

THE CANARD PUSHER

NO. 14 OCT. 77

NEWS OF THE VARIVIGGEN (very vig-in) and VARIEZE (very easy)

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If you are building a VariViggen you must have newsletter 1 through 14.

If you are building a VariEze you must have newsletter 10 through 14.

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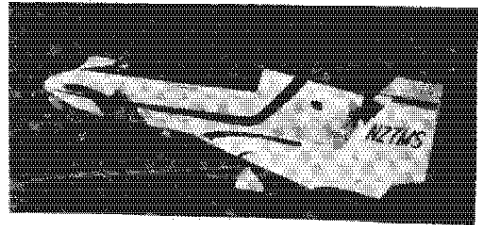
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SOME VERY SATISFYING events have occurred since the last newsletter. First flights of two VariViggen and about ten VariEzes have occurred during the last three months. The EAA convention at Oshkosh, WI. had five VariEzes and one VariViggen attend, each being flown in from out-of-state, plus a static display of a nearly completed VariEze. RAF gave about 30 rides to builders during the show. Langhorn Bond, new FAA administrator got a ride in N4EZ and a demo of its stall resistance.

Last December the prototype VariViggen, N27VV, was promised to the EAA museum at Hales Corners, WI. The day after the Oshkosh convention N27VV was flown to Hales Corners with Ray Hegy in his Chuparosa on our wing. We landed, taxied to the museum and left both airplanes to the care of the very able EAA museum personnel. It's a little heartbreaking to leave a perfectly good airplane in a museum. N27VV has given us some very satisfying flying experiences.

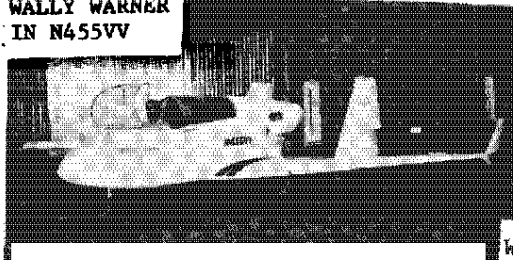
She was flown to the annual Oshkosh flyin six years in a row. She took us on many a vacation trip loaded with baggage. She performed low level maneuvering demos at over 25 airshows, and was flown for a feature film, "Death Race 2000." It is quite fitting that N27VV be preserved at this facility in the years to come, as the future will recognize it as a forerunner of some significant developments in general aviation. Some of these developments are currently under construction at RAF and may enter the general aviation market within the next four years.

The events of Oshkosh 77 will not be covered here, since they are aptly described by Jack Cox in the October EAA magazine, "Sport Aviation." Be sure to read that issue; it has the first article to be published by a VariEze homebuilder/flyer.

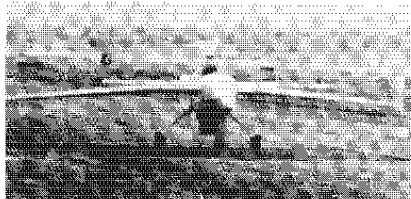


MIKE MELVILL DURING FIRST FLIGHT

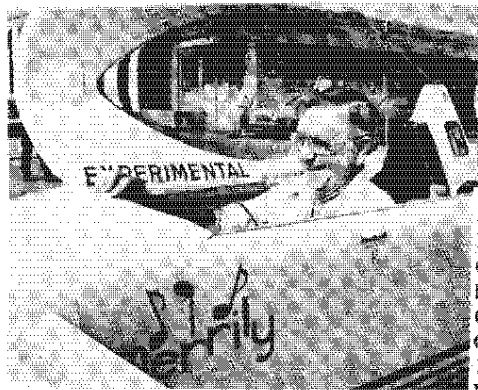
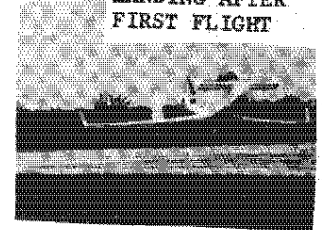
WALLY WARNER
IN N455VV



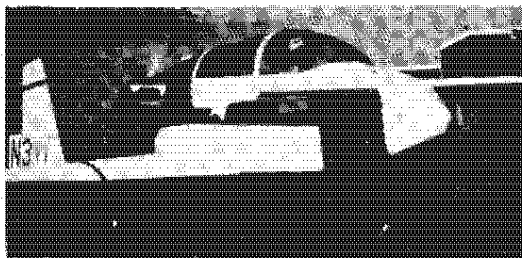
WALLY'S VIGGEN
LANDING AFTER
FIRST FLIGHT



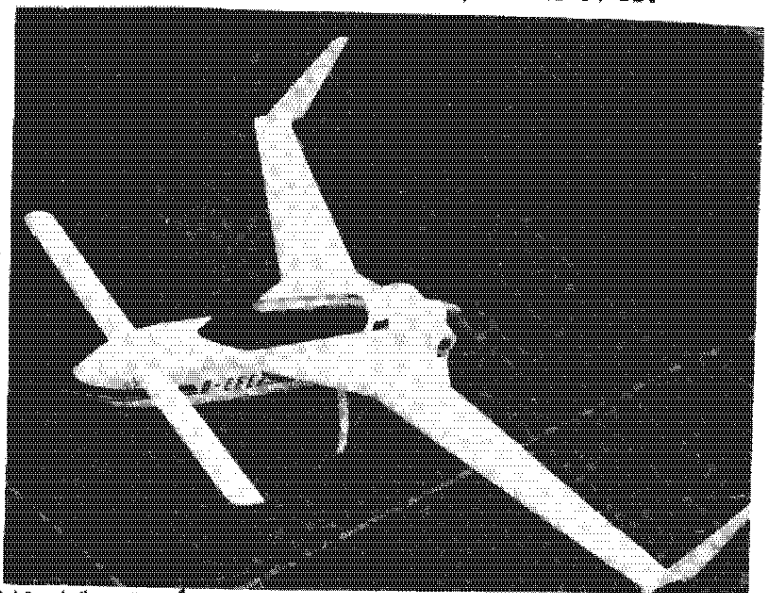
WARREN CURD AFTER
FIRST FLIGHT

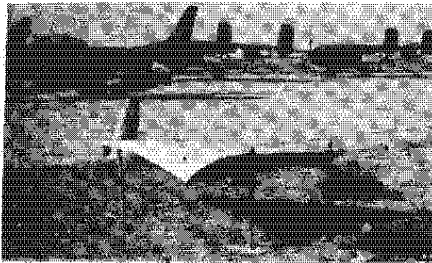


PETER KRAUSS'S EZ:
NOTE EXHAUST COMES
OUT TOP OF COWL TO
MEET THE RIGID
GERMAN NOISE RE-
QUIREMENTS. THIS
IS A STRAIGHT PIPE,
NO MUFFLER, BUT
GROUND NOISE IS
ONLY 64 DB.



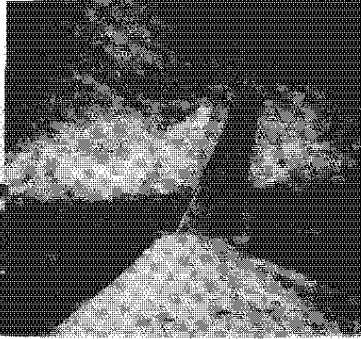
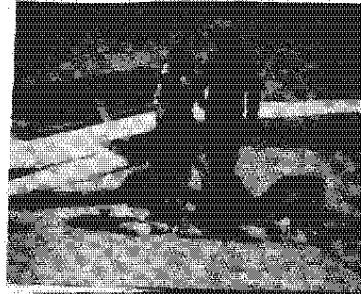
JIM CAVIS IN N31VV
BEFORE ACCIDENT



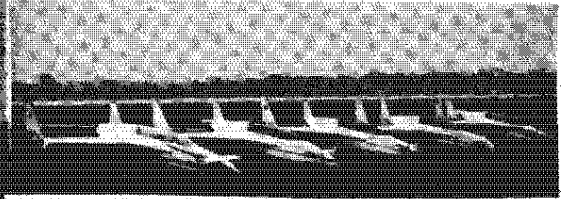


N4EZ WITH LOAD FOR OSHKOSH TRIP. CREW WEIGHT 310 LB. BAGGAGE INCLUDED 3 SUITCASES PLUS MISC ITEMS STOWED IN THE SPAR AND REAR BAGGAGE AREA - 52 LB TOTAL.

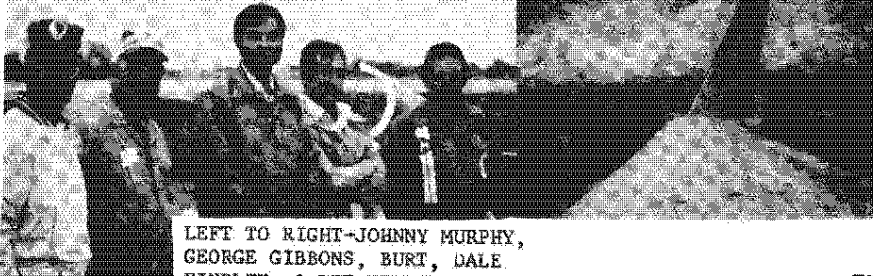
An SP wing - the all-composite (glass & foam) outer panel that has been flown on N27VV for the last 2-1/2 years is now mounted as a picnic table in front of RAF. The sun & blowing sand environment of Mojave is excellent to determine, at an accelerated rate, the effects of ultra-violet radiation exposure on the composite structure. A portion of the wing is painted with Null-V.



EZ's at Oshkosh - left to right, C-85-powered N20VE flown from Cape Canaveral, Fl by Johnny & son, Steve Murphy; Lyc 0-235-powered N655EZ flown from Boston, Ma by Ware Fuller & Dale Findley; 0-200-powered N4EZ flown from Mojave, Ca by Burt & Carolyn Rutan; 0-200-powered N101MW flown from St Louis, Mo by George Gibbons; and C-90-powered N1WX flown from West Orange, NJ by Diane & Lee Herron.

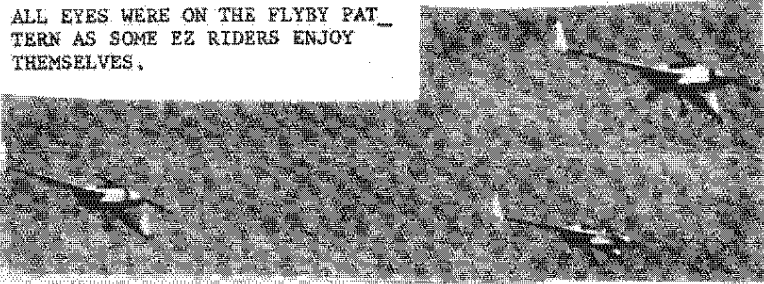


SHOT OF WING & WINGLET AT 12,500-FT O-VER NM - MOST OF OUR OSHKOSH TRIP WAS FLOWN ABOVE 11,000 FT AT 50% POWER AT ABOUT 175 MPH TRUE AND 37 MPG.

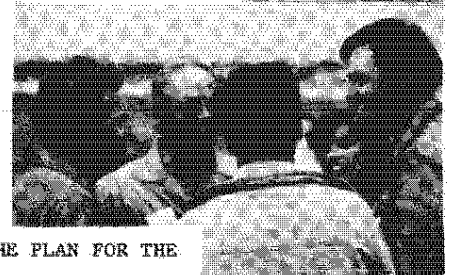


LEFT TO RIGHT-JOHNNY MURPHY, GEORGE GIBBONS, BURT, DALE FINDLEY, & LEE HERRON.

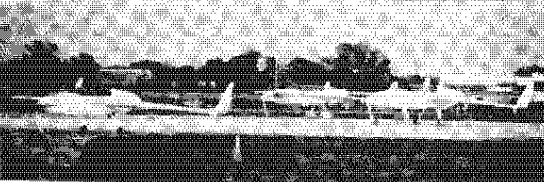
ALL EYES WERE ON THE FLYBY PAT-TERN AS SOME EZ RIDERS ENJOY THEMSELVES.



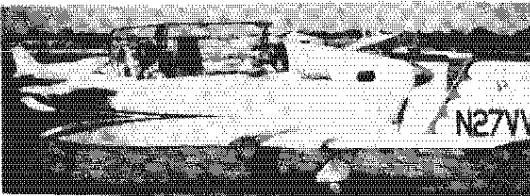
THREE EZ'S TAKE OFF TO JOIN THE FLYBY PATTERN



DISCUSSING THE PLAN FOR THE NEXT FLYBY



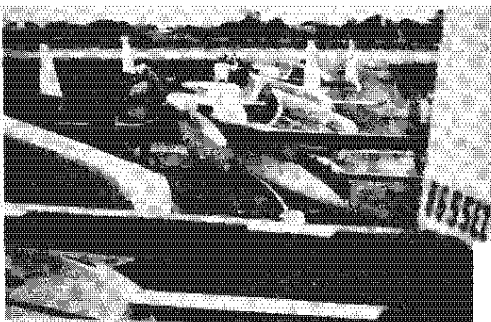
TAXILING IN, ALL SPEED BOARDS OUT.



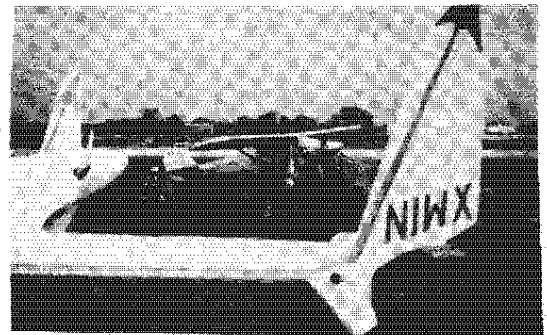
DR. LUTZ, GETTING HIS RIDE IN N27VV



COME ON LEE - FLYING AN EZ IS NOT THAT MUCH FUN!



SPIRIT OF ST LOUIS FRAMED BY N1WX



LINED UP FOR ENGINE START FOR A 4-SHIP FORMATION DEMO ON THE "HISTORY OF FLIGHT" AIRSHOW.

ONE MORE WORKSHOP

We are scheduling one more composite workmanship workshop. It will be an all day construction seminar and will include flight demos - all VariEze and VariViggen builders are welcome - bring your airplane or uncompleted part of your airplane. If you have a part in which you are unsure of its workmanship or acceptability, bring it so we can inspect it or use it as an educational sample for others. This is not a public openhouse; only builders are invited. It will be held at RAF, near the west end of the flight line at Mojave Airport, Mojave, Ca. (2-hr drive, north of Los Angeles on Highway 14), on Sunday, December 18, 1977.

FEATURE MOVIE TO USE VARIEZES

Ferde Grofe Films, in conjunction with the designers of the special effects and robots in STAR WARS, is planning a new film, CENTURION ONE. This is a Galactic Western where the setting is a hostile planet and instead of a horse the cowboys fly VariEzes. Studio sets will be used for many of the shots where the EZs will appear to hover, but real VariEzes will be used for flying photos. A lot of the flying filming will be done in the California Desert with as many as 10 VariEzes. Two EZs will be needed for some filming in some remote areas, including South America, Alaska, Africa and Southeast Asia.

Anyone interested in flying their own VariEze in this film? Contact Ferde Grofe Films, 18139 West Coastline Drive, Malibu, Ca. 90265

DID YOU KNOW?

That the long-sought Kremmer Prize for man-powered aircraft was recently won by a southern California group using a Canard Pusher-type aircraft.

That the new models of the Lear jet will use Whitcomb winglets.

That USAF will test winglets next year on a KC-135 tanker.

That NASA is considering new research to investigate the improved stall/spin characteristics offered by the loaded canard concept. A study of the Curtiss Ascender XP55, an aircraft plagued by bad stall characteristics, shows that if it had been modified to a loaded, high lift, high aspect-ratio canard configuration, it would have had excellent stall characteristics.

That Bill Lear got a set of VariEze plans about a year ago. That Bill Lear has just announced he plans to produce an all-composite airplane.

That RAF is about out of the first printing of the VariEze "Owners Manual" and it is being completely updated to show all revisions, current performance, fuel system, ailerons and landing brake. It will be available in November - ask for 2nd edition of "Owners Manual."

BUILDERS' CLUBS - Northeast VariEze/VariViggen builders Paul J. Dexter, 139 Hayden St., Orange, Mass. 01364, would like to form a regional association to help each other with building/flying activities.

Lee Herron, Box 357, West Orange, NJ 07052, is an EAA designee and is willing to help others with composite construction. Lee's VariEze appears elsewhere in this newsletter.

The Minnesota VariEze club is still the largest and most active. Contact George Wilson, 2924 108th NW, Coon Rapids, Mn 55433. RAF wants to thank the following members of the MVEC for their help running our booth at Oshkosh this year: Vic Berggren, Chet Ellingson, John Novy, Nat Puffer, Jim Tome, Chuck Weitzel, Ed Wieland, George Wilson, and R. Woodall.

Colorado VariEze squadron is now active. Contact squadron commander Lynn Miller, 7325 Tabor, Arvada, Co 80005. (303) 421-2261

Other clubs now active include Ohio (Bill Printz, RR2, Belle Center, Oh 43310), southern Calif (Al Coha, 5173 Leo St, San Diego, Ca 92115), central Calif (RAF Squadron I, Ed Hamlin, 8377 Seeno, Roseville, Ca 95678).

If you are interested in forming a builder's club, contact RAF so we can mention it in a future issue of "Canard Pusher."

The following is the first flight report from a VariViggen homebuilder, Mike Melvill. We are of course pleased to find that his performance is exceeding that in the "Owners Manual!" Wally Warner's (Orland Park, Il 60462) VariViggen flew first flight only three days after Mike's. Mike's Viggen has the standard wing shape in glass and foam. Wally's has the SP wings. Both have 180-hp O-360 Lycomings.

P.O. Box 561
Frankton, In.
46044

9-27-77

Dear Carolyn & Burt,

Well, we finally got there! At 11:30 AM 9-22-77 I took off from the Anderson Municipal Airport, and everything behaved as it should. I stayed up for about 45 minutes, did not retract the gear and made a perfect landing. I can not describe the feeling, it was absolutely fantastic. Thank you so much for a fabulous flying machine! Later the same day I climbed to 5,500 and retracted the gear and checked it out generally. As of today, I have 13.2 hours on it with no problems. At 7,500 in level flight, she trues out at 170 mph. at 2700 rpm. I have a 70x70 "Ted" prop, but for an O-360 even that is not enough, as it will over rev at low altitude. At 3500 ft she will indicate 165 mph at 2700 rpm, but this is not full throttle. Initial climb solo is 1500 f/min. At 5000' solo she makes a steady 1000 ft/min. All systems operate perfectly, reflex, electric trim, and gear are really first class and I am very satisfied. My radios (TERRA 360 com & 200 NAV) are really outstanding, and the tower at Anderson says I have the best transmission of any radio in the area. I can not say enough about the airplane. She really is a hell of a fine craft. I love it.

empty wt. 1252 lbs

empty cg 132.78

main tank holds 24.7 gals

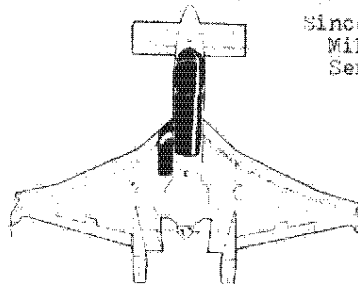
wings hold 6.5 each - 13 gals total

So far I have flown it at 125"cg, 124, 123, & 122. It handles well in all planes so far. Yesterday I loaded 170 lbs in the passenger seat and could hardly tell any difference. It takes 16 minutes to transfer 13 gals from the wings to the mains. Cyl head temp runs between 375 & 425, oil temp 165°, ground handling is excellent, brakes are very good. Rotation with full throttle occurs with full aft stick at 70 mph indicated. Initial climb at 85 mph indicated for gear retraction, then trimmed down to 120 mph. for good cooling gives 1000 ft/min. R.O.C. Canard stalls at 60 mph indicated (airspeed may not be accurate at slow speed) will climb with canard stalling & unstalling, and is fully controllable. Side slips well.

Actually it flies just about like yours. I must say I really get a heck of a kick out of flying it. I will enclose some picutres. I painted it off-white with dark green trim.

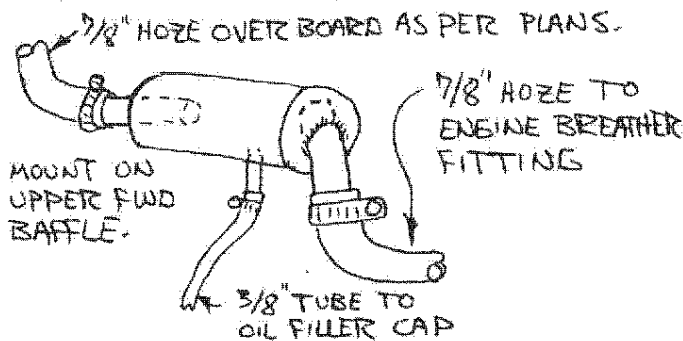
Sally sends her best regards. Thank you again for making it possible.

Sincerely,
Mike N27MS
Ser#115



VARIIZE CONTINENTAL ENGINE - installation in N4EZ has been flown about 53 hours since CP# 13. The installation continues to be trouble free. During the Oshkosh trip we found that it is rather susceptible to carb ice, similar to a Cessna 150. The carb iced up three times, each time carb heat was adequate to clear the ice. We found it advisable to cruise with heat on when in moist air conditions, cruising at 50% power.

If you are losing more than 1/8 qt oil per hour out the breather, install an oil separator as shown below. This can be homemade by welding ends and tubes into a 4-inch length of 2-inch dia aluminum tube. Several commercial separators are also available.



LYCOMING 0-235 FOR VARIIZE

Good news - development of the stripped 0-235 is proceeding well and availability of section IIC is expected in late November. The 0-235 Lyc development is not being conducted at RAF. Air Sport, Inc., Minuteman Field, Boxborough Road, Stow, Mass. 01775, phone (617) 897-6021 is doing all installation development, all flight tests, and will be providing all homebuilder support concerning the Lycoming. RAF will sell the section IIC drawings at \$21.50 (\$23.50 for Air Mail over seas) starting in late November. Profits from sales of IIC will go to Air Sport. All homebuilders questions concerning IIC information should be directed to Air Sport.

The Air Sport EZ now has nearly 100-hours flying time and is very close to completion of required flight tests. Cooling, induction, controls, fuel system, exhaust, mounting and cowling have been essentially debugged. The Air Sport EZ is flying with a Jiran prototype Lycoming cowling. The Lyc cowling is to be available from Jiran by late November (same price as Continental cowl).

Section IIC will include installation of all models of the Lycoming 0-235. The following stipulations must be adhered to: Slick mags must be used. Ring gear, alternator, starter and vacuum pump must be removed. The Lyc is mounted closer to the firewall than the Continental, thus, the balance of the airplane is the same as with an 0-200 with alternator.

Performance with the 0-235 is essentially the same as with the 0-200. Rate of climb will increase about 13% and cruise should be four to five mph more.

VW ENGINES FOR VARIIZE

We still do not have any encouragement to report as yet, except that a serious development program is still planned by Revmaster. Results of their tests will be published here when available. Looking at other programs though does not provide encouragement. It seems that reliable engine experience is the exception rather than the rule. Fred Keller again flew a VW-powered aircraft from Alaska to Oshkosh this year, but even after several years of development, the prototype KR2 and Mini Imp were trailed in.

The two Pazmany PL4A's at Oshkosh this year were powered by Continentals, even though the design and prototype were intended for the VW.

Two other new VW-powered aircraft were at Oshkosh. One trailed in, another had an engine failure in route. The Sonnerai's appear to be having adequate reliability using VW's up to 1700cc, but above that (for adequate power for a VariEze) even they admit that reliability is in question.

TAKEOFF PERFORMANCE - Some EZ fliers who found takeoff distances were too long have found they could obtain the "Owners Manual" distances after assuring they met the following:

1. Brakes should not drag - align the nose wheel once on the runway before the takeoff roll so you don't have to ride a brake.
2. Tire pressure should be at least 55 psi; use 70 psi on the 4-ply tires.
3. Lift off at 60 kt (69 mph) at 900-lb gross weight and 66 kt (76 mph) at 1050-gross weight. Raise the nose early but only slightly; i.e. don't raise it high until the above speeds.
4. Be sure you are getting the correct static rpm. Minimum is 2200 for the 0-200, 2100 for A75 or C85, and 1900 for the A65.
5. The "Owners Manual" data are for the Ted's prop. While the Cassidy prop is more efficient at cruise, it extends takeoff about 20%.

VARIIZE WEIGHT - A lot of the builders are losing sight of the fact that the airplane was designed for the A75 engine which weights 170 lbs and without additional equipment. It is stretching things to install the 0-200 less electrical system (195-lb engine weight). It is really stretching things, compromising useful load and making the airplane tail heavy if you install the 0-200 with alternator or the stripped Lyc 0-235 (210 to 215-lb engine weight). You will probably be happier with overall performance and utility of a 75 horsepower, 540-lb empty airplane than with a 100 or 108 horsepower, 650-lb empty airplane.

Some have commented that, "Oh, I only weigh 160 lb," or, "I plan to fly solo all the time, so I don't mind an extra 50-lb empty weight." This is foolish - the VariEze should always be flown as light as possible, not always be flown at gross weight. I put in enough fuel for the mission required. I fill up N4EZ only when I need the range. If you only weigh 160 lb, are flying solo, and have a light airplane, then you can enjoy some real benefits - spectacular climb; lower approach speed; shorter takeoff and landing; easier on structure, landing gear and brakes; easier to ground handle; much more fun to fly, etc.

Do not install any extras until you know what your final weight is going to be and if you can accept it. The cause for many of the overweight planes is excessive fillers, primers, and paint in the finishing process. If you can, weigh your plane before and after finishing, and let us know the data. We know of some finishes as light as 12 lb., others as heavy as 85 lb!

Bud Bryan's 0-200-powered EZ is now 570-lb empty after removal of alternator; his is the lightest 100-hp EZ I know of - a good goal to shoot for. You should consider an empty weight over 620 as total-ly unacceptable.

We have had several questions (particularly from those who have ruined their useful load with a heavy empty weight) about what happens if you try to fly over gross. This is not something to be taken lightly, since the number "1050-lb" is literally used over 1,000 times in the structural design, performance calculations, structural dynamics, etc. I have operated N4EZ over gross on about 20 flights, including our trip this year to Oshkosh in which we had full fuel on several flights and 52-lb baggage (see photo). This was a useful load of 529-lb and

a gross weight of 1116 lb. Based on our operational data and a re-look at the structural considerations we can approve operation up to 1110 lb, but only under the following limitations:

1. At least 90-hp engine
2. Taxi and takeoff only on smooth, hard surface. Use 65-psi tire pressure on mains; 75 psi if 4-ply tires are used.
3. Maximum weight for landing limited to 1050 lb.
4. Maneuvers limited to normal category +4g, -1g. No intentional abrupt maneuvers.
5. Add 300 feet to gross weight takeoff distance, liftoff at 70 knots (80 mph), climb at 85 knots (98 mph).
6. Pilot proficiency - at least 50 landings in VariEze before attempting overgross operation.
7. High gross weight should not be considered for routine operation, since the chances of surviving an off-airport forced landing diminish rapidly as weight is increased.

The following list is all the instrumentation in N4EZ. This allows me to fly anywhere I want to go, excludes me only from the handful of large airports at the hub of the TCA's and provides adequate references to penetrate a cloud deck if in an emergency and caught on top. Any equipment in addition to this list should be avoided, as it does not increase the utility at all, since night or IFR is not recommended.

airspeed	EGT
altitude	GHT
rate-of-climb	RPM
compass (wet)	oil p.
electric turn/bank (stand by)	oil t.

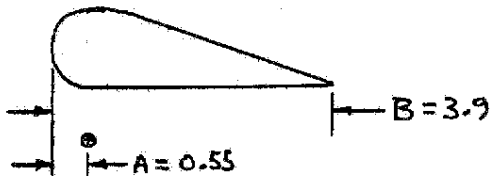
Escort 110 nav/com

FRIGHT TESTING

We recently observed someone taking his airplane to red-line speed for the first time at low altitude. Opening any airplane's envelope, be it a homebuilt or the 10,000th Cessna 150, is a risky flight test that should be done carefully. The first time you do stalls or open up the high speed area, do it at high altitude and wearing a parachute.

VARIEZE PITCH SENSITIVITY- I have flown seven VariEzes and thus have been able to compare variances in flying qualities. In general most have been more sensitive or more difficult to fly in pitch than N4EZ. We have investigated why the average EZ does not feel as "solid" in pitch as N4EZ and have identified the following causes- be sure to check all of them on your airplane.

- (1) Control system friction- the system must be smooth and friction-free. If yours is binding or rubbing, fix it before you fly.
- (2) Elevator dimensions - check these dimensions on your elevator, measured with the bottom of the elevator level. The airplane will be more sensitive if A is too large or if B is too small.



- (3) Aftcg - Those with the big engines with alternators, or those with light pilots are finding that their airplanes are tail heavy. A tail heavy airplane needs to be ballasted with nose weight to obtain a proper cg. To avoid adding a lot of dead weight, it is tempting to fly the

airplane near the aft cg limit. This is ok once the pilot is proficient but aft cg makes an airplane more sensitive and more difficult to fly. Thus, we recommend that you initially fly at mid to forward cg, ie, in the forward part of the first flight box.

- (4) Trim authority - The airplane is easier to fly when in trim. To be sure you have enough trim for low and high speeds, check the following and adjust trim springs accordingly: With trim set at full aft (cable wound up to the nicopress sleeve) and stick held neutral, the force at the stick grip should be about three to four-lb aft. With trim set at full forward (cable unwound) and stick held neutral, the force at the stick grip should be about one to two-lb forward.

Those of you who do have the heavier engines and alternators are finding that the nose weight needed to get the cg forward is cutting into your useful load, already reduced with the heavy engine. If this were a conventional airplane there wouldn't be much you could do, short of moving the engine or wing. But, since the VariEze has two widely separated, lifting wings, the allowable cg range can be shifted by shortening or lengthening the canard. Thus a "tailheavy" airplane can be made to fly "nose-heavy" merely by sawing off canard span, making no change to actual cg! This can be done only up to a point, where directional stability is lost as cg is moved aft. We have tested the flying qualities and confirmed that the canard/elevator is free from flutter at two canard spans - 150" as shown in the plans and 142" which is obtained by sawing 4" off each tip. If 4" is sawed off each canard tip (142" span) you can move the allowable cg range aft 1.2 inches. This is equal to adding 15-lb weight in the nose at F.S. 5.

Let's look at a couple of examples to see what this canard trim can do for you. Assume you weigh 170 lb and you are using an O-200 with alternator and a small battery. When you do your weight and balance you find you will need 30-lb ballast in the nose to get to the nose heavy condition (preferred for low pitch sensitivity) for first flight. Then later you can remove 1/2 the ballast, but will have to carry 15lb of lead in the nose for the life of the airplane. If you trim the canard you will find that you only need 15-lb ballast to get to the forward cg you need for first flight. Then, when you are comfortable with the stick forces you can remove all ballast and have the best useful load and a mid to aft cg. Thus, trimming the canard has increased your useful load by 15 lb!

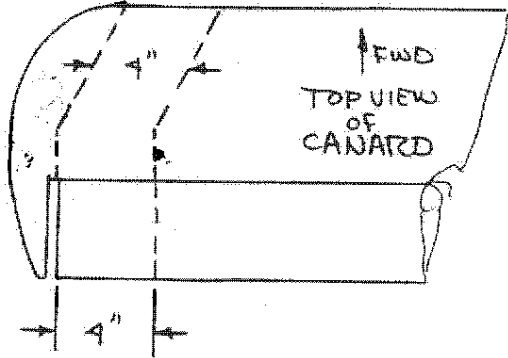
As another example, let's assume you have built an EZ with the engine it was designed for, the A75 Continental. When you do your weight and balance you determine the allowable pilot-weight range is 125 lb to 240 lb. You, yourself, only weigh 130 lb. You note then, that you will always be flying a sensitive airplane (near aft cg limit) unless you carry ballast. You also note that you don't have any friends that want to fly your airplane that weigh over 210 lb. Thus, you decide to trim your canard. With the allowable cg range back 1.2 inches you recalculate your allowable pilot range as 95 lb to 210 lb. Now, you can fly a "mid"cg range without adding ballast, and your 90-lb wife can fly with less ballast.

In summary, the canard trim to 142-inch span lowers the allowable pilot weights about 30 lb. If the airplane were originally designed for the O-200 with alternator the canard would have been about 142 inch span. Do not trim the canard to less than 142 inches, in hopes of using further aft cg (aft of 102.2) to balance a heavy Lycoming and a light pilot. Directional stability may degrade aft of 102.2 and the canard has not been tested for flutter at less span.

The best time to decide if you want to trim

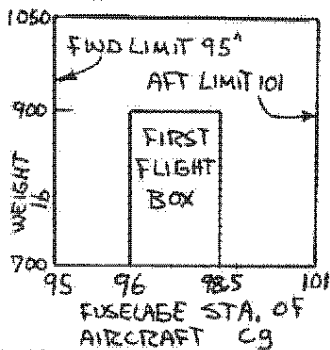
your canard is when you have done your final weight and balance and have calculated your allowable pilot weight range and compared it to your weight. However, if you know you are going to use an O-200 or Lycoming O-235 and your weight is less than 180 lb, go ahead and trim it now, before your paint job. Same goes for even the A75 engine if your weight is less than 150 lb.

The canard can be trimmed easily without much disruption of the paint job. Refer to the sketch. Using a hacksaw or coping saw, saw off 4 inches from the tip of each elevator. Now saw a 4-inch section from the canard as shown so the tip can be glued back on (wet micro) and no recontouring of the tip will be needed.

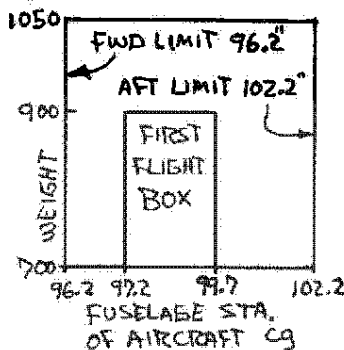


CG RANGES

**STANDARD
150-INCH
CANARD**

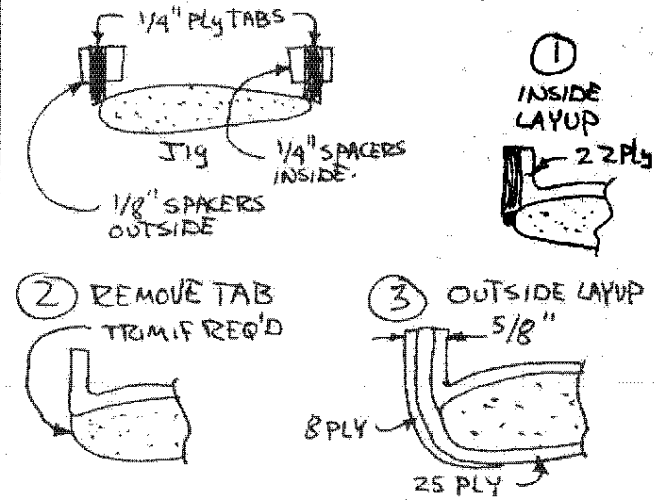


**SHORTENED
142-INCH
CANARD**

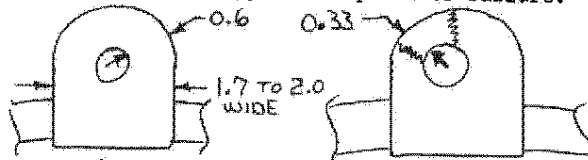


VARIABLE LANDING GEAR- We are asking all of you to make a change to the main gear mounting tabs. This change is not based on any problem with N4EZ nor any drop test result. N4EZ now has about 500 landings, some of them at gross weight and a few of them quite hard. There has been no deterioration of the gear or attachments, so it is a bit confusing to us to learn that 3 or 4 of the homebuilt Ezs now flying have had failures. One was a complete failure of the tab that allowed Cy Mehling's gear to rotate forward, dropping his airplane on its belly while taxiing. Others were discovered before they completely failed. In one case the bolt or spacer had worked in the tab enough to allow the inside and outside pad layups (page 18-2) to move relative to each other, thus partially peeling the tabs from the strut and making the strut loose. Because these failures are apparently not isolated cases but are affecting a large percentage of the builders we recommend that you update your gear to the configuration shown below before you taxi or takeoff.

The modification does two things. First it adds additional material to the tabs and second, it allows the inside and outside pads to bond directly to each other, preventing the relative motion allowed by the previous foam tab. Here's the method for original construction: make the tabs as shown on page 18-1 from 1/4" plywood, not foam. Instead of the two 3/16" spacers, make the spacers in-between the tabs 1/4" thick and the outside spacers 1/8" thick, otherwise follow step 2 exactly. Modify step 3 as follows: make only the inside layup, using 22 plies BID. Clamp lightly (too much pressure will drive out too much resin) and allow to cure. Using the tab as a guide, drill through the inside pad and trim the edges even with the tab. Now completely remove the tab and sand the faces of the inside layup dull. Do not be concerned if you have to remove a little of the gear strut to fair into the trimmed tab. Apply the outside pad layup using 25 plies all around and an additional 8 plies on each side that just lap over the leading and trailing edges. Clamp lightly and cure. Continue, following step 4. This will now result in a solid glass tab in the 5/8" gap between the aluminum extrusions.

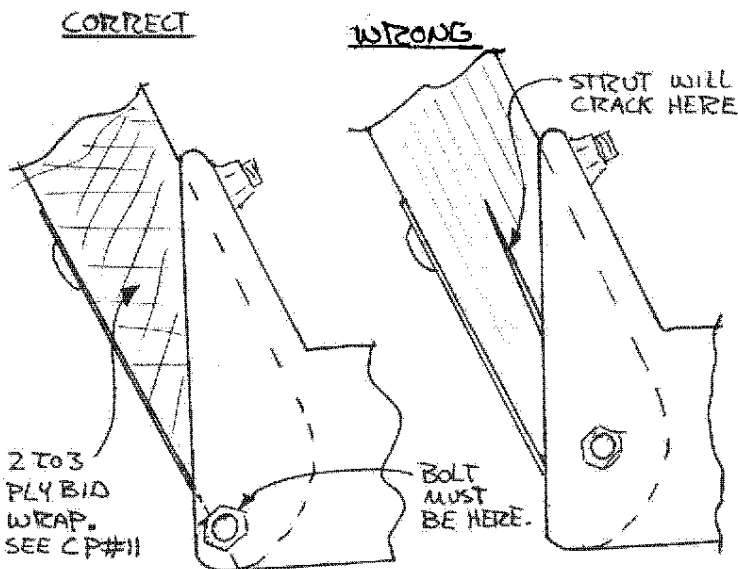


Do not make the layup wider than 2 inches. A wide layup will stiffen the gear locally and can result in the strut peeling away due to bending loads. If your gear is already mounted, use the following procedure: saw off the bottom cover from the rear seat, back about 12". Remove the gear. Peel off the 15-ply outside layup pad (chisel and hammer.) Completely remove the foam tab. Layup about 6 plus on the face of the inside pad, butting them against the gear leg. Trim the strut as required for a smooth corner without a joggle. Layup the 25 and 8-ply outside layup as shown above. Be sure to check that you have the correct 0.6-inch edge distance all around the tab. Cy Mehling's tabs were only 0.33" at the point of failure.



Since I have been alerted to the failures in this area I have been keeping a close look at the tabs on N4EZ. The forward tabs are difficult to see, so I made a 3-inch diameter hole in the rear seat bulkhead immediately in front of each tab, to allow inspection. I recommend that you make these holes in your airplane. They do not show, since they are covered by the back seat cushion. Use a pin router or hole saw.

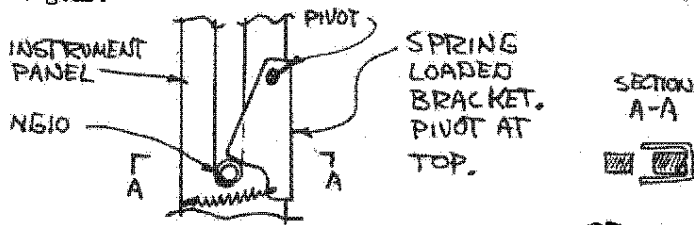
While on the subject of gear strength, a reminder is in order to check that the nose gear strut is installed properly. If this is done wrong its strength is as low as 1/10 and will barely support the airplane's weight for taxi!



Several builders have had various problems with the Rosenhan wheels/brakes. If they are not kept in adjustment they can allow the piston to move too far out and result in O-ring failure. They must be adjusted as follows: turn the adjustment nut until the wheel will not rotate by hand. Back off 1/4 turn only. Check adjustment often. Use only the red MIL H 5606B aircraft fluid. Aircraft Spruce has it by the quart. I have been discussing the homebuilders' experiences with Fred Rosenhan, manufacturer of the wheels. He informs me that he now has a direct-puck actuation brake pad (like Cleveland) in the prototype stage. If it is successful it should increase the effectiveness of braking and eliminate need for adjustment. It is being designed to retrofit on the current Rosenhan wheels. We will keep you posted on the progress of this item.

When you drill the holes to join NG10 and the NG11 block, NG10 must be fully in the lock notch in the instrument panel. If this hole is drilled with NG10 to the left in the slot, the NG11 will not be fully engaged in NG13 with NG10 locked. This can result in NG10 popping out of its lock and the nose gear retracting. This happened 3 times to Dale Findlay on his trip to Oshkosh. Our experience has been that as long as NG11 is snubbed firmly into NG13 on both sides with NG10 in the lock, the nose gear has a very positive down lock. Be sure that the knob has the full one inch of snub (page 17-10). The weakest link in the nose gear is the NG10 pushrod which will buckle between NG11 and NG9 if an overload occurs.

Peter Krauss modified the NG10 lock with a system that is more complex but eliminates the need for NG10 to move sideways and provides a more positive lock. The mod involves making the slot in the instrument panel a straight line. A bracket is added that snaps over NG10 when snubbed down. The pilot must push the bracket out of the way to retract or extend the gear.

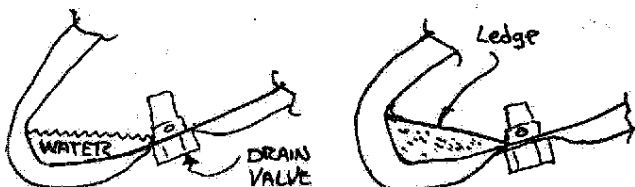


CP NO 14

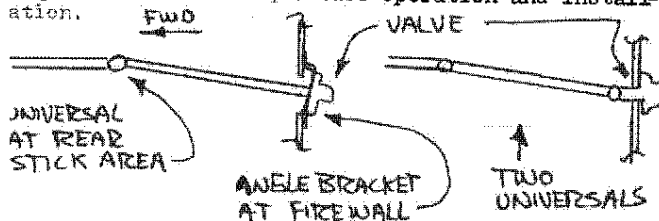
VARIIZE FUEL SYSTEM

It has been determined that, due to a vendor error, some of the fuel cap O-rings in the Brock caps are of the wrong material. They will swell when wet with fuel and make the cap difficult to install. To check yours, soak your cap in fuel. If the O-ring swells enough so it doesn't fit the ring properly, return your O-rings to Brock for replacement.

It is possible to place the main fuel tank drain fittings (CP # 10 pg. 6) in the tank such that they do not drain the low point during nose down parking. This can allow water to remain after draining. Refer to the sketch and build a ledge in front of the fitting (if necessary) such that the drain is at the lowest point. The ledge can be urethane foam with one wet ply of BID.



The fuel shut-off valve, when received has high friction. This is reduced when wet with fuel. Slop your valve with fuel before installation to remove any grease and to verify that it does not bind excessively. The torque tube, installed as per newsletter 11 has a gentle curve from front to rear and is supported at the rear stick area. Some builders have found that one of the following methods improved torque tube operation and installation.



When installing the fuel system be sure all components are placed exactly as shown on the drawings. Be sure the tee sits flat on the floor and do not vent the fuselage tank to the same vent as the wings. With separate vents you have redundancy in case the fuel vent gets clogged.

CP 13 alluded to the possibility that the Bendix carb will not work (pg 1). Johnny Murphy now reports his problem was a totally blocked vent, and once cleared, the fuel system operation is excellent with the Bendix carb. Johnny discovered the block vent only after a forced landing in which he had to glide 10 miles to an airport.

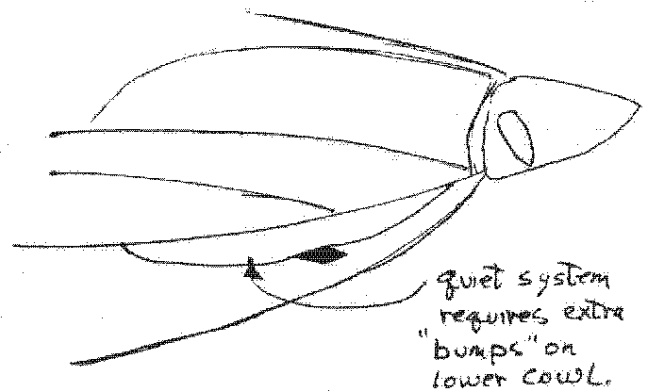
Do not modify the fuel valve's design feature that causes it to interfere with the pilot's wrist when the fuselage tank is selected. Already one VariEze has had a forced landing when the pilot ran the fuselage tank empty during touch and go's. This would not have happened had he done at least one of the following correct things: build the valve handle to plans, read the checklist, select the other tank when engine fails.

Remember, the fuselage tank is only required to extend your range by allowing full use of the two gallons of unusable wing fuel (unusable in extended descents). Unless you are stretching your range over 700 miles you never need to select the fuselage tank. You will find that you rarely use fuselage fuel, but it is extremely useful to be able to completely use all wing fuel when needed due to headwinds or weather. The fuselage tank also provides redundancy. If the cause of an engine failure is unknown, immediately select your other fuel supply.

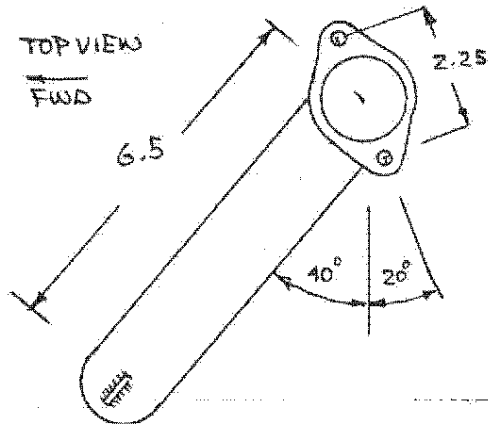
Page 7

VARIEZE EXHAUST SYSTEM - As you know from CP 13, the four-post exhaust system had to be shortened to avoid vibration failures. CP 13 instructed you to shorten your system but did not have a drawing showing all details. The drawing below shows what the system looks like after shortening. Note that it must fit rather tight on the intake manifold to allow adequate cowling clearance. If you have an original-length system from mild steel, saw out a portion of the horizontal length and take it to a welder to get it welded - most auto muffler shops can do an adequate weld on mild steel tube.

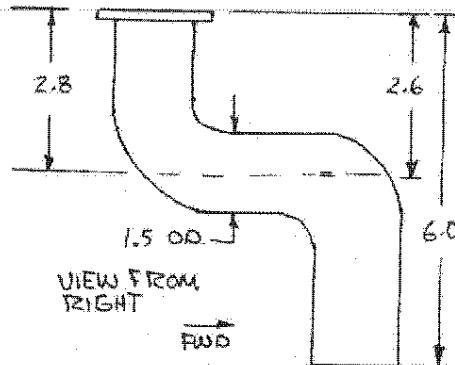
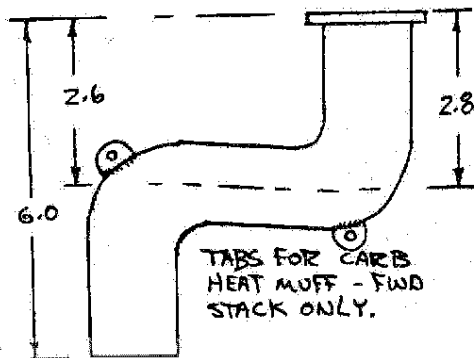
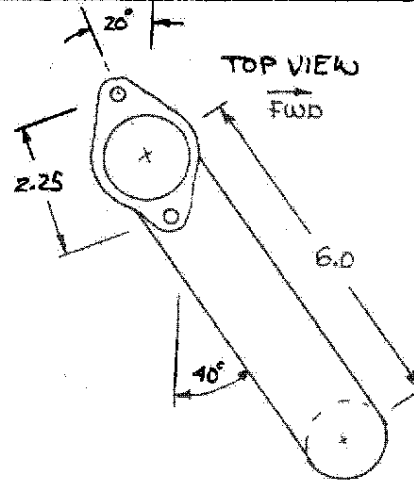
The quiet muffler system mentioned in CP 13 has been flown on N422. It is very quiet, weighs about 8 lb, but presently robs too much engine power. The manufacturer is now modifying it to lessen the power loss. Installation of the two-can muffler system requires "bumps" to be added to the lower cowl (see SKETCH). It is similar to a Cessna 150 in external configuration, but has far superior sound deadening qualities. We hope to have its development completed in time for it to be available when CP 15 is published.



LEFT HAND STACK - MAKE TWO



RIGHT HAND STACK - MAKE TWO



VARIEZE PLANS CHANGES- Be sure to copy these into plans.

Section I, A3

Add the following dimension to all four landing gear extrusion drawings:



Aileron Addendum Page 5

The ZigZag hotwire template for template Y and B has the ZigZag misplaced too far forward. Move the ABCDEFGHIJK ZigZag lines back 0.2" toward the trailing edge.

Section IIIA, Pg. 13

Drill a 1/4" hole in the low point of the air inlet hose to drain fuel for a flooded start. (low point with gear retracted).

Section pg. 18-2

Modify main gear tabs as shown in this newsletter.

Owners Manual page 28

Replace cg chart with those on page 6 of this newsletter.

Section I page 24-4

The 0.3" dimension should be 0.75. This results in the lower winglet being canted outward about 30° from vertical to lower dihedral effect and reduce wing rock at low speeds.

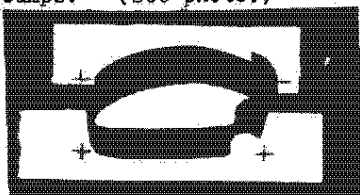
NOTE: Stall characteristics have been found to vary from airplane to airplane. Most Exes and Vigens are not susceptible to departure and can be flown trimmed at full aft stick. Some do exhibit more wing rock than others. Peter Krauss reports that his Eze cannot be flown at full aft stick; that at about 60 mph one wing drops abruptly. This is probably due to incorrect wing twist, as Peter's airplane has required a relatively large trim tab on the wing. Be sure to determine your airplane's stall characteristics at altitude and with a parachute.

VARIEZE BUILDING HINTS - Thanks again to those donating their ideas for this column. Be sure to note the building hints from all letters into your plans so you won't forget them when you reach a particular point during construction. When submitting a building hint please include a self-addressed stamped envelope so you can receive our comments.

Ray Mucha - "When joining canard and wing cores first put the templates together and drill the nail holes all in the same place. Then later when the cores are joined, a wooden Q-tip stick or round toothpick in a few of the nail holes will hold the cores in alignment."

Bill Rice - Low cost syringes in 3cc, 12cc, 35cc, and 60cc used by large-animal vets, can be used and reused to measure resin and hardener. Be sure you check the ratio obtained on your epoxy balance to confirm you are getting an accurate 1-to-5 by weight ratio."

Jim Smith - "Rather than using only the top template to check canard incidence, a double one (as shown) clamps completely over the canard to give a more accurate incidence check that is less affected by local bumps." (See photo.)



Phil Supan - "Use a plastic garbage-can liner to keep epoxy off clothes. Cut three holes, one for your neck and two for arms."

Problem - Dacron peel-ply material wrinkles and is difficult to stipple into place. Solution - use Dacron surface tapes, available in rolls in the correct 2.7-oz weight (Aircraft Spruce catalog pg 99). Apply the tape in individual strips over large areas. You will need about three rolls of 1" tape and 2 rolls of 4" tape.

Dale Findlay - Dale devised a clever way to lock the canopy from the outside by installing a removable link between the canopy handle and the lever for the speed brake. When the speed brake is closed from the outside, the canopy is secured. To open the canopy he pries the speed brake open, which opens the canopy handle. The link is a piece of .063 2024 with two holes about 5.8" apart.

Vic and Mary Sullivan - "Any type cake decorator's cone can be used to apply dry micro. After hot wiring the aileron piece from the wing, nail it back into place so you have the full straight trailing edge available to accurately jig the wing. Remove it before skinning wing."

Dick Cobean - "Updating plans is easy if you Xerox the newsletters then cut and paste the hints and changes into your plans."

Some builders are still having problems drilling and tapping the steel inserts in the canard for the lift tabs. We recommend only the method using the predrilled 1/8" aluminum insert with nutplates installed (see newsletter # 10, pg. 3).

Robert Purdy - "When drilling the NG13 holes in NG30 plates, clamp the NG30's together, clamp the NG13 on and use it as a drill guide. (page 17-5)

Cy Mehling - "Failures that occurred with the 5 volt regulator in the roll trim circuit were solved after installing a 10 watt, 50 ohm resistor in the lead to 12 volts." This is the only case I know of here - has anyone else had to replace the regulator?

If you have purchased a Jiran mounted canopy be sure to check its width before mounting the reinforcements and laying up the inside skin. It may have to be bowed inward somewhat to have adequate room for mounting the 3 brackets on the left side.

When the Jiran fuel tanks are trimmed to fit the fuselage side and wing rib they may end up about 0.8" aft on the fuselage as is shown on the plans. This is ok.

CP No 14 Page 9

If you want to reverse the canard tab bolts to allow forward removal (CP #13, pg 5), install the nutplates on the back of F22 as follows: rivet the nutplates to a 1.5-inch dia. piece of .125-inch thick aluminum. Bond the alum washer to F22 and overlay with one-ply BID to secure it.

Pieces of BID cut at 45° are easily distorted if picked up incorrectly and will not fit the part without a lot of cloth movement in place. To avoid this, roll the piece up while it's still on the flat cutting table, carry it carefully to avoid stretching, then roll it onto the part.

One builder reports his fuel gauge is not readable in other than ideal light. The key to good gauge contrast is to avoid any trace of foam or micro in the gauge area. Lay a strip of grey duct tape or plastic electrical tape in the gauge area before glassing the inside of the fuselage. This saves the work of sanding away all traces of foam. Remove tape before glassing outside. Be sure no micro gets on gauge. Sand both sides smooth and coat with epoxy.

You can generally tell the quality of a man's workmanship just by looking at his shop. Clean up and sweep after every step. Keep your tools organized and clean. Dirt in or under a layup will increase weight and decrease strength. A clean shop will reflect on your airplane, and will make construction more pleasant.

A flour sifter is excellent for getting any lumps out of micro. Keep micro bag closed to avoid moisture.

A key to a good glass layup is preparation. Copy the check list below and post in your shop:

BEFORE ANY GLASS LAYUP	
1.	Tools cleaned & available squeegee cups & sticks brush scissors roller ply 9 or gloves
2.	Workbench clean
3.	Glass cut & rolled
4.	Surface to be glassed - correct shape & smooth contour sanded dull dust blown or vacuumed off
5.	Temperature of room and epoxy 70 to 80°F

VARIEZE ERRORS - HOW TO FIX

Now that the plans are essentially debugged by CP #10 through #13, the most common call or letter we get from builders starts with, "I goofed, how can I fix it?" The following are accepted practice to repair common errors. Of course, it's best to be careful and avoid the error in the first place. Remember, most errors can be avoided by reviewing your newsletters.

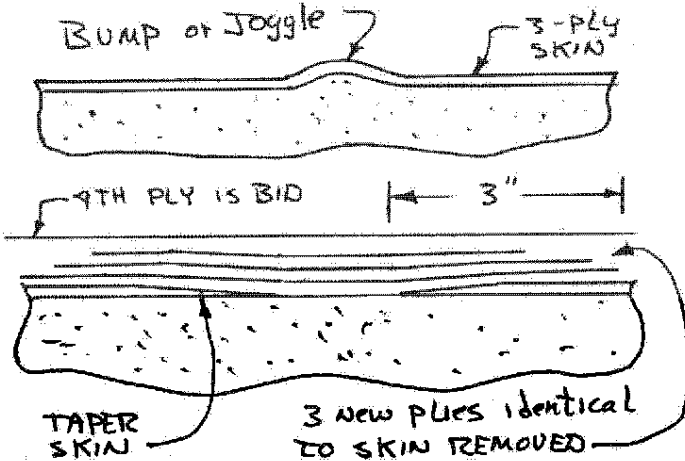
ERROR: Depression in skin or spar cap in spanwise direction on wing, winglet, or canard.

REPAIR: Sand surface dull. Layup UND plies cut as shown to fill depression, fiber orientation spanwise. Add one ply BID at 45° lapping two inches on each side of depression. This repair is allowable for depressions up to 1/10 inch deep.



ERROR: Bump in skin or spar cap in wing, winglet, or canard.

REPAIR: Using a hard block, sand bump level. Determine number of plies in area of bump. Sand completely dull the area around bump to a radius in inches equal to number of plies at bump. Layup the same plies as effected area, being sure to observe fiber orientation. Add one ply BID at 45 degrees as shown.



ERROR: Inadvertently sanded through plies during finishing process.

REPAIR: Determine number of plies damaged. Repair as shown in "bump" repair above.

ERROR: Due to incomplete wetting of layup I have several pin holes in my wing fuel tank so it will not meet leak check.

REPAIR: Pull a mild vacuum (1500 ft) on the tank. Hold the vacuum for 1/2 hour as you brush, stipple, or rub epoxy over the area with pin holes. Then vent tank to equalize pressure. Paint a coat of epoxy over effected area. Be sure tank is vented during cure.

ERROR: Sparkplugs strike top cowling due to cowl being installed too low.

REPAIR: Cut holes in cowl over sparkplugs and build bumps (CP #8, pg 7).

ERROR: Drilled out threads on one of the wing attach bolts.

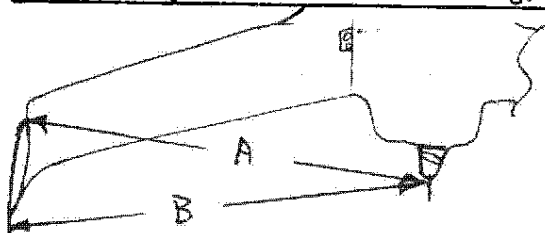
REPAIR: Install a nut on the bottom - dig out and replace foam from the root end.

ERROR: Air bubble caused by attempting to glass around corner without radius.

REPAIR: If height of void is less than 1/10 inch, drill two small holes and force epoxy into void. If bubble is large, sand away and follow repair for "bump" above.

ERROR: Foam cores jiggled in wrong position so that wing or canard will have joggle when glassed.

REPAIR: Cut core loose and bond (wet micro) in correct position before continuing.



ERROR: Glassed surface feels "tacky" after one day cure - This is generally due to improper measuring or mixing of epoxy (too much hardener).

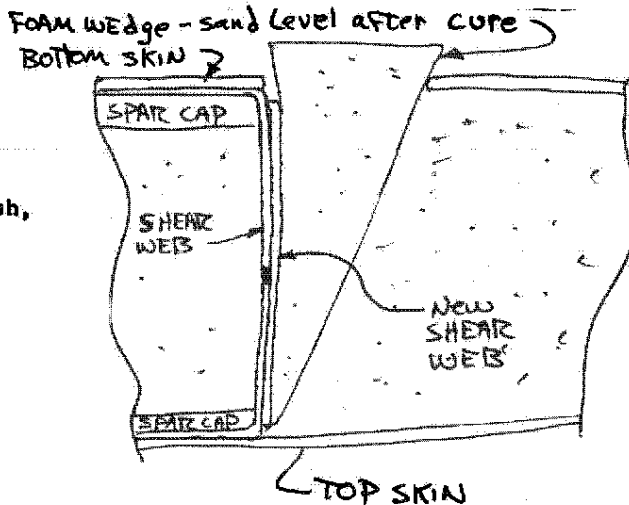
REPAIR: Raise temperature to 80 to 90 degrees for several days. If still tacky and surface will not make a white mark when scratched with a sharp knife, the layup will have to be stripped (peeled) off and redone. Before continuing, do a test mix in a cup and check its surface for a good white scratch mark after cure. Check resin or hardener for settling (CP #12, pg 4).

ERROR: Due to a poor or heavy layup, elevator or aileron will not balance to specification.

REPAIR: Start over; sloppy workmanship cannot be patched on these parts.

ERROR: After wing was completed I noticed that shear webs were butted on sides, rather than top and bottom.

REPAIR: This is a very extensive repair but does save \$ and time over the job of completely replacing wing. Cut skin as shown on wing bottom. Remove foam wedge. Sand entire shear web face dull and glass with 3-ply BID at 45°. Put in new foam wedge with wet micro. Be sure wedge fits well to avoid exotherm. Patch skin as shown in "bump" repair above.

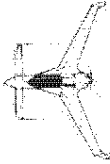


QUESTIONS/ANSWERS - Your questions can be answered directly if you include a self-addressed, stamped envelope.

Q- I know bare foam must be protected from sunlight and the epoxy must have an ultra-violet barrier to protect it from long term exposure, but is it okay to put my unpainted structure outside for a couple of days for rigging? A- Short exposure is okay, but if it is for more than a few hours it should be covered (paper or cloth is ok).

Q- Is there any way to check the incidence of my winglets after the airplane is built? A- The method shown below is an easy way to confirm that the left and right winglet incidences are equal. Measure "A" from the winglet leading edge at the wing top skin to a point on the aircraft centerline (prop hub or spinner tip). Measure "B" from centerline to the winglet trailing edge at bottom of rudder (rudder held neutral). Check that "A" minus "B" is the same for left and right winglets.

VariEze

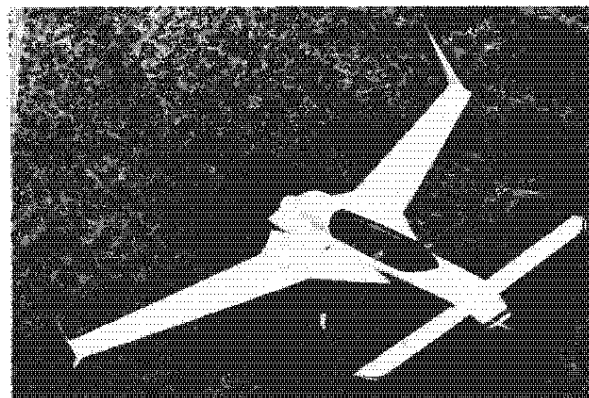


TODAY'S HOMEBUILT WITH TOMORROW'S TECHNOLOGY

THE AIRPLANE The VariEze is a small, high-performance home-built sportplane. It can be built from raw materials costing approximately \$2600 (less engine) in about 1000 man-hours, or from prefab parts and materials, costing approximately \$4000 in about 600 man-hours (about eight months spare time work). Its structure is a sandwich of high-strength fiberglass, using low-density, rigid foam as core material. The structure is fabricated directly over the shaped core, thus expensive tools and molds are not required. Composite-sandwich structure offers the following advantages over conventional wood or metal: less construction time requiring less skills, improved corrosion resistance, improved contour stability, better surface durability, dramatic reduction in hardware and number of parts, easier to inspect and repair. The VariEze uses the small four-cylinder Continental aircraft engines. The O-235 Lycoming, stripped of starter and alternator, is now being tested and should be available soon. The airplane has exceptional climb and cruise performance. It can carry two people 700 miles at 185 mph on less than 20 gallons of fuel. Frontseat passengers up to 6', 7"/250 lbs and backseat passengers up to 6', 5"/220 lbs can be accommodated plus a modest amount of baggage in two custom suitcases. The airplane does not have full dual controls, but does have a backseat control stick. Due to its small size (only 67-sq.ft. wing area) it is not the airplane for installing extra equipment for IFR, night flying, etc. It can handle a simple electrical system with a single NAV COM and gyro instrument. These can even be powered with a solar panel, thus eliminating the heavy alternator. The VariEze is recommended for day-VFR operation only. Due to its relatively high landing speed (60 kt/70 mph) and small tires, it is acceptable only for smooth, hard-surface runways. Its stability and overall flying qualities are superb. Once trimmed, it will hold attitude and level flight "hands-off" even in turbulence. Trim changes due to power, gear retraction, or landing brake are all very small. Its unique aerodynamic design allows it to be flown with full aft-stick, at less than 50 knots, without a stall departure or loss of control, and without altitude loss. The VariEze uses the latest aerodynamic features: NASA winglets, both wings cruise at best L/D, basic arrangement provides stall safety, stiff structure provides accurate contour maintenance, basic system design eliminates or combines complex control systems, which saves weight, cost and building time while increasing reliability and lowering maintenance.

THE TEST PROGRAM The VariEze 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 tests to FAR part 23 requirements, static load tests and landing gear drop tests exceeding part 23 criteria, environmental/thermal tests on structural materials/components, manufacturing methods testing, and many others.

THE HOMEBUILDER SUPPORT The manufacturing manual is 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, provides building hints, etc. Complete owners manual provides all necessary information for safe initial testing and for normal and emergency operations.



VARIEZE DOCUMENTATION is available in six sections.

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 VariEze except engine installation. The manual consists of a 153-page, bound, 11"x 17" book plus nine larger full size drawings. It includes 168 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. The manual identifies sources for all materials and all prefabricated components. **NASAD approved**

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, cowl installation, prop and spinner.

SECTION IIA - Continental A65, A75, C85, C90, O-200

SECTION IIC - LYCOMING 0235 - No accessories.

SECTION III - ELECTRICAL - This is an optional (not required) set of drawings and installation instructions for electrical system.

SECTION IV - OWNERS MANUAL - This is an operational handbook and checklists, including normal and emergency operation, details flying qualities and performance charts, maintenance, maiden flight procedure, pilot checkout, etc.

SECTION V - FINISHING THE COMPOSITE AIRCRAFT - Applies not only to a VariEze, but to other epoxy/composite aircraft. Includes filling/contouring/priming/U.V. barrier/color and trim.

SECTION VI - LANDING BRAKE - Complete full size drawings for an optional drag device. The brake dramatically increases the airplane's glide angle and deceleration in the flare. Without the brake the airplane is limited to runways at least 2400-ft long. With it, runways down to 1800-ft long can be used with appropriate pilot proficiency.

SPECS & PERFORMANCE WITH 100-HP CONTINENTAL, FIXED-PITCH PROP @ GROSS WEIGHT:

Take Off	900 ft	Range @ Max Cruise	700 mi
Climb	1600 fpm	Range @ Econ Cruise	850 mi
Max Cruise	195 mph	Min Speed (full aft stick)	55 mph
Econ Cruise	165 mph	Landing Distance	900 ft
Empty Weight	560 lb	Wing Span/Area	22.2'/53.6sqft
Gross Weight	1050 lb	Canard Span/Area	12.5'/13ft ²

SPECS & PERFORMANCE WITH 75-HP CONTINENTAL:

Take Off	1050 ft	Econ Cruise	165 mph
Climb	900 fpm	Empty Weight	530 lb
Max Cruise	172 mph	Gross Weight	950 lb

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

AIRCRAFT SPRUCE & SPECIALTY CO.
201 W. Truslow Ave, Bx 424,
Fullerton, Ca. 92632 (714) 870-7551

OR

WICKS AIRCRAFT SUPPLY
1100 5th St.
Highland, Il. 62249 (618) 654-2191

All Raw Materials
Catalog costs \$2.

KEN BROCK MANUFACTURING, 11852 Western Ave, Stanton, Ca, 90680 (714) 898-4366.

Prefabricated components: wing attach assembly, nosegear machined parts, control system components, fuel caps, engine mount, rudder pedals. Catalog costs \$2.

FRED JIRAN GLIDER REPAIR, Bldg 6, Mojave Airport, Mojave, Ca 93501 (805) 824-4558.

Prefabricated components: cowlings, fuel tanks, wheel pants, main-gear and nosegear struts, strut cover and nosegear box. Send SASE with 3-oz postage for brochure.

CONLEY ENTERPRISES, Building 170, Mojave Airport, Mojave, CA 93501 (805) 824-2368. Plexiglass canopy.

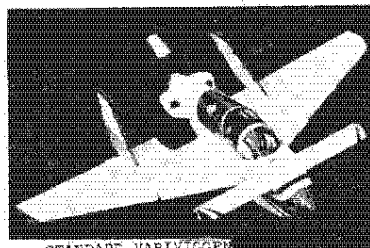
H.C. COMMUNICATIONS, Bx 2047, Canoga Park, Ca 91306, (213) 882-0422. Custom COM & NAV VHF antennas.

Check items desired	Price, including first-class mail U.S. and Canada	Air Mail Overseas*
<input type="checkbox"/> VariEze info kit, includes current issue of "Canard Pusher" newsletter	\$5.00	\$6.00
<input type="checkbox"/> "Canard Pusher" newsletter, published quarterly. One-year subscription	\$4.75	\$6.50
<input type="checkbox"/> Section I	\$94.00	\$108.00
<input type="checkbox"/> Section IIA	\$19.00	\$21.00
<input type="checkbox"/> Section IIC	\$21.50	\$23.50
<input type="checkbox"/> Section III	\$8.00	\$9.50
<input type="checkbox"/> Section IV	\$8.00	\$9.50
<input type="checkbox"/> Section V	\$7.00	\$8.00
<input type="checkbox"/> Section VI	\$18.00	\$11.00
<input type="checkbox"/> 3" tri-colored jacket patch Add \$4 if Calif resident - newsletter is not taxable.	\$1.95	\$1.95
*U.S. FUNDS ONLY		
TOTAL		

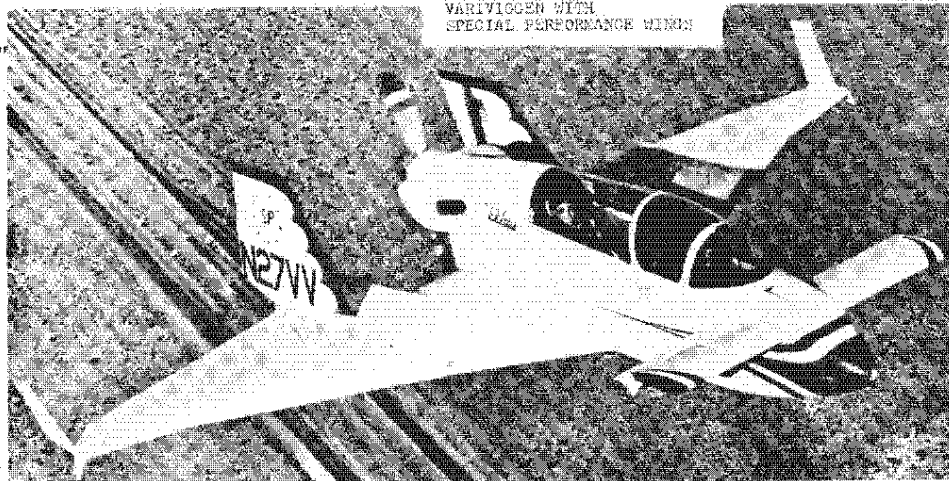
**Rutan
Aircraft
Factory**

BUILDING 15, MOJAVE AIRPORT
P. O. BOX 656, MOJAVE, CA 93501
TELEPHONE (805) 824-2645

THANK YOU FOR YOUR INTEREST IN THE
VARIVIGGEN
 TWO + TWO SPORTPLANE



STANDARE VARIVIGGEN



VARIVIGGEN WITH SPECIAL PERFORMANCE WINGS

Performance with 150-hp, fixed-pitch prop, gross weight.	Take off 850 ft	Climb 800 fpm	Cruise 150 mph	Full Aft stick 49 mph	Landing 500 ft	Specifications Standard VariViggen	Canard Span/Area 8 ft/18.3 ft ²	Wing Span/Area 19 ft/119 ft ²	Empty Weight 950 lb	Gross Weight 1700 lb
Performance with 150-hp. Special Performance Wings	Climb 1000 fpm	Cruise 158 mph				Specifications Special Performance Wing	Wing Span/Area 23.7 ft/125 ft ²	Gross Weight 1700 lb		

PROVEN DESIGN

Complete flight test program completed; 600 hours on prototype with very little maintenance. Won the Stan Dzick trophy for design contribution, Oshkosh '72.

STALL/SPIN SAFETY

The VariViggen's safe flying qualities have been the subject of technical presentations for EAA, SAE, AOPA, & AIAA. It will not stall or "mush in" like the common delta. At full aft stick (43 kts) it will still climb 500 fpm, roll over 50 degrees per second without rudder co-ordination, and make buffet-free turns. The prototype received the Omni Aviation safety trophy at Oshkosh '73, and the outstanding new design award at Oshkosh '74.

EXCELLENT UTILITY

Comfortable tandem cockpits, three-suitcase baggage area, and an adequate cruise speed provide unusual utility for a homebuilt airplane. Its unusual design turns routine travel into "fun trips." Gas service and other airport services have been better, too! Take it home; it's road-towable with outer panels removed.

UNCOMPLICATED CONSTRUCTION

The basic structure requires few special tools and can be built in a simple jig. The few parts that have double-curve are available in fiberglass, ready to install. All machined parts are also available, as well as other prefab parts.

EASY TO FLY

Despite its unique appearance, the VariViggen has no unusual or pilot-demanding flight characteristics. It is easier to handle than conventional aircraft, particularly in gusty crosswind conditions.

THE FOLLOWING DISTRIBUTORS MARKET VARIVIGGEN PARTS:

AIRCRAFT SPRUCE & SPECIALTY CO, 201 W. Truslow, Box 424, Fullerton, Ca. 92632 (714) 870-7551. VariViggen spruce kit, plywood kit, hardware, aluminum and fiberglass. Catalog cost \$2.

KEN BROCK MANUFACTURING, 11852 Western Ave, Stanton, Ca. 90680 (714) 898-4366. VariViggen prefabricated components: all machined parts. Catalog costs \$2.

THE AIRPLANE FACTORY, 7111-A Brandtville Ave, Dayton, Oh 45424. VariViggen plexiglass canopy.

MONNETT EXPERIMENTAL AIRCRAFT, INC, 955 Grace St, Elgin, Il 60120 (312) 741-2233. VariViggen molded fiberglass parts.

GOUGEON BROTHERS, 706 Martin, Bay City, Mi 48706. VariViggen 105/206 epoxy and 403 fibers for wood construction.

GEORGE EVANS, 4102 Twining, Riverside, Ca 92509. VariViggen welded nose and main landing gear, 1-1/4" sq. steel tube.

BILL CAMPBELL (VariViggen builder), Box 253, Phelan, Ca. 92371. VariViggen prefab brackets and fittings.

JESSE WRIGHT (VariViggen builder), 7221 S. Colorado Ct, Littleton, CO 80122 (303) 771-5140. VariViggen prefab wood parts. Send 50¢ for list.

VARIVIGGEN TECHNICAL REPORT - Complete tech report describing the VariViggen two-place sportplane. Includes specifications, pilot report, dimensions, 3-view, stability and performance flight test data, construction cost, description of car-top wind tunnel, 8"x10" glossy photo and current issue of newsletter. Price: \$10.00 first class mail, \$11.50 air mail overseas.

VARIVIGGEN OWNERS MANUAL - Complete operational handbook including normal and emergency procedures, loading, operational record keeping. This manual is a must for those close to first flight. Price: \$6.00 first class mail, \$7.50 air mail overseas.

"CANARD PUSHER" SUBSCRIPTION - A newsletter designed with the builder in mind. Emphasis on distributing to all builders as many ideas, improvements, building tips, photographs, & flight reports as possible. Details mandatory, desirable, & optional changes to plans & to owners manual. A newsletter subscription and all back issues are mandatory for those with VariViggen under construction. Identifies new material sources as they become known. Published quarterly. Price: \$4.75 per year first class mail, \$6.50 air mail overseas. Back issues: \$1.00 each

VARIVIGGEN PLANS - NASAD approved in "AA" category. Sixty-one sheets, completely detailed. Also included are builder's handbook information, step-by-step construction guide, complete bill of materials, flight operating limitations, parts lists. Section breakdown: 1. Introduction, 2. Operating Limitations, 3. Bill of Materials, 4. External Geometry (Lofing), 5. Building Tips, 6. Construction Order & Methods, 7. Canard & Elevator, 8. Fuselage, 9. Inboard Wing, 10. Verticals & Rudders, 11. Outboard Wings, 12. Cockpit & Seats, 13. Canopies, 14. Flight Control System, 15. Fuel System, 16. Angle-of-Attack System, 17. Engine Mount, 18. Cooling & Cowling, 19. Landing Gear, 20. Gear Doors, 21. Electrical System, 22. Parts List. Also included are the tech report & photo described. Price: \$53.00 first class mail, \$59.00 air mail overseas.

VARIVIGGEN SPECIAL PERFORMANCE (SP) WING/RUDDER PLANS - Construction drawings and assembly manual for glass composite outer wing panels and rudders. These are optional wings, replacing the aluminum surfaces shown in the VariViggen plans. The SP wings are easier to build and provide increased climb and cruise performance. They also have fuel tanks which increase range to over 600 miles. Price: \$39.50 first class mail, \$41.50 air mail overseas.

VARIVIGGEN R/C MODEL PLANS - Complete construction plans for the 18"-size radio-controlled model airplane built & flown to evaluate VariViggen spin characteristics. Designed for 4-channel proportional radio equipment & engine in the .35 to .65-cu. inch size. 555-sq inch wing area. All balsa or foam/balsa construction. A maneuverable flying model with outstanding roll rate. Also shown are modifications required for a control-line model (70-ft lines, .19 to .45-cu inch engines). Price: \$4.75 first class mail, \$5.50 air mail overseas.

VARIVIGGEN CONSTRUCTION MANUAL Part 1 of a photo-illustrated construction manual, written by Jim Cavie, S/N 31. Includes fuselage, canard, inboard wing, vertical stabs, control system, and landing gear, along with approximately 100 photos. Part 1 also includes helpful sketches on jigs and numerous building tips. The written information is similar to plans chapter 5, except expanded to about 30 pages. Price: \$18.50 first class mail. \$20.50 air mail

Q. I have built one wing with 90-deg fiber orientation on the BID rather than the 45-degrees shown on the plans. Is this ok?

A. No! Fiber orientation plays a very important role in the stiffness and strength of a composite structural component. Do not modify orientation, even on a bulkhead.

Q. I have bolted my Cleveland wheels and brakes to my axles but things don't fit right. What now?

A. Check two things - orientation of torque plate (CP 13 pg 6) and spacer rings. Two rings per axle must be used to not only space bearings but to provide dirt seals. Spacer rings are available at Aircraft Spruce and Brock.

Q. My cockpit vent on my Eze does not flow air below 100mph. Can I fix this?

A. I have noticed this on other EZs I have flown. N4EZ's does flow down to 60 mph. I think the difference is due to a change in slope of the canopy frame. The change was made after N4EZ was built to improve forward visibility. I think your vent will work at lower speeds if you carve a smooth radius on the front and sides and raise the rear lip about 1/4 inch.

SHOPPING

We have found another source for the epoxy layup rollers. They can be mail ordered from IASCO, 5724 W 36th St, Minneapolis, Mn 55417. Ask for 1-1/2 texture roller - 99¢ each.

The diode for the Edmund solar panel (CP 13) can be two 1N4004 silicon rectifiers in parallel. We have not yet been able to get a thin solar panel produced, but we do have someone working on it. Energy Saving Systems, 8800 W Chester Pike, Upper Darby, Pa 19082, has a unit similar to Edmunds. If anyone knows of a source for a panel at a price less than \$40 per watt, please let us know.

Jim Cavis reports that he is working on the second part of the Viggen construction manual and that repairs to N31VV are in progress.

WANTED: Completed VariEze, all considered. Barclay, 1109 E Broadway, Glendale, Ca 91205 (213) 241-4835.
FOR SALE: Partially-complete VariEze including C-85 engine. Cecil Muchmore, 7237 Via Amorita, Downey, Ca 90241 (213) 927-5802.
FOR SALE: VariViggen project incl 0-320 Lycoming, almost all parts. Bill Lake, 1094 Madrone Way, Livermore, Ca 94550

VARIEZE BILL OF MATERIALS

Most builders are finding that the kit has ample epoxy, enough glass if you use scraps wisely, but only about 1/2 the required amount of microspheres.

VARIEZE AND VARIVIGGEN RETENTION OF CANOPY

As we have mentioned several times before canopy retention is very important. An inflight canopy opening has resulted in the destruction of Tony Ebel's VariEze and a horrifying pattern flight by Peter Krauss. Peter took off without the canopy locked. It opened wide open at 100 mph during the initial climb. He grabbed it, pulled it closed on his fingers and held it while he returned for a good landing. Tony had a canopy latch that was adjusted so loose that it allowed the canopy to rise and fall noticeably during flight. Tony was flying at 6000-ft altitude and 185 mph true (165 indicated) when the canopy opened. He doesn't remember if he had bumped the latch. When it opened the airplane immediately departed from controlled flight, yawed, pitched down past vertical, did a 1/4 turn spin, then pitched up. Tony grabbed the canopy, it was pulled from his hand and the airplane repeated the above maneuvers. This happened about six times until he finally got the canopy closed with fingers outside (Tony did not have the knob installed on the inside). Once recovered to level flight (only 800-ft altitude) he noticed that his prop was stopped and thus he had to make a forced landing.* Due to a combination of almost passing out and fear of the canopy opening, he did not flare. He shoved the stick forward near impact. His own words follow:

"When the canopy opened, it was as if someone threw a hand grenade.** It really startled me. I knew I was in trouble. The plane shuddered and shook. Then started a left turn. It slowed down very fast.

After the first few wild gyrations, spins to the left, recovering straight down, etc., I got it to stall, nose high, and tired to close the canopy. As it fell, the canopy pulled open. This went on for the 5000 ft I fell. I wish I had tried a steep right side slip, or a full power stall, while trying to close the canopy. I was in (a) tense situation, real busy, jump or close it. I did not register any other event. As soon as the canopy came shut, and I noticed that the engine was dead, I had a thought that the sky was getting overcast. I had trouble thinking, finding a field and getting in position. I put the gear down. Then just as I landed, I thought...why did the sun go down? So I shoved forward on the stick, but the bean field was real dark, I heard the nose wheel breaking. Nothing more till after the wreck. So I was out, before I hit anything. Probably lack of oxygen, as maybe I was not breathing much on the way down.... I knew the fence was just ahead. I had tried a 90° turn at about 70 ft., had to level it just before I landed, got 45° of the turn.

Next day I walked the field. It was smooth and solid. So the gear probably would have stayed on, but I would have hit the fence.

I know now..don't try to knock the gear off by pushing on the stick. If I would have been really alert and not passing out, I could have landed in a circle and gotten away from the fence.

Spread the news that I have a good canard, good canopy frame and a repairable left wing for sale, damaged fin and tip, good fitting."

Tony's airplane dug a large hole, cartwheeled once, tore off the right wing and ended up inverted. Tony dug himself out and found that his injuries were minor - cuts and bruises. The airplane was extensively damaged. Since this was the first major overload failure condition on an Eze structure, I was quite interested in inspecting the modes of failure. I flew over the next day and observed the following: wing failure occurred in the spar caps, 3 to 6 inches from the wing fitting - there was no damage in the fittings, winglets failed either in the wing or at the winglet 1/2 span. The joint did not fail. The canard, itself, was not damaged. All seatbelt fittings were intact. The canopy plexiglass was broken in front but the canopy frame was not damaged. The forward fuselage back to instrument panel was totally destroyed. The rear seat area, fuel tanks, c/s spar, fuselage tank, etc., were undamaged. The engine, mount, firewall and everything in engine area were intact and not damaged. Nosegear strut and all its fittings were undamaged. The main gear tabs failed. The gear strut failed at 1/2 span.

* While the prop will windmill down to 60 kt, once stopped you must go above 120 kt to restart. Tony's engine failed due to negative "g" at a speed below 60 kt during gyrations.

** At that high speed it is surprising that the canopy was not torn off. The gyrations at that speed (above maneuvering speed) also should have resulted in airframe failure, but none occurred.

I am confident that inadvertent canopy opening cannot occur if the canopy is built and adjusted properly and locked before takeoff. The handle should be rigged so it must be forced hard forward to engage the latch. The latch and handle should be rigged for preload toward each other. Thus it is impossible to open it by bumping the handle. It should take two hands to open. Be sure the latches engage fully in the positions shown on the plans. Do install the warning horn that sounds if takeoff is attempted without canopy fully locked. Do use your checklist. Do not omit the canopy inside knob.

VARIVIGGEN PLANS CHANGES

Pg 41

Shorten FP3 0.8-inch to move master cylinder closer to pedal, to increase brake effectiveness. Pedal must be vertical or canted aft at the top for best brake effectiveness. Baffling must fit tight all around with no large leaks, to prevent overheating.

Cowl installation instructions

NOTES FROM THE DISTRIBUTORS

Jesse Wright now has a VariViggen tail rib kit. Contact him for details.

Note the new address and phone number for Cowley, Inc. on the enclosed flyer. All plexiglass work is now done at Mojave. Send SASE for info to them. Remember that if you drive in or fly in to get a canopy it comes in a 96x26x14-inch box, which will not fit in a small sedan.

Jiran - all items except wheel pants will undergo about a 10% price increase, due materials & labor inflation, on 1 Jan 78. Jiran needs input from you to determine volume of Lycoming cowlings. They will be in production soon. Backlog is still about two months for gear; less for other items. Send SASE for current delivery status. Send 35c postage for complete brochure.

Brock - current backlog is still six to eight weeks, but panic needs can be filled in less time. Brock's \$1 catalog shows photos of all available parts; many parts are available that are shown as homebuilt-only in the plans. See his catalog for complete list. Brock now stocks the pin router mentioned several times in the plans, as well as piloted countersinks.

Aircraft Spruce & Wicks can still supply a complete kit for pickup if given about two days notice.

Aircraft Spruce has recently added a few hard-to-find items not listed in catalog:

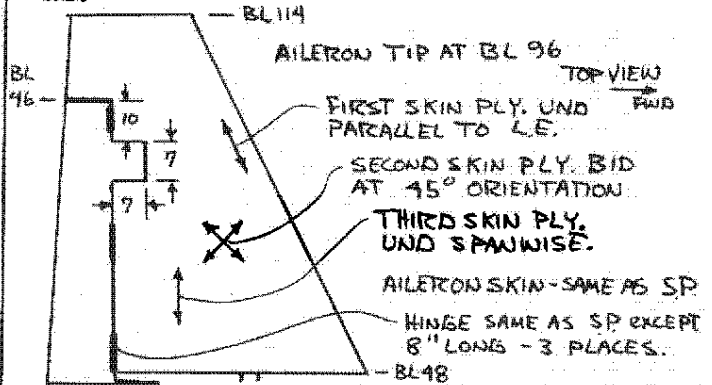
1. Instrument quick-handly template for layout of instrument holes - all sizes \$6.75
2. 3 in 1 engine gauges - oil temp & pressure + fuel pressure. 15' capillary for VariViggen \$65.
3. Epoxy wood sealer for VariViggen inside sealing \$11.75 per qt.

GLASS AND FOAM STANDARD WING FOR VARIVIGGENS

We have worked with several VariViggen builders on an individual basis concerning how to build a standard-shaped (like the metal wing) wing panel out of glass and foam (like the SP plans). Now that a glass and foam standard wing is flying, we are passing this information on to you here. For all details of construction not shown here refer to the SP plans. Also, follow newsletter hints for VariEze concerning glass work.

Use the lofts on page 8 and 9 of the plans for templates at B.L.48, 79.5, and 114. The stub spar is 31.5" long and is shaped to fit the cores less the thickness required for glass spar caps (.012 per ply for 5277; .009 for 5177).

Follow SP plans for spar cap dimensions and all fittings. Follow the sketch below for aileron size and skin glass configuration. The best epoxy is RAES (1 gal required) for foam bonding and heavy caps and RAEF (3 gal required) for skinning. Refer to your buddy's set of VariEze plans for additional hints on the glass work. 5277 is called BID; 5177 is called UNDD.



CP NO 14 Pg 12

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

first class mail

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