



# Vac-U-Tug™

Model Tugboat

Hull Kit

For Radio Control

Manufactured by Vac-U-Boat™

1259 Humphries Rd.

Conyers, GA 30012

philpace@vac-u-boat.com

**Length: 22.5 in. Beam: 7 in. Draft: 2-3/8 in.**

**Thank you for purchasing this Vac-U-Boat hull kit.** It is easy for the novice to build in just a few hours. The drive system is very durable and should provide years of service with very little maintenance. The H.I.P.S. “High Impact Poly Styrene” hull is lightweight and strong. It is trimmed by a rubber rub rail that will greatly reduce the chance of damage to other boats during a collision. At full throttle, it runs at a normal walking pace making it easily controlled by young children without the risk to the the “adult toy boats” in the area.

There is plenty of room inside for your radio gear and batteries. The motor draws only .45 Amp cruising at full throttle. With a two channel radio, electronic speed control & average servo use, the total draw can average .76 Amp. With a new, fully charged 1,500mA 7.2 volt rechargeable battery, Vac-U-Tug will run for 1.5 to 2.0 hours! With this setup, about 27 ounces of ballast weight is necessary. This means that you can substitute heavier batteries or add electronic gear without overloading the hull. Oilite® bearings support the stainless steel prop shaft in a custom-drawn brass stern tube. A syringe of non-toxic, plastic-friendly synthetic grease is included for filling the stern tube. The brass motor-prop shaft coupling uses an acetal plastic dogbone that has self-lubricating properties to minimize wear. The injection-molded rudder is cast over a solid brass shaft and supported at the rudder arm with another Oilite® bearing. The screws are stainless steel. A DU-BRO™ E/Z Connector is provided to attach the stainless steel pushrod to the servo .

The boat can be painted with plastic-compatible hobby spray paints. Plastic-safe paints like Hobby Enamels, Krylon *Fusion* or Rustoleum 2X paints are the best. Sprayed or brushed acrylics work well too. If you are building the boat for a young child, I recommend that you spray the boat in their favorite color (even if they want it sprayed pink) then apply the vinyl decals and let them add their own customizing decorations.

Please read the following information, warnings, tips and tricks before building this model. Use caution with glue, the plastic bags, and small parts if children are around. Read the labels of all adhesives, paints, and electronics purchased for this hull. Use extreme care with hobby knives when cutting plastic.

Remember to turn on the transmitter first, then the boat’s receiver. Mount the boat switch on the cabin wall so it will be easy to locate. Teach your child to turn off the boat before lifting it out of the water. Even a plastic prop can be hazardous to their little fingers.

Enjoy your Vac-U-Tug. If you have any questions, you can contact me at [philpace@vac-u-boat.com](mailto:philpace@vac-u-boat.com).

Phil Pace



## 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. **THESE PLASTIC BAGS ARE NOT TOYS.**

**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. Bronze and brass alloys can contain .03% to 3.7% lead.

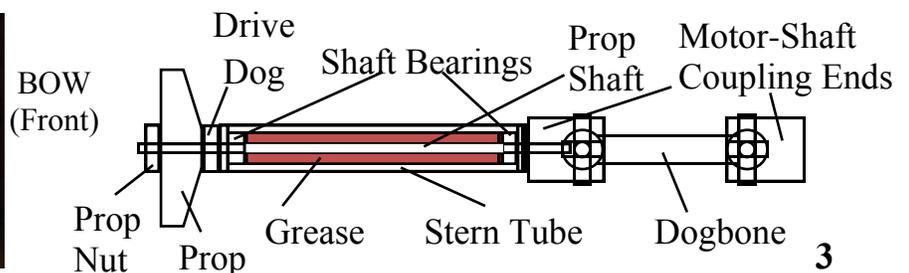
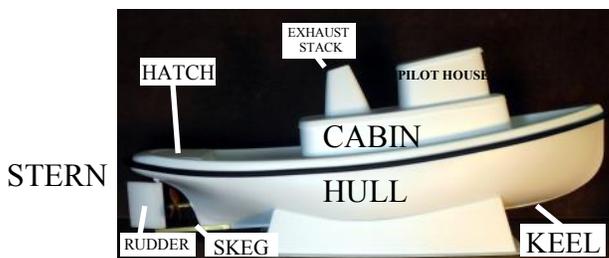
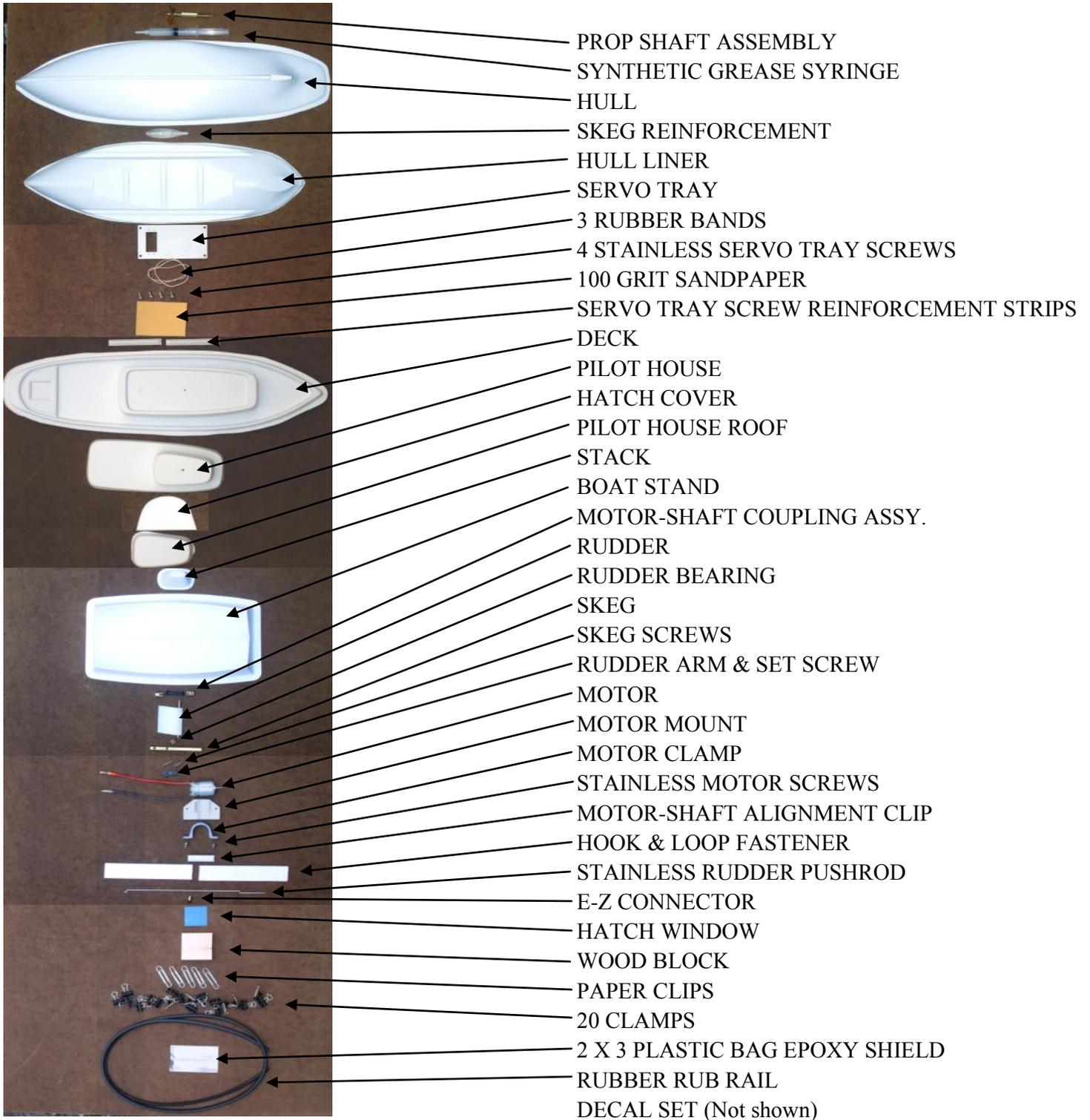
**WARRANTY AND RETURN POLICY:** All Vac-U-Boat Hull Kits are sold direct from Vac-U-Boat. If you purchased this from a dealer, contact that dealer on any matter of return. If you open and inspect this kit and for any reason you do not wish to keep it, return all of the parts to their bags and repack the kit into it's box along with a copy of the receipt. (Keep an original for your records.) Mail to Vac-U-Boat via the United States Post Office, Parcel Post with tracking. Please do not use any Express Mail carrier or send COD. Upon receipt of the complete kit, I will reimburse you the original cost plus the cost of the return postage shown on the package and mail those funds to the name and address on the receipt copy. I will replace any defective part found during the assembly or operation of the boat for a period of three months after the purchase date. This warranty does not cover damage caused by abuse, misuse, improper spray paints, alteration or accident. It does not cover consequential damages. You may have other rights, which vary from state to state. **Caution: Never leave the boat in a hot car. It will melt!**

**CUTTING PLASTIC: Adults only!** A sharp pair of sewing scissors is best to trim around the parts. Cut through sharp corners in the plastic with a hobby knife. While H.I.P.S. is tough, it will tear. When cutting out holes, as in the top of the Cabin and through the rear hatch, score the opening with the tip of the hobby knife. (Just a deep scratch.) Then trace the score 2 or 3 more times and you will cut through the plastic. As you cut through the plastic, hold the knife at a side-angle to keep the blade from binding in the cut. Don't hurry. Draw the blade slowly along the plastic to prevent overcutting. Think about where the blade would go if it slipped. (Like, into your leg or arm!)

**GLUE:** You will need about two ounces of 30-Minute or "2-Ton" epoxy. Most 15-Minute or shorter-time epoxies will break down over time with exposure to water. 30-Minute is waterproof and gives you more working-time for this model. Epoxy is used for the rudder shaft, skeg reinforcement, rudder bearing & ballast weights. Where specified, a filler should be added to make the epoxy less brittle, increase the volume, and to thicken it. Dry plaster, talcum powder, or micro-spheres all work well. Mix the two parts of the epoxy together first. Then, add the same volume of filler material and fold them together until blended. Medium CA (super glue) is best for gluing the H.I.P.S. together when attaching the Hull to the Deck, the Pilot House Roof to the Pilot House and for the Stack to the Deck. "Gorilla" brand Super Glue has a "medium" consistency and works well. If you are inexperienced with CA Glue, those small metal tubes of Model Cement found where plastic model cars are sold, either the regular kind or the "non toxic" type will work. Model cars are made of the same type of plastic as this boat. However, because the sheet plastic is so thin, it will melt more easily if you use too much glue. CA provides the strongest seam with less chance of weakening or melting the plastic but must be used in a well ventilated area. Both CA and Model Cement are permanent. If you think you will ever want to separate the upper and lower hulls, then glue them with epoxy. You will have to scuff the surfaces of plastic to help the epoxy bond to the plastic. Gentle prying will separate the parts. Experiment with the glues using the scrap of plastic you cut from the top of the deck. This scrap can be used for testing glues or paints. Glue them together and then try to tear them apart. Sandpaper, rubber bands, clamps and other tools are included to help with assembly.

**PAINT:** Use spray paints that are labeled as safe for plastics. The short cans of "Hobby Enamel" found at your hobby store, or spray paints safe for plastics like Krylon Fusion or Plasticote brands work best. When buying them, if the lid isn't sealed, remove the cap to see if someone "test sprayed" the can. If it has any paint residue on the spray nozzle, don't buy it. It is likely clogged because it was not properly cleared by inverting the can and spraying the paint out of the nozzle. (See the can's directions.) No sanding is necessary. Hobby Enamels, Fusion, and Plasticote will bond with the H.I.P.S. well as long as the plastic is clean. Don't get grease or oil on the plastic as it can repel the paint. If in doubt, wash your hands with liquid detergent before handling the plastic. Buy a can of Clear Hobby Enamel or Clear Krylon Fusion when you are getting the colors. It makes a great top coat on dull metallic or dark colors that don't gloss on their own. Test the colors on the scrap to see if a coat of clear is necessary. NEVER USE LACQUER OR AUTOMOTIVE PAINTS ON H.I.P.S. PLASTIC. It will soften the plastic and greatly shorten its life span and may completely melt the plastic. Avoid all tall spray cans like Krylon® or other "household enamels". They will damage the thinner areas of the sheet plastic. Don't be fooled by test spraying auto paint onto the scrap. They are thicker than the model parts and will be less affected. Avoid the short cans of lacquer you will find at hobby stores. Ask for hobby enamel. I have listed additional painting tips at the end of the manual.

# Vac-U-Tug Kit Contents IN ORDER OF APPEARANCE:



## To complete the radio-controlled boat, you will need:

**ADULT SUPERVISION**, 2-Ton or 30-minute epoxy, medium CA glue, (Regular or non-toxic model cement will work fine but CA “super glue” is needed for the end joint of the rubber rub rail) electric drill with bit assortment, screwdrivers including a tiny Phillips screwdriver for servo screws, scissors, hobby knife or Xacto® knife, ballast weights (a carton of 5,000 BB’s or lead shot work well), pencil, masking tape, light sewing-machine oil, plastic compatible spray paint or non-toxic type brush or spray acrylic paints compatible with plastic.

1. A 2-channel pistol (Recommended) or stick radio with one standard servo. AM, FM or 2.4 Ghz (Recommended to avoid conflict with other boats, especially needed if you are building a rescue boat.).
2. An economical ESC Electronic Speed Control with forward and reverse. A waterproof ESC is not required. Read about ESCs on the vac-u-boat.com home page link.
3. A rechargeable battery. Either a 6-cell 7.2 volt NiMh Nickel Metal Hydride or a 2S 7.4 volt Lithium Polymer battery. Each type of battery has different rules regarding safely charging them and their charge-state when not in use and their safe storage. Consult the manufacturer or the internet for recommendations for your type of battery. 7 or 8 cell NiMh (8.4 or 9.6 volts) or 3S LiPo (11.1 volts) can be used for more power if your ESC is designed for the additional voltage.
4. A safe charger for your battery. Wall chargers or more expensive peak detection chargers will do fine. Never charge a battery without constant supervision. Read the battery and charger instructions and warnings. Never charge the battery in the model. Never leave the charger unattended.

RC radio sets usually come with a battery pack for 4 AA batteries. These will power the receiver and servos if you don’t have an ESC with Battery Eliminator Circuitry BEC. Most ESCs have the BEC feature. This means that the large rechargeable battery that runs the motor will also power the receiver and servos through the ESC when the ESC is plugged into the receiver. The ESC will have a switch that turns on and off the power to the receiver. For most ESCs, you will not need the 4-AA battery pack.



Squeeze the synthetic grease into the Stern Tube until it comes out the other end.



Push the Prop Shaft into the stern tube. This will push out the excess grease. Wipe off the excess with a paper towel. Be careful to keep any grease off of the brass Stern Tube.



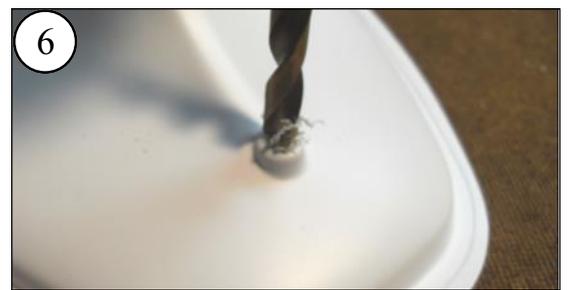
Put a mark on the Stern Tube about  $3/8^{\text{th}}$ s of an inch from the end of the bearing.



You will need sharp scissors and a box cutter or hobby knife, whichever you are the most comfortable using.



Trim the Hull along the marked line on it’s underside. The plastic is thick for a stronger hull. Use sharp scissors!



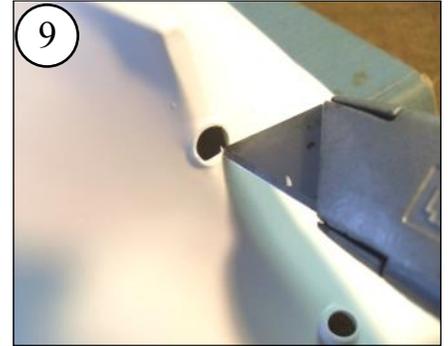
With a  $1/4^{\text{th}}$ ” drill bit, drill through the Rudder Bearing hole. Use gentle pressure. Let the drill slowly drill through the plastic to avoid it splitting.



7  
As you drill, check the alignment to ensure the hole is in the center.



8  
With a rocking motion, slice through the Stern Tube hole as shown. Cut down 2/3rds then cut up 1/3rd to complete.



9  
Round out the hole if necessary.



10  
**Install Skeg Reinforcement**

Sand all surfaces of the Skeg Reinforcement. The skeg is the square brass tube that supports the bottom of the rudder.



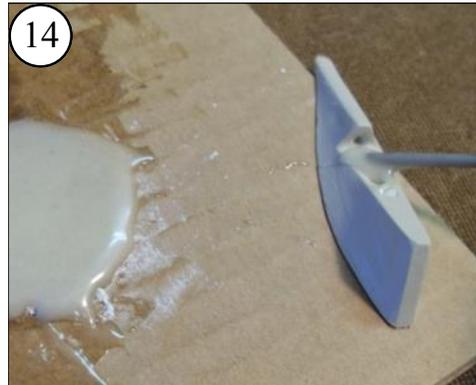
11  
Sand the area inside the Hull at the stern to help the epoxy bond the skeg reinforcement to the Hull. Test fit the skeg reinforcement into the hull.



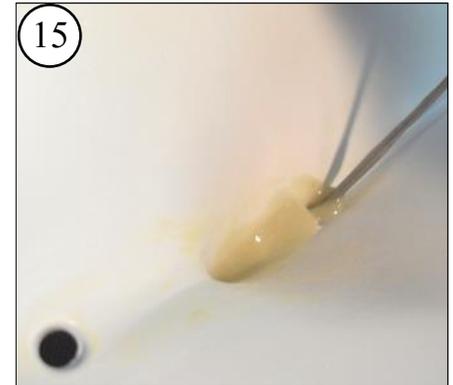
12  
Measure out two inch-wide puddles of epoxy parts A & B.



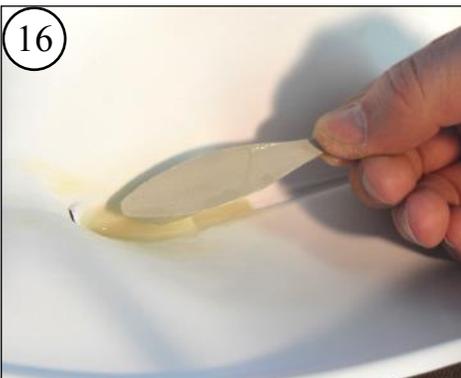
13  
After mixing, fold in the same volume of filler material. I'm using Talcum Powder. The filler makes the epoxy less brittle after it cures.



14  
Put the filled epoxy on the bottom surfaces of the Skeg Reinforcement.



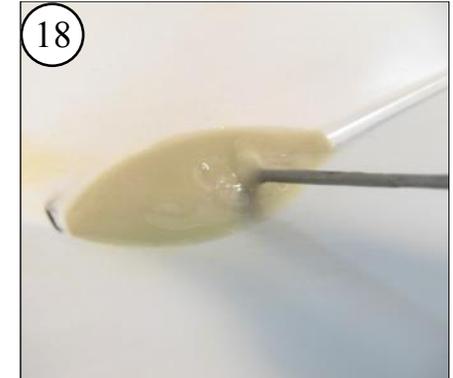
15  
Put lots of filled epoxy in the recess of the hull where the skeg reinforcement will set.



16  
Set the reinforcement into the stern of the hull.



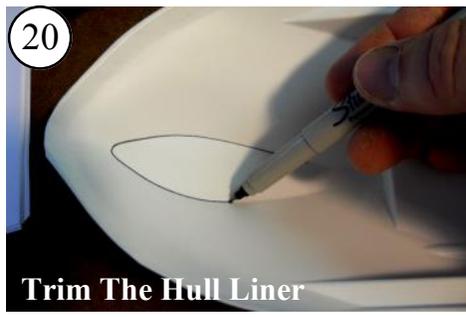
17  
Press the Skeg Reinforcement into the epoxy.



18  
Cover the reinforcement with the squeezed-out epoxy. **5**

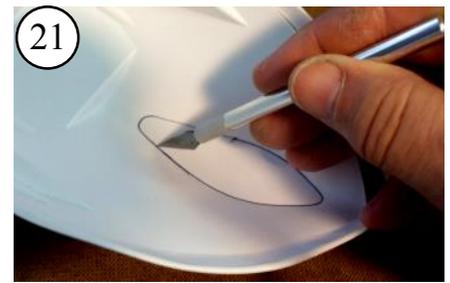


19 Tilt up the hull with a book to keep the epoxy in place as it cures.



**Trim The Hull Liner**

20 Mark the outline of the flat oval at the stern of the Hull Liner.



21 Score the oval along the line until the oval separates from the liner.



22 Trim the edges of the Hull Liner along the marked line.



**Install the Servo Tray**

23 Set the Servo Tray into the Hull Liner as shown. If needed, use 2 rubber bands to snug the liner.



24 With the Servo Tray slid against the raised bumps on the liner, mark the 4 holes with a pencil.



25 Drill 1/8 inch vent holes into the liner on each side of the floor ribs as shown.



26 Drill 3/32 inch holes at the 4 marked Servo Tray holes.



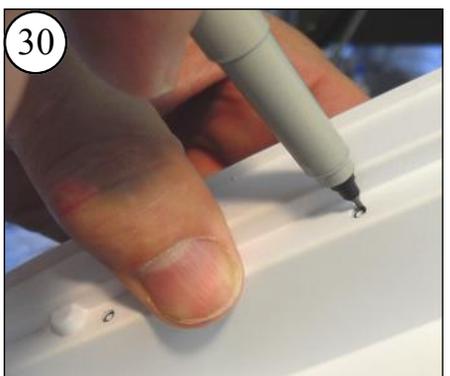
27 These are the Servo Tray Screw Reinforcing Strips. They provide a better anchor for the screw threads.



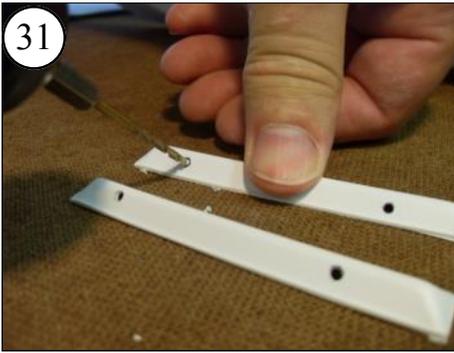
28 Trim any bits from the underside of the drilled holes.



29 Hole the Reinforcing Strip under the tray mount holes.



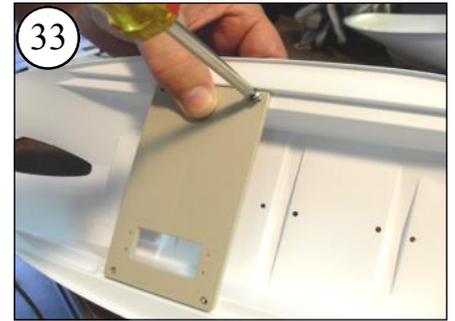
30 Mark the Reinforcing Strip through the Hull Liner.



31 Drill the Reinforcing Strips as marked with a 3/32" drill.



32 Apply Medium CA (super glue) to one strip. Hold the strip against the underside of the rail with the holes aligned.



33 Instead of waiting for the CA to bond, go ahead and install the tray and screws. The screws will hold the strips in place.



34 The screws should pull the Reinforcing Strip tight against the Hull Liner.



35 Now you have a handle for the Hull Liner.



36 Glue in Hull Liner

Turn over the Hull Liner and sand the areas that will contact the Hull.



37 Don't forget the thin edges and bottoms of the floor ribs.



38 Set the Hull Liner into the Hull. Use a pencil to lightly mark the hull along the top of the Liner.



39 Practice setting the Hull Liner into the Hull for the next step.



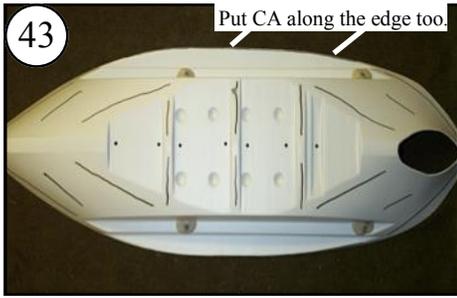
40 Sand the area inside the Hull below the marked line. Sand the areas around the rudder and prop shaft holes.



41 If you are in a hurry, you can CA the Liner. Otherwise, mix another batch of epoxy. 1-1/2 inch circles.



42 Metal rods make great stirrers. With them you can fold the epoxy over and cleanly push it around.



43 If using CA, these lines mark where you should put CA glue on the Internal Tray before inserting it into the Hull.



44 Mix the epoxy and add filler. Find the Epoxy Brush.



45 Holding the Liner, apply the epoxy by lightly dabbing the sanded areas.



46 It doesn't have to be pretty. But, you should work as fast as you can.



47 Dab along the sharp edges. 30-minute epoxy can gel in 10 min.



48 You are ready to set the Hull Liner into the hull.



49 Insert bow-first, trying to avoid touching the sides of the Hull with the Hull Liner.



50 Press into place. If the sides of the Hull are not making good contact with the sides of the Liner, add rubber bands.



51 Use alcohol to clean off stray epoxy.

A couple of cans or similar weights will help hold down the Liner until the epoxy has cured.



**Trim Deck & Superstructure**

While you are waiting on the Hull epoxy to cure, trim the deck pieces.



The Deck top recess is marked. Score 3-4 times and it will separate. Don't try to cut through the first time.



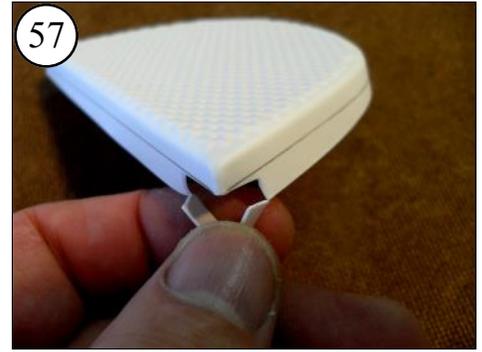
The rear hatch opening is marked for trimming the same way. No rush.



Cut curves by taking shorter snips. If the edge is uneven, you can sand the cut edge.



Sharp corners should be started with a razor using a rocking motion until the blade cuts into the plastic.



Now break off the cut corner. Use scissors to follow the trim line marked on the Hatch Cover.



All trimmed. The hull should be set by now. Check the mixing board to make sure.



**Install Prop Shaft Assembly**

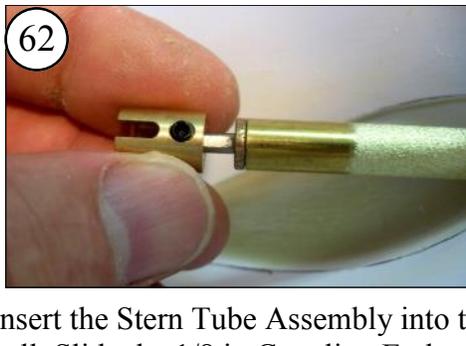
Sand the area where the motor and motor mount will be glued.



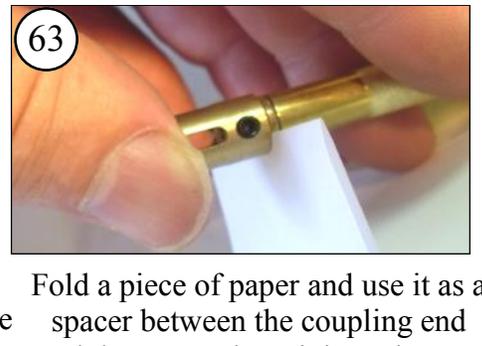
Sand all around the ballast and shaft area.



Sand the rudder hole area if you missed it earlier.



Insert the Stern Tube Assembly into the hull. Slide the 1/8 in Coupling End onto the shaft. Note the location of the flat on the shaft.



Fold a piece of paper and use it as a spacer between the coupling end and the stern tube. Tighten the two set screws and remove the paper. This should leave a small gap there.

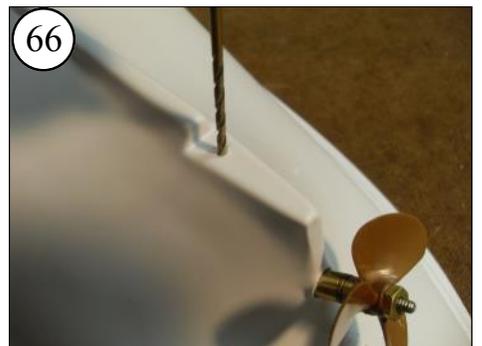


**Install Rudder & Skeg**

Open the Rudder Package. Take the brass Skeg and 2 screws.



Place the Skeg on the hull, aligned with the keel (bottom board) of the hull. Mark ONLY the end screw hole.



Use a 3/32 inch drill to drill a straight hole through the Hull and Skeg Reinforcement.



67 Press the Rudder Bearing into the 1/4 inch hole.



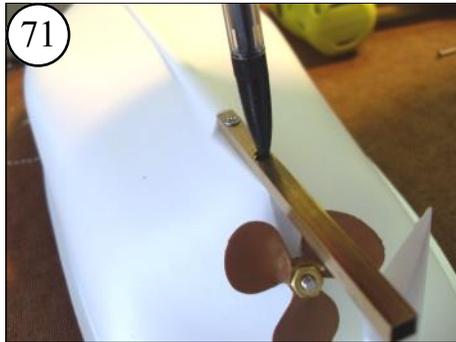
68 Insert the longer brass rod of the rudder into the bearing.



69 Slip the Skeg onto the rudder and attach the bow-end screw into the Skeg. Just snug the screw for now.



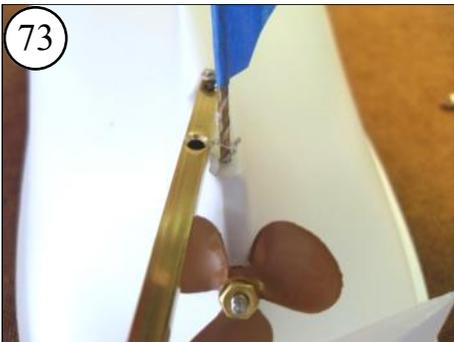
70 Align the Skeg with the Keel of the Hull.



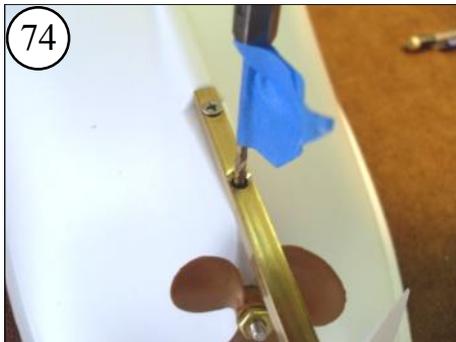
71 Mark the 2nd hole then loosen the first screw 2-3 turns.



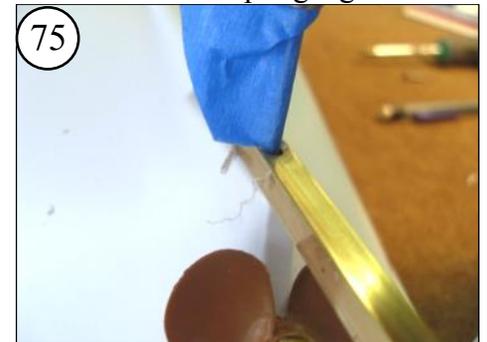
72 Using a Skeg screw as a guide, wrap a piece of tape on the drill to make a depth gauge.



73 Rotate the Skeg aside, and drill only into the white plastic, not into the reinforcement yet.



74 Align the Skeg and tighten the front screw. Now continue drilling into the reinforcement, using the hole in the Skeg as a guide to keep your drill centered.



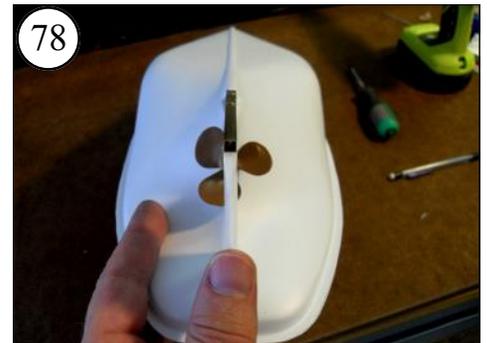
75 Drill until your "Depth Gauge" contacts the Skeg. You should pull out the drill once or twice during the drilling to remove plastic from the drill bit.



76 Tighten both Skeg screws.



77 The Rudder should turn freely without binding.



78 The Skeg and Rudder should align close to this. It does not have to be exact.

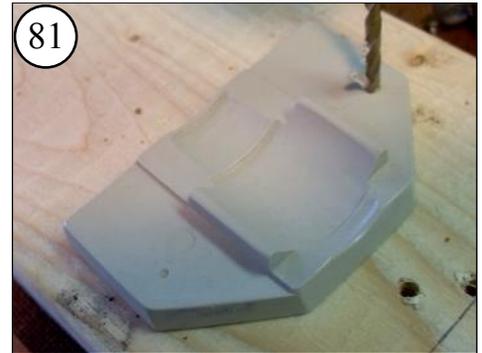


**79**  
Assemble Motor Assy to align Skeg

Unpack the Motor Package. You can install the 3/32 in. Coupling End to the motor shaft.



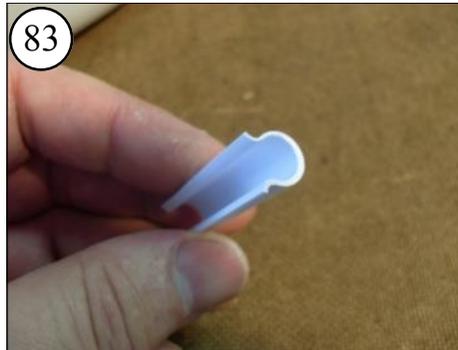
**80**  
The end of the motor shaft should be flush with the bottom of the Coupling.



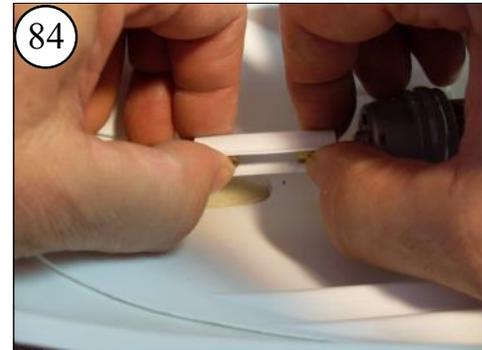
**81**  
Drill two 7/64 inch holes into the marked dimples of the motor base.



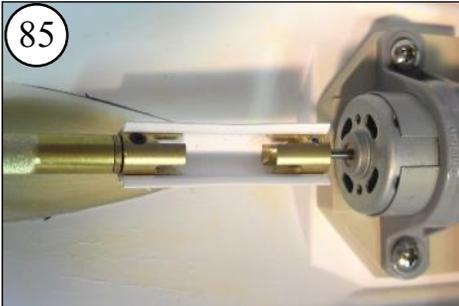
**82**  
Set the motor into the tray just as shown. Screw on Motor Clamp & tighten the screws.



**83**  
This is the Motor-Shaft Alignment Clip. It will temporarily align the Motor and Shaft together.



**84**  
Set the Motor Assembly in place and clip each Coupling End into the Alignment Clip.



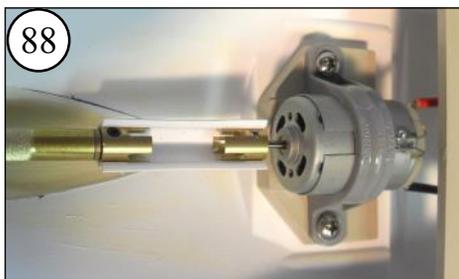
**85**  
Note the orientation of the Coupling Ends in the Alignment Clip. If needed, pull the ends out a little and rotate them so they contact the clip as shown.



**86**  
This lets the Alignment Clip make the best side contact with the Coupling End. Repeat pressing the Coupling Ends into the Clip shown in step 84.



**87**  
Check the mark on the Stern Tube. 3/8 inch from the end of the shaft bearing. It should look like this.



**88**  
Rotate the Prop so see if the shafts appear to be aligned. Center the Motor Mount between the raised side ridges of the Liner.



**89**  
Mix a pair of 1 inch circles of epoxy, but do not add the filler yet.



**90**  
Put a couple of drops of the epoxy at the sides of the rudder bearing. Help it run around the bearing. Keep the epoxy off of the top of the bearing.



91 Just enough to encircle the bearing and fill the narrow gap between the bearing and the Hull Liner.



92 Now add lots of filler to the rest of the mixed epoxy.



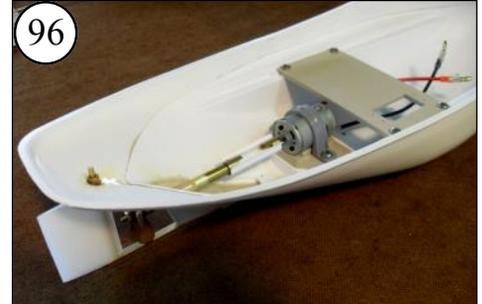
93 Put the filled epoxy over the Prop Shaft Assembly where it comes through the Hull.



94 Push the epoxy under the Prop Shaft Assembly to eliminate any air bubbles under it.



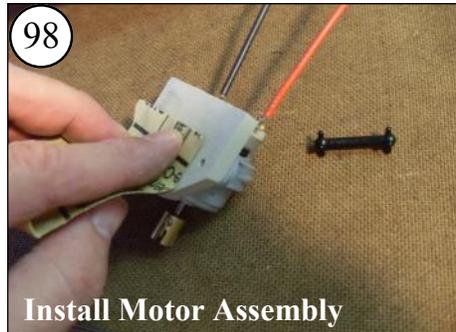
95 Check the shaft alignment. Confirm the motor is still centered and the mark on the side of the Prop Shaft is still aligned.



96 Let this first coat of epoxy "gel" (firm but not completely cured). We will apply 2 more coats in the next steps.



97 Mix a smaller batch of filled epoxy. Carefully apply a layer around the rudder bearing & put the rest over the Prop Shaft Assembly as shown.



98 Install Motor Assembly

Once the epoxy cures, carefully slide off the motor and Alignment Clip. Sand the bottom and bottom edges of the Motor Mount.



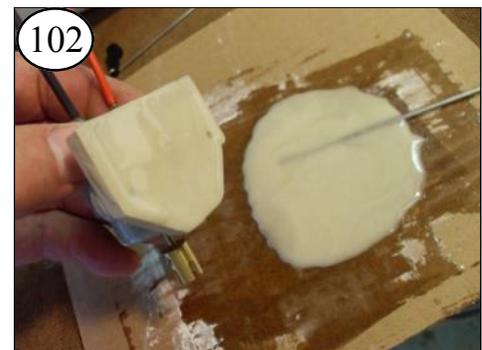
99 Test-Fit the motor to the Stern Tube with the Dogbone between the Coupling Ends.



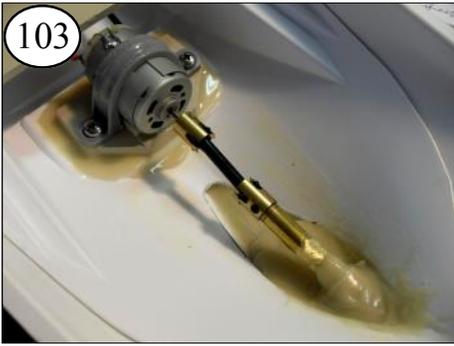
100 Mix the last batch of filled epoxy. Make sure the third layer is still lower than the top of the bearing.



101 Put filled epoxy into the liner where the Motor will sit. If the Servo Tray is in your way, remove it.



102 Put epoxy on the bottom of the Motor Mount.

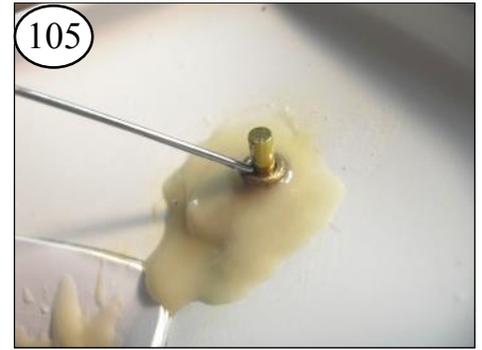


103

Set the Motor Assembly into the Liner. Insert the Dogbone between the Coupling Ends.



From different viewing angles, the Coupling Ends should appear aligned. The Dogbone will have about 1/16 inch of forward/rearward play. (It will slide back and forth between the couplings a little.) As the Motor Mount epoxy cures, check this alignment and Dogbone play until the epoxy is cured.



105

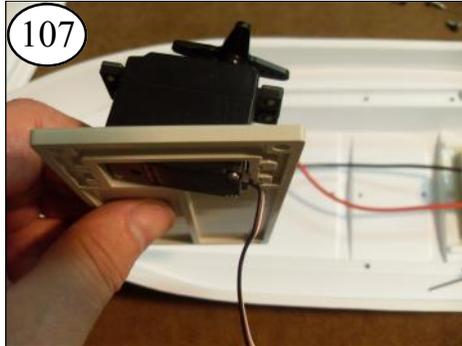
Use a paper clip or wire to put a droplet of oil on the rudder bearing at the shaft.



106

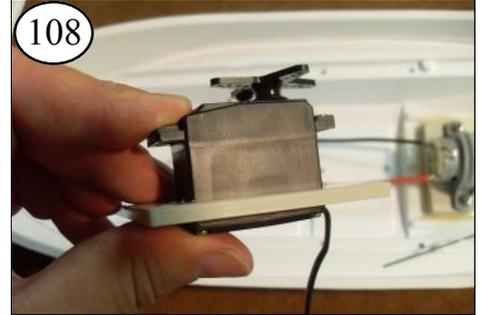
Install Servo & Rudder Linkage

Mount only the top rubber and grommets on your Servo. Remove the Servo Tray for the next step.



107

Insert the bottom wired end of the servo into the tray first as shown. Slide the servo toward the wire.



108

Push down on the other end and the Servo should snap into the hole. You may have to wiggle the servo a bit.



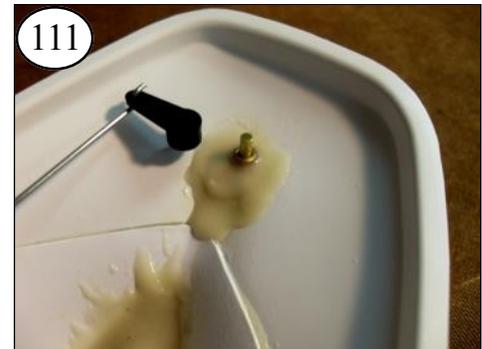
109

Install the 4 servo screws. Make sure the Servo is oriented into the tray as shown.



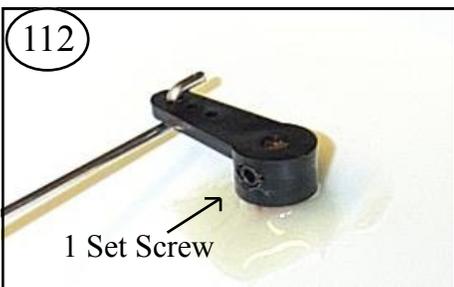
110

Re-install the Servo Tray. The stern of the boat is on the right in this photo.



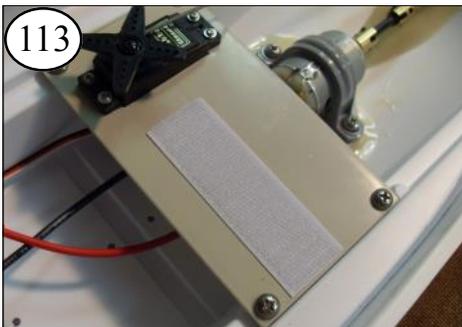
111

Put the Rudder Arm on the Pushrod like this, with the rod inserted from under the arm.



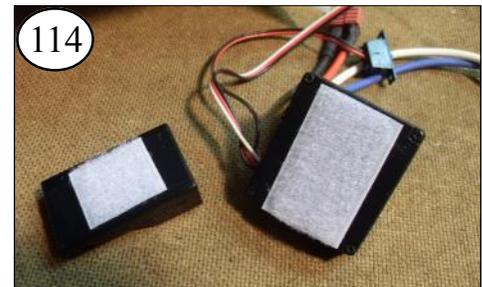
112

Press the Rudder Arm onto the Rudder Shaft. Align the rudder and tighten one set screw against the flat on the Rudder Shaft.



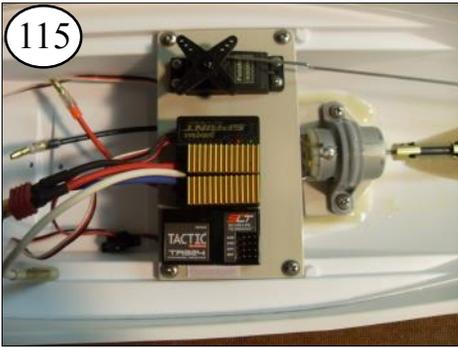
113

To align the Servo, we need to install the electronics. Hook-side of Hook & Loop is stuck to the Servo Tray.



114

Cut the fuzzy "loop" side of the Hook & Loop fastener and put on the back of the Receiver and the Electronic Speed Control.



115

Attach the ESC and the Receiver to the tray. The servo is channel 1, the ESC is channel 2.



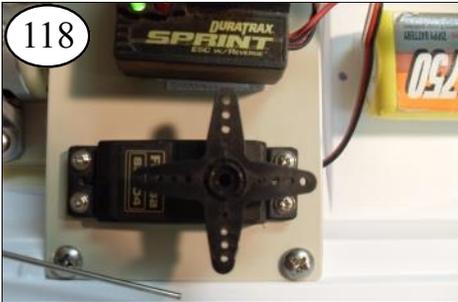
116

Connect the ESC, battery, & servos from the instructions for your electronics. Set transmitter steering adjustments to neutral.



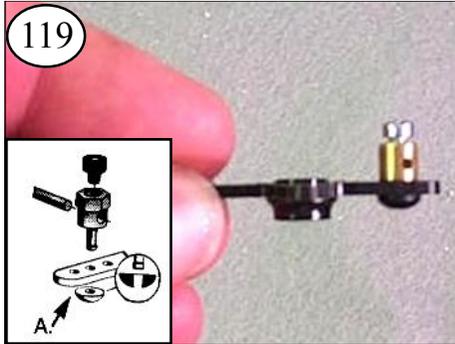
117

Turn on the Transmitter first, then the receiver using the switch on the Electronic Speed Control. In this case, the servo horn is angled.



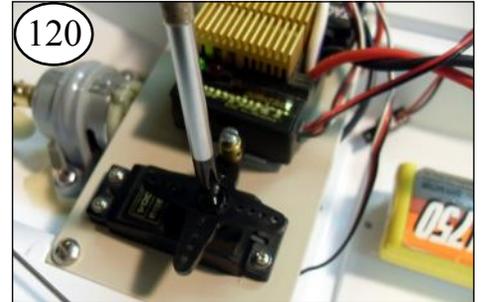
118

Fix this by removing the servo horn and rotating it to each arm until you find one that leaves the arm square to the servo body.



119

Install the E-Z Connector onto the 3rd hole from the center of the servo arm as shown.



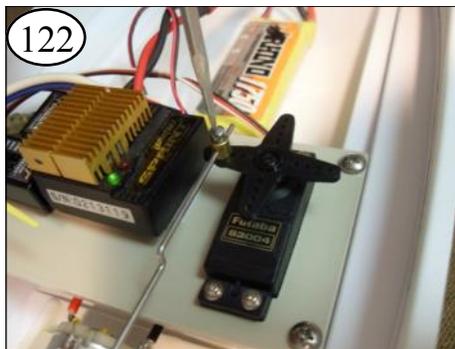
120

Return the servo horn to the servo. Install the servo horn screw. Slide the Rudder Pushrod into the hole of the E-Z Connector.



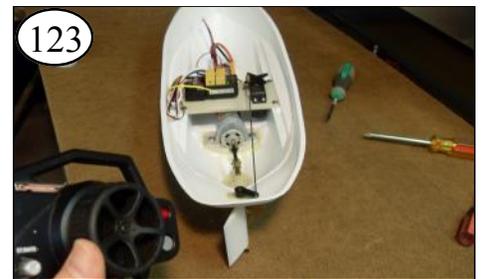
121

Align the rudder as shown. Now, tighten the screw on the E-Z Connector while holding the pushrod next to it. Any further adjustments can be made with the transmitter.



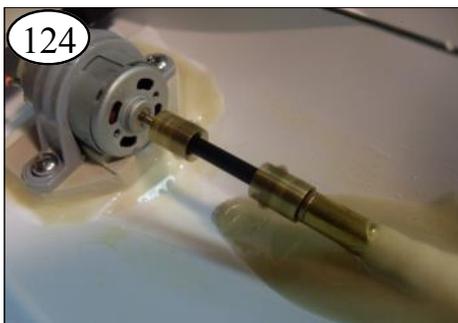
122

Now is the time for an Operational Check. Turn on the Transmitter, THEN the Receiver.



123

Turn the wheel of your transmitter to see if the rudder works. This is a LEFT turn of the wheel. If the rudder is opposite, then reverse the transmitter steering switch.



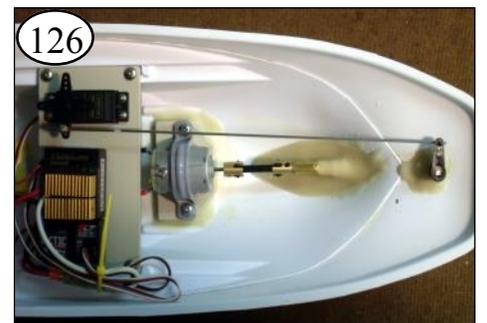
124

Pull the throttle trigger. The motor should turn the shaft freely.



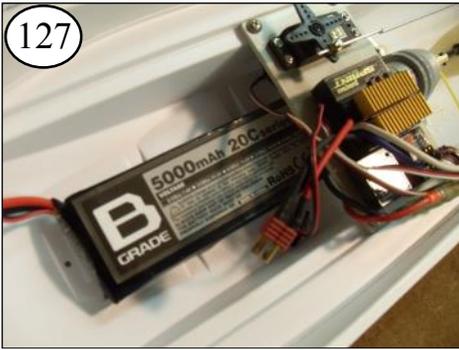
125

Check the direction of the prop. Going forward, it should be turning counter-clockwise as seen from the back.



126

The Rudder Arm and the Servo Horn should be parallel to each other as shown.



127 I tested with a smaller battery. To ballast the boat, I install the battery I plan to run in the boat.



128 Assemble Superstructure  
Cut 1/4" strips of hook & loop.



129 Stick the hook side to the hatch as shown, away from the opening. Put the fuzzy loop side on top and remove paper from the adhesive.



130 Align and press the hatch in place. This will cause the loop side to stick to the hatch.



131 Remove the Hatch Cover and press the strips to set the adhesive.



132 There is a window for the hatch opening. Do not install it yet.



133 Cut 4 squares each of Hook and Loop material. Press together and remove the tape from the Hook side.



134 Stick the Hook & Loop squares on the front and rear of the Cabin as shown. Peel tape. Set Pilot House on Cabin to adhere the Loop to the Pilot house. Remove Pilot House and press the Hook & Loop to set the adhesive.



135 Sand the top of the Pilot House and underside of the Pilot House Roof. Glue together with CA.



136 Center the Stack on the deck of the Pilot House. Lightly mark the location in pencil.



137 Drill a small vent hole in the center of the marked area.



138 Lightly sand the underside of the stack and apply CA. Press 40 seconds onto the Pilot House deck supported by the wood block.



139

### Install Ballast for the Boat

With battery and all gear installed, temporarily clamp the Deck to the Hull with four clamps.



140

Mark the center of the curve of the bow on a piece of tape.



141

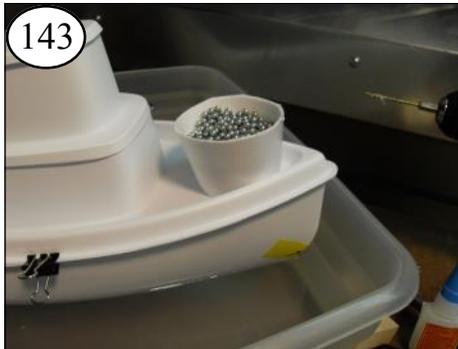
Float the boat in a tub or container of water. It will be top heavy during this.



142

See page 19 for more information.

Using bottoms of foam or plastic cups, add ballast to the front and rear gradually.



143

The bow should set just below your mark. The stern, about 1/8" below the top of the rudder.



144

**The recommended Total Weight for the completed model is 63 - 66 oz.**

Use a small magnet or spoon to remove or adjust the ballast. Too little is easier to fix than too much.



145

Pour front ballast bb's into a plastic bag. Mix 2 one-inch circles of epoxy parts A & B and add to the bag. Use **NO FILLER** with this epoxy.



146

Knead the bb's with the epoxy until they are evenly coated. Set the bag in the bow of the Hull.



147

Still in the bag, press the ballast to shape it into the hull forming a flat topped triangle.



148

Clamp the 2 inch x 3 inch plastic bag around the Coupling and Stern Tube to keep out epoxy.



149

Mix two 1-1/2 inch circles of epoxy with no filler. The rear ballast is a often a little larger than the front.



150

Add the epoxy to the ballast and knead to mix them together.



151

Cut the corner of the bag and squeeze the ballast into the stern.



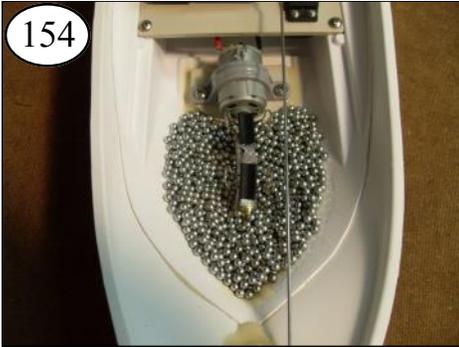
152

Pour it evenly on each side avoiding the Coupling.



153

Arrange the ballast with a paper clip with a bend at the end to reach under the Coupling and Prop Shaft .



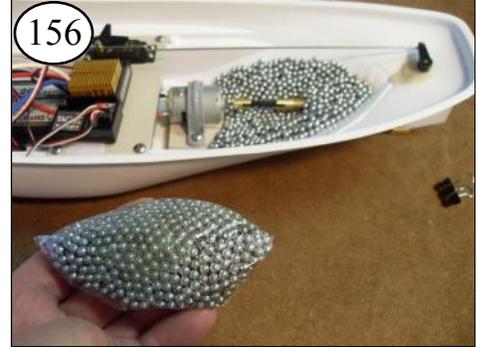
154

Arrange the ballast evenly on each side, with a open gap under the Coupling and Prop Shaft end.



155

Remove the Coupling cover. While the epoxy is still wet, check the arrangement of the front ballast.



156

After it is fully cured, overnight, remove the plastic bag from the front ballast.



157

Cut 2 pieces of Hook & Loop. Stick them to the front ballast as shown.



158

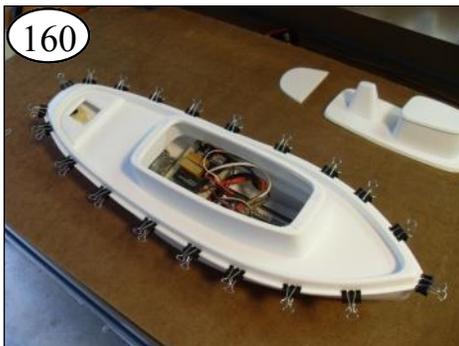
Peel off the paper tape and stick the ballast into the bow. It can now be removed easier to adjust its weight.



159

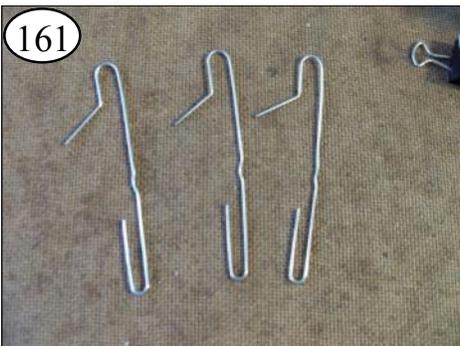
### Glue the Deck to the Hull

Arrange the 20 clips around the Hull evenly. Practice clamping the Deck to the Hull. Start at the bow and...



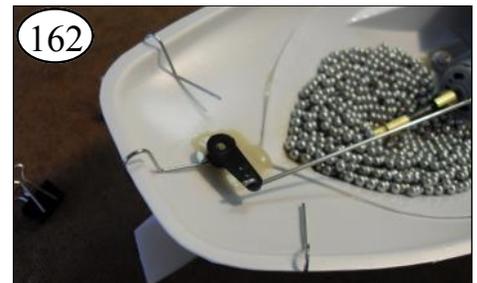
160

work your way rearward. Don't clamp the stern until last. If you clamp the front and back ends, the middle will not meet.



161

Bend 3 paper clips as shown. They will keep the stern of the Deck from sticking to the Hull too soon.

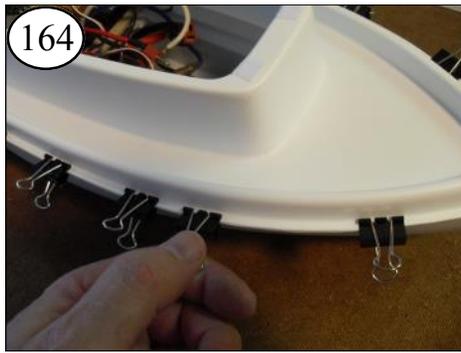


162

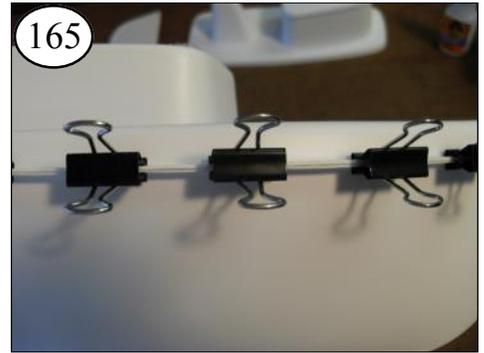
Lightly but evenly sand the mating sides of the Hull flange and Deck flange. Apply a bead of CA around the flange of the hull. Place the three paper clips as shown. 17



163 Align the bow-center and clamp. Then, work rearward left and right aligning the outside edges of the Hull and Deck flanges as you go.



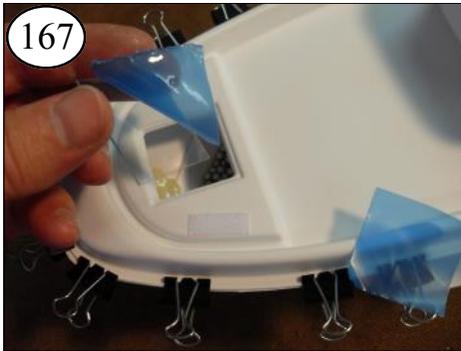
164 After 2-3 minutes, move the clamps to the spaces between them.



165 Look for spots that are not stuck together tight and clamp them.



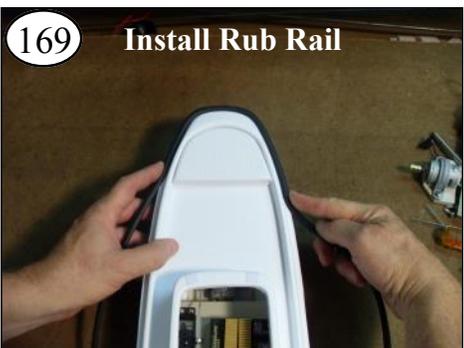
166 Notice the clamps are not jammed against the hull. They are centered on the flange. A few final clamps may need to stay on longer to bond.



167 While you are waiting on the Deck/Hull joint to cure, tape the rear hatch in place.



168 Tape the edges fully. This gives you access to the Rudder Arm and to the Prop Shaft Coupling.



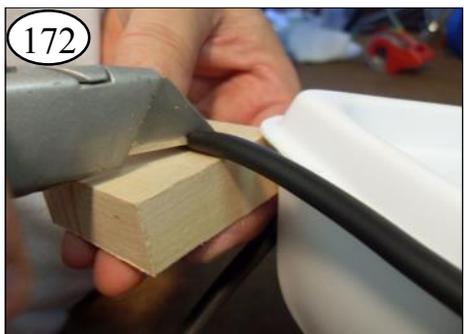
169 **Install Rub Rail**  
Engage the center of the Rub Rail on the Stern. Without pulling hard, run it toward the bow on each side.



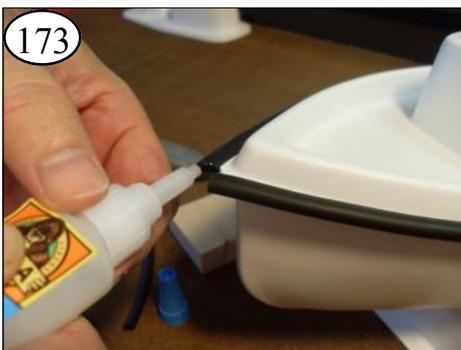
170 This bend will help the Rub Rail open and engage the flange of the hull. No need to glue it. It will stay in place.



171 At the bow, gently pull it around the bow and start a vertical cut with a hobby knife.



172 Continue the cut over the wood block or table. Hold it carefully to ensure a straight cut. Repeat for the other end.



173 Apply a little CA to one end. Using the Deck/Hull flange as a guide, roll the ends together and hold.



174 Hold tight for one minute. Check under the glued ends and if not together, hold that spot too. **18**

175

If you mess up the Rub Rail end glue, you can trim off 1/8 inch and try again. Get the extra length you need by pulling off the rub rail down each side, and re-installing with a little pull as you go to stretch the length of the rub rail a little. You can also practice on the ends you cut off.



The rub rail can be removed for painting or repairs.



Re-install the Rub Rail starting with the (front) bow end and work backwards.

178



All Done!

Your tug is finished and ready to be painted.



Apply decals after the paint has cured.

MEASURE EQUIVALENTS	Daisy BB's	#9 lead bird shot
# per ounce	22	-
Level Tablespoon	2.2oz.	3.0oz.
1/4 cup level	9.2oz.	13.3oz.
1/3 cup level	11.6oz.	16.3oz.
<b>Lead is poisonous. Do not use measuring spoons or cups you prepare food with!</b>		

**PAINTING TIPS:** Click the [Painting Tips](#) link on the [Vac-U-Boat](#) home-page for more help. It is easy to get professional results with a spray can if you know the basics. The same rules apply to spray cans as apply to professional painters using spray equipment. 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. Hobby enamel will take 5 to 15 minutes to flash depending on the temperature. Different colors can take different times to flash. A coat that has flashed properly will support the next coat and prevent it from dripping. 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. After the spray paint has fully dried, you can apply the decals. “Non-toxic” model paints are safest to brush on, for the painter and the boat. Read the spray can. Some types must be recoated before X hours or after X days to avoid wrinkling the old layer with the new layer. Temperature and humidity are important.

Mask the Drive Dog & Shaft Bearing near the Prop to keep paint from gumming them up. If you paint the Boat Stand, let it cure 3 days before using it. Otherwise, it may stick to the boat. A couple of strips of felt along the top of the Boat Stand will prevent sticking and scratching the hull.

**DECALS:** Apply only after the paint has fully cured. Place the boat on it’s stand. The stand holds the boat at a bow-up angle just like it sits in the water. Make sure that doors or square openings are vertical to this position. Otherwise, if you placed the door decals parallel to the floor, they would be angled toward the stern when the boat is in the water. Cut out the desired decal from the assortment. Separate the paper backing from the front tissue. The decal will adhere to the front tissue. Place the decal on the hull and smooth it with your fingernail. Peel off the front tissue paper. The decal set includes several types of Doors, Portholes, Scuppers (deck drains), exterior weatherproof Lights (small ovals), Ladders, Ladder Rungs, retracted Anchors, and two V’s for “Vac-U-Boat” to put on the Stack. The hinge-side of the doors point toward the bow of the boat. You will find left and right doors in the set. See our website for examples.

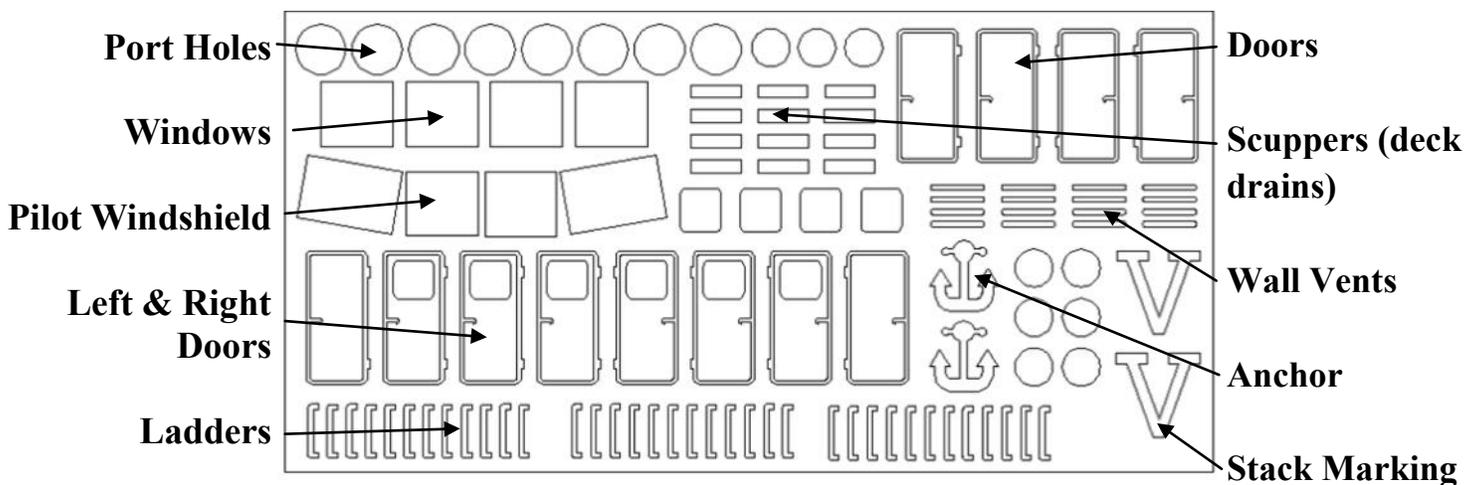
**ANTENNA:** Most 2.4 Gigahertz radios do not have a visible antenna, or have a very short one. If you are using an AM or FM radio, take the end of the antenna and tape it on the upper inside of the pilot house for good reception.

**WATERPROOFING - FLOTATION:** Be sure to tape the clear plastic hatch window in place to prevent leaks. There is plenty of room in the Bow for flotation. An inflated Ziplock<sup>®</sup> bag with the opening pressed and taped closed, makes a nice form-fitting float.

**REPAIR:** In swimming pools, long hair can wind up on the prop shaft between the Drive Dog and the Stern Tube Bearing. If this happens, the shaft will bind and slow or stop turning. To repair, insert needle-nosed pliers through the rear hatch opening and lightly grasp the Motor-Shaft Coupling End to block the shaft rotation. Use a 1/4 inch wrench to loosen the Prop Nut several turns. Unscrew the Prop & Drive Dog 3-4 turns by turning the Prop. Remove the hair and re-tighten the Prop with Drive Dog & install the Prop Nut. Don't store the boat in direct sunlight. This will shorten the life of the plastic. Re-Tape the rear hatch opening afterwards.

**MAINTENANCE: Before running,** place a droplet of light oil between the Drive Dog and the Stern Tube Bearing. Rotate the prop to distribute the oil & wipe off the excess. **After running,** tilt the boat toward the Bow and blot out any water that was hiding under the floor. Even if you find no water, leave the Pilot House off for a day to allow any moisture to dry. The synthetic grease in the stern tube will keep your boat water-tight for years. It needs to be refilled only if you see water leaking into the boat through the inside of the stern tube. To access and relube the Stern Tube, remove in this order: Rudder Arm, Skeg, Rudder, Servo Tray, Motor, Dogbone, Motor-Shaft Coupling on the Prop Shaft. Slide out the Prop Shaft. Squirt new Stern Tube Grease into the Stern Tube from the outside. Catch the overflow with a napkin on the inside. Push the Prop Shaft into the Stern Tube catching the additional grease that will be pushed into the boat. Reassemble all parts. You will have to find the flat on the Prop Shaft by "feel" when you reinstall and properly space the Prop Shaft's Coupling. Hold the Dogbone in place with a pair of needle nosed pliers through the rear hatch opening while installing the motor.

**The set of decals will help trim out your Vac-U-Tug for a realistic look.**



**Now go find some water and have fun!**

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