

Making your Rudder Cassette

A list of the stuff you'll need

The row of materials below is laid out in the order of application. The foam blank shown on the right is available from Bob at www.Flyingfoam.com along with the foam tiller blank (and all other foam blanks used on the Swift). In the lay-up below, I used two pieces of 9 oz s-glass, however you can substitute 3 pieces of 6 oz. These are shown in the sequence they will be applied

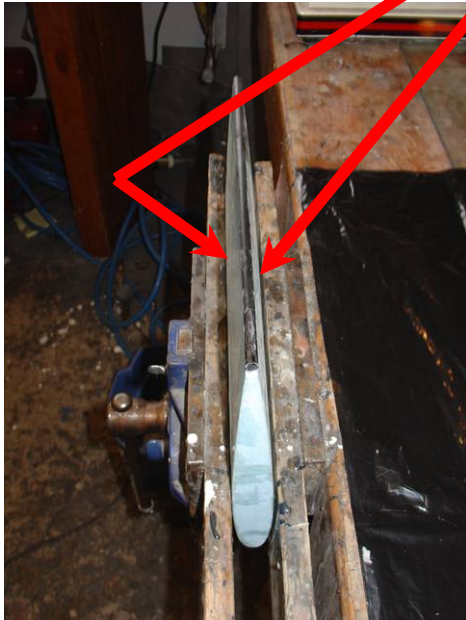


Mylar
Cotton cloth (diaper cloth)
Peelply
6 oz carbon 10 1/2 x 50"
S-glass 10 1/2 x 50"
S-glass
6 oz carbon
Peelply 11 1/2 x 30"
Cotton cloth 11 1/2 x 30"
Mylar 11 1/2 x 24
Double stick tape



In addition to the items listed on the previous page, you'll need the tiller foam blank, a ¼" diameter hollow kite batten, some masking tape, some 5 minute epoxy and the usual WEST System epoxy and epoxy application supplies.

Begin by cutting a 11 ¾" piece of batten and using 5 min epoxy to bond it to the trailing edge of the foam blank. Use some regular epoxy and filler to fill it smooth on each side



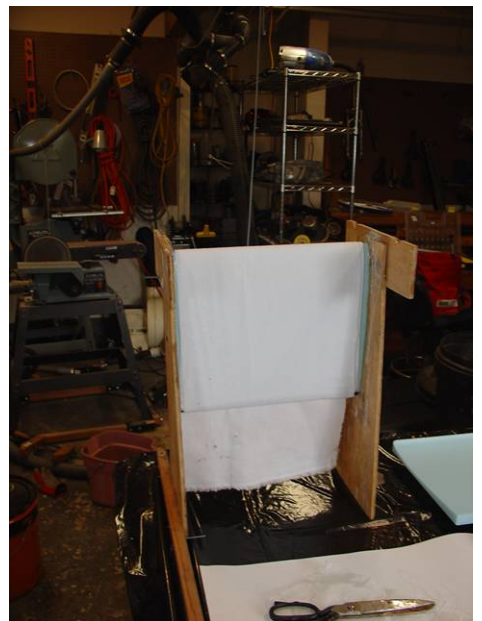
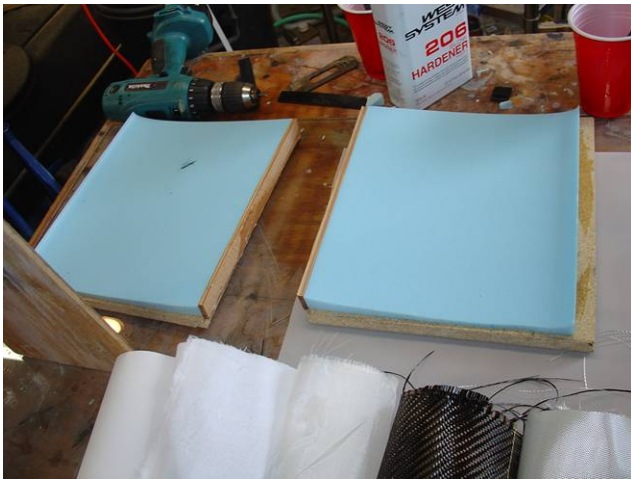
Using the stands used for making your rudder and centerboard, bond the blank (leading edge facing up) to the stands. Use 5 minute epoxy and some long wood screws to hold the foam in place

Wood screws



After cutting off 1" from each of the saddles (length) Use 5 minute epoxy to glue them to some plywood. Add a ½" wide wood strip to the trailing edge of each of the saddles flush with the foam surface. This will extend the saddle to cover the tubing and layup thickness that you've added to the foam blank.

Apply a piece of double stick tape near the batten on the side of the blank of both side as well as a piece near the top on one side. Begin by installing the mylar on the top piece of tape and wrap it around the blank (keeping it tight and smooth). Wrap everything else in the same direction. Use double stick on the cotton cloth and again on the peelply.



Laying it up



Use, 206 hardener because you'll need the time and foam blanks speed up the curing process by retaining the heat.

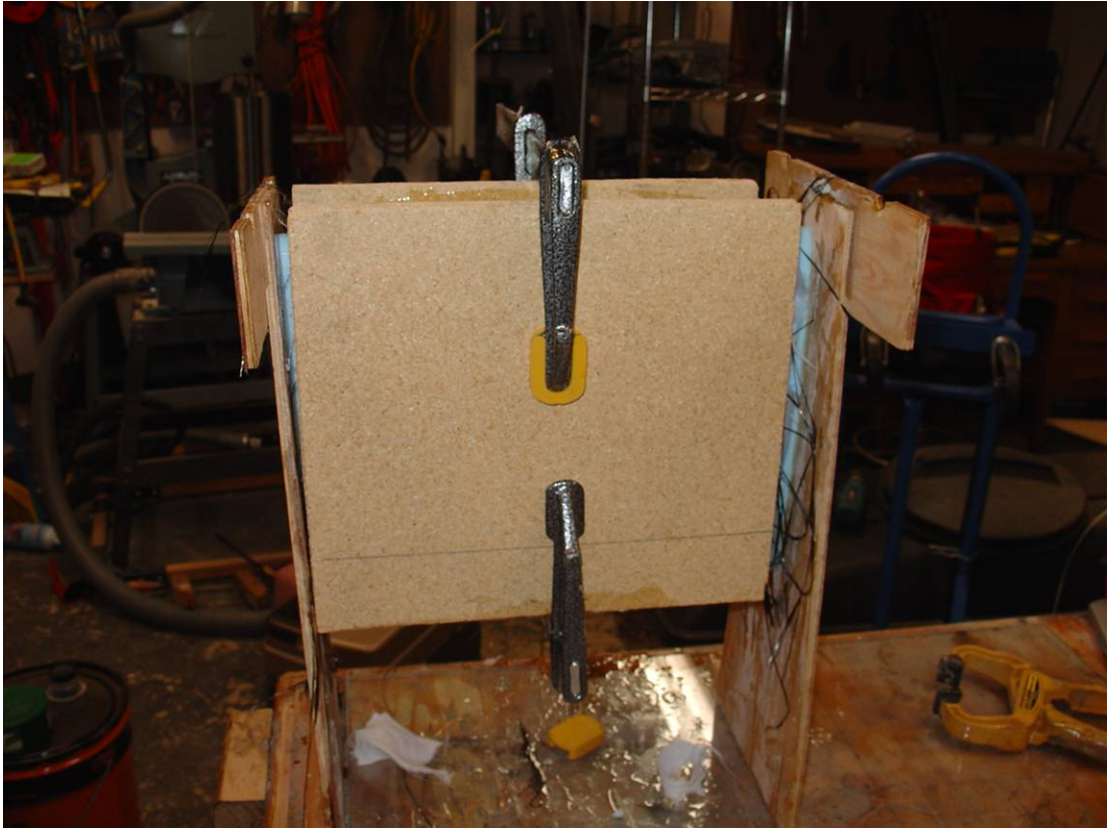
Wet out about 20" of the first piece of carbon and begin wrapping it around the blank.

Continue to wet it out and wrap it tight until you get to the end. Start the s-glass where the carbon ran out and continue wetting and wrapping until the last piece of carbon is complete.

Wrap the peel ply and the cotton cloth and the last piece of mylar before applying the foam saddles.



Clamp the saddles on the lay-up with only a small amount of pressure. Two clamps will do. The objective is to keep the lay-up against the foam blank. The material thickness is such that the saddle shape is slightly different than the outside of the cassette with the breather cloth and peel ply on it but it will still come out great as long as you don't get carried away with pressure.



Use a hand saw to cut the cassette body from the stands. Clean it up by cutting the cassette ends square and end up with about a 9" long cassette. Use a carbide blade in your saw. Peel the breather cloth and peel ply off the outside of the cassette body.

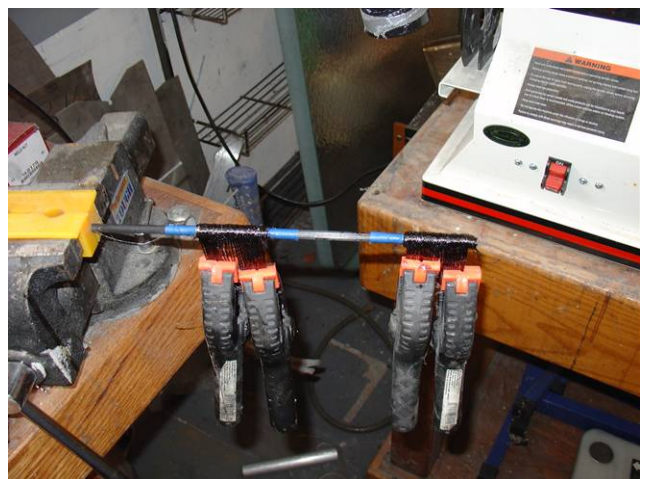


MAKING THE PINTLE HOLE GUIDES FOR THE CASSETTE

This piece will be used to make the bushings for the pintle and guide the drill during the boring process.

Clamp about a 18" piece of your 1/4" kite batten in a soft vice and tape it so that you have a 2" section on the end, a 4" section in the middle, and another 2" section the other end. Use double stick tape to tape a 12" piece of 2" wide carbon tape with the 4" space between them. Epoxy the wrap the tape. Use a couple of clamp for weight to keep the tape tight during curing of the epoxy

Double stick tape

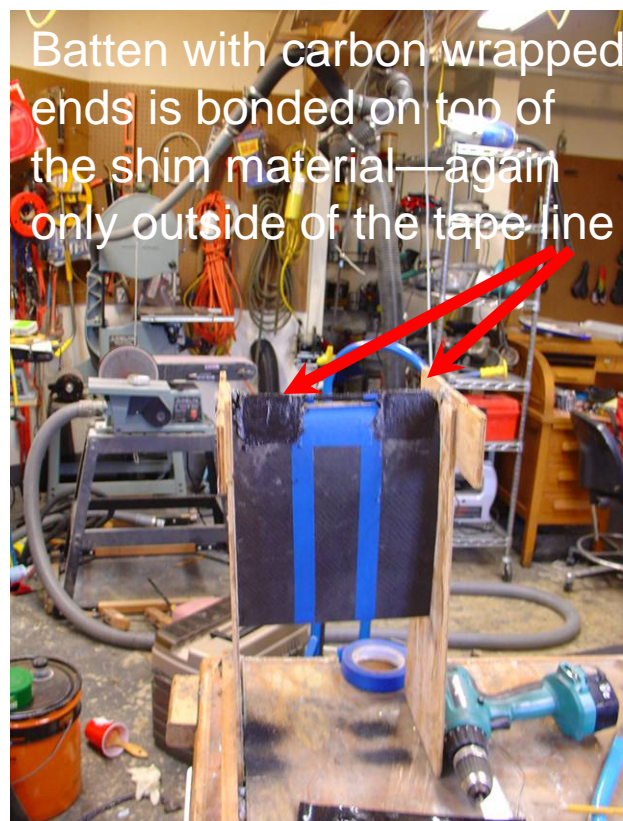


Clean up your plywood stands and glue the cassette back on to the stands. Put masking tape on the cassette body so that the outer edges are 4" apart (leave 2 1/2" on each end). Glue a 1/4" x 1/4" rib on the centerline of the leading edge. I have some s-glass and hybrid stock made up that is 1/4 inch thick that I use for this kind of application. Do not adhere the rib between the tapes

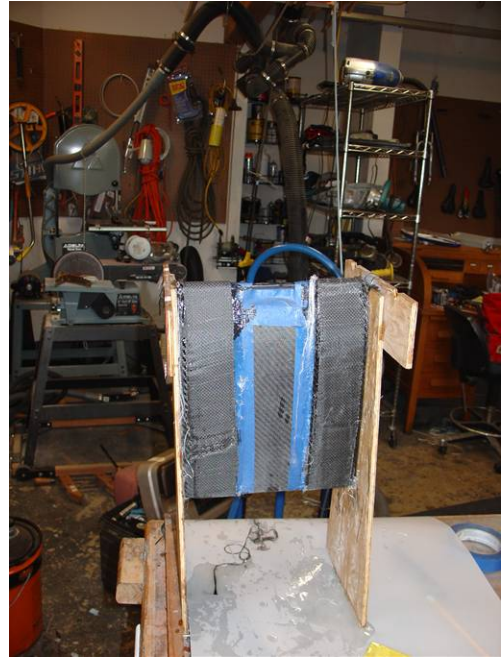
Cut you batten piece to 8" long and install it on top of the rib (after the epoxy has dried on both. Center the carbon bushings that you made with each bushing just outside of the tape.



Fillet and fair the carbon wrapped batten on both ends. This may take a couple of applications since you'll want to be sure the batten is centered and true with the cassette so your rudder will be vertical.



Wrapping the cassette body with carbon tape



Using carbon uni tape and woven tape, cut two 72" long pieces of each.

Begin by cleaning the body with acetone after more light sanding. Then wrap the uni tape first for two wraps before starting the woven tape. This way you'll end up with a good cosmetic woven tape on the outside finish. Use 206 hardener and finish with some peel ply strips about 3" wide and 50" long to wrap each tape bundle tightly.



Once cured, cut the batten at both tape edges.

Cleaning up the cassette body

Cut another $\frac{1}{4}$ off the top of the cassette (square with the leading edge). Measure down the leading edge 8" and make a mark. Cut the bottom of the cassette at a 5 degree angle (the aft edge of the cassette will be shorter than the leading edge).

Use a hole saw to drill two 2 $\frac{1}{2}$ " lightening holes. The aft hole should be near the bottom of the body and the forward hole near the top. These holes serve to lighten the unit and will be used later to pour in the Spartite for the gasket.



Use a screwdriver to remove the foam



Removing the peel ply / cloth and boring the pintle hole



Use a plane blade or knife (and a lot of cussing) to peel the cloth and peel ply from inside the body. You should never sand this inside surface because the peel ply leaves a good bonding surface for the Spartite fill that you'll use to make the rudder gasket.

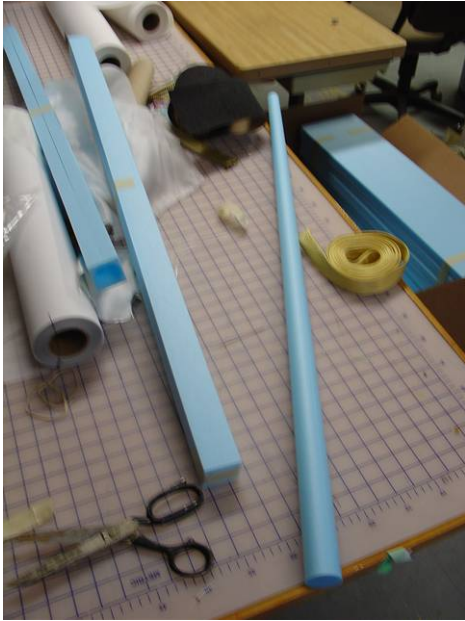
At this point, clean up the edges of the carbon tape with a bastard file and wet sand the body with 200 grit



Now is a great time to bore the pintle hole out to the correct size (5/16"). You'll need a 12" long bit for your drill press. The hollow carbon batten that you used provides the perfect pilot hole and will keep the bit centered.



Making the Tiller



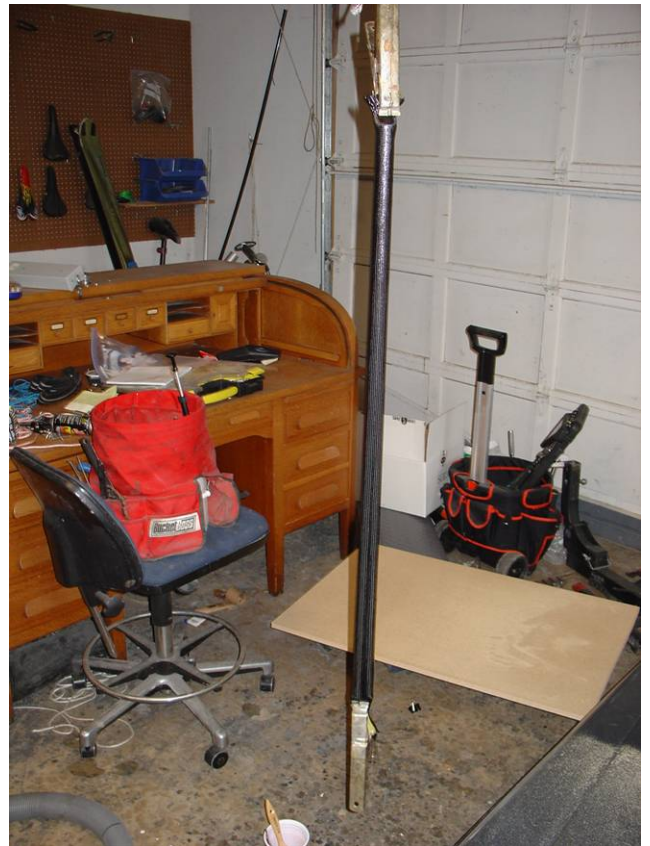
Above you see both Kevlar and carbon sleeve. Above left is the foam core for the tiller. Slide the sleeve over the foam core to measure the amount of each needed.

Cut one full length piece plus 3" of both carbon and Kevlar. In addition, cut an 9" and a 12" piece for the ends. Use the 12" piece on the small end since you'll be bolting the extensions in this area



Cut 2 full length pieces (plus 3") of 2" carbon tape.

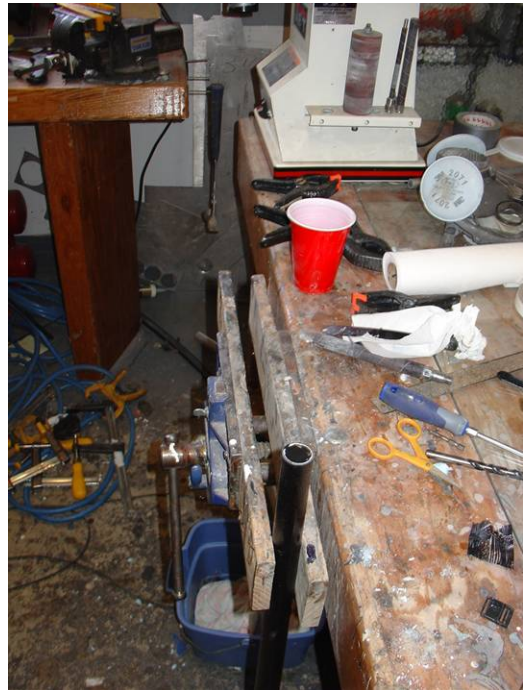
Begin by painting the foam core with some epoxy with silica (light cream). Slide the Kevlar sleeve on and milk it tight with 1 ½ excess on each end. Wet it out with epoxy. Put the short piece of sleeve flush on the big end and the long piece flush on the small end. Again, wet them out. Apply a piece of 2" carbon tape on each side and wet those out. Slide the carbon sleeve on last and milk it tight. With a rope suspended from the ceiling, hang the tiller with a clamp pinching the excess carbon on the small end. Use another clamp as a weight to pinch the excess on the other end. Wet out the carbon sleeve and let it cure.



Preparing the tiller end for shock cord



Use a screwdriver or drill bit to clean out about 2" of foam from the end of the tiller. Sand the inside a bit and clean with a paper towel and some acetone. Fill this space with a mixture of epoxy, silica, and a bit of carbon powder (heavy cream consistency).



After curing, cut the end at a 45 degree angle.

Making the end shockcord attachment



Drill a 5/16" hole on a 45 degree angle starting near the top of the filler. Be sure to have the tiller setting on wood backing to avoid fracturing the carbon fibers around the exit hole in the bottom of the tiller.

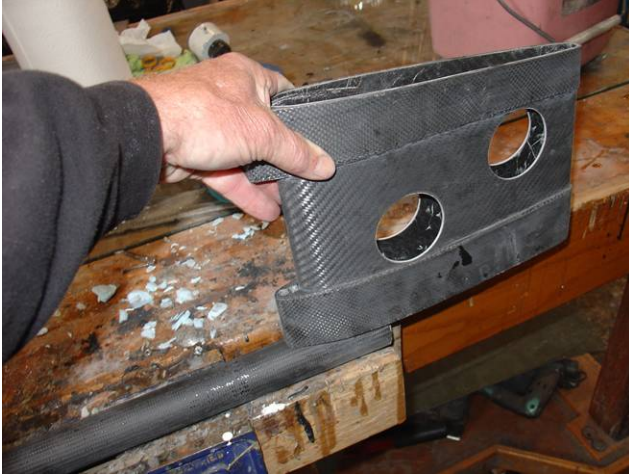
Use a chamfer bit to round out the ends of the hole so they won't cut the shockcord.



Round the end of the tiller to make it user friendly. Remember, anything on a skiff that could possibly cut you will cut you!



Fitting the tiller to the body



Begin by setting the body on the tiller and scribing the inside of the body onto the tiller. Cut to these inside lines. Use a sanding cylinder to begin the trial and error fitting process—constantly sanding and sliding the tiller further onto the body



During this process you can guess the approximate amount of tiller angle. After fitting the tiller, dig the foam out of the tiller about 1 ½" past the nose of the cassette body. You will fill this cavity with filler later

Getting the tiller angle right

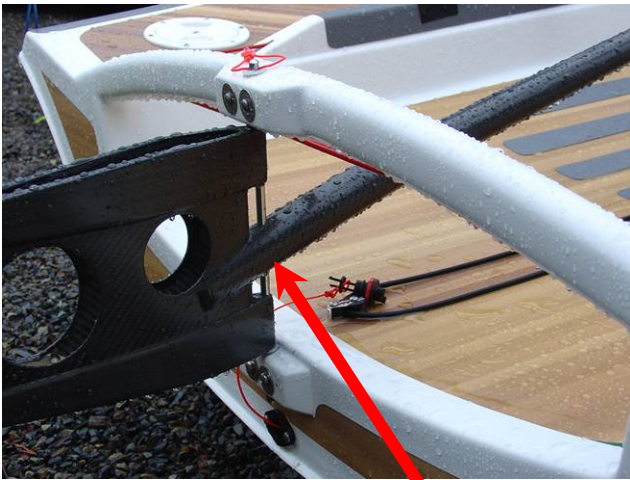


The tiller angle is pretty important. If the tiller extension attachment point is too low, it will cause the extensions to cause issues with the toe rails when tacking. If it is too high, the outer end of the extensions will be more likely to drag in the water—especially during tacks and gybes.



You can see that the impact of raising the tiller attachment point an inch will drop the outer end about 4 inches. If you have the opportunity, install the cassette body on the boat and do the preliminary tiller bonding with the tiller end setting on a $\frac{1}{4}$ " shim on the toe rail

Getting the measurements and angles right



To get it right there are a few constants that you need to know. First, the transom bottom gudgeon block is $\frac{3}{8}$ " below the deck top at the transom. Second, the transom bar was made following the instructions in the manual and is flush with the transom (72" radius). Third, The toe rails are standard height. Use this gudgeon-less system as it has been tested and proven over nearly three seasons of hard sailing

Turn the cassette body upside down and set it on a 2" block 31" from the edge of your table. Remember, the top of the cassette is square with the pintle holes.

Slip the tiller on and use some epoxy with silica to tack it in place after making sure it is straight with the body.

Before drilling the pintle hole all the way through the tiller handle, drill only the top hole and fill the inside void with epoxy/silica/410 mixed to heavy cream consistency. After curing, drill the hole from the bottom up. In the new cassette, the tiller is down tight to the carbon tape so there is no gap below the tiller



Finish up with a little filler, some wet sanding and a finish coat of 207 / epoxy

