How to Sheet a Foam Wing

By Bob Hunt

The Molded Leading Edge Cap

One of the most overlooked aspects of stunt model construction is the accuracy of the leading edge radius. If the top and bottom radii of each of the leading edges is not absolutely perfect, the result will be a model which will have trim issues to one degree or another.

Bill Werwage had a few models that should have flown well, but didn’t. He studied the models in detail and concluded that the common denominator in the ones that didn’t fly well was inconsistent leading edge profiles. In several cases he stripped the leading edges from the models and glued on new ones and then carefully shaped them to insure complete accuracy and instantly the models flew much better! This is what led us to develop molded leading edges for our Lost-Foam built-up wings.

Molding leading edge shells around a mold buck - that is accurately cut with a hot wire - yields absolutely repeatable results that insure perfectly shaped pieces. If these pieces are in turn accurately attached to the wing frames, the result is a perfectly shaped leading edge.

This has been working just fine on the built-up wings for quite a while now. It seems that adapting this technology to foam core wings has been somewhat of an issue, however. The truth is that it is extremely easy to use this procedure on a foam core wing as well.

The key again to accuracy is the ability to hot wire cut a perfect radius on the leading edge of the foam core and then attach a molded cap, which is formed over an accurately cut L.E. mold buck.

I’ve worked up a photo essay that will (hopefully) explain the procedure:

Photo No. 1 shows the 1/16 inch thick balsa LE cap already formed around the foam mold buck. There are a number of things to talk about here: The first step is to make/obtain the foam LE mold buck. You can either make your own if you have the required equipment, or order one from one of the foam wing cutting services.

Note that the rear edge of the LE mold buck is reinforced with a piece of plywood. This stiffens the mold buck so that it will not “bow” during the wrapping process, insuring a straight, accurate molded piece. The balsa is wrapped onto the mold buck in exactly the same manner as you would use to
mold a balsa LE shell for a built-up wing (This entire process is described and shown in detail in Robin’s View Productions’ Lost-Foam Wing Building System DVD set).

Before the LE cap sheeting is wetted and molded, it must be edge trimmed. I do this with a straightedge and a #11 blade knife. After the edge is trimmed with the knife, I sand the edge perfectly square. I use a 24 inch long Permagrit sanding bar for this operation. The Permagrit sanding bar is made from an aluminum extrusion that can be set on its side to allow the balsa sheet to be slid against it and achieve a 90 degree sanded edge (This process is also detailed in the Lost-Foam DVD set).

Photo 1:

I prefer to make my foam core leading edge caps from a piece of 3-inch wide balsa. Trimmed and sanded this piece will be just shy of 3 inches wide ready to mold. After the balsa cap is trimmed and sanded, a centerline should be drawn down the entire length of the piece on the side that will ultimately seat against the wing core. Do this using a ball point pen. Thoroughly wet the balsa blanks in a bath of hot water and then position the blank on the LE mold buck. Align the centerline on the blank with the centerlines on the ends of the mold buck at either end, and hold the blank in place by inserting a straight pin through the blank and into the mold buck. Now wrap the blank down around the mold buck fairly tightly using an elastic Ace bandage. Tape off the end of the wrap and let the molded LE cap
dry thoroughly (Usually 24 hours at least!)

Photo #2

When dry, unwrap the Ace bandage and the results should look like Photo #3. Note be sure to carefully remove the pins that were installed to hold the molded cap onto the mold buck to prevent marring the surface of the molded cap.

Photo 3:
Now it’s time to prepare to install the molded LE caps onto the foam cores. Photo #4 shows all the materials necessary to begin this process. The foam core should be thoroughly cleaned with a vacuum cleaner to remove any foam dust from sanding. The glue will not stick effectively to a dusty surface! You will need a good laminating resin. I use and highly recommend Z-Poxy’s Finishing Resin for this process. It has adequate working time (pot life), is easy to apply and it cures up fairly quickly. It also cures very hard, insuring added strength. Some epoxy resins never get completely hard, and I’m quite certain they do not yield as strong a bond as the Z-Poxy material. You will also need a masking tape dispenser and an acid brush.
Mix up about a half ounce of Z-Poxy Finishing Resin in a cup and then begin brushing it onto the inside face of one of the molded LE caps as shown in Photo #5. Only a very thin application of the resin is required. Too much resin will only add unnecessary weight! Be sure that all the balsa surface that will contact the core is coated before proceeding.
Position the molded balsa LE cap onto the leading edge of the corresponding core and align the centerline on the cap to the centerlines on either end of the core. Pin the blank to the core accurately as shown in

Next, tape the molded LE cap to the surface of the core in several places along the span as shown in Photo #7.
The next step is critical. The core must be positioned in the cradles (pieces of foam from which the core was cut) accurately, and in such a manner that the core is supported equidistant from the surface of the core. This requires placing a piece of balsa in the aft end of the cradle that is the same thickness as the balsa you used for the molded LE cap. See Photo #8.

Position the core in the lower cradle and then place another piece of balsa on
top of the core, as shown in Photo #9, to support the top cradle equidistant from the surface of the core.

Double check to insure that the core and the two cradles are in perfect alignment, and then weight down the leading edge as shown in Photo 10. It is imperative that the bench on which this assembly is placed is absolutely flat. Note that we are weighting it down against a piece of ¾ inch thick granite. I highly recommend investing in a piece of this material.
Photo #11 shows the leading edge cap securely and accurately glued to the core. Repeat this process to attach the other LE cap to the other core.

Photo #11:

At this point all that’s required is to make up top and bottom skins and graft
them to the edges of the LE cap during the sheeting process. I’ll work up another how-to that shows all of that in detail. There are a few neat tips that I can pass along on laying out the skins and joining them.

Again, this method produces absolutely accurate leading edges and in turn better flying models!

Those of you who have your own foam cutting equipment can try the procedure described right away. Those of you who do not have the required equipment can obtain cores that are precision cut with the round nose leading edge and the LE Cap Mold Bucks from Robin’s View Productions. We also offer cores with the molded leading edges already installed for you and even fully sheeted and sanded wings with or without landing gear systems installed. In fact we offer a full range of foam cutting and wing building services that are far too extensive to list here. Please email or call for details and pricing. My phone number is: 610-746-0106 and my email address is: robinhunt@rcn.com.

Please note that all of the photos may not be able to be posted along with the text in one posting. I’ll post it in two or three separate pieces if necessary.

I hope you have found this interesting and informative.
Sheeting the Wing

As promised, here is the next installment on the foam wing processes that I use. I left off in my last thread with the molded leading edge caps accurately attached to the foam core. The next step is to trim and edge sand the sheeting that will be joined up into skins and eventually grafted to the rear edge of the balsa L.E. caps. So… here we go.

Balsa edge trimming and sanding:

The balsa sheets that you have chosen for your skins need to have both edges trued perfectly. I start this procedure by trimming the edges with a straightedge and a sharp #11 blade knife (See Photo #1).

Most balsa stock is cut from raw blocks that have not had their edges trued, and so it is not uncommon to have to trim off as much as 1/8 inch on either side to make the edges of each sheet straight and true. After the trimming process is complete I edge sand each balsa sheet using a 24 inch long Permagrit sanding bar that is laid on its side. The Permagrit sanding bars are made from extruded aluminum and the sides are perfectly perpendicular to the sanding surfaces. There are two different grits on each Permagrit sanding bar. For this operation I use the side that has the finer grit of the two. I position the Permagrit sanding bar at the edge of a piece of 5/8 to ¾-inch thick particle board and then lay a balsa sheet in against it. I use a Great Planes extruded aluminum sanding bar fitted with #80 grit sandpaper as a gripping tool, and that allows me to slide the balsa sheet fore and aft against the Permagrit sanding bar and true the edge (See photos 2 and 3).
Skin layout:

Once all the balsa sheets have been trimmed and sanded, it is time to layout the skins. I like to lay the sheeting out to size right on the core surface to which it will eventually be attached. I lay one piece of trimmed and sanded balsa up against the rear edge of the installed balsa L.E. cap piece and tape it in two or three places to hold it secure (See photo #4).

Next I trim the ends about a ¼ inch past each end of the foam core (See
Lay the next piece of balsa skin stock against the first and tape as before to hold it in place, and again trim each end ¼ inch past the end of the core (See photo 6).
Lay in the third piece of balsa against the back edge of the second sheet and again repeat the end trimming process. Note that there may be a small triangular shaped section of core that is not yet covered with balsa (See photo 7).

Now turn the core over, being careful to not let the taped up balsa skin “flop,” and trim the rear edge of the rear-most piece of balsa so that there is 1/8 to 3/16-inch of balsa sticking out past the trailing edge (See photo #8).
Place the core top side up in its cradle and tape a section of the piece that you just trimmed off of the trailing edge onto the rear of the third piece of balsa. Turn the assembly over once more and trim this piece to achieve complete but unglued skin (See photos #9, 10 & 11).
Tape up and trim all of the remaining skins for the two core halves in the same manner.

Skin joining:

Now it’s time to join the balsa sheets into a skin that is ready to be attached to the core. Remove the pieces of tape that is holding the unglued skin to the L.E. Cap piece (See photo 12).

For the joining process you will need the following: The taped together skins, a masking tape dispenser, some building weights, a 2-ounce bottle of medium cure CA glue, some waxed paper and a flat and clean building board (Se photo 13).
The building weights that I use are scrap pieces of cold rolled steel that I made up while working in my father’s machine shop many years ago. Many have commented on them and have asked how to find such weights. You can try looking in the phone book for a local machine shop and ask them if they would make up a set of similar weights in various sizes. Failing that, try purchasing some small concrete bricks from a home improvement store; they will work just as well for this application. If you do opt for the concrete bricks, try cleaning one side thoroughly and then glue some #80 grit sandpaper to it. The sandpaper is clean and it will grip the balsa better!

Remove the tape from one skin assembly and lay the pieces onto a piece of waxed paper in their proper orientation. (See photo #14).
Now position weights back about 3/32-inch from the edge of the second balsa skin piece (See photo #15).

Next run a bead of the medium cure CA glue along the front edge of the
second balsa skin piece, being careful to not let any glue get on the upper surface of the balsa (See photo #16).

I find that a piece of Teflon tubing fit into the end of the CA glue bottle makes this an easy task. Next lay the first piece of balsa in against the second piece, edge to edge, and then rotate the weights across the seam between the two pieces being glued. Quickly stretch several pieces of masking tape across the joint to pull the two pieces tightly together (See photo #17).
Now repeat this procedure to glue the remaining pieces of balsa together (See photos 18, 19 & 20).
Let the CA glue cure thoroughly (usually about 5 minutes) and then remove the weights and peal the completed skin from atop the waxed paper (See photo #21).
Foam wing sheeting:

I recommend that you sand the outer surface of each glued skin assembly to remove any slight high or low spots at the seams (See photo #22).

I prefer to use an aluminum sanding block, fitted with #220 (or finer) grit.
sandpaper, for this operation. If you did the gluing properly, there will not be any excess glue on the outer surface of the skins, and only a few swipes with the block will be required. Don’t remove too much material, as you will be doing a finish sanding after the skins are glued onto the core.

Before gluing the skins to the wing core it is suggested that you seal the skin’s surface that will actually contact the core. I recommend sealing the wood grain with a thin application of an inexpensive, unscented hair spray (such as Suave or Aqua Net brands) (See photo #23).

Hair spray is actually a type of lacquer and it is much lighter than the epoxy with which we will eventually attach the skins to the core. The hair spray will soak into the grain and when it dries it will form a barrier that will prevent the epoxy finishing resin from soaking too deeply into the wood. Don’t worry; there will still be plenty of grain for the epoxy to grab into to insure a permanent bond between the balsa skins and the foam core!

Hold the can of hair spray about 8 to 10 inches from the inner surface of the balsa skin and apply a light to moderate coat (See photo #24).
Let the hair spray dry for at least 20 minutes before proceeding. For the next step you will need the following items: A box of fresh Z-Poxy Finishing Resin, some old newspaper, a mixing cup, a mixing stick (a Popsicle stick is good) and an epoxy spreader that is made from a piece of 1/32 inch thick birch plywood (See photo #25).
This spreader should be about 3 inches long and all the edges should be rounded with sandpaper to prevent it from digging in during use and marring the balsa skin. Use a three-corner needle file to make several small grooves in the edge of the spreader tool. These grooves should be spaced about ¼ to 5/16-inch apart and be no deeper than 1/64-inch. If you make the grooves too deep, too much epoxy will be left on the skin after the spreading process. You will need to mix up enough finishing resin to ensure that you can cover two skins with a bit to spare. It’s better to mix up a bit too much than to mix up too little! Only experimentation will tell you how much to mix in the future. Place a lower balsa skin for one of the core halves, inner face up, onto a piece of newspaper and then pour a moderate stream of resin lengthwise down the center of the skin (See photo #26).
Use the plywood spreader tool to move the epoxy resin around and try to get all of the skin coated (See photo #27).

After the resin is evenly spread around the skin, place the spreader at the
trailing edge at the tip end of the skin and pull it forward until it runs off the leading edge of the skin. Repeat this process and move down the skin towards the root end. Tiny “rivulets” of resin will be left on the skin (See photos #28 & 29).
Note: Once the skin is fully prepared with the resin as described above, use an acid brush to apply a small amount of resin to the forward edge of the skin where it will butt up against the molded balsa L.E. Cap piece (See photo #30).

For extra strength, use the acid brush to apply a very light coat of resin to the spar area and also along the length of the balsa trailing edge piece (if you have chosen to install one…). See photo #31.
Carefully place the resin coated lower balsa skin onto the corresponding core section, (See photo # 32)

which should be setting on an absolutely flat table in its upper cradle half (I
like a piece of ¾ inch thick ground granite for this). Once in place, stretch a few pieces of masking tape across the seam between the skin and the LE. Cap (See photo #33).

![Image of the flat board with tapes]

The idea here is to draw the seam as tight as possible. Now place the lower cradle half onto the flat table and repeat the gluing process on the inside face of the corresponding top balsa skin piece. Place the top cradle piece in place atop the core and carefully align the sandwich of lower cradle, core with skins attached and upper cradle. Place a flat board atop this sandwich and weight it down with 150 to 200 pounds of weight (See photo #34).
Double check everything for accuracy once the weight is in place. Cut the nose off of several spring-type clothes pins. The nose should be flat when you are done. This will allow the pins to be used as clamps. You will also need several Popsicle sticks (See photo #35).

Place a Popsicle stick on top of the trailing edge piece that will be sticking out in the back of the weighted sandwich. Hold another Popsicle stick below the trailing edge and in line with the upper Popsicle stick. Clamp these tightly against the skin that is on the trailing edge piece (See photo #36).
Now repeat this process all along the trailing edge (See photo #37).

This process will insure that the top and bottom skins are tightly glued to the trailing edge piece along its entire length.
Let the sandwich of parts cure overnight! See photo #38.
Repeat this entire process to glue the skins to the other core half. In the next installment we’ll discuss in detail how to trim and sand the ends of the skins to match the core, and how to final sand the wing halves.

Hope this has been useful. I’d like to thank Bob Kruger who took the time to help me post this long piece to the forum. Without his assistance I’d never have gotten it online!

Yours for better modeling

Bob Hunt