THE CANARD PUSHER

NO. 16 APRIL 1978

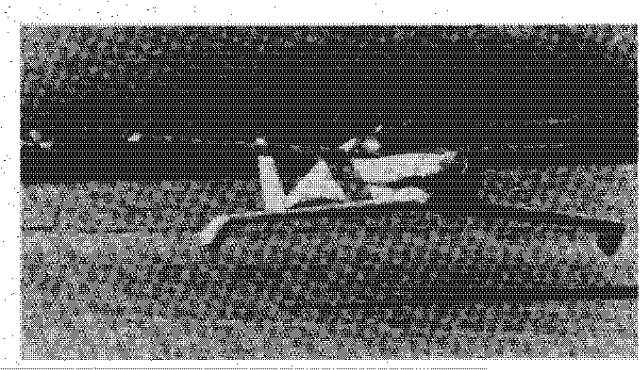
Published quarterly (Jan, Apr, Jly, Oct) by
RUTAN AIRCRAFT FACTORY
Bldg. 13, Mojave Airport
Mojave, Ca. 93501
(805) 824-2645

NEWSLETTER SUBSCRIPTION - $4.75 per year
OVERSEAS (AIRMAIL) - $6.50 per year
BACK ISSUES - $1.00 each

If you are building a VariViggen you must have newsletter 1 through 15.
If you are building a VariEze you must have newsletter 10 through 16.

RAF ACTIVITY since the January 1977 newsletter has involved finishing the test program on the Quickie, construction on the M40 twin, homebuilder support, further evaluation of our solar water heater, consulting on the AD-1, and further flight tests with our VariEzes.

QUICKIE - The Quickie finished its very thorough flight test program on 14 April 78, five months after first flight. Although the Quickie flew well on its first flight it underwent some configuration modifcations during its test program. These included an increase in aspect ratio and span of both the canard and wing, and modification of its ground attitude to optimize takeoff and landing qualities. Its flight test program, conducted at RAF, was done jointly by Tom Jewett, Gene Sheehan, and Burt Rutan. Gene did the majority of the construction work, Burt the design definition, Tom the drawings. All three shared test pilot duties with Burt doing all envelope expansion except the last two spin-attempt flights. Peter Lert flew the last spin attempts - he had done the VariEze spin test two years ago. Tom and Gene have now formed Quickie Aircraft Company, Inc. and plan to have the Quickie kit on the market before June. Their address is Building 68, Mojave Airport, Box 786, Mojave, Ca. 93501. Please contact them, not RAF, for any information on the Quickie. Two aviation writers have now flown the Quickie. Their articles will appear in the June issues of "Air Progress" and "Flying" magazines. Some interesting facts about the Quickie follow:



Peter Garrison landing N77Q

The RAF hangar is located on the west end of the flight line at the Mojave airport, Mojave Calif, approximately 80 miles north of Los Angeles. You are welcome to come by and see our aircraft or to bring in any part for our commemts. We are normally open from 9 to 12 and 2 to 5 on wed thru sat, but you should call first to check, since with the fly-in season starting we will be gone alot. We plan to fly N4EZ to the Chino, Watsonville and Oshkosh fly-ins and possibly some others.

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

EZ's AT OSHKOSH

Maximum sea level speed is 126-mph, cruise at 75% is 115 - This is over 6-mph per horsepower, a considerably higher ratio than any available airplane.

Even though the Quickie has only 18 HP it has no 'sink' or 'mush' on the back side of the power curve. When it is flying at full-aft-stick at 53 mph it 'bucks' or bobs its nose up and down. At this full-aft-stick condition it can maintain altitude at 10,000 ft and can climb 300 ft/min at sea level!

Its total wing area is about the same as the aft wing of the VariEze, 53.8 sq. ft., yet it can heft a 180-lb pilot and 20-lb baggage off the ground at 53 mph and fly him over 600 miles at 100 mph.

The Quickie is characteristically incapable of spinning; its high angle-of-attack flying qualities are identical to the standard-wing VariViggen - docile enough that the pilot does not hesitate to make very tight turns near the ground without fear of stall/spin.

MODEL 40 - Our light twin is now nearing completion, with engine controls, wireing and cowlings yet to be built. See "Canard Pusher" 15 for a description. Of particular interest is the airplane's estimated performance at light weights, i.e., one pilot and one-hour fuel. Weight for this condition is less than 1800 lb and weight-to-power ratio is only 5.6 lb/hp! At this weight we expect a climb of over 3000 fpm, 800 on one engine, with the other windmilling.

It is interesting to contemplate the impact on light twin safety that might occur with an airplane that has no large trim change and requires no pilot action at engine failure. Our design goal specifies absolutely no configuration changes or systems adjustment immediately required when an engine fails. Its throttles are combined into an unit that appears and feels as one grip, but is shaped to provide fore-aft identification. Its fixed-pitch props dictate a normal cruise at 55% rather than 75% power, a wise fuel economy on all twins anyway. However, the 40 is expected to cruise over 10 kt faster at 55% than the competition at 75%, doing so at over 50% more miles per gallon! Of course, these are estimates at this point; we will know much more in a couple of months. The main reason we are telling you so much about an airplane that has yet to fly, is we need your help. We do not have a name for the Model 40 yet. So, we are having a 'Name the Plane' contest. Please send in your suggestions, addressing them to NAME THE PLANE CONTEST, c/o RAF, 13 Mojave, Airport, Mojave, Ca 93501. The winner will get a free five-year subscription to the "Canard Pusher." If possible the name should emphasize the safety, simplicity, or efficiency of the airplane, or its compostie construction.

Please remember that the M40 was not intended for homebuilt construction. At this point it is considered only a proof-of-concept prototype. We are not in a position to answer questions about its future application. We will keep you informed through this newsletter of test results and future plans.

DID YOU KNOW??? That the VariEze on the cover of the April "Air Progress" is owned by Dianne and Lee Herron. They flew two hours of formation photo work to get the beautiful photos used in the article, but were not even mentioned in the magazine. Another unusual item about their coverage is that some very lengthy discussions of the VariEze's flying qualities were written by a pilot who flew one for only a few minutes and made only one landing. The managing editor of "Air Progress" has flown at least 20 flights in two different VariEzes including cross-country flights and spin attempts, yet printed no comments about his flights.

COMPOSITE INTRODUCTION PACKAGE - We are in the process of preparing an introductory kit for those contemplating building a VariEze, Quickie, or VariViggen SP wing. This will be a kit of sample materials (epoxy, glass, foam, peel ply, micro, cups, brushes, etc.) and a booklet describing the use of foam and glass in moldless aircraft construction and plans for several items to build with the sample materials. The purpose of the kit is to, at low cost, help you answer the questions: "Can I build a glass airplane?" or "Do I enjoy working with the materials?" The booklet contains all details about how the materials are applied in moldless composite sandwich construction. Also, detailed is information teaching you how to inspect for flaws and how to repair them. The kit will be available direct from Aircraft Spruce or Wicks (not RAF) about the first of June. Contact them at that time for price and availability (addresses are enclosed within).

VARIEZE/VARIVIGGEN CLUBS -

Lee Herron, Box 357 WOB, West Orange, NJ 07052, (201) 736-9092, has asked that Easterners planning to fly Ezes or Viggins to Oshkosh, contact him to arrange a formation flight, or pickup along the way. By the way, Lee has put light-weight slick mags and removed the generator from his "Dragon Fly" Eze and reports, "The change in performance is fantastic. Climbs like a dragon with its [illegible] on fire!" He also is using an O-200 carb on his C-90. Lee is planning a flyin on 3 and 4 June at the Essex County Airport.

Bernard Dodd, 193 Earlscourt Ave, Toronto, Ontario, CANADA M6E 4B2 (416) 651-2555 is EAA chapter 41 designee in composite structures, and is now organizing a Canada VariEze club/squadron. All Canadian builders contact Bernard; he can give you all valuable help with your projects; he attended the December 77 Canadian composite symposium.

CANADA APPROVES VARIEZE - The canadian DOT has approved the VariEze for Canadian homebuilders. We would like to express our appreciation to the following individuals, and to others who worked so hard to organize the December 77 composite symposium: K.D. Owen, Chief Airworthiness, Inspection, DOT; W. E. Slack, EAAC Tech Committee Chairman; Eric Taada, EAAC, Ottowa, Ontario; Gogi Gogiullett, EAAC President; H. J. Bell-Walker, DOT; George Gibbons, Wicks Aircraft Supplies.

JIRAN MOUNTED CANOPY

Jiran reports that some of you are confused on the use of the mounted canopy assembly. The mounted canopy as supplied is located with the front of the glass frame at FS28. To do this you may have to remove some foam. The rear of the frame DOES NOT reach the firewall.

You may locate the mounted canopy any place on the fuselage should you wish to change the position of the transparent part to suit your particular needs for visibility, up to 2" forward of the position shown in the plans. Do not forget to install all inserts at the correct place to fit the hinge and latches on your fuselage, before glassing the inside. Be sure to clamp the frame to the correct width before glassing the inside.

Trim the rear of the frame as per your plans. The missing part between the mounted canopy and the firewall must be constructed by you into a fuel tank as per "CP" 16.

Cut the front of the frame as per the plans to provide the movable part of the canopy.

The section from FS28 to the movable part of the canopy may be used if desired, but MUST be glassed inside and glassed to the fuselage per the plans to provide fuselage stiffness.

If in doubt, follow "Section I" chapter 22 and make your finished canopy STRUCTURALLY IDENTICAL. The finished outside frame as received has the same number of plies as the plans.

SURVEY OF EZ'S AND VIGGENS NOW FLYING

We are often asked how many homebuilt EZ's and Viggens are flying and what has been their operational experience and performance. Since we do not have a complete list of this information, we are asking all of you now flying to fill out the form below. In most cases it will require you to do a flight to gather the performance data. The correct method to do this is outlined below. Be sure to send this to RAF especially if you have logged more than 100 hours, as we need this informationfor Australian homebuilt approval. The results of this survey will be printed in a future "CP" newsletter.

NAME_____ date_____

ADDRESS_____

_____,_____,_____

Type: VariEze VariViggen (circle one), Tail Number N___

Date of first flight _____

Flight Hours to date _____hrs

Pilots who have flown aircraft:
Name Total Pilot Time Total Eze Time

_____

_____

Engine type_____HP_____prop type/size_____

Circle equipment if installed: NAV COM, transponder, attitude gyro, turn & bank, DG, alternator, starter, gear & canopywarnings, Cleveland wheels, Rosenban wheels, solar panel, wheel pants, spinner, position lights, strobes, landing light, other_____

_____.

Finishing materials (state number of qt of feather-fill and qt of paint used)_____

Empty weight, ready to fly, no oil, no fuel_____lb

PERFORMANCE:

Take off distance____ft @ _____lb weight, @_____ft-density altitude (no wind, use lift off speed from "Owners Manual" 2nd edition, pg 43).

Rate of climb @ indicated 80 kt (95 mph), full throttle:

Rich mixture, @ 3000 ft, _____lb weight _____°C OAT=

_____ft/min.

Lean Mixture, @ 9000 ft, _____lb weight _____°C OAT=

_____ft/min.

SPEED:

(1) Full throttle, rich mixture, 2000 ft altitude @_____lb weight, @____°C OAT,=_____mph indicated

@_____rpm.

(2) Full throttle, lean mixture, 8000 ft altitude @_____lb weight, @____°C OAT,=_____mph indicated

@____rpm.

(3) Full throttle, lean mixture, 12000 ft altitude, @____lb weight, @____°C OAT,=____mph indicated,

@____rpm

(4) Partial throttle at 2000 ft altitude, 2200 rpm,

_____lb weight, @___°C OAT,= _____mph indicated.

(5)Partial throttel @ 8000 ft altitude, 2200 rpm,

_____lb weight, @____°C OAT,=____mph indicated.

(6) Partial throttel @ 12000 ft altitude, 2200 rpm, ____lb weight, @____°C OAT= _____mph indicated.

Shortest field operated from has a _____ft long runway and is at an elevation of_____ft.
State any problems operating from short or rough fields.

Longest flight flown was _____miles, was cruised at_____feet altitude at_____mph indicated airspeed and resulted in _____mi/gal economy, at takeoff weight =_____lb.
State any modifications you have made to the basic configuration shown in the plans (as updated by "Canard Pusher" newsletter)_____

_____.

State all problems or failures you have experienced

_____.

Do you feel the "Owners Manual" (2nd edition for Vari-Eze)adequately prepared you for your (or other pilots') flights?_____ If no, what should be added or deleted?_____

_____

_____.

What do you like most about your airplane?_____

_____.

Dislikes_____

_____

HOW TO DO PERFORMANCE TESTS - Easiest way to measure takeoff distance is to count runway lights. They are generally 200 ft apart - check to be sure. First, line up on the runway and center the nose gear so brake steering will not be required. Raise the nose slightly at 50 knots and lift off at the speed shown in the "Owners Manual" (depends on weight).

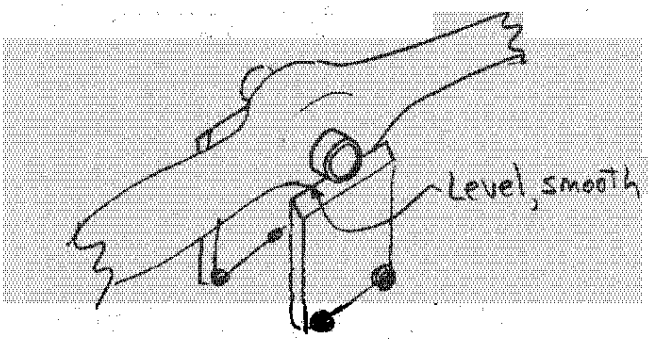
Measure climb rate not with a climb indicator, but by timing a 1000 ft increment with a watch. Stabilize at climb speed 1000 ft below aim altitude. Time from 500 below to 500 ft above aim altitude. Repeat several teimes. Do only in smooth air. Divide 1000 by time to get climb rate. Measure OAT (outside Air temp) at aim altitude.

Speed determination is one of the hardests tests to fly since it requires patience and a fine touch. Be sure the air is smooth, record weight and OAT. Set the power, then hold altitude exactly for at least a full minute then note airspeed, now, increase airspeed one or two knots and confirm that after 30 seconds you are losing altitude. Then decrease airspeed to one or two knots below the target and confirm that you are slowly gaining altitude. If both happen, then the target speed is correct. Be sure to note rpm at target speed.

Room permitting we will present data reduction techniques for weight and temperature corrections and for correcting to standard day conditions in a futre "CP".

PROPELLERS - Good news for those who have found an unacceptable backlog on props. We have flown another vendor's prop and found it performs very close to Ted's prop, same climb and only one or two mph slower speed. It is a 56x69 wood prop for Cont O-200 by B & T Props, 8746 Ventura Ave, Ventura, Ca 93001 (805) 649-2721. They will also make C85 and C90 props.

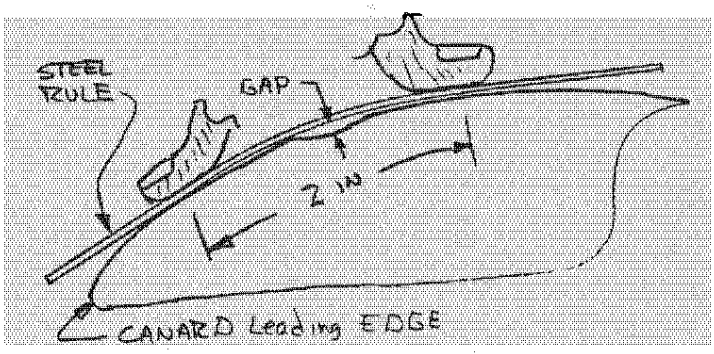
We have found that many of you do not know how to balance a prop. This is necessary should you need to repair a rock nick, etc. It's also a good idea to check balance on a new prop. Slip a tight-fitting tube through the center hole of your prop, long enough to stick out 1" each side. Place the prop across two level edges as shown and note which blade rotates down. Reverse the prop 180° to check for imperfect level of the edges. If you have questions on how much prop damage can be repaired, check with the prop manufacturer. When installing your prop, torque to 180 inch-pounds and check that tips track within 1/10-inch.

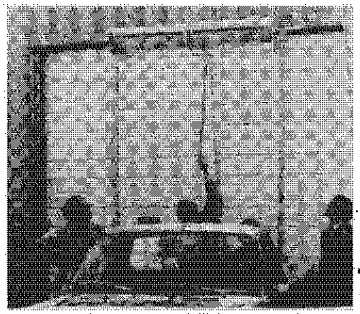


CANARD SURFACE SMOOTHNESS IS CRITICAL - During the Quickie program we built and installed a canard that resulted in very poor low-speed performance. Stall speed was 10 mph higher than predicted and tuft tests showed stall angle-of-attack over three degrees lower than estimated. We later traced the problem to a wavy upper surface. Since the EZ uses the same GU 25-5(11)8 airfoil, we suspected that it, too, may be susceptable to small roughness or waviness. So we tufted N4EZ's canard and put on strips of tape in various locations to simulate a wavy surface. These tests and other wind tunnel tests we conducted confirmed **THE TOP SURFACE OF YOURCANARD MUST BE SMOOTH FROM THE LEADING EDGE BACK TO AT LEAST 6-INCHES FROM THE LEADING EDGE** or stall speeds may be increased and stall characteristics degraded.

Of course, the big question is "how smooth?" The best way to check this is with a steel pocket ruler, the flexible kind that's only .02" thick, or with a plastic drafting ruler. Hold the ruler as shown in the sketch, pushing it to the surface with two fingers 2 inches apart. If the surface is a smooth curve between your two fingers the ruler will lay down following the curve with no gaps. If the surface is bumpy or wavy the ruler will touch the surface only in 3 or 4 places. Take a feeler gauge to measure the gaps between the ruler and your surface. If you have a gap of more than .006-inch your surface is too wavy. Check this in several places from the leading edge back to 50% chord. The bad Quickie wing had gaps of about .012 inch. After refinishing (Featherfil, 70S, and white lacquer) with gaps of less than .004-inch, its stall angle of attack increased from 8 degrees to 12 degrees! VariEze N4EZ has gaps less than .003-inch.

The best time to use the ruler and check for smooth surface is when sanding the Featherfil with the spline. Recheck after sanding the 70S black primer. It will not change when white paint is sprayed on.



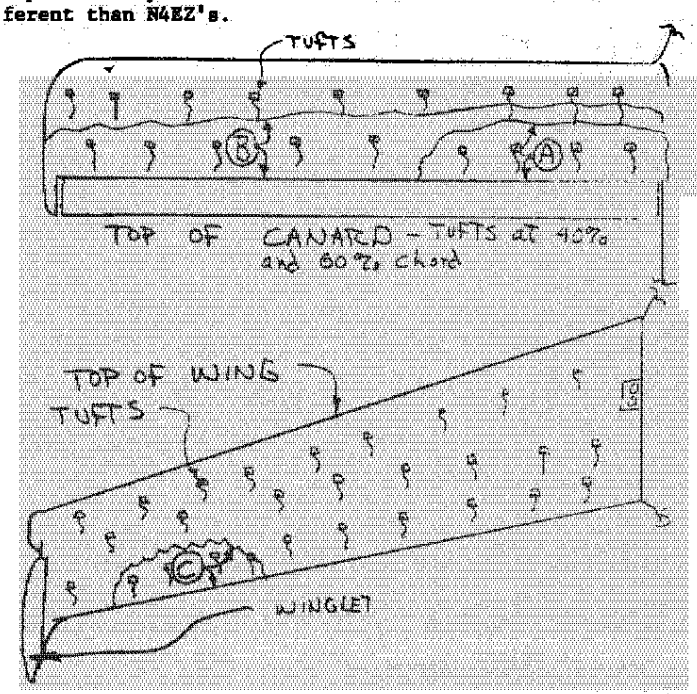


GENE BURT & TOM WITH "WINDTUNNEL" RIG TO CHECK EFFECTS OF SURFACE ROUGHNESS OF THE GU 25-5(11)8 AIRFOIL

If your VariEze is now flying you can <u>see</u> the airflow easily and dramatically by tufting your aircraft as shown in the sketch. All tufts are 3-inch long strands of light yarn held to the airplane with a small dab of masking tape.

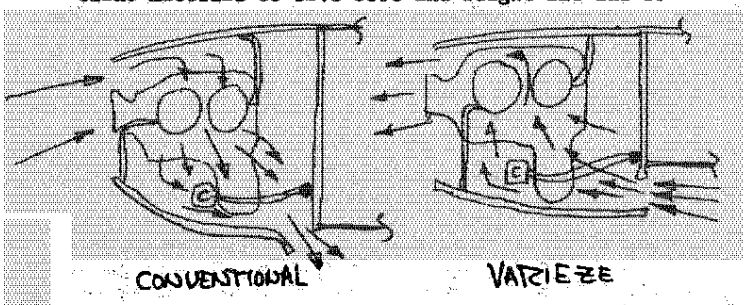
When the airflow is smooth the tuft will lie down steady. When stall occurs the tufts in the stalled area will shake violently or change direction. Refer to the sketch showing stall patterns indicated by tufts on N4EZ, flying at 950-lb gross weight. Above 53 knots (61 mph) all tufts are steady. Between 53 knots and 51 knots (59mph) tufts shake on the canard at the "A" area. Between 51 knots and 48 knots (55 mph) when the aircraft "bucks" the tufts shake on the canard in the "B" area, and at mid or aft cg when the aircraft exibits "wing rock" (see "Owners Manual") the tufts shake on the aft wing in the "C" area.

So, by tufting your airplane and flying at 950 lb weight you can note the tuft patterns and airspeeds and thus compare your airplane to N4EZ. If your <u>speeds</u> are different it could be due to airspeed position or indicator error. If your tuft <u>patterns</u> are different it is likely due to variances in <u>airfoil</u> smoothness. Also, if your tuft patterns are different you can expect that your stall characteristics will be different than N4EZ's.



VARIEZE ENGINES - Most EZs now flying are using A75, C85, C90 or O-200 Continentals. There are three or four flying with stripped Lycoming O-235 engines. Peter Krauss, of Stuttgart, Germany has now installed a 2600-cc, 85 HP Limbach engine (German) and reports 1600 fpm climb (1 seat), 1200 fpm climb (2 seat), and 190 mph max cruise. At 140 mph he burns 3.2 gal/hr. Our original prototype with the 1834-cc VW engine (N7EZ) has recently undergone its seventh overhaul or major engine repair, three within its last 40-hr flying. We are looking for a 60-hp Franklin to repla this engine.

VARIEZE FUEL SYSTEM - Some foreign-built VariEzes have had to change fuel lines aft of the firewall to fire-resistant material in order to obtain flight approval. USA FAR23 also requires this for a certified airplane but it does not apply to an experimental aircraft. We chose to use the low temperature Tygothane material to save cost and weight and did so

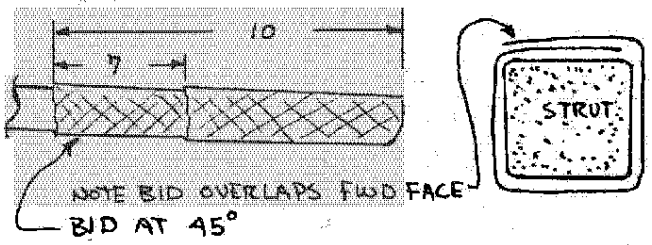


because we feel the fire risk is low with a reverse-flow cooling system. Refer to the two sketches. A conventional aircraft has airflow from the engine and exhaust system blasting at the firewall. The Vari-Eze airflow is such that the source of fire is blown up and aft, away from fuel lines and firewall.

It is possible that you, the aircraft builder, may not agree with us and may want to install your fuel system to meet FAR 23. This is your decision, of course, as you are responsible for the quality control of your airplane. If you want your system to be fire-resistant install Aeroquip 601 hose with 624 sleeve in place of the Tygothane aft of the firewall. Also, you may consider using a gascolator in place of the filter and drain. This costs more, but results in a more positive and frequent removal of sediment when you drain the gascolators on each preflight.

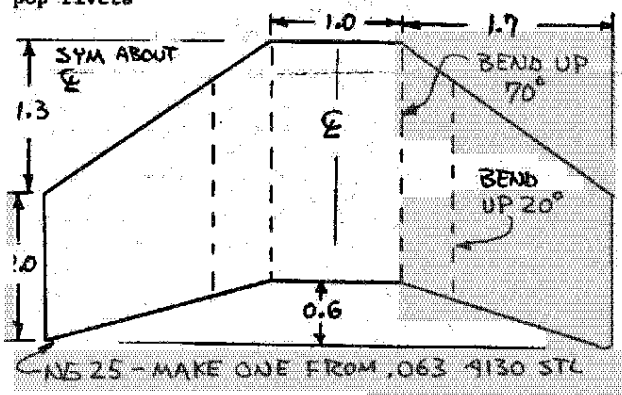
FAR 23 also requires steel, rather than aluminum, be used on primary controls that pass aft of the firewall. Again, since the direction of the airflow directs a fire source away rather than at these areas, we elected to save cost, weight, and building time by using aluminum. If you desire to comply with FAR 23, you may decide to make some aileron control parts from steel and accept the weight and cost penalty. We will continue to fly N4EZ with the config uration exactly as shown in the plans.

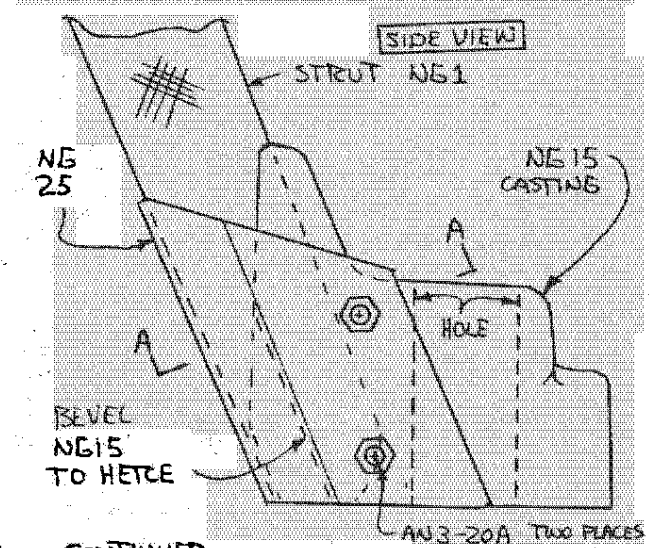
VARIEZE NOSEGEAR FAILURES - There have been several failures of the NG1 strut where it bolts to NG15. It would be easy for us to dismiss this as a problem, since all failures we have seen can be traced to an incorrectly-placed bolt or failure to install the BID on the strut, and we have had no failure with N4EZ after 500 landings, some on rough fields. However, after closely studying this area we do admit it needs improvement. The modification shown below should be incorporated. It should be done even if the gear has already been installed. The modfication involves using a "U"-shaped steel bracket that captures the strut and eliminates the holes through the NG-1 strut. Thus, the full strength of NG-1 can be achieved, greatly reducing the chance of its failure.



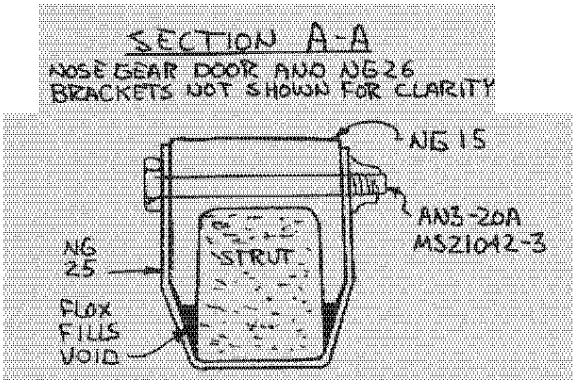
First, here's the best way to apply the BID wrap on the lower end of the strut. Refer to the sketches. Note that 1 ply BID should extend 10" up from the end and a second ply extends up 7". Be sure you have shaped the strut to perfectly fit the rounded slot in NG15, leaving - room for the two plies of BID. The best way to get the BID to wrap completely around the strut without bubbles is to do it in two steps. First round all four corners then epoxy the BID only to the forward face and let cure. Then wet it out onto the other three faces overlapping the forward face. If it will not lay flat all around, wrap it with duct-tape or masking tape to hold it during cure.

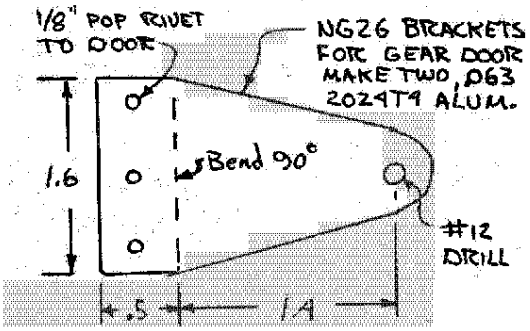
Now, fabricate (or check if Brock has it in stock, yet) the steel "U" bracket, NG25. Fit the NG1 strut into NG15, and file off the bevel in NG15 to allow NG25 to slide all the way on and rest against NG1 full length. Clamp together and drill two #12 holes through NG25 and NG15 as shown. Note the holes must be drilled in the correct positions to miss NG1 and to miss the pivot hole. Disassemble, sand surfaces dull, and assemble with plenty of flox, installing the two AN3-20A bolts before cure. The nose gear door attaches to the two NG26 brackets; they bolt to the upper AN3-20A and rivet to the door with 1/8" pop rivets



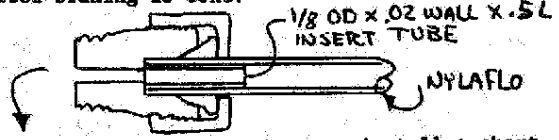


CONTINUED NEXT PAGE →





WHEELS AND BRAKES - Many EZs are now flying with the modified Rosenhan brakes, all with satisfactory results. The original Rosenhan brake system is still proving to be inadequate in most cases. If you have the original Rosenhan brakes (with the triangle pad), install the retrofit kit before you taxi/fly. One builder had excessive dragging and heat buildup doing taxi tests with the original system. He had tight-fitting wheel pants installed so the excessive heat could not escape. The heat buildup was enough to soften the epoxy in the gear strut, allowing it to distort. A good solution for this is to use phenolic, not aluminum for the 1/8" spacer required at the strut (Rosenhan only) to provide insulation. Remove wheel pants for initial taxi tests when alot of repeated braking is done.



We are recommending that you install a short length of brass or steel tubing in the ends of the Nylaflow tubing where they fit into the fittings at the brake and master cylinder. With the tube installed the fitting makes a better clamp on the nylon line allowing higher pressures. See sketch. The tube (four req'd) is 1/8" dia, .02 wall, 1/2 inch long. It can be cut from the one-foot length pieces of telescoping tubing found at any hobby shop. Round the ends so they do not cut into the nylon tubing.

VARIEZE OR VARIVIGGEN SP PAINT COLORS - We have seen some violations of the "white only" recommendations in "Section V." One airplane has even been painted with a wide red stripe down the leading edge of the wings! This may cause serious heat distortion if this airplane is parked in strong sunlight on a hot day with no wind. The temperature of the red area will run 50°F hotter than the adjacent white. Remember, all glass sailplanes are white only. Trim colors, particularly hot ones (see "Section V"), must be limited to vertical or underside surfaces, and never used across the top of wings or canard.

VARIEZE FOAM CORES - Recently, the manufacturer of the styrofoam used in the VariEze stopped making this material in the large 9-inch x 18-inch blocks. Since these blocks are no longer available, you are being supplied with blocks measuring 7-inch x 14-inch. These cannot be used as efficiently as the large blocks, thus, there is more waste and the blocks indicated below result in a total foam volume about 50-board-feet more than the previous sizes. The kit now consists of the following:

2 pieces 7" x 14" x 41"
8 pieces 7" x 14" x 64"

The information supplied below is intended to show you how to modify the procedures in the VariEze plans to obtain the correct parts from the ten smaller blocks.

CHAPTER 4 & 5, CANARD AND ELEVATORS:

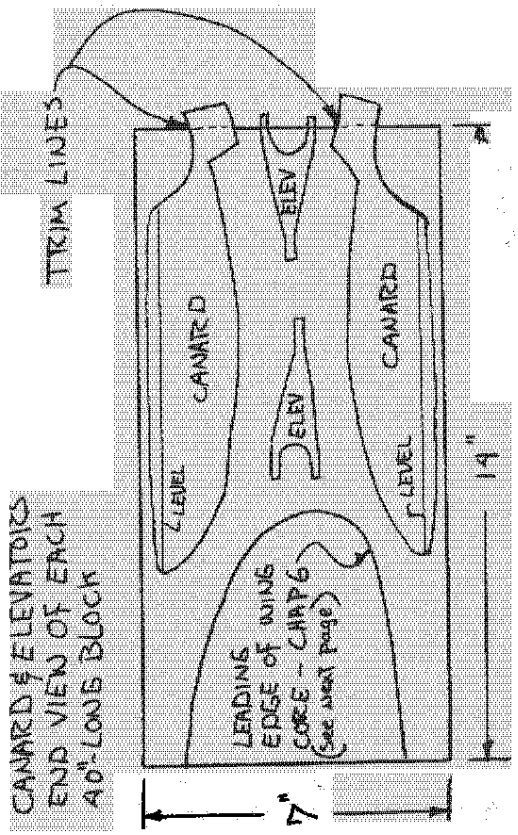
Cut the canard and elevators as shown below from the two 41-inch pieces (trimmed to 40"). Save the large end of these blocks, they are needed in chapter 6 for the leading edges of the inboard wing cores.

CHAPTER 6, WINGS:

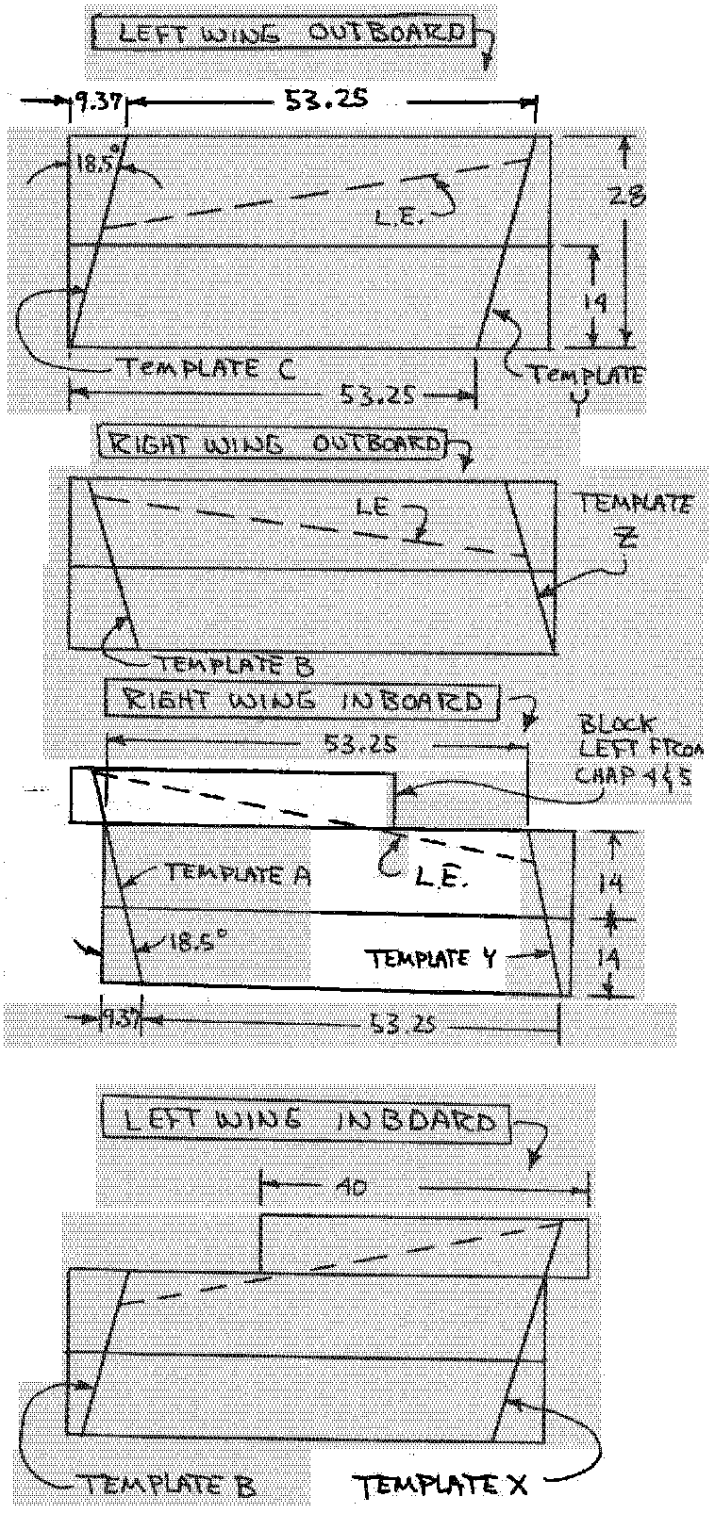
Join the 64-inch pieces in four pairs as shown below and trim the 18-1/2 degree lines to the 53.25" trailing edge dimension. Square the ends, carefully measure the 9.37" dimension, and hot-wire the diagonal cuts. Add the scrap from the canard as shown to two ofof the pairs for sufficient foam for the large inboard cores using care to assure you don't make two left wings and that the leading edges sweep AFT, cut the four wing cores.

CHAPTER 7, WINGLETS:

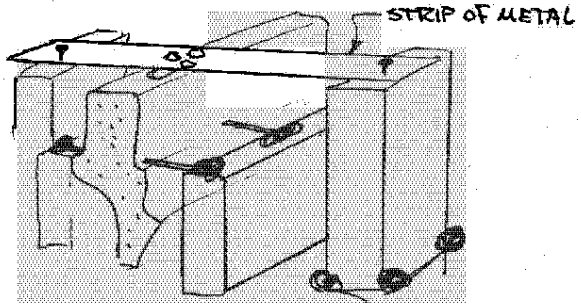
Sufficient foam remains in the outboard core scraps to make winglets.

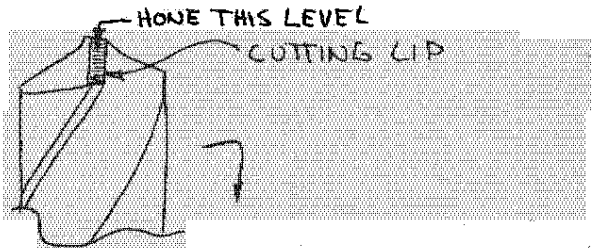


WING CORE SETUP - Trailing edge is at bottom on all four assembly drawings shown below. Templates are all placed upright. L/H are reverse of R/H.



VARIEZE BUILDING HINTS - This simple jig will allow you to find the blind holes in the canard inserts after you have glassed the shear web and reinforcements. When installing the inserts, bolt them to a scrap piece of metal that nails to a board on each side, bondoed to the table. Remove the strip of metal, and glass the shear web. After cure, reinstall the metal strip and use it as a guide to drill the glass.



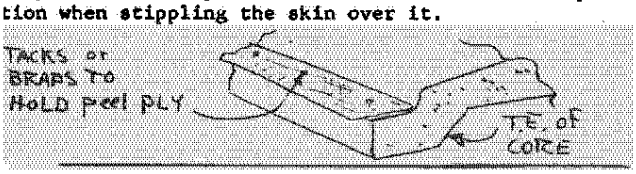


When drilling fiberglass you can get a cleaner hole without the drill grabbing if you hone the lip of your drill bit as shown, flattening the draft aft of the cutting lip. On large critical holes, such as the 1/2" holes in the main gear tabs, use a spotface rather than a drill bit, for a perfect hole.

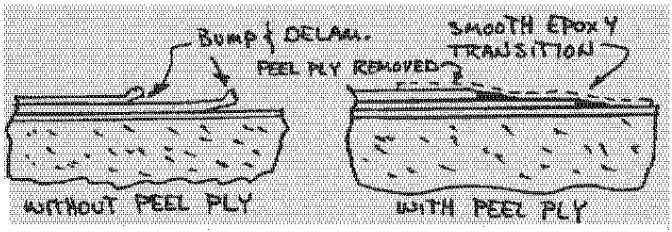
The best material for electrical conduit in the wings is a handful of soda straws, Stretch one end a bit so it will fit over the next straw. Gang them together and micro them into the slot in the wing. They are very light and large enough to push wires through for trim, or as a backup slot should you ever have to replace the rudder Nylaflow tube.

Unless you have a 10 or 12-inch drill bit you should drill the engine mount holes in the aluminum extrusions before mounting them in the fuselage.

When you lay the peel ply into the trailing edge notch before glassing the first side of wings, canard, and winglets, hold it in place as shown with a few tiny brads or staples so it doesn't move out of position when stippling the skin over it.



Up to now you have been using peel ply (Dacron surface tapes) only for preparing glass surfaces for future layups. During the Quickie program Gene discovered another use for peel ply that works so well we are using it extensively on the Model 40 and are strongly recommending that you use it on your Vari-Eze as follows: In several places (winglet attach, fuel tank, cowling lip, nose, fuselage corner tapes) you have fiberglass plies terminating on the part, rather than on its edge. When this is done, the edge generally is rough causing a bump that must later



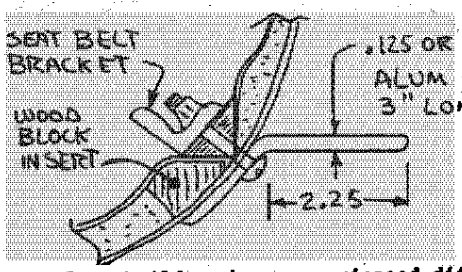
be carefully sanded. Also, (see sketch) unless the edge is loaded up with excess epoxy it can lift, causing the start of a delamination. Using peel ply over these edges, by stippling down a strip of Dacron across the edge (completely wet it out), will force the edge down eliminating the frazzeled bump and providing a smooth transition of epoxy with no delaminating tendency. After cure, strip the peel ply off and you will have a beautiful joint with the glass edge almost invisible and with far less sanding required. Its hard to describe how well this works Try it yourself and see. DO use it, particularly at winglet attach. It will make your cockpit more attractive if you use it to fair all corner tape edges.

Jim Smith reports that a "zippidi-Do" low cost cutting and sanding disc (available at hardware stores) does quick work grinding glass or Bondo when used in a high-speed drill or sanding motor.

Peel-ply the foam before the first layup on the back-seat bulkhead, where the second layup bonds to the first. Before the second layup you can then strip this off and save sanding work.

Aileron hinges - be sure to reverse the piano hinge before cutting the lengths. If you are a little short of material subtract 1/2" from the length of the center or outboard hinge.

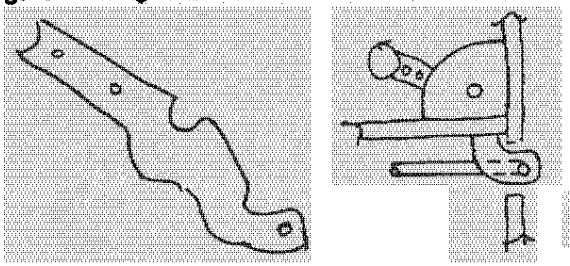
The following sketch shows a builder's suggestion for a simplified boarding step to replace the kick-in one. Calculations indicate less than 1-mph cruise speed penalty.



Some builders have experienced difficulty using Featherfill ("Section V"). Be sure the surface is dry, dull, and clean. Be sure the Featherfill and shop is at least 70°F. Mix the catalyst thoroughly with a paddle or wire on your electric drill motor. After mixing catalyst, mix in about 25% by volume of microballoons, and brush on. Microballoons makes it go further, fill better, and sand easier.

Do not make the armrests removable. If you want better access around the stick, make a small removable panel locally where access is required.

Nat Puffer made up a bracket like the sketch below that mounts to the Brock throttle arm and provides attachment for a pushrod to a back seat throttle This requires a hole in the inst. panel to clear it at idle, and simplifies installation of the gear-warning micro switch.



INSPECTION - We are still seeing some parts that have to be rejected because of flaws that could have easily been fixed before cure. Copy the following inspection summary. Post it in your shop. Read it before leaving any part to cure.

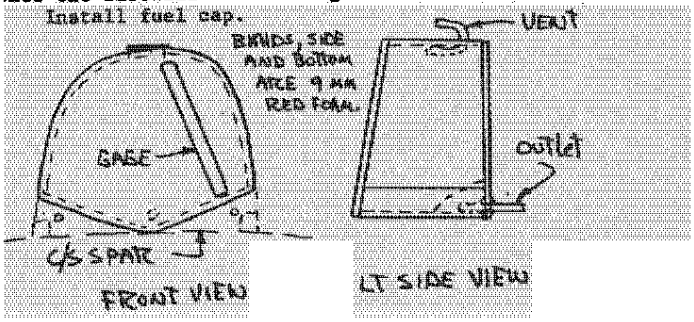
LAYUP INSPECTION CHECKLIST

1. Correct number of plies
   Correct type of plies
   Ply orientation within 15 degrees
   Ply wrinkles - free of major disruption
2. Surface condition -
   Smooth, free of joggles or bumps
   (measure with 12" straightedge span-wise)
3. Foam surface voids
   Uniform slurry, no visible air, no debonds
4. Air bubbles and white air flecks - none present
5. Lap joints - stipple and check for delaminations
   TE and LE must be perfect.
6. Inclusions - FOD, brush bristles
7. Resin rich - Test with squeegee. Runs and pools removed.
8. Peel ply glass edge terminations or areas for later bond.

EPOXY MIX RATIO - Those who have purchased the ratio pump may have noticed that it is labled "4 to 1" (25 parts to 100). This is by volume. Thus, due to different resin and hardener densities the pump actually ratios 22.5 parts to 100 by weight. The plans scale ratios 20 parts to 100 by weight. Our epoxy formulator advises that the acceptable range is 18 to 24 parts by weight and that it's best to be on the hardener-rich side. So, we are changing the scale dimension for the hardener cup from 15 inches to 13.6 inches to obtain 22 parts to 100.

ARIEZE FUSELAGE TANK - Further clairfication is required, since there are several ways to build this, ome easier than others. The following method is asy, light, and makes use of your left-over 9mm, ed PVC foam. Install the tank when you get to hapter 22, step 3. Do not install the urethane foam ehind the plexiglass where the tank will go.

Cut the front and back bulkheads to fit the firewall and canopy, making the bottom in a "V"-shape s shown to allow the main tank vents to go under the uselage tank. Cut the bottom pieces to fit and nail hem in place. Now using a hair dryer, heat-form he curved top/side piece to fit the bulkheads nd match the firewall and canopy. Remove the tank. emove the front bulkhead. Bond the sides, bottom nd rear bulkhead together with wet micro and lay p one ply BID inside. Install vent, outlet and screen. Glass the inside of the front bulkhead with 1 ply BID and micro it on the tank (use a strip of plastic tape on the foam where it will be removed for the sight gauge, to eliminate having to sand the surface later). When cured, round the corners and glass the entire outside surface of the tank with 1 ply BID. When cured, leak check using an altimeter and 1500-t pressure differential. Drill a hole in the firewall to let the outlet through, then micro the tank n place, laying one ply over its outside, lapping nto the firewall and fuselage.

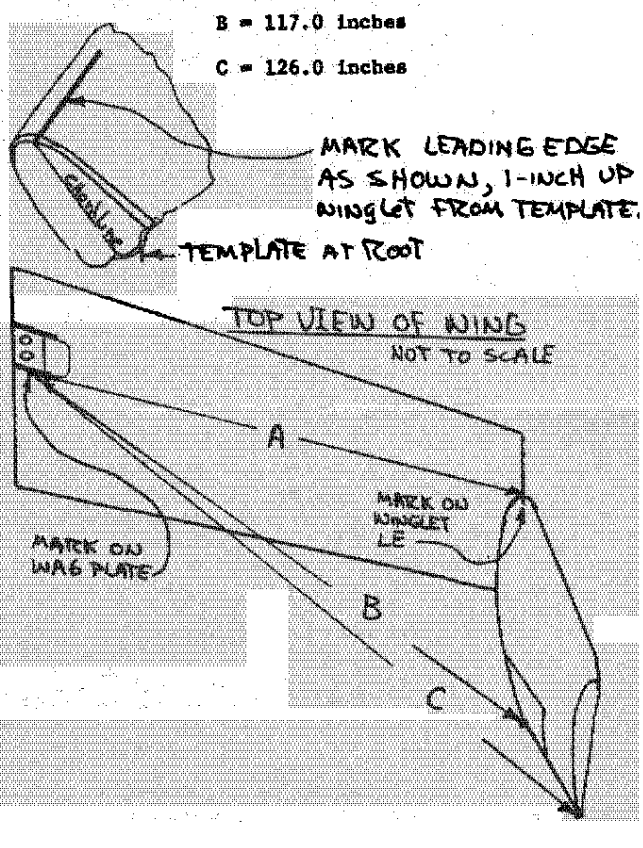


WINGLET ALIGNMENT - Some have had difficulty using the template and plumb bob to align the winglet to the wing. The following method is more accurate if measurements are taken carefully. It involves three measurements from a point at the wing root fitting to the winglet leading edge, trailing edge, and tip. Before trimming the piece from the winglet in step 1, set the root template on the root and transfer the chord line (waterline) up the leading edge as shown. When positioning the winglet on the wing in step 2 use dimensions A, B, and C instead of the positioning template and plumb bob. First measure dimension A from your mark on the winglet leading edge to the .063 aluminum plate (WA-6) on the aft side of your wing fitting. Make a mark on WA-6 where dimension A ends up. This mark is now used to measure dimension B to the bottom trailing edge of the rudder (held neutral) and to measure dimension C to the top trailing edge of the winglet. This accurately sets winglet incidence and outward 'cant.'

A = 108.3 inches

B = 117.0 inches

C = 126.0 inches

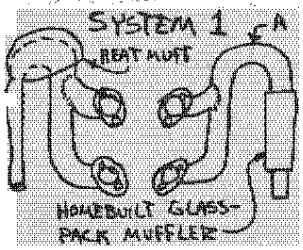


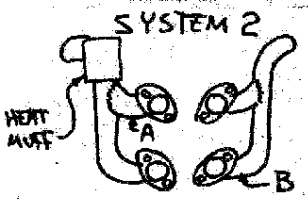
VARIEZE EXHAUST FAILURES - Bad news - The exhaust systems on VariEzes continue to be a problem. Recently, even the short system has f ed, both with stainless and mild steel material. Data available to us on the entire history of EZ exhaust systems is shown below.

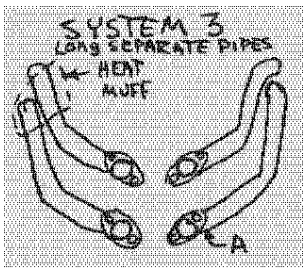
System	Number of Airplanes	History of Durability
1	1(N4EZ)	Cracked at "A" in 20 hr, glass pack degraded at 15 hr.
2	1(N4EZ)	Cracked at "A" & "B" in 50 hr
3	approx 15	Original in N4EZ failed at "A" in 80 hr. Many homebuilders had cracks in less than 50 hr. One stainless system cracked in 12 hr.
4	approx 10	No failures in N4EZ at 100 hr when removed for muffler installation. Homebuilders have had cracks and complete failures at flange in 80hr, 20 hr & 6 hr. One is operating at 130 hr without failure.
5	approx 15	No known failures, however, system may be too short for adequate heat protection of engine valves.
6	1(N4EZ)	High-quality Flight Research Inc muffler-system being developed for Cessna for 150 retrofit. No signs of failure at about 90 hr. Extensive h tory of durability on Cessna 150.

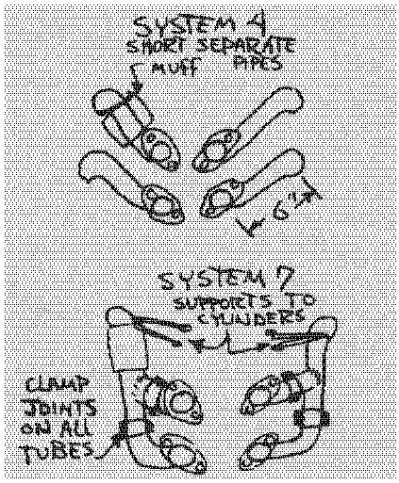
The most important thing we can tell you about the exhaust system is in the next five sentences. Read and follow them carefully. If a piece of failed exhaust system should drop from the cowl and strike the prop it can fail the prop, cause excessive vibration, and possibly destroy the aircraft. If you are using system #4 or 5 you should immediately (before next flight) install a safety attachment to each tube to retain it in the event it fails at the flange. This can be a small welded tab with several loops of .041 stainless safety wire strung to a bolt or tube on the engine, or a small hole with a loop of 1/16" stainless cable looped over an engine component. This is a definite safety of flight item. Do no risk loss of your aircraft or life due to an exhaust tube failure.

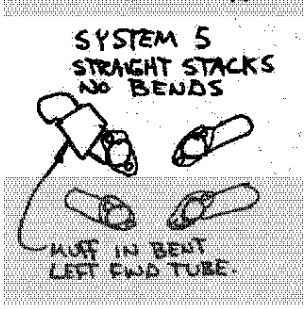
We are presently working with Brock to develop a system that we feel has a good chance of solving this problem. It is similar to systems that have good durability in other applications. We will be flying it soon and will keep you posted on the results (see system 7).







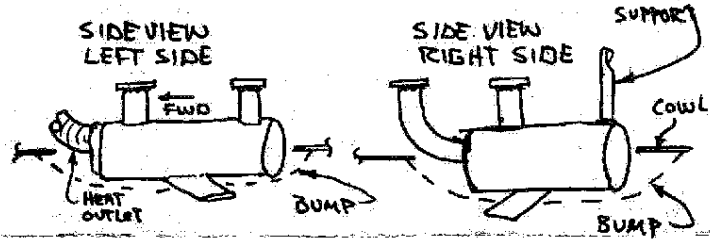




SYSTEM 6 Next Page

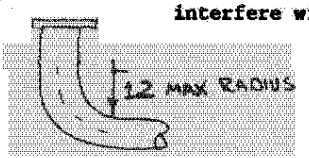
Now for the good news. The muffler system built by Flight Research Inc (reported on in "CP" 13, 14, and 15) has recently undergone some internal modifications to reduce its noise level over that listed in "CP" 15. It is now 6 db quieter than their previous muffler (a reduction of 6 db is a 50% reduction of noise level).
Flight Research Inc manufactures the muffler system for the Cessna 152, which had to meet the rigorous, new noise requirement. They are now porducing a quiet system for Cessna for replacement on the O-200-powered Cessna 150's. This is the same system now on N4EZ. It is available now from Flight Research Inc, Airport Hangar 61, Mojave, Calif 93501. This system is complete with muff for carb heat and cabin heat. It is a bolt-on installation on the O-200, but requires a modification to the cowl, adding "blisters" (see "CP" 14). We built our own blisters by glassing 4 ply BID over a foam bump. We are planning to get tooling prepared so the blisters will be available from Jiran. Thus, the home-builder cuts holes in his cowl and installs the blisters. All indications are that the Flight Research mufflers will not be susceptible to failures and certainly cannot get to the prop should they do fail.

SYSTEM 6 - F.R.I. STAINLESS CESSNA 150-TYPE MUFFLERS WITH HEAT MUFF.



VARIEZE PLANS CHANGES

Section I pg 11-7	Foot depressions in back seat should be 1.0, not 1.7 deep to allow room for landing brake, if used.
Section V	Hencolac NUL-V paint is no longer manufactured. Use acrylic lacquer, enamel, or acrylic enamel.
Newsletter 14 pg 8	Dimension missing on exhaust drawing. If radius is too large, pipe will interfere with intake manifold.



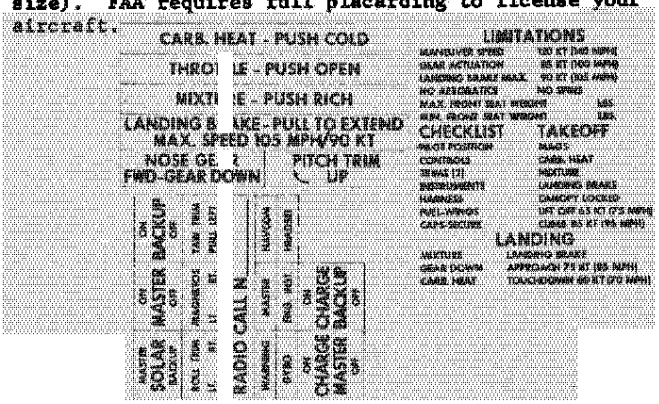
Newsletter 13 page 11	Bill of materials under instrument plumbing -015 should be 0715-015. An315-3(4) should be AN315-3(14)
Section IIA & Section IIC	Ryan Herco fittings in white nylon are different part numbers than the previous polyethelene.

Polyethelene	Nylon	
0715-020	0716-020	Tee
0710-162	0711-162	Elbow
0700-162	0701-162	Adapter

Section IIC page 5	F.S.132.77 should be F.S.133.28
SectionI & all "CP"	Wicks Aircraft Supply address should abe 410 Pine St, Highland, Il. 62249 (618) 654-7447
Section V	Add "check surface contour as described in "CP" 16.
Section I pg 17-9	Add "do not drill in NG15 - See "CP" 16."
Section I pg 18-3	Add "see "CP" 16 for added tube in Nylaflow fittings on brakes and master cylinders."
Section I pg 3-2	Change 15 in to 13,6 in, change 20-part to 22-part
Section IIa & IIC	Note exhaust system changes in "CP" 16.

SHOPPING - Continental A-75's OSMOH $1900. Kal Nelson Aviation Inc, 9801 Glenoaks Blvd, Sun Valley, Ca 91352 (213) 875-0388.

Aircraft Spruce now has VariEze metal placards with special adhesive for bonding to your fiberglass panel. These are die cut and ready to install. A print of the placards is shown below (not full size). FAA requires full placarding to license your aircraft.



Shelf-life of epoxy is two years. Distributors cannot replace epoxy due to settling, etc., if it is approaching shelf-life time.

MIKE & SALLY MELVILL'S VARIVIGGEN

Check the March issue of EAA "Sport Aviation" magazine for an excellent article on November-Two-Seven-Mike-Sally, the Melvill's spectacular VariViggen. This article covers all of Mike's experiences building and flying his Viggen up to December 77, including some great color photos. Note the article has an error - 100 ft/min should be 1000 ft/min. Mike's Viggen is the craftsman's dream in every way, down to the beautiful modern-fighter cockpit layout and upholstery. Since the article was written, Mike and Sally flew to the Sun-N-Fun flyin in Florida and won the runner-up Grand Championship trophy. Their trip totaled over 30 hours including a visit to Key West and flyin demos and Mike reported no maintenance was required. Sally is now checked out in the front seat and flew N27MS on their last trip to Columbus.

The adjacent photos show the screen assembly Mike fabricated to protect the prop from any damage due to items loose within the engine compartment.

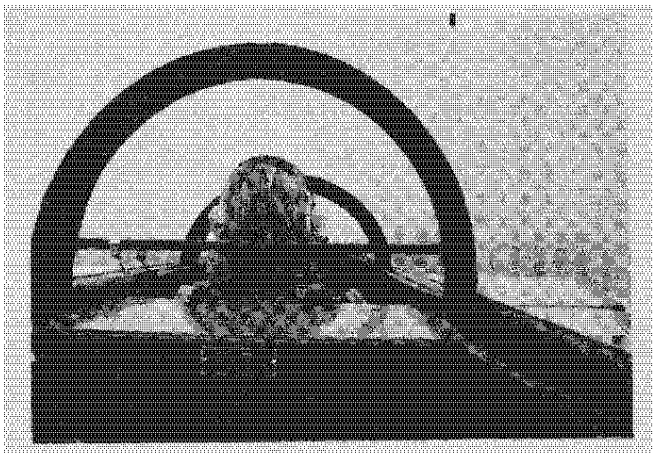
Mike has prepared the 'part two' of the Vari-Viggen construction Manual and is marketing it, himself. This manual has some very valuable information on jigging, skinning, building and trouble shooting the gear retraction system, canopy, firewall, cowling, baffling, exhaust system, SP wing, etc. The manual is $16.00, and is available from Mike and Sally Melvill, Bx 561, Frankton, In 46044, (317) 649-2576. Mike is happy to answer questions you may have about his Viggen or about the construction manual but don't forget to send a self-addressed, stamped envelope for his reply.

Mike redesigned the main gear retraction system to a more complex, but much more durable mechanism. His has been well tested, including over 175 landings on N27MS and has performed flawlessly. He now has available professionally-drawn drawings of his gear retraction system. They are $10.00, from Mike and Sally at the above address. This is a better system than is shown in the VariViggen plans.

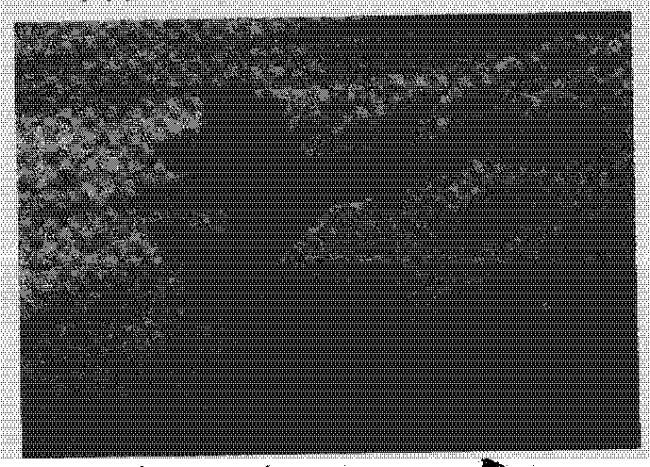
JESSE WRIGHT VARIVIGGEN KITS - Jesse now has available a very accurate set of ribs for the vertical fins as well as detailed installation instructions. Viggen builders should contact him for details on canard parts, fuselage bulkheads, inboard ribs, also. His parts are priced reasonably and can save a great deal of building time. Send 50¢ when asking for info, to pay his printing and mailing cost. J Wright, 7221 S. Colorado Ct., Littleton, Co 80122.

VARIVIGGEN SURVEY - We have no idea how many active builders there are at the present time. We are asking all VariViggen builders to send the following info to RAF. Results of survey will appear in a future "CP".

Name_____S/N_____
Date started construction_____
Currently active building? yes, no.
Chapters of Plans completed_____.
Estimated completion date_____.
Which wing: SP, Standard. Engine type_____.
HP_____.

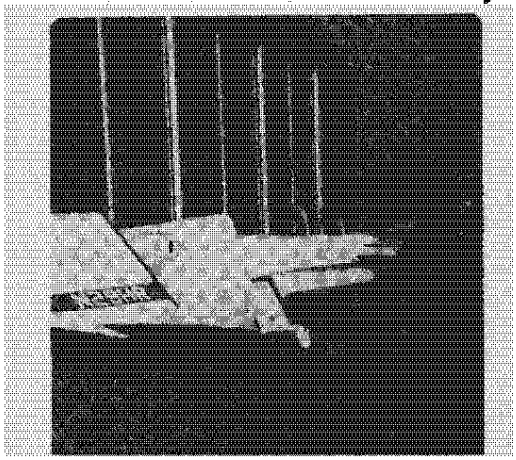


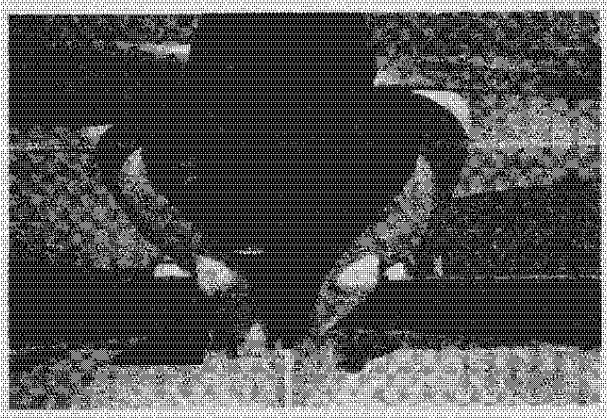
SALLY IS 2ND GAL TO FLY A VIGGEN. CAROLYN RUTAN FLEW N27VV FIRST IN 1973.



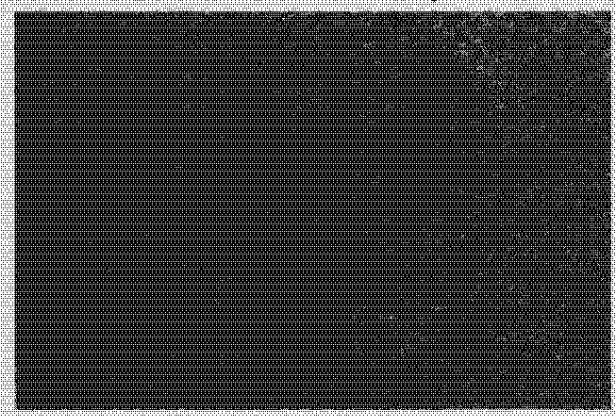
MIKE & SALLY'S VIGGEN →

HAROLD REISS' VIGGEN →



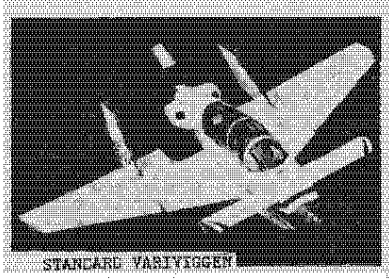


MIKES SCREEN. WELDED FRAME WITH STAINLESS NET AND CAMLOC TABS

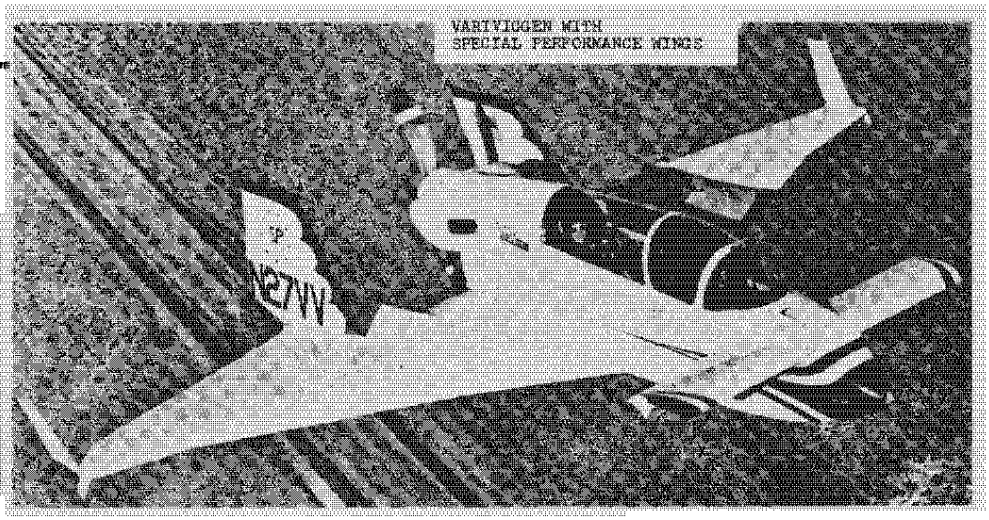


THANK YOU FOR YOUR INTEREST IN THE VARIVIGGEN

TWO + TWO SPORTPLANE



STANDARD VARIVIGGEN



VARIVIGGEN WITH SPECIAL PERFORMANCE WINGS

Performance with 150-hp, fixed-pitch prop, gross weight. Standard VariViggen	Take off	850 ft	Specifications Standard VariViggen	Canard Span/Area	8 ft/18.3 ft²
	Climb	800 fpm		Wing Span/Area	19 ft/119 ft²
	Cruise	150 mph		Empty Weight	950 lb
	Full Aft stick	49 mph		Gross Weight	1700 lb
	Landing	500 ft			
Performance with 150-hp. Special Performance Wings	Climb	1000 fpm	Specifications Special Performance Wing	Wing Span/Area	23.7 ft/125 ft²
	Cruise	158 mph		Gross Weight	1700 lb

PROVEN DESIGN
Complete flight test program completed; 600 hours on prototype with very little maintenance. Won the Stan Dzik 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 (41 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-curvature 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 Brandtwista Ave, Dayton, Oh 45424. VariViggen plexiglass canopy.

MONNETT EXPERIMENTAL AIRCRAFT, INC, 955 Grace St, Elgin, IL 60120 (312) 741-2223. 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.

MIKE AND SALLY MELVILL
Part Two of Construction Manual
Box 561, Frankton, Ind. 46044

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 VariViggens 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

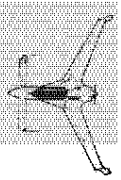
VARIVIGGEN PLANS - NASAD approved in "AA" catagory. Sixty-one sheets, completely detailed. Also included are builder's handbook information, step-by-step construction guide, complete bill of materials, flight operating limitations, parts lists. Section breakdown: 1. Introduction, 2. Operating Limitations, 3. Bill of Materials, 4. External Geometry (Lofting), 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 1/4-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 Cavis, 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 airmail overseas.

VariEze



TODAY'S HOMEBUILT WITH TOMORROW'S TECHNOLOGY

THE AIRPLANE The VariEze is a small, high-performance homebuilt 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's design eliminates or combines complex control systems, which saves weight, cost and building time while increasing reliability and lowering maintenance.

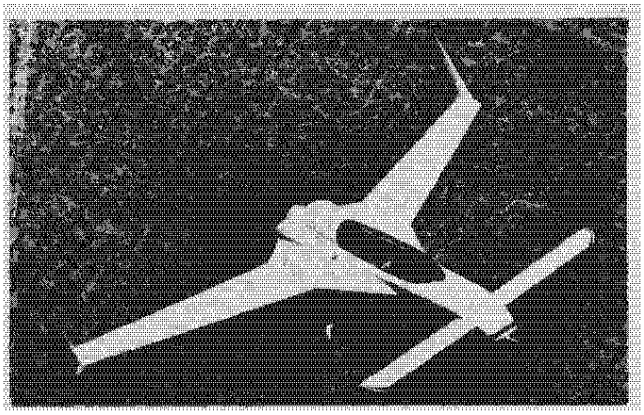
THE TEST PROGRAM The VariEze test program was probably the most extensive and successful ever conducted on a homebuilt. It included basic flight tests for flying qualities, performance and systems, spin and dive tests to FAR part 23 requirements, static load tests and landing gear drop tests exceeding 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.

Check items desired	Price, including first-class mail U.S. and Canada	Air Mail Overseas*
○ VariEze info kit, includes current issue of "Canard Pusher" newsletter	$5.00	$6.00
○ "Canard Pusher" newsletter, published quarterly. One-year subscription	$4.75	$5.50
○ Section I	$94.00	$108.00
○ Section IIA	$19.00	$21.00
○ Section IIC	$21.50	$23.50
○ Section III	$8.00	$9.50
○ Section IV	$8.00	$9.50
○ Section V	$7.00	$8.00
○ Section VI	$10.00	$11.00
○ 3" tri-colored jacket patch	$1.95	$1.95
Add 6% if Calif resident - newsletter is not taxable.		
*U.S. FUNDS ONLY TOTAL		

Rutan Aircraft Factory

BUILDING 13, MOJAVE AIRPORT
P. O. BOX 656, MOJAVE, CA 93501
TELEPHONE (805) 824-2645



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, cowling installation, prop and spinner.
SECTION IIA - Continental A65, A75, C85, C90, O-200
SECTION IIC - LYCOMING O235 - 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, detailed 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'/53.6ft^2
Gross Weight	1050 lb	Canard Span/Area	12.5'/13ft^2

SPECS & PERFORMANCE WITH 75-HP CONTINENTAL:

Take Off	1050 ft	Econ Cruise	145 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
410 Pine
Highland, Ill. 62249
(618) 654-7447

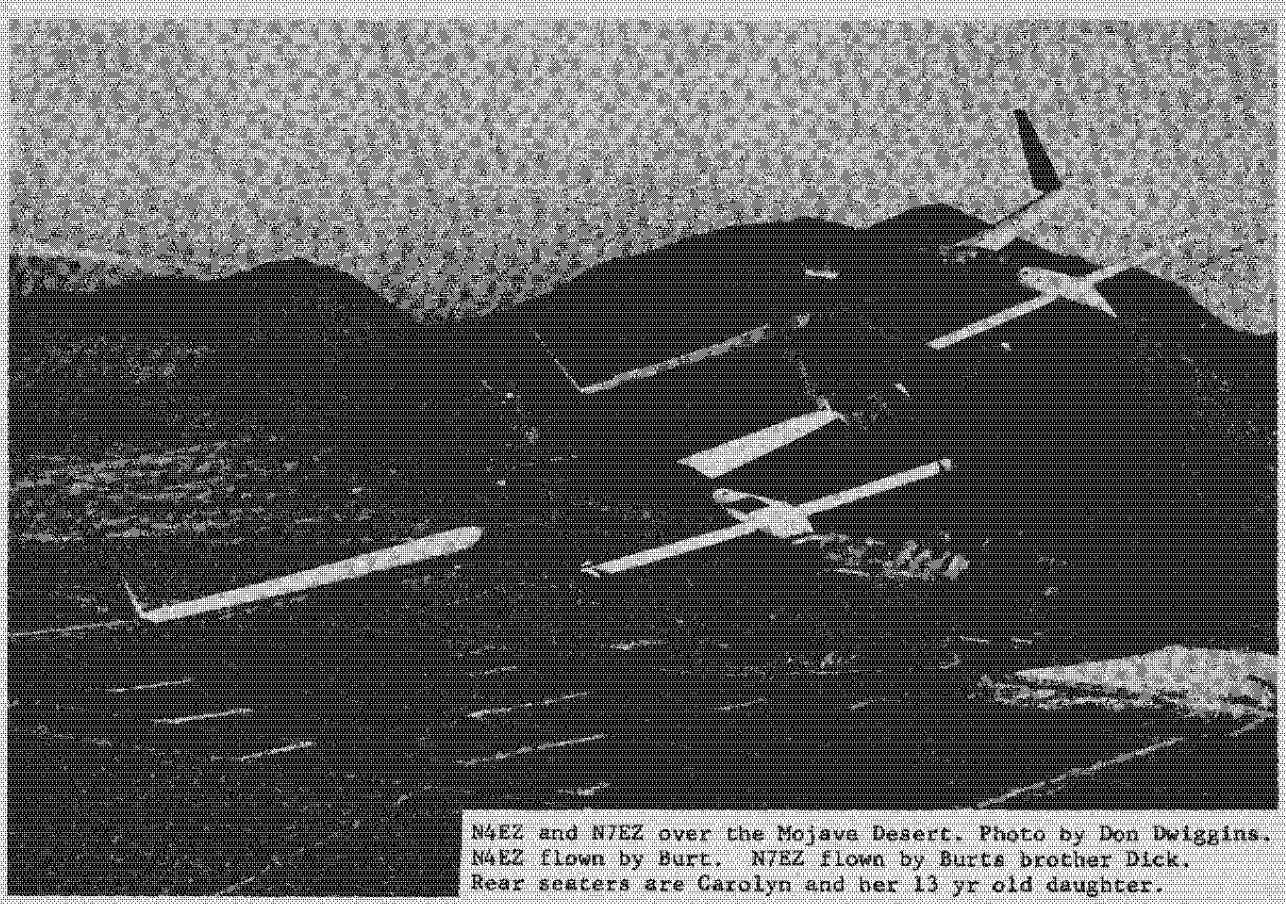
All Raw Materials
Catalog costs $2.

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: cowling, fuel tanks, wheel pants, maingear and nosegear struts, strut cover and nosegear box.
Send SASE with 3-oz postage for brochure.

COWLEY 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 antennaes.



N4EZ and N7EZ over the Mojave Desert. Photo by Don Dwiggins.
N4EZ flown by Burt. N7EZ flown by Burts brother Dick.
Rear seaters are Carolyn and her 13 yr old daughter.

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

first class mail

TO:

The number which appears on your label before or after your name, is the last newsletter **issue** which you will receive and requires you to renew to receive the next issue. If your label has a 16 on it, then #16 is your last issue and you need to renew.

16

PLEASE STATE THAT YOU ARE A RENEWAL!!