

Subject: [c-a] LEZ wings

Date: Thu, 16 Dec 1999 18:36:36 -0500

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[The Canard Aviators's Mailing list]

Howdy Berend and Canardobrainarians,

I have finished up a set of Long EZ wings. I do not have my own web page, but I learned a great deal during construction from others web pages to include "read and build per plans" and maybe:

1. Build the winglets first (don't forget the antennas). Makes for good practice for wings. I used a four foot electrical conduit (1/2 inch) for ensuring trailing edge straightness on the foam for first skin. Some clamps come in handy (every 3 inches) holding the pipe/skin/foam together for a really nice, straight trailing edge. I peel plied the foam areas where the high performance rudder and "spine" of the winglet was to be cut and a "minor spar" was to be installed later. It made the foam removal and subsequent glass "rough up" a little easier. No big deal tho.

2. Foam cores. Foam has internal stresses. Remember this when you weight them down for cutting. They will spring back. Weight accordingly to not stress the foam during cutting. I used .041 safety wire (thick wire) on my wire saw to reduce wire lag. Used a tight wire. All cuts are on the outside of the templates anyway, and excess foam burn is determined by wire heat and speed of wire through the foam. I think (memory?) I used about 22-24 volts for that thickness wire. I had a pretty old "adjusto voltage" supply unit, tho. Practice a bunch first, per plans, so what if you use up a little foam. Ambient outside air temp (foam temp) may have some effect on wire speed, but not much. Wing and winglet tip cores (smaller ends) were slightly undersized (.010 inch) at the tip templates, due to slower speeds of the wire due to template number distances, but it didn't matter much as 7 uni plies and 2 bid plys were used during winglet attach phase, so I got lucky. After winglet attach, minimal filler was used to ensure wing straightness. Remember the wing has washout (twist) so when using a long sanding block, the straight sanding line is not always parallel to the trailing edge. Cut the wing planforms accurately. It makes a difference later in the jig if you don't. I installed aluminum wing attach hardpoints and access holes prior to jiggging the wing on the floor. It was easier to do on the bench.

3. Jig the wing straight. I used two 4 inch by 3/8 thick square steel tubes 12 feet long leveled, shimmed, and bondoed to the floor. I got them at the local metal salvage yard for \$40.00. I have never seen a straight floor in my life. This was useful for span straightness as well as trailing edge straightness. Also the precision in which the jigs are made can be significant. I used the "string" method to align the -inside- of the jigs to insure a straight shear web layup. I suppose a laser light would work too. Once the shear web is straight and cured in place, you have determined the straightness of your wing. It won't move after cure, at least not that I could determine. I used the aluminum foil (heavy duty) technique and laid the web up on a table and got some help to flip it over onto the foam. Scissor trim the aluminum after "finding the edge" (just squeegee the aluminum foil to find the edge), remove the foil, squeegee, and easy as pie. For a neater job, tape newspaper on the sides of the wing to keep epoxy drippings off your nice

cores before laying up the webs.

4. Spar caps are a snap. Per plans. Some guys will insist you pull the cross ties. I did not. It was too anal retentive for me. Besides, I did them without helpers and did not have enough time for that stuff. I would have been there all night.... I have never heard of a weak wing or structural problem due to the retention of the cross ties in the .035 three inch uni tapes. I received dozens of emails from guys who did not pull the ties, and one even pulled 9 g's and said he had no problems at all with cross ties. So, decide for yourself, some guys say it wets out easier, I had no problems. I used a hair dryer to assist in wetting out. Peel ply per plans. Check for high spots, and weight down. I knocked off the hard edges at the edge of each spar cap layup (per plans) with a sanding block (after peel ply removal) to smooth before skinning. I had a slightly (.010-.020 inch) low spar cap depression after cap layup, and got some uni and filled to even with the foam after cure and peel ply removal. Remember to re peel ply for a good cap to skin bond later.

5. Bottom skin. No problem. Hardest part is cutting the uni cloth to size as the pieces are so big. I used the Geogon brothers dry layup technique as described in their boat building book. I laid up all the glass layups dry, aligned, straightened, pulled, and rechecked the straightness of the fibers. I then got some of that low adhesive backed masking tape and taped the edges together to keep the whole dry cloth layup from coming unstraight when I peeled back the layups to the spar caps to expose the foam for slurry. I used some wood blocks near the spars to hold down the dry cloth so it would not move around during "peel back." Slurry the exposed foam, layup one ply at a time, squeegee each, remove tape on each ply, and repeat on the other side (after removing the weights. I suppose it would be unwise to leave the tape on for more than a few hours as it may contaminate the cloth. However, the low adhesive (not regular masking tape) came off easily and left no visible (or to the touch) contamination. I did the trailing edge side first as it was easier to weight the cloth on the spar for the root part of the wing. Layup dryness or wetness is personal preference, but I like a little wet, as the bubbles (and excess epoxy) come out easier with the squeegee. Less pinholes. I also never get any bubbles in my epoxy while mixing, yea sure, that's the ticket. Trailing edges were straightened with a one inch diameter electrical conduit that had been straightened by hand (never found a perfectly straight piece of 10 foot conduit or pipe) and grey taped. Use the clamps every 3-4 inches, and voila! straight trailing edges. Leave the grey taped pipe glued to the trailing edge during jig reassemble, of course you remove the clamps. You will need to relieve the jigs to accept the pipe. Bondo the pipe to the jigs after reassemble. this comes in handy after final jig reassemble and inversion (reversion?) of the wing on the table. The trailing edge stays straight in preparation for the top skin. By the way, when the jigs go on the table, leveling the jigs laterally and longitudinally will provide the correct wing twist. (build jigs accurately)

5. Repeat for top skin per plans, and read plans thoroughly, every word.

May or may not be continued for winglet attach.

I'm getting tired and am going to bed. All for now. I built the wings first as there are no "mods" to contemplate while the epoxy is curing. Oh, by the way, outside air temperature (and foam temp) during skin layups should be at least 80 degrees F. Use your gloves and mask, and wash your hands with soap and water after each layup completion. You never know when your gloves may have been punctured. Looking closely for

air in the layup puts you dangerously close to the fumes of epoxy. Ventilation is a good idea.

I have opened myself for criticism for some of my techniques, but not tonight. I'm going to bed, where everything is safe and Snoooooooooooooorrrrrrrrrrrrrrrrrring is easy.

Happy Holidays and good luck on your wings. You will be amazed and proud of the sculptures that you will create from a pile of foam and a role of glass.

The Garage Boy