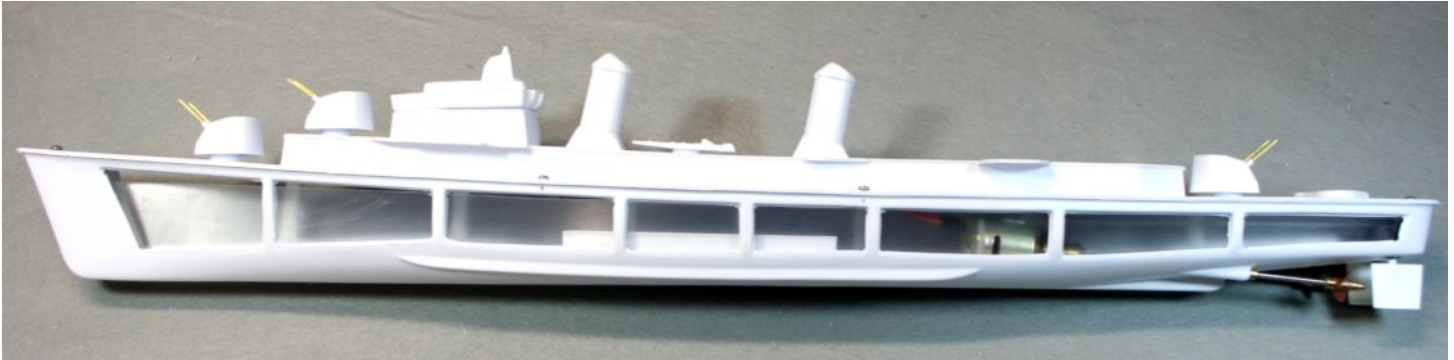


Combat Vac-U-Gearing™

1:144 Semi-Scale Model RC Warship Combat Gearing-Class Destroyer Hull Kit
Manufactured by Vac-U-Boat 1259 Humphries Rd. Conyers, GA 30012 philpace@vac-u-boat.com



The ***Gearing Class*** was a series of 98 destroyers built for the U.S. Navy during and shortly after World War II.

While no RC Warship Combat kit is “easy to build or inexpensive”, this “Beginner Class” kit will get you started in this fascinating hobby and not only give you an understanding of construction, control and weapon systems, but will make an effective addition to any fleet in battling against your buddies!

This Combat Vac-U-Gearing Hull Kit Features: Tough high-impact polystyrene hull with polyurethane-bonded sub-deck and carbon-fiber-reinforced hull-ribs & sub-deck cross-members. The sub-deck hatch openings and the hull’s pre-formed penetrable area panels can be removed with a hobby knife or box cutter. Clear hatch lids & hatch tape waterproof the hull. The deck supports realistic details and can house a forward-firing 50-round cannon or mounted as a stern gun (not included). The rudder kit includes twin 1-1/8 square inch rudders (Total 2.25 square inches.) cast on brass shafts with a self-aligning rudder brackets, rudder arms, stainless steel pushrods, and e-z connectors servo. A mini servo is included for the rudders. Servo models will vary according to availability. The twin drive kit includes two “365” motors direct-driving counter-rotating precision stainless steel shafts supported by Oilite® bushings in brass stern tubes with brass couplings, injection-molded copper colored polyethylene props, 6-32 threaded drive dogs, and prop nuts.

This Gearing-Class Destroyer is a 1.5 unit ship under the rules of the International Radio Controlled Warship Combat Club. It can be equipped with a “1/2 unit bilge pump” and a 50 round cannon (Not included).

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 that 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 Warship Combat clubs and organizations for assistance.** Keep your work area away from children. 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! Once you complete the boat and are running it in a lake, know that the boat can injure life, limb, and property. Never touch the propeller, spinning or not, while there is a battery inside or connected to the boat. Even if it is turned OFF, assume it can glitch and run on its own. 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 the boat with the battery inside it, 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!

All of these warnings are just for the Hull Kit! Add the RC Warship Combat parts and this model is ABSOLUTELY DANGEROUS. Use safety clips in the cannon when not battling to prevent accidental firing of a bb. Know that Lithium batteries are dangerous if mishandled, damaged or if charged improperly. CO² powered firing systems contain pressurized gas that can project parts at a high rate of speed during assembly or repair. Everyone wears SAFETY GOGGLES when in combat, repairing or testing on the work bench.



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 International Radio Controlled Warship Combat Club

<http://ircwcc.com/main/home/rules/>

KIT CONTENTS



Hull & Sub-Deck joined with openings reinforced with carbon fiber rod. Top view and bottom view.



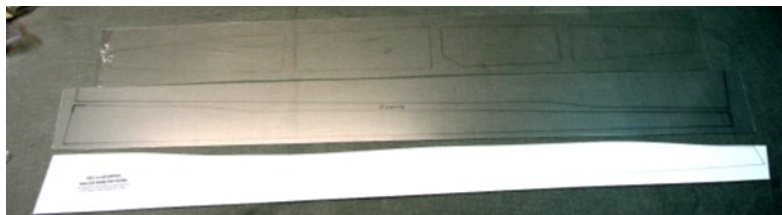
Pre-Trimmed Deck



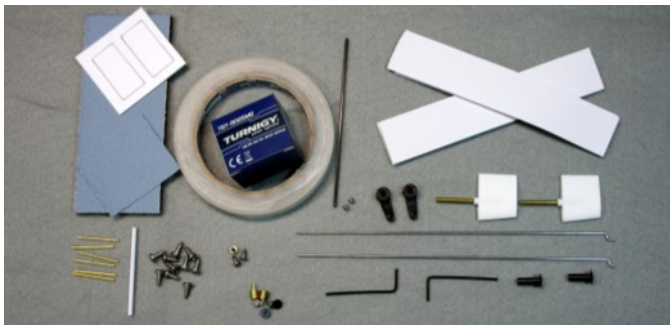
2nd Deck & Deck Components



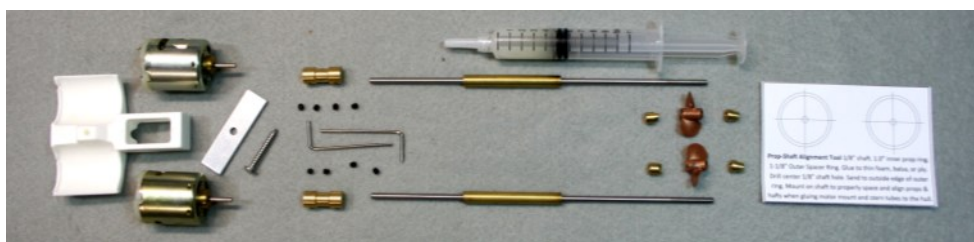
Boat Stand and Internal Electronics Tray.



Internal Armor, Hatch Covers & Balsa Skin Cutting Template.



Hull Hardware Kit with stainless steel deck screws, plastic & brass 5" gun barrels, prop alignment templates & torpedo launcher base, 2 rudders, self-aligning mounts, rudder arms, stainless set screws, stainless pushrods, ez-connectors, mini-servo, sanding block, sandpaper, hook & loop tape and 72 yards of hatch tape.



Twin Drive Package with stern tubes, precision stainless shafts, couplings, drive dogs, prop nuts, props, synthetic grease, motors, motor/servo mount, couplings & template.

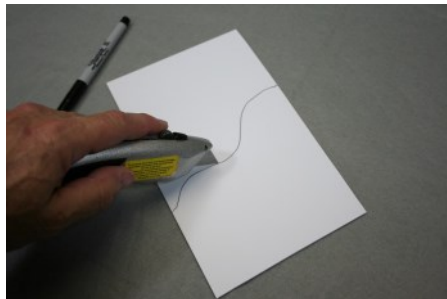
INSTRUCTIONS

We are ready to get started building this combat gearing hull kit. 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!

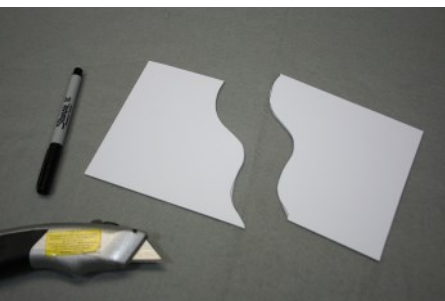
To build this kit you will need: A variable-speed drill. A hobby knife or box cutter, sharp scissors, medium CA glue or Gorilla brand super glue, Devcon 2-Ton epoxy or hobby epoxy with a 30 minute or greater cure-time. 5 minute, 7 minute, or 15 minute epoxy is not waterproof and has too short of a working time to fold in filler and use with this model. Baby powder (100% Talc), micro-spheres or your preference as filler for epoxy. Drill bits 3/32", 1/8", 5/32" and 3/16". A #2 Phillips screwdriver and a roll of painter's masking tape. A step-drill bit is handy for making large holes safely. Following smaller drills with larger ones will work. A Dremel Rotary hobby grinder will be helpful to cut flats on the shaft ends.

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

When drilling styrene, drill at the **slowest setting**. 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 surfaces have a strong bond.



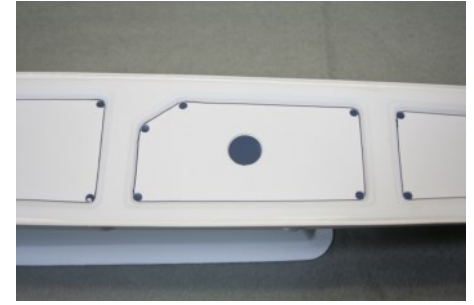
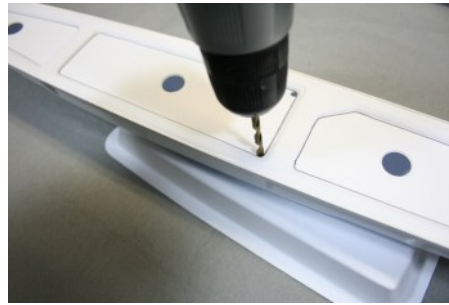
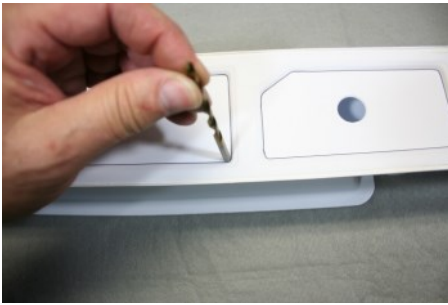
Styrene can be cut by scoring and breaking, or with scissors. The first score should be very light while concentrating on accuracy. The second and third score is made with more pressure and will follow the first.



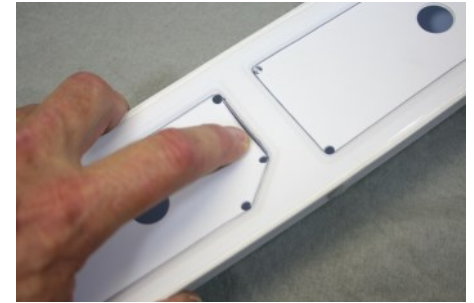
Bending at the score will break the plastic along the scored line. You can cut with scissors if you prefer. Either way, any rough edges can be smoothed out with the included 100 grit sand paper or sanding block.



The stand fits the hull as shown. The right end of the stand lines up with the rear of the bilge keels on either side of the hull. Outline the bottom of the sub-deck openings with a pencil. Use slight outward pressure on the pencil so it will follow the outline of the recess. The mark helps you see where to score the opening.



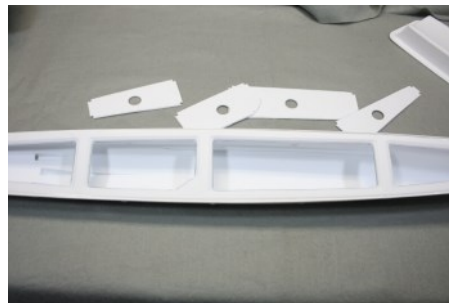
Use a 3/16" drill to round the corners by drilling next to the marked line at each corner. Do this for all 4 openings.



Score along an opening, lightly the first time and with a little more pressure the 2nd or 3rd time. If your knife falls through the slit, tilt it sideways to pull it free. Press on one end flexing the plastic until it separates.



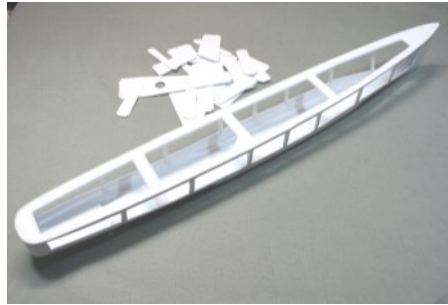
Continue to work the plastic with your finger until it breaks free. If it resists, then score the opening one more time with the knife and try again.



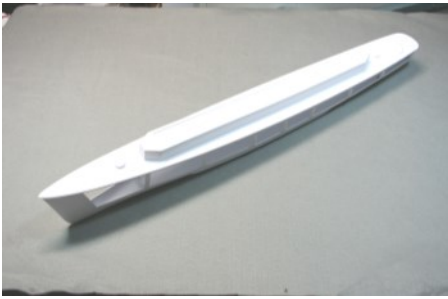
Save the scraps. Repeat for the other three deck openings. The side openings have three sides that are easy to mark. The bottom is located by using the side of a pencil to mark the change in the hull curve.



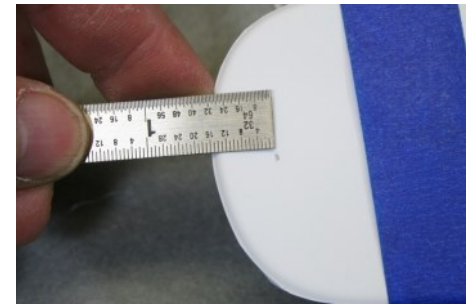
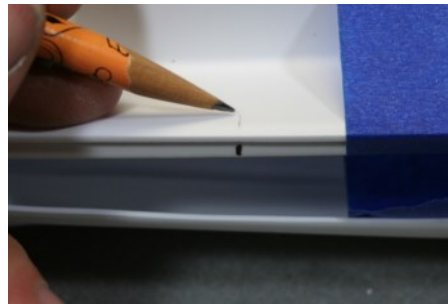
Make the bottom mark about 1/16" ABOVE the pencil line. Drill the four corners of each opening with a 3/16 inch drill. Score the four sides of an opening. It is thicker at the bottom line. Additional scores there.



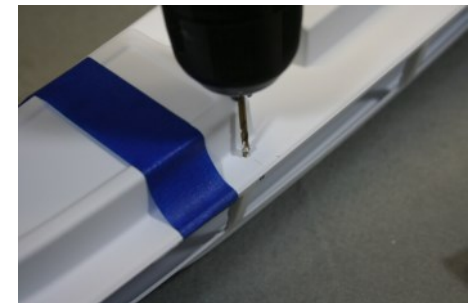
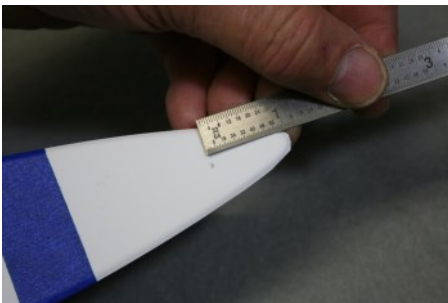
Push the side panel inward causing it to separate at the bottom and remove it. Repeat 13 more times. Mark the upper side of the hull at the center of the front two sub-deck cross-members to help locate the deck screw holes.



Set the deck on the sub-deck. Turn it upside-down. Look to see that it fits into the deck overhang evenly.



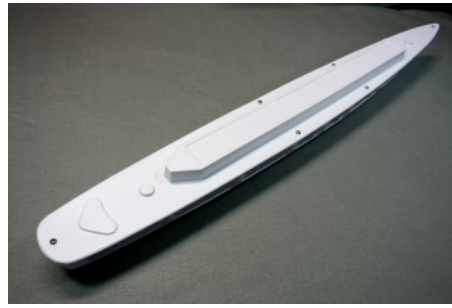
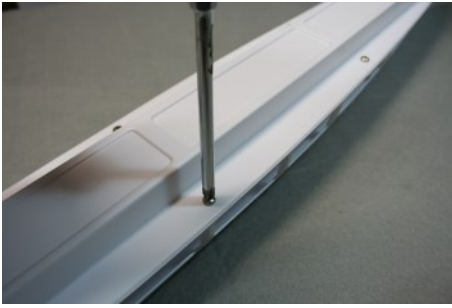
Tape the deck to the sub-deck/hull assembly. Set upright. Make a light line above each side cross-member mark. At the center of the stern (back end) make a dot 1/2 inch from the edge of the deck.



At the bow (front end) make a dot centered one-inch from the tip of the deck. On the sides, mark the dot 3/8 inch from the outer edge. Drill 3/32 holes through the deck & sub-deck at each dot. (Six holes.)**



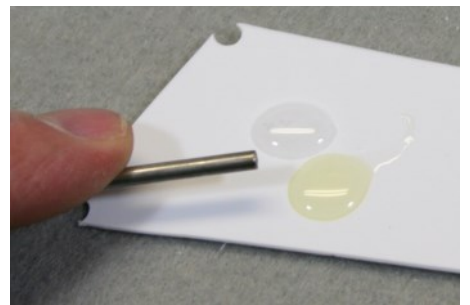
****You can omit screws at the rear-most crossmember without affecting the appearance of the kit. Remove the deck. Drill through the center of the **deck** holes with a larger 5/32-inch drill.**



Insert the #6 x 3/8 inch Phillips pan head screws. Keep them straight as they thread into the sub-deck until just snug. Don't over tighten. Next time, start them by hand and lightly snug with screwdriver. Use a 3/16 inch drill to drill into the center of the rudder inset at the stern of the hull. Wallow out the hole a little so the rudder base will fit.



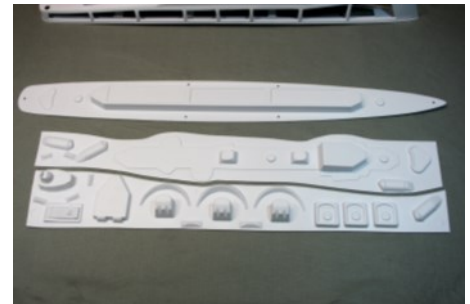
Remove the deck. Test fit the rudder mount. It should drop in and sit flush. If it binds, enlarge the hole a little with the 3/16 inch drill. Sand the underside and stem of the aluminum mount and the inside of the recess.



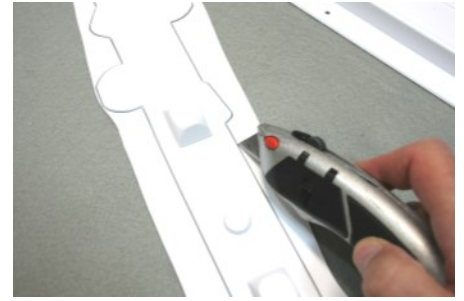
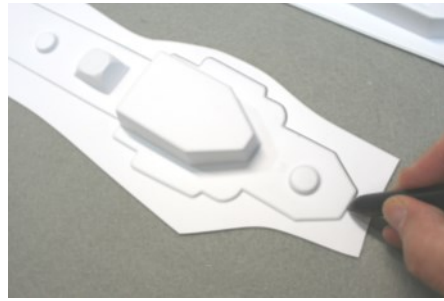
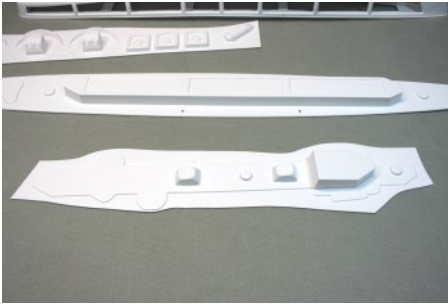
Inside the hull, sand the top of the rudder mount recess. Test fit the rudder mount again. Mix epoxy together.



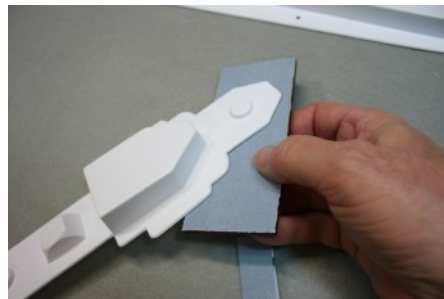
Fold in the same volume of filler until smooth. Rub a little into the sanded area of the rudder recess.



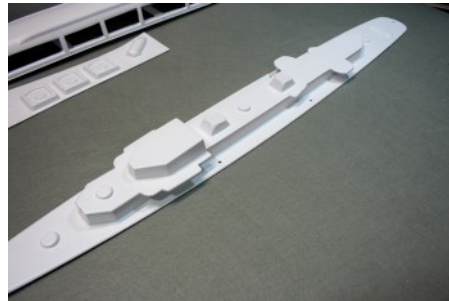
Spread epoxy on the rudder mount. Press into the hull. It should look like this. Less epoxy is OK. 7
Check the alignment and set the hull aside for the epoxy to cure. Lay out the deck and deck accessories as shown.



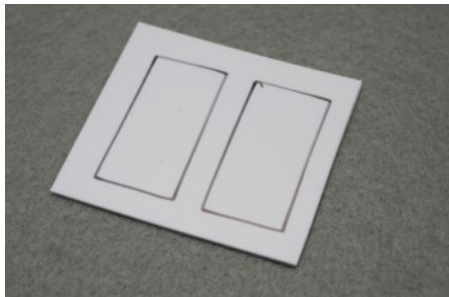
The 2nd deck sits on top of the deckhouse. It has a raised outline. Mark the bottom of the outline with a pencil and use your knife to lightly score the line. Repeat scoring 3-4 times until the edges will break away.



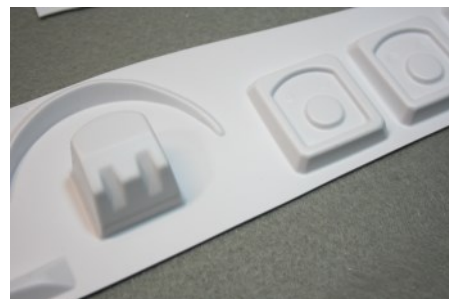
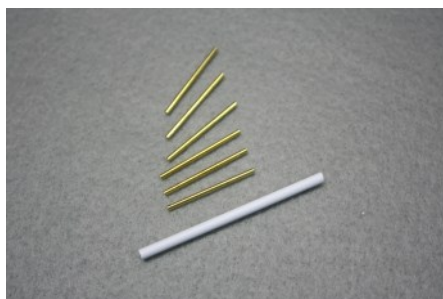
Bend the cut line back & forth to separate. The rough edges can be smoothed with the sanding block & sandpaper.



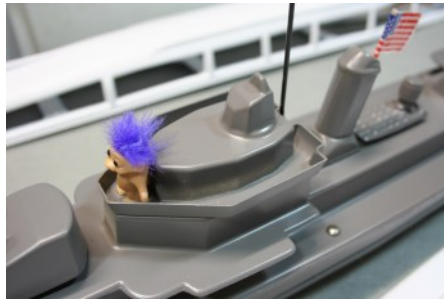
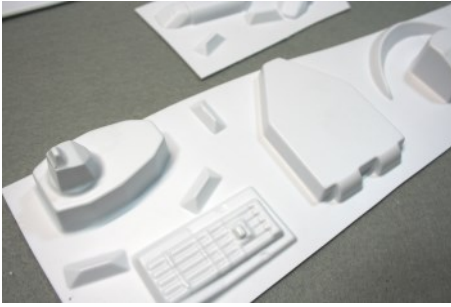
The slight curve to the edges of the part remains and helps align the 2nd deck to the top of the deck. The 2nd deck sits centered on the deck house. Here are comparison photos of deck parts and their location.



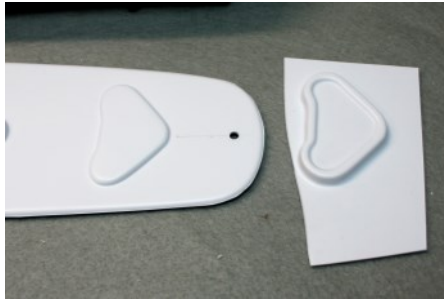
The torpedo launcher is installed behind the first stack. One of these rectangular bases helps glue it to the deck. This one happens to be located where an installed bb cannon's magazine filler cap emerged from the deck.



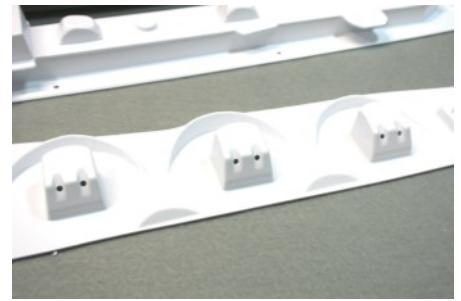
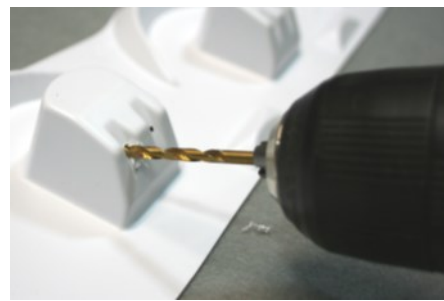
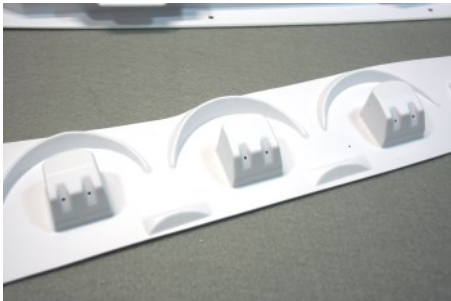
These brass rods, plastic tube, gun housings and bases go together to make three of these dual 5-inch gun mounts. 8



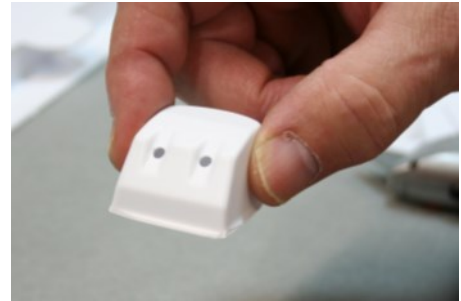
These two parts form the Bridge. Troll-Captain not included. Four stack-halves are glued together...



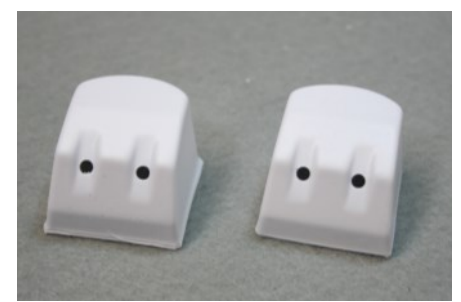
to form the two exhaust stacks. This hatch surrounds the stern anti-aircraft guns (guns not included)



Consider the up-angle for your gun barrels. Mark each gun and drill with 1/8-inch drill, each at the same angle.



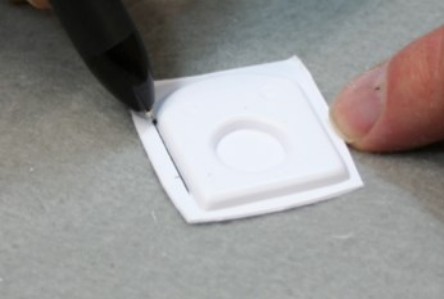
Trim the gun housings close. Then, lay the scissors along the side of each to trim closer. Once trimmed, the gun housings will still have a slight curve or flair at the bottom.



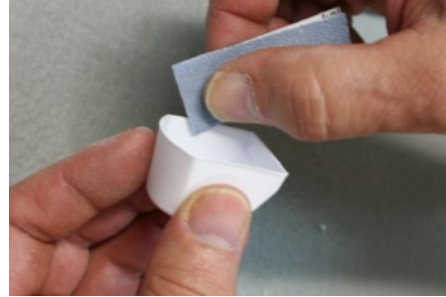
Sand the gun housing back and forth on the sanding block, rotating frequently to remove the curve evenly. Sand only until the curve is mostly gone. Before & After sanding.



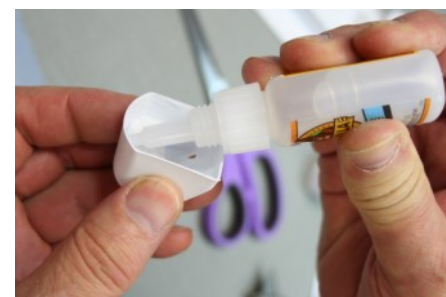
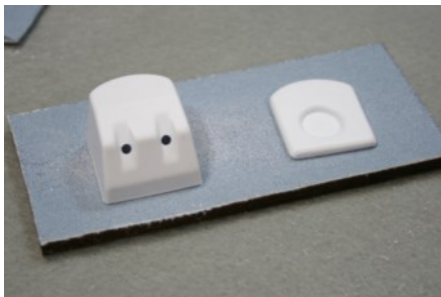
Separate the three gun bases. Trim away the edges as shown. Turn over and trim closer but don't cut the raised area.



Trace around the raised area to guide your cutting. Cut to the line with scissors. Sand away any edges missed.



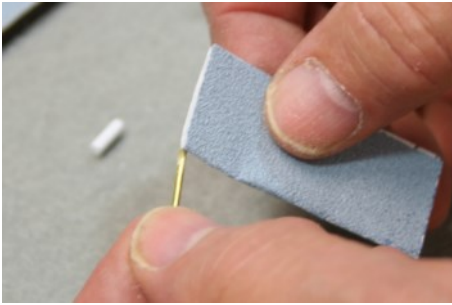
The sanded base has smooth turned-down edges. Sand the inside bottom of the gun housing. It is a good idea to put a piece of foam inside the housing for flotation in case your gun gets shot off of the deck.



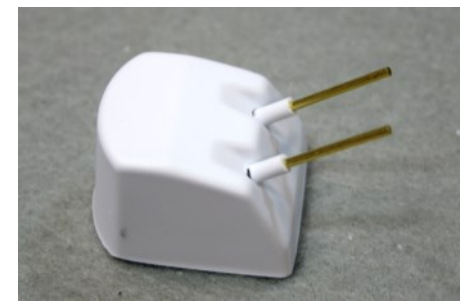
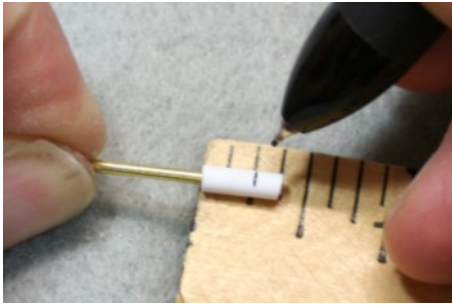
Gun housing and base ready to glue. Put superglue around the inside edge of the housing. Set the base on a flat surface that the glue won't damage. Don't forget the small piece of foam.



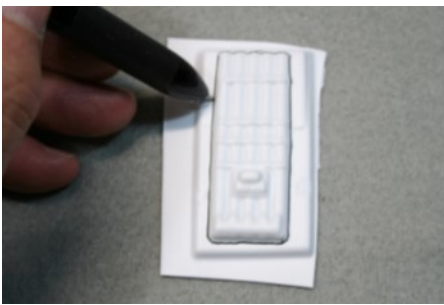
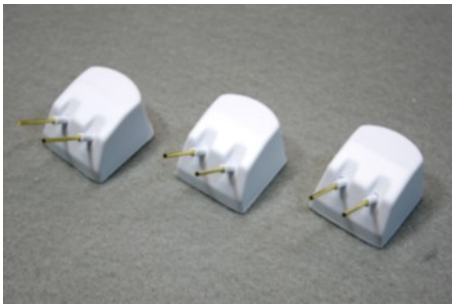
Press the gun housing over the base and hold for 10 seconds. When picked up, the bottom of the gun housing should look like this. Repeat for the other two guns. Cut a 3/8-inch long piece of plastic tube.



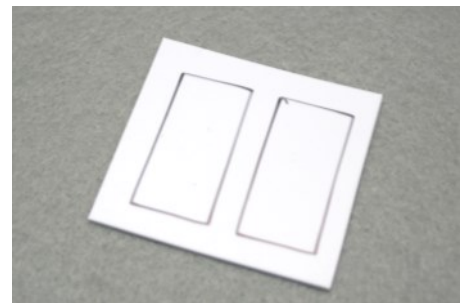
Sand 1/4 inch of the end of a brass rod. Slip the 3/8" piece of tube over that end. Add a little CA around the end of the rod and press the tube over the rod until even with the end of the brass rod to form a gun barrel. Make 6.



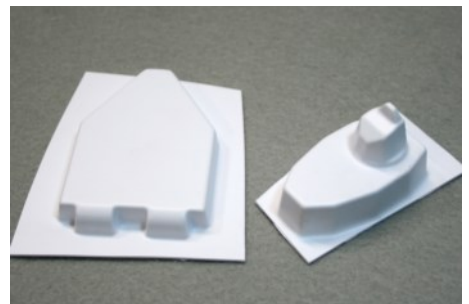
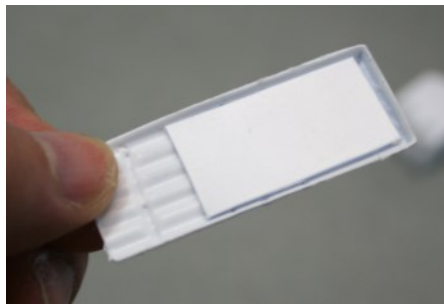
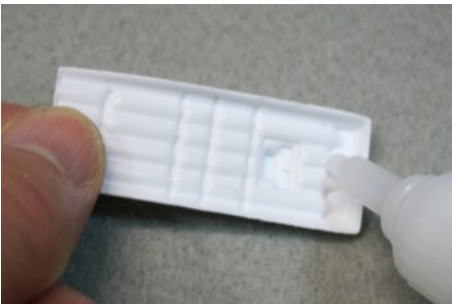
Mark the tube 1/8" from the end. Put a tiny amount of CA around the end of the tube and insert 1/8" into the gun.



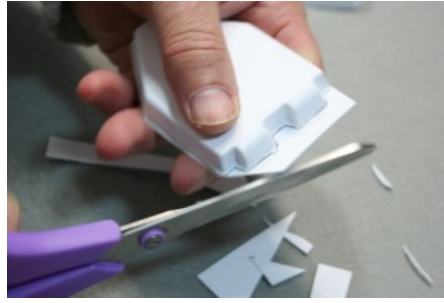
As you insert, make sure they are aligned and parallel to each other. Mark around the torpedo launcher and trim.



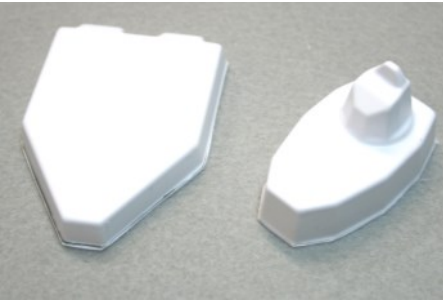
Sand the edges and bottom to a smooth finish. Turn over & scuff the underside. Cut out one rectangle.



Scuff one side of the rectangle. Put CA on the raised areas on 2/3rds of the underside of the torpedo launcher. Attach the scuffed side of the rectangle and hold 10 seconds. Get the two bridge pieces.



Trace the edges with a pencil and trim with scissors. Use a hobby knife to get the inside corners.

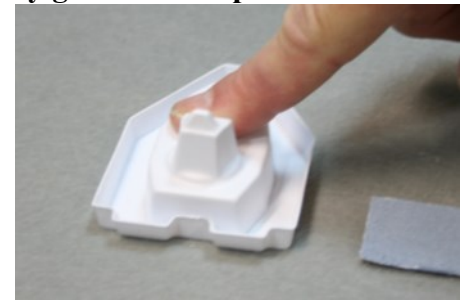


Like the gun housings, use the sanding block to sand away the edges left by the scissors. The thinner pieces are easier to hold with a handle made from masking tape.



Sand or scrape away any bits inside the walls of the bridge railing. Set the pilot house as shown, centered and touching at the rear of the inverted bridge. Trace a light pencil line around it.

IMPORTANT - If you are installing a bow cannon, do not glue the pilot house to the bridge yet. OK to glue the bridge to the second deck without the pilot house. The cannon may go under the pilot house.



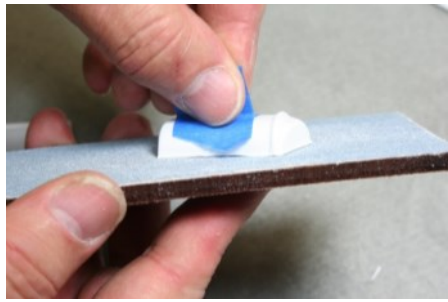
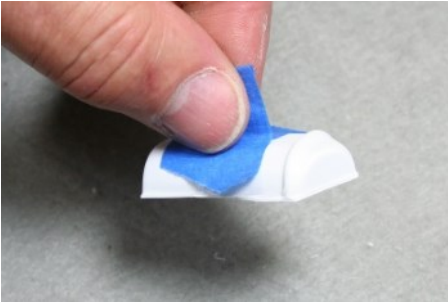
Scuff in side the line for the glue to adhere. Put CA on the bottom edge of the pilot house. Align and press in place.



Trace around the stern anti-aircraft gun placement. Trim with scissors. Add a tape-handle, and sand against the sanding board, rotating frequently to remove the curved edges left by the scissors.



Get the four stack halves. Trim with scissors. Cut off the bottom just below the curved edge. Make a tape handle.



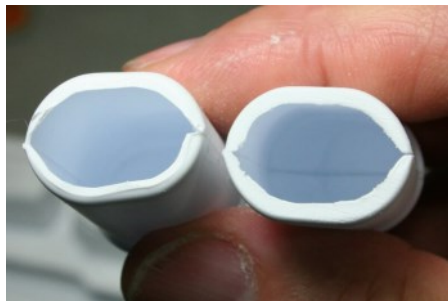
Easier to hold the stack half for sanding. Sand to a flat surface. Don't press too hard. Before & After sanding.



Tape one side of a pair together. Open the 2 halves. Put a thin layer of CA along the mating surface of one half.

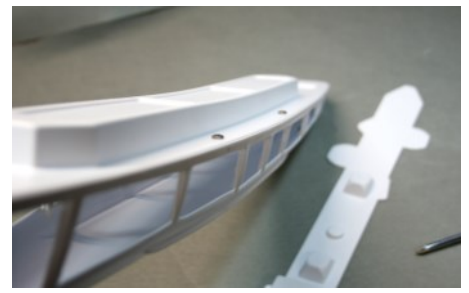
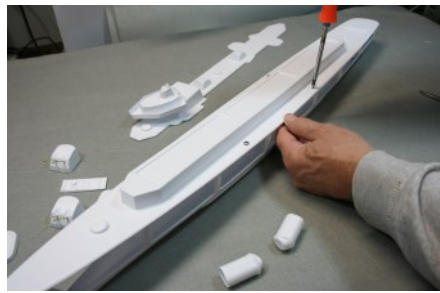


Fold together and align the seam. Hold for 15 - 20 seconds. Secure with tape and let it dry at least one hour.

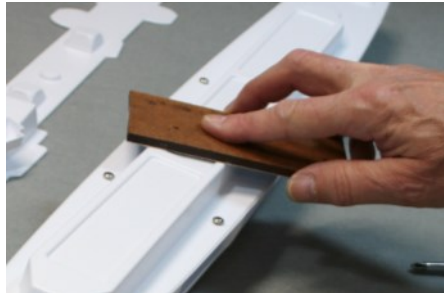
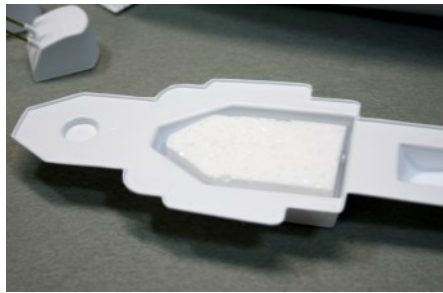


Holding at the base, with light pressure, sand the bottom flat to where the sides of the stack begin to curve inward. Take your time. Check frequently to make sure it sits straight on a flat surface. Before & After photo.

Insert a piece of foam and put mixed epoxy inside the stack on the foam and along the inside of the glued seam to strengthen the stack and make it float. Set aside for the epoxy to cure.



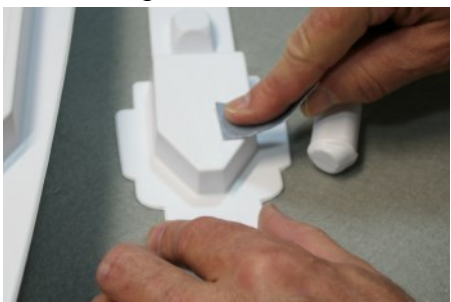
Inside the hull, add filled epoxy to reinforce the stems of the rudder mounts as shown. Use a bent wire to reach around to distribute the epoxy. Attach the deck to the hull with the center 4 screws. The deck and hull are curved. Gluing on the 2nd deck with the deck attached to the hull will help preserve the curve of the deck to match the hull's curve.



Optionally, you can add some foam inside the 2nd deck to help the boat sink upright in battle. Sand the raised portions of the top of the deck house. Sand the corresponding areas under the 2nd deck. **Important - Leave out any foam in the 2nd deck if installing a bow cannon as large holes would be drilled there.**



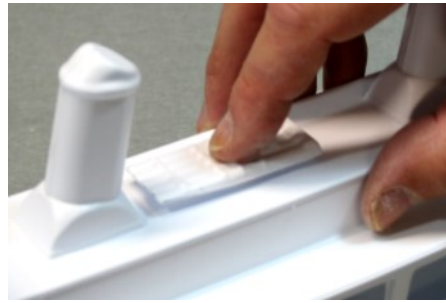
Apply CA to the top of the deck house raised areas. Set the 2nd deck on the deck house centered and aligned. Hold in place 10 seconds. Press all surfaces to bond the CA. Sand the mating surfaces of the deck fixtures.



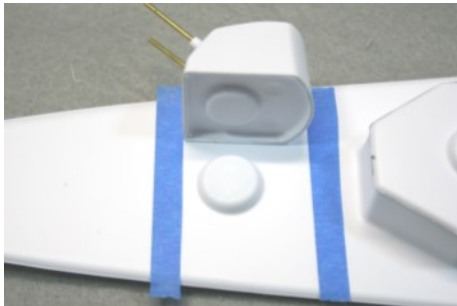
The base for the pilot house, round gun mounts, the rear anti-aircraft gun placement and the top of the stack bases.



Apply CA to the bottom of the stacks and glue to the stack bases on the 2nd deck. Orient them as shown.



The torpedo launcher points toward the bow of the ship. The pilot house front edge lines up with the base under it. Note the raised walls of the bridge railing hang over the sides of the base under it.



For the guns, tape will help you align the round piece under the gun with the round mount on the deck. Don't install the gun where you plan to mount your bb cannon later. After CA cures, drill 5/64" hole through deck into gun base. Insert an included #4 x 1/4" stainless screw to help hold gun in place when hit by enemy bb's to help avoid embarrassing gun loss in battle.

IMPORTANT - If installing a bow cannon, do not glue the #2 gun to its base.

If installing a stern cannon, do not glue the #3 gun to its base.



The accessory tray is installed with hook & loop to make it easy to remove for drying or working on the electronics. There is room under it for a layer of ballast, and a water channel.



Trim the marked edges of the boat stand and the Combat Gearing Hull Kit is complete. If you have the complete kit with the twin motor drives, the installation of the hatches to the sub-deck and the internal armor panels will be discussed after the drive installation directions. The shipping box makes a great temporary storage box for the hull if trimmed as shown.

The included servo may be factory water resistant. If not, before installing the Servo, it can be made water-resistant: Clean off any oil or dirt on the servo case. Scuff the servo case with sandpaper. Paint over the case seams and case screws with two coats of a conformal coating, dope or some nail polish. Put a dab of filled epoxy where the wire comes out of the servo. After the motor installation, squirt some stern tube grease around the output shaft under the servo arm. The Motor/Servo Mount will accommodate the Traxxas 2065 waterproof mini servo.



Once water gets into most servos, they will die. If yours starts to show symptoms or erratic behavior, unplug it immediately and plan to open it up and dry the interior at the end of the day. You may be able to salvage it.



Prop templates can help you align the prop shafts to the hull and rudders in a scratch-built drive system. Glue to flat plastic scrap. Drill 1/8 hole at center & sand to the outer ring. Mount at the center of the threaded part of the shafts temporarily while gluing the motors and stern tubes in place. The inner ring is the prop's 1-inch diameter.

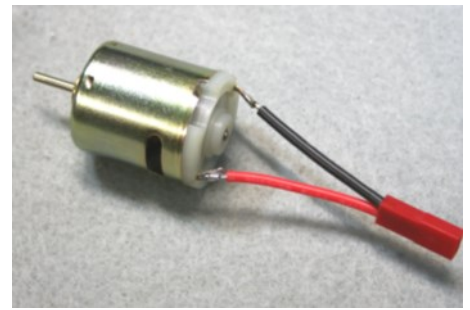
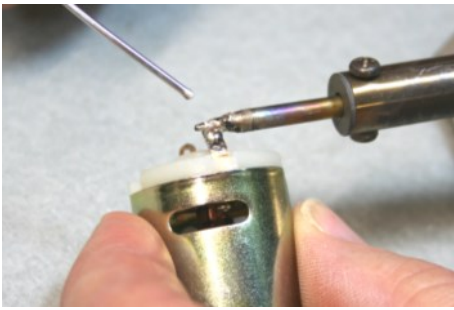
The space between the rings is the clearance you want between the prop and the hull.

With this kit, the motor/servo mount will align the prop shafts pretty well without using templates. You can just install the two props and use them to make sure you have things aligned and proper spacing between the props and the hull. Set the motors on the motor mount as shown.

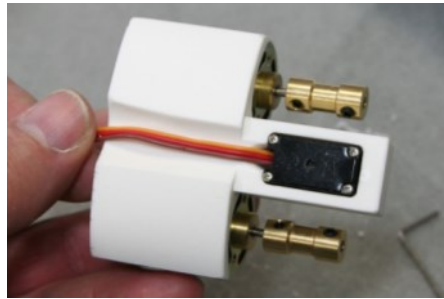
This is one of the smallest classes of ships. The motors only draw an amp or two in normal use. Heavy wires and 100 amp speed controls are not necessary. Weight is a serious factor to properly ballasting the ship. Consider small inexpensive 10 amp Electronic Speed Controls that use red JST connectors. 20AWG wire is better. 22AWG wire is OK. Less breakage with thicker wire. Buy only JST connector pairs that have silicone insulation and you will have less breakage near solder joints. Wire both motors the same, red to + and black to -. The ship has counter-rotating props. One of the motors will run reversed. Make reverse "Y" connector at your ESC where the polarity of one motor connector is normal and the other is reversed. This way you only need one wired spare motor to serve either side of the drive because the ESC's plugs determine which one is running in reverse.



Now is a good time to solder a wiring harness to your motors while they are out of the hull. Next to each brass tab, there is an embossed + and - to indicate the positive pole and negative pole of the motor. Shorten the female JST connector to about 2-1/2 inches. Strip the insulation at the ends. "Tin" the wires by applying solder to them, **16** even if they are "Pre-tinned" silver.



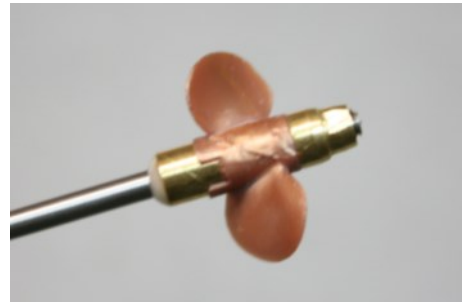
Tin the motor tabs. Connect them by holding the tinned wire to the tinned tab and apply heat to melt them together.



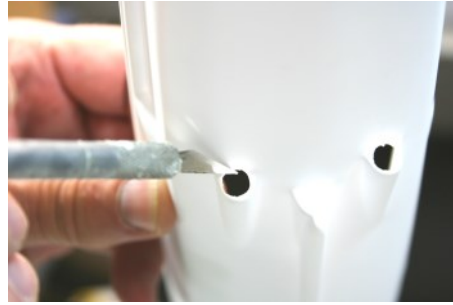
Install the motor clamp and screw. Tighten only until snug. Install the servo with the wire running toward the stern of the ship as shown. Drill 1/16" holes at the dimples in the mount and attach with the two screws included with the servo. Insert shafts fully into motor coupling & **lightly** tighten one set screw.



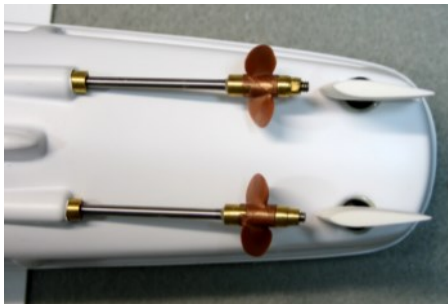
Push the couplings onto the motor shaft. Install and tighten the motor-side set screws. Remove the shaft set screws. Mark the coupling holes on the shaft with a fine tip felt pen to locate where you will grind flats on the shafts. Flats prevent the set screws damaging the shafts which would make them harder to remove for maintenance or repair. Use a Dremel tool to grind 2 flats on each shaft where the shaft was marked. Scrape off any burrs along the edge of the ground area with a hobby knife to prevent binding in the coupling. Do not attach shafts to the coupling yet.



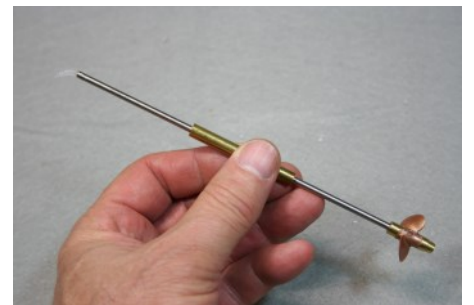
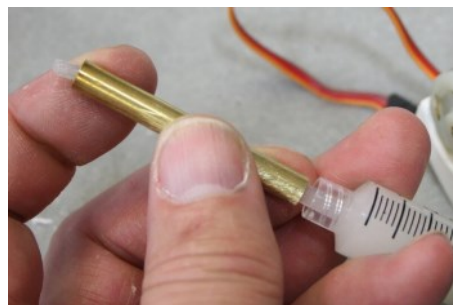
As viewed from the stern, the right prop turns clockwise and the left prop turns counter-clockwise. With threaded drive dogs and prop nuts, they can unscrew when a shaft is turning clockwise. To prevent this, add some thread locker or some epoxy to the front 1/4-inch of threads as you screw on the drive dog. Do not put thread locker on the prop or prop nut. If the drive dog can't rotate, then the prop won't rotate either. Screw on the drive dog to the end of the threads. Push or screw on the prop until it contacts the drive dog with the slots lined up with the tabs on the drive dog. Screw on the prop nuts. They will seat the props into the drive dogs. Tighten until snug.



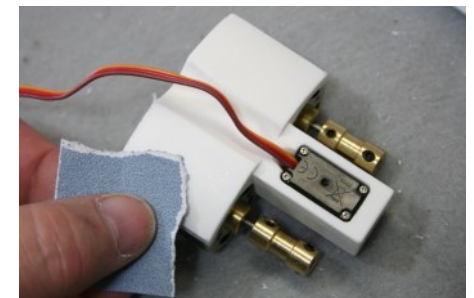
To avoid binding or excessive friction in the drive shaft, the brass stern tubes should fit fully into their hull journals (angled depressions in the hull). The hull is pre-drilled for the stern tubes, but the openings will need some adjustment if the stern tubes are up on the end when inserted like this. Once the top of the hull opening is trimmed, the stern tube will lay down into the journal.



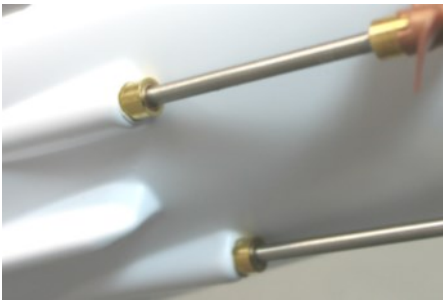
You want the shaft ends approximately 1/8 inch in front of the rudder leading edge. Set the hull on the stand. Insert the motor assembly. Connect the shafts to the couplings but don't fully tighten the set screws yet. Align the props to the rudders and check for clearance between the blades and the hull. Inside the hull, mark the position of the motor mount on the hull with a pencil at the front and rear of the mount. This marks the area you need to sand plus once glue is applied, returning the mount to these marks will assure that the props are in the correct position relative to the rudder.



Loosen the shaft set screws and remove the motor mount and two shafts & stern tubes. Scuff the outside of the stern tubes to help them bond to epoxy. Inject grease into both stern tubes. With the sanded stern tube end pointed toward the propeller, insert a shaft into each to the shaft center which will push out excess grease. Clean off any spilled grease from the parts or on your hands. Grease will lubricate the shaft and prevent water entering the tube.



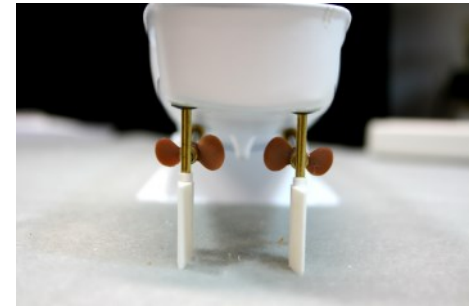
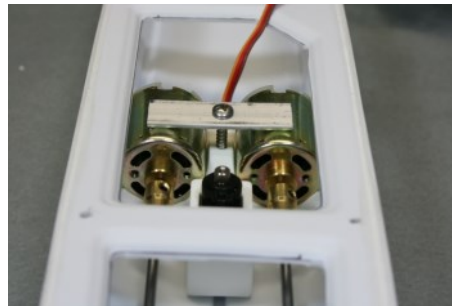
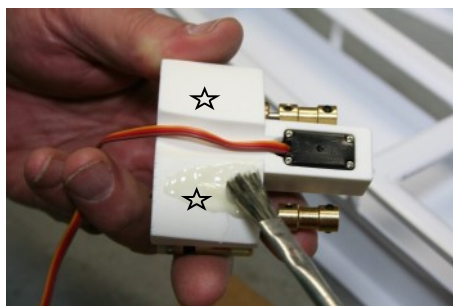
Sand the slots for the stern tubes and re-install the shafts & tubes. Sand the underside of the motor mount. Do not sand the servo or the servo area of the mount.



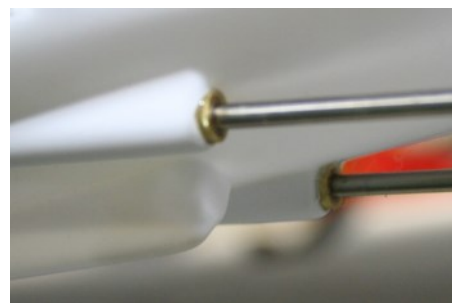
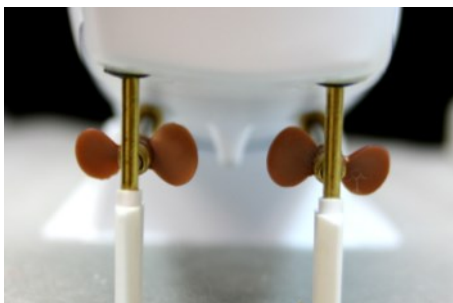
The final location for the stern tubes is with only about 1/8-inch or less protruding from the hull journals. Keep the epoxy off of the shafts. Mix two 1-1/4" puddles of epoxy and add filler.



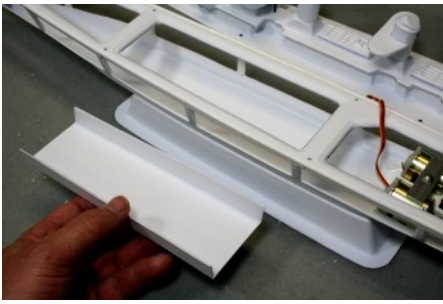
While holding up the inside shaft end, use a rod or narrow brush to force epoxy under the stern tube into the hull shaft journal. Rotate the tube to distribute the epoxy. Clean any grease off of your fingers to avoid contamination.



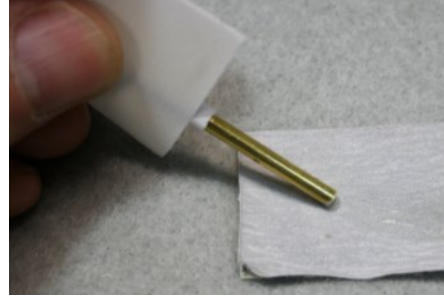
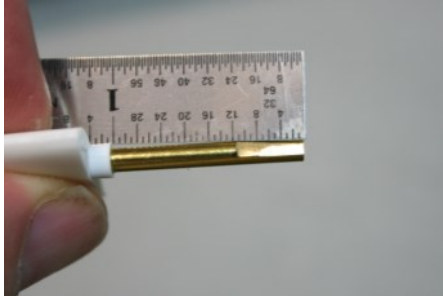
Brush filled epoxy on the underside of the motor mount. **No epoxy near the tunnel to avoid the servo wire.** Set the motor assembly into the hull at the marked location. Hold in place. Attach shafts aligning the flats with the coupling set screw holes. With the boat on the stand, insert the rudders into the rudder mounts for reference.



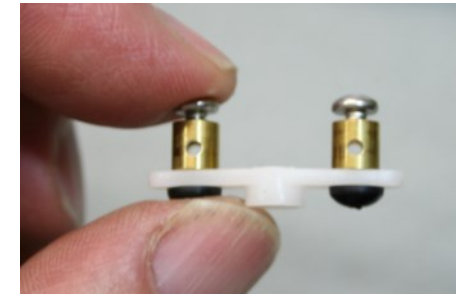
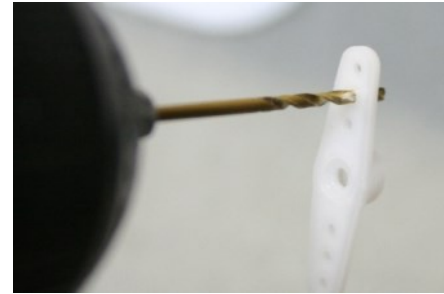
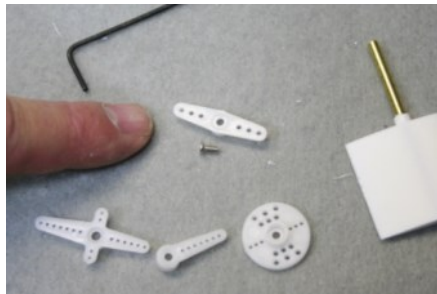
Visually center the two props to the rudders. The motor mount will slide a little left or right. Check the position of the stern tubes. Note the servo is approximately centered to the keel groove in the floor. Check the distance from the end of the prop shafts and the leading edge of the rudders. When everything is lined up, let the epoxy cure. Check as it cures to make sure nothing moved while the epoxy was still liquid.



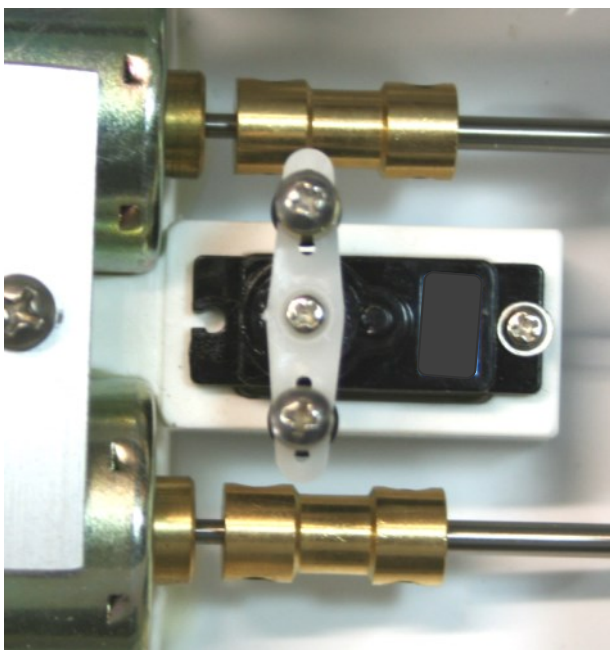
This is the electronics tray. It fits into the 2nd bay from the bow. You may not need all of it. It helps you lay out your electronics. Best to attach it later to the ballast or hull with pieces of hook & loop for easy removal for drying or working on the electronics once you have designed the layout and location of the internal parts. It holds the receiver, switches, ESC, firing boards or other components. Open the rudder package and servo packet.



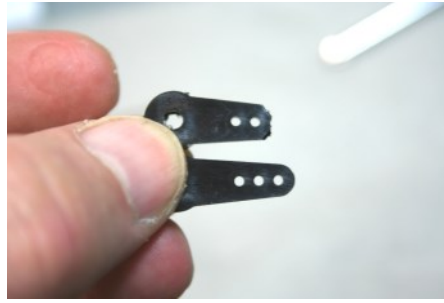
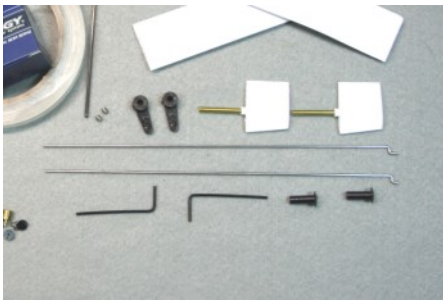
Grind a 3/8-inch flat on the leading edge of the rudder shafts facing forward. Sanding off the sharp corners of the end of the shafts will make it easier to insert into the rudder arms. Put a little grease on the shafts near the rudder blades.



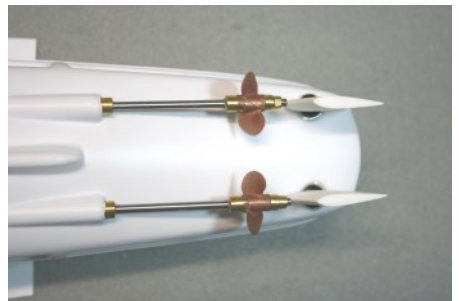
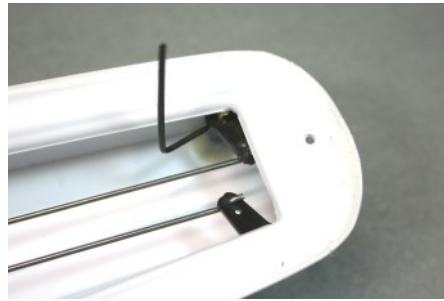
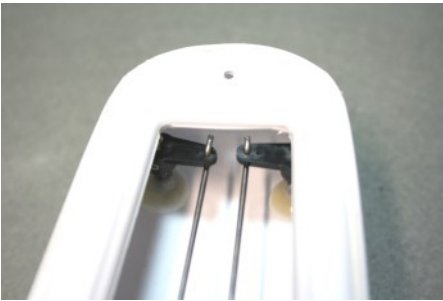
Find the double-ended rudder arm in the servo packet. Drill the middle holes on each end of the arm with a 1/16-inch drill. Insert an ez-connector into the hole. If it is a tight fit, then remove the ez-connectors and drill again to enlarge the hole a little. With the plastic keeper snapped in place, they should rotate easily, but not too loose.



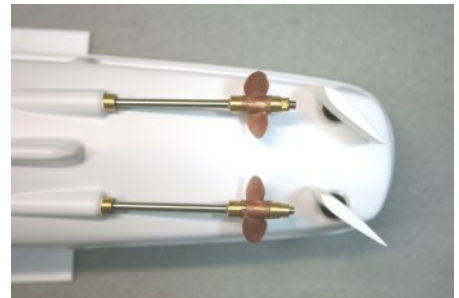
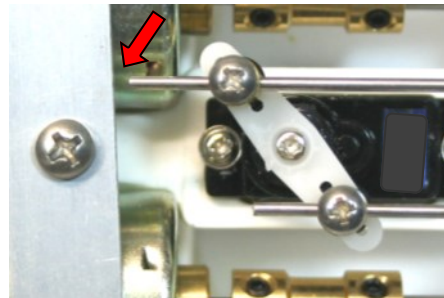
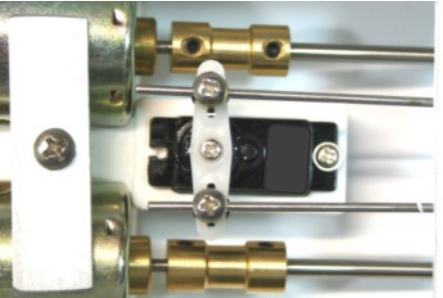
Before attaching the servo arm to the servo, we need to “Center” the servo. This can be done with a servo tester or by connecting it to your radio system and powering it up. Connect the servo lead to the #1 channel of your receiver. Turn on your transmitter. If you are using an ESC with “Battery Eliminator Circuitry” (BEC), the ESC supplies power to the receiver when you attach the battery to the ESC. (No need for a separate battery for the receiver.) Connect the ESC to the receiver and battery. Turn on the Transmitter, then turn on the receiver. (You may need to consult your radio system’s manual or ask for help from your fellow captains.) With the system on and working, center the radio’s steering stick and center any adjustment wheels or switches to center. This centers the servo. Attach the arm. If it is a little angled, then turn it around and it may fit straighter. Press in place and attach the small screw from the servo accessory packet.



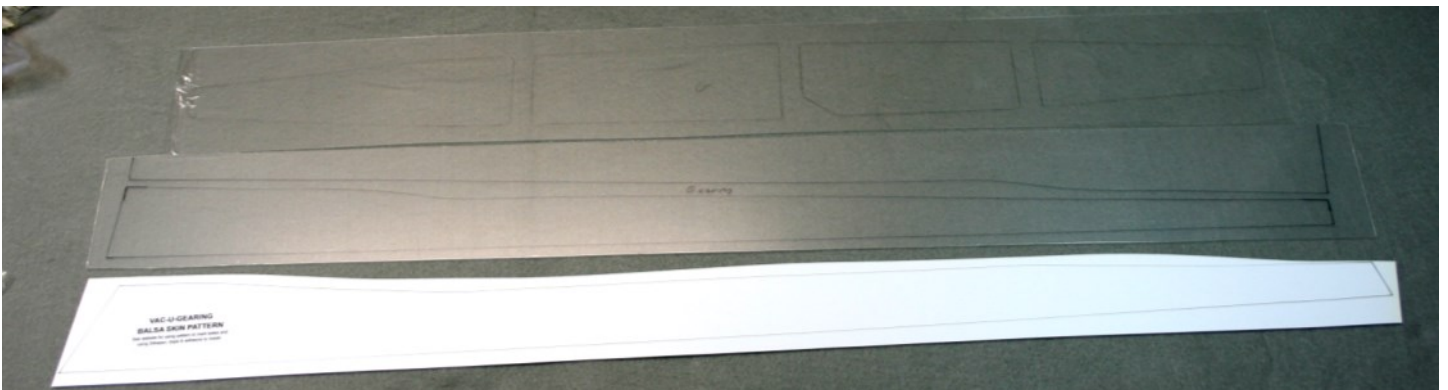
Get the two pushrods, rudder arms, set screws and hex wrenches. Cut away the outer hole of each rudder arm as shown and round the two corners a little. Install the Z-bend of each arm from underneath into the outer hole as shown. The set screws will install from the bow-end.



Insert the rudder shaft through the mount and rudder arm. Leave a little up and down play in the rudder to prevent binding. Tighten the rudder arm screws against the flats of the rudder shafts until snug. Turning the rudder will give you wrench access. With the servo centered, insert the rudder pushrods into the servo arm EZ-Connectors as shown.



Holding each rudder straight, tighten the ez-connector screws. Connect your radio gear. Turn on your transmitter and receiver. Turn your rudders left and right. Make sure the pushrods don't contact the motor clamp at extreme left or right rudder. If they do, trim them shorter. Confirm both rudders are parallel with each other.



Cut out the white balsa skin pattern. Use it to mark your 4-inch x 36-inch piece of balsa to make the two penetrable hull skins. Cut out the four hatch covers then peel off the protective plastic from both sides. They are applied using the 1/2-inch clear tape. They may not be symmetrical so flip them over if they don't fit well. Cut out the two pieces of armor but do not peel off the protective plastic. The protective plastic may help the armor resist bb impacts. Round off the corners of the narrow end to help their installation. Once all of your hardware and electronics are installed, insert the narrow end from the bow with the straight edge facing up, along outside of the electronics tray to the stern of the ship until it extends to the side of the rudder arms. Curl the large end into an S shape to fit through the front hatch opening and into the bow. Secure with tape if necessary.

It is time to make decisions about your internal components and weapon system. Will you use high-ampere connectors or smaller ones rated for what this model uses? Or, will you just solder everything together, eliminating the plugs with their weight, but making it harder to service the boat in the field during a battle. You have to think SMALL and LIGHTWEIGHT. Wiring the bilge pump and each motor with their own short wire-leads and plugs will make servicing or replacing them between battles much easier. Removing bulky plastic cases can save space. Velcro will hold receivers, ESCs, and switches in place for easy removal. Small, inexpensive ESCs made for brushed motors can be waterproofed by coating in epoxy or conformal coatings. They should be Forward-Reverse ESCs. Avoid any that advertise “With Brake” as they require extra stick action to engage reverse that just doesn’t come naturally in the heat of battle. You will have to use 12g or 16g CO2 cartridges to fire your cannons. Some lightweight cannon designs have tested at a solid 120 shots at 150psi on a single 16g cartridge using a beverage-industry CO2 regulator with a Clippard MAV-2 poppet valve triggering the gun. While this may mean two sorties per cartridge, how much gas you use per shot depends on how your cannon is tuned and what is firing it. By their design, some solenoids have a minimum cycle time that may release more gas per shot than a different model or a servo-actuated poppet valve. At least, you should expect over 50 rounds on a less-expensive 12g cartridge. As these hulls are built, we will post examples of equipment setups and sources to help get you started.

In RC Warship Combat, a Destroyer is normally an Advanced Build. This is because the ship is small and does not displace as much water as the larger ships. This limits the amount of stuff you can put into the hull and still have it float properly. Many components made for general RC Warship builds just won’t fit into a destroyer’s hull. You must think about the weight of everything you put in this ship, and where to put it that the ship remains relatively-balanced. What may seem fine for a dry ship can be unstable when there is some water in the hull. You want heavy things in the bottom to help ballast the ship to hold it upright. You want everything to weigh less than what it takes to have the ship sit at its normal water-line. The best outcome is that you have to add at least eight ounces ballast weight to finish the build. The bottom of the ship must be heavier than the top so it will stay upright and run well. The vacuum-formed parts make this easier to accomplish. Recent product advances by suppliers of RC Warship Combat parts has helped. If you are new to this, then seek the experience and advice of groups and clubs experienced with RC Warship construction. If you are a seasoned veteran of RC Warship construction, know that you have to bend some established rules of construction to accommodate the size and weight limitations of this “Tin Can”.

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. Rust-Oleum 2X Ultra Cover or Krylon Fusion paint 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. “Non-toxic” model paints are safest to brush on, for the painter and the boat. “Primer” colors like grey or red can make good hull paints.

Painting The Hull: Styrene is best painted with Acrylics, Hobby Enamels, Krylon “Short Cuts”, 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, like regular “Krylon” paints will melt or weaken the styrene in thin areas or when applied wet-on-wet. Use them at your own risk! Test your paints on the leftover hull scraps. See “Painting Tips” on the website.

MAINTENANCE: After a day of battling, remove all hatch covers. Drain all water from the hull. Rinse with clean water if necessary. Remove everything except the glued-in ballast, armor, cannon, drive system and rudders. Unplug all connectors. Use compressed air (best) or canned air to blow water out of cannon & hoses, drive motors, the bilge pump, the electronics, and out of all plugs, male and female. Don’t blow the top of the servos where waterproofing grease is located. Lay-in the top of the armor at the bow and middle to help air get to the balsa skin. Set the ship and all of the pieces in front of a fan for several hours. Leave the boat open for 2-3 days so the inside can completely air dry. Lube motor and shaft bearings with a tiny droplet of oil. Wipe off any excess as oil which can damage plastic. The stern tube grease will only need to be changed if water leaks in along the shafts. It should last for years without changing.