

Make the composite fins

Now for the fins. For these I will use a combination of GL 3/8" honeycomb with balsa and air-ply edging. The GL honeycomb is already laminated with .01" fiberglass and is very flat – ideal for this purpose. If I vacuum bagged my own honeycomb it would not be ideal – the vacuum bagging process causes little dimples to form. So while just as strong the surface would need a lot of filling.

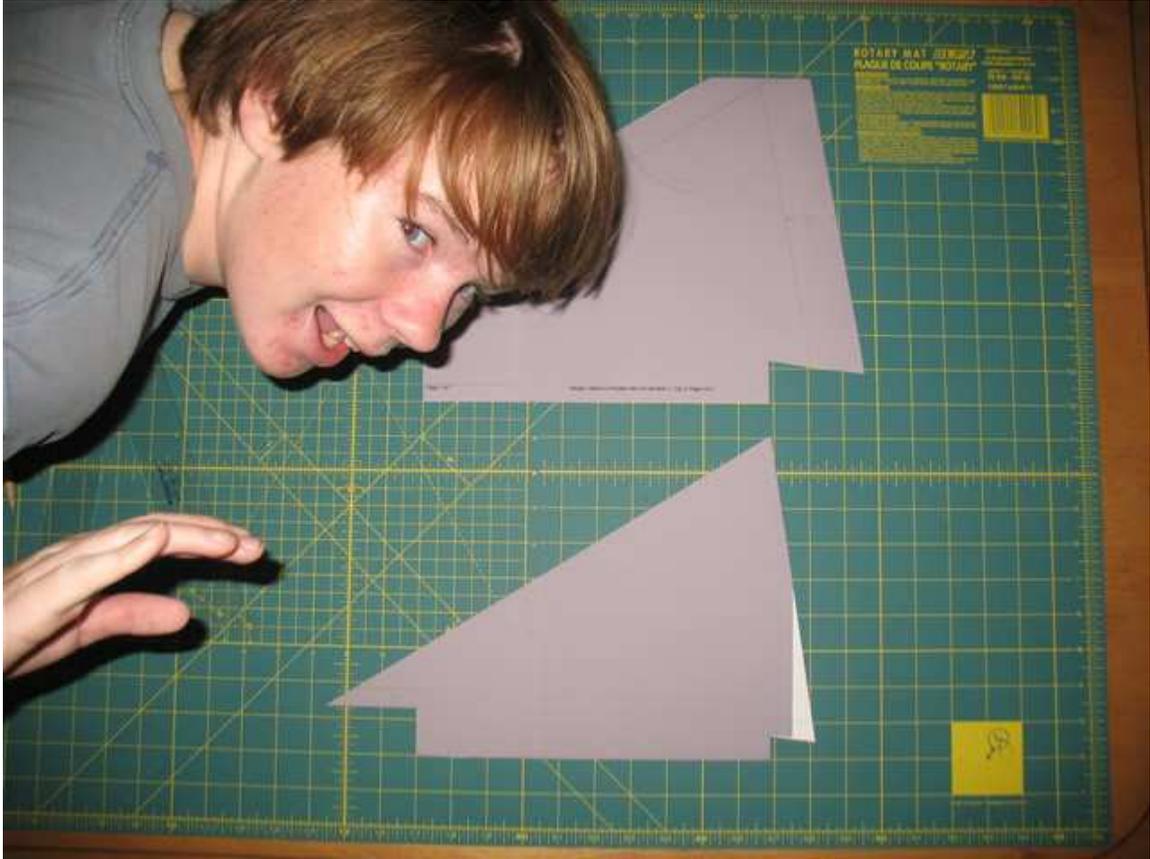
To further keep the fin weight down I chose balsa for the leading and training edge. Balsa is very light and easy to shape. Also the fins will have carbon laminated over them so there will be plenty of strength. Lamination over the fin from inside to out consists of:

1. One layer of carbon from the root out to 5". This makes the root tab very strong.
2. Additional two layers of carbon over the entire fin
3. 8oz glass
4. 3oz satin weave glass to provide a good finishing surface.

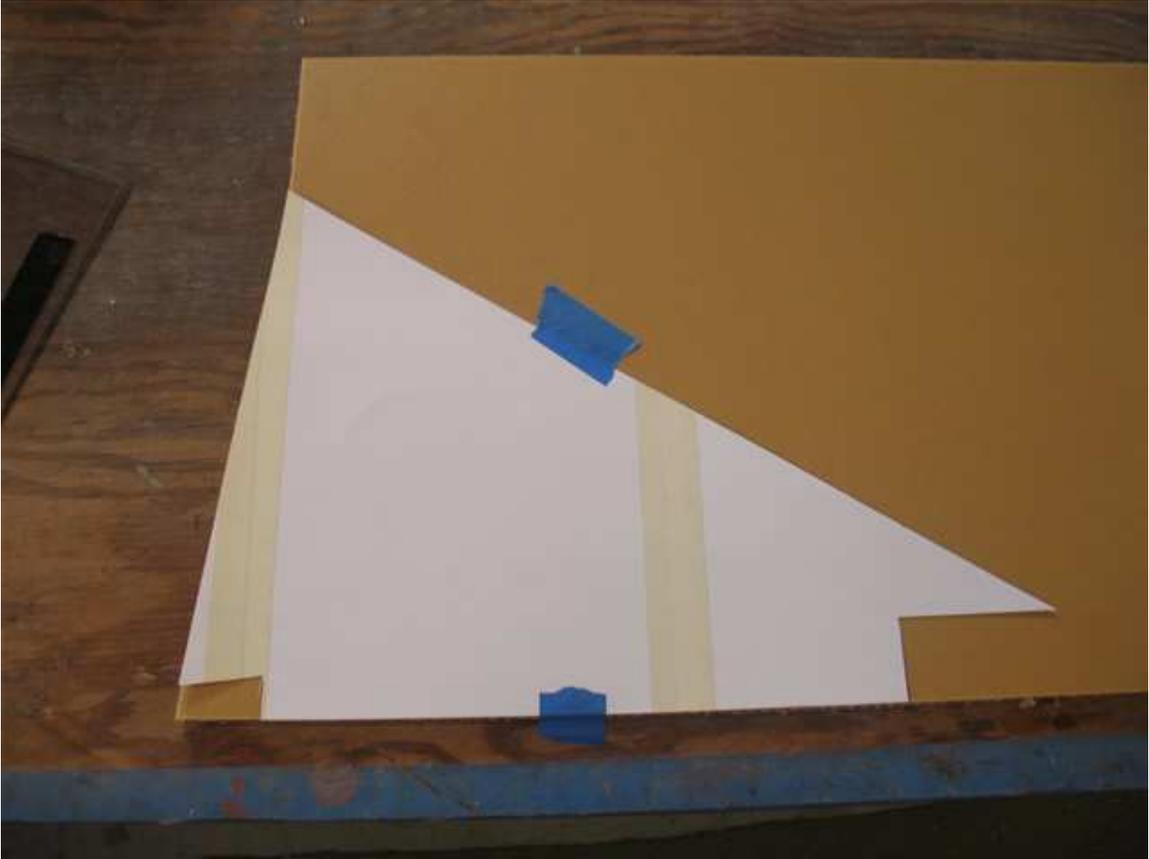
The entire structure is laid up in a single session and vacuum bagged.

The construction starts with printing the fin pattern from Rocksim – actually two of them. The first pattern sets the overall dimensions as well as I add outlines for the 1" wide balsa leading edge and 1.5" balsa training edge. I also use a .5" wide by 3/8" thick air-ply root to increase strength. The inner boarder of balsa and air-ply sets the size of the honeycomb. The second pattern is cut down in size by this much and used for cutting out the honeycomb board.

On to the pictorial...



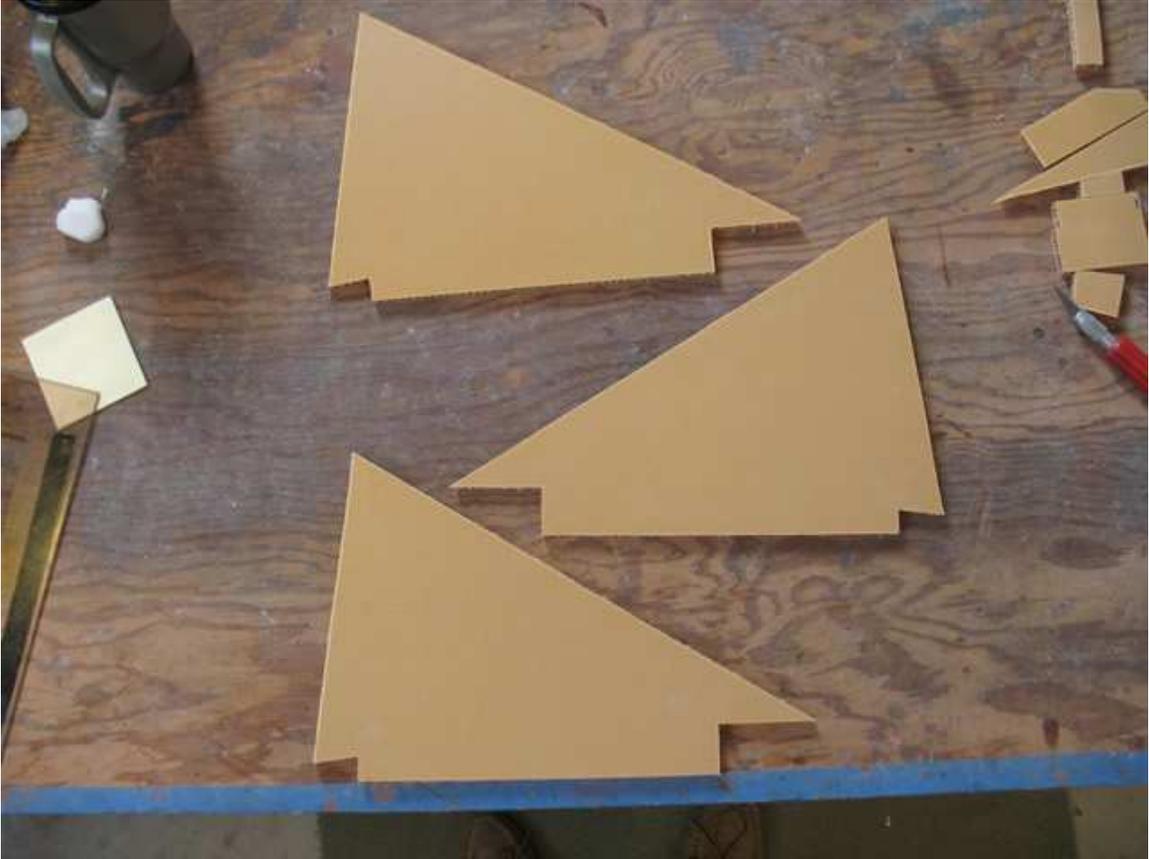
Here are the two fin patterns. The top is the entire fin. You can just make out the outline of the edging. The bottom is just the honeycomb core. Oh - and that's Phil my 13 year old son as spokes-model.



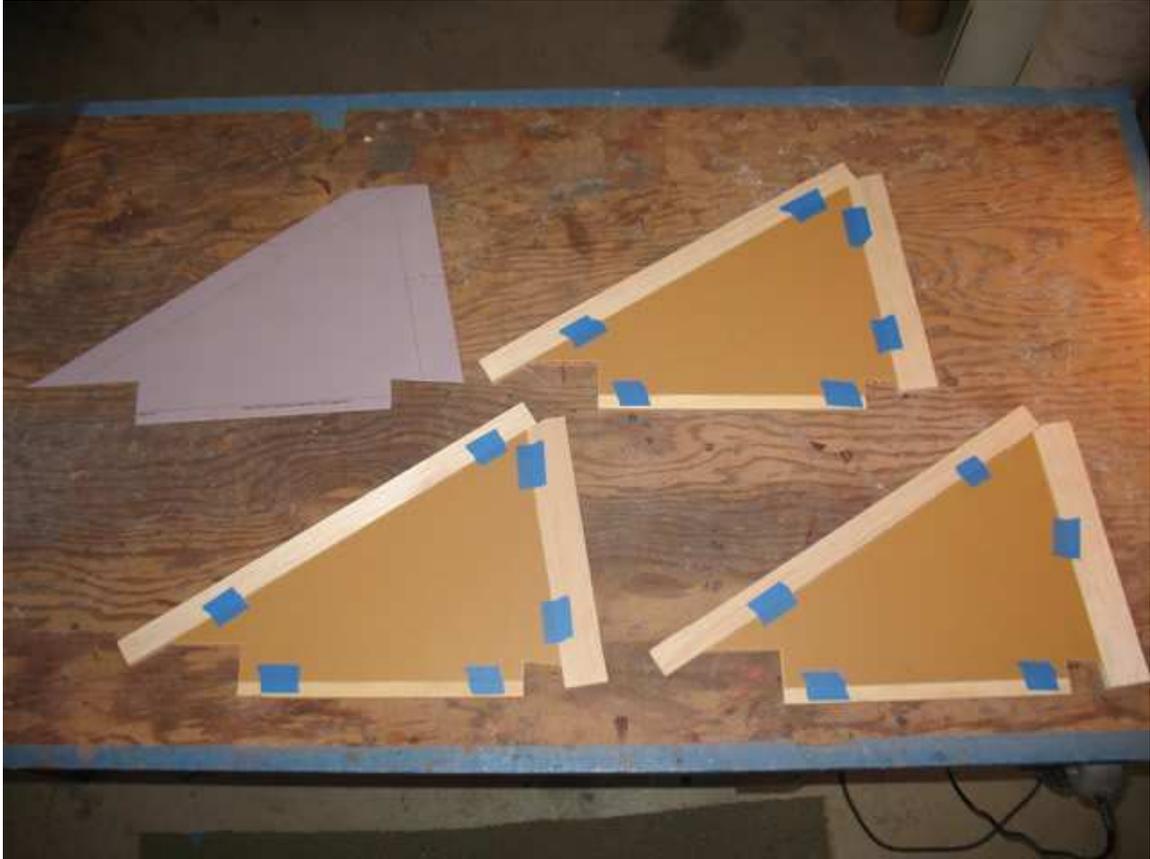
The honeycomb pattern is transferred to the material.



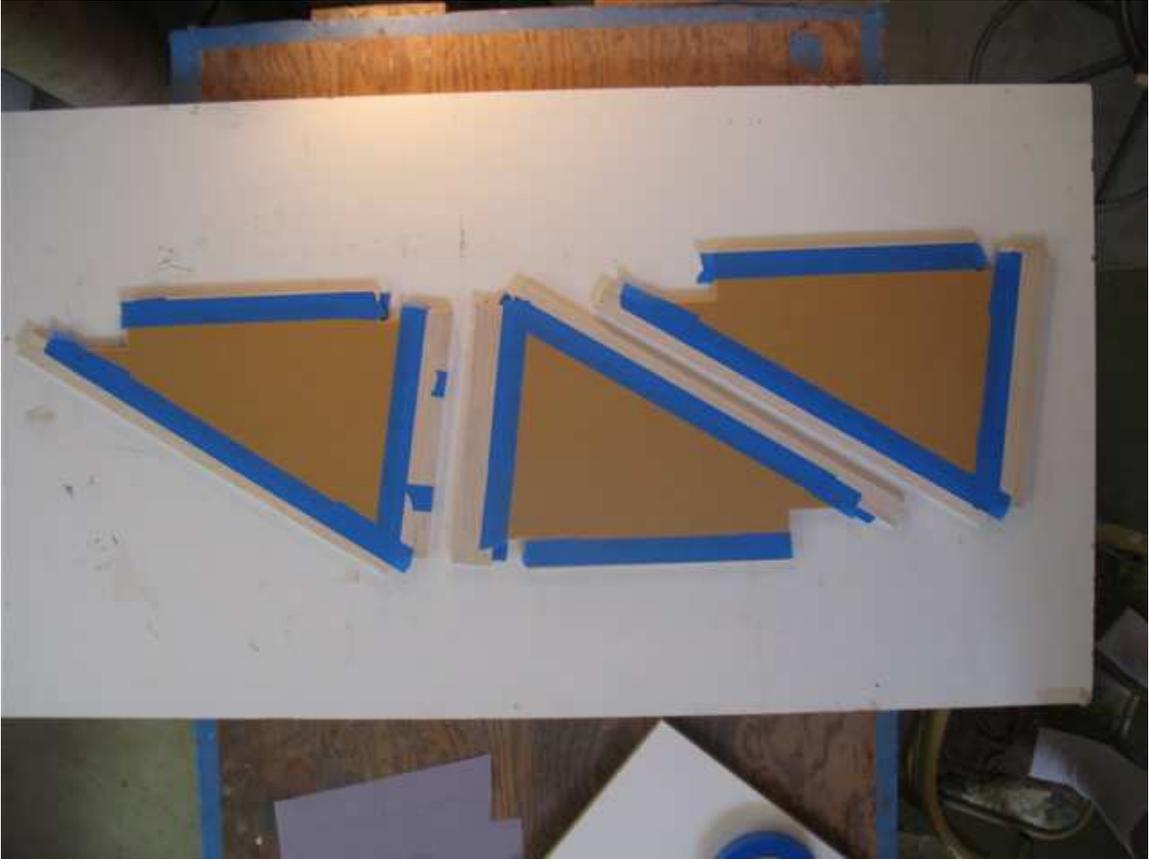
I cut the honeycomb using my old Dremel scroll saw. It cut very easy.



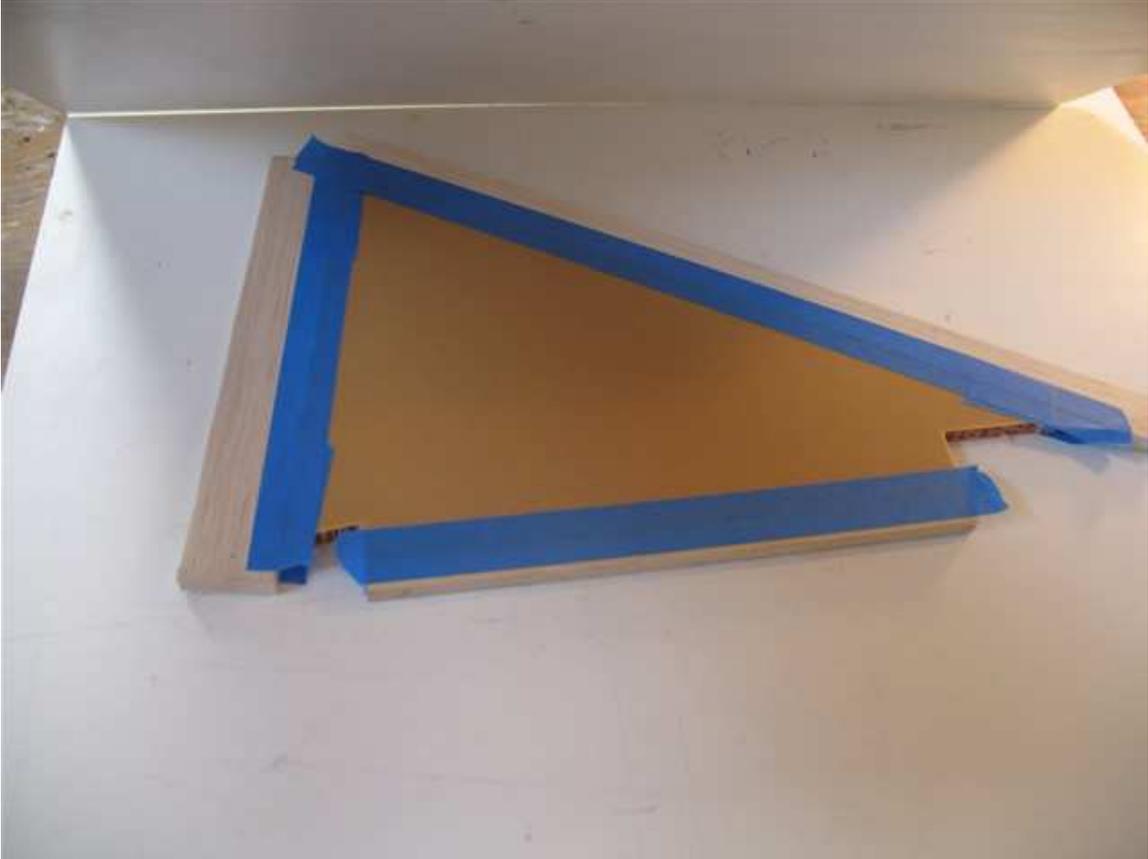
Here are three cores ready to go.



I stripped 1" and 1.5" balsa and taped them to the core. I also added the air-ply for the root.



I applied tape over the entire back edge.



Using the tape as a hinge I opened up the joint and applied Aeropoxy. The edging is then closed and tape applied. Both sides of the joint are sealed with tape.

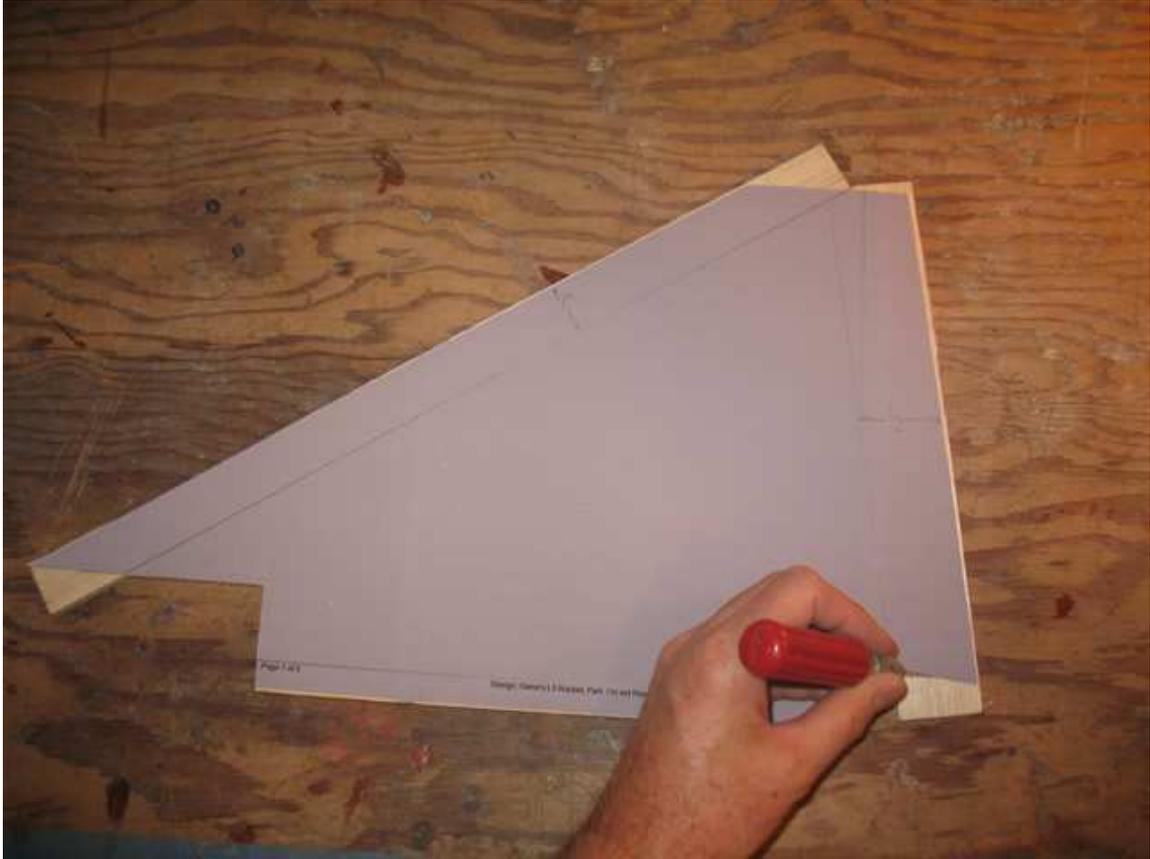


I placed a piece is shelving material that is very flat over the fin layup and put a heavy weight on it. This keeps the entire assembly flat.



After baking over night and removal of the tape the edging is done.

Make the fins – Cont



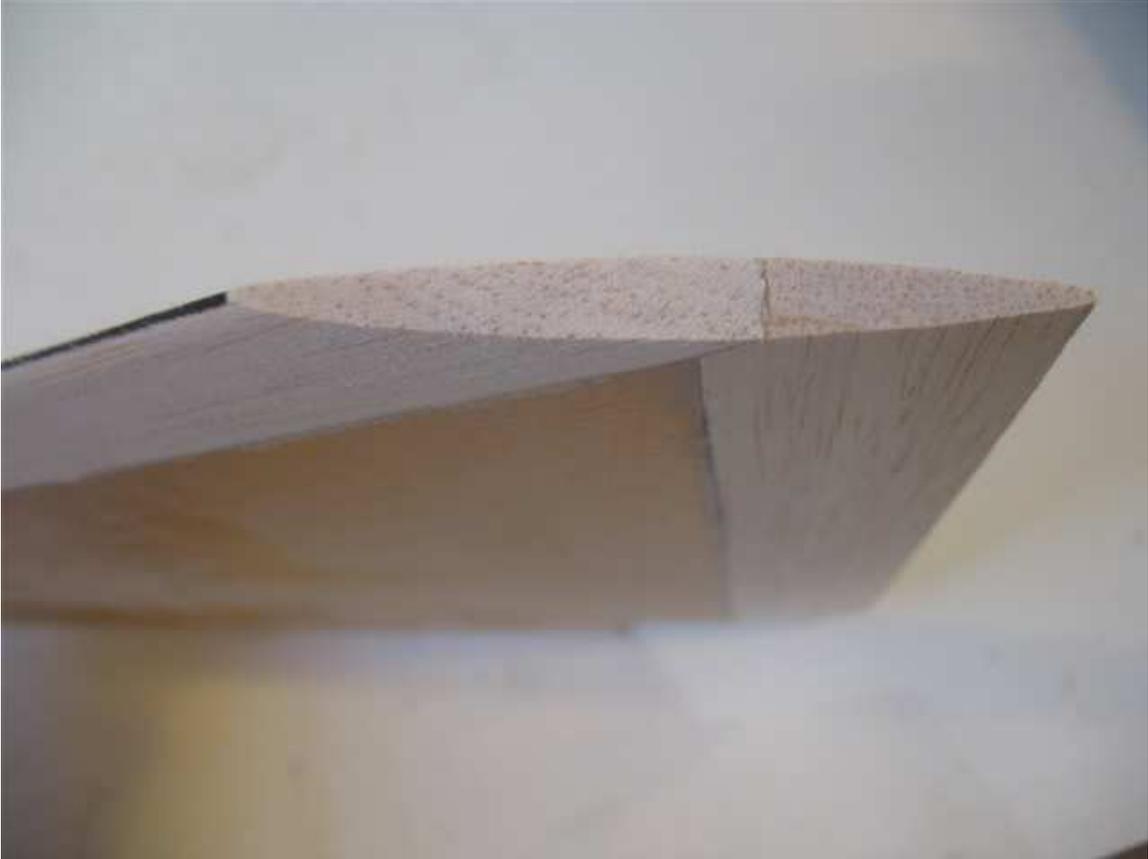
I use the fill size pattern as a cutting guide to trim the edging.



The fin edging is now ready to shape.



Before shaping I mark a center line on the balsa edging. I use this as a guide to assure the sides are symmetrical.



I use my bench sander disk and belt to do the rough shaping. I use a t-bar sanding tool for the fine sanding. Results speak for themselves. Note the centerline still visible. These fins have near perfect symmetry.



I cut the material and do the layup in a single session. Sorry – no detail pics here, it was just too hectic!



Another view of the layup under vacuum. I get a 24cm vacuum out of my pump, or about 10lb / sq foot I would guess.



Here is a pic of my rig. At the top is the pump which I bought at a garage sale years ago. It is a centrifugal pump and draws a vacuum very fast. I also use a 10gal compressor tank as a vacuum reservoir. The bags almost always leak a little and the reservoir really slows down the loss of vacuum by giving a much larger volume to draw down. The layup has a small volume and even a tiny leak would cause the vacuum to fall very fast. After I pump down the bag I close a valve on the pump. I monitor the vacuum (see gauge on tank) and run the pump again as needed. So I only need to periodically run the pump – keeps the energy use down!



After baking for 8 hrs and while it's still green (not sticky but not fully cured) I peel off the peel ply – beautiful!



Sorry – pic is sideways, but you see all three fins attached by the “flashing”.

Make the fins – Cont 2



I use a jig saw with a carbide blade to cut the fins apart. Do this before it's fully cured to make it easier. Once fully cured it's really tough going. I position my shop-vac to suck up the cuttings. Carbon dust is nasty and causes your skin to itch.



Sideways again;) A fin cut and ready for shaping. Now I let the fin cure the rest of the way (24hrs in this case). Sanding before this clogs the paper.



After much shaping, sanding and fussing there are the three fins ready to go. Each fin weighs just 10oz – very light. And they pass my standing test with absolutely no flexing. They are incredibly stiff!

next up – Vacuum bag the lower airframe.