10-1/4 pound boat. That is a perfectly reasonable outcome, but it is not as light as allowed. You should always strive for that minimum weight. Otherwise you will always be blaming it on your "bad thumb" days. Even painting the hull weighs something.

Alignment

Because of the method of construction, the Soling One Meter can be built incorrectly by misaligning the keel to the hull. Great care should be taken to ensure that both have the same center plane. This means not only do the fore and aft points of the keel have to lie on the hull centerline, but the bottom trailing tip of the keel must be directly under the hull centerline as well. You can't do this by balancing everything on the workbench! You need a jig or alignment tool. See the construction details that follow for ideas. Note that some clubs may have jigs you can use.

Another important area of alignment is the rudder. It should lie in the center plane as well. The details are mentioned in the appropriate construction section.

Durability

The one real problem with the Soling One Meter kit is that if built to the Victor plans, the boat will not last very long in heavy use. This is particularly the case with boats built by builders without a lot of experience in the materials and adhesives involved. There are 5 areas that should be beefed up:

1. The mast step. If built according to the plans, the mast step will push the deck down just behind the forward bulkhead.

2. The keel-box forward bulkhead joint. Constant flexing of the hull in use and in transport will break this joint.

3. The screw eyes. The side stay screw-eyes often aren't long enough to get a good bite into the blocks. They will pull out. Nearly all of the other screw-eye attachments are too weak, and need to be replaced or strengthened in some way.

4. The Hull-deck joint. This joint is hard to build water tight and strong.

5. The rudder block to hull joint. Another area of constant flexing that fatigues the plastic.

Ideas on strengthening each of these areas are covered in the relevant construction sections. When in doubt, add a bit more strength; the weight increase will be small, and the benefits will be large.

3. A Non-Trivial Project

Building the Soling One Meter is a non-trivial project. There is much work to be done, and there are long periods of waiting involved. A project plan which allows other work to continue while some sub-assemblies are curing or drying is important if time is a factor.

Expect to spend at least 30 hours in construction if this is your first Soling. This 30 hours does not include several 24 hour periods between gluing an assembly and use of that assembly. In calendar time, there is probably at least a week or two of sequential drying stages, especially if you plan on doing a nic finish job. We recommend the following order of the major operations:

1. Cradle or Jig
2. Keel and Rudder
3. Keel to Hull
4. Internal Framing
5. Electronics installation and checkout
6. Deck to Hull
7. Rigging
8. Finishing

There are many minor subassemblies and time consuming work that can go on while these major steps are in process. In particular, note that all wood parts should be painted or varnished, sometimes with several coats. The entire rig (mast, booms, sails, and all the wire and fittings) can and should be worked from the beginning, during curing waits.

Materials

The materials selection in the Victor kit is based on economy, not by durability or weight considerations. You can improve a few parts at some additional cost. In general, if you are reading these words, you are probably serious enough to spend a bit more to ensure your boat lasts a bit longer and doesn't have a built-in disadvantage.

Although the Soling kit is very complete, you are required to obtain a few items: the radio, the lead ballast, and glues and paints. The selection of a radio is covered in a later section. The lead should be #8 or #9 lead shot. The rules require lead shot, and #9 is about the smallest that can be obtained and still be called "shot".

Several kinds of glues are required. A good marine epoxy is a must. The enormous amount epoxy required (the keel and rudder are literally filled with it) means a substantial investment must be made in epoxy. We can highly recommend West System epoxy.

While the West System epoxy can be used for typical gluing tasks, the slow-cure type recommended for the keel is thin and runs excessively. For wood-wood and wood-styrene bonds, we can recommend a typical hobby store 15- or 30-minute epoxy. Avoid 5-minute epoxies; they tend to be more brittle and prone to impact failure, especially in the wood-to-styrene joints required all over the Soling. You thought RC sail racing is a gentle hobby without impacts? Ha!

For styrene-to-styrene bonds, we recommend liquid plastic cement, such as that sold by Testors. The tube-type styrene cement will work, but it tends to be stringy and it is definitely difficult to apply in the minute amounts required for good joints. Styrene cements are really solvents that weld the plastic together. They do not bridge gaps or form strong fillets, so the thicker tube cement is only a problem.

CA glues can be used for many bonds. Typically, it is applied after parts are mated, and "wicks in" to the bonded area. The standard version of these glues is very thin, and dries very fast. Thicker versions exist that can bridge small gaps. CA bonds are very strong if the parts being glued make perfect contact over a large surface area. Be sure to have a bottle of the de-bonder handy whenever working with CA. It is very common to glue one's fingers together -- and don't try to get them apart without a de-bonder! CA glues don't last long after being opened, and are very prone to contamination. Water vapor alone will gum up a bottle in a month. They are also relatively expensive.

There are other adhesives that have proved successful, and it is worth experimenting. The non-drying silcone adhesives that come in tubes for a caulking gun are light and bond well to the styrene. Their principal benefit is that they span huge gaps -- like those you will inevitable find in the fit of your

The important thing is to have everything planned out. This will ensure that you have strength where it is needed. So be sure to read this document through before embarking on too much building.

That @#%&! Transom

The transom of the Soling frustrates many a beginning builder. There are two reasons: first, there are no hard points to locate from; second, the transom cut often comes from the factory with significant asymmetry.

The asymmetry is easily fixed. Take a long string and tape one end securely to the center of the bow, on the outside. You will be using this string quite a bit, so do it right. Glue it if you have to. Now find the side of the hull at the transom that is closest to the bow. Using the string as a measure, mark off the same point on the "long" side. We have seen this to be as much as 10mm in front of the transom cut!

The short side and the the mark are what you will align the transom to. Place the transom in postion and secure it with a few pieces of tape on the inside. The transom flanges go on the INSIDE. Then take a pencil and trace on the hull around the back of the transom. Remove the transom piece and cut the hull back to this line. Now your hull is at least symmetrical. While doing this, check to see that your hull is going to be 1 meter long. Don't let it be longer, but don't cut off too much, either. Don't forget to have the deck on when measuring overall length.

The transom should be glued with liquid plastic cement. You need to tape it firmly in place on the outside and wick some liquid plastic cement in everywhere you can. Then add a 1/16 inch styrene tube or rod up against the inside of the flange. Cement it in place and use tape to make sure it stays while everything dries.

Near the deck line, the transom seems to want to try to bring the hull in too far. Don't glue too high, just let the top half-inch or so be unattached. When it comes time to put the deck on, we will want to fill the gaps that happen in this area, but for now, don't touch the hull for 24 hours.

5. Keel and Rudder

The keel and rudder of the Soling are similar in construction. Each is made from two sides of styrene with a post of some kind trapped inside and sticking out the top. Both should be filled with epoxy.

The keel halves should be prepared by first roughening the entire inner surfaces with coarse sandpaper. Then the two halves should be *flat-sanded.*

Flat Sanding

Flat sanding ensures that the two halves will meet throughout their intended region of contact. As received from Victor, the halves are usually pretty close to final shape. To bring them to final shape, tape an entire sheet of 320 or 400 grit wet/dry (the black kind) sandpaper to a flat surface. The tape should cover the edges of the paper. Then make little masking tape "handles" and attach them to the outside of the keel half. Using the handles, push the keel half around on the paper until all edges have been trued. It is best to concentrate on one side at a time, but putting pressure on it as you move the part; the fine grit will prevent you from sanding away too much. Do this to both halves. When flat-sanded correctly, the keel halves will meet at the seam without any gaps.

Keel Assembly

Using the Victor plan, draw a pencil line on the inside of both keel halves where the post leading edge should lie. Then place the post in place with the correct amount appearing beyond the part, and trace the bottom and back edges onto the keel half. Draw another line on the post itself on where it passes the top of the keel half. Put all these lines on both halves and both sides of the post. These lines will tell you where to rough up the plastic and where to put the epoxy. They also serve as a guide when clamping.

Rough up both halves in the area that the post will contact. Mix up a batch of regular epoxy and attach the keel post to the starboard half of the keel. Use blocks to distribute the clamping force over the entire area. Ensure that the outside block does not extend beyond the bottom of the post. While tightening up on the clamp, ensure that the post is still where the pencil lines say it should be.

After the starboard side has set, you can epoxy the port side to the post. The key here is to line up all of the edges of the two keel halves. To do this, after putting epoxy on the post, place the port keel half over the starboard and use masking tape to attach the two sides to each other. The tape will tend to force the mating edges to align with each other. Then put the blocks and clamp on, and set aside to cure. Don't try to glue the keel edges yet.

After the epoxy is completely cured (overnight, at least), remove the tape along the edges of the two keel halves. Starting at the top front of the keel, brush on a stroke (2 to 3 inches) of liquid cement. Wait 5 seconds, then squeeze the area just wetted together. You should see a slight ejection of melted plastic along the seam. Holding the squeeze, tape over the edge just glued to hold it. Do the same for the next section, and so on, proceeding all the way around the keel. Set the entire assembly aside to dry at least 12 hours.

At this point, you should have a hollow keel assembly that is fairly light. Don't sand, file, or do anything else to the plastic seams. You may even want to leave the tape on. The lead shot and epoxy pour can crack the seam; you don't want to weaken it.

Rudder Assembly

The rudder halves need to be rough-sanded on the inside. Mark on both halves the point at which the rudder post will emerge based on the plans. Then take the rudder post (actually a tube) itself and mark off 2 inches from each end. One of these is the bend point, and the other is the point marking the insertion depth into the rudder. With a light hammer, tap the lower section flat, tapering from full round just above the bend mark to completely flat at the bottom.

Place the post in place against one half without glue, and sandwich it between the other half. Tape the two halves together in a few places to hold pressure on the shaft. Then take liquid cement and, like the keel, do a little bit at a time, taping and clamping with closepins until the entire seam is done. Leave this assembly to dry overnight. The post can be removed after that; it doesn't get glued in until the epoxy is poured, but it is needed to get the proper shape. Again, don't clean up the edges of the rudder until after it is filled with epoxy.

Lead and Epoxy Pour

The West System of epoxy is strongly recommended. Although the expense is staggering, the quality is unsurpassed. Use slow-curing epoxy! In the West brand, use 105 resin with 206 hardener. These are not 1:1 mixes, but 1:5. West even sells nice little pumps to ensure the ratio is exact. I strongly recommend you get them as well as one of the little syringes that allow squirting epoxy into tight places, or, sucking it out. The little pumps and syringes are frills to be sure, but they really make the whole pour process

fun.

You can use other epoxies, but the heat released during the keel cure can destroy the parts. Don't underestimate this! You will ruin your keel. With the slow-cure, the keel barely gets warm. If you really want to use normal curing epoxy, you need to take steps to cool the part while curing, either outdoors in winter, or in the refrigerator.

Since the keel and the rudder are the only use of the West epoxy, it helps to do them at the same time. To prepare the parts for the pour, tape wax paper around the openings so that stray spills don't get on the parts. Then prepare a place where the parts can STAND UP while curing. The slow-cure epoxy is fairly thin. It can leak out through cracks and such. Make sure you have wax paper under the parts until cured.

Get the lead shot ready. It should be all weighed and in a suitable pouring container. Get a long shaft ready to do the tamping. This needs to be long enough to reach the bottom of the keel and thin enough to get through the top. Get a flashlight. You use it to look down and see how things are going inside. You don't really want to pick the keel up during the process.

Start by pouring a bunch of epoxy into the keel. Then pour a little bit of shot and tamp it into the epoxy. Don't tamp too hard! You will break the keel seam and epoxy will start pouring out the bottom. This is Not Fun. Try to keep the top of the pour wet; don't pour in so much shot at a time that the shot makes a dry mound inside the keel. This method will reduce the air trapping to a minimum. Keep pouring epoxy and shot until you run out of shot. It should come up to the bottom of the post. As a general rule, put more in front of the post than behind it. I don't know what ideal is, but it seems better to err with having the weight toward the front. Finally fill the keel with epoxy; right to the top. The level will go down after the trapped air rises and leaves, so you will want to fill in the trough the next day. You can use regular epoxy for the top-off job.

We should note here that some enterprising builders are not filling the rest of the keel up with solid epoxy, but are using microballoons or some other filler to make the rest of the pour much lighter. You can put more lead in if you do this, but we don't recommend playing too many games like this in your first boat. Championships have been won with boats built to the plan; don't get carried away with lowering the CG.

Now inject the epoxy into the rudder, filling it up. It doesn't get any lead. You don't HAVE to do this. You could just epoxy the post in and make an air-filled rudder by capping the top with some styrene. This will have the effect of moving the CG forward. It may also give you a rudder that floats, which is useful if your setscrew ever lets go.

Wow!

It never ceases to amaze builders how heavy and dense these keels feel the first time they are picked up after curing. You have to take extra care not to drop it. Always carry it with the bottom held deeply into the palm of one hand. It seems silly to have to say this, but dropping and breaking the keel is common enough that it is clearly necessary. It is heavy and sharp enough to go through your foot as well; consider yourself warned.

Something neat to try is to hold the keel up to a bright light, so you can see through it. You will see where the lead shot is and where it isn't. Should have tamped a bit more, eh?

Finishing

When all is cured, it is time for the sandpaper. Use water and wet/dry sandpaper, starting off coarse and