

Custom Step-by-Step Victoria R/C Sailing Yachts by OMSA
revision January 27, 2006, Chapter B

Okanagan Model Sailboat Association, Kelowna, B.C. Canada



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Step B1: Building the rudder push-rod



Now we continue with the "custom" part of building your Victoria. Let's **build a custom rudder push-rod** to be used by the "alternative rudder servo-mount" in the next step.

Here we are using the kit-supplied rudder push-rod and clevis. Thread on the supplied metal clevis onto the end of the push-rod allowing 1/8" of thread to be visible inside the clevis. Measuring from the pin of the threaded clevis, the unthreaded end of the rod will be cut off at a length of 7 and 3/16 inches which will allow for a 1/4" 90 degree bend which is enough to engage the servo arm. When completed, the "end to end" length of this rudder push-rod assembly should be 6 7/8" long measured between the 90 degree bend and the locking pin in the clevis. *This length assumes the use of the Du-Bro rubber 3108 push-rod seal.*

Note that the clevis that will engage the tiller-arm will allow the overall length of the push-rod to be adjusted after installation to center the rudder.

A very nice carbon-fibre and brass rudder push-rod is also available from LONGBOW Racing Yachts and is can be seen on the LONGBOW catalogue on this web site.

Step B2: Building the rudder servo mounting plate.

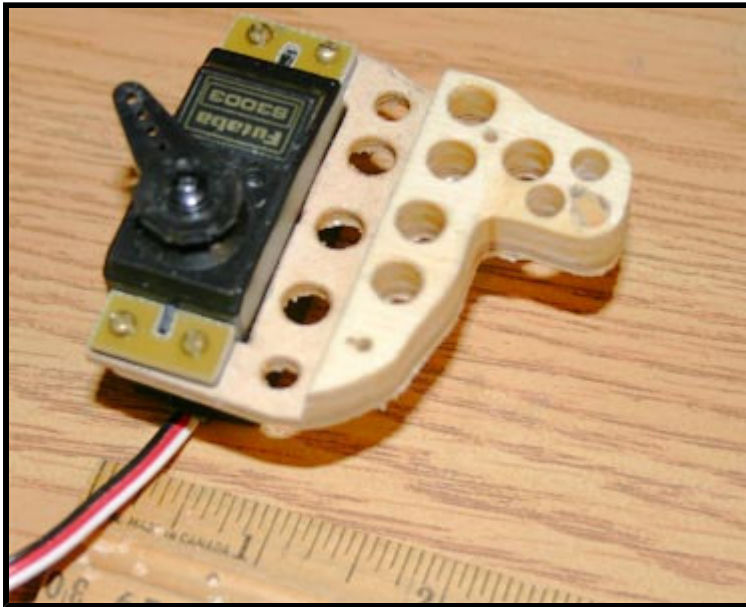
In our club we have almost universally adopted a variation of an "alternative rudder servo mount" as described by Brian Roberts, the AMYA Victoria class

addendum: April 4, 2005

The secret to making a small and light mounting plate is to make a plain wooden plate much larger than shown here, perhaps 3" square. Position it in place as per step B3, then

secretary.

see the Victoria Class web site for his description at <http://www.victoriarc.org/FAQ/Radio/Servo/Servo.htm>



The rudder servo is mounted on a separate plywood plate on the underside of the cockpit surface. This lined up the rudder push-rod with the tiller arm and resulted in solid rudder control as well as simplifying the installation of the sail servo.

Shown here is a very common Futaba 3003 servo, but smaller and lighter servos should also be considered, such as the Hi-Tec HS-81 for a weight reduction of 20 grams.

drill one mounting hole through the deck and installing one #2 brass screw to hold it in place while the 2 remaining holes are drilled. **Once the position of the 3 mounting holes are known, the wooden plate is removed, cut down to minimum size, and drilled out to remove excess material and weight. Then remount it in place..**

Do not glue the plate to the hull; allow it to be removable for servo replacement if required in the future.

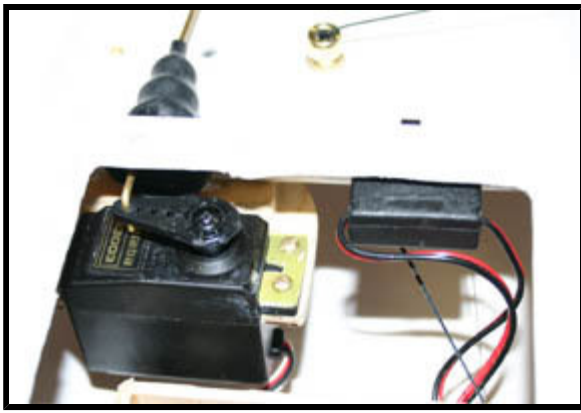
Note that the Futaba 3003 rudder servo has 4 arms. **All but 1 arm will be removed** with a saw or side-cutter prior to installation. Also note that in this photo we have made up a couple of small fiberglass plates that act as "washers" to mount the servo to the plywood plate as the #2 brass wood screws we were using here have a fairly small head. The use of #4 sheet metal screws would work too as they have a larger head.

Note that the excess plywood pieces that are left over from the making of your boat-stand may be used to make this rudder servo-mount but the lower plywood piece here really should be a piece of stronger 1/8" model-grade plywood material as there isn't much supporting material in the two "arms" that go under the rudder servo.

Step B3: Mounting the rudder servo plate

Now we are ready to **mount our rudder servo plate on the underside of the cockpit** of your Victoria. To properly align the servo with the rudder push-rod exit hole in the cockpit we need to exercise the rudder with a working radio. So assemble a receiver, battery pack and plug in the rudder servo to the receiver. Install a set of batteries in the radio transmitter as well.

Right-handed skippers control the rudder with their



Note the Du-Bro rubber push-rod seal (part # 3108), used here rather than the Victoria factory exit guide.

The large diameter of this seal makes it easy to align the rudder servo with the exit hole. **Enlarge the exit hole with a round file to fit the rubber seal.** The seal is used without the associated mount or O-ring and is inserted through the exit hole from the inside.

Insert the push-rod through the Du-Bro 3108 rubber push-rod seal and insert the clevis pin into the rudder tiller **using the middle hole in the tiller.** This should be a smooth fit with no excessive friction. **Insert the rudder push-rod into the servo arm's outermost hole.** This seems to produce the correct amount of rudder authority.



right thumb on the controller.

Left-handed skippers are left to their own resources.

Now, with the radio on and working, you should be able to exercise the rudder servo. Ensure that the "trim" controls on the radio transmitter are set to the "center" of their range. At this point you will likely have to remove and **re-install the plastic arm on the rudder servo so that it is positioned at a 90 degree right angle to the center line of the boat.** There is a small screw holding the plastic arm in place for this purpose. **The three unused arms should be cut off now to ensure they can't interfere later with the control lines to the boom.**

Next, while exercising the radio transmitter rudder-control back and forth, position the entire servo mounting plate on the underside of the cockpit deck so that the **push-rod moves without interference** as well as seeing that the rudder is roughly centered. You might need a third set of hands for this step.. When all is working well, hold it steady and drill one 1/16" hole right through the cockpit and mounting plate. Change to a 3/32" drill bit and enlarge just the cockpit surface to accept the shank of the #2 screw. Temporarily install 1 #2 wood screw to pin it in place, check the alignment again, then drill the 2 remaining mounting holes.

Do not glue the rudder mounting plate to the hull. There may be a time when you wish to remove the rudder servo in the future.

Now remove the servo plate, drill and cut to make it as light as possible, and then remount it back in the boat.

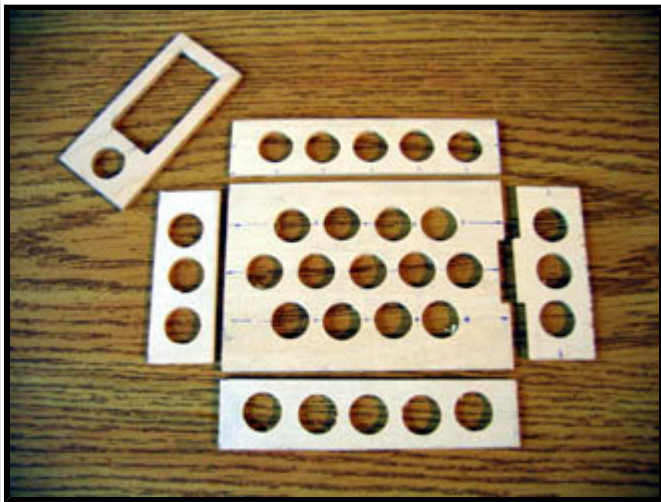
Now adjust the overall length of the push-rod assembly with the threaded clevis at the tiller so that the

rudder is perfectly "centered".. Again, ensure that the rudder trim control of the radio transmitter is still "centered" while checking final rudder position.

Hey!, it works!!.....well done!

Step B4: Building a custom radio/sail-servo box

Using the plywood pieces that come with the Victoria kit, construct a radio box similar to that shown in this photo. *A solid installation of a radio box contributes to a greatly strengthened hull in the area of the keel as well as securing the sail servo, radio and batteries.*

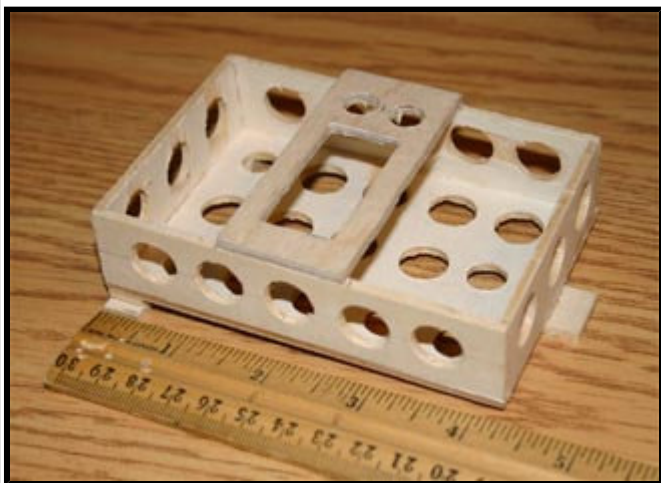


Note that since the sail servo will be mounted crossways in the box, the base piece and the side rails can be **shortened to 4 1/4" in length**. As well, before glueing the pieces together with c/a glue, the two sides and the two end pieces are **reduced in height by 3/8"**. This allows the sail servo to sit lower in the box.

The stock plywood piece that was intended to be used for the top of the radio box is not used; instead a new piece is cut from 1/8" light plywood.

The correct size hole is cut into the top piece to suit your particular sail servo and then mounted across the box so that the sail servo can be positioned toward the left or port side of the box. A couple of small supports should be glued along the sides to ensure this top piece doesn't ever come loose from the force of the sail-servo.

The position of this support piece allows room for the battery pack to fit either *ahead or aft* of the servo and the radio receiver can be placed in the unused end of the box.



The completed weight of a radio/servo box comes in at only 23 grams compared to the stock design of 42 grams.

With a 1/2" drill, have fun making a large number of holes in all four sides and the box bottom, which removes a significant amount of unnecessary weight. There are 33 holes in this particular radio box counting a couple of smaller holes in the cross member.



This version has a removable servo plate to allow the sail servo to be readily exchanged with a different model if desired.

Either the Futaba S3802 sail servo or a HiTec HS-645MG sail servo will work well for you and will do a decent job controlling the sails even in quite difficult conditions. Note that the sail servo shaft is quite well centered side-to-side in the radio/servo box. The Futaba S3802 servo is somewhat heavier (17 grams heavier) and is also stronger than the HiTEC HS-645MG.

With a few small pieces of scrap plywood from your kit, add the three tabs shown here to both level and support the box in the Victoria hull. The two front corner tabs are 1/4" thick and the central rear tab is 1/8" thick. The tabs are glued in place with a few of drops of c/a glue which works amazingly well on wood/plastic surfaces.

Before installing the radio box, it receives a coat of clear Verathane to waterproof the box. Unprotected bare wood is hard to keep from absorbing moisture. This added 2-3 grams of weight but was worth it.

The three tabs installed on the radio box allow the box to be *positioned above the keel molding in a level attitude*. The stock radio box should be positioned about 1/2" rearward of the brass keel tube or placed further aft if the shorter box is used.

If you choose to make the recommended shorter radio box of 4 1/4" as previously described, then the box can be positioned about 1" to 1 1/8" aft of the brass keel tube. This still leaves enough clearance between the box and the rudder servo.

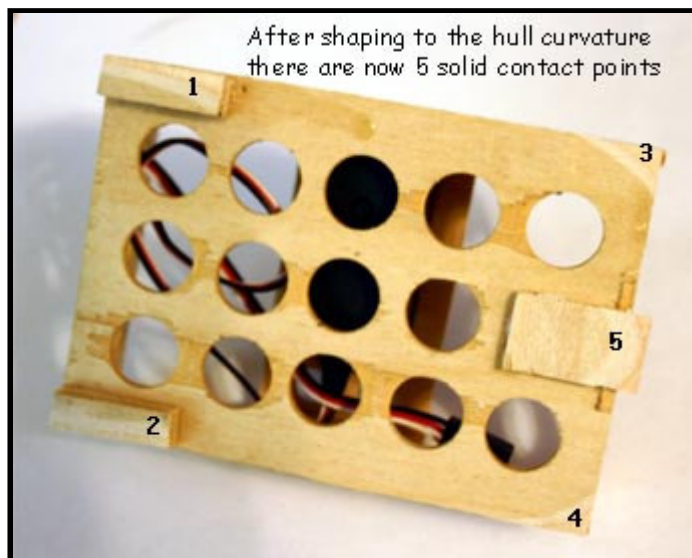
The three tabs on the underside of the servo



box now need to be shaped to match the compound curvature of the Victoria hull. This is real easy..



Place some coarse grit sandpaper in the Victoria and rub the box back and forth over the sandpaper. The tabs assume the correct curvature in no time at all and guarantees that the c/a glue will bond the tabs perfectly to the hull. Remove the sandpaper when done of course.



Test fit your radio box into your Victoria hull and mark its final installation position with a few pencil marks. The aim is to have the box centered side to side in the bottom of the hull and ensuring that the box is stable side-to side.

The final product of your efforts is now ready to be dropped into position in the Victoria hull with a few drops of c/a glue under each tab then pressing firmly into place for 1 minute.

(dont jiggle now).

Step B5: Building and installing a sail servo arm.

The 6" by 1" sail servo arm can be made next. The easiest way to make it is to find an old-fashioned paper cutter, the kind you might remember from your school days. Even 2024-T3 aluminum is no match for it.

The sail servo arm is made of .032" (about 1/32") type 2024-T3 aircraft grade aluminum alloy sheet or is available ready-made in the LONGBOW Victoria hardware kit.

The five center holes in the arm are drilled out to 21/64" while the two outer holes have to be carefully filed out to the diameter of the bead that you are using. The beads will be glued into the outer holes with C/A glue and will guide the lines running to both the jib and the main booms. If you want to get



fancy, instead of the beads, you could install a couple of small pulleys that are available at a hobby store that will further reduce the running friction of the lines (sheets) as the sails are pulled in or let out. The control line layout is described later in section E3.

The arm is then fastened on the underside of the plastic servo fixture as per the photo in step B6.

You could use small screws for this but we prefer to use a couple of very small 3/32" aluminum "pop" rivets. Get a bunch for your friends as they are cheap and you will also be using these rivets later for the mast assembly. The 6" arm is mounted across the beam of the hull and will clear the sides of the hull nicely.

While exercising your sail-servo control on the radio transmitter, position the sail servo arm on the servo so that it is positioned straight across the width of the hull when the transmitter primary controls and the trim controls are in the center of their ranges of travel.

Step B6: Configurations of radio box & power switch

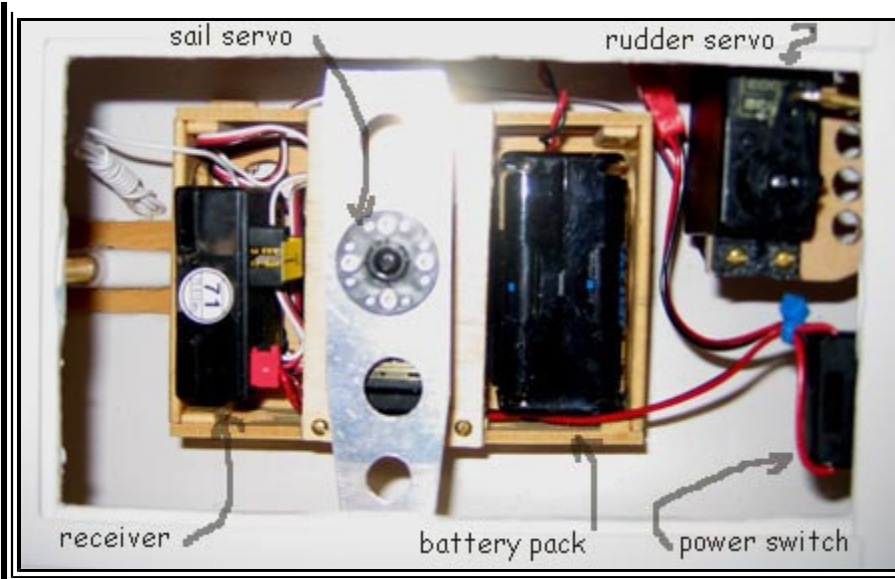
Install the ON-OFF power switch in the port side front surface of the cockpit after drilling another mounting hole and drilling & filing a rectangular opening for the slide switch. The stock holes in the cockpit surface can be used as a starting point for this. This allows the Victoria to be turned on-off without opening the hatch cover.

Most of our Victoria sailors have now placed the batteries in the aft end of the radio box for better down-wind performance. See below.

As we sail here in fresh water, we have not had the slightest problem to date with moisture affecting the on-off switch. Salt water sailors could waterproof the switch with a protective cover.

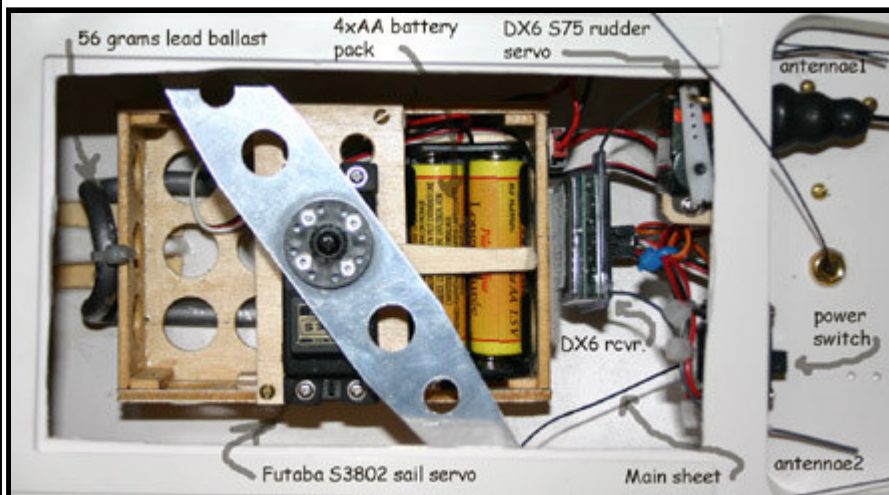
The inside of the hull is dried out after every day's sailing with the use of a small fan as described in Chapter "H".

This is very important to do, as the servos and the electronics do not



appreciate any moisture in them. A thorough drying-out between sailing sessions will keep your Victoria dry and light.

"Nipper" - commissioned Feb 16, 2006



Here is an example of our newest radio/battery layout using the revolutionary radio DX6 radio system from SpektrumRC.

The very light dual-link receiver and rudder servo allowed no less than 2 oz of lead to be placed underneath the radio box, immediately above the keel. Note the very short 4" dual antennae on this 2.4 Ghz system.

Total all-up weight ready to sail: 4.50 lbs or 2042 grams.

Step B7: Making the deck chain-plates

Our sailors like to dress up the Victoria a bit with the addition of brass hardware on the deck to accept the shroud lines, and the jib swivel.

Shown here is a shroud line chain plate using a 1.5" length of 1/4" brass angle material available either at your local hobby shop or from OMSA.

With a 1/16" drill bit, drill through the existing mounting holes in the deck surface that were intended for the plastic shroud line anchors. Make your 3/32" screw holes in the chain plates match the holes in the deck for the #2 by 3/8" wood screws. These screws and the brass material are included in the OMSA



hardware kit.

The brass chain plates are an easy addition to your Victoria that doesn't hurt your boat speed and sure does dress up the boat a lot.

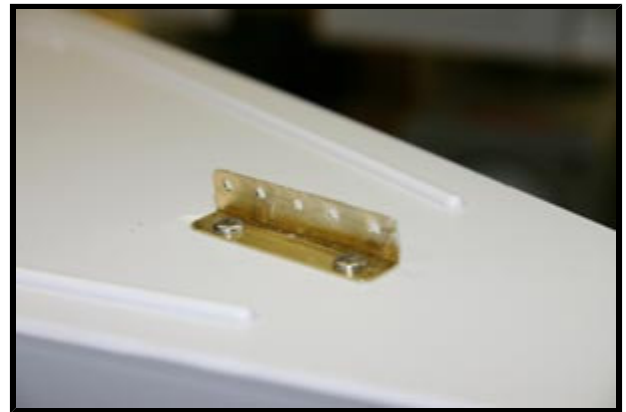
Step B8: Construction and mounting of a jib chain-plate.

Using the same 1/4" brass angle material as above cut off a piece 1 1/8" long to be made into a jib chain plate. Drill a couple of 3/32" mounting holes as per the next photo..

Also drill five 1/16" holes into the vertical surface that will be used to fasten the jib swivel.

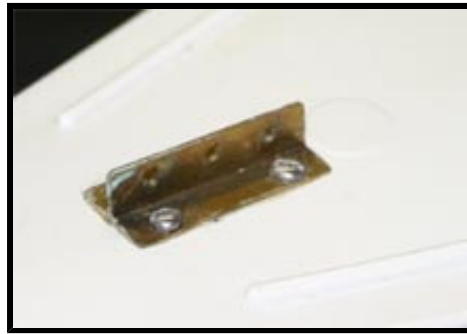
Mount this jib chain-plate to the deck centered over the stock location on the foredeck with 2 small (size #2) stainless metal screws into 1/16" diameter drilled holes. These stainless screws need to have threads right up to the head and are included in the LONGBOW hardware kit.

The Victoria deck is very thick at this location and will easily take small sheet metal screws without the use of a backing plate.



This jib chain-plate allows lots of choice of jib swivel location both fore and aft of the stock location.

After a couple of years of sailing, the jib chain-plate will start to look like this ruffian. This jib plate is of a double-width design and is 1.5 grams heavier than the current design.



Step B9: Transom back-stay mount and drain plug.

Most of our current Victorias are now using this very simple arrangement for the backstay mount and has proven to be more than strong enough and looks quite acceptable.



It uses a stock plastic insert from your kit.

We do, however, redrill the hole (5/64") in the transom so that the insert fits as shown. C/A glue in place while pressing very firmly.

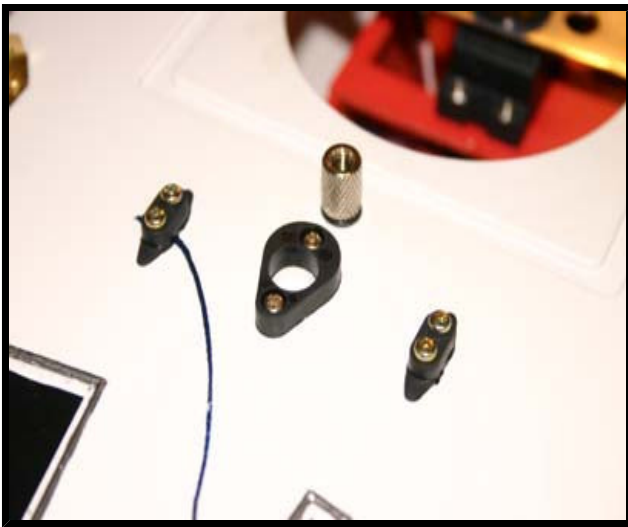
The tapered plug on the transom allows a quick check for water between races. This one was made from a piece of plastic wire insulation supported by a short length of 1/16" aluminum rod from one of the "pop" rivets. A cribbage peg should work just as well.

Step B10: Installing mast step and forward cleats

There are a couple of choices at this point.

- 1: The stock mast step can be installed as shown below or you may wish to install a custom **LONGBOW 4** position mast step.
- 2: The two lines controlling the sails can be secured under the supplied plastic cleats or else brought back to the aft end of the Victoria to a pair of quick adjusting sail sheets as shown in Chapter I-4 of this guide.

Option 1: using the stock kit mast step and cleats.

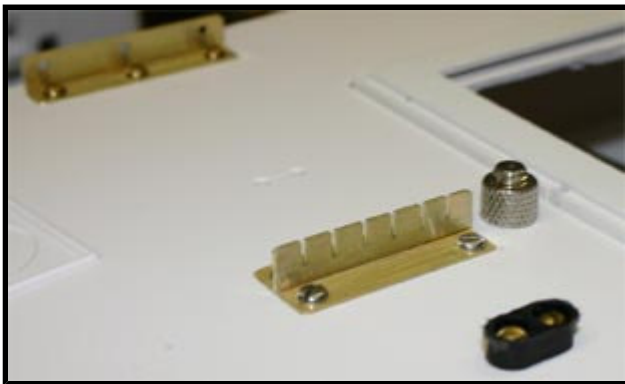


Mount the plastic mast step on top surface of the deck using the OMSA supplied #2 by 3/8" brass wood screws or the stock kit screws.

Mount two of the supplied plastic cleats at the stock position on either side of the mast step.

The starboard cleat will anchor the end of the jib sheet while the port cleat will anchor the short down-haul line attached to the main sail. **The lines pass under the cleat** and are securely held in place.

Note: So that the lines can't get caught on a cleat while sailing, simply **snip off the overhanging arms** of each cleat.



Note the knurled nut for the keel bolt behind the mast step. It is permissible to cut the stock knurled keel nut in half to provide more clearance for a boom vang. (and to save 1/2 gram of weight as well)

Option 2: Installing the **LONGBOW** mast step on "Northern Dancer".

This was just as simple as installing the stock plastic mast step but it allowed the mast to be repositioned, and with the matching mast stub from **LONGBOW** the mast is prevented from rotating. Four #2 stainless screws were used here without a backing plate.

A stock plastic cleat was installed on the port location to tension the downhaul line attached to the foot of the main sail. The arms of the cleat were cut off and the line will pass underneath to be pinched to the deck. Assuming that you are mounting this cleat with the #2 by 3/8" brass wood screws from **LONGBOW** Yachts, then pre-drill the deck holes with 1/16" drill. If using the stock kit steel screws which are shorter, no pre-drilling is necessary.

"Northern Dancer" is going to receive the quick adjusting sail sheets as per chapter I-4 so the starboard cleat normally used to anchor the jib sheet is not installed.

Step B11: Installing the aft cleat for the main sheet adjustment



If you have decided to use the quick adjusting sail sheets as described in Chapter I-4, then this cleat is not required to be installed. Pre-drill the deck with 1/16" before mounting this cleat.

Here is the aft cleat installed on the cockpit ready to anchor the adjustable end of the main sheet. The end of the main sheet will be run under the cleat and locked in place when the screws are tightened. The length of the sheets determine the position of the sails for sailing close-hauled upwind. See the kit-supplied Victoria construction manual for adjusting the sails or get some advice from some of the experts linked in Chapter I.

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