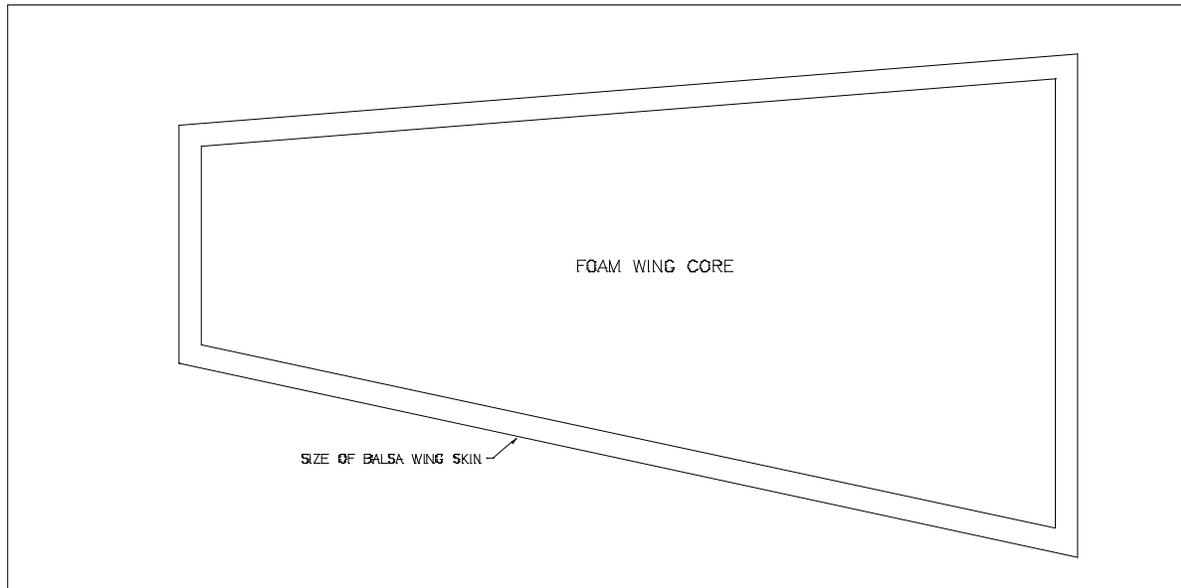


Balsa Wing Skins the Right Way

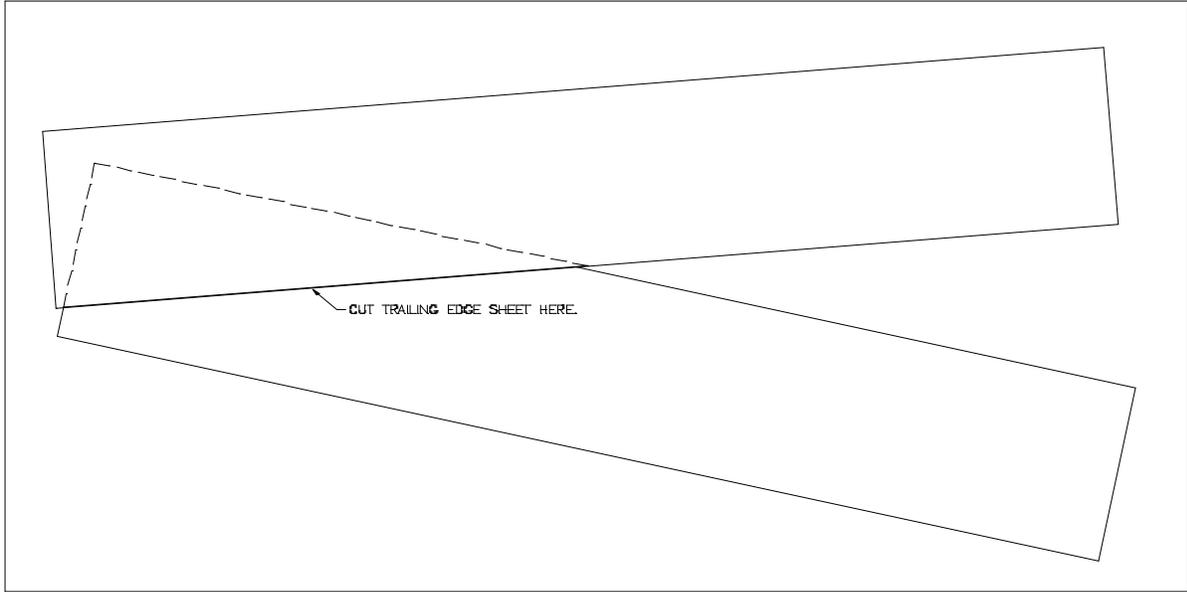
Jim Ryan

Gluing up balsa wing skins for sheeted foam or traditional built-up wings is a common task for the kit or scratch builder, but most builders go about it the wrong way. Generally, builders just true the edges of the balsa sheets, tape them together and glue, but this isn't ideal for tapered wings. The ideal is to have the wood grain parallel to the leading and trailing edges. But how to do both on a tapered wing? Here's how.

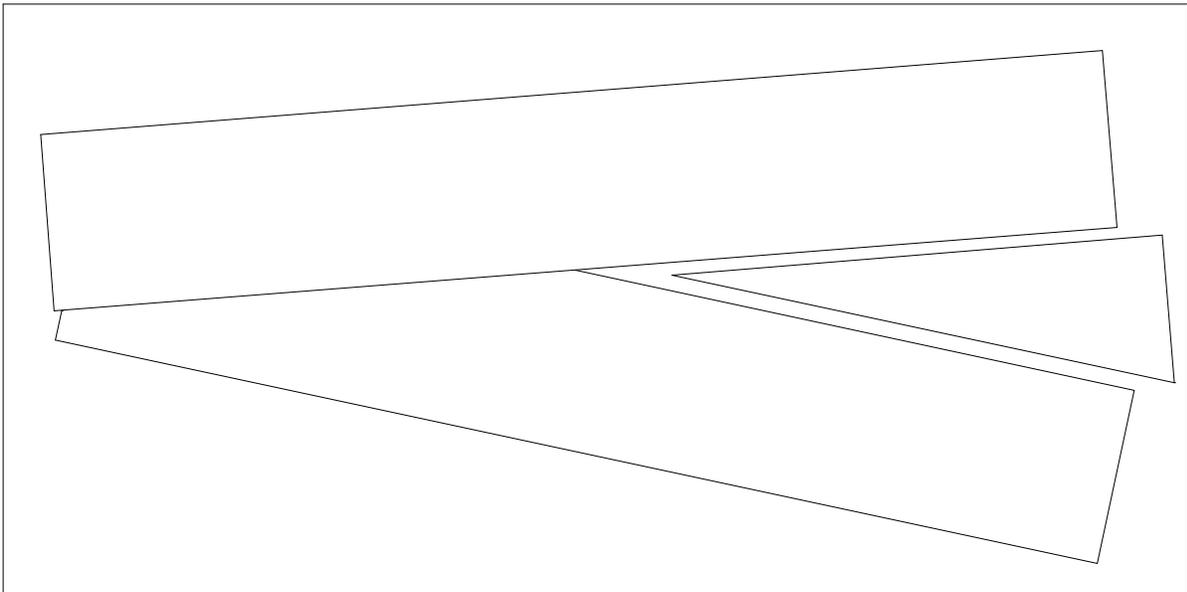
In this example we're using a small 30" span wing, but the same methodology can be used on larger wings by substituting wider sheet stock or pre-gluing front and rear sections and then proceeding as shown here.



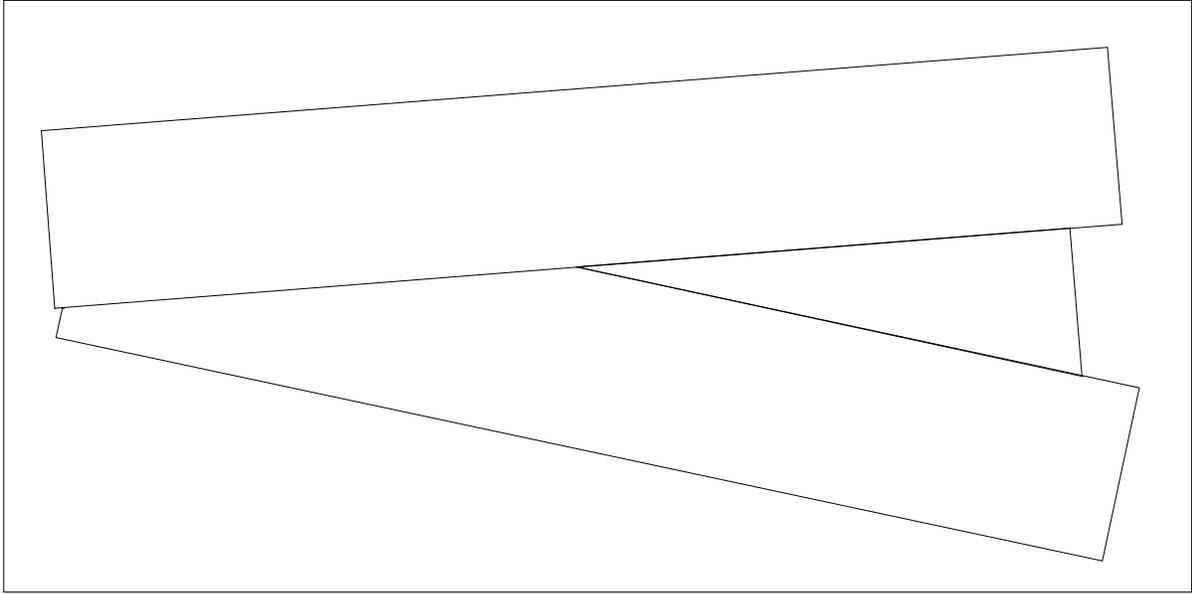
Step 1: Determine the size of your wing skins. For foam core wings, I like to allow 3/8 to 1/2" around the perimeter to allow for trimming later.



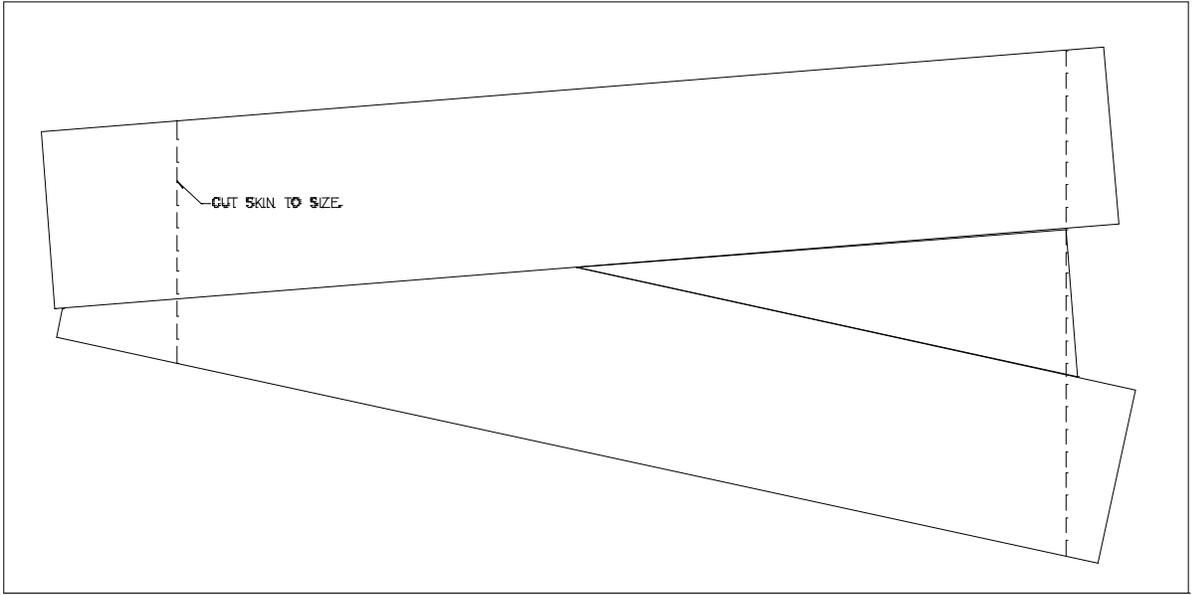
Step 2: Overlap the leading edge skin over the trailing edge so they align with your planned rough dimensions. Using a steel ruler and a sharp X-Acto blade, cut the trailing edge to mate with the leading edge.



Step 3: Flip the remnant from the trailing edge and fit it into the space between the leading and trailing edges.



Step 4: Press the sheets tightly together and tape them together with masking tape. Carefully apply thin CA to all seams. Once the glue has cured, remove the tape and block sand both sides of the skins.



Step 5: Trim skins to rough size and proceed with sheeting the wings.

SHEETING FOAM WINGS

Jim Ryan

Introduction: Balsa-sheeted foam wings are an excellent option for model aircraft, but some builders are unfamiliar with the particular techniques for sheeting foam cores. Following is a description of the technique I've used and refined over that last 30 years. For demonstration purposes, I'll describe sheeting a wing for a small electric model, so we won't address details like spars, landing gear mounts etc. that might be needed on larger models.

1. Here are the materials needed: I generally use thin balsa for the skins, 1/32 for models under 30 ounces, and 1/16 for larger planes. You'll need some specialized adhesives: 1) Thin regular CA for gluing up the skins. 2) Thick odorless CA for attaching the leading edges and tips to the foam cores. 3) Thin odorless CA for applying the glass tape to the dihedral joint. 4) Gorilla Glue or ProBond urethane for bonding the skins to the cores.

Note: Regular CA will attack polystyrene foam. Do not use it on any exposed foam surface or for parts that will penetrate the balsa skins, like hinging the ailerons.

2. Trimming and taping the skins: The first step in sheeting foam wings with balsa is to assemble the skins. Use a long straightedge and trim the edges off all the sheets. Next, lay the sheets edge to edge on a clean, flat surface, and after making sure the joints are tight the length of the sheets, tape them edge to edge with masking tape.

Note: For tapered wings, refer to my article on assembling wing skins on this same website.

3. Gluing the skins: After all the sheets have been taped together, flip the skin over on a sheet of waxed paper and run a light bead of thin CA down each seam, rapidly wiping with a paper towel to remove any excess and rubbing until the CA kicks. Repeat this process for each glue joint until the skin is complete. Check to be sure that each seam is fully glued from end to end.

4. Sanding the skins: After the skins have dried, carefully peel off the tape. Carefully block sand the skins until they're perfectly smooth on both sides. Use a good flat sanding block for this purpose and 150 or 220 grit sandpaper. Be careful to sand the joints flush, but don't concentrate in any one place for too long. Rather, work back and forth across the skin uniformly, until it's smooth.

5. Prepping the Cores: Machine-cut cores require minimal surface preparation. This is doubly good, in that there's less chance of you altering the airfoil shape. The best technique is to use 220 paper on a sanding block (or better yet, a long sanding bar) and to take very light strokes in one direction only. This way, you don't rub the crumbs into the surface. You only want to remove the "angel hair" from the core. Once you accomplish that, *stop*. Vacuum the cores and the skins to remove all dust. Any dust that gets between the skins and the cores will interfere with adhesion.

6. Gluing the Skins: Years ago I switched to using Gorilla Glue urethane for sheeting my wings. It's light, forgiving and provides a long-lasting bond. I have models over 20 years old that still look like new, with no sign of delamination. The beauty of urethane glue is that it foams slightly while curing, filling any small gaps in your layup. For this reason, you don't need a massive amount of weight or a lamination press to get good results.

Lay out newspaper or butcher paper on your work surface and wear disposable gloves. Gloves are important if you don't want blackened fingertips for the next week. Arrange your prepped wing skins on the paper with their inner faces up. Dribble Gorilla Glue on each skin and then spread the glue evenly with an old credit card or plastic scraper. You want a uniform sheen of glue on each skin, but not too much.

Place a lower foam cradle for one wing on your bench and then lay the lower skin in the cradle glue-side-up. Take a wet sponge and wipe the foam core so that it's damp over its entire surface. This is important, as water is the catalyst that causes the glue to foam and cure. Lay the core on the lower skin and then wet its upper surface. Lay the upper skin on the core and add the upper cradle to the stack. Carefully check alignment so that the core is aligned with the cradles and balsa skins are extending evenly around the perimeter. Stack weights on top to press it all together. Allow the glue to cure at least 24 hours. The moisture on the cores will cause the glue to foam just slightly and then cure. The slow cure time is helpful, as the cradles and weight will result in a perfectly straight wing.

Once you gain experience, you can glue up both wings in one continuous stack, but for your first effort, I recommend doing them one at a time.

7. Installing Trim: Once both wings have been sheeted top and bottom, you're ready to go on to the next step. Trim and block-sand the skins flush with the leading edge, root and tip, and then use a straightedge to trim the trailing edge about 3/16" behind the core. Glue on the leading edge cap with thick odorless CA, and plane and sand it to the proper shape. Be very careful shaping the leading edge, as this has a large effect on flight performance. Install the wingtips with thick odorless CA and sand them to shape. You now have two light, straight and perfect wing panels, ready for joining. If you're installing ailerons, you can cut them free and face their edges with balsa.

9. Joining the Wings: The easiest and lightest way to join wing panels for small models is to block up each panel and block sand the root to the proper dihedral angle. Join the panels with thick CA or epoxy and block them up at the proper angle to cure. Then cover the dihedral joint with a strip of glass cloth and saturate it with thin odorless CA. After the CA has cured, block sand the fiberglass tape to feather it into the balsa.

Conclusion: Foam wings are easy to assemble, durable and extremely resistant to warping. Using this technique, you can have a smooth and true wing with just a couple of hours of total work.