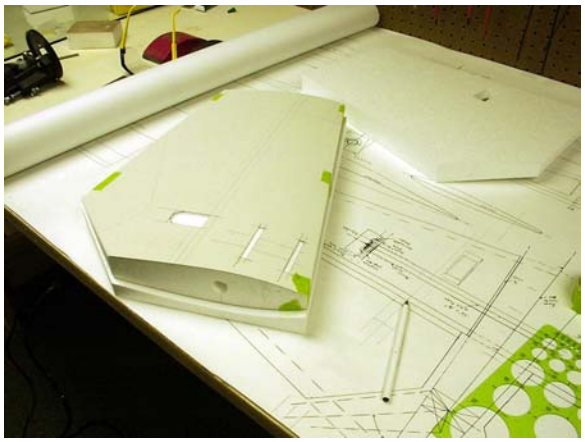
Prepare the Foam Cores

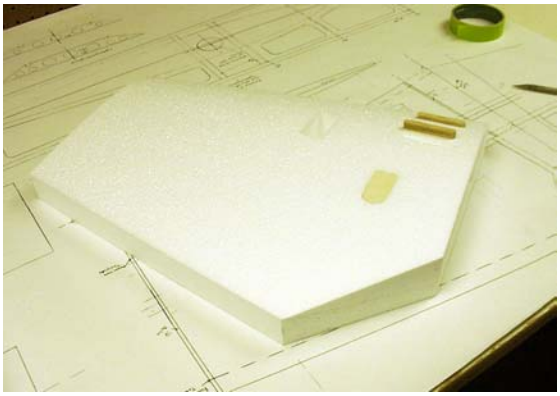
Before we discus the various sheeting methods, let's prepare the foam cores. You must first determine where a number of points will need attention such as servo bays, hard points for control horns, alignment dowels, etc. We like to make a template out of thin poster board so after the cores are sheeted we can align the template and know where we located all of the stuff that was buried in the foam under the sheeting. We'll know where the servo bays are, where the dowels go, and so on.

An easy approach to an accurate template is to slide poster board under the plan. Working on a building surface that allows pins to penetrate, place a pin at each corner of the part and at each corner of the objects that you want to locate. In our case, we wanted to bury dowel stress bearing plates for the control horn dowels and ¼ inch x 3/8 inch x 2 ¼ inch spruce servo rails. Remove the poster board from under the plan and connect the dots (holes that you made with the pins). Later we'll use the template for marking and cutting the hinge lines so be sure to add that to the template.



We used a Dremel tool with a router attachment to cut bays for the bearing stress plates and servo rails. The servo rails were sunk into the foam enough for the servo to fit nearly flush with the surface of the wing or stab. Be sure to account for the thickness of the skin when making your depth calculation.

Since our builder, Erik, will be vacuum-bagging his wings, he added some very soft balsa to the rails to temporarily bring them flush with the foam. This way the sheeting will stay consistent under the pressure from the vacuum-bagging. Later, when the servo bays are cut out, he will cut away the balsa so that the servos can sit further down into the bay and stay flush with the wing's surface.



The control horn stress-bearing plates are there to tie the top and bottom stressed skins together and make for an even fulcrum for the horn to pivot around the hinge. A ½-inch dowel will pass through and adhere to both plates. A bolt will pass through the dowel and act as the control horn.

To me, this is just about the ultimate control horn configuration for foam surfaces. It's extremely strong and rigid, uses the entire thickness of the surface for mechanical advantage, and is serviceable in that the bolt does not need to be epoxied in place and can be removed and replaced at any time.

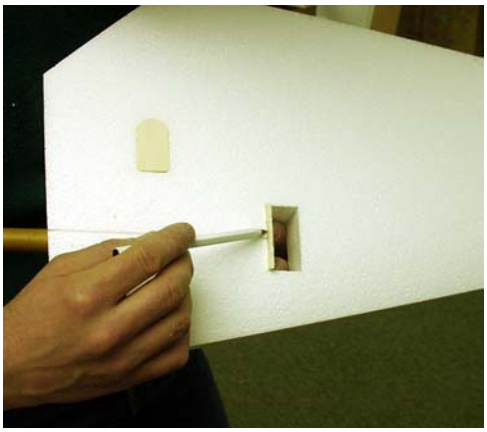
The stress plates are installed so that they protrude slightly into the cut area for the leading edge of the elevator or aileron. Later, when those surfaces are cut from the wing or stab, the stress plates will be cut too and then they are sure to glue flush against the leading edge material.

You'll note that the corners on everything that we install in the cores are rounded. The rounded edges have less tendency to produce a stressed point or a failure point.

Next, make the tube socket stress-bearing plate. In the foam core is an open bay where the stress plate holds the wing tube socket. This stress plate is very important. Without it the foam would start to crumble in just a few short flights.

We measured a piece of light ply to fit perfectly from side to side inside the bay but had excess hang out of the opening on both sides of the core. We used the tube socket end dipped in an inkpad to mark the location to make a hole in the stress plate for the socket. After the hole is marked and cut to fit perfectly around the socket, place it back into its location with the tube in place, and trace the outline of the wing core.

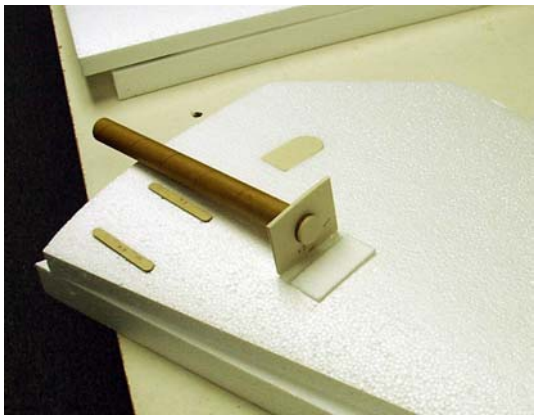
The idea is for this plate to glue the tube socket, the foam, and the wing skins all together so leave a slight oversize when cutting to fit so that you can sand it perfectly flush with the core and the sheeting will bond to it. We will also fill the bay with scrap foam and sand it flush so that the whole assembly is securely glued together.

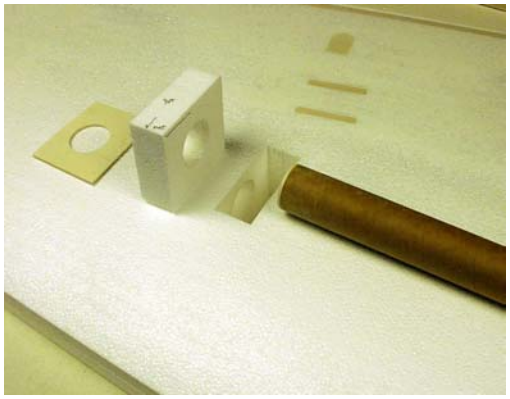


Now it's time to glue the dowel stress plates, the wing tube socket, the wing tube socket stress plate, and the servo rails into place before sheeting. In our foam cores, made by flyingfoam.com, the channels for the servo wires are already cut into the main wing foam. For the stabs we'll just use a ½-inch copper tube to cut a channel later on. Cap the end of the tube socket with 1/8-inch light ply and sand it flush. This will act as a tube stop. Without it the wing or stab tube could migrate into the foam and cut as it went.

We used epoxy to assemble everything. Other glues that are compatible with foam such as carpenter's glue or Probond polyurethane are fine too.

After the glue is set, sand the installed components flush to the core's surface. Make sure there is at least 3/8 inch of excess socket material extending from the root of the wing or stab. You can see that the stress plate bay has been filled with scrap foam, the servo rails and stress plates are in and flush, and that everything should glue nicely to the sheeting we are about to apply. The servo bays and holes for the control horn dowels will be cut after the sheeting is in place.

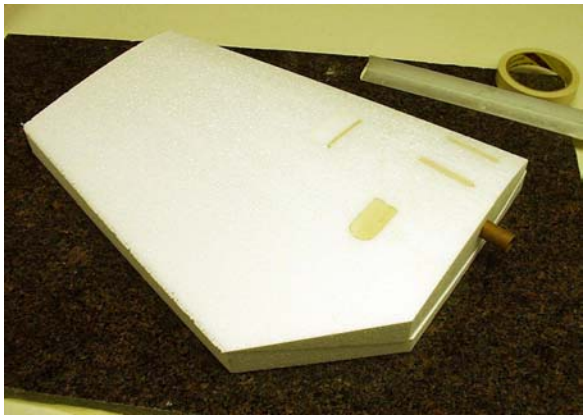


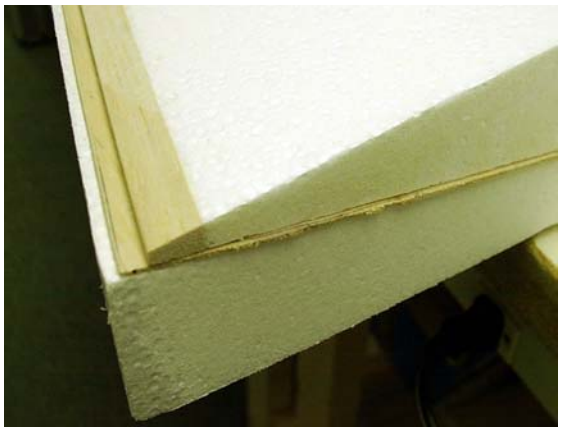


On our wings and rudder we decided to bury our trailing edges inside the sheeting. This method is structurally much stronger than butt-gluing the trailing edge (TE) to the wing after it is sheeted. One of the worst enemies of large control surfaces, especially long ailerons, is flex. A flexible surface is more prone to failure due to flutter. We are striving for very light, yet very rigid, surfaces and although it may be a bit more work to build the trailing edge into the wings the strength advantage is well worth the effort.

The idea is simple. Glue the TE to the bare foam and shape it to create an extension of the foam, and then sheet over the whole assembly. The wings on the Extra were not designed to have completely sharp TEs but the cores from flyingfoam.com are cut oversized and go to a point so that you can cut them to achieve your desired final result.

We cut exactly an inch off of the trailing edge of the wings and rudder and added a half-inch of balsa to create our TE, then sanded the balsa flush with the core. After the wings are sheeted, your trailing edges will already be done and all that will be needed will be a cursory sanding to true up the TE.





Now it's time to fit the wings and stabs to the fuse and sand them to get a flush fit. Since you can't cut off the phenolic tube at this point it may be a good idea to make a thick dummy root rib that will fit over the phenolic and fit tight against the fuse side. Adjust by sanding the foam wing or stab root until you get a nice tight fit.