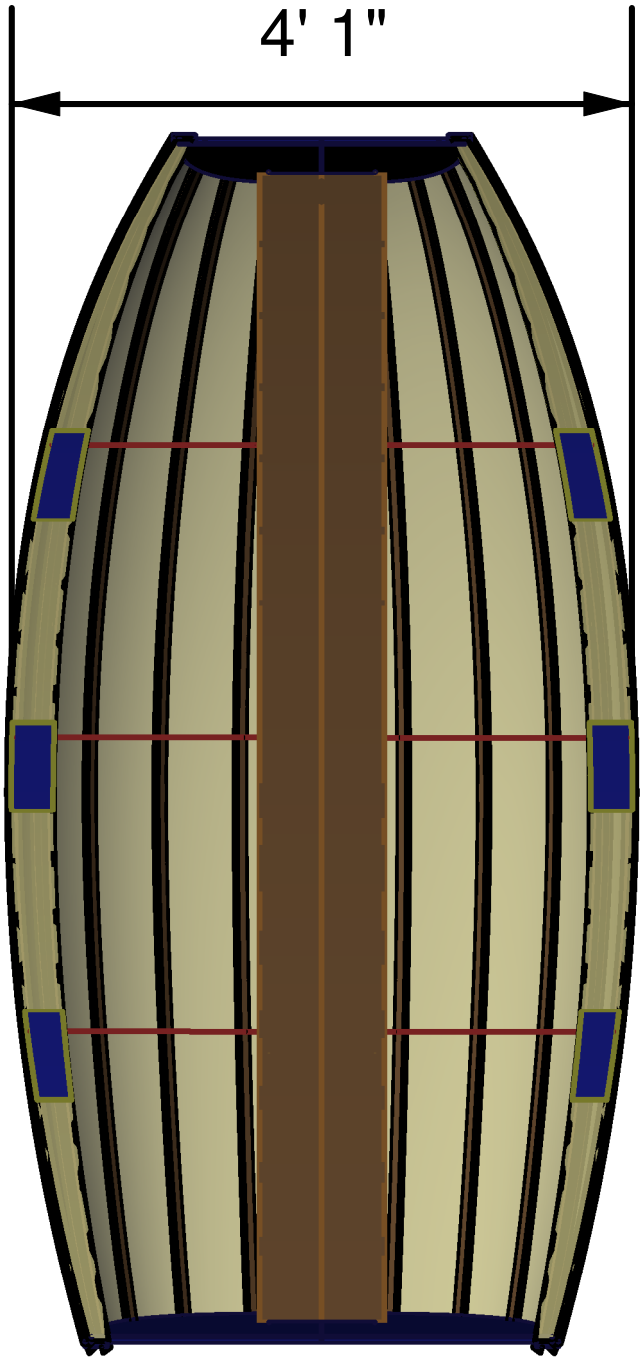
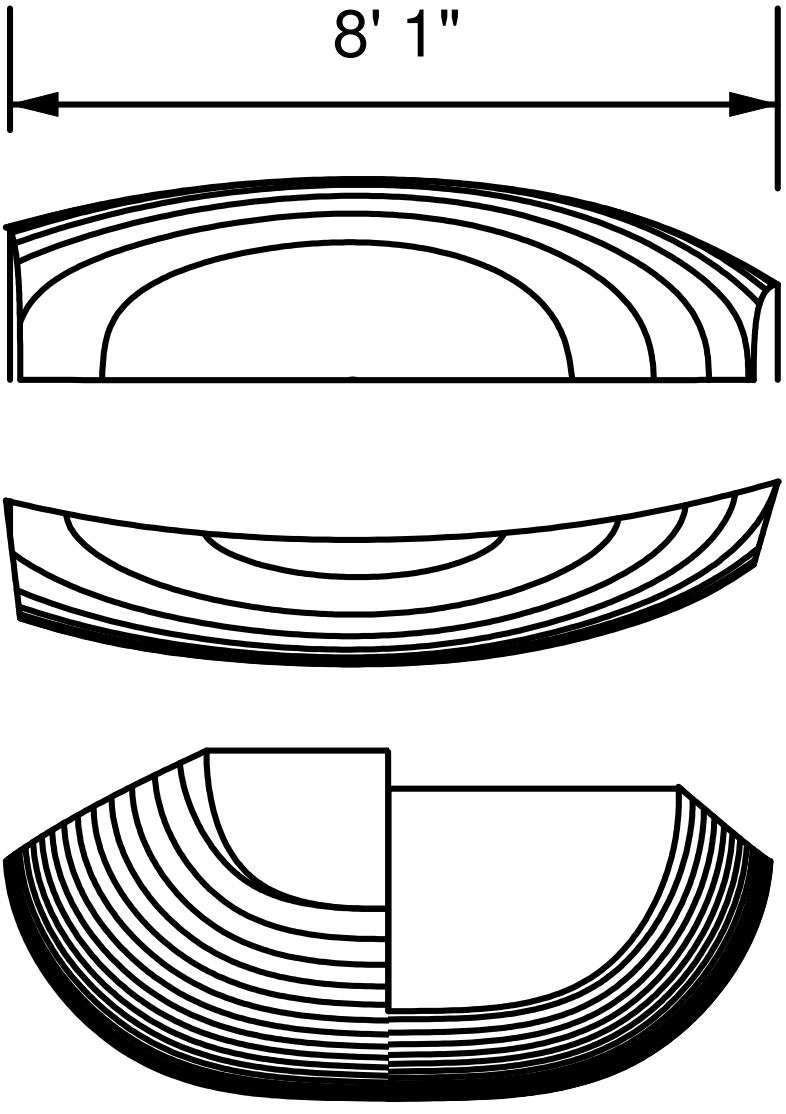
Building the Owl and the Little Owl

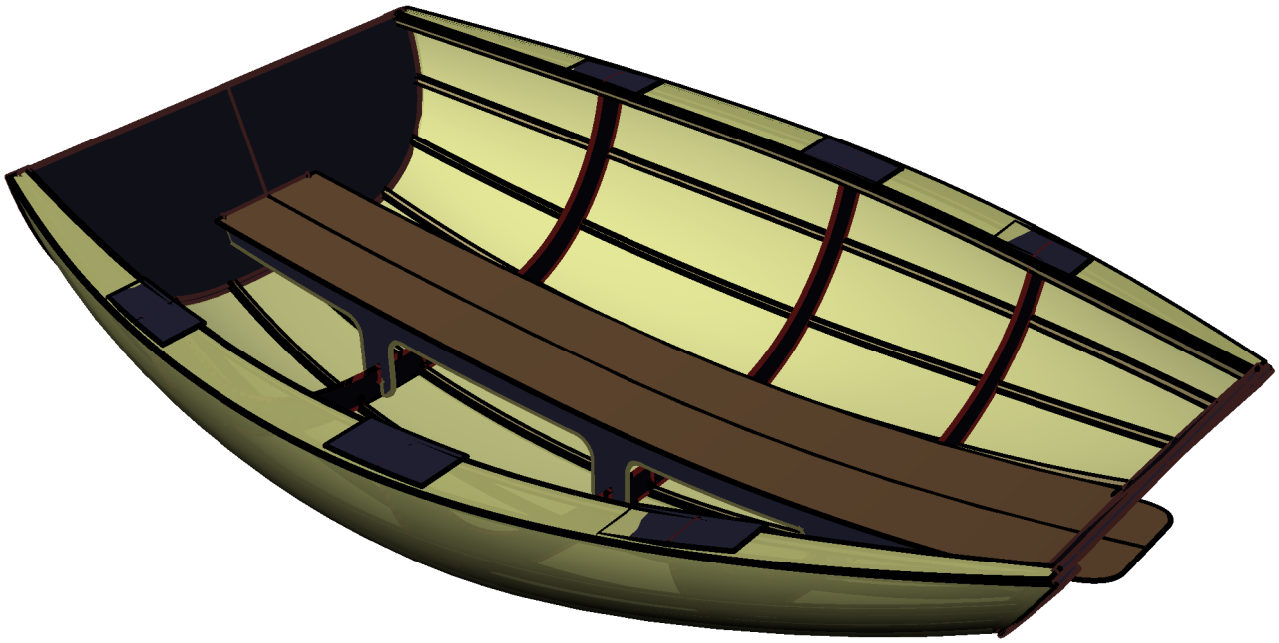
A guide to assembling an 8' 1" and 6' 7" skin-on-frame dinghy

Hermit Cove Boats http://www.hermitcoveboats.com

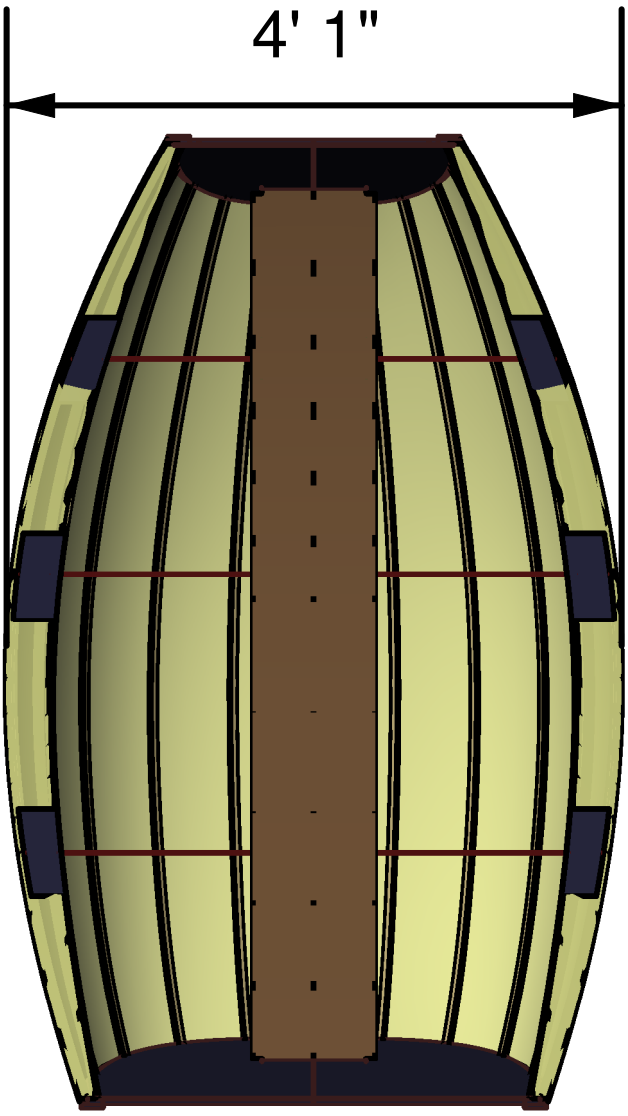


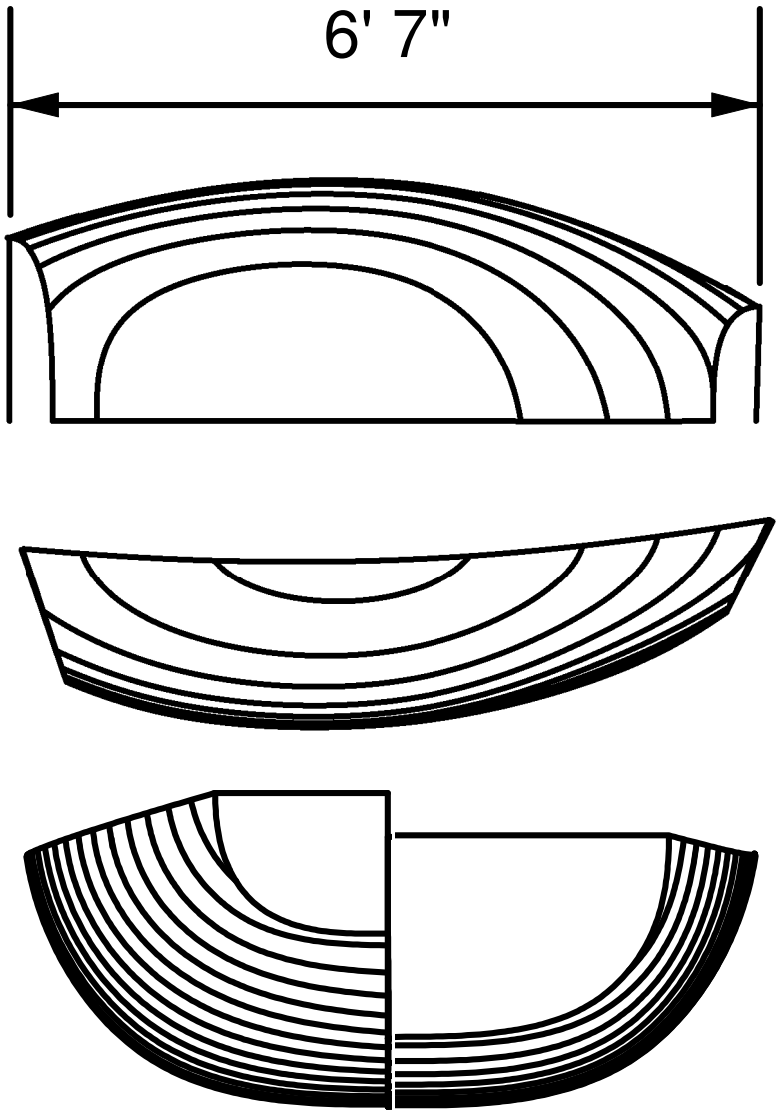
The Owl





The Little Owl





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1. Introduction

We are going to build a skin on frame dinghy. Unlike traditional boats where the hull is both structure and waterproofing, this style of boat uses a flexible fabric of some kind stretched over a frame. The fabric keeps the water out and the frame gives the fabric the correct shape. This is a very quick and simple way to build a boat, but you have many choices along the way. This guide walks you through those choices step by step, but requires your active participation. This is not a Lego kit, where following each step precisely will lead you to the desired end. Instead, this is a process where you build your own boat, so you must take steps to be sure that it is the boat that you want.

This guide covers building both the Owl dinghy (8' 1") and the Little Owl dinghy (6' 7"). Both boats have all the same parts, are built using all the same steps, but they are shaped somewhat differently. You can either buy the kit which provides all the plywood parts, buy the full sized plans, or you can trace the shapes onto plywood using the pdf somehow (see appendix A). Once you have the plywood parts in hand, the construction process is divided into a few big steps:

1. Epoxy and clamp bow and stern transom[1] parts together (the bow and stern transoms come in two pieces which are easily lined up because the holes are in the same place on both parts)

2. Dry fit plywood parts to familiarize yourself with how they fit and to test your clamps.

3. Coat the plywood surfaces that touch with epoxy, then go over those same surfaces adding a thickened epoxy fillet[2] along the edges to increase surface area and strength.

[1] The transom is the flat part of the boat's hull commonly in the stern. Boats like the Owl have a flat part in the bow as well which is also technically a transom. To reduce confusion (or possibly to increase it, one can never be sure) say "bow transom" for that part.

[2] A smooth radius between two joined surfaces

4. Fair, sand, and paint all plywood parts
5. Use holes in the plywood parts to lash stringers[3] into place.
6. Attach skin material to the boat by stapling it tightly to the bow[4], stern[5], and to the gunwale[6].
7. Cut excess skin away using a hot knife
8. Coat the skin, and caulk the skin at the bow and stern, assuring a watertight contact.
9. Attach gunwale braces, oarlock sockets, and keel strips.
10. Go for a row.

Figure 1.1.: Plywood parts from the kit

These steps hide a few details, and there are some things that are easier done a certain way. If you want to skip this guide entirely and get to work with that

[3] Structural parts that run front to back. The term has different meanings depending on the type of construction. In skin on frame boats, it is the part that gives the boat shape for the skin to stretch around

[4] The front of the boat

[5] The back of the boat

[6] The uppermost part of the side of a boat. In a small boat, it is the surface that oars attach to, and is often reinforced in some way

overview, you certainly may. The first 3 steps can be completed in one session. Next you must wait for the epoxy to cure. Then after sanding and painting you must wait again. After coating the skin you must again be patient. The construction time for the Owl is determined by drying time more than it is by human labor. "How many hours does it take to build?" "Well that depends, how hot and dry is your work space?" It is possible to finish in 4 days, but working at a reasonable pace it should not take more than 3 weekends.

If you haven't already, now is the time to decide if you want to start with a kit or cut the plywood parts yourself. Then you must choose your skin material. After that, you can decide what coating to use on the skin.

For the plywood, starting from the CNC cut kit will take the least time, but the cost of the kit and the shipping is substantial. If you use full sized plans and cut carefully with a jigsaw, you can come very close to the precision of the kit. In exchange for your time, you save on shipping, and get to pick your grade of plywood. You can also use the pdf plans using a large printer or a projector to transfer the plans to plywood. Finally, you can use the AutoCAD file to cut the parts out with a CNC machine, for those of you who have CNC machines just lying around.

There are many choices for skin and coating, and every possible choice is the correct one for some use. Therefore the purpose of the boat must be considered. The construction guide includes notes to help you with whatever choices you make. For more detail on those choices, see appendix B. That said, I strongly recommend ballistic nylon, 8 ounce weight or greater, and the two part urethane sold by Corey Freedman of the Skin Boat School in Anacortes, WA.

2. Gathering tools and materials

If you plan to cut your own plywood, you can either use the full sized plans, or use the electronic plans to loft or project the lines onto the plywood. You can use any sort of plywood, I suppose, but I strongly recommend ⅜” (9mm) marine grade plywood. In any case, be certain to use plywood with a waterproof glue binding the various plys. The plans include notches where the plywood slots together. If your plywood is not exactly ⅜”, you will want to use a sample from the plywood to trace the notches over the plans. A tight fit for the notches is desirable.

In addition to the plywood parts, you will also need:

1. Stringers (see below for dimension information)
2. Lashing twine
3. Skin (synthetic fabric)
4. Coating for the skin
5. Paint for the plywood frame
6. Glue (two part epoxy)
7. Staples (monel)
8. Clamps (lots and lots of clamps)
9. Staple gun
10. Drill
11. Japanese pull saw, or equivalent
12. Hardware for attaching the gunwales to the deck
13. Hardware for attaching the gunwale pads to the gunwales

14. Hot knife for cutting the skin

The hand saw will cut the extra parts of the stringers that hang past the bow and stern. A Japanese pull saw is ideal for this purpose. The staple gun is for monel staples, which are only available in Arrow size “T50”, so be sure to have the correct staple gun. The drill will be used to make holes in the gunwale braces for screws and oarlock[1] sockets. The hot knife will cut the edges of the skin so that the fabric won’t unravel. There are some really nice hot knives out there, but I found the little 40 watt kind used for burning patterns into wood carvings to be perfectly adequate.

Other tools can be helpful, of course. Table saws to rip stringers from raw boards, jig saws to cut out plywood parts from full sheets, and so on. But there are ways around needing those tools, especially if you purchased the kit.

One never has enough clamps, so go out and buy some more now, no matter how many you already have. I’ll wait.

2.1. Stringers

The hull shape is formed by the parts that run fore and aft called stringers. Stringers must bend easily, but also be stiff enough to keep their shape over the unsupported span between frames. Because the stringers are lashed to the frames, and not constrained in a notch or channel, any diameter and cross sectional shape can work. Wood is ideal for stringers with its combination of strength, weight, bendability, and low cost. But feel free to experiment: PVC is quite bendable, but may be too weak to span the frames rigidly. Aluminum rods are very bendable and strong, but expensive. Also consider bamboo or ocean spray[2] branches for an uneven but very strong and light alternative. The gunwale stringers must be a material that takes staples, or you must have some plan of your own for stretching and attaching the skin without staples.

For an excellent choice, I recommend sticks ¾ inches on one side, ½ inches on the other, cut from boards of clear vertical grain yellow or red cedar. For the gunwales, which have a harder life (you tend to lift the boat using them, and they support the

[1] The oarlocks (called rowlocks in the UK) connect the oars to the boat. The oarlock either surrounds the oar or supports the oar, and inserts into the oarlock socket. The oarlock turning in the oarlock socket provides the leverage and smooth motion needed for rowing.

[2] A bush with very straight branches, used in making arrow shafts, for instance

oarlocks), use a larger sized stick. ⅝ by 1 inches is large enough to take the gunwale pad bolts, but not so stout that bending becomes impossible. Red cedar looks the best varnished and costs less, but you need a very high grade (sometimes called "boat grade") of red cedar. Nothing beats yellow cedar for pliability and even grain. Both are rot resistant and the stringers have an easy life with great ventilation, so it is unlikely that the wood will develop rot unless severely neglected. Douglas fir is a great wood, but it has big grain so choose your boards carefully. Any other type of wood that will take the bend will likely be good enough. Varnish is optional, but know that it will be very difficult to keep the finish looking sharp, so choose a durable varnish.

For the Little Owl you will need sticks 7 feet long. For the Owl you will need sticks 9 feet long. If you are trying to get away with shorter boards, the shortest stringer is the keel stringer, 6 feet long in the Little Owl and 8 feet long in the Owl. You will also want an external rub strip, called a bilge runner, to go on the outside of the hull along the keel. You need 4 gunwale sticks, 9 stringers, and 1 bilge runner, for a total of 14 sticks.

Part	Ideal Dimension	Quantity
Owl gunwales	9' x 1" x ⅝"	4
Owl stringers	9' x ¾" x ½"	9
Owl keel bilge runner	9' x ¾" x ½"	1
Little Owl gunwales	7' x 1" x ⅝"	4
Little Owl stringers	7' x ¾" x ½"	9
Little Owl keel bilge runner	7' x ¾" x ½"	1

Table 2.1.: Summary of lumber requirements

The lumber you need will not be available off the shelf. If you have a table saw you can use larger boards and rip them down to size, or pay your local lumber yard to do the cutting for you. Ideally, you can find boards that are already ¾ or ½ inches in one dimension, and then rip the boards to the other width. This way you minimize waste, and produce the least sawdust. Using a narrow blade also helps reduce waste. I used a blade from a battery powered circular saw in my table saw. A tiny little blade, but then the stringers aren't so big either.

2.2. Skin and glue, hardware

You will need epoxy and a thickener for gluing the plywood parts together. For thickener, I use fine sawdust, though a wide variety of commercial thickeners are available.

You will need twine for lashing the stringers to the plywood frame, and also for sewing the skin together if you are working with two parts. Twine is sold in a wide variety of confusing designations, sometimes given three or four different designations all at once. You will want something waxed or tarred, so that it will hold tension well. I suggest "artificial sinew", which in a land of numerous size designations is sold without any dimension to describe it at all. The lashing material you want is small enough to allow many turns while remaining compact, but not so small that it will cut you as you pull on it.

You will need staples to hold the skin in pace once you have stretched it. You might later opt to use copper tacks instead, hammering them in place and then removing the staples. But if any staples remain on the boat, they must be monel, a metal alloy that does not rust. Ordinary staples won't last a year, and the word "stainless" is misleading at best.

You will need skin material, likely nylon or Dacron, and an appropriate coating for that skin type.

For materials recommendations check appendix B.

2.3. Assemble the plywood parts without glue (dry fit)

Got more clamps? Good. We're going to need them.

Now put the parts together so that you can be sure of how they fit. The thwart[3] runs front to back, and the two spines[4] run along its length. The three frames[5] slot into the spines. Because the bottom of the boat is curved, you will want to use spacers (anything at hand, a box, offcut lumber) under the outermost frames. This

[3]The seat that is formed by the cross bracing in a small open boat. The name is inspired by the seat being abeam, because a synonym for abeam is athwart. The name literally means "running from beam to beam". Which is inconvenient, because in the Owl, the thwart runs fore and aft

[4]The spines are the parts that connect the frames and the seat together. The resulting box section gives the boat stiffness. I am using the term spine here by choice, it has no special meaning in boat construction

[5]The transverse structure that gives a boat its cross-sectional shape

Figure 2.1.: Dry fitting the frames and spine

way it will not rock back and forth as you work. You can see the spines and frames propped up this way in fig 2.1. Finally, the bow and stern transoms slide over the thwart and come to rest on the seat spines (fig 2.2). The final shape of the boat will be apparent when the parts rest together this way.

The bow and stern transoms are each made of two parts. One part covers the most area, and the other part is a smaller border. Each has holes in the same place, so they should line up. The two parts are used so that there is a notch on the inside for the stringers to fit into, and a notch on the outside to staple the skin to, and to use as a cutting and gluing guide. Before the dry fit, you can epoxy the two parts together. If you prefer to work more quickly, you can clamp the parts together for the dry fit, and then epoxy all plywood connections at once.

The order of the frames is important and they look very similar. To help you, they are numbered 1-3, with 1 being closest to the bow and 3 closest to the stern. The bow is the smaller of the two end pieces, the stern the larger. The thwart has a narrower end and a wider end. The narrower end goes toward the bow, the wider end toward the stern.

Once all of the parts are in place, check that everything is lined up, that the seat is centered on the spines, and that the spines meet the frames at right angles. Once everything looks lined up, try using your clamps to keep the loose parts correctly placed. Use clamps to angle the bow and stern parts correctly, getting them snug

Figure 2.2.: Dry fitting the thwart and spines

against the seat spines. Also use clamps to keep the seat in contact with the seat spines over the whole length. It is important to be sure of how you will use your clamps ahead of time, because when you start working with the epoxy you will have a limited time before it hardens. You must make sure all of the epoxied parts are in firm contact when that happens.

A handy way to make the bow and stern transoms stay in the correct angle is to tie a cord from the lower hole on the transom to the lower hole in the nearest frame. If you tie this tightly, it will act like a clamp. It doesn't matter how you do it, as long as the epoxied parts remain in contact. Make sure the clamp isn't so strong that it squeezes out too much epoxy, and be sure the gap between the parts is fully bridged by the epoxy.

The underside of the thwart is markered where the spine meets it. These guide lines will help you apply the epoxy to the correct spot, and to line up the spines when you clamp them together.

3. Gluing the plywood parts

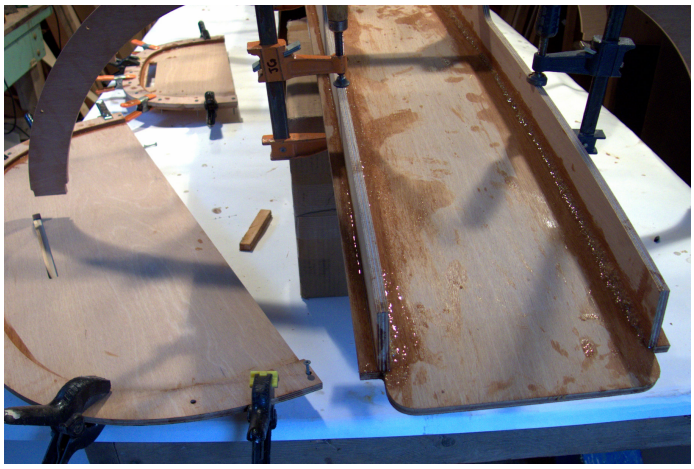
I strongly recommend epoxy for gluing parts. The core strength of this boat comes from the glue joint that runs along the seat. You can use any waterproof glue and not be called insane, but be aware that good coverage of the plywood contact points is critical, and some glues like Titebond shrink as they dry. Epoxy gives you a limited working time before it hardens, so it is important to already have practiced the dry-fitting step to prevent surprises. Those surprises may take some time to address, and you don't want the epoxy to harden while you puzzle it out.

You will want to have epoxy and thickener handy. You use the thickener, some kind of sawdust or a dust made for the purpose, to make the epoxy have the consistency of putty. This allows you to build up a smooth transition between corners, called a fillet, for the plywood joints. I use fine sawdust, though there are products available that provide more strength and a more even texture.

If you've never worked with epoxy before, there are some things to keep in mind. For one, different kinds cure at different rates. If you are working in a hot condition, you may want to use a slow hardener to give yourself more time. Also, larger batches cure faster than smaller batches, because the heat of the reaction is greater in larger containers. I suggest using epoxy on some test subject first, to get a feel for how it flows, how long you can work with a batch, and so on. Practice thickening a small amount as well, so you know how to reach the correct thickness. For more information on how to work with epoxy, refer to appendix C, under "West System Epoxy User Manual".

First, apply glue to the thwart where the spines will set. This process is called "wetting out". By putting glue on both sides of the joint, the hope is that when they are clamped together, there is an excess of epoxy between the two and no dry spots remain. Use the lines on the seat to apply epoxy in the right place. Then wet out the tops of the spines, one at a time. After each is wetted out, set them on the wetted line along the bottom of the seat. Carefully use clamps to hold each spine in place. The spines are under some pressure to hold the thwart in a curve. It can

(a) Applying epoxy



(b) Clamping the parts after applying epoxy

Figure 3.1.

help to prevent the spine buckling and twisting if you already have the frames (or at least one frame) in place. Once both long spines are clamped down, slot all the frames remaining frames into position.

Now that you have gotten the spines placed and glued to the thwart, you need to coat the slots where the frames meet the spines. Take one frame out at a time and wet out the slot on the spine and the slot on the frame so that when you put them together, again the joint is nicely coated. Repeat until all are coated. Now that the parts are about to be glued in place, make doubly sure that everything is even, that the thwart is centered over the spine, and that the frames are square with the spine (fig. 3.2).

Now, add thickener to the epoxy until you get a peanut butter consistency. Use it to coat the wetted joints. Apply it like toothpaste and smooth it with a stick or gloved finger to get a nice smooth line. This extra epoxy creates a ”fillet” and adds a lot of strength to the joint between thwart and spines. It is easy to make a mess in this step. Keep in mind that whatever mess you make you will later be rock hard and you will need to clean it up with sandpaper. A little extra care and neatness here can save a lot of time later.

Depending on your schedule, the type of epoxy you are using, and the temperature where you are working (can you get it all done before it hardens?), you may want to try to glue all of the parts in the same session. If so, after all the joints are glued properly, you can turn over the well clamped frame. Once the frame is right

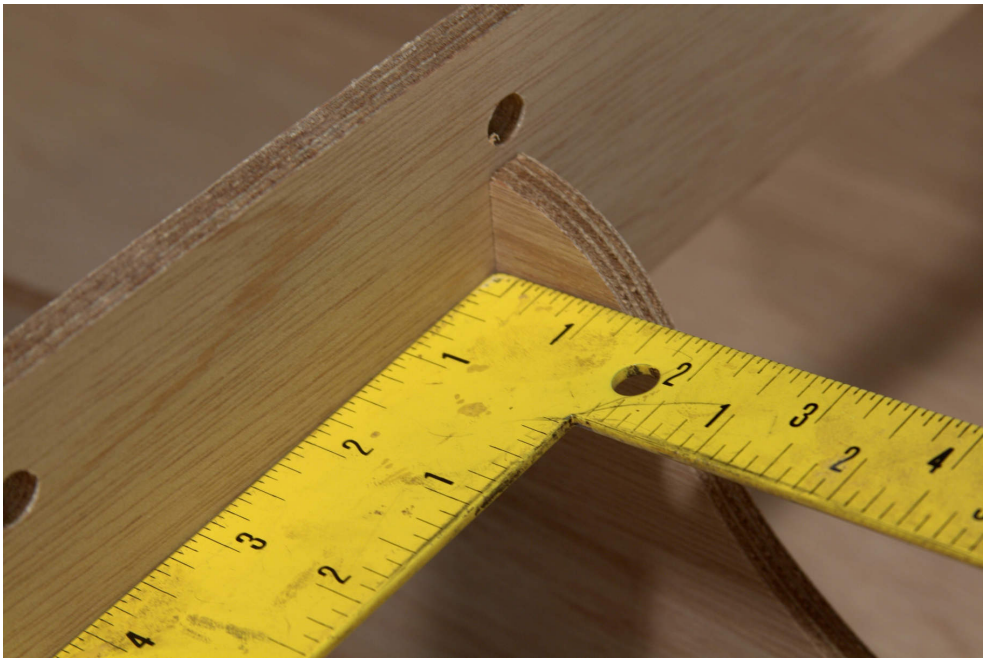
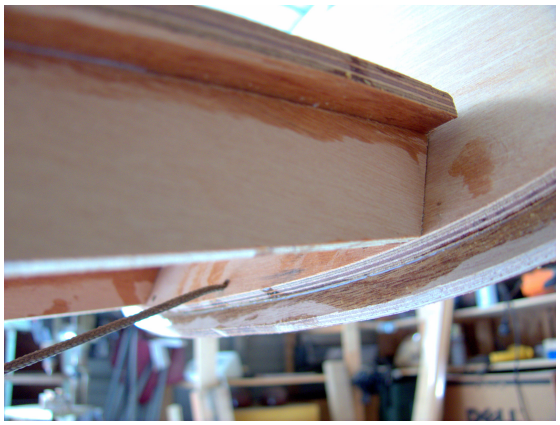


Figure 3.2.: Checking frame alignment



(a) Lashing the bow to hold the correct angle

(b) Filling the bow gap with epoxy

Figure 3.3.

side up it will be easier to glue the bow and stern parts. Those with time may wish to first allow the epoxy from the previous step to cure before moving on to this step, as it will be less stressful that way. The bow and stern parts will be glued to the thwart they surround and the spines that they lean against. Wet out these joints as before, and then add the thickened epoxy fillet to the seat spine. The joint

between the thwart and bow and stern parts might require even thicker epoxy, more like cookie dough than peanut butter. There is a lot of space in this joint, and pressing on one side can push epoxy through to the other.

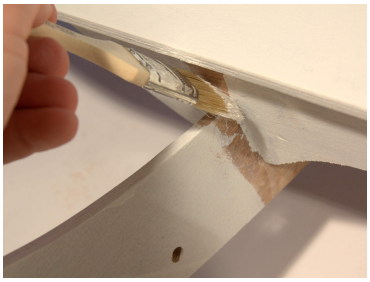
Now we wait for the glue to dry. Usually it is best to wait a full day for the epoxy to cure.

Excellent work!

4. Sanding and painting the frame

Now that the glue has dried, you can sand the frame. This step is only to get a good finished look, so you can go easy on the underside of the seat. Pay special attention to the exposed edges of the frames and the areas where epoxy was applied. Start with a medium grit paper like 150, and then finish with something finer than 200 grit. I used an orbital sander. A tiny sander (for instance the Black and Decker "Mouse") would be helpful for reaching nooks and crannies around the frames and seat spines.

Marine plywood uses waterproof glue, but if the wood becomes very wet it may swell to the point where it pulls itself apart. A very thorough person would epoxy the edges of the plywood where most water is absorbed. But even a person in a big rush should at least paint the frame. The color you paint the frame may depend on the type of skin coating you use. See appendix B for more information. Some paints are very thin, and if you don't want the plywood edges to show through, you will need to sand carefully and use a thick primer first. The edges of the plywood, unless sealed earlier with epoxy, will drink the most paint. You can skimp on the paint under the seat, but be sure to get as much paint as you can on the bottom of the frames.



(a) Painting the nooks

(b) Painting underneath

(c) Rolling the edges

Figure 4.1.

Surface preparation is the key to a good paint job. You can use a fairing compound[1] to cover any big blemishes. Sand thoroughly to smooth out wood grain, plywood edge texture, and areas that have fairing compound. Also, when painting, use a high build primer so that the first coat of paint also helps to cover unwanted texture.

The best technique for painting is called “rolling and tipping”. You start with a roller to apply paint to a small area. Then you follow up with a brush, holding it at a shallow angle to knock down the knap left by the roller. The brush itself collects paint rather than applying it. For a uniform finish, work methodically, rolling and tipping one area, and then overlapping that area with the next while the previous area is still wet. You can find good guides on “rolling and tipping” online, links in appendix C under “Rolling and Tipping”.

At the same time as you are sanding and painting the frame, it is a good idea to also sand and paint the gunwale braces, so you don’t have to wait for paint to dry twice. Also, if you choose to varnish your stringers, this might be a good time to varnish them as well. Its best to combine as many “wait to dry” steps as possible.

Let the paint dry. Usually 10 or more hours.

Nice job!

[1] Similar to thickened epoxy, this is glue with some material in it. The glue is chosen to be a little softer than epoxy, and the material chosen to be easy to sand. You can build up a damaged area with the fairing compound, and then sand it all back to level again.

5. Lashing

In this step, each stringer is lashed to each frame as well as to the bow and stern transoms. The lashings are tight, and once they are in place there will be no movement between the stringers and frames. If you have nice, knot free vertical grain wood, this step will be a joy. If not, you may break a few stringers in the effort. Its good to have a few spares.

Once the stringers are lashed to the frame, it will be very difficult to paint or varnish them. So before lashing, make sure the stringers are finished to your satisfaction. When the finish wears off, it will be hard to replace, so choose a durable coating, or leave the wood natural. On some boats I've used "Natural Teak" Cetol, which is a durable product, and on others left the wood natural. If the wood is kept dry most of the time, by simply turning the boat over for storage, its life should be very long indeed. The stringers get enviable ventilation.

5.1. Overview

The shape of the hull is dependent on the placement of the stringers. If you lash them evenly, not trapping any twist or bend in the plywood frame, then the final boat shape will be correct. That said, don't get hung up on exact placement. It is most important that you be consistent, using the same kind of stringer, and the same lashing pattern, for each point. You will be trapping a lot of tension into each stringer at first, as you bend them from frame to frame. In the end, the tensions will even out and the wood will relax into its new shape. However at first the bends are difficult to achieve. Keep these tips in mind to make the process easier:

1. **Start from the middle stringer** The frames are loose until lashed to the stringers, so you must be careful not to lash them in a bent shape. The bottom most stringer attaches to the frames where they are most rigid, under the thwart. By starting here and moving to stringers that are ever closer to

the gunwales, you arrive at the gunwales with frames that are already well reinforced.

2. **Loosely lash bow and stern first** Rather than using the middle frames as levers to bend the stringers, possibly bending the frames under the load, lash the stringers loosely at the bow and stern. This springs the stringer out into a curved shape naturally, putting less tension on the frames.

3. **Cut the bow notch once the correct angle is apparent** One of the most difficult things to get right is the angled cut in the stringer at the ends, where they meet the bow and stern transom notches. If you have the stringer loosely lashed into a curve, you should be able to estimate the correct angle to cut for the bow notch. Cut this at the end of the stringer, and then lash it into place. This way you only need to make the angled cut at the right length on the other end. The bow angle is greater, so it is better not to have to estimate the length on this end.

Figure 5.1.: Cutting the stringer to the notch angle

4. **Lash frames 1 and 2, but leave 3 until the stringer is cut to length** Once all but the last frame is lashed, you will need to bend the stringer into place

at the stern, mark the angle, and then cut it too long. You want to cut it too long because cutting it too short means starting over again with new wood. If you try to cut it close to the correct angle from the start, you will be surprised at how wrong you are. Better to slowly nibble at the length until it is correct. You leave frame 3 unlashed because you need enough wiggle room to bend the wood into place in the notch. If frame 3 were lashed, the bend would be too dramatic and break the stringer. After the correct length is cut and the stringer lashed into place at the stern, you can lash frame 3. If the stringer is the correct length, it should more or less rest flush on frame 3. If it is bowed away from the frame, the stringer is too long and must be cut slightly shorter. If you cut the stringer too long and force it into place, you risk trapping twist into the frame, or bending the transoms outward. A tight fit is ok, and a loose fit is ok, but try to get the same fit for all stringers.

5. **Work slowly** If the wood complains or is hard to bend into place, try lashing it into a partial bend, and take a break. Forcing a bend quickly will break wood that would happily move into place if given time. Even if the wood is agreeable, your hands will get tired. Again, use the lashing to help you, letting it take the strain while you rest.

Figure 5.2.: Start by tying a bowline through the hole

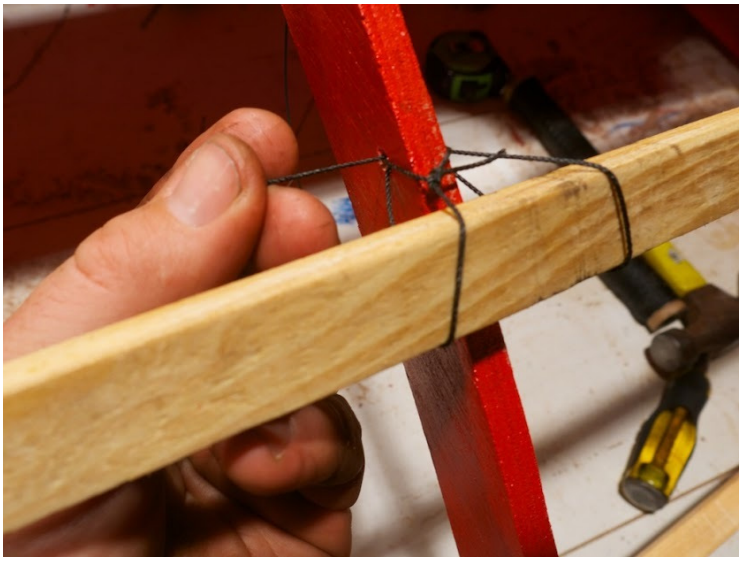


Figure 5.3.: Several loops, then tighten

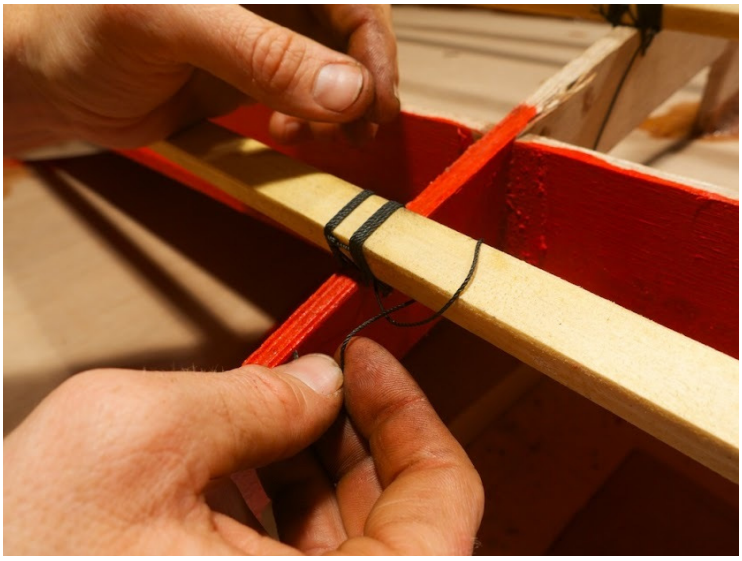


Figure 5.4.: More loops to lock in the tension, then finish with several hitches

5.2. Lashing technique

To start lashing, tie your line using a bowline to a hole in the frame (fig 5.2). Then loop around one side of the stringer, back through the hole, and then around the other side of the stringer. Leaving it loose at first and passing through a few times means that as you tighten the lashing and bend the stringer into place, you can

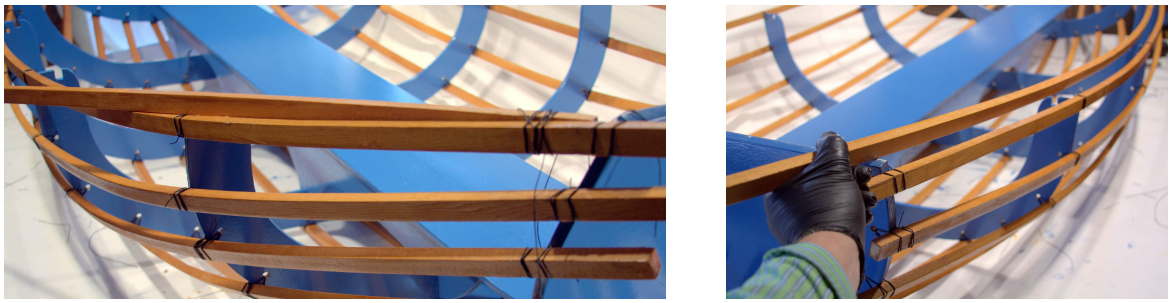
rely on the friction of the lashing to easily hold tension while you rest (fig 5.3). Finish the lashing by tightly wrapping a few turns around the other way, between stringer and frame like a belt around the waist of the previous turns, and then finish tying it off with a few hitches and a rolling hitch (fig 5.4). See appendix C for how to tie these knots. Be careful that while lashing the stringers into place, you don't force any twist into the plywood frames. They bend out of shape easily until lashed in place. The lashing should be tight enough that once the stringer is lashed to the frame, they can't move back and forth.

Lashing the stringers at the transoms is a little bit different than at the frames. You can't go around both sides of the stringer to get a nice strong purchase. Instead, tie your bowline onto the stringer itself, go through the hole transom hole, but then take a turn around the stringer before going back through the hole. This gives more friction for the lashing to pull with, and keeps the lashing from falling off of the sides of the stringer.

5.3. Lashing the gunwales

Finally, after lashing your way up the sides, you reach the gunwales. These are different because the lashing must pull downward to trap them into the provided notches. Like the bow notches, its ok if they hang out over the notch, but its important that they settle firmly into the notch. The procedure here is the same as elsewhere on the frames, except that rather than pulling in evenly with each lashing, you instead want to pull down with each lashing, trapping tension to pull the gunwale down against the notch. At the transoms it gets even more interesting. Here two lashing holes are provided. This is so that you can wrap around the stringer, pull down, go through the bottom hole, in the top hole, and then around the stringer again. This allows some downward force, and keeps the stringer flush with the top of the transom.

The inside stringer and the top-most outside stringer work together with the little square plywood braces to create stiffness and a platform for the oars. Attaching the inside stringer is a bit different from the rest. You lash it in the same way as the top-most outside one, but the ends must be cut to fit inside the boat, and then the cut end is lashed to the outside stringer. See fig. 5.5a for a view of how the two stringers meet. The cut need not be precise, but getting it as close as possible to the bow will look neat. Using a Japanese pull saw is convenient here: you can line



(a) (b)

Figure 5.5.: Placing the inside gunwale

up the stringer with the bow and cut close because the saw is so slim. Once it is cut, lash the inside stringer to the outside stringer.

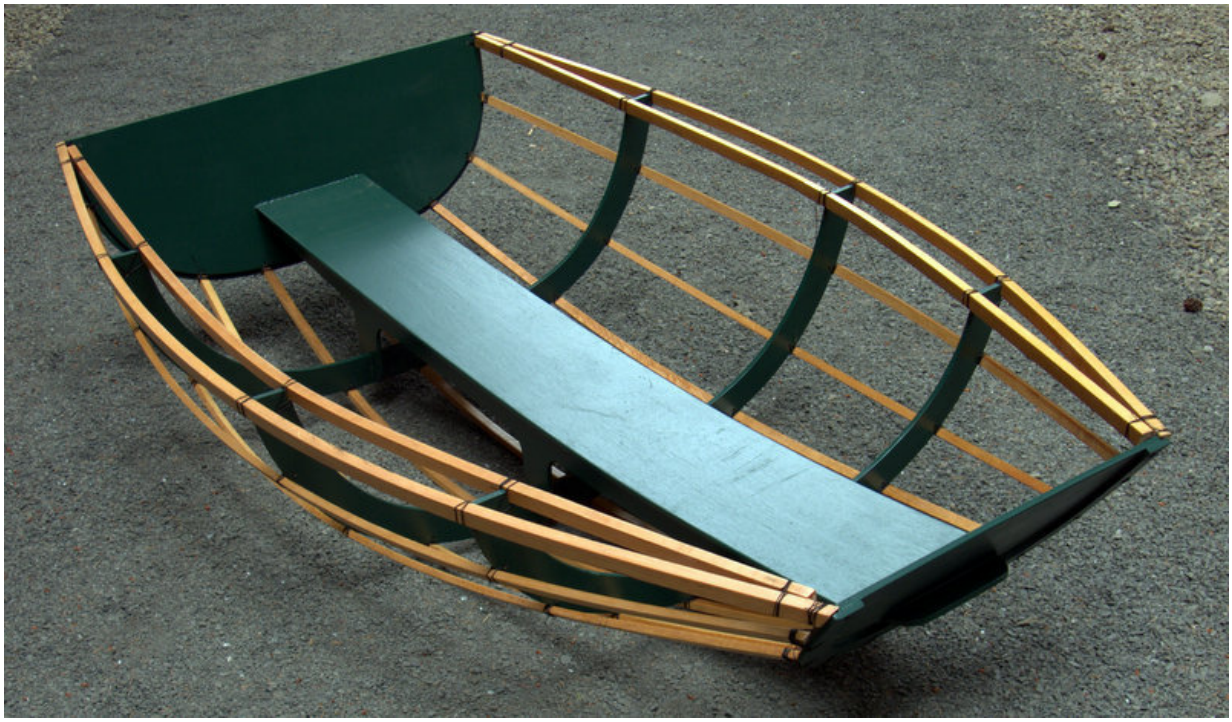


Figure 5.6.: The finished frame

Now that all the stringers are on the boat, you can look for alignment issues. Alignment isn't critical, but especially with the bottom most stringer (which should run in a straight line fore and aft), small variations from straight and true are easily noticed. You can usually pull a little on the already tightened lashings to get

the stringer to line up. For the other stringers, just look for any obvious problems. The gradually curving lines help to hide tiny imperfections. Measure from bow corner to stern corner. Both sides should be the same. If they aren't, try tying a line from one corner to the opposite corner, tensioning the line to correct the twist. This isn't critical. You will be changing the tension again when you skin the boat. But keeping things even throughout the process is a good idea.

Nice work!

6. Skinning the frame

This step may seem daunting, but it is really just slow, steady work. If you find it isn't going well, you can back up, pull some staples and try again. There is a knack to it, and if you have worked with fabric before, you will have an advantage. The idea is to drape the skin evenly over the frame, and then stretch it in one direction, lock the tension in place with staples, and then move on to another direction. Doing it all as evenly and methodically as possible will help. Both the Owl and the Little Owl have similar maximum widths. These are wide, and only a few available fabrics will stretch over the whole hull. See appendix C for fabric sources. At the time of this writing, George Dyson is selling an 82 inch wide 8oz nylon fabric that is wide enough. The minimum width (its always nice to have more) is 79 inches. Allow for an extra foot of overlap on the bow and the stern when ordering.

If you can only find less wide fabric, it is possible to join two parts together into a larger width. That process involves stapling both halves of the skin to the keel strip, tightening each half individually, and then sewing the seam with a compact stitch to make the hem lie as flat as possible, and to aid coating the seam completely. For more instructions, refer to the assembly manual for the Pacific Loon.

Start with the boat upside down, draping the skin over the frame evenly. Use clamps to hold it in place, so that the skin will stay put when you begin the stretching process. Put clamps on the bow and stern, add one or two along the gunwales, and then turn the boat over to finish clamping the gunwales.

If you have skin that is way too long, you can trim the excess length, but be sure to leave plenty of extra. It is easier to grab the skin and pull it tight if you have something to grab. The skin is likely to be narrowest abeam[1]: it is easy to find fabric in any length, but the available widths are limited. So take extra care that the skin is lined up to allow both sides to wrap around and under the gunwales at the point of widest beam.

[1] Arranged from left to right in the boat, rather than front to back

Figure 6.1.: Draping the skin over the frame

Any cuts you make in the fabric should be done with a hot knife (fig 6.2a). Using scissors or a normal knife will be difficult, and will allow the edge to fray. The hot knife cuts and seals the edge at the same time.

6.1. Stretching the skin

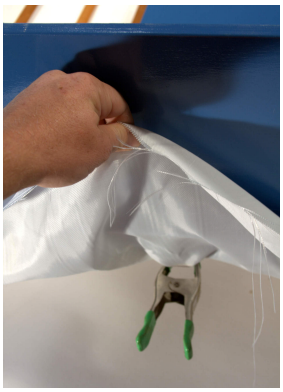
If you are using nylon, try to work in a cold and wet environment. The fabric sags most when cold and wet, so you can get it tighter over the frame that way. If its hot and dry where you are, try wetting the fabric with icewater. I hosed my fabric down to get it evenly wet. If it is not evenly wet, streaks may result, as sediment in the fabric is not evenly distributed.

When you staple to the bow and stern, use the outer transom part as a ledge, and staple to the inside edge. This allows a clean finish, and gives the staple extra holding power. It can be hard to reach this spot under the thwart (where it protrudes through the transoms), but you can get the staples to stay if you angle the staple gun correclty.

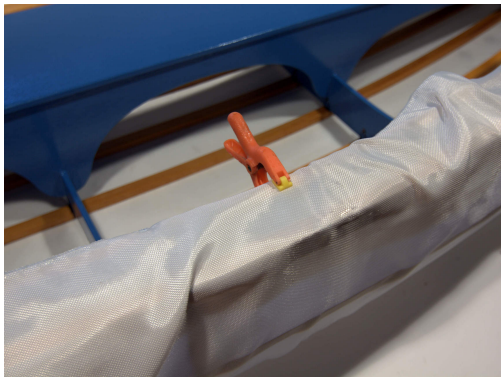
Start by stretching the skin down the middle along the bottom, from bow to stern. Staple the skin to the bow several times close together for this first spot, as we will soon pull it tight and test those staples. Now move to the stern. Pull the skin as tight as you can (see fig 6.3a). Ask a friend for help if needed. Get it good and tight, and then staple it to the stern (see fig 6.3c).

Now change directions and tighten the skin abeam. Pick the widest point, and if

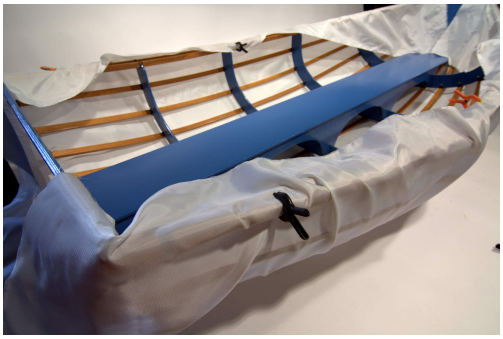
(a) Hot knife for cutting the skin



(b) Clamp bow



(c) Clamp gunwales



(d) Getting it even

Figure 6.2.

the skin width does not allow much overlap, be sure to line it up precisely so that the overhang is the same on each side. Pull it tight, and staple it to the outside of the gunwale. The staples in the outside of the gunwale will be pulled out later. It is much easier to pull tight if you are pulling straight down, and this allows you to work with the boat upside down the whole time. If you have non-monel staples, you can use them here, because they will later be removed. Once you've stapled the skin on one side, move to the other side of the boat, and pull the skin as tight as you can manage, and then staple it down on the other side.

You should now have the skin tightened in two directions (fore and aft, and abeam). Now repeat the process, tightening the bow and stern just to one side of the last staple point, and then the other. Then tighten the skin abeam again, forward of the previous staple, then aft. Then again bow to stern, and then again abeam. Move a few inches each time, moving enough to make progress, but not so

(a) Stretching tight around the bow

(b) Staple to the outside of the gunwale

(c) Staple the bow

(d) Staple along the inside gunwales

Figure 6.3.: Stretching and stapling

far that the skin can pucker between the staples. As you move towards the bow and stern, you will start to pull both down and forward on the skin. With enough finesse, there should be no wrinkles in the skin.

Now that the skin is tight on the frame, fold the skin around the bottom of the inside gunwale, and staple it down (see fig 6.3d). The top-most stringers at the gunwale will be reinforced with square plywood braces once the skin is completed. These will hold the oarlock sockets as well. They must overlap the gunwale stringers enough to allow the screws to go through the braces and into the stringers. This means that if the stringers are too wide, you will need to squeeze them together to allow the needed overlap. If the skin is already attached, this will create a pucker in the skin. To avoid this, put the plywood squares temporarily in place while you are stretching the skin, so that you can get the right spacing when you staple the skin tight. You can read ahead to the gunwale bracing section to get an idea of what that step is like in chapter 7. Once the skin is stapled to the inside of the gunwales, you can remove the staples from the outside of the gunwale.

You can shrink nylon skin with an iron or heat gun, just not very much. You must be careful not to overheat the fabric, you can melt it, and then it loses all stretch. Having the skin a little moist helps to avoid overheating. Especially if you are using a heat gun, keep moving, don't heat one area too much. You will get some tightening, but not a lot.

If you are using Dacron, **do not use a heat gun**. It is too easy to melt the dacron. Use a household iron on a medium setting, and keep the iron moving. You should get a noticable amount of tightening. If you don't notice any tightening, use more heat and move a little slower until you get the desired result. Don't rush it.

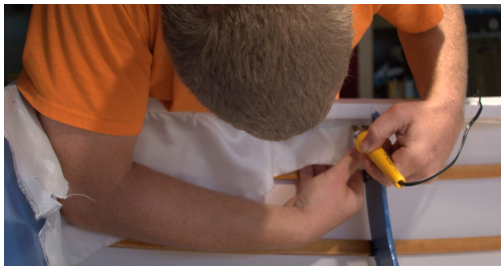
Figure 6.4.: Taking up the slack with a stitch

If you have one area that is sagging, and the iron isn't taking up the slack, try using the iron over a larger area. Getting the skin tighter in one area tighens it everywhere else as well. If you still can't get the wrinkle out, consider sewing up the excess. You can stitch a fold into the skin, taking out the slack. It ends up looking a little like Frankenstein's neck, but not in a bad way.

6.2. Trimming and finishing the skin

Now that the skin is tightly stretched on the frame and stapled in place, you can move on to finish work, preparing the skin to look neat once painted. The corners transition from the trimmed transoms to the gunwales. The best way to handle this is to cut the skin even with the transom border, and then angle the cut outward

to the gunwales. This transition section can then be folded up, and stapled to the inside of the gunwale (see fig 6.6).



(a) Trimming gunwales

(b) Cutting around the frames

Now that the corners are handled, you can trim the excess under the gunwales. Try to cut the skin even with the inside gunwale stringer, so that the bottom of the stringer is covered by skin. This will be held in place by the coating, and leave a finished look for the edge. Where the skin meets the frames, it will bulge out. Cut a slit here so that you can pull these edges tight and staple them underneath the inside gunwale (see fig 6.5b).

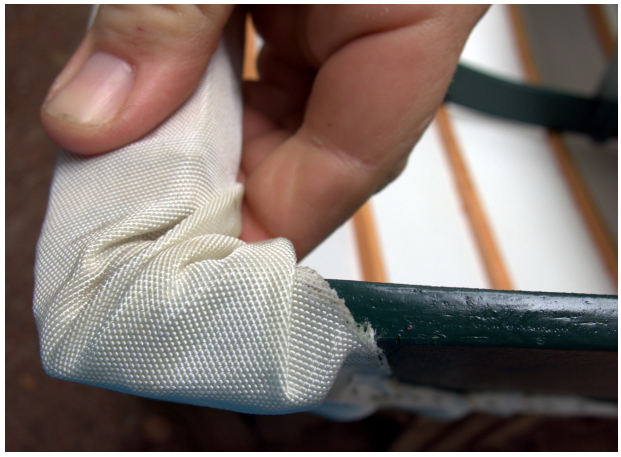


Figure 6.6.: Trimming corners

Now you can move to the bow and stern. You will want to cut a nice attractive line here, mirroring the shape of the bow and stern. Use the your hot knife and cut a curve that follows the line of the staples in the outer transom piece. Give it half an inch or so of overlap, close enough to capture the skin's edge with sealant in the next step.

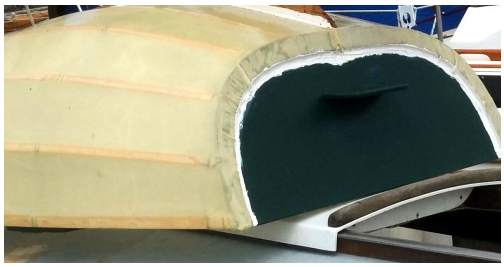


Figure 6.7.: Sealing the transoms

The cut edge of the skin is not far from the water line, and when the boat is loaded, the edge may be well under water. **The staples alone do not make a waterproof connection**. Some coatings join the skin so well to the bow and stern that the resulting joint is waterproof (Corey's Goop, for instance). But this is too important to leave to chance. This is a boat after all, and it must float. To be sure, use a polyether caulk like "3M 4000", and lay in a healthy bead of caulk in the notch between the two transom parts. Try to capture the cut edge of the skin in the caulk, and smooth it out to an attractive fillet. It will be a challenge to be neat here, but neatness counts, especially if you are using a translucent finish. White caulk will leave a more attractive mess if you fail to be perfectly neat. Once enough caulk is in place, press the skin firmly down against the plywood, to make sure a waterproof bond is formed. You can clean up the mess with rags and rubbing alcohol.

The skin is now finished and ready for painting. Good work!

Figure 6.8.: Finished skin

6.3. Painting the skin

The technique for painting the skin will vary depending on your choice of coating (detailed in appendix B). The process is very similar to painting anything else, except that you will use a lot more coating to soak the skin than you would to cover an equivalent area of wood. I strongly recommend using “Corey’s Goop”. It is durable, easy to apply, and you can use his excellent tutorial, listed in appendix C, under “The Skin Boat School and Store”. If you go with anything else, I suggest rolling and tipping, just like when you painted the frame.

Especially when using fancy yacht coatings, be sure not to coat too thickly. Some paints will take weeks to cure if put on too thickly. Better to apply the paint in several coats instead. If you are working in a warm condition, you may get away with several coats a day. “Corey’s Goop” can cover a boat completely in one day. With others, it may take some time to reach the desired thickness.

You are technically done as soon as the skin is watertight, but you should aim to fill the weave of the skin so that the surface is smooth. This will reduce drag and make rowing easier.

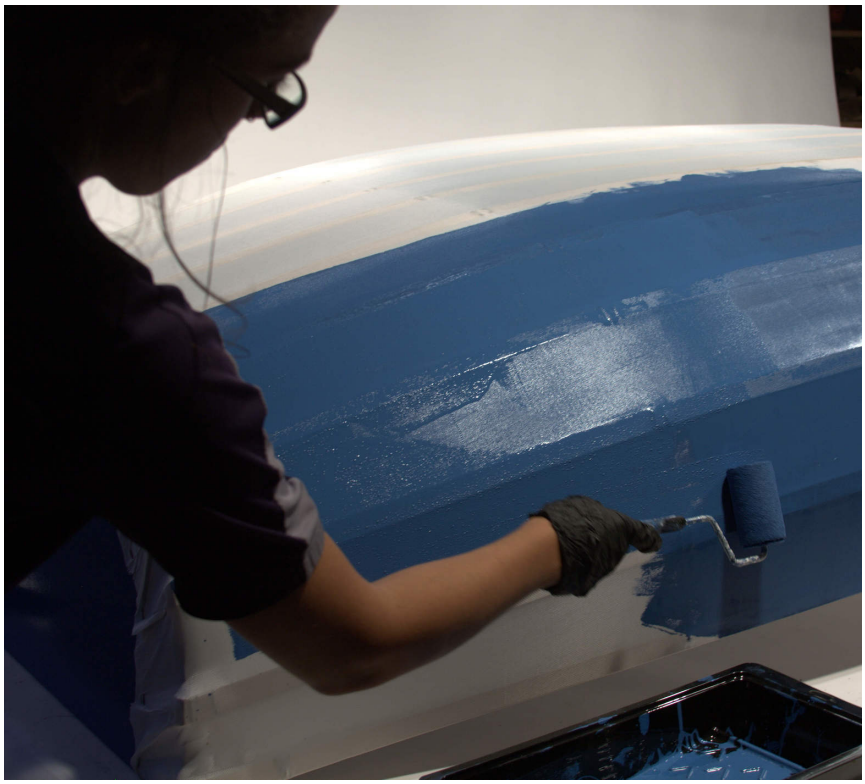


Figure 6.9.: Painting the skin

7. Gunwale braces, oar sockets, skeg and runners

You've got a boat now, or at least once the coating dries you will. But you won't get far without a means of propulsion. Outboard engines are out of the question, their weight would make a boat this light pop a wheelie and sink. Adding a lead acid battery would mean lots of weight, just what we'd like to avoid. There are some electric motors with advanced battery packs that would work, like the "Electric Paddle" (see appendix C). But you will want oars in any case. And to use oars, you will want oarlock sockets.

To take all the force of rowing, you will need sturdy mounting points. The 6 small plywood rectangles (3 per side) will be screwed to the gunwales to provide this support. They will also stiffen the boat in general, locking the gunwale stringers together over each frame. If you have your rowing hardware (oarlock sockets, thole pin holes, etc) install them in the blocks before attaching the blocks to the frame.

The blocks are labeled so you can identify which belongs where. Block 1 goes between the bow and the first frame, then block 2 between the first two frames, and so on. Line them up over each frame. Once they are lined up, use the hot knife to cut holes in the skin where the oarlock hardware will pass through.

Use skinny bronze bolts to attach the blocks to the gunwales. Using a narrow bolt weakens the gunwales the least. Pre-drill holes for the mounting hardware. If the inside and outside gunwales line up with the blocks, great. If not, you'll need to force some overlap.

Get oars that fit inside the boat. They need not be longer than 6-7 feet. Small boats are easy to row and impossible to row quickly, so the exact length of oar is not critical.

7.1. Runners

Only one chore now remains. Your boat will no doubt be run up on beaches and dragged over gravel. The more carefully handled, the longer the skin will last, but using wooden runners[1] to take the punishment will significantly increase the life of the skin. I put one runner down the middle line, running nearly the full length of the boat. Then I used two much shorter runners along the sides. You should decide at this point if you want a skeg[2], and if you want to attach it to the inside or the outside of the middle runner. See section 7.2.

Start with the middle runner. Be sure to line it up with the stringer on the inside of the skin, so that you will have something to screw into when attaching the runner. Use bronze wood screws, not too thick, and not so long that they could protrude on the inside. Drive the first screw through the runner and stringer amidships[3], where there is very little curve to the hull. Then work towards the ends, bending the runner into place and screwing it down, keeping it flush with the hull. Six or seven screws should be plenty. If you have extra length in the runner, leave it until after you glue it in place. For the side runners, keep the length short, two feet or so, so that there isn't much curve along their length. Three screws should be enough for these. Choose the location for these by lining them up with the stringer three over from the middle. Locate them fore and aft by resting the boat on its bottom and noting where it sits on a flat surface. Put the stringers there. Because they will end below the water line, the ends of these two stringers should be smoothly angled at the ends.

Now that you've screwed the runners down, you can unscrew them and use caulk (polyether caulk like "3M 4000") to thoroughly coat the area where the screws puncture the skin. Also apply some along the length of the runner. Carefully line the runners up with the screw holes again, and screw them down. You want a good coating of caulk along the length of the runner to keep debris out from between the runner and skin, and also a good coating where the screws go through the skin itself. Clean up the stuff that squishes out, using rubbing alcohol and paper towels.

[1] Runner, bilge runner, a strip that runs along the bottom of the hull. Its role can be to protect the hull, or to stiffen the hull.

[2] From a Scandinavian word for beard, a deepening of the keel towards the stern. The extra depth then, usually in a fin like shape, helps the boat stay moving in a straight line.

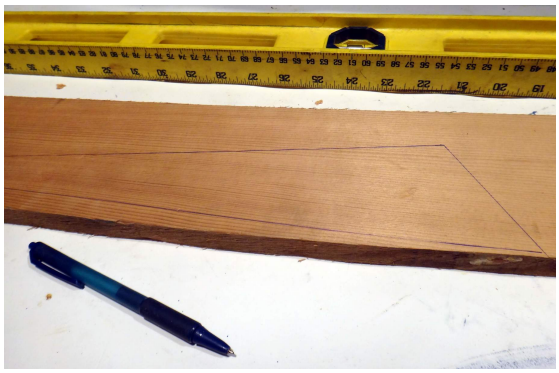
[3] In the middle of the boat.

A credit card also makes a good scraper if you have a lot of extra goop.

7.2. Skeg

The Owl is designed to be a fast turning boat. When in a crowded marina, it is nice to be able to swing around quickly. Those who prefer a boat that stays going straight without constant correction may want to add a skeg. To cut the skeg, first add the middle runner according to the instructions in section 7.1. Then take the board from which the skeg will be cut and line it up with the middle runner, resting it on the hull. You can then trace the curve that you need to cut by running your pencil along the runner's length. This will be very close to the correct line, and variation will not be more than the inevitable errors that occur when cutting the shape. Once you've cut this shape out, rest it on the runner and look for high spots. You can remove the high spots with a saw, a chisel, or sandpaper, depending on how big they are.

(a) Tracing the curve of the hull



(b) Trace the desired final shape on the board

(c) Fine tune the shape to match the runner

(d) Epoxy the skeg to the runner

Figure 7.1.

Now that you have a skeg cut out, you must attach it to the runner. If you have a small one with a very good fit, you can just use epoxy. I prefer to use two long skinny keel bolts to go right through the middle runner, the skin, and the lowest stringer. If the bolts aren't long enough, you'll need to drill a recess in the skeg, so that the bolts will stick through the inside stringer for enough to tighten it down. For the lowest profile part of the skeg I just use the same screws I used for the middle runner. This way allows a firmer connection, and therefore a larger skeg. If your skeg lines up very well with the middle runner, you can use epoxy. If the fit isnt that tight, I suggest using caulk, to bridge the large gaps. Only use caulk if your bolts and screws are already strong enough to hold the skeg in place.

Pay special attention when attaching the skeg that you don't put any twist in the wood, and that it lines up bow to stern. If this is out of alignment then your boat will always want to turn the wrong way! The runners, stringers, and skin are all flexible so if there is a slight error you can likely fix it by applying pressure to the skeg overnight in a corrective direction. If not, you may want to run a reinforcing attachment down from the transom to the stringer. The Pacific Loon (another Hermit Cove boat) does this, so if you think it will be necessary to keep your skeg pointed the right way, refer to that manual.

For looks, you may choose to varnish the runners and skeg. This will at least cover the inevitable epoxy smears, but know that after hard use, there is no way this finish can survive. These parts are meant to take impacts, and will look the part soon enough.

Have fun!

Appendix A. Using plans to cut plywood

Included with this manual is a PDF plan showing the plywood parts fitting onto sheets of plywood. The PDF is a 2 page document, but the pages are 4 foot by 8 foot in size, which is probably larger than your printer can print. Also included is a PDF with smaller pages that will be easier to print, but will not match the best layout to cut from 4 foot by 8 foot plywood.

If you want to use these plans to cut the parts out yourself, the smooth curves and numerous lashing holes will not make the job easy. If a few hours spent working slowly with a jigsaw sounds unpleasant, I suggest getting the kit, which includes these difficult parts cut by machine. But maybe shipping is prohibitive to you, or you are just cheap and want to save a few bucks using ACX plywood from the hardware store. More power to you.

I know of two techniques to use this PDF to make your parts: print the plans out really big and then glue them to plywood, or shine a projection of the plans onto the plywood and trace the lines.

Using a full size paper will give good results, but such a large print will be expensive. The only errors will be cutting errors when the jigsaw strays from the line. To save money, you can also glue several smaller overlapping pages to the wood, in the extreme case doing it all with 8.5 x 11 pages (free if you print from work!). Send me a picture if you do it that way, you frugal overachiever. Use a weak spray glue like 3M Spray Artists Adhesive to glue the pages to the plywood.

If you are using a projector, you will have two sources of error: tracing errors and cutting errors. You will not produce a perfect product, so give that idea up now. But! The nature of this plan, with its lashings and skin and gap filling epoxy, is such that many mistakes can be hidden. If you work carefully and make small mistakes in every direction, the end result will be very close to correct. Mistakes can cancel themselves out.

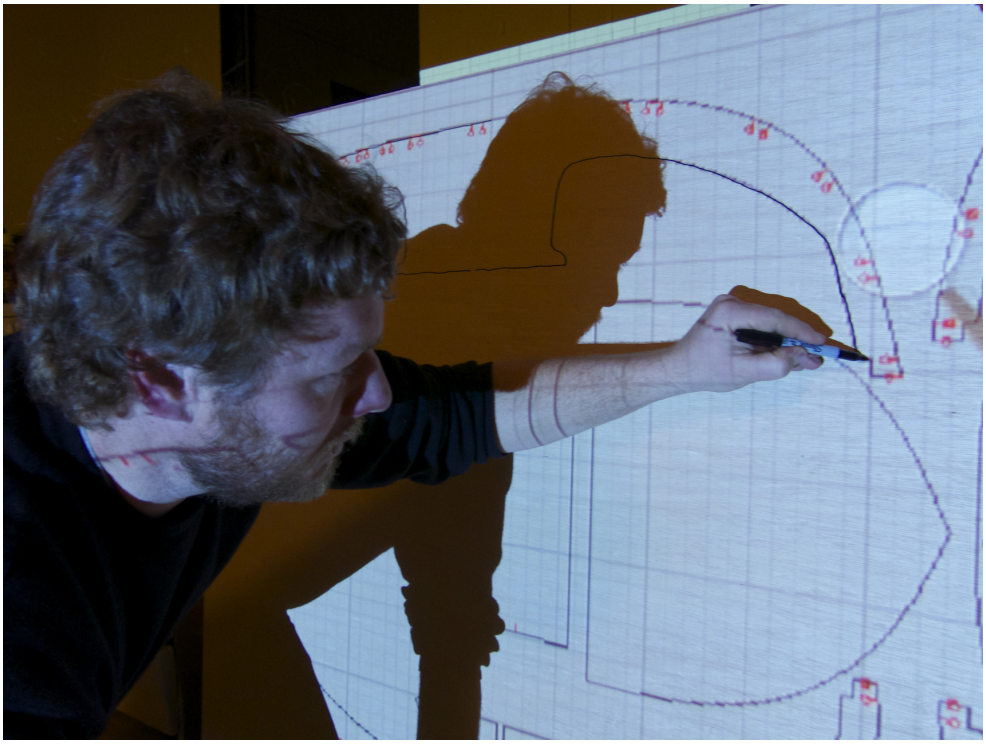


Figure A.1.: Tracing plans using a computer projector

You will spend some time setting up the projector so that it casts the correct image onto the plywood surface. Choose an image viewing program like “Irfanview” (see appendix C) that allows a full screen view and zooming in and out, to help with image alignment. The plywood should be well supported from behind, so that the pressure of the pen tracing will not move it out of place. On the image are several calibrating lines, one in each corner. Measure these to confirm that the image is falling evenly over the whole surface of the plywood. When you encounter the notches, the places where the plywood slots together with itself, you need not trace each line. Instead, mark the start points of the notch, and the final depth of the notch. This is because in the next step you will use a scrap of plywood to trace the precise width of the plywood itself.

With either approach (printed or projected), you must now make sure that the notches are the correct width. They are meant to be exactly as wide as the plywood you are using. Cut a small piece of plywood and use it to trace the exact shape over the notches, lining up the piece on edge with the start of the notch, and ending it at the correct depth. Plywood varies in thickness even within the brand, so be sure

to check. If you used the projector method, you will probably have big errors in tracing which won't amount to much, but make sure that these notches are traced and cut very carefully.

Once the plans are in place, either glued or traced, get a jigsaw and a drill and get to work. Some long cuts will be easier using a circular saw, and a band saw can come in handy, but the real workhorse will be the jigsaw. There are a lot of cuts, so get a good jigsaw, or if you get a cheap one, keep the receipt.

Have fun!

Appendix B. Choosing materials

B.1. Skin

Historically, skin and frame boats were made with literal skin: seal skins. It took a great deal of skill to sew them into a continuous waterproof covering for a boat. We live in a lucky time; a wide range of materials are available in widths and lengths to allow covering an entire boat without the need to stitch. Although anything that can be considered fabric will work as a covering for a while, there are some "excellent" choices: canvas, polyester, and nylon. They all have their strengths and weaknesses, and the best choice depends on your needs.

First, let's consider canvas. It has one really nice trait: it shrinks when it gets wet. This means if you don't do a great job getting the skin tight on the frame initially, it will look better once you get out on the water. But of the three "excellent" choices, it is the weakest, pound for pound. Another nice trait of canvas is that it will take many different coatings. People report that oil based paint works well. But canvas is only marginally cheaper than polyester and nylon. Given that it is not particularly tough or affordable, make sure you know why you want to use canvas. Because you think it is really cool looking, for instance.

Second, let's consider nylon. Nylon is a term for a family of plastics, but when talking about skin for boats we mean "ballistic nylon". This term was coined by DuPont, who marketed a woven nylon product for bulletproof vests. Nylon is no longer used for bulletproof vests, but that it ever was should give the boat builder confidence. Ballistic nylon is almost hilariously tough. I offered a sample to a friend who is proud of his sharp knife. I stretched the sample out, and the tip of the knife would not go through. When finally, under great pressure, the tip broke through, it immediately stopped. The next cut would be as hard as the first. When my boat made of 12oz ballistic nylon hits barnacled rocks, it leaves behind murder and mayhem, a soup of ground up barnacles that never deserved such treatment, and the skin is unmarred. It is the toughest choice in any weight, and a great option

for skinning boats. But in it's toughness lies its drawbacks: the material stretches rather than tearing. It can stretch really well, much better than most coatings. Opaque paints can't stretch as well and gets torn off when the nylon it clings to stretches out of its grasp. Only a few coatings are able to stretch with it, and they are all translucent. Nylon stretches around curves nicely, and you should be able to get a nice tight frame using nylon. It will start nice and tight, that is, but then when it gets cold and wet it relaxes, stretching even more. It is rare to see a nylon skin and frame boat without a wrinkle.

Third, let's consider polyester. Polyester, like nylon, is a term for a family of plastics, but when talking about skin for boats we mean "Dacron", a trade name for the kind of polyester used to make sails for modern sailboats. It's a wonderful material. It shares canvas's affinity for many paints. With polyester, you can use opaque paints, and there is the whole rainbow to choose from. And you can choose to use cheap paint from the local hardware store, or the most expensive yacht coatings made. Polyester is also much stronger than canvas. Unlike canvas, once stretched over the frame, it doesn't shrink or grow, staying relatively stable. If you got a nice, tight fit when building the boat, it will stay that way. Polyester also heat shrinks well when moistened and ironed. So once you stretch the skin as tightly as you can over the frame, you can use an iron to hide your mistakes and tighten it further. Its a wonderful material. But because its so stable once finished, when it runs into sharp objects, it can't get out of the way. It is much more likely to puncture than nylon.

Which to choose? If you want a drum tight finish, and are OK with treating your boat with some care around rocks and beaches, consider Dacron. If you want a bright colorful finish, again, consider Dacron. If this is your first boat, or if you want a boat you can toss around without worry, go with ballistic nylon. Nylon can't be beat for toughness, and if you choose "Corey's Goop" to coat the boat, there are great guides online to help you coat the nylon.

What about pvc, or canvas, or transparent plastic, or old bed sheets, or... For your first boat, start with reliable options. If you want to try something else, remember that the skin material is not that expensive, and re-skinning your boat does not take that long. You will have time to experiment if you wish.

B.2. Coatings for skin

If you have chosen polyester or canvas skin, you can use any of the coatings listed below, and probably a lot more as well. Nylon, on the other hand, is capable of such stretch that it can stretch right away from most coatings. If you use nylon, choose only Corey's Goop, Coelan, or Dura-Tuff.

B.2.1. Opaque Paint

Boat builders report that affordable oil based exterior paints, like Rustoleum, work well. Because all yacht paint must be waterproof and UV resistant, consider using yacht paint though it is a more expensive option. Epifanes brand recommends their mono-urethane product, but probably their competitors' mono-urethanes will work equally well. When using yacht paints, consider applying thin coats and letting the coats dry completely before re-applying. It can take a very long time for Epifanes mono-urethane to dry if it is applied too thickly. You should use the "rolling and tipping" method for all opaque paints.

B.2.2. Corey's Goop (two part urethane)

For nylon skin, the most popular coating is "Coreys Goop", a two part urethane with excellent durability. It produces a white translucent coating that fades to yellow translucent quickly in the sun. Corey provides excellent support and documentation for applying the coating. The recipe is a secret, and Corey claims it is non-toxic. See more in appendix C, under "The Skin Boat School and Store".

B.2.3. Coelan

Some say that the best coating available is "Coelan Marine Coating", but it is expensive and hard to find, so first hand accounts are rare. Those who have used it rave that it is easy to put on, and very tough. Coelan claims to have UV protection. That could mean it will not yellow in the sun. Apply it by rolling and tipping as you would paint.

B.2.4. Dura-Tuff

Dura-Tuff is an exciting product. It can be applied by roller like Coelan, and also shows promise in toughness and UV resistance. With Corey's Goop, the yellowing happens in just a few months. In my testing, Dura-Tuff has lasted a year so far without yellowing. It is half the price of Coelan, however Dura-Tuff is toxic stuff and requires a mask. You should only apply it outdoors, or take extreme safety measures.

B.2.5. Exterior Oil-based Varnish (Zar, Varathane, Rustoleum, Etc)

Reportedly this product does not stick very well to nylon. But if you have chosen Dacron and want an affordable translucent finish that is easy to find locally, consider oil based varnish.

B.3. Coatings for plywood

How you coat the plywood frame is a matter of taste more than performance. You can varnish the plywood or paint it with an opaque color. If you are very lazy, leave it untreated, but it will not last as long.

For the stringers, which are not subject to delamination like plywood, paint or varnish will be a purely decorative choice. The wood can be left natural.

Taken together, the choice of coating for the skin, paint for the plywood, and finish for the stringers will have an enormous impact on the final look of your boat. Consider some of the possibilities:

1. **Opaque paint for the plywood, translucent skin, and untreated wood stringers** A classic choice would be a white frame, untreated yellow cedar stringers, and a translucent skin. The clear skin and untreated wood remind one of the aboriginal origins of the construction technique.

2. **Opaque paint for the plywood, translucent skin, and varnished red cedar stringers.** This can be considered the "high trim" level choice. Choose a bright yachty color for the frame, let the varnish show red cedar's lovely grain, and then let the translucent skin advertise the unusual nature of the boat.

3. **Opaque paint for the plywood, Dacron skin painted that same color, varnished stringers.** It is helpful to choose the same paint color for the frame

as for the skin, if the skin is going to be an opaque color. This is because you are bound to get paint on the frame when coating the skin, and no one will be able to tell if they are the same color.

4. **Opaque paint for the plywood, a different color for the skin, and untreated wood stringers.** This option will require great care at the bow and stern where skin meets plywood. You are urged to find some trim material to cover the boundary between colors, which will be imperfect. Your efforts will be rewarded by a striking combination of colors between outside and inside. For extra credit, consider painting the stringers as well. You seem to want to do something detail oriented and frustrating, after all.

The stringers will get some of the skin coating on them. The coating seeps through the skin, and the stringers are in contact with the skin. This is ok, because the part of the stringer that gets painted is hidden by the skin.

There are many other choices of course, but these are among the best. If you've chosen nylon for the skin, you have no choice but to also choose translucence. If you go with Dacron, translucence is still a good option. If you use "Corey's Goop" with a painted frame, remember to color match the eventual yellow color of the skin after UV exposure, not the initial clear hue. If you want to keep that initial white hue, choose the more expensive Dura-Tuff or Coelan coatings.

Appendix C. Resources

The internet! It knows everything! It doesn't agree with itself!

Skin on frame kayaks are far more popular than open skin on frame boats, but the issues involved are largely the same. For questions of skinning and coating your frame, consider these forums:

The Greenland Kayak Forums

Qajaq USA (Qajaq is an alternate spelling of Kayak)

`http://www.qajaqusa.org/default.html`

`http://www.qajaqusa.org/cgi-bin/GreenlandTechniqueForum_config.pl`

Wooden Boat Forum

The frame of a skin on frame boat is wood, so they are wooden boats. The discussion here is broad, but if you search well, you can find good information.

`http://forum.woodenboat.com/index.php`

Kayak Forum

Like the Greenland kayak forums, you can find lots of advice about how to skin and coat a frame here.

`http://www.kayakforum.com/`

DYSON, BAIDARKA & COMPANY

Order materials from a living legend. Who has no website for some reason.

`https://dl.dropboxusercontent.com/u/18771264/MaterialNotes.pdf`

435 WEST HOLLY ST., BELLINGHAM WA 98225

Telephone: 360-734-9226

The Skin Boat School and Store

An excellent source for all materials related to skinning and coating, the source for "Corey's Goop," a popular two-part urethane, and a source for excellent tutorials.

http://www.skinboats.org/

Especially useful is the urethane application manual:

http://www.skinboats.org/#!urethane-application-/c1xub

West System Epoxy User Manual

The West System user manual covers how to glue two pieces of wood together. Great stuff.

http://www.westsystem.com/ss/assets/HowTo-Publications/User%20Manual%202012%20Part1.pdf

Coelan Supplier

http://www.supplyground.com/

Dura-Tuff Supplier

http://www.creative-wholesale.com/Dura-Tuff.html

Geodesic Airolite Boats

If you want a light boat, and are willing to treat it carefully, it will be hard to beat the Geodesic Airolite Boats. They are light, and lovely as well. They are also very high labor to build.

http://www.gaboats.com/

http://www.gaboats.com/faq.html

Dave Gentry Boats

Dave Gentry Boats offers a wide variety of skin on frame designs. If Hermit Cove Boats are very easy to build, and Geodesic Airolite designs are difficult, then Dave Gentry boats must belong in the middle somewhere.

http://www.gentrycustomboats.com/

Kudzu Craft

Kudzu Craft has written a book on this type of boat construction. They offer kayak kits, and have good instructions as well.

http://kudzucraft.com/

http://kudzucraft.kudzupatch.com/articles/whichskin.php

Yost Werks

Interesting kayaks, including a folding kayak and an inflatable kayak. Also includes instructions on skinning a frame in PVC, a material something like a

pre-coated Dacron skin.
`http://yostwerks.com/`

Knots

To lash the boat, you will need to know a few knots. But these are so useful, you should know them in any case:
Bowline: `http://www.animatedknots.com/bowline/`
Clove hitch: `http://www.animatedknots.com/clovehalfhitches/`
Rolling hitch: `http://www.animatedknots.com/rollinghitch/`

Knots, Splices and Rope Work

A free eBook, full of knots, lashings, and information for "Travellers, Campers, Yachtsmen, Boy Scouts"...

`http://www.gutenberg.org/files/13510/13510-h/13510-h.htm`

"Rolling and Tipping"

`https://www.youtube.com/watch?v=k-SGcSlNmoo`

Electric Paddle Outboard Motor

`http://www.electricpaddle.com/`

Making Complex Shapes, Templates and Spiling

`http://www.diy-wood-boat.com/spiling.html`

Irfanview

Image viewer for Windows, allows full screen viewing with smooth zooming in and out. A great help when lining up the projection of the plans with the plywood.
`http://www.irfanview.com/`