

Tugster

Twin Tug Boat

Competition or Sport Tug Kit



A Zippkits R/C Boat

Building Instructions

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The Zippkits Twin Tugster was developed from the very popular Springer class models.

This is the twin motor version of our best-selling Tugster kit.

The TT is great for working, weather it is pushing/pulling giant model seaplanes to shore, towing in that dead boat or pulling you around the pond in your small boat.

Suitable for all skill levels and ages, this kit is fully customizable. We supply our standard "Indiana Twin" wheel house, but you can purchase optional wheel houses and superstructure kits from us, as well as make your own from scratch.

Maybe model it after a tug you like?

However you decide to finish it, take the time to read this entire manual, so that you are familiar with all of the buildings steps and their proper order. Take your time; make sure you understand everything before you do it and you will be rewarded with a great running tug!

This kit can be considered a toy. Although R/C boating is a fun and rewarding hobby, it can be dangerous if not done with common sense and safety in mind. Just about anyone should be able to build this kit, but care should be taken, especially when handling LiPo batteries.

The manufacturer assumes no liability for damages or other loss in the use of this product, as we have no control over the construction or end use of this product.

Tools and supplies needed to build

- Sanding blocks with 80 and 150 grit paper
- Drill with 1/16, 3/32, 1/8 and 5/32 bits
- Flat file
- Round (1/8) file
- FLAT Workbench
- Flat work surface
- Medium CA glue and accelerator
- Good quality 30 minute epoxy
- Epoxy finishing resin, polyurethane, lacquer or shellac
- Spring clamps, paper clamps, c clamps, etc.
- Razor blade or X-Acto knife
- Masking tape
- Waxed paper
- Wood filler
- Primer
- Paint

Additional items needed to complete

- 2x 550 size brushed motor (Zipp 504)
- 1x Electronic Speed Control (Zipp 503)
- 2 channel radio
- 1x Standard size servo (Zipp 5003)
- Ballast (BB's or lead)
- 2x Battery- 4.5A Gel Cell /SLA or 2x 2S LiPo (7.4v)

The following parts required are included in the optional Twin Tugster Hardware Set

- 2x 1/8 inch drive shaft
- 2x 5/32 Brass shaft tube
- 2x 1/8 to 1/8 coupler
- 2x 1.5 inch 3 blade prop
- 2x Rudder pushrod
- 3x 1/8 inch steering arm
- 2x Rudder
- 2x 5/32 brass rudder tube
- 2x Shaft Oiler Set

Let's identify the parts so that we can easily find them when needed. Mark the parts with light pencil.

1/8 plywood parts:

See Printed Version

See Printed Version

See Printed Version

See Printed Version

See Printed Version

Misc. parts

Do an inventory of all the parts, to be sure that everything is there. If anything is missing or damaged, contact us as soon as possible, so that we can get replacements to you quickly.

Glue

You can use any type of water proof glue you want. This includes Titebond, Gorilla glue, CA, epoxy, etc.

We used medium CA and 5 minute epoxy for the entire build.

Work Surface

We recommend that you use a straight, flat work surface.

Minimum size would be at least 24 by 12 inches.

Every critical component on this hull depends on a straight, flat surface.

Do whatever it takes to get this done.

A note about Ballast:

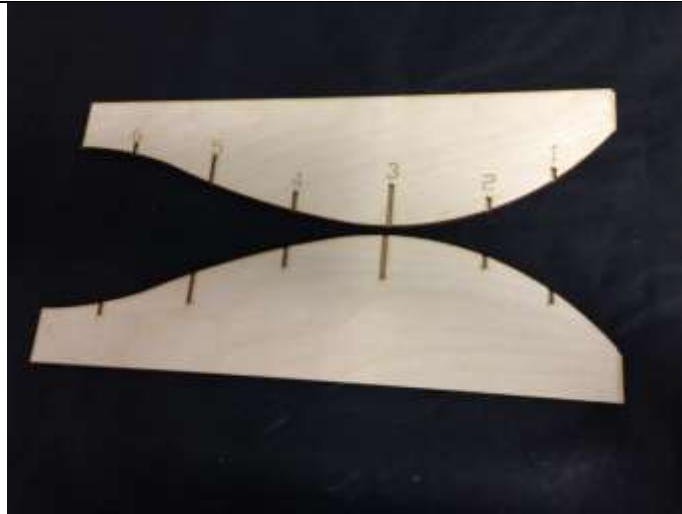
This tug requires ballast- a lot of it.

The batteries are good for almost 4 pounds...

We use BB's and epoxy for the remainder, but you can use anything heavy.

Some regulations require that this tug weigh 8 pounds with battery, and we recommend at least 6-1/2 pounds.

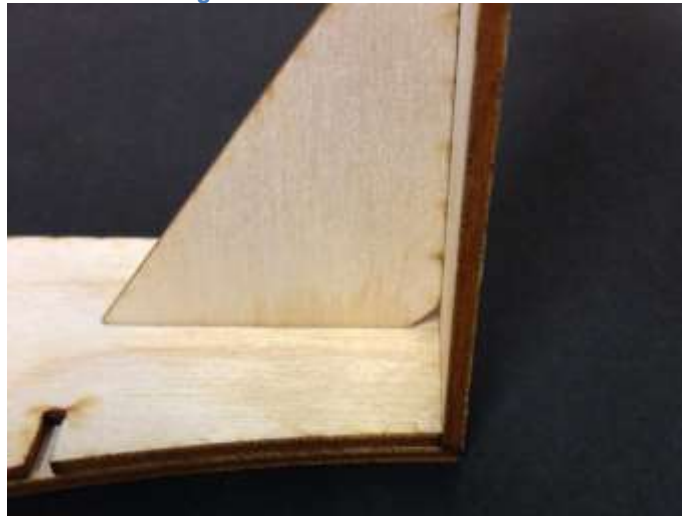
If you are having a contest (water polo), make sure that you set a minimum weight, as the lighter boats will be faster.



Hull sides arranged for left and right sides.



1/8 inch overhangs in front and rear.



Use the square provided.

Hull

The hull sides are laminated from 2 pieces of ply.

The inner piece has the slots for the bulkheads.

The inner piece is also shorter than the outer. This allows you to glue the end pieces (marked "outer") into a strong joint.

We used medium CA glue for all assembly. You can also use epoxy or any water proof glue.

Glue the inner hull to the outer hull, **leaving 1/8 inch on each end.**

Be sure to make a right and left side. The best way to do this is to make mirror images of the sides as shown.

Be sure that you make a right and left side.

Weight or clamp until cured.

Bulkheads

Test fit the bulkheads in place. They will only fit in their respective slots.

Glue the ends in place. These are marked "outer". These go in the step at each end of the hull.

Use the large square provided so that these are 90 degrees to the hull sides.

Bulkheads 1, 2 and 6 are the same. Glue these in place on one of the hull sides.

Use the square and be sure all bulkheads are square in 2 planes as shown. Get the bulkheads square side to side as well as front to back.



Check for square both ways.



All bulkheads in place.



Adding 3A doubler to front of 3.

Glue the rest of the bulkheads in place using the square provided.

Be sure that all bulkheads are fully seated and again check that all are square to the hull side.

Turn your square 90 degrees and check that all bulkheads are square to the bench.

Glue in doubler 3A in FRONT (motor side) of BH 3.

Put the hull upside down on your bench on wax paper and glue all bulkheads to the other hull side.

Glue in the fwd and aft bulkhead doublers. These are marked "inner".

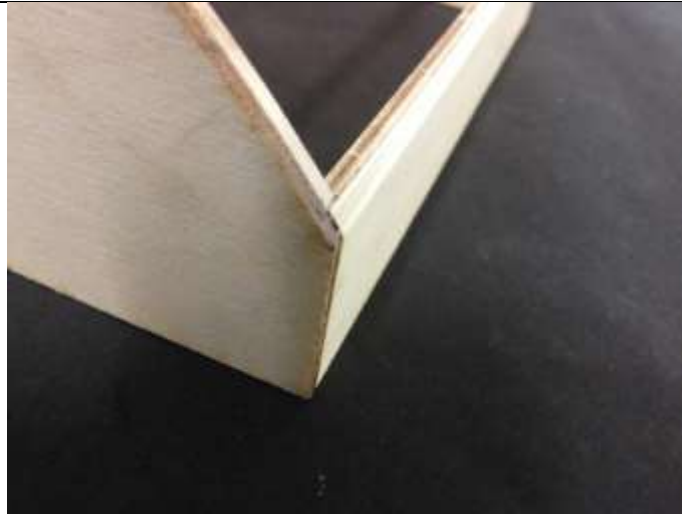
Install the doubler 3A.

This goes on the **forward** side of bulkhead 3.

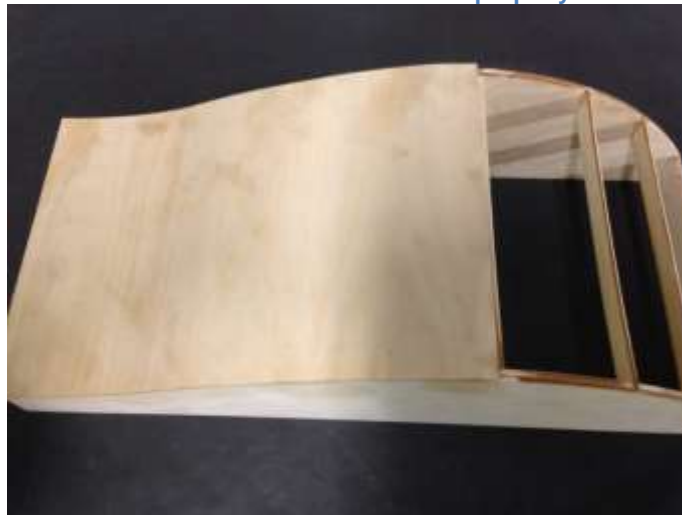
Allow to cure.

Step back and admire your new tug. That was no work at all. Just fun...

Let's get ready to put the bottom in place.



Bevel and sand so that bottom sheet fits properly.



Aft sheeting in place. Note that it covers half of 3/3A.



Another view.

Bottom

The hull bottom is 2 sheets of 1/16 plywood, installed cross grain.

The aft bottom is longer and they both meet at BH3.

You can wet the aft bottom if you want (outside only) but you don't have to.

Sand the hull bottom so that no bulkheads are sticking up and the ply has a smooth surface to attach to.

Sand the front bulkhead so that the angle matches the hull side.

Glue the aft sheet in place, starting halfway across bulkhead 3 and moving all the way back.

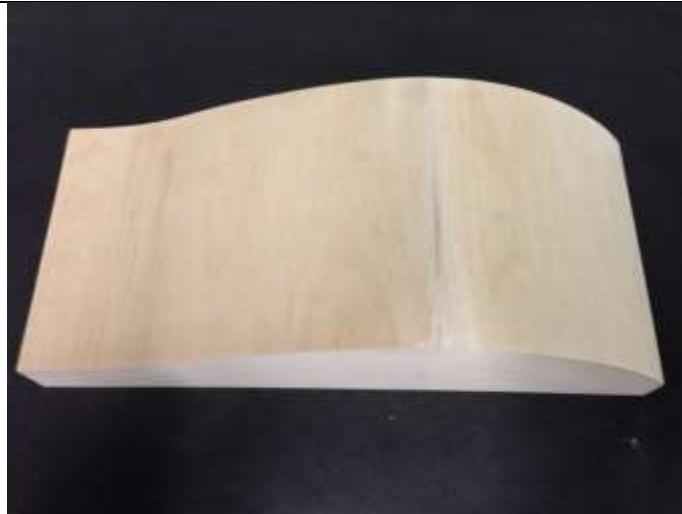
Note that the bottom sheets are larger than required, and will be sanded later.

Use clamps, rubber bands, your little brother, weights, tape or whatever you need to hold the aft bottom on complete contact with the hull.

Double check that the aft bottom only covers half of bulkhead 3 and that you have a little overhang all around.

Allow to cure.

Glue the fwd bottom the same way, butting it up against the aft sheet at bulkhead 3. Leave an overhang all around and allow to cure.



Bottom sheeted.



Seal the inside.



Parts sealed on one side before assembly.

When cured, sand the bottom all around. You may round the corners slightly, but not much.

This is really starting to look like something now!

Take this time to seal the inside of the hull with 2 coats of sealer. This can be epoxy, lacquer, polyurethane, shellac or just about any oil based paint or sealer.

You can skip ahead and complete the deck, hatch and wheelhouse if you want (we did). That way, you can seal the inside of everything at once.

Also seal the radio tray, battery tray and tray sides. DO NOT GLUE IN PLACE YET.

Let's get the stuff put in to make her go!

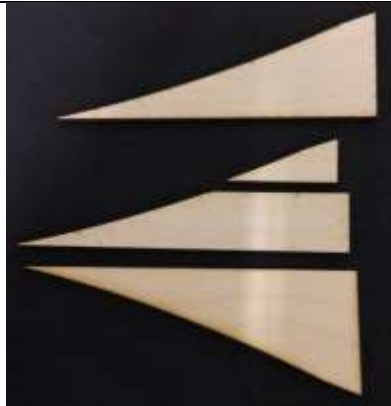
Keels

The keels are laminated from 4 pieces, leaving a groove all the way through.

Grab one of the keel sides and glue inner keel A to it.

Glue inner keel B above it, leaving a 1/8 inch gap.

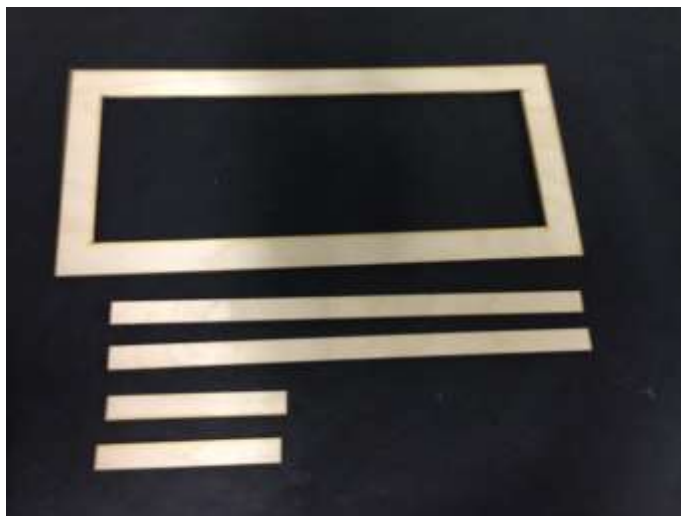
Be sure to match the inner keel outline to the outer.



Keel parts.



Keel inner parts.



Deck parts.

Glue the other keel side over the inner keels, again matching the outline.

Allow to cure.

Drill out the slot with a 5/32 drill bit. Run the drill in and out of the keel a few times to make a nice round slot.

Repeat for the other keel.



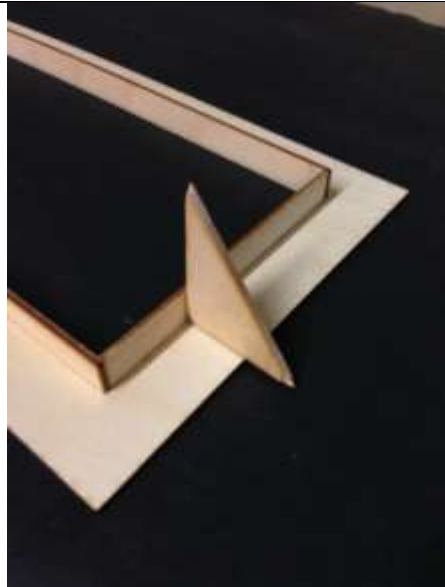
“hollow” keel.

Deck

The deck has 5 parts. 4 of them form a lip that the hatch fits on.

Glue the long strips in place first.

Use your square and make sure they are flat on the bench, and flush with the bottom of the deck.



Deck being assembled.



Hatch.



Completed hatch.

Glue the 2 short end pieces in place. These go between the long ones. Use your square.

You can seal this as soon as you are finished.

Hatch

The hatch is assembled from 5 pieces. 4 of them form the lip that goes over the deck that you made earlier.

Glue the 2 long strips **on top** of the hatch.

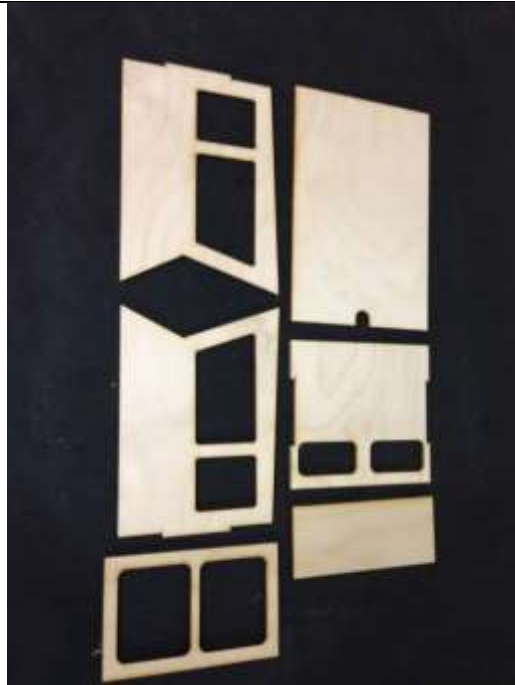
Note that all strips are **glued to the top of the hatch**, not the side.

Be sure to use your square, and glue all 4 strips in place.

The shorter strips go **between** the longer ones.

Make double sure they are all square.

When cured, sand if necessary and then seal both sides.



Wheelhouse. Yours may differ.



Back and side.



Getting there...

Wheelhouse

The wheelhouse is the focal point of the tug. This is one area that you can really make your tug special.

We supply the standard "Indiana" wheelhouse, but we have others available.

The wheelhouse is assembled from 6 pieces.

Note that all windows are on the upper part of the wheelhouse.

Keep that in mind when assembling.

Start by gluing the back to one side.

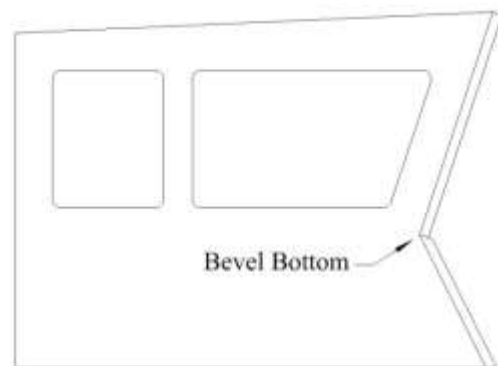
Use your square and be sure it is all good.

Add the other side.

What are you going to use? Your square!

When cured, glue the top front in place.

Glue this so that it is all the way down to the "corner" formed by the upper and lower front.



The lower front (without windows) must be sanded to a bevel to match the upper front.



Top being attached.



Note overhang front and rear.



Holes drilled and filed for tubes.

Take your time and get a nice joint here.

Remember, everyone will see this part, so do a good job...

Once the glue has cured, sand the top and bottom flat.

Glue the roof in place so that the cutouts are in the rear, and flush with the back.

This cutouts are for the smoke stacks.

Sand the wheelhouse and apply sealer.

Seal both inside and out.

If you have not done so, apply a second coat of sealer to all parts and allow to cure.

Shaft Tube

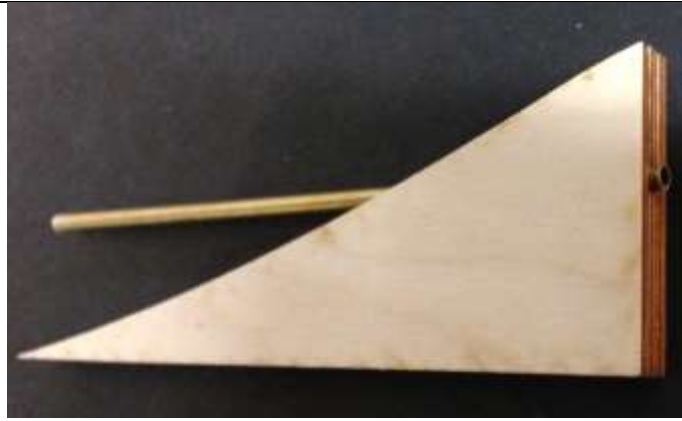
We need to drill a 5/32 hole through the bottom for the shaft tube.

To do this, use a drill bit by hand and drill from **inside** the hull.

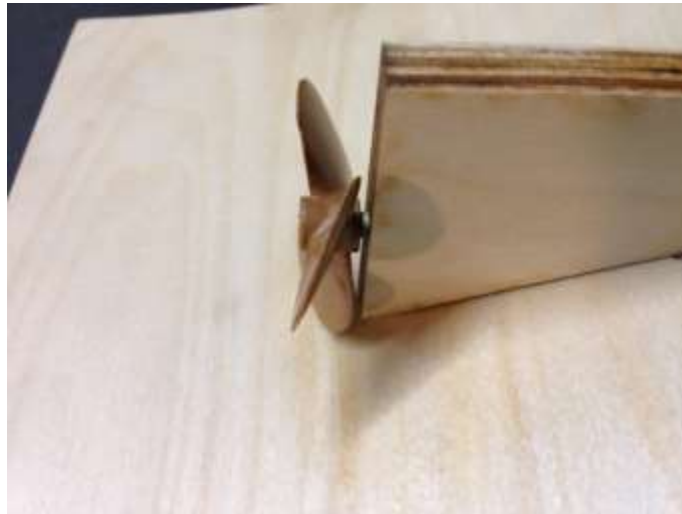
Drill through the shaft hole in bulkhead 5 (actually a shaft "notch").

You are only drilling through 1/16 ply so it won't take long.

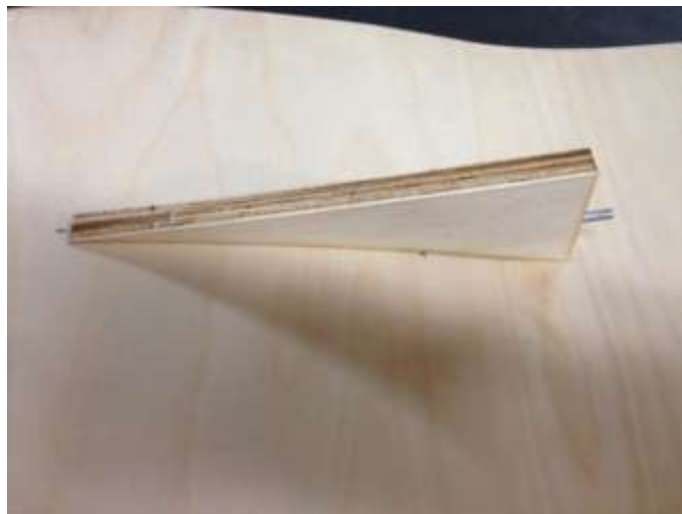
This is important for a smooth running shaft so take a little time to get it right.



Drill out the keel for the shaft tube.



Shaft tube sticks out a tiny bit.



Keel in place

Once you get the hole through you can chuck your bit in a drill and clean up the hole from outside the boat..

Push the 6 inch shaft tube in place through the hull bottom. Be careful as the shaft tube will easily bend.

Don't bend the shaft tube in any way...

With the tube in place through bulkheads 5 and 4, slip the keel onto the shaft tube to check the fit of the keel against the hull bottom.

Grab the 1/8 stainless steel shaft and press on the plastic prop to one end.

Slide this shaft into the shaft tube and occasionally check to be sure that it spins easily.

You may find that as you push the keel against the hull, the shaft will start to bind.

To fix this, use a small round file to open up the hole in the bottom until it doesn't bind.

Please take the time to get this right. If the shaft binds, even a little, your run time could be reduced in half!

Don't be afraid to file that hole until the shaft turns very easily when the keel assembly is pushed against the bottom.

If all is okay, remove the keel and tube.

Rough up the outside of the shaft tube with 80 grit paper and glue it into the keel so that about 1/16 inch is protruding from the rear.



Another view.



Oiler block being drilled with a 3/32 bit. Be careful.



Shaft tubes and oilers glued in place.

Now is the time to test fit the shaft oiler onto the shaft tube. It should slide onto the tube with some resistance, but should not be hard to push on. Use your 5/32 drill bit to ream the hole if needed.

Slip the oiler block onto the tube just before it goes into bulkhead 4.

Use epoxy to glue the keel to the hull bottom.

Put a little glue on the shaft tube (inside the hull) where it comes in.

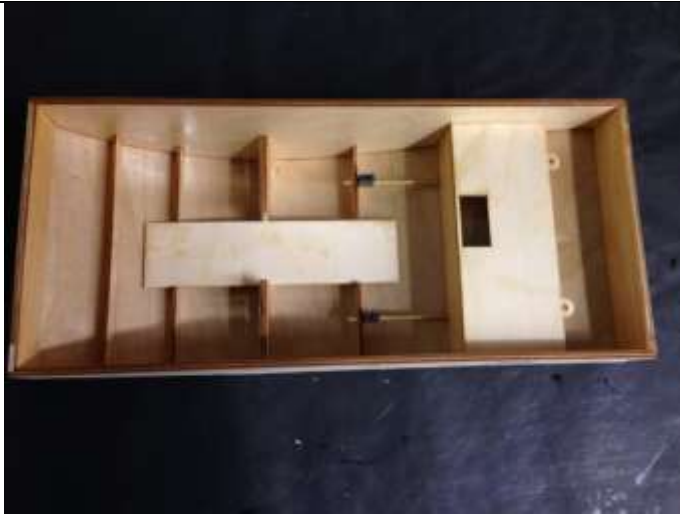
Glue the oiler block to bulkhead 4.

When you are done, the plastic oiler should be in contact with bulkhead 4 with the hole facing straight up.

Allow to cure.

Remove the steel shaft and drill a 3/32 inch hole into the shaft tube from the oiler block for oil. Be careful to only drill through the top of the shaft tube.

Run the steel shaft in and out a few times to break the little burr from drilling.



Battery and servo trays in place.



Battery tray side in place.



Rudder tube square tool.

Glue a 1-5/8 long 5/32 brass tube into the top of the oiler block.

Repeat for the other keel.
You are the one that chose a twin...

Battery Tray

Sand the bulkheads where the battery tray will sit, if necessary.

Glue the battery tray bottom in place, **sealed side down**.

Align the tray, front to back, so that it does not touch the bottom sheet.

Glue the servo tray in place the same way, **sealed side down**.

Glue the battery tray sides in place.
Glue then so that the slot openings face to the rear.

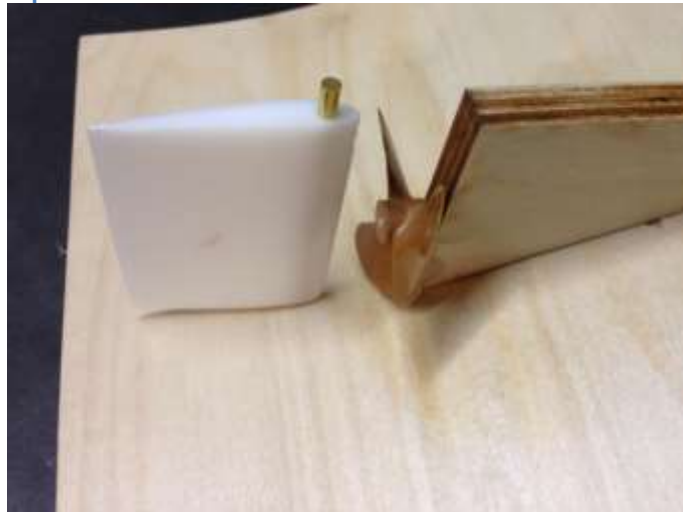
Add the other tray side.

The slots allow you to use rubber bands to hold the batteries in place. You don't want the heavy batteries moving around...

Allow to cure.



Square tool in use.



Rudder in tube.



Keel shoe and plastic bushing.



Rudder Tubes

The rudder mounts to a brass tube in the hull, and is supported on the bottom by the keel shoe.

It is very important that you drill the hole for the rudder correctly.

If you do not, the rudder will not line up with its lower support.

Glue the 2 small squares together.

Glue these just at their edges as shown.

This leaves a little “notch” that we can use as a drill guide.

When cured, use the drill square you just made and drill a 5/32 hole thru the hull bottom.

Drill down through the hole in the radio tray.

Use your square to be sure that the bit is square in 2 planes.

Take your time and make sure that you are drilling straight.

Roughen the two 5/32 brass tubes to prepare for gluing.

The longer tube (1-5/8) goes on the left side (as viewed from the rear). The shorter one (1-1/4) goes on the right.

Slip the brass tube in place.

Leave a tiny bit of brass sticking through the bottom. About 1/16 or less is good.

DO NOT GLUE YET...

Keel Shoe

The keel shoe does several things.

It provides a lower support for the rudder and protects the prop from obstacles.

The keel shoe needs some work before we can install it.



Bushing glued in place.



Sanded flush.



Sand a bevel on the front of the keel shoe.

The first thing we need to do is install the bushing for the rudder.

This is simply a piece of plastic tube that gets glued in place.

Grab the small piece of white plastic tubing and check the fit in the shoe.

This bushing goes in the last hole (the rounded end of the shoe).

If all is well, carefully glue in place. Leave some sticking out of both sides.

Do not get any glue inside the bushing.

Allow to cure.

When cured, sand the top and bottom of the tube flush.

You may have to run a 1/8 drill bit thru this bushing several times until the rudder shaft turns smoothly, without being tight.

Slip the rudder in from the bottom and check to see if it is straight up and down and centered behind the prop.

Use the shoe to see if the rudder is perfectly aligned behind the keel.

If it is off, you can open up the hole in the hull bottom and shift the rudder tube until it is straight.

When you are happy with this, glue the rudder tube in place.

Be sure to leave a tiny bit sticking out the bottom and double check for square.

Repeat for the... Well you know.



Countersink holes for screws.



Keel shoes in place. Note how they provide rudder support.



Motors in.

With the boat upside down and the rudder in place, set the keel shoe on the keel, and poke the rudder shaft up into the plastic bushing.

The keel shoe should be pretty straight on the keel.

You will have to sand a bevel on the front of the shoe to match the hull bottom.

Once you have the shoe fitted, its time to screw it down.

Before we mount the shoe, we need to countersink the 3 holes for our flat head screws.

You can use a countersink if you have one, or you can use a 1/4 inch drill bit to **carefully** countersink all 3 holes.

Be sure you countersink the side opposite of the bevel.

Put the shoe back in place and mark the location of the 3 holes in the keel.

Drill the holes with a 1/16 drill bit.

Be careful not to drill too deep and hit the shaft tube.

Secure the keel shoe with the 3 brass flat head screws.

Remove the shoe and apply sealer to all sides.

Guess what you need to do now?

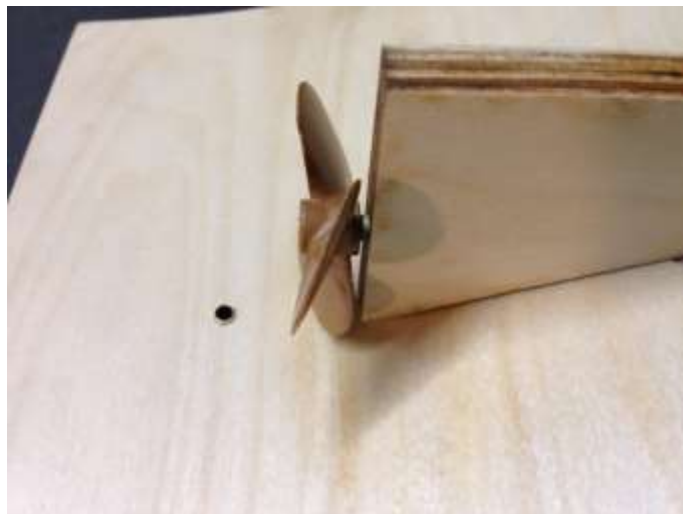
Hint: You just did it once...



Shaft coupler.



Shafts and couplers in place.



Prop ready.

Motors

Slip the motors in place from the front and secure with the 2 M3x8 screws and washers.

Run the motor wires to the side of the hull.

Prop Shaft

The prop shaft is 1/8 stainless steel, and the plastic prop simply pushes on the end.

Don't worry about the prop slipping. There is not enough torque to make it slip.

Clean the prop shaft with any solvent as it is manufactured with a protective coating.

Assemble the motor coupler. This is a piece of clear plastic tubing with 2 metal collars.

Slip a collar on each end of the clear tube.

Make them about 1/8 inch from the ends.

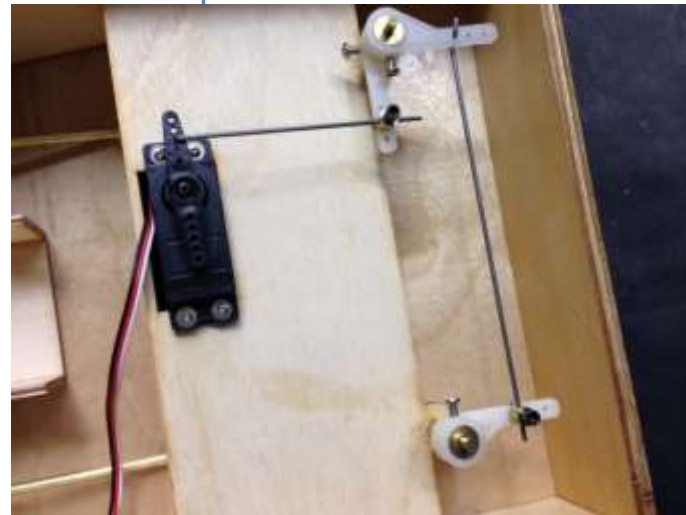
Put in the set screws but do not tighten.

Slide the motor coupler assembly onto the motor shaft so that it is about 1/4 inch from touching the motor.

Lightly oil the prop shaft and wipe off excess oil.



Rudder servo in place.



Rudder pushrod. "Z" at servo end.



Cross link in place.

Slide the prop shaft into the shaft tube, and into the motor coupler.

Leave a tiny gap between the prop and shaft tube.

Tighten both set screws until they are just snug. Do not over tighten...

Repeat...

Radio

Assemble the rudders and keel shoes.

Put the rudder steering arm on the starboard (right) rudder shaft so that it is touching the rudder tube.

Install your rudder servo.

Leave a gap towards the front of the servo so that the wire can exit.

Install the EZ connector onto your servo arm.

Put the .050 music wire "Z" bend into the rudder steering arm and slip the other end into the EZ connector.

Don't tighten anything yet.

Assemble one of the steering arms by installing an EZ connector in the closest hole of the arm.

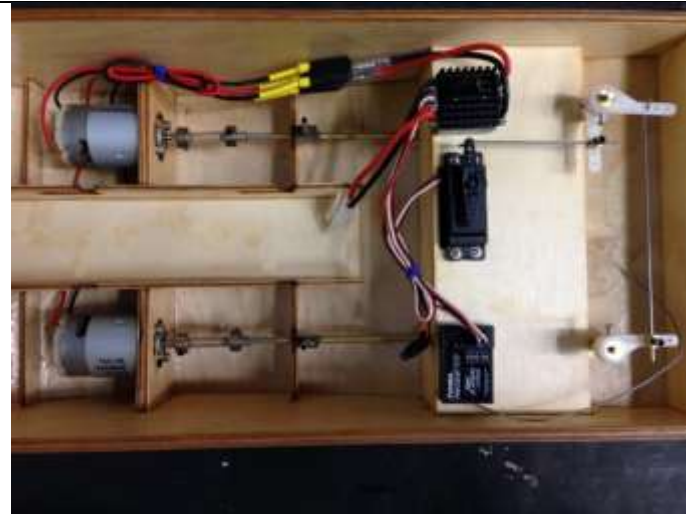
Put this steering arm on top of the first one, only point this one towards the rear.

Put another arm on the port rudder the same way (facing rear)

Slide the provided link rod into the inner hole of the port rudder arm, and into the EZ connector of the other.

This is the cross link that moves both rudders.

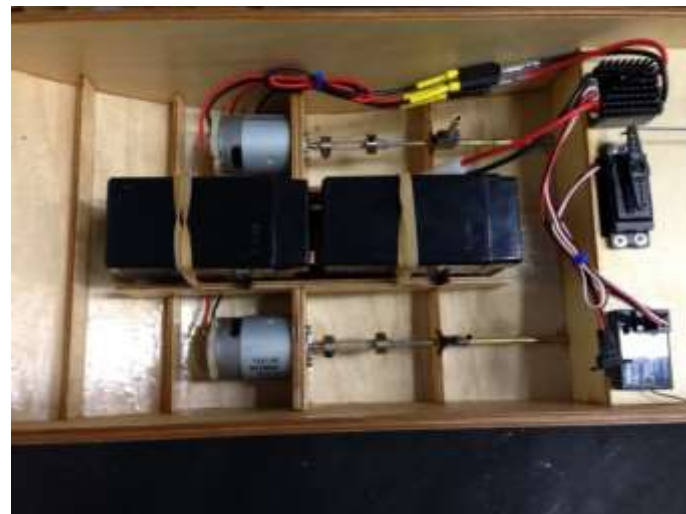
Put the arms on so that you can get to the little phillips attaching screws. See the pictures.



All hooked up.



Motors wired in parallel.



SLA batteries in place. Note rubber bands.

Speed Control

Use two sided tape to attach the ESC (Electronic Speed Control) to the radio tray on the starboard side.

Mount the radio receiver the same way on the port side.

Attach the motor leads to the ESC. You can solder the motor wires together (red to red, black to black), or you can use a parallel "Y" connector.

Plug in the ESC and rudder servo to the receiver. Rudder is usually channel 1 and ESC channel 2.

Turn on your transmitter and be sure that the rudder trim is centered.

Plug in your battery.

Turn on the ESC and check for servo and motor function.

Reset the rudder servo arm so that it is straight side to side.

Set the rudder steering arm parallel to the servo arm.

Make sure the rudders are straight and tighten the lower steering arm screw. Don't over tighten.

Put in the servo arm screw.

Both rudders should move in the same direction, and the same amount.

Batteries

Use 2 rubber bands on each holder to retain the battery.

The batteries are wired in parallel (red to red, black to black).



Smoke stack assembled.



Stacks showing possible position.



Another view.

Exhaust Stacks

The supplied stacks are pre-beveled dowel.

Glue together as shown.

Seal and allow to cure.

If you are painting your Tugster, don't glue the stacks or wheelhouse yet.

Ballast

Put your tug in the bathtub.

Add weight (a lot) until the hull sits at the designed water line as shown on last page.

Note that the transom is in the water, but the nose is out.

This gives a slightly nose up ride, and helps keep the bow wave from coming over the deck.

When satisfied, use sealer or epoxy to secure the ballast.

We mix epoxy and BB's then pour the mixture in the boat.

Make sure you put the deck and wheelhouse in place, and the battery and everything else should be installed.

Tip:

You can add ballast under the rudder servo if needed.

Finishing

Glue the deck to the hull.

Sand all around and round all edges slightly.

Seal the outside with 2 coats of sealer.

At this point, everything should have 2 coats of sealer.

If not, get it done now.

If you are painting, it's easier to paint the stack and inside of the wheelhouse before you glue them to the deck.

Sand the entire boat with 220, then 400 grit paper.

Don't forget the stack, wheelhouse and keel shoe.

Apply paint and allow to dry

Determine where you want to position the wheelhouse and glue it in place.

We like to use an automotive clear coat for maximum protection from our buddies...

Good luck and happy boating!

