

# ***3DS1M Almost-Race-Ready Kit***

## ***3DS1M Building Procedure***

*3D RC Boats is proud of the 3DS1M kit. This kit is meant to be sailed competitively in the Soling One Meter class of the AMYA (American Model Yachting Association) or just for fun. This boat was built using 3D modeling and other 3D machining for all its molds/parts including its 3D printed keel trunk and rudder assemblies. We've made it as symmetrical as can be, which in turn will aid in building a true and straight boat. Also, the Styrene used is of the best quality, giving the 3DS1M its weight savings and competitive edge without sacrificing its strength.*

*Note on Building Jigs:* No Jig is needed in this build. You WILL need a stand, so build or buy a simple stand.

## **Supplies Needed:** (Items in **bold** generally available at Hobby Shop)

- **Exacto Knife**
- **Needlenose pliers**
- **Disposable epoxy brush** (metal-handled paint brush)
- Methyl Ethyl Ketone (MEK)-from a paint store
- **Thin and Medium CA Glue**
- **CA Glue Accelerator**
- **Wet/Dry Sandpaper- 220, 600, 1000, and 1500 grit**
- Measuring Tape- 6ft. or longer, metric/ English if possible
- Body Filler- **Bondo type or Squadron waterproof**
- Drill motor, 1/16", 3/32", 1/8", 3/16", 11/64", 13/64", 9/32" drill bits, cutoff wheel
- Paint Thinner (Mineral Spirits)
- **Slow-Setting Epoxy-** 24 hr., such as WEST # 105 resin and #206 or #209 Hardener
- 6-3/4 lbs. #9 or #8 lead shot (unless buying a pre-made keel)
- Lacquer thinner
- **Small paint brush** (that you won't mind ruining)
- Flexible plastic ruler- clear if possible
- Isopropyl alcohol (use as a cleaner when pouring epoxy and for cleaning surfaces before painting.)

## **Adhesives:**

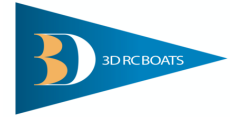
### **Thin CA Thick CA**

**MEK** (methyl ethyl ketone—available at paint stores) is the recommended material by 3D RC Boats for bonding plastic to plastic. MEK works to bond plastic to plastic in the kit. MEK will “wick” through the tight joints of polystyrene, “welding” them together and sealing in the Process—works very quickly.

**The downsides**—MEK will cause the plastic to ripple.

**The best advice is to use solvents sparingly as you assemble.** You can always then go back and “flow” the chemical around to seal the hull/deck joint by quickly moving and rolling the boat around letting the chemical flow to all areas.

Other Builders have used other adhesives than the MEK for joining hull and deck.



Here are some other possibilities. ALL of the below have been successfully used by Soling builders.

**Plexus MA-310**—2-part structural marine adhesive. Very strong, used for “difficult-to-bond” plastics.

**3M 5200 Fast-Cure Adhesive**—this is a strong adhesive, with a longer work time and cure time than the Plexus. Available in **fast cure** (full-cure 24 hours) and regular (7 days) at West Marine, and other marine outlets.

**Thin and Thickened CA**—used for wood-to-plastic and wood-to-wood joints. Hobby-grade CA at the hobby shop is different and higher quality than the “instant glue” or “super glues” you buy at convenience, grocery or even hardware stores. CAs cure “instantly” in the presence of water, hence they instantly bond skin. **Be careful**—especially with kids and CAs. The “**CA Accelerator**” is a water-based material that sets CA very quickly. **CA De-Bonder** is to break apart a bond.

**Epoxy**—making your keel, you should use epoxy and hardener, to mix with the #8–#9 lead shot ballast (not polyester too much heat). Any normal (slow cure—at least 30-minute) epoxy will work, but you have to take measures to control heat in the keel-pouring operation.

**WEST #105 Epoxy Resin**, plus a SLOOOOW hardener, like **West # 206**, which takes 12 hours to fully cure with limited heat generation is available from marine stores.

Another good choice is **System 3 Epoxy**, available from Jamestown Distributors. Buy the pump set for precise proportioning and foolproof results.

**IMPORTANT:** With conventional epoxies (even from the hobby shop) you should keep the keel assembly under water during the cure to control the heat.

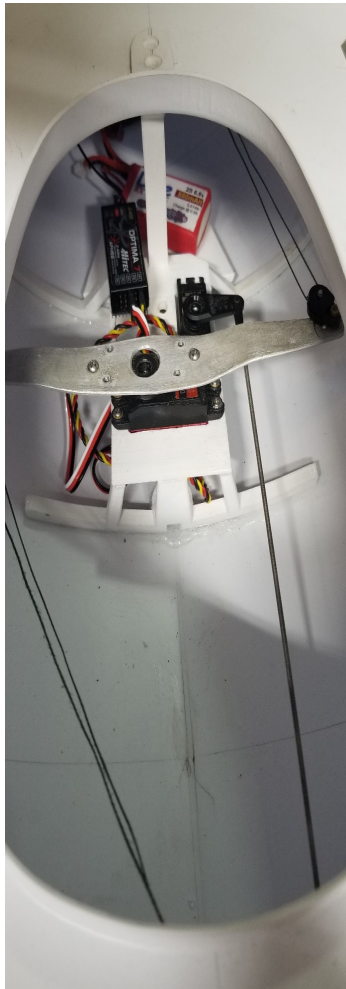
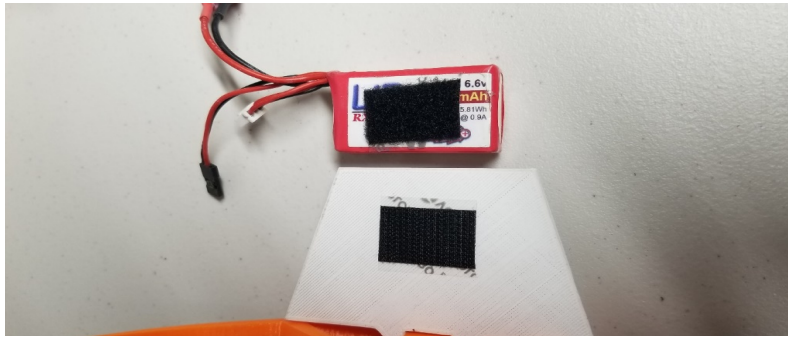
### **Parts included:**

- 1 polystyrene Hull with Keel and Rudder assembly, Deck, and Transom installed
- 1 Mast step
- 1 Keel Assembly (ready for epoxy)
- 1 Rudder with rudder post
- 1 Hatch cover
- 1 Hatch cover gasket
- 1 Push Rod and Kwik Link for Rudder
- 1 Steering Arm Assembly

### **Building Instructions:**

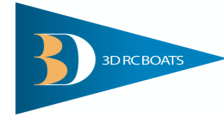
#### **Installation of the electronics:**

Install the rudder and rudder servo on the servo board on the keel trunk assembly. Then, install the sail servo. (See picture.) Receiver can be mounted opposite of rudder servo using Velcro.



### **Fill the Keel (after all finishing, rigging, etc.)**

1. Put all on the boat—including batteries, install servos, mount the rig, including the sails. Mount the keel (do not glue). Don't forget, if you are going to paint the boat it will add about 2 to 3 oz.
2. Using a digital scale, put your stand on the scale (or make a cradle using a box), zero out the scale, then weigh the boat several times. Write the weight in pencil on the boat (so you won't misplace it). The boat should come in at about 2 lbs. 14 oz. (indicating a needed keel fill of a total 6.75- 7 lbs). If it comes in lighter, great (assuming you have everything installed on the boat!).



3. A pound is 16 oz. Epoxy weighs about 2/5 of lead. Subtract your boat weight from 10.0 lbs/ 160 oz. to determine desired total keel weight.
4. Determine the needed total weight to add to the keel in lead shot and epoxy to reach 160 total ounces (or slightly less). Multiply by 5/8 or .62 to estimate the amount of lead.
5. Weigh the epoxy and the lead to see if they come up to approximately the weight that you determined you need in step 4 (above).
6. Double check to see that the keel shell halves are solidly bonded together. Then, tape mask the keel especially around the top (at least 2”), so you won’t get epoxy on the outside of the keel shell. Or, to be safe, the whole keel to lessen the chance of dripping epoxy on the shell.
7. Mix up epoxy in about 5 oz. batches. Thoroughly mix in SLOW hardener
8. Weigh and record how much lead you use at each step.
9. Pour or inject about a tablespoon of the catalyzed epoxy into the keel shell and move it around to coat the bottom of the shell.
10. Follow with pouring ¼ of the lead you anticipate using into the keel.
11. Pour in about 3 ounces of epoxy. Using a screwdriver, carefully mix the lead shot and epoxy that is inside the keel. Use caution to not puncture the bottom of the keel
12. Repeat this procedure, alternating lead then epoxy, and mixing. Weigh the keel after each addition to be sure you are getting to your desired weight. If you are filling the keel too fast, start using more lead/less epoxy.
13. Once the keel is up to weight, prop it up in a tub or bucket of water (not over the top of the keel), just in case you get some heat buildup.
14. Allow the keel to cure for 24 hours before topping off with epoxy. (There will be some shrinkage in the epoxy.)

## Fixing the Keel to the Boat

1. Coat the keel spar and inside of keel trunk with catalyzed epoxy.
2. Slide keel into the keel trunk.
3. Place boat onto stand with keel setting on bottom and place some weight on the deck to help keep keel set down into the keel trunk. A small hole (1/8”) can be drilled into top of keel trunk to let trapped air and excess epoxy out.
4. Clean up the mess using alcohol.

## Finishing your Soling One Meter

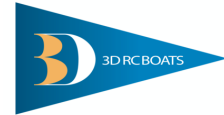
Options from simplest to most complex.

### A. Simplest:

1. Of course, leaving the hull and deck “as is” (white styrene) is the easiest route to take. The plastic styrene hull looks pretty smooth either sanded with a progression of wet/dry sandpaper grades (220- to 1500), or even just rubbed out using automotive rubbing compound.
2. **Add striping or decals** Using vinyl tape (automotive pin-striping) to add stripe or decals to the unpainted topsides is an easy way to distinguish your Soling.
3. A plain Soling can be dressed up with some **graphics**—thin decals, over sprayed with several coats of clear lacquer, sanded and polished.

### B. Painting:

1. In preparation for painting, start by sanding the hull with 220 wet dry paper for better adhesion. You may use a sanding block (these are sold in most hardware stores).
2. Fill in around the **transom and the aft end of the deck**, using "Bondo"-type body filler. **After curing, sand the seams until they are smooth. Once you are happy with the result, carefully wet a tissue with Thin CA, then quickly wipe the filler with the CA-dampened tissue which will waterproof the filler and harden it.**



3. Use only the paint and primer of the same brands and types. **Prime**-paint the hull with primer and let dry overnight. (**Exception**—the “paint for plastics” paints do not need a primer.)
4. Sand hull again with 320 wet dry paper on a sanding block. The boat is “smooth enough” when your fingernail passing over an area cannot feel any imperfections. Next prime the hull again, let dry, and hand sand (no block) this time with 600wet/dry paper.
5. Now you are ready to apply the color coat. Paint the hull with at least 3 or more thin coats of paint, until the color is even in tone. “Thin” means essentially misting the paint on in successive layers—you can almost immediately put on additional coats, about 1-2 minutes after painting. Light colors will take more coats than reds, black, dark blue, etc.
6. Put on accent stripes or a water line using striping tape. Or use decals to apply graphics to the hull—you will have to clear-coat over decals using Krylon Clear (see below).
7. To get a super-smooth finish, sand with 600 wet/dry paper, then 1000, 1500, and finish off with a 2000 paper, rubbing compound, then polishing compound. The paint will take 4 to 6 weeks to fully harden. So, be careful handling it, and when you put it in a stand, be sure to line the stand with a soft cloth.

### C. Paint Choices

There are many good paint choices. Always use the same brands of paint and primer, and the same brands in two colors if using two colors. *Never* mix types. For example, you should not use different types of paint for the lacquer on the deck and enamel on the hull, even if the can says you are able!

Paint Types:

- **Alkyd aerosols**—common in aerosols. **Solvents in aerosol paints are still “flashing”** for up to a week after painting, and the second coat will attack the first coat if you don’t do so **within 1-2 hours** after the first coat, **or wait up to 7 days to recoat**. Read the instructions on the can.
- **Real Enamel**—available in pint cans. (Rustoleum Rust Preventive Enamel). Can be airbrushed or brush painted. Be sure to thin it. Enamel is soft and never gets as hard as some other paints, making it respond to buffing better, and enamel will scratch easier. However, it is also easier to repair through buffing.
- **Lacquer**: This is another “old technology” paint. Lacquer dries faster, harder, and glossier than enamel. Clean up with lacquer thinner. (Do not try to *wipe* off mistakes when painting with lacquer. You have to *sand* mistakes off after the lacquer dries.) Probably the widest availability in hobby lacquers is **Tamiya TS-series** aerosols, which are sold in some hobby shops. These are “synthetic” lacquers, and can result in a beautiful, hard, and high-gloss finish. They dry very quickly, and can be recoated at any time. **DO NOT** allow the hobby shop to sell you Tamiya PS (for polycarbonate) or Acrylic paint. **ONLY** use Tamiya TS-series paint.
- **Polyurethanes**: these include automotive basecoat/clearcoat systems- 2-part paints (plus a reducer for thinning). An example is DuPont *Imron*. Polyurethanes are hard, very glossy, and durable. But, urethanes are generally not recommended for amateur use. They are very hazardous (toxic fumes and flammable) and hard to apply correctly. We do not recommend them for 3DS1M painting, unless you are an expert with the right respiration equipment.

*Parts of these directions were used with the permission from and thanks to the Western Reserve Model Yacht Club.*