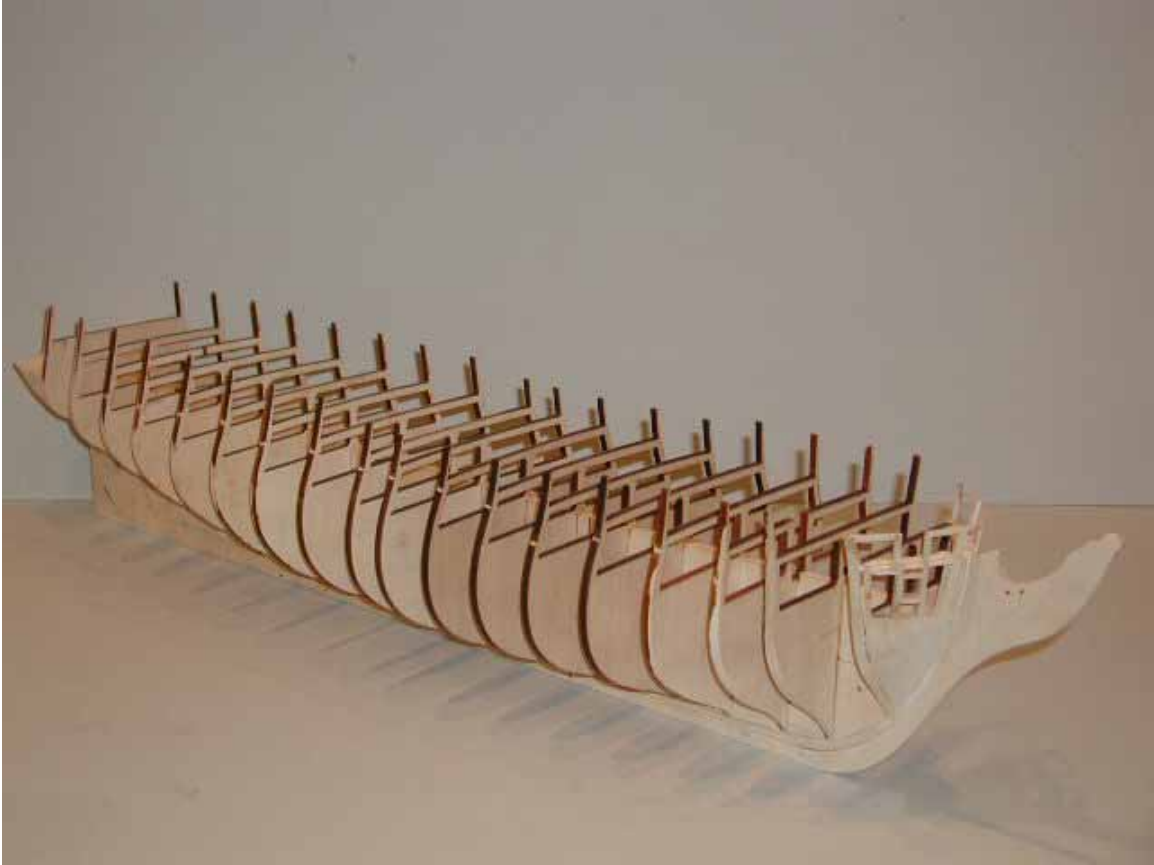


Modeling the Constitution

Chapter 1



A Practicum by Robert E. Hunt

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Introduction

First, let me say welcome to all who are participating in this practicum. Together we will build this country's oldest surviving ship, USS Constitution, better known as *Old Ironsides*.

For many years now practicums have been written for scratchbuilt models. However, the majority of model shipbuilders do not build from scratch nor do they wish to learn how. Scratchbuilding is a complex, lengthy procedure requiring special tools, a commitment of thousands of hours of time, and skills in woodworking, carving, metal work and even sculpting at times. To some modelers, these skills come natural. But to many it can take years to master them or even become good at them. But what most modelers don't realize is that even building a kit involves much scratchbuilding. The major difference is that a kit provides premilled stock, cast fittings, and to some degree, a set of instructions.

I built kits for many years and gained much experience in figuring out what the instructions left out. It was a long road and many models were less than I had envisioned. When I first started building model ships, I had never heard of the internet and was pretty much on my own. Living in a small town, there were no other experienced modelers to mentor me. I basically had to teach myself. My method was to learn from my mistakes. And believe me, I have made them all. I've probably thrown away as many models as I have finished.

The kits are often times flawed with poor quality materials, inaccurate plans, and vague if not difficult to understand, instructions. Today there exist numerous forums on the internet and the majority of questions and problems come from modelers building kits and running into these same problems over and over again.

After completing two scratchbuilt models through practicums and participating in other scratchbuilt practicums, I came to the conclusion that I was no longer enjoying the lengthy process of building a model ship from scratch. So I ordered some new kits. And what I had found was that things had improved since I last built a kit. A new set of kits were being developed with laser cut parts, parts that actually fit together. Plans had greatly improved and instructions were better as well. But I still saw the same questions being asked by modelers on specific methods for things like planking, coppering, painting, and finishing. It was then that I decided that the time had come for me to take what I had learned over the years and put it to meaningful use.

This practicum is not the first such detailed writing on how to build a model ship based on a kit. An earlier writing by Gene McClure was written based on the Mantua kit of HMS Victory. However, that kit is no longer available and has been

replaced by a newer, less detailed kit. The kit I have chosen is one developed by knowledgeable and experienced people in the industry of model ships, the Model Shipways kit of the Constitution sold only by Model Expo Incorporated and it's authorized retailers. As I build this model myself, I will provide you, the participant, a detailed set of instructions based on my methods. These instructions will be accompanied by photos of my model as it progresses as well as actual photographs of the Constitution docked in Boston, MA. Now one thing I want to emphasize is that my methods work for me quite well. They are not gospel. If you know of an easier method that works for you to perform a certain part of the construction, then by all means, use what works for you. Share your methods with the group if you like.

A forum has been set up on my website (<http://www.lauckstreetshipyard.com>) for this practicum. This forum is for participants in the practicum only. It is an unmoderated forum so you may post your questions, comments or methods there so that other participants may benefit from them as well. I am will attempt to answer any and all questions posted in the forum. **Should you conduct yourself in an unacceptable manner in the private or public forums that I provide, you will be banned from these forums and no refund will be available. However, I will continue to support your practicum related questions through private correspondence. But I will not tolerate poor conduct in my forums and have, in the past, banned practicum participants due to improper conduct. I think that the majority of you understand the disruption such conduct causes and can appreciate my policies on this matter.**

If you encounter problems or don't understand a particular part of the practicum, post a question in the forum so that it benefits others. I will do everything I can to assist you and help you in building this model.

We will be building the model as the kit provides, based on the 1993-97 restoration of the ship. However, from time to time I may decide to replace existing parts such as castings with scratchbuilt pieces. This will be documented in the practicum but you do not have to do so if you do not desire. I may also replace some of the basswood provided in the kit with another hardwood such as boxwood, ebony or holly. Again, you do not have to do so and the practicum will offer the standard as well as alternative constructions.

I will be referring to two sources of reference as I build the model. One is the book "The Frigate Constitution and Other Historic Ships" by F. Alexander Magoun. The ISBN is 0-486-25524-7. The other book is "Old Ironsides, The Story of USS Constitution" by Thomas P. Horgan, Captain, USNR. This book is out of print now and does not have an ISBN number. I will also be referring to many photographs I took of the ship when I visited it in June of 1999.

Most of the construction of this model will be done with basic hand tools. As most modelers do not possess some of the more expensive power tools, I will be writing this practicum based on hand tools so that it may benefit everyone. That is not to say that you must use hand tools if you possess some of the more expensive power tools. However, in the first chapter there are large blocks of basswood that must be reduced to smaller dimensions in which I do use power tools to make the cutting easier.

When possible, I will also specify where you can purchase a particular tool that I might use if it is still available and I will give the vendor's stock number. I believe that most of the tools I use today are still available. There's much work ahead of us so let's get started.

Format of This Practicum

I will be using a special format throughout this practicum. First, each chapter will be broken down into sections and sections will be broken down into subsections. For example, Chapter 1 is on the assembly of the framework. That chapter is broken down into several sections:

- 1.1 Center Keel Assembly
- 1.2 The Bulkheads
- 1.3 Framework Assembly

Sub sections will be numbered according to their section numbers:

- 1.1.1 Gluing the Laser Cut Parts
- 1.1.2 Cleaning the Keel Parts
- 1.1.3 Assembling the Center Keel

At the end of each sub section, a summary will be provided with checkboxes that you can use to check off the construction as it is completed.

Summary

- Remove all of the parts indicated on sheet 1 of your plans.
- Surface glue each pair of parts and clamp with office clips.
- Lay clamped parts on a level surface to prevent warpage.

This will enable you to first read the sub section to understand what you must do, and then keep track of your completion as you progress. It is hoped that this format will help to simplify the complexity and completeness of this practicum.

Should you encounter a problem or have a question you wish to post in the forum for the groups benefit, or to me directly, you can then reference the section

or sub section by number making it easier to know exactly what area of the practicum you are having trouble with.

A Word About Tools

I guess I should say something about tools. Over the years I have accumulated a number of tools and have become accustomed to their use. That is not to say that the list I'm going to give you is gospel. These are tools I like to use and it took me years to acquire them. I am not saying you need to rush out and buy all of these tools before starting this practicum. If you've been building model ships for a while, you probably have a lot of these tools or equivalents. Some of these tools are a must, some make the job go much easier. So I only list these because many modelers have asked me what tools I use to build my models. Where possible, I list the Micro Mark catalog numbers as I find that source to be invaluable to the modeler. You can reach Micro Mark at (800) 225-1066 or <http://www.micromark.com>. I am in no way affiliated with Micro Mark nor do I receive any benefits from them by mentioning them in this practicum.

Here are the tools that I've acquired over the years and use frequently:

1. No. 5 Exacto knife handle (Micro Mark #36117).
2. No. 2 or equivalent Exacto knife handle (Micro Mark #14351 or 70233).
3. #10, #11 and #22 Exacto blades (Micro Mark #14360, 36102 and 36113).
4. Micro Saw Blades (Micro Mark #14346)
5. Dremel Rotary Tool (Micro Mark #82592)
6. Helping Hands (Micro Mark #21120)
7. Weldbond white glue. (Home Depot or Lowes)
8. Zap A Gap mid cure super glue (Micro Mark #80877 or 80878)
9. Z Ends for Zap A Gap (Micro Mark #80890)
10. Five minute epoxy (Home Depot or Lowes)
11. Delta Scroll saw or Jewelers Saw (Micro Mark #22105)
12. Microlux Tilting Arbor Tablesaw (Micro Mark #80463)
13. Swiss style watchmakers tweezers (Micro Mark #19101)
14. Deluxe pin vise (Micro Mark #82110)
15. Dimensioned mini square (Micro Mark #82147)
16. Ponce wheel (Micro Mark #15200)
17. Steel machinist square (Micro Mark #10117)
18. Angled high precision micro shear (Micro Mark #80334)
19. Tweezer nose pliers (Micro Mark #80338)
20. Mid size file set (Micro Mark #81063)
21. Stainless steel 6" ruler (Micro Mark #10114)
22. True Sander (Micro Mark #14475)
23. Micro drill bit set (Micro Mark #60362)
24. 3" Toolmakers angle plates (Micro Mark #60626)
25. Office clips, small and medium size
26. Pan vise (Micro Mark #21123)

27. Delta bench top mini disk/belt sander (Micro Mark #82218)
28. Preac tablesaw
29. 9" bandsaw
30. Mini wood lathe with duplicator

There are probably other tools I use infrequently and did not mention. By the looks of this list, I should own stock in Micro Mark, perhaps we all should.

Now before you get excited, or maybe depressed over this lengthy list, let me say this one more time. You do not need to rush out and buy all of these tools. In writing this practicum, I will try and mention the tools you'll need for a particular assembly as we go along and alternatives for those who may not possess some of the larger and more expensive power tools. Keep in mind, this is not a simple kit. It has many assemblies and will take time to construct. Use the tools you feel comfortable with and can afford to buy.

Some Supplies You Will Need

There are several items I use regularly in the practicum that do not come in your kit. So that you will be prepared when the time comes, here is a list of certain supplies you will find yourself using routinely:

- Weldbond White Glue
- Zap A Gap Super Glue
- Z Ends
- Five Minute Epoxy
- Tracing Paper
- Thick Card Stock
- #10, 11, 22 Exacto Blades and Knife
- 100, 150, 220, 330 and 400 Grit Sandpaper
- Polyurethane Satin, Wipe On Poly or Sanding Sealer
- Toothpicks
- Office Clips
- Rubbing Alcohol

Other items may be needed as we progress and I will try and give some advance notice of these items when they come up.

As to tools, once again let me say that most commonly you will be able to build the model with simple hand tools. However, there may be times when the job is much easier if some form of power tool is used. This kit is nearly 100% basswood. Basswood is a soft wood that can be cut fairly easily with a knife or razor saw. However, there will be times when I suggest substituting other materials to either make the job a bit easier or to improve the quality of the

finished product. Whether you choose to follow my suggestions is entirely up to you. I will still follow the kit's supplied pieces as much as possible.

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Ok, that's the legal mumbo jumbo. It is hoped that you all understand that to build a model ship is no easy task. To build the model and go into descriptive detail with photos to explain the entire process is even more work and challenging. The monthly subscription fee for this practicum is small and barely covers costs. I do hope that you all will respect these copy rights and abide by them. If you find it absolutely necessary to not adhere to them, please contact me first and explain your situation. I'm pretty darn easy to get along with if I understand the problem. Thank you.

Summary

In summation, I hope that you will find this practicum useful and wish you success in completing the model. I will attempt to steer you clear of problem areas and keep the sequence of construction in a meaningful and useful fashion so that we don't paint ourselves into a corner and accept mistakes that could have been avoided.

Good luck and thank you for subscribing.

Bob Hunt

1. Assembling The Framework

Once again, welcome to the Constitution Practicum. Chapter 1 begins our assembly of this historic ship by building the hull's basic structure or framework. I will take you through the process step by step to ensure your success.

1.1 Center Keel Assembly

We will begin with the center keel assembly. The kit provides laser cut basswood parts 1/8" thick. However, the center keel assembly is made of two layers of these parts to make the finished assembly 1/4" thick. When the pairs are glued together they result in a total of 8 pieces used to construct the center keel assembly.

1.1.1 Gluing the Laser Cut Parts

First find the 1/8" basswood sheets that contain these parts. Sheet 1, Laser Cut Keel and Bulkhead Patterns, identify these parts. There are 8 pairs of parts. They are identified at the bottom of the plan sheet as "Center Keel Set". Find these parts in your laser stock.

Let me mention something about laser cut parts. The laser cutting has two effects on the part. First and probably most noticeable, is that the edges that are cut are burned and discolored. Second, and less noticeable, the cut is not perpendicular to the surface of the wood. When you remove a laser part from it's billet, look at the cut edge by sighting down it lengthwise. You will see that the edge is not 90 degrees but has a slight angle to it. This is the inherent nature of laser cutting. As the laser cuts through the wood, the intensity of the beam of light gets less and this causes the angle we see. You might notice that the back side of these parts is barely cut while the front side is wide enough to get a #11 exacto knife into.

Most laser cut parts have small tabs on them where the laser did not cut through the wood. This is so that the parts do not break free in shipping and get damaged. You will need to cut through these tabs with your #11 exacto knife. You may also have to cut through on the backside of the basswood sheet to free the part. Never force the part out of it's billet or it may split, crack or even break off in places. If the part does not fall out once the tabs have been cut, examine the backside for any areas the laser did not cut and cut through them also with the #11 exacto blade.

Once you have removed all of the parts indicated on sheet 1 of your plans, match the pairs up. Be careful with the keel pieces and make sure the pairs match up. The keel piece labeled 4 on your plans has an upward rise at one end. The

piece labeled 2 on your plans at the stem also is wider at the stem area than where it mates to the piece labeled 3.

Each pair of keel parts must be surface glued together first. I use a white glue called Weldbond. I prefer white glue over the yellow glues because they're less visible if some gets on the outside of parts and they are easier to remove when dry than some of the yellow glues. Also, if a mistake is made, the Weldbond glue can be unglued by applying denatured alcohol or rubbing alcohol to the wood and glue joint. After all, mistakes do occur and sometimes it is necessary to unglue a part or make it all over from scratch.

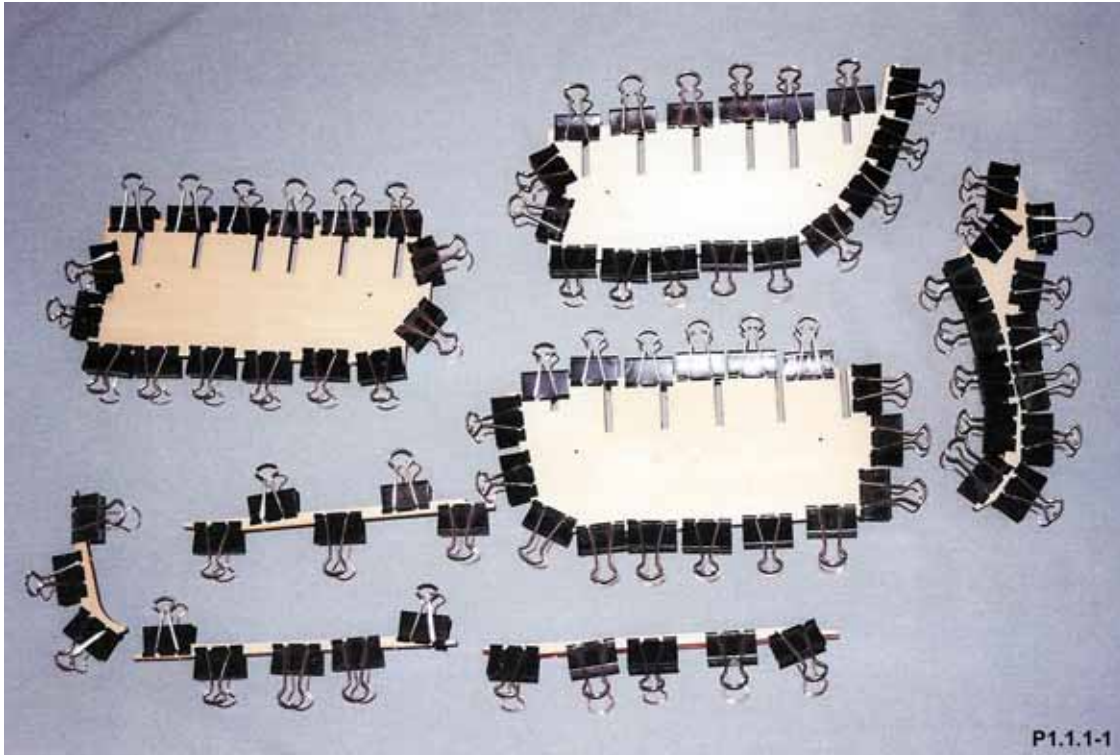
Now to clamp your parts together, I use office clips. These are black metal clips used to clip a stack of papers together. They come in several sizes. I find the medium size clips work best for clamping 1/4" stock. You'll want an ample supply of these so you may want to stock up. They come in very handy for model shipbuilding.

With glue and clips in hand, start with the small pieces first. The Weldbond sets up rather fast. Match a pair of parts first, then apply glue all over one side of the part. I often use a toothpick to spread it around to make sure that the entire surface is covered with glue. Don't go overboard or you will have glue oozing out on all sides when you clamp the two pieces together.

Once you've spread your glue, press the other part against it. I find it helpful to slide the two parts around some to spread the glue onto the other part some. There are alignment holes in these parts so you can use those to align them but I find that the best judge of alignment is to watch all of the outside edges. Because of the angle from laser cutting, you're not going to get perfect alignment. We'll take care of that little problem later. The main thing is to make sure the parts are as aligned as possible and sanding will take care of the rest later.

Clamp the parts together all around and use as many clips as will fit the part. When that part is clamped, set it on a level surface and let the glue dry for several hours.

Repeat this process for each of the 8 pairs of parts. The large center keel parts will require fast work before the glue sets up and many clamps around all four sides of the parts. Photo P1.1.1-1 shows the 8 pairs of parts glued and clamped up.



P1.1.1-1

Be sure and lay the clamped parts on a level surface to prevent any warpage. The glue is water based and the moisture from it can cause a part to warp if you're not careful.

Summary

- Remove all of the Center Keel parts indicated on sheet 1 of your plans.
- Surface glue each pair of parts and clamp with office clips.
- Lay clamped parts on a level surface to prevent warpage.

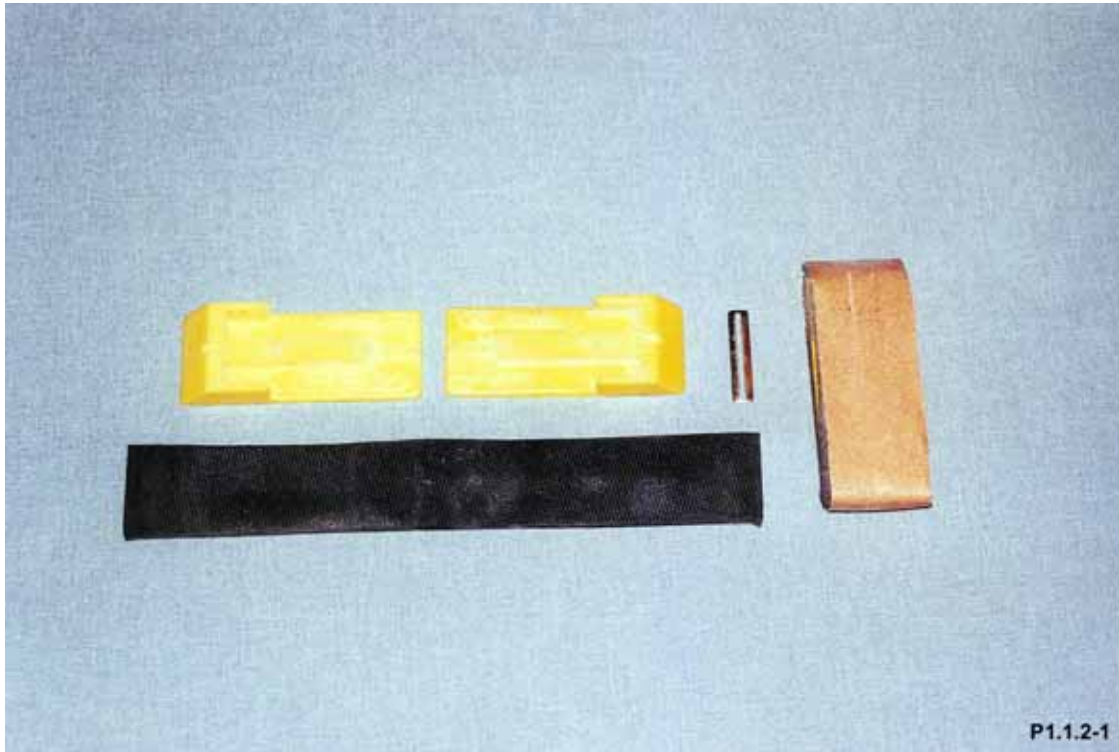
1.1.2 Cleaning the Keel Parts

After allowing several hours for the glue to dry, you may remove the clamps. The next thing we must do is clean up the parts.

There is a tool I've found most useful for this purpose and for many other purposes as well. It's a hand tool called the True Sander. It's sold by Micro Mark and the catalog number is 14475. The tool consists of a small board and a square metal sanding block. The sanding block is what I used to clean up the edges of the keel pieces.

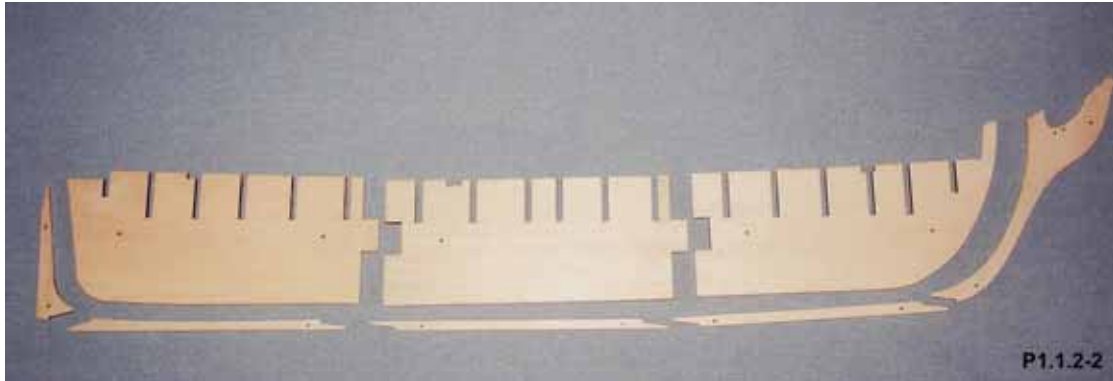
You can purchase various grades of sand paper at your local Lowes or Home Depot that have a stick-on side and a sandpaper side. They are usually used with palm sanders. I purchased 100, 150 and 220 grit. These sheets can be cut to fit the metal sanding block. And since the sanding block has four sides, you can put a different grit on each side. Simply cut it to the proper width, peel off the protective sheet and stick it to the True Sander sanding block.

You will need to sand each edge of the glued pair of parts. Be careful with the top edge of the center keel set. Too much pressure while sanding can break the tabs that frame the slots for the bulkheads. On curved areas, such as the stem, you won't be able to use the True Sander. Instead, I use a small yellow plastic sanding block I bought years ago at my local hobby shop. I'm not sure who makes them or if they are available any longer. The sander consists of two yellow surfaces with teeth that interlock. They are angled on the ends and there is a rubber pad between the plastic block and the sand paper. Photo P1.1.2-1 shows a picture of the sander I'm referring to.



P1.1.2-1

You'll want to use some form of padded sanding block to sand the curved surfaces or just use a piece of sandpaper folded several times. I used 100 grit paper to clean all edges. Then I sanded the sides with 150 grit paper. Photo P1.1.2-2 shows all of the keel parts glued and sanded, ready for assembly.



P1.1.2-2

Summary

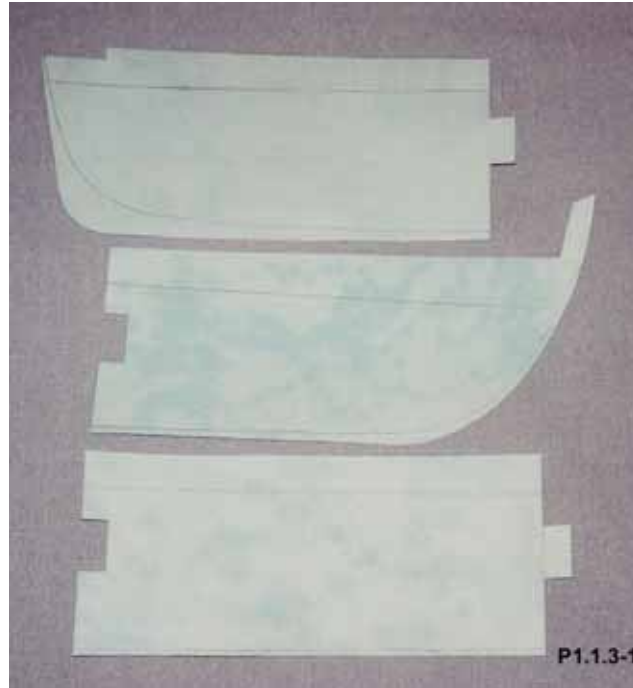
- Clean edge surfaces with the True Sander sanding block.

1.1.3 Assembling The Center Keel

Before we glue the three center keel sections together, there are some preparatory things that need to be done. There are several reference lines that need to be transferred to the three pieces. I find it easiest to do this by making cardstock templates.

First use tracing paper to trace the pattern of each center keel section. It is not necessary to transfer each bulkhead notch when you trace the pattern. Only transfer the basic outline, the reference line and the bearding line.

Once you've traced each pattern, rubber cement them to a piece of card stock. I purchased a ream of thick blue card stock at the local office supply store. Give the rubber cement time to dry, then cut out the template. Photo P1.1.3-1 shows the templates cut out.

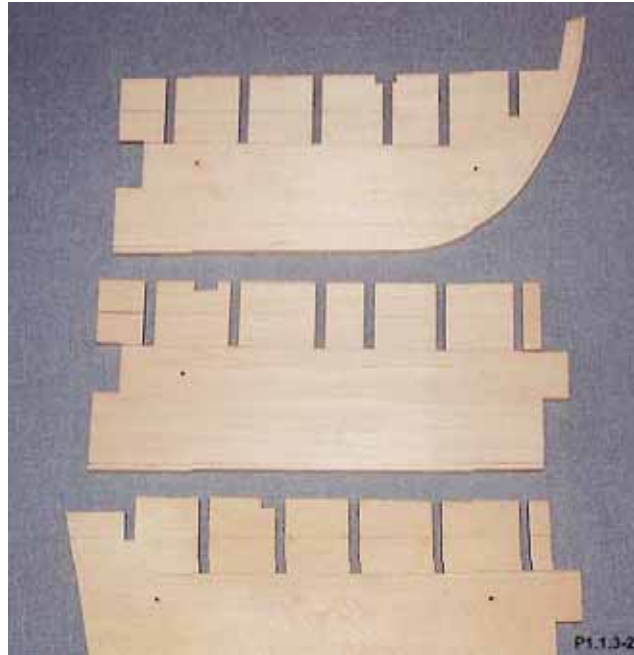


P1.1.3-1

Next, we need to transfer the reference line to each section. To do this, cut along the reference line removing the upper section of the cardstock template and place the template on your part aligning the bottom edge. Take a pencil and mark the top edge that is the reference line. Do this for each of the three pieces.

To transfer the bearding line, first cut away the stock on the bearding line of each template. Then align the top edge of each template with the reference line you just drew and mark off the bearding line on the keel piece. After you've done that, take the upper section you removed at the reference line and cut off the bearding line portion for the first and last center keel section (there is no bearding line on the center section. Again, use the reference line to align the pieces and mark the upper section of the bearding line.

Another line that needs to be drawn for reference purposes is a straight line connecting the bottom of each bulkhead notch in each of the three pieces. Use a ruler and align it with the bottom of the bulkhead notches and mark the line with a pencil. Repeat this on each of the three pieces. Photo P1.1.3-2 shows the reference line marked on each piece as well as the bottom bulkhead line and bearding line.



P1.1.3-2

You now have three points of reference on each center keel piece for aligning the pieces properly. If you used the outside edges to align the pieces, you could have possibly thrown the bulkhead notches off on one piece and that would have had a terrible effect on the overall shape of your hull. The main thing is to be sure your reference lines match up. You might want to check this before you begin gluing.

All that's left now is to glue the three pieces together. Place some wax paper down on a nice flat surface. You'll need some epoxy and some heavy weights. I have some 3" steel blocks I purchased from Micro Mark called Toolmaker's Angle Plates, stock number 60626. They're quite heavy and work well for squaring bulkheads to the center keel.

Mix up some epoxy. I prefer 5 minute myself. Coat the tabbed edges of both ends of the center piece and the tabbed edges of the two outer pieces. Place them on the wax paper and insert the tabs into the notches aligning the reference marks we made earlier. Do not worry if the top or bottom edges match up. We will take care of that later.

Place some heavy weights on each piece and allow ample time for the epoxy to set up. If using 5 minute epoxy, allow an hour. If using 30 minute epoxy, allow 2 hours.

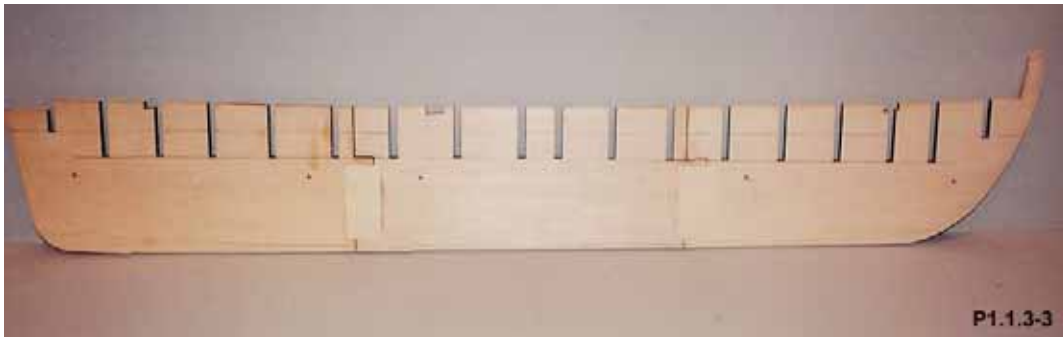
To give the structure a little added margin of strength, I added a small piece of 1/32" basswood scrap 1" wide and 2" long over the joint on the side facing up where the tab is inserted into the notch. If you do this, make sure the piece is

below the bulkhead line by at least 1/8" and does not interfere with the bulkheads when they will be inserted into their respective notches later on. I will add pieces on the other side once the epoxy has set up.

After the epoxy has had ample time to set up, peel the center keel assembly from the wax paper and turn it over. We must also mark the reference line and bearding line on this side. Fetch your forward and aft templates from the trash, oh, you did throw them away, didn't you. But I didn't tell you to. Fetch the forward and aft templates and the bearding line pieces you cut off and using scotch tape, tape the bearding line pieces back in place. Now align the template at the bow along the bottom edge and mark the reference line. Do the same for the stern template.

After the reference line has been marked, remove the taped bearding line piece, align the bow piece with the reference line now and draw the bearding line. Repeat for the stern piece. Now you can connect the bow and stern lines to mark the missing center piece.

If you glued the small basswood strips over the joints on the first side, repeat for this side now. Photo P1.1.3-3 shows the assembled Center Keel.



P1.1.3-3

Summary

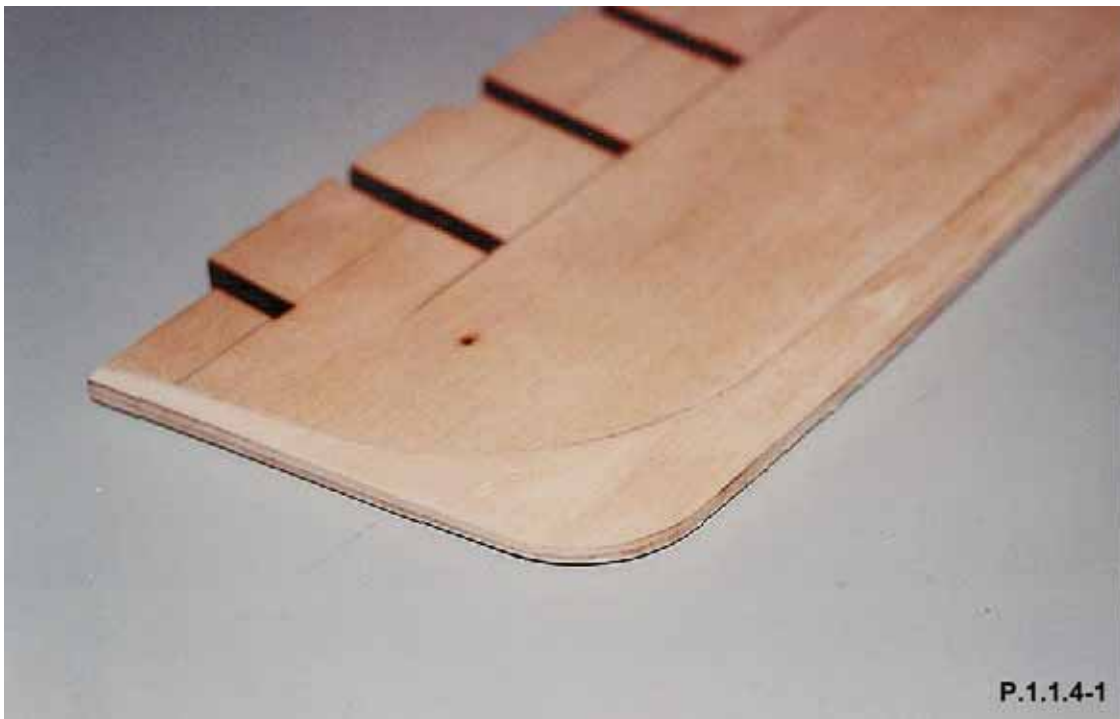
- Trace the pattern of each center keel section.
- Rubber cement them to a piece of card stock.
- Cut out card stock templates.
- Transfer the reference line to each section.
- Transfer the bearding line to each section.
- Mark a line at the bottom of the bulkhead notches on each section.
- Glue the three sections together with epoxy adding weights to keep them flat and using the reference, bearding and bulkhead lines for alignment.
- Transfer reference, bearding and bulkhead lines to the other side of the assembly.
- Glue 1/32" basswood strips to joints on both sides for reinforcement.

1.1.4 Cutting The Rabbet Joint

Before we can attach the stem, keel and sternpost, we must cut the rabbet joint. To do this, draw a line 1/16" from the edge on the bottom of the center keel assembly, around the bow and around the stern. You can use a compass or simply hold a pencil in your hand and use your finger against the side of the center keel to guide the pencil in a straight line. This 1/16" line coincides with the thickness of the planking. We will first cut from the bearding line to this new line around the bottom perimeter of the center keel. This forms a bevel or taper along the bottom edge of the center keel. Later, when we get into the planking, we will refine this line if needed.

To cut the rabbet, I prefer the #22 exacto blade. This is a large, curved blade and makes a good cutting tool if you don't have chisels. I find it much easier to handle a knife than a chisel but use the tool that works best for you. After rough cutting the rabbet all the way around, sand it with 100 grit sandpaper. The True Sander sanding block works well for this operation. Try to keep the bevel flat and sharp, not rounded on the edge of the center keel.

At the stern, the bevel gets very wide making this taper much different than on the bottom. When you have completed one side, be sure to draw your line around the bottom 1/16" from the edge for the other side and cut the rabbet on that side. Photo P1.1.4-1 shows the stern area of my model with the rabbet cut. Note the penciled line of the original mark on the surface of the center keel. The depth of the cut is 1/16" at the edge as explained.



P1.1.4-1

Summary

- Draw a line 1/16" from the edge on the bottom of the center keel assembly.
- Cut rabbet from bearding line to bottom line just drawn.
- Sand the rabbet smooth.

1.1.5 Attaching The Stem, Sternpost and Keel

Now we are ready to attach our stem, sternpost and three keel sections. I found it best to start by gluing the stem and sternpost to the center keel. Test the fit of these pieces first. I had to do some sanding and trimming at the stem on the center keel and stem piece to get a good fit. You want to make sure the top edges of both pieces are aligned as the bowsprit sits on top of this area. You should not have any serious gaps between the two pieces. If you do, sand and trim to make the pieces fit as flush as possible.

You also must make sure the entire length of the bottom edge of your center keel is one smooth and continuous line. Especially where the center piece mates with the forward and aft piece, you may see some misalignment. This is where the True Sander sanding block comes in handy once again to sand the entire edge surface.

Once you are satisfied with the fit, put a bead of Weldbond on the center keel edge and press the stem in place. I found it best to lay the center keel and stem down on a flat surface to keep the stem in proper alignment with the center keel. If you attached the 1/32" layer of basswood over your center keel joints, you will also need to lay a piece of 1/32" basswood under the stem and center keel where the two pieces are joined. Otherwise, you will not get proper alignment.

Give the glue some time to set up before trying to move the pieces. If some glue oozes into the rabbet joint, you can wipe up the excess with a paper towel and then scrape the excess with your exacto knife and a #10 blade. Be sure and remove any excess glue from both sides.

Do the same for the sternpost and once you have a good fit, glue it to the center keel the same way you did the stem.

The three keel pieces are very similar. However, the piece that mates to the sternpost has an upward curve at one end. The piece that mates to the stem is thicker at one end. Test fit the pieces that mate to the stem and sternpost first. I found that the scarf joints did not fit as well as I wanted and had to do some additional trimming and cleaning with sandpaper to get a good fit. If any large gaps appear between the two pieces, you can glue a thin layer of basswood onto

one surface and sand and trim it until you have a good fit. I ran into this problem when I joined the center keel piece to the stem and sternpost keel sections.

After the stem and stern keel sections have been glued, you can fit and glue the final center section of the keel. I found that my center section was 1/16" too long and had to do some trimming on the two scarf joints at one end to get a good fit.

Photo P1.1.5-1 shows the keel section joined to the sternpost. Note how the rabbet joint now becomes more pronounced and visible.



P1.1.5-1

Summary

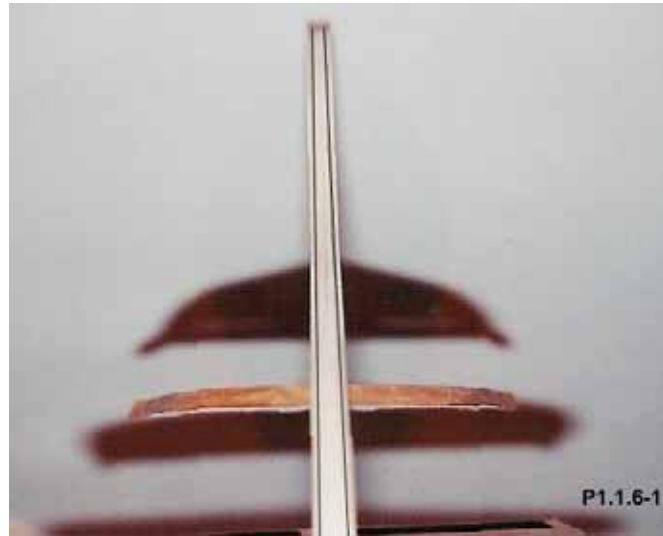
- Attach sternpost to Center Keel assembly with white glue.
- Attach stem to Center Keel assembly with white glue.
- Attach stern keel section to Center Keel with white glue.
- Attach stem keel section to Center Keel with white glue.
- Fit and attach center keel piece to Center Keel with white glue.

1.1.6 Tapering the Stem and Sternpost

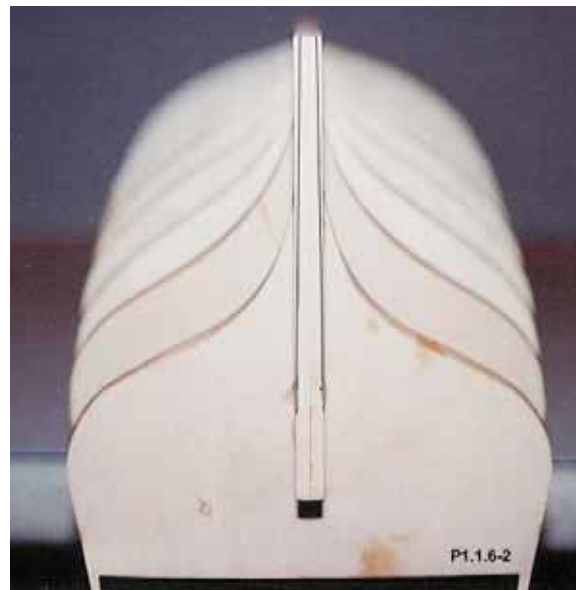
There is one other detail we need to tend to, the tapering of the stem and sternpost. Unlike most British warships, the Constitution's stem is tapered throughout its length to 1/8" from the rabbet joint forward. Where the stem joins the keel, this taper is very smooth. At the top of the stem, the taper ends just at its tip where the scroll work will eventually be located.

When tapering the stem, be careful that you do not change the thickness at the joint that forms the rabbet. This should remain 1/4" thick. Measure 1/16" from

the edge of the stem and draw a line from the scarf joint where the stem joins the keel to the top edge where it rounds over. You can use a compass to keep your line consistent and parallel to the edge of the stem. Photo P1.1.6-1 shows the lines drawn on the stem to denote the final thickness of the stem after tapering. Photo P1.1.6-2 shows the sternpost. Note that on the sternpost, the taper does not end at the top but further down. We'll talk about that later.



P1.1.6-1



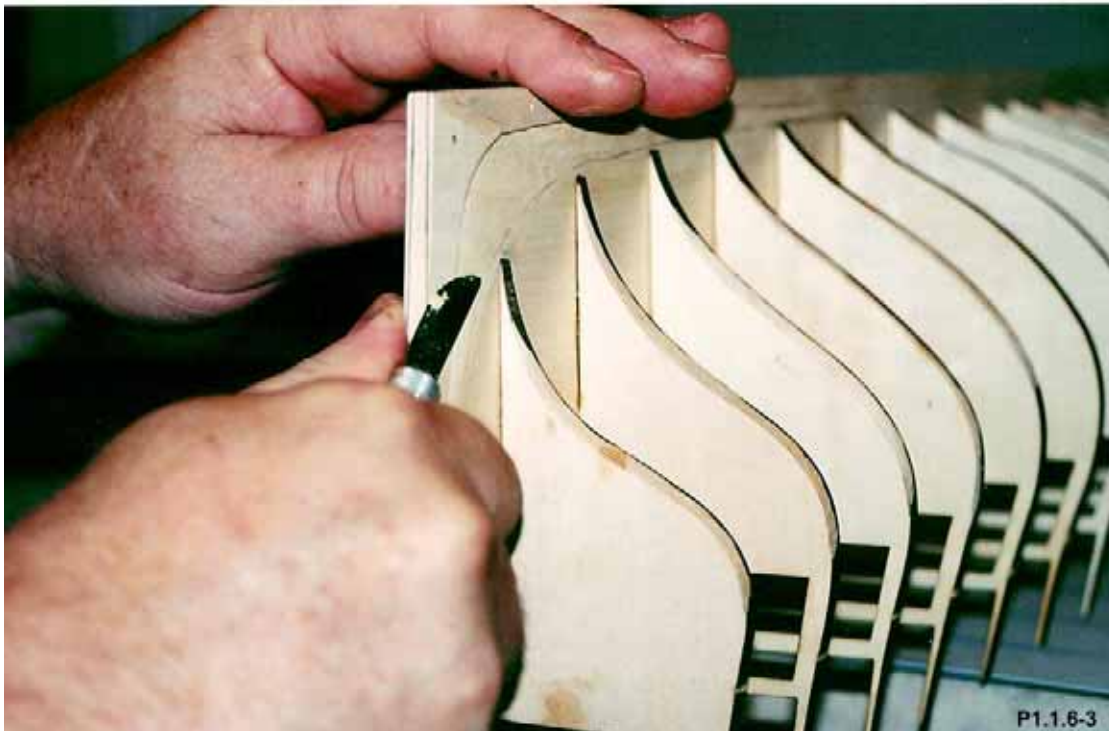
P1.1.6-2

Note: You'll notice the bulkheads are attached in these photo. I realized after I attached the bulkheads that I had forgotten to taper the stem and sternpost. Fortunately for you, I have saved you the headache of trying to taper them with the bulkheads attached. It is

much easier to do the tapering now before the bulkheads have been attached.

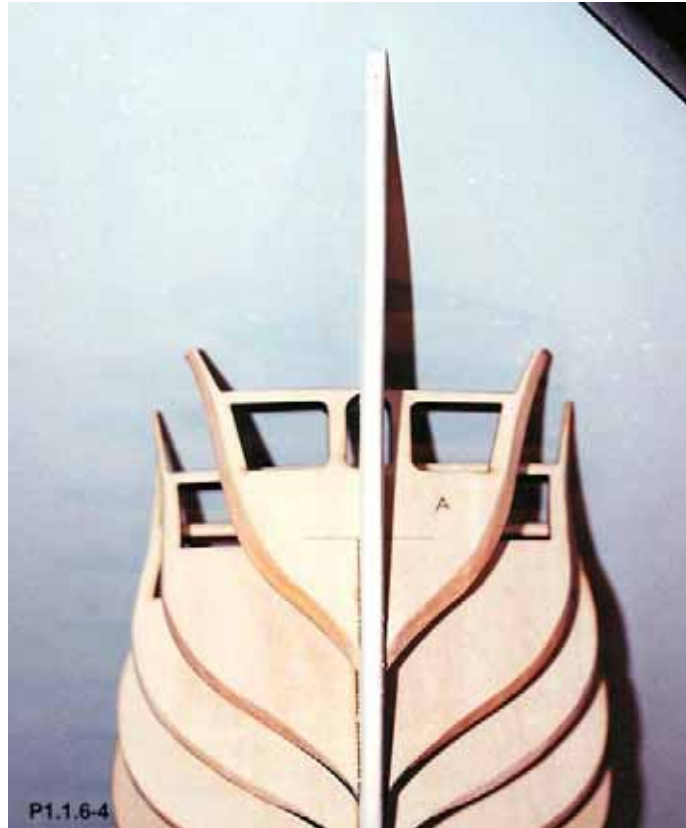
You can refer to the profile view of the hull on sheet 2 of your plans and see that the taper begins at the forward edge of the rabbet joint. The next series of photos shows the taper at the bow. Also note that the entire edge of the stem is rounded over. I used a #22 exacto blade to rough shape the taper in the stem, then sanded with 100 grit sandpaper to smooth it out. I finished with 150 grit sand paper.

The sternpost is also tapered from just above the point where it is curved downward to the keel where it ends at a thickness of 1/8". Photo P1.1.6-2 shows lines that I have drawn on the sternpost to show where it needs to be tapered. At the area on the back of the stem where it goes from a straight edge to a concave curve, measure 1/32" in on both edges. At the bottom of the sternpost, measure 1/16" from both edges. Connect this line to form a straight tapering line that ends at the keel with a total width of 1/8". Photo P1.1.6-3 shows how I used the #22 exacto blade in a large handle to taper the sternpost.



P1.1.6-3

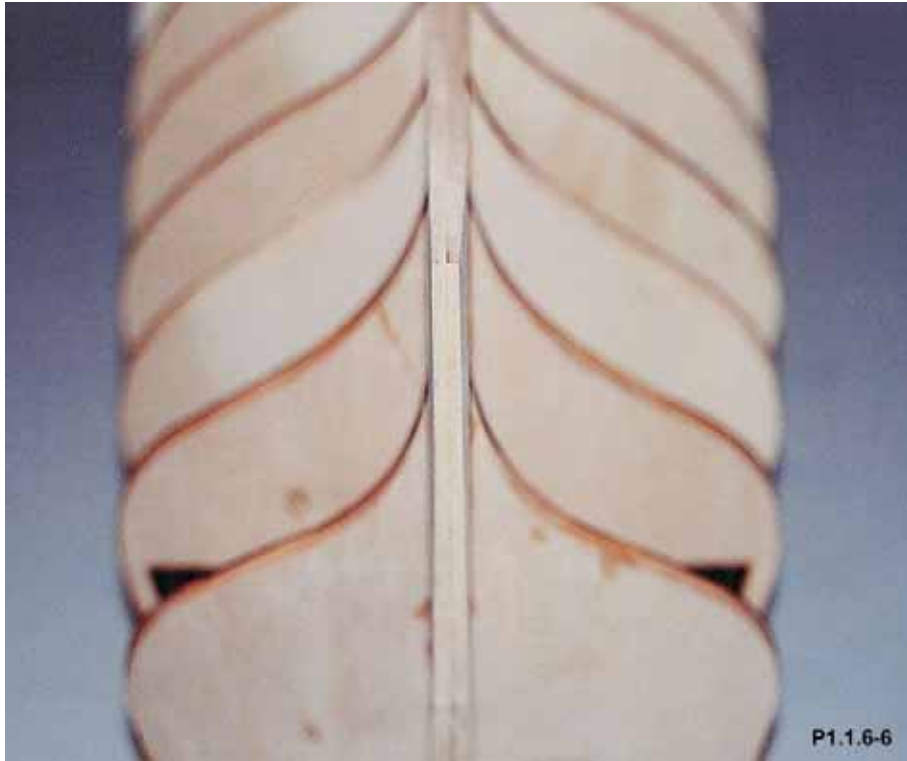
The remaining photos show the tapering of the stem and sternpost. One difference in the sternpost is that you want to leave the edges crisp, not rounded as you do to the stem.



P1.1.6-4



P1.1.6-5



P1.1.6-6

Summary

- Mark the stem for tapering.
- Taper the stem and sand.
- Round over the edges of the stem up to just below the decorative roundness at the top.
- Mark the sternpost for tapering.
- Taper the sternpost and sand leaving the edges crisp.

1.2 The Bulkheads

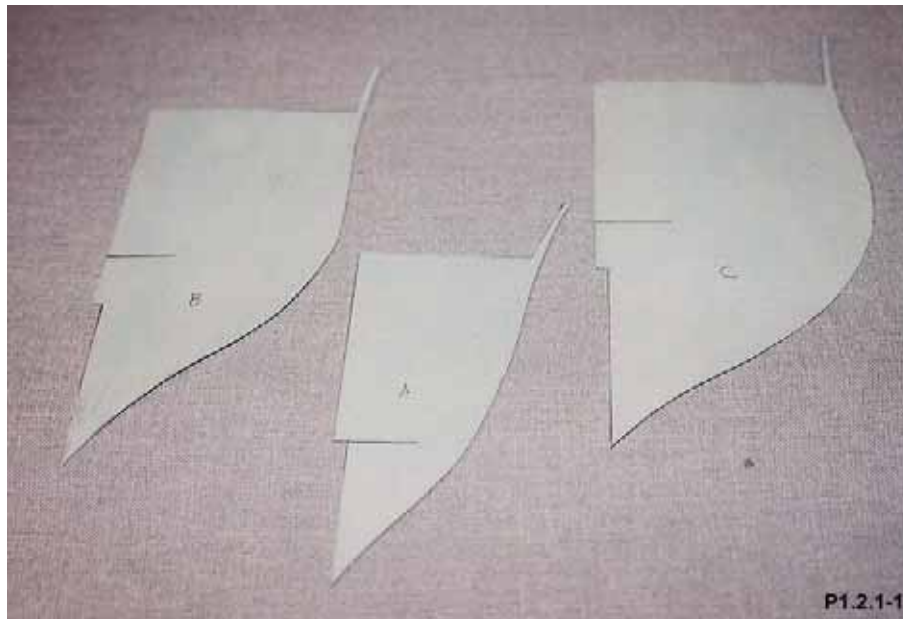
In this section we will prepare and assemble the bulkheads to the Center Keel forming the basic framework of the model. Before we can do this, there are some preparatory things that must be done.

1.2.1 Preparing The Bulkheads

Before we can attach the bulkheads to the keel assembly, we must do some preparatory work. First, we must transfer some lines from the plans to the bulkheads. Bulkheads A through E are beveled as are L through R. So we must transfer the bevel lines. And all bulkheads have a reference line on them that matches the reference line we drew on the Center Keel assembly.

Once again, I use tracing paper and card stock to prepare templates. Start with bulkhead A and trace just the right hand side of the bulkhead from sheet 1 of your plans. Trace just the outline starting at the centerline and the notch and only trace the outline from the beveled edge inside line, not the outer one. This is the dotted line. Also make sure you trace the reference line.

Once the pattern has been traced, rubber cement it to some card stock and cut the pattern out when the cement has dried. Repeat this process for each of the bulkheads that have bevels. Photo P1.2.1-1 shows bulkheads A, B and C as cardstock templates.



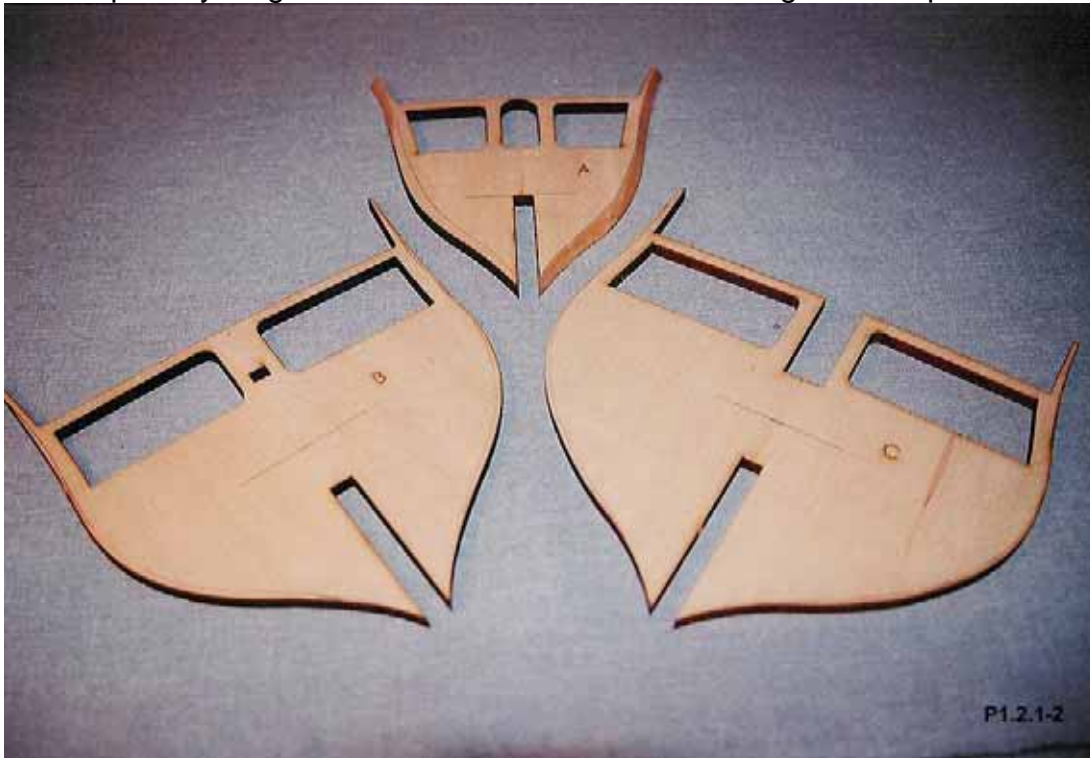
P1.2.1-1

When all of the templates have been made, transfer the bevel line and reference line to the bulkheads. Now if you will recall, the laser puts a slight angle on the edge of the part when it cuts. On bulkheads A – E, we want the forward side of

the bulkhead to be the side with the letter etched into it by the laser. **This is very important.** Draw your bevel line and reference line on this side of these bulkheads. When you glue these bulkheads to the Center Keel, the laser lettered side will face forward toward the stem.

On bulkheads L – R, you will also mark the bevel line and reference line on the side with the bulkhead letter etched into it by the laser, but the bulkheads will be glued to the Center Keel in the opposite direction so that the letter faces the sternpost. Remember that.

You will need to transfer the bevel line and reference line to both sides of the bulkheads. By both sides, I mean the left hand and right hand side, not the front and back. After transferring these lines, you will need to bevel the bulkheads. Bulkheads A – E are beveled toward the bow while bulkheads L – R are beveled towards the sternpost. Photo P1.2.1-2 shows bulkheads A, B and C with the lines transferred. You can see that Bulkhead A has been partially beveled. We will true up everything once the bulkheads have all been glued in place.

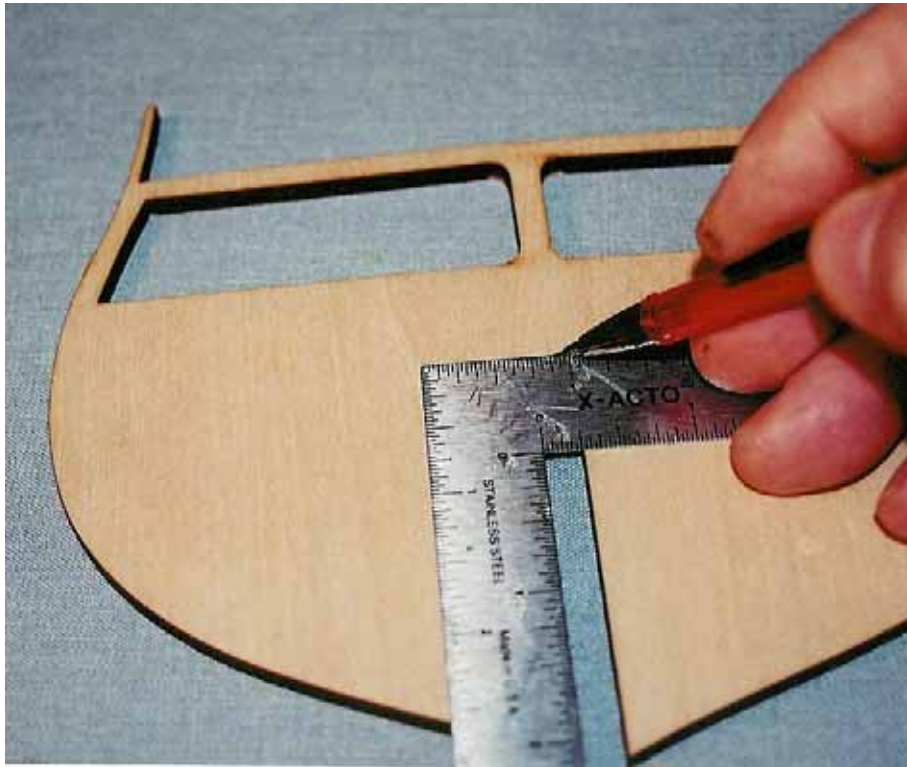


P1.2.1-2

Once you have marked all of your bevel lines you may bevel the edges. Bulkheads A – E are beveled back to front while Bulkheads L - R are beveled front to back.

Bulkheads F – K are not beveled but need the reference line transferred. I found it easiest to use a ruler to measure from the top of the bulkhead to the reference line and then use a square as shown in photo P1.2.1-3 to draw the reference

line. The square is aligned with the notch in the bulkhead to ensure that the reference line is perpendicular to the invisible centerline.



P1.2.1-3

Here is a list of each bulkhead and the distance from the top to the reference line:

- F = 1 15/16"
- G = 1 29/32"
- H = 1 7/8"
- I = 1 27/32"
- J = 1 27/32"
- K = 1 13/16"

Mark each bulkhead reference line on the side that has the letter laser cut into it.

Summary

- Trace bevel and reference line for bulkheads A – E and L - R.
- Make templates of tracings.
- Transfer bevel and reference lines to associated bulkheads.
- Bevel the edges of bulkheads A – E and L – R.
- Transfer reference line using measurement chart for bulkheads F – K.

1.3 Framework Assembly

Finally, we are ready for assembly. This section will begin the process of assembling the basic framework of our model. By using the reference lines we drew earlier, we will be able to construct a true and fair frame that will result in a very uniform and symmetrical hull.

1.3.1 Gluing the Bulkheads

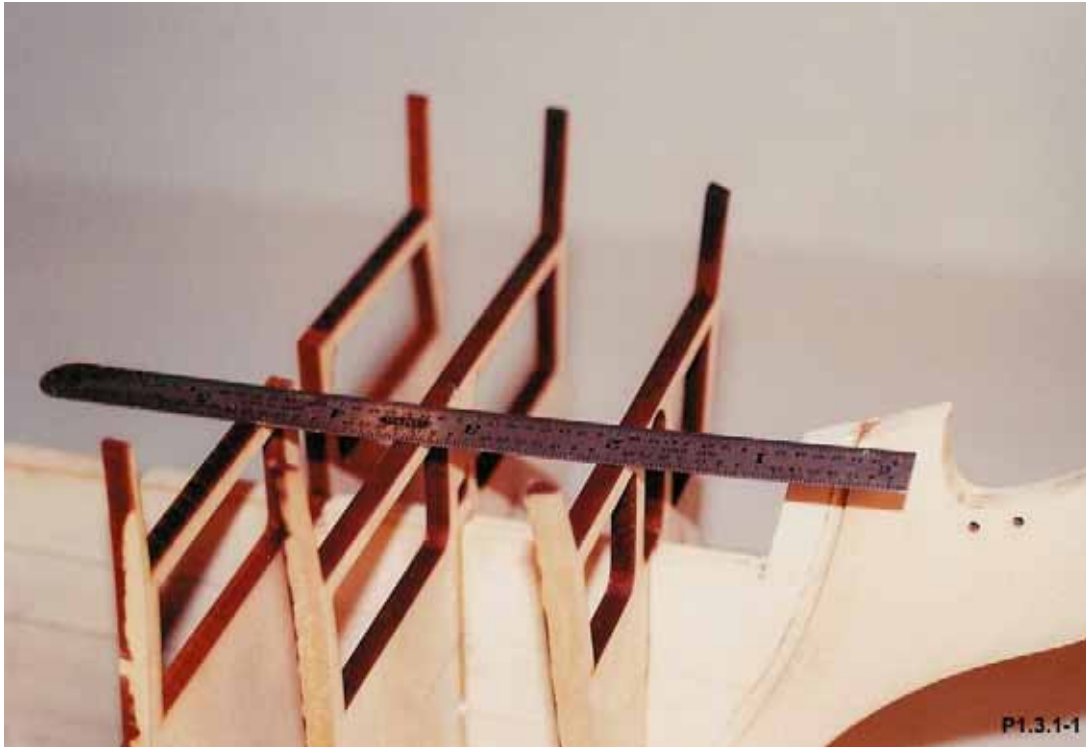
As we prepared the bulkheads, you will recall that we transferred a reference line to each bulkhead. This reference line will be used to align each bulkhead with the reference line we transferred to the Center Keel assembly. The bulkheads do not necessarily fit such that the notches touch the notches in the Center Keel. This is very important to note as doing so may throw off the alignment of your bulkheads and result in an uneven hull.

In addition to using these reference lines to align the bulkheads to the Center Keel, we will also use a plank or ruler to align the tops of the bulkheads. This will correct any errors that may have crept in when we were transferring lines from our templates to the bulkheads.

We will begin with bulkhead A. Gluing bulkheads to the center keel is pretty straight forward. You should first test fit each bulkhead in its appropriate slot and do any trimming necessary to get a good fit. The fit should be snug but not so tight that it makes it difficult to insert and remove the bulkhead. If it is too loose, the bulkhead may move from its intended position before the glue sets up. I used five minute epoxy to glue my bulkheads in gluing two at a time.

For bulkheads A – K, make sure that the side of the bulkhead with the letter laser etched in it faces the bow. For bulkheads L – R, the etched side faces the stern. You will need some way of holding the keel erect as you add bulkheads. The 3” steel blocks were used to hold my model erect. You also need to keep an eye on horizontal alignment making sure that the bulkheads remain perpendicular to the Center Keel. The steel blocks can be pushed against the bulkhead you are gluing to ensure it is set correctly allowing the glue to set up before moving to the next bulkhead. I found that if you do not trim the notch in the bulkheads and only trim the Center Keel notches such that the fit is snug, the bulkheads will remain at 90 degrees to the Center Keel.

After gluing bulkheads A, B and C, check the tops for proper height alignment by placing a flat ruler or plank on top of the bulkheads. There should be no gaps or high points, the ruler or plank should lay flat across the tops of these bulkheads. Photo P1.3.1-1 shows the ruler on top of the bulkheads. Photo P1.3.1-2 shows the use of the reference mark on each bulkhead and how it aligns with the reference line on the Center Keel.



P1.3.1-1

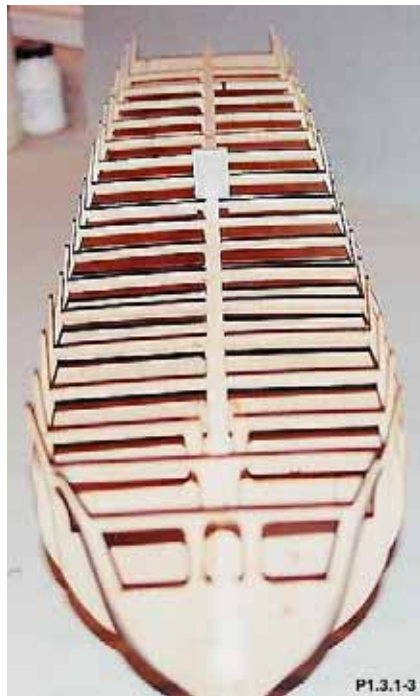


P1.3.1-2

Continue to glue bulkheads to the Center Keel, a few at a time and be sure and check the top alignment as you go using a thick plank supplied in your kit. The

deck line slopes slightly downward as it progresses towards the center of the ship and then slopes upward slightly towards the stern, it is not a perfectly straight line from bulkhead A to R. Pay particular attention to the deck alignment, even if your reference marks do not align properly. Keep in mind that you could have built some margin of error in your reference marks simply through the process of transferring them by template. It's not an exact science. The epoxy is somewhat slippery and allows you to make minor adjustments to the bulkhead height before it sets up.

Photo P1.3.1-3 shows the model with all bulkheads attached. Note the plank laying on top of the bulkheads to check alignment. It is okay if there are slight differences as the laser cutting induces some of this. We will remove those differences through fairing by sanding the tops of the bulkheads as well as the sides.



P1.3.1-3

Summary

- Glue bulkheads A – K to Center Keel with laser etched letter facing bow.
- Check alignment of tops with a plank.
- Glue bulkheads L – R to Center Keel with etched letter facing stern.
- Check alignment of tops with a plank.

1.4 Filler Pieces

There are several filler pieces that must be carved and applied to the bow and stern to strengthen the hull assembly and give us a surface to attach planking to. When I first began work on this section, I started by cutting the large basswood blocks supplied in the kit to the dimensions needed. But as I worked through this process, I realized that cutting these blocks, let alone shaping them, was not going to be an easy task for someone with only hand tools. Even though basswood is a fairly soft wood in comparison to such woods used in scratch building like boxwood, holly or pear, it is still fairly difficult to shape to the curvature needed for these filler blocks. I soon decided that these pieces could be made much easier out of balsa wood and still provide the rigidity needed for this part of the hull structure. So if you do not have basic wood working machinery such as a miniature saw and scroll saw, you can still make the filler blocks from balsa wood which is softer and easier to cut but still will provide the rigidity needed for planking later on.

That is not to say that you must substitute balsa wood for the supplied basswood. The decision is entirely up to you. The steps to make these parts are the same, regardless of the type of wood you work with. Therefore, I only mention this substitution of materials now. My parts were made from the supplied basswood blocks.

1.4.1 The Counter

Assuming that you will use the supplied basswood, you will need to find a way to cut the blocks supplied. We will start with the counter. This is made from a piece of stock 1/2" x 2" x 6". Locate this basswood block in your kit. It should be in a small plastic bag with a few other basswood blocks.

You will need to cut this block to a length of 5". If you have access to some power saw, it is much easier to cut it. Otherwise, use a razor saw. Micro Mark has a set of three different sizes, stock number 50284.

After cutting the block to length, You will need to reduce it's thickness to 11/32". There are a number of ways to do this. First, measure from the top of each edge, 11/32" and extend a line all the way around the perimeter of the block so that you will know the thickness you are to reduce to. Then, using a #22 exacto blade, you can shave away wood until you are just above the line all the way around. Or you can use chisels to reduce the wood. Since we are working with basswood, it is soft and with a little effort you can reduce the thickness to 11/32" saving the last bit of wood to be removed by sandpaper and a sanding block.

Once you have gotten the block to 11/32" thick, you must cut the width to 1 3/4". After shaping it will be glued to the top of the Center Keel behind bulkhead R.

Once again we will use the tracing paper and card stock to make a template. Detail 2-G on sheet 2 of your plans shows the pattern for the counter. Trace the large pattern only and rubber cement it to a piece of card stock. When the cement has dried, cut the pattern out in its entirety.

On the block of basswood, place the pattern on one side and align it so that the long edge is against one edge of the basswood and centered. Trace around the pattern and mark the centerline. Then use a small square to mark the centerline across all four faces of the block. Photo 1.4.1-1 shows the block with the pattern marked on it.



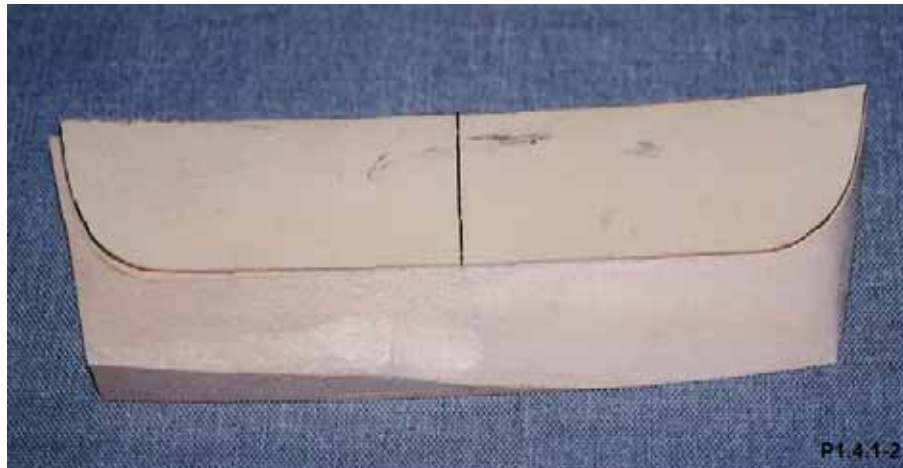
P1.4.1-1

Cut the hole out of the pattern for the rudder and mark this as well. The rudder hole is actually at an angle. The angle is such that the top side of the hole is closer to the back of the counter and the bottom of the hole is closer to the front of the counter on the bottom. This may be confusing but when we cut this hole out and test fit the counter with the rudder it will make more sense. The sternpost is slanted backwards from bottom to top. So the hole must also be slanted. The pattern shows two sets of lines from front to back. For now, simply trace the outer set of lines onto the top of the counter blank.

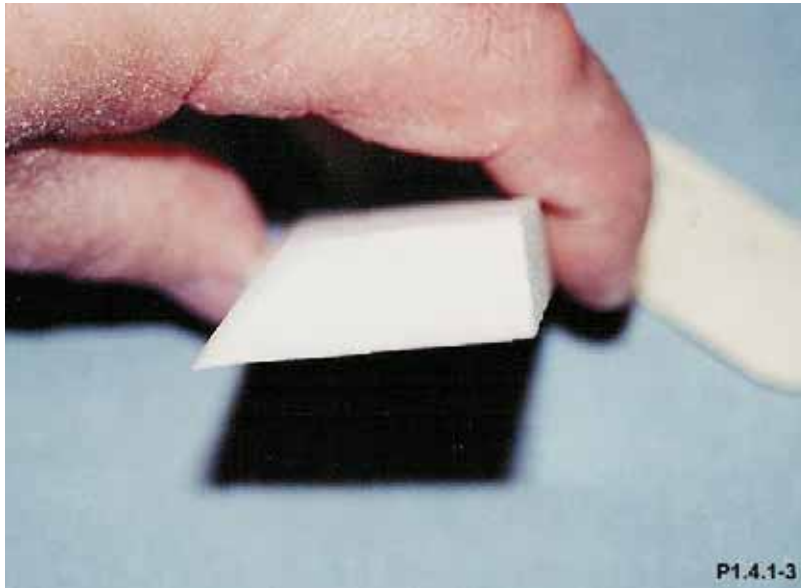
For those with power tools, if you have a scroll saw, it is easy to cut the counter out on the lines you just traced. For those with hand tools, you will need a small saw, coping saw or jewelers saw to make these cuts. Note that the line that defines the aft portion of the counter is not a straight line like the forward edge. Instead, this is a curved line (this is the edge where the hole is for the rudder. Be very careful when you cut the counter out that the cuts are perpendicular to the surface and that they are as straight and on the line as is possible. If you go inside the line, you're changing the shape. If you stay outside the line, you can clean the part up with sandpaper.

Now it's important that you understand the pattern you traced. There are two curved lines on the pattern. The part with the rudder hole is the part you will not need for the next part of the construction. Using scissors, cut the pattern out on the larger set of lines as shown in photo P1.4.1-2. This photo shows the beveling of the counter. On the bottom of the counter (choose a side to be the bottom), align the back edge of the pattern and trace the curved areas. Also note that the pattern is slightly smaller than our block of wood on the sides, meaning that the sides have a slight bevel on them as well.

I used a #22 Exacto blade to carve away the excess wood. What you want to do is to bevel from the top edge of the counter to the line you just drew. The top corners need to remain crisp, not rounded. But as you can see from the photo, the bottom has a very abrupt roundness at the corners. Again, photo P1.4.1-2 shows the counter after carving and sanding. Photo P1.4.1-3 shows the counter from the end view. Notice how the counter has a very sharp angle from the top to the bottom. The bottom is the carved side.

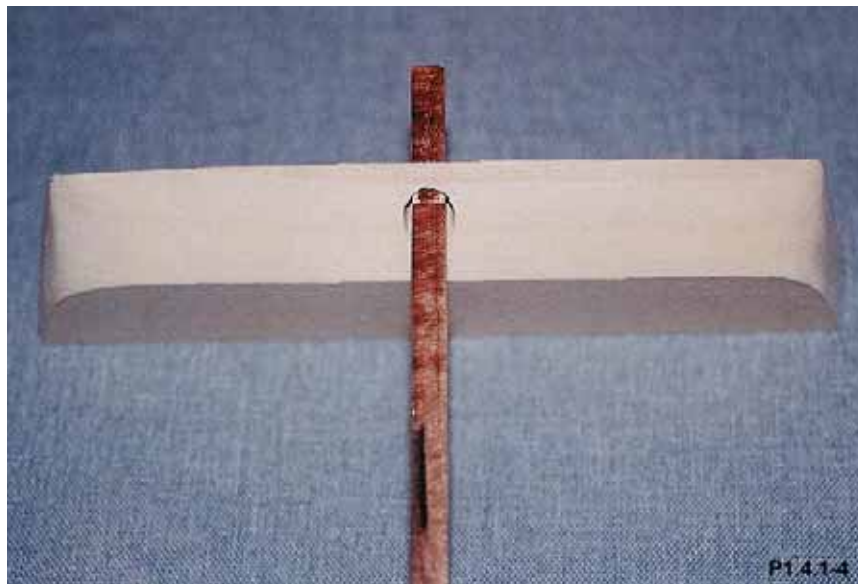


P1.4.1-2



P1.4.1-3

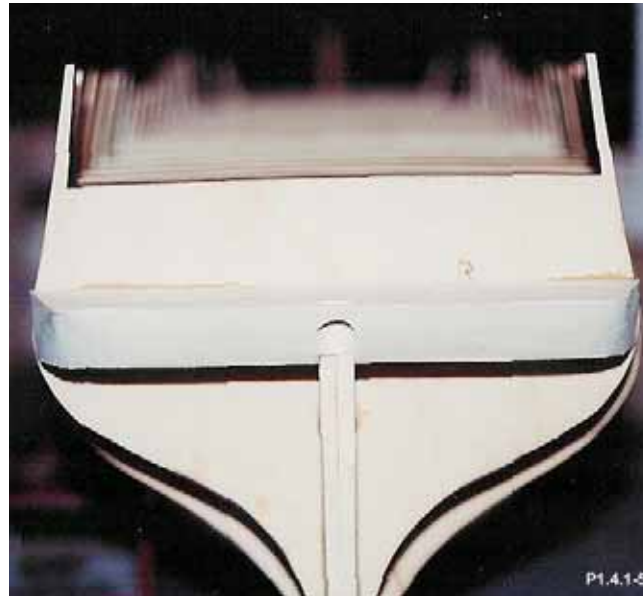
Now we must cut out the rudder hole. I started with a 1/8" drill bit and first drilled a pilot hole. I then used a #11 Exacto blade to enlarge the hole. I finished up with a rat tail file filing the hole to the lines drawn and ensuring that the hole had a slight slant from aft to front. If you place the counter piece on top of your Center Keel and against the backside of bulkhead R, you can place the rudder in the hole and flat against the sternpost. You will see how the rudder slants backwards. Photo P1.4.1-4 shows the rudder fitted through the hole before the counter was mounted to the model.



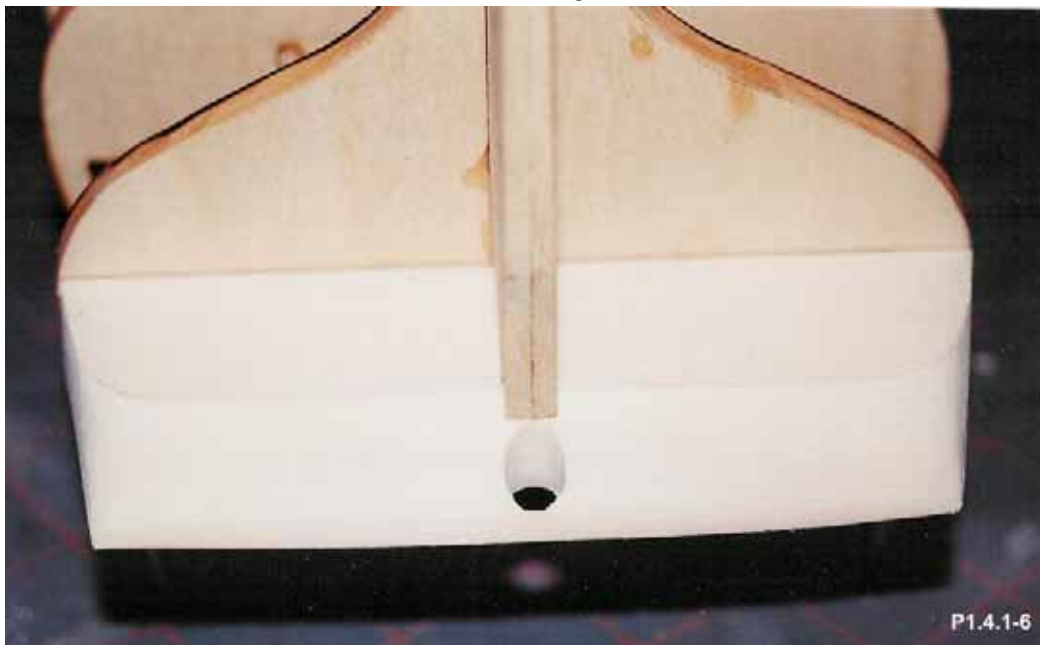
P1.4.1-4

Once satisfied with the fit of the counter and the rudder, use epoxy to glue the counter to bulkhead R and onto the Center Keel. I used a small square to draw reference lines on each side of the Center Keel that were perpendicular to the sternpost. Align the outer edges so that the counter is centered. Your centerline drawn on the part can also be used as a reference to the center of the Center Keel where the two parts were glued together. Photo P1.4.1-5 shows the counter glued to the Center Keel and bulkhead R. Photo P1.4.1-6 is another view from the bottom. Note how the hole for the rudder is even with the sternpost so that the rudder will fit flush against the sternpost when it is inserted through the hole.

It is important that the height from the top of the counter to the top of bulkhead R where the deck will be laid is 1". You can check this by taking one of the laser cut transom frames and placing it on top of the counter at various locations. The top of the transom frame should be flush and even with the top of bulkhead R where the deck is laid, not the top outside portion that makes up the bulwarks. If the transom sticks above this point, you will need to sand the counter block down in thickness until the transom frame is flush.



P1.4.1-5



P1.4.1-6

Summary

- Cut the 1/2" basswood block to a dimension of 1/2" x 2" x 6"
- Reduce the thickness of this block to 11/32"
- Trace the counter pattern from Detail 2-G on sheet 2 of your plans.
- Glue the pattern to a piece of card stock and cut out.
- Mark the counter pattern using your template on one surface of the block of wood.
- Cut the block of wood out staying outside the lines.

- Mark the rudder hole on the counter top and cut the template out on the curved line keeping the larger piece.
- Mark the curved line on the bottom of the counter using the centerline to align the pattern.
- Bevel the bottom side from the top outside edges to the line marked and sand smooth keeping the corners crisp.
- Drill and cut the rudder hole using a small drill, #11 Exacto and rat tail file.
- Test fit the counter to bulkhead R and Center Keel and glue with epoxy.
- Make sure the rudder hole aligns with the sternpost and that the rudder fits freely through the hole.
- When you glue the block in place, the distance from the top of the block to the top of the bulkhead R where the deck will go is 1".

1.4.2 Stern Filler Blocks

Next we need to cut the stern filler blocks. These blocks are cut from the large 2" x 3" x 6" basswood block. There are two blocks. They are 2 3/4" long. First cut off 2 pieces of the block that are 2 3/4" long. These blocks now need to be cut to a width of 2 3/8". Use the 3" side and trim it to a width of 2 3/8".

Finally, the pieces need to be 1 1/8" thick. Trim the 2" side down to 1 1/8". You should now have two pieces that measure 1 1/8" x 2 3/4" x 2 3/8". The grain of the wood should run the length that is 2 3/4". The side that is 2 3/8" will glue to the backside of bulkhead R eventually.

Again, we will use the template provided in Detail 2-H on sheet 2 of your plans. Trace both patterns and rubber cement them to card stock.

Cut both patterns out on the outer lines. First, transfer the pattern to the side of the blocks. The side is one with the length of 2 3/4" and the pattern is the one with the gradual curve. This curve matches the bearding line on the Center Keel.

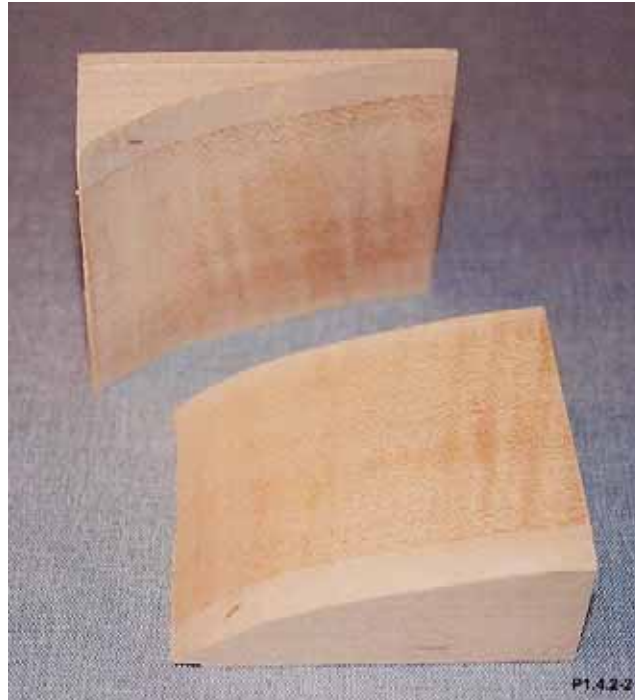
Now transfer the pattern to the bottom (or top, whichever) of the blocks. This pattern matches the curve of the counter. Photo P1.4.2-1 shows the two patterns against the block so that you can see the orientation of these patterns.



P1.4.2-1

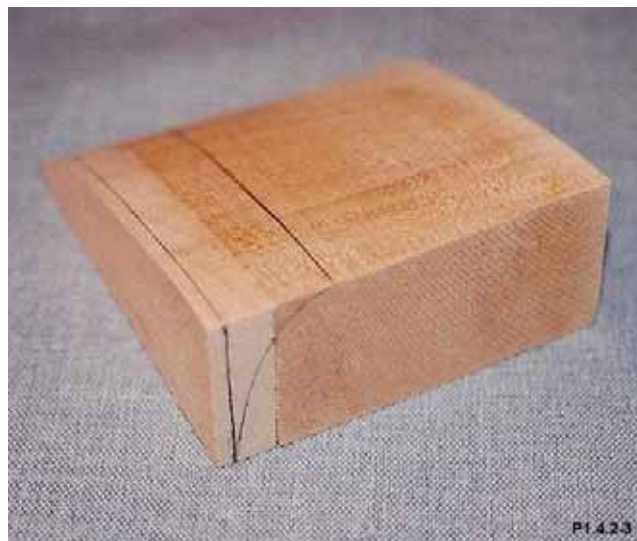
Now comes the difficult part. If you have access to a scroll saw, I highly recommend that you use it to cut the plug out. Otherwise, you will have an extremely difficult time shaping all of these filler pieces and may want to use balsa wood instead of the supplied basswood.

First cut out the plug using the side pattern that mate's to the bearding line. Photo P1.4.2-2 shows the plug cut out at this stage.



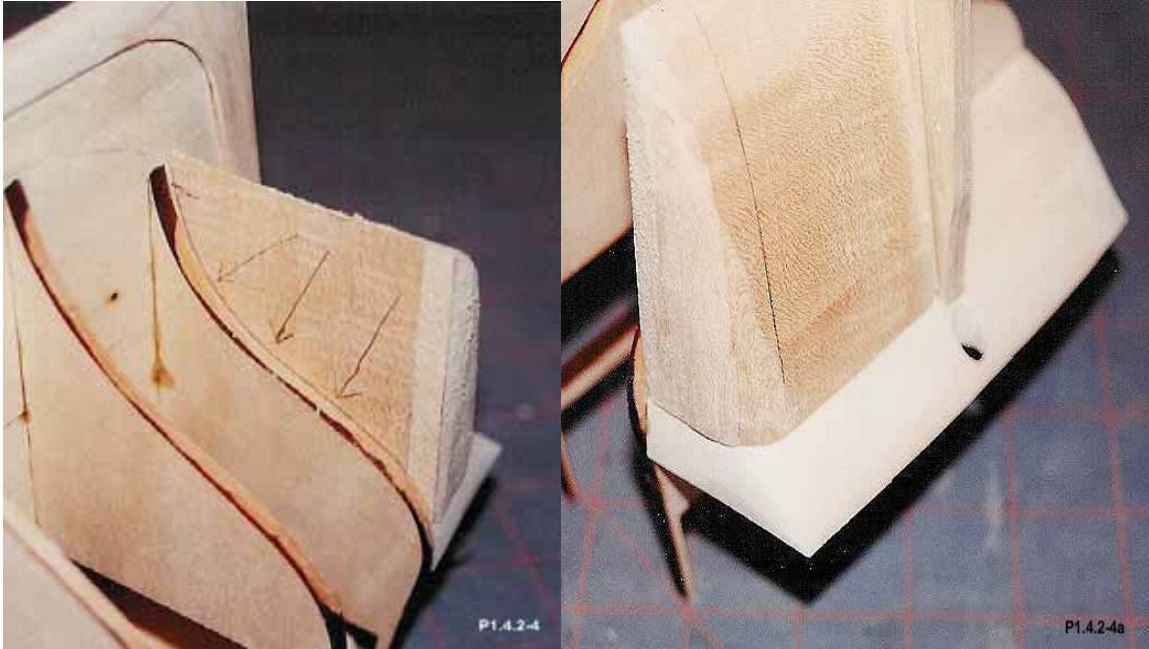
P1.4.2-2

Next, round the bottom edge so that it matches the bottom of the counter. This comes from the pattern shown in photo P1.4.2-1. Photo P1.4.2-3 shows the marking for the curve that will match the rounded side of the counter.



P1.4.2-3

At this stage, you need to take a pencil and mark the backside of the plug where it meets bulkhead R. Photo P1.4.2-4 shows this marking, with arrows pointing to where the mark is made.

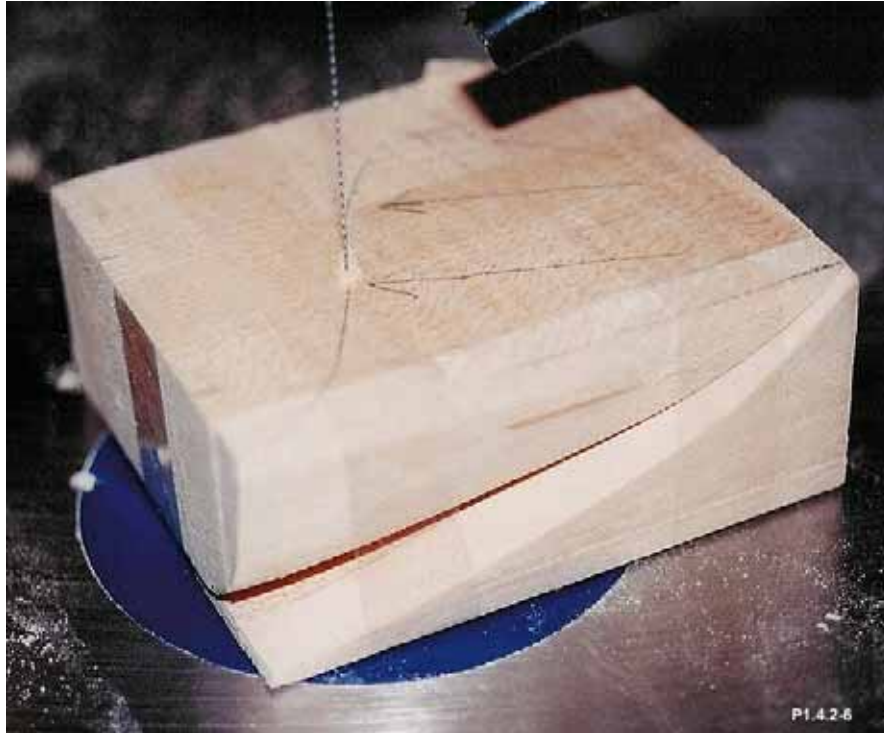


P1.4.2-4

Now you will need to join the two main pieces back together with scotch tape so that you have a flat surface to cut this third dimension out on the scroll saw. Photo P1.4.2-5 shows the pieces taped together and ready to cut. Photo P1.4.2-6 shows the pieces being cut and P1.4.2-7 shows the final shape of the plug.



P1.4.2-5

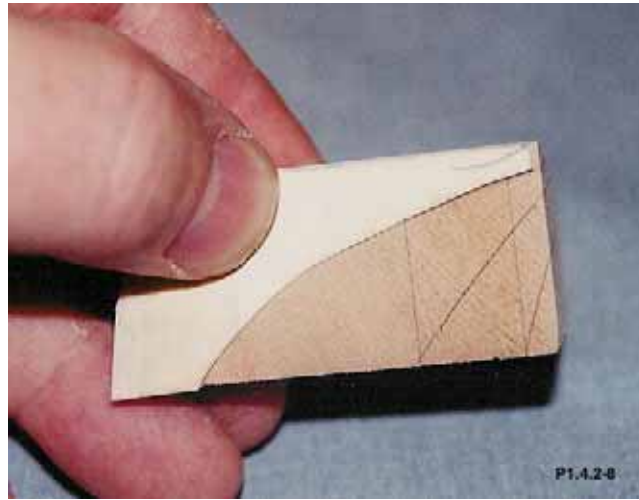


P1.4.2-6

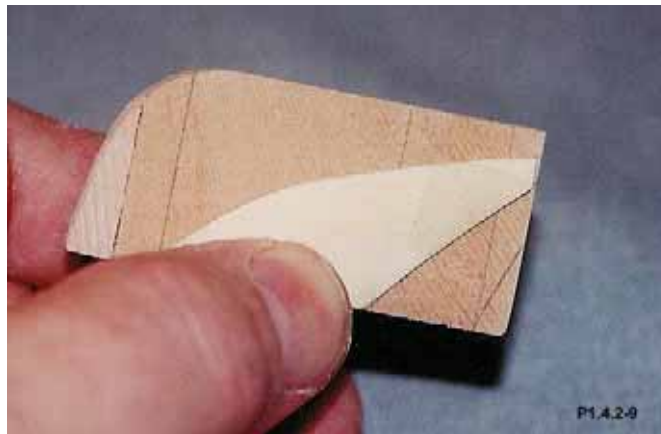


P1.4.2-7

When the plug reaches this final rough shape, you will transfer the lines from the bottom pattern. First, use a small square and extend the lines on the side pattern perpendicular and across so that they are parallel to the bottom (the bottom is the side that mates to the counter). Next, cut on the first line of the template for the bottom as shown in photo P1.4.2-8 and transfer that line to the bottom piece. Then cut the middle pattern and transfer those lines as shown in photo P1.4.2-9. And finally, cut and transfer the final line. You can omit the very tiny line pattern as it is insignificant.

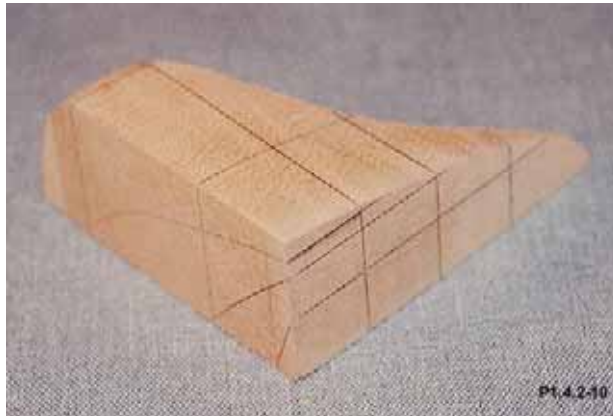


P1.4.2-8

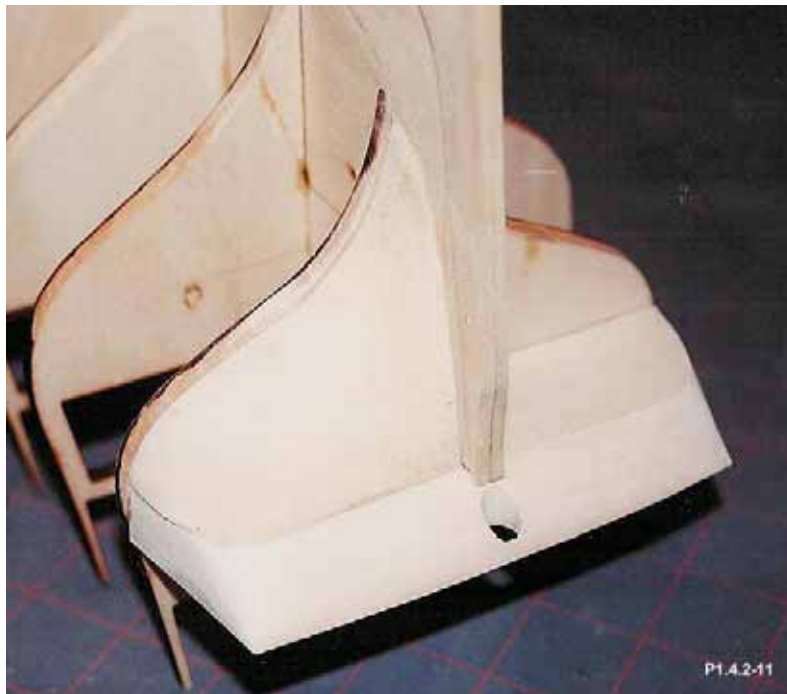


P1.4.2-9

Now we must carry these lines up the side and back of the plug and form a grid work of lines on all four sides. Photo P1.4.2-10 shows this grid work. Photo 1.4.2-11 shows the plug sitting on the counter.

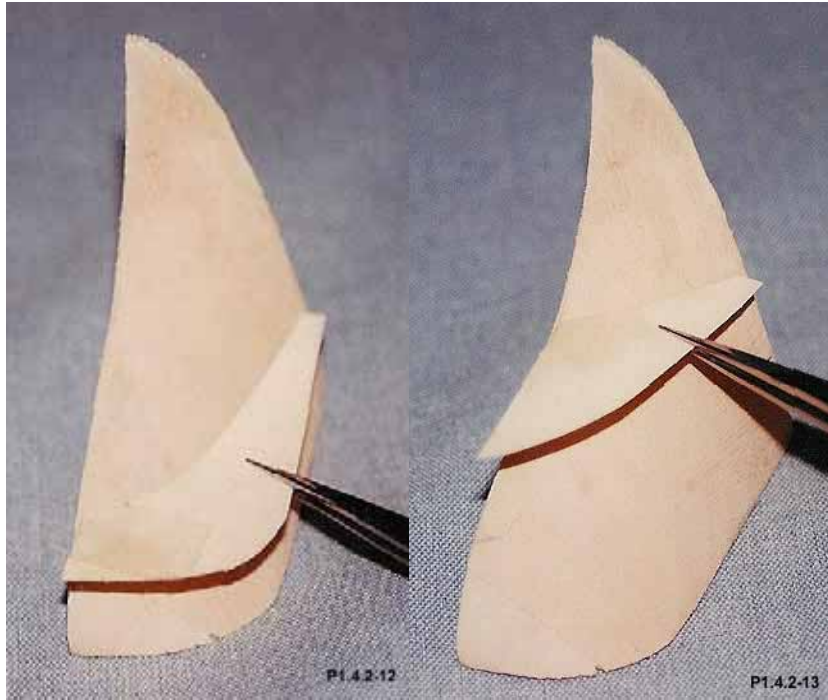


P1.4.2-10



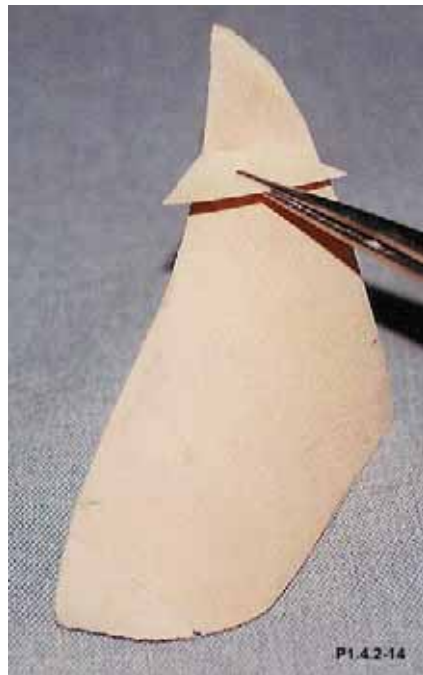
P1.4.2-11

What we must now do is carve away the center area of the plug to form a smooth transition from the point where it meets bulkhead R and the point where it meets the counter and the point where it meets the bearding line. The templates will be used to check the cutting until we reach the point where we have the right curvature. The grid helps to align the templates on the side and back to check if we've cut away enough material. The next sequence of photos shows the templates held against the carved plug showing their relationship at the various points.



P1.4.2-12

P1.4.2-13



P1.4.2-14

Photo P1.4.2-15 shows the finished plug in place on the bottom of the counter and against bulkhead R. Notice how smooth the transition is from bulkhead R to the counter and to the bearding line where the rabbet joint is. This plug is precisely what you want to end up with and will provide a smooth flow of the

planking without any sharp bends as it follows the bottom of the hull around to the sternpost.



P1.4.2-15

Now all that is left is to repeat this same process for the plug on the other side.

Summary

- Cut two pieces from the 2" x 3" x 6" basswood block to a dimension of 2 3/4" x 2 3/8" x 1 1/8"
- Trace the stern block patterns in Detail 2-H and rubber cement to card stock.
- Cut out card stock patterns and transfer patterns to the basswood blocks.
- Cut out on scroll saw following the bearding line template.
- Apply counter template and hand carve curve of plug to fit counter bottom.
- Mark outline of bulkhead R onto backside of plugs.
- Tape plug and plug remains back together and cut out bulkhead R side.
- Transfer pattern lines from template to sides of plug.
- Shape plug with #22 Exacto knife and sand testing templates for proper shape.
- Glue plug to bottom of counter, backside of bulkhead R and Center Keel.

1.4.3 Bow Filler Blocks

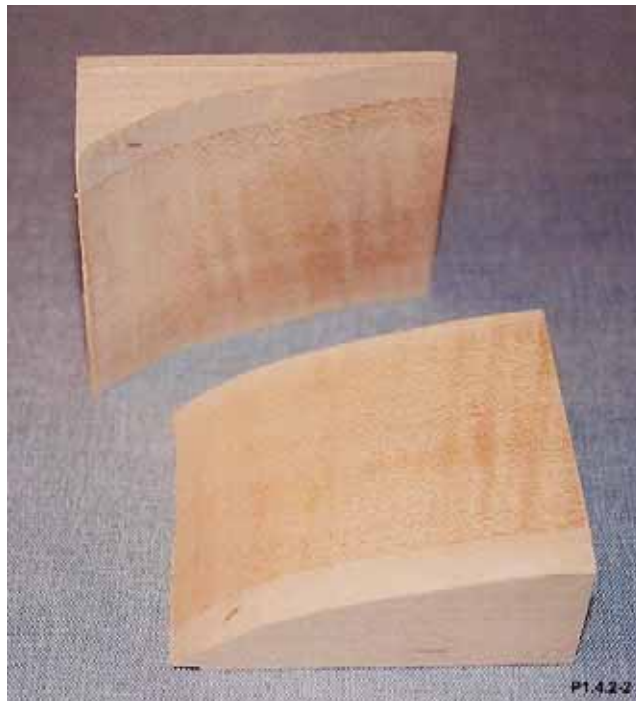
There are two bow filler blocks made from the remaining 2" x 2" x 6" basswood block. First cut a section from the block that is 1 1/2" wide. From that piece, cut the 2" side to 1 1/4" wide. And from that piece, cut two pieces 2 1/2" long. You should end up with 2 pieces 1 1/2" x 1 1/4" x 2 1/2". The grain of the wood should run the length that is 2 1/2" long. These pieces will eventually glue to the forward side of bulkhead A.

The stem filler pieces can be found in Detail 2-A. Trace both patterns and rubber cement those to a piece of card stock and cut out. Like the stern filler blocks, we will first transfer the pattern that matches the bearding line and cut the block out on that line. Photo 1.4.3-1 shows the two pieces cut out.

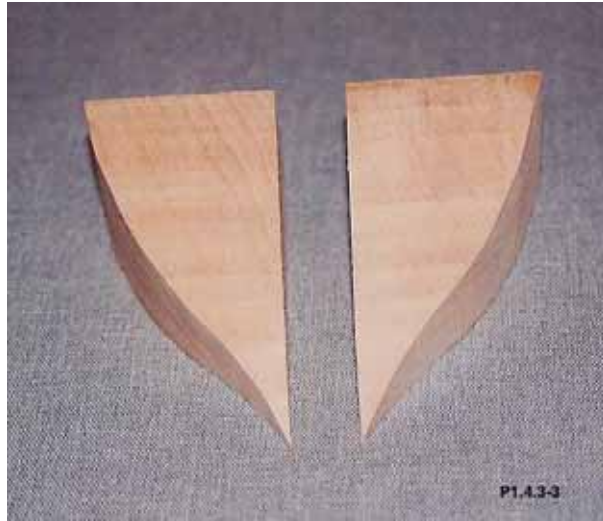


P1.4.3-1

Test fit the plug and trace the outline of bulkhead A on it's back surface. Then tape the plug and it's mate back together as shown in photo P1.4.3-2. Cut out the bulkhead A pattern on the scroll saw. Photo P1.4.3-3 shows the plug at this stage.

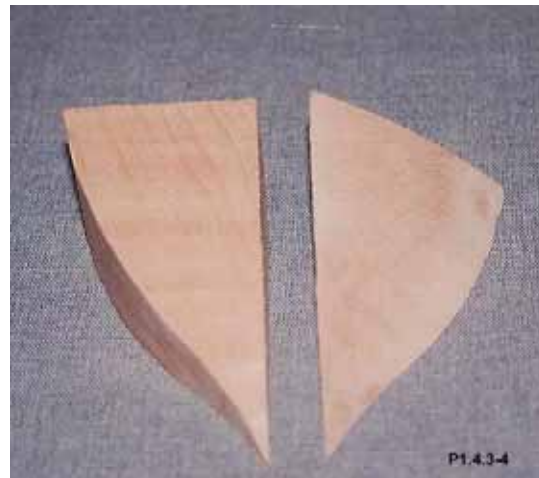


P1.4.3-2



P1.4.3-3

Now all that is left is to shape the piece. Start at the top where it is the thickest and start cutting down towards the line. Continue your cutting from both sides towards the center. Do not change the shape of the sides any. You will see that the template that shows the cross sections shows that the bottom sections are pretty much straight lines. So you must continue to work the piece using the #22 Exacto knife or other tool of your preference trimming the piece down. It almost looks like a triangular wedge or slice out of an apple when it is done. Photo P1.4.3-4 shows one piece complete trimmed and sanded. Note it's appearance to the unfinished piece.



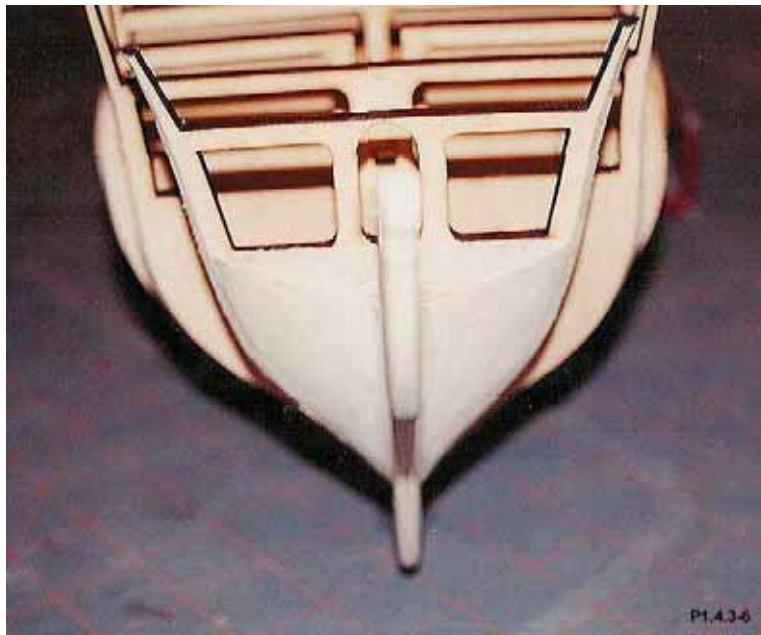
P1.4.3-4

Test fit the plug as you refine the shape and use your template slices to check the cutting. This is a fairly easy piece to shape compared to the stern filler pieces.

When you are satisfied with the trimming you may glue the piece to the Center Keel and bulkhead A. The top of the piece fits the top of the Center Keel. The front edge should match the rabbet joint at the bearding line and the back edge should match the bevel in bulkhead A. Photos P1.4.3-5 and P1.4.3-6 show the filler pieces installed from two different angles.



P1.4.3-5



P1.4.3-6

Summary

- Cut two pieces from the 2" x 2" x 6" basswood block to a dimension of 1 1/2" x 1 1/4" x 2 1/2".
- Trace the patterns from Detail 2-A and rubber cement to card stock.
- Cut out the card stock patterns and transfer the pattern that matches the bearding line to the blocks.
- Cut out the bearding line edge on the scroll saw.
- Test fit the plug and trace the outline of bulkhead A onto the back of the plug.
- Tape the plug and its mate back together and cut the outline of bulkhead A on the scroll saw.
- Trim and carve the plug to it's final dimensions and shape using the templates that are cross sections to test the final shape.
- Glue the plug in place to bulkhead A and the Center Keel.

1.5 Chapter Summary

This concludes Chapter 1. To summarize what we have accomplished in this chapter, we did the following:

- Glued and cleaned up parts that form the Center Keel.
- Assembled the Center Keel
- Attached the stem, sternpost and keel parts.
- Tapered the stem and sternpost
- Beveled bulkheads at the bow and stern and transferred reference line.
- Attached bulkheads to the Center Keel
- Shaped and attached the counter.
- Shaped and attached the stern filler pieces.
- Shaped and attached the bow filler pieces.

In Chapter 2, we will continue our framework with some additional bow framework, install stern transoms and gunport openings in the transoms, and add gunport framing between bulkheads. I hope you found this chapter useful and were able to accomplish the construction without too much difficulty.