles on Highway 14. When arriving at Mojave by car turn east at the Carl's Jr restaurant to find the airport.

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

Mike and Sally's Long-EZ by Mike.

In CP 26 Sally and I were going at it as hard as we could to try to finish N26MS before the Bahamas trip. Due to several circumstances, some beyond our control, we were unable to fly our Long to the Bahamas, although we did manage to get a few flights on it prior to leaving on the trip.

We really burned the midnight oil the last few weeks and without help from Burt, Pat, Bruce and Giles, we would not have got it flying before leaving. We filled and primed all the parts and then transported it down to Mojave Airport, where we finished up engine baffling and wiring. On Sunday, 21 December we finally had it all done. We put 10 gallons in each fuel tank, flushed the fuel system thoroughly and started the engine. Since Sally and I overhauled the engine, it was a great relief to have it start and run so smoothly! We ran the engine for half an hour, then after conducting a careful weight and balance, determining that the cg was in the center of the first flight box for me, I taxied out for the first runway flights. I made 3 runs down the runway, checked brakes, rudder effectiveness, rotation speed and on the 3rd run lifted off a foot or two. It felt absolutely great, it was straight, no trim required, so I landed, taxied to the end of runway 12, and with Dick and Sally in Burt's Long-EZ on my right wing, I took off.

It felt absolutely right. It is a difficult moment to describe on paper, when you depart the runway environment completely, and commit yourself and your new airplane to the air, it is an incredible feeling. All engine instruments were in the "green", so I climbed on up to 5000 ft and carefully explored various control inputs and power settings. I am delighted to report that it required no trim to fly straight and true. I flew for about 40 minutes, landed and Sally made the next flight. She is also delighted with the handling qualities. Just before dusk Burt took it up and was pleased with it.

Since getting back from our Bahamas trip we have been putting hours on our Long. I have opened the envelope up to 185 knots indicated at 9000 ft, and she loops and rolls beautifully. The roll response is even better than the prototype N79RA. With no wheel pants, the large 500 x 5 tires and no spinner, speeds are not very meaningful, but at 7500 ft she trues out at 151 knots (173 mph), so I believe that with wheel pants, a spinner and a magneto that sparks on all 4 cylinders our Long-EZ will be at least equal to the owners manual, possibly a little better.

Evaluation of N26MS by Burt - Sally and Mike built this one with alot of attention to accuracy. The reward is an airplane that flies ball-centered at neutral roll trim, hands-off. Its roll qualities are crisp with minimal adverse yaw. Pitch handling is solid with firm speed stability. Stalls are optimum - a very mild pitch bobble at full aft stick. Roll reversals and sideslips performed at full aft stick are smooth and do not produce wing rocking. Engine noise and vibration are lower than the prototype due to the dynafocal mount. A superb flying airplane, the best of any type I've flown.

Back to Mike - We will continue to report on how it goes, as we accumulate time and data.

Before final assembly we got a few more relevant weights:

Wings with ailerons and rudders complete (before finish)	64 lb each
Rudders (filled and painted)	1.2 lb each
Left elevator (filled and painted)	3.5 lb
Right elevator (filled and painted)	3.0 lb
Ailerons, with hinges, universal and torque tube, (filled and painted)	5.4 lb each
Canard with fairing cover (filled and painted)	18.5 lb
Canopy, with hinges (filled and painted)	17 lb
wings with winglets, no rudders, no ailerons (filled and painted)	60 lbs each

We ended up with a total of 1200 hours. This included all man hours put in by everyone who worked on the airplane. This also includes overhauling the engine, developing the new engine mount and baffling, installation of such things as tape deck, intercom and what Burt calls "fru-fru" (non-essentials). See page 4 of this newsletter for Burt's comments.

CROSS COUNTRY IN A LONG-EZ by Mike Melvill

Due to our Long-EZ not having all the hours flown off in time for the Hospitality Club fly out to the Bahamas, Burt very kindly let Sally and I use N79RA. While I have quite a bit of flying time in Burt's Long, it has all been around the airport, this was my first long cross country in a Long-EZ.

To say that I was impressed would be putting it mildly. This is absolutely the nicest cross country flying machine I have ever flown. At 9,500 ft we trued out at 158 knots (183 mph) at approximately 72% power. At sea level, full throttle we trued out at 169 knots (194 mph).

We flew 3 legs of 5 hours and one of just over 6 hours. We were extremely comfortable at all times. Cabin noise level is a little high and a good noise-attenuating headset really is a must. The tremendous range is something I have not experienced before and there is a lot of comfort in knowing that you can fly for 7 or 8 hours if you have to, particularly in a bad weather situation. We generally had great flying

weather, but on the way back Sally and I ran into about four hours of marginal VFR, low ceilings and occasional low visibility in rain. It was great to know that we could turn around or fly around virtually any sized weather system, without having a fuel problem. We flew in loose formation with Burt and Pat in the Defiant on part of the trip, and on one occasion we had to stop because the Defiant was getting low on fuel! Sally and I shared the flying almost equally and I was pleased to find how comfortable I was even in the back seat. I spent 17 1/2 hours there! On one leg, from Las Cruces, New Mexico to New Orleans, Louisiana, a distance of 1016 sm, the Defiant and Long-EZ went together non-stop at 9,500' and covered the distance in 5.1 hours, a ground speed of 199 mph! During this flight in smooth air several times, I did not touch the controls for an hour at a time, a super airplane. Total trip distance, including sight-seeing and demos was 6440 statute miles. All we did was add fuel and oil, no maintenance of any kind was required. N79RA now has 493 hours, averaging nearly 1 hour per day since first flight in June 1979.

### CONTEST TIME!!!

We have had many requests for a Rutan Aircraft jacket patch, and of course we do not have such a thing. We will give a prize to the winner of the "Patch Design" competition, in the form of a New Mexican, laminated silver belt buckle, your choice of VariViggen, VariEze or Long-EZ on the buckle and a ride in Long-EZ here at RAF in Mojave. What we would like to see is a stylized or futuristic patch depicting Burt's canard type airplanes, or whatever you talented artist type builders can think of. Submit your ideas to RAF by March 30th 1981, and we will announce the winner in CP 28.

Peter Calvert of Leicester, England flying his VariEze, G-LASS, recently set two World records in Class C sub Class C-1-A.

- 1) Speed over a recognized course,  
Malta to London 145.05 km/h
- 2) Speed over a recognized course,  
Ajaccio to London 155.37 km/h

While the speeds may appear a little slow, Peter had to stop enroute twice for customs, fuel and the mens room, each stop of about 1 hour. Congratulations Peter.

Tom Garrison - Route "S" Box 80, Tulia, Texas, 79088 is trying to get a Long-Ez/VariEze group together in the Texas panhandle area. Any builders interested please contact Tom at the above address.

### THE EZ BAHAMAS ADVENTURE - by Bruce and Bonnie Tiff

#### Island Hoppers:

Mule and Debbie Ferguson, Boomer, NC. (Debbie flew commercially to the island, while Mule carted his guitar in the back seat of the EZ).  
Ed and JoAnne Hamlin, Rocklin, CA  
Jim Heitkotter and June Hartley, Fresno, CA  
John and Mary Jackson, Jackson, MS  
Byron McKean and Diane Meader, Seguin, TX  
Mike and Sally Melvill, Tehachapi, CA  
Dave Langston, Georgia and Jeff Rose, Chattanooga TN  
Norm Ross and Glenne Campbell, Victoria, BC, Canada  
Burt Rutan and Pat Storch, Mojave, CA  
Bruce and Bonnie Tiff, Ventura, CA  
Earl and Barbara Wilson, Citrus Heights, CA

It is indeed a difficult task to attempt to relate the many wonderful experiences, feelings and thrills associated with this particular EZ adventure. However, we will try to recapture and share some of the highlights of the trip.

Our adventure started on the crisp, clear dawn of Saturday, December 20th. Anticipation and excitement filled us as we took off from Santa Paula Airport,

on a trip that we and others had been planning and scheduling for over a year. First stop - Las Cruces, NM and a warm and friendly reception from EZ Hospitality Club members Joan and Charles Richie. Super Mexican dinner at LaPosta (afraid the Richies were saturated with Mexican food by the time the other migrating EZs passed through). We were joined in Las Cruces by the Northern California contingent, Ed and JoAnne and Earl and Barbara (lo and behold, not another yellow EZ - beautiful). This was Earl and Barbara's first trip after frantically getting their plane signed off in time for the journey. Ed did the navigating and led the way allowing Earl to concentrate on flying his shining new bird.

Next stop - - New Braunfels, Texas. As we open the canopy we hear Christmas music over the loudspeaker and a grinning "real-live" Santa Claus, alias Byron McKean, welcomes us. They don't exaggerate when they talk of Texas hospitality. It was great!

We again join up with the Hamlins and Wilsons in historical New Orleans on Christmas Eve. With the gracious assistance of Club member, Dewey Straley we enjoyed a delicious Cajun dinner at Berdous Restaurant and then real "southern comfort" at the Straley home. A gathering of EZs took place Christmas Day as Byron and Diane arrived at Lakefront Airport. Shortly after, the Louisiana sky was filled with the roar of the arriving Defiant and Long (Burt, Pat, Roger, Mike and Sally). Christmas evening was spent taking in the intoxicating atmosphere of the French Quarter with some fantastic jazz at Preservat Hall and then on to Pat O'Briens for a roaring good time.

Burt, Pat and Roger, desiring some over-the-water experience, navigated the Gulf to Boca Raton. The rest of us, having only one engine, meandered in groups along the coastline to Ft. Pierce, Florida. Our timing was incredible because as we were flying over Ocala, Florida, we happened to catch the Southern contingent grouping there (the Jacksons, Mule, Dave and Jeff).

St. Lucie County Airport was bustling with EZs from all over the country as we arrived (by the way, Sally was front-seat pilot of the Long on this leg of the journey). Many of the local Club members were there to welcome the group. Our Bahama Tourist host, Marshall Dent, was also on hand to haul us all to the Holiday Inn. (At this point, we must extend our very special thanks to Norm and Gertrude Dovey for rescuing the "BEEZ"). After an excellent steak dinner and a round on introductions, pilots and crew tackled the job of getting 9 EZs, 1 Long and 1 Defiant across the Atlantic to Andros Island. After a great deal of discussion (can you imagine all these "individualistic" individuals trying to come to a single solution!) it was decided to have three separate flying groups. The Defiant would lead the way and check weather, etc., and report to the others. Radio channel 123.4 was filled with chatter between the Blue, Yellow and Red flight groups. It was an incredibly beautiful flight and all three groups successfully invaded the sleepy island of Andros (no one had to test the "floatability" of their plane).

Although the clouds hid the sun from the island for the first few days, the group jumped in with both feet and went native. Perhaps the following will give you a few glimpses of the activities;

Norm, Glenne, Bruce and Bonnie bicycling in the rain.

Pat and Sally not able to resist the temptation to swim in the aquamarine water in their undies. (sorry for squealing on ya' ladies)

Barbara sitting in the "Yellow Tuff" at Ft. Pierce making sure, at long last, that she made it to the Bahamas.

Ed trying to calm JoAnne down after she was greeted by a big green frog in her bathroom.

John trying to talk someone into playing doubles tennis so he didn't have to face Mary alone.

Mike, Burt and Norm in one very small sailboat going out to the reef for some fantastic snorkling. June and Jim bicycling a very long distance and being rescued by a friendly van driver who hauled them and bicycles back to the hotel. Byron jogging down the runway in the early dawn accompanied at various times by Jeff, Burt or Bruce (where were you, Diane?). Mule entertaining the entire hotel with his guitar medlies. Of course, everyone joined in the singing including Maurice (a friendly gent from Montreal) who sang the old hillbilly tunes in French. The whole "nutty" group building a 6 place sand EZ on the beach - conch shells for strobes, whiskey bottle for pitot tube? Dave diving for conch shells and conning Mule into hauling them back for him. John and Jeff taking a "walk" by the "topless" girls on the beach. 22 nuts in one van coming back from the beach. The group terrorizing the poor controllers at Nassau International Airport who kept insisting that we where all Defiants or referring to us as "small jets".

The group departed at different time intervals and started winging their way homeward. It was indeed a wonderful adventure; one I am sure we will all remember and cherish for a long time. The thrill of flying the plane across the United States, combined with the friendship and fellowship of the Club members and people along the way, made for a holiday that will be very hard to top! To answer the question everyone was asking - WHERE TO NEXT? Our reply - we haven't the foggiest notion - ANY SUGGESTIONS??

For Norm Ross and Glenne Campbell, with their 1979 Oshkosh Grand Champion VariEze, Bahamas was just a jumping off point on a more extensive trip. Pegasus, based in British Columbia, was going on the longest trip yet flown by a VariEze. Traveling is not new to Pegasus, having flown 420 hours (70,000 miles) in the 17 months since Oshkosh '79. The following is Glenne and Norm's story:

Bahama Adventure follow up - Just hours before press time Norm and I have arrived in Mojave to catch Bonnie's report on the EZ Bahama Adventure. As a follow up to her quest 'where to next' we'll report a sampling of what goes on further south.

Pegasus and crew departed Andros Island and Eze people accompanied by Mike and Sally as send off party. We flew down the colorful cays to Exumas Island, landed, dined, refueled and shared fond farewells. As Mike and Sally 'rolled out' I held my breath and maintained (?) disbelief in the safety in numbers theory. Norm and I caught a ride into Georgetown, the village haven of royalty from all over the world. Truly a beautiful location with a variety of affordability and activity.

Onward the following day we flew down the cays, refueled at Great Inauga, and onto Port au Prince, Haiti. To our surprise the Haitians speak very good French, a lot of Creole and some English. There we refueled and climbed out to make our journey high above the clouds to Kingston, Jamaica. No worry of flying over the water this leg of the journey as the cloud cover was so thick nothing below was visible. The tall tale sign of land was a square inch of mountain peak off in the distance. Norm's navigation brought us right out over the top of Kingston where the clouds cleared for eze access. Jamaica was interesting. We had to pay a dollar each to ride in a van with 20 others to town. General aviators are not warmly recieved in Jamaica. Landing fees are twenty dollars, you must clear health and pest control (the aircraft is sprayed) as well as security, immigration, and customs - all very time consuming. All flights in Jamaica require inward and outward declaration, flight route clearance, and customs clearance. We were not allowed to fly to and land at the town we had plans to meet friends at so had to leave the plane at Montego Bay where security was assured but left us 'uneze'.

We travelled 50 miles by taxi in the dark to Negril on the west end of the island. Accomodations there are plentiful but must be sought out as the natives rent rooms and camping space. The head of every Jamaican family will tell you that Jamaica is a place to "cool the brain", but don't plan on doing it in the cool of the evening as every family has an assortment of at least five skinny dogs who act as doorbells, night watchmen and alarm systems from sundown to sunup.

Needing a rest, we returned to MoBay, cleared customs, recovered our wings and departed for the return stretch of our journey. Back in Haiti we stayed overnight in a motel "on the hill" where we met numerous people from around the world, each in the country for a different purpose. It was there someone suggested we visit Santo Dominigo on the south coast of the Dominican Republic. We flew there via Cap Hatien, Haiti, where the eighth wonder of the world sits perched upon a mountain top as the citidelle built to protect the natives from reinvasion of the French many moons ago.

Santo Dominigo is the location of Christopher Columbus's discovery of the western world. We landed at Las Americas airport, here most (excluding American Airlines employees) speak Spanish. Fortunately a young fellow befriended us and assisted us through customs etc.

Unfortunately we felt the need to return to the continent so didn't spend time in the city which looks to be very interesting historically and culturally.

Our return flight took us Santo Dominigo - Great Inauga - Fort Pierce - and so far Mojave. Many thanks to Norm and Gert Dovey, Jack and Marilyn Day and Harry and Donna Bush for their fine hospitality. By the time we touch down home at Victoria B.C. we will have covered 11,000 miles and as Bonnie says "Where to next?" Any suggestons??

- Tips for Caribbean travellers:
- inward and outward general declarations are required. by each country. These are available from AOPA
  - file flight plans, keep tanks full of fuel,
  - have a good communications radio
  - VORs are few and far between
  - speak some French and Spanish
  - carry a good Caribbean guide, such as Fodors.

Best wishes, Norm Ross and Glenne Campbell.

International VariEze Hospitality Club Fly-in

Organizer: Charles and Joan Richey,  
 (505) 523-1300  
 Camping and Condo's in Alpine Ski Valley  
 Cookout planned.  
 4th and 5th July 1981.  
 Taos Ski Valley, New Mexico, fly in to Taos Airport.

NACA FLUSH INLET

Steve Woods and Tim Gheres (address: Wood & Gheres Inc. 105 Appleblossom Court, Orlando, FL 32807) are selling plans and providing builder support for those builders installing flush inlets. (see CP #26).

Mike installed one on his Long-EZ and used a 12 inch wide inlet, rather than the 14 inch size suggested for the O-235. His O-235 runs cool. We recommend using the 12 inch configuration for the O-235 Lycoming. Mike also installed an access panel aft of the main gear strut in the "top"(bottom?) of his NACA duct. This panel is an oval shape, 5" x 10" and is constructed and installed using the same method shown on page 13-11 for the nose door. This allows inspection of main gear attachment and access to plumbing and wiring normally only accessible through the hole in the back seat bulkhead. This same panel can also be installed on a Long-EZ (or VariEze) without the NACA inlet, in the same place. Do not make the entire area removable this cover area is required for structural reasons and should not be omitted.

## Plans for Installation of Lycoming Engines in Long-EZ

As many of you know, we have not had a Lycoming engine section available since June. Section IIC was written in 1977 by an outfit on the east coast who first developed the Lycoming VariEze installation. We found many fit-related problems with this section when we used it to install the engine on the Long-EZ prototype, N79RA. Also, the Long has a number of major changes involving the fuel system, exhaust system, baffles, dynafocal mount and carb controls. Since it was evident that major changes were needed and that some of them would have to be flight tested, we decided last June to use Mike's Long-EZ to check the changes and to hold up printing the new plans until every detail had been flight tested.

Presently, Mike's engine is being fitted with EGT and CHT probes on all four cylinders to check inlet distribution. By the time you read this all testing will probably be complete. Because of the extent of the revisions, we will be publishing an entirely new section, Section IIL, for Lycoming. Section IIL will be available in early February 1981. As soon as it is received from the printer it will be mailed to those who have a Section IIC on back order.

Some of you Long-EZ builders have purchased, and received a Section IIC before the supply ran out last June. Do not use IIC to install your Lycoming in a Long-EZ. Return your IIC to us, we will replace it with a new IIL at no charge.

### IMPORTANT WEIGHT INFORMATION - LONG-EZ

The most disappointing thing about the VariEze experience has been the general lack of adequate weight control by most builders. It is necessary to use diligence in controlling and eliminating each gram in order to avoid an undetected growth of many pounds. It is a reliable prediction that many Long-EZs will be built over-weight and be limited to short range or single-place operation. An equally reliable prediction is that many Long-EZs will be built with little equipment, careful weight control, and will be considerably lighter than those now flying. They will enjoy a high useful load, great takeoff and climb performance and unexcelled range.

The following information is a complete analysis of the actual weight of Mike and Sally's Long, N26MS. If you are building a Long, it is very important that you study all this information before you plan your equipment installation and that you be aware of the weight impact of any additional equipment. N26MS has excellent structural workmanship, thus, most airplanes with less attention to good layouts will probably be heavier than the data shown below. Study the table below. Note particularly the magnitude of the additional equipment.

N26MS was built with two conflicting requirements that added considerably to its empty weight: (a) full electric start with large alternator, and (b) pilot weight of only 108 lb using no temporary ballast. While the heavy electric (number 4) and ballast provisions (number 7) had the major impact on their heavy final empty weight of 883 lb, their utility has not suffered as much as one might think. The reason is the total weight of Mike and Sally is only 263 lb. Thus, using the 1425 gross (owners manual page 30) their allowable fuel load is 46.5 gallons giving 1000 mile range at 75% or 1550 miles at 40% power, with reserves. Their allowable fuel load at normal gross is 29.8 gallons. Consider this same airplane with two 190-lb adults as crew and without the then-unrequired number 7 ballast provisions. That situation leaves only 207 lb (34.5 gallons) fuel for a range at 75% of only 700 miles, with reserves, or 350 miles with a 1325 lb take off. Obviously, with that 360 lb crew weight strong consideration should be given to using the electrical system in number 2 and eliminating as many items as possible in number 6, and 8, to provide the high utility and long range available with the Long-EZ.

We encourage everyone to use the light electrical system as in number 2. This is the one installed in the RAF prototype N79RA. Then, add only the equipment you absolutely need and diligently refrain from seemingly - "small" additions.

Note that it is possible and advisable to have the Nav, Com and transponder with the small alternator and have an empty weight of less than 720 lb. However, if your front-seat pilot weight is less than 170 lb., you should use the 25 AH battery in the nose and accept the 19 lb. increase. This will be needed anyway to balance the aircraft. Also, if you are a very light pilot (less than 150 lb), be prepared to suffer a large penalty in empty weight if you want to install a electric starter. The starter, ring gear, alternator, brackets etc. mount way back at station 150+ and will require nose ballast for light pilots.

If you are successful in obtaining an empty weight of less than 730 lb you can fly two 180 lb people with the full 52 gallons of fuel and attain over 1800 nautical miles (2070 sm) range at economy cruise - a feat considerably in excess of any other light aircraft.

### LONG-EZ EMPTY WEIGHTS BASED ON N26MS

1. BASIC EMPTY WEIGHT (BEW)  
VFR instruments plus g meter and turn/bank gyro.  
No starter and alternator, graphite cowling.  
All equipment and components per plans.  
Conical engine mount and ram inlet.  
No avionics, cabin heat or lights.  
Small motorcycle battery to power  
warning system and fuel pump. 693.4 lb.
2. BEW plus the small alternator.  
(see Cp 26), including wiring  
and regulator (4.9 lb) 698.3 lb.
3. Number 2 plus Com, Nav, Transponder  
and all installation misc. (15.4 lb) 713.7 lb.
4. BEW plus standard 60-amp alternator  
starter, ring gear, belt, brackets,  
mounting hardware, regulator, wiring,  
relays and 25 AH battery (68.5 lb) 761.9 lb.
5. Number 4 plus Com, Nav, Transponder and  
all installation misc. (15.4 lb.) 777.3 lb.
6. Number 5 plus additional equipment on  
N26MS including: 500 x 5 tires, dynafocal  
mount, NACA inlet, landing light, Nav  
lights, strobe lights, cabin heat, relief  
tubes, primer, intercom and stereo tape  
player. (38.1 lb.) 815.4 lb.
7. Number 6 plus provisions to allow Sally  
(108 lb pilot) to fly at cg =102.2  
(1.8" fwd of aft limit). Includes  
a second 25 AH battery, wiring and switches  
to use the second battery, and 15 lb  
of lead permanently installed in front of  
NG 31 bulkhead. (44.8 lb) 860.2 lb.
8. Number 7 plus some extras added because  
they were nice and "didn't hardly weigh  
anything". Misc ranging from small covers  
and aluminum knobs, to heavier upholstery  
and different fuel caps ( 12 "small" items  
22.8 lb) 883 lb.

Advanced Composite Lightweight Cowling.

Graphite (carbon-fiber)-reinforced cowlings for the Lycoming Long-EZ will soon be produced and available through Aircraft Spruce and Wicks. Differences between these and the standard cowl are shown below.

<u>Standard.</u>		<u>Graphite</u>
Materials:	Gel coat Glass Mat/cloth Polyester resin	Glass Cloth Graphite Cloth Epoxy.
Weight:	18 lb	12 lb.
Cost:	Approx. \$245	Approx. \$360

(both halves)  
We have tested a prototype of this graphite cowl and are pleased with it. The part numbers are as follows for all Cowl's, Standard & Graphite.

Part #	Materials	Aircraft	Engine	Top/Bot
CCT	Glass	VariEze/Long	Cont	T
CCB	Glass	VariEze/Long	Cont	B
LCT	Glass	VariEze	Lyc	T
LCB	Glass	VariEze	Lyc	B
LCT-L	Glass	Long-EZ	Lyc	T
LCT-LGrap	Graphite	Long-EZ	Lyc	T
LCB-LGrap	Graphite	Long-EZ	Lyc	B
LCT-Grap	Graphite	VariEze	Lyc	T
LCB-Grap	Graphite	VariEze	Lyc	B
LCB-L	Glass	Long-EZ	Lyc	B

Continental O-200 Engine for Long-EZ??

As you have read in recent CP newsletters we are strongly recommending the Lycoming over the Continental for the Long-EZ. This is not to say the O-200 will not work - its installation is well-tested in VariEze airframes and, with the addition of mechanical fuel pump should operate well. However, with the O-200 you may find it a difficult and expensive modification to adapt an approved mechanical pump. Also, you will not be taking advantage of our recent development effort the last six months in refining and flight testing all the components in the Lycoming installation (section 11L). If you have an O-200 you might consider trading it up for an O-235. O-200's are bringing an excellent price now days.

FIBERGLASS LAYUPS

We have recently inspected some layups with unacceptable epoxy-to-glass ratios and improper fiber orientation. Aircraft structure, whether its fiberglass, aluminum, or welded steel must be built properly or must be rejected. It is not satisfactory to accept any critical part that has excess epoxy. On every part, be sure to do the squeegee test for a "ridge" - see page 3-11 step 7. Pull the squeegee along, stop and remove it and see if you have piled the excess epoxy up into a ridge. You must spend time with the squeegee pulling all excess off the sides if the test reveals a ridge. Do not attempt any layup (except small corner tapes) unless you have a clean, flexible, smooth squeegee to use. It is not possible to smoothly remove excess or determine correct ratio with a brush. When building any type of aircraft structure, your very best workmanship is just barely adequate. Do not accept anything less. Practice on your Chapter 3 flat layups until it is perfect before building aircraft parts. If in doubt on how a given layup should look, duplicate it on a small piece and send it to RAF for our comment. It is difficult to access the acceptability or dry or wet layups on the phone.

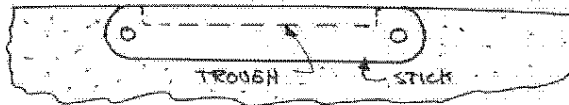
BUILDER HINTS - LONG-EZ AND VARIETZE

Do not use peel ply over entire structure. This starves epoxy from lower foam surface, makes inspection difficult, gives an erroneous impression of good surface smoothness, makes it easy to unknowingly damage structure during finishing and adds weight. For example - if the elevators are peel-plyed they will be too heavy to balance and must be discarded. Do peel ply surface edges of glass plies whenever they exist and, of course, whenever a layup will be later made over a cured surface.

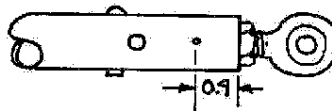
Cockpit Paint - We have recieved a number of questions regarding ultraviolet protection of the glass structure inside the cockpit. Cockpit structure, like the external structure should never be exposed to direct sunlight without the protection of a suitable ultra violet barrier. A well-maintained coat of color paint is adequate, but it is desirable to use primer over the fiberglass surface. Dupont type 70S provides the best UV barrier (high content of carbon-black), however type 100S will result in better adhesion to enamel paints. Mike and Sally used a Standard Paints product, called "Zoletone", Charcoal gray in their cockpit. This material gives a beautiful spackle-type finish that hides minor irregularities and the glass cloth weave. This paint was sprayed directly on to the glass interior, after scuff sanding with no filling at 70 lbs per square inch pressure.

Engine mount and mount extrusions - The older conical-type engine mount had tubes that were flexible enough to accomodate minor variances in the positioning of the aluminum angle extrusions in the fuselage. The new mount designed for the Lycoming dynafocal configuration has extra supports and is very rigid. Extreme care was taken to make the Brock welded mount accurate, to fit the extrusions, however normal tolerances may preclude a good fit on all airplanes. Thus, we are recommending the following method to assure an acceptable fit: Before allowing the extrusions to cure in place in the fuselage, clamp the welded mount to them. Shim with additional plies of BID if needed on the fuselage and centersection spar. Let the extrusions cure with the welded mount clamped in place.

Hot wire troughs - use the following method to separately cut the troughs. This gives more accurate, sharper cuts. Nail a temporary template ( a popsicle stick works fine) to guide the wire straight across over the trough. Then, remove the stick, and in a separate pass, cut the trough. Be careful to not let your core move between the cuts.



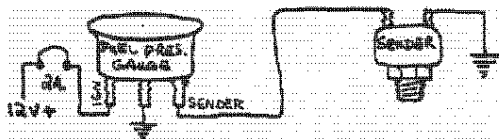
Drill a sight hole through all control push rods in order to verify that you have the rod ends screwed in with sufficient threads into the push rods. This hole should be 1/16" dia. located at 0.4" from the end of the push rod.



page 9-3, Long-EZ plans, a small 1/8" o.d. brass tube 1/2" long is called out to be used in the end of the Nylaflo brake line. In some cases the little brass tube will slip up into the nylaflo tube, and be difficult to extract. This problem can easily be overcome by using a Weatherhead tube, part # 2030X4. This little tube has a flange on it and it works great. If you cannot obtain it locally, Aircraft Spruce has them.

### Wiring the Rochester fuel pressure gauge.

Mike used Rochester gauges on his Long and they work well. The oil pressure and oil temp. gauges were straight forward to wire. However the fuel pressure gauge is a little different and some builders may not have received a wiring diagram.



We put a Marvel Shevler MA3-spa carburetor on N79RA without a primer system and since have accumulated over 350 hours on the airplane. The MA 3-spa carb has a built in accelerator pump which really makes starting the engine a lot easier, particularly in cold weather. If you plan on operating your O-235 Lycoming in cold climates, an accelerator pump or primer should be considered almost mandatory.

After you have installed your ailerons, check to be sure you have a minimum of 0.1" gap between the aileron leading edge and the bottom skin of the wing. This is necessary for protection from ice freezing the aileron to the wing. This can happen even in VMC conditions, if the wing is wet and you climb above the freezing level so do be certain to comply with this.

### Long-EZ builder hints.

Heavy Unidirectional Fiberglass Tape - The 3" wide roll of unidirectional fiberglass is used only for the spar caps of the wing and center section spar. "BID" tapes called out are cut from BID cloth (generally 45° orientation). Other UND pieces or strips are cut from UND cloth. Be sure fiber orientation is correct.

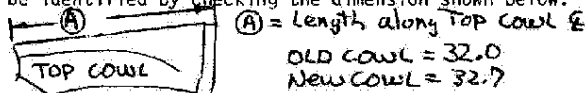
The canard inserts (page 10-2) should be drilled to match the hole pattern of CLT (page 10-3). These inserts (CLI) are available from Brock. Brock is also stocking the NG5 plate (page 13-3).

Note: the raw materials list does not include the 1/8" aluminum for these parts.

Aft fuselage side shape. A number of builders have noted that the A-5 drawing has a different shape than that obtained when fabricating the fuselage sides per the page 5-1 dimensions. This approximately 0.2" error will not present a problem if you follow these instructions: carefully follow all the dimensions on page 5-1. This will assure that the firewall will fit. Do use the 5.8 and 6.9 dimensions on A5 and be sure the extrusions are perpendicular to the top longeron. Ignore the small difference between the bottom shape and that on A5.

### Long-EZ Cowl and Canopy fitting.

As will be shown in the new Long-EZ Lycoming engine installation section (IIL), the Lycoming cowl has been moved aft 0.7" from where it was in a VariEze. This was done to provide better clearances. With the new dynafocal engine mount, the engine is moved aft also, to provide good magneto clearances and an acceptable structural arrangement for the mount tubes. The new Section IIL will show you how to fill the cowl-firewall gap when mounting the cowl using the method used on N79RA and on Mike and Sally's Long. Cowlings manufactured for Long-EZs after December 20 1980 have the lip extended to allow easier installation. These cowlings can be identified by checking the dimension shown below.



This cowl move has resulted in a miss-match of cowl-to-firewall at the top of about 0.2". Mike faired this miss-match in with dry micro, since he had already fabricated the canopy aft cover piece (Chapter 18). To avoid this micro fill, we suggest that you: trial-fit your cowl to the firewall before carving your canopy aft cover piece. If you have not cut out your firewall, make it taller at the top and trim to fit your cowl during Chapter 18. (see LPC #48).

### VariEze builder hints.

Under the thigh support, in the front seat on the right side, there will be a gap under the right console, which could possibly allow a small object stored under the thigh support to slip under the console into the area near the pitch control belcrank. This "gap" should be closed off. 1 ply of BID will do it.

We have talked to several builders lately building from 2nd Edition of the plans who have not been reading Chapter 26 (plans updates). Do update your plans with Chapter 26 and all applicable newsletters before continuing construction.

### ACCIDENTS

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

A Tennessee VariEze crashed, fatally injuring the pilot and passenger. The aircraft was observed making a low pass by his house when the aircraft hit a tree and crashed. The pilot had a reputation for this type of flying and had been warned by others in the past but to no avail. The accident was late in the afternoon and the fact that the pull out from a steep dive was into the sun could have been a factor in the pilot's inability to judge the pull out angle.

No malfunction of any part of the aircraft could be found. This flight was clearly in violation of FAR minimum altitude criteria.

### PLANS CHANGES

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

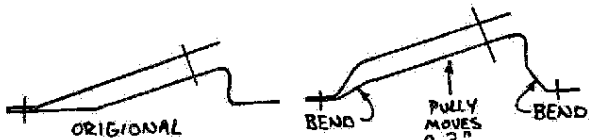
It is the homebuilder's responsibility to maintain, inspect and modify his aircraft as he desires. However, we at RAF feel that part of our job is to provide information to the homebuilder in the form of recommendations that, in our opinion, are required for him to achieve a satisfactory level of flight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

<u>Category</u>	<u>Definition</u>
MAN-GRD	Mandatory, ground the aircraft. Do not fly until the change has been accomplished.
MAN-XXHR	Mandatory. Accomplish the change at next convenient maintenance interval or within XX flight hours whichever comes first.
DES	Desired - Strongly recommended but not requiring grounding of the aircraft
OPT	Optional - does not effect flight safety
OBS	Obsoleted by a later change.
ME0	Minor error or omission.

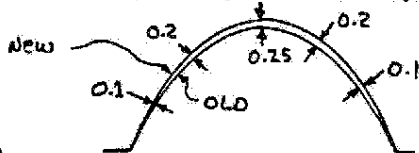
LONG-EZ PLANS CHANGES

- LPC #42  
OPT Page 4-2 add "alternate the BID and UND plies that reinforce the sides of the forward face of F-22". Note: Modification is not required if you have already installed these without alternating.
- LPC #43  
MEO Page 18-7 lower right "to firewall bulkhead" should be "to aft end of canopy frame FS 117" (two places). see page 18-5
- LPC #44  
MED Page 10-1 step 1 paragraph two, refers to two 7 x 14 x 41 blocks (two places) change this to one block.
- LPC #45  
OPT Page 9-3. Move the 3/8" holes in all four extrusions up 0.4". Also modify outlines to maintain original edge distances around the 3/8" hole. This moves the entire main gear up 0.4, resulting in an improved gear-fuselage juncture reducing aerodynamic drag.
- LPC #46  
OPT Revise F28 bulkhead by moving the longeron notch down 0.25". This raises F28, for better fit to canopy.

- LPC #47  
DES. Dut to a probable rubbing of the rudder cable on the aileron pushrod, the left hand rudder pulley bracket should be moved up 0.6". If you have already mounted the 3 bolts in the firewall such that you cannot make this change, you can provide cable clearance by carefully bending the rudder pulley bracket to move the pulley aft approx. 0.2". Bend as shown below.



- LPC #48  
DES Firewall, page A4. Increase size of firewall at top as shown to assure adequate height to fit cowling.



- LPC #49  
MEO Page 22-6 on circuit breakers, change "roll trim" to "fuel pump".

- LPC #50  
MEO Page 7-1 Section A-A. This sketch is not accurate. See page A2 for the correct full size drawing. Also note LPC #46 in this C.P.

- LPC #51  
MEO Page 10-1 step 1 refers to chapter 13 for winglets, should be chapter 20.

- LPC #52  
MEO Page 8-1. Roll over structure assembly 4.5" should be 4.0", moving shoulder harness insert outboard 1/2".



EZ-CALC

The development of the fuel flow calculator is still underway but delayed somewhat due to parts availability. We expect to be testing a mock-up unit in our airplane this month. We will also evaluate a new turbine fuel flow transducer in a gravity flow system to determine if it can be used in a standard VariEze. The dimensions are 3" x 6" x 1.5" mounted vertical and the unit will be detachable or can be flush mounted. See CP 24-7 and 26-6 for more complete details.

More foam substitutes - CP #26 listed a high density (18 lb/ft<sup>3</sup>) white urethane foam as an allowable substitute for the 16 lb/ft<sup>3</sup> R250 PV foam previously listed VariEze and Long-EZ. We are now listing a medium-density Clark white urethane foam as an allowable substitute for the 6 lb/ft<sup>3</sup> PV R100 (light red) foam. See the table below. The distributors may be supplying either type for a temporary period. We have no plans for any substitution of the PV R45 dark blue foam in the Long-EZ list. Its superior peel strength and damage resistance justify its higher cost.

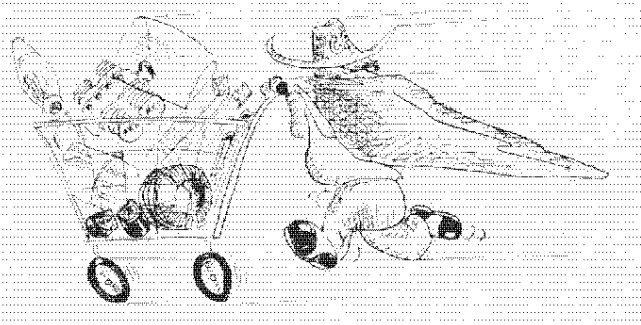
VariEze

Old Specs.	New allowable substitute
R100 6 lb/ft <sup>3</sup> (light red) 2 pcs. 90cm x 80cm x 9mm	6 lb/ft <sup>3</sup> Clark (white) 3 pcs. - 3/8" x 24" x 48"
6 lb/ft <sup>3</sup> (light red) 2pcs. 90cm x 30cm x 9mm	6 lb/ft <sup>3</sup> Clark (white) 1 pc. - 3/8" x 24" x 48"
6 lb/ft <sup>3</sup> (light red) 1 pc. - 15cm x 27cm x 25 mm	6 lb/ft <sup>3</sup> Clark (white) 1 pc. - 1" x 6" x 12"

Long-EZ

Old Specs.	New allowable substitute
R100 6 lb/ft <sup>3</sup> (light red) 1 pc. - 1" x 6" x 10"	6 lb/ft <sup>3</sup> Clark (white) 1 pc. - 1" x 6" x 12"
6 lb/ft <sup>3</sup> R100 (light red) 2 pcs. - 0.25" x 35" x 44"	6 lb/ft <sup>3</sup> Clark (white) 3 pcs. - 1/4" x 24" x 48"

CP 27 Pg 7



#### SHOPPING

Aircraft Spruce and Wicks stock a safety kit which includes -  
 50 gloves  
 1 pair goggles  
 12 dust masks  
 1 can hand cleaner.

The kit costs approximately \$25.00 and we have found them to be most useful.

Aircraft Spruce would like to request that overseas customers order all finishing materials that they may require (featherfill, primer, surfacer etc) with their initial order, so that all of it may be shipped by surface vessel. Flammable materials cannot be shipped by air due to regulations. So if you wait until you need finishing materials, you will not be able to get them very quickly, as they will have to go by surface vessel.

Both Aircraft Spruce and Wicks will have the 3.40 x 5 wheel pants in stock in February. These are suitable for both VariEze and Long-EZ. They will also be stocking wheel pants for 500 x 5 tires (Long-EZ). Contact them for expected date.

Ken Brock Manufacturing catalogs are \$3.00 and this is not refundable with an order. Catalogs cannot be sent out C.O.D.

Ken Brock is now manufacturing the heavy 1/2" aluminum main gear mounting extrusions. They incorporate the 0.4" move (plans change #45) and also have 3/8" dia flanged steel inserts for improved durability. Part numbers are - Aft: LMGB-RA and LMGB-LA, Fwd: LMGB-RF and LMGB-LF. The forward parts are supplied without the large lightening holes, so VariEze builders can saw off the top 1" to install a Long-EZ gear on a VariEze.

#### PRICE INCREASE ON GEAR.

Due to increases in materials and labor costs we are having to increase the price of the S-glass parts. Effective 1 February 1981 the new prices are:

NG-1	\$309.00
MG-1	\$ 55.55

Backlog on these parts is approximately 9 weeks. Main gear are shipped Greyhound, freight collect. Nose gear are shipped UPS. Please be sure to include your phone number with orders.

#### Video Tape of Moldless Composite Construction -

RAF had a crude preliminary version of an educational video tape on glass/foam construction at the booth last year at Oshkosh. Many have asked for copies of the tape when it has been shown at our weekly Saturday demo. We have investigated the costs of producing an improved version for sale in the 1/2" home video formats of VHS and Beta II. We currently plan to have the tapes available by late February, contact us at that time for prices.

#### VARIVIGGEN NEWS by Mike Melvill

Wayne Wilkins reports good progress on his Viggen 12VV. He sent in a bunch of photos and has his main gear and nose gear installed per N27MS, and is happy with it. It looks excellent in the photos. Wayne's Viggen is skinned on the bottom and is on the gear.

Ken Winter, Tulsa Ok. is working on composite SP outboard wings. Inboard section is basically complete. Ken may be the next Viggen to fly.

Orvill Winfield also has the N27MS main and nose gear and his looks great in the photos. His Viggen is upside down on saw horses and he is skinning the bottom.

Arthur Schwartz' Viggen now has 16 hours on it and Arthur is very pleased with it. The problems we reported in CP 26 page 9, have been corrected and Arthur reports that his Viggen is hands off now and he really is enthusiastic about it. N27MS is flown here at Mojave about every Saturday but since returning from Oshkosh, has not been on any trips, she now has 480 hours.

#### RAF MODEL 58 PREDATOR UNVEILED

We are using this newsletter to announce a development program that has been underway at RAF since late 1978 on a new agricultural aircraft. The design came out of a feasibility study done by RAF for Mr. David Record. The requirement was for an efficient, high-capacity aircraft using the PT-6-34 turboprop engine. The span had to be long for maximum swath width. Stall/spin resistance, visibility and pilot crash protection were also prime considerations.

After evaluating several configurations, a connected-tandem wing arrangement was judged best for the requirement. This arrangement allows a long span and provides low induced drag. The chemical hopper at the cg does not interfere with wing structure. The pilot's position in the large vertical fin allows improved protection and visibility. The elevators, on the inboard forward wing provide pitch and 'direct-lift' control for improved ground-proximity flying qualities. Differential ailerons on the outboard wing provide roll and proverse yaw without a pitch trim change. There are no controls on the aft wing. The inclined bracing of the wings allows an extreme span without excessive structural weight.

The RAF Model 58 will have satisfactory climb performance at its gross weight of 12,300 lb. (6700lb in the hopper) in a 1.5-g turn. Current ag aircraft using the same engine have marginal turn performance using only 4200 lb payloads. Maximum L/D for the Predator is over twice that of current ag aircraft. Combining advantages of payload, speed, swath width, turn performance, ferry speed and fuel flow, results in a productivity of greater than twice that of current ag aircraft.

The concept of joining tandem wings is not a new one. It was originated in the 20's by Norman Warren and Rex Young of England. Wind tunnel tests were later done by Darroll Stinton and Warren using the concepts earlier proposed. More recently, Dr. Julian Wolkovitch, an aerodynamicist from California, used joined wings on a recreational glider prototype. He has proposed several configurations of wing joining, to make maximum use of the structural benefits of the bracing achieved with large dihedral angles. The Rutan-designed Predator Model 58 has undergone extensive wind-tunnel tests conducted by NASA's dynamic stability branch at Langley, VA. Those tests are directed by Joe Chambers and Joe Johnson who have had the foresight to keep alive an aging 12-foot wind tunnel to investigate many interesting aerodynamic theories and configurations. The wind-tunnel test (see photos elsewhere in this newsletter) program has solved several stability deficiencies and confirmed the performance of the Predator configuration.

Details of the development plans for Predator cannot be released at this time. When an announcement can be made it will be in the Canard Pusher.



**IMPORTANT! WRITE RAF IF YOU HAVE A RAF-DESIGN FLYING**

The following paragraph was printed in CP #25, but we have had a poor turnout of letters from the owners. This list and the CP newsletter is our only means of notification of safety bulletins. If you have a airplane that has flown, please scan the list below then drop us a card or letter with the needed information. Also, if you have not already done so, please send a photo of your aircraft to the Historian of the International VariEze Hospitality Club - Irene Rutan, 8526 Caimada, Whittier, Ca 90605.

RAF maintains a list of completed EZ's so we can contact you direct in the event of a flight-safety-related problem requiring an emergency directive. This list is also beneficial to access statistical items relating to structural and systems reliability. The list is, of course, kept in confidence. A printout of registration numbers is shown below. We believe there are about 100 flying VariEzes that are not on our current list. If you have an EZ flying please scan this list to find your number. If you are on the list please write RAF and tell us the date of first flight and the current total flight hours. If you are not on the list please write and supply:

1. Type - (Long-EZ, VariEze, VariViggen)
2. Name of Owner
3. Address
4. Date of first flight.
5. Registration number (N-number)
6. Total hours.

1 N9283A	54 N899EZ	107 N34RD	160 N21LR
2 N78LM	55 N78248	108 N12CN	161 N2JN
3 N83DL	56 N36EZ	109 N48EZ	162 N25RH
4 N6SB	57 N7110B	110 N77EJ	163 N13EZ
5 N1WX	58 N35EZ	111 N4985Z	164 N60EZ
6 N999EZ	59 N4WH	112 N808CM	165 N9608A
7 N51975	60 N15LL	113 N77LF	166 N78JK
8 N78EZ	61 N216EZ	114 N666EZ	167 N322EZ
9 N747U	62 N124G	115 N3VE	168 VHEZK
10 N9HR	63 N9783A	116 N67EZ	169 N9RC
11 N?	64 N300EZ	117 N770DY	170 N500EZ
12 N4CM	65 N37913	118 N50RW	171 N115EZ
13 N7WC	66 N84ST	119 N837	172 N51820
14 N91CL	67 N?	120 N295EZ	173 N139EZ
15 N16BG	68 N9113A	121 N76WJ	174 N222SK
16 N7EJ	69 N13CF	122 N39EZ	175 N37EZ
17 N747TC	70 N95BC	123 N34MB	176 N89EZ
18 N65H	71 N253EH	124 N4ZZ	177 N98EZ
19 N5021Y	72 N7ER	125 N66EZ	178 CGHYD
20 N22802	73 N123EZ	126 N?	179 N2VE
21 N78SP	74 N34RD	127 N27CP	180 N36SD
22 N2NP	75 N9783A	128 N234EZ	181 N999JD
23 N?	76 N9693A	129 N?	182 N70VE
24 N90331	77 N27CP	130 N18VL	183 VHIWS
25 N224DC	78 N281	131 N?	184 N103B
26 N6RM	79 N101EZ	132 N17DR	185 N44EZ
27 N51WC	80 N45N	133 N5WZ	186 N22803
28 N27CH	81 N6EZ	134 N41GL	187 F-PYHZ
29 N301RW	82 N81JC	135 N808CM	188 N77TJ
30 N1798B	83 N34VE	136 N?	189 N40EZ
31 N36RJ	84 N?	137 N26EP	190 N245EX
32 N3AX	85 N45846	138 VHDED	191 N11SK
33 N95DB	86 N752EZ	139 N27EZ	192 N99VE
34 N344SP	87 N28JF	140 N3KJ	193 N11SQ
35 N10	88 N13CG	141 N90395J	194 N55VE
36 N46JT	89 N?	142 N?	195 N24RW
37 DEEEZ	90 N17EZ	143 N7EZ	196 N2CR
38 COMEZ	91 N240EZ	144 N4EZ	197 N37517
39 N111EZ	92 N21DN	145 N23FF	198 N45790
40 N?	93 N37S	146 NGLASS	199 N681JB
41 N79PJ	94 N7840	147 N5EP	200 N?
42 N?	95 N115AM	148 N56EZ	201 N13MW
43 N57EZ	96 N98CG	149 N8037T	202 NROJG
44 N2280K	97 N95F	150 N50EP	203 N10ZM
45 N8886	98 N25LP	151 N?	204 N?
46 N2TV	99 N33ST	152 N1WX	205 N?
47 N27RG	100 N4588A	153 N60HD	206 N?
48 N575JW	101 N6LK	154 N2286A	207 N3050
49 N22809	102 N29CE	155 N886	208 N77NS
50 N6459	103 N64CB	156 N859	209 N?
51 N378	104 N477CM	157 N46EZ	210 N80EK
52 NCGVEZ	105 N20VE	158 N877EZ	211 N80PB
53 N78PD	106 N9036G	159 N51935	212 N27GM

213 N101LE	225 N62MV	237 FPHYR	249 N1055K
214 N43TM	226 N13WM	238 N?	250 N20VE
215 N248G	227 N99FW	239 HB-YBG	251 N2PRR
216 N1050G	228 N857EZ	240 N8477T	252 N70VE
217 N34HA	229 N40LC	241 N39DP	253 N88EZ
218 N810TC	230 N15RL	242 N3762B	254 N5ZY
219 N24EZ	231 N16DT	243 N78BN	255 N8886
220 N32LP	232 N8021B	244 CGLJZ	256 N5021Y
221 N80681	233 N76PG	245 N86DH	257 N47EZ
222 N25RR	234 N56LC	246 N55VE	258 N34VE
223 N37LL	235 N80PW	247 N797MM	259 N14533
224 N45CR	236 N7AH	248 N67TR	

Comments from Jud Bock - "I have installed the Long-EZ nose and main gear on my VariEze so I am sure I will have a lot better landing gear system, but it is making me even more overweight than I already was. I decided the best thing to do about it was to lose 30 excess pounds off of my 230 lb body, which I have almost accomplished. Also my wife has lost nearly 20 lbs, so the 17 or 18 extra lbs I picked up on the bird is more than compensated for by the 50 lb weight loss of my wife and myself. I attend Weight Watchers and you can rest assured I am the only one in the class who isn't losing weight because of a woman or a man. My white, red and blue mistress has put on weight, so in order to be compatible with her, I had to lose or else become a single place pilot".

Fuel venting - Long-EZ

The Long-EZ fuel vent lines in the wing are positioned so their inlets are above the fuel level in level flight or climb. Thus air expansion with altitude increase is expelled out the vents with no fuel loss. However, when parked nose down with a large fuel load, the vent inlets are submerged. If the fuel caps were perfectly sealed, expansion on the ground due to rising air temperature could force some fuel out the vents. The fuel caps used in the Long-EZ do not provide an air-tight seal around the dzuz-head. Thus, this parked fuel loss will not occur. If you install a tightly sealed cap, like those on Mike and Sally's Long, consideration must be given to expansion. A tiny hole in the fuel cap will do, or you can install a second vent line with it's inlet at the far aft inboard top of the tank. This vent must be routed to the same outside location and orientation (into the airflow) as the other vent. We have tested an alternate configuration consisting of a small hole in the existing vent line where it enters the tank, however this configuration results in fuel loss in a climb.

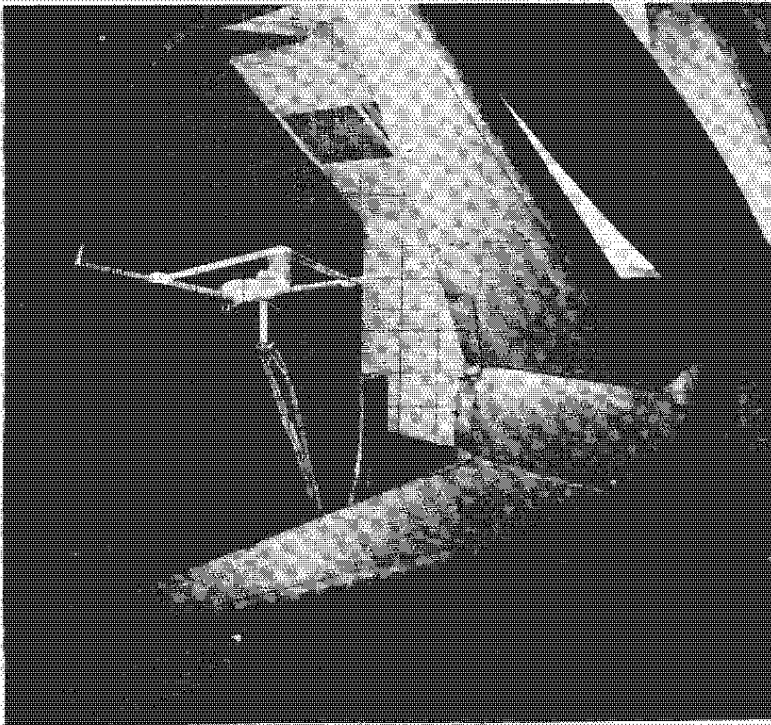
FLIGHT TEST DATA

Capt. Ken Swain of Travis AFB, Ca., has recently conducted an extensive set of tests to document the performance of his O-235-F VariEze using his newest-configuration Scimitar prop. Data for his super-performing VariEze are presented below. Of significant note is the passive "constant-speed" action of the prop: full power climb at 80 mph results in 2800 rpm and at maximum speed in level flight (217 mph) rpm is only 2950. This results in a significant improvement in takeoff performance over a conventional prop that lugs the engine down to 2500 rpm at low speeds. Scimitar props have been flying since the 30's. However, they have not had adequate structural reliability. If a reliable full-Scimitar prop can be built, we will see very substantial low-speed performance increases in our high-speed fixed-pitch aeroplanes.

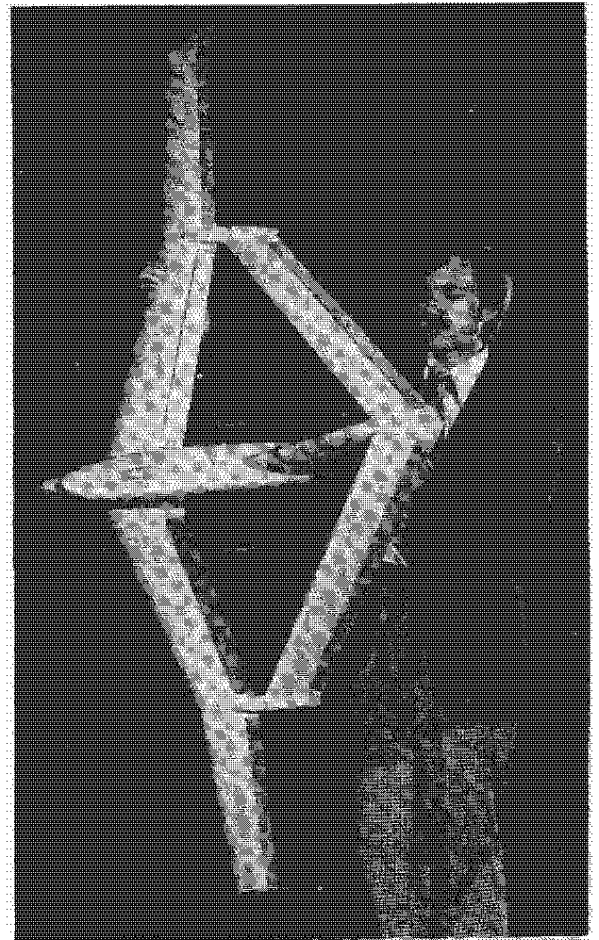
LEVEL FLIGHT SPEED-POWER				VARIABLES	0-235-F2B	3 NOV 80					
ALT 29.92 Hg	V <sub>i</sub> KIAS	OAT °C	RPM	MP IN Hg	% POWER	KTAS	TAS MPH	DENSITY ALT FT	BOOK GAL/HR	CALCULATED	
										MI/GAL	
1000 FT	80	24	1750	15.5	31	83	96	2300	3.0	32.0	
	100	24	1875	16.9	36	103	119	2300	3.4	35.0	
	120	23	2150	18.6	45	124	143	2200	4.2	34.0	
	140	24	2425	20.7	57	145	166	2300	5.2	31.9	
	160	25	2675	22.9	72	166	191	2400	6.7	28.5	
FULL THROTTLE	V <sub>h</sub> =181	25	2950	27.6	100	188	217	2400	10.7	20.3	
5000 FT	80	17	1825	14.9	29	88	102	6100	2.8	36.4	
	100	18	2075	16.2	38	110	127	6200	3.6	35.2	
	120	17	2325	17.8	46	132	152	6100	4.3	35.3	
	140	18	2675	20.0	63	154	178	6200	5.7	31.2	
	160	18	2825	22.8	79	174	201	6200	8.1	24.8	
FULL THROTTLE	V <sub>h</sub> =164	19	2875	23.8	85	181	209	6300	8.7	24.0	
7000 FT	80	14	1850	14.8	29	91	105	8500	2.8	37.5	
	100	14	2100	15.9	37	114	134	8500	3.5	38.3	
	120	15	2425	17.5	49	136	157	8600	4.5	34.9	
	140	16	2725	19.3	61	159	184	8700	5.5	33.4	
	FULL THROTTLE	V <sub>h</sub> =156	17	2850	22.0	76	178	206	8800	7.5	27.4
11000 FT	80	9	1925	13.6	29	97	112	12900	2.8	40.0	
	100	8	2175	14.9	37	121	140	12800	3.5	40.0	
	120	8	2525	16.2	49	145	168	12800	4.5	37.3	
	140	10	2775	18.5	61	170	196	12900	5.5	35.6	
	FULL THROTTLE	V <sub>h</sub> =144	10	2825	19.0	66	175	202	12900	6.0	33.6
15000 FT	80	0	2050	12.8	30	103	119	16600	2.9	41.0	
	100	0	2375	14.1	39	129	149	16600	3.7	34.8	
	120	0	2750	15.2	50	155	179	16600	4.6	33.7	
	FULL THROTTLE	V <sub>h</sub> =128	0	2775	16.3	55	165	191	16600	5.0	33.0

SAWTOOTH CLIMB - FULL THROTTLE				VARIABLES	0-235-F2B	3 NOV 80				
H <sub>i</sub>	H <sub>e</sub>	V <sub>i</sub> KT	ΔT <sub>30</sub>	AVG MPH	RPM	MPH	CLIMB RATE MPH	% POWER	AVG DENSITY ALTITUDE	58X73 SCIMITAR PROP
1000	2000	70	41	24.7	2800	17°	1463	93	2100	
		80	33	26.7	2800	17	1818	93	2100	
		90	30	26.7	2800	17	2000	93	2100	
		100	31	26.7	2800	17	1935	93	2100	
		110	33	26.7	2825	17	1818	94	2100	
		120	42	26.7	2825	17	1428	94	2100	
3000	4000	70	46	24.9	2750	15°	1304	86	4200	
		80	39	24.9	2750	14	1538	86	4200	
		90	38	24.9	2750	14	1579	86	4200	
		100	41	24.9	2750	14	1463	86	4200	
		110	43	24.9	2800	14	1395	87	4200	
		120	44	24.9	2800	14	1364	87	4200	
8000	9000	70	63	20.8	2750	9°	952	71	9800	
		80	60	20.8	2750	9	1000	71	9800	
		90	57	20.8	2750	9	1053	71	9800	
		100	57	20.8	2750	9	1053	71	9800	
		110	61	20.8	2750	9	984	71	9800	
		120	69	20.8	2775	9	870	72	9800	

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Pg 10



Predator Ag-plane in the wind tunnel. Photo courtesy of NASA.



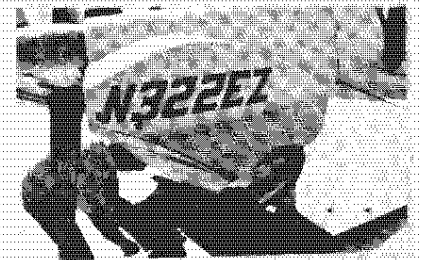
Richard White, at NASA Langley with the original Predator wind tunnel model.



Well folks - it's done!!



Getting ready for 2nd flight of N26MS.



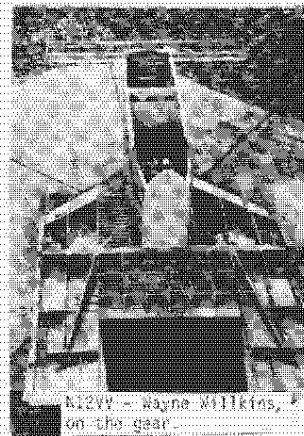
Mike DeFate, from San Diego has installed this "quiet" exhaust system on his VariEze. It was designed and built by Rudi Kurth, and Mike reports that it is quieter than the standard exhaust system. Anyone interested in this should contact Rudi Kurth, Langgasse 51, CH-3292 Busswil, Switzerland.



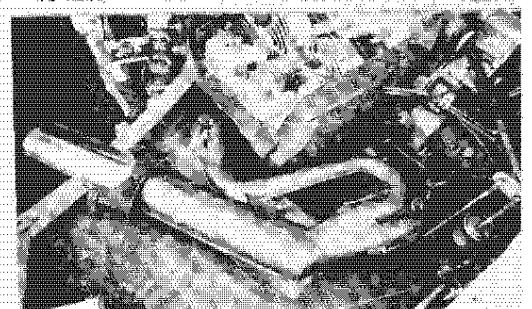
N26MS - first flight with prototype 79RA.



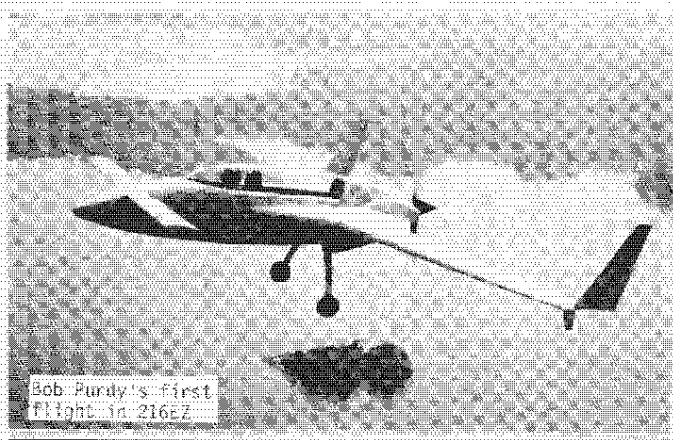
Sally and son Keith rolling N26MS over in their garage. A winch holds the aft end up by the prop extension. A rafter was removed to allow the roll.



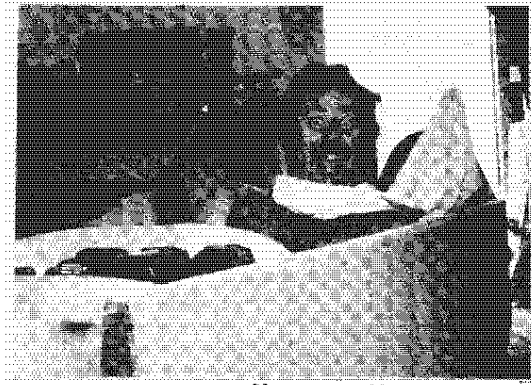
N12VV - Wayne Millkins, on the gear.



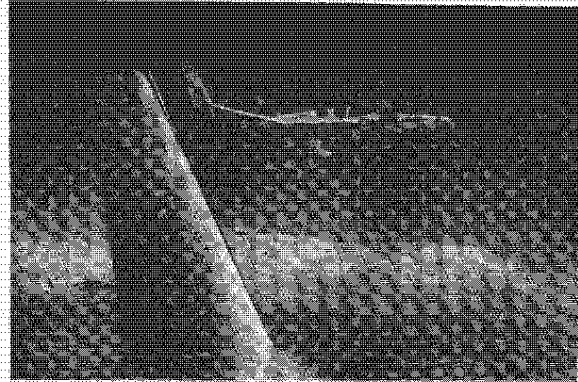
In Switzerland, homebuilts have to meet strict noise controls, and Rudi has developed this system on his own VariEze and has over 200 hours on it now.



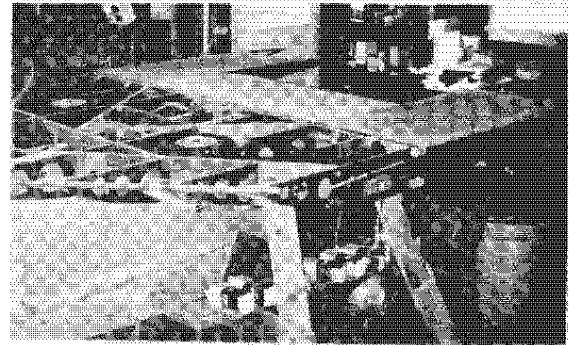
Bob Purdy's first flight in 216EZ



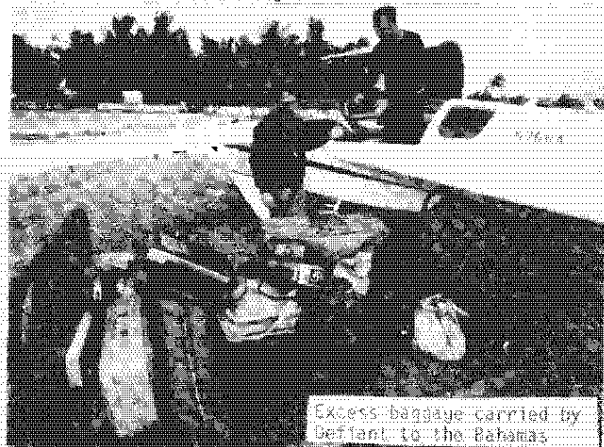
Clarence Willwerth flying his fuselage around the garage



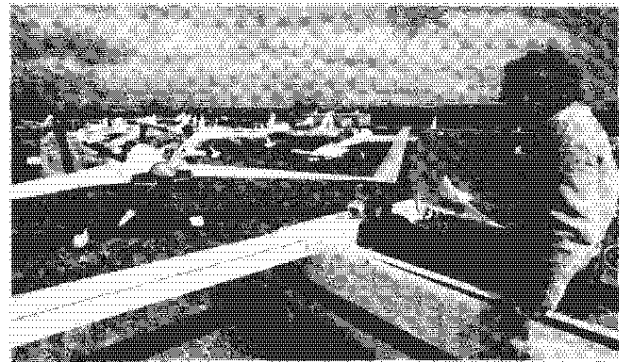
The Tiffits and Defiant on the way to San Andros with no land in sight!



Orville Winfield, VV being skinned.



Excess baggage carried by Defiant to the Bahamas



Mule Ferguson entertaining the troops at San Andros.



Sleepy Ed Hamlin catching 40 winks!



Bruce and Bonnie Tiffits' best enroute to San Andros.

Our trip organizer: Bonnie Tiffit



The following letter was received just at press time for this newsletter. With Victor's permission we are printing it:

Dear Bert and Company,

Thank you for your Christmas card. It found me recovering from a crash landing of my Veri-Eze and with even more respect for the design. On November 11, 1980 I was ~~was~~ working to take off the 40 hours a bit at a time. We had about 30 minutes before dark after work (my second mistake) to get a few trips around the patch. Mary-Kate and I had decided to install the new Long-Eze elevator trim but I over-ruled and decided to put it off until certification (my first mistake.) I wanted to complete the 8 hours remaining to my certification as soon as I could.

After one touch and go I was climbing out about 600-700 AGL when I eased the stick forward to level off at 800 and nothing happened. The bolt between BC4W10 and CS136 had come off. I immediately called "Mayday" and requested emergency equipment. I thought I was dead. However, I realized 62MV was still climbing so I began to analyze my possibilities. I could not reach past my right leg to reach CS136 so I experimented with power changes. I found that at about 80 MPH indicated the nose would begin to drop and at about 120 MPH it would pick up. The initial oscillations must have been 200-300 feet up and down. I found by careful throttle changes and by moving my body forward and backward I could greatly reduce the up/down changes, but I still was faced with only gross control. I flew 3 patterns, about 15 minutes, and on the last down wind discovered I could touch the elevator balance weight with my right toe. Holding about 100-110 MPH and using the toe technique to give progressive downward dips I made my final approach to runway 10 (4000' long) into a 5<sup>0</sup> right wind of 5 to 10 knots. At about 30 to 50' feet AGL, darkness made judgement poor, I was almost to the runway when the nose began its upward cycle at about 80 MPH. Knowing I would not stand another cycle, especially the 120 mile per hour dive I cut power and dropped it in. At the same time I cut power I deployed my landing brake, I probably should not have used the landing brake since it does tend to increase the sink rate.

The landing was just about 20 feet short of runway 10 in a slight left turn so that I skidded across the corner of the runway and onto the grass beside the runway. I came to a stop in the newly planted wheat field about 20 feet from the runway. I had lowered the nose gear to take up shock as well as the possibility I could make a controlled landing. The nose gear push rod bolt sheared, the main gear attach tabs on the gear sheared or split and the lower cowl was crushed. The intake spider broke and the carb separated as did the gascolator and intake hose. The oil pan was crushed and the bottom 3" of the firewall cracked and bent aft about 15<sup>0</sup>. We hit so hard that the pilots seat area broke and combined with skidding across the runway made a hole clear through the pilot compartment floor about 3" from the left console and about 9" wide by 20" long. I was able to turn everything off, release my harness and climb out. I noticed severe pain in my back so decided to lie down because the ambulance was pulling up. I next woke up in the ambulance on the way to the hospital. I suffered shock and two cracked vertebra #L2 and L3. After 11 days in the hospital and a month at home I am feeling pretty well. I will wear a back brace for at least another month but should not have any future problems.

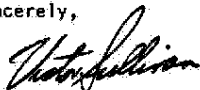
Why did the nut (MS210042-4) come off? I don't know. I may not have had it on all of the way but I am sure I did because I had developed the habit of checking for 2-3 threads through the nut. The canard and of course this nut had been off about 10 times for work on the electrical and instrument systems. Do such nuts wear out? The nut and bolt are included for your inspection. I find I can get it on to almost one thd. with just my fingers. The FAA inspector was Glenn Martin of Wichita GADO. He was just as surprised as I to find out that a VariEze will fly without elevator control.

N62MV normally trimmed out level with a slight nose down force required. I was able to correct it with the original spring trim system. At the time of this flight I had 2 gal. in the fuselage tank and about 7 gal total in the wing tanks. The engine is an A80-8 and the original long canard is installed.

I expect to wait about a year before repairing the plane. What do you think of having the main gear strut and wing attach areas x-rayed? There doesn't appear to be any damage to the wing or canard attach fittings or surrounding areas. Both lower winglets were ripped off, right rudder was destroyed and of course the gear and gear attachment area. The enclosed photos were taken by Glenn Martin. I would like to have them back because they are all I have. Enclosed find SASE.

Thanks again for an outstanding design. If you would to question me please feel free to call.

Sincerely,



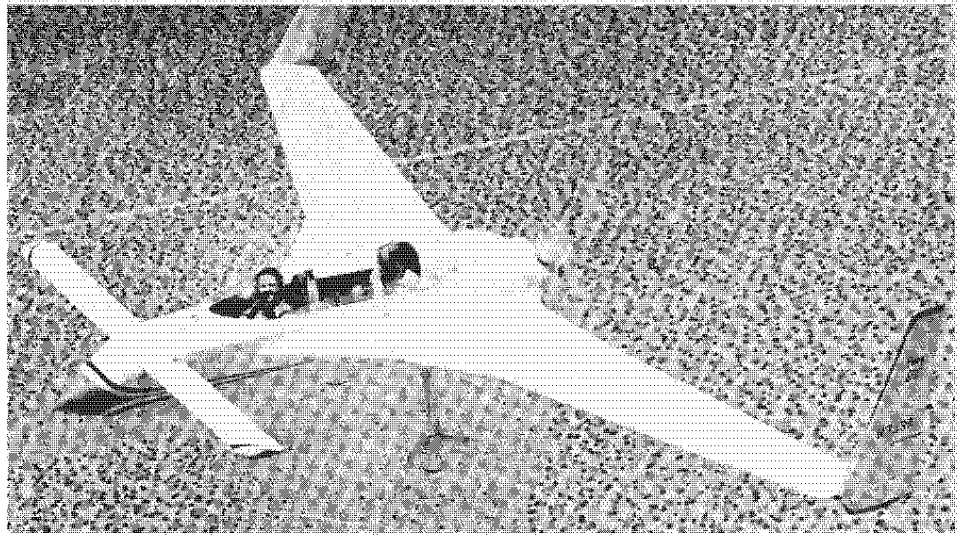
Victor Sullivan

It should be emphasized that an elevator disconnect downstream of the trim system will not necessarily result in the amount of control Victor was able to achieve. Any small inconsistency in elevator shape could result in a very low or very high trim speed. Victor had rejected his original elevators and built new ones to a more accurate shape - he probably could not have survived a control disconnect with the original ones. The new trim system, of course, could have allowed a satisfactory amount of control and safe landing.

We have inspected the bolt and nut and found it is of the proper length and that the locking friction, though reduced from new condition, seems adequate for proper safetying. It appears improbable that it could have been tightened properly. Victor agrees that it may be possible that he was distracted during canard installation and might not have tightened the nut beyond finger tight. Even the most critical items can be overlooked by the most competent mechanic. For example, one VariEze attempted a takeoff without the 2 bolts that hold the canard on - the canard flew off when the pilot pulled the stick back for rotation. Builders should follow the accepted practice of replacing critical locknuts after several repeated installations (discard any fiber-lock nuts after one use). Also, discard any bolt or nut that has any sign of reduced locking friction.

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# LONG-EZ



FAST - EFFICIENT - HIGH UTILITY - LONG RANGE

## THE AIRPLANE

The Long-EZ is a small, high-performance, high-utility homebuilt sportplane. While recommended mainly for day-VFR operation, competent pilots can also equip it for night and IFR flying. The recommended power plant is any model of the O-235 Lycoming. Note that

a mechanical fuel pump is required. It has an alternator-powered electrical system and can be equipped with electric engine starter. Its cockpit layout is designed to complement pilot work load, with throttle, mixture, carb heat, pitch trim and landing brake controls on the left console and side-stick controller on the right console. Seating provides correct armrest, lumbar, thigh, and headrest support allowing "recliner-chair" comfort not found in conventional aircraft seats. This allows long, fatigue-free flights. The inboard portion of the large wingstrakes are used as baggage areas, accessible from the front and rear cockpit. These, combined with special suitcases and three other storage areas, provide nearly 10 cubic feet of baggage room.

The airframe structure is a sandwich of high-strength fiberglass facings with a core of rigid closed cell foam. Extensive use is made of the new type R45 PV core foam (poly vinyl). The facings are laid up directly over the shaped core, thus expensive tooling is not required. Flying surfaces are full-core reducing complexity, increasing contour stability, and improving corrosion resistance. As compared to conventional metal and wood, composite sandwich structure offers less construction time, more uniform stresses, improved fatigue life, better environmental resistance, and increased surface durability.

## TRAVELLING MACHINE

At last, an airplane that is specifically developed for efficient, high speed, long range traveling with room for two adults and plenty of baggage. Fuel allowance with two adults is 38 gallons. Single place, you can carry 52 gallons! If you're in a hurry, you can cruise at 75% power at 8000 ft at 185 mph (161 kts) burning 6.51 gallons per hour. This will take two of you from Los Angeles to Seattle or Chicago to Daytona Beach non-stop (965 miles), in 5.2 hours with a 40 minute fuel reserve. If you're not in a hurry, you can cruise "economy" at 12000 feet at 144 mph (124 kts), burning only 3.42 gallons per hour. This will take two of you from New York to Dallas non-stop (1430 miles) in 10 hours with a 40-minute fuel reserve. Single place, using the entire 52 gallons fuel capacity, stretches the maximum range and endurance to over 2000 miles and 16 hours!

The prototype has exceeded these figures on several occasions: longest two place trip, 1840 miles at 175 TAS, with 50 lb. baggage. Maximum level flight speed, 193 mph.

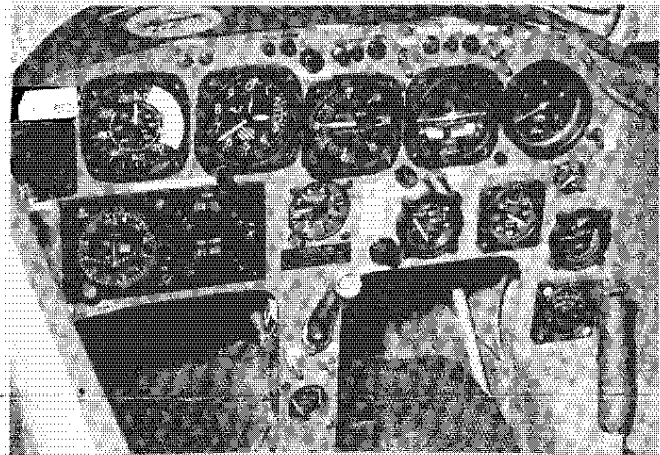
## UNUSUAL EFFICIENCY

The Long-EZ uses the very latest aerodynamic technology, combining winglets, a high aspect-ratio wing with Eppler airfoils optimized for efficient cruise, and a configuration with far less wetted area than conventional airplanes. As a demonstration of its efficiency, our prototype with a large rear-seat fuel tank flew over 4800 miles, setting a world's distance record, and landing with enough fuel to surpass 5000 miles. At that, its capability was not taxed - its initial climb rate was over 600 ft/min! At light weight, it climbed to 27000 ft in still air - an altitude unheard of, for a fixed-pitch, non-turbocharged airplane. Out Long-EZ is so efficient, the engine can be shut down while at 5-ft altitude over the numbers at only 120 knots, then it can pull up, fly a 360 degree pattern and land on the same runway - completely without power! Its power-off glide angle is only 3.7 degrees - thus a belly mounted drag devise (landing brake) is used for landings.

## SUPERB FLYING QUALITIES

Development of the Long-EZ included flight testing of many refinements to optimize flying qualities. It is a very solid, stable airplane that has responsive ailerons, good turbulence response, excellent "hands-off" stability and docile stall characteristics. It resists stall or spin even when maneuvered sharply to full aft stick. Flight test show the prototype to be free from stall departures and spins for all type of entries, including tailslides. Climb is excellent, even at the full-aft-stick speed. Trim changes due to power, gear retraction or landing brake are all very small. Its wide cg range allows a large range of pilots or passengers weighing up to 250 lbs.

The Long-EZ's approach and landing speeds are 75 mph (65kts) and 60 mph (52 kts) at normal landing weights. The approach and landing are docile and conventional. Forward visibility is excellent even during a "full stall" touchdown - a considerable improvement over our earlier VariEze.



## THE HOMEBUILDER SUPPORT

The plans are a literal education in using the materials and is a detailed step-by-step guide to construction using an illustrated format not common in aircraft plans. The Rutan newsletter, the "Canard Pusher" published since mid 1974, updates plans, provided building hints etc. Complete owners manual provides all necessary information for initial testing and for normal and emergency operations.

## THE TEST PROGRAM

The test program was probably the most extensive and successful ever conducted on a homebuilt. It included basic flight tests for flying qualities, performance and systems, spin and dive test to FAR part 23 requirements, static load tests and landing gear drop test exceeding part 23 criteria, environmental/thermal tests on structural materials/components, manufacturing methods testing, and many others.

## COST AND BUILDING TIME

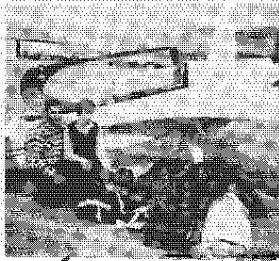
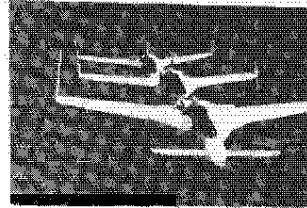
The complete package of raw materials available from the two distributors listed, including all fiberglass, epoxies, foams, fillers, sheet metal, tubing, hardware, control system materials, plumbing, tires, wheels and brakes costs about \$3200. Any of these items can be purchased separately. We strongly recommend that you get the distributor's catalogs to familiarize yourself with the materials. A complete bill-of-materials is in the plans.

The 5-glass roving molded structural fiberglass main gear and nose struts are available from RAF, at \$277.95 and \$49.75 respectively. Many other prefab parts ranging from propellers, cowlings, canopies and welded engine mounts to small aluminum brackets and bushings can be purchased from the listed manufacturers. All those prefab parts cost approximately \$2000 - and using them, the competent builder can build a Long-EZ in as little as 800 man-hours. The budget-minded builder may elect to build most of these prefab parts himself, using the drawings in the plans. His building time would exceed 1500 hours and he would save most of the above costs of the prefab items. Contact the manufacturers for their catalogs showing available prefab parts. These are also listed in the plans bill-of-materials.

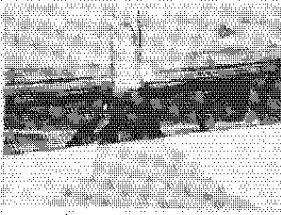
Engine costs vary widely. Our prototype has an O-235 Lycoming, that had 1400 hours when purchased, for \$1500. It has 600 hours to overhaul and will be worth then, about what we paid, thus this is a very economical way to go. Newly overhauled or new engines can cost from \$3000 to \$6000. Engine accessories, such as instruments, prop extensions etc. cost about \$300 to \$500.

In summary the total cost can run from \$5800 for a basic airplane with a 3/4 runout engine and owner-built prefab parts, to \$10,400 for everything available purchased on a zero-time engine. IFR avionics can add from \$2000 to \$15,000 to those numbers, with many options available.

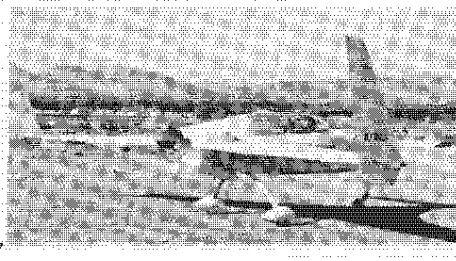
Brief Long-Ez specifications/Performance			
Engine Lycoming O-235 108 hp.			
Span	26.3ft	takeoff (solo/gross)	550/830 ft
Area	94.1sq.ft.	Climb (solo/gross)	1750/1350 fpm
Empty Basic	710 lb.	Cruise 75% 8000 ft	183 mph
Empty Equipped	750 lb.	Cruise 40% 12000 ft	144 mph
Solo Weight	960 lb	Max range * 75% (solo/2 place)	1370/965 mi
Gross Weight	1325 lb.	Max range * 40% (solo/2 place)	2010/1430 mi
Max Fuel	52 gal.	Ceiling (solo/gross)	27000/22000 ft
Cabin L/W/H	100/23/37 in.	Landing dist. (solo/gross)	450/680 ft.
*40-minute reserve			



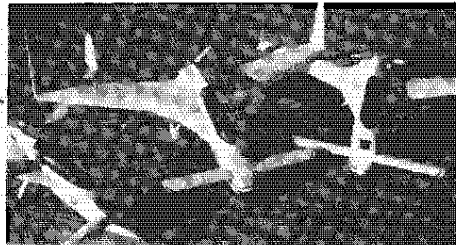
This amount of baggage fits nicely in the Long-EZ baggage areas. Baggage is accessible in-flight



Sally McVill taxiing out for her first Long-EZ solo flight



Long-EZ parked nose-down with two VariEzes



### 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.

**SECTION II - ENGINE INSTALLATION** - This is a set of drawings and construction manual 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.

**SECTION IIC - Lycoming O-235**

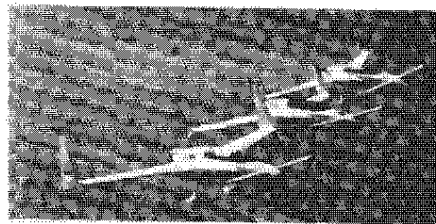
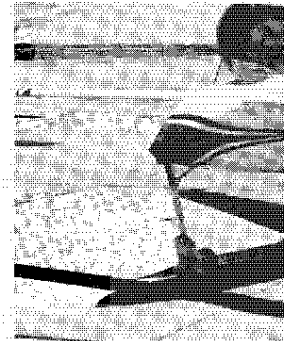
**OWNERS MANUAL** - This is the required operations handbook and checklists, including normal and emergency operation, detailed flying qualities and performance charts, maintenance, maiden flight procedure, and pilot checkout.

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

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

The nose gear retracts for parking and in flight

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



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<input type="checkbox"/> "Canard Pusher" newsletter. Published quarterly. One year subscription. Approx 10,000 words per issue.	6.75	8.75
<input type="checkbox"/> Long-EZ plans. Section I	198.50	212.50
<input type="checkbox"/> Section IIC Lycoming	21.50	23.50
<input type="checkbox"/> Long-EZ Owners Manual	9.00	10.50
<input type="checkbox"/> Long-EZ Landing Brake	10.00	11.00
6% tax, if Calif. order Newsletter not taxable.		
TOTAL		

THE FOLLOWING ARE RAF-AUTHORIZED DISTRIBUTORS OF LONG-EZ MATERIALS AND COMPONENTS. CONTACT THE DISTRIBUTORS AT THE ADDRESSES SHOWN FOR THEIR CATALOGUES AND DESCRIPTION OF ITEMS.

ALL RAW MATERIALS & COWLINGS	
<b>Near Los Angeles.</b>	<b>Near St.Louis</b>
AIRCRAFT SPRUCE 201 W. Truslow Ave. Bx 424 Fullerton, Ca 92632 (714)870-7951 Catalog \$4	WICKS AIRCRAFT SUPPLY 410 Pine Highland, IL 62249 (618)654-7447 Catalog \$3
KEN BROCK MANUFACTURING, 11852 Western Ave., Stanton Ca 90680 (714)898-4366: Control system parts and all machined or welded parts, fuel caps, engine mount rudder pedals and exhaust system. Catalog \$3	
PLEXIGLASS CANOPY BUBBLE, NOSE & MAIN GEAR STRUT RUTAN AIRCRAFT FACTORY INC. BUILDING 13 airport Mojave Calif 93501	

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January 1981

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