# Model Yachting

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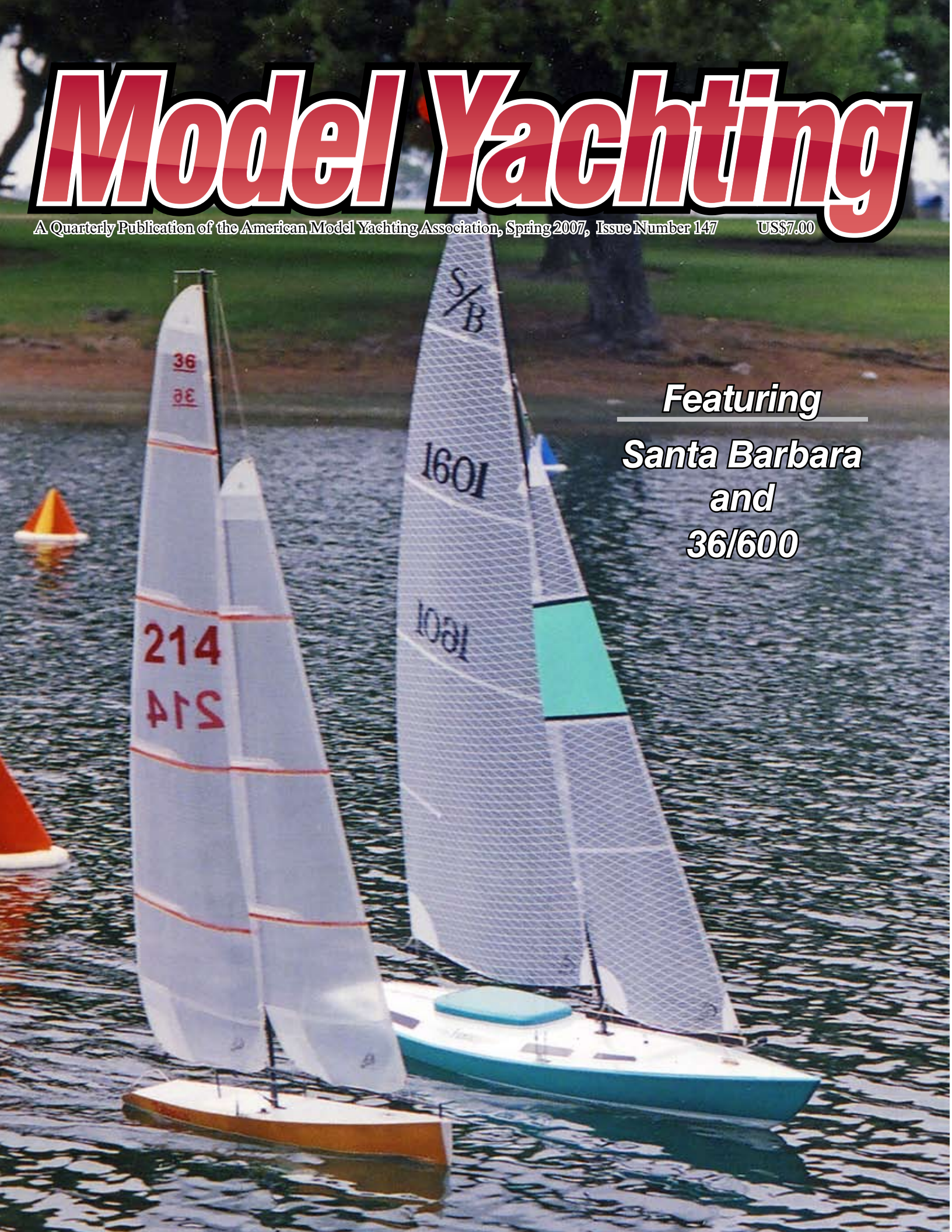


## Featuring

## Santa Barbara and 36/600

# On the Cover

Photo by Dennis Deprois. This picture was taken at the Mission Bay Model Yacht Pond in San Diego, California, during Race Week 2006, sponsored by the San Diego Argonauts. It was the first day of the National Championship Regattas for the Santa Barbara and 36/600 Classes. The picture was taken just before the first race. The 36/600, sail #214, is being sailed by Craig Macky of Bellevue, Washington. Craig sailed on to the 2006 36/600 National Championship. He is racing a Venom made by Bob Stern, who has written an article for this issue. The Santa Barbara, sail #1601, is being sailed by Ken Forbes of Escondido, California. He is sailing a new boat manufactured by Ludwig Mfg. of University City, Texas. The boat was built by Bob DeBow of San Diego.

The American Model Yachting Association (AMYA), a not-for-profit organization that is dedicated to promoting the designing, building, racing, and preservation of all model sailing yachts and is open to all people who are interested in these activities..

In pursuit of these goals, the AMYA publishes *Model Yachting Magazine*. *Model Yachting* is published four times per year in accordance with the AMYA calendar. The staff of the magazine is composed primarily of AMYA member volunteers who devote countless hours of their time to produce this publication. Editorial policy is ultimately determined by the AMYA Board of Directors; however, the views expressed in this publication do not necessarily represent the views of the Executive Board, the Board of Directors, or the majority of the AMYA membership.

Advertising in this publication is encouraged as an informative service to the AMYA members and as a means of helping defray the costs of printing. The AMYA does not take any responsibility for any advertiser's products.

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# Advertiser Index



# Contents of Issue 147



*Issue 148 Final Deadline is March 26, 2007*
*Featuring*
*The Soling One Meter Class*

# Assembling a Santa Barbara

## Part 1

*By Rich Matt*


*The Santa Barbara One Design is a legend in the world of R/C sailing. These S/Bs are heading for the weather mark in San Diego where the Argonauts have hosted regattas for the class since 1971. Photo by Bruce Lopez.*

Have you considered a Santa Barbara One Design (S/B OD)? To find out more about the boat, ask a person already owning one, and he will most likely start out by telling you, "It's a good performing boat." He will go on to compare the looks, sailing characteristics, and handling of the S/B to that of a full-size racing sailboat. Experienced sailors will also be ready to tell you that the S/B class rules provide a certain appeal to those who prefer to sail rather than argue. The hulls and keels are as alike as cupcakes. A single one-size rig having one sail plan is specified—No need for a Storm Rig, A, B, C, or even a D rig! Only user-friendly lead shot pellets are allowed as keel ballast. A couple inches shorter than six feet long, having a tall 72" sail rig, a 16 lb fin keel, and a balanced rudder means it will sail a steady coarse, be highly maneuverable at a starting line, and be big enough to be seen when rounding a mark. A sturdy, seaworthy deck is required. Both a minimum-maximum keel weight and an all-up weight requirement are specified. In 1970, the S/B OD was the very first to get Sanctioned Class status by the AMYA, and thirty-six years later, it is still around and going strong! Not too many boats can match all these advantages.

The one-design concept of the S/B has been maintained successfully ever since Tom Protheroe designed it way back in 1968. Older boats fitted with modern sails routinely demonstrate they are just as fast and competitive as newer ones. A used S/B, up for sale, will probably bring the same price as when the seller first bought it. It has proven to be large enough, heavy enough, and sturdy enough to handle strong winds and large waves. Yet, for its size, it is not all that difficult to pack up and transport. Pondside assembly or disassembly of the rig, rudder, and keel takes only a few minutes.

When Vortex Model Engineering stopped producing, the S/B the class went for over a decade without a source of new boats. Then, about ten years ago, Dwight Hartman's Hartman R/C Fibreglass came to the rescue and started making available the *Yacht 420* hulls, keels, decks, and rudders. No longer did the class need to sustain itself on the availability of used boats alone. Once again, folks having a basic workbench and kit-building skills were able to put together a new boat meeting the class specifications. Dwight Hartman has a long-standing reputation for supplying quality products. For example, more than 900 of his 42" LOA (length overall) Douglas Greg Harbor Tug kits have been produced.

Today, in addition to Hartman R/C Fibreglass, there are two more S/B Class-approved manufacturers: Ludwig Mfg. Co. and Midlife Boats. If you are ready for a S/B Class boat of your own, you now have options. With three S/B OD class-approved manufacturers to pick from, you can find a boat in do-it-yourself kit form or pre-assembled to any degree of completion. Whether a short kit having the molded parts alone or a boat completely assembled, it is like ordering a pizza. Decide on your extra toppings and baking style when you place your order. Also, as when ordering a pizza, you might need to wait in line for your order and wait for your order to bake—our S/B Class suppliers do not necessarily have their products in inventory and ready for immediate delivery.

Supplier Option 1: From Hartman R/C Fibreglass, Box 86, 233 Melrose St., Argenta, IL 62501; or phone: 7:00 to 9:00 a.m. or p.m. CST, 217-795-2275. Order *Yacht 420* hull—$154.00, keel—$95.00, keel installation pack—$5.00, rudder—$15.00, Soling-50-style deck with hatch covers—$104.00, full-size plans—$10.00, and a double-wall cardboard shipping box—$10.00. It adds up to about $400.00. The epoxy-resin fiberglass parts require some trimming, some filling, and painting. Dwight Hartman offers only the essential fiberglass parts. He does not offer wooden parts, lead-shot keel ballast, spars, hardware, or sails. The kit builder has other sources and choices for those items. The Hartman S/B Short Kit in the hands of a kit builder having average skills will result in a nice boat, which has been proven to win races and will hold its value.

*This S/B OD was assembled using the Short Kit parts available from Hartman R/C Fibreglass. Photo by Rich Matt*

*Dwight Hartman in his workshop. The mold alongside is for an EC12. He is a Class-Approved Manufacturer of the S/B OD, EC12, and Soling 50. Photo by Rich Matt*

Supplier Option 2: Ludwig Manufacturing Co., 429 E. Wright Blvd., Universal City, TX 78148. Phone: 210-724-3827. Website: <www.LudwigRCYachts.com>. E-mail: <Larry@LudwigRCYachts.com>. Larry Ludwig offers the *Santana 70*, a class-approved hull, ocean-racer style deck, rudder, and ballasted keel, all in white gelcoat for $415.00. Larry is available to install the necessary interior parts and assemble the short kit. Rather than use wood for below-deck support parts, if he is doing the assembly, he prefers the use of Divinycell foam-core glass sandwich. For him to install the deck reinforcing parts, install the keel supports, install the rudderpost, and install the deck, it will cost about an additional $200.00. He is available to also assemble, equip, and rig the boat, ready for the water—whatever degree of completion a buyer might want. Hardware available from Ludwig Mfg. Co. includes an airfoil shaped, clear-anodized, T-6 6061 aluminum 72" mast plus 24" main boom for $27.00. Other new hardware items include: a mast crane, mast deck step, gooseneck, boom vang swivel, clew slide, and spreaders, all of which are made from carbon, stainless steel, plastic, or nickel-plated brass, which is rust-free and useable in salt water.

*A S/B OD like this one is available from Ludwig Mfg. as a Short Kit or pre-assembled to any degree of completion. Photo by Ernie Mortensen.*

*Larry is holding together a fresh-from-the-mold, Ocean Racer-style deck, along with a fresh-from-the-mold S/B hull. Photo by Rich Matt.*

Supplier Option 3: No short kit, but a gelcoated, assembled hull, deck, rudder, and ballasted keel that meets the class rules; the *Ventura 70,* is available from Midlife Boats, 5264 N. Ventura Ave., Ventura, CA 93001. Website: <www.pondboats.com>. E-mail: <Michael@pondboats.com> to contact Michael Kelley, or <roninventura@gmail.com> to contact Ron Thornhill. Phone: 805-658-1108. This fully assembled and ballasted boat, ready for you to install your radio, winch, deck hardware, and sail, is available for $800.00. Or, you can opt for them to provide the boat fully rigged and ready for the water.

*Ron Thornhill (top photo) and Mike Kelley (bottom photo) are proprietors of Midlife Boats. Their S/B class approved boat comes from the shop with the deck attached to the hull. Top photo by Mike Kelley. Bottom photo by Ron Thornhill.*

Option 4: Visit <www.modelyacht.org/ahab> and check out Honest Ahab's Classified For-Sail Ads. Mark Cooper does a great job of managing the classified ads for Ahab's web page. Another source of used boats is the new Santa Barbara Class Internet forum: <www.groups.yahoo.com/group/San-


*A S/B like this one is available from Midlife Boats, completely assembled and ready for the water. Photo by Mike Kelley.*

taBarbaraOD>. Occasionally, a Santa Barbara is listed for sale on Ebay. Notice how a twenty- or thirty-year-old S/B holds its value! If needed, a new suit of sails and some rigging maintenance are all it might take to revive an older boat to race-winning condition.

Also to be considered in addition to the hull, keel, rudder, and deck are those things that are essential to every R/C sailboat: sails, a device for trimming the sails, spars, rigging, and hardware. At least a two-channel radio will be needed for operating sheets and rudder. The class does not limit the number of channels and servo functions. Many S/Bs are also equipped with jib trim, adjustable backstay, and jib flipper.

Since the S/B is a big boat having a big sail rig and is often sailed in strong winds, the Sail Control Unit (SCU) needs to have some muscle. The most popular S/B SCU is of the swinging-arm variety. This type of sail control can be mounted to one side of the keel-bolt wing nuts and works a single, long arm, or it can be mounted on the centerline between the keel-bolt wing nuts if having a two-sided arm. A good one to consider is the W-12 SCU from Ozmun Design, 3608 Fox Road, Huron, OH 44839. Phone: 419-433-3025. The W-12 sells for $160.00 plus $7.00 shipping and handling (s&h). Ray Ozmun now makes available another version of the winch, the W-12BB. It features stainless steel ball bearings, output shaft, and other parts. The basic W-12 is a stump puller to begin with, but with these modifications, it results in an additional 100 lb-inch of torque. The W-12BB sells for $250.00 plus $7.00 s&h. For a long time, Ozmun Design has provided the popular Goldspar airfoil-shaped aluminum masts and booms. The 72" mast costs $25.00 plus $7.00 for the mailing tube. For $9.00 additional, you can get a 24" main boom made of the same aluminum mast material. Since the boom can be readily inserted in the shipping tube along with the mast, there is no additional shipping and handling expense.

If you would rather install a drum-style winch, consider the RMG SmartWinch. It is high speed, high torque, and "intelligent." RMG, <www.users.bigpond.com/rmgsw> has a display ad here in *Model Yachting*. Some of the S/Bs in California are using the RobotZone SPG815 servo with the 4:1 ratio as a swinging arm SCU; for more info: <www.servocity.com/html/spg815_power_servo.html>.

You will need a suit of sails made according to the class rules. Black Sails, Carr Sails, and Bob's Boat Yard have been in the business of making S/B sails for over three decades. Walrus Sails and Vision Sails should also be considered. All five sail makers have display ads in this issue of *Model Yachting*. A virtue of the S/B OD Class is that one sail rig is all that is allowed and needed. In all winds, the boat moves well, stays in balance, and doesn't submarine under this well-designed, original sail plan.

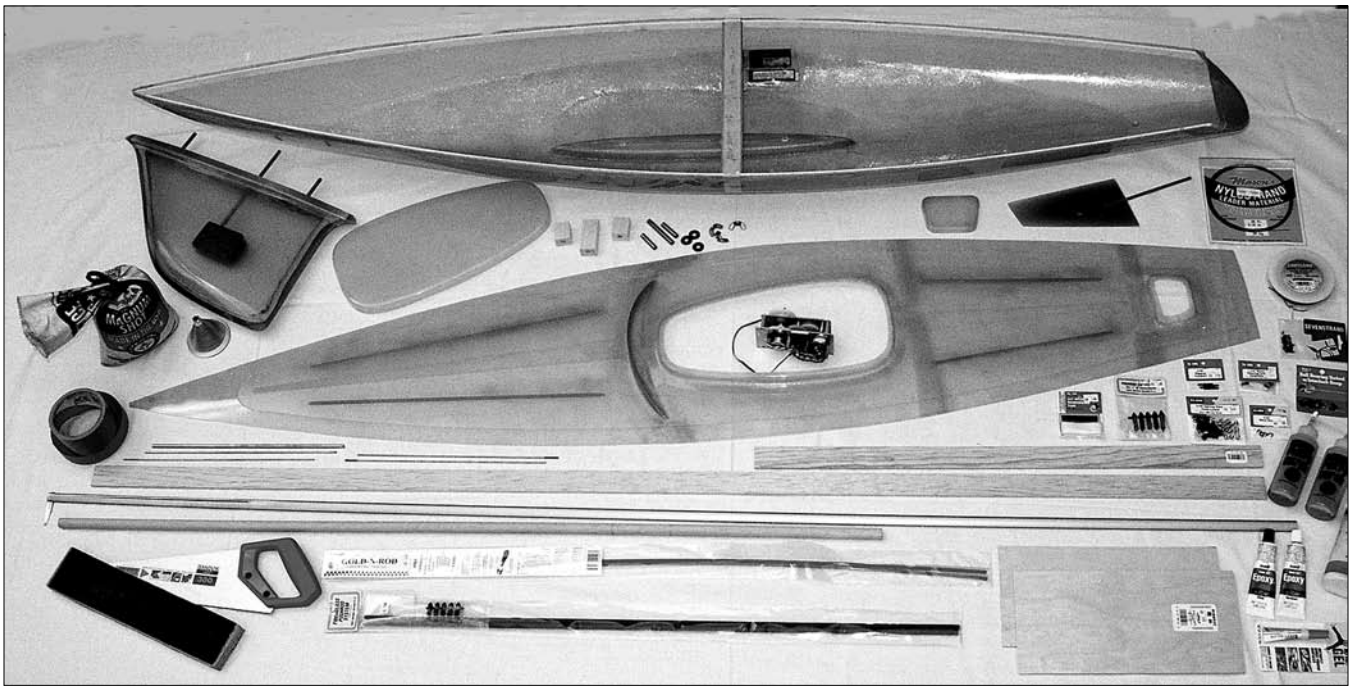
As mentioned above, an aluminum, foil-shaped mast in the S/B Class-required 72" length is available from either Ludwig Mfg. Co. or Ozmun Design. Another version of aluminum mast and a full-line of hardware are available from Great Basin Model Yachting: <www.gbmy.com>. If you prefer a carbon-fiber mast, contact Bob's Boatyard, <www.myrc.org/bobsterne>. Booms can be aluminum, carbon fiber, fiberglass arrow-shaft, or wood.

A choice of hardware fittings is now available. Every boat needs a gooseneck, vang fittings, cleats, tangs, turnbuckles, chainplates, screws, screw eyes, bowsies, spreaders, rigging wire, jumper-stay fitting, and masthead fitting. Going to the Internet, or getting the neighbor's computer-savvy kid to go to the Internet for you, is important when researching what model sailboat hardware is available. Start with Ludwig Mfg. Co. <www.LudwigRCYachts.com> and other *Model Yachting* advertisers: GRP Model Yachts <www.modelyachting.com>, Great Basin Model Yachting (GBMY) <www.gbmy.com>, and Roger Cousineau <www.modelyachtfittings.com>.

Also, while researching hardware on the Internet, be sure to go to AMYA Website, <www.ModelYacht.org>, bring up the Class Rules page, and print out the S/B Class Measurement Specifications. Every class of boat has measurement rules, which are intended to define the physical parameters and insure the boats are equally competitive with each other. For the Santa Barbara, the class rules are easy enough to deal with. In brief, all you need do is: 1) buy the hull and keel from a class-approved manufacturer; 2) have a suit of sails that meet the measurement rule; 3) use cold lead shot and not poured molten lead as ballast and keep the keel between 13.5 and 16.5 pounds; 4) use the same rudder as does everyone else; 5) install a seaworthy, hard material as decking; and 6) pay heed to a few measurement specifications: 1.62" maximum deck crown, 72" maximum mast height, 53.5" maximum jib stay attachment height, a beam tolerance of 12.5" to 13.0" at 37" aft of the bow, and a full-boat weight of 23 to 28 pounds.

When assembling a short kit, it will be necessary to get a variety of items from a hardware store or home-improvement big box. The wooden parts are made from an 8' length of 1/4" x 1-3/8" pine lattice molding. Sheer strips for providing support and a gluing surface for the joint where hull meets deck can be made from a 6' length of 1/4" by 1-3/8" pine lattice molding that has been rip-cut lengthwise. A 3' length of 5/8" diameter birch dowel, cut in half, installed under the deck to either side of the hatch opening makes for handy boat carrying handles. When it comes time to epoxy the deck to the hull, you will want a roll of duct tape and a roll of blue masking tape. Coarse, medium, and fine grit sandpaper will be needed. A dozen "acid brushes" are essential for applying epoxy glue. A pint of acetone will help clean off mold release wax from gluing surfaces and clean epoxy from the acid brushes.

Putting together a short kit means you also need to plan a trip to the hob-



by shop. You will need an aircraft nylon steering arm for use on the rudder shaft, a package of nylon reinforcing tape for reinforcing wood-to-fiberglass glue joints, a fiberglass arrow shaft and clevis fittings to use as a rudder pushrod, both quick-set (5 or 15-minute) and slow-set (at least one-hour) epoxy glue (in that quick-set epoxies are not proven to be waterproof, a coating of slow-set epoxy, to be used later in the building process, is recommended to cover this vulnerability), a container of micro-balloon filler to thicken epoxy glue, a 6" x 12" sheet of 1/8" birch plywood to use as radio and SCU mounting boards, a jar of model maker's surfacing putty, and a small bottle of thin CA glue for making lashings and knots permanent.

The Ludwig Short Kit comes with a ballasted keel. But, if you are planning to get the Hartman R/C Fibreglass Short Kit, you will need to visit a firearms dealer for a bag of #8 lead shot to use as keel ballast. A half-pint can of polyester resin from the hobby shop will be needed in order to solidify the shot in the keel. For obvious reasons, a small funnel is essential to the keel ballasting procedure! If it happens that your local firearms dealer won't sell you lead shot without you having a gun-owner registration permit, take this magazine over to the police department, show somebody this article, and ask them nicely to phone an Okay to the firearms dealer.

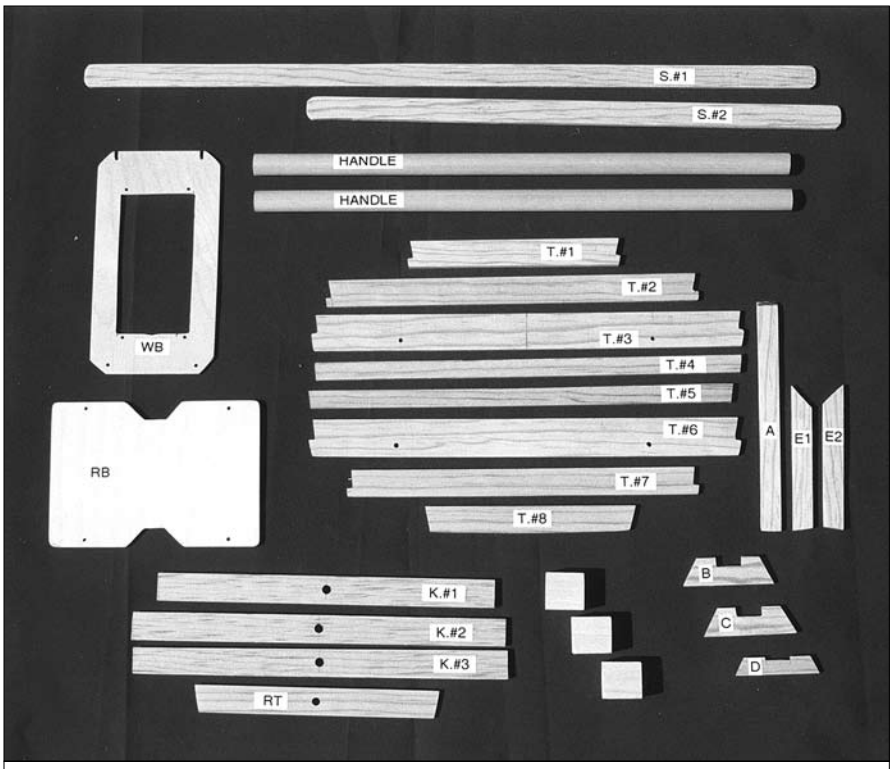
You are not done chasing around just yet! Head on over to the fishing tackle store and pick up a spool of 45 lb-test Dacron line to use as sheets and for lashing the carrying handles to the deck thwarts. While there, pick out a package of larger-size, ball bearing swivel clips to use as jib tack and backstay fittings.

Opting to put together a fiberglass-parts-only Short Kit from either Hartman or Ludwig means that you will need to provide the necessary wooden parts for supporting the removable rudder, removable keel, and permanent deck. Once you have gathered the pine lattice molding, birch dowel, and birch plywood, it will be necessary to rough-cut the wood along its length, as well as cutting it to length. A table-saw is best; a motorized scroll saw will do nicely, or a fine-tooth hand saw would even work when doing the along-the-length "rip" cuts. Final fitting and tapering of each part is best done with a hobby razor saw and a sanding block. Yes, it is possible and permitted to use a high-tech, exotic, space-ship proven, oven baked, super-composite, sandwiched material instead of primitive wood. However, remind yourself of the class weight requirement and just go-ahead using the easy-to-work-with, cheap, and convenient wood. A list of the rough-cut measurements is shown on page 13. About 1/4" to 1/2" extra length has been added so as to accommodate final fitting and tapering.

This article is intended as an instruction manual that applies specifically to the Hartman Short Kit. There are some differences with the Ludwig Short Kit. The Hartman keel-top flange and hull-keel socket are flat-sided, and the keel-top flange mounts three keel bolts. The Ludwig keel top and hull-keel socket are rounded, and there are two keel bolts. There will be some differences in keel mounting and keel fitting procedures, but these differences should be apparent to the builder and accommodated accordingly. The fore and aft location of the hatch opening is different, and this will affect the placement of the deck thwarts. Also, the Hartman hull comes from a two-piece mold and has a seam that will require a little bit of fairing. The Ludwig hull comes from a one-piece mold and is therefore seamless.

The Hartman hull will come with a length of wood temporarily taped in place at the point of maximum measured beam. Leaving it there while the wooden parts are being installed will insure that the maximum-minimum beam measurement of 12-1/2" to 13" is maintained and that all wooden parts will be fitted so as not distort the natural sheer or shape of the hull. After installing the sheer strips to the top edge of the hull, it may be necessary to adjust the length of this beam gauge in order to meet the specified range of beam measurement. The beam gauge should be taped in place while all below-deck and deck support parts are glued in place.

Before beginning the assembly of your S/B or any other polyester or epoxy resin hull like it, such as an EC12, AC, M, Soling 50, Wheeler, etc.; you will




Wooden Parts for a Hartman S/B Short Kit

| | | | | | | |
|---|---|---|---|---|---|---|
| T3 | 1/4” | x | 1” | x | 12-1/4” | Deck Thwart |
| T6 | 1/4” | x | 1” | x | 12-1/4” | Deck Thwart |
| | | | | | | |
| K1* | 1/4” | x | 3/4” | x | 9-1/2” | Keel Thwart |
| K2* | 1/4” | x | 3/4” | x | 10-1/2” | Keel Thwart |
| K3* | 1/4” | x | 3/4” | x | 10-1/2” | Keel Thwart |
| RT | 1/4” | x | 3/4” | x | 7-1/2” | Rudder Thwart |
| T1 | 1/4” | x | 3/4” | x | 6-1/4” | Deck Thwart |
| T2 | 1/4” | x | 3/4” | x | 10-3/4” | Deck Thwart |
| T7 | 1/4” | x | 3/4” | x | 10” | Deck Thwart |
| T8 | 1/4” | x | 3/4” | x | 8” | Deck Thwart |
| A | 1/4” | x | 3/4” | x | 6-3/4” | Mast Support |
| B | 1/4” | x | 3/4” | x | 2-1/2” | Stringer Shim |
| C | 1/4” | x | 3/4” | x | 2-1/2” | Stringer Shim |
| S1 | 1/4” | x | 3/4” | x | 21” | Fwd. Stringer |
| S2 | 1/4” | x | 3/4” | x | 15-1/2” | Aft Stringer |
| T4 | 1/4” | x | 1/2” | x | 12-1/4” | Deck Thwart |
| T5 | 1/4” | x | 1/2” | x | 12-1/4” | Deck Thwart |
| D | 1/4” | x | 1/2” | x | 2-1/2” | Stringer Shim |
| E1 | 1/4” | x | 1/2” | x | 4” | Chainplate Back-up |
| E2 | 1/4” | x | 1/2” | x | 4” | Chainplate Back-up |

(2) Sheer strips: 1/4” x 5/8” x 70”
(2) Handles: 15” Birch dowels
Radio Board*: 1/8” x 4-1/8” x 6” plywood
SCU Board*: 1/8” x 3-1/2” x 6-1/2” plywood

* These measurements are intended for a Hartman Short Kit. Because the keel bolt locations are different in the Ludwig Short Kit, wooden parts K1 and K2 will be different, and K3 will not be needed. The different keel bolt locations will also affect the measurements of the plywood radio and SCU boards.

need to know about the adhesives you will be using. Most builders have been using the epoxy glues readily available from the local hobby shop or Internet hobby suppliers. There are about five or six different brands of epoxy glue to pick from. All of them involve mixing an equal amount of “Part A” with an equal amount of “Part B.” All brands come both as your choice of “quick-setting,” meaning that it hardens in five to ten minutes, or “slow-setting,” meaning that it hardens in about thirty minutes or longer, preferably at least an hour. Quick-setting epoxy is handy for positioning wooden parts in place, but it is not entirely waterproof unless it is given a second coat of slow-setting epoxy. Only slow-setting epoxy must be used when attaching the sheer strips to the hull and when attaching the deck to the sheer strips—you will need some working time when doing these two assembly steps. Many experienced model boat builders would rather use the epoxy adhesive products that are used by the full-scale boat builders. *Model Yachting* Technical Editor, Dick Lemke, has provided for this issue a separate article about these epoxy adhesives. Please refer to it when deciding which adhesive you will be using.

Many epoxy resin systems used to make fiberglass hulls involve polyamine-based hardeners. When the epoxy cures, a waxy substance, called amine blush, floats to the surface. This material will interfere with the bonding of any coating applied to the epoxy or of an additional application of epoxy. It will appear on both the outside and inside of the hull. But, it can be relatively easily removed by washing the surface with water using an abrasive such as a Scotch-Brite pad. (Do not use a solvent.) Wet sanding will do the job. When washing or wet sanding is complete, immediately dry the surface with paper towels, which will absorb the blush solution. If applying another layer of epoxy (either as a coating or in gluing), further abrade the just-cleaned surface with 80-grit sandpaper to provide “tooth” to aid in bonding by increasing the surface area and making it more irregular, thus making the bond more secure. If the waxy substance is really some left-over mold release wax, use acetone to remove it. Another routine with epoxy glue is to mix one part of “A” with one part of “B” and add

the equivalent of one or two parts micro-balloon filler to the glue. It will do wonders to keep the glue from running or failing to fill any gaps. After a first application of glue hardens, but does not cure completely, apply a 2" length of 3/4" nylon reinforcement tape at each end of the thwart and up the side of the hull. This nylon tape, half on the thwart and half up the hull, when impregnated in a second coat of epoxy, will help strengthen the joint.

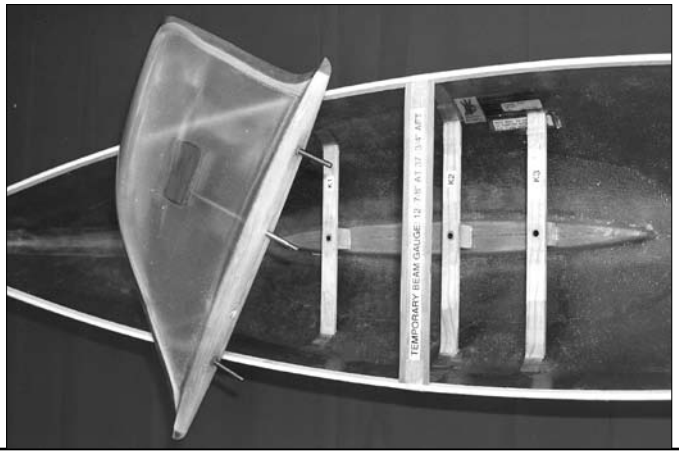
### **Step One:** Installing the Sheer Strips

Cut and shape a piece of the 1/4" x 1-3/8" lattice molding into a triangle that fits into the bow. Glue it in place using quick-set epoxy mixed with micro-balloons so that the top of the wood is flush with the top edge of the hull. Cut the two sheer strips to proper length so they fit from this block in the bow all the way aft to the transom. These sheer strips will serve to strengthen and serve as a gluing surface for the deck-to-hull joint. Clamps, lots of them (about one-dozen per side), will be needed to hold the sheer strips in place while glue sets up and hardens. C-clamps are good, but expensive. What works well are "paper clamps," available from the office supply store. The paper clamps to get are shiny black in color, have two "U" shaped squeeze-handles, measure 1-1/4" wide, and open to a "bite" of 1/2 inch. Run a perimeter of masking tape all around the outside top edge of the hull so as to catch any glue run-off. Before mixing up the glue, do a "dry run" with the clamps so as to be certain you have enough clamping power to hold the sheer strips tight to the hull. Mix up micro-balloons with slow-setting epoxy glue, not the quick-set stuff—you will need time to do this job. Using an acid brush, apply the glue mixture to both one side of the sheer strip and to the inside top one-inch of the hull. Line up the top edge of the sheer strips with the top edge of the hull as you put on the clamps. Use the acid brush to tidy up the glue underneath the sheer strips. Let harden overnight. Next day, remove the clamps and use an 80-grit sanding block to bring the top of the sheer strip flush with the line scribed in the hull, put there to indicate height of the deck.

### **Step Two:** Fitting Keel Flange to Hull Socket

The next step is to install supports for the removable keel. Drilling the holes in the hull for the keel bolts requires some careful pre-drill measuring. Along with using a ruler, make a paper template that matches the top of the keel and fits down over the keel bolts. When this template is then placed into the hull's keel socket, it should give you an accurate indication of where to drill. Begin with holes that are about half the diameter of the keel bolts. Compare and measure the keel bolt positions repeatedly as you enlarge the holes while using a round and tapered rat-tail file. Once the holes in the hull-keel socket are large enough to allow the keel to be inserted, it will be obvious that the keel-top flange and the keel will need some final fitting. Use a sanding block with 120-grit paper to shave down the sides of the keel-top flange. Use 120-grit paper wrapped around a putty knife blade to work inside the hull socket. Slipping a corner of a piece of paper in, around, and about the gap between keel flange and hull socket will readily indicate where more sanding is needed. At places where the paper gauge won't pass, and instead gets stuck, are where you make a pencil mark and need to do more sanding.

Both keel top and hull socket have a seam running fore and aft where the two molded halves have been joined. Hartman does do a careful job of trying to minimize this seam, but it does exist, and it does need to be smoothed flat. A filler such as NHP's Micro-Fill, available from the hobby shop, works well and is easy to sand. Then too, lots of micro-balloons mixed with a little bit of the polyester resin, used for solidifying lead shot in the keel, can also be used as filler, but it is harder to sand down. Plan on sanding with 120-grit on a sanding block. A final sanding with 220-grit will remove enough surface material to allow for the thickness of paint to be applied later.




### **Step Three:** Installing Keel Support Blocks and Thwarts

Available with the Hartman Short Kit are three wooden blocks that are to be glued in place above the holes in the keel socket. Each block is predrilled with a hole into which a length of brass tubing is to be glued. When at the pond and the boat is being rigged for launch, the keel bolts protruding from the top of the keel are to be inserted into these brass-lined support blocks. A rubber washer, then a metal washer, and then a wing nut on each keel bolt secures the keel to the boat. When finished sailing for the day, the wing nuts are undone and the keel can be removed.

Preparing the keel-bolt support blocks, thwarts, and tubing assemblies is easy. If need be, use the round file to make the holes in the blocks and thwarts large enough to allow the tubing to be inserted readily. You will want the tubing to extend from the top of the block by the 1/4" thickness of the thwart. The tubing should extend about 1/16" from the bottom of the block so it extends down into the hole in the hull-keel socket. Scuff up the outside of the brass tubing with coarse sandpaper so as to provide "tooth" for the glue that will secure it in the wooden block. Use a cotton swab from the medicine cabinet to spread epoxy glue inside the block and on the tubing. Put a hole in the center of each keel thwart (K1, K2, and K3 on the list of wooden parts) just large enough so that the thwart can fit down outside the tubing and flush against the top of the block. Cut and trim the keel thwarts to size by using a 6" pocket ruler to measure from the keel bolt over to where the thwart will meet the hull. Plan to cut the ends of each keel thwart at about a 45-degree angle so that it meets neatly the upward curve of the hull. Trim these ends to perfection with a sanding block. Thwarts that

turn out a little short are okay. Epoxy glue will later fill in any gaps.

Make a final inspection to see that the keel top, keel socket, brass tubing, keel blocks, and keel thwarts all fit as they should. On the top of the keel, use pieces of office-type transparent tape to mask off around each keel bolt. Use a cotton swab to apply a little paste wax or grease to the taped areas, the keel bolts, and the inside of the brass tubing. When we epoxy the blocks and thwarts in place, we do not want the keel itself to get stuck to the hull by glue that's in the wrong places. The tape, the wax, and then removing the keel before the epoxy sets completely hard will prevent the problem.

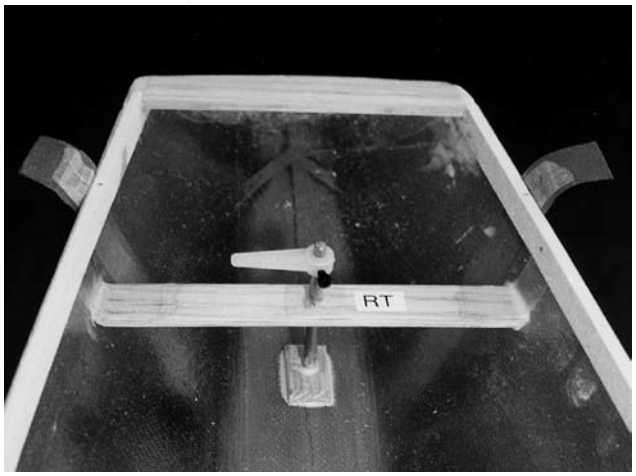
Concern about accidentally gluing the keel shell permanently in place can be minimized. Glue the thwart-blocks in place one at a time. Hold the keel in place by having the two other thwart-blocks held in place by their wing nuts. Use quick-set epoxy as the glue. Install a thwart and block; wait until the glue appears to be hard; remove the three wing nuts; tap gently straight down on the top of the bolt with a hammer *handle* and jiggle the keel free. Repeat the procedure, one at a time, for the other block-thwart assemblies. You are asking for grief by attempting to epoxy all three thwart blocks in place at the same time.

At this point, it would be good to refer to Step 7 of this article, Radio and SCU Installation, and drill the holes in the keel-block thwarts needed for the mounting board screws. Once the deck thwarts and carry handles are in place, it will be difficult getting in there with a drill.

### **Step Four:** Installing Transom Thwart and Rudder

T8, the piece of wood needed to fortify the transom, is next to be fitted and glued. After some careful cutting and shaping to fit T8 against the sheer strips and transom, glue it in place. After the glue has hardened use an 80-grit sanding block to shape the top of the wood to meet the 1/8" crown indicated by the scribed line on the fiberglass transom.

The technique for installing the rudderpost is much the same as that used to install the keel blocks and keel thwarts. Drill a 1/8" hole in the hull where Hartman has made an indentation indicating the rudder location. Use a round file to enlarge the hole so that the rudder shaft fits into it. Using a file to enlarge the hole, rather than a large drill bit, minimizes the risk of chipping the fiberglass. Make a little piece of wood with a hole in it that is large enough for the brass tubing rudderpost to pass through. This will provide a sturdy and leak-proof base to the post. Wax or grease the rudder shaft and the inside of the rudderpost. Make a pencil mark 64" aft the bow on each side of the hull just outside the sheer strips. Insert the rudder into the hull, and use a tape measure from the pencil marks to the tip of the rudder to find the perfect vertical position. Also as a double check, install the keel and eyeball the rudder alignment from the stern. To hold the rudder in position, use a length of tape from one pencil mark on the hull over the bottom tip of the rudder and then over to the other pencil mark on the other side of the hull. Folded-over business cards wedged fore and aft of the rudder shaft will ensure the fore and aft centering of the rudder. Drill a hole in the center of the rudder thwart (wooden part RT) to accommodate the rudderpost. Measure, cut, and sand a hull-conforming taper to the ends of the thwart. You will want the thwart to be level, perpendicular to the hull centerline, and rest about 1/2" down on the 2-1/2" rudderpost. If it happens that one side of the rudder thwart turns out to be a tad longer than the other, don't worry about it. As long as the rudder itself looks and measures, outside the hull, as being straight, that's what is most important.



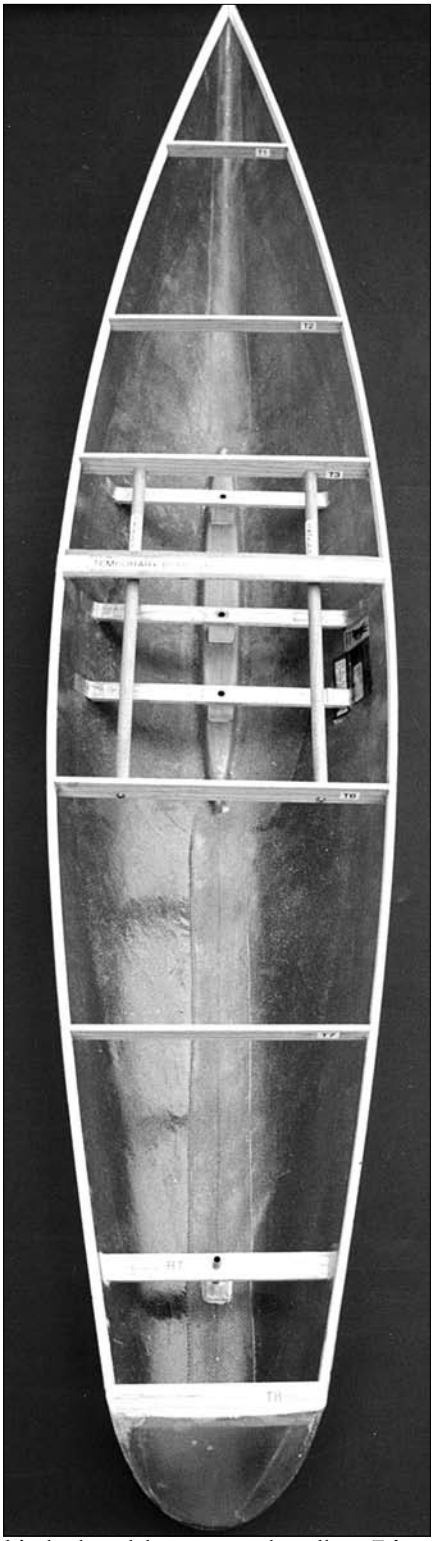

When all looks right, glue the base, post, and thwart in place. Don't forget to clean and sandpaper the surfaces to prepare for gluing. Don't forget to add micro-balloons to the epoxy. Use nylon reinforcing tape when applying the second layer of glue. When the glue has dried, this will be a good time to install a screw eye on top of the rudder thwart and about 1/2" to port of the rudderpost. This screw eye will later be used to secure the small rubber band that holds the rudder hatch in place. It's no easy trick to install this screw eye once the deck is installed!

After the epoxy has had a day to cure hard, remove the keel and rudder. Use medium sandpaper wrapped around a pencil point to taper and smooth the four sharp-edged hole openings. A light touch with a countersink or pointy-shaped grinding-stone bit will work even better.

### **Step Five:** Fitting and Gluing the Deck Thwarts

An effective way to mark the sheer strips, so that the deck thwarts turn out to be square to the centerline of the boat, is to hang the hooked end of a steel tape measure on the tip of the bow; then bring the tape measure back on an angle to a point 12" aft on one of the sheer strips and make a pencil mark. Next, swing the tape measure over to the other sheer strip and make a mark at 12 inches. These matching marks indicate where the first deck support thwart, T1, is to be installed. Repeat the procedure at 24" for T2, 32" for T3 and its doubler T4, 47" for T5 and its doubler T6, and at 56" for T7.

It is very important that the Maximum Beam Gauge remain taped in place while working on this next step. Carefully cut and trim T3 to the length necessary for it to span the hull at 32" aft of the bow so that it will not cause any affect to the beam. Cut both ends of this 1" high thwart so as to provide a notch that meets the fiberglass hull and, in effect, hooks under the sheer strip. A razor-saw and sanding block are ideal tools for this job. Hold off doing any gluing. Once T3 is fitted and ready, then prepare T6 the same way. These two thwarts will provide the end attachments for the two, 5/8" diameter, 15" long,



birch dowel boat-carry handles. (It's a real joy to be able to launch and retrieve the boat using only one hand—a hand that stays dry.) Thwarts T3, T6, and the dowels are best assembled with screws while on the workbench and then later installed in place as a unit. Into the end and center of each dowel, drill a hole to accommodate a 1-1/2" #4 self-tapping screw. Select the drill bit carefully. You want the screw thread to bite the wood, but you do not want to make a hole that is too small and then have the screw cause the dowel to split.

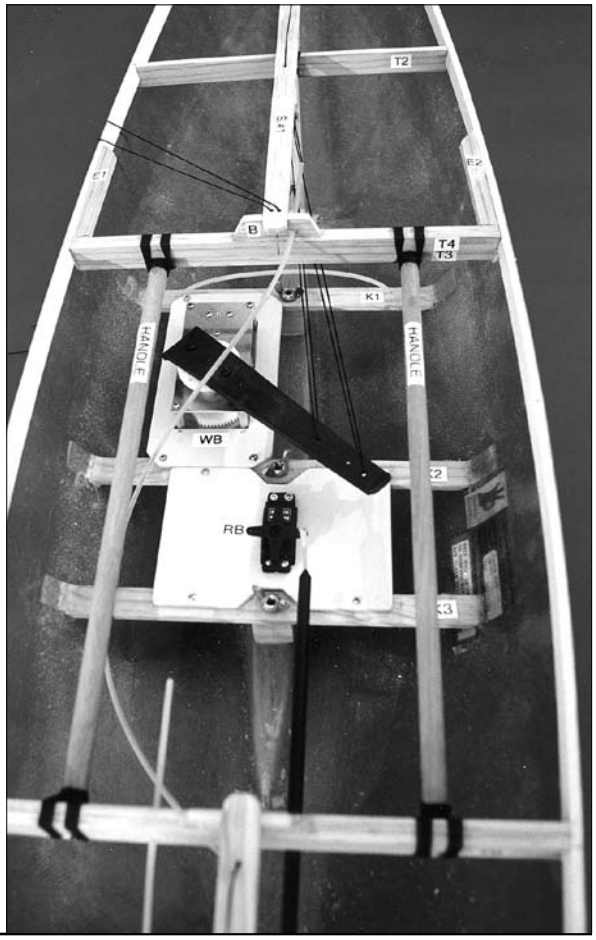
To mark T3 and T6 where holes for the handle screws belong, mark the center of each thwart, and then measure and mark 3-1/4" out from each side of the center, thereby locating the handles 6-1/2" apart from each other. Mark the screw-hole locations to be 5/16" above the bottom edge of the thwart. This 5/16" is the radius of the dowel and will result in the bottom edge of the dowel being flush with the bottom edge of the thwart. These holes should be slightly larger than the threads of the screws to allow the dowels to be drawn tight to the thwarts when the time comes. Screw this four-part assembly together without gluing, and then check its fit in the hull. Look to see that T3 and T6 meet their fore and aft location marks on the sheer strips, and that it does not distort the hull and cause any disagreement with the maximum beam gauge. In case there is some distortion or inadvertent twist in the assembly, ease the screws about one turn. Use tape to squeeze the hull and hold the assembly in place while you cut and fit T4 and T5. T4 will be glued to the aft side of T3 so it rests on top the dowels. T5 will be glued to the forward side of T6 so it, too, rests on top the dowels. Using slow-set epoxy, glue everything together and in place.

Even though the handles are glued and screwed together, have doubler thwarts and ledges, plan to apply a second layer of epoxy. This second layer should make use of nylon reinforcement tape over the top, the end of each thwart, and then down the side of the hull. The second layer of epoxy on the dowel-to-thwart joints needs some reinforcement. Cut four, 5' lengths of 45 lb fishing (sheet) line to use as a wrap. Developing a wrapping pattern is easy. First make a 360-degree wrap around the dowel; then bring both ends up from under the thwart, over the top of the thwart, back down under the handle, and then make another complete wrap around the handle. Repeat the procedure six times on each of the four joints. Don't overlap the wraps on top of each other. Dress them tightly side-by-side. Smother the wraps with CA and then with epoxy glue to fuse everything together. It will probably require the use of a hatchet if ever it comes time to take these joints apart!

Final beam measurement at individual deck thwarts: T1 at 12 inches aft the bow is about 6-3/8 inches, T2 at 24 inches aft is about 10-5/8 inches, T3 doubled to T4 at 32 inches aft is about 12-3/8 inches, T5 doubled to T6 at 47 inches aft is about 12-1/8 inches, and T7 at 56 inches aft is about 10 inches.

**Step Six:** Other Below-Deck Wooden Parts

Wooden parts labeled S1 and S2 are stringers that run fore and aft under the deck, except where there is a hatch opening and at the very bow and stern where they are really not needed. They provide a back-up for the jib tack fitting, a sturdy mast step, a back-up for the sheet exit guides and provide an appearance-pleasing crown to the deck.



No matter what style of deck you are planning for a S/B, you need a stringer that, in effect, runs in a straight line from tip of the bow to top of the transom. Flat sheet material, used as decking, does not respond happily to being curved in more than one direction. Funky things happen when a deck is both bent down to meet the sheer strips and, at the same time, bent down to match any sheer in the mid-section of the boat. In order to maintain a straight-line sheer, plan to install wooden spacers on tops of the thwarts to support the stringer at the right height. Resting the tip of S1 directly on T1 provides the 1/4" rise desired at this location. A total of 1/2" rise from top of T2 to top of S1 will be provided by installing a scrap piece of the wooden lattice molding. Wooden Part B, on top of double thwart T3-T4, needs to be trimmed to provide 5/8" total rise. Wooden Part C goes on top of double thwart T5-T6 and is also adjusted to a 5/8" rise. Wooden Part D, resting on T7, should be trimmed to provide a 1/2" rise. Use quickset epoxy to fix the risers in position. Deck stringers S1 and S2 are to be positioned and glued so that only about 1/4" of their ends protrude into the main hatch opening.

Wooden Part A is intended to be a combination vertical mast-step support and a key functional part of the swinging arm SCU sheeting system. It is angled from the hull floor just ahead of the hull-keel socket, then up and forward to rest on the aft side of T2 and also make contact with the underside of S1. Cut the base of Part A on an angle that conforms to the floor of the hull. Then cut the top end so that it meets under S1 and the aft side of T2. Before gluing it into place, drill two small holes about 2" down from the top. Both holes are centered and are about 1/4" apart, one above the other. The holes should be large enough to accommodate four or five wraps of sheeting line that will be used to lash a PeKaBe #525 double-sheave block tight to the aft side of Part A. Give this lashing and the holes it passes through a dose of CA. This will keep the block from flopping around. About 2-1/2" below the turning block, install a screw eye. Glue Part A in place using a few pieces of nylon reinforcement tape at the base and some wraps of line around T2 so as to keep it from ever breaking loose.

Wooden Parts E1 and E2 are back-up blocks that will provide a solid material for screwing down the chainplate hardware. They are glued to the sheer strips just forward of T3-T4. Since the deck is crowned over the back-up blocks, you need to avoid any gap between them and the underside of the decking. It happens, conveniently, that the built-in outward angle of the sheer strip's inboard flat side provides a ready-to-use gluing surface at the correct angle to match the deck crown. When gluing, allow the block to be up about 1/16" higher than the sheer strip. Once the glue has set, use a ruler across the hull, bending it down over the stringer as if to imitate the crown of the deck. Look to see if it might be necessary to use the sanding block to bring down any high spots on the chainplate back-up blocks.

**Step Seven:** Radio and SCU Installation

The Sail Control Unit most often used with the S/B is the swinging arm variety. The best reason to opt for the swinging arm over the drum type is that the jib boom is noticeably shorter than the main boom. The span from jib tack swivel back to the jib sheet attachment point is about 13 inches. The span from gooseneck aft to where the mainsheet is attached to the main boom is about 19 inches. With a swinging arm sail control there are holes spaced about a half-inch apart. Using the hole 4" out from the arm's pivot will provide the ideal 15" of travel for the jib sheet as the arm rotates through a range of 160 degrees. Using the hole 5-1/2" out on the arm provides 21" of ideal mainsheet travel. Using an SCU having a single arm mounted to one side of the boat, versus a double or two sided arm mounted on the centerline, allows more convenient access to the keel bolts.

The piece of 1/8" plywood used as an SCU mounting board, Wooden Part WB, needs to have a hole cut out, in order to accommodate the electronics on the underside of the SCU. Also, two holes need to be made in the aft end of the board for the screws to secure it to K2. Two slots, instead of holes, need to be made in the forward end so as to allow the board to be slipped in or out from under two screw heads permanently set in T1. Since these two forward screws will be out of easy reach of a screwdriver, the slots on the end of the board make removing and reinstalling the SCU a simple matter.

The 1/8" plywood radio board, Wooden Part RB, will be screwed at its corners to K2 and K3. The forward edge and the aft edge of this board need to be notched in order to clear the keel bolt wing nuts. Make a cutout to accommodate the rudder servo. Install the receiver and battery to either side of the rudder servo with Velcro. Use a length of fiberglass arrow shaft and nylon clevis fittings to make a rudder pushrod. Depending on the height of the servo and the height of the rudder control arm, it might be necessary to sand away a portion of T7's underside so as to keep it from rubbing against the control rod.

There are a variety of different ways of routing the sheets from the SCU to the booms. The method used here provides for the sheets to be dead-ended at the booms and be adjusted by tying off to deck mounted cleats. One end of the jib sheet gets hooked to a screw eye on the jib boom. From there, it passes through a hole in the deck (All holes in the deck will be drilled later after the deck is installed). From there it goes down to the turning block mounted on Wooden Part A and makes a 90-degree turn aft to the swinging arm. It then makes a 180-degree turn through a rounded hole in the arm and, then, forward in the direction of the turning block to the screw eye installed in Wooden Block Part A. From the screw eye, it can be led through another hole in the deck where it can then be tied to a conveniently accessible cleat near the mast.

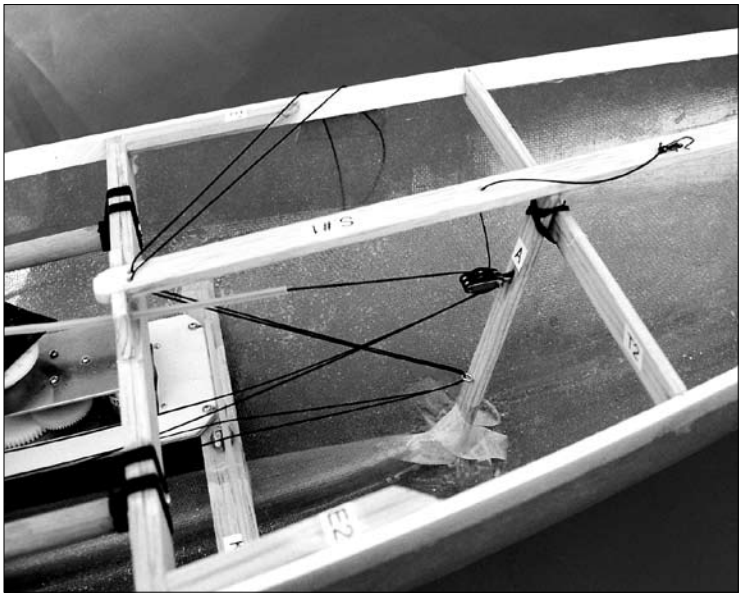
The main sheet runs from the main boom directly down through the deck and all the way forward to the turning block on Wooden Part A. After being led through the turning block, it goes back aft and through a hole in the arm. From the arm, it goes 180 degrees forward to that same screw eye it will share with the jib sheet and, then, up through a hole in the deck to its own cleat. The lead of the mainsheet might look a little convoluted, but it works. Those deck-mounted cleats make it easy to adjust sheets between races.

A length of inner-section, flexible, nylon tubing push-rod allows a sheet to run through it with very little friction—even around turns and bends. Use it as "sheet plumbing." Use CA glue to hold

nylon tubing in place where it passes through holes in the wood.

### Step Eight: Gluing On the Deck

The grand finale of all this preparation work is the installation of the deck. At this time, it is a good idea to waterproof all wood surfaces—all sides—with a coat of slow-setting epoxy glue. (The waterproof slow-setting epoxy should be able to cover up the sins of the not-so-waterproof quick-set epoxy used in various places in the assembly process.)



Leave bare of glue the top surfaces of the sheer strips and the stringers. A special sanding block should be used in order to prepare the sheer strips for installation of the deck. To a foot-long piece of wood "one-by-two," cover 6" of a wide side with coarse sandpaper. While the portion of this sanding block bare of sandpaper rides along the stringer and the portion having the sandpaper makes contact with the top of a sheer strip, go around the entire boat, sanding the top of the sheer strip. While sanding, look to see that there are no high spots on the wood that might prevent the fiberglass deck from making contact with the fiberglass hull. Pay careful attention to the areas near the bow and the transom where the deck will meet the hull. Because the deck material bends only so much, these areas need be nearly flat.

Apply a double layer of masking tape all around the hull, keeping the tape flush with the hull's top edge. Later, once the deck is glued down and ready for the deck overhang to be trimmed away, this tape will provide a visual signal that it's time to switch the sanding block from coarse to fine sandpaper.

Carefully position the deck on the hull and use a few pieces of tape to hold it in place. Drill a lead hole 12" aft of the bow where the jib-tack deck fitting is to be installed. Then use a larger drill to enlarge the hole in the deck material to clearance-hole size. Use a small screw to temporarily fasten the deck to the stringer. Important: A hole in fiberglass must be bigger than the diameter of any screw passing through it. Otherwise, as you drive in the screw, you risk chipping the fiberglass surface. Rely on the smaller hole drilled in the wood under the hole in the fiberglass to provide bite for the screw thread. Do likewise with a screw at the center of the transom top where the backstay fitting will eventually be installed. These two screws will serve as guides when lowering the deck into place on top of wet glue. And, they will keep the deck centered and stationary as duct tape is being applied during the deck-to-hull gluing process.

Have handy a big roll of duct tape. Mix up about two ounces of slow-set epoxy with enough microballoons added so that it is very slow to drip or run. With an acid brush, first apply glue to the top and sides of stringers S1 and S2. Use a dabbing or scraping technique to apply a good quantity of glue to the tops of the sheer strips and transom. With the deck bottom-up on the workbench, brush glue all around the one-inch outside edges where it will meet the sheer strips and along the deck centerline where it will meet the stringers. Handling the deck by the hatch opening with one hand, turn it over, right side up. Drop a screw into the pre-drilled hole in the deck intended for the jib tack fitting. Drop a screw into the pre-drilled hole in the deck intended for the backstay fitting. Carefully lower the bow end of the deck over the hull and line up the screw with the hole pre-drilled in the bow stringer. While holding up the aft end of the deck a few inches above the hull, give the screw a few turns so as to keep the bow stationary. Avoid smearing the glue as you finish lowering the deck while keeping it in line with the screw intended for the backstay fitting. When both screws are tightened snug, the deck will not slide out of alignment.

Grab the roll of duct tape. Tear off an 18" length. Starting from the area of the hatch, and applying the tape across the beam; use it to bring down and clamp the deck to both sides of the hull. Apply more tape strips, while working from this first tape, towards the bow and alternately towards the stern. Leave about one inch between tapes so that a portion of the joint is visible all around the boat. The space between tapes will allow you to see if the tape has stretched and allowed any small gaps to develop anywhere along the joint. In order to correct any gaps that may have developed, it will be necessary to pull the tape away, stretch it tight, and reattach it. Once the tapes have made a Zebra pattern from bow to stern check for any gaps; then go ahead and double up on the tape. The stuff is cheap. Cover the spaces between the first layer of tapes and make the boat look like a mummy. When finished with the taping,


*Photo by Mike Kelley*

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turn the boat upside down and leave it that way overnight. With the boat upside down, glue will flow and create a filet at the deck-to-sheer-strip joint.

The next day is the earliest time to right the boat, deck up, and to peel off the duct tape. Carefully start sanding away the excess deck overhang and excess hardened epoxy that has squeezed overboard. Resist the urge to go at it with a power disc sander. Eighty-grit sandpaper on a sanding block is a low-risk way to do the job. Apply sanding pressure only in a downward motion from deck towards hull. Think in terms of pushing down on the glue joint and not pushing in the direction of opening the glue joint. As the excess is sanded away, keep an eye on the masking tape. When you see scratches on the tape, it is time to switch to finer 120-grit sandpaper and start sanding in a fore and aft direction.

This article about putting together a S/B short kit was first written in 1979. It was published as a booklet available from the AMYA Ship's Store. At that time, we had three reliable sources of deck and rigging hardware: Vortex Model Engineering, Probar Design, and A.J. Fisher. By the time the article was revised and reprinted as a two-part article in the Fall 1999, Issue No. 117 and Winter 1999, Issue No. 118 of *Model Yachting,* Vortex and Probar were gone from the market, leaving A.J. Fisher as the only source of rigging and deck hardware. Today, A.J. Fisher hardware is also no longer available. This, the third version of the article, will also be printed in two parts. Part II of *Assembling a Santa Barbara* will be published in the next issue, No. 148, of *Model Yachting.* Part II will describe the rigging of a S/B while using hardware fittings available today from Ludwig Mfg. and GBMY.

In addition to being about rigging the boat's deck and spars with fittings and hardware, Part II will also describe loading and solidifying the lead shot ballast in the Hartman keel.