CP10/2

The following are average weights for items constructed from the VariEze plans:

 CANARD (chapter 4) 16.7 lb.

 Both elevons with weights 6.3 lb.

 Each wing with fitting 34.0 lb.

CP10/3

Important! Some builders have indicated that they inadvertently drilled into the tapped metal insert for the canard lift tabs. We have given them the following instructions to install nuts on the inserts. Also, if you are not positive that you have good full threads on your inserts you should follow this procedure, which can be done even if the canard is completed. \*\*SKETCHES OMITTED\*\*

Note: The correction in the next section adds nutplates on the insert. If you have not installed the canard inserts yet (chapter 4, step 2), use the following procedure: line up the insert with the lift tab. Clamp together and drill the three 1/4-inch holes. Mark the inserts and tabs (top, front, right) so they don't get flipped over or reversed. Mount a K1000-4 nutplate behind each hole. Fill the nutplate and hole in the insert with silicone rubber (GE or Dow silicone bathtub caulk). This keeps epoxy and micro out of the threads when the insert is installed. Let the silicone dry 24 hours before installing the inserts. Now install the inserts as shown in the plans. After the step 2 cure, follow this procedure to drill the glass pad: make a stop for your 1/4-inch drill to avoid the possibility of the drill slipping into the nutplate. Drill the center hole only. Install the center bolt and lift tab. Carefully line up the tab and using the tab as a drill guide, drill the other holes. Remove the bolt, prepare both surfaces for bond and install the three bolts and tab with wet flox. The bolts will push the silicone back on installation. The best quality holes in the glass pad can be obtained if the step 2 cure is allowed to cure two to three days before drilling. An alternate method is to use the plans procedure, but substitute 1/4-inch steel for the 1/8 inch aluminum inserts.

CP10/3

Be sure the elevon slot in the canard is correct and true before skinning the canard bottom. Warps or high places may limit up-elevon travel.

CP10/5

4 - 3, 4 - 16, Inserts

Install nutplates, three per insert over holes drilled in place with lift tabs, see 'building hints' in this newsletter.

CP10/6

5-6, Tip Fairing

The small cosmetic fairing at each canard tip is not shown on the plans. This fairing is attached to the canard and fills the one-inch void outboard of the elevons. Shape is not critical, just be sure it doesn't rub on the elevons. See sketch below.

\*\*SKETCHES OMITTED\*\*

CP11/3

Alignment - If your foam core is cockeyed when you glass it, your airplane will be cockeyed too and probably fly that way. Get your foam cores assembled correctly. Use lots of nails to hold it straight while the micro cures. Check the depth of the spar notch and be sure that it's correct, top and bottom. Wing and canard foam cores should be assembled vertically as shown in the photos on page 6-6, nailed together firmly, and the depth of both spar notches checked before placing it in the jig blocks.

CP11/4

Ed Hamlin reports that a Dremel #428 wire brush works beautifully for cleaning the residual foam and micro off of the canard, wing and winglet trailing edge overlaps in preparation for the top skin lay-ups.

CP11/4

Be sure you have at least the overlap shown at the trailing edge for the top and bottom skins (0.4 inch on canard; 0.5 inch on wing and winglet). Be sure the overlap area is sanded well before top skin layup.

CP12/6

Leading edge overlap on wings, canard, and winglets, can be done with ease and very neatly using the paint roller. As you layup the upper skin plies, use the roller to wrap the overlap up onto the bottom skin instead of stippling with a brush. The brush tends to fray the cloth as you stipple giving the cured overlap a very rough surface requiring ambitious sanding to fair. The roller leaves the cloth smooth and unfrazzled. Scissor trim each successive skin ply a bit shorter than the preceding ply giving the lap joint a semi-tapered finish requiring far less work to sand smooth, and eliminating any tendency for the plies to pull away before cure.

CP12/6

Trailing edges. When making your final inspection and preparation of the foam core for skinning, look carefully for potential trouble spots. A hot-wiring defect or too abrupt curvature may tend to leave voids in the trailing edge corners between the glass and foam. If you even suspect the possibility, sand the area to a more gradual transition before laminating. A well prepped foam core makes the layup much easier.

CP12/9

Section I

Page 4-8

 Change 3 hour to 4 hour on skin layup time.

CP13/5

Some have complained about having to remove the canard to service the battery--you're right. I'd suggest moving the canard cover joint aft as shown and add an access panel. The hole should be done similar to the hole in the rear seat bulkhead. The door can be a piece of .025 2024 T-3 aluminum using six #10-32 screws or four camlocks. You might even want to reverse the canard lift tab bolts so they can be reached through the new hole--it takes a long arm to reach them through the cockpit. \*\*SKETCH OMITTED\*\*

CP13/5

Several builders have asked how to repair a poor trailing edge overlap in the canard, wing, or winglet. The method shown below works quite well. The surface is prepared for bond, the dry BID cloth at 45 degrees is taped to one side, wrapped to the other side and taped snugly to pull out wrinkles. Once it is taped down well the BID is wet out with a brush (RAEF) and allowed to cure. Remove the tape (gray duct tape works well) and fair in the edges with 36 grit sandpaper. This method can be used full span on the wing for a super strong trailing edge joint, with a small weight penalty. It is not considered mandatory, though. \*\*SKETCH OMITTED\*\*

CP13/6

In areas where the thickness of glass buildup is important - shear webs, spar caps, pads, etc. - always calculate the thickness (0.13" per ply for BID, 0.009" per ply for UND) and measure the foam core to be sure the foam is the correct size before glassing. The spar cap and skins must make a smooth, straight transition onto the outboard cores (wing and canard). Be sure you fully understand the quality control criteria in "Section I," "Section V," and newsletter 10.

CP14/5

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. \*\*SKETCH OMITTED\*\*

 (3) Aft cg - 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, i.e. 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 a 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 0-200 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 15 lb 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 0-200 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 0-200 or Lycoming 0-235 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. \*\*SKETCHES OMITTED\*\*

CP14/9

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."

CP14/9

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.) \*\*PHOTO OMITTED\*\*

CP14/9

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).

CP14/9

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.

CP14/10

ERROR: Foam cores jigged 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.

CP15/6

Before glassing canard or wing bottom put masking tape below the knife trim line on the leading edge. This keeps epoxy off the foam on the top surface. A few pieces of 2"-thick, 2 ft-square foam rubber are handy to support wings and foam cores so they can be handled and worked on, without damage. Sticking nails into the leading edge of the wing cores at the W.L. at tip, root and mid-span will help in eyeballing the leading edge straight. Thanks, Duane Solberg, for the above hints.

CP15/6

Nat Puffer discovered that the canard bolts can be reached through the nose access door without need to reverse the bolts. He also suggests routing pitot line around, rather than under, battery to eliminate moisture trap.

CP15/8

SECTION I

pg 4-2, 6-1,

& 7-1

 Add "Be sure to use the method shown at the top right of pg 7 of newsletter 12. This will assure a straight leading edge. Hotwire L.E. wire

CP16/4

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 susceptible to small roughness or waviness. So we tufted N4EZs 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 YOUR CANARD 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.

CP16/6

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 of 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.

CP16/7

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. \*\*SKETCHES OMITTED\*\*

CP16/7

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. \*\*SKETCH OMITTED\*\*

CP18/5

Trim change in rain - Based on the Bull session and on the test several owners made returning from Oshkosh, VariEze's all have a nose up trim change when in mist or light rain - this occurs even before the mist is seen on the wind shield. In moderate to heavy rain some VariEzes trim nose down.

CP20/6

PVC FOAM COLORS

Several builders have accidentally used 9mm PVC foam for their F22, F28 and instrument panel bulkheads. The confusion has arisen through variations in color of the PVC foam. Rather than going by color check the thickness and obvious density. The 5mm(.2") high density foam is more dense than the 9mm (3/8"). It has a smoother texture - finer cells than the 9mm, which has a course texture with a larger cell structure. If you are one of the builders who has made this mistake, here is the fix. The only area that is a structural problem, is F22 where the canard lift tabs are attached. To stiffen this area you should dig out the foam as shown (use a 1/4" drill) and make four (4) 1/4" birch plywood inserts (scrap firewall material), which should be a nice snug fit, and should be glued in with wet flox. This mistake will, of course, also necessitate longer VECN1 bushings. This fix will provide adequate bearing strength, and structurally the airplane will be more than satisfactory. \*\*SKETCHES OMITTED\*\*

CP21/4

MAN-GRD CP14-6 Shorten Canard - New cg ranges (if cg requires)

CP21/4

MAN-GRD CP16-4 Contour canard within 0.006

CP22/3

Moisture change - moisture on a wing from rain will affect its lift. This effect is small on a conventional aircraft, ie, the Grumman Tiger descends 500 fpm if untrimmed entering a rain shower, but is easily trimmed out. A Canard aircraft generally has a much larger trim change in rain because its high lifting wings are located far apart. We do not fully understand the reasons for this, but the following characteristics exist for most VariEzes: if a trimmed

EZ enters light moisture or light rain it will climb, requiring about 1/2 lb to 1 lb push to maintain level flight. In heavy rain, most EZs trim nose down, requiring a mild aft stick pressure to fly level. The trim change varies with speed, being barely perceptible at 70 knots and higher as speed is increased. One EZ flyer reported a heavy aft force required (15 to 20 lb) when making a 150-knot (172 mph) descent through a heavy rain shower.

CP35/6

Canard Construction - VariEze and Long-EZ

Builder support on canards has been quite heavy, particularly in regards to getting the leading edge foam core bonded to the shear web, on the two inboard cores, in the correct position, vertically. If this is bonded on too low (relative to the airplane) the result will be a hollow lower spar cap and a bump in the top spar cap. This bump in the top cap is a problem, since it cannot be corrected. If yours is this way, our experience has shown that a small error here can usually be accepted provided a good job of filling with dry micro and fairing is done. The worst of this problem will be buried within the fuselage under the canard fairing block and usually will not extend much more than 10" to 15" outboard of the fuselage sides. A bump of up to 1/16" at the fuselage side, tapering to nothing at B.L. 25 each side, has not been detrimental to flying qualities.

A method we have used to eliminate this problem is as follows: Hot wire cut 4 canard cores. Before cutting the leading edge off the two inboard cores, obtain 6 pieces of wood dowel 1/4" diameter, 6 1/2" long, sharpen one end to a point just as you would sharpen a pencil. \*\*SKETCH OMITTED\*\*

Insert these dowels equally spaced into the trailing edge of the two inboard cores as shown. Push them into the foam, twisting them with your fingers. They should protrude beyond the shear web cut line about 1 1/2". Now pull the dowels out and hot wire cut the leading edge foam cores at the shear web. \*\*SKETCH OMITTED\*\*

Jig the inboard cores, and layup the shear web per plans. After this layup cures, drill 1/4" holes through the shear web in 6 places where the dowels will go through (use a flashlight to locate the holes). Now bond the leading edge foam cores to the shear web per plans, using micro. Paint micro onto the dowels and push all 6 of them in, until they are flush with the aft face of the canard. Complete the canard per plans. The dowels will guarantee that the leading edge foam cores are perfectly aligned and your spar troughs will be correct top and bottom. We recently built a canard using this method and ended up with a really nice contour, top and bottom, with no bump or hollow place in the spar cap area. Try it, you'll like it!

CP38/4

Pitch Trim - VariEze and Long-EZ

While most VariEzes and Long-EZ have a rather mild pitch trim change in rain, some are less mild then others. Try this: scuff sand your canard using 500 wet or dry (wet). Sand only in a chord wise direction, until you have a uniform dull look. Ken Clunis did this to his with surprisingly good results.

CP43/2

The new Roncz 1145MS canard will not be recommended for the VariEze. The airfoil used on the VariEze main wing, is working very hard to maintain attached flow even with the GU canard. This new canard may ruin the stall characteristics of a VariEze. Feed back from VariEze flyers indicates that while most VariEzes do have a small rain trim change, it is just that, a small trim change that in most cases is not significant enough to warrant the flight test program that would be required to qualify a new canard for the VariEze.

CP69/8

Chapter 4

CP Issue 16-4

Subject surface smoothness

MAN/GND The top surface of the canard must be smooth within .006 in. How to check, flight tests to confirm.

CP69/15

Chapter 4

CP Issue 10-3

Subject lift tabs

Install nut plates behind lift tab insert. Do not use method shown in the plans. Other hints for lift tab installation.

CP86

Long EZ canard bracket corrosion. Treat all aluminum parts with Alodine 1201 after prepping with Alumiprep 33 before installation.