NH Boat Museum
Back Bay Skippers

Soling 1M
Building Manual

2023
by
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Editor
Steve Leker

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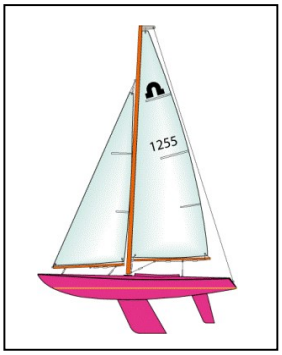
A. Soling 1M Class Rules



American Model Yachting Association

Soling 1 Meter ™ Class Rules

Effective 10-1-2021

Note: Underlined text changed since last revision dated 01 October 2020.

1.0 Concept

The definitions, dimensions, limits, and restrictions listed are intended to maintain the one-design concept of this class. The concept behind the Soling 1 Meter class is that a first-time skipper should be able to build and sail a model yacht that has essentially no performance differences from a boat built by an expert. All aspects related to performance are intended to be restricted to what can be achieved by building the boat straight from the manufacturer's assembly manual. Aspects not affecting performance are not as strictly controlled. These rules are intended to ensure that all boats are as close as possible with regard to hull, deck, keel, rudder, sails, displacement and ballast. Any obvious attempt to negate or violate this concept shall require the boat be barred from competition until such time as the violation is corrected.

1.1 General

The class specification is defined by these class rules, the control drawings, the manufacturer's assembly manual, and any applicable rules of the AMYA, in that order. If a feature which may enhance performance is not shown in the manufacturer's assembly manual and not specifically permitted by these class rules, then it is prohibited. All dimensions shown in the manufacturer's assembly manual and the Control Drawings are to be adhered to unless specifically overridden by these class rules.

2.0 Standard

The class shall be called the Soling 1 Meter. Boats conforming to these class rules must be purchased from an approved manufacturer. The Class Secretary shall maintain a list of approved manufacturers of the boat.

2.1 Hull and Keel: The hull and keel shall be as supplied from an approved manufacturer. The keel can be removable or permanently attached to the hull in the location shown on the control drawings.

2.1.1. Keel Thickness: The keel shall be that which is supplied in the kit. The assembled keel may not be thinner than .410 inches measured 2.0 inches below the bottom of hull and 2.0 inches aft of the leading edge.

2.1.2 Rudder Thickness: The mounting location is to be that shown on the control drawings. Rudder thickness: the rudder may not be narrower than .25 inches measured at the fore and aft of center of rudder, 1.5 inches aft of the leading edge and 1.5 inches below the bottom of the hull.

2.2 Deck, Hatch, and Lazarette

The deck shall be that supplied from an approved manufacturer. Any method of deck attachment is permitted, provided that the deck inboard of the hull is unchanged. The deck flange, if any, may be removed. An alternate hatch cover may be fabricated but must conform with that supplied from an approved manufacturer. One opening (hole) may be in the deck area over the rudder shaft horn assembly. This opening, to be known as the lazarette, is optional. If installed, the lazarette opening in the deck is restricted in size to a maximum of 9 square inches (58 sq.cm). The shape of the lazarette and its covering material is uncontrolled.

2.2.1 Beam Measurement: The beam measurement at the widest point shall be a minimum of 8.875 inches (8-7/8").

2.3 Rudder: The rudder is to conform in size and shape with that that supplied from an approved manufacturer. The mounting location is to be as shown on the control drawings.

2.4 Interior Construction

The construction, layout, materials, and equipment used inside the hull are unrestricted except where prohibited by any other rule. If an alternative method of reinforcing the deck at the mast step and mainsheet exit is provided, the hull and deck may be assembled without the forward and aft bulkheads supplied in the kit.

3.0 Displacement and Ballast: The minimum ready-to-sail weight of the yacht shall be 10 pounds (4.54 kg.). The ready- to-sail weight shall include the radio receiver, batteries, steering servo, sail control unit, sails and rigging.

3.1 Materials: Ballast shall consist of No. 9 lead shot permanently bonded in the keel. Molded, solid lead ballast shall be prohibited.

4.0 Spars

4.1 Materials, shape and construction: The mast and booms shall be made of aluminum alloy tube, solid wood or plywood. Spars may be any shape, although tapered masts are prohibited. Slotted mast is permitted. Spars may be reinforced using line wrapping. Hollow wood or hollowed plywood spars are prohibited. If used, plywood must have all layers of uniform density.

4.2 Dimensions: Masts must have a uniform dimension of 1/2" (12.7 mm) Maximum and 3/8" (9.52mm) Minimum thickness x 53/64"(21 mm) Maximum and 5/8" (15.87mm) Minimum depth, not including reinforcement.

4.3 Any method of sail attachment to the mast is permitted.

4.4 The jib boom (club) and main boom shall be made of solid wood or plywood, or aluminum alloy tube, having minimum dimensions of 3/16" (4.76mm) across x 3/8" (9.52mm) thick and a maximum length of 15-1/2" (393.7mm). Booms shall not be permanently curved fore and aft. No weight shall be added to the jib club (boom) forward of the swivel.

5.0 Rigging

The use of commercially available or home-made fairleads, turnbuckles, screw eyes, eye bolts, tangs, bowsies, goosenecks, boom vangs, mast jacks, mast cranes, outhauls and woven or braided wire for shrouds and stays shall be permitted. Fairleads (sheet exit guides) shall not extend higher than ½ inch (12.7 mm) from the deck. Larger screw eyes or though-deck eye bolts may replace screw eyes supplied with the kit.

5.1 Standing Rigging

The use of multiple diamond rigging shall be permitted. A permanent backstay is required. The ends of the spreaders shall not extend beyond the width of the hull at the mast. Spreaders shall be made of wood, aluminum or brass. Spreaders shall not be angled fore or aft of the mast. The side stays (shrouds or diamond stays) descending from the outer ends of the spreaders shall attach either to the mast (diamond stays) as shown in the manufacturer's assembly manual or to the deck (shrouds) in the range shown by General Configuration Control Drawing Note 4. If diamond stays are used and located as shown in the manufacturer's assembly manual, a second set of shrouds may be attached between the spreaders and the deck in the range shown by General Configuration Control Drawing Note 4.

5.2 Mast Crane - Backstay Bracket

The mast crane at the top of the mast may be longer than the one supplied in the kit and/or mounted at an angle as shown on the control drawings to prevent the mainsail from interfering with the backstay. The mast crane may be constructed of wood, aluminum, or brass. The lower end of the backstay may be attached at, but not beyond the transom.

5.3 Mainsail Height: The maximum height of the mainsail from the deck shall not exceed 51-¼ inches (1302 mm).

5.4 Jib Stay Attachment: The height from the deck to the jib stay attachment on the mast shall not exceed 45-¾ inches (1162 mm) including the jack screw, if used.

5.5 Wind Indicators: The use of a wind indicator or wind vane on the top of the mast shall be permitted.

5.6 Deck Layout

Deck hardware shall be located in conformance with the control drawings. The method of attachment to the deck of any hardware is uncontrolled. Racks may be used on the deck in place of screw eyes. If fittings exist in alternate locations not permitted by the control drawings, the legal positions shall be clearly marked.

5.7 Mast Step: The mast must be stepped on-deck, but any mast step arrangement is permitted. Placement of the Mast Step shall be in accordance with the control drawings.

5.8 Running Rigging

Any outhauls, Cunninghams and halyards shall each be attached to a single spar. The use of a separate jib halyard is permitted. Topping lifts are prohibited.

5.9 (not used)

6.0 Sails: Sails shall be single-panel and shall be cut to match the control drawings.

6.1 Sail Material: Sails shall be made only from woven polyester fiber cloth.

6.2 Battens

6.2.1 Mainsail: No more than 3 battens may be used, positioned in such a way that the leach is divided into 4 equal parts. Maximum batten lengths: top 5 inches (127 mm), middle 6 inches (152 mm), bottom 4 inches (102 mm).

6.2.2 Jib sail: No more than 2 battens may be used, positioned in such a way that the leach is divided into 3 equal parts. Maximum batten lengths: top 4 inches (102 mm), bottom 2.5 inches (64 mm).

6.3 Sail Reinforcement: The sails may be reinforced by addition of woven cloth or tape material within 3 inches (76mm) of the head, tack, and clew corners, and within ¼ inch (6.4 mm) of the leech edge.

6.4 Sail Numbers and Class Logo

Sail numbers shall be a minimum of 3 inches (76 mm) in height and 3/8 inches (9.5 mm) in stroke width. They shall be placed as shown on the control drawings. The class logo shall be optional, but if present, must be as shown on the control drawings. Alternatively, sails may be marked according to the Racing Rules of Sailing (current edition).

7.0 Radio

Any brand or type of radio equipment is permitted. Transmitters and receivers may have more than two channels, provided no more than two channels are used, one channel for sail sheet control only, and one channel for rudder control only. The use of a backstay tensioner, extra jib trimmer or jib twitcher is prohibited. Use of radio transmissions from the boat except for the establishment and maintenance of a radio control link, control unit positioning information, signal strength and battery status information while racing is prohibited.

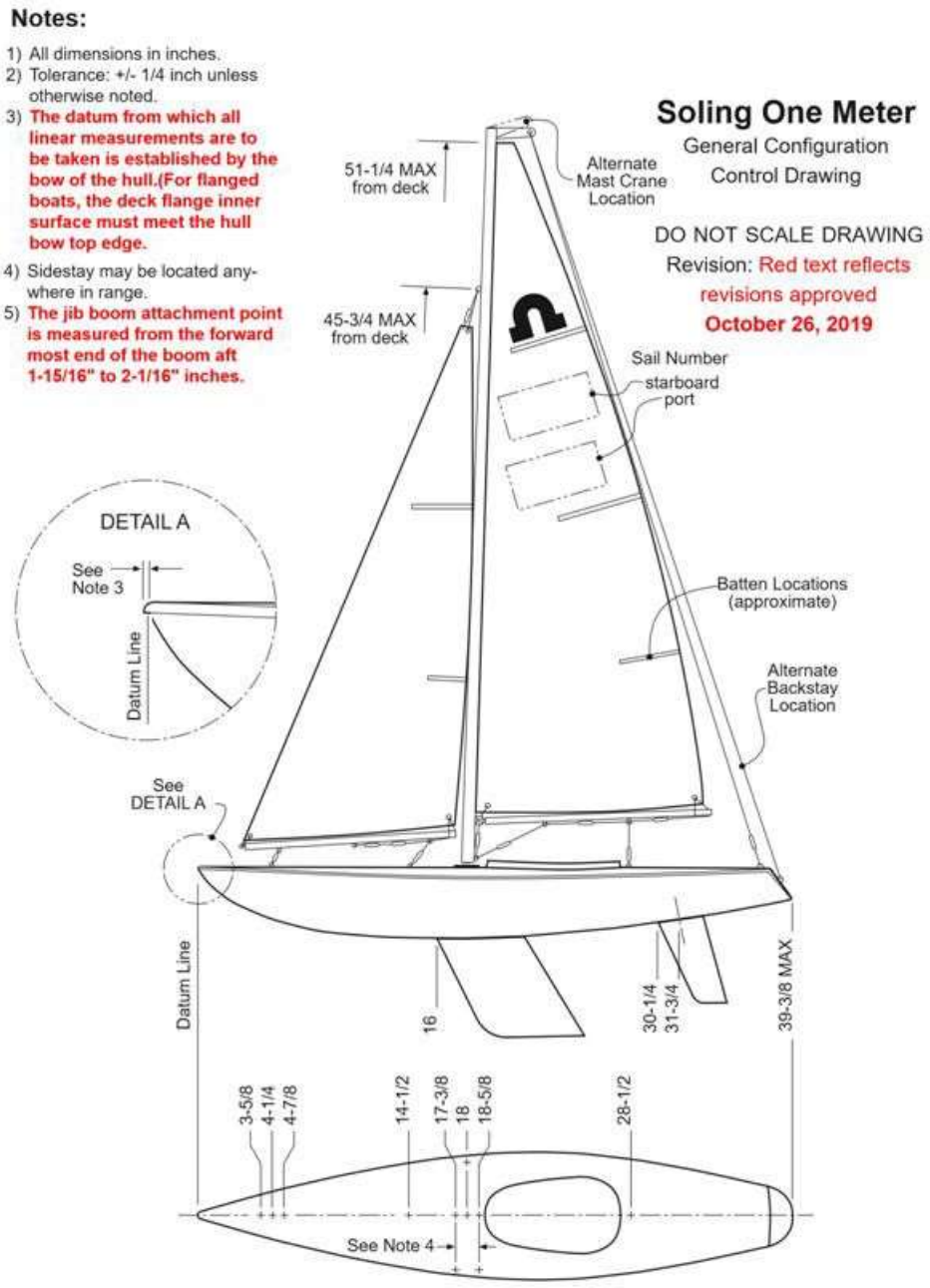
8.0 Adhesives: The use of any adhesive is permitted to bond any part provided from an approved manufacturer or permitted by these rules.

9.0 Control Drawings The following control drawings are to be read as part of the class rules:
9.1 Sail Control Drawing dated 14 February 2004.
9.2 General Configuration Control Drawing **dated October 26, 2019**.

10.0 Manufacturer's Assembly Manual: The approved manufacturer's assembly manual is as supplied with the boat.

CONFIG DRAWING

General Configuration Rev 10.28.19

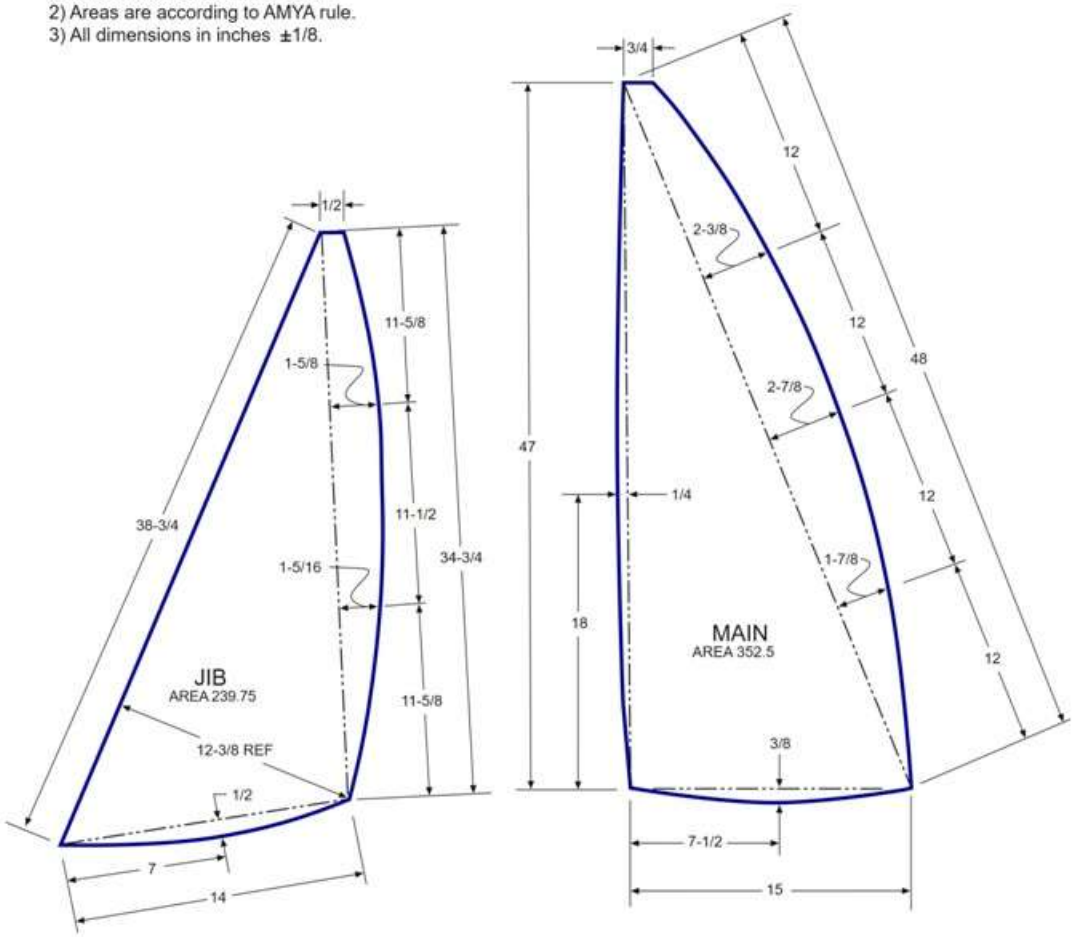


Soling 1 Meter

Sail Control Drawing

Notes:

1) This drawing defines the shape of sails in the flat, not on the boat.
2) Areas are according to AMYA rule.
3) All dimensions in inches ±1/8.



DO NOT SCALE DRAWING

Revision of: February 14, 2004

"Soling 1 Meter"

Boat name revised 10/1/2021

Any questions or concerns regarding these Rules or their interpretation are to be referred to the Soling 1 Meter Class Secretary: e-mail: soling1m@rcsailing.org

B. Vac-U-Boat Instructions

Vac-U-Soling™

An AMYA *Soling One-Meter Class* Lower Hull Kit

Manufactured by Vac-U-Boat 1259 Humphries Rd. Conyers, GA 30012 philpace@vac-u-boat.com UPDATED 4/19/2021

The Vac-U-Soling™ Lower Hull Kit Features: Tough high-impact polystyrene hull with a tongue-in-groove perimeter deck joint, full deck, partial hull and transom reinforcing liners that can be trimmed/adjusted for weight savings, removable one-piece 7 pound keel with options to special-order lighter or heavier weights, completed rudder with safety clip, Du-Bro rudder arm, hex wrench, stainless pushrod and easy-connector for your servo, self-aligning rudder mount, integral transom on the hull, no wood components, precut fiberglass deck cleat backers, pre-drilled self-centering keel mount/fiberglass servo board/crossmember, 8 servo screws with hex wrench, stainless steel keel hardware, stainless steel deck hardware, plastic mast step, magnetically attached hatch cover, removable carbon fiber king post, industrial- ceramic deck fairleads.

The crossmember is pre-wired with a power switch, battery extensions and a blue LED power indicator. It has precut openings for standard sail and mini rudder servos. The rudder servo is mounted near the rudder or can be mounted on the crossmember. There are no bulkheads giving you better access to the hull's interior.

This kit does not include paint, sails, mast, booms, sail rigging or electronics. We are considering a basic sail mast-rigging kit for release in the future.

To build this you will need: A 50-pack of wooden clothespins (more if you want to laminate the hull and deck on the same day), talc-cornstarch-microspheres (your favorite epoxy filler), 2 pumps of West Systems 105 epoxy with 206 hardener or similar product (Ask if you don't have access to West-Systems epoxy.), 30-minute set (or longer) epoxy glue (Devcon 2-Ton at Ace Hardware), one caulking tube of Loctite PL S40 polyurethane window, door & siding sealant and paper towels.

Tools you may need include a box cutter, 1/16" drill, 5/64" drill, 7/64" drill, a step-drill set (allow you to drill large holes in plastic without splitting), wrenches, screwdrivers, drill, an old bath towel, plastic gloves, mixing cup & sticks, alcohol (for cleaning up epoxy), mineral spirits (for cleaning up polyurethane sealant) and you will need to borrow five 15oz. cans of vegetables from the pantry.

Now for the Warnings!

Read all of the instructions! Review and understand each step, and the one after, as you build your boat. Don't rush. Good work takes time.

This is not a toy! I know. It LOOKS like a toy, but it isn't. Toys are generally safe for small children. This boat is not safe for small children. Assembling it requires the use of sharp tools that can cut skin, strong adhesives than can bond flesh and injure eyes, spray paints that can be flammable and toxic, as well as batteries that can short causing severe burns or fires. Read all of the instructions and warnings on all of the tools and chemicals you plan to use. Use protective eyewear when recommended. **USE SAFETY GLASSES! If you think you don't have the skills, or are uncomfortable with tools and chemicals, or just changed your mind, then pack up this kit and return it immediately for a full refund including economical standard return shipping. If you need some help, find a local boat club to join, check with the hobby shop where you purchased your radio gear, or contact local RC sailing clubs and organizations for assistance.** Keep your work area away from children & pets. Even if you have no children, when not working on the kit, keep all sharp objects and all chemicals locked away in a safe area. You never know who will come to visit and how well they will supervise the young ones with them.

This is STILL not a toy! Never run the boat if swimmers are in the water. Don't chase wildlife. Be careful with rechargeable batteries. They have the ability to dump large amounts of current in a very brief period of time if shorted, causing burns or fires. Never store rechargeable batteries inside your boat, connected or not. Keep your batteries in a safe place, out of the reach of children. You are responsible for the safe use of this product. You are responsible for choosing wisely, those who you entrust the use of the boat and radio, even for a few minutes at a lake.

Never swim after a disabled model boat!

NEVER LEAVE YOUR BOAT IN A HOT CAR. Extreme heat can damage the plastic parts.

Read warnings on all products used in the construction of this kit. Keep your work area clean and tidy. Whenever using hobby knives, box cutters, or razors, cut *AWAY* from your body. Keep in mind where the knife will go if it breaks or suddenly cuts through the plastic. Plastic can bind the blade of a knife and suddenly release it. If it is binding, you may be doing it wrong. Additional force is not the answer. Angle the blade so the plastic can separate without binding. Read the section on cutting plastic safely.

WARNING

CHOKING HAZARD - Small parts. Not for children under 3 years.

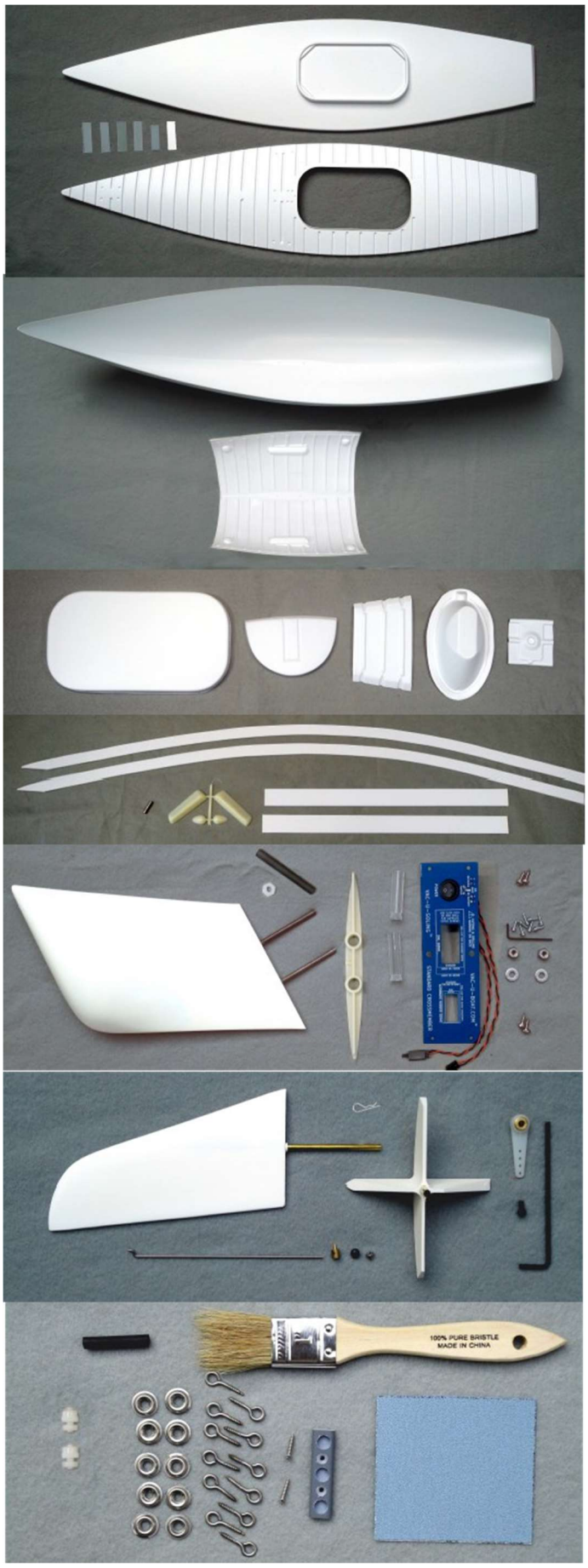
WARNING - To avoid danger of suffocation, keep plastic bags away from babies and children. Do not use in cribs, beds, carriages or play pens.

WARNING: Brass parts in this kit contain lead, a chemical known to the State of California to cause cancer and birth defects and other reproductive harm.

WARNING: **THIS IS NOT A TOY!** Once completed, this model should only to be used with the Safety Rules and guidelines of the American Model Yachting Association.

https://theamya.org/

KIT CONTENTS



High-Impact Polystyrene Deck, Deck Reinforcing Liner, Pre-Cut Fiberglass Deck Cleat Backers.

Hull with integral Transom, Hull Reinforcing Liner.

Hatch Cover, Transom Reinforcement, Battery Tray, Rudder Servo Mount, Upper King Post Mount.

Hull Anchor Inserts, Hull Crossmember Mount Inserts, 8 Hatch Cover Magnets, Hull & Deck Temporary Clamp Strips.

Keel, Keel Shoe, 2 Keel Posts, Switched & Wired Crossmember, 4 Crossmember Screws, 8 Servo Screws with Wrench, 2 Stainless Keel Nuts & Washers, King Post & Nut.

Rudder, Rudder Mount, Rudder Arm, Rudder Arm Set Screw & Hex Wrench, Safety Clip, Stainless Steel Pushrod & EZ-Connector.

2 Nylon/Ceramic Deck Fairleads, 12 Stainless Steel Deck Eye Screws with 10 Stainless Steel Flanged Finish Washers, Mast Step with Stainless Steel Screws, 1-1/4inch Rubber Drill Depth Gauge, 1-inch Bristle Epoxy Brush, Double-Sided

Follow the photos and captions to assemble your boat. Read through the instructions before building. Assemble the necessary tools and adhesives on a clean workbench or table. Keep paper towels handy to catch spills. Don't forget the safety glasses!

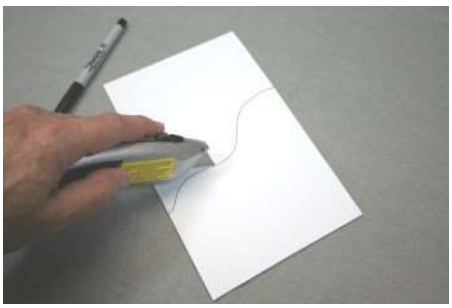
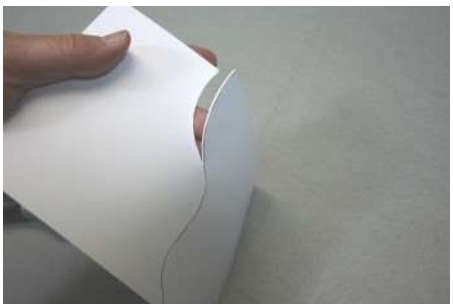
Read ahead for each step. With hobby knives or box cutters, always cut in a direction away from nearby body parts. Practice harder steps without glue to be comfortable with what is needed to ensure a good fit.

When drilling styrene, drill at the **slowest speed.** The material is soft so little pressure is needed to drill into it. All surfaces that will be glued with epoxy or CA-super glue need to be sanded/scuffed with 100 grit sandpaper to help the sur- faces have a strong bond. Step drills are best for drilling locator dimples or making large holes in plastic. Get a set.

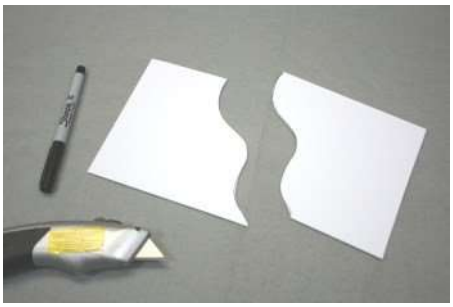
Sanding/trimming for a nicer looking model. These instructions use the plastic parts just as they were supplied in the kit. Some sanding/trimming of parts can improve the looks of the finished hull. In particular, the Deck Flange is as-cut from the mold. It has a slight flare at the edge of the side flange. Using a sanding block with 80 or 100 grit sandpaper, you can sand away about 1/6-inch of material to remove that flange. It will be easier to hold and sand after it is laminated to the Deck Reinforcing Liner but should be sanded before you attach the Hull to the Deck.

Light weight build. Be careful if you trim or discard parts to save weight. The painted lower hull kit without the keel, rudder, or rudder linkage weighs approximately 2 pounds 3.7 ounces. If you want to stay close to the 10-pound minimum weight, do your research first and discuss with the Soling1M forum or with your club as to their recommendations.

CUTTING STYRENE

Styrene can be cut by scoring and breaking, or with scissors. The first score should be very light while concentrating on accuracy. The second and third score is made with more pressure and will follow the first. Repeat scoring the line until the part separates or after 2 or 3 scores, bend the plastic to break it.



Bending down at the score will break the plastic along the scored line. Then, bend up to separate it cleanly. Don't tear or it will leave an uneven edge. You can cut with scissors if you prefer. Either way, any rough edges can be smoothed out with the included 100 grit sandpaper.

Be careful when drilling holes in sheets of plastic. Practice with the cockpit opening scrap. For tiny holes like the 5/64-inch (2mm) holes for the deck screw eyes, a standard drill bit is fine. For larger holes, a step drill will allow you to drill or enlarge holes without the bit "digging" into the plastic causing the plastic to split.

CLEAN HANDS

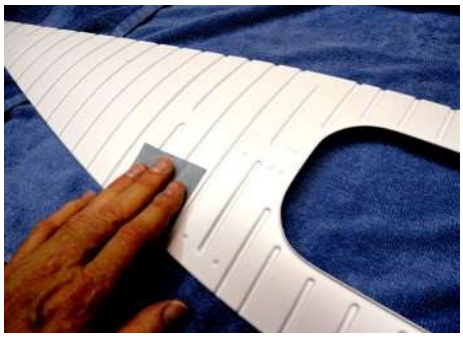
Using "plastic friendly" spray paints or acrylics, you can paint the boat without sanding first. A clean oil-free surface is important. Wash your hands with soap & water before handling the plastic, after meals, etc… Contaminants or oily fingerprints can be removed with Windex, Alcohol, or Low Odor Mineral Spirits without affecting the plastic's ability to chemically bond with paints like Krylon Fusion or Rustoleum 2X Ultra Cover. Although they have a reputation of being runny, with some guidance and patience you can get good results.

Conventional paint methods involving scuffing, priming, and painting for this boat are available and have been discussed by several clubs. Avoid lacquers because they will melt styrene plastic. Wet-on-wet spraying of some enamels can be harmful as well.

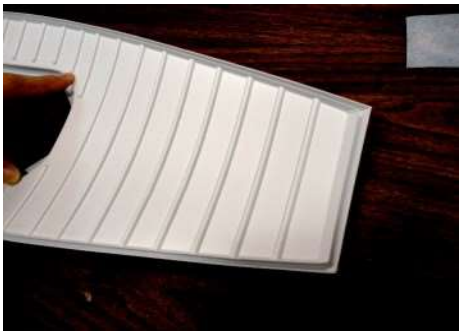
LAMINATING THE DECK: You will need the Deck, 2 Temporary Deck Clamping Strips, Deck Reinforcement, 50 clothes pins, 1-inch epoxy brush, 1 level tablespoon of powdered filler (talc), 1 pump of West Systems 105 epoxy with 206 slow hardener, mixing cup, dowel or craft stick to mix, 100grt double-sided sandpaper, an old bath towel, the two pre-cut paint stirring sticks and three 15-oz. cans of vegetables. The towel protects the deck's surface while you are sanding the underside. **After trimming and sanding, we will practice first. No Glue.**



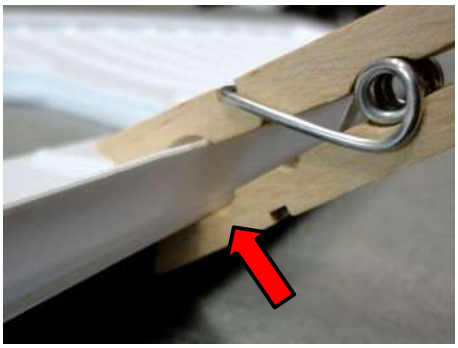
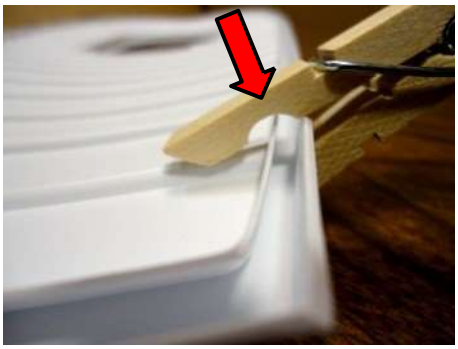
Lightly score around the inside of the cockpit opening from the top of the deck. Repeat until the center pushes out. **Score the deck reinforcing liner from its <u>underside</u>**. This leaves a raised lip around the top of the liner's opening. Set the scraps aside for testing paint or practice drilling holes. Tape the temporary deck clamping strips on top of the deck, even with the deck's edges.

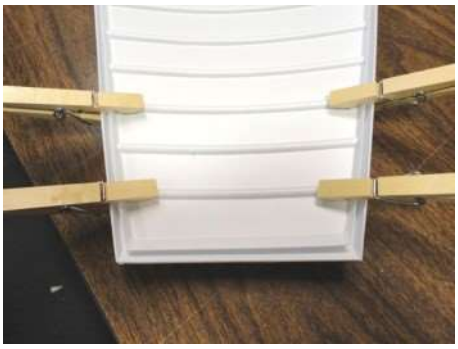
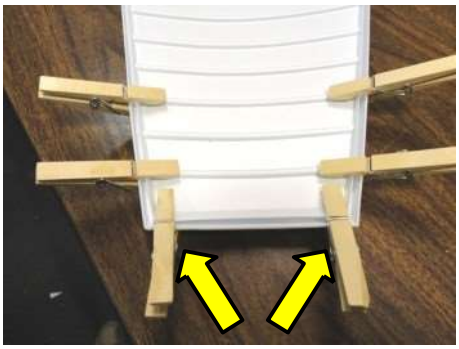
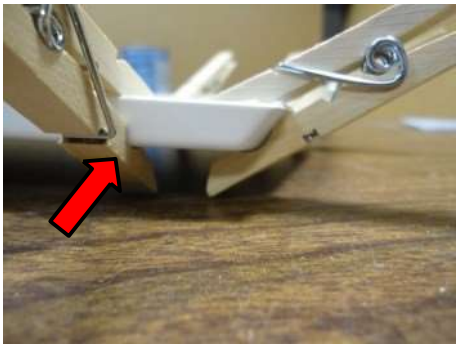

Lay out a towel & turn over the deck onto the towel. Sand the UNDERSIDE of the Deck thoroughly. Use a criss cross or circular pattern to roughen the surface for the epoxy to bond well. Sand the TOP of the Deck Reinforcing Liner. Check the edge trim of the Deck Liner. Use the sandpaper to straighten any uneven spots like at my thumb.


Remove the towel. Set the Deck upside-down onto the work surface. Set the Deck Reinforcing Liner into the Deck using the cockpit opening to align the Liner to the Deck. You will notice an even spacing around the perimeter. This will be the groove of the tongue-in-groove seam for the hull.

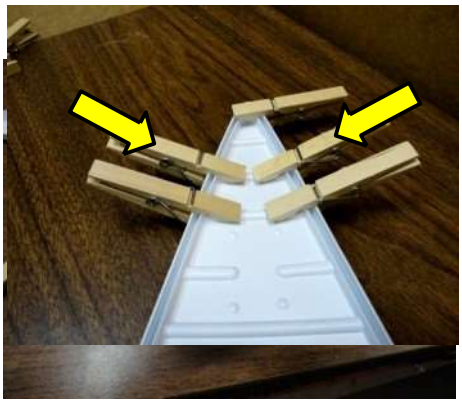
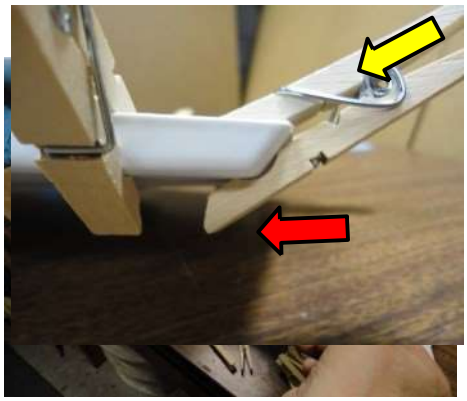




Take a clothespin and clamp the rib of the Deck Liner to the Deck near the Transom. Adjust it until the corner of the deck clamping strip falls into the notch of the clothespin. The flange of the Deck Liner is within the other notch in the clothespin.

Clamp 3 more clothespins keeping the Deck Reinforcing Liner centered to the deck. Clamp two more at the end of the stern.

There are no ribs there but still keep the deck corner into the notch of the clothespin.

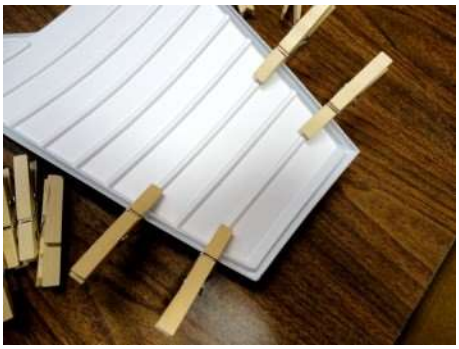

Attach 4 clothespins at the bow clamped to the 2nd & 3rd rib, then put one on the end clamped flat to the tip of both the Deck and the Deck Liner. The end pairs of clothes pins (yellow arrows) will be touching the deck evenly to ensure that there is no twist in the deck before the epoxy cures. Practice is over. Lay out the rest of your materials to laminate the Deck.

Mix 1-Pump of West Systems Epoxy and stir in 1 level tablespoon of filler. Brush the filled epoxy on to the Deck Liner. Hold the brush almost flat against the surface and very lightly brush the surface. Flat strokes will distribute the epoxy on the surface without it getting it in to the grooves. If it gets into the grooves, scoop it out with the brush.

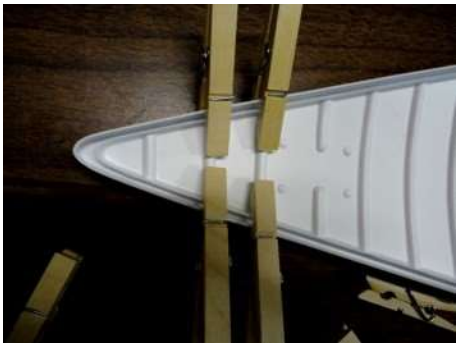


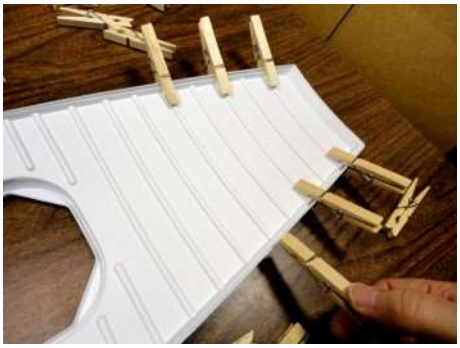
Holding it vertically will help prevent epoxy from dripping off of the edges. You want it to look thin but fully covered with no dry areas. Do not put epoxy on the edges, just the top. Once you are done, any extra epoxy can be brushed onto the areas where the deck cleats, mast-step and their fiberglass backing strips will be located to further-reinforce them. **The brush will flick droplets of epoxy around as you brush past the edges of the Hull Liner. Keep good parts away from the work area to prevent epoxy drying on them. Once you are done, wipe up any drops of epoxy on the work surface and clean the residue with alcohol while it is still liquid.**



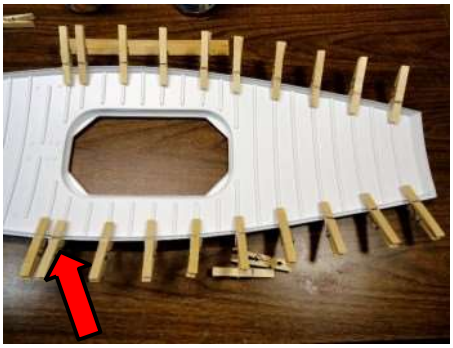
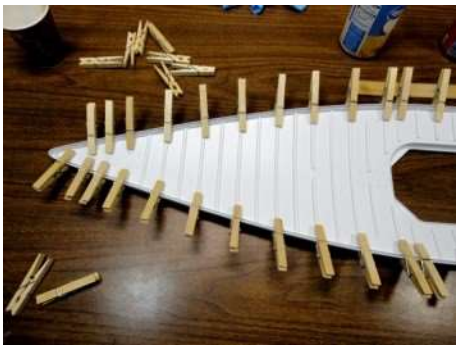


Carefully set the Deck Liner epoxy-side down into the Deck. Press the four corners of the cockpit opening to align it. Clamp 4 clothespins to the stern-end sides of the deck at these two ribs.

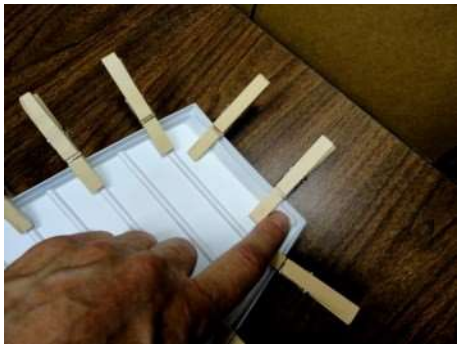
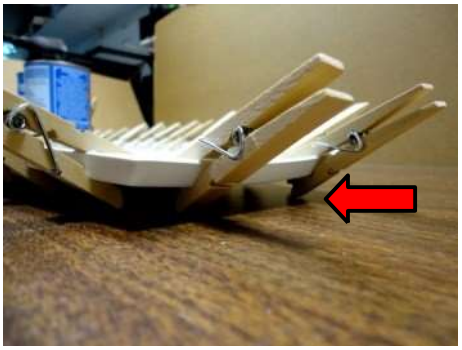




Center the tip of the Deck Liner to the tip of the Deck. Clamp 4 clothespins to the 2nd & 3rd ribs as shown. Check that the cockpit opening is still centered. Starting at the stern end, alternating left then right, attach clothespins to every other rib working toward the cockpit.

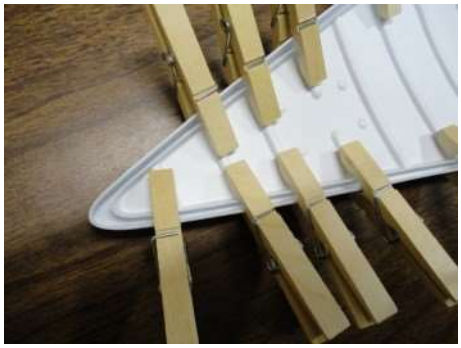




At the bow-end of the deck, put clothes pins on the two ribs shown next to each other. Then continue every other rib to the bow as shown. Put a single clothes pin at the tip of the bow. Set your paint stirring sticks into the cockpit. Long stick first with the left end (bow end) covering the five locator bumps next to the cockpit opening as shown. Put the short stick on top.

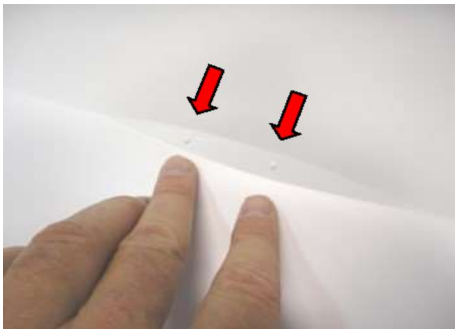
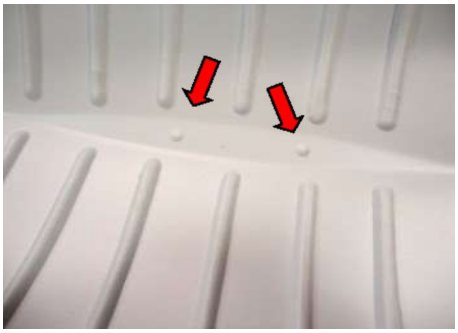
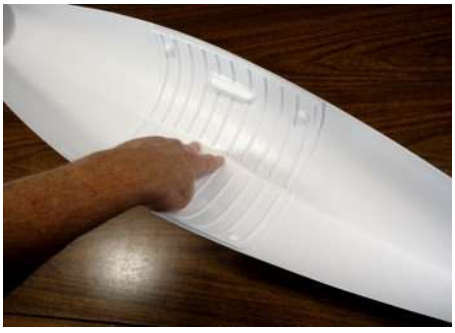




Put a 15 ounce can on the center stick then set the other two cans of vegetables on each end of the long stick as shown. At the stern, place two clothes pins on the end of the deck resting on the ends of the clamping strips. These clothes pins will touch the table and hold the stern-end of the deck assembly square to the build table.

Clean the brush with alcohol before the epoxy sets. You will use it for the hull later.

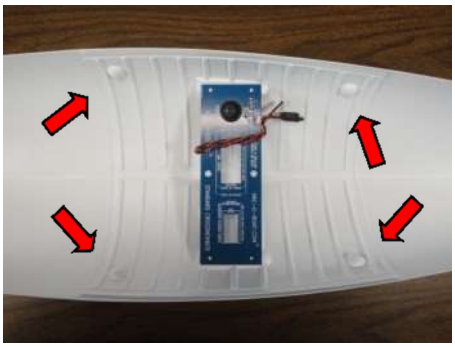




Examine the two bow-end clothespins. If one is not touching the table, it could have a slight twist. Lightly grasp the Deck bow and twist up at the side where the clothespin is touching the table to remove the twist. Set down & examine again to confirm it is level. If neither are touching, a small weight added to the center of the deck will help them touch. Attach the last clothespin to the bow. Take one last look to be sure that all clothespins are even and properly clamped to the deck edge, that the groove width is even all around the deck and that no epoxy dripped onto the edges of the deck or to the work surface. Slide it back out of the way to cure overnight and prepare to work on the hull. You will need the Hull, Hull Reinforcing Liner, Crossmember Mount Inserts, Anchor Point Inserts if you need anchor points, 30-minute epoxy & filler, 2 each 1-inch x 16-inch plastic clamping strips, your towel and around 32 more clothespins.

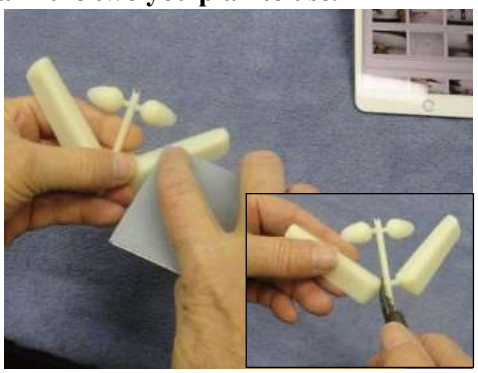




Inside the Hull at the center bottom where the Keel is installed you will see two locator points. The Hull Liner has two corresponding points. Using 2 fingers, slide the Hull Liner along the Hull until you feel the bumps line up. The bow-end of the Hull Liner is narrower than the stern and must be oriented to the bow of the Hull as shown.





Use a pencil to mark the edges of the Hull Liner onto the hull. This will help you align it later and marks the area on the Hull you will need to sand. The Crossmember looks like this. Bow is on the right. Note the 4 bumps on the Hull Liner..These are possible anchor points if your rigging requires them. **Mark the two you plan to use.**


In the Hull Liner you will need to glue inserts into the two shelves that support the Crossmember and the two marked Anchor Points. Sand the 4 reinforcements and separate them from each-other. Each crossmember reinforcement is different.



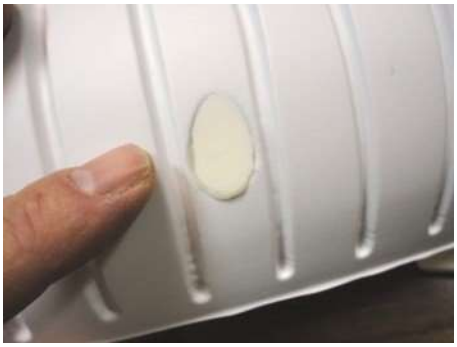
This is the correct Crossmember shelf insert for this side. It fits flush and evenly into the opening. The anchor point inserts fit any anchor point. Sand the insides of the two shelves and two inserts you marked.



Lay out the shelf inserts and anchor point inserts near where they go to avoid mistakes. Pour two 1-1/4-inch circles of 30 min. epoxy and mix. A steel rod works well for this. A 1/8" diameter rod was used for these photos.



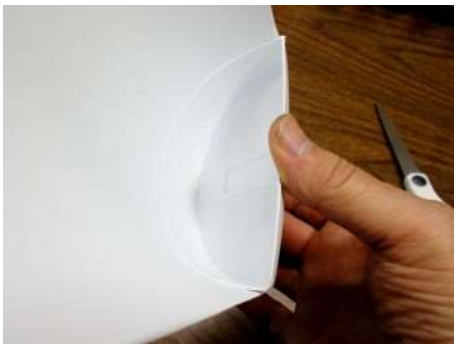
Fold-in an equal volume of filler powder & mix well. Scoop up some and distribute around the inside of the chosen anchor point. The insert is form-fit so little epoxy is needed.



Press the insert into the epoxied recess. Wipe away any excess epoxy. Repeat for the other anchor point and the two Crossmember shelf inserts.



Check the inserts to make sure they are flush with the contour of the Hull Liner and won't get in the way when you bond the Hull Liner to the Hull. While you wait for the epoxy to cure, **sand the inside of the hull between the Hull Liner pencil marks**. Use the towel to protect the outside of the hull from scratches and to support the hull as you sand. **Be careful to not sand off the two locator bumps at the keel. You will need them later.** On the rounded part of the Transom Reinforcement, use scissors to cut off some of the excess plastic leaving about 3/8ths to 1/4 inch from the transom.



Set the Transom Reinforcement into the Transom end of the Hull and align to the sides of the hull. Mark along the Transom top and Hull Sides for trimming. Be careful not to move or shift the reinforcement while marking.

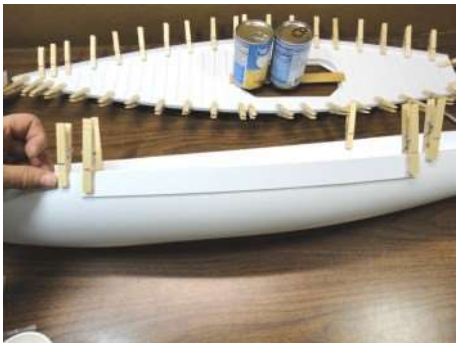


Carefully trim off the marked top of the Transom Reinforcement by scoring with a knife or use scissors. If scoring, lightly score once then repeat until you can break off the scrap. Set the Transom Reinforcement back into the transom firmly seated in place and mark the edges in the Hull for sanding.



Sand inside the Hull at the transom back and sides. Carefully support the back of the transom while sanding as it is very thin.
Sand the outside of the Transom Reinforcement. If the reinforcement epoxy is cured, sand the Hull Liner as shown.
The folded towel will allow you to support the shape while sanding.





Support the edges in order to sand the sides evenly. In the Hull, mark the lines for the Hull Liner with 4 clothespins. On the outside of the Hull, center the Clamping Strip between those markers and clamp in place. The strips help prevent the clothespins from dimpling the sides of the hull.



You can tape them in place. **Practice** setting the Hull Reinforcing Liner into the hull without touching the sides to prevent epoxy from rubbing off onto the hull. Repeat centering on the two locator bumps with your fingers and confirm the location with the end-marks you drew on the hull. The Hull should be sitting directly on the worktable. To keep it from falling over, steady the sides with a folded towel or other object that won't get in the way of clamping.



Mix 1-Pump of West Systems Epoxy and add 1 level tablespoon of filler. Brush onto the Hull Liner like you did the Deck Liner. When you are done, a little extra around the crossmember inserts will help strengthen this area. **Don't use all of the epoxy. Save some for the Transom Reinforcement.**

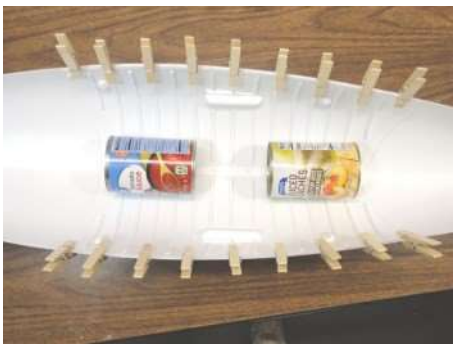


While holding the side together a little, set the Hull Liner into the hull and align it using the two locator bumps and the marked end lines. When you are confident it is in the proper place, set two 15 ounce cans of vegetables into the Hull Liner as shown.



The cans will hold down the Hull Liner. You start clamping the top at the center. Lightly pinch the sides together with your left hand while you clamp with your right. Center the clothespin on the rib.

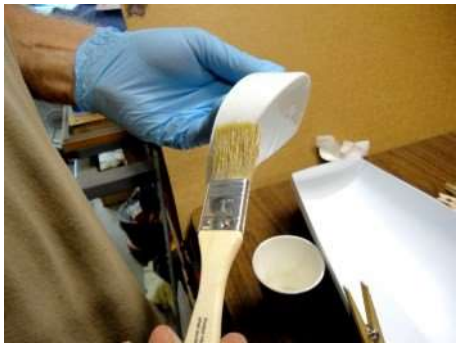




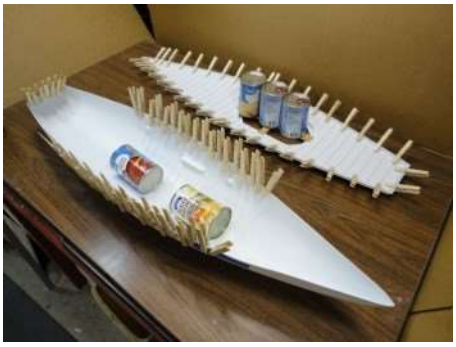
Notice how the clothespin is clamping the end of the rib and the top edge of the Hull Liner. The Spring is not touching the plastic. Continue pinching and clamping every other rib until both sides are done.



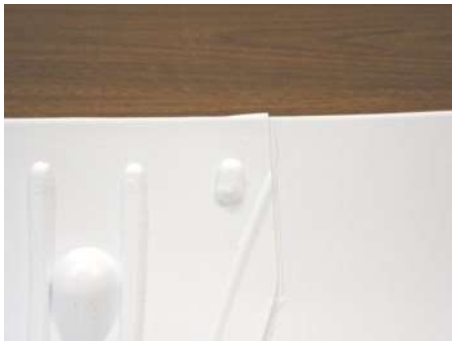
You will notice that in between the clothespins there may be gaps between the Hull and the Hull Liner. Clamp these gaps with another clothespin, not clamping the rib this time. Look for any epoxy oozing out of the top and clean it while it is still uncured. Apply the filled epoxy to the Transom Reinforcement.



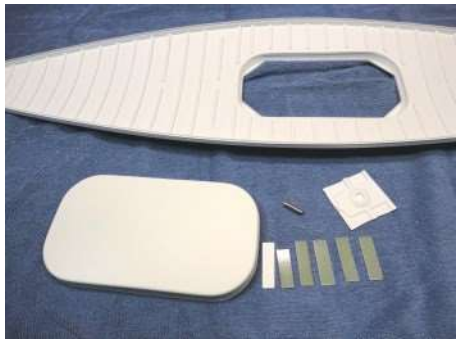
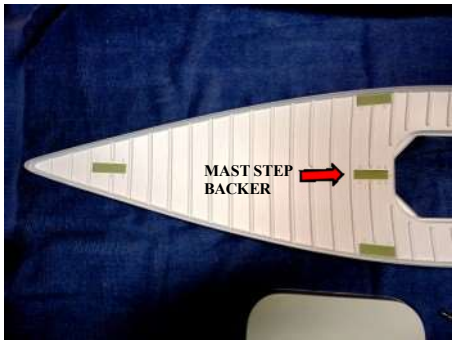
Don’t forget the sides. Insert the Transom Reinforcement into the Transom, pressing it into place while supporting the outside of the Transom. Clamp one clothespin fully onto the Transom center. Check the alignment.

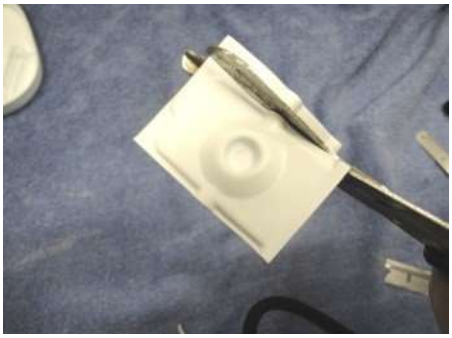
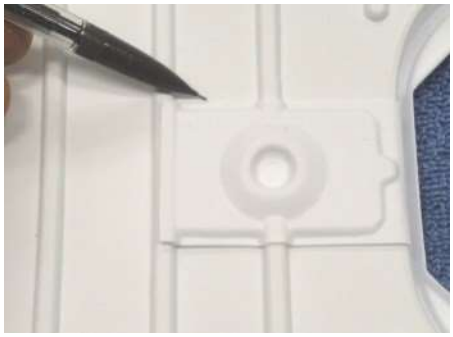
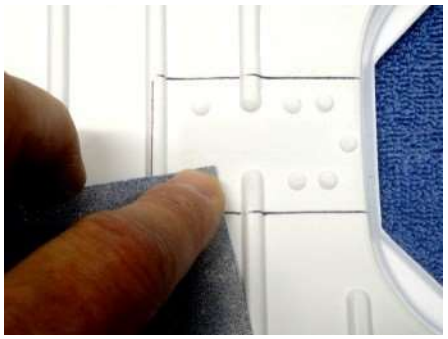

Important: Check for epoxy oozing out of the Transom Reinforcement. Unclip any clothespins necessary and wipe up the epoxy & clean or replace the wet clothespins or it will glue your clothespins to the Transom. Check closely for any epoxy drips and clean the work surface. You can put a clamp on each side of the flange of the transom reinforcement if needed. Let cure overnight. The next day, examine the top edge of the Hull for uneven areas.

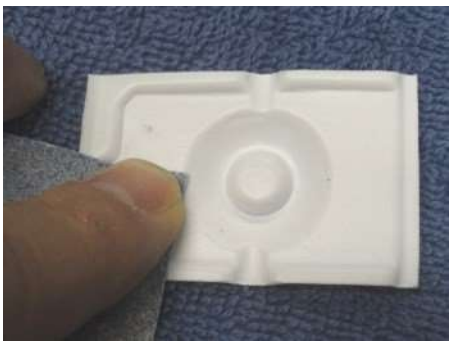

Smooth any high spots. Use the sandpaper or lightly scrape with a knife. The sealant used in attaching the deck will bridge any low spots so it does not have to be perfect. Note the Transom has a curved top to match the crown of the deck.

The top of the Hull will go into the deck groove a little easier if you knock off the sharp edges by lightly scraping only once or twice with a knife at an angle. Blow or sweep out any bits. Lay out a towel. This step attaches backers to the Deck and Transom, the King Post Upper Mount and Magnets to the Deck and Cockpit Cover. Note that one of the Backers is white plastic. This is a spacer used in the Transom so the threads of that screw eye will engage the fiberglass backer properly. The shorter fiberglass backer is also for the transom. The rest back the deck cleats or the Mast Step as shown.

After the Mast Step Backer is glued in place, the Upper King Post Mount is glued over it on the underside of the deck. Set the mount in place and mark its outline on the underside of the Deck. Now sand this area. OK to sand the bumps.



Sand the underside of the King Post Upper Mount. Sand inside the Transom inside the raised rectangle where the Transom Backer will be glued. Sand one side of the shorter fiberglass backer. Sand both sides of the white plastic spacer and the backer for the Mast Step. The short backer is for the Transom.



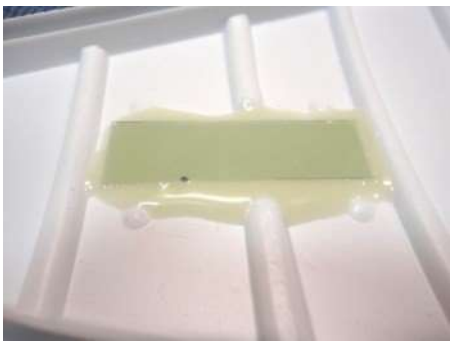
Hazard: Rare earth magnets are plated with Tin, Chromium, Cadmium or other harmful metals. Avoid dust and debris from scuffing them. Sand them outside. Take the row of magnets and sand one end to roughen the surface. Take a magnet from the other end and snap it over the sanded magnet. Repeat until **one side** of each magnet is scuffed. Sand the **underside** of each corner shelf of the Cockpit Opening.



Sand the back of the ledge as well. Sand the **underside** of the Cockpit Cover in the same area. Mix two 1-inch circles of epoxy and add the same volume of filler. Put a 1/4-inch bend on the end of a paperclip to distribute the filled epoxy.



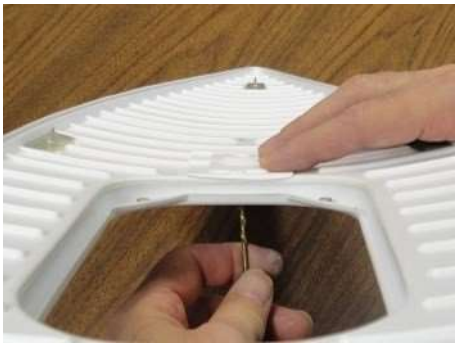
Put just a small spot of filled epoxy into the underside of the corner of the Cockpit Opening. You will add more later. Place a magnet scuffed-side-down into the epoxy and center it in the corner touching the inner edge of the sanded area. Take a second magnet and while holding a finger on the glued magnet, place the 2nd magnet under the glued one. It will snap into place and hold the glued magnet in place until the epoxy cures. Check and adjust to center. Repeat for the four corners. Wash your hands of any magnet residue.

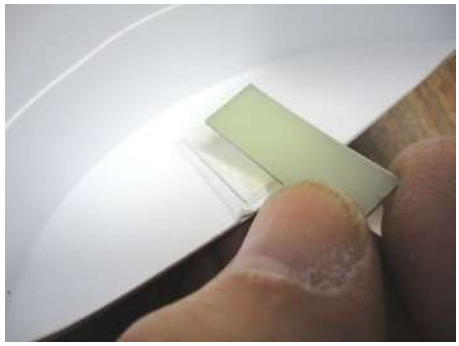

Epoxy the marked locations for the Backers and place them sanded-side-down. Bow Backer and Side Backer shown.



Attach the Mast Step Backer then apply filled epoxy to the King Post Upper Mount and set into place.

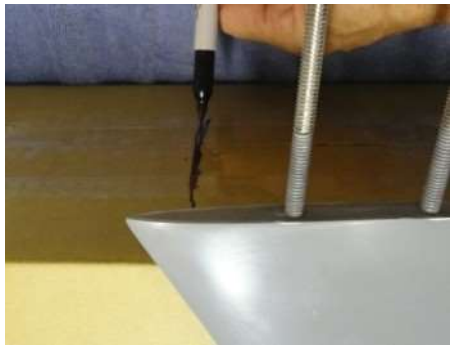

Check that it is centered to the cockpit. The mount's center recess should align with the center Mast Step locator dimple, indicated by the drill bit used as a pointer so you can adjust the mount to center. In the Transom, first glue in the white plastic spacer into the center recess and press into place.


Add filled epoxy to the white plastic spacer. Press the shorter fiberglass Backer into the spacer, the end aligned to the bottom end of the spacer. **Important:** This leaves the top of the fiberglass backer about 3/8-inch down from the top of the transom. This is to allow room for the Transom to fit into the Deck groove later.



Confirm the 3/8-inch space and clamp with a clothespin. Put some filled epoxy over and around the 4 Cockpit Magnets to better hold them in place. If your epoxy is beginning to harden, mix a small fresh batch to do this. Set aside to cure.




Build a temporary Building Stand for the Keel. Get or make a box at least 6 inches high, 5 inches wide and 12 inches long. Lay your Keel on it to mark where the upper leading edge of the Keel intersects the top and the rear bottom is even with the end of the box. Cut a 1/2-inch slot in the top to that point. In this box it was 10 inches. The length of the slot depends on the height of the box.

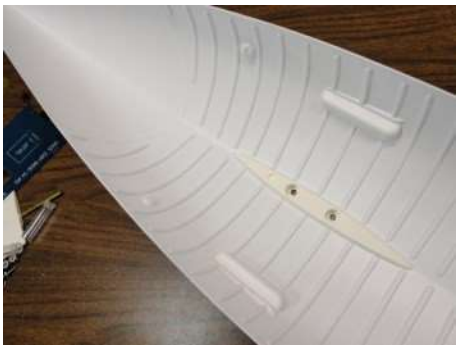
Cut a 2 inch wide slot in the back stopping 1-inch above the floor of the box. Reinforce the end of the slot with tape and cardboard. Set the Keel into the box. It should sit roughly level. Adjust the end of the slot if needed.

This step installs all of the bits inside the hull. You will need the Rudder, Rudder Mount, Rudder Servo Mount, Battery Tray, Keel Mount Shoe, 2 Keel Posts, 2 Washers, 2 Nuts, Crossmember, 4 Crossmember Screws. Tools include a 5/64 inch (2mm) drill bit, a 7/64 inch drill bit, step drill set, a 1/4 inch nut driver (or a hex drive handle with the hex bit removed), a 7/16 inch combo wrench, a socket wrench with 7/16” socket and short extension, a tube of Locktite PL Window, Door & Siding Polyurethane Sealant and the little piece of black rubber hose Drill Depth Gauge.



These are the Hull drill locator dimples. You used them earlier to center the Hull Liner into the Hull from the inside. Practice drilling through a scrap of this plastic with a step drill. Use a slow speed setting. Be patient. Use little pressure.
Note the drill diameter markings on the step drill. Locate the 1/4-inch mark for the Keel holes.

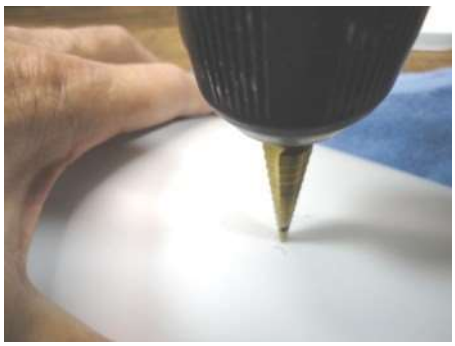




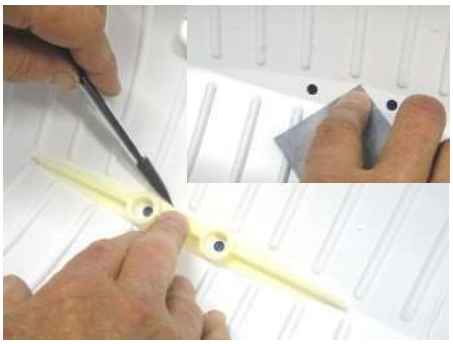
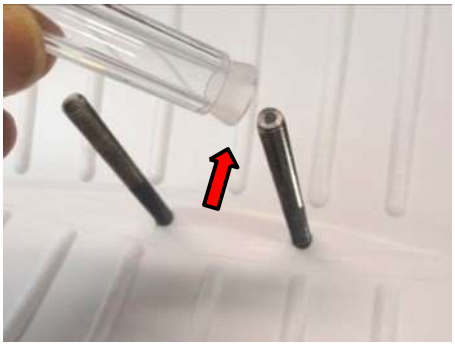
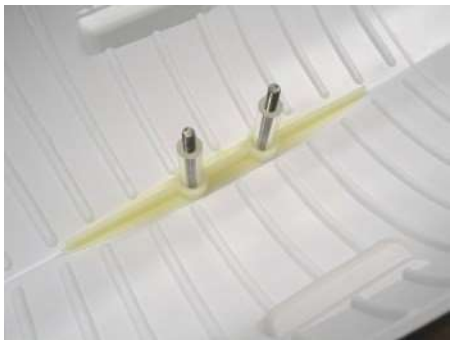
Use a Sharpie marker to plainly mark the 1/4-inch part of the drill. Drill the two dimples to 1/4-inch diameter. Turn the Hull over and set the Keel Mount Shoe into the hull.



Use a pencil to mark a line around the Shoe. Sand the area where the Keel Mount Shoe will contact the Hull and sand the bottom of the Shoe. Turn over the Hull again and note the Rudder Mount Drill Locator Dimple near the Transom.

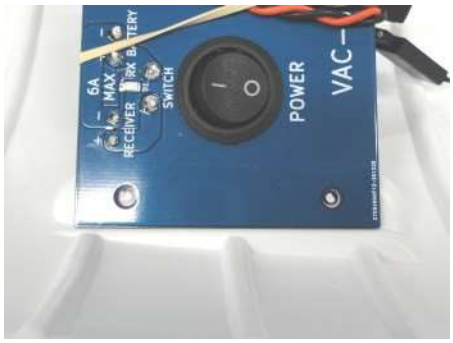

Clean off old Sharpie markings with alcohol. Locate the 3/16-inch point on the drill and mark that section plainly with the Sharpie marker. Drill the Rudder hole to a 3/16-inch diameter. By hand, you can use the step drill to de-burr the hole on the inside.

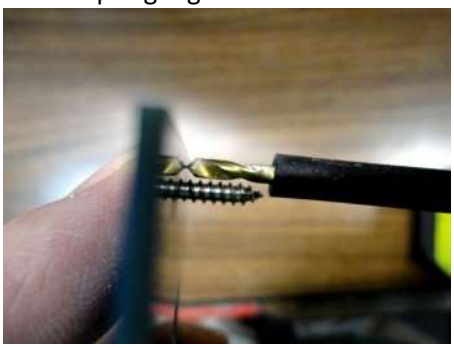
Set the Keel Shoe into the hull centered on the keel holes and mark the shoe's outline. Sand the underside of the shoe and sand the shoe's outline in the hull. Set the hull onto the Keel. Place the Keel Mount Tubes over the Keel Bolts with the end that is grooved on the bottom (arrow). Set the Keel Mount Shoe over the two tubes.

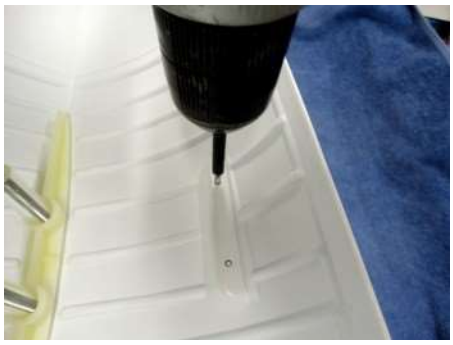


Set the Crossmember onto the Keel Bolts. While holding the Crossmember to prevent rotation, install the two 1/4-inch stainless steel washers and the two 1/4-inch Keel Nuts. Just snug with wrench. Do not over-tighten. While squeezing the hull between your hand and stomach, check that the ends of the crossmember are square to the ridge on the back of the shelves then mark the 4 screw holes onto the shelves.

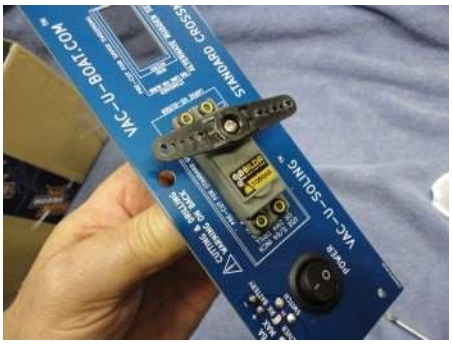
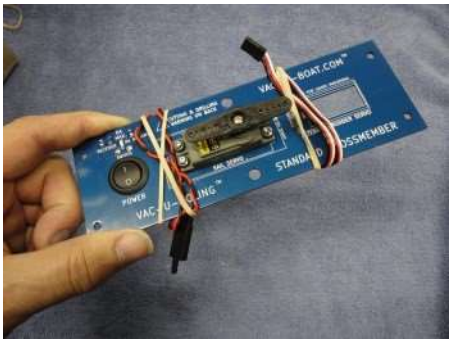
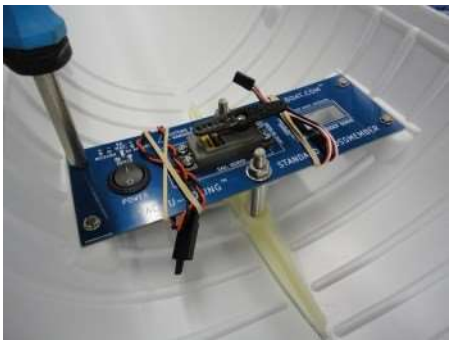



Remove the Crossmember. These holes will be drilled with a 3/32-inch drill. Insert the drill bit into your drill and slip the rubber hose depth gauge over it.





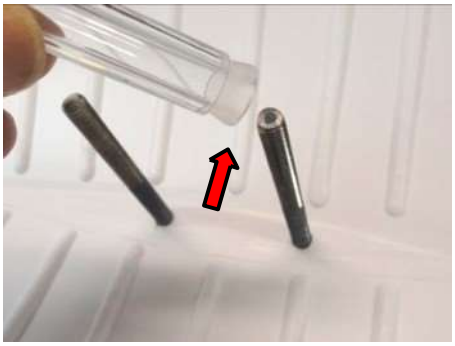
Place a screw into one of the Crossmember mounting holes. Holding the screw, adjust the hose until the exposed drill bit is the same length as the exposed end of the screw. Loosen the drill chuck and slide the drill in until the hose touches the chuck then tighten it. Check the exposed drill bit again to be sure. Drill the 4 shelf holes. Holding the drill as straight as possible at a slower speed, drill into the marked points. The chuck of your drill will probably be touching the side of the hull during this. Pull out the bit 2 or 3 times during drilling to clear debris. Stop just when the rubber hose Depth Gauge touches the shelf or when you feel the drill drop into the void molded into the shelf reinforcement.

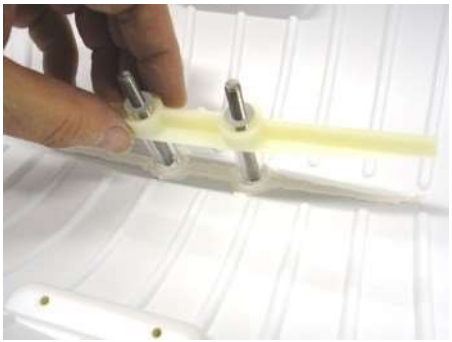
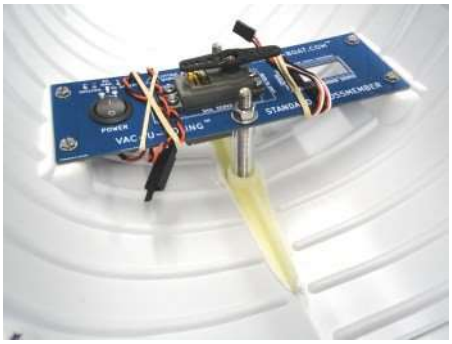
Now is a good time to mark and drill the servo screw holes into the crossmember. Use a 5/64" (2mm) drill for this kit's servo screws. READ THE WARNINGS on the crossmember when drilling holes or enlarging openings. Secure any loose wires on the Crossmember. TEMPORARILY install the crossmember with mounting screws. **ADVANCED:** Now is a good time to check the alignment of the keel to the rudder shaft if you want to do this.



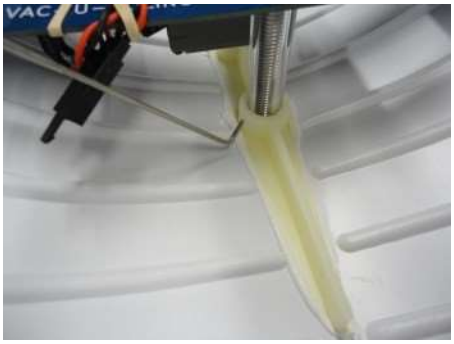
I flipped over the hull for clarity. You can do this with the Keel in the Keel Box as long as there is room for the sticks and clamp between the box top and the Hull. Paint stick or two rulers are clamped on the flat part of the Keel. The two sticks should be approximately centered on the hole for the rudder shaft. If not, the Keel holes can be adjusted to align before sealing the Keel Mount. After sealant is added but before the keel bolts are tightened, you can check again if needed.

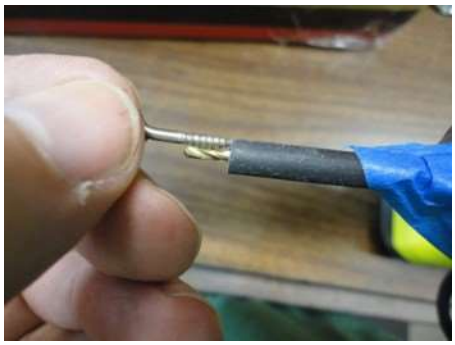


Remove the Crossmember, Keel Tubes & Keel Shoe. Install the two keel tubes. Put a bead of sealant along the center of the hull at the Keel Shoe outline. Just a 3/16" bead but put more around the grooves of each of the tubes. Use a bent wire to work the sealant into the grooves filling them. **Important** to get the sealant completely around the grooved part of the two acrylic tubes. This will form a seal between the tubes, the shoe and the hull so the Keel Mount will not leak.

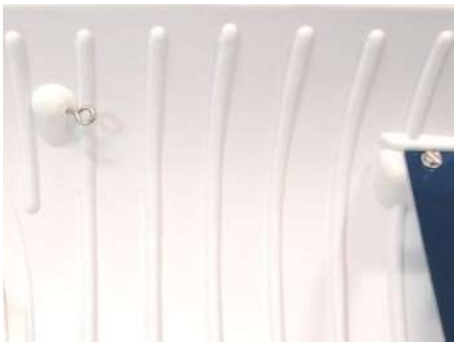
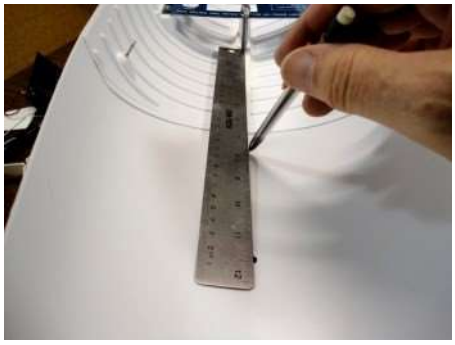




Set the Keel Shoe over the tubes. **DO NOT PRESS DOWN YET.** Install the Crossmember with 4 end screws and the washers and nuts at the center. Tighten the end screws and lightly-tighten the Keel Nuts. (Tighten holding the head of the wrench, not the end of the handle.) **Press the Keel Shoe into the sealant firmly.**

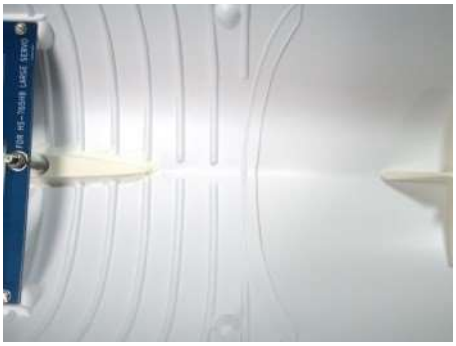
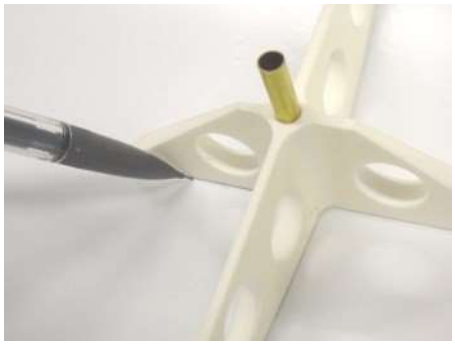
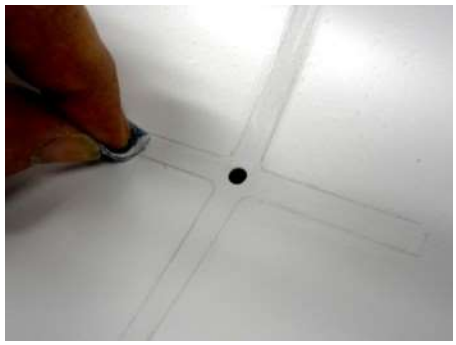




A bent wire will help remove any excess sealant. The sealant is messy stuff so you may want to leave the excess sealant alone for a better appearance. If you are using Anchor Points in the Hull, they need to be drilled and installed now. Otherwise, skip this step. Repeat the Drill Depth Gauge setting. This time with a 1/16-inch (1.5mm) drill bit the length of the eyelet threads. Secure the hose with tape or it will slide off of the smaller drill.

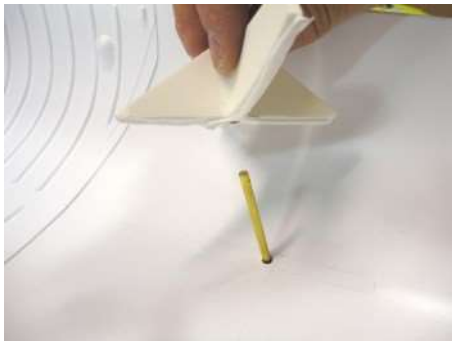




Drill into the two reinforced Anchor Bump from the side, direction of the pull, as to not pierce the Hull. Screw the Screw Eye into the bump just as far as the threads. Install the Rudder & Rudder Servo Mount: Using a straight edge, mark a light pencil line about 4 inches from the Rudder Mount hole toward the end of the Keel Shoe.

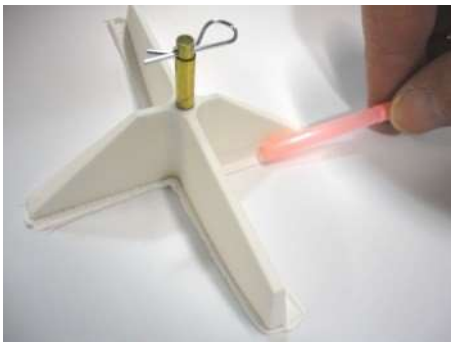




Insert the Rudder Mount into the hole with the **pointed end toward the Crossmember.** Align the point to the middle of the pencil line. Remove the Rudder Mount and sand the marked area. Also sand the corresponding bottom of the Rudder Mount.

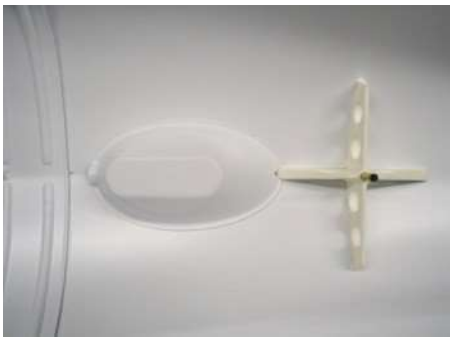




Put a very thin bead of Sealant on the bottom wings of the rudder mount. Use a wire to push the sealant fully around the end of the brass tube to ensure a good waterproof seal. Insert the Rudder Shaft up through the hole to assist you in aligning the Rudder Mount to the hole. Align the Rudder Mount pointed end to the pencil mark and push it into the hull. Confirm the short brass tube at the bottom of the mount entered the hole in the Hull. You may not feel the mount drop into the hole until most of the excess sealant has squeezed out from between the mount and the hull. Check under the hull to ensure the brass tube is fully in the hole in the hull.

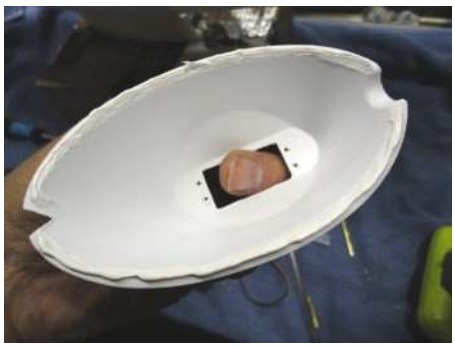




Once you are sure that the Rudder Mount brass tube is in the hole, remove the rudder and wipe off any sealant on the shaft. Clean with mineral spirits if necessary. The end of the brass tube should be even with the Hull as viewed from underneath. Re-insert the clean rudder shaft and clip the Safety Clip to the top to help hold the rudder mount in place. Use a paper towel to wipe off any excess sealant on the bottom of the hull. Wipe up any excess sealant around the Mount. Visually confirm the alignment of the rudder to the keel.

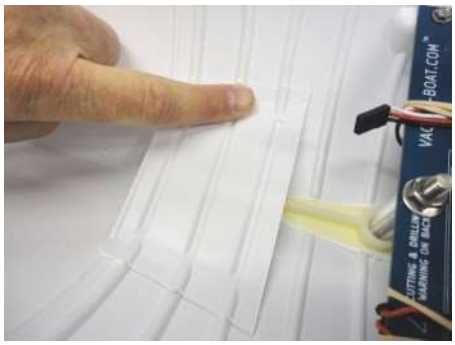




Take the Rudder Servo Mount and trim to a 3/16” flange. Open the notch on the right side of the photo. That notch will engage the tip of the Rudder Mount. Note the rounded tunnel opening on the left. That is where your rudder wire will come out of the mount. Set the Rudder Servo mount into the hull with the notch touching the point on the Rudder Mount. Square the mount to the hull and trace its outline on the hull with a pencil. Sand the hull and the flange of the mount where they will be bonded. Use your rudder servo to mark the servo hole on the top of the Servo Mount.

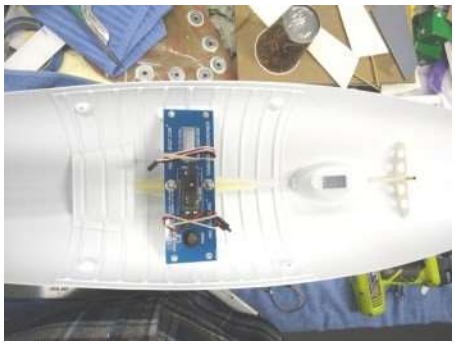




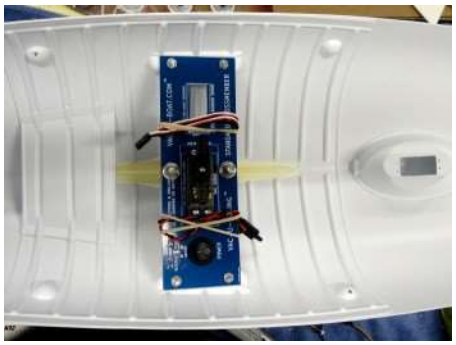
Drill a 1/8-inch hole at each corner of your measurements and connect the holes by scoring through with a knife. Use the rudder servo to locate and drill its mounting holes with a 1/16” drill bit. Apply a thin bead of sealant and set the Rudder Servo Mount into


the hull aligning it with the Rudder Mount and the pencil marks you made earlier. Press into place. Wipe away any excess sealant. Set the Battery Tray into the Bow. It only fits into this location. Trace its outline onto the hull with a pencil. Sand the Tray and Hull at the point of contact. If you plan to put a strip of Velcro® on the battery tray, do it now, before you apply sealant or do it tomorrow after the sealant has cured some and before you install the Deck.

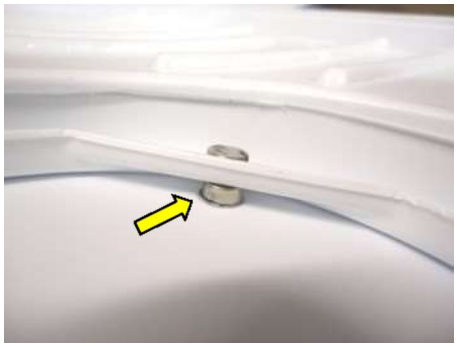
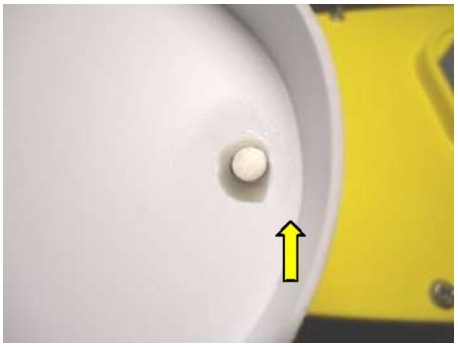
Apply a thin bead of sealant to the side flanges of the Battery Tray and press into the hull. Wipe away any excess sealant.




The Hull is ready for the Deck. Leave the Hull on the Keel to cure overnight, approximately 24 hours and seal the end of the caulking tube to keep fresh until then. **Two more things to do to the Deck before tomorrow.** The magnets you glued to the underside of the Deck were sanded-side-down into the epoxy. You clamped that magnet in place by putting another magnet under it.



Turn over the deck. Now those four magnets are sanded-side-up and located right on top of the other magnets. You have already sanded the inside corners of the Cockpit Cover. Put a droplet of CA (Super Glue) on the center of each magnet.

Install the Cockpit Cover onto the Cockpit opening and press in place. Turn both over to make sure the Cover made contact with the Magnet and the CA is visible (arrow). If one is not touching, press on both sides until they are touching and hold for 20 seconds for the CA to bond. Remove the Cockpit Cover. The CA is temporary. It will come loose in time. For a permanent bond take some filled epoxy and work it around the Magnet's sides. Clean away epoxy between the magnet and the corner of the Cockpit Cover (arrow). This leaves room for the raised edge of the Cockpit opening.



The tongue-in-groove joint will go together easier if the sharp edges of the plastic are reduced. Use your knife to lightly scrape only once or twice along both sides of the Deck groove and both sides of the Hull edge with the blade at an angle to the edge.



Next you will insert the Hull into the Deck without glue or sealant to mark the sides of the Hull.
Because the Transom is angled, you have to engage the Deck into the Transom first, at an angle. Once the Deck in on the Transom, put a piece of masking tape over the end to hold it in place.



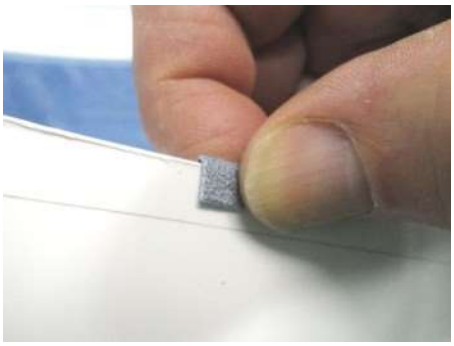
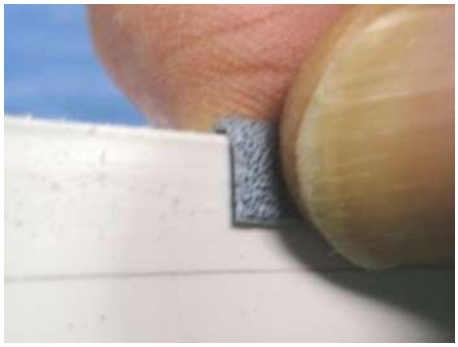
Working from the stern to the bow, tuck the Hull into the groove of the Deck. Add tape at the middle when you are farther along. When you finish at the tip of the bow, add a piece of tape there. Press evenly to ensure the deck is fully engaged on to the hull. Adjust the tape to remove any slack. No need to tightly pull the tape. It is just there to hold thing in place.



Mark a thin pencil line onto the Hull around the edge of the Deck. Remove the Deck. The line should be a uniform distance from the top edge of the Hull, around 5/16-inch. If it is not even, it was not fully engaged. Examine the hull for burrs or debris that would have caused it to not fit together. Repeat until you have an even line. When using sealant to glue the Deck to the Hull, this line will confirm that the Hull is fully seated into the Deck groove so there is no question that they are properly bonded together.
GOOD TIP: On the Bow, both sides about 4 inches back place a strip of painter's tape below the marked line with the edge of the tape on the line. Same for the stern, taping the transom and 3 inches on each side at the transom. If any sealant squeezes out at the bow or stern, you can remove it before it cures by peeling off the tape.

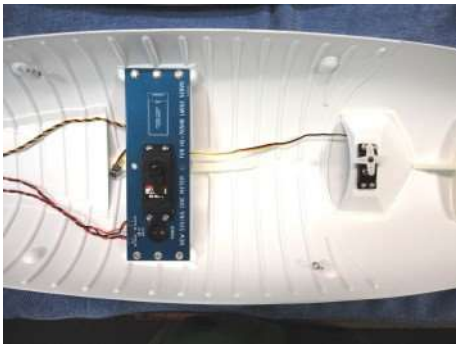


Carefully tape along the line on the Transom. Sealant will ooze out of this end. The tape will help with the clean-up. Cut a piece of the double-sided Sandpaper roughly 5/8-inch x 1-inch and fold it in half long-ways as shown.

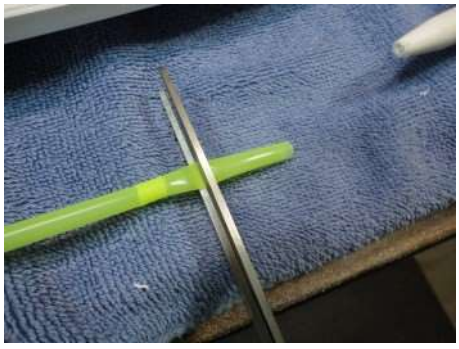




Firmly pinch the piece of Sandpaper over the top edge of the Hull and slide back and forth to roughen the surface. Open the piece and remove plastic debris often. The horizontal scratches will help the sealant grip the plastic. Sand half of the hull then refold the piece to sand the other half. Cut another piece about 1-1/2-inch square. Fold in half then fold again. Press tight.

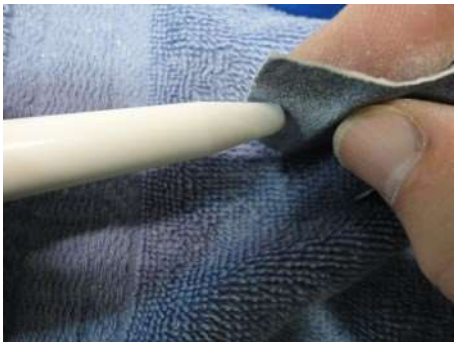
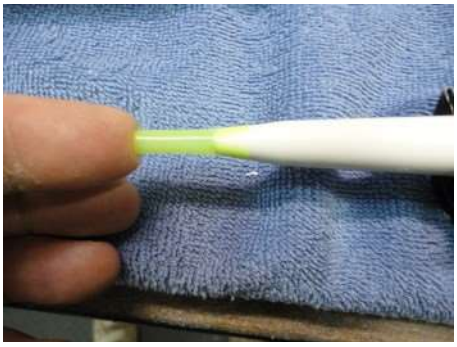
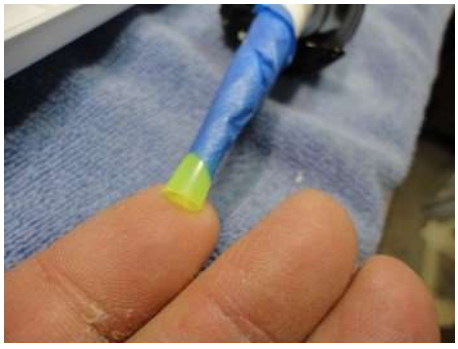




Run the double folded sandpaper back and forth in the grooves of the Deck. Remove it often to clean off any plastic debris. Check it for loss of granules and refold as needed to finish the job. Now is a good time to install any equipment you plan to use in the boat. Velcro® for the Battery Tray, wiring and Servo for the Crossmember and the Rudder Servo. Tape down any loose wires to keep them away from the Deck to Hull joint. No need to install the rudder or linkage at this time.

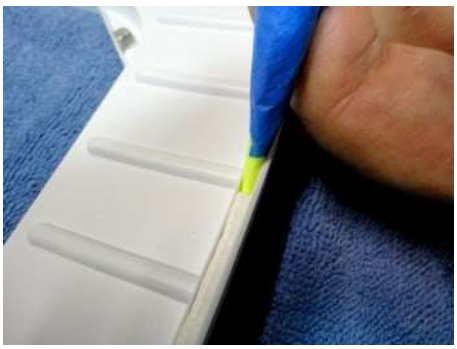




The nozzle of the tube of sealant is too large for the Deck groove. You need to extend the nozzle with a thin flexible tube. A plastic drinking straw works well. Clip off about an inch. Cut two short slots on one end.

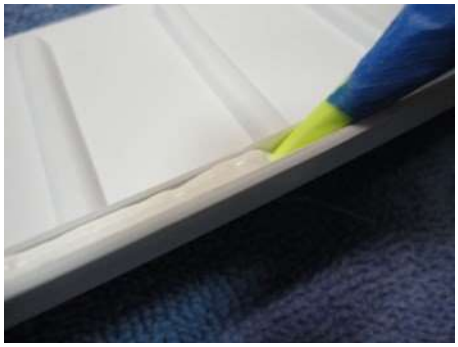




Lightly round just the sharp edge of the spout at the end of the caulking tube. Push the slit-end of the straw onto the caulking tube just past the end of the slits. Carefully tape to leave no gaps for the sealant to ooze out. Pinch the end of the straw to make it flat so it can slide into the Deck groove. If it comes out of the groove while you are applying sealant, take a paper towel and pinch it again to help it go back into the groove.

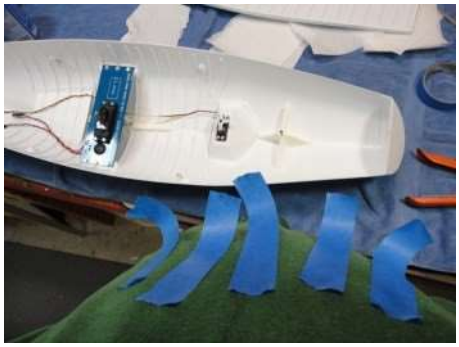




Adding weights to the deck will help hold it in place on the towel. You will need both hands to apply the sealant. Insert the straw-nozzle fully into the groove. As you dispense sealant, let it fill the groove from the bottom-up until it is just below the height of the Deck Liner's edge as you pull the nozzle along.



Don't try to do this in a continuous movement. A "stitching" move where you stop, letting the sealant build up then back up a fraction of an inch and let it fill again works well. High spots will happen. They can be scraped out later before you bond the Deck to the Hull. No hurry, take as long as you need. If sealant starts oozing out of a hole in the tape you may need to tape over or make a new nozzle and start again.


This bead of sealant will work. It is continuous with no gaps. It is just below the height of the Liner's side of the groove and about halfway up the edge of the Deck. In preparation to attach the Deck to the Hull, have 5 or 6 pre-cut pieces of tape nearby. Remember to tape down any loose wires in the deck. As before, engage the Transom first while holding up the other end of the Deck.



Like earlier, engage the angled transom first, securing the Transom end with a piece of tape. Don't try to reach the line on the Transom with the Deck yet. Work toward the bow, tucking in the hull. At the middle, add tape to secure.



Tape the bow. The Hull should be in the groove of the Deck, but not fully seated. Using light pressure, push the Deck onto the Hull until you are at the indicator line you drew earlier.



Move along seating the Deck over the Hull. As you seat the Deck, re-position the tape. No need to pull hard. The sealant will stay in place. The tape just holds it there. There will be lots of oozing at the Transom. Once the Deck is on the line, add tape to the sides of the stern of the boat.

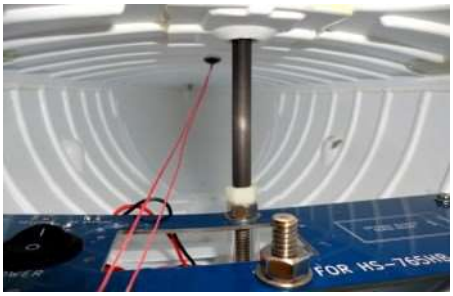


Keep working around the boat until everything is aligned. No additional tape is necessary. Before sealing up your tube of polyurethane sealant, run out several 3/16-inch diameter beads of sealant 6 to 8 inches long onto a plastic bag and mark the date on the bag. Store the beads of caulk with the Hull as it cures. To test the strength of the cured sealant, remove one of the beads and pull & stretch it to get an idea of how much the sealant on the hull has cured at that time.

ANOTHER TIP: Painter's tape or masking tape can sometimes come off overnight. To keep the short pieces in place, run long strips of tape over the short tape ends along the deck top and hull sides to prevent peeling. No need to press hard.



Remove the piece of tape at the Transom and scrape away the excess sealant. You will also find some excess sealant at the bow of the boat. You may not find any on the sides. Most of the excess side sealant can be found inside the boat. This is a good sign that the seam is complete and has no voids that could leak. The sealant is paintable. Should you get a fingerprint on the plastic, it will clean off with a paper towel very slightly dampened (1 drop) with mineral spirits. Or just wipe it clean with a dry paper towel if you don't have any mineral spirits. Let the boat cure 24 hours before painting or adding Deck hardware.



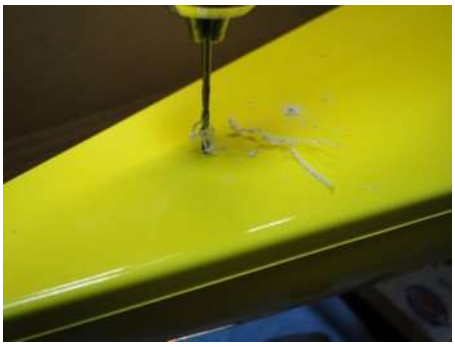
The King Post sits on the forward Keel Bolt. **Wait until the sealant has cured for 3 days before installing the King Post and tensioning the mast rigging.** More on that later. The boat is OK to handle after 24 hours at room temperature. After 24 hours you can paint the boat and 24 hours after that, install deck hardware & rigging. Resist the urge to start sailing. You might as well paint the boat while you are waiting. Most "plastic-friendly" paints will dry in a day but they won't harden for 3-4 days. That means that you can easily scratch or dent the surface of the paint for a few days after painting. In the water too soon and the surface of the paint may feel sticky and you could leave fingerprints. 24 hours after painting, you can mount the hull back onto the Keel & Keel Box and start drilling for the Deck Hardware. While you can handle the boat by holding the Keel, you should avoid lifting the boat by the cockpit opening or by the hull with the Keel attached until the sealant is fully cured. For painting the Deck, the Keel and Keel Box make a great stand. For painting the Hull, remove the Keel by removing the two Keel Nuts & Washers from the crossmember and lift the boat off of the Keel while holding your hands on either side of the Keel under the hull. Invert the boat onto a clean surface to mask the edge of the Deck and paint the Hull. Don't forget to mask the Keel and Rudder holes. You can use small pieces of tape or (better) you can tightly roll a
scrap of paper or paper towel, insert into the hole and let it relax to fit the hole.



If you are brave, skilled, have long arms and want the boat to be one color, you too can paint it all at once. Mask the interior with a large piece of paper. Have a hook ready to hang up the boat between coats so the paint can flash (dry to the touch) for at least 15 minutes between coats in warm weather. Longer if cold. I recommend you put the hook indoors like in the garage or porch. Hung outside, bugs will land on it. If you see a bug in the paint, leave it alone until that coat has flashed, then scrape off with a pin or knife. Resist the urge to pick up the bug while the paint is wet. You will do far more damage to the paint with your finger than the bug will do. Wear a glove and wrap your arm. Wear a mask. Move far away from the cars or they will be painted too. If you use a Tack Cloth to remove dust (I'd recommend one.) just use light pressure. If it is warm outside, too much pressure on the cloth can leave sticky residue on the boat that you would have to clean off with alcohol. One light and one or two medium coats of Rust-Oleum 2X color plus a top coat of their UV- resistant clear gloss. This was hung up inside to dry overnight. Hardware was installed the next day.

Deck Fairleads: Find the fairlead drill locator dimples which are 4-1/2 inches in front of the cockpit opening and ½ inch behind it. Drill 1/4-inch holes through the deck at the two dimples.

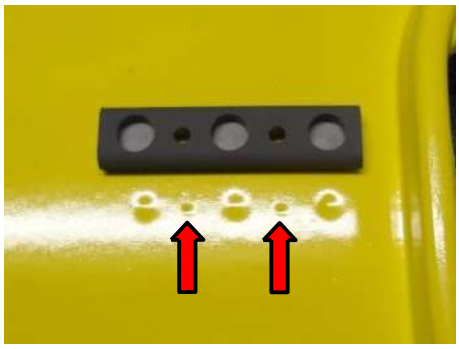

Each Fairlead includes a 1/4-inch Nylon bolt with a pink ceramic eyelet pressed on each end of a hole running through the bolt. Insert the bolt from under the deck through the 1/4 inch hole. Screw and hand-tighten the thumb nut onto the bolt as shown.
Deck Cleats: Use a 1/16-inch (1.5mm) drill for the Deck & Transom screw eyes. The Transom screw eye can be about 1/2-inch below the Deck overhang, centered on the Transom. There is no locator dimple on the transom.

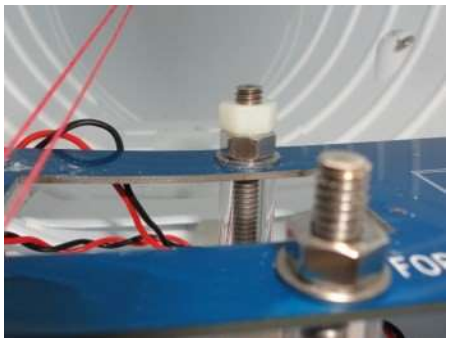
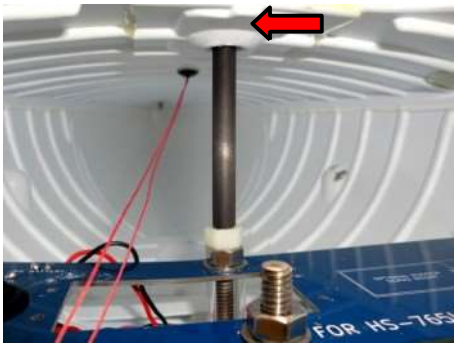

The stainless steel flanged finish washers help support the screw eyes from side loads. Start the screw eyes by hand.



As they bite into the fiberglass backers, use a bent wire or Allen wrench for the leverage to screw them the rest of the way until they contact the washers. Don't forget to glue a piece of foam inside your Cockpit Cover. It will sink without some flotation.


The Mast Step supports the mast. Note the five locator-dimples in front of the Cockpit opening. The two smaller ones (arrows) are for drilling holes to mount the Mast Step. Drill two 5/64-inch (2mm) holes at those marks down through the layers of the deck including the Deck, Deck Reinforcing Liner, fiberglass Backer and the King Post Upper Mount. Secure with the two #4 x 1/2 inch Phillips Flathead stainless steel screws. The Mast Step will normally support the mast in the center hole as shown.
Don't install the mast yet. Once the deck/hull sealant has cured a few days, **install the King Post**.

King Post: (Sail Servo removed for clarity.) When you stack the washer, the keel nuts, and the Nylon spacer nut on the bow- end Keel Bolt you will have about a quarter inch or less of threads showing. The King Post will fit over the exposed threads as it rotates into the upright position. By using a ¼ inch drill to de-burr the inside of both ends of the post, it will be easier to **slip over the threads as you rotate the top up and into the upper mount.** You have to lift the deck at the front (bow-end) cockpit opening to help engage the post into the slope-sided recess of the upper mount. As you rotate the top of the King Post forward, and the bottom is touching the white nylon nut, it should just touch the flat area (arrow) in front of the angled recess if it is the correct length. If it is tight and binding there, it may need trimming with sandpaper. If your mast & rigging is on the boat, you have to **remove the tension from the mast** to be able to lift the deck to insert or remove the King Post. **The Lower Hull Kit is complete and ready for your Mast, Rigging & Sails.**

Painting Tips: It will take 2 to 3 coats of most hobby paints to give a good even color. Never try to get full coverage with the first coat. It will run every time! You should be able to see through the first coat. **The best tip about any kind of spray paint is to let the paint "flash" between coats.** A coat of paint has "flashed" when it is dry to the touch. Don't touch the boat. Touch the masking paper or somewhere where a fingerprint won't show in case you touched it too soon. Hold the can a full 12 inches from the surface. "Plastic Friendly" paints have a reputation of being thin or easy to drip. Rust-Oleum 2X Ultra Cover or Krylon Fusion paint will take 15 minutes to flash depending on the temperature. Different colors can take different times to flash. Set a timer and walk away. A rushed paint job will look rushed. A coat that has flashed properly will support the next coat and prevent it from dripping. Read the directions on the can. Most list a maximum time you can wait between coats, to mask over one color to apply a 2nd color for example. Exceed that maximum recoat time and the new coat can cause the earlier coats to bubble or blister. They may say "Recoat within 2 hours or after 7 days". The second coat will take longer to flash than the first. Be patient! Practice on a scrap stood on it's end. Your goal is to get coverage without runs. Avoid spraying enamel on very humid days. Humidity can cause the paint to "blush" leaving a cloudy appearance to dark colors or a dull appearance in glossy paints. "Non-toxic" model paints are safest to brush on. Although these paints will dry to the touch in an hour or so and may be dry enough to handle in 24 hours, they will be soft and easily dented or scratched until they harden in 3-4 days so handle with care until then.

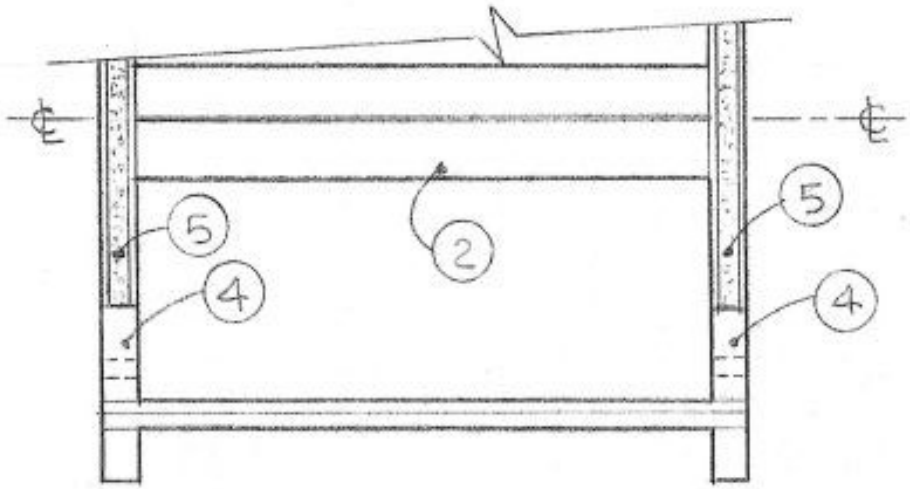
Painting The Hull: Styrene is best painted with Acrylics, Hobby Enamels, Krylon Fusion paint or Rust- Oleum 2X paint that is safe for plastic. Sanding may not be necessary as these "Bonds to Plastics" paints chemically bond with the hull plastic. They will not peel from the surface, even when scraped by rocks or other sharp objects. Lacquers and regular enamels may melt or weaken the styrene in thin areas or when applied wet-on-wet. Non-plastic-friendly enamels may need the surface to be scuffed so they can bond to the plastic. Use them at your own risk! Test your paints on the leftover plastic scraps. See "Painting Tips" on the website. Ask others with experience the best way to paint. Learn from other's mistakes.

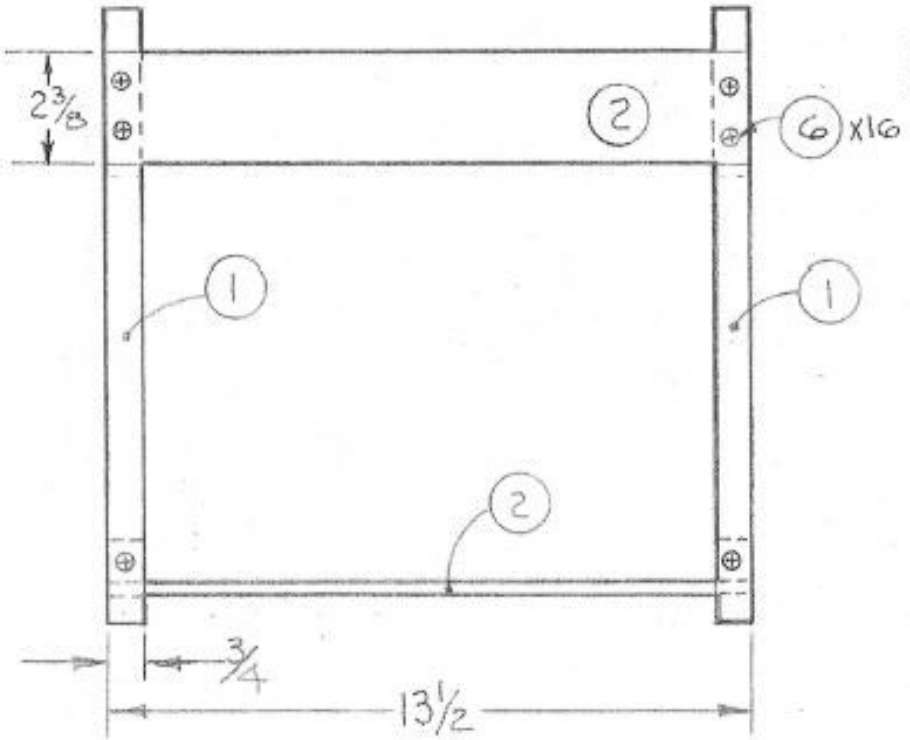
MAINTENANCE: After a day of sailing, remove the cockpit cover. Remove any water inside the boat. Leave it open to dry. If you find water, after removing the water set a fan to blow air into the hull for a day to ensure all moisture is removed. Occasionally add a little plastic-friendly (synthetic) grease to the rudder shaft.

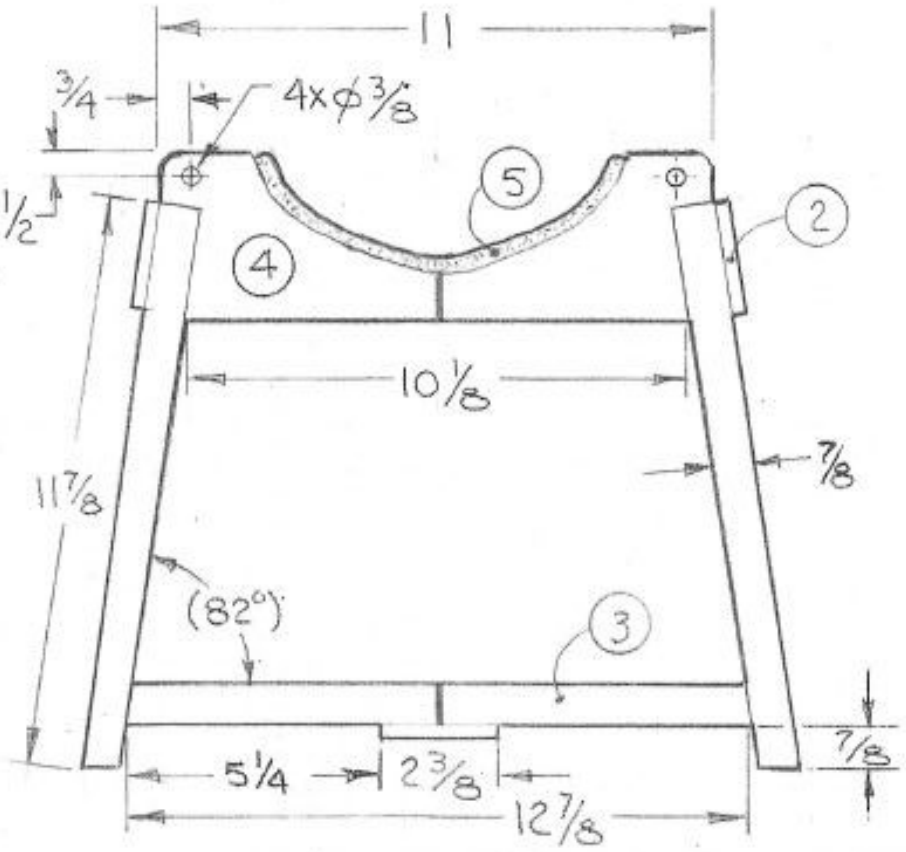
C. Boat Stand Plans

MATERIAL LIST

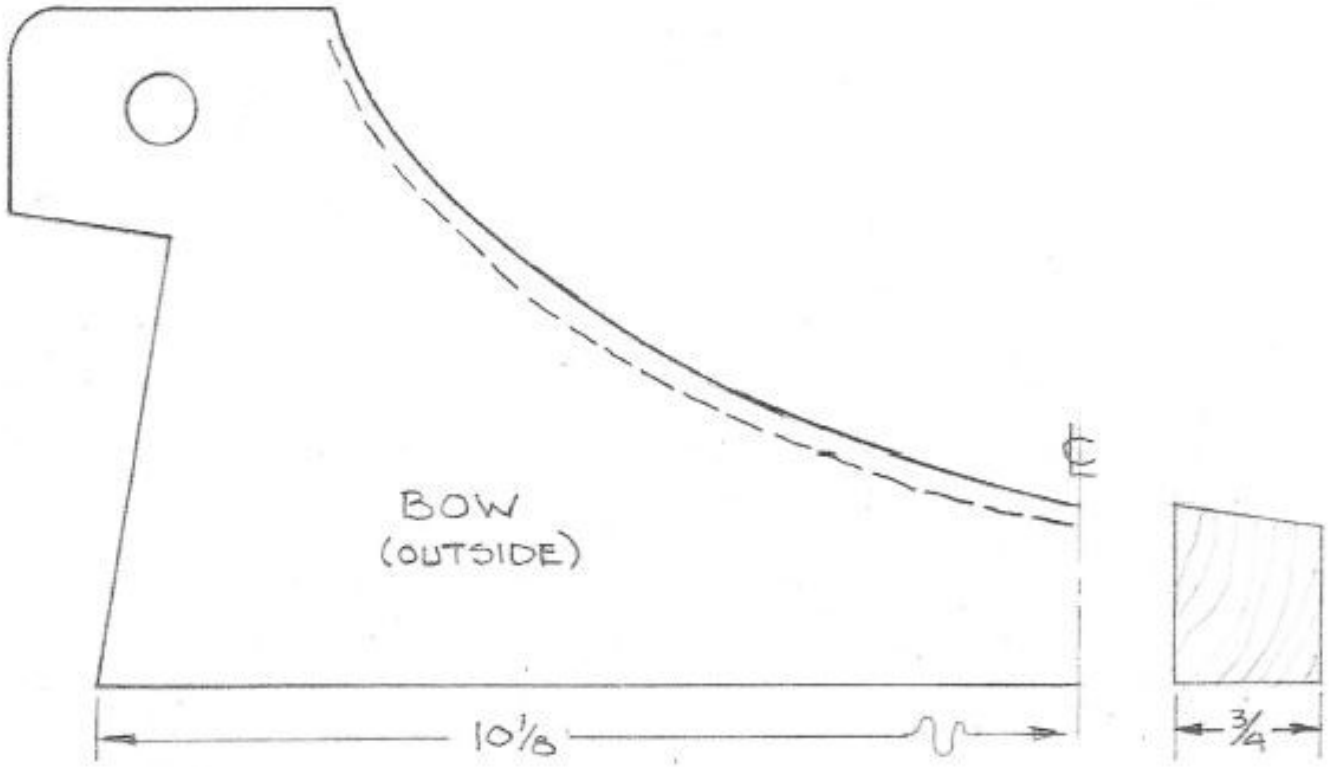
① 4x 3/4 x 7/8 x 11 7/8 PINE
② 3x 1/4 x 2 3/8 x 13 1/2 PINE
③ 2x 3/4 x 7/8 x 12 7/8 PINE
④ 2x 3/4 x 3 1/2 x 11 PINE - SEE Fig. 2
⑤ 3/8 x 1/2 x 19 FOAM WEATHERSTRIPPING
⑥ 16x 1 1/2 DRYWALL SCREWS

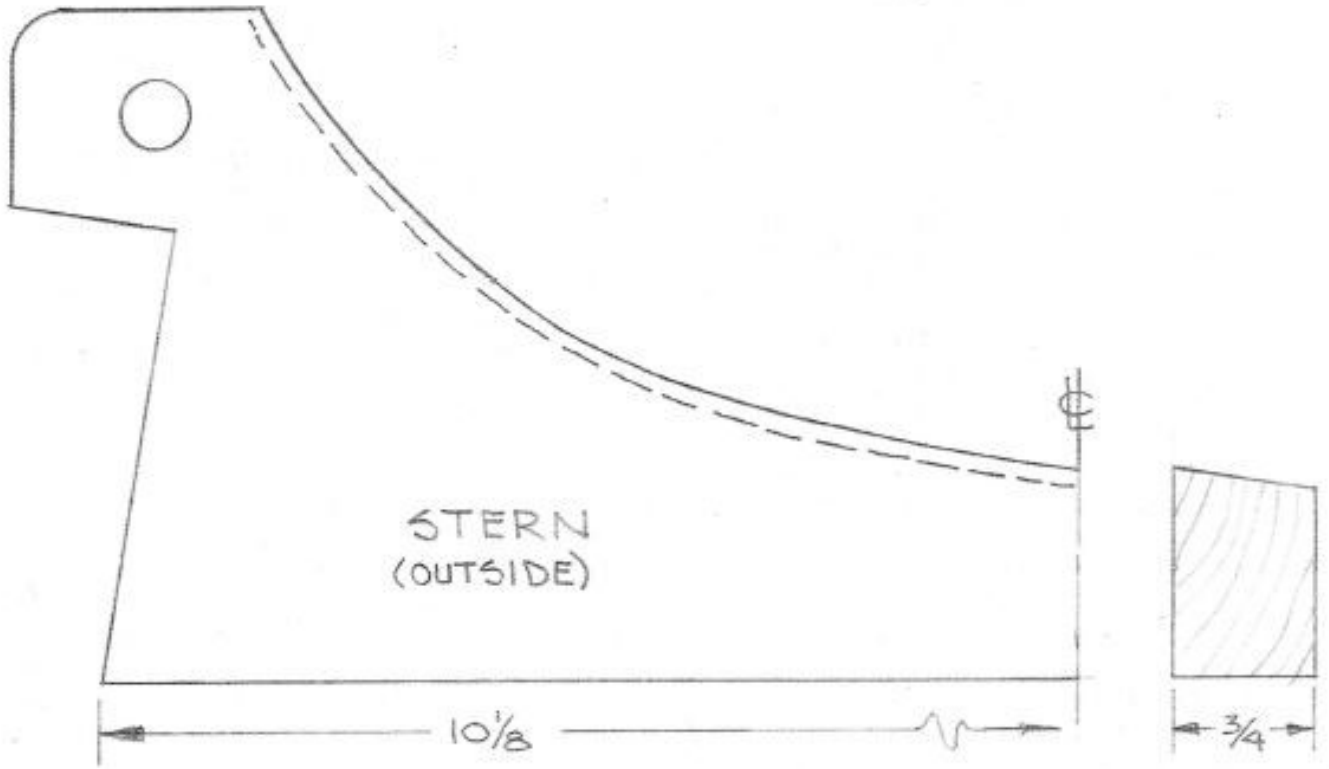






SCALE	TITLE	FIG.
1/4" = 1"	BUILDING STAND	1





SCALE	TITLE	FIG
1" = 1"	BUILDING CRADLE	2

D. Mast Construction

Mast Class Rules

The mast and booms shall be made of aluminum alloy tube, solid wood or plywood. Spars may be any shape, although tapered masts are prohibited. A slotted mast is permitted. Spars may be reinforced using line wrapping. Hollow wood or hollowed plywood spars are prohibited. If used, plywood must have all layers of uniform density.

Masts must have uniform gross cross sectional dimensions of between 1/2" (12.7 mm) and 3/8" (9.52mm) minimum thick; and between 53/64" (21 mm) and 5/8" (15.87mm) deep, not including reinforcement.

Any method of sail attachment to the mast is permitted. The jib boom (club) and main boom shall be made of solid wood or plywood, or aluminum alloy tube, having minimum dimensions of 3/16" (4.76mm) across x 3/8" (9.52mm) thick and a maximum length of 15-1/2" (393.7mm). Booms shall not be permanently curved fore and aft. No weight shall be added to the jib club (boom) forward of the swivel.

Construction

If available, Sitka spruce will give a strong and light weight mast. Bass wood is an acceptable alternative. Three strips make up the mast and should be cut to 3/16 x 3/4 inches, taking note of grain direction as you cut the strips. The inner strip grain should be across the strip and the two outer strips should form a V shape (either up or down) as you look at the end grain of the mast. See Mast X-Section Detail.

Solid Mast

Using either epoxy or a quality waterproof glue (Titebond III) spread adhesive evenly making sure all the mating surfaces are covered, place strips together evenly and clamp or wedge to a U-shaped jig or solid flat surface. It is recommended that you use wax paper around the mast to prevent sticking.

After drying, drill all required holes, while mast is square. Rout a 3/8" slot 1" deep at the bottom of the mast. Prepare a hardwood plug of the same dimension with a pre-drilled 11/16" hole (1" deep) into the plug. Then enlarge the same hole by drilling 13/64" (3/8" deep) for the mast jack. Glue the plug into the mast.

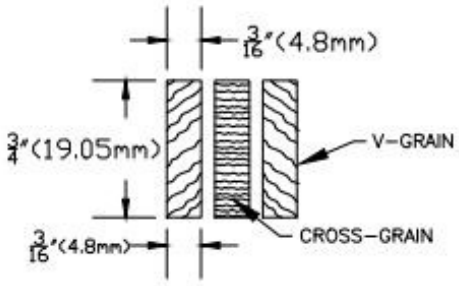
Cut each side strip of the mast into a wedge shape by making a diagonal cut. Set the blade 9/16" from fence. Finish sand and round all corners on belt sander or by hand.

Slotted Mast

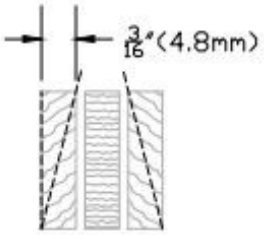
If available, Sitka spruce will give a strong and light mast. Bass wood is an acceptable alternative. The two outer strips should be cut to 3/16 x 3/4 inches, taking note of grain direction as you cut strips, the grain should form a V shape (either up or down) when placed together (see drawing). The inner strip (hardwood core) should be cut at 2 degrees on both sides, resulting in 3/16” width at the bottom, and 7/32” at the top of its final 1/2 inch height. The outer strips are then routed 1/16” from the edge with a 3/16” round bit, 3/64” deep.

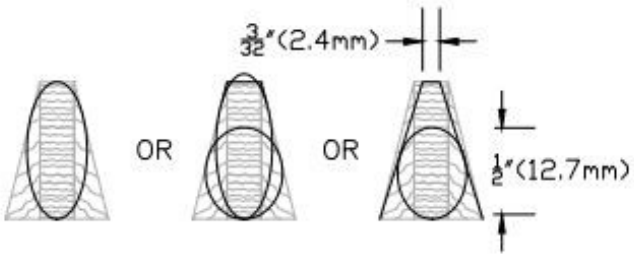
Using either epoxy or a quality waterproof glue (Titebond III) spread adhesive evenly, making sure all the mating surfaces are covered, place strips together evenly and clamp or wedge to a U-shaped jig or solid flat surface. It is recommended that you use wax paper around the mast to prevent sticking. After drying, rout a 3/8” slot to install a hardwood plug, as described above for the solid mast. Finish sand and round all corners on belt sander or by hand.

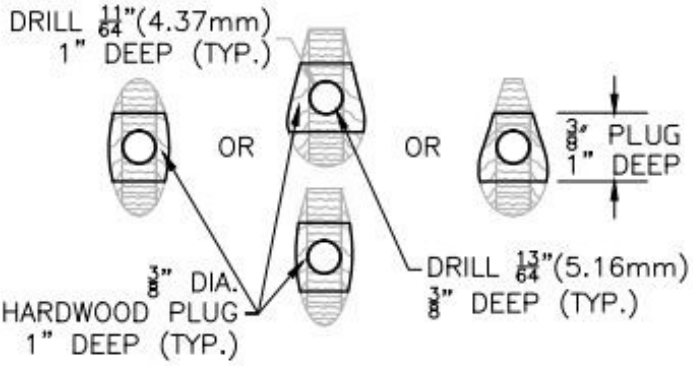
MAST X-SECTION DETAILS



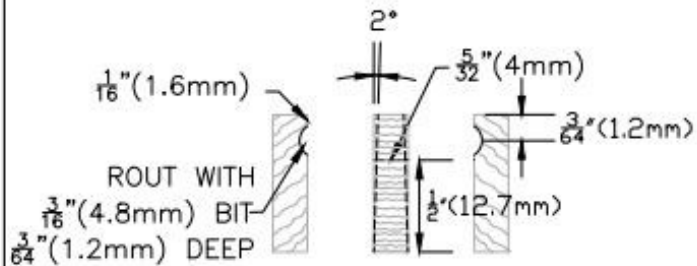
SOLID MAST

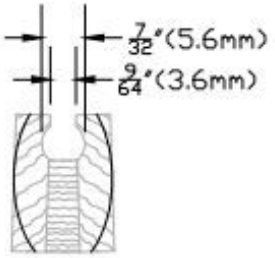


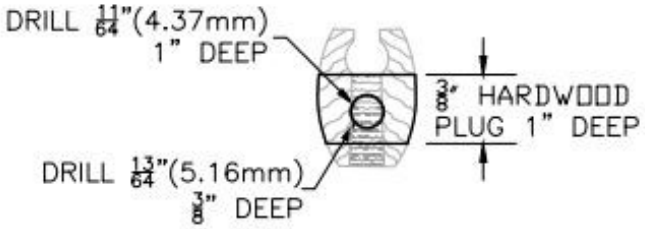




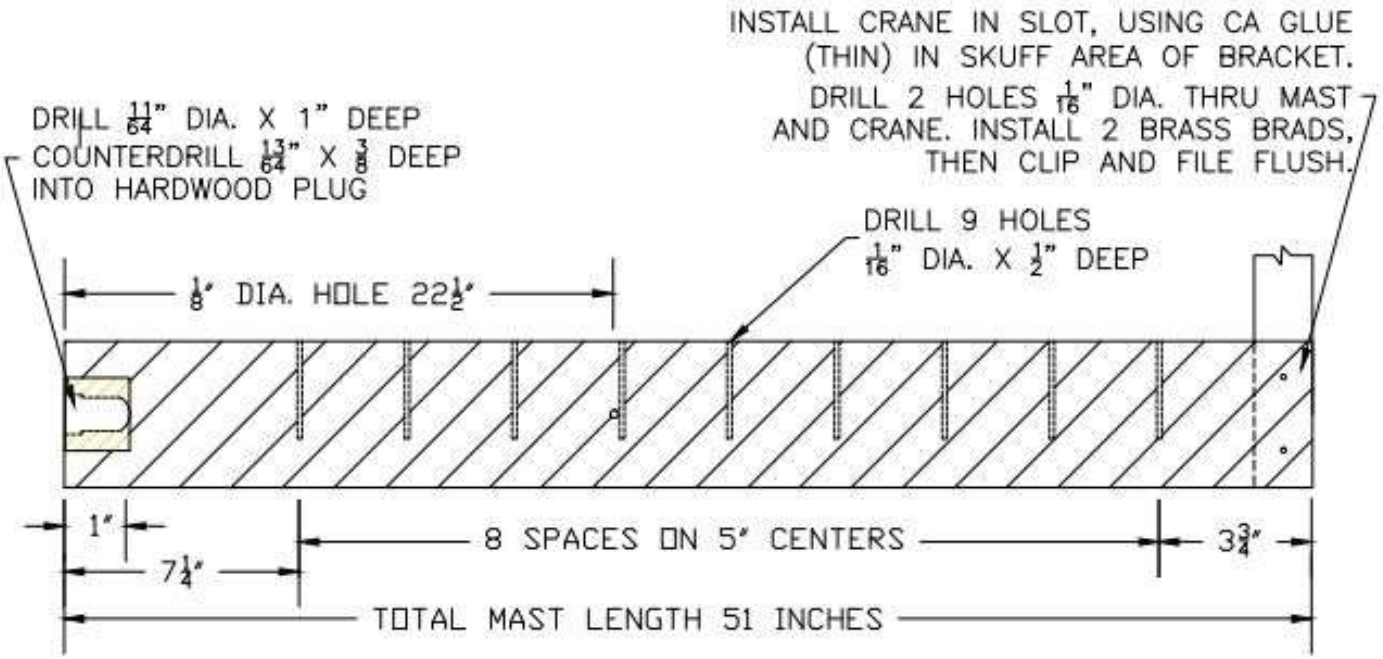
SLOTTED MAST



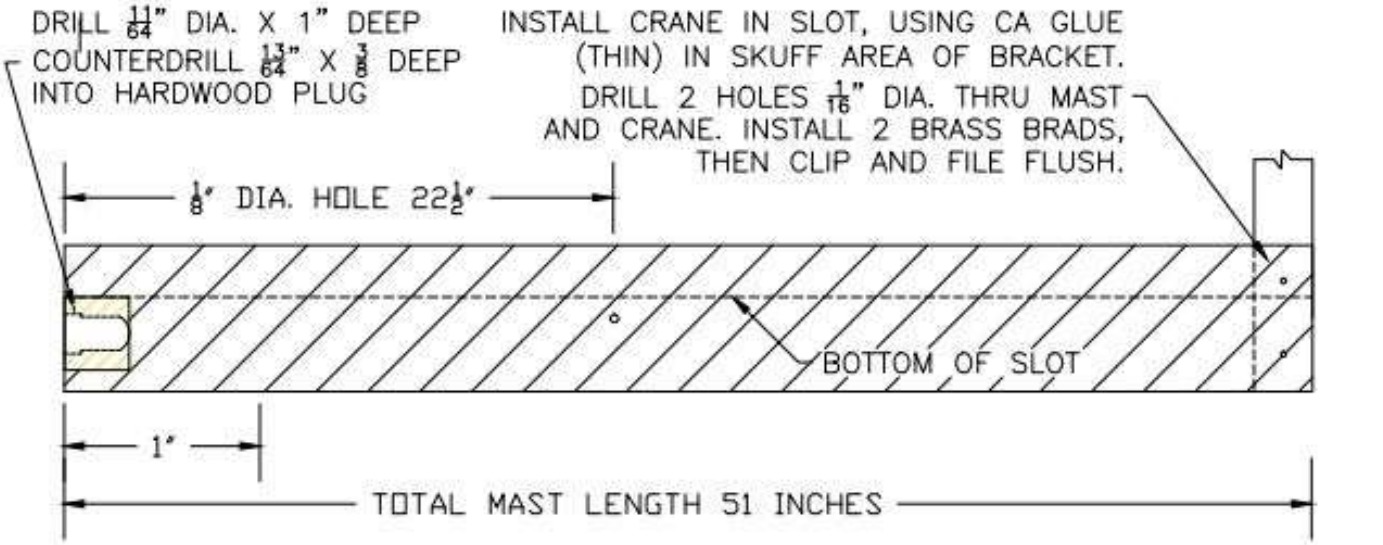




MAST DETAILS



SIDE VIEW – SOLID MAST
(not to scale)



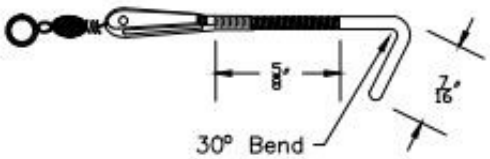
SIDE VIEW – SLOTTED MAST
(not to scale)

E. Mast Fittings and Details

MAST FITTINGS & DETAILS

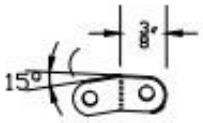
Stay Hooks (4 required)

Stock: .081" Brass Rod 1 7/16" long
2-56 thread Gold Clevis
#3 Swivel
Directions:
Make 2-56 threads 5/8"
Bend 30 degrees at 7/16"



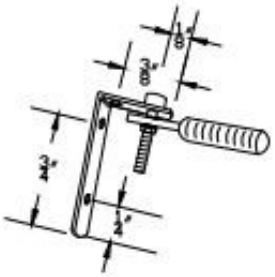
Tangs (4 required)

Stock: .032" Flat Stock 1/4" x 3/4"
Directions:
Bend 15 degrees at 3/8"
On two, drill 1/8" hole at one end, and 3/32" hole at the other end
The other two tangs have 3/32" holes at both ends
Burnish all 3/32" holes



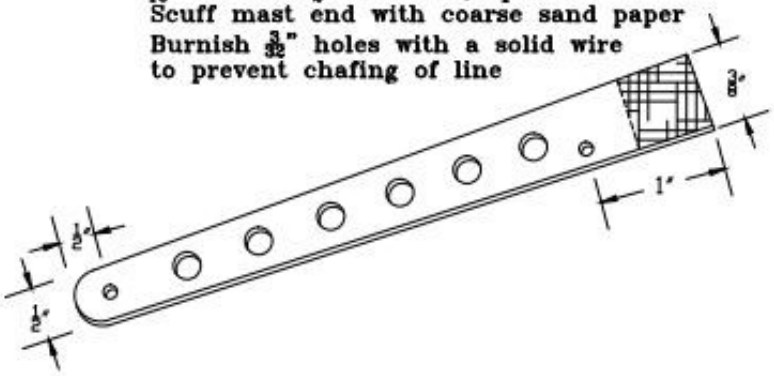
Goose Neck

Stock: 2-56 DuBro Ball Link
.032" Brass Flat Stock 1/4" x 1 1/2"
Directions:
Make 90-degree bend at 1/2"
Make (4) 3/32" holes:
On 1" leg, at 1/4" & 3/4"
On 1/2" leg, at 1/8" & 3/8"



Back Stay Crane Bracket

Stock: 4 to 4 1/2" x 1/2" x .063" Aluminum or Brass
Direction:
Drill 3/32" hole at 1" and 1/4"
Taper width from 1/2" to 3/8"
3/16" holes @ 1/2" intervals, optional
Scuff mast end with coarse sand paper
Burnish 3/32" holes with a solid wire to prevent chafing of line



Mast Jack

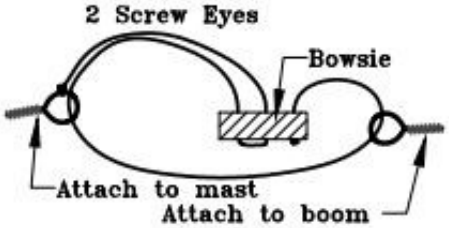
Stock: #10 T Nut
#10 x 3/4" cap screw
#10 Nut
Small servo arm

Stay Line (6 required)

Stock: 60# Test Dacron Braided Line
2 @ 24" Lower Stay
2 @ 48" Upper Stay
1 @ 63" Backstay - 1 bowsie
1 @ 52" Forestay - 1 bowsie
(working lengths, not actual)

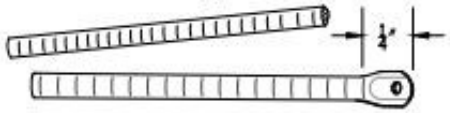
Boom Vang

Stock: 15" 60# Test Dacron Line
1 Bowsie
2 Screw Eyes



Spreaders

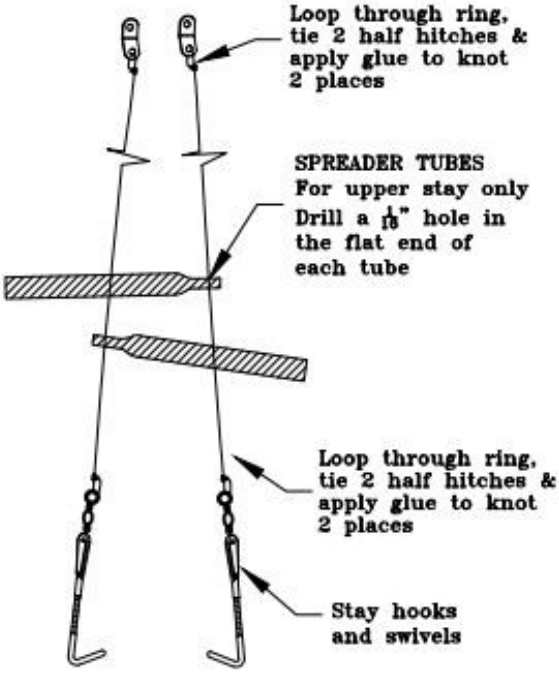
Stock: (1) 1/8" x 2 1/2" Brass Rod
(2) 1/8" x 2 1/2" ID Brass or Aluminum Tube
Direction:
Crimp 1 end of tube at 1/4"
and drill 1/16" hole



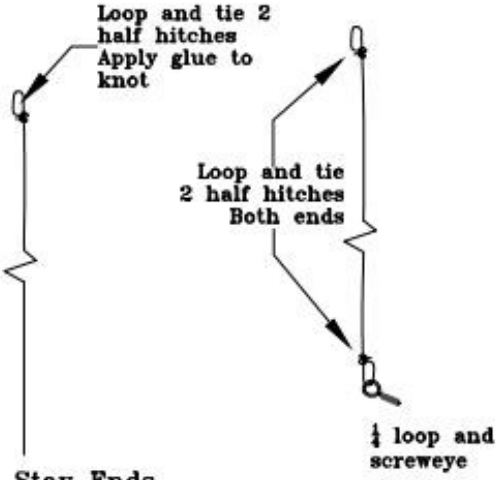
JAN 2023

F. Standing Rigging Details

STANDING RIGGING DETAILS

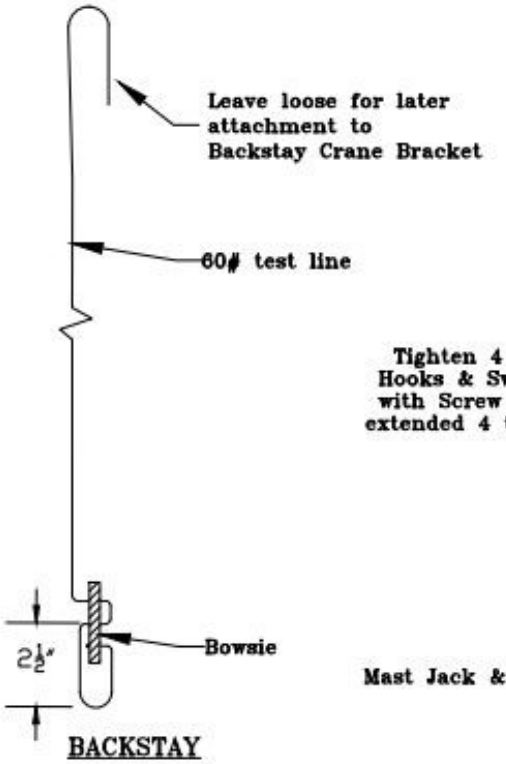


UPPER & LOWER STAY ASSEMBLIES

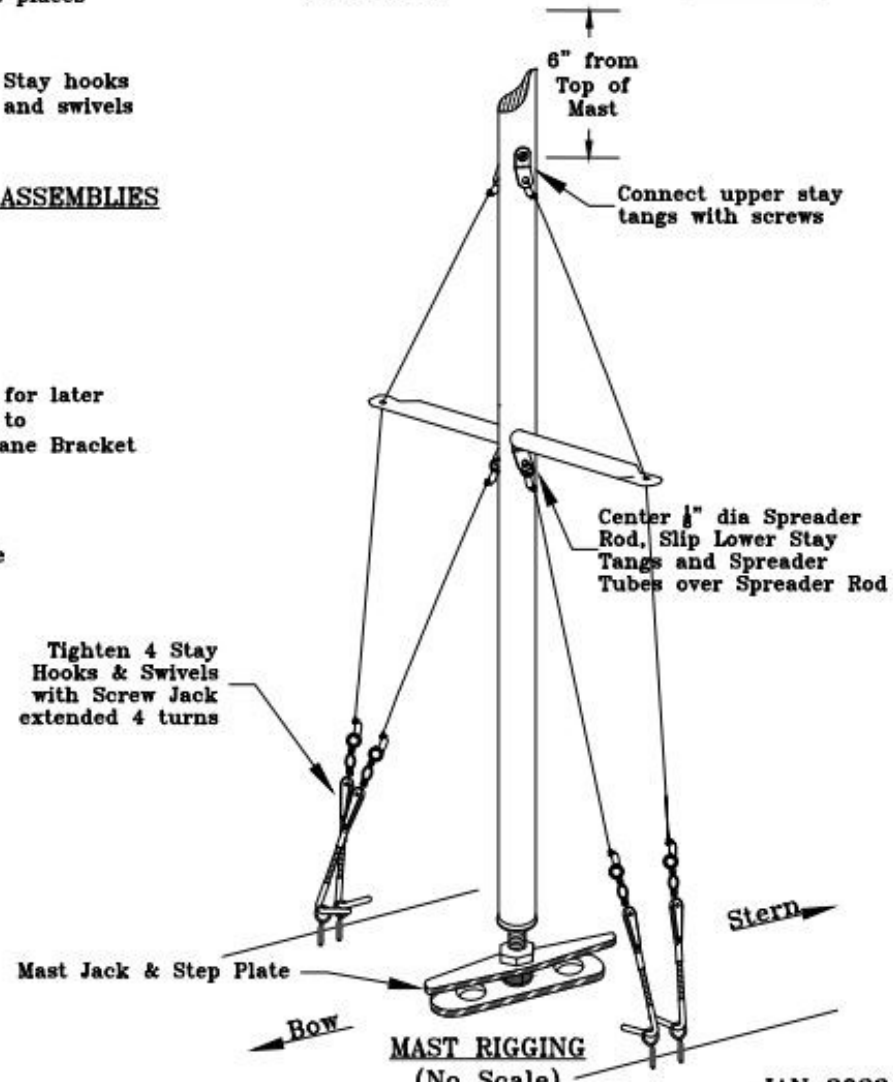


Form Stay Ends as Shown

FORESTAY



BACKSTAY

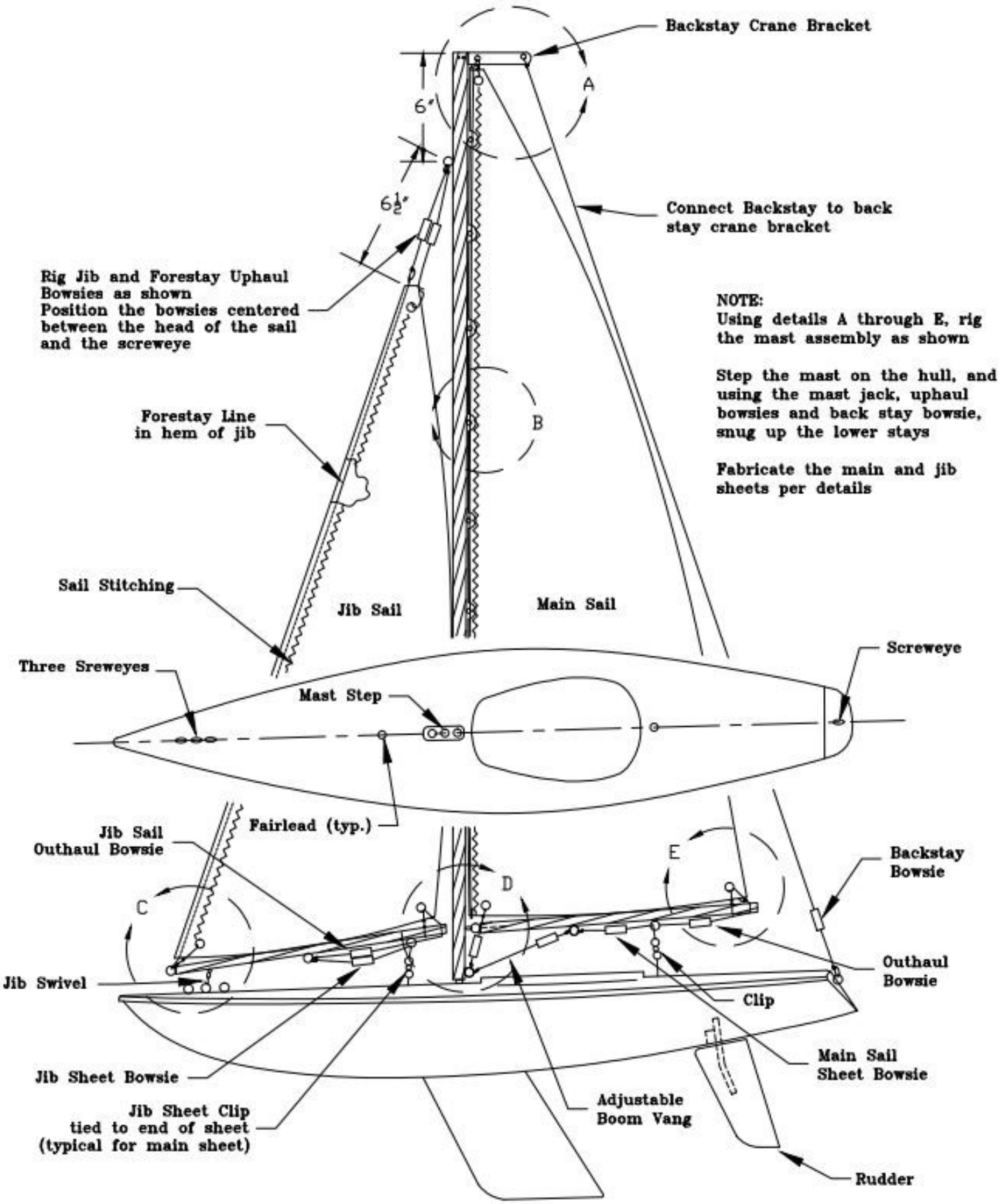


MAST RIGGING
(No Scale)

JAN 2023

G. General Rigging Layout

GENERAL RIGGING LAYOUT



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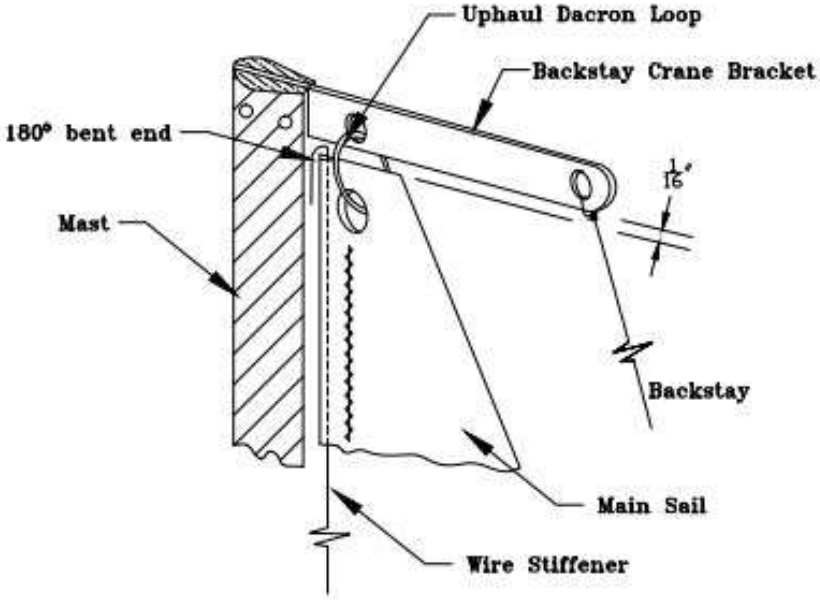
GENERAL RIGGING DETAILS

DETAIL A
MASTHEAD RIGGING

1. Cut a piece of stay wire 48½ inches long. Tightly bend each end of the wire ½" inch x 180°. Insert the wire in the sail hem and center. both ends of the wire will be exposed.
2. Using Dacron line, install the uphaul loop. Fix the knot with a small drop of CA glue and kick immediately with accelerator to prevent the line from stiffening.
3. Connect the backstay line to the crane bracket, using two half hitches.



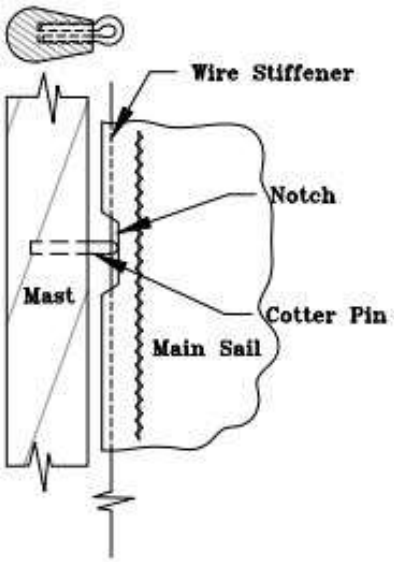
DETAIL B
MAIN SAIL ATTACHMENT

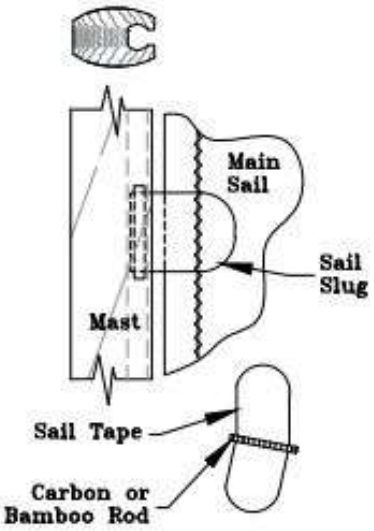
SOLID MAST

1. Position the sail hem with the wire stiffener installed adjacent to the mast. Mark the sail with the position of each of the 9 pre-drilled 1/16" diameter holes in the mast.
2. Using a sharp X-acto knife, slit the sail hem ⅛ inch adjacent to the wire in 9 places. Seal frayed edges with a hot soldering iron.
3. Place a cotter pin over the exposed wire in each notch. With the Dacron loop installed in Detail A, insert the cotter pins to the eye in each pre-drilled hole in the mast (9 places).

SLOTTED MAST

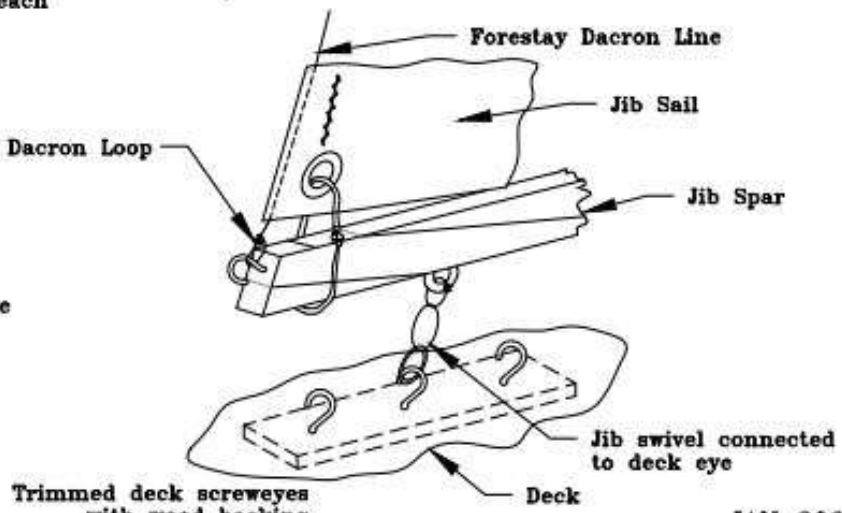
1. Create 10 sail slugs: Lay 4mm x 1" carbon or bamboo rod across ¾" x 2" sail tape. Fold to sandwich sail fabric.
2. Attach 8 slugs, centered along sail luff, spaced at 5"; attach one at each end spaced at 1½".





DETAIL C
SHOWING JIB SAIL TACK AND SWIVEL ATTACHMENT

1. Screw the forestay screweye into the tapered end of the jib spar. Pass the forestay fully through the jib sail hem from the bottom.
2. Using Dacron line, tie 2 half hitches to attach the sail to the screweye. Fix the knot with a minute amount of CA glue.
3. Rig the jib sail clew eye details using Dacron line as shown in Detail E.



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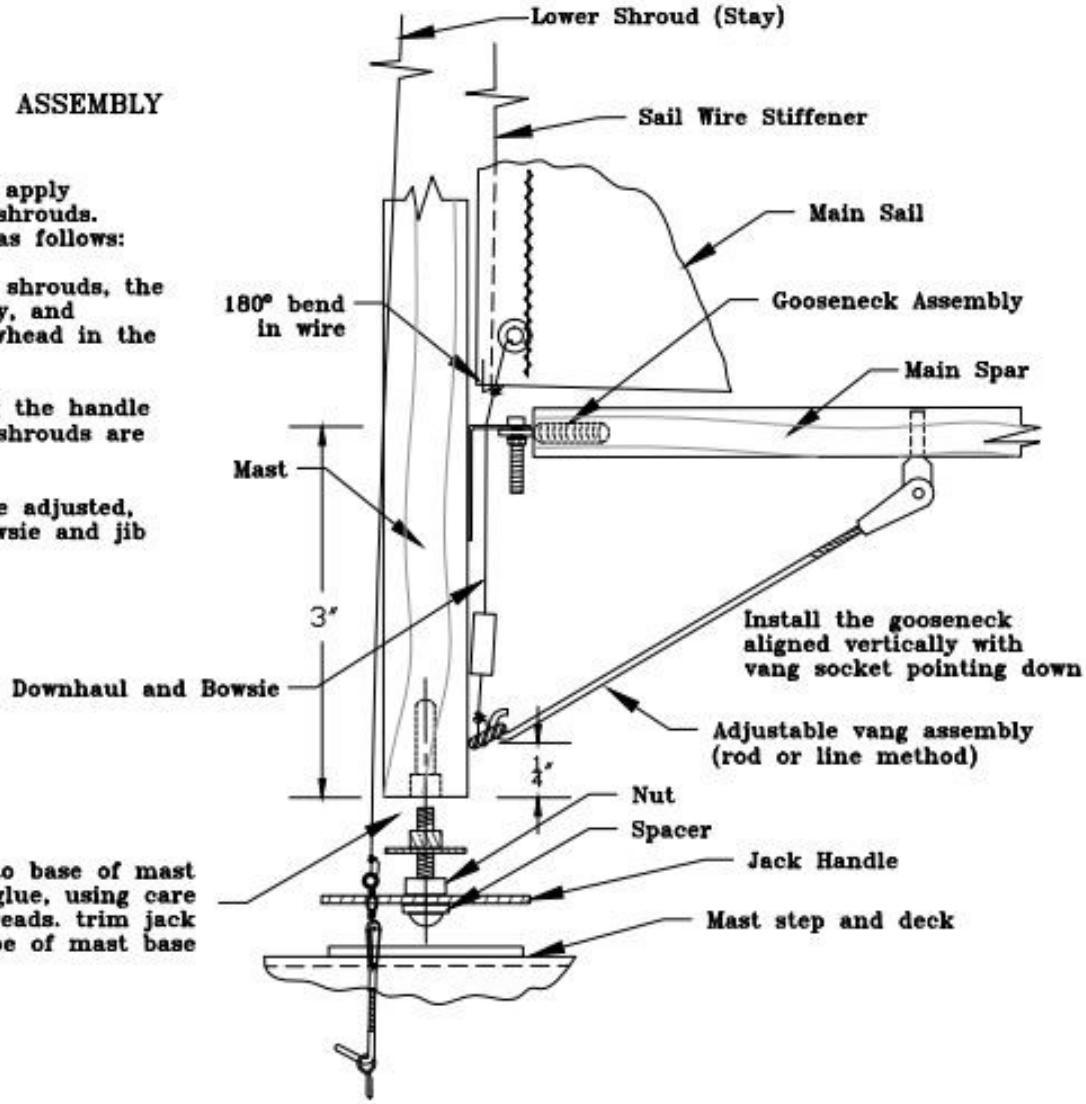
GENERAL RIGGING DETAILS

DETAIL D
SHOWING MAST BASE, MAST JACK AND VANG ASSEMBLY

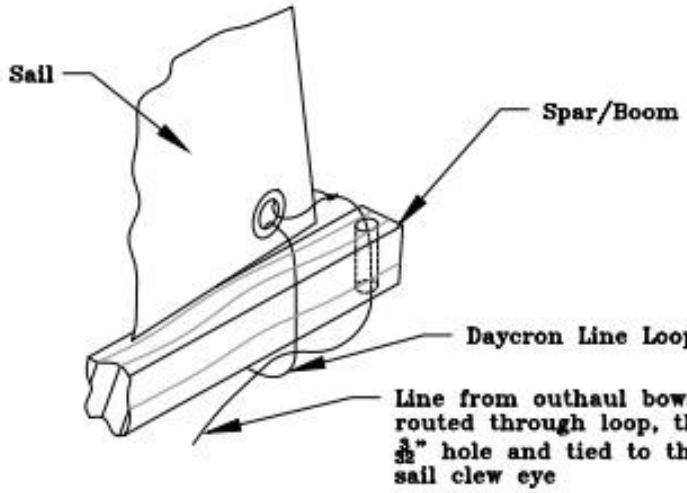
MAST OPERATION
The mast jack is used to apply tension to the two lower shrouds. Erect the mast assembly as follows:

1. **Connect the two lower shrouds, the jib swivel, the backstay, and position the jack screwhead in the deck mast step.**
2. **Rotate the screw using the handle (servo arm) until the shrouds are just tight.**
3. **Mast rake may then be adjusted, using the backstay bowsie and jib uphaul bowsies.**



DETAIL E
SAIL CLEW ATTACHMENT METHOD TYPICAL FOR MAIN AND JIB

1. **Form a loop around the jib and main spars, using Dacron line and a two half hitch knot. Adjust the length so that sail is approximately ¼ inch above the spar.**
2. **Using Dacron line and bowsies, form and route outhaul bowsies through the loop, spar and 3/32" diameter holes.**



H. Electronics

Radios

There are many good radios on the market.
Currently we are using the Flysky FS-i6 Transmitter with FS IA6 Receiver. This radio-receiver package can be purchased on Amazon for about $55.00.

Radio Specifications:
Channels: 6
Model Type: Glider/Helicopter (and Sailboats!)
RF : 2.405-2.475GHz
Bandwidth: 500KHz
Band: 142
RF Power: Less than 20dBm
2.4G System: AFHDS 2A and AFHDS
Code Type: GFSK
Sensitivity: 1024
Low Voltage Warning: Less Than 4.2V
DSC Port: PS2; Output: PPM
Port: No
Length: 26mm * 2(Dual Antenna)
Power: 1.5AA * 4
Display Mode: Transflective STN Positive Type,
128 * 64 Dot Matrix VA72 * 39mm, White Backlight.
Size: 174 * 89 * 190mm
Weight: 392g
Online Update: Yes
Color: Black

Receiver Specifications:
Channels: 6 Channels
Model Type: Airplane / Glider / Helicopter
Frequency : 2.4--2.48GHZ
Band Width Number: 140
Transmitting Power: Not More than 20dBm
RF Receiver Sensitivity: -105dbm
2.4G mode: The second of an enhanced version of the automatic digital system
Encoding: GFSK
Antenna Length: 26mm * 2 (Dual Antenna)
Input Power: 4.0-8.4V DC
Size: 47 * 26.2 * 15mm
Weight: 14.9g
Color: Black
i-Bus interface: Yes

The transmitter is the handheld radio used to control the sails and the rudder of the Soling (or any other style RC sailboat.) The transmitter sends control input signals to the small receiver mounted inside the hull of the boat. The receiver is connected to the sail winch arm servo and to the rudder servo. The servo is a small motor and gearbox housed in a plastic case that mounts inside the boat. The motor and gearbox turn a splined output shaft. The output shaft mates to a servo arm which converts the rotational motion of the shaft to a lateral back and forth motion.

NOTE: The receiver and servos shown in this manual ARE NOT WATERPROOF!

A properly built boat stays amazingly dry inside yet a gusty day can put water over the deck of a Soling, especially going downwind. The radio and servos are mounted high inside the hull and away from any water that does find its way in. A small sponge is a good way to remove water from the interior of the boat. A good practice is to store your boat with the hatch cover off to allow any moisture to evaporate.

Controls

Soling Class rules allow control of only two boat functions, the rudder and the jib & main sails. The sail winch arm adjusts the jib and the main simultaneously with one servo.

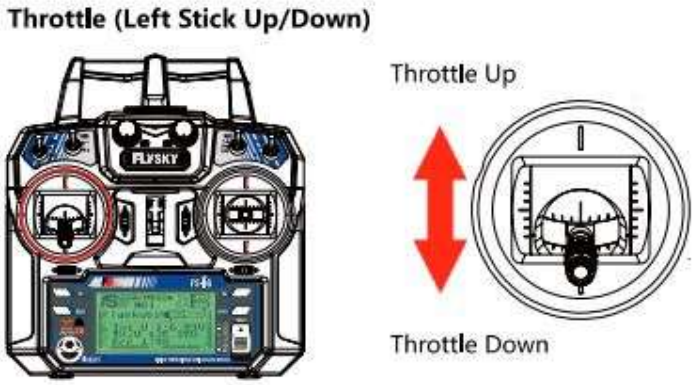
Common practice in RC sailing is to use the left stick on the transmitter for sail control, and the right stick for rudder control. Since we are using an aircraft-style radio, the left and right sticks are both mounted on gimbals that allow each to have up/down and left/right motions.

The up/down motion of the left stick is not spring-loaded; it will stay (and the sails will stay) in whatever position the sailor desires. The fully Up position allows the sails to be let out all the way; running downwind. The fully Down position brings the sails in tight; beating close-hauled. The left stick left/right is not used in RC sailing.

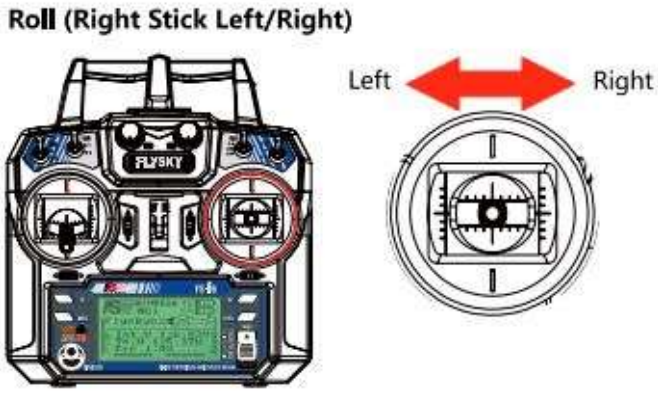
The left/right motion of the right stick is spring-loaded; it will return to center (and the rudder will return to center) upon releasing it. Move the stick right to turn the boat to the right (starboard.) The right stick up/down is not used.

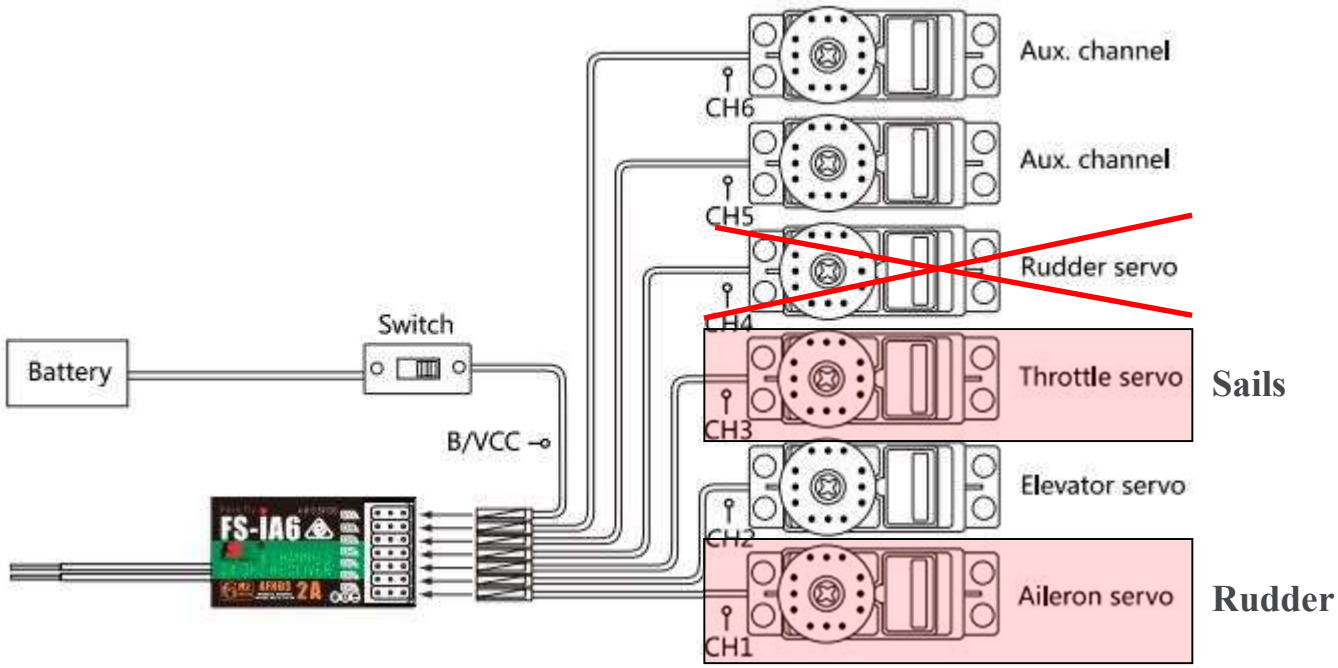
To prevent fatigue and provide better control, a lanyard around the sailor’s neck is used to support the radio. The radio has an attachment point on the face just for this purpose. It also comes in really handy to keep your radio out of the lake when leaning over to launch or retrieve your boat!

The Flysky operator manual designates the channels as used with RC aircraft. In the manual, the **left** stick up/down is the Throttle on Channel 3. This is the channel used to control the Sails. Plug the lead from the Sail Winch Arm servo into Ch 3.



In the Flysky manual, the **right** stick left/right is the Aileron on Channel 1. This is the channel used to control the Rudder. Plug the lead from the Rudder servo into Ch 1.





NOTE: The Rudder servo shown on the diagram is only for Airplanes, not Sailboats.

The Flysky operator manual can be found here: **https://www.flysky-cn.com/fsi6**

Servos may not arrive in the box turning in the direction you need. For example, all the electronics are installed and when the right stick is pushed right, the rudder turns left. The servo direction can easily be reversed using these directions from the Flysky manual.

5.2 Reverse

The reverse function changes a channels direction of movement in relation to its input. For example, if a servo has to be mounted upside down due to space restrictions within a model, this function can be used to correct its movement so that it matches up with the user controls.

Setup:

1. To change between normal and press the "OK" key until the desired channel is selected, then use the "UP" and "DOWN" keys to change setting.

Nor = Normal, Rev = Reverse.

2. Hold the "CANCEL" key to save and return to the previous menu.
3. To return to default settings press and hold the "OK" key for 3 seconds.Press and hold the"CANCEL"key to save.

Binding

The transmitter is “bound” to the receiver electronically. This prevents the signals from one radio to interfere with the signals from a different radio. The transmitter and receiver in the box may arrive already bound from the seller. If not, it is an easy procedure.

4.2 Binding

The transmitter and receiver have been pre-bound before delivery. If you are using another transmitter or receiver, follow the steps below to bind the transmitter and receiver:

1. Connect the supplied bind cable to the B/VCC port on the receiver. *
2. Insert power into any other port. **
3. Hold the "BIND KEY" while powering on the transmitter to enter bind mode.
4. Remove the power and bind cable from the receiver. Then connect the power cable to the B/VCC port.
5. Check the servos' operation. If anything does not work as expected, restart this procedure from the beginning.

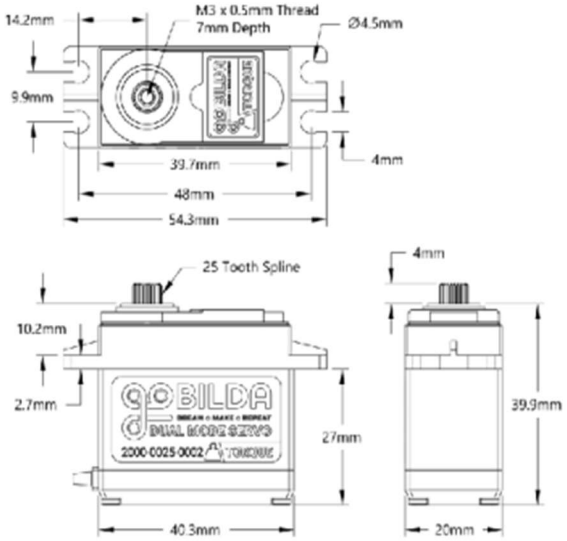
* The Bind Cable (or binding plug) is the small plastic loop included with the receiver. It is just a jumper wire.

** Check to be sure the transmitter is OFF before connecting the lead from the battery to the receiver.

SERVOS

Sail Servo

BILDA 2000 Dual Mode Servo (25-2 Torque)



Let's look at some selected specs:
Voltage Range: 4,8-7.4 V
No-load Speed: 50 rpm (6V)
Stall Torque: 300 oz in (6V)
Stall Current: 2.5 amps (6V)

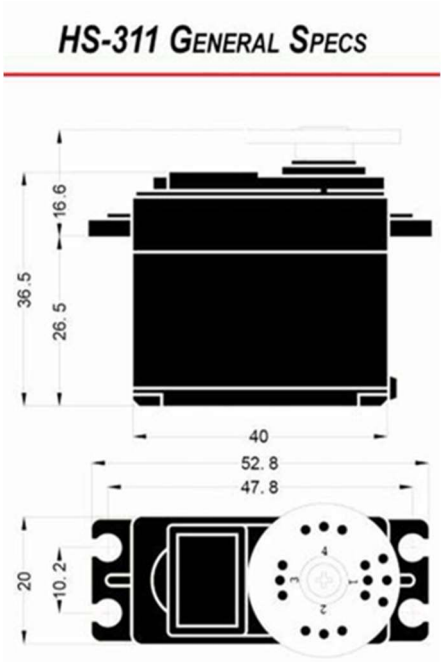
Default Rotation: 180°
Max Rotation: 300° or continuous
Motor: Brushed DC
Output Shaft: Dual Ball Bearings
Shaft: H25T Spline

Rudder Servo

HITEC HS-311 Standard Economy Servo

Product Specifications

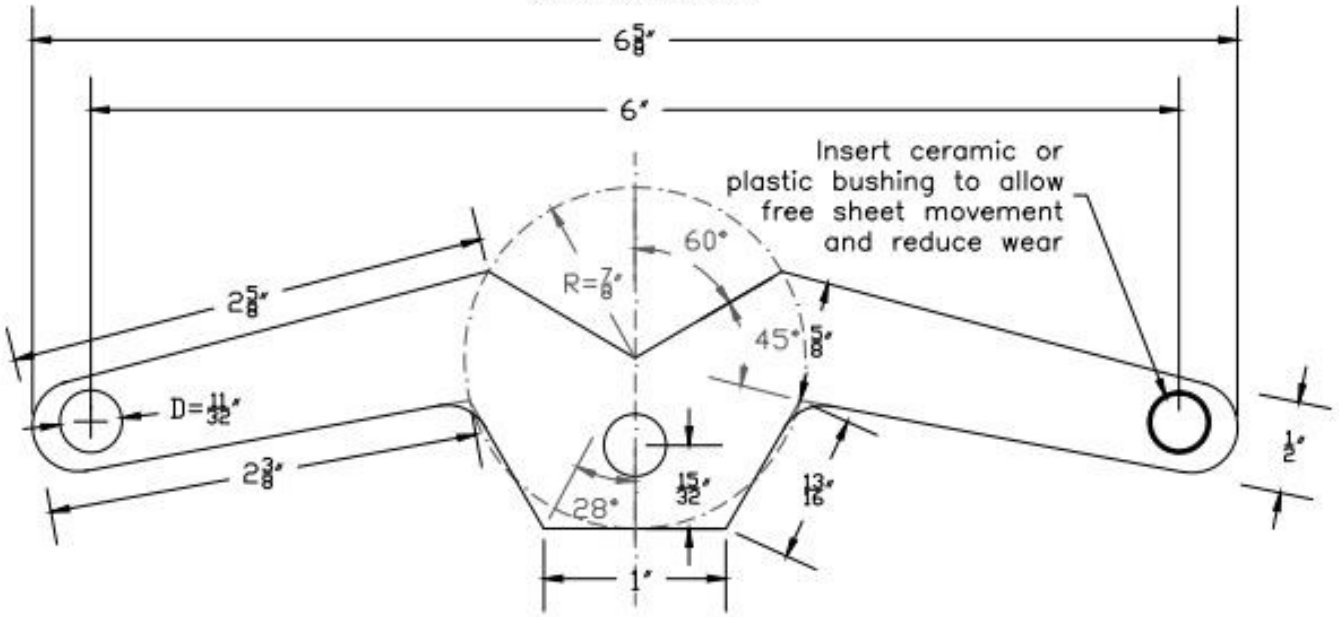
Current Draw Stall	800 mA
Motor Type	Brushed
Servo Operating Voltage	4.8 - 6.0V
Max Servo Torque	40-99 oz-in
Current Draw Idle	7.7 mA



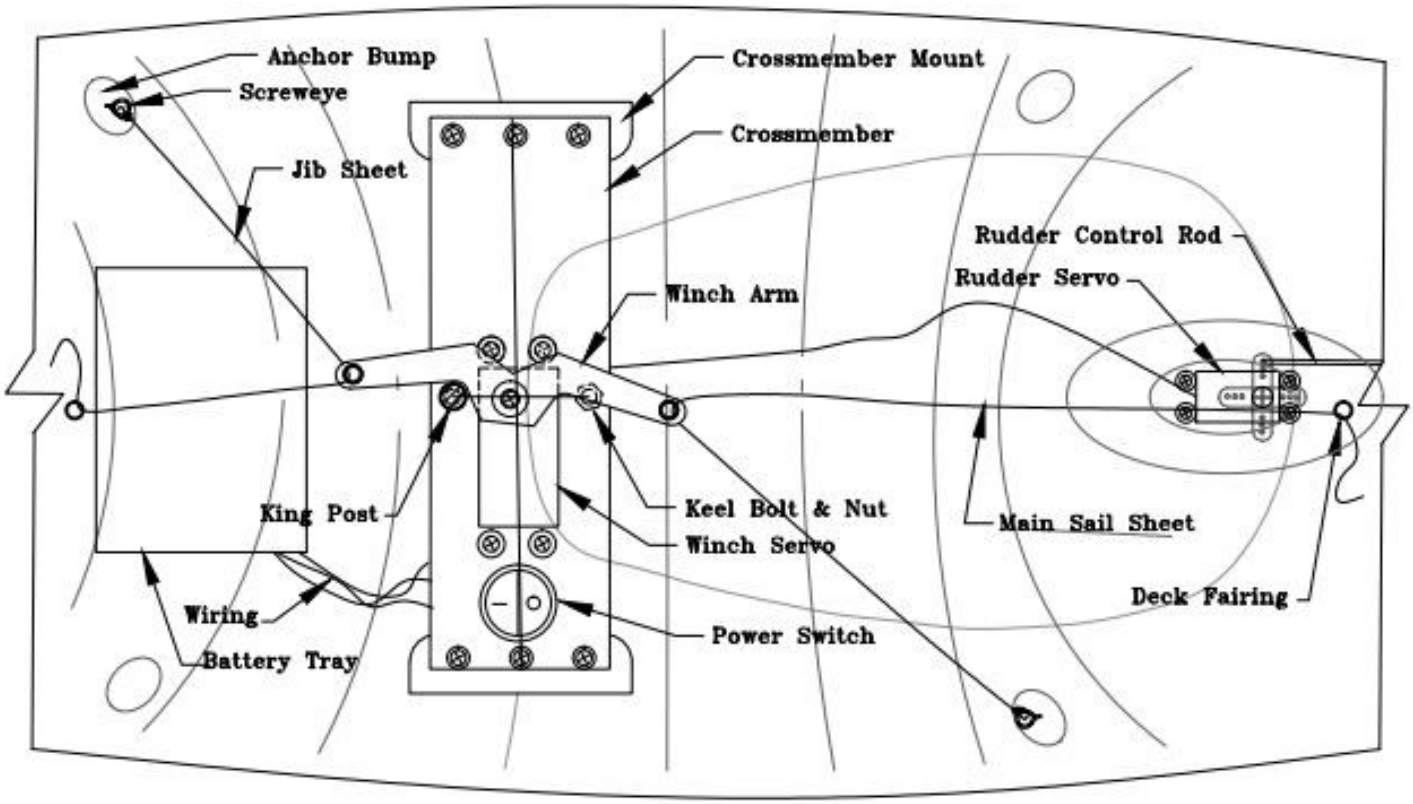
I. Winch Arm and Equipment Details

WINCH ARM & EQUIPMENT PLACEMENT

Winch Arm



Hull Equipment



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J. Other Information

Purchases

Servos and battery leads are available at Servo City.
https://www.servocity.com/ phone: 620-221-0123
Sail servo - SKU # BL2406S
Rudder servo - SKU # 31311S

Sails

The museum was able to purchase a supply of closeout sailcloth that will meet the needs of our building class. We do recommend the use of sail Battens. They are made from plastic packaging, cut in strips and attached with basting tape. The number and length are listed in the rules.

There are other suppliers of sailcloth available, but make sure that it is Dacron to meet the class rules -- any weight cloth is acceptable.

Sailrite.com

Ready-made sails are also available from several sources:

Siriussails.com Millicansails.us
Carrsail.com Windjamingsails.com.

All the fitting needs are available online; we found most on Amazon.
K & S ¼" flat brass stock is part # 8240
K & S .081 brass rod is part # 8168

CA glues, CA accelerators, sealants, and epoxies are available at most hobby shops locally or online, and at hardware stores.

Small screws, nuts, and bolts are available at Micro Fasteners.
microfasteners.com phone: 610-438-6177

Several of the small fittings and braided Dacron line used are fishing supplies available at local stores and online.

Shop Notes

Carefully follow the building instructions. They are tested procedures that work and will make your building process much more enjoyable.

In Building, as in Sailing, Rule #1 is HAVE FUN!

Review the rules and do not be afraid to experiment within the rules.

Look at other boats for ideas that skippers have developed. As an example: Some run their sheets through the deck and have the adjustment bowsies on the deck, eliminating the bowsie on the boom.

Another popular procedure is to wrap the base of the mast and the end of the main boom at the gooseneck with line. The wrapping should measure about an inch. Then carefully soak the line with CA glue to reinforce these high stress areas.