THE CANARD PUSHER

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If you are building a VariViggen from 1st edition plans you must have newsletter 1 through 26. If you are building a VariViggen from 2nd Edition plans you must have newsletter 18 through 26. If you are building a VariEze from the 1st Edition plans you must have newsletters 10 through 26. If you a building a VariEze from 2nd Edition plans you must have newsletter 16 through 26. If you are building a Long-EZ from 1st Edition plans you must have newsletter 24 through 26.
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 newletter 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 to 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 as shown below) 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). This will be done each Saturday except for the date listed below.

27 December 1980 Christmas weekend.

We will be closed from the 25th to the 28th December and also the 1st and 2nd January 1981.

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.

ITEMS FOR SALE AT RAF -

Long-EZ/VariEze Main Gear	$277.95
Long-EZ/VariEze Nose Strut	49.75
VariViggen Fiberglass parts:	
VV Cowl - left or right half	129.50
VV Nose Bowl	92.00
VV Tank Cover	63.00
VV Visor	68.00
VV Landing Light Dome F25	9.50

Long-EZ or VariEze canopies.

Clear	$199.00
Green	229.00
Smoke	249.00
Bronze	249.00

Add 6% for California orders. Add $20.00 for overseas main gear and canopy orders. Main gear are shipped by Greyhound - freight collect. Please include telephone number with gear orders. We would like to have at least two weeks advance notice if you intend to come by and pick either main gear, nose strut or canopies. Canopies are for pick up only at RAF. otherwise shipped FOB from Dayton, Ohio. Canopies - overseas orders. Freight on a canopy can be as high as $400, so if at all possible try to get with other builders to double up when ordering. Two or three can go for the same freight.

The Prototype Long-EZ prefabricated Fuel/Baggage Strakes

These will be in stalled on Mike's Long-EZ, to check the fit and develop installation drawings. These items should be available this winter. Bear in mind that these are large pieces and therefore are likely to be quite expensive. We will report on difficulty of installation and on building time saved in a report in the next newsletter.

NEW BROCK ITEMS

Ken Brock Manufacturing now stocks a new stick grip that fits VariEze and Long-EZ. It is styled after the ski pole grip that nests the lower side of your palm, resulting in a comfortable, low-fatigue grip. Part no. LESG1. Ken also has in stock, the new square style 12 volt fuel pump. This pump can be substituted for the Bendix electric pump with a small weight savings and at less than half the cost. Part no. is EFB. We have recently finalized the engine mount design for the Lycoming dynafocal configuration. By the time you read this, Brock will have this item available.

Section IIC Lycoming Installation

When we ran out of this section this fall, we decided to prepare a new edition, incorporating modifications and improvements for the Long-EZ. We have held up final layout and editing on this until Mike completes his Long-EZ dynafocal engine installation. Thus, the new edition will be thoroughly checked for accuracy, but will not be available until at least mid November. If you absolutely need one before that we can zerox you a copy of the old edition, but we strongly recommend you wait for the latest.

THANKSGIVING SEMINAR - 29th November 1980

Rutan Aircraft and Quickie Aircraft Corp. will hold a joint workshop at Quickie Aircraft in Hangar 68 on Mojave Airport. Flight demonstrations of the Long-EZ, VariEze, VariViggen Quickie and Q-2 will be held between 10 am and 11 am. Lunch will be from 11 am to 12 noon. The workshop will be from 12 to 5 pm. There will be no catered lunch as such, but the airport cafe has been alerted and will have sandwiches available. We will have chairs, but it is possible that we may have more people than seats, so if at all possible, bring your own chair!

The seminar will cover methods of construction on Long-EZ, VariEze and Quickie aircraft. Anyone with parts they would like inspected, bring them along.

Due to an expected large crowd and in order to better prepare the airport cafe, please write and let us know if you intend coming, and the number of people in your party.

OSHKOSH '80

Sixty two VariEzes, both Long-EZs, a VariViggen and a Defiant at one flyin? The only place this can happen is Oshkosh. For the second year running, a VariEze won the Grand Champion Homebuilt Trophy. This year it was Fred Keller of Anchorage, Alaska. This is the third year he has flown his EZ to Oshkosh, round trip mileage 7000 miles! For a complete write up on Fred's airplane and on the Oshkosh convention, refer to the articles by Jack Cox in the October 1980 Sport Avaition magazine.

To help Fred celebrate, Burt and Pat flew the Defiant to Alaska after the Oshkosh show. We really enjoyed the Alaskan hospitality, and the beautiful scenery. Special thanks to Randy Doll, Norm Ross, Glenne Campbell, Peter Gerdtson, Fred and Sharon Keller and George and Ruby Pappas, for showing us what it is like to fly amphibians and floatplanes and how the bush pilots operate. Within the next year we may plan a Nome, Alaska to Puerto Rico non-stop distance record in a Long-EZ.

Our return trip was down the west coast, 13 flying hours from Anchorage to Mojave with an enjoyable overnight stay in Ketchikan, Alaska. The beautiful 17000 ft Mt. Logan with it's glaciers reaching to the sea is a sight we will not soon forget.

OSHKOSH 500 - The LBF Race

This years' race was well attended with the following entries:

- Four Formula-one Racers
- Two Long-EZ's
- Six VariEze's
- One Adventure
- One RV4
- One KR1
- One KR2
- One BD4
- Two Mustang IIs

This year, for the first time there was a separate $1500 prize for the best placing VariEze/Long-EZ. The following put up the money to sponsor this EZ class:

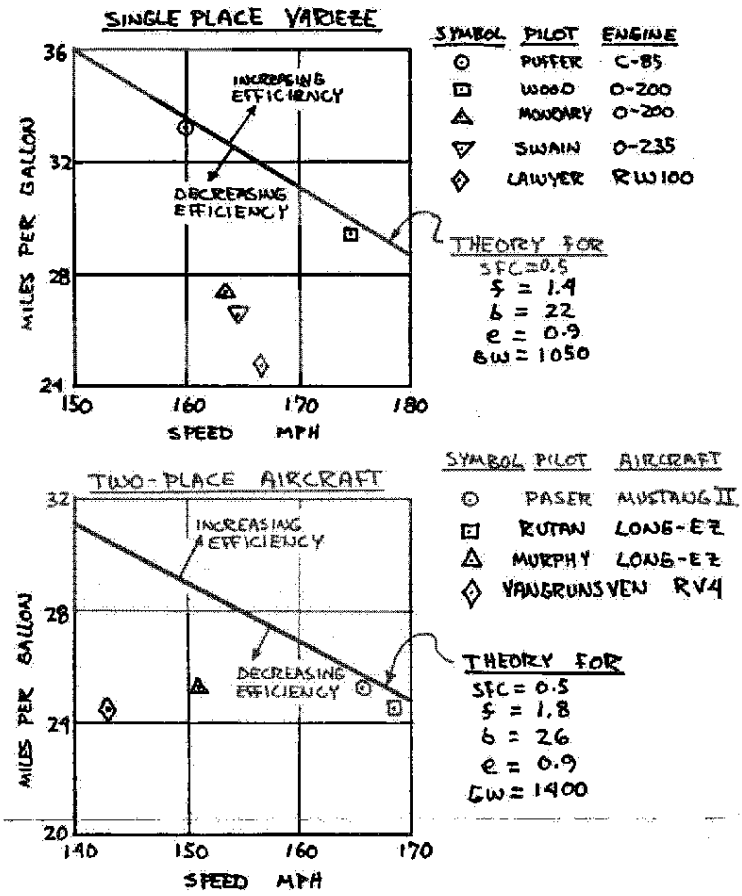
- Aircraft Spruce and Specialty
- Wicks Aircraft Supply
- Ken Brock Manufacturing
- Applied Plastics.
- Herb Sanders
- Rutan Aircraft Factory.

Steve Wood's VariEze N56EZ won the EZ class money plus $500 for placing third overall. Nat Puffer won $200 for placing 5th overall. Refer to the October 1980 issue of Sport Avaition for detailed results. The LBF race is a good format for a comparison of airframe and engine efficiency. When reading the results, use care to note which airplanes flew two place since they are handicaped differently. To qualify for the VariEze prizes the VariEze must fly single place.

In order to compare efficiencies, we have taken the VariEze results and plotted miles per hour vs. miles per gallon. On this plot we have drawn a sea level theoretical curve assuming 0.5 specific fuel consumption, 1.4 sq. ft. f, 22 ft span, 0.9 span efficiency and 1050 lb gross weight. The data show that Nat Puffers airframe/engine combination was the most efficient, having a very slight edge over Steve Woods, If Nat had opened her up and flown the race faster he probably would have beat Steve in fuel-corrected speed. Many had expected the water cooled Rotorway to be more fuel efficient than the aircooled engines. Race results show otherwise. It ran 8 mph slower than Woods, while burning 19% more fuel - both were running peak EGT mixtures. The reader is cautioned to not assume that all the differences are engine related, since there are often relatively large differences in airframes and pilot technique.

Only four of the two-place entries finished the race. Their relative efficiencies are shown in the second plot. The RAF Long-EZ ran at essentially the same efficiency as Kent Pacers exceptional Mustang II. Johnny Murphy's Long-EZ ran poorly mainly since he had to use rich mixture to prevent overtemping the oil (he has since solved his cooling problem).

OSHKOSH 500 RACE RESULTS



LARGER ENGINES FOR LONG-EZ ?

A number of builders have asked if it is feasable to install the 160 hp Lycoming O-320 engine in a Long-EZ. At this time we must respond that this installation is definately not approved. In order to approve this we would have to do a new structural analysis and possible beef up of a large portion of the airframe, install the engine, then conduct new tests to confirm structural adequacy and to develop the cooling, induction, vibration, exhaust, propeller matching, expansion of aerodynamic envelope, etc. Unless these tests and development are done it would not be known if it were feasable, much less recommended.

A larger engine will make the airplane tail heavy and lower the useful load. Higher horsepower would result in a small increase in speed and a large increase in climb. However, the Long-EZs ceiling of over 19000 ft at gross and demonstrated 27000 ft at light weights, makes it the last light plane that needs better climb! Lycoming engines have their best fuel effiency at about 70% power. If an O-320 were throttled down to 51% power, to cruise at the same cruise speed as the O-235, it would burn more fuel than the O-235. The calculated comparison below shows that the O-320 saves only 18 minutes on a 500-nm trip, but costs $9.11 more in fuel. This is over $30 cost per hour of saved trip time.

	115 hp O-235	160 hp O-320
75% power cruise	161 kt	179 kt
75% Power fuel flow	6.7 gph	9.32 gph
Nautical mi/gal @75%	24	19.2
Nautical mi/gal @ 127kt	37.3	36
Range @ 75% power (45 min reserve)	1150 nm	920 nm
Flight time-500nm trip	3 hr 6min	2 hr 48 min
Fuel cost - 500nm trip	$36.46	$45.57

Long-EZ High Density Foam Substitutes

Due to excessive cost increases, the dark red, 0.2" R250 PV core foam is no longer being used in the Long-EZ kits. For a while this summer and fall, 3/16" thick plywood was supplied in its place. We have recently approved a high density urethane/polyester foam (white in color, 18lb/ft^3 density) for this use also. If you recieve the white foam it will be in four pieces, 12" x 48" 0.2"thick. This requires a micro joint for the instrument panel and F22. This joint need not be a separate cure, it can cure with the first skin.

Regardless of whether you are using the red or white foam or plywood, do not change any of the layups of fiberglass or any of the core carving shown on page 13-5 of plans.

Due to excessive costs of the aircraft grade of the R45 dark blue PV core foam, marine grade is being substituted for two of the eight pieces of 0.35" thick R45. The marine grade is identified by a slightly different thickness and an occasional void. Use the marine for the consoles and the aircraft grade for the tank skins. (see page 2-3 of plans).

Also, due to excessive cost increase, the 0.8" and 1.6" thick pieces of R45 are now being supplied in marine grade. The marine grade is available 32" wide rather than the 24" wide as shown on page 2-3. Even though you are getting some excess foam you are paying only half to two-thirds the price of the previous aircraft grade.

Marine grade and aircraft grade PV foam are similar in formula and structural characteristics. The differences are in the occasional voids and thickness tolerance. Fill any small voids with dry micro. Fill voids larger than ½" dia. with a foam chip and wet micro.

Mike and Dick's Long-EZ's by Mike Melvill

Progress has been good since CP #25. All major structural parts are complete, wings, winglets (upper and lower), centersections, fuselages, canards, elevators, mains and nose gears. Dick plans on completing his in the same building we rented and I have transported mine to our home in Tehachapi, where Sally and I have been working like mad in our two car garage.

At this point our Long-EZ (N26MS November two six, Mike Sally) is on its gear, the canopy is complete and mounted, the engine is mounted. The canard is mounted, without the fairing block. The wings have been mounted and drilled into the centersection, which is hard mounted into the fuselage. The speed brake is installed and operational, pitch trim, roll trim and control sticks are installed. Upper and lower winglets are mounted on the wings, as are the ailerons.

Still left to do, mount the wing strakes (fuel/baggage areas) which will be the prefab parts (see page 1). Fit and install the cowling, install and hook up all instruments, throttle quadrant, and complete all plumbing and wiring. Then of course it is finishing time, lots of dry micro, featherfill, primer and paint.

Sally and I have been trying very hard to get our Long-EZ ready for the Hospitality Club Bahama's trip this Christmas. At this time I am not certain we will make it. To a large extent it now depends on being able to get all the little parts it will take to finalize the whole thing, we will keep on going as hard as we can and it will not be for lack of trying if we don't make it.

During the course of our building we have weighed virtually all the parts and kept an accurate record of man-hours we have spent building. Here is a list of weights and hours spent on the parts. Use this as a guide to judge if you are too heavy, too light or spending far too much time on a part:

Front seat bulkhead	2 lbs. 14 ozs.
Back seat bulkhead	1 lb. 7 oz.
F28 bulkhead	3 oz.
F22 bulkhead	1 lb. 7 ozs.
Instrument panel	2 lbs. 2 ozs.
Fuselage sides (with gear attach layup and angles and bolts)	10 lbs per side.
Fuselage, assembled with bottom on and carved outside, but not skinned	41 lbs.
Skinned fuselage, with roll over structure and speed brake (from F22 to firewall)	59 lbs.
Speed brake	2 lbs. 2 ozs.
Main gear strut with 8 ply UND torsional layup	24 lbs 14 ozs.
Main gear with attach tabs complete	27 lbs
Centersection spar	29 lbs. 5 ozs.
Wing, skinned top and bottom, no root ribs, ailerons cut out.	46 lbs.
Wing, with root rib layups, and aileron trailing edge spar complete (no aileron)	46 lbs. 8 ozs.
Aileron with mass balance, hinges, torque tube and universal	5 lbs 2 ozs.
Wing, complete to end of Chapter 19, with level reference board bondo'd on, ailerons, hinges, controls, etc.	51 lbs 8 ozs.
Upper winglet with R.S.T. antenna, coaxial cable and BNC connector, ready to install on wing	6 lbs.
Lower winglet	1 lb. 3 ozs.
Canard no hardware, no elevators	17 lbs.
Left elevator, no hinges, no counter-weights	2 lbs. 2 ozs.
Right elevator, no hinges, no counter-weights	1 lb. 13 ozs.
Left elevator, ready to finish	3 lbs. 8 ozs.
Right elevator, ready to finish	3 lbs. 4 ozs.
Canopy complete ready to finish	16 lbs.
Fuselage, complete with centersection (INCLUDES SIDE CONSOLES & FORE & AFT CANOPY FRAME) brake cylinders, main and nose gear (500 x 5 tires on main gear) no wing strakes, no canard, no canopy, no engine mount	183 lbs.
wing, complete with upper and lower winglet, rudder mounted and hinged, ready to finish and bolt to mounted centersection spar	64 lbs.
Dynafocal engine mount	5 lbs 3 ozs.

Building times in Man Hours (MH)

Note: These are not just layup times. These are total hours worked for all people, including shop cleanup.

Fuselage, assembled with nose, nose gear, main gear, and roll over structure	86 mh
Main Gear (complete, no axles)	9 mh
Canard	38 mh
Elevators	8 mh (2 pcs)
Centersection	62 mh
Both Wings	97 mh (2 pcs)
Upper winglets	11 mh (2 pcs)
Lower winglets	6 mh (2 pcs)
Wing root layups, aileron cut out and trailing edge spar layups (2 wings)	15 mh
Ailerons, complete, hinged and operational in the wings with controls (2 wings)	32 mh
Canopy complete	36 mh
Wings, jigged to centersection and drilled in	6 mh
Upper winglet, jigged to wing, and all layups complete plus lower winglet, jigged and layed up	23 m (per wing)
Rudder layout, cutout, layup, mount hinge and bracket, string cable	7½ mh
Total Man Hours to date	458 mh.

This is where I am at this time and we will continue to report progress, weights and times in future CPs.

TULLAHOMA 80 by Dick Rutan

This was our first time we had been to this event and thoroughly enjoyed it. Good weather, nice crowds and a lot of fun flying. The side trips to the "Grand-Ole Opera" and the Jack Daniels distillery were interesting. I flew the Long-EZ each day in the airshow demonstrating it's maneuverability by doing some very basic aerobatics both with and without power.

The event was well attended by VariEzes and all the Long-EZs in the world were in attendance. Johnny Murphy flew his Long-EZ non-stop from Florida. Friday night the EZ crowd got together at the VFW club for dinner. I took the opportunity to give special recognition to some very nice flying machines. I selected John Benjamin N40JB VariEze as the overall winner with Steve Darlington N36SD and Robert Vaughan N66EZ so close behind they also recieved awards. "Good job guys, it makes us proud to see such fine machines".

The significant part of my trip was the demonstration of the Long-EZ, long range cruise efficiency by flying from Mojave, Ca to Tullahoma Tn. non-stop, arriving with fuel to hold almost two hours. Myself and my friend Jeana Farrar with baggage for two weeks flew the 1600 nm (1840 statute miles) in 10 hours 46 minutes non-stop, for an average speed 148.7kt (171 mph). This included a detour to see the Grand Canyon at dawn. The total flying time was 11 hours 6 minutes including holding and an arrival airshow demonstration. Total fuel burn was 55 gallons for 4.74 gph. Fuel burn for the leg not counting holding was 53 gallons for 34.7 sm per gallon. Not bad for two people at over 175 mph true airspeed. In August, the non stop flight to Oshkosh from San Francisco was virtually the same distance and speed as this one. We were very pleased with the data on both of these long flight because it was just slightly better than what is stated in the Owners Manual. Both Flights were blessed with good smooth weather and a 3-4 kt average tail wind. At over 12000 ft cruise altitude , we were using only about 58 % power. The Lycoming O-235 (at 1500 hours total time) ran smooth with very low oil burn.

On our return trip we stopped off at Ray Field, a little 2000' grass strip just south of Mobile Alabama, to attend a local EAA chapter meeting. Even with trees at both ends the Long-EZ operated out of the grass strip with no problem. I want to thank Rick and Kully Thompson and all the chapter members for replacing our burned-out landing light, and bedding us and the Long-EZ down for the night.

It is very interesting to note that Mojave to Tullahoma via jet airliner requires a 2 hour drive to Los Angeles, a 7.1 hour airline flight (including one stop) to Nashville Tennessee, a half hour baggage pick up and another one and half hour drive.

Mojave to Tullahoma - Two people, one way

	Airlines & Car	Long-EZ
Total Time	11.1 hour	10.8 hours
Cost-Airlines	$580.00	-
Cost- Car	40.00	-
Cost - Fuel and Oil	-	$88.00
Cost - depr. hangar, overhaul, ins.	-	$90.00
Total Cost -	$620.00	$178.00

It may surprise many to find that you can go 3/4 the way across the country faster than airlines and at less than 30% of the cost!

From the Builders/Owners

This section contains miscellaneous information recieved from the homebuilders that maybe of interest to others:

From Laurent Morelle, France - "First flight 10 July 1980 for F-PYHT and no problem. It is a wonderful machine. I won Grand Champion cup at Brienne Le Chateau show and VariEze G-LASS (Don Foreman, England) won best foriegn aircraft. Four other EZ's are flying in France. Mr. Lesschaeve reports that 5 EZ's were at the Brienne Le Chateau including Rudi Kurth (Switzerland) and Mr. Ghimbal and Briguet of France. Our development of the nose gear shock strut (CP #25) was preceded by Mr. Bruno Ghimbal who uses a polyurethane damper on his VariEze nosegear. He reports it rides " like a Citroen CX!".

From Dr. John Steichen - "I would recommend the shock strut for all VariEzes. I recently removed the bolt from NG10 and found it bent with no memory of any pot holes".

From Harry Jobes, Michigan - "As a builder of both the VariEze and the Long-EZ, I have had the opportunity to work with both sets of plans. The VariEze plans and instructions are great - - but those for the Long-EZ are an order of magnitude better.

Even though, in some areas, the LE is more sophisticated than its predecessor, the plans are easier to follow. Drawings are more numerous and crisper. Added cross sectional views are a big help. The designation of the layups is a thoughtful feature. The addition of bills of material by chapter and a foam cutting schedule are cost and time savers.

Keep up the good work! I am eagerly anticipating getting my Long-EZ in the air in 1981".

From Ray Richards - Toledo, Ohio - "After 150 flight hours (VariEze) I dissasembled the carb heat muff and found the carbon steel door spring broken into a dozen pieces. To replace, I wound 0.40 stainless wire into a spring on a lathe mandrel. Works great - - other than that all is fine and N48EZ behaved faithfully".

Has anyone else had carb heat spring deterioration? Do check for this, it may possible to injest a piece into the engine.

From Ivan Shaw, England - "I use modeling clay to hold jigs temporarily before applying the Bondo - real helpful and easier than playing about with shims - - - I bettered the wing layup times by using two 2-inch brushes - it double efficiency. I'm a drummer and can get 16 stipples a second!" While this works well for a professional drummer, we at RAF still recommend minimum use of brushes. By pouring on epoxy and spending most of the time with many light passes with the rubber squeege, most people will do fast, accurate, quality layups.

From Mabel Coha, San Diego, Ca - she and husband Al recently made a VariEze trip from San Diego to Alaska and back - "On July 19 1980, Al and I departed from Montgomery Field, San Deigo, Ca, in VariEze N2CR. Flight time to Sacramento, Ca was 3 + 20. In Sacramento we visited Earl and Barbara Wilson. Barbara designed the VariEze Hospitality Club patch.

Flight time for the second leg to Victoria B.C., past Mt. St. Helens, was 4 + 41. After clearing customs we renewed acquaintances with Norm Ross and Glenne Campbell, after their visit to San Diego several weeks earlier.

The third leg from Victoria to Fort St. John was flown under overcast to broken clouds with scattered light rain showers. The flight time for this leg was 3 + 14. We fueled and departed for Whitehorse, Yukon with and ETA of four fours and five minutes and weather forcast of 3,500 foot overcast with light rain showers. Six miles west of Ft. Nelson the clouds merged into the trees. With 5,000 foot peaks ahead, we did a 180 and landed at Ft. Nelson. The flight time for this leg was 1 + 32.

After two days at Ft. Nelson, B.C. during which time we enjoyed meeting many friendly, curious, interested Canadians, the cloud base lifted to 5000 feet. We departed for Whitehorse with the usual light rain showers in the mountains. By flying through the saddles, we were able to maintain VFR and arrived at Whitehorse after 3 + 11 enroute.

The 80 octane fuel truck was broken at Whitehorse so we had to round up some Jerry cans. We departed for Fairbanks, flight time for this leg was 3 + 30. After clearing U.S. customs and talking to the usual friendly group of people, we parked N2CR in the transient parking area and had dinner with a friend from San Diego who is now working with the Fairbanks FAA office.

After visiting the points of interest at Fairbanks and waiting for the weather to clear, we departed for Anchorage VFR below the overcast again. We spent several days in Anchorage with friends and attempted to attend a fly-in at Soldotna with Fred and Sharon Keller but were turned back by bad weather along the route. We departed for the

return trip to San Diego in a moderate rain and lowering ceiling getting through Chickaloon Pass before it became closed by weather. We passed through some of the most s spectacular scenery in the Wrangell Mountains, a 'short-cut' between Gulkana and Burwash. We cleared customs at Whitehorse after a flight of 3 + 41 and fueled for Ft. St. Johns.

Again the weather forecast promised scattered to broken clouds and light to moderate rain showers for the leg to Ft. St. John. We were able to maintain VFR once again and arrived after a flight of 3 + 54. After fueling for the leg to Victoria we were offered a ride into town, where we ate supper.

That night was the first time blue sky was overhead so we slept out on the grass in back of N2CR. The leg to Victoria was flown in 3 + 43. On the way back to San Diego, we visited Orcas Island, (don't recommend stopping there unless they sweep the stones from the runway), Tillamook, Oregon, Sacramento and Watsonville.

Flying time for the trip was forty-five hours, fuel consumption 220 U.S. gallons, statue miles 7200.

The scenery was spectacular with gorgeous snow covered mountains, glaciers, braided rivers, lakes, green plateaus, and rocky peaks. Quick changes can occur in the weather in this area at any time of the year. However, June and the first two weeks of July are apt to have the best weather conditions.

We found everyone who saw the VariEze showed much interest in the plane and now feel it should be named "Ice Breaker". It certainly has increased our circle of friends".

The photo elsewhere in this newsletter shows the equipment taken on the trip. Mabel carried much of it on her lap! We wonder why someone named Al Coha wouldn't build an Aluminum airplane, or, what would you expect from Mr. E. Poxy!

From Dan Lundberg, House Springs, Mo - " I will be installing the VariEze rudder cable shortly. One of your newsletters stated that your trim can be eliminated by filling in behind the left rudder after the correct position is determined. Can I eliminate the yaw trim and parking brake? My plan is to ground adjust trim at rudder during initial flight tests and I see no need for the parking brake when parked nose down".
Answer - Yes, Dan, this is the currently recommended procedure for VariEze (CP#24 page 5) and is used on Long-EZ. You will find this better and simpler than the origional VariEze trim.

From Ed Rockwell - "I've decided to sell my VariEze, can you advertise it in the newsletter?"
Answer - due to the inferred approval of airplanes that we do not have control over their quality control and work-manship, we cannot do this. It presents a possibility of liability on our part if it were defective. The builder of a homebuilt should seriously consider the liability aspects before selling his aircraft. Since he is an aircraft manufacturer todays American legal system may charge him for strict liability in tort. What this means is, if the airplane he builds injures someone he maybe held liable even if he is not proven to be negligent! It's surprising what a lawyer may dream up if the airplane you built should ever crash. Even though you are not negligent in any way it could cost you more than the airplanes worth just to defend yourself. The following is a true story: An individual conducted all the flight test of a new homebuilt in a competent and professional manner. He then put it up for sale. A buyer arrived and the seller conducted a full checkout. The buyer nearly crashed on his first flight due to low pilot proficiency and low threshold of panic. The seller worked with him until his proficiency improved to the point where he was more comfortable, but cautioned him to not carry passengers and to fly in a limited envelope until he had a great deal more experience. The buyer left with the airplane and as soon as he arrived at his destination he took off with a passenger and with the cg out of limits. He crashed, killing both occupants. Now, nearly two years later, the seller is being sued for ten million dollars.

Because of the present ridiculous legal liability situation we at RAF would never sell any of our experimental aircraft. Both the VariViggen prototype N27VV and the VariEze prototype N7EZ were donated to the EAA museum.

CP26 Pg5

From Byron McKean - "I have the Goodyear 6-ply 3.40 x 5 tires and have ruined 3 inner tubes at the joining of the valve stem to the tube - - I enlarged the hole and rounded the edges but it still went flat after 15 landings - - Tire repair stations say the rim is too wide for this tire". Ben Duarte machined his wheels (and modified axles) to narrow them to reduce sidewall flexing, as he has had sidewall breadkdown with his 6-plies. We at RAF believe the primary cause of both stem failure and sidewall failure is under-inflation. Under-inflation is almost always the cause of stem problems. When we introduced the 6-ply tires in CP #24 (page 7) we recommended a pressure of 80 psi. These tires are rated for pressure up to 95 psi. We ran them at 110 psi for the world record flight (gross weight was 1920 lbs.) We got over 180 landings on the first set and second set of 6-ply tires. We have run them too low (60 psi) for much of their service. We experienced sidewall breakdown in the form of blisters, near the end of tread wear, but never a flat. Because of the reported incidence of sidewall breakdown be sure to carefully inspect tires on your preflight inspections. (last pages of owners manual) If you have had or do have a breakdown or a flat, report it to us, indicating the service life and pressure history. We will access this data to determine if a wheel modification or change in tire specification is to be recommended.

GEHRES AND WOOD'S NACA INLET - Tested on VariEze N4EZ.

Due to the interest many of you have expressed in the flush scoop we decided to evaluate it ourselves.
We got the plans from Tim and Steve. They are oriented to installing the inlet on an already completed airplane, but may be used on a new construction project. First, we drained all fuel and oil and removed both batteries, removed the wings, and the canopy. Then we flipped the fuselage over, sat it on two saw horses and weighting the nose to keep it stable. Following the plans pretty close, we sanded the bottom, built card-board dams, poured 2 part "pour-in-place", urethane foam, carved it to shape, cut down the existing bottom cowl and used blocks of urethane, as well as "pour-in-place" to build it up to the new shape. After it was carved to our satisfaction, it was glassed, filled and painted. The entire operation was accomplished in about 35 man-hours.
Testing - Before installing the Gehres/Wood mod we carefully conducted baseline tests of ground cooling, climb cooling, cruise cooling and V_h (max speed with best power mixture at several altitudes). We repeated these tests after installing the engine baffling, then again after installing the flush inlet. Two CHT gages and four probes were used. Based on the Gehrs/Wood testing, we had expected a large improvement in cooling due to the baffles and some loss of this improvement due to the flush inlet. The Gehres/Wood test results also agree with logic.

However, our test with N4EZ showed no cooling improvement with the baffle modification. A slight reduction in CHT was observed after we curled up the edges of the baffle pieces as shown in CP#22, Page 4. Also, we obtained a definite improvement (30 to 35°F) in cooling (CHT) when we installed the flush inlet. We contacted the other two VariEze owners known to be using the flush inlet (Johnny Muphy's Long-EZ and Ken Forrests' VariEze) and they both report an improvement in cooling. The reason for this is unkown, since theory and NACA test show that flush inlets do not have as good pressure recovery as ram scoops.

Our performance test were carefully run to accurately measure the speed change due only to the flush scoop. Full-throttle speed increased an average of 2½ to 3 knots at density altitudes of from 4000 ft to 12000ft. Ken Forrest reported no speed change, but it's possible his test were not as accurately run. Johnny Murphy reported a larger speed increase, but he had made other improvements at the same time.

To summarize: You can pick up a little speed (aprrox. 3kt) and your engine will probably run a little cooler in level flight with the modification. A lot of people like the look of the airplane better with the "flush" NACA inlet (we call it the "female EZ".)

Plans for the installation of new baffles and a NACA inlet for a VariEze or Long-EZ, are available for $20 from:

Wood and Gehres Inc.
105 Appleblossom Court,
Orlando, Fl 32807

The plans are well done and easy to follow. They require you to discard the normal cowl-inlet and patch into your existing lower cowling. If there is sufficient interest in the NACA inlet we may consider investing in tooling to produce a new bottom cowl (or forwrad part of a bottom cowl) and the inlet (two molded parts that will bond to fuselage). If you would like us to see see these parts are available, please write in to RAF.

Propellers

In CP. #25 we announced the Great American Propeller Company (GAPC) as a recommended propeller manufacturer. Their 56 x 68 prop was one of the best we have tested on the Continental O-200 VariEze.

We have just completed an evaluation of their 58 x 65 prop on the Lycoming O-235 powered Long-EZ. The prop gives excellent performance and meets or just slightly exceeds the speeds listed in the owners manual. We are happy to recommend this prop to any Lycoming O-235 powered Long-EZ flyer. The following is a current list of recommended propeller manufacturers:

Larry Weishaar
1924 No. 6th
Springfield,
Il. 62702
(217)544-6086
(Homebuilt Props)

B & T Propellers
5746 Ventura Ave,
Ventura,
Ca. 93001
(805)649-2721

Ray Hegy
Marfa,
Texas 79843
(915)729-4249

Ted's Custom Props.
Ted Hendrickson
9917 Airport Way,
Snohomish, Wa 98290
(206)568-6792

Bill Cassidy
4652 Montview Blvd,
Denver, Co 80207
(303)322-3423

The Great American Propeller
555 West Mont Drive # 212
San Luis Obispo
Ca 93401
(805)481-4450

Ezcalc Electronic Instrument Up date

In CP #24, page 7 we talked about an electronic unit that would give instantaneous fuel flow and trip average. Additional displays: total fuel used/remaining fuel/distance/time to arrival and also to dry tanks. (Pilots in-puts ground speeds). Battery voltage, OAT, CHT, RPM, EGT, fuel low warning, clock, local, zulu time and approach timer. This, all in a 3" x 6" vertical-oriented box. The developmental program in still in work, but delayed. We are currently expecting deliveries in Febuary 1981. We should have an update in CP #27. Note: Long-EZ or VariViggen only. Installation requires fuel pressure, so this cannot be used on a gravity-feed VariEze.

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 acheives 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 responsiblity 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.

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

LONG-EZ PLANS CHANGES

LPC #29 MEO	page 16-3	CS119 should be 4.1" not 3.1"
LPC #30 MEO	page 10-3	Upper right drawing #3 holes should be 1".
LPC #31 MEO	page 19-5	Lower left paragraph, 3 plies should 2 plies.
LPC #32 page 19-3 MEO		Last paragraph, third sentence between "at" and "12" add "the correct place at the wing top. Hot wire "0" to".
MEO #33 Page 11-2 MEO		Lower left side, 3 lines up - should be 2 strips, not 3 strips.
LPC #34 page 2-1 MEO		LMGA is used in Chapter 5 not chapter 9.
LPC #35 page 9-1 MEO		Landing brake paragraph - after the word "installation" add the words "and other important landing brake details".
LPC #36 page19-15 MEO		page 19-16. clarification: CS127 can be made from the drawings on these two pages. Use .032" 2024T3 aluminum.
LPC #37 page 8-1 MEO		Sides of roll over structure should be 13" not 12.7"
LPC #38 page 10-3 MEO		Two places, cut 12 pcs UND should be, cut 6 pcs. UND.
LPC #39 page 26-1 MEO		"VariEze canopy (Chapter 22)" should be "Long-EZ canopy (Chapter 10)"
LPC #40 page 16-3 MEO		The AN 315-3 jamb nut shown is not supplied in the bill of materials. It is satisfactory to substitute a MS21042-3 nut. Run a 10-32 tap through the MS nut before installation.
LPC #41 page 33 MAN GRD		Owners Manual after "70 to 80 psi" add "75 to 85 psi for 6-ply tires".

VARIEZE PLANS CHANGES

MAN 100HR
Sect. IV pg 39. Wing Attach Bolts - two builders have found corrosion in the wing attach bolts. Add the following to your owners manual: "Remove and inspect your wing attach bolts for possible corrosion annually or each 100 hours. Spray LPS #3 on the bolts and taper cones before reinstalling them, this will give excellent corrosion protection".

DES
Sect I pg 6-5 Add the additional information for attach fitting layups shown on page of this newsletter, CP 26

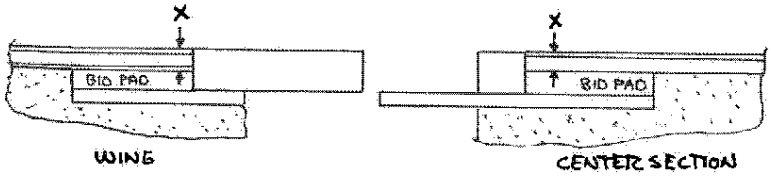
MAN-GRD
Sect IV pg 33 After 55 to 65 psi add "(75 to 80 for 6-ply tires)"

VariEze Builder Hints

VariEze wing attach fitting layups, centersection and wings. Builders continue to have difficulty in achieving the proper layup thicknesses. The BID pads (8 places) must be laid up, weighted and cured per CP 15, page 6 or per Chapter 26 (second editon plans). For the number of plies of BID in each pad, use the table below, not the plans.

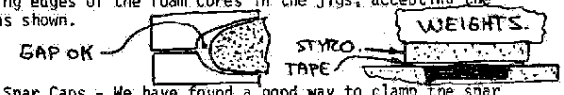
Now, after the BID pads are cured but before laying up shearwebs, spar caps or skins, measure the "X" dimension (top of BID pad to top of WA3 or WA5) and compare it to the table below "X" must be at least the dimension shown, if not, sand the BID pads down before continuing. This step should eliminate buildups too thick to fit between the metal plates.

	# Plies in BID Pad	Minimum Dimension "X"
Wing Top	11	0.196"
Wing Bottom	14	0.151"
C/S Top	16	0.160"
C/S Bottom	19	0.124"



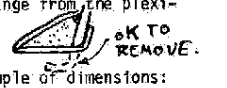
Long-EZ Builder Hints

Wing Jig Templates - Clarification - after gluing the 'A' drawing together, connect the W.L.'s with a straight edge. This will make it a lot easier to get things straight, and will be a check that the drawings don't warp when glued down. When Dick and Mike built their Long-EZ wings, the jigs fit the foam cores well except at the leading edges, where a gap of 0.1" and 0.4" was apparent between jigs and foam cores. A few builders have found this as well, and a few have reported that their's fitted tight. The jigs are sized to be a bit loose to avoid interference with the foam core and possibly there is some paper stretch or shrinkage during gluing If you have a gap, it is not a problem. Go ahead and align the foam cores using the trailing edge as a reference, (butt core T.E. to jigs) and center the leading edges of the foam cores in the jigs, accepting the gap as shown.



Wing Spar Caps - We have found a good way to clamp the spar caps during cure to get minumal waviness and to force them down level with the wing cores. See the accompanying sketch. Select some hot wire cuts of styrofoam (left over from wing core cutting) about 1" to 1½" thick and cut them 4" wide. These should be covered on one side with grey duct tape for a release, and you should cut and fit them end to end to go the length of the spar cap. Get these prepared before doing the cap layup. Now layup the cap normally, squeegee it out properly, then carefully place the foam pieces (with duct tape down) on top of the wet cap. Weight the foam down evenly with lead shot bags, milk jugs full of sand, salt bags or whatever. This will pack the cap layup down evenly and result in less sanding before the skin layup.

Canopy - page 18-2. Do not compromise the Ⓐ dimension, this 13½" is required for good forward visibility. If it is desirable to lower the aft end of the canopy to better fair it into the cowling, or to meet the Ⓑ dimension, it is structurally ok to remove the flange from the plexiglass aft of the roll over structure.



When you get your canopy, do check a couple of dimensions: measure from the point of the plexiglass nose, aft 27". Now squeeze the sides in at this 27" point, till it measures 18.5", hold a straight edge across at this point, and measure up to the inside top of the canopy. For it to fit a Long-EZ satisfactorily this dimension should be from 11.25" to 12.75". If it is less than 11.25" it would reduce forward visibility by forcing the pilots head too low.

Wing Attachment - Follow the instructions on page 19-18, step 1 except drill the ½" holes through the forward face and the aft face of the centersection spar. Now follow through step 2 and use two sawhorses/boxes per wing, with blocks of foam left over from the wing to bring the wings up close to the height of the centersection spar. Now cut 4 foam wedges 7" wide, 2" thick tapering to nothing. These are used to fine tune the height of the wing at the centersection spar and the tip. Now get a suitcase strap, rope or several belts and strap the inboard wing to the centersection spar. This stabilizes the wing against the centersection spar, and stops it from moving fore and aft and in sweep while you adjust the tip and root for correct relationship to the spar. Cinch the straps tight, double check that the wings fit well to the centersection and especially important that the incidence is correct (of course, the fuselage must be level). Four large 'blobs' of bondo about (3/4" dia) are placed roughly above and below the hard point. Allow this bondo to cure completely, before you attempt to drill the 6 mounting holes. Now, run your long ½" drill through the centersection spar and drill through the "hard points" in the wings. You are now ready to enlarge all six holes to 5/8" dia., using your spotface tool. As you drill into each "hard point" the 5/8" spot face will break through each lamination of glass and aluminum. You will find that the spot face will break loose a thin "washer" of glass or aluminum located on its cutting edges each time it breaks through a layer. At this point it can no longer cut, and you must withdraw the tool and remove the small "washer" or "disc". Do not try to drill all the way through one hole in one operation. Clear the spotface often, and every time it breaks through a layer of glass or aluminum. It is good idea to move from one hole to another to allow each hole to cool off. You must not get the wing fitting area hot, go slowly and carefully, clearing often, and if necessary, stop and allow things to cool. We have found that this entire set up, jigging and drilling both wings to the centersection, takes about 5 hours, 2 hours just for drilling. If you are building your Long-EZ in a 2 car garage, you will have to take it outside to do this set up. Be sure to protect the fuselage and wings from direct sunlight with white bed sheets or newspapers.

We found that our spotface tool tended to bore a hole as much as .007" over its intended .625" size. This results in a loose fit on the LWA9 bushings. It is satisfactory to fill this void with wet flox when installing the bushings It is recommended that this flox be cured while the wing is bolted to the centersection spar. This assures perfect alignment of the bolt holes.

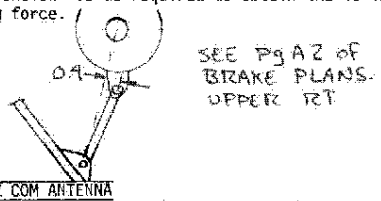
Finishing - CAUTION! Do not ever wipe paint thinners on any part of your structure. Minute pin holes in the epoxy/glass skin can allow the thinners to penetrate down to the styrofoam, which desolves in thinners. This can cause the skin to debond from the core. For the same reason, care should be taken to fill any possibly dry areas (presence of air voids) or areas with pin holes, with epoxy, before applying featherfill or primer, both of which contain solvents that can attack the styrofoam. Epoxy wiped onto the surface with a rag should be sufficient to seal layups that otherwise maybe dry enough to allow thiners or primers to penetrate. The surface must be sanded after epoxy cure.

A builder has suggested using left over scraps of R45 (dark blue) foam in the landing gear attachment area where we call out using urethane foam. This is fine, although not as easy to carve down to the wood longerons as the urethane.

Ailerons - use care on the leading edges of aileron to get the full raduis around the mass balance without a sharp edge. A sharp edge will cause early airflow separation on the up-deflected aileron and will reduce roll power.

Landing Brake Installation - Page 24-1, the sketch showing LG1, does not show the cutout necessary for seat belt clearance. Before bonding LG1 into place, make the cut out per the right side.

Speed Brake Rigging - Due to the fuselage bottom on the Long being thinner than the VariEze you may have to shorten the LB21 pushrod (turn a few more threads on it with a die). When rigging the speed brake, be sure to obtain the correct amount of offset with the brake in the down position. The top rod end must be 0.4" aft of a straight line drawn between the upper and lower pivots. It is acceptable to vary the 0.4 dimension ±.1 as required to obtain the 40 lb brake closing force.



LONG-EZ COM ANTENNA

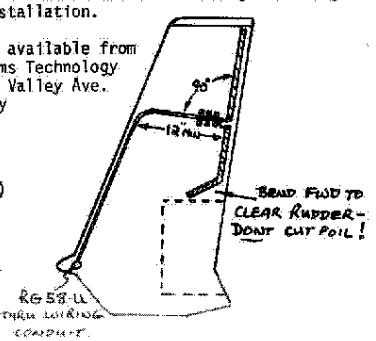
At last, a high performance com antenna Jim Weir from Radio Systems Technology developed a com antenna for the Long-EZ that fits in the winglet. (see photo) We have tested it in the Long-EZ N79RA and found it to have excellent range. We were able to use it at distances of over 80 nm. The antenna uses copper foil and RG58U lead in. It does not require a ground plane. It can be installed on the foam core before glassing and is completely enclosed within the winglet. Ours was placed on the outside skin after drilling some carefully-aimed holes. Install the antenna system before glassing the inboard side of the winglet. Cut 2 strips of copper foil 20.3" long, remove the protective backing and stick the foil to the foam one inch from and parallel to the trailing edge. Measure the rudder cut out area and bend the lower (2") end of the foil forward to miss the rudder. From where the two foil strips come together cut a slot just deep enough to hold the RG-58U/A lead in cable flushwith the foam surface. Hold the lead in with tooth picks similar to the method used on page 19-7 rudder conduit. Be sure the three Ferrite Balums are installed just above the conection as shown. Solder the center wire of the RG-58U/A to the top foil strip and the outside "ground" braid to the lower foil strip.

Be sure the upper and lower foil strips don't touch or short out. Use about 1/8" separation. Check that none of the wire, ferrite balums etc stick up above the foam surface, trowel in dry micro around the solder joints as other voids and glass the inboard winglet as per the plans.

Coil up the excess cable and thread it through the wing during winglet- installation.

The antenna kit is available from
Radio Systems Technology
10985 Grass Valley Ave.
Grass Valley
Ca 95945

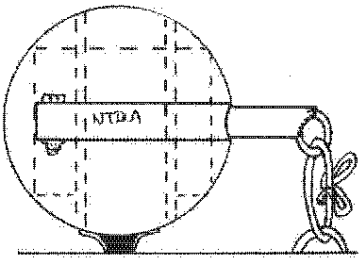
Antenna kit price -
Assembled - $25.50
(with BNC connectors)
Unassembled - $15.00

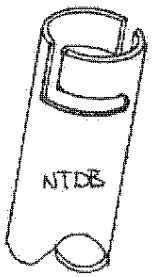


CP26 Pg7

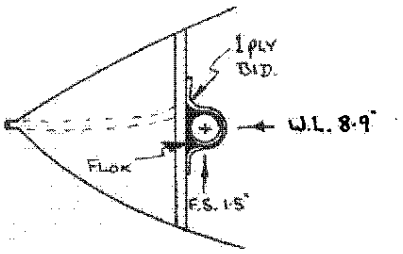
Nose Tie-Down for the Nose-Down Parking

In order to tie your Long-EZ or VariEze down when parked nose-down (best way for high winds), we recommend installing this simple tie down, which is located at F.S. 1.5" and W.L. 8.9". The tie down consists of an aluminum tube floxed into a hole in the side of the nose, oriented horizontally. A removable steel tube slides into this aluminum tube and locks with 90° of rotation. The steel tube protrudes approximately 2½" out of the left side of the nose, and has a steel ring welded to it, so that when the steel tube is pushed in, turned 90° to lock, the steel ring points at the ground. (see sketch).



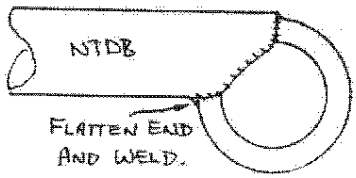


Materials required:
Part # NTDA 1 pc. 7/8" O.D. x .058"wall x 7½" long, 6061-T6 aluminum tube.
Part # NTDB 1 pc. 3/4" O.D. x .049" wall x 10" long 4130N steel tube.
1 hardware store type 2"dia. steel ring (3/16" or ¼" wire size)
1 AN3-11A bolt
1 MS21042-3 Nut.



Be sure To clear THE pitot TUBE

On a new Long-EZ, the best time to install the nose tie down is in Chapter 13 page 11. With the top of the nose cut off to fabricate the nose door (step9), drill or cut with a dremel a 7/8" dia hole through the left side at F.S. 1.5" and W.L. 8.9. This hole must be drilled through both NG30's as well. Before installing NDA tube, drill a #12 hole through it, 3/4" from the inboard end.
When you slip the NTDA tube into the holes it should lie right against the NG31 bulkhead. NTDA should be sanded dull with 220 grit, and should be floxed in with wet flox. One ply of BID should be layed up over the tube onto the NG31 bulkhead both sides. Orient the #12 hole vertically and install the AN3-11A bolt and nut. Allow this to cure.



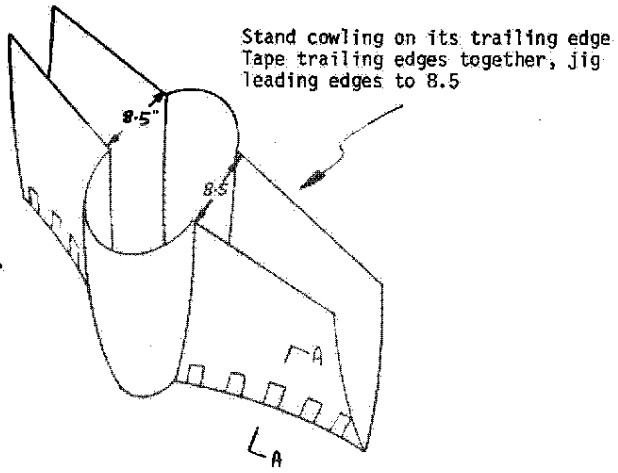
NTD-B is a 10" long piece of 4130N steel tube with a 2" dia. hardware store steel ring welded close to one end per sketch. The other end is slotted and notched so that the ring is held horizontally facing forward, while NTD-B is slipped into NTDA. The slotted end locates over the AN3 bolt, then the NTD-B tube is rotated 90° to orient the ring vertically down, pointing at the tie down.

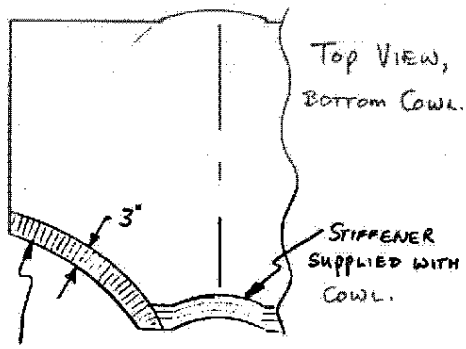
To park the airplane, park it with the tie down ring directly over the normal "tail" tie down rope, and snub it down firmly. The large ring allows you to use ropes or chains normally found at airports.

VariEze Builders

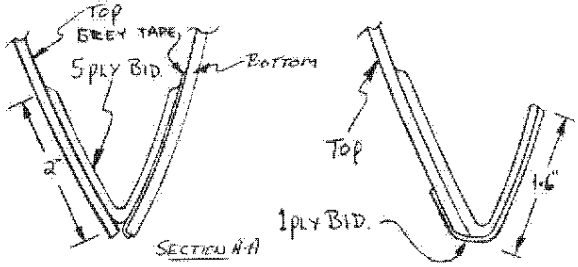
Installation of Cowling Trailing Edge Closeout. This cowl is not supplied with a trailing edge close out piece. This is custom-laid by the homebuilder to assure an accurate fit.

Apply shiny-surface grey duct tape on the inside TE of the bottom cowl half as shown. Sand dull, the TOP COWL TE. JIG TE down, with the TE taped together and with the front opened 8½" as shown. Cut 10 strips of 45° BID 4" wide x 24" long and 2 strips of 45° 3" wide and 24" long. Now, layup the 5-ply BID TE close out. Cure, then pop off the bottom cowl and layup the 1 ply BID ply lapping onto the top. Trim the closeout to 1.6" as shown. This TE close out will have four equally spaced fasteners on each side. (three for Long-EZ)





Grey tape this area on bottom cowl - sand on top cowl



CP 26 P98

VARIVIGGEN NEWS by Mike Melvill

In early September this year, I was fortunate enough to travel to the east coast (airlines, not by Viggen!) where I visited with Arthur Schwartz, whose VariViggen was ready to fly, at the Suffolk County airport on Long Island.

As you can see from the photo Arthur's Viggen, N37678 is a fine looking aircraft. He had already weighed the plane several times on two different sets of scales, his Viggen weighs 1154 lbs (empty weight), and his cg came out very well. We spent several hours going over the control system, and generally checking the security of everything. Arthur had done an excellent job, so any further dilly-dallying was only wasting time. We gassed it up and I "drove" it around on the ramp and taxi-ways to get the feel of it and to familiarise myself with the cockpit and systems.

A couple of high speed taxi runs down the runway, lifting the nosewheel off, felt really good, the Viggen tracked straight as an arrow and has effective brakes. I taxied back to where Arthur was standing on the ramp, and told him to get his camera ready.

The tower cleared me for take-off so I taxied out onto the runway and lined it upwith the centerline. Power was brought smoothly up to full throttle and acceleration felt about the same as mine (N27MS). The most noticeable thing to me on takeoff was the relatively flat deck angle at lift-off compared to N27MS. Arthur's Viggen has the S.P. outboard wings, N27MS has the standard wings. The difference in pitch attitude at liftoff is almost 3 degrees due to the SP wing and the fact that Arthur's Viggen is almost 100 lbs lighter than mine. He has a Lycoming O-320 160 hp. Even so, Arthur's Viggen was airborne considerably before I expected it to be. My Viggen is normally rotated to what seems like a very steep angle (6° - 7°) then it rolls for a while on the mains before the wings take all the weight, and it lifts off. Someone familiar with a standard wing VariViggen, flying an SP wing, will be surprised when it "levitates" into the air at a relatively low angle.

After lift-off, the airplane felt solid and responsive. I rocked the wings briefly, pitched it up and down, asked myself "was I holding the airplane one way or the other?" The answer was no, it was in excellent trim. I continued the climb to 3000 ft above the airport, where I throttled back to keep the airsped from going over the gear down speed of 125 mph. I flew around for 40 minutes, generally checking trim roll response, pitch response and control authority. The engine ran flawlessly, all temperatures remained in the "the green". The first landing was amazingly easy, even easier than N27MS, there is a tendency to float if you are too fast, but it lands very slowly and uses very little runway.

We looked it over carefully, added a little gas and I went up again to look at stalls, slow flight etc. The SP wing and lighter weight is very noticeable in low speed performance. It hung on with no problem down to 40 mph indicated. This is below normal stall speed, so there must be some system or indicator error. N27MS will fly at 55 mph indicated, although at a higher angle of attack. The biggest difference between the SP wing and the standard wing in the stall is that if you get the controls crossed the SP will drop a wing, the standard will not.

One strange thing showed up on Arthur's Viggen. I was not able to go very fast due to the decision to leave the gear down but at 110/120 mph at higher power settings in level flight, there was a noticable tendancy to pitch nose down, something my Viggen or Burt's Viggen has never done. Even at 200 mph indicated. This remained a mystery until after I returned to Mojave.

Unfortunately, the next morning while taxiing very slowly, the right main gear collapsed, due to the pin in the cable pully, (first edition plans, cable driven main gear) shearing, which allowed the down lock to disengage. When I turned left, the right gear folded inboard, allowing the airplane to come down on the right wing tip, breaking off the lower winglet. Needless to say, this put a stop to further flight testing, so I returned to Mojave.

I am happy to report that Arthur has already repaired it and has about 6 hours on the airplane at this time. He has now raised the gear and has been able to increase his speed, however still is getting the nose down trim situation. While on the phone to him last week, Burt and I determined that instead of 2° of down thrust, Arthur had inadvertantly built in 2° of "upthrust"! This is probably the reason for the nose down trim he is seeing. Arthur has promised us a report as soon as he has checked it out.

FLASH!

Just recieved more information from Arthur. He made external templates of his out board wings and from these we have determined that he does not have enough 'washout' out board of the ailerons. In fact this deficiency in washout calculates to be equal to 3° of reflex. This together with the "upthrust" he had built in, undoubtedly accounts for the nose down pitching moment. We have given Arthur the information he requires to correct the problem, and will report on his findings as they be come available.

This does bring up an important point, and we should all learn from this example. Just prior to glassing the top of your outboard wing, you must check the washout. This is done by putting the inboard and out board hot wire templates back onto the foam cores and checking that the waterlines (level lines) are level to each other. This is extremely important. Do not omit this step! Once the top skin is on, this is very difficult to correct.

Oshkosh '80 - Sally and I flew out in N27MS and we flew in loose formation with Burt and Pat in the Defiant. We had an outstanding trip, flying from Mojave, via Zion National Park to Page, Az. We then flew up the length of Lake Powell (unbelievably beautiful) directly over the continental divide to Denver, where we had lunch. From there to Omaha where we spent the night. The next morning we flew directly to Oshkosh, arriving at noon on Friday. N27Ms performed well with the exception of wearing out a brush in the alternator just after leaving Omaha. The nice thing about having a 35 amp hour battery is that it presented no problem and Alcor supplied us with a new brush free of charge at Oshkosh (old one was defective).

While at Oshkosh, though the starter went bad, but again we were fortunate enough to be able to obtain a replacement through Basler, the FBO at Oshkosh. I flew the Viggen in the fly-bys several times and in a three ship formation demo four times during the week. We had a lot of Viggen builders come by the airplane and the RAF booth, and quite a few builders are getting close to flying. It was great to be able to chat with so many guys at one time who were building the same airplane.

We at the RAF booth and myself especially, were extremely busy all week and really was sorry not to be able to spend more time with Viggen builders, maybe next year we can set up a day or two where we could have a bull session on the flight line at N27MS.

Other than very bad weather for the first two hours (we made two 180's!) we had an excellent flight back to Mojave via Rapid City, S.D., Salt Lake City, Utah and Las Vegas, Nevada. We put 30 hours on the Viggen and she now has 460 hours total.

PHOTO BY PETER GARRISON

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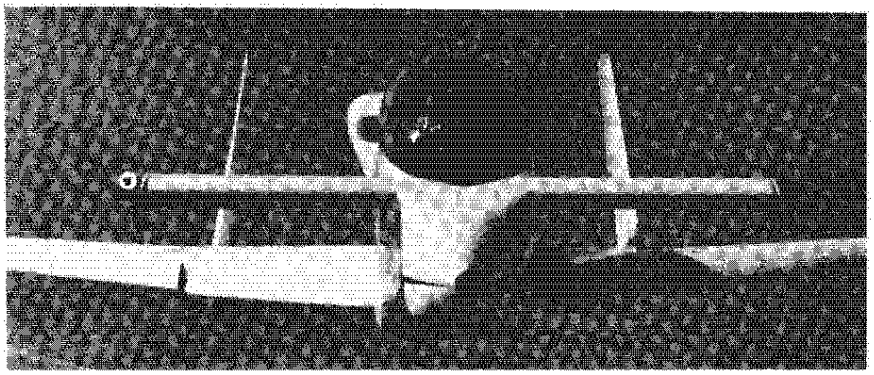


Accidents

The CP Newsletter reports accidents and discusses their conditions and causes for information purposes for all operators. We have always investigated accidents in the interest of determining information that we can disseminate to you to prevent recurrance. 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.

1) An Illinois VariEze crashed on landing approach, fatally injuring the pilot/builder. The pilot had turned sharply from a low slow downwind and failed to upright the aircraft. Impact was 150 feet short of the end of runway. Weather conditions were low ceilings and strong gusty direct crosswinds of about 25 mph. The pilot was thrown forward through the instrument panel and clear of the fuselage. The seat belt (EON 8000 type 4) was found open. (see CP 24 page 4). This airplane had previously been damaged when landed short of a 5000 ft runway.

2) A VariEze crashed as it entered the downwind leg of the busy approach pattern at the Oshkosh EAA convention. The aircraft was observed to maneuver erratically then turn and dive at very high speed, with high power maintained to impact. Both occupants died immediately. The aircraft struck a concrete street in a near vertical (60 -70°) dive, at a low angle of attack. A pilot witness 200 feet away observed that it did not appear that the pilot was attempting to pull out of the dive. This points to a possiblity of either a pitch control system disconnect or pilot incapacitation. All but two parts of the control system were found - they did not indicate control system disconnect. The aircraft did not have a rear seat control stick. Thus, pilot incapacitation is the suspected cause.

   Destruction of the aircraft was unbelievable, only small parts remained. The engine struck the concrete road at the same point that the nose did. The bow shape of the main gear strut was clearly imprinted on the concrete at the impact point.

   Initial investigation at the scene of this accident suspected fuel starvation because there was no evidence of fuel and there was no fire. It was determined that the tremendous force of the estimated 200 mph impact resulted in a fuel and oil explosion, however there was no resulting fire. There have been no fires associated with any VariEze accident.

3) A Washington state VariEze crashed on approach while making a series of touch and go circuits. It was observed on a high final when the pilot initiated a sideslip. The airplane then rolled inverted and the pilot attempted to pull out in a reversing direction. Insufficient altitude was available for the pullout. The aircraft struck the ground in a near level attitude removing the landing gear and the bottom of the fuselage. The pilots injuries were fatal. The departure that rolled this aircraft over appears to be the winglet stall discussed in CP # 22 page 7 and 8. While the pilot appears to have disregarded the operational limitations recommended, this still should not have resulted in a departure. We intend to inspect the winglet contours of this aircraft to determine if any variances may have changed its susceptability to winglet stall.

   To prevent possible recurrance of this type of accident we urge all VariEze operators (does not apply to Long-EZ or VariViggen) to again review the information on page 7 and 8 of CP 22. Check your rudder rigging, wing cuffs, and winglet contours. In addition, to determine the actual departure susceptability of your particular aircraft, conduct the following test at an altitude of 10,000 feet: full rudder sideslip, abruptly applied left and right at speeds of 100 kt. 90 kts, 80 kts, 70 kts, and full-aft stick. Your airplane should yaw, under control, with no tendency to stall or roll off. If your airplane has any undesirable characteristics report these to RAF so we can analyze the causes and the extent of any variations.

4) A VariEze pilot ran out of gas on an extended trip. He selected the fuselage tank, restarted the engine and continued, overflying one airport, attempting to stretch his range to another. Total fuel depletion occurred several miles short of his destination. His forced landing was downwind in a turn. The airplane was damaged extensively and ended upside down. There were no injuries.

5) A Nebraska VariEze equipped with the original 2-ply tires, was making a gross weight takeoff. The pilot began rotation at 85 to 90 mph, (above the normal lift off speed of 75 mph), when the right tire blew. He aborted the takeoff, using left brake all the way to stop to maintain directional control. He reported it was not hard to control even though the right brake bleed failed and the right wheel pant and brake rotor was destroyed. His gear strut was the original configuration, not reinforced. He placed the right wheel up on a dolly tilting the aircraft with most of the weight on the left wheel, then pushed it half mile to a hangar. On arriving, the left gear strut buckled a few inches above the axle, inside the tightly-sealed, non-vented wheel pant. The cause of the strut failure was heat. The long, continuous high speed braking resulted in a very hot brake. This heat, sealed in by the wheel pant, slowly permeated the fiberglass strut allowing it to soften and buckle under load. Lessons learned: Do not use the two-ply tires. Ventilate the top of your wheel pants. If unusually heavy braking is done, 'set' the gear to relieve load or jack the airplane to relieve stress while the strut cools. Glue a piece of your fiberfrax fire wall insulation material to the strut (use silicone rubber adhesive) adjacent to the brake disc. Your VariEze and Long-EZ should lift off and land at under 65 kts and 60 kt respectively, unless you have an airspeed instrument error or airspeed position error. Leaving the airplane on the ground above this speed increases tire stresses and reduces tire life.

SHOPPING

Engines for Sale -

Continental O-200 with factory installed engine - driven fuel pump (as removed from a Champion Lancer) 275 hours since new.
Jim Gibson
788 South Third Street
Terre Haute, In 47807
(812)232-4912

Continental O-200 run out for $900 Call after 6:00pm
Jerry Keller (402)772-3701

Continental O-200, 500 hours since major
Les Boyer
RR #4 Box 259
Festus, Mo 63028
(314)937-6014

O-235-C1 OSMOH, 2000 hours total time
$3,350 plus crating charge
Harvey Bolin
Brandon, Mn
(612)524-2229

Continental C-85-B 6 hours since overhaul
New slick mags, Stromberg Carb. $2,550
Joe Moore
11320 Hubbard Road
Grass Valley, Ca 95945
(916)265-4952

Continental O-200 Zero SMO for VariEze including engine mount, prop extension, Ted's prop, Jiran cowling. Complete package $4800
No collect Calls
(415)757-3621

Continental O-200 A crankcase, accessory case including oil pump. Standard cam journals $450
Donna Stubbs,
15150 Magnolia
Apartment 217
Westminster, Ca 92683

VariEze Dust Cover as seen on Herb Sander's VariEze at Oshkosh (N70VE). Excellent quality, covers entire airplane. $129
Herb Sanders
P.O.Box 18690
Memphis, Tn 38118
(901)365-7606

B & C Specialty Products has developed a lightweight aircraft power generating system. This system was specifically developed for today's weight-sensitive homebuilt designs and has undergone extensive in flight service testing.

Two models are available, one is a gear driven alternator. This bolts onto the alternator pad on the accessory case of the C-85, C-90 and O-200 engines. The other alternator is belt driven, designed for the Lycoming O-235. Can also be adapted for other engines. The complete alternator system weighs only 4¼ to 4 3/4 lbs., depending on the type of drive.

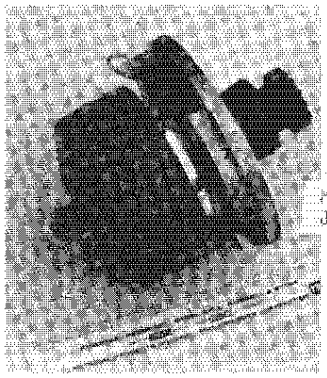
B & C Specialty Products,
518 Sunnyside Ct
Newton, Ks 67114
(316)283-8662

Note : RAF is currently testing the B & C lightweight alternators on our VariEze and Long-EZ. Their kit is very nicely done and easy to install. Performance and support by Mr. Bill Bainbridge has been excellent. Many of you saw these at Oshkosh.

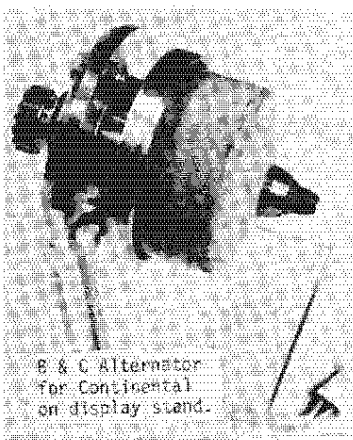
John Friling made his own lightweight alternator, for his Continental powered VariEze. John purchased an alternator from a Yanmar Japanese garden tractor.
Part # 942131-41410 (stator)
Part # 942741-42299 (Magnet wheel)
Part # 49-401-01 (Kohler regulator, 15 amp)
John used his old Continental generator shaft, bearings and flange, (see photos). John has a really nice set of drawings for those of you who would like to make one like his. John Friling
852 Westgate Drive,
Addison, Ill 60101

Prefab Parts, New Unused, in the original cartons.
VariEze fuel tank laminates
VariEze nose gear strut (NG1)
VariEze nose gear strut cover (NG2)
Harry Jobes,
1005 Red Mill Dr
Tecumseh, Mi 49286
(517)423-8226

Hand carved Long-EZ pins. Available in Sterling silver for $50 or 14 K gold for $500. Approximately 2" wing span.
Charles Gray
6893 Seagrape Terr.
Miami Lakes, Fl 33014
(305)822-5040

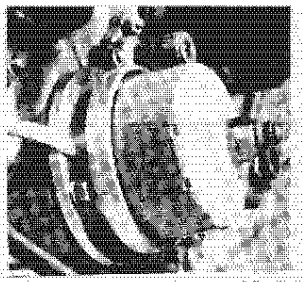


Homebuilt alternator by John Friling.

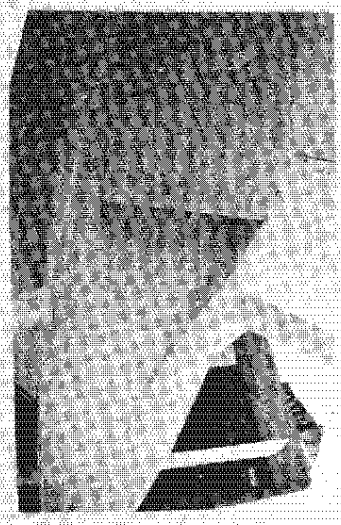


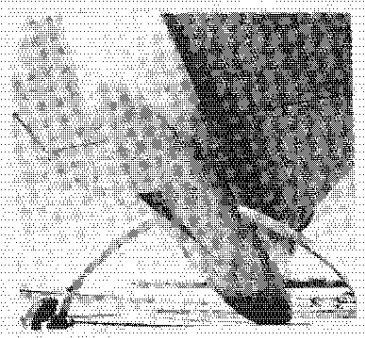
B & C Alternator for Continental on display stand.

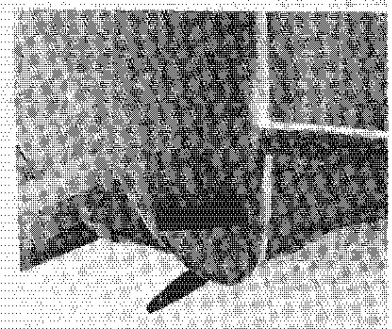
B & C Lycoming installation includes split-type pulley for crankshaft.

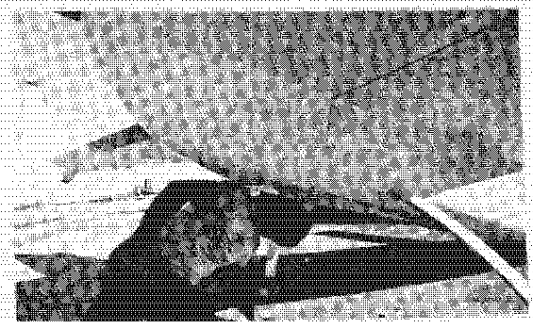


B & C Alternator installed on an O-200 Continental.

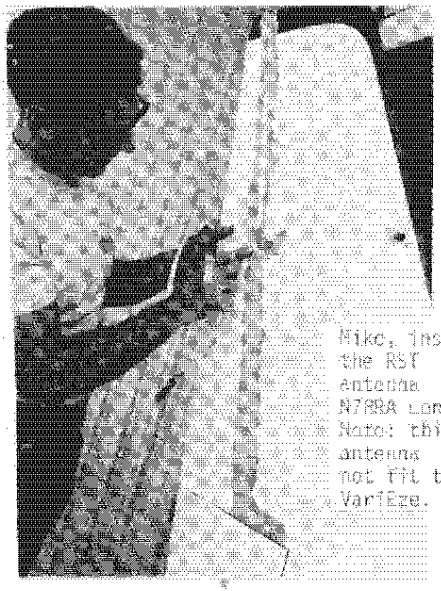




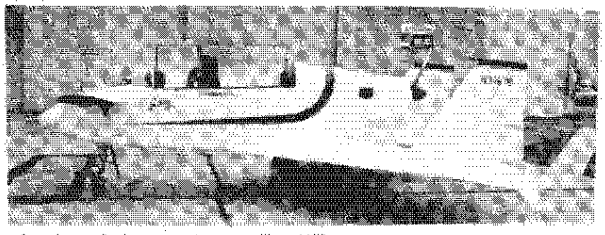




These photos show the Woods/Gehres-designed flush scoop installation on our VariEze N4EZ. It blends to meet the standard cowling.

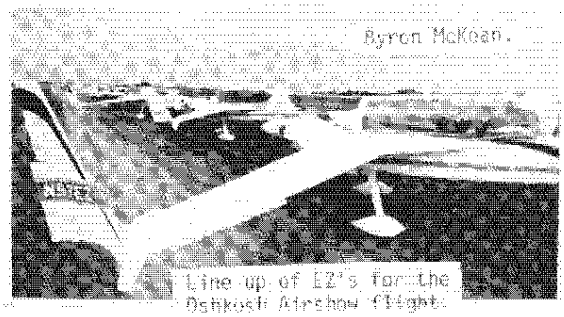


Mike, installing the RST antenna on N78RA Long-EZ. Note: this antenna will not fit the VariEze.



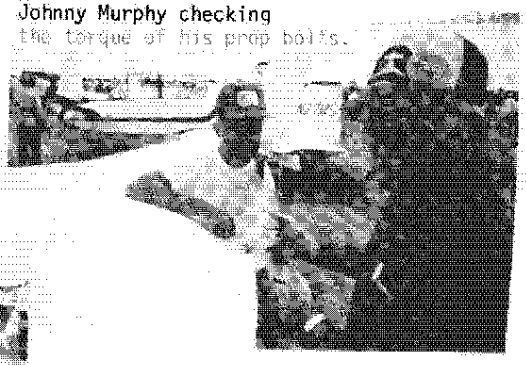
Arthur Schwartz' new VariViggen

Al & Mable Coha with baggage for their Alaska trip!



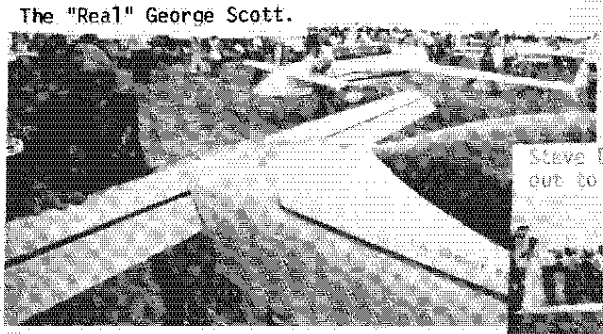
Byron McKoan.

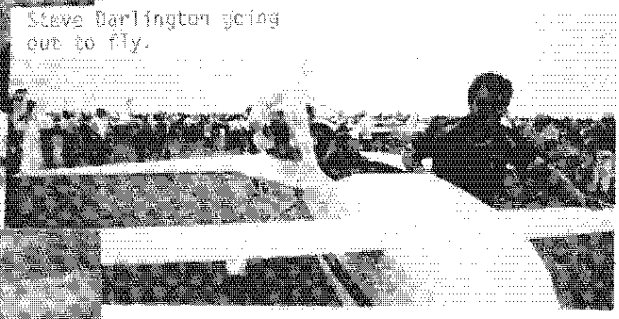
Line up of EZ's for the Oshkosh Airshow flight.



Johnny Murphy checking the torque of his prop bolts.

The "Real" George Scott.





Steve Darlington going out to fly.

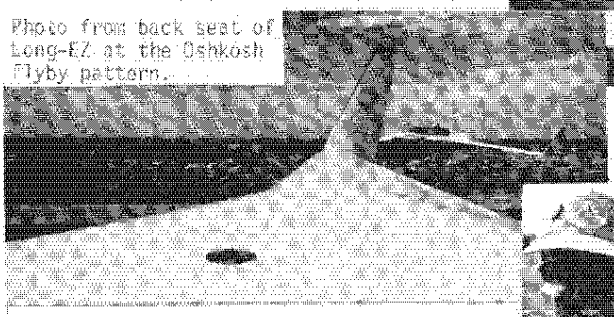
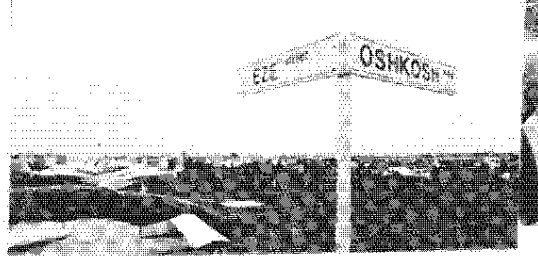
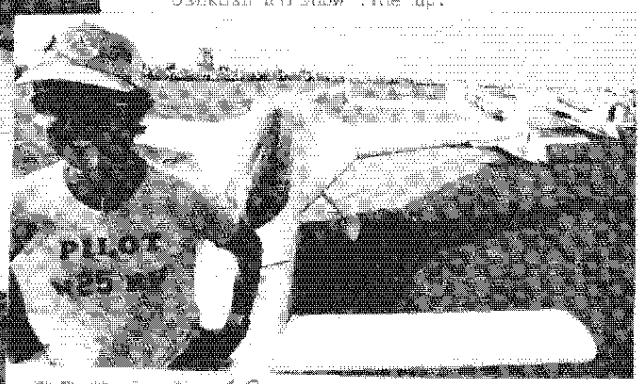


Photo from back seat of Long-EZ at the Oshkosh flyby pattern.

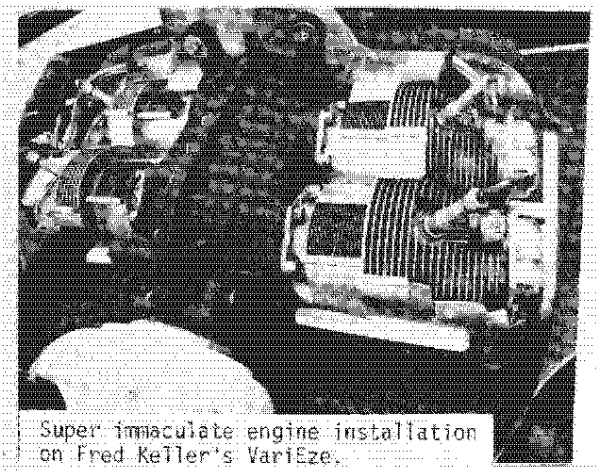




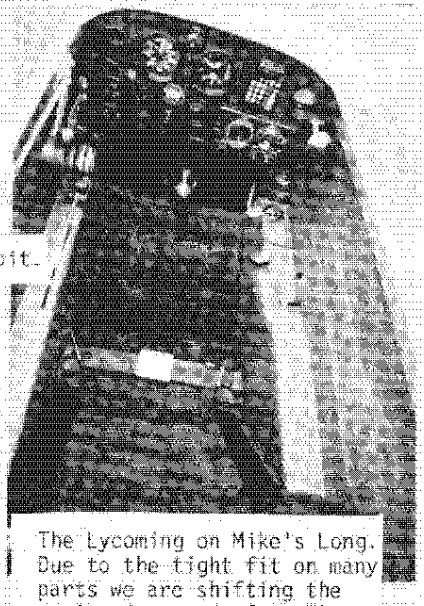
Rich Rhorick at the Oshkosh airshow line up.

Mom & Pop Rutan, Fred Keller, Sally Melvill, Pat Storch, Burt & Mike shortly after Fred won the "Lindy" for the Grand Champion Homebuilt.

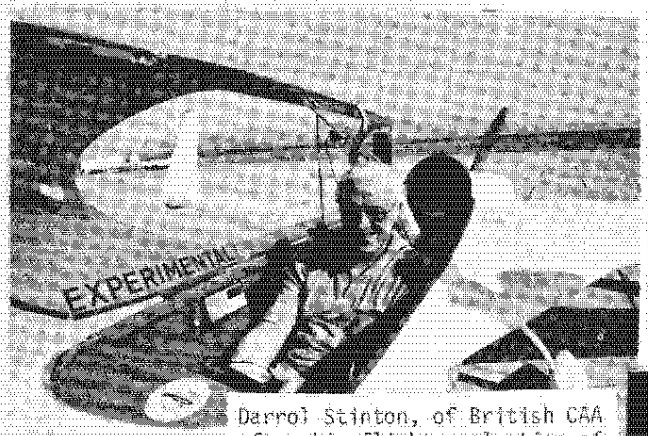
Fred's cake at Anchorage party.



Super immaculate engine installation on Fred Keller's VariEze.



Fred's Cockpit.

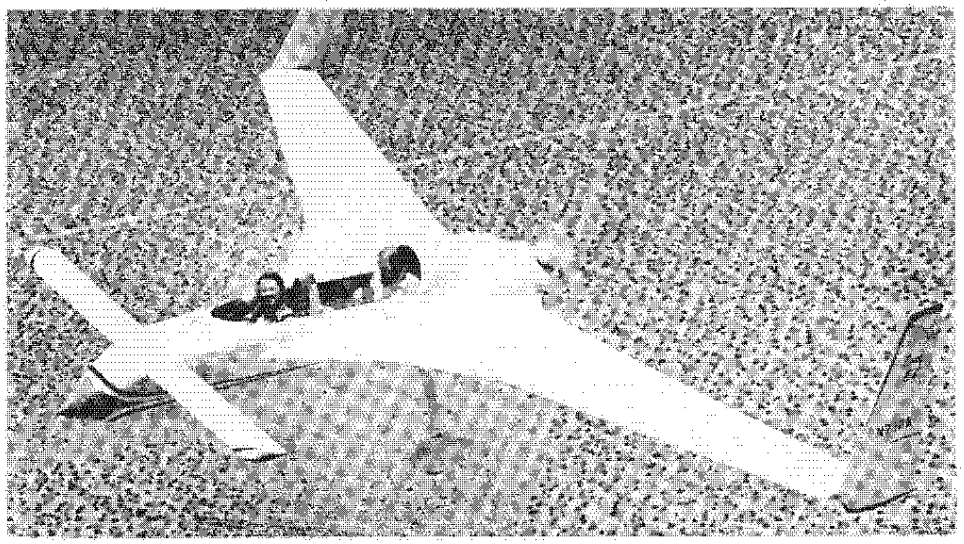


Darrol Stinton, of British CAA after his flight evaluation of the Long-EZ.

The Lycoming on Mike's Long. Due to the tight fit on many parts we are shifting the engine down and aft. These changes will be reflected on Brocks mount and on the new edition of Section IIC.

Mike & Sally Long-EZ, mating the wings.

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. Power plant is either the O-235 Lycoming or the O-200 Continental. The O-235 is highly recommended as a mechanical fuel pump is required. It has an alternator-powered electrical system and can be equipped with electric engine starter. It's cockpit layout is designed to compliment 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 enviromental 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.

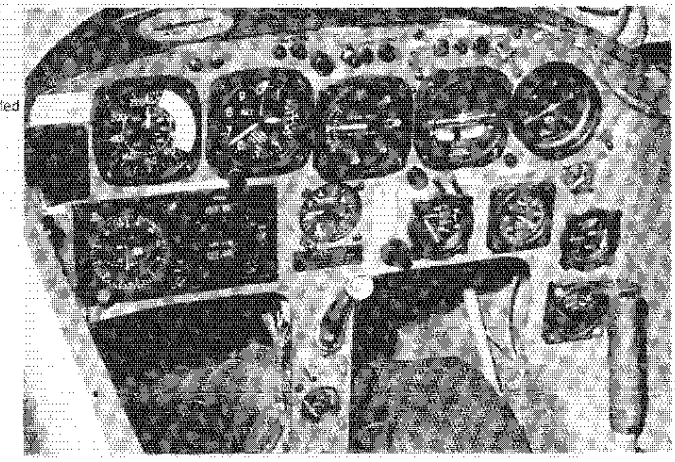
UNUSUAL EFFICIENCY

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 worlds distance record, and landing with enough fuel to surpass 5000 miles. At that, it's capability was not taxed - it's initial climb rate was over 600 ft/mn! 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! It's 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. It's 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 intitial 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, enviromental/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, tools, tires, wheels and brakes costs about $3100. 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 S-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 ecominal 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 an a zero-time engine. IFR avionics can add from $2000 to $15,000 to those numbers, with many options avialable.

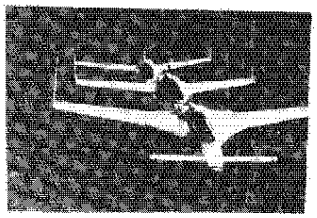
CP26 Pg 14

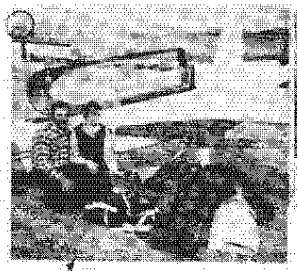
Brief Long-Ez specifications/Performance

Engine Lycoming O-235 108 hp.

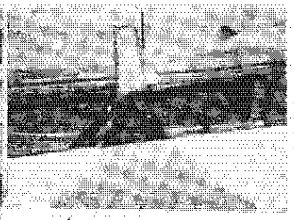
Span	26.3ft	Takeoff (solo/gross)	550/830 ft
Area	94.1sq.ft.	Climb (solo/gross)	1750/1350 fpm
Empty Basic	710 lb.	Cruise 75% 8000 ft	183 mph
Empty Equipped	750 lb.	Cruise 40% 12000 ft	144 mph
Solo Weight	960 lb	Max range * 75% (solo/2 place)	1370/965 mi
Gross Weight	1325 lb	Max range * 40% (solo/2 place)	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

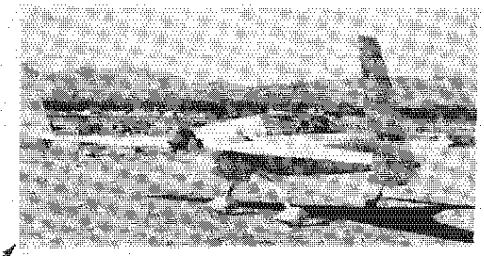




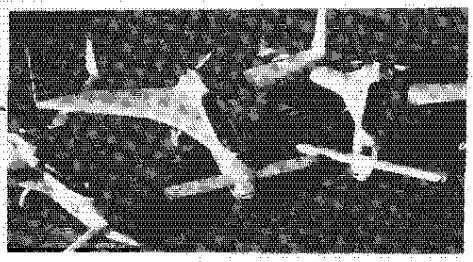
This amount of baggage fits nicely in the Long-EZ baggage areas. Baggage is acessable in-flight



Sally Melvill 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 electical system, fuel system and finishing procedures. The manual identifies sources for all materials and all prefabricated components.

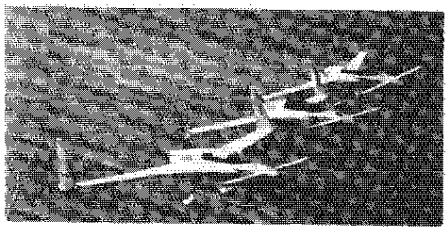
SECTION II - ENGINE INSTALLATION - This is a set of drawings and construction manual for the complete engine installation including mount, baffles, instrumentation, electricals, fuel, exhaust and induction systems, carb heat box and muff, cowling installation, prop and spinner.
SECTION IIA - Continental O-200
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, etc.

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.

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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◯ Section IIA Continental	19.00	21.00
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TOTAL		

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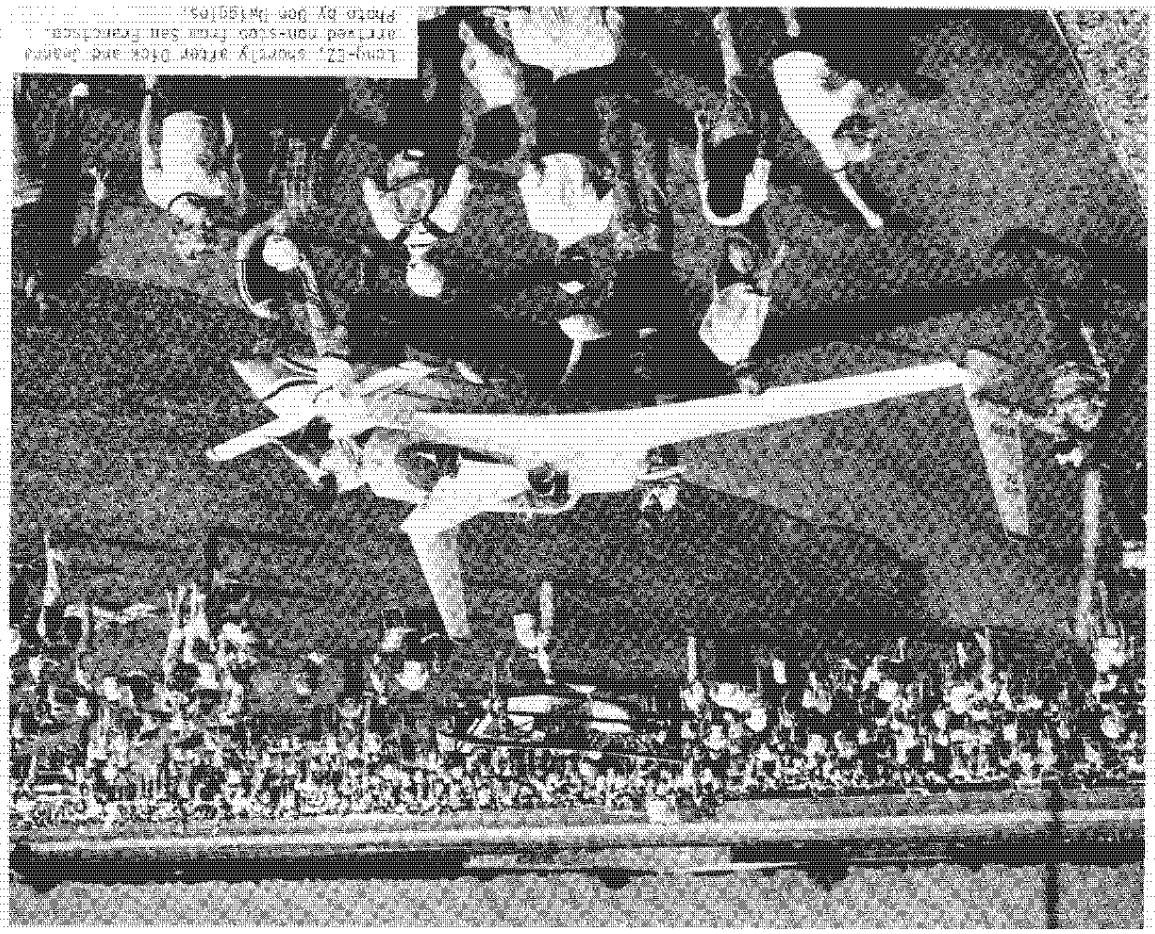

Long-EZ, shortly after they were delivered from San Francisco.
Photo by Bob Waldie.

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