CP10/5

7 - 1, 7 - 2 Winglet

Clarification: The dimensions at the top of page 7 - 1 are to rough out a block to use for the winglet. Trim the block to the dimensions in the center of the page and on page 7 - 2 to obtain the correct winglet size. 103 deg should be 103.7 deg.

CP10/5

7 - 3, R4 Angle

Substitute the following pattern for the R4 angles. Two are bent up, two are bent down. \*\*SKETCH OMITTED\*\*

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.

CP10/7

7-1

 The four UND skin plies are considerably oversize as shown (fifty-five inches by thirty inches) and may be reduced to fifty inches long and twenty inches wide at root.

CP10/7

7-2

 The middle sketch at the top of the page should look like this. \*\*SKETCH OMITTED\*\* Use the drawing at the bottom of 7-2 to cut the winglet planform, not the info at the top of page 7-1.

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

7-2

 Section C-C shows 2-2 with two 1/2 inch diameter holes (not 3 pieces!). It should show only one.

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

We have received several comments that the return spring at the rudder is too strong. It is possible that if the hooks are installed short this spring will be far too tight. The only requirement for this spring is to return the rudder to neutral on the ground. Inflight airloads firmly return the rudder. The spring can be lengthened or a lower-rate one substituted. It only needs to be firm enough to overcome friction of the system and the rudder pedal spring. We have selected three different screen door springs available at our local hardware store. The dimensions and spring rates are shown below.

 Outside dia. Wire dia. Lb/in for 1"length Max. force

#1 0.30 0.045 31 20

#2 0.35 0.05 38 30

#3 0.39 0.62 50 35

CP13/6

For the rudder return spring you can use either a 4-1/2 inch length of #1 or a 5-1/2 inch length of #2. Both of these have a spring rate of 6.9 lb/inch.

CP14/10

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

CP15/7

Q. Can I use Scotch Brite dish pads to dull the fiberglass for a future layup? A. No, use only 36-grit or 60-grit sandpaper. Better yet, plan ahead and use peel ply. We've noticed that many builders are not using peel ply for winglet attachment. Be sure to peel ply the outboard 18" of the wing and the lower 14" of the winglet.

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

CP16/6

CHAPTER 7, WINGLETS:

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

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\*\*

CP16/7

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 VariEze 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 frazzled 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. \*\*SKETCH OMITTED\*\*

CP16/9

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

 \*\*SKETCHES OMITTED\*\*

CP17/8

Q. I'm now using the CP16 pg 9 method to jig the winglets to the wing. I've noted that this method results in the top of the winglet being further inboard than the plumb bob method. Is this intentional? A. Yes. We failed to mention that in CP16, but we did intend to remove some of the 'cant' to reduce dihedral effect. The EZ is less susceptible to wing rock at low speeds and is a bit easier to fly with rudders with some dihedral effect. The Defiant's winglets cant inward from vertical about 3 inches. Some builders have found some mis-match of the winglet incidence template at the trailing edge and rudder hinge line. This is of no concern since the incidence template is not needed when using the CP16 method.

CP21/5

The following is from Jim Davis' about his first flight experience: "On first flight, I experienced unusual roll on climb out and level flight. This occurred unexpectedly, both right and left at a random rate. First landing was exceedingly hard and resulted in damage to the main gear, wings, etc. I believe this was due entirely to pressing on the rudder bars inadvertently. I had flown back seat of another VariEze and experienced the unusual sensitivity of the controls. However, this didn't carry over well to the rudders which I had been tromping on for brakes during two hours of high speed taxiing. Rudder cable length was short, cut to insure solid brakes with toes down. Seat cushions, adjusted to other Rutan criteria definitely accentuated the problem. I didnâ€™t realize the unusual roll induced in swept wings by rudder action.

CP21/6

Suggestion: Make sure your rudder cables are long enough to keep foot pressure off rudder bars without any effort. Make every effort to ride the backseat of another VariEze before first flight in yours. Fly dual in a Thorpe T-18 or other small plane with very sensitive controls and speed on final of 80 mph. There is really no substitute for this experience and keep your feet off your rudder bars unless you want yaw and plenty of roll."

Jim Davis, Falls Church, Va

CP22/7

VARIEZE LOSS-OF-CONTROL We have just completed another series of flight tests on N4EZ to test its departure (loss-of-control) resistance. What prompted this is reports from two VariEze pilots in Texas that they experienced a partial or full snap roll at about 80 knots. These occurred below pattern altitude and fortunately the pilots managed to recover in time to avoid an accident. The maneuver was described as follows: Full aileron and partial rudder steady sideslip, then full rudder was applied which caused the airplane to yaw excessively and abruptly roll, experiencing negative g. Recovery with neutral control was prompt, but several hundred feet of altitude was lost.

The most surprising thing about these incidents to us was that control was lost at such a high speed - 30 knots above stall. Reinspection of our stall/spin test data and the NASA tests indicated no susceptibility to departure. We then initiated a new test program to investigate this. Dick performed full rudder sideslip with N4EZ at all speeds and experienced no departures. Concentrating on the 80-knot speed range he then aggravated the yaw with abrupt rudder inputs while in a rolled attitude. On one of these he experienced a departure - a roll off in the direction of the slip. He then tried to repeat the maneuver and could not get a departure in over 20 attempts. We then adjusted the aileron and rudder rigging, moved the cg aft, and repeated the tests. Dick found that by learning a specific technique he could cause a departure nearly every time, if speed were above 75 knots and an excessive sideslip angle were generated. The departure generally consisted of an uncontrolled roll away from the rudder input direction. Recovery with neutral controls was prompt. However, on several of the maneuvers the yaw angle was extreme at departure causing a massive stall of the winglets and blanking of the upstream wing. The airplane then yawed past 45 degrees, abruptly rolled, and entered a 1 to 2 turn inverted incipient spin. The airplane always promptly recovered with neutral controls. If aileron or rudder were applied for recovery it could cause a further "snap" departure and delay recovery. Altitude loss on the worst of these maneuvers was as much as 1500 ft.

Why did we not find this departure when we did the original tests and the tests with cuffs in 1978 (CP #19)? The most probable reason is that most of those test were done at high angle of attack (full aft stick) which was thought to be the worst case. However, we have found that at lower angle-of-attack ie, 80 knots, the rudders can generate more sideslip than at high angle-of-attack, and thus can be powerful enough to stall the winglets in an accelerated yaw maneuver. We were then faced with a decision on what to do: (1) caution pilots that the airplane can be departed when using excessive yaw inputs or (2) fix the airplane to improve its departure resistance. Since we feel strongly that good departure resistance is an important asset and design goal for the VariEze, we set out to attack # (2).

We have always known that the EZ has more rudder power than needed for normal maneuvers - a full aileron steady sideslip at low speeds requires only 60% of the available rudder to hold heading. The available travel is 3 1/2 inches, measured at the top of the rudderâ€™s trailing edge. We then limited the rudders travel on N4EZ in various increments, 3", 2.6", 2.3" and 1.8". At each increment we flew tests to determine departure susceptibility and the necessary rudder authority for crosswind landings.

As expected, the departure susceptibility reduced as rudder travel was limited. After extensive testing and evaluation by three pilots we have N4EZs rudder now rigged for a two-inch full travel. With this rigging, the following characteristics exist: crosswind landings up to a component of 24 knots are possible without tire scrub. The aircraft is not susceptible to departure during any normal maneuver. Thus, we are now recommending a mandatory rigging change to limit the rudders to two-inches of travel.

It must be noted that this may not guarantee total departure resistance. This may vary from one airplane to another, due to expected tolerances in things like winglet leading edge finish and shape, fuselage shape etc. Also, even at 1.8 inch rudder travel, Dick was able to induce a departure by learning an unusual and aggressive combination of control inputs: full left aileron, full left rudder at 30 degrees bank, then at 100 degrees bank abrupt full right rudder. When this was done a departure was possible (not probable) even though the rudder was limited to 1.8 inches.

The important thing to note is that, even though this design is not as susceptible to loss-of-control as a conventional aircraft it should not result in over-confidence on the part of the operator. Assume your aircraft is susceptible to departure until proven resistant during your stall tests with lots of altitude and a parachute. Refer to the plans-changes section of this newsletter for a caution note to be added to your owners manual and for instructions on rigging rudders to two inches.

CP30/5

Rudder Pedal Failure

There have been at least two cases of failure of the top tab which is welded to the rudder pedal, and to which the rudder/brake cable is connected. One case was a gas welded, homebuilt part, and this was attributed to a poor weld. Another case was a prefab Brock part, but according to the owner, the tab had been bent and then straightened cold. If this tab should fail, it will invariably fail while taxiing under braking load, when you need it most, and directional control will be lost.

As of this date (Oct 81) Brock-supplied rudder pedals have been modified per Figure 1, to strengthen the tab. If you purchased your rudder pedals prior to this date, you can obtain from Brock a pair of tab reinforcement brackets. Brock part #LE2026R-1 and LE2026R-2, and these must be riveted into place over the existing tabs per Figure 2. This will stiffen and back up the weld which failed. Of course, you can also homebuild these brackets from Figure 2. This is a mandatory change, see LPC #86. \*\*SKETCHES OMITTED\*\*

CP40/7

Another potential place to keep an eye on is the hole in the firewall where the rudder/brake cable goes through and connects to the CS15 bellcrank. Check and be sure that it is not possible for the nicopress sleeve on this cable to go into the hole and jam. If necessary enlarge these holes a little, or adjust the brake cable length to limit the travel so the nicopress sleeve does not get into the firewall.

CP51/4

CONTROL SURFACE BALANCING

We have published this before but since it's one of the most common problems we get calls and letters about, here it is again!

First of all, your ailerons, elevators and rudders can be very thoroughly sanded, far more so that the rest of the aircraft. Use a blue foam (Styrofoam) block, sized to fit your hand, and a half sheet of 40-grit sandpaper. Sand vigorously the top and bottom skins of the control surfaces, particularly toward the trailing edges. You can safely sand off up to 50 percent of the top ply of UND - this leaves one and a half plies of UND - more than adequate for control surfaces. What it does is reduce the weight of these parts considerably, especially aft of the hinge, which makes it much easier to balance and ,more important, since it is now very smooth it takes much less fill and paint to finish the part, making it easier to balance. Using this method, and assuming reasonably good workmanship, it should be easy to balance your elevators. Elevators absolutely must be balanced per the plans criteria or they will flutter! This means they must balance after finish.

Ailerons are not as critical due to the much stiffer wing they are hinged to, but even though we have not had a single case of aileron flutter reported, you should still be sure to balance them within the plans criteria. If after sanding them thoroughly as called out here and checking to be certain that the mass balance is correctly positioned relative to the hinge, they still don't balance, the best method of adding mass balance weight is to go to your nearest golf pro shop and purchase a roll or two of soft lead ribbon used by pros to weight the heads of their clubs. This is a 3M product and consists of a roll about 1/2" wide of lead ribbon with a sticky back. Stick it on top of your existing steel rod mass balance, as far forward as possible without increasing the chord of the ailerons. Stick it on the full span. Use as many layers as it takes to balance within the criteria, then lay up one ply of BID over the lead to permanently attach it to the aileron.

EZ type rudders do not require balancing, however they can benefit from a thorough sanding because it will take less fill and paint to finish and therefore, they will be lighter. As far aft on the aircraft as the rudders are, excess weight here is hard to take care of.

This is the method we have used for many years here at RAF and it works well. In about every case, the sanding alone will balance the ailerons and elevators without any additional lead. At least, this has been our experience.

CP51/6

INSTALLING TEFLON "SPAGHETTI" TUBING IN AILERON AND RUDDER HINGES

John Bingham, VariEze builder, suggests the following idea: Split the Teflon tubing as shown in CP39, page 7, then, using a needle and about 12" of strong thread, stitch the thread into the end of a piece of Teflon tubing per sketch. \*\*SKETCH OMITTED\*\*

Now, pull the needle through the aluminum hinge using a small magnet. Then, pull the thread at the same time as you push the Teflon tube through the hinge. While it is difficult to push the Teflon tube through the hinge, it is easy to pull it through! Thanks, John.

CP67/7

SPRINGS FOR FLUSH BELHORNS

NOTE NEW ADDRESS AND PHONE

Many builders have had difficulty locating the correct springs called out to be installed in the rudder cables when installing the flush rudder belhorn modification. The springs called out in the plans are available from Century Spring Corp. but this company has a $25.00 minimum charge! Fortunately, John York, a Long-EZ builder who experienced the same problem, has informed us that he has a supply of these springs and is willing to keep them in stock for a year or two. He will sell the springs for $1.50 each plus $1.00 shipping. So send John a check or money order for $4.00 and he will send you a pair of springs!

Contact: John York

 921 College Rd.

 Lebanon, IL 62254

 618-537-2142

CP69/12

Chapter 7

CP Issue 34-6

Subject hinges

MAN Rudder hinge pins must be saftied. Shows proper method.

CP95

Winglet crack on high time Cozy and Long EZ and repair.