

# VBox

# Crackerbox

*Deep Vee Sport Crackerbox*



A Zippkits R/C Boat

## Building Instructions

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[www.zippkits.com](http://www.zippkits.com)  
Toll Free (866) 922-ZIPP

The Zipppkits VBox 2 Crackerbox was developed from a very successful series of Crackerbox kits. We made improvements and redesigns through the years.

The VBox 2 is a sport Crackerbox and a culmination of all of our design tricks and is by far our Easiest building Crackerbox.

It is based on the full size APBA Crackerbox with the addition of a deep vee, to drastically improve turning performance.

This new hull is not legal in any Crackerbox racing classes, due to the deep vee bottom.

The ABox 2 is legal for racing in the Gas Mono class.

Take the time to read this entire manual, so that you are familiar with all 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 an impressive running hull...

Note that the pictures in this manual may be of a different boat to better illustrate a point.

This kit is not 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 it should not be operated by children without close adult supervision.

***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

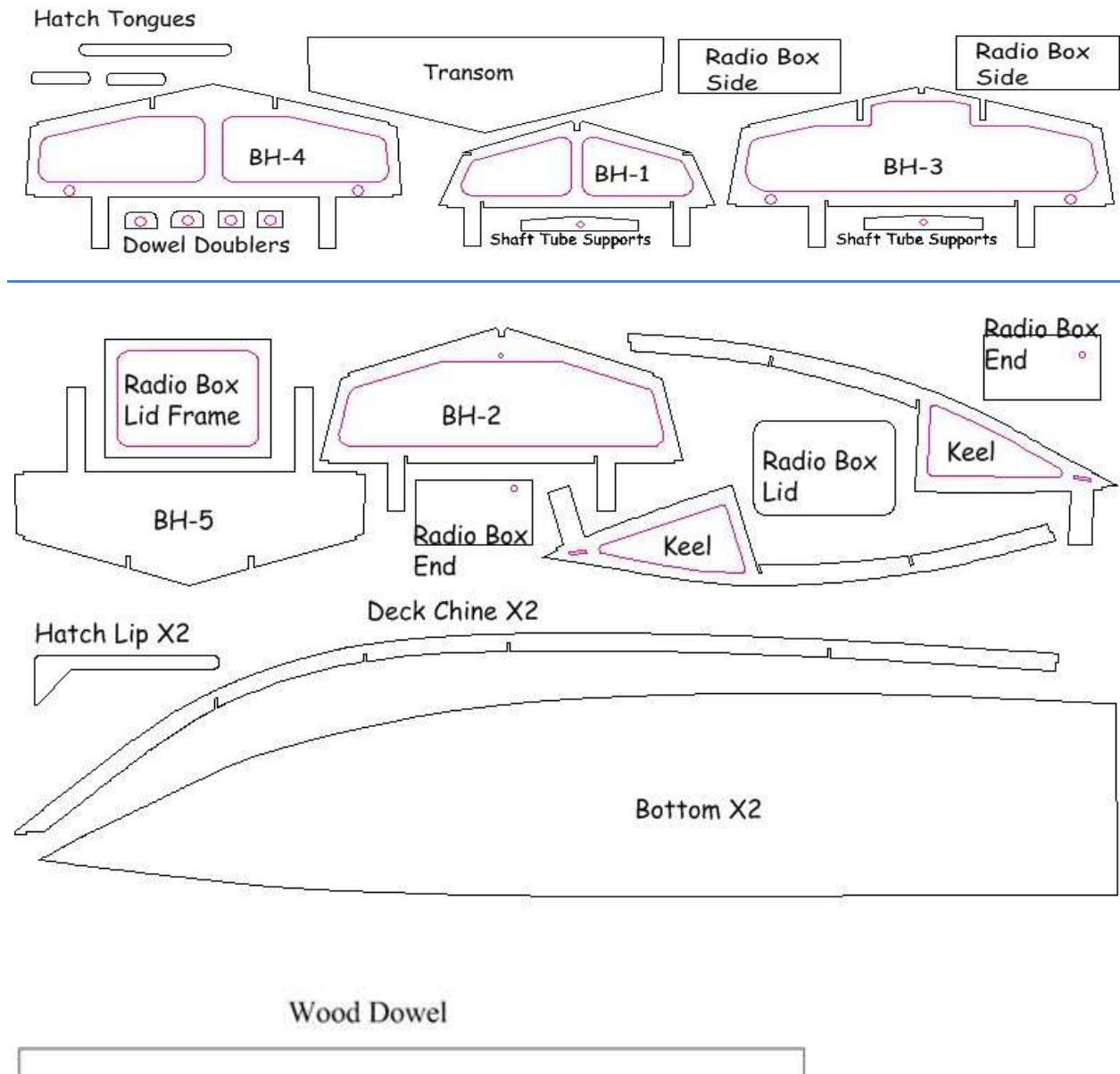
- Sanding blocks with 80 and 150 grit paper
- Drill with 1/4, 5/16, .201 and 5/32 bits
- 1/4-20 tap
- Right Angle Drill
- Square
- Flat file
- Round (3/16) file
- FLAT Workbench
- Hex ball drivers
- FLAT Workbench
- Medium CA glue and accelerator
- Good quality 30 minute epoxy
- Epoxy finishing resin or Klass Kote Epoxy
- Spring clamps, paper clamps, c clamps, etc.
- Razor blade or X-Acto knife
- Masking tape
- Waxed paper
- Wood filler
- Primer
- Paint
- FLAT Workbench

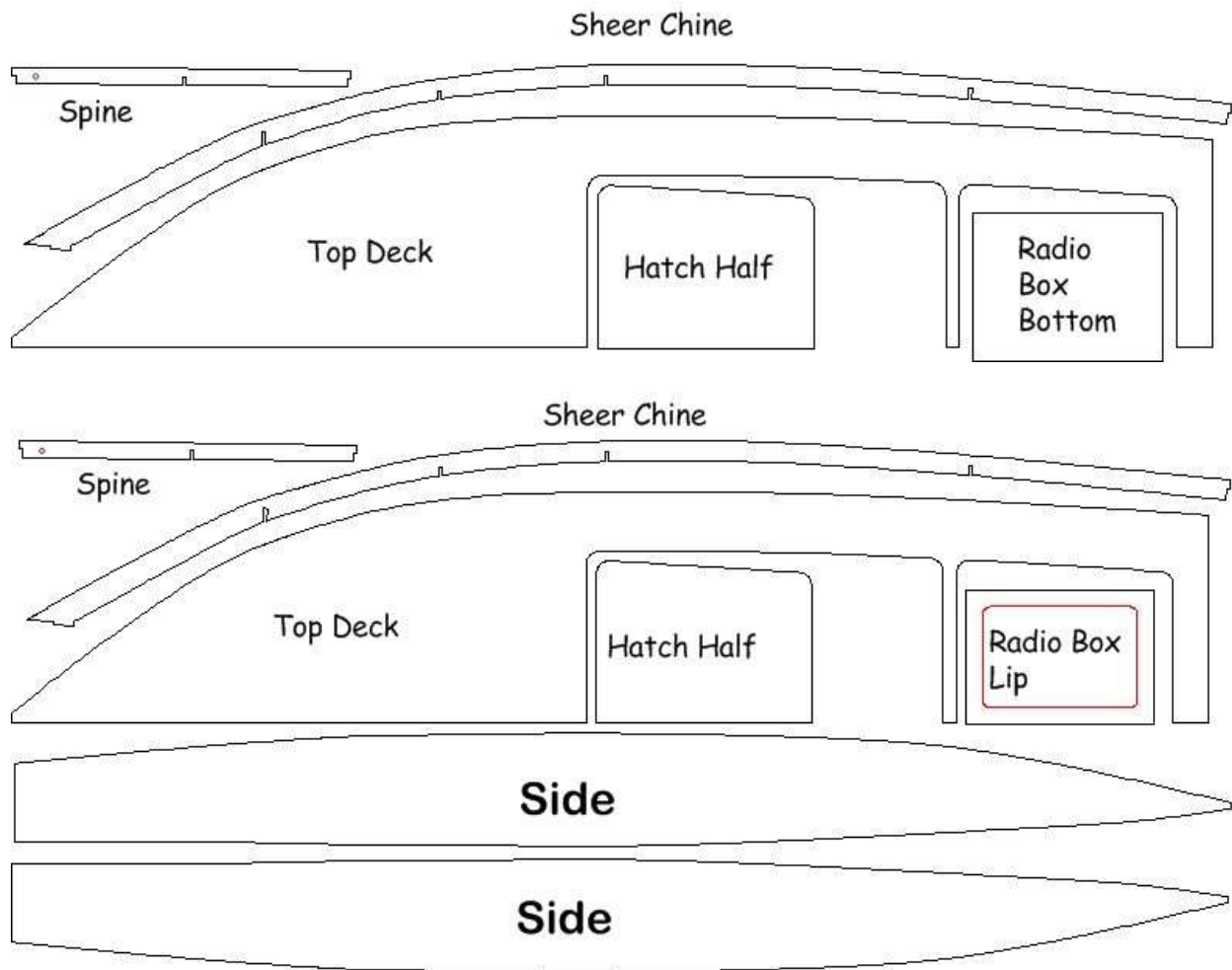
# Additional items needed to complete

- Gasoline engine (Zipp 3800)
- 5 inch mounts (Zipp 3409)
- .250 Collet for engine (Zipp 3440 or 3426)
- .250 24 inch cable w/welded stub shaft (Zipp 3444)
- Tuned pipe or canister muffler (Zipp 2011 or 3532)
- 2 channel surface radio with 1 standard and 1 heavy duty servo (100 in/oz minimum)
  - Throttle pushrod (Zipp 3462)
  - Rudder pushrod (Zipp 3463)
  - 2 pushrod seals (Zipp 3404 or 3422)
  - 16-24 ounce fuel tank or IV Bag and tubing (Zipp 3506)
  - .250 stinger (Zipp 3401)
  - .250 drive dog (Zipp 3442)
  - 470 or 670 prop (Zipp 4000 or 4016)
  - Prop nuts (Zipp 3450)
  - Cable grease (Zipp 3532)
  - Large rudder ( Zipp 3413)
  - Stinger Drive or Strut (Zipp 3401 or 3416)
  - 8 feet large silicone tubing (Zipp 3461)
  - 18 inch length of 5/16 brass tubing (Zipp 3452)
  - Flootation (pool noodles, foam, etc.)
  - Transom turn fin (Zipp3410)
  - Aluminum Servo Mounts (Zipp 3429 and 3430)
  - Large trim tab set

Let's identify the parts so that we can easily find them when needed. Mark the parts that are inside other parts.

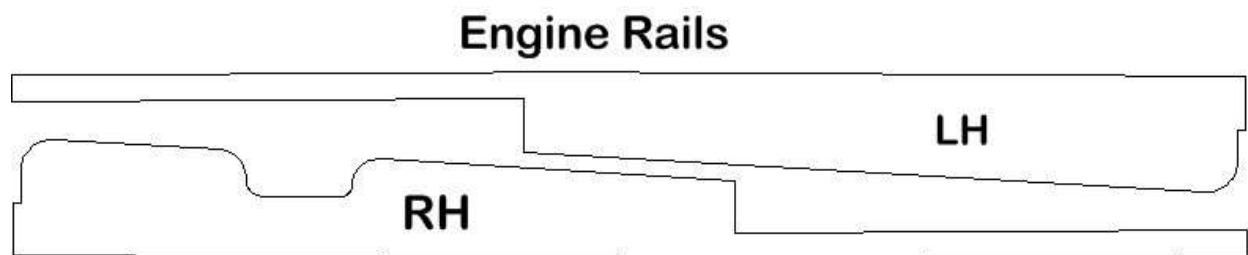
## 1/8 plywood parts:






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## 1/8 plywood parts




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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.

# Work Surface

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

Minimum size would be at least 24 by 48 inches.

Your work surface should be able to take screws or nails (this eliminates the kitchen table...)

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

Do whatever it takes to get this done.

Sand the parts while they are still in the sheets.

You can lightly mark them if you want.

Remove the radio box lid frame and radio box lid from the sheet.

Put these in a safe place, away from your work area for now.

The lid frame looks exactly like the radio box lip, but is not.

Confusing these parts would be bad for the radio box...

You may want to use simple rubber band clamps for clamping the sides in place.

These are simply #64 rubber bands and pieces of 1/2x1/2 wood about 7 or 8 inches long.

These put just the right amount of clamping pressure, without distorting the chines.

Thanks to one of our customers for that.





Building jig attached to bench.



We use nails to secure the jig.



All bulkheads on position.



Keel halves before being laminated.

## Building Jig

Sand both sides of the jig.

Attach the jig to your FLAT bench with screws, nails, clamps or whatever you need, to make sure it's attached to the surface.

Make sure the "F" is so that you can read it.

Remove bulkheads 1, 2 and 3.

Sand the edges with 80 grit to remove the fuzz, as well as the little tabs that held them in the sheet.

Put bulkheads 1, 2 and 3 into the jig, engaging the tabs in the slots.

Starting from the front of the jig, glue the tabs of bulkhead 1 to the jig.

Use a square to ensure that it's 90 degrees to the jig. Also make sure that the tabs don't protrude under the jig.

Use CA and accelerator.

When dry and square, glue bulkheads 2 and 3 to the jig the same way. Use the square.

Remove sand and glue bulkheads 4 and 5 to the jig.

Remove both keels from their sheets.

Sand as before.

Using CA, glue both keels together. Be sure that the keels are aligned with each other.

Clamp while drying.

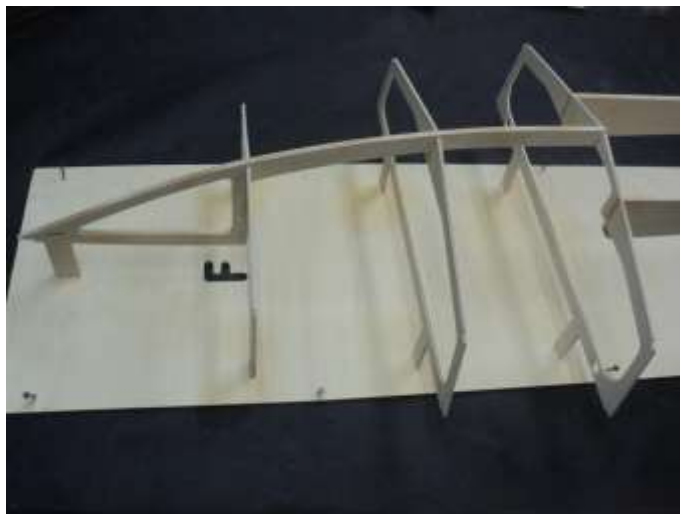




Keel clamped.



Engine rails in place. Note cutout for carb.



Keel glued to the face of BH1. Be sure it's square.

Find the four 1/8 ply engine rails. Laminate them into pairs. Sand them smooth with 80.

Clamp a piece of wood to the back of BH 5 for the next few steps, to keep it flat.

Check the fit of the engine rails into bulkheads 3, 4 and 5.

One engine rail has a relief for the carb. This goes on your left side (right side when the boat is upright).

If ok, glue them in (the big end goes forward).

Use 30 minute epoxy for the engine rails.

Be sure that bulkheads 4 and 5 are square.

The keel should be dry by now.

Check the fit of the keel into bulkheads 1, 2 and 3.

If ok, glue it in, making sure the keel is centered on bulkhead 1. Use a square to be sure that the keel is in the center of bulkhead 1.

Also be sure that the keel is flush with the top of bulkhead 1.

This kind of looks like a boat, doesn't it?

Take a break, and give the glue a little while to completely cure.

Next, we will install the chines. Make sure you follow along closely, as these are very important to the final shape.

Using CA, glue one of the deck (closest to the bench, remember the boat is upside down) chines to the notch in bulkhead 5.



Make sure keel is flush with top of BH1.



Deck chine in place.



Fitting front of deck chine in place.

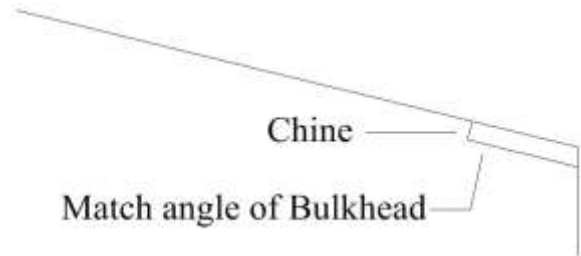
**Be sure that the chines are glued in so that they match the angle of the bulkhead tops.**

Hit the glue joint with accelerator. Hold it in place for 30 seconds or so.

When you are sure the glue is cured, glue to bulkhead 4.

Hit that with accelerator, hold for 30 seconds or so, then move ahead to 3, then 2, then 1.

Do not glue the chine to the keel yet.



Do the other deck chine, but don't glue it at the nose yet.

Now you get to glue yourself to the boat! Try not to...

Using CA, put glue on the ends of the two top chines.

Squeeze both chines together at the tip of the keel.

Make sure that both are even, and fit into the notch on the top of the keel.

Hit the joint with accelerator, and hold for a minute or so.

Try not to glue your fingers to the chines! If you do, it could be rather embarrassing to have your wife try to free you. She will use that story for life!

Hint: Nail polish remover debonds CA...



Deck chines meet at nose.



Install chines following angle of bulkhead.



Lower chines meet at nose.

When you are sure the joint is secure, glue in the bottom chines.

They are done the same way, but the chine matches the bottom angle on all but the forward bulkhead 1. The chine will have to twist to accomplish this. It will lay flat (with relation to the bottom angle) on bulkheads 5, 4 and 3.

At bulkhead 2, you can start the twist so that it meets the keel at the proper angle.

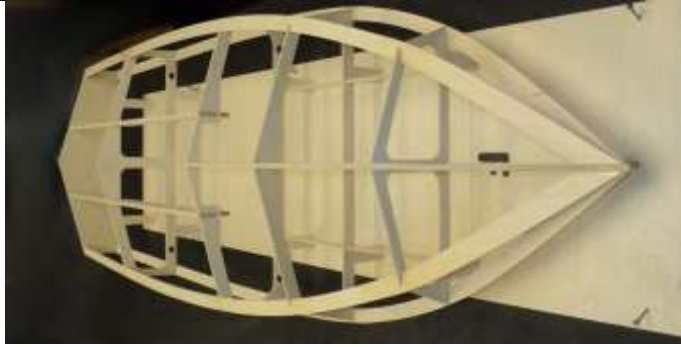
**Be sure that the chines are glued in so that they match the angle of the boat bottom. Bulkhead 1 is the only one where the chine does not match the angle of the bottom.**



Note how bottom chine matches bottom angle until BH 2.

When that is secure, put some glue in the area where all of the chines meet at the nose, to give it a little extra strength.

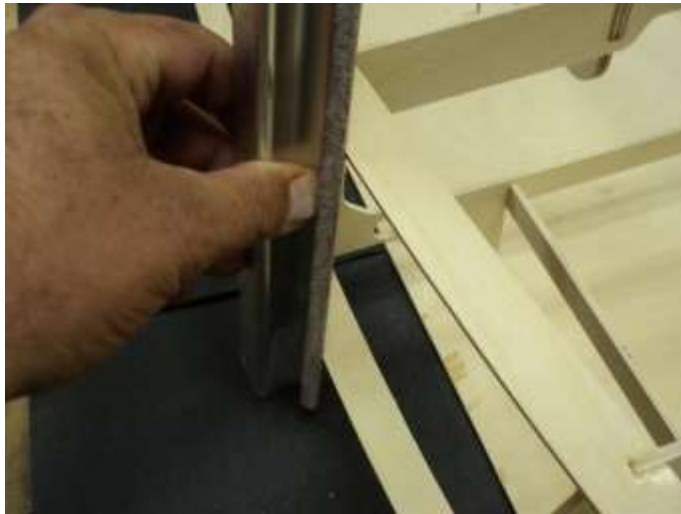
Time for another break. Give your beautiful boat skeleton at least 20 minutes to cure.



A boat!



Using sanding block to blend chines. Abox shown.



Make all edges flat. Hold sanding block 90 degrees to chines.

## Blending the chines

Before we can glue the side sheeting in place, we need to make sure the chines are flat. Do this with your sanding block and fresh 80 grit paper.

Sand the chines, using your sanding block to blend them at the front.

Check to see if your sanding block sits flat on the chines at all points. If it does not, the side sheeting won't either. The front of the chines will need a fair bit of blending. The rear will need very little.

When the chines have been sanded and blended, it's time to start the side sheeting.

Dry clamp the side sheeting in place.

We use lots of large size paper clamps. You can buy these at your local office supply store. Get about 24 or more...

Clamp and adjust the sheeting so that it overhangs an equal amount on the top and bottom. Leave a little hanging off of bulkhead 5 as well.

When it looks good, make a reference mark somewhere that is easy to see. I make it between 3 and 4.





Use lots of clamps.



Brushing epoxy onto edges with cut down acid brush.



Front of side sheeting coated with epoxy.



Mark a line on the chine and the sheeting, so that you can align the marks quickly when gluing.

Remove the clamps.

Label the front inside of the side sheeting.

Using 30 minute epoxy, mix up about 1/2 ounce. Stir very well.

Using a small stick or acid brush, coat the chines and bulkhead edges. Work quickly.

Make sure that all surfaces that will touch the sheeting are coated. Try not to use so much that it runs all over. Brush epoxy on the front 6 inches or so of the side, to help strengthen the high stress nose area.

Align the marks and start clamping, adjusting the sheeting for equal overlap on the top and bottom.

You can use your rubber band clamps here.

Do not put any clamps between bulkheads 3 and 4 yet. This is a long span, and should be clamped last. Be very careful when clamping this area. Don't bend or twist the chines in this area.



Don't clamp this area until last. Then clamp carefully.



Clamps in rear.



Transom clamped in place.

Clamp thoroughly, but be careful not to distort the chines.

Allow to cure at least 2 hours.

Using a new mixing container and applicator, do the other side. Be sure to test fit again. You will have to trim the front tip of the first side, so the second side fits.

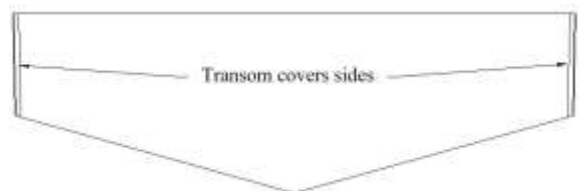
Allow to cure at least 3 hours.



Use whatever you need to hold things together.

After the side sheeting has cured, sand the rear of BH 5. Sand any of the engine rails that protrude.

Use 30 minute epoxy to attach the transom to BH 5.



The transom should be flush top and bottom. Any overhang should be at the sides.

Clamp and allow to cure.

## Bottom Sheeting

When the glue is fully cured on the side sheeting, sand the side sheeting to match the angle and contour of the chines and bulkheads.



Side sheeting sanded flush at nose. Note overlap.



Center marks on bulkheads 4 and 5.



Bottom sheet taped and clamped in place.

Use your sanding block with fresh 80 grit to match the angle of the bulkheads. Also, **lightly** sand half of the keel at the same time, so that the bottom sheet lays flat on the structure. Do not change the shape of the keel, just match the angle.

The keel will have a slight "V" shape when you are done.

**Be very careful not to sand the keel too much, or the bottom will not fit!**

Make a mark in the exact center of bulkheads 4 and 5. Make this mark on the edge, so that you know how far to glue the sheeting.

Test fit the bottom sheeting in place. It should cover exactly half of the keel. Also, sand a gradually increasing bevel on the inside (center) edge, so that both sheets will meet squarely.

Make sure the front is accurately aligned with the center of the keel and that there is some overlap at the rear (1/16 inch is plenty).

When satisfied with the fit, make an alignment mark on the bottom sheeting and the keel.

Cut about 8 pieces of wide tape, and set aside.

Mix about 1/2 ounce of 30 minute epoxy.

Using a small stick or acid brush, coat the chines and bulkheads where the bottom sheeting will contact. Work quickly.

Also coat half of the keel and one engine rail.

Brush epoxy onto the first 6 inches of the front of the sheet, to help the glue joint here.

Align your marks and put a couple of clamps along the keel, clamping the sheeting firmly to the keel.

Check your center marks on bulkheads 4 and 5.

Wipe all excess glue off of the keel, as it will interfere with the other side sheeting.

If everything looks good, start wrapping the wide tape across the bottom sheeting.



Nose detail. Notice half of keel showing.

Start at the keel, and pull the tape tight as you attach it to the side.

Use as many pieces of tape as you need, to make sure the bottom sheeting is tight to the keel, side chines and sheeting.

Look for any "crown" in the sheeting as a result of taping. If it exists, use some weights to flatten it out.

Also put weight over the engine rail, to help hold it against the sheeting.

It is critical that the bottom sheeting be bonded to bulkheads 3, 4, 5 and the engine rails.

Make sure that you take the time to fit the parts accurately, as this boat **WILL NOT** run correctly if the bottom is wrong.

After you tape and weight the bottom sheet, look under the boat to see that the bottom sheet is touching everywhere it should be.

For very inexpensive weights, break up some cinder blocks. You can get many different shapes and weights, and their rough surface helps keep them in place.

After the glue fully cures (at least 3 hours), remove the tape and clamps. Check for any glue that may have squeezed onto the keel. Use a sharp knife or razor blade to scrape any excess glue away.

Test fit the other bottom sheet, and make any adjustments before you glue.

Make sure that both bottom sheets meet as perfectly as possible.

Take your time here. Start from the rear. Put the sheet in place, and mark any areas where the two bottom sheets touch, keeping the sheeting from meeting perfectly. Use your block with 80 to sand these "high" spots.

Move forward and sand, fit, sand, fit, until it fits perfectly. Be sure to sand a progressively sharper bevel, so that the bottom sheets fit tightly together.



Use weights to keep everything in contact.

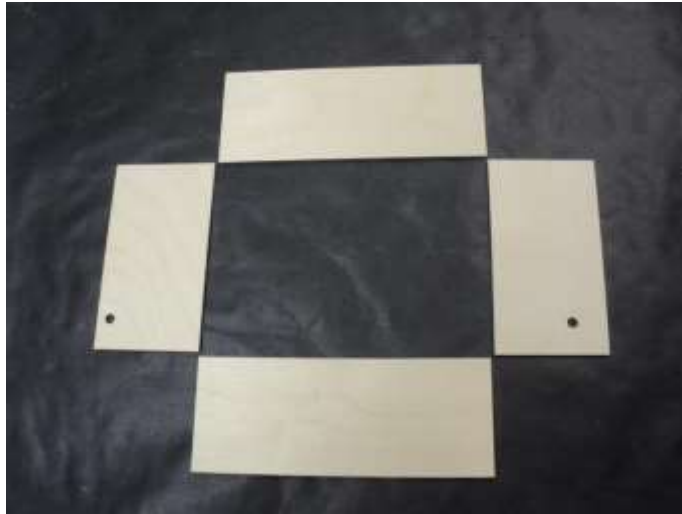


High spot marked on bottom sheeting.





Both bottom halves taped and weighted.



Radio box parts. Rear of box on left.



Joining sides. Short sides go between long.

Glue the other side of the bottom sheeting on the same way as the first, only this time you can't use clamps.

Tape the crap out of it, put weights on it, and look under the boat to be sure that the bottom is touching bulkheads 3, 4, 5 and the engine rails.

Let's build the radio box while the glue cures on the hull.

## Radio Box

Remove all of the radio box parts: Two long sides, two short sides, the top and bottom.

Note that the kit comes with a 1/8 ply top and lid. This is the actual radio box top. Keep this away from the radio box during assembly, and only get the lid after the box is assembled and ready for it.

The radio box lid frame and lid fit inside each other with a tiny clearance all around.

The top with lid and the regular top look identical, but they are not interchangeable.

If you mix them up, you will have a worthless radio box.

Sand all the parts smooth with 80.

Lay a piece of plastic wrap or waxed paper on your bench.

The radio box must be assembled correctly, as the pushrod holes are pre-drilled.

The rudder pushrod hole is higher than the throttle.

Lay out the parts of the box as shown.

Both pushrod holes are on the same side of the box, and towards the top.

Using CA, glue the two small sides to the two long sides.

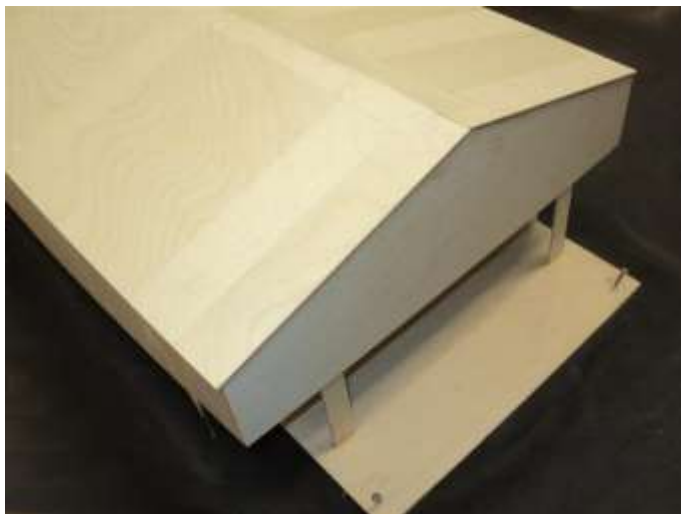
The small sides go between the long ones.



Bottom glued in place.



Rear of box facing you.



Getting ready to cut the boat free of the jig.

Use a square.

Put glue on the edges, and join the two box halves on the bench.

Lightly sand the bottom of the box.

Note that the bottom is about a half inch too wide.

This overhang is used to screw the box in place.

Glue on the bottom. Be sure to leave a  $\frac{1}{4}$  inch overhang on each side of the box.

Leave the top off at this time.

Lightly sand the top.

Stand back and admire your awesome radio box!

Back to the boat:

Make sure that it has been at least 3 hours since you glued the bottom sheeting to the hull.

With your razor saw, cut all the tabs that are holding your hull to the building jig.

Ditch the jig. We don't need it any more.

Hey, this is really starting to look like something now!

After you finish admiring your cool new hull, let's move on.



Boat flipped over and off of jig.

Trim the excess bottom and side sheeting flush. Finish with an 80 grit sanding block.

Don't spend too much time where the side sheeting meets the top, as we will come back to this area later.



Installing spines. Hole goes forward.

Get the two spines. Push the center slot of the spines into bulkhead 2. Check the fit; it should be flush with the top of the bulkhead.

The spines go from bulkheads 1 to 3.

The hole in the spines should face forward.

Glue the two dowel doublers in place on the left side of the hull. One on the front of bulkhead 3 and one on the rear of bulkhead 4.



Dowel doublers in place.

These give more gluing surface for the deck support dowel. This dowel protects the deck when you pick the boat up.

We supply two sets of these doublers. You should put them on both sides. If you later want to add another ½ inch dowel (not included) to the other side, the boat will be ready for it.



Top deck.



"Hinge" glue method.



Top deck taped together until cured.

## Top Deck

Sand the mating edges of the two top deck sheets. Try to keep the edge square.

Using masking tape, tape the decks together as shown. Pull the tape tight so that the decks fit well.

Run one long piece of masking tape the full length of the seam, right on top of the other tape.

Flip this assembly over.

Mix up some 30 minute epoxy.

Flip the joined sheets over and "hinge" them open.

Apply 30 minute epoxy in the joint.

Place the assembly flat on the bench, and wipe any excess glue off of the seam.

Put a few pieces of tape across the seam, to hold it tightly together. Let sit for at least 2-3 hours (overnight is better).

When cured, remove all masking tape and sand both sides of the seam smooth.

Determine which side looks better and mark the other side as "bottom".



Glass cloth in place.



Fiberglass on center seam.



Lines are parallel. Camera makes them look otherwise.

## Fiberglassing Seam

Use the supplied 6 ounce cloth,

The cloth is pre cut into two pieces, one from the back of bulkhead 3 to 4, and one from 4 to 5.

Mix more finishing resin.

Brush resin onto the center seam and lay the cloth down, centered on the seam.

The cloth goes between bulkheads 3 and 4, then another piece between 4 and the transom. This cloth reinforces the center seam area and must not be left out.

Brush in a coat of resin, so that the cloth is completely wetted.

Continue coating the inside with finishing resin.

If you need to mix more, use a new container and brush. If you don't, the old resin will mess with the new resin, and create a problem. Trust me...

If you have any excess resin, go ahead and start coating the inside of the hull.

## Hardware

Now is a good time to install all of the hardware, as well as the engine, shaft tube and radio.

Without the top deck in place, everything is easy to get to.

Draw a line on the transom, from top corner to top corner.

Draw a line from the center of this line to the bottom of the boat at the vee.

This is the center of the transom.





5/16 brass shaft tube in place.



Stinger drive in place.



Mark pushrod hole in transom.

Make a mark  $\frac{1}{2}$  inch up from the bottom (shaft tube).

Make a mark 2-1/2 inches to the right of the center line (rudder).

Make two marks that are each 1-1/2 inches from the center, at the bottom (trim tabs).

Drill a 5/16 hole for the shaft tube,  $\frac{1}{2}$  inch up from the bottom, on your mark.

Put your 5/16x18 inch brass shaft tube thru the holes in bulkheads 4 and 5. Use a round file if needed in bulkhead 4.

Grab your stinger drive. Center it on your guide line, and mark the screw hole locations.

It helps to put the flex shaft in the stinger and use this as a guide to getting the stinger aligned with the shaft tube. The shaft should go in and out of the stinger with no resistance.

If you feel resistance, the stinger and shaft tube are not aligned, and your flex shaft will bind and break. Get it correct.

Drill the holes in the transom, and bolt the stinger assembly on.

Lightly sand the tops of the engine rails, where the radio box will sit.

Set the box in place, making sure that the rear of the box is against the transom. The rear of the box has the hole up high.

With the box against the transom and centered on the rails, trace the rudder pushrod hole location on the inside of the transom.



Rudder mounted over pushrod hole.



Trim tabs mounted on your marks.



Turn fin on right. You can add one to the left as well.

Drill this hole in the transom with a ¼ inch bit. You can enlarge this later if needed.

Assemble the rudder to the brackets.

Mount the rudder to the transom over the pushrod hole, aligning the rudder blade to your reference line, 2-1/2 inches to the right of center.

Try to get the pushrod hole centered in the rudder access hole.

## Trim Tabs

Mount your trim tabs to the transom so that they are flush or just a hair up from the bottom. No more than 1/16 inch above the bottom

Also mount them so that they start 1-1/2 inches from the center of the hull, on your marks.

## Turn fin

The turn fin should be mounted on the extreme right side of the transom, above the trim tabs. Make sure the fin is 90 degrees to the bottom. It will be canted outward with the hull level.

The turn fin should extend to the keel, with the boat sitting level on the table.



All transom hardware in place.



Engine sitting on scrap wood.



Tracing around rubber mounts.



## Engine mounting

Put a  $\frac{1}{4}$  inch drill bit in the collet.

Use scraps of wood to angle the engine so that the drill bit is pointing to the center of the boat, and about 3 inches in front of bulkhead 4.

The engine should be mounted as far forward as you can. Within  $\frac{1}{2}$  inch of the front of the ply rails.

Mark the rear hole locations on the engine rails as follows.

Once you are happy with the engine placement, draw around as much of the rubber isolators as much as you can. Use a sharp pencil. Remove the engine and use a flat washer about the size of the rubber isolators to draw a center hole.

Drill this hole  $\frac{1}{4}$  inch with a right angle drill.





Using washer to mark center holes.



Mount the engine to the rails.

Mark the location where the drill bit points to the bottom.

Remove the engine.



Engine mounted to rails.

Put the 5/16 brass shaft tube in place and mark the location where the bit pointed to. Be sure to leave at least  $\frac{1}{2}$  inch sticking out of the transom.

Remove the tube.

Anneal the brass tube around your mark. Do this by heating the tube with a propane torch until it changes color (a few seconds) and allow to cool.

When cool, carefully and slowly bend the tube on your mark to about 40 degrees, or about the same angle as the engine.

Put the drill bit into the brass tube as you slide the engine in place.

You can bend the tube as you put the engine in.

You may need to cut some of the brass tube at the engine end. You want to end up with about  $\frac{1}{2}$  inch gap between the engine collet and brass tube.

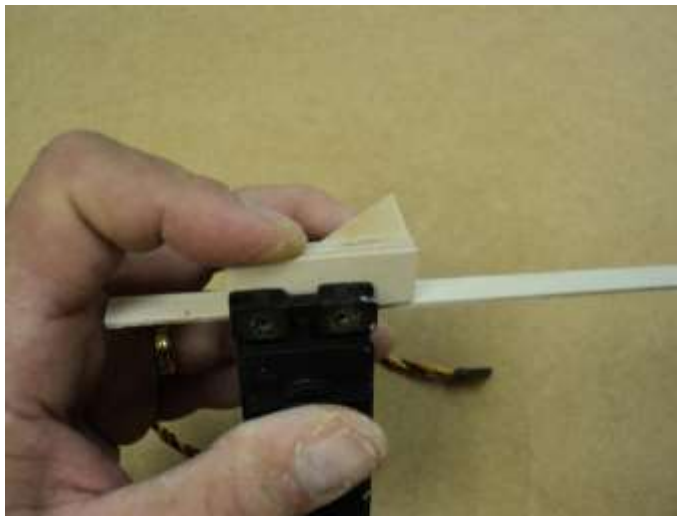
Work the engine in, adjusting the bend in the brass as you go.



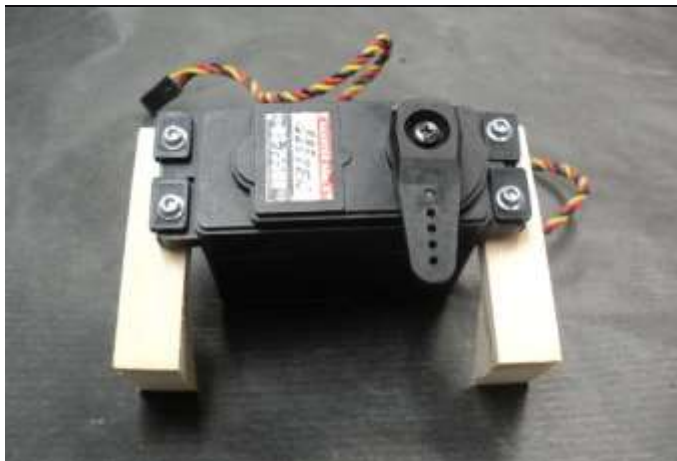
Shaft tube in place over drill bit.



Shaft tube brace installed.



Use a piece of 1/16 scrap as a spacer.



Rudder servo mounted on long mounts.

When you are close, mark the tube where the bulkheads and transom are. Pull the engine out.

Use 80 grit sandpaper to rough up the tube at your marks. Also sand the last  $\frac{1}{2}$  inch at the engine end.

This is done so that the epoxy will have something to bite to.

Grab the two shaft supports and laminate them together with CA. Clamp until cured.

When dry, slip the shaft support onto the brass tube and bolt in the engine with the drill bit inserted into the brass shaft tube.

Wiggle the shaft support around until it is about  $\frac{1}{4}$  inch from the end of the shaft tube. If all looks okay, use epoxy to glue in the shaft tube and support. Glue the tube to the transom and bulkhead 4, as well as the shaft support.

Allow to cure.

## Radio:

We recommend only aluminum servo mounts, due to failures with the wood mounts.



Rudder servo in place.



Throttle servo added.



Radio box screwed in place.

Make sure that the servo assembly is near the rudder servo hole in the radio box (the hole that is higher on the box).

Use CA or epoxy to glue the servo mounts to the side of the radio box.

Space the mount about  $\frac{1}{4}$  inch forward of the rear wall.

Repeat for the throttle servo. It is mounted in front of the rudder servo and also about  $\frac{1}{4}$  inch back from the front wall.

Don't forget to put the  $\frac{1}{8}$  scrap spacer under the throttle servo.

When cured, flip the box over and mark for mounting holes.

We made the holes 1 inch from each end, and  $\frac{1}{8}$  inch in.



Drill the radio box lip with a  $\frac{1}{16}$  bit.

Put the box in place on the  $\frac{1}{4}$  inch rails about  $\frac{1}{4}$  inch behind bulkhead 4.

Be sure that the box is centered on the rails and drill into the rails using the holes in the box as your guide.

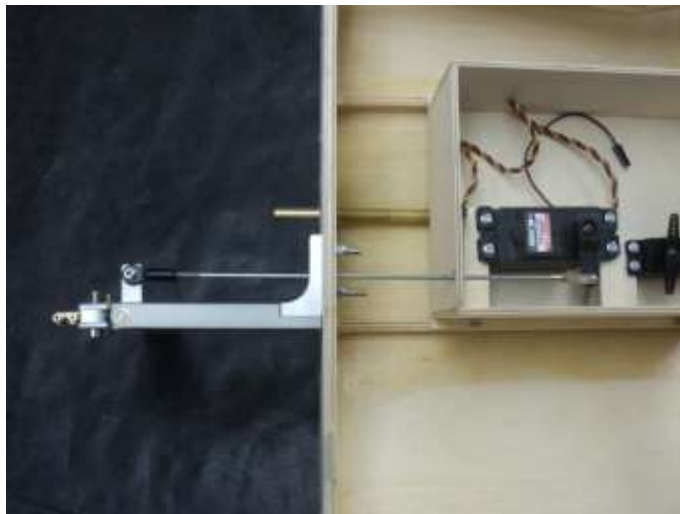
Secure the box with 4 #2x $\frac{1}{2}$  inch screws (not included).

Bolt the rudder in place and thread the 4-40 ball link onto the 4-40 pushrod.

Put the rudder pushrod in the holes in the transom and radio box.



Marking rudder pushrod. Be sure rudder is straight.



Straight shot to rudder.



Close up of throttle bellcrank.

Secure the ball link to the rudder arm with the 4-40 screw and nut.

Put a 4-40 solder clevis on the servo and hold the pushrod against it.

Be sure that the servo arm is 90 degrees to the servo and that the rudder is straight.

Mark the pushrod about 1/8 inch past the opening in the clevis.

Remove the pushrod and cut it at your mark.

Clean and solder the clevis to the pushrod, leaving the 1/8 inch protruding from the clevis.

When cool, slip the pushrod back in and put in the 4-40 screw and nut on the rudder arm.

The clevis should line up with the hole in the servo. If not, turn the pushrod in or out of the 4-40 ball link for small adjustments.

The throttle is similar, except we use a nylon 2-56 clevis at the carb end and an EZ connector at the servo.

Cut the pushrod as needed.

Take some time to get the throttle opening and closing all the way. You will be rewarded with a fast, safe boat.



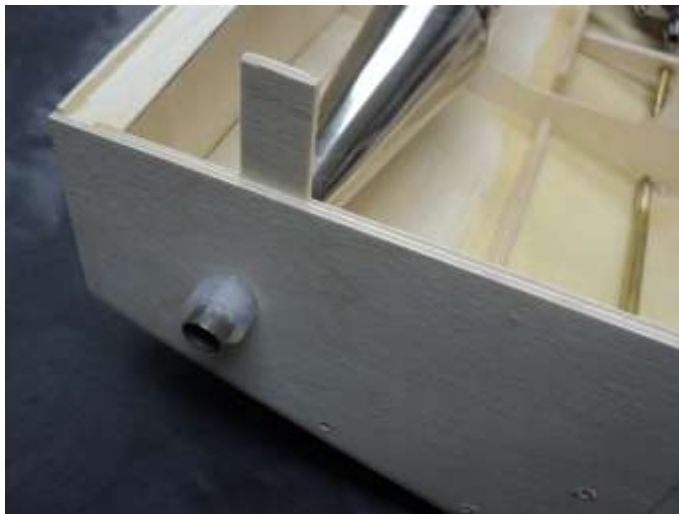




Pipe against transom for marking.



Transom marked for pipe.



Note silicone surrounding pipe thru hole.

## Exhaust

Plan the exhaust carefully. It can be a major source of trouble if not done correctly.

We use a 3 inch offset 90 degree header and tuned pipe.

Be sure that your pipe is mounted firmly near the outlet.

Never pull a pipe to one side to mount it. Even if you only put a little side pressure on the pipe when mounting, it can leak water into the pipe and kill performance.

We like to assemble the header and pipe to the correct length (13.5 inches for the Zipp Super Tuned Pipe) first.

If the tip of the pipe is short of the transom, use an exhaust outlet and silicone tube.

If the tip must pass thru the transom, either loosen the pipe and slide it forward on the header, or remove the engine mount bolts.

You need to be able to slide the engine back so that the pipe tip just contacts the transom.

Be careful not to pull the pipe to either side.

Carefully mark around the tip, on the transom.

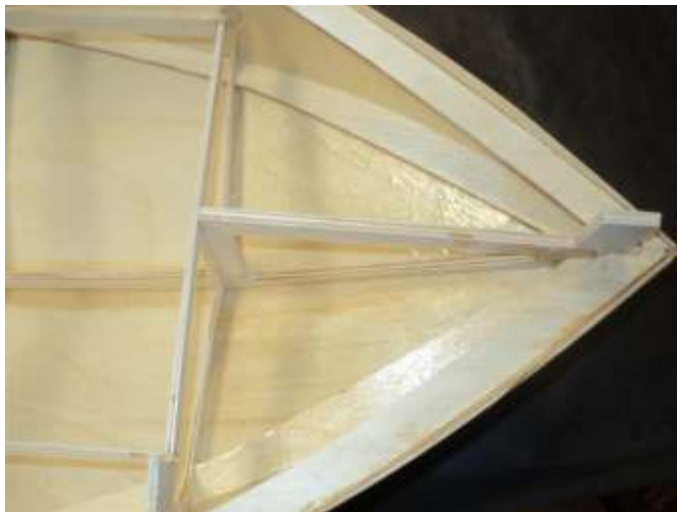
Drill this out in steps so that the tip will fit the hole with a piece of silicone tubing over the tip.

Use Zipp hi temp silicone exhaust tubing to line the hole in the transom.





Deck dowel.



Sealing inside.



Close up of dowel doubler.

## Fuel bag

We recommend a 500 ML IV bag for the fuel.

We provided a small hole in the center of bulkhead 2 for you to secure a bag there.

A strong magnet on the front of the bag, and another bolted to the small hole on the bulkhead will hold a full bag very well, but will still allow you to easily remove the bag when needed.

You can also use a small spring clip. Remember, this connection will be under the deck. Make sure you can get to it thru the bulkhead.

## Sealing Interior

Now we need to seal the inside. It is vital that all exposed wood be sealed.

Mix up about 6-8 ounces of epoxy finishing resin.

You can also use Klass Kote clear epoxy paint.

Start from the front.

Using a brush, coat all areas of wood inside the hull. Get inside the holes.

Be sure to seal the underside of the chines. You can use a metal acid brush with a bend in it to reach up to the underside of the chines.

Try not to get too much resin on the top edges of the bulkheads and chines, as it will make it more difficult to sand later. Be sure to get the bottom edges of the spines.

Also seal the bottom side of the top deck that you marked earlier.

After you are 100% sure that all exposed wood inside the hull has been coated, let it sit overnight.

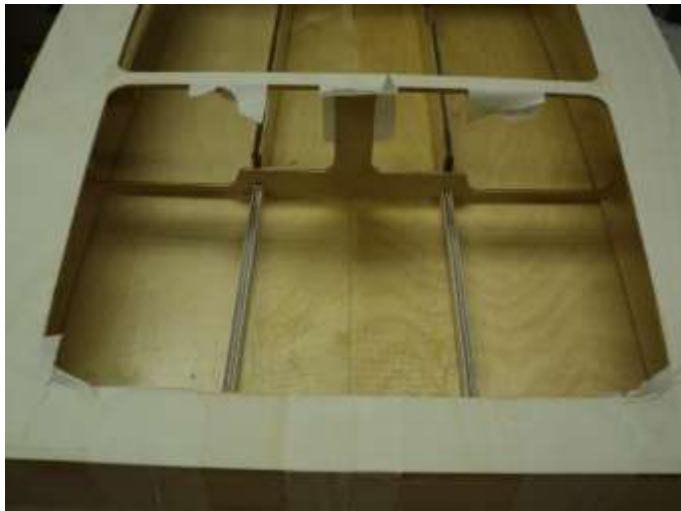
Now is also a good time to seal the deck dowel as well.



An example of floatation. Yours will differ slightly.



Getting the hull ready for the deck.



Make sure that the deck is in contact all around.

Repeat this process for a second coat. You will notice that this coat uses far less epoxy, as it doesn't have to soak in to the wood like the first coat.

Sand the underside of the deck with 180 before laying on the second coat.

You can glue in your deck dowel now. Use epoxy.

## Floatation

Now is the time to put floatation in the hull.

**DO NOT OMIT THIS STEP!** Without floatation YOU WILL LOSE YOUR BOAT!

You can use white, pink or blue foam, pool noodles, plastic bottles, almost anything that floats.

You will need about 1 full small pool noodle or half of a large one

Stay away from spray in foam; it has too many disadvantages for this use.

If you use blocks of foam, make them as big as you can. You can get pool noodles at the dollar store or Wally World.

Be sure the floatation will not interfere with the top sheeting or the fuel bag. Use epoxy to spot glue floatation that is not captured by the deck, like on each side of the fuel bag.

A boat stand is a good idea at this point.

You can make a boat stand out of PVC pipe or wood.

Let's get this puppy closed up!

## Top Sheeting

Let's get the hull ready for the top sheeting.

Trim the building tabs, and sand the bulkheads flush with the sides and chines, if you have not already done so.



Tape and weights.



Whatever it takes.



Hatch halves.

Do this the same way you did the bottom.

Use 80 grit to finish it up. Be sure not to round the edges.

Cut about 20 pieces of wide tape for the next steps.

A shipping tape dispenser works very well for this.

Mix about 1 ounce of 30 minute epoxy.

Using a stick or acid brush, coat the tops of the bulkheads, chines and spines with epoxy. Work quickly.

Start taping the deck down.

Align and tape the center of the deck at bulkhead 3.

Then align and tape at the nose, then center of the transom.

Start taping the sides.

Tape tightly.

Check all around to make sure that the deck is tight against the top of the hull.

Continue adding tape until the entire deck is in contact all the way around. Check the transom from behind, and add tape if needed. Check bulkhead 3 as well. When everything looks good, add weights to the deck center area.

Allow to cure overnight.

After the deck sheeting is fully cured, use your plane and 80 grit to sand flush.

Give the whole boat a good sanding with your 80 grit block.

Use wood filler to fill any gaps or gouges, and to build up the nose, if necessary.

After the filler is dry, sand it with 80 grit, using light pressure. At this point, you can round the deck where it meets the sides.

Don't round off any edges except for the top deck. We need all other edges sharp to sheer water.





Hatch tongue glued to front of hatch.



Hatch tongues glued to opening.



Hole marked for hatch screw.

## Hatch

Using CA, glue the hatch halves together, making sure they are aligned properly.

Check the fit of the hatch in the deck opening.

If it doesn't fit, sand the hatch to fit, not the opening.

Be sure to leave a 1/16 gap all around, to account for your finish (paint, clear coat, etc.).

When satisfied with the fit of the hatch, glue one hatch tongue in place on the front of the hatch, and the two short tongues to the front of the hatch opening in the deck. These go on each side of the hatch tongue, but glue to the opening. Use epoxy, and be sure to sand before you glue.

Glue in the 2 tongue/bolt plate pieces on each side of the opening. These are used with the nylon hatch screws.

Epoxy these in both sides, allowing about a 1/8 inch gluing surface at the rear.

The idea is to have a hatch that fits into the opening, but won't fall thru it.

Set the hatch in place. When satisfied that it fits correctly, drill a hole in each back corner with a #7 drill bit.



Hatch screwed in place.



Seal the radio box, inside and out.



Stay close to the corner so that you drill thru both the hatch and the corner bolt plate.

We measure  $\frac{1}{2}$  inch from each edge. Where the lines intersect, drill.

Remove the hatch and drill the holes in the hatch only with a  $\frac{1}{4}$  inch drill bit.

Tap the hole in the bolt plate with a  $\frac{1}{4}$ -20 tap. Wick some thin CA into the threaded holes and hit each with a shot of accelerator. Wait a few seconds.

Run the tap thru the threads again.

Put the hatch back in place and attach with the supplied nylon screws.

Remove the hatch.

Apply epoxy resin sealer or Klass Kote to the hatch and set on waxed paper to cure.

Apply a second coat of sealer to the hatch.

Next, we will mount everything we need, to make this boat go!

## Radio Box Top

Glue the radio box top on.

This is the  $\frac{1}{8}$  inch Birch top without lid.

Using 80 grit, sand the overhang on the top so that it's flush with the sides.

Sand the top with 180 or 220 grit paper on a block.

Go get the lid and the  $\frac{1}{8}$  ply radio box top that you moved earlier.

Glue the  $\frac{1}{8}$  ply top to the radio box.

It has a slightly larger hole for the lid, so try to center it so that the "lip" is even all around.

Make sure that you don't get any glue in the "lip", as it will interfere with the way the lid seats.



Drive dog and prop in place.



Shaft filed for drive dog set screw.

Sand the entire box with 180.

You can seal the inside, top and all four sides of the outside in one session.

Also seal the servo mounts.

Allow to cure overnight.

When cured, seal with a second coat.

## Flex cable prep

Get the flex cable, drive dog, prop and prop nut.

Put the drive dog on the stub shaft, then the prop.

Engage the drive dog into the prop, and slide this assembly back until the prop covers about half of the threads on the stub shaft. Tighten the drive dog set screw.

Mark the stub shaft at the front of the drive dog.

Remove the dog and prop.

Measure  $\frac{3}{16}$  inch back from your line, and file a flat spot, about  $\frac{1}{8}$  inch wide and  $\frac{1}{16}$  inch deep.

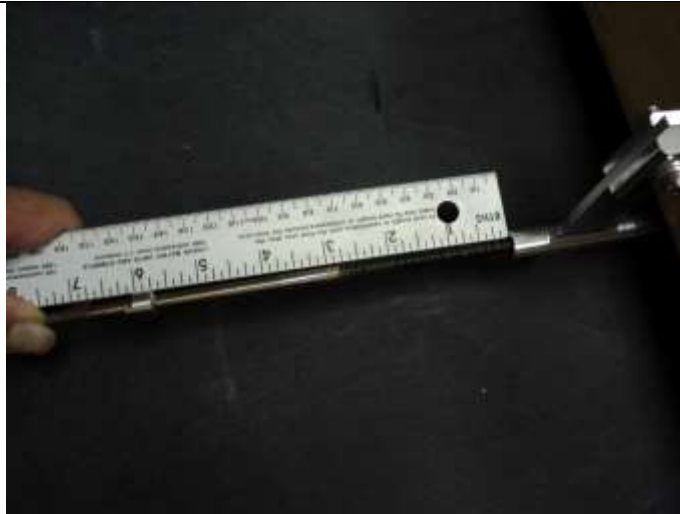
This is for the set screw. File off any burrs, and put the drive dog back on, tightening the set screw into the flat.

Loosen the collet and slide your assembled flex shaft in until it bottoms out in the collet. Do this several times, and make sure it goes in all the way (at least about  $\frac{3}{4}$  of an inch).

Tighten the collet slightly with two wrenches.

Measure the distance from the back of the strut to the front of the drive dog. Subtract  $\frac{1}{4}$  inch from your measurement.

We want the shaft  $\frac{1}{4}$  inch too long.



Measuring flex shaft.



Leave a gap at the rear for flex shaft "wind up".



Sealing the outside.

Remove the cable assembly and cut the cable by the amount you just determined.

To cut the cable, use a motor tool with a cut off disk, and file or grind the end smooth.

Put the cable back in and there should be a 1/4 inch gap between the strut and drive dog.

You must have this  $\frac{1}{4}$  gap when running, as the cable will "wrap up" and get shorter in use.

## Finishing

Sand the entire hull with 80.

Fill any dings, dents, craters, valleys or chips with wood filler.

When dry, sand again with 180. Check to make sure that all imperfections are filled.

If not, fill and sand again.

Spend a little time getting this right, as it will make your boat look so much better when done.

Blow off the hull with compressed air, or use a vacuum to get the dust off.

Mix about 1 ounce of finishing resin, or 2 ounces of Klass Kote.

Use a credit card to spread out the resin on the top and sides.



Hull with two coats of clear epoxy.



Squeegee as much as you can. Get a thin even coat of resin on all areas.

Use a small acid brush to get the edges.

Scrape as much resin as possible. You just want to wet the wood with resin, any excess will just have to be sanded off later.

This first coat is easy, as the wood will darken as it gets wetted with resin.

When you are sure that all areas on the top and sides are covered, let it cure overnight.

When cured, sand lightly with 180. Just make it smooth. It's ok if you sand through the resin on this coat.

When done, blow the dust off and do the bottom.

When the bottom is cured, sand with 180.

Repeat the whole thing for the second coat, only this time, after the second coat has cured, sand with 220 wet.

Sand with a bucket of water, a dribbling hose or in your bathtub.

Use one of those rubber sanding blocks.

Don't worry about the hull, it's waterproof now...

Sand the inside of the hull too.

Sand until all areas are smooth, but don't sand through to the wood. If you do, you have to re-coat the area with resin, and re-sand.

## Strakes

The VBox features turning strakes on the bottom. These help the smooth bottom "grip" the water when the boat turns, minimizing slide.

These are necessary for the hull to turn, so don't skip this step.

The strakes come pre cut, but must be rounded on the front.

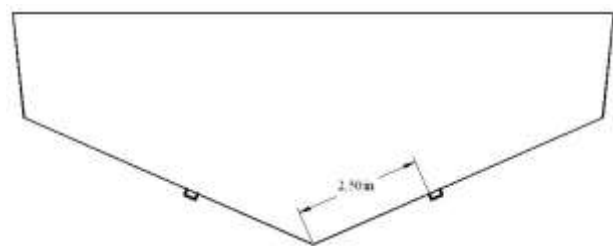




Measure 2-1/2 inches from the keel for strakes.



Rear edge of strake.



Strake detail.

When you get them, the strakes are identical. After we sand and blend the front, they will be mirror images of each other, so follow along carefully.

Lat out the strakes on your bench, as shown below.



With a pencil, mark them "R" and "L". The rear of the strakes are on the left.

Sand and blend the front of each, so that it blends into the hull at the front.

With a pencil, make reference marks on the hull bottom, to attach the strakes.

First, Mark 4-1/2 inches forward of the transom.

Then mark 2-1/2 inches out on each side of the keel.

Where these two lines meet is where the rear of the strake starts.

Using a yardstick or similar. Draw a line forward from the mark you made, 36 inches long.

Maintain the 2-1/2 inch distance from the keel.

Once both halves of the bottom are marked, we can glue the strakes on.

We only get one chance at this, so take the time to make sure everything is correct before you glue.

Look at the drawing at left, and make sure that the strakes are oriented correctly. The bevels face inward.

When you are sure that everything is ready, get out your medium CA.

Put a small bead of CA on the bottom of one strake.

Only use a tiny bead, from end to end. We don't want any to squeeze out from between the strake and the bottom.

Start at the rear, align your marks, and touch the rear of the strake to the bottom. Don't let the forward part touch yet.



Front of strakes. Easy Vee shown.



Another view.



Easy Vee again.

Press down, and move forward, making sure that the strake is following your line exactly.

It must be parallel with the keel. The glue will stick almost instantly to epoxy. When done, repeat on the other side.

When both are done, seal them with a coat of resin with a brush, and use a clean rag to wipe excess resin off, after it has soaked in for a few minutes.

Make 100 percent sure that there is no glue fillet between the strake and the bottom. This would make the strakes useless, as we need the edge to “bite” as we turn.

Mask the openings in the hull from primer overspray. Spray a light coat of primer. Let this flash for a few minutes, and spray a heavy coat on.

Let sit overnight.

When the primer is dry, use icing or body filler to fill any nicks or surface imperfections.

When dry, wet sand with 400 on a rubber block.

If you are happy with the surface, spray on another medium coat of primer.

When dry, wet sand with 600 or 800.

Watch out for the sharp skeg...

Use compressed air or a vacuum to remove the dust on the inside and outside of the hull. Wipe down the entire boat with alcohol.

Use a tack cloth to lightly wipe all surfaces.

Spray your color coats.

When cured, wet sand with 800+ and clear coat the entire hull.

Make sure the clear is completely cured before final assembly.

To apply your decals, wipe the area with alcohol and allow to dry before applying decals.

Be sure to install pushrod seals when you reassemble your boat.

Follow the setup guide below.

# Setup

Adjust the stinger so that it is level or about 1 degree negative (the prop end is slight lower).

Grease the flex cable.

Slide the cable through the strut, into the engine collet.

Leave a ¼ inch gap between the drive dog and strut.

Tighten the collet.

Wrap your receiver, failsafe and battery pack in foam rubber.

Mount the switch.

Turn the transmitter on first, then the receiver.

Make sure the trims are centered.

Put the rudder servo arm on. It should be parallel with the servo and 90 degrees to the pushrod. Use the sub trim function, if your radio has it. If not, get it as close as you can.

If you are going to run the boat on the stand, take the prop off, but leave the shaft connected to the engine. This will help to “break in” the strut bushings.

If you are using a new engine, you should run it on the stand before going to the pond.

This will do several things; It will allow the engine to loosen up a little, making starting a simple matter, as well as get YOU familiar with its starting and running characteristics.

When new, the engines are very tight, and starting is difficult at best.

You will need to supply cooling water to the engine and exhaust while running on the stand.

Use the Zipp garden hose adapter on your hose.

Adjust the water flow so that there is a stream of water about 2 inches coming from the outlets.

Now is the time to check all water connections for leaks.

Under no circumstances should you ever run a marine engine for an extended time without cooling water.



# At the pond

Make sure your transmitter and receiver batteries are fresh, or fully charged.

Do a range check with your transmitter antenna down or select low power, and note the distance. You should do a range check every day that you run. Should a problem arise, you can fix it before you damage anything.

Tape the lid on the radio box with radio box tape, or use Scotch Plastic Tape. Regular tape leaves a residue.

Make sure that your prop is sharp and balanced.

Make sure the trim tabs are flush, and not up or down. Use a small straightedge to check.

Make sure all screws and nuts are tight.

Fill the fuel bag. Make sure you evacuate all the air from the bag.

Turn on your transmitter, then receiver.

Wiggle the rudder so you know it works, and then start the engine.

Don't rev the engine much, as there is no load on the prop until it's in the water.

To launch, have a helper drop the boat in level.

You can give it a little gas as it gets to the water, but not too much. Most people don't like getting sprayed with water...

Run around at  $\frac{1}{4}$  to  $\frac{1}{2}$  throttle to let the engine warm up for 30 seconds or so before giving it full throttle.

Drive past yourself, and make sure you have a stream of cooling water.

If you don't see any cooling water, bring it in pronto! Fix this before you cook things...

If all looks good, hit it!

Notice how the boat rides in the straights. Does it lean or pull to one side?

How about the turns? Does the nose rise or fall in the turns? Does it slide or hook?

It's a good idea to have a helper write down your comments as you run the boat. After the run, you can use the included "Crackerbox Tuning Tools" sheet to help you sort out any problems.

## Good luck and happy boating!

# Cracker Box tuning tools

**Stinger Angle-** Negative to push the bow down, positive to push the stern down. This is a course ride angle adjustment. Small changes in the strut angle make large changes in ride attitude.

**Trim Tabs:** Inner- Use these for fine adjustment of the ride attitude, as well as to control torque and chine walk.

Outer- use these for fine adjustments to turns.

**Rudder: Trim-** Use this to make the boat go straight. The rudder should be parallel to the hull centerline. Anything less will rob speed. If you have to trim left, it's probably prop walk.

**Rudder: angle-** Use this to control the nose in turns. Kicking the bottom of the rudder forward will cause the nose to rise in the turns. Kicking the bottom back will cause the nose to drop in the turns. It only takes a little; 5 degrees either way would be too much for most hulls.

**Turn fin:** This is mounted to the right side of the transom, and 90 degrees to the bottom of the hull. Make sure that there is never any fin area forward of the pivot bolt (kick it back slightly).

**CG:** This is the longitudinal (fore and aft) balance of the hull. Monos are usually 33-36 percent of the hull length, from the transom. This is the pivot point for turning. A forward CG keeps the hull wetter, preventing blowovers. Limits absolute top speed due to drag.

An aft CG keeps the hull out of the water, and usually blows over with very high speed. That's why they call it a "balance" point...

**Prop:** The prop is very important to speed, as well as overall handling of the boat. You can (and should) experiment with many props, lifting and non lifting, to get the best speed and handling from your boat. Always sharpen and balance your props! A sharp prop helps reduce "prop walk", and a balanced one usually stays together!

# Additional information

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## **IMPBA Website**

**[www.impba.net](http://www.impba.net)**

National Model Boating Organization

## **NAMBA Website**

**[www.namba.com](http://www.namba.com)**

National Model Boating Organization

# **Zippkits.com**

**If you have any questions or comments, we would love to hear from you. Email or call us**

**[support@zippkits.com](mailto:support@zippkits.com)**

**Toll Free (866) 922-9477**

## **Thanks for buying our stuff!**