Building a Half Model

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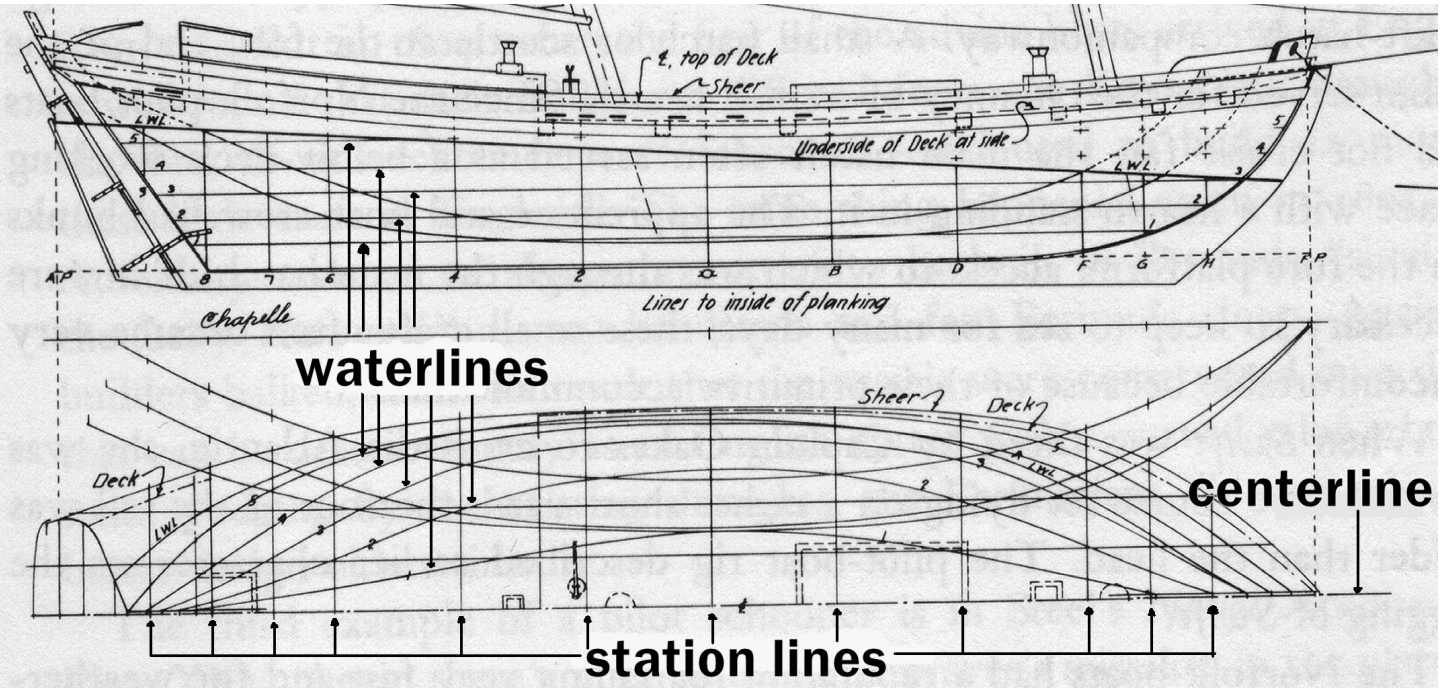
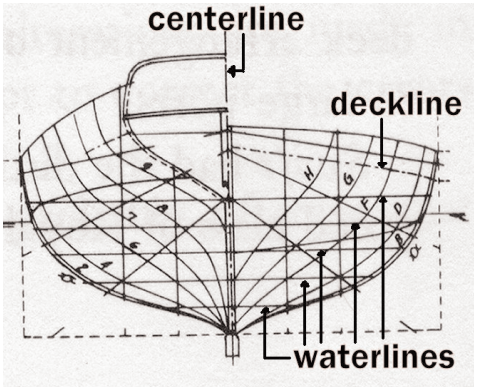
If you have ever had this problem you will know what I am talking about. What problem? Burn out. Plain and simple. The model is there, but you cannot get yourself motivated. Something happened, either you changed your daily schedule or you had an illness. Whatever it was, it just got you out of your routine and now you do not feel like building. I got out of my usual habits over the Christmas holidays and afterward, I could not get motivated.

I have often heard that one way to get out of the doldrums is to build something small and quick. Not much time invested and there is a sense of instant gratification that gets you back in the mood to build. I decided to try a half model to get me out of my doldrums. I have always wanted to learn how to make them and now seemed the perfect time to try. The really good thing about a project such as this is that it does not take much time, very few tools, and little in the ways of materials. On my first half model, I spent about 15 hours of spare time over the course of one week, about $10 or so in materials, and used only the most basic scratch building tools.

When I first decided to try my hand at building half models, I was not sure how to begin. But, then I told myself it always begins with the lines drawing. This is where every model building project begins. If you look at a given lines drawing, you will see that the waterlines in the sheer profile drawing are at more or less regular intervals from the keel up. If you are building a half model, then the layers of wood you use must match the thickness of the intervals between the waterlines on the plan. The upper layer is always a bit thicker to account for the curve of the hull's sheer line or deck line that has to be cut into the upper layer.



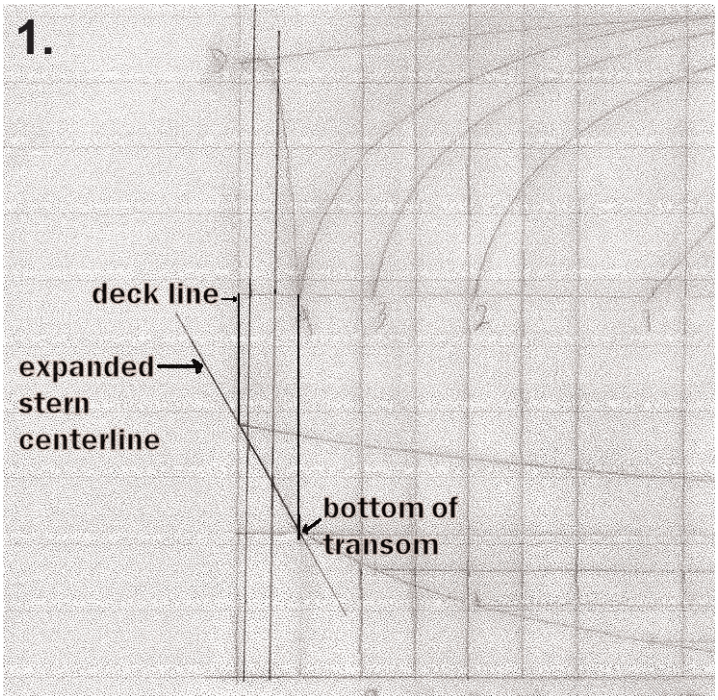
For the purposes of this description, let us lay out some terminology. The layers of the hull are called lifts. This style of building is often referred to as a lift model or a bread and butter style model. The layers are the lifts, or in the case of the second term, the bread. The glue is the butter, much like the butter between two slices of bread (or wood in this case). The side view on the plan is called the sheer profile drawing, but for the purposes of a half model, we will call it the profile. The waterlines on the plan can also be called lift lines since each waterline corresponds with the shape of a given lift.

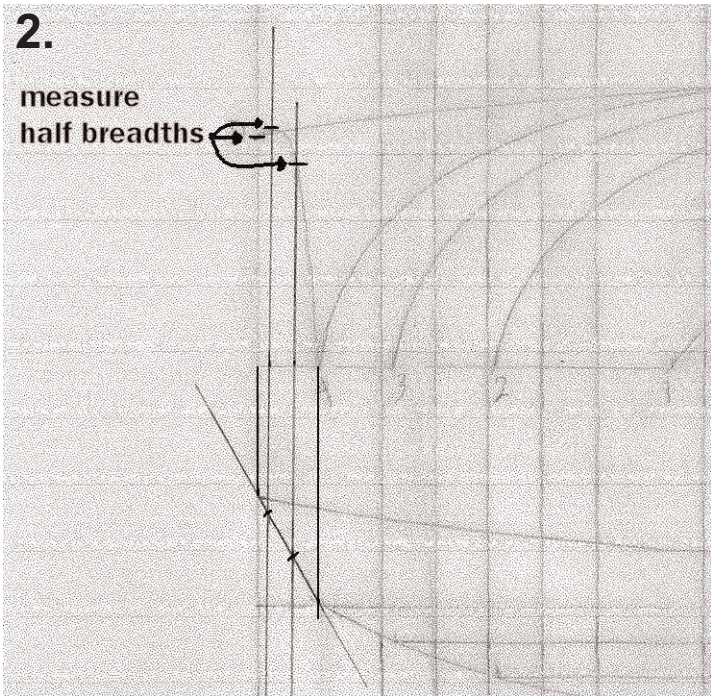


There will be templates needed to build this model. The profile template is one, and then there are also the lift templates. The lift templates are each waterline shape in the half breadth drawing of the lines plan. There are also the section templates. These are taken from the body plan of the lines drawing.

One other useful template will be the transom template. This one is a little different and it takes just a bit of explanation. To illustrate this, I will use the example of my Biloxi schooner half model's plan. What you need is the expanded shape of the transom. You cannot use the shape of the transom in the body plan because the shape given does not account for the angle of the transom. The body plan shows you a foreshortened view of the transom. What you need is the "full face" shape of the transom.

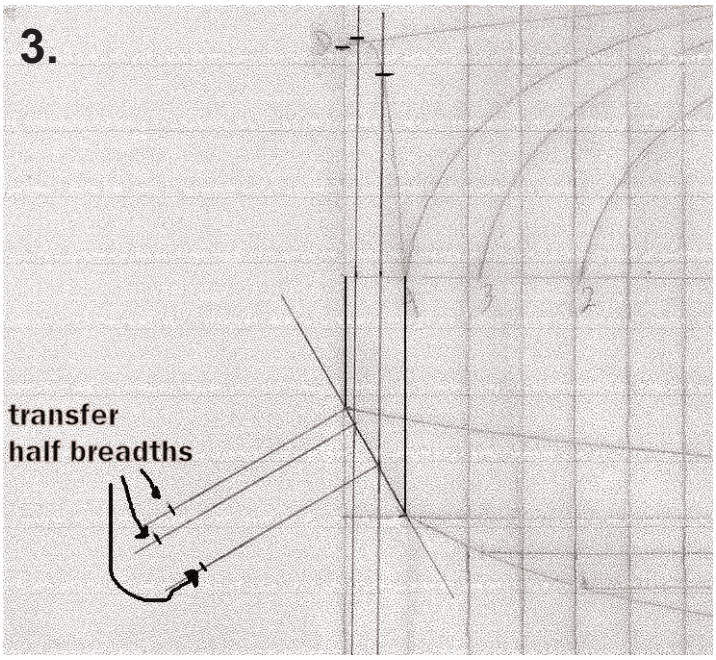
First, take a deep breath and do not panic. If you have a ruler, a scrap of paper, a sharp pencil, and a little time, you can do this. I will walk you through the basics. Look at the sheer profile and half breadth views of the plan. The sheer profile gives you the upper and lower extremities of the transom and they correspond with the same extremities given in the half breadth. The top of the transom is at the deck line and the lowest point of the transom is where the angle changes in the profile. For each section template, there is a centerline. In the expanded view we will create, the centerline for the transom is the aftermost angle of the profile also called the rake of the stern. Use that angled line as your centerline. (Photo 1)

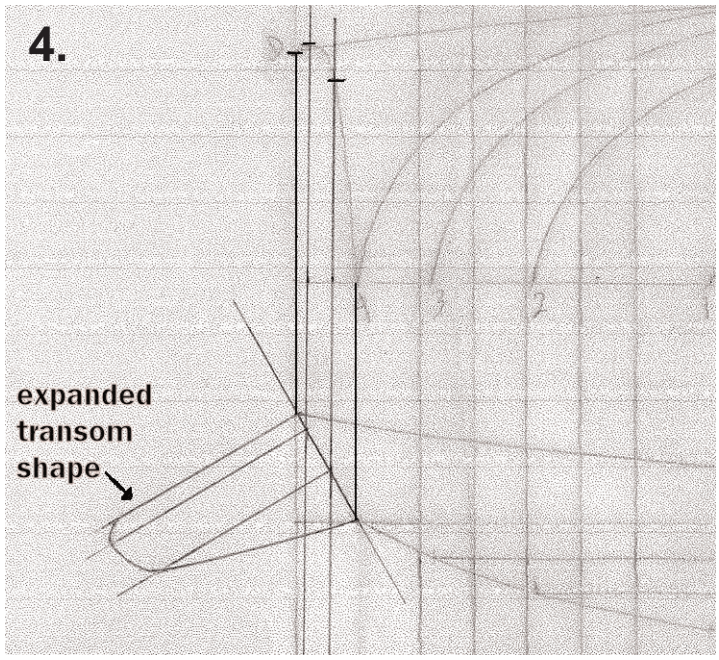




Next, use a T square to strike in reference lines from which you will measure the widths of the transom curve. These measurements are taken on the half breadth, but we need those reference lines to extend down to corresponding points on the angled line that is the centerline of the expanded transom. There is no hard and fast rule about where these reference lines must be placed. The only thing to keep in mind is that you want to get a couple of reference points to create the curved shape of the transom. Locate your reference lines accordingly. (Photo 2)

Next, use a tick strip to measure off the width of the transom's shape in the half breadth along each of those reference lines you just created as well as the half breadth width of the deck. Transfer those lines down to the corresponding reference lines on the profile drawing, measuring out from that angled centerline at right angles. (Photo 3)

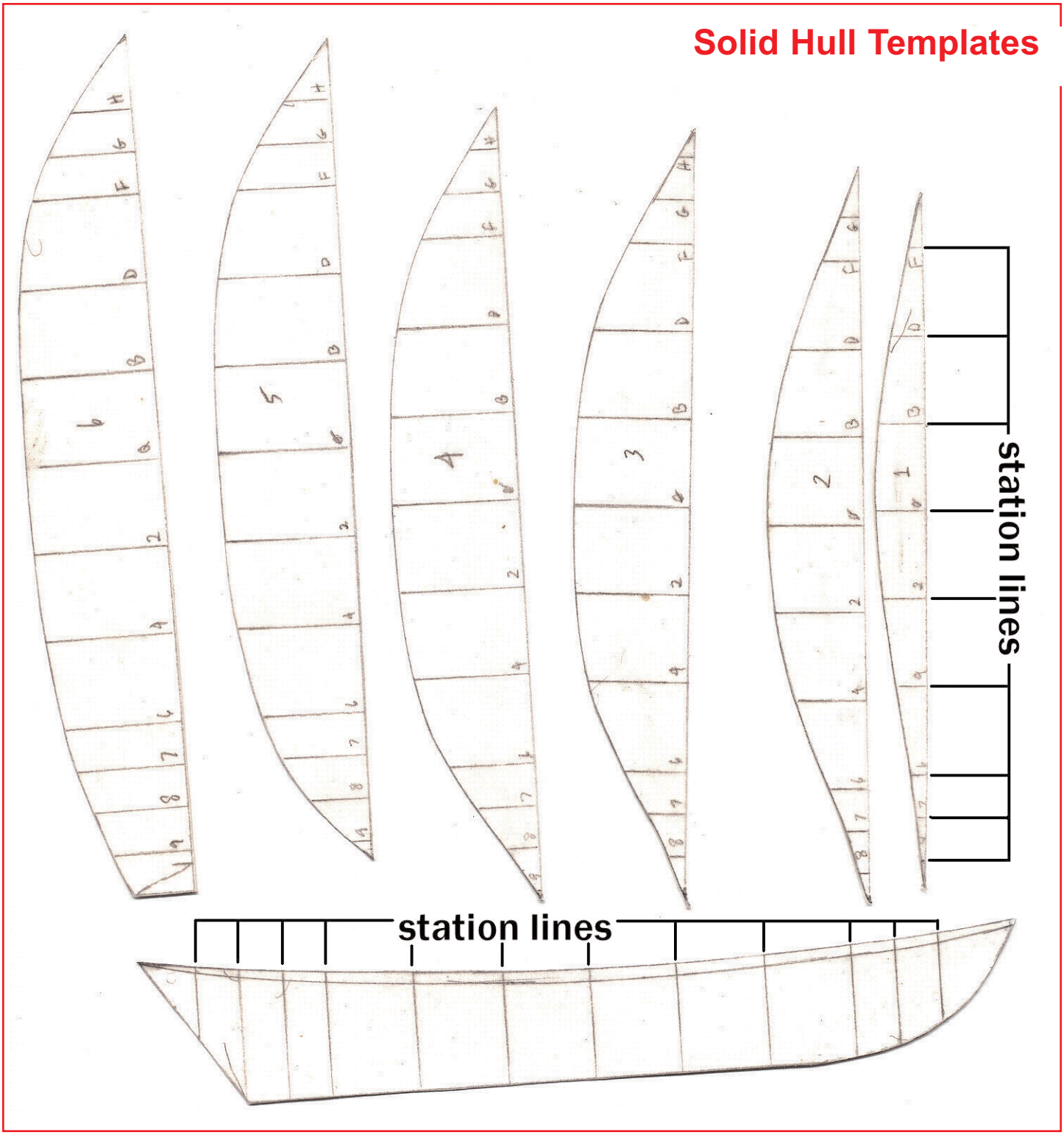




With those reference points marked, you can use a French curve or a ship's curve to create the expanded shape of the transom. Now, trace this shape onto a piece of tracing paper and then rubber cement it to some poster board for use as a transom template for the model. The transom template requires only the centerline and the shape of the transom. (Photo 4)

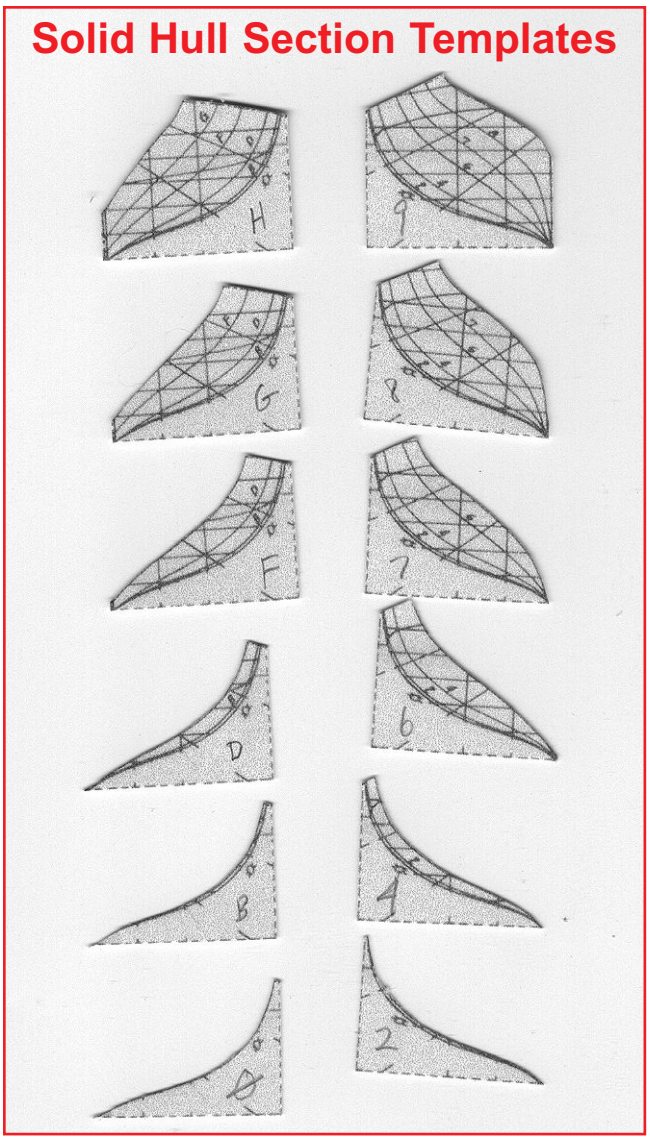
The rest of the templates can be gotten directly from what is already on the lines drawing. If you wish, you can make multiple copies of your lines drawing and use each copy to cut out a different template. Or, you can tape the drawing down on a flat surface and trace the templates using tracing paper. Either way, make sure to take in all the reference lines needed for the template to work properly. For the lift templates, be sure to include the centerline of the hull as well as the station lines. These are important for proper alignment of the templates on their corresponding lifts. The profile drawing needs to have the station lines, the baseline along the top of the keel, and the horizontal waterlines. For the section templates, you will need the centerline and the horizontal waterlines. If you make multiple copies of the plan and cut out the various elements, then these lines are already on the plan. You just need to make sure you do not cut them out of the template. If you are tracing your templates, make sure to have a good straight edge to keep these lines nice and even and also make sure to keep your pencil nice and sharp.

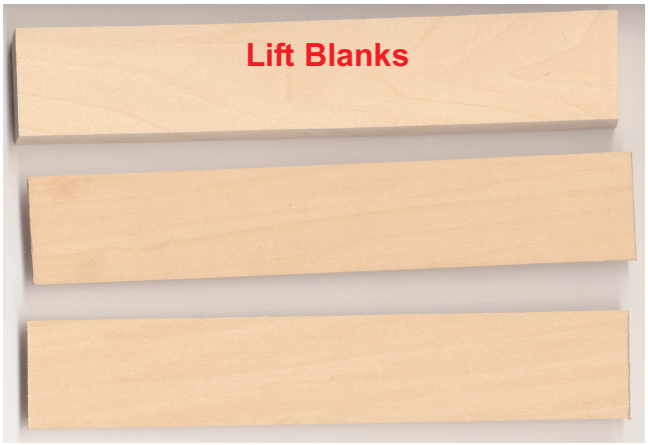
To complete your templates, I highly recommend rubber cementing them to poster board and then cutting them out. You can simply rubber cement them to the wood, but it pays to have a template



that you can use at several points in the construction process to double check alignment and shapes. This is particularly true of the section templates as they will be needed to check and re check the hull as it is faired. Having a set of templates on poster board also allows you to reuse them at a later date for making another model from the same plan if you choose.

The next step is to cut some timber for the lifts that will make up the model. The vertical spacing of the waterlines in the plan will tell you how thick the lifts should be. In my case the lifts in the lower part of the body wanted to be 1/8" thick while the uppermost lift was about ½" thick. The uppermost lift will be thicker so the sheer curvature of the deck can be cut into it. You can either buy your tim-

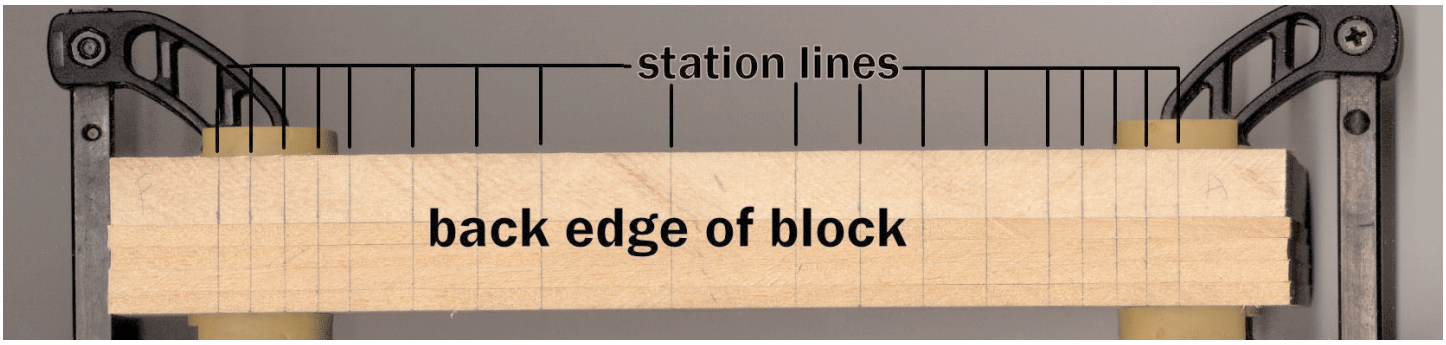




ber to pre-milled specifications or you can mill your own. Basswood will do, but since it is a soft wood, staining might be a problem. I have had mixed results using basswood. Sometimes it will stain well and other times not. I always use a pre stain conditioner, but even that does not always guarantee good results with basswood. Basswood is easier to work, but it will show every nick and ding. Whatever wood you use, you will create a block made up of the various lifts. Once you have your lifts sized for their vertical thickness, make sure they are a uniform width. The length can be approximated, but it is probably best to make the lifts uniform in both length and width. The width of the lifts should be about ¼" wider than the width of the finished hull. The length of the lifts should be about ¾" or so longer than the finished hull. (See photo below left)

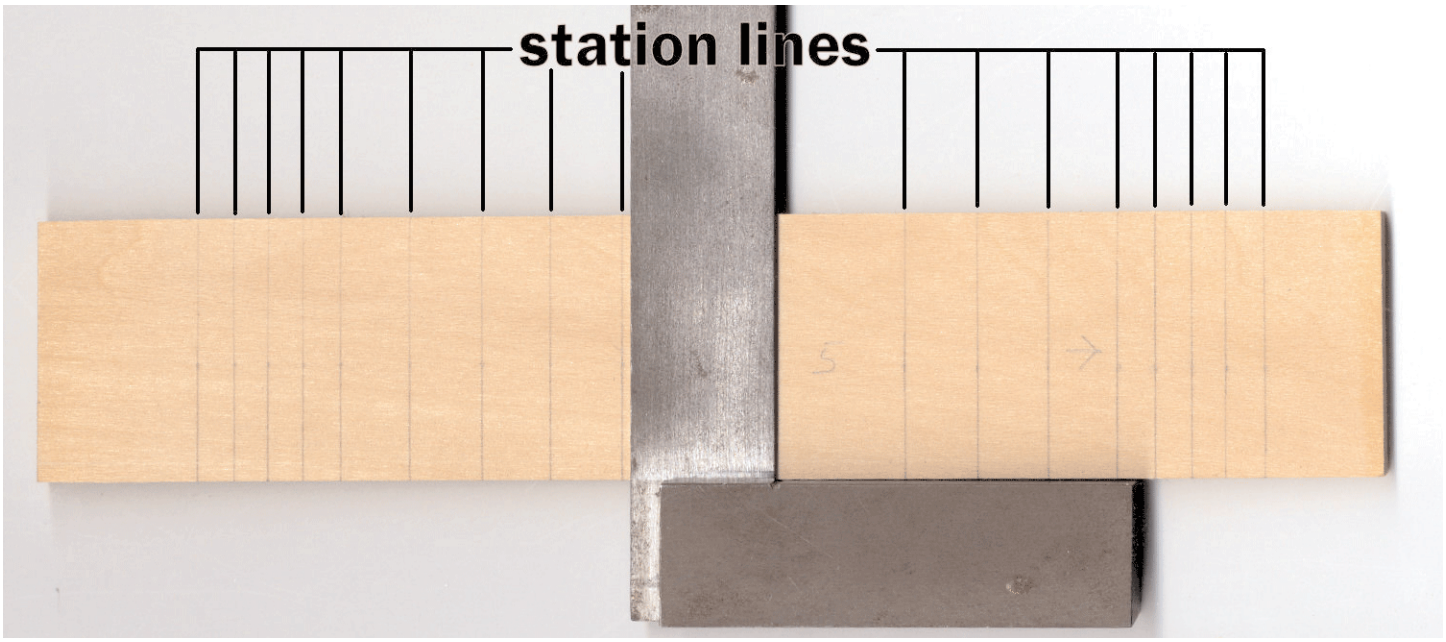
With the lifts ready, stack them to create a hull block. Clamp the block at each end. I use miniature sliding bar clamps for this. While you have the block clamped up, decide which edge of the block will be the centerline of the hull. Mark the edges of those lifts to remind yourself where the centerline is. From your plan, make a tick strip to create a template for the station lines. Just mark those station lines with a small tick at each point. Now, place your tick strip on the back side of the block and align it so that there is plenty of room at each end of the block. Transfer the marks for the station lines onto the back side of the block. Set that tick strip aside as you will use it later on in the shaping process. (Bottom Photo) Those station lines are a master guide to the alignment of the model and now that you have that tick strip, do not throw it away.

Next, use your machinist's square to draw the station lines all the way across the back edge of the block. Transfer the station lines all the way around the block. To do this, I just made a small mark at each station on the faces of the lifts once I had the stations

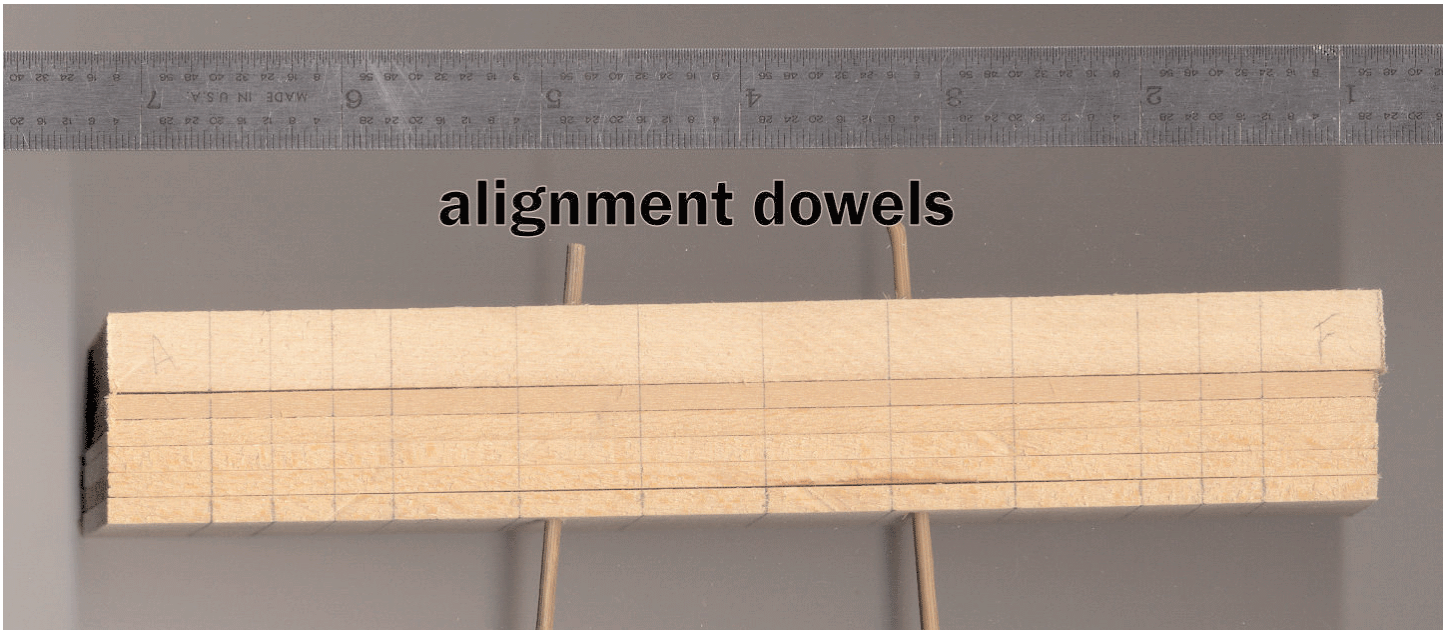


marked on the back edge of the model. I lined up my machinist's square on the marks and struck the lines across the face of the upper and lower lifts in the block. Then I proceeded to mark the station lines on the front edge of the block using the same method. By the way, here is another situation where your pencil lead must be sharp. If you cannot sharpen a pencil, this model will be very difficult to build. These marks must be spot on. If not, then it will not be possible to maintain proper alignment when you are tracing the lift shapes onto the lift blanks. If your lifts are all cut and sized properly, when you carry your station lines around the block, the last ones you draw will meet the first marks you made on the back edge of the block.

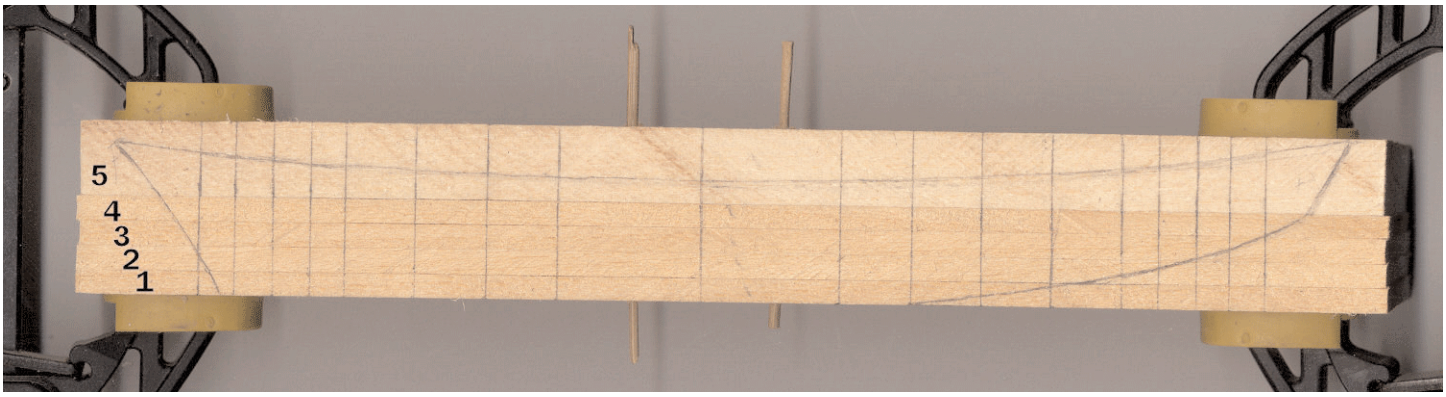
Now, here is where the accuracy pays off. Take the block apart and mark on both faces of each lift the station lines from the edges of the lift. Use your machinist's square to mark the stations on both faces. On one face you will trace the shape of the lift and on the other face you will trace the bevel for the next lift down in the block. When you are drawing these station lines, now is a good time to mark which face of each lift is up and which is down. This will be important later on so make sure you keep track of this point. If the station lines from both edges are even, you will know that you will be able to properly align your template when you begin the tracing operation. If the marks do not line up, then be sure to align the station lines from the back edge of the lift. Of course, if you have been careful in your marking and kept your pencil lead sharp, then there should be no problem. The more careful you are in this marking process, the easier the shaping process will be later on and the more accurate will be the finished model.



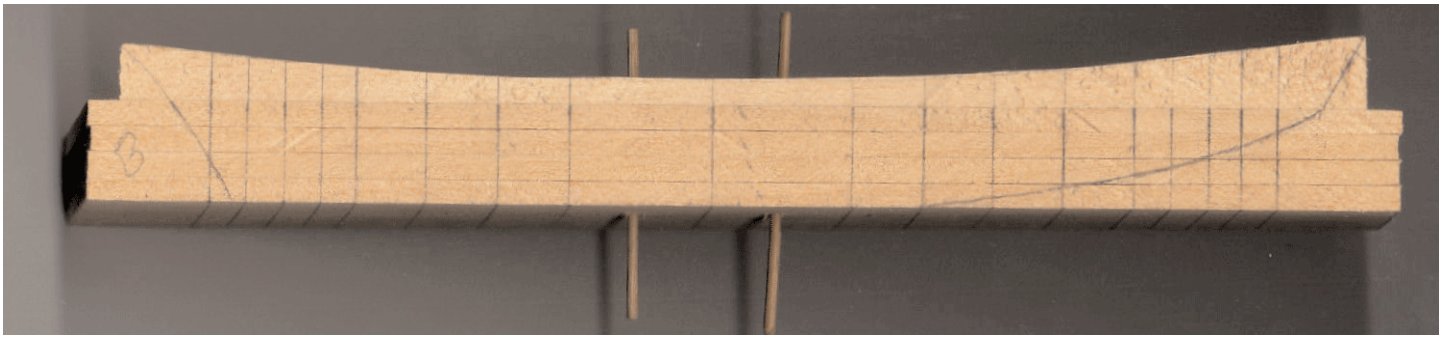
With your lifts cut and properly sized, clamp them back together so they are even all around and the station lines are all aligned. Now, take your lowest lift template and lay it on the block and line it up with the station lines. Lightly trace around it. Remove the template and then mark two points within that area so you can drill alignment holes. If you have a drill press, this is a good time to use it. Drill holes down through the block from top to bottom. If you wish, you can set the depth of the drill press so the bit will not break through the bottom, but since most half models had visible alignment dowels showing through both top and bottom, there is no need to hide the dowels. The main thing is to create alignment holes so that each lift has corresponding holes. Next, create some alignment dowels. You can use bamboo like I did or you can use basswood or any other hardwood. The key is to have two dowels that will hold the block in proper alignment throughout the process. Even when you take the lifts apart and cut them or sand them, you will be able to put the hull back together held in proper alignment with those dowels.



Now that the block is reassembled and in proper alignment, you can trace your profile onto the back edge of the block. The back edge of the block will be the edge nearest the alignment holes. Lay the block down, still clamped and with the alignment dowels in place, and place your profile template onto the back edge of the block. Line it up so that the station lines on the profile template coincide with the station lines you marked on the block earlier. Make sure the horizontal waterlines on the profile template also line up with the lift lines on the block. Once you are all lined up, trace around the profile template, marking its shape onto the back edge of the block. Mark this shape well. Keep the line as sharp as possible, but make sure it is nice and dark. It is probably worth it to flip the block over and trace the profile shape onto the front edge of the block as well. You will thank yourself for taking this extra step when it comes time to cut the sheer line into that upper lift.



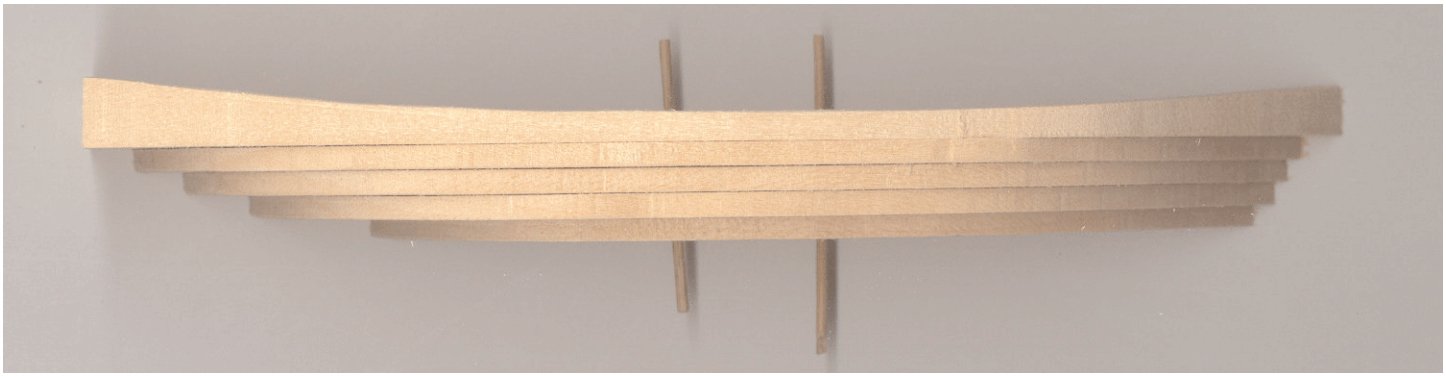
The next operation is to take the block apart and cut the sheer line into the upper lift. What tools you will use to make this cut is up to you. I used a simple scroll saw, cutting the shape rather full. Then I finished off the shape with files and sandpaper. You can also use a chisel or perhaps a spoke shave. The spoke shave will operate much like a miniature draw knife which is actually what most builders would use when cutting the sheer line in a much larger half model. You will need a bench mounted vise to hold the lift when using a spoke shave or chisel. When finishing the sheer cut it is best to cut a sanding block with a curved face. Glue some coarse sandpaper onto the curved face of that block and use it to finish sand the sheer curve. Of course, once you get the surface very close to the lines, switch to progressively finer grades of sand paper to get a smooth finish. I used a single edged razor blade for the final smoothing of the sheer cut.



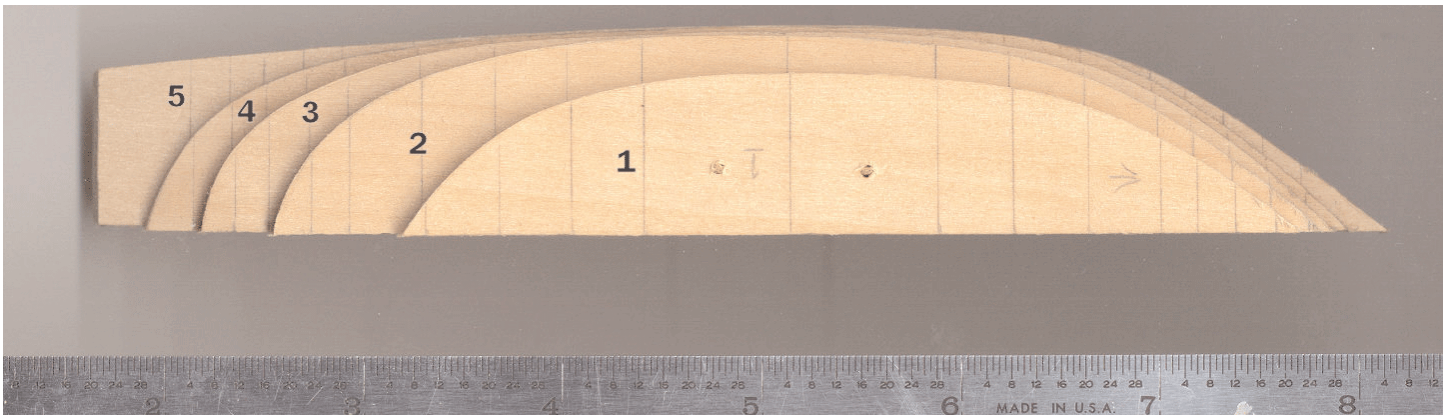
There are two things to keep in mind when cutting the sheer. First, you want to get that finished sheer line correct. Second, you want to get the sheer line correct on both the front and back edges of the upper lift. Since the lift blank for the upper lift is rather wide, it will be difficult to cut that sheer curve so that it is equal on both the front and back edges of the lift. Even if you are cutting very carefully, it will probably be that one side will be closer to the line than the other. Just make sure to cut full of the line on both edges. Do not, under any circumstances, cut too deeply. One can always remove some more material, but in making a half model, it is impossible to add on material and have the finished product look acceptable. If you have traced the profile on both the front and back edges of the lift, you will have no problem getting the sheer line correct on both edges. This will leave you with a nice flat deck that will have the sheer on both edges. If you wish, you can always add the round up of the deck, but for the purposes of a half model, it is not really necessary.

Once you have the sheer line cut and properly finished, remark the station lines across the top face of the upper lift so you can align your lift template properly. Now, lay your lift template down onto the upper lift, taking care which side of the lift is the back edge and that the template is lined up with the station lines, and trace around the template. Make sure to line up the centerline of the template with the back edge of the lift. Once your shape is traced onto the lift, you can use a scroll saw to cut that half breadth shape in the lift. Leave a little extra along the cut edge so you can finish it off with files or sand paper afterwards.

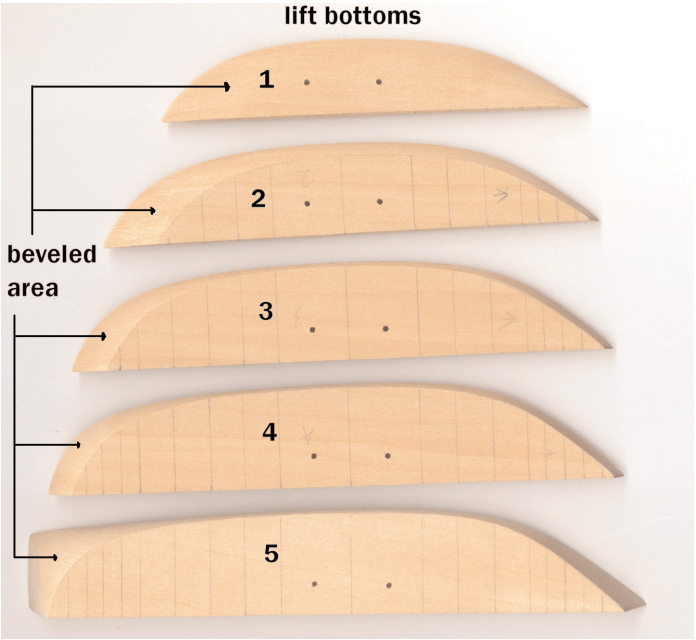
Next, you can trace the shapes of the rest of the templates onto their corresponding lifts. It is a good idea to mark each lift blank with the template number to ensure you can tell which is which later on. I marked my lifts from 1 to 5 beginning with the lowest lift as number 1. I also marked each lift with a small arrow to point to the forward end of the lift. Make sure to note carefully which side of the lift blanks are the back edges and align the templates properly. Also, take care to note which side of the lifts are the upper faces. Be sure to align the templates with the station lines. It is very important to keep the templates aligned and to keep them in proper orientation to each other. If you mistakenly cut the wrong side of the lift blank, the model will not go back together properly because the alignment dowels will not match up. As the old carpenter's adage goes, "measure twice, cut once." When you are satisfied that the lift blanks have been properly marked, go ahead and cut them on a scroll saw.



Your lift shapes are now roughed out and you can use your templates to sand each lift to accurately match its corresponding template. This can be done with a sanding drum in a rotary tool or you can use a hand tool such as file or even sand paper. Just bring the lifts even with their templates. That's all for now. Once you have the lifts sanded to shape, you can trace the bevel for each lift. On the lowest lift, you cannot mark any bevel right now, but on the other lifts it is a good practice. Here is how I did it on my models. I traced the shape for lift 1 onto lift 2, placing lift template 1 so that it was aligned with the centerline and station lines on the bottom side of lift 2. I then repeated the process using template 2 to trace onto lift 3, template 3 to trace onto lift 4 and finally template 4 to trace onto lift 5. Make sure that the bevels for each lift are marked on the bottom side of the lifts. Take care to note which side of each lift is up so you can maintain the proper alignment of the model. If the bevels are marked haphazardly, you will end up with lifts that will not go together properly.

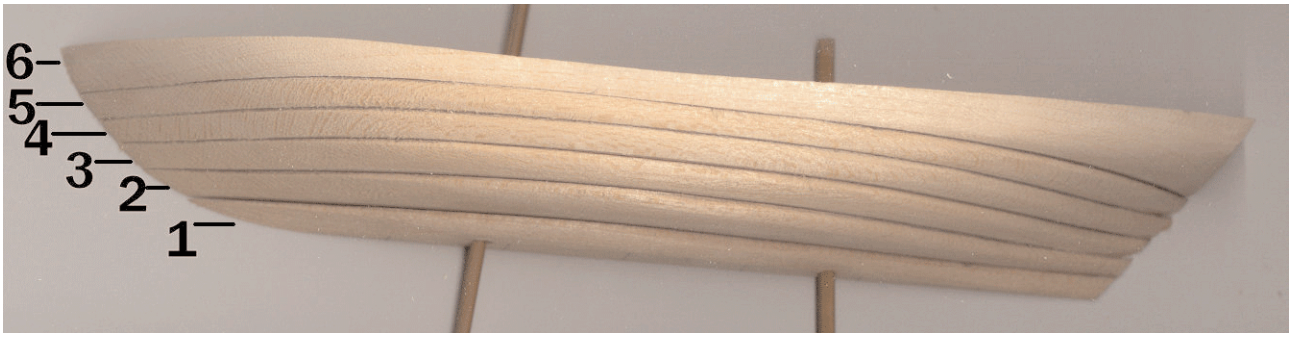


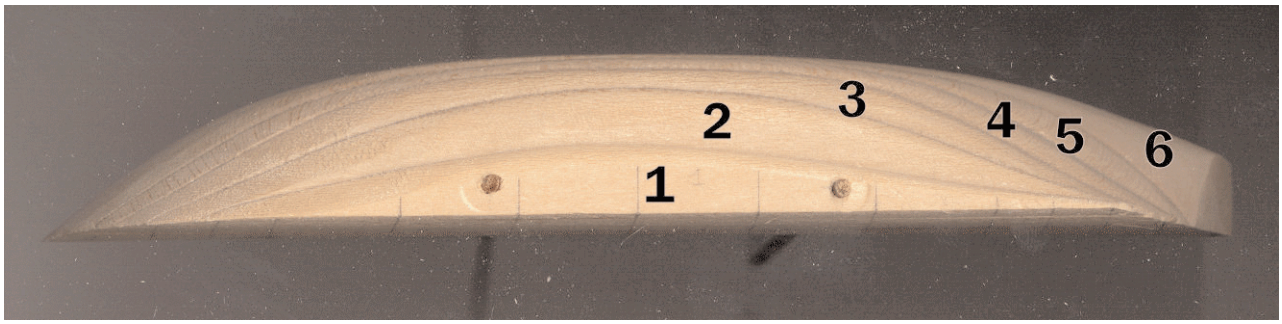
Once you have the bevels marked on the lifts, you can begin removing material to create the hull shape. This is the part of the shaping process that demands a good deal of attention. Never, ever remove a lot of material at one time. I cannot stress enough the need to go slowly and measure often. Do not try and remove all the material on a given lift at any one pass. Sand some and then examine the work. Note where the bevel line is and make sure to never remove any of the lift's upper edge. If need be, rub your pencil lead along the upper edge of each lift so you will know to stay away from that line while you are sanding the bevels. Once you complete the beveling, those pencil marks can be erased. The lowest bevels will be the most difficult because the shape of the underbody will likely change more radically than in the upper part of the hull. Each hull will create different challenges, but generally speaking, the lower lifts will cause the most problems with sanding bevels.



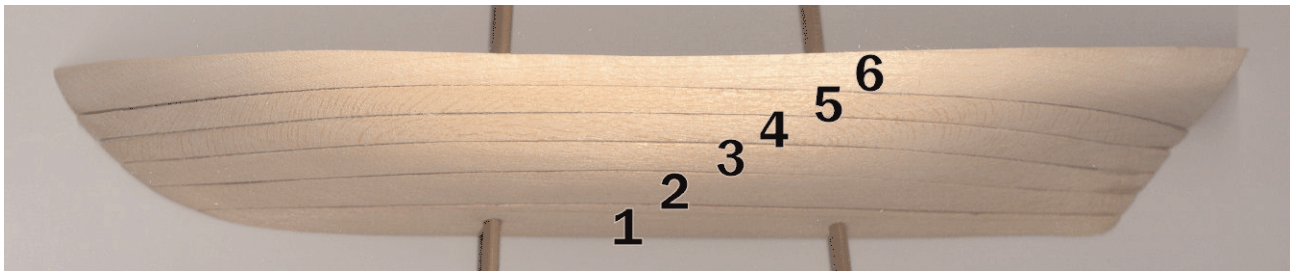
You can use either hand tools or power tools for the beveling. I used a disc sander on my scroll saw as well as files and sand paper. If I had a rotary tool with a drum sander, I would probably try it. A chisel or a spoke shave would do the work as well, but you will need to have a bench vise to use those tools really well in this capacity. If you intend to use power tools, be especially careful not to remove too much material. Also, keep a steady hand on the work lest you inadvertently let the lift slip and end up gouged by the tool.
Once you have the majority of the material removed, reassemble the block and secure it with your dowels. Do not glue anything yet. Look the hull over and note where you can remove a bit more material on some of the problem areas.

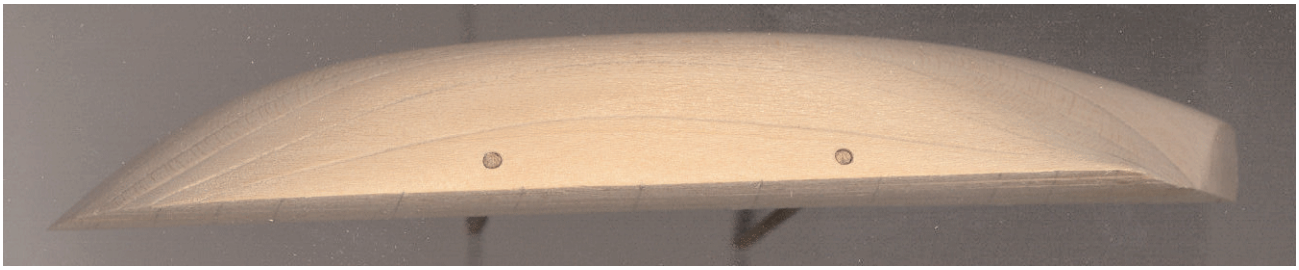
Take the hull apart and do a little more sanding. Again, do not try and get it perfect at this point. When you have refined the hull's shape a bit more, reassemble the block and look it over again. Go through this cycle as many times as you feel necessary to work the shape of the lifts until you get close to the beveled lines.



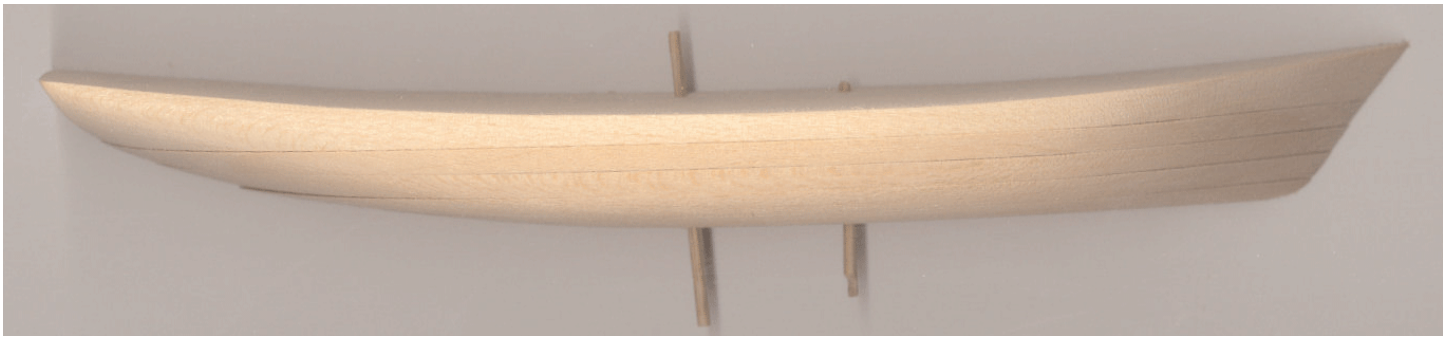


Up till now, you have worked to create the lifts as single units for the most part. Now, reassemble the hull and begin to work the hull as a single unit. When you get to this point, you can, if you wish, go ahead and glue the lifts together. With the bevels fairly close to their finished shapes, there is not really any more to be gained from disassembling the hull. I recommend yellow carpenter's glue for this operation. Do not use a lot of glue on each lift. I glued just one face of the two lifts to be joined and I made sure there was only a thin layer that covered the surface thoroughly. You want to minimize glue squeeze out when the lifts go together. Make sure you have a damp cloth ready to go over the hull and wipe off any glue that does squeeze out. Do not let it set there. Get it off the surface as quickly as possible. If you do not, then there will be a problem in the staining and finishing process later on. Pay special attention to the dowels that will go in and help hold the lifts together. They must be trimmed down and every trace of glue removed from around their ends. Once the hull is glued up, let it set for a few hours before you try and do any more work on it.





With the hull glued up and dried solid, you can begin to refine the shape of the hull some more. Here is where the rough edges of the hull get worked down. Have your section templates ready. It is a good idea to have a sheet of paper taped to the workbench that has the vertical station lines laid out. Let's call this a station line master. To mark the stations on the station line master, use the same tick strip you used to create the station lines on the original block. Make sure the lines on the station line master extend far enough so you can lay the hull down and see the lines both above and below the hull. Make sure you have some marks on the upper lift near the centerline by which you can align the hull on the station line master. By using the station line master, you can have a reference mark for your station templates when you hold them against the hull to check the hull's shape during the fairing process. The process is to do a little sanding, then lay the hull down on the station line master and check the area of the hull with the appropriate station templates. Note where more material should be removed, and sand some more. I used 60 grit sand paper for the first sanding on the glued up hull. After I got the shape of the hull very close, I switched to 220 grit and then finally to 400 grit. By that point I had a very smooth hull ready for finishing.



How you finish your model is entirely up to you. I like the look of a stain and clear finish to bring out the character of the wood, but you may want to paint. There are no hard and fast rules here, so choose what pleases you best. Since I was using basswood for my models, I chose to stain with Minwax cherry. I used the Minwax pre stain conditioner first. I followed all the directions to the letter. Once I gave the hull a light coat of cherry, I let it harden overnight. The next morning I put on a coat of clear gloss polyurethane. I eventually used three coats of polyurethane. I created a display board for the model made of American walnut. I stained it with Minwax Jacobean stain and then gave it three coats of gloss polyurethane. The model was fixed to the display board by screwing it from the back of the display board. I added a name plate of the same kind I have used on my other recent models. The name plate was doweled onto the display board from the back side.

Although the methods I have described were used to make a small scale half model, these same methods and tools can be used to create a much larger half model. If you prefer, you can build a full solid hull model using these same methods. Rather than making just one side of the hull, you can use your templates to make both sides of the same hull and then join them together with a keel, stem, and sternpost. In this way, a fully rigged model can be made. The possibilities are many when considering how to make and display a half model, so get out your plans, choose your timber, and use your imagination to create a half model (or a whole model) for yourself.