Build a Centerboard
by Dave Misunas

People that know me well will tell you I'm not the type to leave "good enough" alone. Although I named my DAY SAILER "long gone" I knew it would take some tinkering and research to have her live up to her name. Over the last four years I had slowly eliminated many of the things that make a slow boat (except the skipper he stayed), good sails, mast tuned, boat close to minimum weight, etc. Eventually I got around to the centerboard. The original board had a loose fit in the trunk and not much of a shape. If I had it to do over, building a centerboard would be first on my list of things to improve. The new board has made one of the most noticeable changes in up wind performance.

Gathering information on how to construct a board and assembling a supply list took a lot of time and thought. I found myself haunting Libraries, visiting book stores and interrogating other Day Sailers on what it took to build a blade that was strong and fast. What type of wood should be utilized? Or should it be made of solid fiberglass like the one that came with my DAY SAILER when new? If so, should epoxy or polyester be used and what type and weight of fiberglass cloth. Other things to be considered where what shape should the foil be, and how to keep the shape true the length of the board while also making sure that both sides of the board where exactly the same. And what about the hole for the handle? What could be done to stop the rounding out of the hole from repeated use?

Since then I have made a number of boards and would like to pass on some construction techniques that have worked for me. Hopefully they will give a starting point and trigger some ideas of your own. To anyone considering building a blade, it's not that difficult and is within the ability of any handyman, but it is time consuming. It could make a nice winter project.

A good place to start is the center board trunk. With the old board removed measure the width of the trunk in the area where the centerboard head would be. A minimum of four dimensions will be needed for the head of the new board

(1) in front of trunk at the hull line.

(2) at front of trunk 12" up inside the trunk.

(3) 14" back from front of trunk at hull line.

(4) 14" back from front of trunk and up 12".

Take the time to make precise measurements, the trunk is tapered from top to bottom, and board head will have to be shaped to match. Also check the length of trunk, max. length of board is 39" my trunk would only accept a 38" board.

Make the board wide as possible while still allowing it to fit in the trunk. A properly shaped centerboard with widest point 1/3 back from the leading edge will create lift (much like a sail). A wider board creates more lift than a flat board, and more lift equates to higher pointing. The leading edge should not be sharp but rather have a small radius; 3/16 is about right. While the trailing edge works best being 1/8" wide with sharp corners, these sharp corners will help the attached flow exit the board with less turbulence.

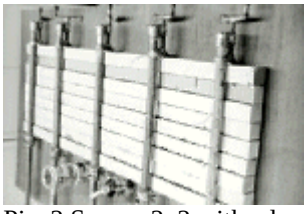
When close hauled, the main job of the centerboard is to change the side force created by the sails into forward motion. But it will never be able to overcome all of the side force, so there will be some leeway. This leeway is what deflects water around one side of the centerboard more than the other, creating lift and counteracting some of the leeway. There will always be some leeway when beating (approximately 4 degrees off the direction the boat is pointed).

On a run, with sail force in the same direction as boat heading, there will be no side force, thus no leeway. The centerboard will be going straight through the water, which will flow the same on both sides of the board. This will not create lift, only drag (a good reason to raise the board on a run).

The following pictures and captions are an attempt to show the major steps in constructing a centerboard.

Pic. 1 End grain of each piece should not slant the same way, they should alternate ///\\\//\\\

for strength and to stop warping. Sitca spruce was used on this board for it's strength to weight ratio, it's straight grain and light weight made it a good choice for my over weight boat. A solid fiberglass construction would have been heavy. (If you need to add weight to your boat the centerboard is a perfect place to put it, but remember 25 pounds is the limit). If you want a heavy board for its added stability try mahogany or straight grain fir.



Pic. 2 Square 2x2 with a length of 52" glued using 2 part "RESORCENAL" waterproof glue. Several pipe clamps where used to hold in place over night. Tighten just enough to start glue oozing out of joints but not to tight as to squeeze all glue out. Keep the bottom of boards flat on the tabletop; use wax paper to stop board from being glued to tabletop.

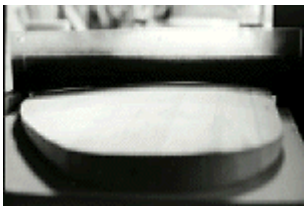
Pic. 3 After glued board has been planed down to 1/16 under the size you want the finished board to be, (board should be thinner by 1/16 to allow for the fiber glass covering) use a template to draw the shape of foil on the end of board opposite the head.

To make a template draw your favorite shape on paper and glue it to a piece of 1/4 inch plexi-glass. Use a small saw to cut the glass staying close to the line, then sand or file right up to the line, splitting it if you can. Be as precise as you can, this will also be the tool used to control the shape of the board (see pic. 6).

Set up a radial arm saw or table saw with dado blade to cut 3/4 inch wide strip the length of the board stopping at the base of the head, blade is tilted approx. 6 degrees. Take a shallow test cut, lower the blade take another test cut keep doing this until the saw cut touches the line of shape on end of board.

Pic. 4 Continue until board is roughed in. This should give you a very straight shape that can be belt sanded and block sanded into a precise foil.

Pic. 5 When whole board is shaped, cut off the leading and trailing edges. These must be in place while saw work is in progress to support and stabilize the board. Use radial arm saw with regular blade for this procedure. Draw tip shape on board, cut out using jigsaw or saber saw. (specs for this shape are in the handbook).

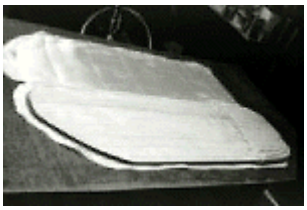


Pic. 6 Using a template (same one used to draw shape on end of board) check for high spots and sand them off. I used a belt sander with 60 grit, and a 2x4 with a 60 grit belt cut to create one long piece of sand paper and fastened to length wise to the 2x4. Repeatedly check for high spots and sand them off until the template can be dragged the length of the board with no light showing between the template and the board surface. This is the time consuming part of the project; it can be long and tedious depending on how precise you want to be. After the body of the board is shaped start tapering down the tip. This is where the rounded leading edge will blend into the squared off trailing edge. Remember to keep the draft 1/3 back from the leading edge in this area also. The board can be worked down to about 3/8 inch wide at the tip.

Pic. 7 At the head of the board, sand each side until you get down to the dimension you took out of the trunk, remember to make them 1/16 smaller. Next rout out 3x3 1/2 inch deep hole to accept an aluminum piece. Use a utility knife to square the corners of hole. The center of aluminum and wood will be drilled and filed square to accept the square end of the handle. Use your old board as a template to find the location of the hole in the head of the board. Epoxy aluminum into the hole.

Pic. 8 Check to see if board is centered in the trunk (this should be done in earlier stage of construction before fiberglassing is started). Test for pivoting up and down, at this stage is should move very easy. Later after fiberglass is on it will become a snug fit.

Pic. 9 System III epoxy was used for its superior strength and ability to bond to wood. Board was covered on both sides with epoxy and allowed to dry over night.



Pic. 10 Block sand epoxied board taking down high spots. Trim 9oz. "S" cloth to the shape of center board allowing for one inch overlap.

Pic. 11 Drape cloth over board that suspended by two wires, each wire is attached to a finishing nail, one in the end of tip the other in the top of head. Paint on the epoxy wetting out all of the cloth. Squeegee off all excess until it starts to look dry (no thick shiny pools of epoxy). Allow to harden. Trim off excess fiberglass with utility knife or large scissors. Block sand to remove high spots, (80 or 100 grit OK) try not to sand into fiberglass. Lay board on side, keep it level with shims under tip and trailing edge. Apply final coat of epoxy allow to harden, then do other side. Block sand again filling any low spots with dab of epoxy or glazing putty, wet sand with 180 grit or 220. You can paint it if you like. There is so-called epoxy paint in spray cans, which is used on cloths washers and drier appliances. I decided to not paint my board, I was anxious to use it and I wont have to touch up any paint chips. I finished it off with a good wet sanding using 400 grit on a soft rubber block.

Pic. 12&13 Finished product. Test for minimum side play, grab end of board and move side to side. If there is to much side play, shim up head with small strips of fiberglass and epoxy, board should go up and down smoothly with some resistance.

LIST OF SUPPLIES USED

9 2" x 2" x 60" Sitca Spruce

1 Quart Epoxy Resin

1/2 Quart epoxy Hardener

1 Resorcinol Glue

10 Sandpaper Each 80, 100, 200 grit

10 Wet/Dry Sandpaper 200, 400

2 Sanding Belts 60 or 80

1 Yard Fiberglass 9 OZ. "s" cloth

1 Aluminum 3" x 3" x 1/2"

10 Throwaway Paint Brushes, various sizes