

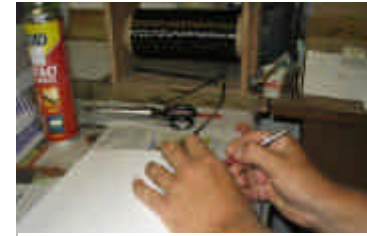
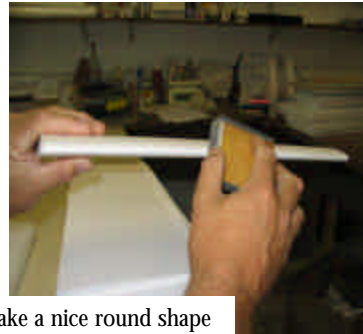
Step by Step Wing Bagging

By Evan Shaw
Part 1

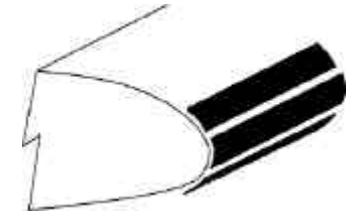
Preparing the leading edge



Sand the LE to make a nice round shape



Mark out about 7mm back from the LE on top and bottom. We are going to put 3 tows of 5mm wide carbon onto the LE. One on top one on the front and one underneath.



Mask off the cores



Spray glue the LE with a light coat of contact



Immediately apply carbon tows to the LE, sticking them down to the wet contact glue



Mix about 10ml of resin. I use LR20 resin with LH137 hardener, which cures fairly quickly, giving about 10 minutes of pot life and a few hours to cure. My preferred method is to use a syringe to get the correct proportions as a scale is not accurate enough.



Wet out the carbon on the LE using your fingers. Remember to wear gloves.



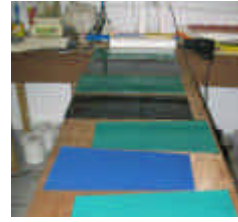
Allow the LE to cure undisturbed overnight

Preparing mylar sheets

In the mean time wax some mylar sheets with Run In Ram Wax and let them dry properly. These sheets are cut exactly the same span as the wing panels but about 15mm to 20mm wider than the wing cord. Use thick mylar sheet. About 0.5mm thick is best. When the wax is dry, polish the excess wax off and set aside.



When the wax is dry, polish off the excess, and set aside.



Cutting fibreglass skins



I use two layers of cloth. For the centre panels, the top layer is 49-gram cloth at 90 degrees and the bottom layer (closest to the foam) is 86-gram cloth at 45 degrees. For the tip panels both are 49-gram cloth, one at 90 degrees and the other at 45 degrees.

Paint the waxed side of the mylar with your chosen colour scheme. Remember that this is what you will see on the finished product, so if you are putting a name on then it must be applied first and in reverse and the base colour is applied last. Set these painted sheets aside to dry before proceeding with the next step.



Do all your cutting on newspaper as it helps in the handling of the cut pieces and keeps the cloth in the correct shape. Especially the 45 degree one. Cut the bottom 86-gram cloth first, the 45 degree one. Roll the cloth out over a newspaper and place the painted mylar sheet face down onto the cloth.



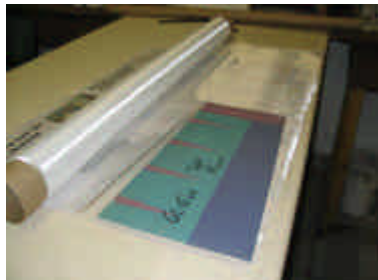
Using a straight edge over the mylar cut the cloth. Use a roller cutter as it prevents any pulling of the cloth



Cut all the 45-degree skins first and set them aside with the paper underneath, the cloth in the middle and the mylar on top.



Now roll out the 49-gram cloth over newspaper and place the mylar sheet, face down on top at 90 degrees



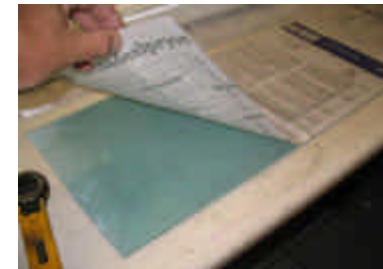
Cut the second skins out



Flip the whole thing over so the paper is now on top



Now, carefully remove the paper without disturbing the fibreglass cloth.



Now take the first skin, with the cloth at 45 degrees and turn it over with the paper holding it in shape and carefully place it on top of the cloth at 90 degrees, lying on the mylar sheet.



Line the two sheets of fibreglass cloth up as best you can.

Part 2 in the July is-
Or look on the web page

Step by Step Wing Bagging

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Part 2

Preparing pre-cured T-spars



Cut a strip of Mylar about 100mm wide and a little longer than your longest wing panel. Apply release agent as per above and then place a piece of off-cut fibreglass cloth onto in. Wet this out with resin and squeegee out the excess.



Apply strips of carbon tows onto the wet cloth, spacing them about 2mm apart



Pour resin onto these strips and squeegee it into the carbon tows



Squeegee the resin into the carbon tows so that they spread out enough to touch each other and set them aside to cure properly



When the resin has cured, remove the mylar sheet and using a sharp blade to cut the T spars into individual strips of about 6 mm wide.



Finally, remove the release agent from the back with some thinners

Preparing the cores



Make a "spar cap groove sanding block" from MDF board with a 20mm wide strip of 100grit sandpaper glued in the middle of it. Mine is 150mm long x 50mm wide. Round off the ends of the wood so that it does not dig into the foam as you sand.



Sand a groove onto the wings "high point" by running the sanding block along a straight edge held onto the cores.



The 100grit sandpaper makes a groove just the right depth for the carbon tows to fit into without protruding above the groove.

Laying-up the carbon spars



The first job is to prepare the cores for the skins, because they need to be applied while the spars are still wet. So sand the carbon LE to remove any roughness. Then lightly sand the entire core to remove any fine hairs left by the cutting wire. Be especially careful at the TE where the foam is very thin.



Mark out in the groove where you want to put the T spar. I don't put my spars above one another, but rather stagger them, so put the top spar 8mm from the front of the groove and the bottom spar 8mm from the back of the groove.

Use a sharp blade held against a straight edge and cut into the foam about 6mm deep.

Then use the back of an old blade to widen the cut so the T-spar can be inserted easily.



Mix about 20ml of resin. Don't mix too much at a time, as it will start curing in the pot before you are finished. You can always mix more if you need. Use your fingers to liberally coat the pre-cured T-spar.



the T spar into the slot and push in until it is flush with the foam.



Smear some resin into the groove.



Lay 4 carbon tows next to each other into the groove. For the tips I taper the groove from 20mm to 10mm and lay the two outer tows first and stagger the others to fill the groove.

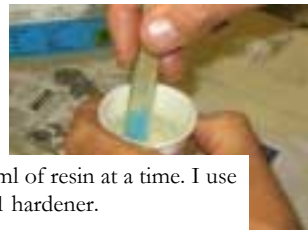


Pour a little resin onto the tows and squeegee the resin into the carbon. Make sure the carbon completely fills the groove and that they are properly wetted out. Do all the spars the same way and set aside.

Wetting-out the wing skins



Measure out about 30ml of resin at a time. I use LR20 resin with LH281 hardener.



Pour some resin on the fibreglass cloth. Some experience will help you gauge how much to use but start with a squiggly line of resin poured along the middle of the cloth and add more later as you need.



Squeegee the resin into the fibreglass cloth, starting from the middle and working outwards towards the edges. Working on newspaper helps soak up the excess that you squeegee off. It is important that you do not use too much resin. Squeegee as much resin away as you can so that the cloth is wet and you can see the weave. Do not leave pools of resin. A good quality squeegee helps but an old credit card works just as well.



It is now a simple matter of placing the wetted out skin onto the core and lining it up. I place the skin about 3mm onto the carbon LE and flush with the ends. The skin should protrude about 15mm to 20mm past the TE.



Rub it down so it sticks to the spar. Do all the skins and place them onto the cores, top and bottom and set them aside ready for the bagging process.

Part three of Evan's guide to wing bagging will be in the September 2004 issue of SAMAA News

Step by Step Wing Bagging

By Evan Shaw
Part 3

Bagging



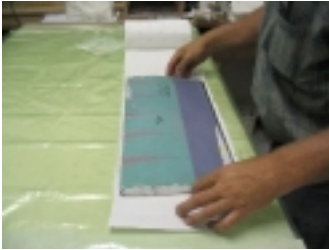
My vacuum pump is an old air conditioner compressor and has one of those vacuum regulators from a cars advance and retard thingy for the distributor with a normally open switch connected to that. The whole lot sits on top of an old compressor vessel, which gives me a reservoir of vacuum so that the bag is emptied quickly at the start of the bagging process.



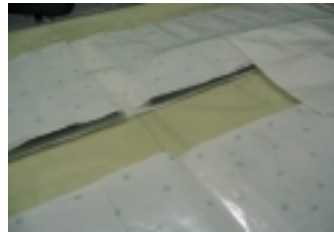
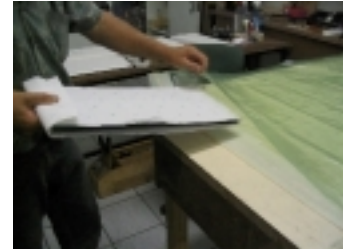
The vacuum bag should be big enough to accommodate the whole wing and is sealed on the ends with ordinary "press stick". The suction pipe must be protected from closing under pressure. I use one of those aerating stones for fish tanks and wrap it in paper towel



Open one end of the bag and place a strip of mylar over the "press stick" so it does not re-stick while you are trying to insert the skins



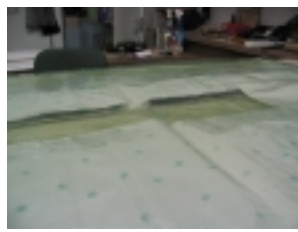
Roll out some paper towel and place the wing onto it and then fold the paper towel back over the top.



Carefully pick up the wing and paper towel sandwich and place it into the bag. Place all the wing sections into the bag and make sure that the end of the suction pipe is covered with paper towel and that that is in contact with the paper towel over the wings



Once all the wing sections are in the bag, remove the mylar strip and re-seal the bag.



Start your vacuum and wait until the vacuum is achieved. Stop the pump as soon as you get vacuum.



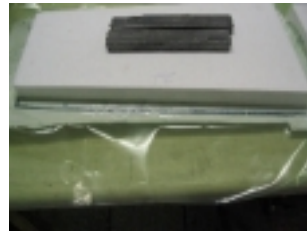
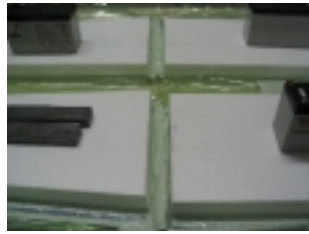
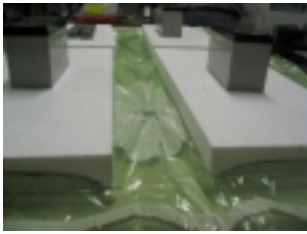
Now place the bottom outer core under the bag and align the wings into them.



Now place the top outer cores over the wing and align with the wings in the bag.



Re-start your vacuum and check to see you are getting enough vacuum at the end of the bag furthest from the suction pipe. You should just be able to pull the bag away from the foam. Too much vacuum and you risk squashing the wings. To little and the skins will not adhere to the foam properly.

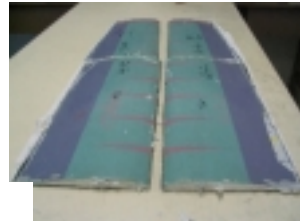


Place weights on top, make sure everything is well aligned and leave to cure overnight.

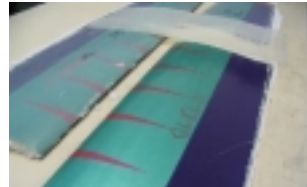
Final finishing



24hours later, remove the wings from the bag.



Start by removing the paper towel.

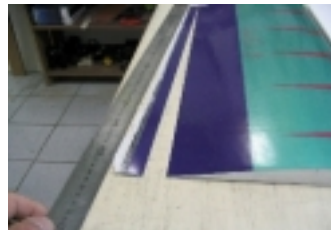
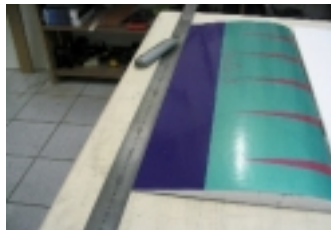


Gently ease the mylar away from the skin by starting in one corner and slowly working all the mylar loose from the entire skin

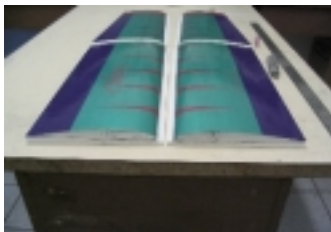


Place the wings into the bottom outer cores and line up the LE. Then make where the TE should be.

If your waxing was properly done you should have no problems.



Lay the wing onto you work table and cut the TE off using a sharp blade against steel straight edge.



The final job is to clean up the ends of the wings where bits of paper towel are suck. When that is done, sand back to the foam, remembering to keep the dihedral angles correct.

Final assembly



And here is the proud owner with her new wing



Glue the panels together with epoxy, jiggging the ends up at the correct dihedral angles and let the glue set. Then wrap the joints with a 30mm wide strip of fibreglass cloth and stick down with resin after you have sanded away the release agent next to the joints. Dust the wet resin with some micro balloons and let dry. Now all that is left to do is some final painting and touch ups *et voila* you have a wing.