

b.

MBR Club - "BASIC" Dinghy

Construction Section - Swing Rig

(Updated on 5 Feb 2003)



TRANSLATOR'S NOTE

This document has been translated from German. It relates specifically to the German BASIC Jolle Class but is generally applicable to small to medium swing rigs. It originally appeared on the website of the prominent German model yacht club Modellbau Rodenkirchen e.V.. The accompanying copyright notice reads as follows.

The BASIC was developed by Modellbau Rodenkirchen e.V. (MBR – Rodenkirchen Modellers) as an inexpensive way into RC sailing. It is recommended by the Deutschen Seglerverband (DSV – German Sailing Association) as an official beginner's boat.

We would expressly like to encourage clubs, youth groups, school classes and individuals to build more examples of the boat. These pages contain all the information you need to build the boat. Non-commercial building and passing on the information and plans is free, subject to acknowledgement of the source. The BASIC is already being sailed with a great deal of pleasure throughout the world. The DSV and MBR wish all (future) BASIC sailors lots of fun!

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1. List of materials

Low viscosity cyano adhesive

Some sewing thread

Paperclips (the plastic covered ones)

Small bowsies from the model shop (see photos)

Approx. 100 mm steel wire \varnothing approx 0.6 mm

4 grommets, inside diameter 4 mm (electronics or radio shop)

2 grommets, inside diameter 3 mm (electronics or radio shop) or elastic bands from fitting servos

2. Parts to be bought from the kite or model shop

1.5 m x 6 mm carbon fibre tube

0.5 m x 4 mm carbon fibre tube

1 T-connector for 6 mm tubes (see photos)

1 Tube connector 6 mm ID, straight (or 30 mm alloy tube)

1.2 m spinnaker cloth

2 m self-adhesive spinnaker cloth 50 mm wide or 1 piece self-adhesive sailcloth, size approx. DIN A4

Thin Spectra, Dyneema, kite string diameter approx. 0.8 mm

3. List of parts for the rig

No. Description

1. Mast 6 mm carbon fibre tube approx. 1150 mm long (sawn from 1500 mm)
2. Main boom 6 mm carbon fibre tube 207 mm long (sawn from 1500 mm)
3. Fore-yard 6 mm carbon fibre tube 125 mm long (sawn from 1500 mm)
4. Jib boom 4 mm carbon fibre tube 160 mm long (sawn from 500 mm)
5. Backstay crane 4 mm carbon fibre tube 65 mm long (sawn from 500 mm)
6. Filler piece 4 mm carbon fibre tube 15 mm long (sawn from 500 mm)
7. 1 Main boom extension and
1 mast step 4 mm carbon fibre tube 30 mm long (sawn from 500 mm)
8. Alloy or brass tube connector, approx. 30 mm long, ID 6 mm
9. T-piece, plastic, ID 6 mm
10. Eyes from Paperclips made in accordance with photo
11. 3 clevis pins made from paperclips made shown in photo
12. 2 press-in eyes made from paperclips as shown in photo
13. Mast bearings, plastic ID 6 mm, OD 7.6 mm, 5 mm long



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Important note: When working with tools or adhesives, please observe the manufacturer's safety instructions. This applies in particular to the use of cyano glues.

4. Description of construction

Before you begin building the rig, please look at the photos of the steps in its construction. This will make many points clearer that are otherwise described in highly technical terms. When choosing materials for the rig for the BASIC you do not always have to be falling back on bought-in parts. To make the sail you can use gift-wrapping foil, florists foil or a very thick blue rubbish bag instead of sailcloth. What all these "alien" materials have in common is that they are good value for money and easy to work with. The performance of such sails is at least as good as when using "proper" sailcloths. In the building instructions only the use of spinnaker cloth is described because particular care must be taken over various points when using it. You can easily make the T-connector for the mast and booms for yourself out of plywood. Glue two triangles of 1 mm thick plywood together at the point of connection and fill the gap with scraps of wood or plastic. A piece of rubber or plastic sleeving can be used instead of the grommets.

5. Preparing the sail pattern

First draw out a pattern for the sail, i.e. the sail at full size in accordance with the measurement sheet on e.g. a piece of wrapping paper.

5.1. Mainsail

1. The starting point is a straight construction line as long as the sail.
2. Draw the luff round. Mark the distances to the baseline at the appropriate points and join these up
3. Draw out the head and foot of the sail.
4. Setting out the leech. The reference for the chord of the sail is now always the luff as have just drawn it. All transverse measurements of the sail are taken across the entire sail: the baseline is needed only to construct the luff round.

5.2. Jib

Draw out the jib as described above.

5.3. Making the sails (applies to main and jib)

Lay the sailcloth on the template and draw through it. When doing this the direction of the threads should run parallel to the leech (this way the sail will not crease later). Cut the sail out. If you use a soldering iron for the purpose, the edges will be welded together at the same time. If the sail material is opaque (e.g. as with coloured films), the template is laid on top. All the construction points are transferred with a sewing needle.

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5. Apply self-adhesive spinnaker cloth across a width of 6 mm on either side of the luff. Make sure that there are no creases (NB: it is very difficult to glue a 12 mm wide strip round the luff without creases). As an alternative, you can cut the luff reinforcement out of sailcloth and attach it with double-sided tape.
6. Apply reinforcement to the head of the sail using adhesive cloth or sail cloth 20 mm wide on either side.
7. Double-reinforce the mainsail clew on both sides. First glue on pieces approx. 30*30 mm each, and then pieces 50*50 mm each.
8. If you have used rather thicker sailcloth for the reinforcement, you can skip this item. This step is necessary only if head of the sail of still very flexible. Glue a steel wire onto the head to reinforce it. To do this glue a piece of adhesive cloth to one half, projecting upwards by approx. 100*50 mm, lay the steel wire on the top of the head of the sail and then wrap the cloth round onto the other side.
9. Eyes are not needed for our sails – they simply look rather more professional. Later holes will be pierced in the appropriate places using a darning needle. Pros now secure the luff reinforcement on the sewing machine with stitching in the middle of the reinforcement from the head of the sail to the tack (you can do this, but you don't have to).

6. The rig

6.1. Preparations

Tip: When cutting the carbon fibre parts into lengths, first carefully saw a groove approx 0.5 mm deep round the entire circumference. Only then part the component off. This prevents the tube splitting. Alternatively, you can wrap a layer of adhesive tape round the point of division beforehand.

1. Saw parts 1, 2 and 3 from the 1.5 m long carbon fibre tube. Polish the ends until they are free of scratches.
2. Saw parts 4, 5, 6 and 7 from the 4 mm carbon fibre tube. Polish the ends until they are free of scratches.
3. Make eyes. Remove the insulation at the ends by the loop.
4. Make the clevis pins (simply fold a piece of paperclip together).
5. Make press-in eyes.

6.2. Make main boom

6. Attach an eye (10) for attaching the sail to the main boom (part 2) 195 mm from the end using a drop of cyano. Then parcel the ends of the eye and the boom with sewing twine and seal with cyano.

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7. Glue the main boom extension (7) into the end of the main boom by the eye, so as to give a total length of 227 mm. Fit a press-in eye (part 12) in such a way that it is lined up with the eye (10). Then glue in place.
8. Push 2 grommets onto the long end of the main boom (i.e. the mast end).
9. Fix an eye for the sheet lead to the underside of the boom between the two grommets. A piece of 2-3 mm ID tube 5 mm long is suitable for the purpose. The far end should be 93 mm from the aft side of the mast. Wrap with sewing twine and seal.
10. Make the sheet attachment. Bend both ends of a 15 mm long wire to approx.30 degrees. This will result in a very wide "V". Wire diameter approx.1 mm. Attach this part to the upper side of the boom between the grommet on the mast side and the sheet lead 15 mm away from the tube. Bind and seal the horizontal section.

6.3. Fore-yard

11. Glue the filler piece (7) into the fore-yard (part 3) flush with one end. A clevis pin (11) is pushed into the filler piece far enough for a piece of string to be attached to the small eye that results. Then glue in place.
12. Push a grommet onto the fore-yard.

6.4. Jib boom

13. Push a small grommet onto the jib boom. Glue a press-in eye (part 12) into the jib boom (part 4) at this end. Glue a clevis pin into the other end. Secure both ends of the tube with sewing twine. Attach the fore-yard 45 mm from the other end. The press-in eye (part 12) faces upwards and the mounting faces downwards.

6.5. Backstay crane

14. Glue a clevis pin (part 11) into the backstay crane (part 5) as described above and secure this end only, using sewing twine. Glue a piece of round rod approx 15 mm long (e.g. toothpick, skewer or anything else available) into the other end as protection against kinking.
15. Cross-drill the tube connector with a 4 mm bit.
16. Glue the backstay crane (part 5) into the cross drilling in the tube connector.

6.6. Mast

17. Attach an eye (10) to the mast 230 mm from the top with a small drop of cyano. Then parcel the ends of the eye and the Mast with sewing twine and seal with cyano adhesive.

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18. Drill through the T-piece (9) with a 6 mm twist drill and align with the mast. If the drill hole has too much play, a strip of paper can be inserted before slipping on to the mast. Distance from the top to the centre of the cross-drilling: 1040 mm. Fix with cyano.
19. Slide the assembled back stay crane on to the mast and align.

6.7. Last jobs

The photos act as a model for the following construction steps.

20. Connect the press-in eyes of the backstay crane and main boom with the backstay. Tie securely directly onto the backstay crane and onto the boom with sheet line¹ and a bowsie. Now pre-tension the mast so that it approximately follows the shape of the mainsail luff.
21. Tie a loop tightly diagonally round the T-piece (9). The tack of the sail is attached to this.
22. Tie a loop round the mast above the T-piece (9). Diameter slightly greater than the mast. Later the jib sheet will run through this loop.
23. Attach the mainsail to the mast. There must be a gap of approx. 1 cm left between luff and mast. It is a good idea to make the attachment to the Mainsail clew with a two-part purchase. In this way the sail can be trimmed considerably better.
24. Tie the jib boom to the fore-yard with a gap of approx. 20 mm. Do not use special metal swivels from an angling or model shop. With a rig the size of the BASIC these are unsuitable, especially in light winds, because of their frictional resistance.
25. Tie the jib and forestay securely to the forward clevis pin. Attach the clew to the grommet with a wire clip. Attach the head of the sail and forestay to the eye on the mast with sheet line and bowsies. Make and fit the topping lift (this is the connection between the point at which the sail is attached to the mast and the end of the jib boom).
26. Fit the jib sheet – from the eye on the jib boom, through the loop on the mast to the grommet on the fore-yard. The sail can now be adjusted (trimmed).
27. Push the upper mast bearing onto the mast from below. Glue a piece of 2 mm diameter round bar into the heel of the mast (7) with epoxy resin so that it projects approx. 10 mm (a nail cut off and nicely rounded at the end will do). Cut the mast to length so that, with the mast heel used, the main boom can swing approx. 4 mm above the sheet lead with the rig in the boat. When the right measurement has been arrived at, glue the mast heel in place. Line the mast bearings up flush with the upper edges of the mast tube in the boat and glue in place. If you have a suitable piece of plastic available for the upper mast bearing, you can make do as follows: determine the correct position for the bearings. Wind a strip of paper 5 mm wide round the mast at this point. A 0.5mm split

¹ Schotschnur -

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- should be visible in the mast tube in the hull. Seal the paper strip with cyano; the whole assembly gives a durable joint. Second method: pull a heat shrinkable sleeve over the paper strip. When doing so, cover the mast and regulate the heat carefully: excess heating can make the mast brittle.
28. Prepare the main sheet. Make a loop in one end of the sheet. This should be tight enough to that it can still be slipped over the sheet fitting on the main boom. The remainder of the lead of the sheet can be gleamed from the construction photographs.

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7. Illustration of construction steps

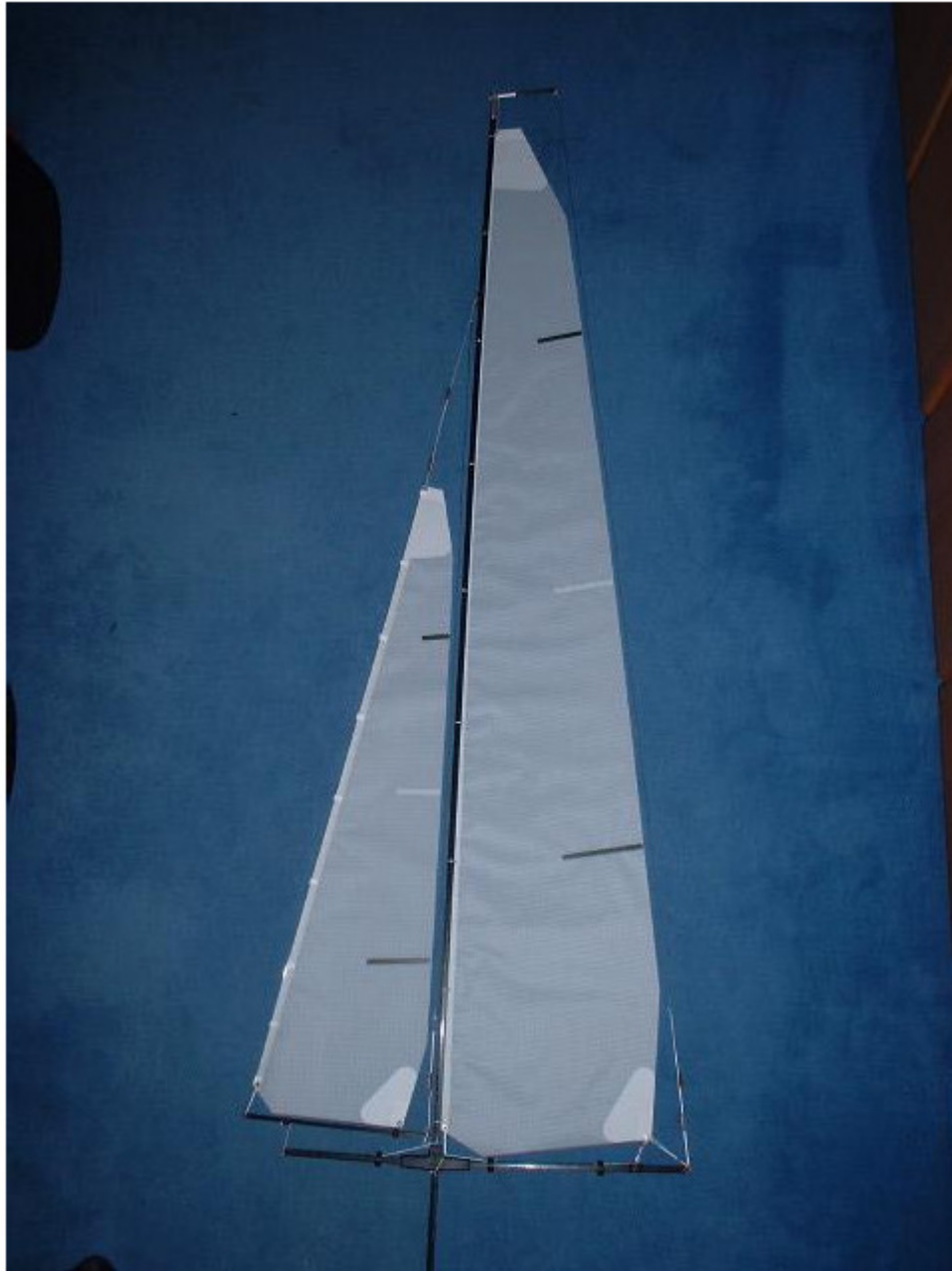


Figure 1: The complete rig. Just stick it in the mast socket.

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Figure 2: The mast bearings.

The upper bearing, a plastic ring, should turn easily in the mast tube. The lower bearing journal has play as against its counterpart in the mast tube.

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Figure 3: The upper attachment of the jib

The forestay is attached to the mast with a piece of line and tensioned with the upper bowsie. The sail is made fast to the eye on the forestay and can be adjusted with the

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lower bowsie. In this way the forestay and luff tensions can be adjusted independently of one another.

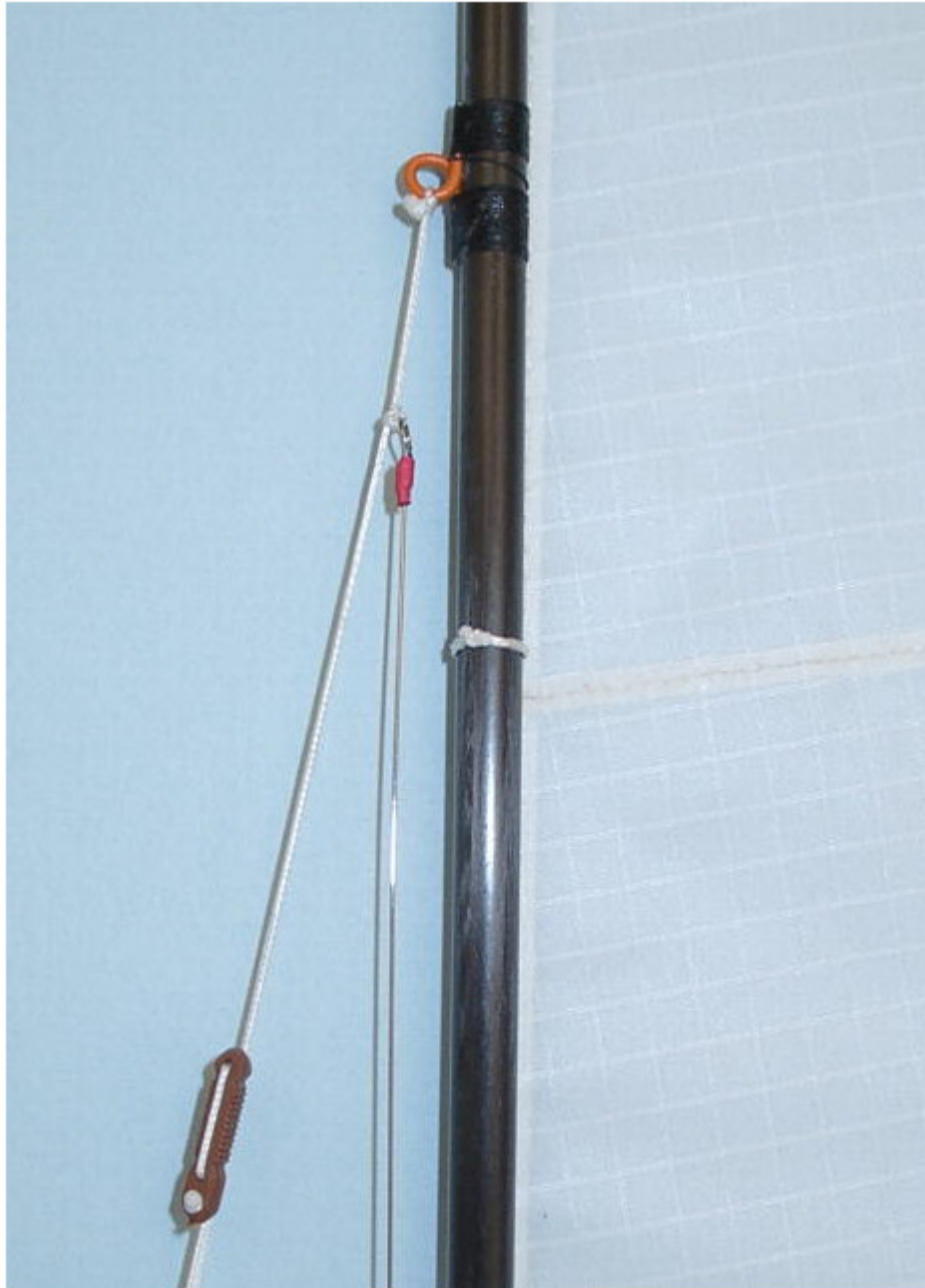


Figure 4: Upper attachment to the mast

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Attach the line for fixing the forestay to the mast and tie the topping lift (the line for adjusting the leech) on approx. 15 – 20 mm below the eye. In this way the topping lift is far enough way from the mast and the jib will pivot easily



Figure 5: The head of the mainsail with the back stay crane

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When attaching the sail, make sure that it can blow out equally on either side.

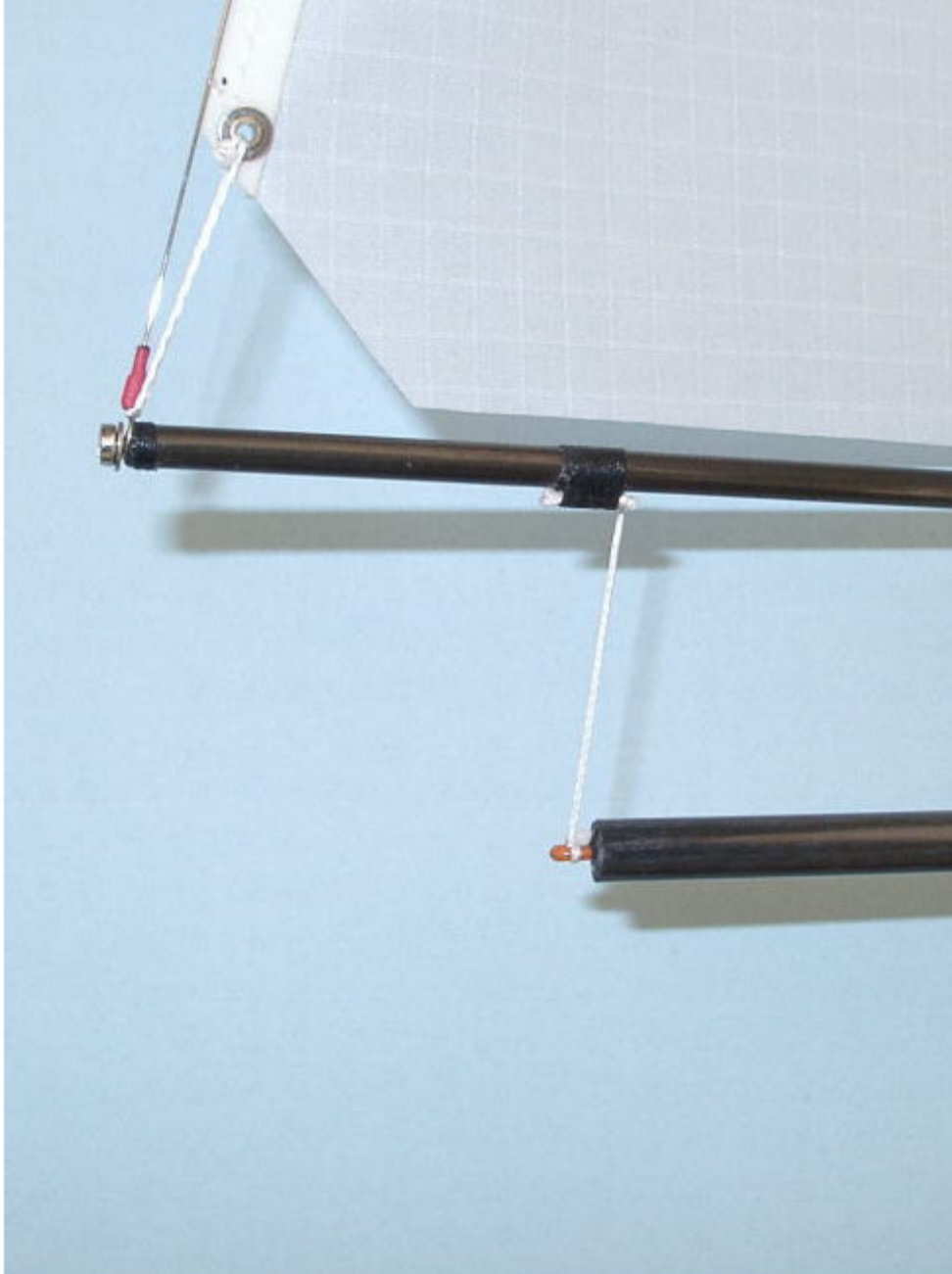


Figure 6: The jib boom

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Here is an alternative to the paper clip clevis pin showing the forestay attached with an M2 screw. Firmly wrap paper approximately twice round the screw and align with the jib boom. Undo the screw and soak the paper that remains in the boom in a little cyano. All this results in a screw thread. Attach the sail with a piece of thin line – double-twist yarn will do. The profile of the sail must not be disturbed.

Upper attachment of the jib boom: Another alternative to an eye. Attach a thin tube below the boom. Tie a line to the fore-yard and push it through the tube from aft. Make a bulky knot in it and push the end of the line back through the tube to restrict its cross section. The line can now be twisted so that the jib boom goes out equally on either side.



Figure 7: The lower attachments of the sails

The clew of the jib is held with just a thin wire. This is simply pushed under the grommet.

Connecting the topping lift to the jib boom is done using a double purchase so that the leech can be adjusted precisely.

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Tie the jib sheet loosely to the jib boom, pass it through the loop on the mast and then pull it through under the grommet. Put a knot in it. The whole thing must run freely.

For the main luff downhaul, tie a line to the diagonal loop, pass it through the tack, through the loop and push it through under the grommet. Put a knot in it. For very fine adjustment, you can make the loop-sail connection 4:1.

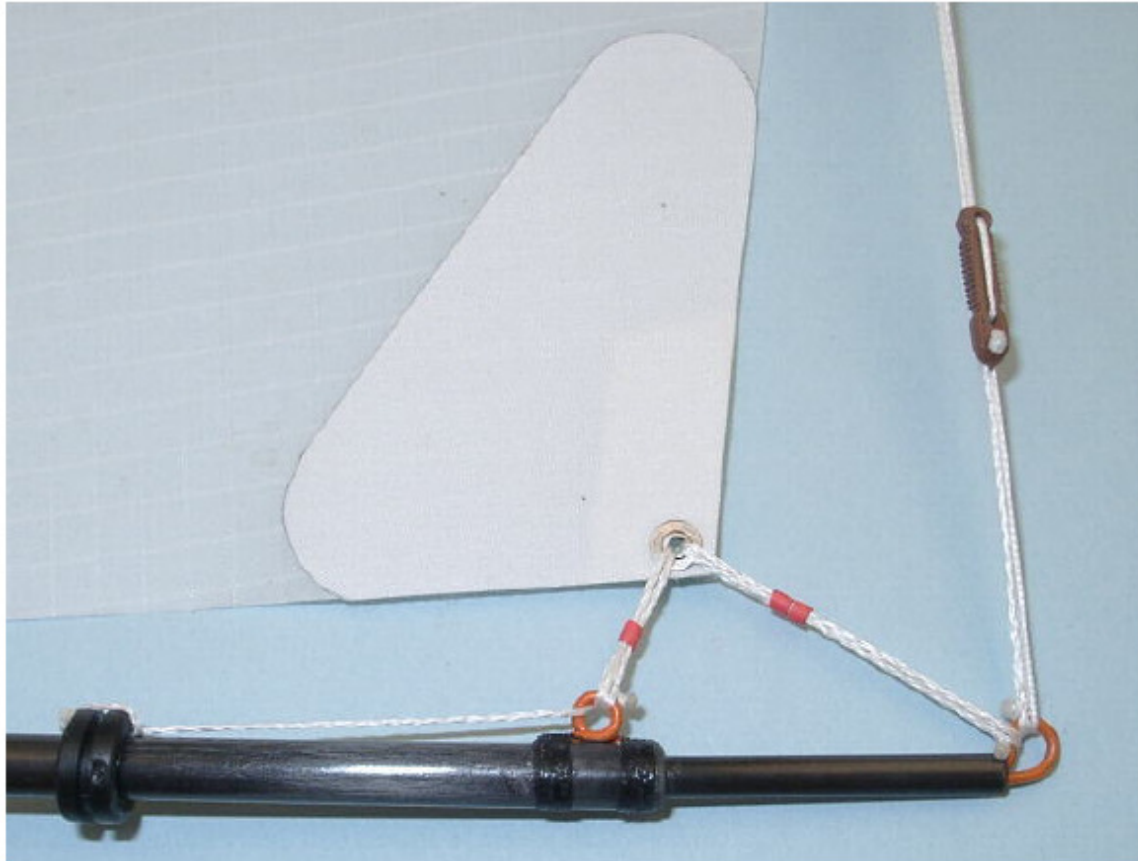


Figure 8: The Mainsail clew and the backstay. This looks more complicated than it is

Attaching the backstay: tie a line securely to the aft eye on the main boom and push a bowsie onto it. The lower hole remains unoccupied: the line for the main outhaul will be attached to it later. Continue through the eye on the backstay and back through the eye on the main boom, and push a bowsie onto it (the upper hole remains unoccupied), through the eye on the backstay and tie onto the bowsie.

The outhaul (this is the right hand connection between boom and sail): attach a line to the eye at the end of the boom, pass it through the sail, back through the eye (the line is now quadrupled) make it fast to the free bowsie.

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The leech line: tie a line to the forward eye, pass it through the sail, back through the eye, push it through under the grommet and finally secure with a knot.

Too expensive? Your boat's engine is the sail. The more precisely you can adjust it, the better its sailing performance will be.

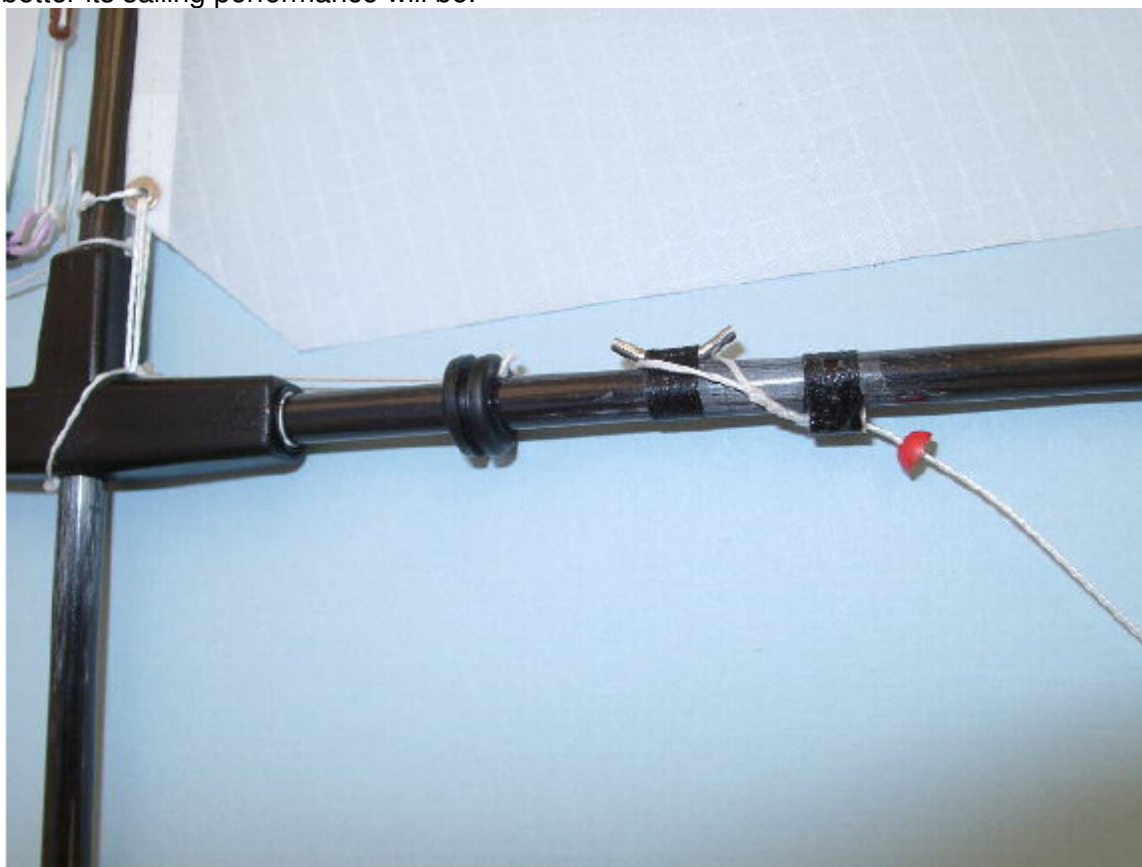


Figure 9: The sheet attachment on the boom

Making it is described in the building instructions. If you use multiple rigs, make sure you have the same distance to the sheet lead in the deck. That way you only have to adjust the sheet once. The split plastic ball prevents the sheet slipping down into the hull during transport. Other things to observe: the boom has not been glued in, but wrapped with a layer of paper and thus wedged in place.

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Figure 10: The rig on the BASIC

We will recognise the sheet, the only connection between hull and rig. On a second glance you will see that the sales are trimmed to a profile that has put a curve in the foot. The slot should be set to 25 - 30 mm for initial trials.

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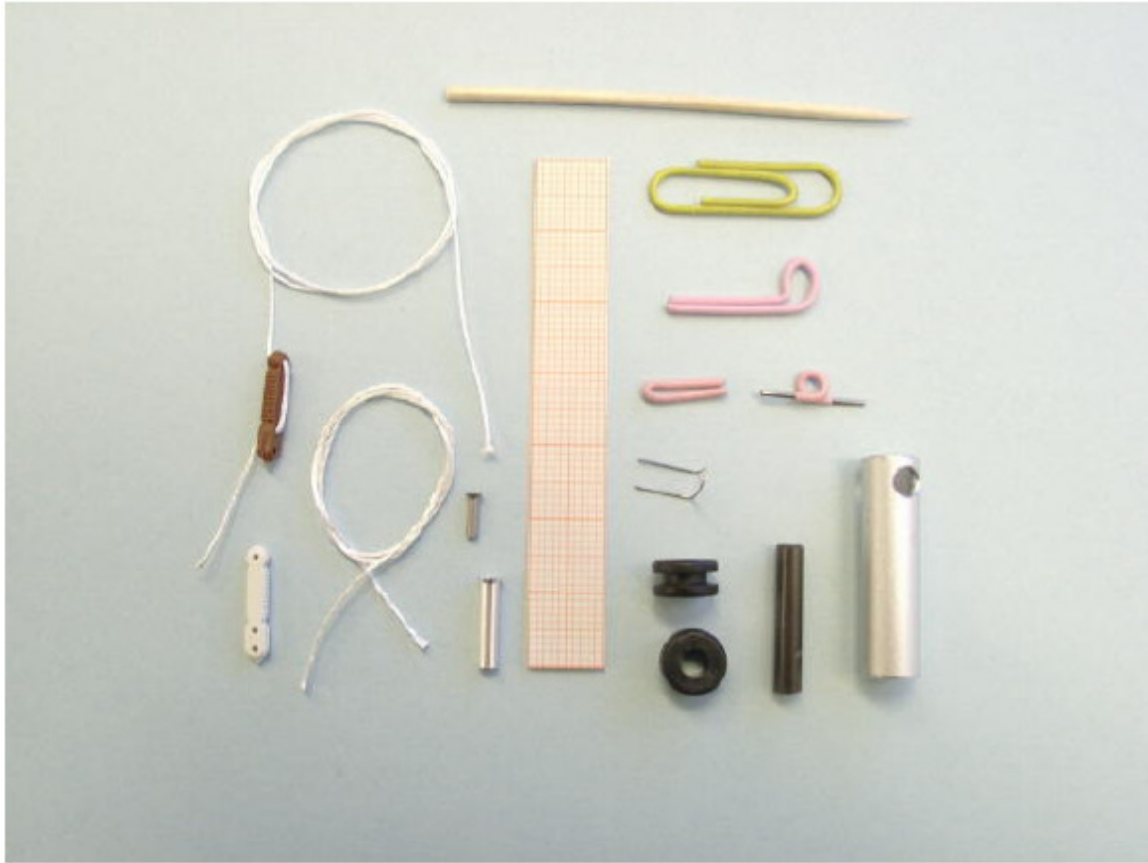


Figure 11: The small parts for the rig

Small bowsies from Graupner (there is no other known source), with some sheet line. The line below it is half the diameter. The tubes are end sleeves from the electrician, cross section 0.75 mm² for upper attachment of the jib and 2.5 mm² for attaching the sheet to the main boom. Alternatively scrap pieces of small-bore alloy or brass tubes from modelling or empty biro refills. In time you will get an eye for the 'proper' use of objects. A piece of toothpick – or even a match – is glued into the backstay crane as protection against kinking. A paper clip, basic material for all attachments to carbon fibre parts. Below it a press-in eye for the aft ends of the booms. On the left a clevis pin for the backstay crane and fore-yard, on the right an eye for fixing the head of the jib to the mast and attaching the mainsail. The small piece of bent wire holds the clew of the jib. The grommets have an inside diameter of max. 4 mm. Alternatives include a piece of plastic or rubber hose, a sealing ring,... The black tube is the filler piece described in the building instructions, the alloy tube holds the backstay crane.

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Figure 12: Adjusting the length of the sheet

The sail control servo horn has one arm free. This is used as a bowsie for adjusting the sheet. The sheet is threaded in a ring through 2 holes and has its end pushed through under its loaded part. Do not tie. The whole thing is self-locking and easily adjustable. If you are using a tube as a servo arm, the sheet is led through the tube – otherwise fit eyes as shown in the photo.

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