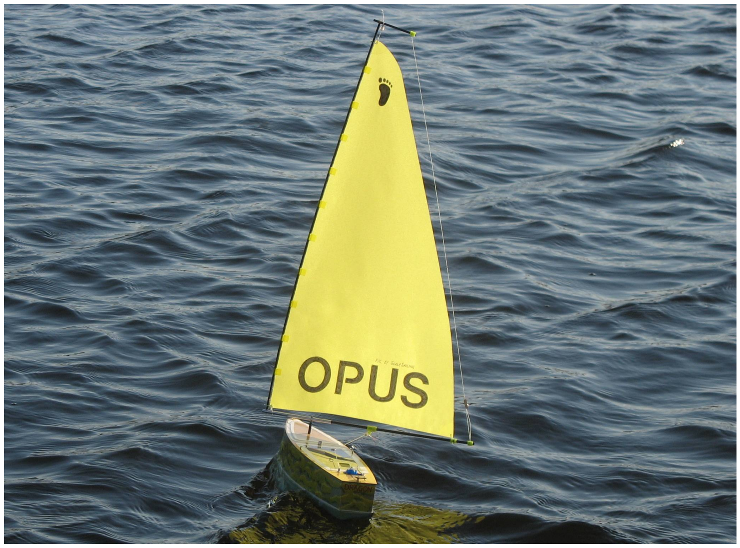
McALLISTER MODELS & DESIGN

THE OPUS RIG



an Offset Pivot Una Sail

designed by Graham McAllister

In developing OPUS I was inspired by the una rig on the Laser dinghy. The curved mast on the Laser is shaped by the sail pocket. I decided to create the mast curve with a backstay instead which allows the mast to be shaped independently of the sail, thus allowing some sail camber control. A pure Laser rig would have the mast set too far forward for a short hull like the Footy so I have adopted an offset pivot on the main boom so the rig now became a una swing rig. I have been careful to allow little to no flex at the base and boom mounting so all of the flex and gust reaction is handled by the flexible carbon mast and the sail itself.

If you have any questions please contact us at…

email: mcallistermodels@gmail.com phone: (920) 208 1652

www.mcallistermodels.com

Sheboygan, Wisconsin 53081 USA

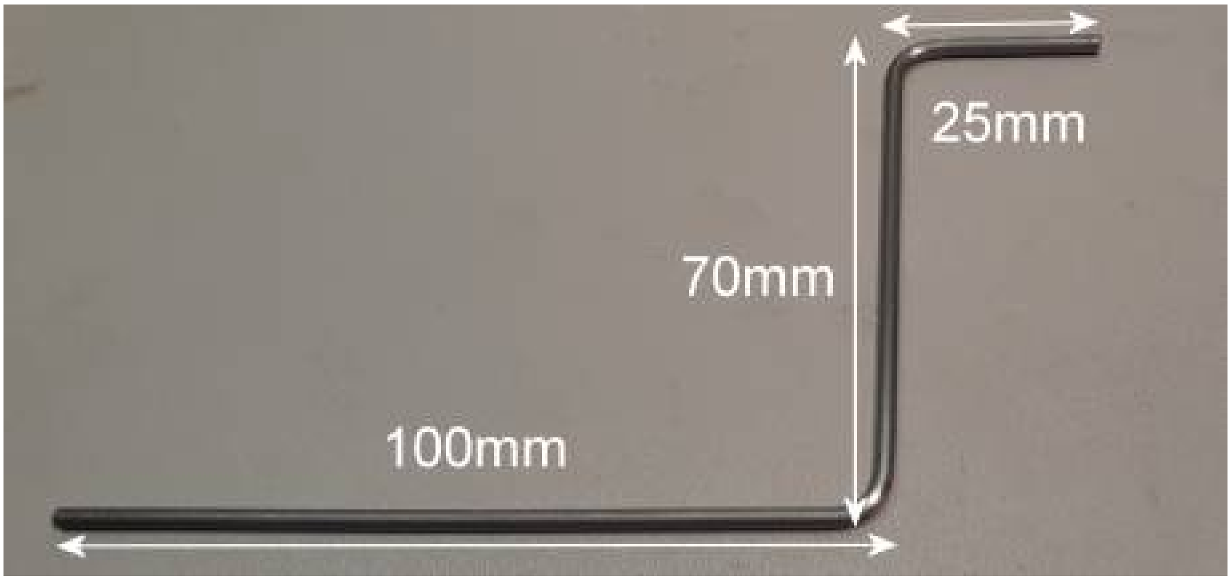
BEFORE YOU BEGIN

▷ Seal all knots in the rigging thread with a small drop of medium cyano adhesive (superglue) or wood glue.

▷ When threading through a hole you may find it helpful to harden 1/2” (12mm) or so of the thread end with cyano. This is almost like using a needle.

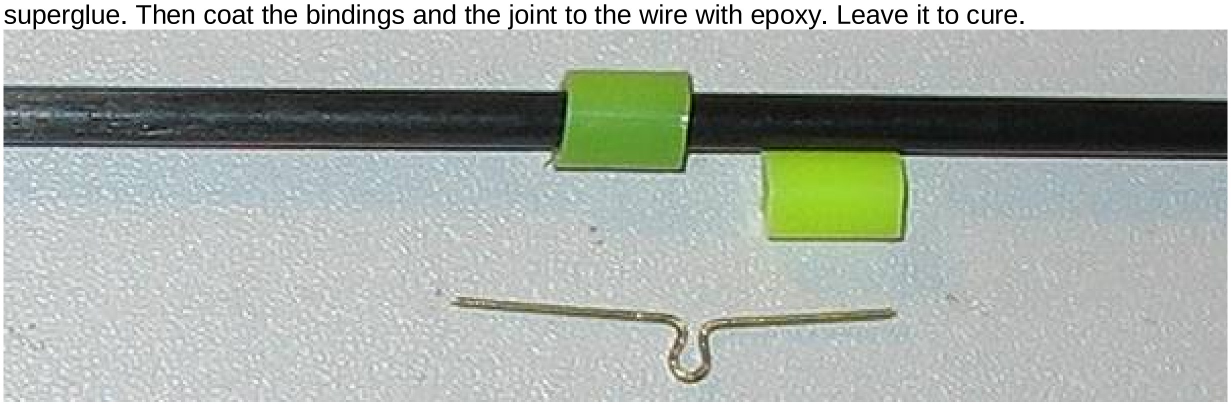
Boom Assembly

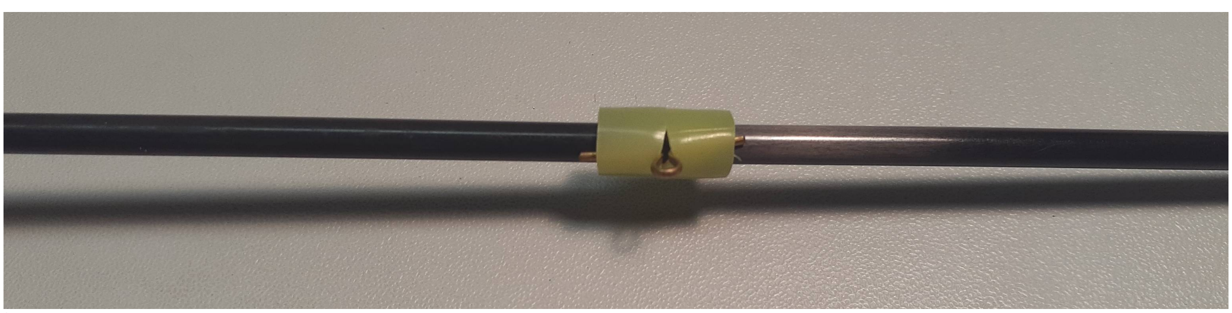
▷ Bend the wire boom pivot from 3/32 music wire.



File the long end of the wire smooth and slightly rounded. This will be the pivot point.

▷ Cut the 5/32" (4mm) carbon boom tube to length, 12" (305mm)
▷ Lay the wire boom pivot and the boom on a flat surface. Put some pieces of thin card under the wire to lift it up to the middle of the carbon tube. Glue the two together with superglue.
▷ Use rigging thread to bind the boom to the wire as shown above. Seal the bindings with thin superglue. Then coat the bindings and the joint to the wire with epoxy. Leave it to cure.

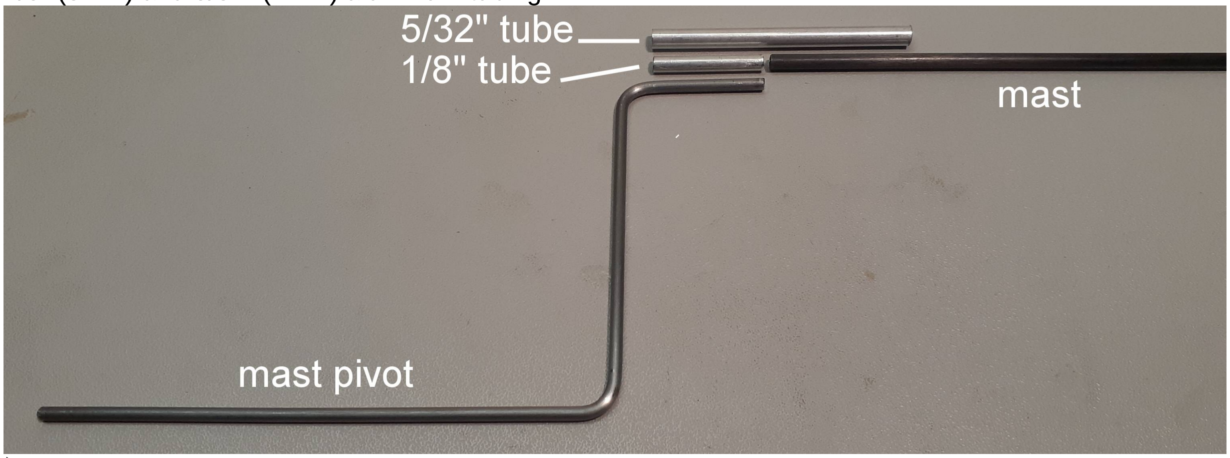




▷ Take a small split pin. Open it up flat as shown in the photo. Cut two 3/8" (9mm) lengths of silicone tubing and slide one on to the main boom. Push one leg of the split pin under the tube so it is at the bottom of the boom.
▷ Slide the other length of tubing along the boom and over the split pin leg to keep it in place. The split

pin position needs to be adjustable, so do not glue the tubes to the boom. The initial position for the split pin loop should be 3-1/2” (86mm) back from the boom pivot rod.
▷ Trim the extra length of the split pin legs flush with the edges of the silicone tubing so that rigging wires do not get caught on them.

<u>The Mast</u>
▷ The mast is a length of 1/8” (3mm) carbon tubing. Cut the mast to length and also the short lengths of 1/8” (3mm) and 5/32” (4mm) aluminum tubing.

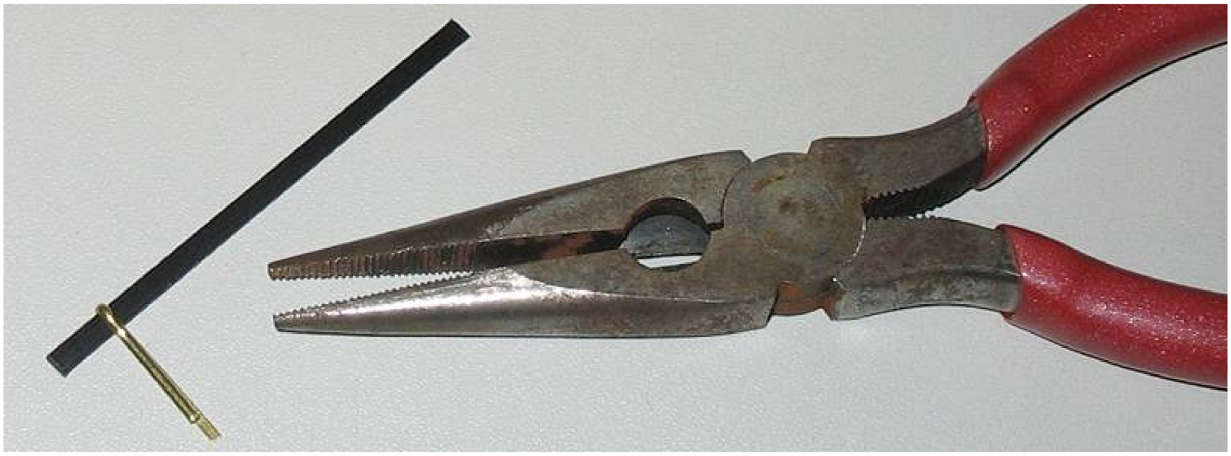


▷ Apply epoxy to the outside of the 1/8” tube and slide it into the 5/32” tube so that the ends line up.
▷ Immediately apply epoxy to the outside of the mast end and slide it into the 5/32 tube from the other end until it hits the end of the 1/8” tube inside. Be careful not to get epoxy INSIDE the 1/8” tube.

▷ When the epoxy is cured, slide it onto the mast stub on the mast pivot to check the fit.

▷ If the mast has some natural curve in it, twist the mast so that it curves backwards towards the back of the boom.
▷ Cut a 3/16” (4mm) length of silicone tubing and push it about an inch down on the mast from the top.

<u>Mast Crane</u>
▷ Cut the mast crane, which is a 2-1/2” (64mm) length of 1/8” (3mm) flat carbon strip. Or cut from 1/8” (3mm) carbon tube. Take a ½” (12mm) brass split pin. Push the split pin over the carbon strip leaving 3/8” (9mm) of the carbon strip on one side of the split pin. Squeeze the loop with pliers to tighten the split pin onto the carbon strip.



▷ Push the legs of the split pin inside the top end of the mast.

▷ Remove the split pin again and mix up some epoxy. Liberally coat the split pin legs and push them down into the mast top so that the mast crane long side is to the rear and in line with the boom. Coat the split pin head and the carbon strip with epoxy at their juncture to make a well glued and faired joint.

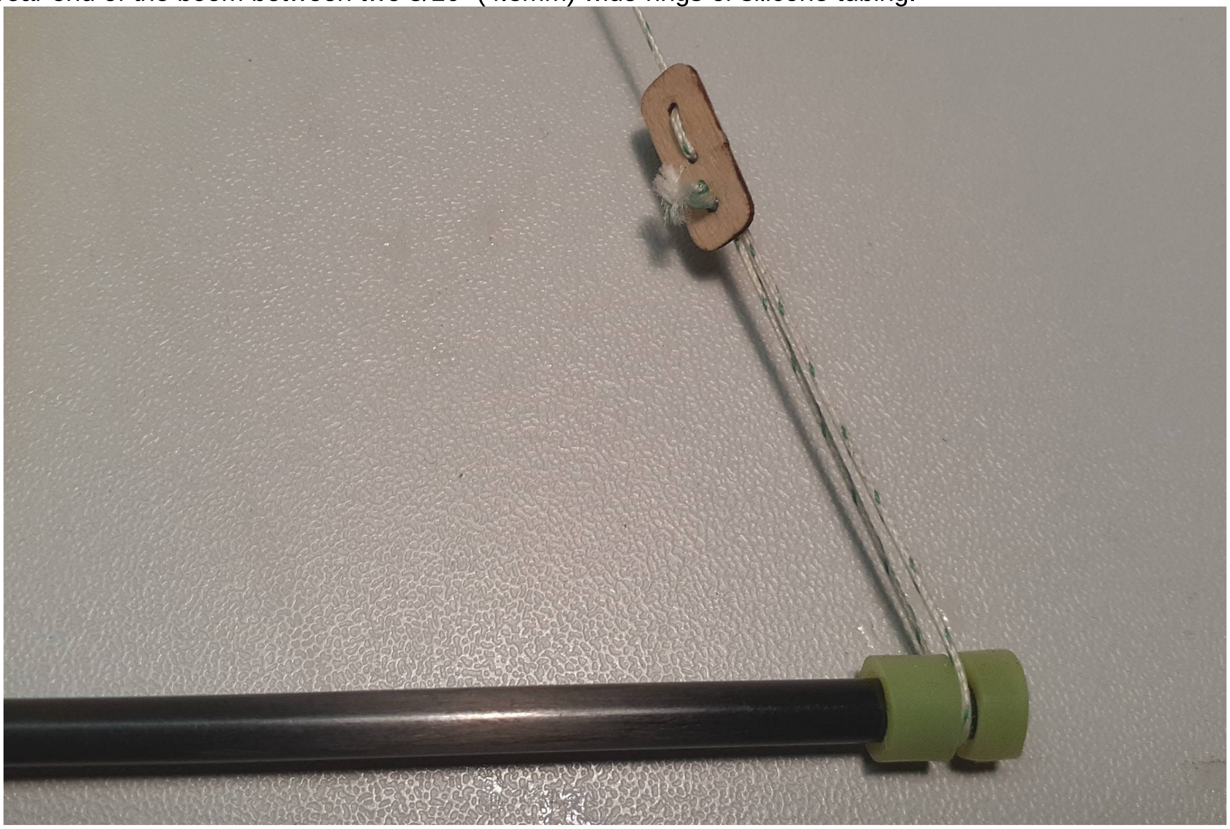
▷ The mast crane should be set at 90 degrees to the mast. Leave to cure.

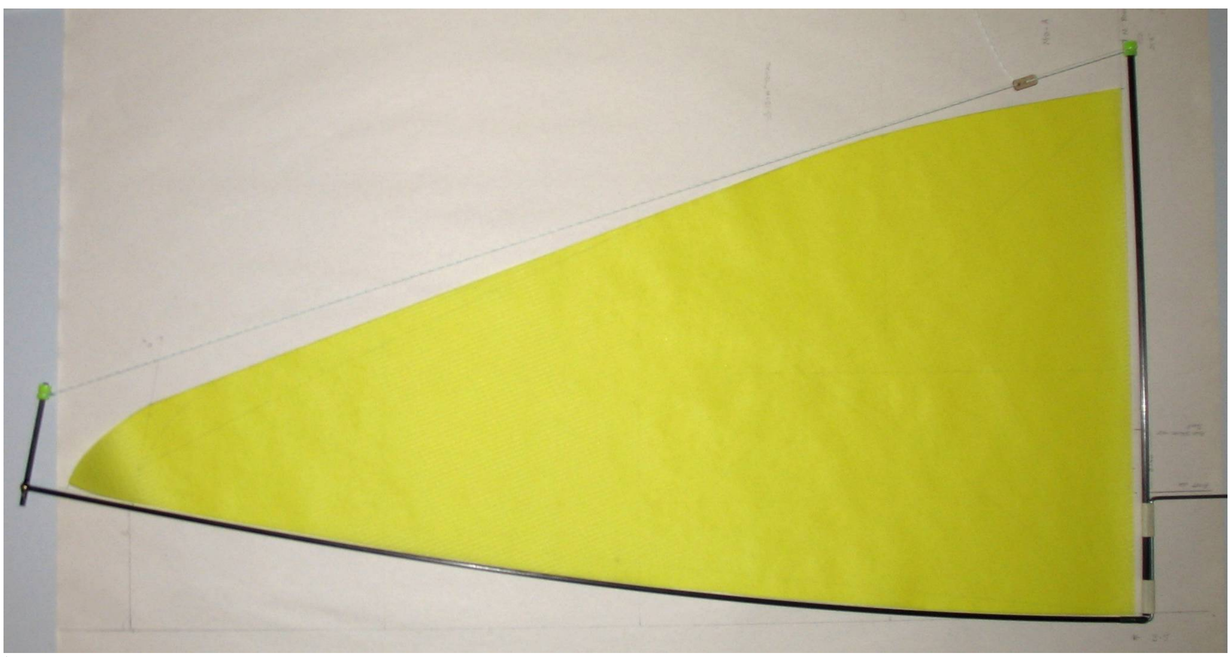
▷ Cut two rings of the silicone tubing, one about 1/8" (3mm) wide and one about 3/16" (4mm) wide. Slide these onto the mast crane with the wider ring at the rear.

<u>Backstay</u>

▷ Tie one end of a length of rigging thread to the mast crane between the two rear silicone tube rings.

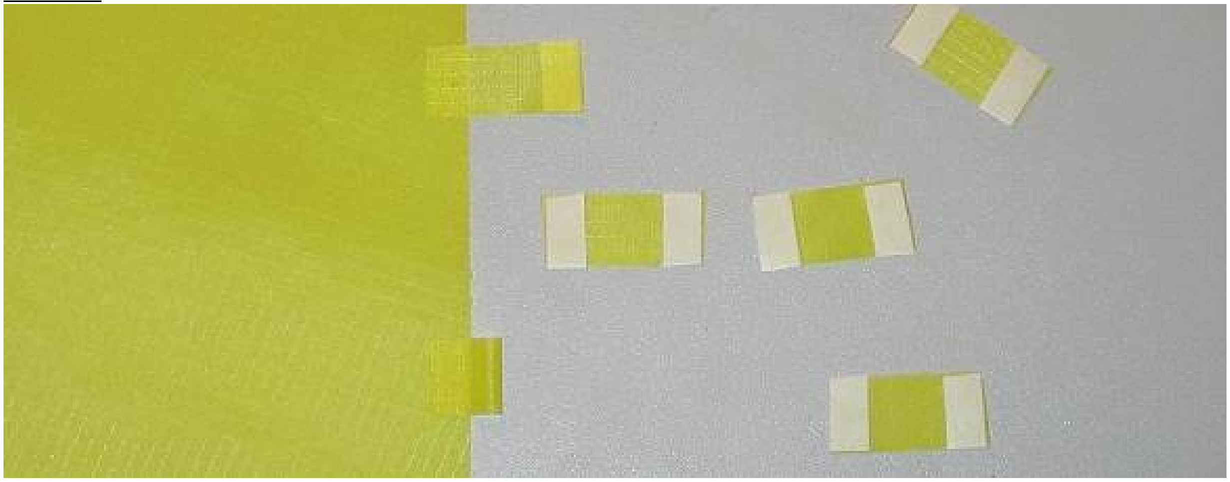
▷ The other end of the backstay passes through a plywood bowsie which gives you the adjustment required to control the mast bend. The thread passes through the first two holes of the bowsie, then forms a loop and ties off back at the third hole in the bowsie. The backstay should be long enough to fit onto the rear end of the boom between two 3/16” (4.5mm) wide rings of silicone tubing.



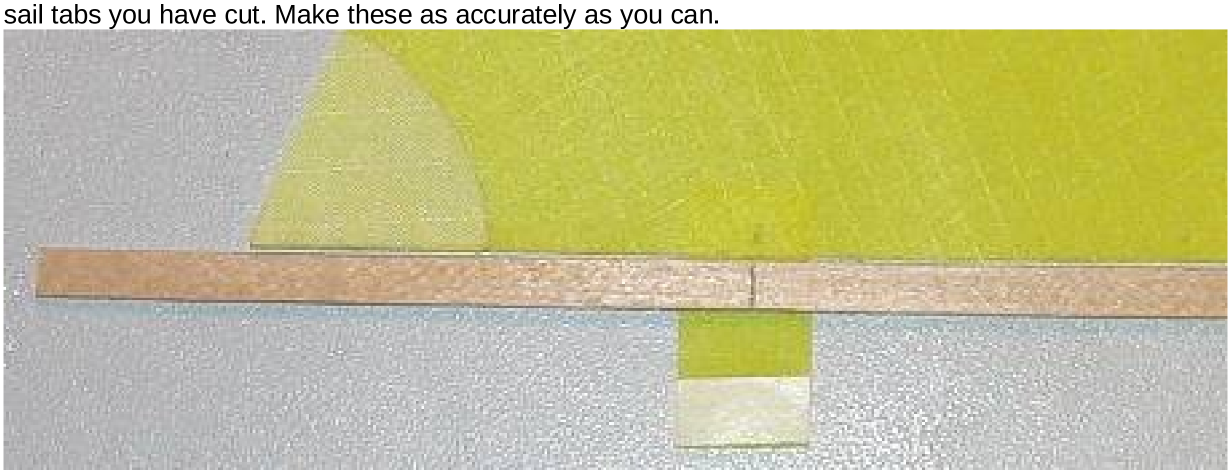


▷ With the mast plugged onto the boom stub the backstay will be able to bend the mast (by tightening the backstay). Tighten the backstay until the top of the mast is directly above the mast pivot. You now use this curve to create the shape of the sail. The most important thing is that the front edge of the sail matches the bend of the mast. So draw that first on your sail material. The bottom of the sail is drawn parallel to the boom and about 3/8” (9mm) above it. The top of the sail is 1” (25mm) short of the mast crane. The rear edge of the sail is then drawn as seen above, the shape isn’t critical but should not overlap the backstay. Make a card template first if you prefer. Disassemble the mast and boom. Remove the silicone rings from the end of the boom..

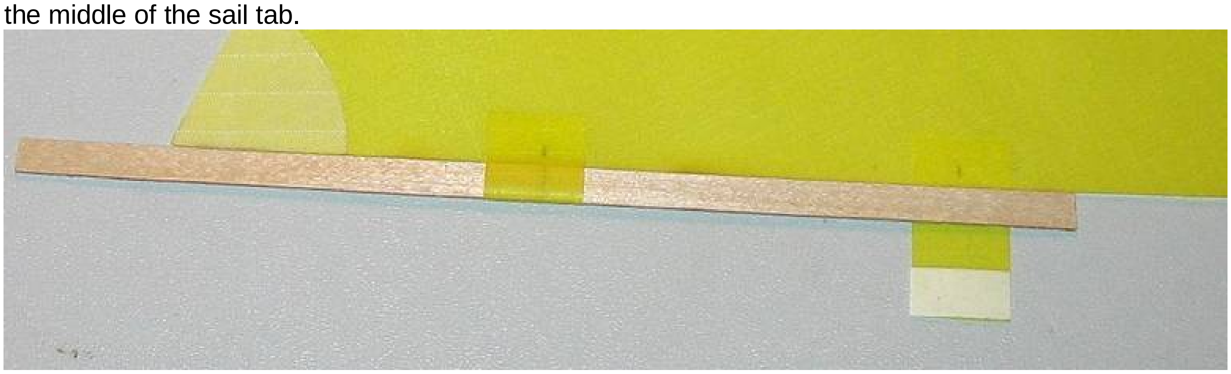
The Sail



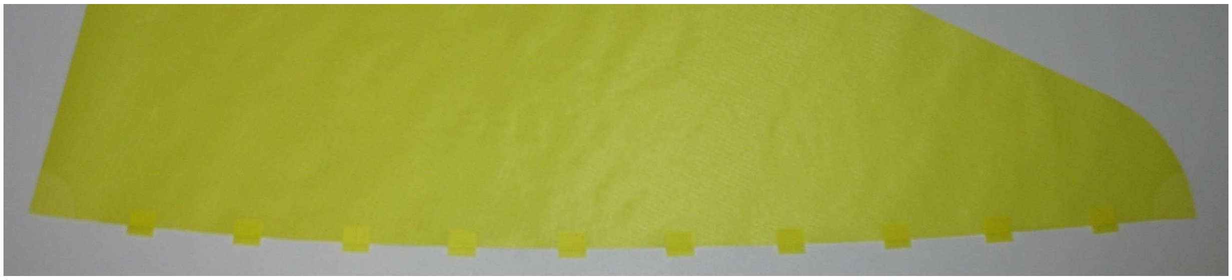
▷ Cut the sail to shape.
▷ Cut 1" (25mm) lengths from a 1/2" (12mm) wide strip of sailcloth. Cut 11 of these sail tabs.
▷ Cut 1/2" (12mm) lengths of the high strength double-sided tape and stick one across each end of the sail tabs you have cut. Make these as accurately as you can.



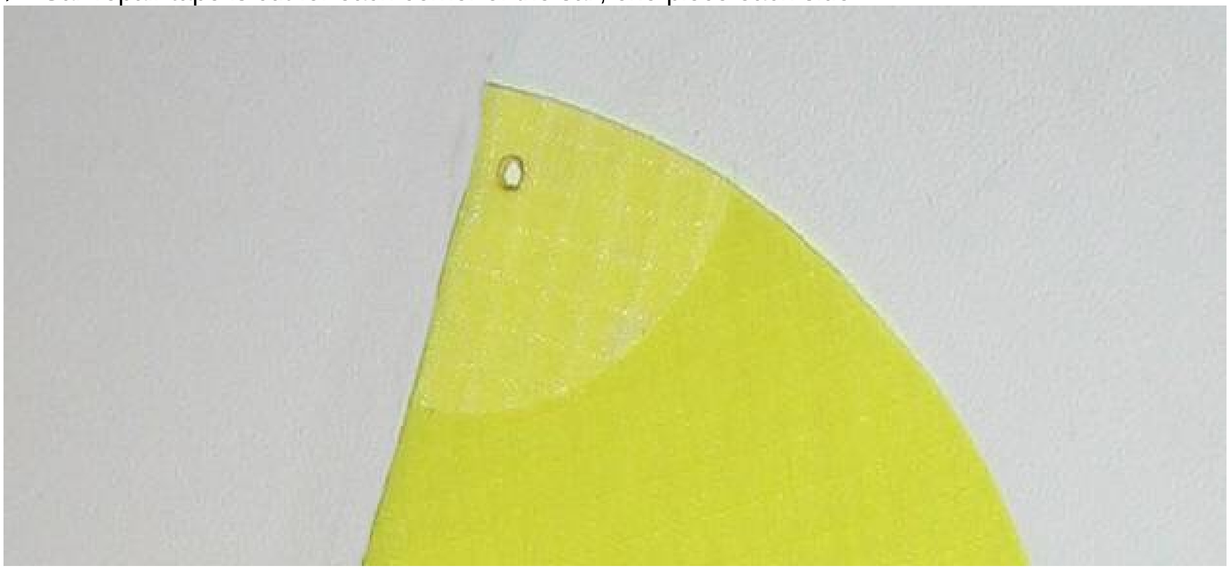
▷ Mark 2" (50mm) down from the top of the sail and stick one of the sail tabs on one side of the sail at the front edge. The back of the tab should be about 5/16" (7mm) back from the front edge of the sail.
▷ Lay a 3/16" (4.6mm) wide strip of plywood tangential to the curve of the sail edge with a centre mark at the middle of the sail tab.



▷ Peel off the paper backing and fold the tab closely over the guide strip and stick it down onto the sail to form a loop. It is important that all of the sail tab loops are the same size. This is quite easy using the guide strip to form the loops.



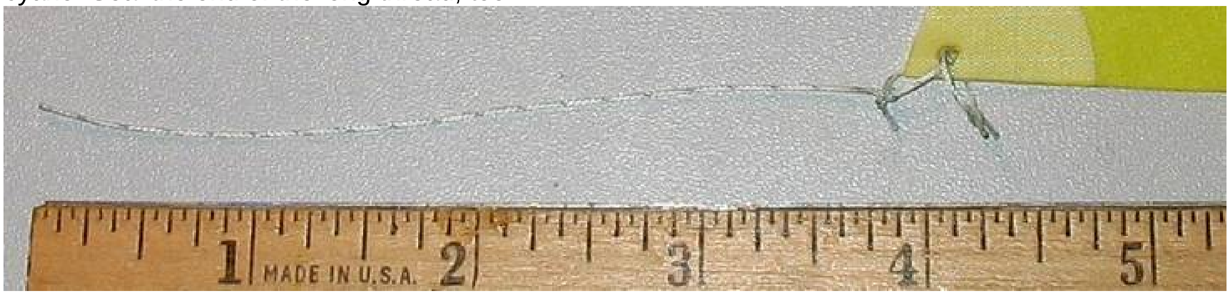
▷ Remove the guide strip and add the other sail tabs at 2” (50mm) spacing along the front edge of the sail. At the bottom of the sail put the final tab just above the aluminum tubing.
▷ Sail repair tape is cut for each corner of the sail, one piece each side.



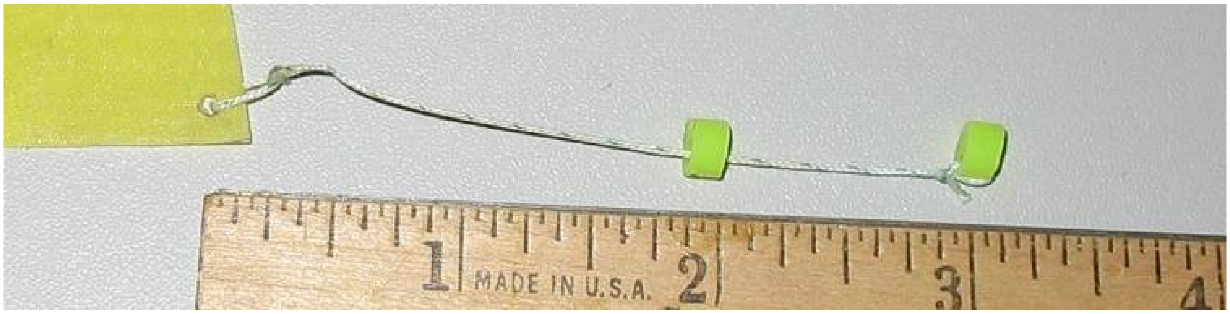
▷ Carefully trim the tape to match the shape of the sail.
▷ Make a hole about 1/8” (3mm) from each edge of the sail through the sail and repair tape. With care you can use a heated needle or thin wire to make a sealed hole.
▷ Repeat for the other two corners.

<u>Rigging the Sail</u>

▷ At the top corner of the sail, tie a length of rigging thread through the hole in the sail to extend about 4” (100mm) above the sail. Tie square knots (left over right, right over left) and seal them with medium cyano. Seal the end of the long thread, too.



▷ Tie a small loop through the same sail hole to fit around the mast as closely as the sailcloth loops.
▷ At the bottom front corner tie a similarly sized loop to pass around the mast.
▷ Tie another loop through the same hole. This needs to be long enough to slip over and hook behind the silicone tube on the front of the mast pivot wire when the mast is plugged onto the boom. See image below the next one.



▷ At the bottom rear corner of the sail, tie a length of rigging thread through the hole in the sail, pass it through a 3/16" (4mm) wide loop of silicone tubing, and tie it around another similar size loop of tubing. When finished this thread should be about 3" (75mm) long from sail hole to end.

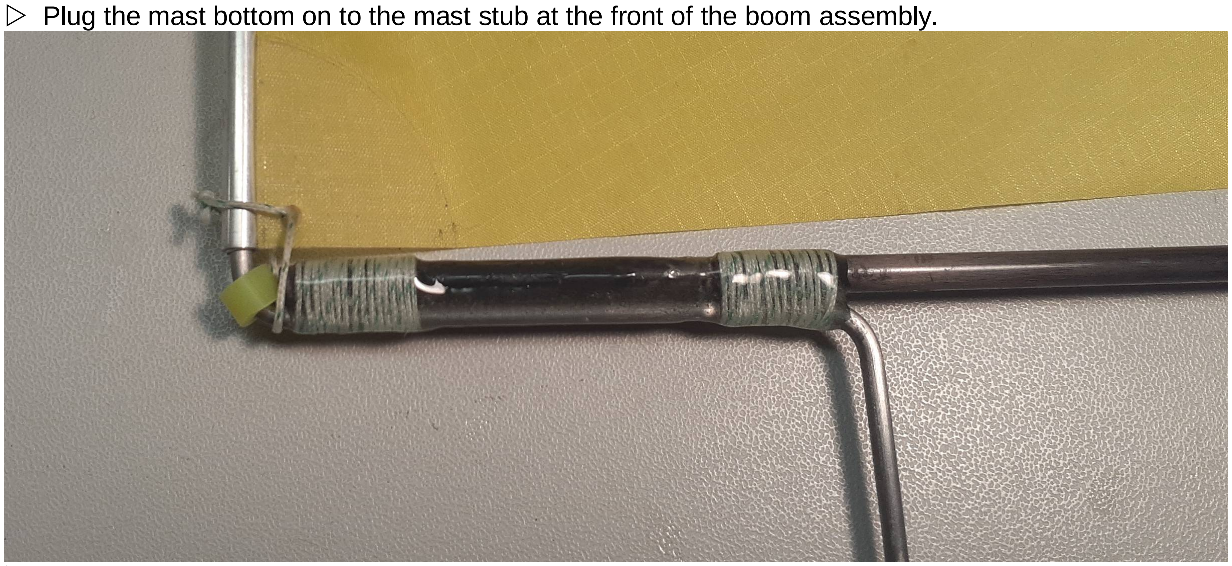
<u>Rig Assembly</u>

Now to make sense of the above rigging.

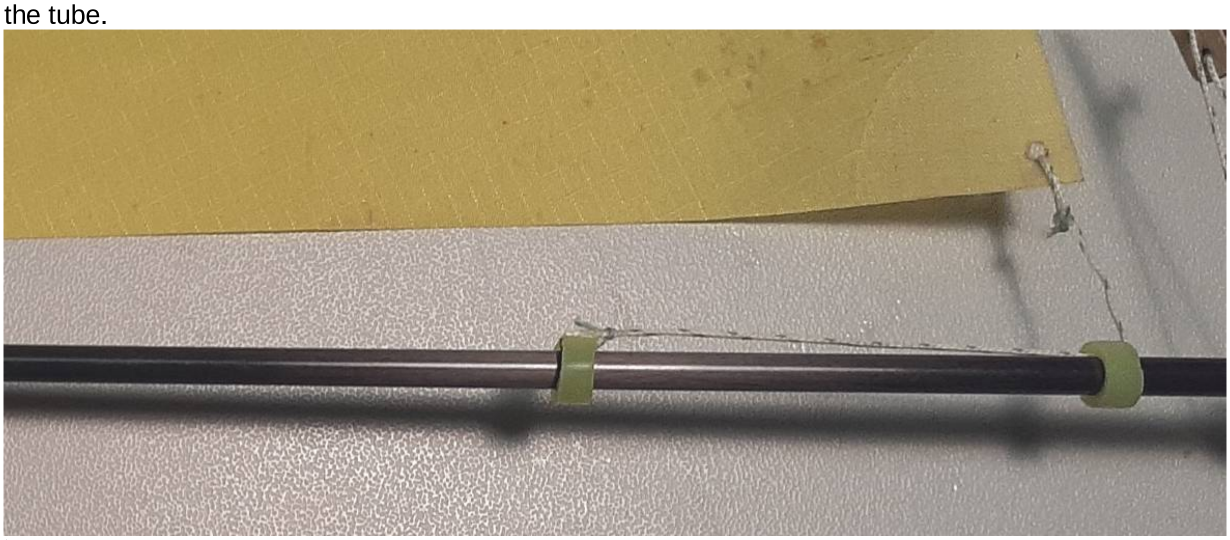
▷ Slide the mast down from the top of the sail. Pass the mast through the thread loop, each sail tab in turn, and the bottom thread loop. The sail will not lay flat at this stage, but this is normal.

▷ Slide a 1/8" (3mm) silicone tube ring onto the mast stub and push it down onto the curve of the wire.

▷ Plug the mast bottom on to the mast stub at the front of the boom assembly.

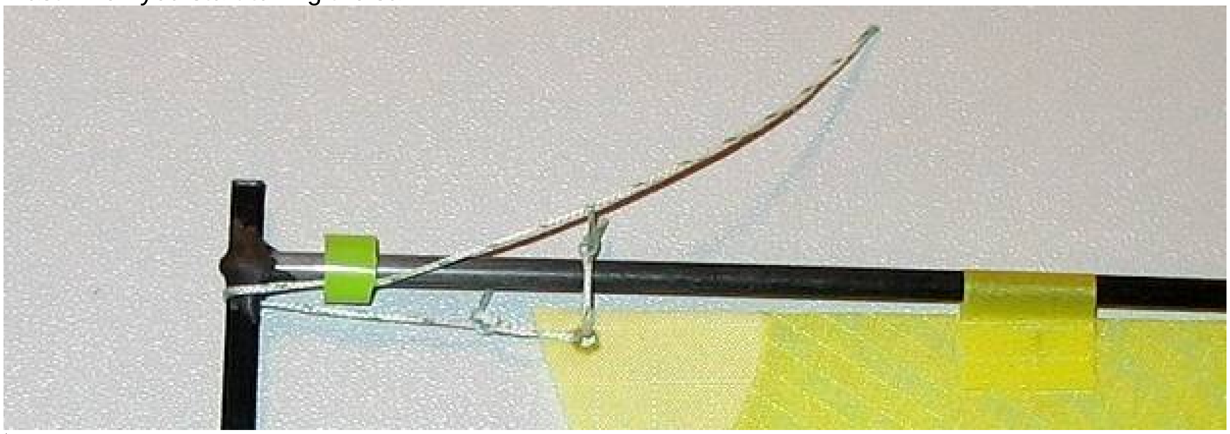


▷ Swing the loose thread loop down around the silicone tube at the front of the boom pivot so it is behind the tube.



▷ Next the rear of the sail is attached to the boom. Slide the first silicone ring onto the boom (this is the one that the thread is tied off to). Then slide the other ring on.

▷ These two rings and thread can be moved along the boom to set the position and height of the rear corner of the sail.
▷ Slide two silicone rings onto the rear of the boom. These are used to hold the position of the backstay.
▷ Hook the loop of the backstay onto the boom between the last two silicone rings. See "backstay" section above for images.
▷ Tighten the backstay until the mast takes on the same curve as the front edge of the sail. When this is right, the sail will sit flat on the bench without any major wrinkles. This will be your basic setting for the mast when you start tuning the sail.



▷ At the top of the sail the loose thread goes over the mast crane and under the silicone ring at the top of the mast. Use a large needle to thread it under or lift the tube with thin wire and slide the thread under it. This adjustment will lift and tighten the front edge of the sail and keep it straight.
▷ The whole rig assembly simply drops into the mast tube in the BANSHEE hull. The boom control line from the sail servo has a figure 8 hook attached to the end. Slightly open the end of the figure 8 to create a hook. This is hooked into the split pin under the boom for easy removal.
▷ A thin 1/16" (1.5mm) ring of silicone tubing can be used as a lock in the middle of the figure 8 when the hook is in place.

<u>Mast Tube</u>

If you are installing the OPUS rig onto a MMD BANSHEE, the mast tube will already have been installed when building the hull. So please skip this section. For installing the OPUS rig to another boat please use these instructions as a guide only.

The mast tube should be positioned about 3-1/8" back from the bow of a 12" hull. You may need to experiment a little due to differing hull shapes.
▷ The mast tube is a length of 4mm OD carbon tubing.
▷ Your tube should reach from the hull bottom (sitting on at least a 1/16" [1.5mm] plywood pad) and protrude 1/2" (12mm) above the deck of the boat.
▷ The tube is epoxied to the pad with a support of 1/8" (3mm) ply around the base of the tube so that water cannot get into the hull through the tube. The boom pivot rod end rotates on the plywood pad. If you have a shallow hull you may want to cut the length of the wire boom pivot rod to lower the whole rig closer to the deck. Be careful of how this will all fit in the measuring box if you are building a race legal Footy.
▷ Be sure that the mast tube is set vertical in the hull when measured from either side as seen from the front. The side view angle will depend on your hull design. Either set the angle the same as that of the original mast or mast tube shown on the hull design. Or, consider setting the mast tube perpendicular to what I call the "working waterline" (that is the waterline which the hull floats on when it is moving along at a good speed but not nose diving). A fair guess for this would be about 1" (25mm) above the static waterline at the bow and maybe 1/4-1/2" (6-12mm) below the static waterline at the stern.
▷ The whole rig assembly simply drops into the mast tube in the hull. The boom control line from the sail servo should be hooked into the split pin under the boom for easy removal.

<u>Sail Tuning</u>

▷ Please refer to "Tuning Your OPUS Rig" at www.scalesailing.com

<u>GO SAILING!</u>

Materials required

Sail material			
3mm O/D carbon mast	1	22-3/8”	568mm
4mm O/D carbon boom	1	12”	305mm
sailcloth loop strip	1	12”	305mm
3/32” music wire for mast pivot	1	12”	305mm (K&S Metals)
5/32” (4mm) aluminum tube	1	2”	50mm (K&S Metals)
1/8” (4mm) aluminum tube	1	7/8”	22mm (K&S Metals)
3x1mm carbon strip mast crane	1	2-1/2”	63mm
1/16” brass split pin	2		
1/16” (1.5mm) plywood for bowsie	1		
silicone tubing	1	3”	75mm
rigging thread			
double sided kite tape			
sail repair tape			