Less than a week into building, Sailor Girl is ready for finishing. This shot was taken at the conclusion of a boat building course at The Home Shop in Charlotte, Mich.

Photo by John Wilson

Build a SAILOR GIRL On Your Own

A week in your own shop will produce a boat that's fun to sail or row.

When I was a Boy Scout 50 years ago, I remember reading an article titled "Building an Orange Crate Canoe." At the time I read it, however, oranges were no longer crated in anything suitable for canoes.

The concept, however, of making a boat from readily accessible materials stuck with me. Here is a boat, called Sailor Girl, that uses my design and construction methods. It's made from wood you can easily find at the local lumberyard.

Each May participants come to my shop to learn the boat building process for themselves. They come from a variety of backgrounds as diverse as a doctor and his 13-year-old son to a woodworker/blacksmith from a rural skills center. For each of them, making a boat fulfills a dream.

by John Wilson

John Wilson learned to sail growing up in the Finger Lakes region of New York. At the age of 9, his first boat was a used 12′ Moth that needed work. He raced a Snipe as a teenager, and taught boatbuilding at Lansing Community College for 15 years. Currently he operates The Home Shop in Charlotte, Michigan, where he teaches classes and sells Shaker box supplies.

At the class, just as in your shop, boat building begins with assembling all the side plywood and connecting pieces during an intense three-hour session. While the epoxy remains wet the boat sides will be sprung into shape. Here Lars Hamre (left) and Jim Hott (right) spread epoxy on the gunwale that goes along the top edge of the side panel. The chine log is already clamped to the edge where the panel and bottom will meet. Lars came with his father, Merlin Hamre (middle).

Epoxy and Plywood

Boats present challenges not found in cabinetry. Just about every line is a curved one. The joints need to be watertight and waterproof. And the whole project needs to be reasonably lightweight, yet be able to take the stress of use under sail.

A key ingredient in making this possible is the development of epoxy adhesives. In the early 1970s, a company in Bay City, Mich., pioneered the use of epoxy as a way to solve problems arising when wood gets wet.

The Gougeon Brothers were making large wood propellers for wind turbine electric generators. Wood was an excellent choice for lightweight and strong blades, but rot and wood swelling when wet were problems standing in the way of its use. They solved this by saturating the fibers with the strong-bonding substance epoxy. They called their product WEST, which stood for wood epoxy saturation technique.

In a 12'-long boat, the plywood must be scarf joined for length. The long beveled overlap joint uses scrap blocks on each side squeezed together with deck screws. Merlin (left) and Rick Eisenlord use waxed paper to prevent the blocks from being epoxied to the hull, as you see here.

From left to right, Hott, Merlin, Lars and Eisenlord wrestle the assembly of the sides, stem and transom into shape with a temporary spreader to hold the shape of the hull. As you can see, it takes all hands on deck to pull these parts together.

The other necessary ingredient is the familiar product plywood. Besides giving us standard wide sheets of 4' x 8' wood, plywood also solves the problem of solid wood expanding and contracting in water. It does this by cross directing wood fibers in each adjacent layer of wood. Wood fiber is dimensionally stable in length while expanding in width.

The net result is that panels cut from plywood don't change size when wet. With epoxy and plywood, a boat hull is strong and long lasting while at the same time lightweight and relatively simple to construct.

Anyone Can Build a Boat

Sailor Girl is a 12' sailing and rowing boat designed to take advantage of epoxy and plywood. The methods devised for her construction are straightforward so that basic shop tools can produce a fine boat in a reasonably short amount of time. Hardware is readily available from marine supply sources. Even the sail is designed for making at home.

The four boats proudly flying their new sails on a Sunday afternoon in May 2004 were all begun the previous Friday morning. Cutting materials for this assembly was done before the event started. Also, a minimal amount of time was spent reading the construction manual as I was directing the event. Sailor Girl is designed to be built with a minimal amount of fuss, with commonly available materials, using shop equipment you already have, in time measured in days – not months or years as you might think.

Buying Your Lumber

Let's start with sourcing materials. You'll need two sheets of 1/4"-thick 4' x 8' plywood. Properly reinforced with solid wood strips epoxied to the edges and bottom, luan plywood underlayment can be used for building a boat. It's 5.2mm thick, which is slightly thinner than the common 1/4" reference by which it's sold in this country. It's made from large, knot-free logs found in the Pacific rim countries where it's manufactured.

There is a wide range of quality in underlayment, so what do I look for? Inspect both sides for cracks, voids and overlapping edge joints of layers. Epoxy can repair most of these defects, but it is easier to start out with a clean sheet.

Secondly, I feel the weight of the sheet and select ones that are the heaviest. This will not adversely affect your boat's total weight, and the heavier sheets have more strength. A lightweight sheet of underlayment can weigh 15 pounds while a heavy one can weigh more than 20. Because I like to paint my boats for ease of maintenance, the color of the plywood does not affect my choice, but it may be important in yours.

Finally, I check for glue quality. As both interior and exterior grades are sold, you want to ask for exterior ply. At home, soak a scrap of plywood overnight in water to make sure that delamination won't happen to your boat.

Lumberyard etiquette may interfere with selecting the right stuff for your project. With hardwood suppliers, you can pick over

RESOURCES

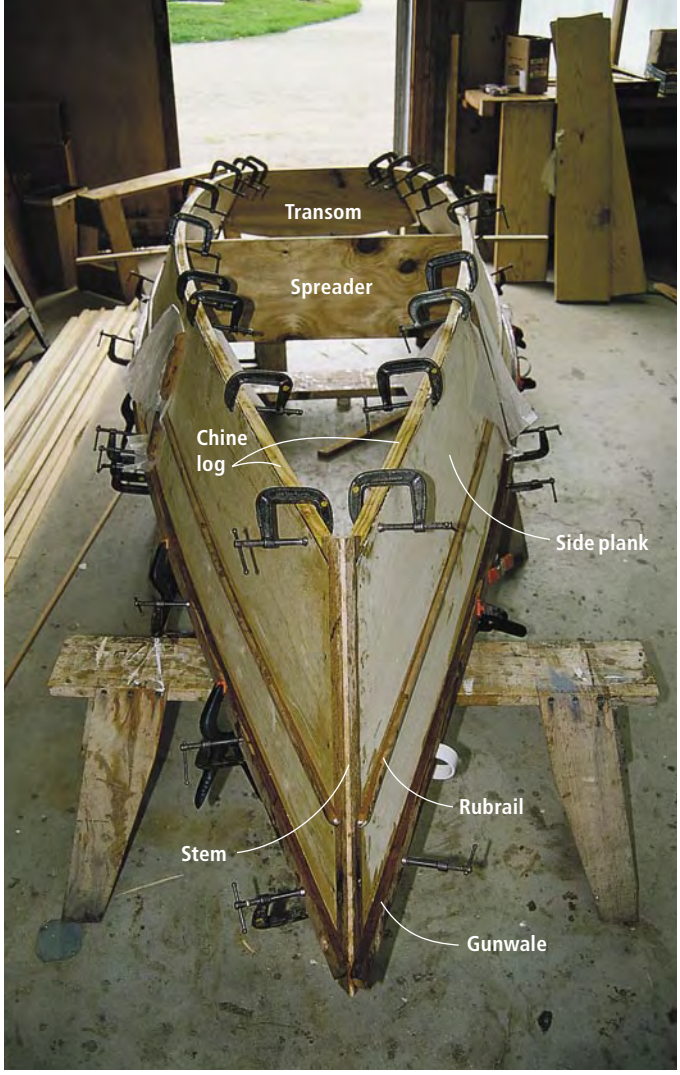
The Home Shop
406 E. Broadway
Charlotte, MI 48813
517-543-5325
(9 a.m. to 5 p.m. EST)
shakerovalbox.com

- A four-day class to build "Sailor Girl" will be held May 12-15, 2005. Fee of $950 includes all boat materials for hull, oars, mast and sail.
- A one-day class in paddle making ($90 fee) will be held March 19, 2005.
- "Building Sailor Girl with John Wilson" manual contains plans, material lists, and building methods with many photos. $30 + $3 S&H

West System Epoxy
West System Inc.
989-684-7286
westsystem.com

Marine Hardware
Jamestown Distributors
800-423-0030
jamestowndistributors.com

Single-unit design accomplishes the boat shape in one session. Less than three hours has elapsed since the epoxy was first spread. From left to right, Eisenlord, Hott, Merlin and Sarge clean the epoxy squeeze-out before it hardens. Note the use of 5-cent PVC clamps along with regular C-clamps.



The result of a three-hour work session is the completed hull.

the pile as long as you put it back. This is not so with softwood yards primarily catering to the home-construction market.

You need to enlist the support of the yardman at the outset. He may even wish to build a boat himself, and will want to see you be successful. After all, the number of pieces you need is rather small, but quality is important. If you don't get the help you need, try returning another day and work with another yardman, or go elsewhere.

Solid wood is used for the long thin pieces cut for mast and sprit, gunwales along the edges for clarity and keel for the bottom. The seats, small deck, transom knees, rudder and tiller, and leeboard are also all cut from solid wood (see above right). I use a combination of softwood and hardwood in my boats, but it can all be made from softwood by following simple rules of thumb: Select heavier pieces of wood that have more strength and increase the thickness by 25 percent when using softwood.

What you will find in straight-grained, relatively knot-free lumber the day you go shopping is pretty hard to say. Just don't forget to get on the good side of your yardman. Also, it's helpful to know that longer lengths are more likely to yield straighter-grained, knot-free sections than the shorter ones.

With the bottom ply cut to shape, and the chine logs planed flat, Lars and Hott hold the boat while Merlin trims the stem so that the bottom can go together.

Sarge and I begin the inside work with fitting the small deck block. Together with the inside gunwhale and transom knees, this will contribute stiffness to the hull.

The bottom fin, called a skeg, will help the boat track well underway. Sarge uses the thickened epoxy to fillet the joint for strength. The flat board going stem to stern is important both for protection from grounding and to support the plywood bottom.

The seats rest on blocks epoxied to the hull. My assistant, Tom Jarosch (left), and Merlin clamp the blocks with waxed paper between them to the seat. Using the seat this way ensures that everything will fit when the epoxy dries.

A key skill in using plywood for any boat more than 8' long is being able to scarf pieces to required length, as shown on page 88. The scarf joint is made by tapering the ends to be joined, thereby exposing wood fiber along their stronger orientation. The normal cut is a 1:8 to 1:12 ratio of thickness to length of the joint. In solid wood the joint strength will come close to that of a continuous piece.

In plywood underlayment I taper 1" back for the 5.2mm thickness, which is a ratio of 1:5. This works where panels are supported by solid wood. Stacking up layers of plywood will make planing and using the belt sander easier in preparing the tapered ends. Expose a goodly band of the top and bottom layer. Strength depends on having a continuous wood fiber layer on both surfaces.

Building the Hull

The single-unit design of Sailor Girl compresses much of the time needed to form the basic hull shape, greatly easing construction. It eliminates making a strong back, or building a frame on which to lay the planks and other parts to achieve the bends of the hull.

The side panels were originally glued up flat on the bench to save time in scarfing and attaching the edge trim. But these preassembled panels were too stiff for each assembly. The solution was to combine all the side-panel construction and attachment to stem and transom in a single three-hour session of epoxy "open time," as shown on page 89. A single spreader holds the boat shape in the center until the bottom and seats are in place.

Looking at the photographs of Sailor Girl being made may leave you wondering where you can locate so many C-clamps. There is a simple alternative that can replace most of them. I call them my 5-cent PVC clamps. Take a length of 2" PVC schedule 40 pipe and cut it into 1" segments. Then slit one side on your band saw. They will open enough for clamping the gunwale assembly as long as you use a C-clamp at strategic points to prevent slipping.

Making the Sail

The sail is the last major part of the boat, and it too can be done

The sail is made from Tyvek in a cloth finish rather than the stiffer building wrap used in home construction. The cloth comes 10' wide, thus avoiding the need for any center seams. From left to right, my partner, Eric Pintar, I and Lars use seam tape to add reinforcements into the corners.

Pintar and I hem the sail all around using seam tape. A bolt rope and grommets will add strength to the hem. The corners can be stitched by hand or by a sewing machine.

at home with good results. I had a prototype sail made by a professional sailmaker. It is a good design and well made. But I wanted to include making the sail in the boat event and give participants the satisfaction of doing their own, and saving some money.

Just as plywood sheets and epoxy glue make the hull possible, so do wide widths of Tyvek cloth and seam tape make sailmaking possible. The Tyvek used here is made for cloth applications such as hazardous materials' handling suits, and not the building material product that has a hard stiff surface. I plan to sell the Tyvek cloth I use to make my sails. To purchase contact The Home Shop (517-543-5325, 9 a.m. to 5 p.m. EST).

Tyvek comes in a roll 10' wide, which makes for a seamless sail. The edges are folded over and secured with double-faced seam tape used for basting, as shown on page 90. The corners are stitched to reinforce the bolt rope worked into the hem.

Boat building in your shop has come a long way since "Building an Orange Crate Canoe." However, the joy of fashioning a craft with your own hands still resonates the same responsive chord in the hearts of craftsmen. I hope you soon can experience this joy for yourself. **PW**

An important aspect of the set of the sail is the location of the mast and the angle at which the mast is held in the step. Here a simple jig is used to locate the mast step under the cross piece with the hole called the mast partner.

Merlin makes his boat ready for sail by attaching cord for lacing the sail to the mast. All the parts have come together for a boat, which now has oarlocks at two stations for rowing singly as well as with a passenger.

Four boats in less than a week! Here the participants in the class, Sarge, Eisenlord, Merlin and Hott line up before The Home Shop in the late afternoon sunshine.

A STATEMENT OF THE FREE

Building your own sailboat is an individual's declaration of independence. You are free from the uncertainty over being able to do it, now that she is built. You are free from standing on the shore, now that you are afloat. You are free from oar or motor power the moment the breeze first fills the sail. It is akin to being in flight. No engine roar, no sweating at the oars like a galley slave. Only the wind tugging at the sheet while the boat responds with the sound of lapping waves under the bow. To have the privilege of building your own sailboat is a statement of the free.

–Taken from "Building Sailor Girl with John Wilson"