Modeling a Norwegian Sailing Pram

An authentic scale model of a real boat

The second in a series of progressive model tutorials

Kit number MS1471 Scale 1:12 (1" = 1' 0")
Model overall length 12½", width 4", height 15½" Baseboard: 3½" by 7"

Model design and instruction book by David Antscherl
based on a design by Simon Watts

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Pram model parts list:

Your kit should contain the following:

1 sheet ¼" laser cut basswood 4" x 12"
2 sheets ⅛" laser cut basswood 4" x 12"
2 sheets 3⁄32" laser cut basswood 4" x 12"
1 sheet 1⁄16" laser cut basswood 4" x 6"
3 sheets 3⁄64" laser cut basswood 4" x 12"
1 12" length of 1⁄32" x 1⁄16" strip basswood
2 12" lengths of 3⁄32" square basswood
2 12" lengths of 3⁄32" x ⅛" strip basswood
2 12" lengths of 3⁄64" x ⅛" strip basswood
2 12" lengths of ¼" dowel
0.3 mm beige line
0.5 mm beige line
0.7 mm beige line
1 sheet of photo-etched parts
4 cast oarlocks
3 cast rigging clips
16 brass nails
3" of 24 gauge copper wire
3" of 1⁄16" brass rod
3" of 1⁄32" brass rod
3" of 1⁄16" brass tube
Sailcloth

Tools and materials:

Please read pages 40-43 for a full description of all the tools and materials that you will need to build this model successfully. Most of these are available from Model Shipways.

Basic tools (you have these if you have built the dory model):

White (polyvinyl alcohol) glue
100 and 150 grit sandpaper
Cutting mat
Knife handle and #11 blades
Set square
Small saw
Clamp on vise
Paint brushes
Fine point tweezers
Clips and elastic bands

For the pram model you will also need:

Hard metal flush-cutting shears
⅜" round file
Bench block
Miter box
Swivel head pin vise
#55 drill bit and a #61 to #80 drill set
⅜" diameter round file
#15 narrow saw blades and #17 chisel blades
Pin vise
⅜" diameter round file
Cyanoacrylate glue
Set of six broaches (optional)
Mini plane (optional)

Please read this first!

Plans:
Not all plans are actual size. Study drawings, photographs and assembly instructions before starting so that you understand how the parts come together. Please follow the recommended building sequence!

Make allowances:
You may need to adjust for small differences as your model shapes up and how the parts relate to each other. As long as it looks right, it is right. Again, study the photographs.

Kit lumber:
This kit contains laser cut basswood parts. A common misconception is that the parts should simply be punched out of the carrier sheet. Not so! Laser cut parts are held in the carrier sheet by small bridges of uncut wood called *tabs*. These may be oriented in any direction to the grain.

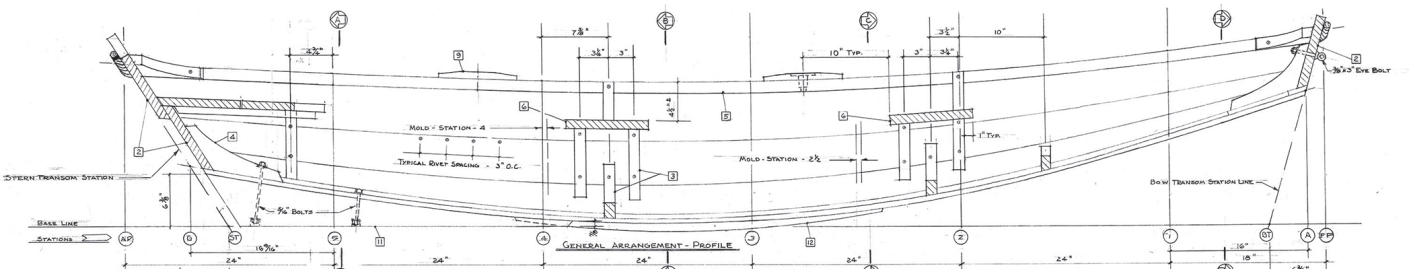
It is always better to *cut* through all tabs rather than try to push out parts and risk breakage. You may need to cut through not only the tabs but any part of the outline not cut completely free of the sheet. Turn the carrier sheet over and cut from the back to release parts without damaging them.

Preparation is needed before gluing laser cut parts. The laser cutter leaves a brown, shiny surface. This does not allow for good glue adhesion. I recommend lightly sanding or scraping away the char before gluing. It is not necessary to remove all the char unless the wood surface is to show when the model is complete. Sometimes simply scraping using the back edge of a #11 blade (see the **tools and materials** sheet) is sufficient.

Take your time!
Building a model is not a race! Take the time to read the instructions over first to give yourself an overall view of the process and to familiarize yourself with the parts' names.

The *sequence* of building a model is important. You don't want to paint yourself into a corner and find out that you should have fitted something first that is now difficult or impossible to add. I've worked out the best order of things for you to make it easy. That said, some steps are not without challenge.

In summary, enjoy the process of building your 'real' boat model. The skills you continue to develop while you construct the Norwegian pram will help you successfully complete more complex models.



This drawing of the Norwegian pram above is from a three-sheet set by the late Simon Watts. The actual plans for building the full-size craft are at a much larger scale. The drawing above is at no specific scale. These plans, along with comprehensive instructions, are available from Mr. Richard Watts at:

http://simonwattsfurniture.com/norwegian-sailing-pram.html

Important notes on glue:

I strongly recommend polyvinyl alcohol (PVA) or white glue. It is easy to clean up with water, is non-toxic and dries clear. Many kit manufacturers suggest cyanoacrylate glue. True, it is almost instant, but does not allow for adjustment, is difficult to undo without toxic chemicals, may stain and, for some, is allergenic. If any other adhesive than white glue is needed, it will be mentioned.

Using white glue:

I like to squeeze a small blob of glue onto a piece of scrap plastic. Pick up glue on a round watercolor brush (a number 1 or 2 size is good for this) and transfer a generous amount of glue to one of the surfaces to be joined. Press the pieces together. Some glue will squeeze out. This indicates that the joint is not glue-starved. Adjust the pieces before the glue 'grabs'.

Wash the brush in water and then mop up any excess glue using the same brush. For white glue clean-up water is your friend! You may need to wash glue off the brush and around the joint several times to clean things up to a professional finish.

Carpenter's yellow (aliphatic) glue can also be used in the same way. It is more waterproof when dry. However, when dry it is not colorless like white glue.

Help! I glued it wrong:

Don't panic – you can rescue a mistake; we all make them. Isopropanol (rubbing alcohol) will dissolve white glue (and, to a lesser extent, yellow glue). Either 95% or 99%, available from your drug store, is best. Use this away from any source of ignition, please. Either immerse the parts to be separated in a closed container for an hour or more, or flood the joint repeatedly with isopropanol using your brush. Be patient, don't force it, and the joint will eventually separate. Scrape off the rubbery glue remnants, wait a few moments for the solvent to completely evaporate, then carry on as if nothing had happened.

Using cyanoacrylate glue:

This needs to be used with extreme care. It can bond to your skin instantly. Use the smallest amount possible only where mentioned in the instructions.

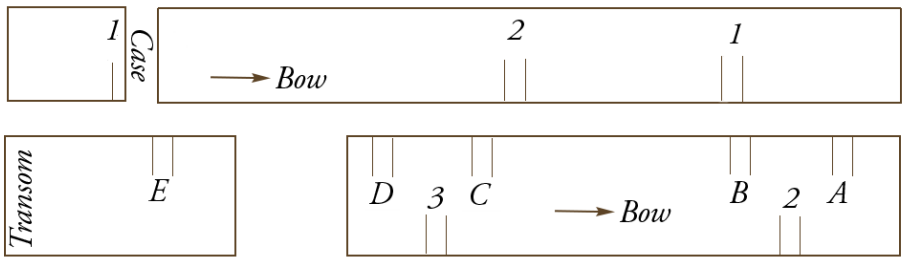
Epoxy glue:

Can be used instead of cyanoacrylate glue if preferred. See page 43 for details on using epoxy glues.

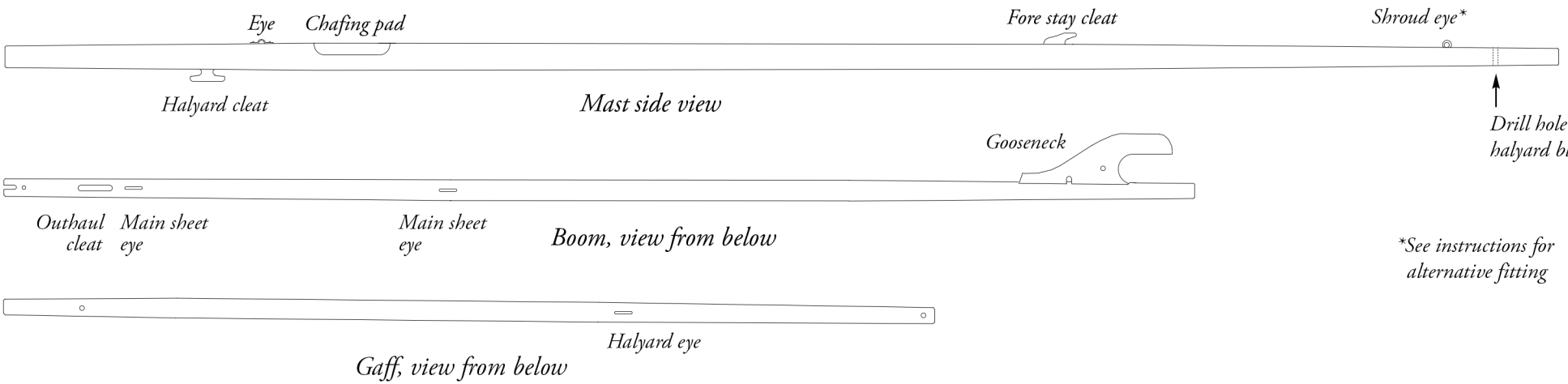
Rubber cement:

This is used for making sanding sticks and other temporary joints. Details on how to use rubber cement are on page 40.

These measuring strips are used to locate the various frames inside the boat. See instructions and photographs on page 15.



Tick strips for frames; see instructions



Mast side view

Boom, view from below

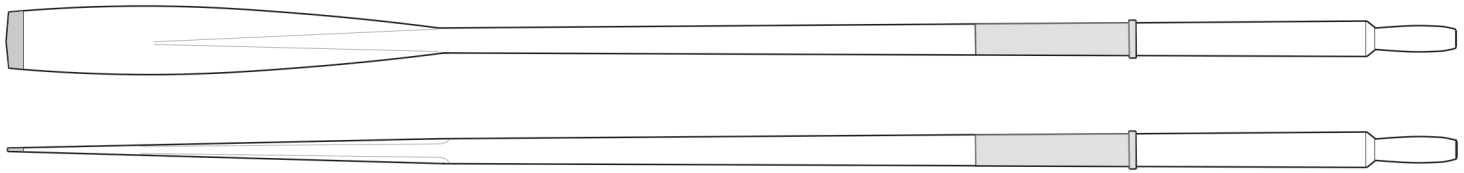
Gaff, view from below

Halyard eye

**See instructions for alternative fitting*

End protection

Leathering

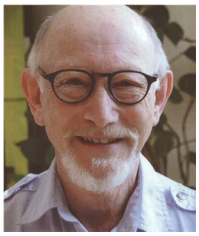


The plans on this page are full size for 1:12 scale

Ready to build your second model? Welcome back! So many would-be modelers want to begin by building a huge 100-gun ship of the line. Most of those very expensive kits get started but never finished. The job is much too complex and the poor builder hasn't acquired the skills needed.

For this second, intermediate kit, some previous knowledge is necessary in order to be successful. If you have already built the Model Expo Lowell dory kit, you are well prepared. If you haven't, I strongly recommend you do so first, as you will learn valuable techniques, tips and methods that will come in very useful for this model. I'd hate for you to give up in frustration because you lack some basics first.

Let me introduce myself. My name – Antscherl, also spelled Ančerl – was originally Bohemian-Moravian. However, I was born and brought up in England close to the National Maritime Museum at Greenwich. I've been building model ships since I was about six years old, which is a long time now. I became a professional model-maker in 2000 and have been happily sharing what I've learned over many years by way of articles and books, as well as giving workshops in both the U.S. and Canada. This progressive series of models is yet another way of helping folk like you either become model makers or better model makers. I'm glad you've decided to join me. So, let's get to it!



This kit is the second in a series designed to develop your skills and confidence step by step, to be able to build more complex ship models. Each kit is *not* a toy but a faithful miniature version of a real boat. I look forward to accompanying you in discovering the pleasure and satisfaction of building 'real' models.

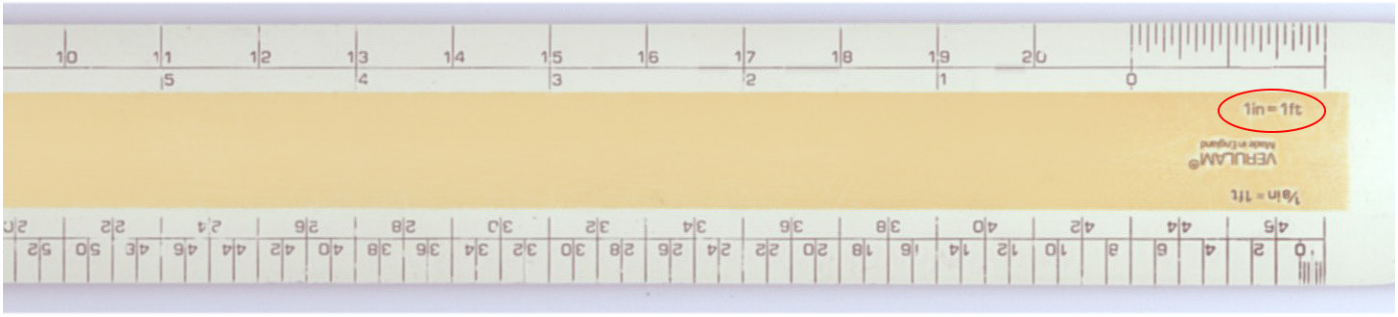
Each kit will teach you new ideas, skills and tricks that prepare you for the next in the series. Having started with just a few simple tools, just add more only as you need them. Please take a few moments to read about **tools and materials**, pages 2, 4 and 40-43. It's economic just to buy tools as you progress in building more complex models.

Now, a little background on the Norwegian sailing pram. Their ancestors were the Viking longships. Examples such as the Gokstad and Oseberg ships still survive in museums. They were double-ended lapstrake built. These ships, of oak, were both rowed and sailed. The pram was developed along the coast about 1,000 years ago and used in sheltered waters such as the numerous fjords. They were as small as eight feet long and as large as 18 feet. Our model is slightly less than 12 feet in overall length. This model was developed using plans by the late Simon Watts, who was a respected and well-known boat builder.

Prams are planked up in a similar way to the dory, but with some differences. Rather than a flat bottom, there is a flat keel plank. Also, both bow and stern are fitted with transoms; a small one at the bow and a larger one aft. The sailing pram is also fitted with a *dagger board*. This is a movable fin that reduces *leeway*; the sideways drift that occurs under sail when the wind is off the boat's beam.

Each time a new term or word is introduced it is set in italics and its meaning, or way the word is said, follows.

A word about scale. This model is at a scale of 1:12. This means that one inch on the scale represents one foot in real life, or just 12 times smaller than the real boat. This model is twice the scale of the dory. Copy the scale ruler on the next page if you wish to measure anything on your model. Read off complete feet from the zero to the left, and then the number of additional inches and fractions to the right of zero.



Ready to begin? I will take you step by step through the process of building your boat like the real thing, but in miniature. The pram looks deceptively simple to build, but you will find some interesting challenges to do it well. Don't rush; remember it's the journey, not the destination, that's important.

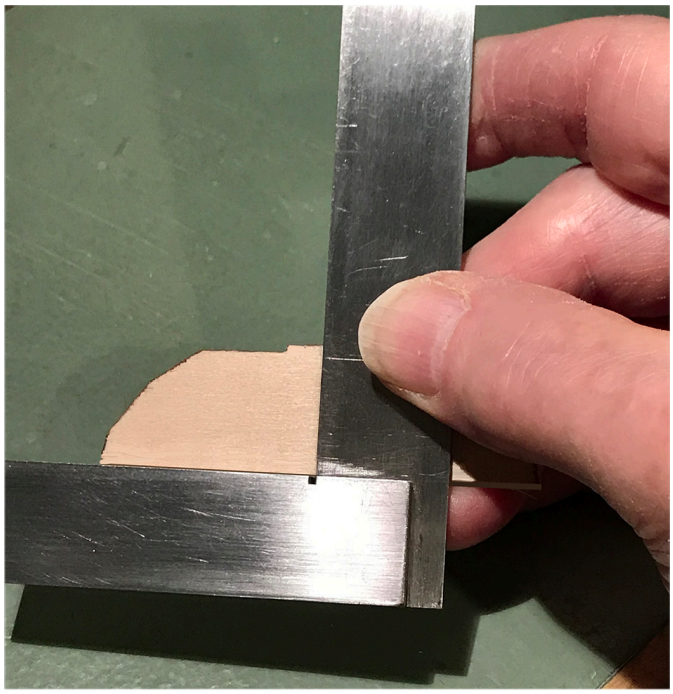
1. The transom knees

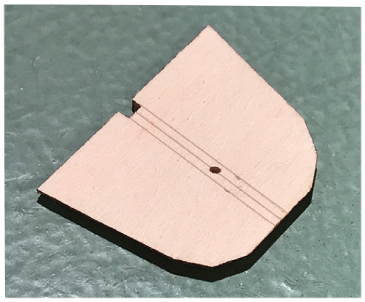
The first step is to prepare the transom knees that support the ends of the boat. Remove these knees from the sheet (Read page 3 for how to do this correctly!) Carefully sand off the char on all edges, keeping the surfaces at right angles to the sides. Use your set square as a guide as you did for the dory model. *If you did not build the dory model, I suggest you do so first. You will learn many techniques such as sanding, gluing and un-gluing.* Mark the knees in some way so that you do not confuse bow and stern!

2. The bow and stern transoms

The bow transom is in one piece and the stern transom in two. Both have temporary extensions which will be cut off later in the build.

Carefully remove the bow transom from the sheet. The side with the lines on it faces forward and indicates the bevels that will be needed. You will first need to draw a centerline on the *other* side of the bow transom as shown, using your set square (above right) or the wood one supplied. Make sure that your pencil point is sharp; a thick line is not helpful! Now draw a parallel line on each side of the centerline, the thickness of the knee apart (opposite).





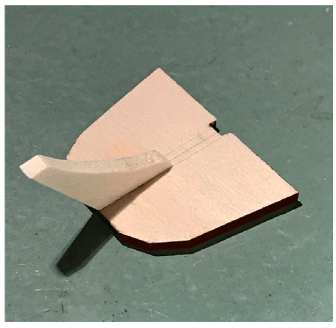
Make any pencil marks just dark enough to see them.

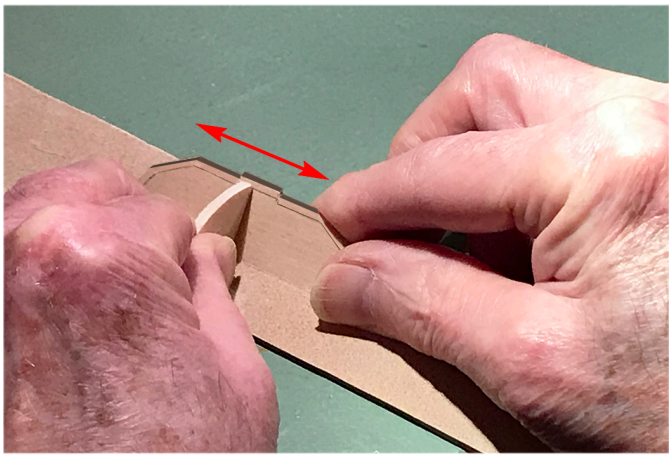
Next take the bow knee and glue it* to the transom so that the corner lines up with the bottom surface of the transom. Make sure that the arm of the knee is placed along your guide lines. The assembly should then look like the photograph overleaf.

Prepare sanding sticks using rubber cement to glue the paper to wood.

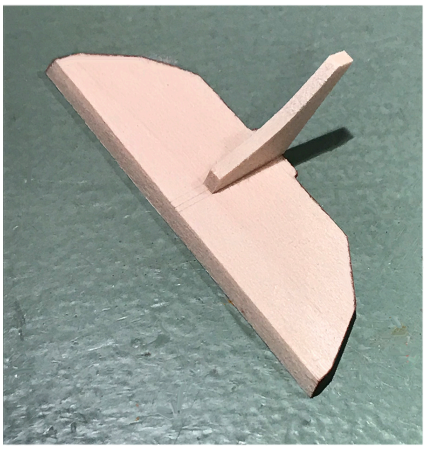
** See important information about glue on page 4.*

Before repeating this process with the lower stern transom, you will need to bevel its horizontal upper surface. The long straight edge is *under* beveled, as seen from the marked side. Turn the transom so that the bevel marks are facing away from you. Hold the bevel guide (supplied) as shown on the sanding surface with the transom against its sloping edge (photograph below). Sand the bevel until the char just disappears. Keep the bevel guide handy for later in the build.





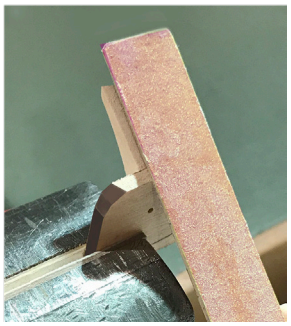
Next mark out the centerline and parallel lines on the side of the transom that does *not* have bevel lines. Remove the stern knee from the sheet, sand as before and glue it to the lower stern transom. Again, make sure that the corner of the transom knee lines up with the edge of the transom.



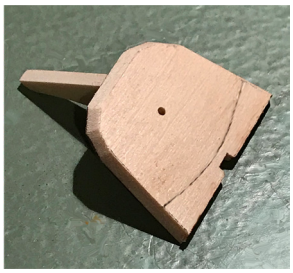
3. Completing the bow transom

Hold the bow transom in your bench vise. (See **tools and materials,** pages 40-43 if you haven't yet got a vise!) Sand the edges using a 150 grit sanding stick (read about sanding sticks in tools and materials). Sand so that the brown char disappears from the far 'uphill' edge just as you reach the guide line on the near 'downhill' edge (photograph below). Use the bow knee as an angle guide for sanding the first edge.

Make sure that, on each facet, the char line remains parallel along the far side of the transom. Correct as you go if necessary. These other facets will be refined later.



The bow transom, once all the angles are completed, should look like the photograph opposite. An extra transom piece is provided on the sheet, in case you have a problem with the first attempt.

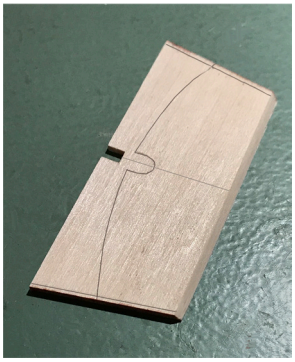


The last item to attend to is to clamp the transom by the knee and drill a #55 hole vertically through the knee. Do this by hand using a pin vise for control (at right, plus see tools and materials).

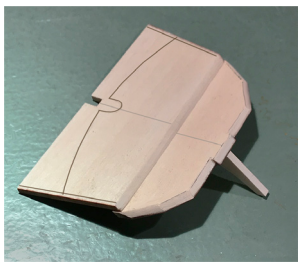
4. Completing the stern transom

The stern transom is made of two pieces. The upper part is aft of the lower part. Remove the upper piece from the sheet. The overlapping edge needs to be beveled before the two parts are joined. In this case the

bevel appears on the *aft* side where the bevel markings are seen. Sand the bevel along the long side using the bevel guide just as you did for the lower transom. Mark a centerline on both sides. The upper transom should now look like the photo at right.



Turning back to the lower stern transom, make two angled cuts using your razor saw, as shown here (see tools and materials). Now sand the bevels on the other transom edges, except the outermost ones.



The upper and lower transoms can now be glued together, using centerlines on each piece to align them. The overlap is exactly ⅛". Mark this on the *inner* side of the upper transom, then glue the pieces up.

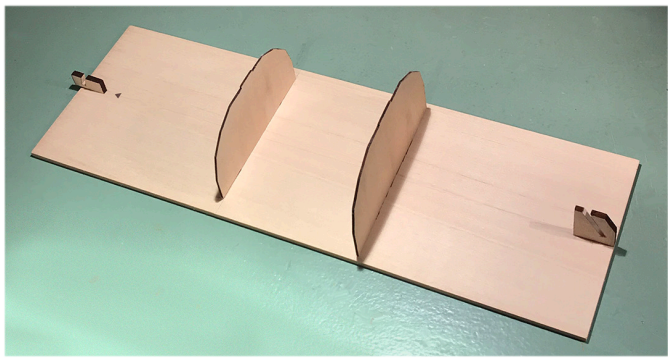
The outer two edges may now be beveled down to their lines.

A note about edges and corners:

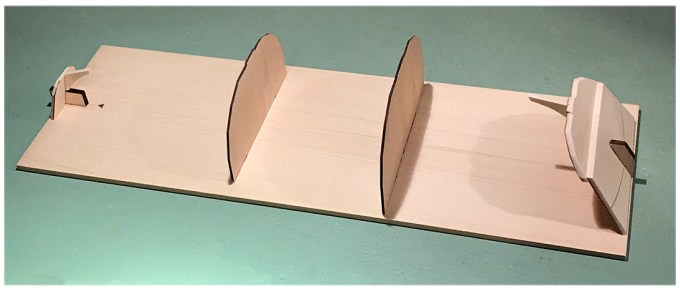
In boats and ships, all sharp edges and corners need to be softened. A sailor could be badly hurt if thrown against an edge in a lively seaway. Also, this reduces the possibility of splinters. All exposed edges are sanded off slightly in either a chamfer (a 45° angle) or sanded in a small radius. The edges of the transom knees may be chamfered in this way. Don't overdo it, though!

5. The building board

The real boat was built right side up, but as it would be hard to crawl under a scale model, we will build our boat upside-down. Clear the slots in the building board and prepare the two molds. The one labeled 2.5 goes toward the bow (the bow is indicated on the board) and the other, labeled 4, is toward the stern. There is no need to sand off the char on these molds. Simply slot them in place (see photograph below). In addition, push the transom supporters into their slots at bow and stern. Only glue the bow one in!



Now press home the transoms in their slots, making sure that they are parallel to the ends of the building board (see below). Do not glue them in. We are finally ready to begin the planking process!



6. The keel plank

Carefully remove the central keel plank from its sheet and clear the slot in it for the dagger board case. Sand the char from the edges. Don't worry about the ends for now. The plank is slightly over-length.

This is the first item that will require bending. There are several methods of bending wood. The first is to

use moisture. Soak the plank in hot water for several minutes. Then bend it around a curved form of some kind and allow it to dry out thoroughly in its bent shape. You need to over-bend the piece, as it will tend to spring back somewhat after it is dry.

Another method is to use heat. A tea light inside an empty tin can on its side will do. Heat the wood against the outside of the can. (If you have a thermostatically controlled soldering iron, that will also work. Do not try to use a regular soldering iron – you will scorch the wood!) Wetting the wood before heating it will assist the process, as water turns to steam inside the wood, altering its structure.

A third method is to use steam. A kettle that does not automatically switch off when boiling can be used. Place the plank in the steam flow and gently bend or over-bend as required. Take care not to scald your fingers! Hold the curve a few moments until the wood has cooled.

Whichever method you use, allow the wood to dry thoroughly before adding the part to the model. For the prototype kit seen here, I used steam.

To complete the keel plank, sand it lightly where the wood grain was raised. Do not attach it yet!

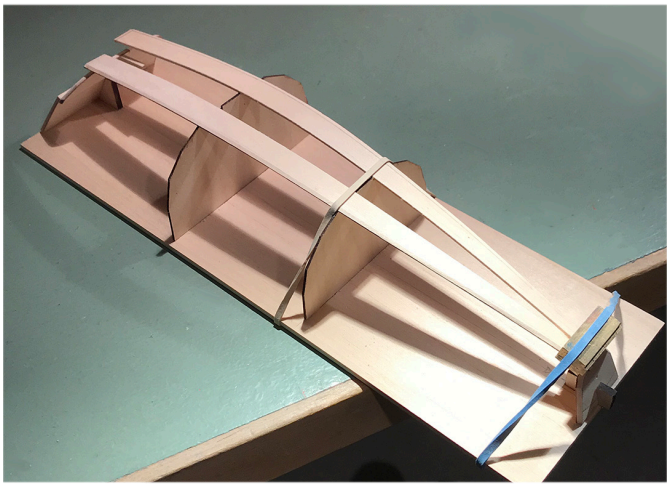
7. The bottom planks

Remove these two planks from the sheet. There are laser etched lines 1" in from the outer edges. You will need to bevel the edges to this line so that just a thin line of char is left on the far side of the edge. Sand this bevel as you did for the dory model. To gain confidence, practice on a scrap strip of wood first. When the bevel is complete, sand the char off the remaining edge (photograph at right).

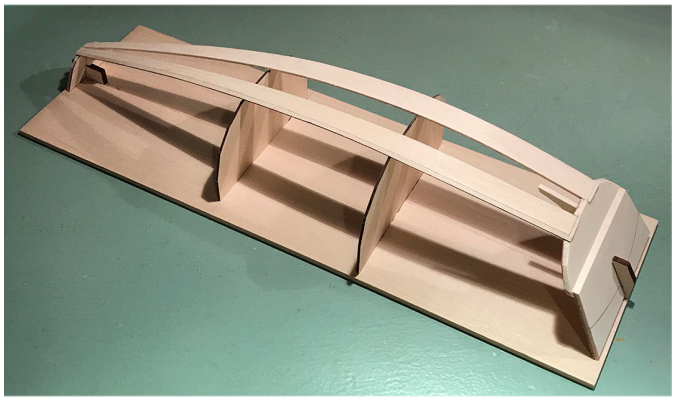
Bend these two planks as you did the keel plank and allow them to dry overnight, then sand down the raised grain on both sides of the planks.

8. Assembling the bottom of the boat

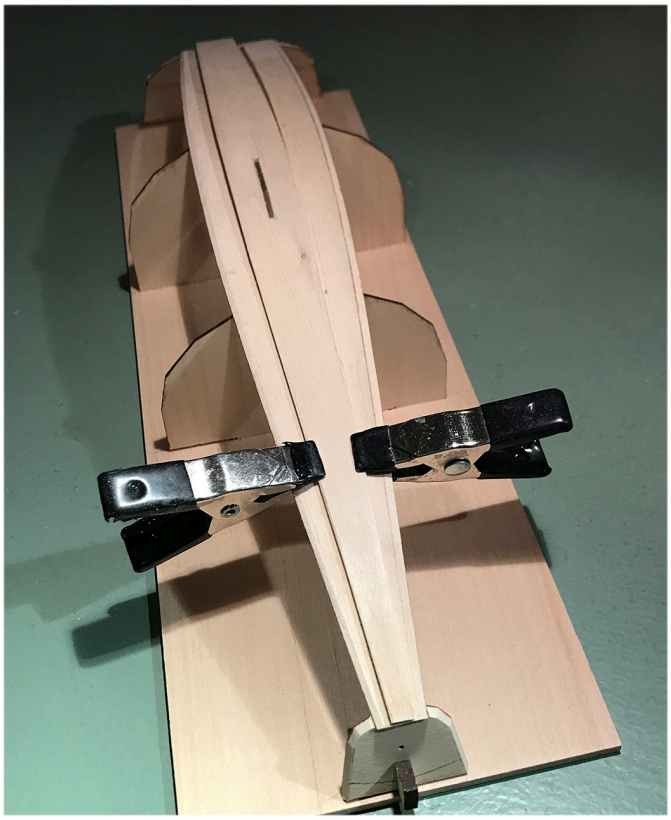
The keel and bottom planks form the flat base of the pram. It will be easier to place the bottom planks over the molds and attach them to the bow and stern transoms first. At the bow these two planks touch each other at the centerline. Glue them to the bow transom first, making sure they align properly at the centerline and sit against the side of the step of the first mold (photo below). Do *not* glue the planks to either mold! Elastic bands are helpful here to maintain position while the glue sets up. Remember to remove glue squeeze-out on both sides with a damp brush.



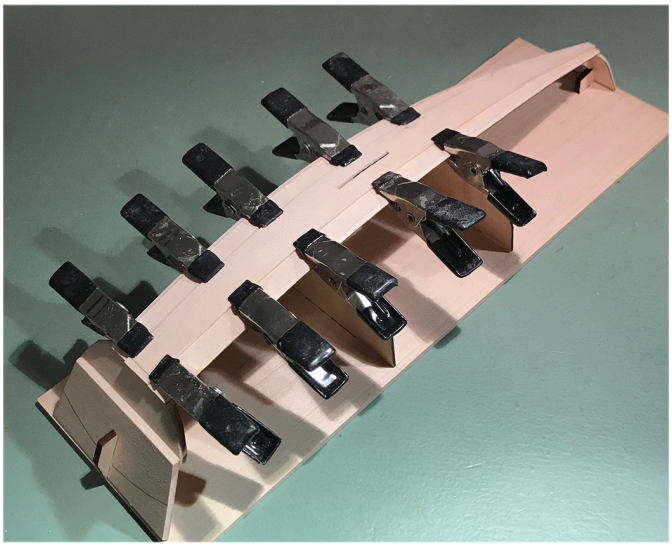
When set, repeat this exercise at the stern, making sure that the planks rest against the aft mold and the transom steps. Allow any plank overlap to occur at the stern. All planks are deliberately left a little long to allow for minor differences in building. They will be trimmed later. You may find that a plank has twisted a bit. Wet the surface and hold the plank down with elastic bands, small wedges and clamps where necessary and leave to dry. When shaped to lie without stress, glue the ends down on the stern transom.



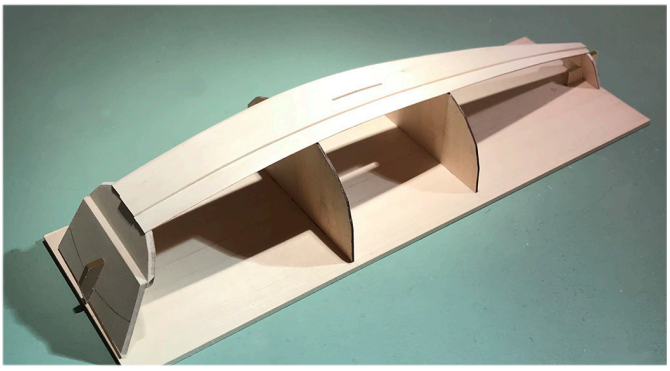
Your model should now look like the photograph above. The keel plank may now be added, gluing it along the overlaps with the bottom planks. Again, use elastic bands and small clamps. I recommend gluing down the bow end of the keel plank first as far as halfway to the first mold, making sure that it is kept centered, photograph below.



Once this has set, then glue down the rest of the plank so that the aft end is also on center (photograph top of next column).

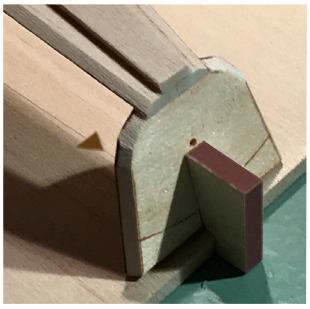


You may find that the structure tends to bow up and lift off the molds. If this happens, wet the *inner* sides of the planks using a brush and clamp or use elastic bands to hold the hull down on the molds. You may need to repeat this process a couple of times until the model conforms to the molds.



Before proceeding further, some tidying up is in order. To make installing the remaining planks easier, it is a good time to trim back the plank ends forward and aft. If there is a larger overhang at the transom, the bulk can be carefully cut away using your razor saw (photograph overleaf). Note the rubber band I used over the step in the transom to stabilize the model. Take care not to cut into the transom! The stub ends of plank may be sanded flush using a sanding stick.

The plank ends at the bow are also sanded flush to the bow transom (photograph overleaf).

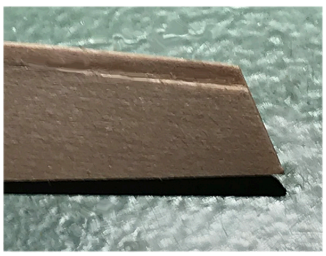


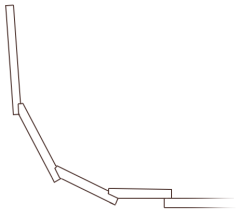
9. Garboard planks

The next pair of planks to install are the *garboards*. These are the first angled planks above the boat's bottom. A little preparation is required. Use a sanding stick to lightly refine the beveled edges of the bottom planks so that they match the angles on the molds and transoms.

Remove the garboards from the sheet and prepare their beveled edges as you did for the bottom planks. There is one more step needed before bending them. You will need to cut a small gain on the *inside* face along the *opposite* edge to the bevel. (If you remember, you cut gains on the inside of the dory planks on a rolling bevel.) However, the gains on this boat are different. Each is a sloping *rabbet*, rebate or recess, cut along the last scale foot or so at each end of the plank. This gain is a scale inch wide. You can measure this using the scale rule (page 7). Mark this distance on the edge of a paper strip, then transfer this measurement to the plank.

Carefully cut along the line with a sharp blade. Don't press too deeply! Then shave the slope using a chisel blade in your craft knife handle. Make the deep end of the rabbet no more than about ⅓ the thickness of the plank. At the transom the planks fit as shown here (below right).

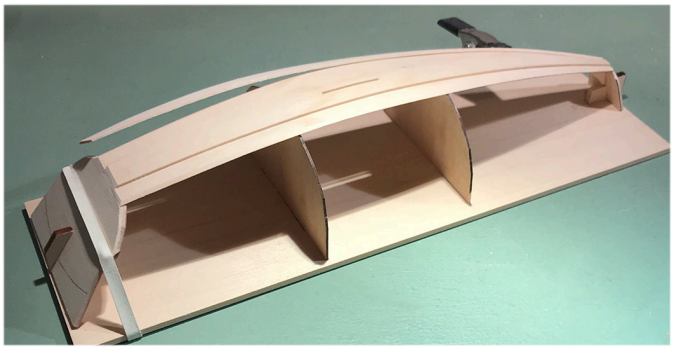




Cross-section, not to scale

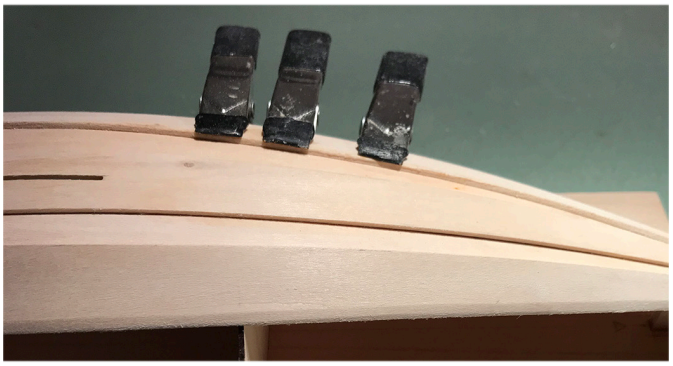
Next, bend the planks as you did for the bottom and let them dry. Watch out for any tendency for the plank to twist as you bend it and correct this.

Glue the bow end of the plank to the bow transom and along the bevel to the first mold making sure that the gain seats nicely. Use a clamp if needed (photograph below).



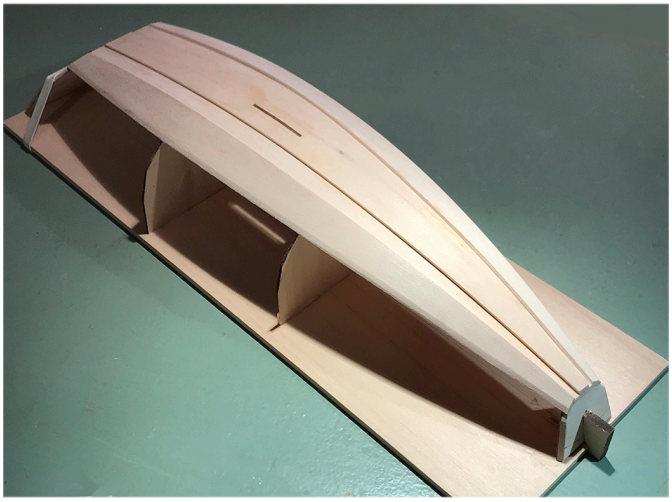
When the glue has set, continue to glue down the 'seam' between the planks to the second mold and then on to the stern transom. Check that the plank is sitting against both molds and the hull is not beginning to spread.

Sometimes there may be slight gaps along a joint. To close them, run dilute white glue into the joint, then clamp it. Wetting the planks in the area will also assist in closing any gap, as shown below. Let it dry well.



Once satisfied with the first garboard, repeat this process with the second side. Again, check that the plank is against the molds and take care of any slight gaps along the plank seam.

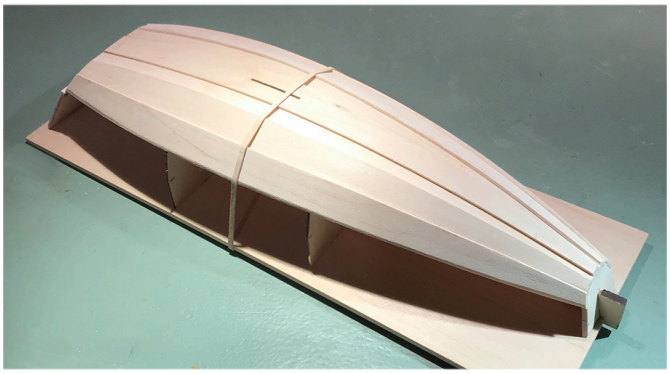
When everything is dry, trim the planks flush to the transoms and lightly sand the outer surfaces smooth. Your model should now look like the next photograph.



10. Second strake planks

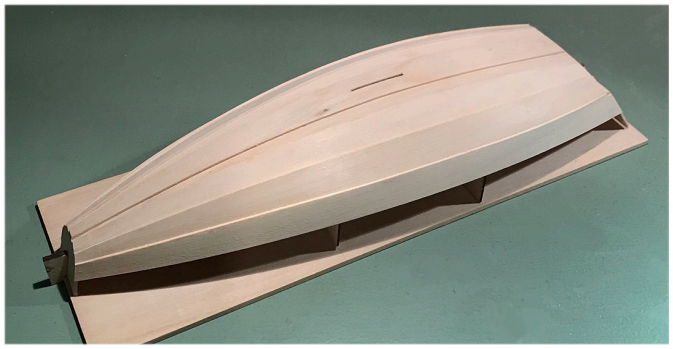
Repeat this process, remembering to cut the gains in these planks. As before, bend them, then let them dry thoroughly. Note that there is also a twist to these planks, particularly towards the ends. Apply the planks from bow to stern section by section, again making sure that the boat does not bow up from the molds. Sometimes a little ingenuity is needed to hold things in position (see below). Use your imagination!

If you need to close up any gap between the garboards and the second planks, you will need to remove the model from the building board in order to clamp the joint. Lift off the bow end first, then slide the transom out of its slot. It is surprising how rigid the shell is at this point. When satisfied that the joints are tight, return the model to the board. Make sure that the hull is all the way down on the molds (photograph top of next column).



11. Sheer planks

The process is the same as before, except that no bevel is needed along the upper edge of these planks, However, you will need to cut a gain at each end as for the other planks. Make sure that the joints are tight at bow and stern before gluing the planks in place in the same way as before. Wet the plank as you go to modify its bend as needed. Check the joints for any open gaps. If you find any, remove the model from the molds, glue and clamp as before. Trim the bow and stern ends flush with the transom and sand everything smooth.



Any small divots in the planks or gaps at bow and stern – and there will be some! – may be taken care of with a little automotive body filler well sanded down. This will be hidden by paint later. Your planking is now complete.

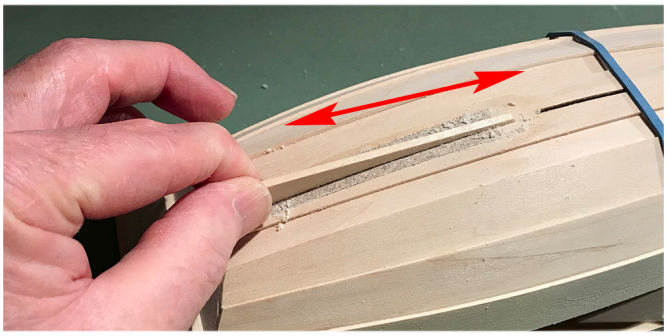
There may still be a tendency for the hull to bow away from the building board, so it is a good idea to put a 'keeper' elastic band over the middle of it for the moment.

The pram's hull has a number of angles on it where the planks meet. This is called a *multi-chine hull*. The simplest form of hull has a single angle; this is a *hard chine*. Your dory is an example of a hard chine hull.

12. Skeg

The *skeg* is a fin-like piece of wood that extends aft of the dagger board slot along the centerline of the boat. It has two functions. One is to protect the rudder and the other is to add some resistance to sideways drift of the boat when under sail. It assists the action of the dagger board, which we will deal with later on. Often the skeg is protected by a brass rub strip.

Return the hull to the building board. Release the skeg from its sheet and check whether it makes good contact with the central keel plank all the way along its length. If not, rubber cement a strip of sandpaper to the keel plank and carefully move the skeg a short way back and forth along it until the surfaces match. Gently hold down the other end with a finger of your free hand (not shown below for clarity). This is a good method for fitting curved joints.



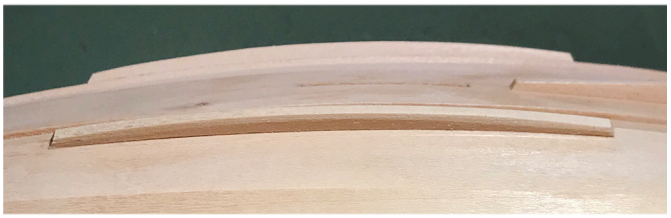
Hint: when sanding two curved parts to fit, make a few pencil marks on the surface to be fitted. When all the marks have just disappeared, the surface is ready.

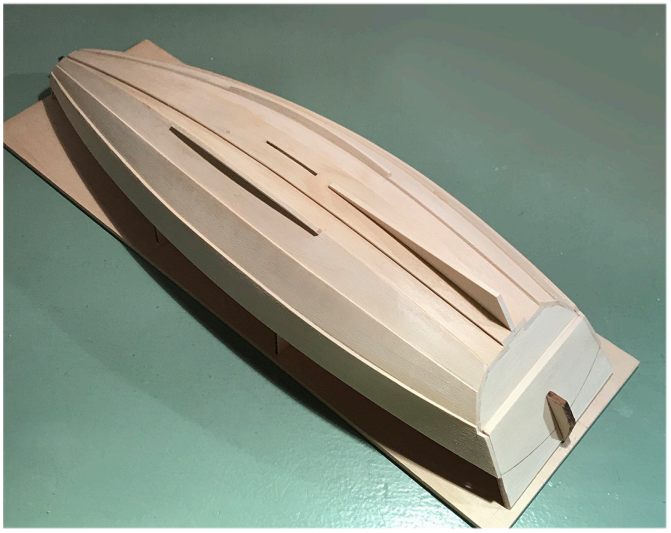
After peeling off the sandpaper strip and removing rubber cement remnants, glue the skeg on, making sure it is vertical and centered (photograph top of next column).

13. Bilge keels

Bilge keels are wooden runners that protect the bottom of a boat and keep her upright when beached. They also help the boat stay on track when rowed. Where coasts have rocky shores, brass wear strips are added to the undersides to reduce damage.

The bilge keels attach along the inboard edges of the garboard strakes in the positions indicated. Again, use the same strategy as you did for the skeg to get a good, close fit. Glue them in position as shown below. Sand the outer surfaces vertical as shown below. This completes work on the bottom of the boat.

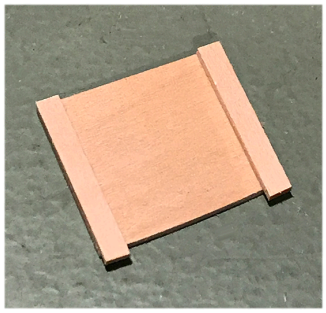


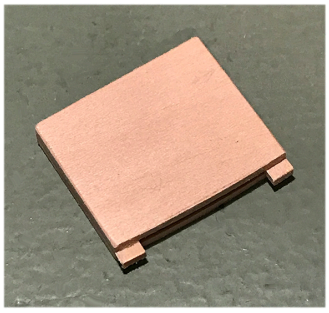


13. The dagger board case

The case is simply a box, open at the top and bottom. The *dagger board* is a sort of fin that can be lowered or raised through it as circumstances dictate. In the lowered position it reduces *leeway;* the effect of wind pushing a boat sideways when blowing from the side. The board is raised in shallow water or when beaching the boat.

Remove the two sides and end posts from the sheet. The bottom edges of the sides are slightly curved to fit the bottom of the boat. Use the sandpaper/rubber cement method to conform the bottom edges of the sides to the boat bottom. Make a light pencil mark on the outer sides to remind you which way is forward. The end posts project through the bottom of the boat.





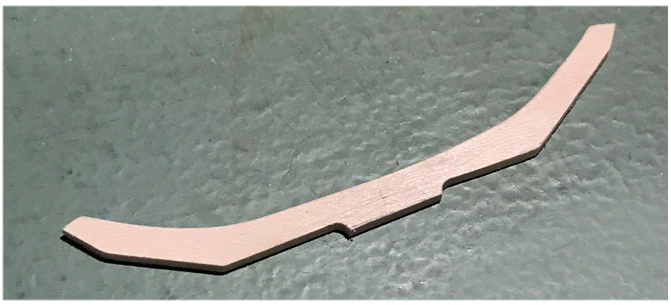
Glue the parts together, making sure to keep things square, as shown above. Sand the sides and ends of the box smooth, then bevel the top edges and corners as well as the vertical sides. Remove the hull from the building board. Glue the case into the boat, making sure that it is vertical. Finally sand the protruding posts underneath flush with the outside of the keel plank.

14. Bottom frames

There are three frames that cross the keel plank at right angles. To locate these inside the boat, use the tick strips provided **on page 4**. Cut them out. Place one end against the dagger board case end and mark out the keel plank (top of next column).

The aftermost frame, number 3, is the easiest of the three to install. Remove it from the sheet and test fit

it. It is a little over-size to allow fine tuning. Look and analyze where the frame will need reducing. Carefully, using a sanding stick, reduce the facets as needed, maintaining the angles of the frame until it is a good fit. There should neither be obvious gaps nor should the frame push the sides of the hull out. A spare frame is provided, should things go sideways.

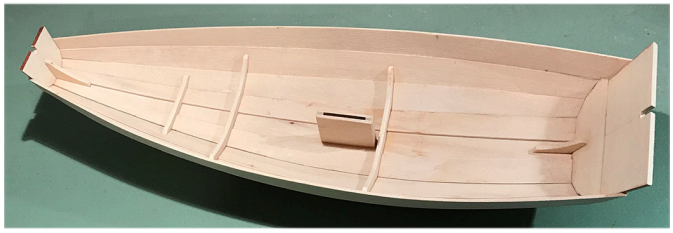


Once satisfied with the fit, take off the angles along the top surfaces and round them over slightly. Make sure that there is a gap at the junction of the keel and bottom planks to allow water inside the boat to drain down.

Check now: the distance across the widest point of the hull should be 3' 9" (3¾" actual) to the outside of plank. If it is more than about a scale inch or so wider, you will need to adjust the frame to bring things in. If you do not do this now, there will be issues in fitting thwarts later on.

Once you are satisfied all is in order, glue the frame in position, making sure it is at right angles to the keel plank.

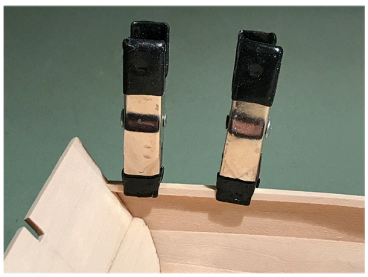
Bottom frames 1 and 2 are dealt with in the same way, but with one important difference. These need to sit *vertically* on the sloping planking. This means first carefully fitting the lower surfaces of the frame, then sanding them at suitable angles. Do this gradually until the frame sit upright on its marks. You can keep the upper surface square to its sides, or slope it as well. Either way, the edges and top need to be softened as you did for bottom frame 1.



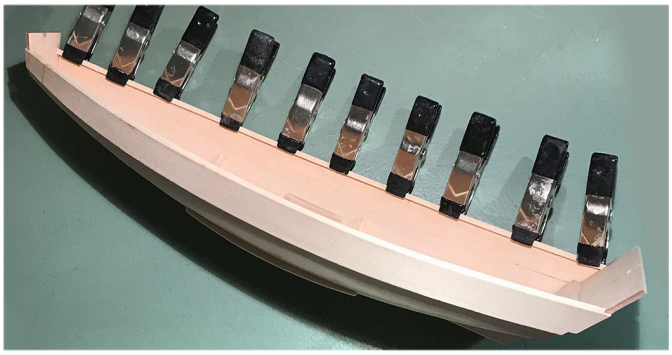
15. Inwales

Inwales are strips of square-section wood that reinforce the top edge of the sheer strake. As their name implies, they attach to the inner sides of these planks.

Take the two 3⁄32" square strips of wood and pre-bend them using one of the bending techniques previously described. Cut one end to fit against the stern transom. If there is a small gap at the lower side of the inwale, it will be hidden later. However, make sure that it contacts the transom at the upper edge. Glue in about the first inch or so of the inwale, making sure that it is absolutely level with the top edge of the sheer strake, photograph below. You could use clothes-pegs.



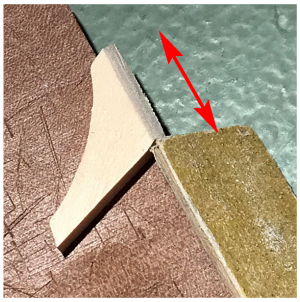
The next step is the trickiest! The forward end needs to be cut to fit snugly against the bow transom. I would first trim this level with the bow side of this transom. Get the angle about right as seen from above. Then gradually sand the end down until it slips nicely into place when the rest of the inwale is level with the sheer. If the fit is less than perfect inside the transom, don't worry. It will be hidden soon.



Now glue in the rest of the inwale, washing things well down with a wet brush. Be sure to remove any excess glue under the inwale. If you omit this, other inboard fittings will be difficult to install later. Repeat this process for the second inwale.

16. Stern quarter knees

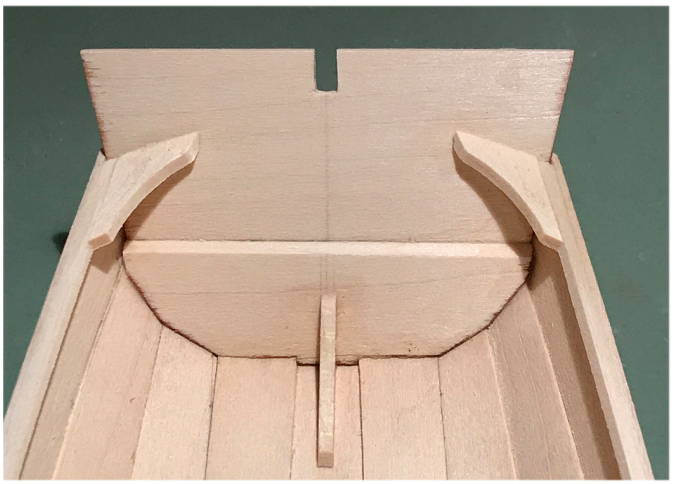
Quarter knees tie the tops of the sides and transom together and further strengthen the top of the boat. Remove the knees from the sheet and clean up their edges as usual. The *side arm* that abuts the inwale does not need any bevel. However, the *athwartships arm* that attaches to the transom will need an under bevel in order to *fay* (sit in close contact) with it. You may find that you need to adjust the angle, as seen from above, to fit your own model. Make sure that you bevel a left and right hand pair, not two of the same!



One method of cutting a bevel is to place the knee on a scrap block of wood and use your sanding stick as shown. The piece is held with your other hand (not shown here for clarity).

Helpful hint: even the best model-maker can find that a small gap appears along a joint such as this beveled one. If this is the case, mix some sawdust, a little water and white glue. Use a point such as a craft blade to

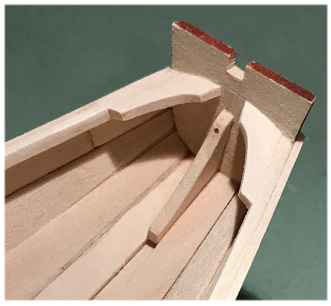
push this mix into the gap and let it dry thoroughly. Sand as needed. Try to aim for this as a last resort, not your first strategy, though!



The knees are set in at right angles to the top of the inwales, not horizontally (photograph at the top of the next page). Glue them in place. As an optional refinement, the athwartship arms on the full sized pram are thinned down a little on top. Their inner ends thin from 1¼" to about 1". A sanding stick works best here as well. Soften the edges.

17. Bow quarter knees

These have the same function at the bow as the stern quarter knees that you have just installed. According to Simon Watts, the boat's designer, the transom needs this reinforcement because of stresses placed on the bow when the boat is towed. Shape and attach these knees in the same way as you did those at the stern. Sand the knees smooth and soften the edges after gluing them in.



18. Seat and thwart frames

These are the upper framing components inside the hull that support the sides and seating arrangements. These need to be accurately placed, so take care marking them out. To do so, use the tick strips **on page 4** for this in the same way as previously shown. The five upper frames are lettered A to E from bow to stern.

Start with the frame pair marked A. Release and clean char from their edges, then check for fit. For your model, these may need some careful trimming. On such small pieces extra care is needed. Once a good fit is established, bevel the side faces of the first frame to match the curve of the side. The athwartships arm should be at right angles to the keel as seen from above and the frame vertical as seen from the side. Glue in place and repeat with the opposite side seat frame A.

Repeat this process for seat frames B, C, D and E. Frames C and D amidships should not need beveling after fitting.

At this point, your model should look like the photograph above.

19. Floor board cleats

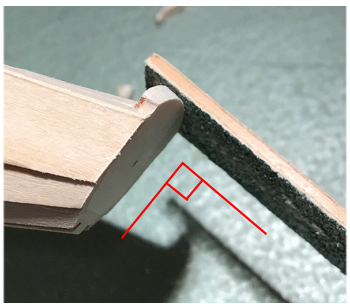
There are a number of floor boards that run cross-wise in the bottom of the boat. To support them and keep a space clear for drainage, there are several battens or *cleats* fastened fore-and-aft to the bottom planking.

These cleats need to be slightly curved. Cut them from the 3/32" x 1/8" wood strip supplied. As the pieces are quite small and short, I recommend that you place them in boiling water for about a minute. Fish them out using tweezers and mold them to shape by hand. They will require time to dry out properly. While they dry, it is a good time to trim down the transoms.

20. Completing the transoms

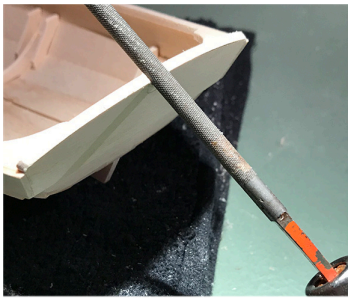
The transom pieces were designed oversize for initial construction. Their actual top outlines are marked on the pieces. These are cut at right angles to the faces of the transoms. Place the model on a towel or other soft surface to prevent damage. Remove the bulk of the waste using a razor saw, then cut and sand to the lines. Ignore the U-shaped cut-out in the stern transom for the moment.

If you view the model from the side (photograph at right), you can see if the sanding stick is at the correct angle relative to the outer face of the transom.



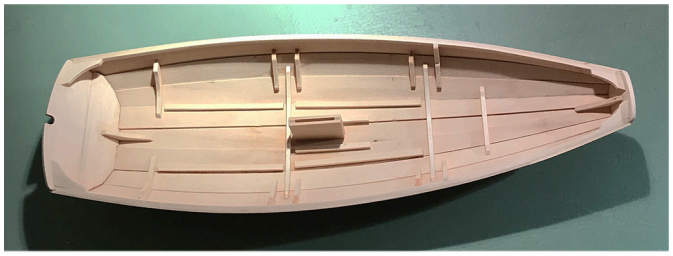
Once you have sanded down to the lines, you will see that there are small corners between the top curve and the sheer plank. Carefully round these corners off.

To deal with the U-shaped notch in the stern transom, make a 'V' notch at the top center. This will keep your file on track. If you do not have 3/8" diameter round file, buy one at your local hardware store. Carefully file down, supporting the transom with your free hand. Check frequently to make sure that your file isn't wandering to one side. Finish sand the outer faces of the transoms. Also, sand small bevels along the edges of the transoms.



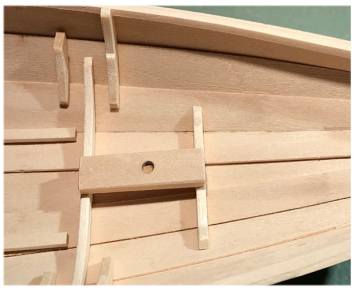
21. Installing the floor board cleats

By now these will have dried and can be installed as seen in the photograph below. These may need to be trimmed slightly to fit your own model. They should end about 1" away from the adjacent frames.



22. Mast step

If you are planning on rigging your model – and I hope you are – the mast step should be installed now. It is attached to the tops of the two forward frames on the centerline. The kit version consists of two layers. The top layer has the hole for the mast foot and the lower layer is solid for it to rest on. Glue the two layers together. Sand the sides and bevel the edges at 45°. Glue this assembly to the frames, making sure that it is central. There will be a slight overhang fore and aft. When the glue is dry, sand the fore and aft faces flush with the frames, then bevel the edges.

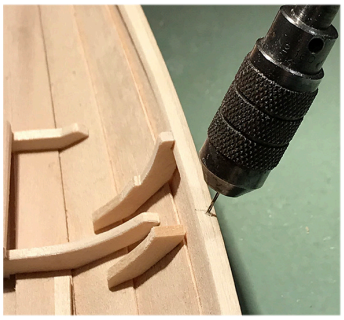


23. Chain plate slots

On each side of the hull there is a metal strap with a

hole for the mast *back stays*. These are the supporting lines or ropes running aft from the mast head. At the bow is another plate for the *fore stay,* running forward from the mast. There is already a hole in the bow transom for this.

A slot for the stay plates is needed on each side of the inwale just inboard of the sheer plank. To mark out the position of these, they should be a scale foot (or one inch) aft of the mast step hole. To make the slots, first drill a hole at the spot you have marked. Make sure that the hole will be in the inwale, not the plank! Prick a center mark for the drill. I would use a pin vise with a #72 bit. Make sure that the hole is drilled parallel to the sheer plank, not vertically (below left).

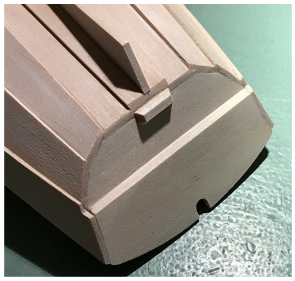


Take a #15 narrow saw blade and push the point through the hole with the saw teeth facing aft. Again, make sure that the blade is angled as was the drill. Once the blade has penetrated, gently saw the slot until it is scale 2" long (above right). Turn the saw blade around and square off the other end of the slot. Clean the slot up using a small piece of folded sandpaper. Repeat this on the opposite side.

24. Rudder gudgeon pad

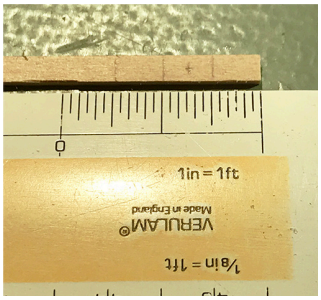
Because the transom's outer surface is jogged, not flat, a wood pad is needed for the lower *gudgeon* to be fixed to. A gudgeon is a metal fixture that is part of the hinge for the rudder to swing on. It is hollow to receive the *pintle pin*. The pintles, fixed to the rudder, are the metal pins that comprise the other part of the hinge.

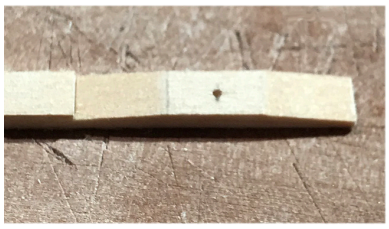
Take a length of 3⁄32" x 1⁄8" strip left over from the floorboard cleats and find the angle guide you used for the transom pieces (see page 8). Sand one edge to this angle. Next, cut off a 6" length (½" in full size). Bevel the ends and glue the piece to the lower transom (photograph at right).



25. Rowlock pads

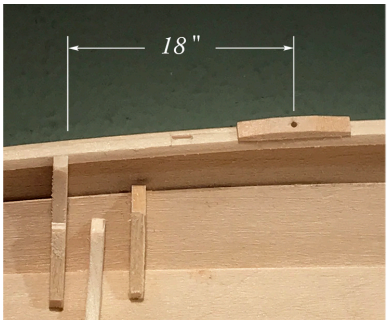
Rowlock pads are reinforcing pieces of wood necessary to take the strain of the oars while rowing. Cut these from 3⁄32" x 1⁄8" strip as well. Each is 9" long. Mark off 3" segments and bevel the two end ones down as shown. You can do this best using a sharp #17 or #18 chisel blade. Rest the end of the piece against a solid wood stop (not shown) so that you can use both hands to control the cut. For shallow cuts, use the blade bevel side down. Several fine shavings are better than trying to remove waste in a single cut.





Each pad should be marked at the center for a hole. Drill with a #55 bit. A useful optional tool to clean the hole is a *broach*. These come in a set of six. They are used to clean up and slightly enlarge drilled holes. Simply insert one of a suitable size and turn. The square hardened cross-section scrapes the hole clean. Don't push the tool hard into soft wood, though! A gentle twirl does it.

The centers of the completed pads are located 1' 6" aft (1½") of the forward thwart frames. Mark these out and glue them into position. Drill through the inwale at the angle shown to avoid drilling the sheer strake.



26. Rub rails

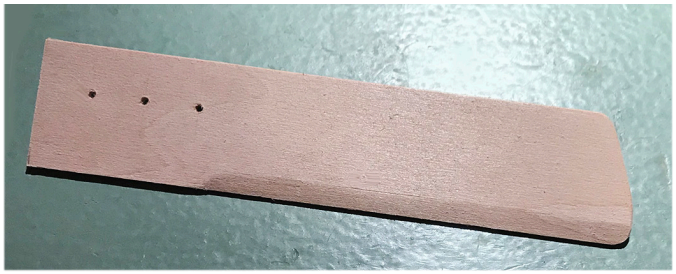
These outside rails protect the top of the boat against docks, boats and other obstacles. When used as a tender to another, larger vessel, the rail is grooved and a rope bumper inlaid. Our version has a plain rub rail along the topsides.

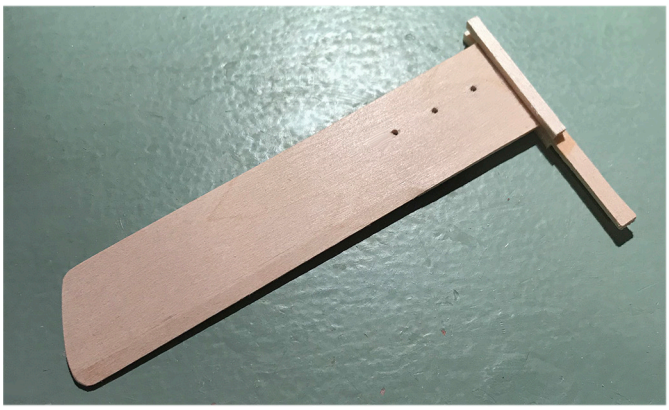
Use the two 3/64" x 1/8" strips for the rails. As these strips are so thin, steaming to shape is not needed. Glue one end down, then progressively glue and clamp the strip along the side. Make sure that the top edge is level with the sheer plank and inwale tops.

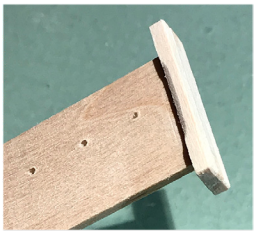
When the glue has dried and the rub rails sanded, cut off the overhanging ends, then sand them to a quarter round. Soften the edges of the rub rail and inwale, both inboard and out.

27. Dagger board

Remove the dagger board from the sheet. Test it for fit in the case. You will need to thin and narrow it a little for a *loose* sliding fit. (If tight, it will bind after painting.) The aft edges will need to be tapered as shown. Mark out the second side for the bevel and sand both sides alternately.





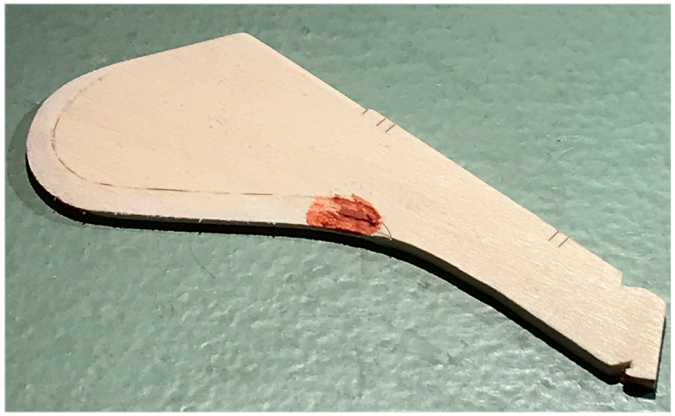


The stop at the top of the dagger board is made from 3/32" square strips. Cut two lengths the length of the dagger board case and glue them to each side of the board top. Take scrap 1/16" stock and add pieces in the spaces on either side of the board (above top). Cut these and sand them smooth. Soften all the edges and corners. File in the finger grips on the lower edges of the stop (above right).

If the dagger board *shipped*, (removed and stored) there is a lid provided to close off the top of the case. It looks exactly the same as the top of the dagger board, except it is cut off about 2" below the stops. You can make a lid up from scrap.

28. The rudder

Release the rudder from its sheet and sand the char as usual. There are several marks along its straight edge. From the lowest mark to the bottom corner this is shaped to a half-round. Press your knife blade in at 45° on the mark and on the opposite side at the same level. Nick a small piece out from the lower side of this cut. This defines the upper limit of the half-round. Shape the half round using a sanding stick. This edge can be seen on the photograph (middle of next column).



The curved line on the curved side of the rudder denotes the bevel. This is done on both sides, so you will need to mark out the reverse side. Again, shape with sanding sticks, leaving about ½" of the original contour intact along the aft edge.

The red-brown patch shown on the photo above is automotive filler where an 'oopsie' occurred. Even a model-maker with years of experience can have such moments! Of course, this will become invisible under paint.

Lastly, file shallow grooves on the edge of the rudder for the rudder *pintles* (pins) between the pairs of marks as shown here.

31. Thwarts and stern sheets

The *stern sheets* is the term used to describe the seat furthest aft. It consists of two planks separated by a small air space. It is connected by two cleats underneath. The aft plank needs to be beveled to fit tightly against the transom. Again, use your angle guide to sand this to the correct angle. The plank may need to be trimmed in width to fit nicely against the transom.

Check the fit of the forward plank as well before proceeding. Neither plank should jam against the sides.

The long edges between the stern sheet planks should be eased. In the case of the forward curved edge, a well-rounded profile is preferred. No-one wants to get splinters in a sensitive spot!

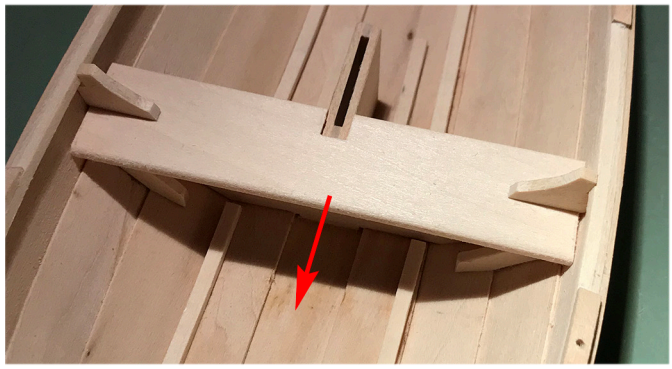
The seats and thwarts may be left in a natural wood finish, varnished or painted according to taste, before installing them. ***So do not glue these in yet!*** It is best to wait until painting the hull is complete.

The midships thwart is notched to fit around the dagger board case. Again check for fit, then round off the long edges to finish it. ***Do not install this yet either.***

The fore thwart is notched to fit over the fore upper frames and rests on the aft ones. In the actual pram, this is a removable item. Fit and shape the thwart as you did the midships one, but do not install it permanently either yet.

32. Midships thwart knees

These knees sits over the middle of the thwart. With the thwart temporarily in place, fit the knees on either side. Glue them to the sheer plank and inwale **only**, so that you can slide out the thwart, as indicated below. You will need to remove all the thwarts while you paint your model.



33. Painting the hull

Now is the time to think about painting the hull, before adding any further details. It would be difficult to paint the inside once the floor boards and thwarts are in place. You may choose any color or color combination that you wish. Some possible combinations to consider:

Inside hull:	Deckhouse Light Buff	MS4821
Outside hull:	White	MS4831
	or Warm White	MS4832

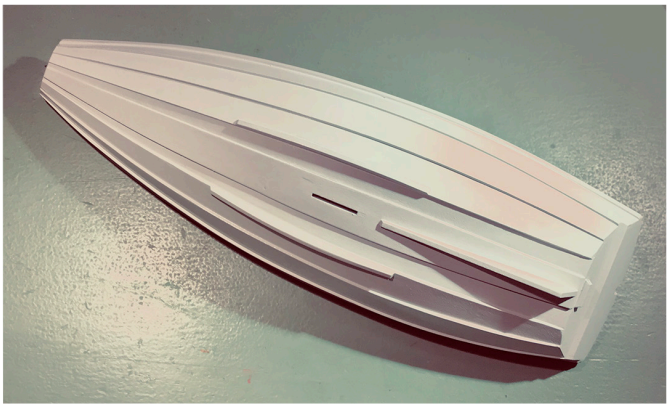
Inside hull:	Deckhouse Dark Buff	MS4816
Outside hull:	Hull Red	MS4968
	or Copper Red	MS4814

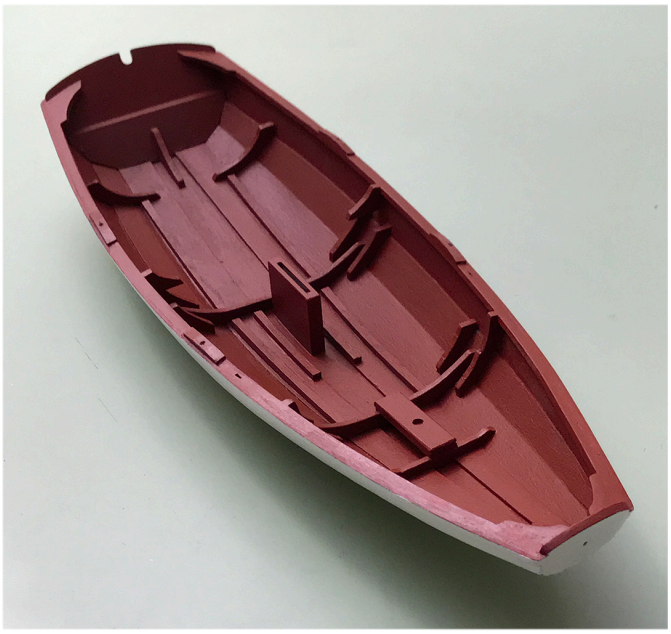
You could also use the same colors that you painted your dory model with, or go for an unpainted wood finish.

As discussed in the dory instructions, acrylic paint on basswood raises the grain. I recommend spraying a light coat of universal primer first to seal the wood, lightly sand, then use paint. Alternatively, two coats of sanding sealer, well rubbed down between, could be used.

Once you have primed the hull, any divots or defects will show clearly. Use a little automotive filler and sand down well. Re-prime those areas.

Paint the outside of the model first. When you paint the inside surfaces, take your flat brush in a wiping motion across the top of the rubbing strake from inboard to out. With this method masking off the hull is unnecessary. There are lots of crevices inboard, so check that you have painted all surfaces by looking at your model from all angles. *For further paint tips, refer back to the dory booklet of instructions.*

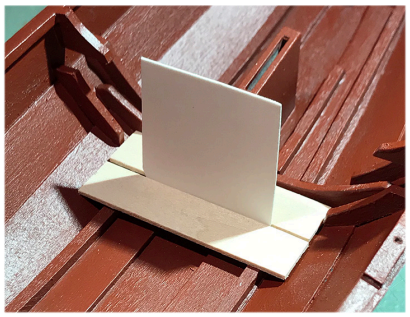




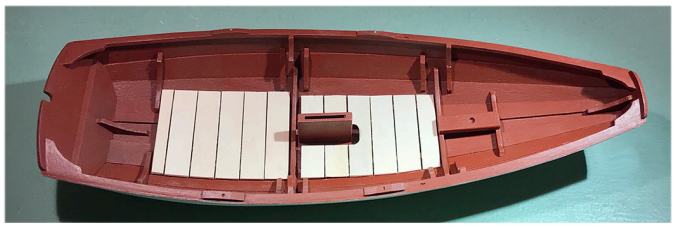
The prototype model, shown above, is Copper Red inside and Warm White outside. In addition, the outside was spray coated with a semi-gloss varnish after the paint was thoroughly dry.

34. Floor boards

These are laid crosswise over the cleats. There is a small gap for drainage between each board. A piece of card such as a business card acts as a spacer. Floor boards are usually left unfinished for a slip-free surface. Glue them in place.

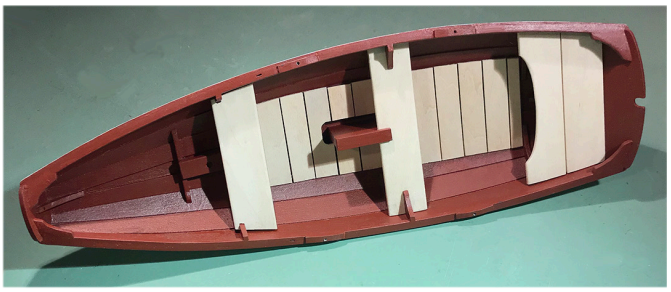


Note that the boards should be laid in order. Begin next to the midships floor frame and work aft, then forward. Note the gap left around the dagger board trunk. This allows collected bilge water to be bailed out. If necessary, trim down the width of the boards in each section so that they sit on their cleats.



34. Installing thwarts and stern sheets

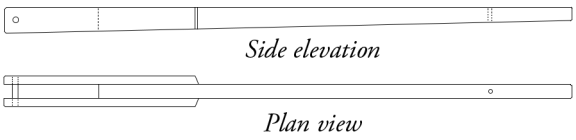
You can now glue in the two thwarts and stern sheets permanently (photograph below). Make sure that the middle thwart is seated properly and is fully home against the dagger board case.



35. The tiller assembly

The last wood items for the hull are the tiller and its extension. The tiller is in three parts. The central tiller has two side pieces attached, leaving a gap for the assembly to be slipped over the rudderhead. A bolt through these side pieces fits into the notch in the rudderhead before the tiller is slipped over it.

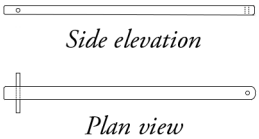
There is also an extension piece that swivels from the far end of the tiller. This extension can be swung out to increase reach if a single-handed sailor needs to sit on the gunwale amidships to counterbalance the boat in fresh conditions.



Side elevation

Plan view

Tiller assembly

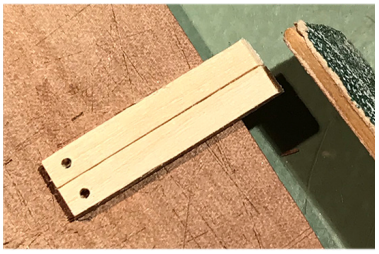


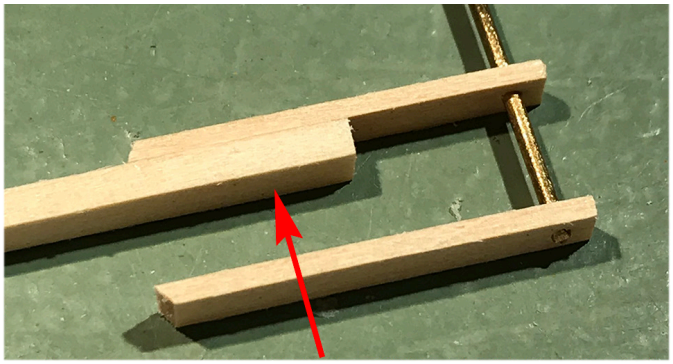
Side elevation

Plan view

Tiller extension

Release the tiller and side pieces and clean them up as usual. Before gluing them together, place the tiller on the plan above and mark then drill the hole near the far end*. Bevel the fore ends of the side pieces, as shown below to get them to match. Glue one side piece on, lining it up with the mark on the tiller. Make sure that the bolt holes are aligned using a drill bit, then glue on the other side piece.





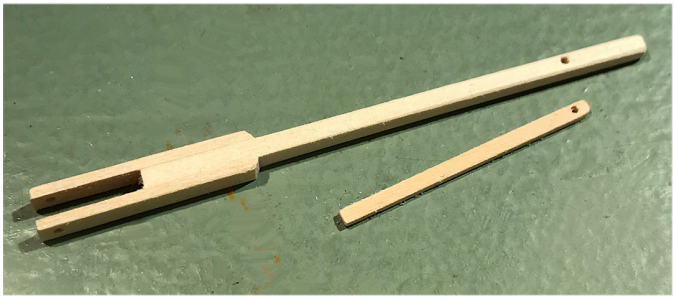
The tiller extension also needs a small hole drilled through one end as shown on the plan above. Again, place the piece on the plan to mark the correct spot to drill. Be very careful to keep the drill vertical to the surface of the wood, as this piece is quite narrow. Practice on scrap first. A spare extension piece is provided, as well. See hints for drilling small parts, overleaf.

* If you happen to have a small drill press, this is easy. However, it is not essential!

Hints for drilling small parts:

First, always spot the center of the hole using a sharp point. I also like to drill my holes a little under-size. This allows for small corrections if necessary. With a thin piece such as the tiller extension, place it on a hardwood surface so that, as the drill exits the wood, it does not splinter out. Place the piece so that you sight along its long axis. If you are slightly 'off' vertically along the length it is not as critical as coming out at an angle. I bring the hole up to size using a broach (see page 25, section 19).

Finish by softening off all edges and corners of the tiller and its extension in the usual way.

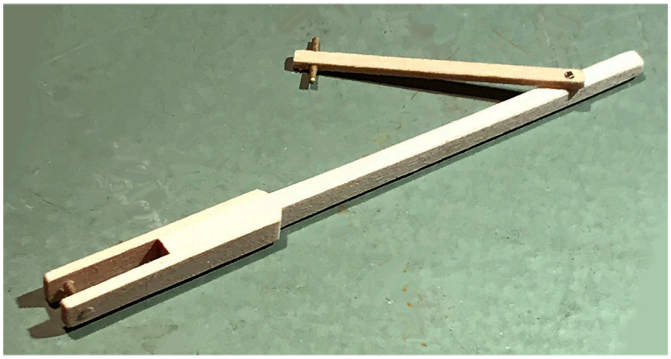


Working in metal

If you have never worked in metal before, you are probably thinking, "Uh oh." Taken step by step, and with the appropriate tools, it is not difficult. First, we will work metal cold. You will need three pieces from the supplied 1/16" diameter rod to complete the tiller. Thread the rod through the two side pieces of the tiller until one end is just protruding from the hole on the 'far' side. Take your wire-cutting snips (I use Bead-Smith flush-cutting ones) and cut the metal just above the 'near' side hole.

For the next step, you will need a small hammer and a hard metal surface. Place the tiller on its side on this surface. The pin will protrude a little. Very gently tap the top of this several times. It will begin to mushroom. Turn the assembly over and repeat on the other side. That's all there is to it! You have made your first rivet. Repeat this process to join the tiller with its extension. Make sure that some movement between the parts is possible.

The last piece of this assembly is the pin through the end of the tiller extension. This should be about 3" (¼" actual) in length. After cutting it, gently file the ends smooth.



Filing tip:

Always cut on the push stroke and lift the file off for the return stroke. It is not a saw or sandpaper! The teeth will last longer as well.

Insert the pin into its hole. To secure it, the easiest way is to take a brush with dilute glue and run it into the hole. The moisture will swell the wood a little, causing it to grip the pin, and the glue will maintain the smaller hole size.

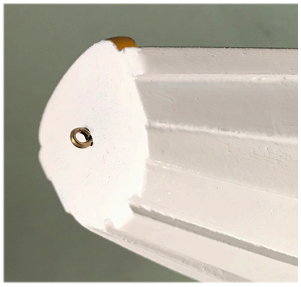
To mount the tiller, slip the forked end pin into the hook in the aft side of the rudder with the tiller held vertically. Then pivot the tiller forward and down into the notch. It is a simple and effective locking device to ship or unship the tiller as needed.

36. Metal fittings: eyebolt in the bow

There are several fittings to be prepared and added. Some of these are in photo-etched brass. However, the first item is an *eyebolt.* This is a loop of metal with a stem attached.

The eyebolt for the boat's bow has about a 1¼" (scale) outside diameter. Leave a stem on the bolt at least 4" long for now. It will be trimmed later on. This bolt is

used for the *painter:* the rope used to tie the boat up when moored.

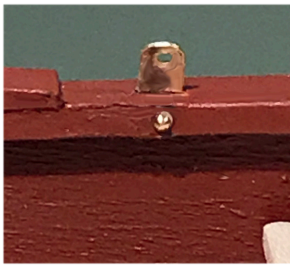


Hint: To seat eyebolts properly, use the blade of a eyeglasses screwdriver pushed into the wood a little way. The stem of the eyebolt should not be visible.

37. Stay plates

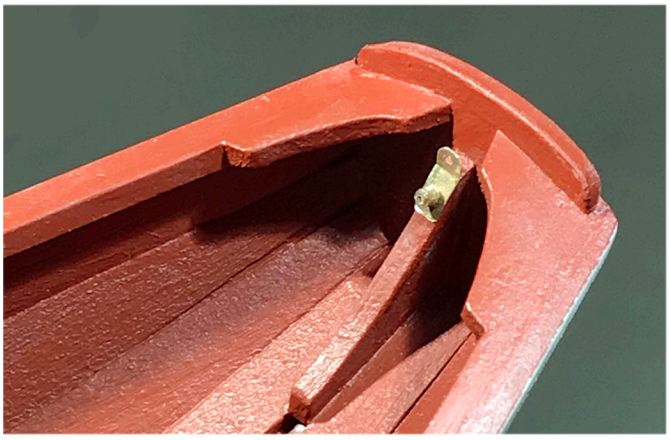
There are three *stay plates* used for securing the *fore stay* and *back stays*. They are the lines that hold the mast upright. These anchor points should be installed now.

Two plates are for the back stays, one on each side. They go through the slots in the inwale that you cut some time ago (see pages 18 and 19, item 23). Bend the plate at about a 20° angle halfway down. Bend it by holding the longer part in your parallel pliers so the bend will be at the edge of the plier jaws. Use a piece of scrap wood to bend the upper part by pushing and rotating it at the same time. The larger hole is at the top of the plate. Before fitting, make sure that this hole is large enough to pass the clips. Open the aperture using a broach if necessary.



A bolt is driven through the plate and inwale. Drill a #71 hole through the inwale below the center of the slot. If the pin too long, clip it short first. A smear of cyanoacrylate glue will ensure that the bolt does not loosen. Place the plate in place and drive the bolt home through the inwale and plate. It should 'bite' a little into the sheer plank beyond.

The third stay plate, for the fore stay, is bent at about 45°. The plate is then placed over the long stem of the eyebolt against the bow transom. Use cyanoacrylate glue to secure a short piece of brass tube, representing a hex nut, over the eyebolt stem and, when set, cut any excess stem off with your end cutters.



38. Rudder gudgeons

These are the two hardware sockets on the stern transom that the rudder fits into. They consist of a strap with a short length of tube attached at right angles.

The straps can be removed from the photoetch web. You will need to cut two short pieces of tube. First make sure that the end of the tube is straight. A few passes of a file will help, if necessary. Now cut off two pieces of tube a little longer than the strap is wide. First anneal the metal by heating it. This makes it easier to cut.

Tips for annealing brass:

Most brass is half hard or hard from processing. To soften it, heat it to cherry red and allow it to cool. It is easier to see the color of the metal in dim light. Hold the piece in a clip or vise or on a ceramic mat and use a small butane torch. Let it cool completely before handling it! Remove any oxidation using fine sandpaper or wet-and-dry abrasive emery paper.

Use your fine-toothed razor saw to cut the tube. A miter box will help make a straight cut. File the cut end of the tube smooth before cutting the second piece off.

Drill two holes in a scrap piece of 3/32" thick wood. Place the wood on a hard metal surface and put the pieces of tube, rough ends up, into the holes. Now file the tube ends down flush to the wood. If there are fragments of brass over the tubes' bores, use a broach to clear the holes.

Before you can glue the tubes to the straps it is very important that the surfaces are cleaned of any oxidation or dirt. This can be done by abrading the parts using fine wet-and-dry carbide sanding paper.. After this treatment only handle the parts with tweezers! If you accidentally touch them, repeat the cleaning.

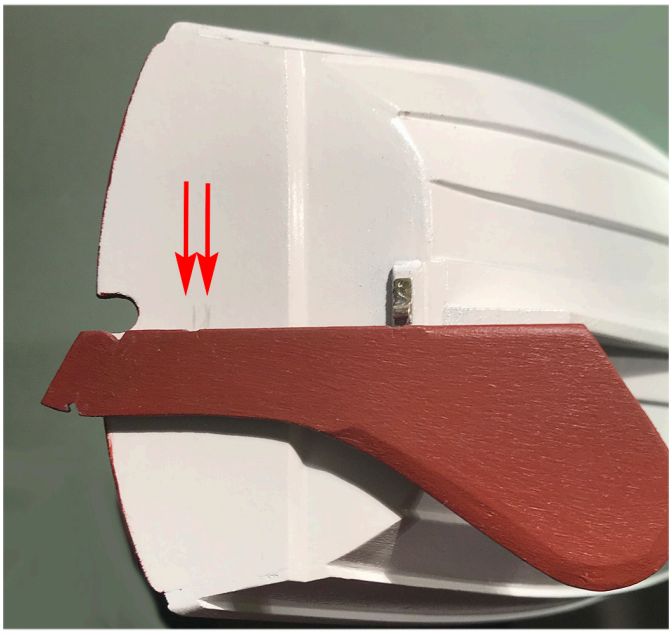
Thread the segment of tube onto the brass rod. It should slide on nicely. (Do not bother to clean the rod – you don't want to glue this!) In fact, a smear of wax will ensure it doesn't accidentally get stuck. Now place the strap on a piece of paper, in case glue gets over the edge, and place the tube segment at right angle across it. The rod should make this easy. Hold the rod down using small weights so that it cannot move. You are now ready to glue.

Put a drop of cyanoacrylate on each side of the tube. Allow this to set properly for several minutes, then clean up any excess using fine sandpaper. The end result should look like this photograph.

Attach the first gudgeon on the pad just above the skeg. I roughened the area a little, used a touch of cyanoacrylate and, when it had set, drilled the holes and drove the shortened bolts.

To locate the second gudgeon accurately, use the rudder as your guide. The photo below shows how. After you have located it, repeat the process as you just did for the lower gudgeon. Make sure that the tubes are vertically in line.

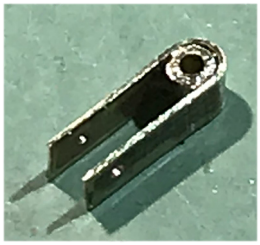
Attach the upper gudgeon on its marks. Use a dab of cyanoacrylate. Once this had set, I drilled and added the bolts as before.

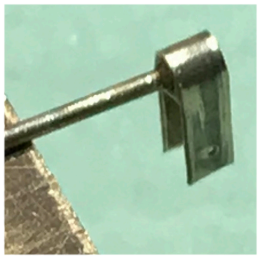


39. Pintles

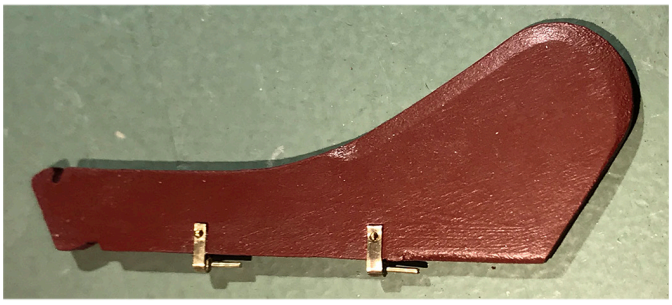
Pintles are a little tricker to make. Free and clean up the pintle straps from the photo-etched sheet. Cut two more pieces of tube and clean them up as before. Bend the strap around the tube as shown. If the two legs of the straps are not quite identical in length, it doesn't matter. No-one can see both sides of the rudder at the same time! Clean the parts as before. Fix tubes and straps using a drop of cyanoacrylate.

Clean up a piece of thin rod and cyanoacrylate glue it into one end of the tube. When set, cut the rod to length. Note that the lower pin is longer than the upper one. This is so that, when the rudder is hung, the lower pin engages first, before the upper one. The pintle lengths overall are 3/16" and 1/4" (actual) respectively.





Once the assemblies are set, they can be positioned on the rudder. Again, use a smear of cyanoacrylate for this. Carefully drill the rudder for the bolt holes. Don't go all the way through! Cut the bolts short before gluing them in place.



40. The model display stand

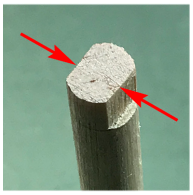
Before hanging the rudder and adding the dagger board, the stand needs to be made. A simple stand can be put together using the base pieces with two lengths of dowel, supplied. For a more sophisticated appearance, you could substitute 1/4" acrylic rod.

Release the two base cross-pieces and remove the char. The slotted piece is the aft support. Cut two lengths of 1/4" diameter dowel. One is 3 1/4" (actual) long, and the other 3 1/16" long. The shorter length will be the aft support rod.

Take the shorter length and draw a line around it 1/8" from one end. Saw a shallow cut at that line. With either a sharp chisel blade or file, cut a flat as shown.

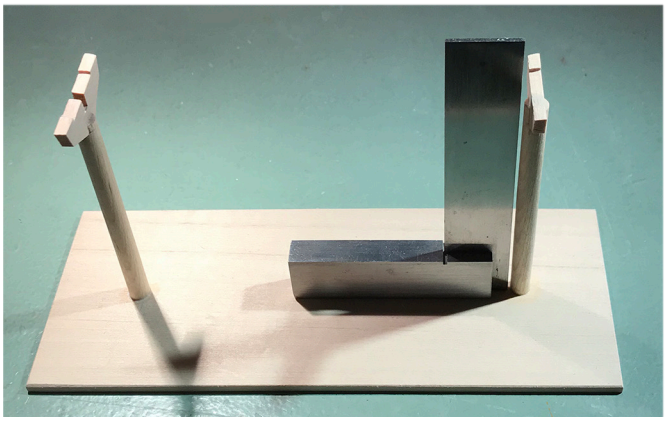
Now place the dowel, flat down, on the edge of a piece of scrap wood. Mark a line to show the upper center point. Repeat the shallow saw cut here and cut another flat. This should be parallel to the first flat. The distance across the flats should be filed to a width of 3/16".

Repeat this process with the longer dowel, but this time make the flats 3/16" long. Once the cross-pieces are a nice snug fit on their posts, glue them together.



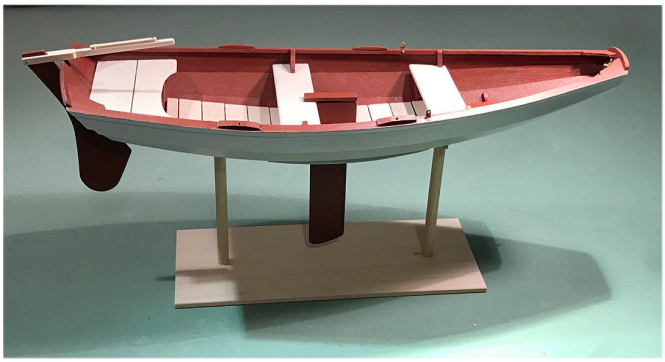
Once set, the cross-pieces can be beveled to fit the bottom of the hull. Use either a sanding stick or a file. Bevel the edges of the baseboard. Leave the base in natural wood, varnish or paint it according to taste.

Assemble the rods on the baseboard, making sure that both supports are vertical, both as seen from the side as well as end-on (photograph below). Also make sure that they are glued in with the bevels facing in the correct direction.



41. Final hull assembly

Glue the model hull on the support crosspieces. Slide in the dagger board (you may need to sand the slot a little wider) and carefully hang the rudder. Add the tiller, and you are ready to begin the spars and rigging!



42. The mast

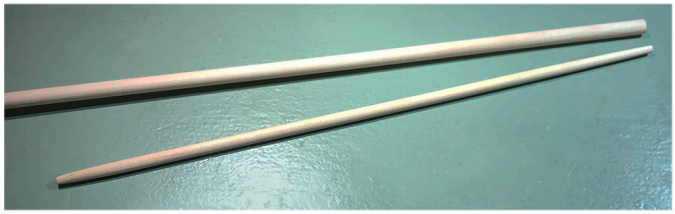
There are two methods of making masts and spars for models. One is to simply shape a length of dowel. The other is to shape the spar from a square-section length of wood, just like a real boat-builder. You will have the opportunity to try both methods.

The first method is one most model kit makers present. Try both methods and see which works better for you. Take a ¼" diameter length of dowel and cut off a 10" (actual) length. Mark off a 1" actual length for the lower end and 3⅛" at the upper end. These delineate the tapered parts of the mast. ***Refer to the spar plans on page 5.***

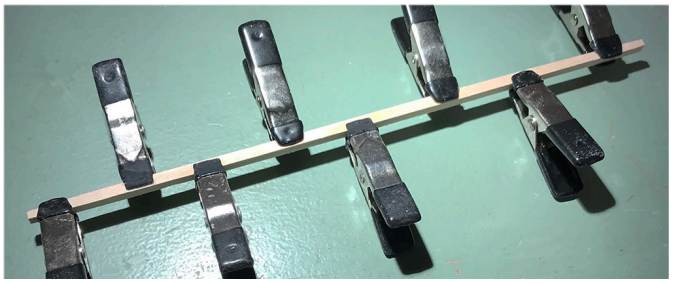
Shave off the bulk of the waste using a chisel blade. You may find that the blade digs in if you encounter grain going the wrong way. Reverse the direction of cut if this happens. Keep rotating the mast every few shavings to keep the taper more or less even.

With the rough shaping done, put the mast in your vise and, with 100-grit sandpaper strips, round off all the edges as you did for the dory's oars. However, you are still not done! The main length of the spar needs to be reduced in diameter as well. Again, use sandpaper. When the rough shaping is complete, refine it with 150-grit paper until it matches the drawing on page 5. Nothing looks worse on a model than 'fat' or over-scale masts and spars.

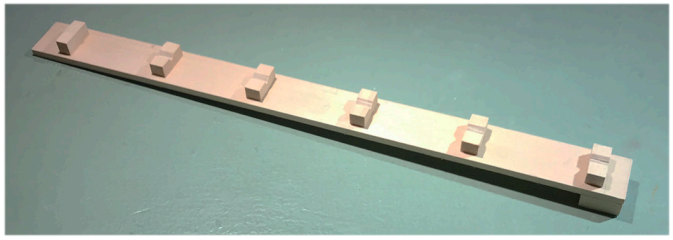
Note the difference (photograph below) in thickness between the original dowel and the mast when shaped. Even though I'm experienced, it still took me over two hours to shape the mast by this method. And it was extremely dusty work. There are other disadvantages as well, as you will soon see.



The second method, which I far prefer, is to begin with *square* section wood. Remove the mast halves from the sheet and glue them back to back. Use as many clamps as you can along the assembly. Any tendency to warp will be canceled by the way the pieces are oriented.



While this is drying, assemble the spar shaping jig so that it resembles the photograph below. The bench hook piece goes on the underside at the opposite end to the end block.

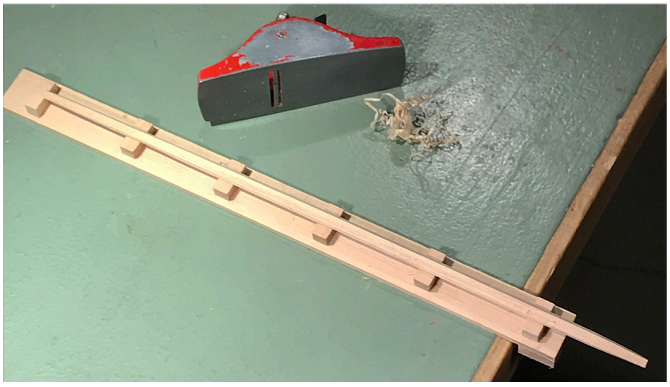


Once the mast is dry, there are four holes to be drilled. One hole has already been laser cut, but the halves may not be perfectly aligned, so drill it out using a #70 bit.

The other holes need to be drilled at right angles to the first, so rotate the spar 90°. Drill the first pair of holes, near the top of the mast, using a #60 bit, 5/16" and 3/8" (actual) below the top. The other holes are drilled 1⅝" and 1¾" above the bottom of the mast using a #70 bit. This is much easier to do while the spar is square rather than round.

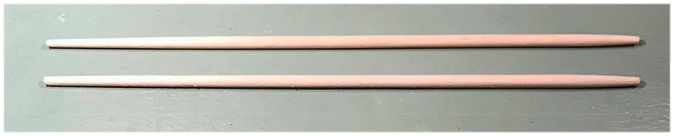
Taper the top and bottom of the mast to match the sides that are already tapered. Place the mast on the shaping jig. It will sit at 45° in the grooves and should snug up against the stop. Now shave the uppermost surface, keeping your tool edge horizontal, down to the laser etched line. Either use a miniature plane if you have one, or use a chisel blade, bevel down. Reverse direction of cut if grain is an issue.

Repeat this process to bevel off the other three corners. From there, put the octagonal mast in your vise and sand off the corners as before.



I think you will agree that this method – used by professional spar-makers – is much quicker and easier than tapering dowel. It took me less than 20 minutes to shape the mast using this method. Both versions of the mast are shown at the top of the next column.

Professional spar-makers call the stages in shaping a mast or spar foursquare, then eight-square and, for full-sized work, sixteen square. It is then smoothed off.



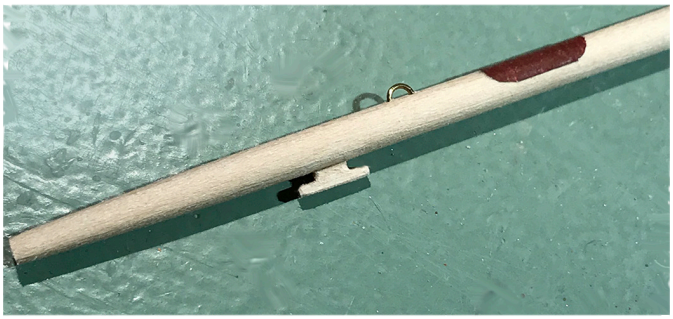
If you are using the dowel mast, drill the five holes described in the previous column. It will not be easy on a round stick to ensure that the holes are at right angles to each other and on center.

43. Mast fittings

There are several fittings needed for the mast to complete it. The *eye for the downhaul* is first. The downhaul line will *reeve* (pass) through this later. Bend a length of brass wire into a half-hoop using round-nose pliers, cut it so that it has two short legs, then glue it into the holes that you drilled earlier.

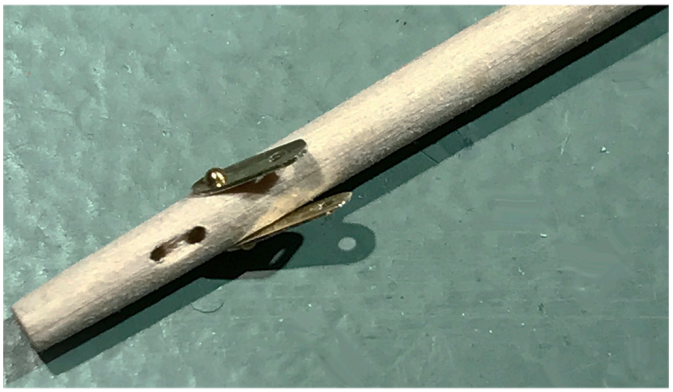
Next is a *chafing pad*, so that the boom does not wear the mast. In the actual boat this is of copper sheet nailed on. For the model, I used paper painted red-brown. The pad is a scale 6" high and 5" wide with rounded corners. Glue it on the same side of the mast as the downhaul eye.

The next fitting is a T-shaped *cleat.* This secures the downhaul line. Free this from the sheet and clean off the char. Wrap a piece of sandpaper round the mast and sand a concavity into the cleat's base to match the mast. Glue the cleat (refer to the plan, page 5) on the side opposite to the chafing pad. Once glued, gently sand off all the edges and corners, as seen in the photograph below.



There are more fittings at the top of the mast. The first is the *fore stay cleat.* It prevents the stay from slipping down. Mark the point at which it is attached from the plan on page 5. Remove the cleat from the sheet, clean it up and sand the concavity into it as you did for the other cleat. Glue it to the aft side of the mast. With the two-part mast it is easy to see the mid-line along the glue joint.

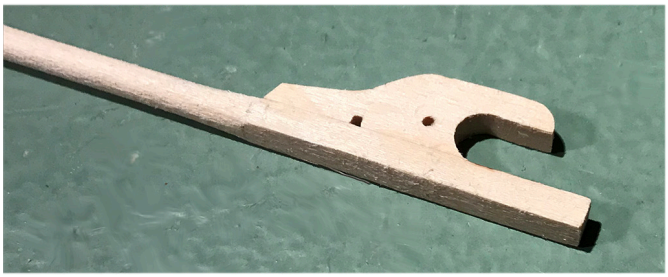
Further up the mast is a *halyard sheave*. This is used for hoisting the sail. The sheave is in a slot cut through the mast. You have already bored two holes fore and aft. To imitate a sheave, take a point such as an awl, and press it in diagonally on each side between the two holes (photo below). Don't overdo it, or you may split the wood.



The last items are a pair of straps for the back stays. Carefully remove them from the photo-etched sheet. These are attached to the mast head using brass bolts. Cut the bolts quite short so that one does not push the other out, and attach them using a smear of cyanoacrylate for security. This completes work on the mast.

43. The boom

The lower spar that the sail attaches to is called the *boom*. On the inner end is an extra piece that forms the boom jaw. The spar needs to be rounded, except for the inner 1⅛" (actual), where this *goose-neck* is attached, see the photograph at the top of the next column.



Hints: The boom is too small to mark out for the octagon, so just shave the four corners off the spar on your spar jig. Remember *not* to do this on the inner 1⅛". When rounding the spar using 100-grit sandpaper, go at it with some delicacy. You don't want to take off too much material or snap the spar.

When the boom is shaped, glue on the goose-neck. Make sure it is attached to the correct face of the spar! Once the goose-neck is attached, round off the spar as shown below.

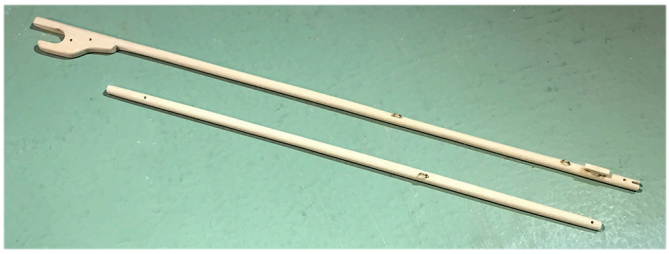
Bend up two half-hoops for the eyes needed for the *main sheet* and the cleat for the *outhaul* (both to be described later). Add these to the underside of the boom as illustrated on page 5.

44. The gaff

The *gaff* is the upper spar that the sail is set on. It is shaped in the same way as the other spars. Remember to subtly taper both ends. The only fitting is the eye for the *halyard;* the line that hoists and keep the spar up. This completes the spars for the pram.

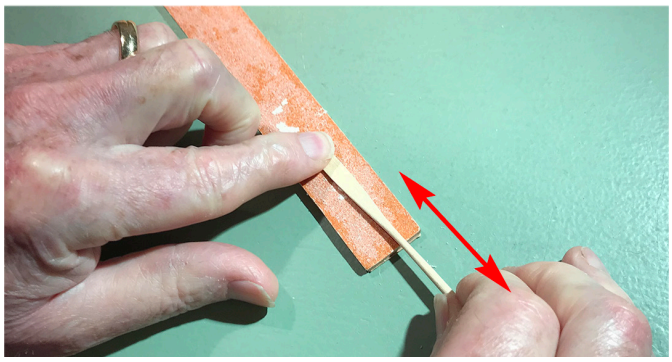
Usually boats' spars are varnished. You may leave the mast and spars plain, or use a semi-gloss varnish on

them. If planning to use a clear finish, I recommend that you test it out on scrap wood first.



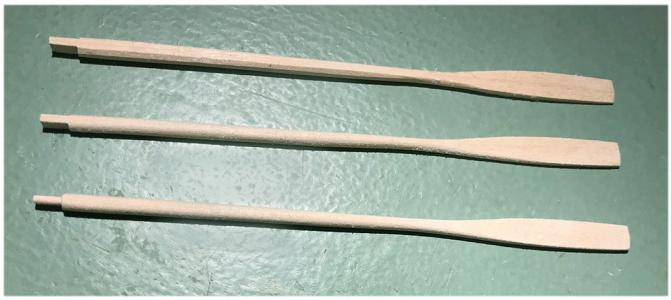
45. Oars

While five oars have been supplied (one is extra for practicing on), only two oars are really necessary. The process for shaping them is similar to that for the dory. After removing char, thin the blade of the oar from the tapered portion of the body so it looks like the photograph. You can either whittle, then sand or simply sand the oar down as shown. Hold the oar at a slight angle, apply light pressure with your finger and sand as shown below, alternating sides.



The handle, *loom* (inboard section) and *body* (outboard part down to the blade) are all round in cross section. Using a sharp blade, shave off each corner at about 45°, top example in the photograph top of the next column. You can use your spar jig for this.

Clamp the oar while shaping it. Do this a section at a time so that there is not too great a length protruding from the vise. Turn it a quarter turn to keep the



rounding off even on all sides. Use a small strip of 150 grit sandpaper to round off the body and loom. Be methodical and careful. The oar should now look like the middle example above.

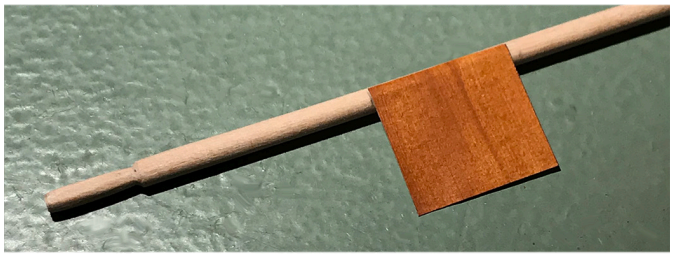
Cut the two sides of the handle down to a square cross-section, shave the corners off, then round the handle *very* gently and carefully using a sanding stick. You don't want to break it off! Round off the corners of the blade a little to complete the oar. Your oar should now look like the lowest example shown above.

46. Leathering

These oars have wear strips of leather nailed around them where they worked against the oar locks. You can imitate this using a ¾" wide strip of paper, painted brown. Raw sienna paint imitates tanned leather nicely. Leather is wrapped around the oar as indicated on the plan, page 5. Pre-paint the paper.

Using white glue, stick one edge of the paper to the oar like a flag (photograph on next page). Let it dry. Then, on a surface that you can roll the oar over, paint on slightly diluted glue and roll the paper up, rather like you would a carpet. After a complete turn around the oar, slice off the excess parallel to the oar and glue it down securely.

A thick band of leather is also added around the inboard end of the wrap. This prevents the oar slipping overboard, should one lose one's grip. Cut a strip of paper a little over 1/16" wide and about 5" long. Treat this in the same way as described above, gluing and rolling about half an inch at a time. Make sure that



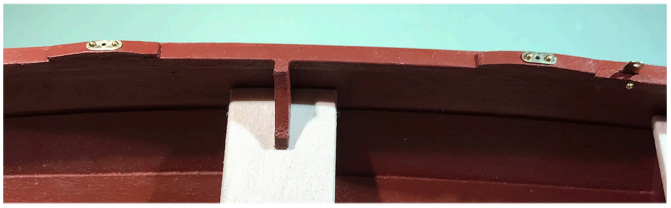
the paper strip spools on directly over the top of each previous turn. After about 4" has been rolled, cut the excess off with a chisel blade and glue the end down. Paint the edges to complete the work. If a little paint get on the oar itself, let it dry. A sharp blade will scrape it off.

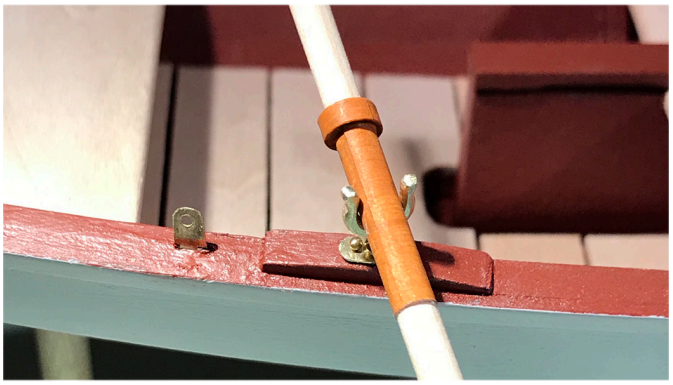
47. Oar blade tip protection

The oar tips are easily damaged, so are protected by copper or tin reinforcements. Also, end grain soaks up water if not sealed and will cause rot. Reinforcements may be painted on; brown for copper or light gray for tin. This completes the oars.

48. Oarlocks

These consist of the plates and the twin-horned locks themselves. Remove the plates from the photo-etch sheet. Check that the stems of the oarlocks can pass through them. A smear of cyanoacrylate will position them on the oar-lock pads. After the glue sets, drill through with a #71 bit and pin them to the pads. Again, the bolt shafts may need shortening to prevent them breaking through. Clean up the oarlocks if needed and insert them into their sockets.





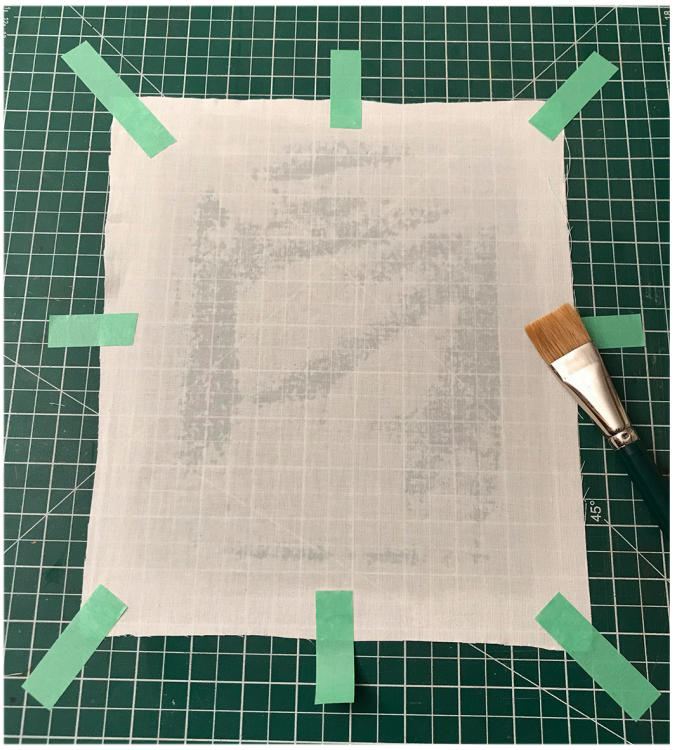
Now it's time to make the sail for your model! At scale sizes there is no need to sew fabric. I will teach you how to deal with fabric is other, easier ways.

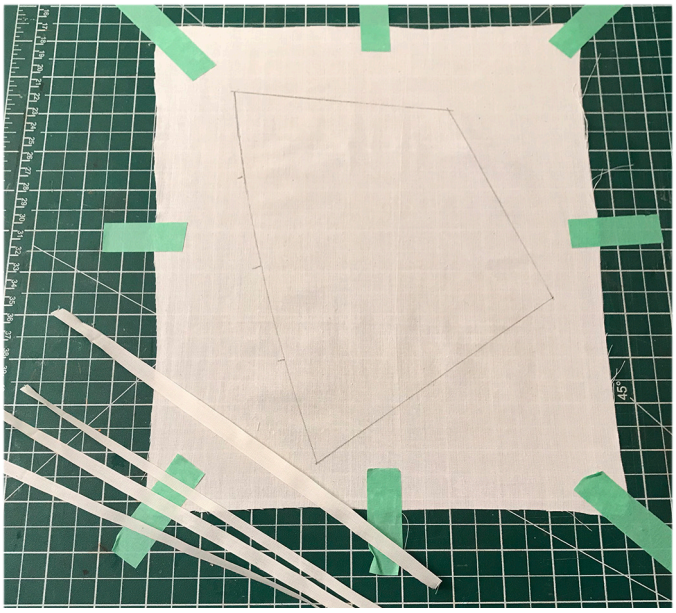
48. Making the lug sail

There is more to a sail than just a piece of material. Cut a piece of sailcloth about 8" x 12" and place it on a non-stick surface such as your cutting mat. Make sure that the mat is clean. Stretch the fabric out using pieces of masking tape as follows: Stick pieces on the center of two opposite sides, then on the centers of opposite ends. Finally stick pieces diagonally in all four corners, pulling very slightly (photograph next page).

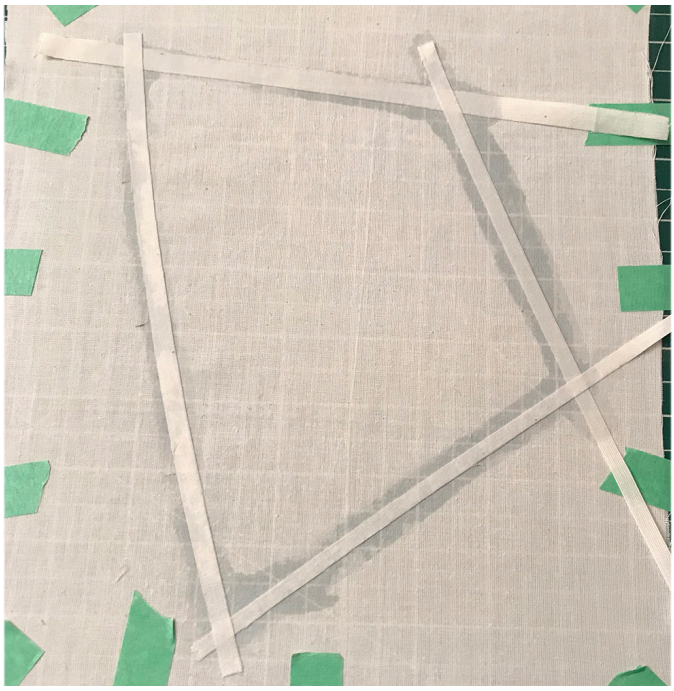
Dilute some white glue to about the consistency of cream and paint the material with it. Allow this to dry. The mixture will stiffen the material, flatten it and prevent fraying when it is cut. While this is drying, stretch and glue another piece of cloth about, 12" x 3", in the same way.

When the cloth has completely dried, mark the sail out using a soft pencil (photo on next page). The pattern is provided on page 39. Note the direction of the cloth weave.

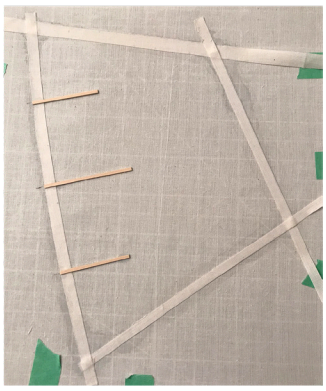


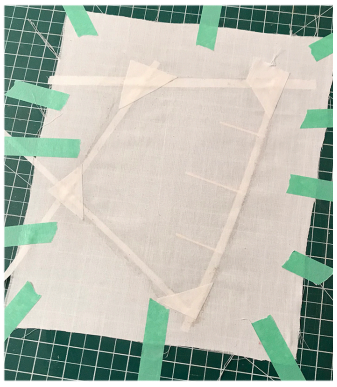


Cut strips of cloth from the smaller piece using a sharp knife and straightedge. You will need one strip ⅜" wide and three ¼" wide (actual). Using somewhat diluted white glue to a heavy cream consistency, glue the wide strip along the *head* (top) of the sail. Glue the other three strips along the inside of the other edges. The strip along the *leech* can be bent to shape. Make sure that the material is saturated with glue. It will look ugly while wet, but will look much better when dry (photograph below)!



There are three stiffening *sail battens*. Cut these from the supplied 1/32" x 1/16" strip basswood and glue these on at right angles to the leech of the sail. (The curve along this is called the *roach*.) Dampen the side of the wood opposite the glue so that the wood does not warp upward. Allow the sail to dry thoroughly (photograph below left).

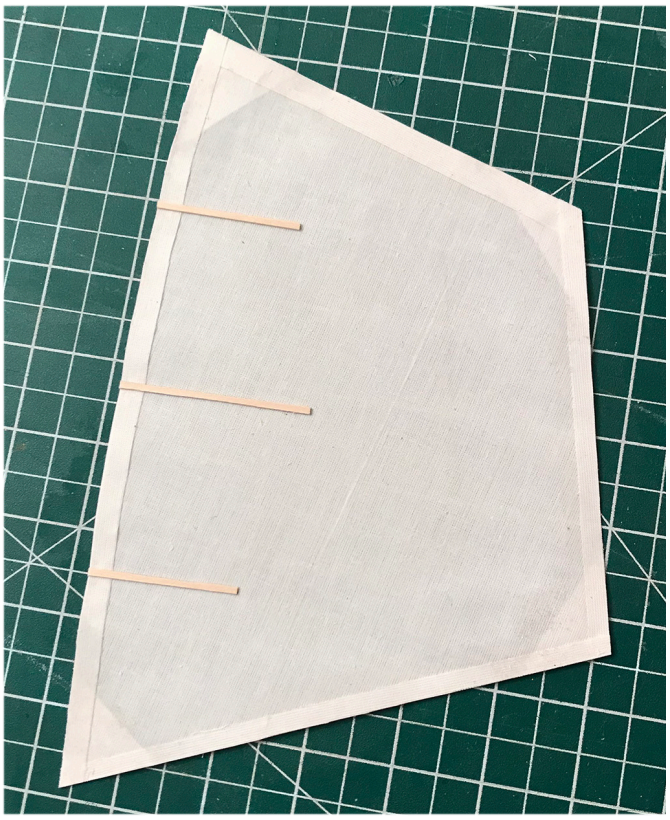




When completely dry, carefully take off the masking tape and peel the sail off the cutting mat. Re-tape it, other side up, to the mat. Now cut four reinforcing

triangles of material and glue them down to the four corners of the sail (photograph previous page). Again, allow to dry thoroughly.

When dry, carefully cut the sail out using a very sharp blade and straight-edge. Alternatively, peel the sail off the cutting mat again and use sharp scissors. Trim the angled corners off slightly.



There are a number of holes to be made in the edges of the sail. The small ones along the head of the sail are for the *lacing*. This is the line that attaches the sail to the gaff. Dots of paint here will further reinforce the holes. I used Deck Light Buff. As the material is now stiff, it can be drilled. Use a #60 bit for these holes. Each of the four corners also have holes. Make these a little larger using a #55 drill. This completes the sail.

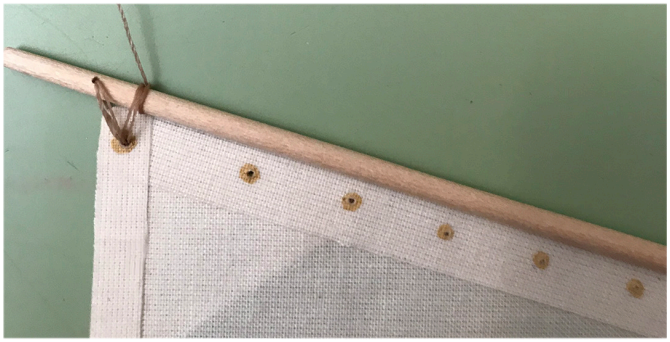
49. Lashing the sail

Lashings are needed to tie the upper corners of the sail to the gaff. There are different ways to do this. Use the 0.3 mm line supplied. The simplest way is as follows:

Pass one end of an 8" length of line through the hole on the peak corner of the sail. Make two half hitches and dab on dilute white glue to set this. Take a smear of white glue and roll it into the other end between your fingers to stiffen it. Once the glue is dry, trim any line past the knot off. Thread the other end of the line through the hole in the outer end of the gaff from above. (The brass halliard eye is on top.) Make sure that this eye is closer to the *luff* end of the sail before continuing. Pass the thread loosely two or three times through the peak corner hole of the sail and gaff.

Tie off at the inner *throat* end of the gaff and sail corner in the same way. Gradually tighten the threads so that the sail hangs equally in from both ends of the gaff, then tie off the ends, glue them and trim.

A more shipshape method is to pass two turns as before, then two more turns as shown in the photograph.

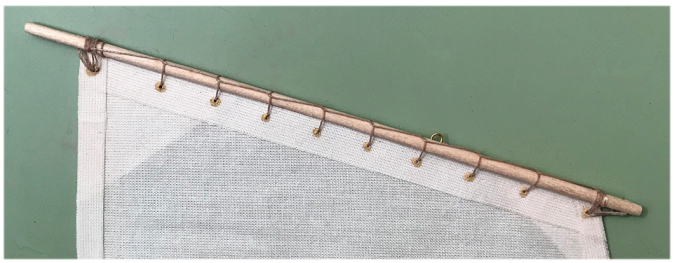


49. Lacing

Use at least a 12" length of 0.3 mm line for the lacing. Begin by taking two half-hitches around the gaff at the peak end of the spar beyond the lashing that is already in place. Glue these down. Stiffen the far end of the line for threading, as before. Loop the line through the first hole in the sail, hitch it around itself and so on.

When you reach the luff end, finish off with two more half-hitches around the other lashing.

When using nylon line, wetting it will help tame it. Also use dilute white glue on it once everything is snugged up. Alternatively, buy a reel of cotton thread. This may be easier to work with. Again, a little water on the line is your friend.



50. Gaff halyard

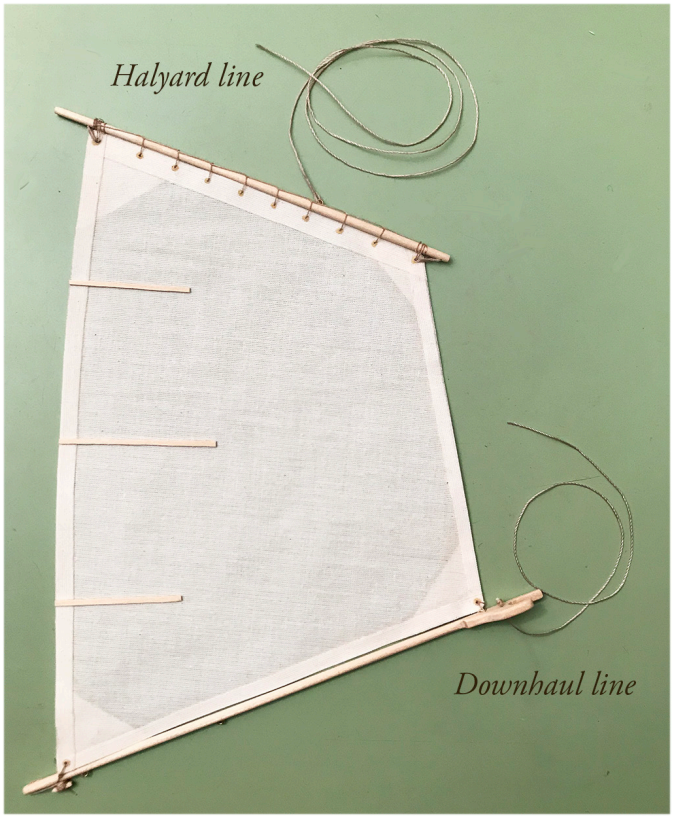
A *halyard* is literally the "haul yard". This is the line that raises the gaff. It attaches to the loop on the gaff. Use about 24" (actual) of 0.5 mm line for this. Pass one end of the line through the gaff loop and secure it with a couple of half-hitches fixed with dilute white glue (photo at right).

51. Downhaul line

The *downhaul* keeps the inner end of the boom from rising up the mast. Using 0.5 mm line, make a knot in one end large enough to stop it from slipping through the hole nearest to the goose-neck jaws. Stiffen the other end to thread the line through from above. Glue the knotted end to the top of the goose-neck. Leave the other end long for now.

52. Tack and clew (outhaul) lashings

The lower corners of the sails now need to be attached to the boom. First attach lengths of 0.3 mm line to the lower corners of the sail as you did for the upper ones. First attach the *tack* line. This is at the inner corner of the sail near the mast. Pass the line through the hole between the goose-neck and boom from above to below. Pass the line around the boom and through the eye in the sail twice, then tie off with a couple of half-hitches, making sure that the sail is snug to the top of the boom (photograph below).



The *clew* or *outhaul* line (from the outer, lower corner of the sail) is attached to the sail. It is then taken several times around the cleat on the boom in a figure eight pattern and half hitched. This tightens the foot of the sail. You will need to use dilute white glue after each turn to 'fix' it (photograph above).

53. Traveler

This line, with a movable block on it, helps control the boom. The *sheet block* needs to be prepared first.

Optional: The block supplied with the kit can be improved if you wish. It can be shortened and rounded off. The profile should be more oval and the groove in

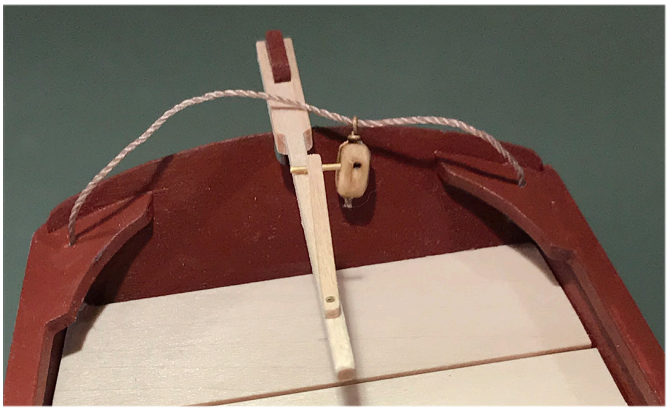
each end deepened. The photograph below will give you the idea. Reshape the end away from the hole using a chisel-edge blade, sanding stick and files. Finish the block with either stain or a little wax.

Take a length of soft copper wire. Shape a loop in it, as in the photograph. Pass the two ends around the block and twist them tight. Trim off the excess wire.

The traveler line is of heavier rope. Thread a length of 0.7 mm line down through one hole in the stern transom knee on one side. Tie a knot in the end so that it will not pull through. Thread the other end through the loop in the block *before* taking the line down through the hole on the other side! Knot it so that there is a some slack in the line. When taut, it should easily clear the tiller. Cut off excess line below the knees on both sides (photograph next column).

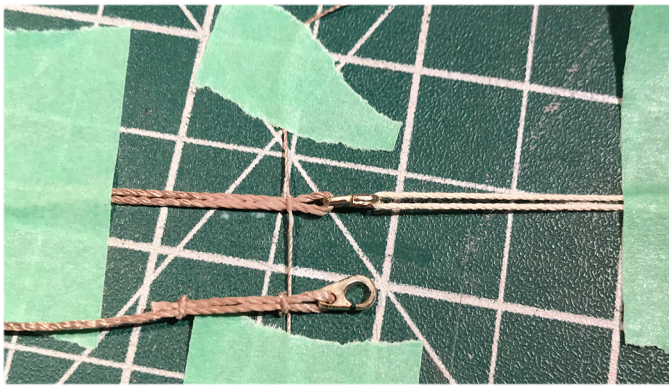
54. The fore stay

Take one of the supplied stay clips and attach a length of 0.7 mm line using two half hitches. Alternatively,



follow the optional procedure described below. Hook the clip to the bow stay strap. Put the mast in place and take the line up, around the aft side of the mast and over the cleat. Mark the spot where the line crosses the back of the mast. Remove the line and make a loop large enough to slip over the mast.

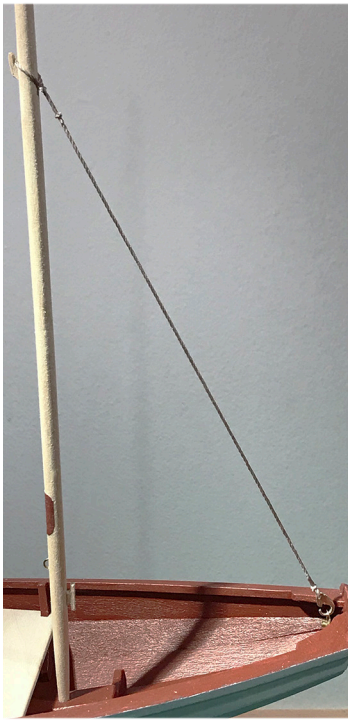
Optional: Another way to form a loop or eye is to take the loose end of the line and glue it beside the standing part, as shown. Then tie 0.3 mm line around the combined lines, glue, secure the ends with masking tape, let it dry and trim off the excess line.



Slip the loop of the fore stay over the mast head and down to the cleat. Reattach the clip to the inside of the stem (photograph top of next page).

55. The back stays

There is one on each side of the boat. Take two lengths of 0.7 mm line and attach one end of each to the clips



using two half-hitches or by the optional technique shown on the previous page. Take each line and, with the mast in place, thread it through the holes in the stay straps near the mast head. Looking at the mast from straight behind, adjust the stays until the mast is vertical. Clips on the loose ends may help here (photograph above). Tie off the stays, using either method, and trim them.

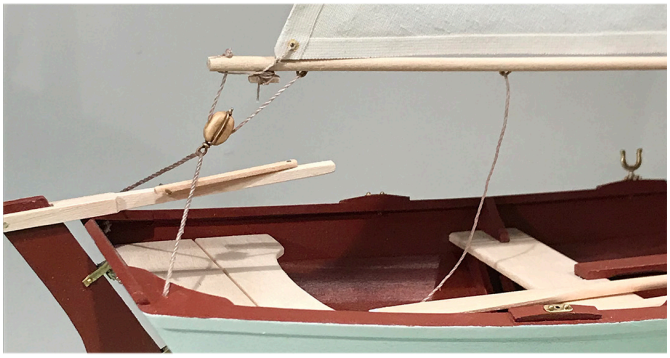
56. Hoisting sail

Take the sail assembly and thread the halyard through the sheave in the mast head from aft to forward. Pass the downhaul line through the eye at the foot of the mast and tie it off on the cleat so that the boom jaws are at the center of the rubbing piece. Pull the halyard until the sail is fully raised, then wrap the halyard around the cleat on the mast. Secure with glue and trim to length.

57. The main sheet

The *sheet* is the line that controls the swing of the boom. Take a 15" length of 0.7 mm line and knot one end. Stiffen the other end with glue. Pass the line through the hole at the outer end of the boom from above to below. Now pass the line through the block on the traveler from aft, forward. Thread the line through the aft eye under the boom, then the forward one. Adjust the tension until the boom is centered. A few dabs of glue will secure the system.

The extra line is required while sailing in order for the boom swing out to catch the wind. Coil this neatly on the floor boards and secure with glue.

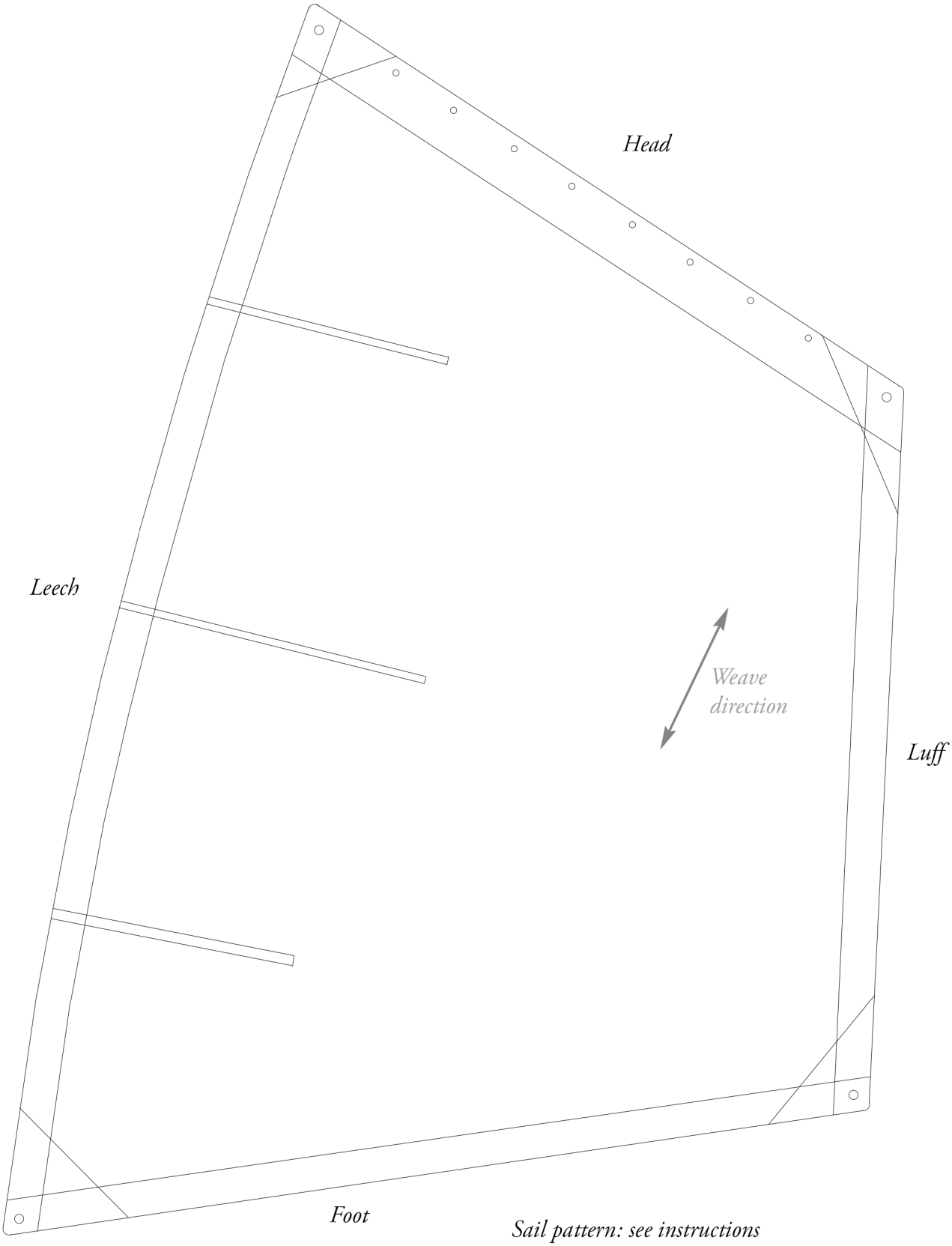


Congratulations! You have successfully completed your second model. I hope that you have learned some new skills and techniques and gained confidence for your next.

Your next model:

The third model in this series will stretch your planking and rigging skills a little more. It is the very attractive Muscongus Bay Lobster Smack.

The completed Norwegian pram model



Sail pattern: see instructions

Tools and materials

The following tools and materials are all you will need for the Norwegian pram. You should have most of these from the dory build. New items (see pages 2 and 44) can be added as you progress. **of these items are available from Model Expo.**

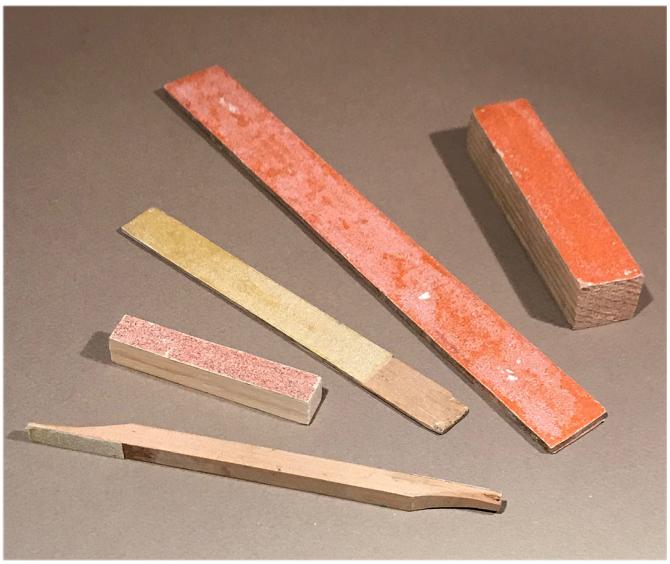
Glues

The most often used glues are polyvinyl alcohol (PVA) white glue and aliphatic yellow carpenters' glue. Both are easy to use and clean up with water before setting. Available from your local hardware store. These glues can be dissolved using rubbing alcohol (see below).

Another useful glue is rubber cement. This is used like contact cement. Coat both surfaces to be joined and allow the cement to dry. They will then stick to each other. Excess dry glue can be rubbed off with a piece of crêpe rubber, or use a regular rubber band like an eraser. This is very useful for sanding sticks. Rubber cement is available at your local craft store.

Rubbing alcohol

You will need this to separate a glue joint if something goes wrong. Try to get 95% grade or higher, available from your local drug store. The 70% has higher water content and wood will need time to dry out before re-gluing. Do not use near a source of ignition!



Sandpaper and sanding sticks

Sandpaper comes in a wide variety of grades from coarse to very fine. Two useful grades for our purpose are 150 grit and 220 grit. Coarser grades cut too aggressively and finer ones produce very fine dust without finishing the surface appreciably better. Find these at your local hardware store.

Sanding sticks are very helpful. They can be easily made by sticking sandpaper to a piece of flat or curved scrap wood, or even heavy card, as needed (photo above). You can control the sanding process much better by moving the item to be sanded than holding a piece of sandpaper or the sanding stick in your hand. Move the piece back and forth along the stick.

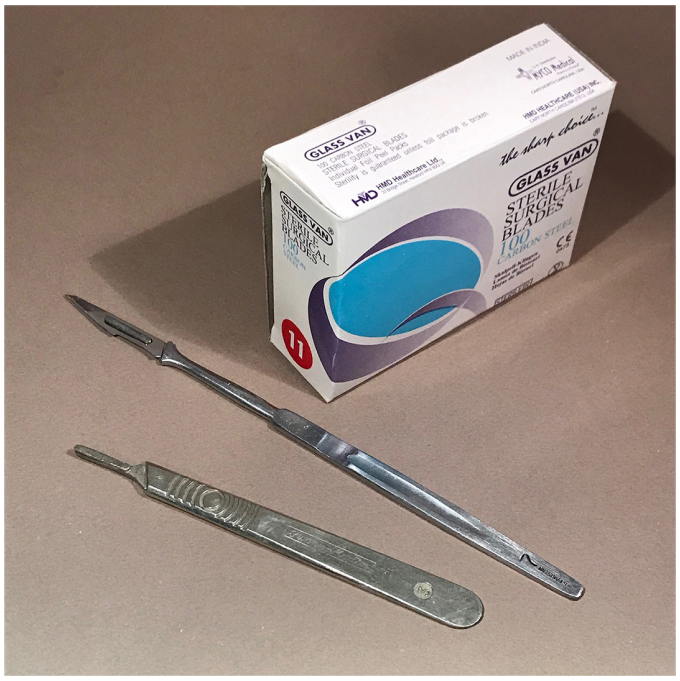
I use rubber cement (see *glues*) to stick sandpaper to the stick. When dulled, the paper can be peeled off and replaced with a new piece. You could use white or yellow glue instead, but then you can't peel off used sandpaper to replace it.

I coat the back of the sandpaper and the stick with rubber cement and let it dry. When both surfaces are ready, press the stick onto the sandpaper. Trim the paper using a disposable box-cutter style blade.

Cutting surface

A plastic self-healing cutting mat is a must, particularly if building on the dining room or kitchen table! It will save a lot of grief or explaining. Get the largest size that will work best for your situation.

Knife and blades



For these kits, a basic knife such as an X-Acto or Excel with #11 blades is a start. However, these blades get blunt and need to be replaced quite often, so the cost can add up. You might wish to consider a surgical scalpel handle, such as Swann Morton. A box of 100 #11 blades will last you a long time. These are available from medical supply houses or from Model Expo online. I recommend changing blades using small flat-nose pliers*; even dull blades can cause damage! Don't ask how I know this! Dispose of used blades in a sharps disposal container, please. A small supply of ⅜" wide chisel-end blades such as #17 size* will also be useful.

Set square

A small steel or plastic engineer-style set square will be very useful, but not essential.

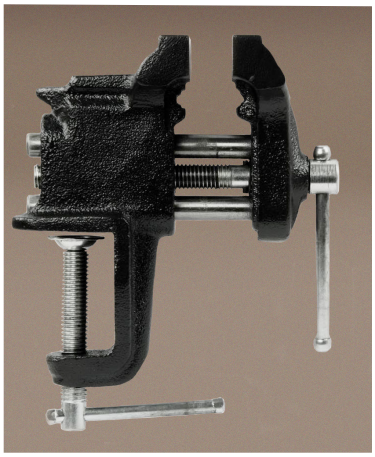
Saw

A small razor saw with replaceable blades such as X-Acto or Excel (above) is a very helpful tool to have.

Clamp-on vise

I prefer the kind that clamp onto the table edge. There are suction-mount ones available, but I find that they always come loose when you don't want them to! A small vise is all that is needed, such as a 3" Irwin, DeWalt or Bessey. A more expensive option is a universal or rotating vise, but this is not really necessary. Find one at your local hardware store or on-line.

So that you do not mar the workpiece, line the jaws with a softer material. I custom cut pieces of cardboard to size and rubber cement them on. They are easily replaced when they get chewed up, as will happen.



Paint brushes*

For model work I find 'flat' brushes best. Please buy quality brushes and look after them – cheap brushes that you replace cost more in the long run and will probably shed hairs in your paint! I find ⅜" or ½" wide ones for acrylic paint the most useful. Also from your local art or craft store.

For glue, I use a number 1 or 2 size artists' round brush. Wash it out well after every session. Should glue dry on it, rubbing alcohol will rescue the brush.

Care: wash your brush out well with soap and water after use. Should paint dry on the brush (please try not to let this happen!) you can dissolve acrylic paint in rubbing alcohol. When washed and clean, rub a little soap into the hairs to re-shape them before storing. Never, *ever* leave your brushes bristles down in a water jar! They will splay out permanently. I have brushes over 20 years old that are still in good shape because of the care suggested here.

Paint

Any good acrylic paint for models such as the Model Expo range will perform well.

Tweezers

A good pair or two of fine pointed stainless steel tweezers are a useful item to have, particularly when it comes to rigging.

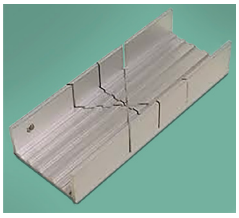
Clips

2" mini-spring clamps with rubber tips are very helpful. 'Bulldog' style binder clips are also occasionally useful. An assortment of smaller sizes can be found online or at your local stationery store. Buy more in the sizes you need, when you need them. One can never have enough clamping gizmos!

Elastic bands

These are handy and inexpensive items to have. Keep a number of different sizes on hand.

Miter box



This is a very useful item for making saw-cuts at right angles or at 45°.

Epoxy glue

Two-part epoxy glue is available from your local hardware store. The five minute variety in tubes or squeeze bottles is recommended. Mix equal quantities of both parts well on a disposable surface.

Tools for metalworking:

Here are a few basic metalworking tools that you will need sooner or later.

Hammer

A small jeweler's hammer is very useful. Either style by Model Expo will do.

Hard metal flush cutting shears

Shears for soft metal will not work on hard brass. You will simply damage the cutting edges. I use the Bead-Smith ones. The Xuron 9200 might be an alternative.

Pliers

A set of parallel pliers are most useful (above left). Also a quality pair of small round-nose pliers, also shown, will be needed for bending eyebolts. On line suppliers.

Files

Add these as you need them. A small flat fine-cut file and ⅜" round file are all you need for now.

Bench block

A small steel bench block is useful for a number of purposes, including riveting. An anvil is overkill!

Soldering mat

A ceramic heat-resistant mat is essential for soldering operations. You do not need this, a soldering iron or butane torch for the pram model.

Soldering iron

Either model offered will work for soft soldering. However, the 30W set includes solder.

Small butane torch

Use this to heat metal to anneal (soften) it. It is much too hot for soft soldering, but will also be useful when you learn to silver solder later on. In the meantime, use it in the kitchen to make crême brulée! Available from your local hardware store or on line.

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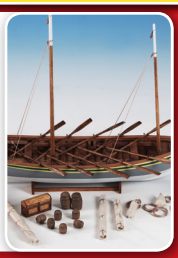
Scale Models of Legendary Wood Ships

HMS BOUNTY'S LAUNCH
Length 17-1/4"
Height 14-3/4"
Beam 5-3/8"
Scale (1:16)
No. MS1850



DAPPER TOM
Length 24"
Height 18"
Scale 5/32" = 1 ft.
No. MS2003

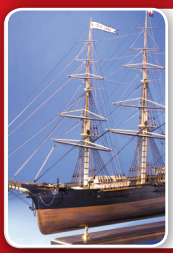
NEW BEDFORD WHALEBOAT, C. 1850-1870
Length 24"
Height 4-5/8"
Scale 3/4" = 1 ft.
(1:16)
No. MS2033

HARRIET LANE
Length 19-1/2"
Height 9-1/2"
Scale 3/32" = 1 ft.
No. MS2010

PINNACE
Length 11-3/4"
Width 2-1/2"
Scale 1/2" = 1 ft.
(1:16)
No. MS1458

18TH CENTURY LONGBOAT
Length 11-3/4",
Scale 1/4" = 1 ft.
No. MS1457

PHANTOM, NEW YORK PILOT BOAT
Length 13-1/2"
Height 13-1/2"
Scale 1/8" = 1 ft.
No. MS2027



FLYING FISH
Length 36"
Height 22-1/2"
Scale 1/8" =1 ft.
(1:96)
No. MS2018

MAYFLOWER, 1620
Length 22"
Height 17"
Scale 5/32" = 1 ft.
No. MS2020

FAIR AMERICAN
Length 26-1/2"
Height 22"
Scale 1/4" = 1 ft.
(1:48)
No. MS2015

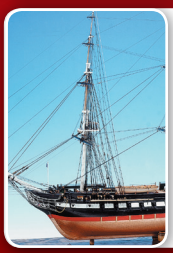
SULTANA
Length 17"
Height 15" Scale 3/16" = 1ft. (1:64)
No. MS2016

RATTLESNAKE, PRIVATEER, 1780
Length 28"
Height 18"
Scale 3/16" = 1 ft.
(1:64)
No. MS2028

GUNBOAT PHILADELPHIA
New from Bob Crane, designer of USN Picket Boat No. 1
No. MS2263

WILLIE L. BENNETT, SKIPJACK
Length 24"
Height 16"
Scale 3/8" = 1ft.
(1:32)
No. MS2032

USS ESSEX
Length 27"
Height 8"
Scale 5/32" = 1 ft.
(1:76.8)
No. MS2041



USS CONSTITUTION, 1797
Length 48"
Height 32"/Width 16"
Scale 5/32" = 1 ft.
(1:76.8)
No. MS2040

BENJAMIN W. LATHAM
Length 33"
Height 27"
Scale 1/4" = 1 ft.
(1:48)
No. MS2109

PRIDE OF BALTIMORE II
Length32"
Height 22-1/2"
Scale 3/16" = 1 ft.
(1:64)
No. MS2120

BLUENOSE, CANADIAN FISHING SCHOONER
Length 32"
Height 26-1/2"
Scale 3/16" = 1 ft
(1:64)
No. MS2130

CHARLES W. MORGAN, WHALING BARK
Length 25" Scale 3/16" = 1 ft.
(1:64)
No. MS2140

EMMA C. BERRY LOBSTER SMACK
Length 26-3/8"
Height 28-1/2"
Scale 3/8" = 1 ft
(1:32)
No. MS2150

ARMED VIRGINIA SLOOP
ength 31"/Height 18"/Width 8-1/4"
Scale 1/4" = 1 ft.
(1:48)
No. MS2160

GLAD TIDINGS, PINKY SCHOONER
Length 29-1/2"
Height 23" /Scale 1/2" = 1ft. (1:24)
No. MS2180

CHAPERON, STERNWHEELER
Length 34-1/2"/Beam 7-1/2"/Height 12"/ Scale (1:48)
No. MS2190

NIAGARA, U.S. BRIG 1813
Length 36-1/2"
Height 24-1/2"·
Scale (1:64)
No. MS2240

SYREN, US BRIG 1803
Length 33"
Height 27"/ Scale 3/16" = 1 ft (1:64)
No. MS2260

U.S.N. PICKET BOAT NO. 1, 1864
Length 22-1/2"
Width 5"/Scale 1:24 (1/2" = 1 foot)
No. MS2261

CONFEDERACY
Length 35"
Height 8-1/2"
Scale 3/16" = 1ft
No. MS2262