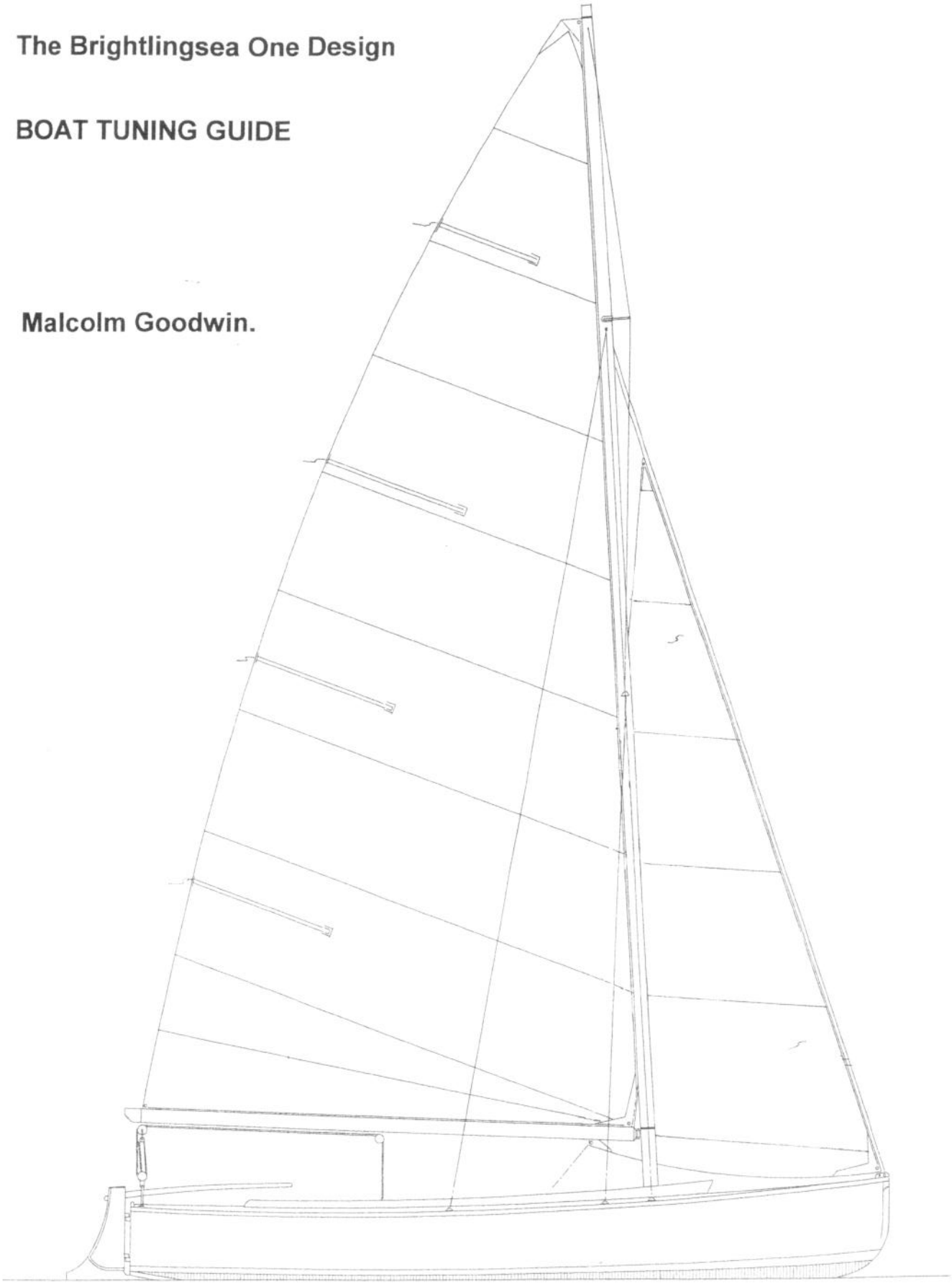
# The Brightlingsea One Design

# BOAT TUNING GUIDE

Malcolm Goodwin.



## The Brightlingsea One Design

# BOAT TUNING GUIDE by Malcolm Goodwin.

**Published by Mike Hempstead for the BOD Association**

January 2008


Contents

**FOREWORD**
priorities

**HULL**
rocker, smoothness, ballast distribution, toestraps.

**CENTREPLATE**
smoothness, leading edge, shape, hoisting winch.

**RUDDER**
rake of blade, lack of backlash on steering, leading edge rounded, length of tiller and extension.

**MAST**
rigging, stiffness, rake, pre-bend, cunningham, backstays, spreader lengths, pre-bend advantages, diamonds.

**BOOM**
stiffness, kicking strap, outhaul, reefing.

**AERODYNAMICS**
Kutta condition, stagnation streamline, telltales.

**MAINSAIL**
seam shape, battens, cunningham, halliard stability, tack tie, outhaul.

**JIB**
luff tension, halyard stability, sheeting angle, sheeting rake.

**SPINNAKER**
pole height, sheetbase, fittings for gybing etc.

**CONCLUSION**
good sailing!

## FOREWORD

This guide is longer than first intended but half a story is no good !
Even then, it is only a start and all on-going contributions to develop it are very welcome.

Really the whole thing about boat tuning comes down to minimising drag, of which there is potentially a great deal and maximising propulsion, of which there is never any to spare. These two factors are critically close when sailing to windward, which tends to emerge as a priority in most tuning manuals, including this one

It is probably fair to say that it is easier to win a race when leading at the windward mark, in a boat that is then going to be slightly slower, than to get to the windward mark first in a boat that is slower upwind.

The quality and design of sails is obviously a big item and an expensive one. Some sails will never be any good but it is worth considering first whether existing sails can be made to perform better when the boat is set up correctly.

**More detail follows, but if time is short, consider these priorities.**

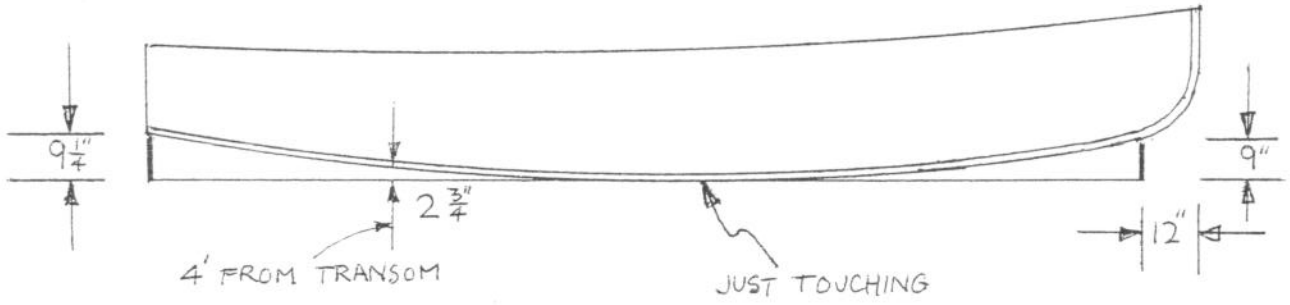
1 Check the hull rocker (all rebuilt boats are OK)
2 Rake the rudder blade forward.
3 Round the leading edge of the centre plate and the rudder blade.
4 Check that the jib fairleads are far enough inboard.
5 De-clutter the mainsheet blocks at the horse so that the top of the boom can come down within 12 inches of the deck.
6 Cut the main spreaders to 22½.inches and upsweep them 6 degrees, which is 2 ¼ inches at the outboard end.
7 Check that the backstays are short enough to set the mast rake (wire part no longer than 20' 11" (6379mm) will give a 5" adjuster at the deck).
8 Provide some means of adjusting and solidly Chocking the mast at the deck (crude is better than none).
9. Fit a 12 to1 kicking strap that works.
10. Check that the boat is carrying only enough ballast for minimum weight.
11. Watch and copy the fast boats, how they trim and how they sail.

Don't dwell too much on any of this when you could be sailing !

## HULL

### Keel rocker

Some of the older unrestored boats can tend to go flat at the aft end of the keel causing the transom to drag in the water. The shape can be restored on a jig during a full rebuild or, where a basically sound boat has been badly stored, by using a jack onto a temporary cross beam lodged under the deck beam shelves. The shape is then fixed with an extended backbone or knee aft of the centre case. Do then store the boat with keel chocks only at the transom and within 2 foot of the bow. The keel rocker should just touch a tight string, representing the original base line as below.




Cut two short lengths of wood to the offset measurements and hold to the keel as above with a taut string line.

If the keel is more than ½ inch away from the string line at its deepest point, or more than 3¼ inches at 4 ft from the transom, then consider a remedy.

### Hull smooth and fair

Ideally the hull should be as fair as possible (free from lumps and hollows) and also smooth. Paint or anti-fouling, straight from a brush onto a rubbed down surface is OK. But a hard surface, enamel or hard copper powder based anti-fouling , rubbed down to 400 grit may be even better.

### Weight / ballast

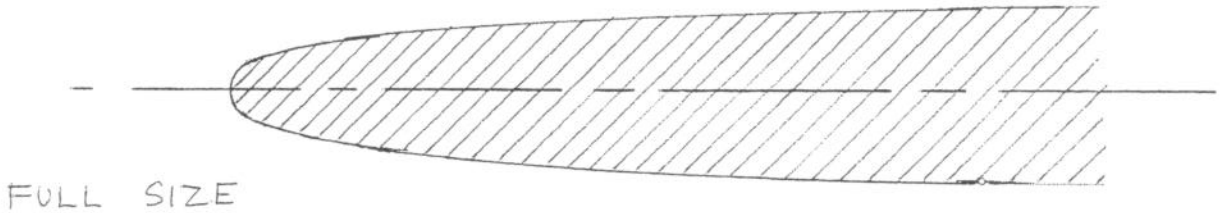
Keep as much weight out of the ends of the hull as you can, especially the bow, in order to reduce pitching moment. Viewed from the side while moving through the waves, one point near the waterline near amidships will in theory be motionless. This is the right place for all the ballast! But as you will see when your boat is balanced on a trolley, it is rather far aft. Currently most of the fast boats carry their ballast a shade further forward than this. They trim with the keel at the transom just touching the water when no one is aboard.

### Toe straps

Fit toe straps for the crew so that they can make their weight count properly.

## CENTRE PLATE

The centre plate is cast to an aerofoil section, although not a very refined one. Use epoxy or body filler to enhance and smooth the surface but don't increase the thickness at the thickest point especially if the plate is a close fit in the box. Most important is to form a rounded leading edge similar to the section below.



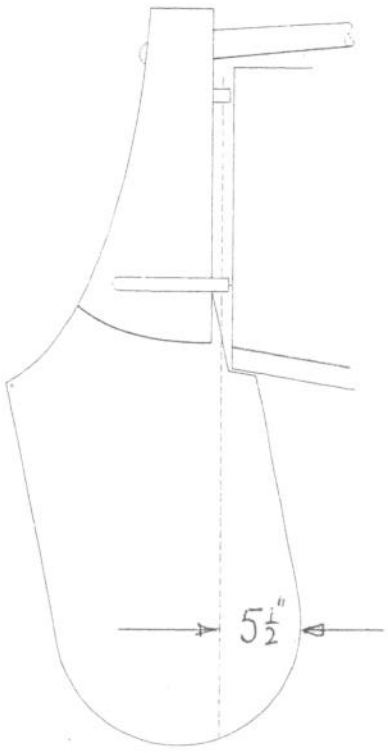

Produce a reasonably smooth surface finish, either straight from a brush over primer rubbed down to 240 grit, or enamelled and then rubbed down with say 400 grit.

Obviously the winch and hoisting arrangement for the centre plate do not directly affect the speed through the water but they are heavily loaded and will need to be strong, well lubricated and handy

## RUDDER

The rudder blade will also need a rounded leading edge and a sharp (ish) trailing edge and be similarly smooth. The rudder blade will need to swing down below vertical, as below. (make sure it clears the keel)

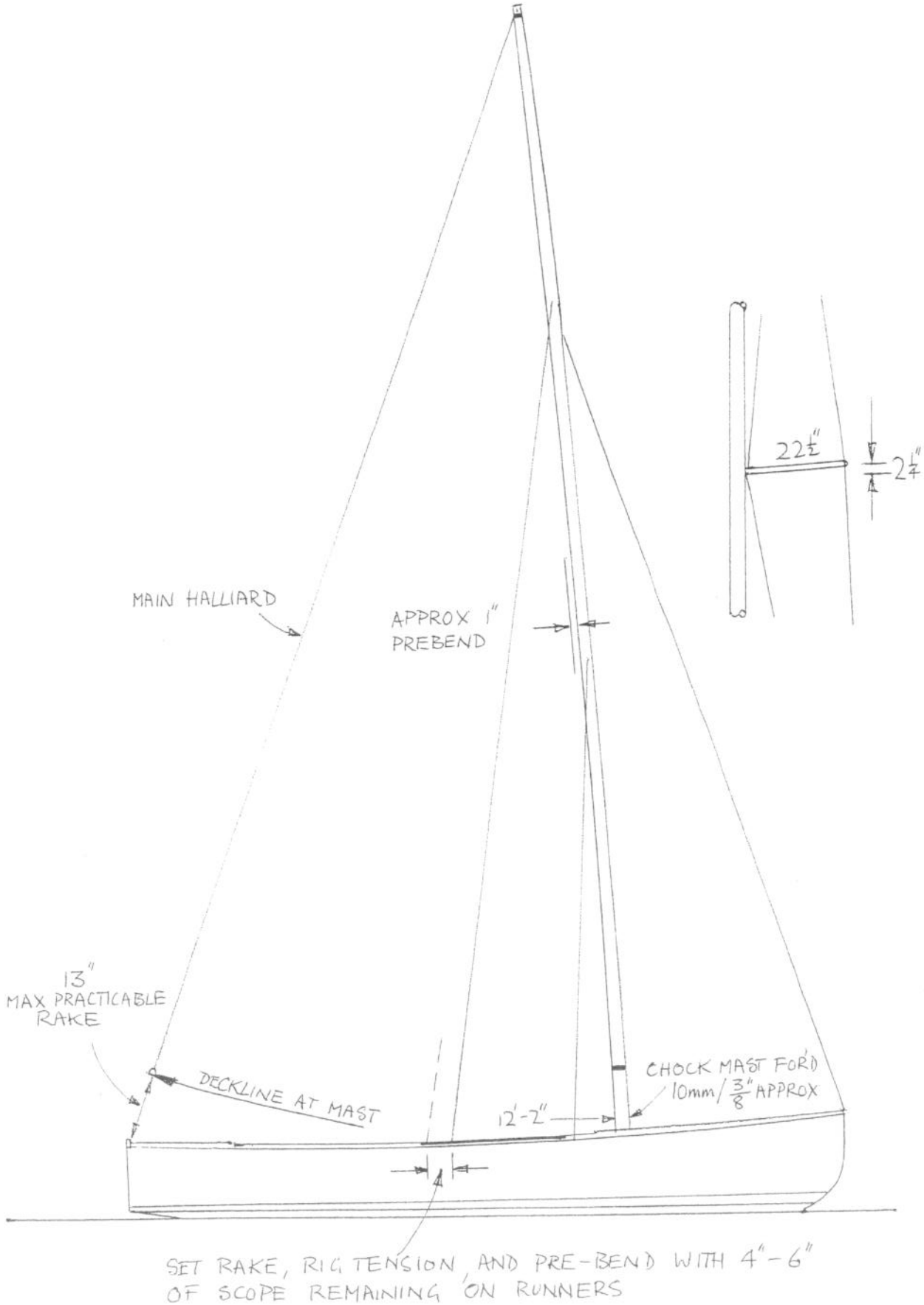
This angle is very important as it allows the mainsail to be full enough and to be sheeted enough to power the boat properly without transferring excess weather helm to the tiller. Of course all of the side load is still there but only the right feel is left in the tiller. The remainder is balanced in the pintles.




The best length for the tiller will probably be found at about 50 / 51" from the front of the stock and the tiller extension 32 / 36", all of which remains comfortable steering from a forward position.

Try and eliminate play from the pintles, the tiller socket and the rudder blade in the slot.

**MAST**
**Diagram showing rake, prebend and spreaders.**



## MAST

Rigging

The mast will need to be equipped with 4mm standing rigging except for the top diamonds which can be 2mm. The diamonds can be adjusted with polyester or nylon lanyards at the lower end whose stretch will offer some variation in topmast bend. Typically set them up just tight on a wooden mast and slack on an alloy one or only just tight on either.

Main and jib halyards will ideally need to be 3mm flexible wire or line which is entirely stretch free.

### Spreaders

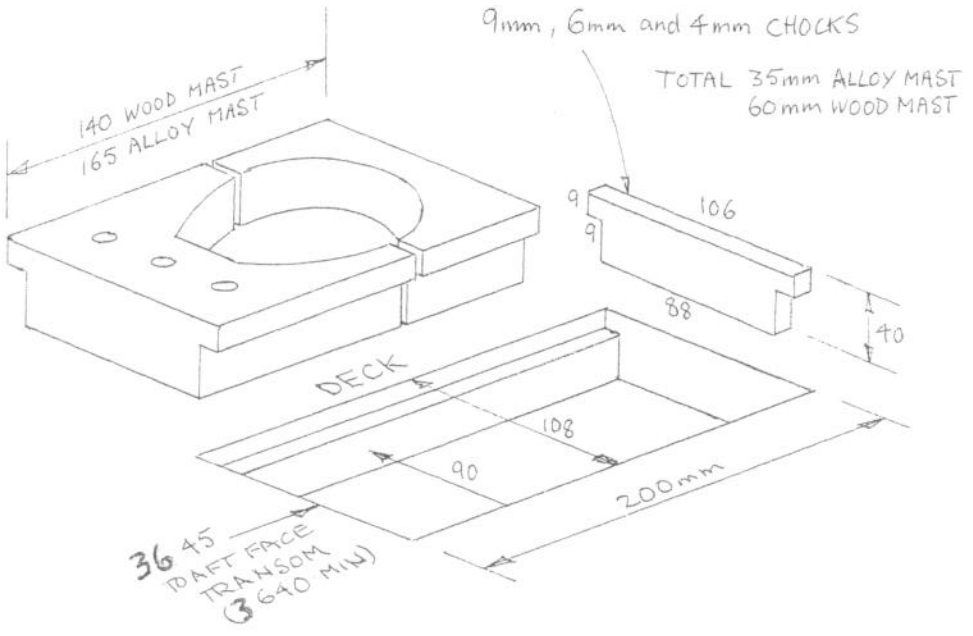
The main spreaders are 22½ inches long and 6 degrees or 2¼ inches upswept at the outer ends so that the angles with the shrouds, both above and below the spreaders, are the same. That way the spreader is entirely in compression and will not be gradually forced down at the outer end, reducing efficiency with effect that the mast bends to leeward progressively more towards the top and the leeward shroud goes very slack. The result is that the top of the mast is well to leeward and even when the sail is fully sheeted, it remains twisted open and the boat will not point.

### Keel and deck

The mast heel tenon will need to fit the step in the forward extension of the centre case so that the mast cannot rotate and have wedges to prevent fore and aft movement.

At the deck a method of supporting the mast with no sideways or fore and aft movement but allowing fore and aft adjustment in small increments is ideal.

This can be achieved with a slot in the deck, a shaped out oblong chock made in two pieces assembled around the mast and T shaped plywood spacers of varying thicknesses which when swapped will give infinite adjustment but retain a tight fit.




ALTERNATIVELY, CUT A PLAIN 200 x 90mm SLOT WITHOUT REBATES, AND MAKE 50mm DEEP CHOCKS TO STAND PROUD OF THE DECK

## MAST

### Setting up the mast

Step the mast with forward face of the tenon usually around 15¼ in ahead of the vertical forward end of the centre case. But in any case so that the aft face of the mast at deck level settles at around 12ft 2in (cutaway wooden masts) or 12ft 1in (parallel alloy) from the aft face of the transom.
Set up all the standing rigging slack. Take the main halyard and cleat it so that the fall, when tight, just touches the top of the deck immediately behind the mast. Swing it aft so that its line would extend to the top of the transom and measure the distance to the top of the transom. This can be as low as 13 -14 inches. At this stage set up the forestay and backstays temporarily so that it is near enough and chock the mast at the deck.
Now set up the upper shrouds finally to 50 kg (if you have lanyards then just as tight as you can ever get them). Sight up the mast and eliminate any sideways bend by loosening and tightening opposite shrouds as necessary.
(13 / 14 inches will give a low-ish boom if you are using a mainsail with maximum leech length, but has a proven performance to windward. Maybe though the beginnings of a detectable loss when running in light conditions unless the mast is allowed to flop forward by easing the back stays, and if necessary also pulled forward by hauling on the jib halliard.)

Now return to the rake and finally set up the forestay and running backstays. If you use lanyards set them up as tight as you can with the rake at 13-14 inches, or as preferred, and in any case with 4-5 inches left to run on the backstays. If you have a tension gauge set 50 kg on the forestay.

### Pre-bend

Now rechock the mast at the deck pushing it forward 5-10 mm so that 1 inch of pre-bend appears at the mid height of the mainsail luff. You can't climb up and measure but you can hold the main halyard tight and take a good guess.
With an alloy mast, because it is stronger, you may need to ease the backstays, then place the chocks behind the mast, then pull the mast back again with the backstays to get the pre-bend.

Whenever you leave the boat, let the backstays run forward 9-12 inches on the tracks to reduce rig tension and pre-bend.

(There are several subtle advantages normally given for pre-bend which are worth describing. Firstly being further into bending the mast is assumed to be stiffer for any given section. But being bent the cunningham pulls across the arc at the head and will bend the topmast more readily.
Then the fact that as you ease the mainsail out, less of its luffcurve is absorbed by the pe-bend curve of the mast and so the sail automatically becomes fuller offwind.
Also, sailing upwind, looking at the rig from the angle at which the wind is approaching, the luff of the mainsail more closely matches the parabolic

leeward curve of the leech. This can be further accentuated if the top of the mast remains on the centre line and the middle can be made to curve sideways to leeward.
The effect is that the mainsail sets with less twist for any given mainsheet / leach tension. The sail does not get flattened before it's sheeted, especially at the top, and the options around pointing and/or footing are enhanced.
Then there is the point that a sail with a curved, and raked, leading edge is slightly more like the fabled semi elliptical "spitfire wing" aerofoil. And finally the more the mast is raked aft and the more it is bent aft the nearer its centre of gravity is to that of the rest of the boat and the less the boat will pitch in waves, which both mis-uses momentum and disturbs the flow across the sail.)

Retuning to the task in hand, now to set up the lower shrouds. With a wooden mast these are best left slack enough to describe a 9 inch circle at head height. A wooden mast is limber enough for the windward spreader compression to bend it to leeward slightly at the centre with the advantages described. Indeed, an alloy mast may do the same. The main thing to avoid is for the lowers, if set up tight, to effectively pull the middle of the mast to windward going upwind. The top goes to leeward the sail twists, the boat wont point. Probably because it compresses, it appears almost impossible to prevent a wooden mast bending to windward in the centre if the lowers are tight.

When your boat is nicely set up, you do not need to lose all your adjusted rigging lengths when you take the mast down. You can simply unshackle them all except the uppers, which will be too tight, and require slackening to release them.

**Mast tuning . other possibilities**.
A pre-sailing rigging load of the order of 50kg as outlined above is rather low, and is a legacy of the wooden mast which, because it compresses shows less benefit from very tight rigging. The required bend shape can be achieved while the leeward rigging has already gone slack even in rather light breezes. Further development with the rather strong alloy mast will need to follow practice used in competitive fleets of other similarly rigged boats and dinghies.
One way would be to step up the rig tension to 100kg plus so that the leeward rigging remains tighter longer. Then think in terms of setting the rake rather upright at the deck chocks, and pre-bend the mast back progressively further with first the lowers, then the backstays keeping it on the centre line all the way up, and achieving the same measured rake. Varying the length of the backstays (only between races) and varying the point to which they are pulled back during races, while adjusting the jib halyard would offer further rake and bend adjustment as the wind rises. This will be further enhanced by the Cunningham pulling across the arc of the bend. A firm mainsail luff rope will not only recover well when the Cunningham is eased but will impose even more compression, and potential mast bend, when the Cunningham is on.

## BOOM

Whether for a wooden or alloy mast a stiff and light alloy boom with a powerful kicker is essential for controlling the leech of the mainsail.

### Outhaul

On trapeze boats a tiny advantage can sometimes be gained by easing the outhaul a fraction in those marginal upwind conditions where a deeper sail will just get the crew out trapezing. A similar advantage, along with others, such as dead downwind in light conditions, may be reason enough to fit a sophisticated outhaul to a BOD. If so it will need to have a 4 to 1 advantage and be handy to adjust.

Alternatively, and if you are in any doubt on your ability to perceive such gains then be happy with any system where you can pull the outhaul bang tight and leave it. By using a tack tie around the mast only just above the gooseneck, the mainsail foot will automatically slacken as the boom is eased out because the elongated section of the mast folds towards the boom.

( Note: don't be surprised if your mainsail foot never reaches the boom black band because the measurement happens to be rather long in comparison with the mainsail width at ¼ height. Sailmakers are reluctant to make a sail with a hollow leach.)

### Mainsheet

Fit the normal mainsheet layout with either a 2 to1 or a 3 to 1 block system between the boom end and the horse neatly enough so that the top aft end of the boom could be hauled down to within 12 inches of the deck. A ratchet block in combination with the swivel jammer at the centrecase is handy, as is a light canvas fairlead on the underside of the boom above the helm's head.

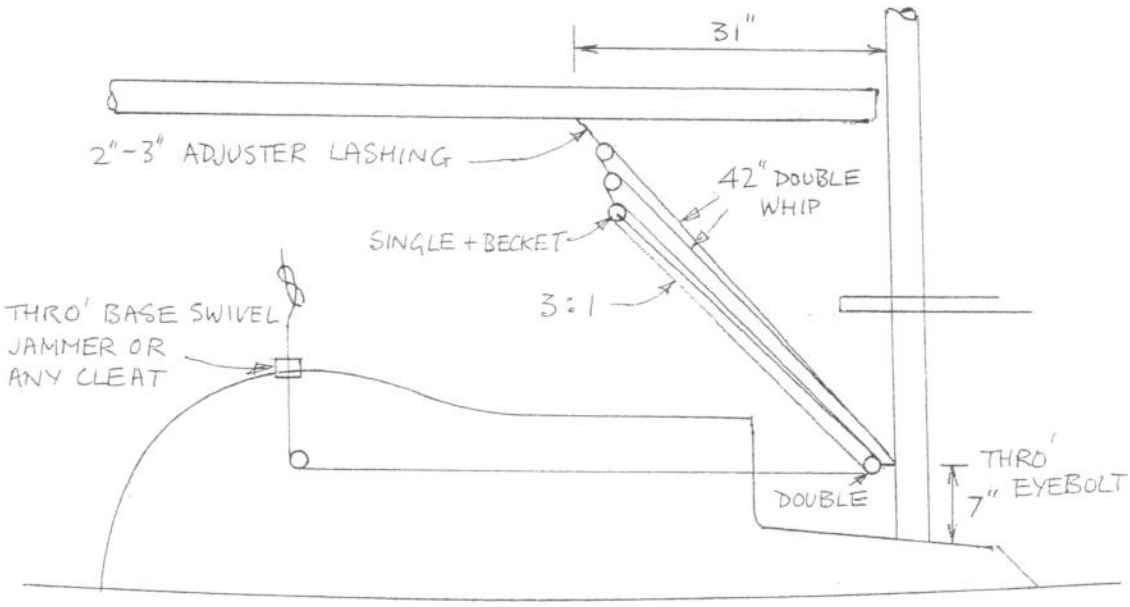
### Reefing gear

Having effective means of reefing is good seamanship.
In ultimate competition, boats of the BOD type would be tuned and sailed to accommodate any conditions and not reefed. Nevertheless for club sailing BODs and others of their type should have effective means of reefing both as a matter of seamanship and practicality. With a variety of skill levels and crews much sailing that would have to be missed is made possible by the ability to reef.
Organise the kit so that you can slacken the halyard, then secure the tack, then secure the clew, then reset the halyard and finally set the reef points.

**Kicking strap**

The kicking strap needs to be powerful enough and handy enough so that as the wind increases the boom can be eased away outboard of the horse but prevented from rising by the kicking strap, or hauled down. This function of the kicking strap, which by bending the mast, changes the shape of the mainsail to being flat and quiet and further out ( as apposed to sheeted in and deep and flogging ) cannot be emphasised enough.

To do this, a kicking strap of 12 to 1 at least, is needed of which this arrangement is just one example. Effectively a 3 to1 on to a double whip (cascade). The double whip is very efficient but to take full advantage of the available scope, needs to be made up accurately to 42" bearing to bearing when fully extended.




ALTERNATIVELY THE 3:1 PULL CAN BE ALL WITHIN THE SLOPING PART OF THE KICKER IF A PULLEY WITH A VEE CLEAT IS USED.

THE PURCHASE CAN BE INCREASED TO 16:1 WITH A 4:1 PULL

## AERODYNAMICS

The available propulsion forces from sails, especially upwind, are obviously key to good boat speed. Some background theory may set the scene for the practical hints that follow.

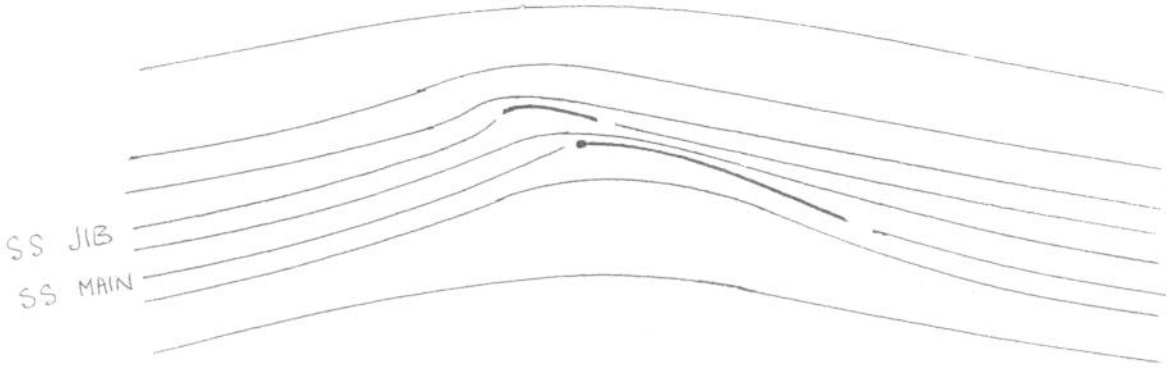
Aeroplanes fly and boats sail by generating lower pressure on the upper (leeward) side of an aerofoil than on the lower (windward) surface. Aerodynamics theory surrounding this quest is rather complicated but two features are particularly important in upwind sailing and observing their effects has become universally useful.
One is the Kutta condition, which is named after the man who established it's relevance and the other is the stagnation streamline, which is not!

While still well upstream of the boat, the wind streamlines begin to organise themselves to flow around the sails (or any object). The flow settles with one minutely narrow streamline whose approach is somewhere near the centre of the obstacle, theoretically unable to pass either to windward or to leeward. It becomes stagnated on the luff of the jib or the centre of the mast and effectively marks the dividing plane between those streamlines passing to windward of the sail(s) and those passing to leeward.

Two sails will generate two stagnation streamlines but the one that us sailors are obsessed with is the one dividing at the jib luff and activating the jib telltales. Get them streaming just right and you are on the money.

But there is more,-- squeeze the mainsail in absolutely to its optimum and the same nice deep fully aerofoiled jib will point higher without adjustment. Ease the mainsail again and the jib will lift! This is all because sheeting the mainsail presents more "block" which drags the approaching stagnation streamline(s) aft. More air is diverted around the luff of the jib and at a lifted angle. So sheeting the main puts the jib in a permanent lift.

Two molecules of air, approaching the sails but on either side of the stagnation streamline, will always be at the same speed and pressure. The Kutta condition is simply jargon for the fact that the same two molecules can only be at the same speed and pressure when they meet again upon leaving the sails. The one taking the leeward route travelled further, therefore faster, therefore at lower pressure and the windward one just the opposite. Hence lift in an aeroplane wing and drive in sails.



**Aerodynamics** continued

But there is of course more,-- the Kutta condition must pertain whatever the shape of the sails and the angle it is sheeted. If it is too full and sheeted too much the leeward streamlines cannot remain stuck to the sail and will roll away so dragging a column of turbulent air behind the sail. It is easy to see when this is happening because the mainsail leech telltales will stall and droop. Meanwhile the two molecules will meet, but further downstream, at the trailing edge of the turbulence, and Mr Kutta's condition remains intact.

Such an aerofoil (sail) which is trying to be too deep and powerful actually finishes up thinner (flatter) because the attached taper of turbulence must be taken into account as part of the aerofoil.

Regarding the Kutta condition, in lighter winds, the most efficient sails would be where all the mainsail leech telltales are just streaming, or intermittently just streaming and breaking. That way the two molecules will have re-established compatibility exactly at the leech of the sail. You can be sure of extracting every last ounce of leeward slipstream speed, and therefore pressure differential, without dragging any turbulent air.

In practice "best average" compromises by both the sailmaker and the sailor are called for, with the leech telltales as a guide. As has been mentioned, in the lighter wind range the boat will frequently feel and perform better dragging a little turbulence. But always get the boat romping first, then squeeze the mainsail in and point up.

As the wind rises, the difficulty flips to the opposite. The leech telltales may all remain streaming continuously even if the mainsail is being sailed too full, Their significance is reduced and other indicators such as helm balance and heeling force will dictate the trim of the mainsail.

Telltales are reliable indicators of airflow. Using them as a guide to help set and sheet the sails and point the boat will help those actions become instinctive, which then allows more attention for other racing priorities.

## SAILS

Our sails are made from flat pieces of cloth with curved edges joined together. This type of sail is now at an advanced stage of development and in very competitive fleets it is said that the biggest difference between sails from one boat to another is the sail makers mark! A sound and repeated tendency to copy winning designs is the cause and the larger and more competitive the fleet then the closer to the optimum, and to each other, the sail designs become.
While total optimisation is a slower process in smaller fleets nevertheless the principle of relying on race-proven designs is still the safest. Choices (dilemmas!) may arise where boats are equally successful using different

sails and spars. Or the same kit is rather quick on one boat and less so on another. Save your money until you have established the facts.

**Mainsail**

As well as the joined curved edges of the panels, the luff of the mainsail is also curved. Different luff rounds would ideally be used for different amounts of mast pre-bend and stiffness. (Always more luff round, sometimes more than double) But except in extremes the mast pre-bend can be adjusted to suit the sail. Pre-bend cannot be induced in the top mast but even pronounced mainsail luff curves will not show excessive shaping at the top.

The built-in seam shaping of the mainsail cannot be adjusted. Some flattening distortion will take place when the Cunningham is tensioned but the original seaming put in by the sailmaker is critical.

Too much flow too far aft, especially low down, is a problem especially upwind, fully powered up. The helm will feel heavy and the boat will constantly want to luff even with a correctly raked rudder blade.

It should be possible to make the sail totally flat along the boom by tensioning the outhaul. Above that the sail will need to take the saucer shape invented in the 1970's. Viewed from astern, the sail will be rather flat at the bottom. When sheeted in, the exit line out of the leech of the sail will be almost the same all the way up. There may be a very slight tendency for the leech to hook above the centreline at the bottom and be slightly open at the top.

This characteristic, combined with a maximum seaming depth placed around the 45% back from the mast, forms the basis of mainsail design. (the flow may appear to be further forward due to additional induced flow from the luff round).

**Controls**

Adjustments to a mainsail so shaped, can be made by changing the tack tie, the outhaul, the mast pre-bend, the cunningham downhaul, the kicking strap and the mainsheet.

Setting the pre-bend has been discussed; experimentation will be needed to get it exactly right.

The tack tie and outhaul can be used in combination to position the sail on the boom relative to the mast. With the sail closest to the mast and the foot tight, the luff will be a fraction fuller, but the exit remains flat, especially low down.

The effects of these controls are not huge, except when you let the outhaul right off! But they are worth investigating. As has been mentioned some possible advantage may be found, with a properly designed sail which is flat in the bottom, by easing the outhaul a fraction upwind until two people are sitting out, pulling back on very tight when fully powered up.

The sail battens should be an entirely passive means of supporting the curved roach of the mainsail to a continuously fair aerofoil.

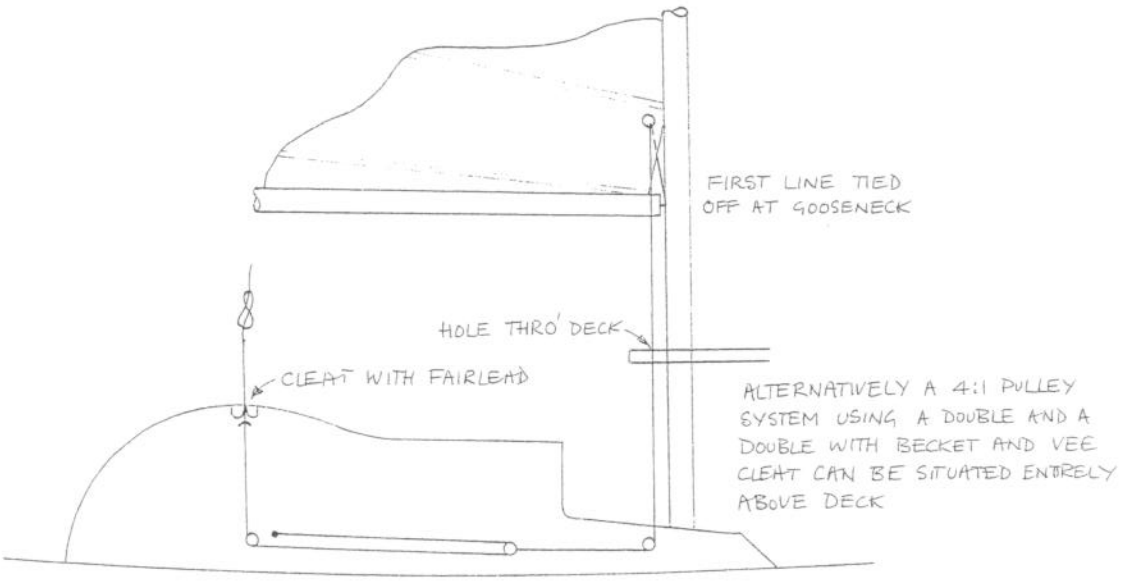
Make sure that the inner ends of the battens, especially the top two, are flexible enough so that they do not poke hard spots into the sail.

**Mainsheet, Cunningham, kicking strap.**
Controlling and optimising the mainsail while sailing to windward through the full range of wind speeds principally involves the combined use of the mainsheet Cunningham and kicking strap.

**Light winds**
No tension to either kicker or Cunningham is applied until all three crew are sitting out. In lighter conditions than that all the load will be on the mainsheet which will be hauled in so that the boat points and foots as well as possible.(as well as the other boats, or better!)
This is relatively straight forward, simply sheet the jib correctly and bear away just enough so all the jib tell tales stream.
Looking aft, the mainsheet at the horse `will be vertical (except in very light air) and as the lighter breeze increases, squeezed down to hold the mainsail leech in as the boat feels more lively.
Looking up, the lower mainsail luff will be showing horizontal creases, the tack tie has been drawn up the mast a little by the crimp in the mainsail luffrope, which is adding to the depth of flow in the sail. The mainsail lower leech tell tales may droop and the top ones fly intermittently. This is fine, in light conditions a little drag caused by stalled out flow lower down is paid for by the top of the sail working properly in more wind. Easing the main may make all the leech tell tales stream properly but almost certainly the boat will come upright and lose power and pointing.

**More wind**
Now as the wind rises further, continue to sheet the boom (and probably the jib) down a fraction just to hold the leech as it was. Do this without applying kicker or Cunningham tension for as long as you can still hold the boat born off to the jib telltales.
As soon as there is sufficient wind that with all three sitting out hard, the boat still heels over, develops weather helm, and you struggle to hold it off the wind sufficiently to keep the jib tell tales streaming. Then adjustment is needed.
Ease out the mainsheet a fraction and pull down the kicker a fraction to find a set up where you can just hold the boat to the jib telltales most of the time. Looking up, the mainsail is a little flatter and not flogging or backwinding. Looking aft the boom is at least as low as it was, and has moved a fraction to leeward of the sheet horse.
Although, as the wind rises more, you may like to pull the centre plate up 3 inches or so, further increased kicker tension, and then Cunningham tension will restore your ability to keep the jib telltales streaming, the mainsail quiet, and the boat balanced and moving.
The typical amount of kicking strap tension required to control the boat upwind will render it much less controllable as you bear away around the windward mark. So in strong winds ease the kicker as you come into the windward mark.

**Cunningham downhaul** (named after its inventor)
The Cunningham flattens the mainsail because by pulling the luff down the mast, every threadline from leach to luff has to span a greater distance and therefore becomes straighter. And as has been mentioned it will also tend to bend the mast more, with compression load across the arc of the mast bend. Combined use of the mainsheet, kicker, and Cunningham effectively facilitates "reefing" of the mainsail by presenting it edge-on to the wind, so making it "fit" the slipstream. The importance of such facility in stronger winds cannot be over-emphasised. Here is one example of a 4 to 1 cunningham downhaul.




**Mainsail, running**
Running performance in light / medium winds may be improved if the mainsail is equipped with a leech line, led through the clew ring and forward along the foot of the sail to a "V" cleat attached there by the sailmaker. When tensioned, this will deepen and cup the edge of the sail. A problem peculiar to the BOD, which would never originally been equipped with a kicking strap, is that the kicker bears on the front of the cockpit when dead running. This holds the main sheeted more than is desirable in lighter winds for running really deep. Easing the kicker works but it can be difficult to get it just right sometimes, and the boom still rise up. A simple additional kicker fastened at the mast just above the deck might work in light winds, allowing the proper kicker to be eased away. Problems with the slack leeward backstay also arise but for genuine windward – leeward races some means of squaring the boom right off, under control, might pay. Also as has been mentioned, allowing the mast to flop forwards while running, either just by applying less backstay (say up to 12" short of the backstop) or hauling on the jib halliard as well, is worth consideration in manageable winds.

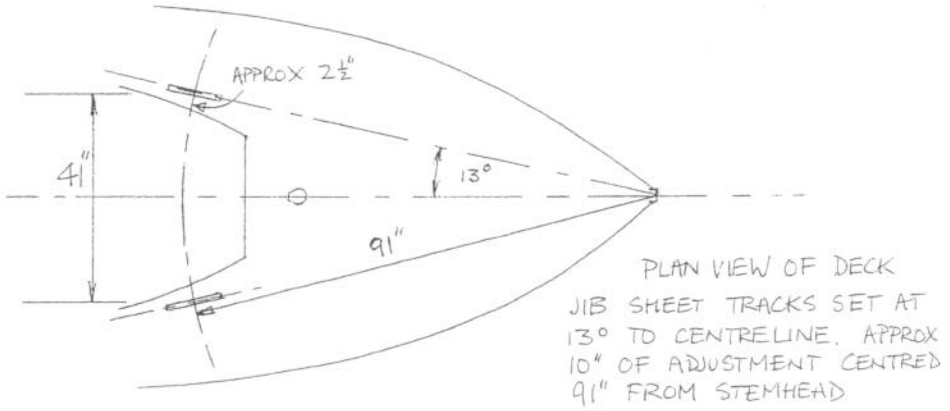
## THE JIB

### Fairlead setting

Moving the jib fairleads inboard has improved the boat by increasing the pressure created by the jib. There is less tendency to weather helm and so to windward in a breeze, the boat holds off the wind better. In lighter conditions the mainsail can be sheeted a fraction closer and the boat points better. ( the 24 inch width of mainsheet horse stops, currently required, may now impose a false limit on the natural pointing angle of the BOD in lighter conditions.)

A good average position for the first fairlead of the jib sheets is as shown, which is around 2½ inches outboard of the cockpit edge.

A fore and aft track allowing 10 inches adjustment (5 in forard and 5 in aft) Is adequate. Alternatively a more complex system could be devised also allowing inboard / outboard adjustment of the fairlead, so long as all the kit is sighted on the deck.




Either way the sheet can then optionally be led through a fixed turning block, a cleat and across the boat. The sheets can be continuous or single.

### The jib halyard

Two separately adjusted tensions are associated with the jib luff, the wire and the sailcloth. Tension in the luff wire is identical to that in the jib halyard to which it is connected. So the jib halyard will need to be strong enough and sufficiently stretch-free so that the luff wire is never slacker than the forestay. Otherwise the luff wire will sag in loops between the hanks.

First slack off the backstays and then any existing (slightly stretchy) halyard can be initially set up tighter than the forestay. Set just right, when the backstays and mainsheet are loaded up, the halyard, although weaker, will settle with just enough tension to avoid sags between the hanks. In practice this works surprisingly well.

The alternative is to employ an adjustable wire halyard system strong enough so that the jib luff takes all the standing rigging loads and the forestay then always remains slack.

**Jib luff sag**
Despite all this, a generalised sag in the forestay / jib luff while sailing cannot be avoided however tight it is set up. To fit this sag the jib is cut with a hollow luff of 20mm or so, unlike the mainsail which has a rounded luff to fit the mast. The jib can therefore be made a little fuller near the luff by deliberately allowing the forestay to sag further into it.
This can be achieved on a BOD by not pulling the backstays on so tight before tacking and is occasionally useful when there is less wind than chop. (leftover chop) when the boat seems to pitch up and down without getting anywhere.

**Jib luff tension**
Tensioning the sailcloth down the luff wire, which most sailmakers allow for with a lashing at the tack will flatten the sail a little and shift the flow forward.
Both the above are useful but neither will make a major difference. If in doubt, sail with the forestay tight and the sail luff just tight enough to be wrinkle free.

**Jib fairlead adjustment (leech and foot tension)**
The angle of downward pull on the jib-sheet, varied by the fore and aft position of the fairlead, and the tension applied to the jib sheet by the crew, are critical.
Try the fairlead at the middle of the track. Now sheet the jib for sailing to windward and compare the tension in the leech and in the foot, in the following way. The vertical shape of the leech should form a parallel slot with the back of the mainsail. And at the same time the foot of the sail should take up a curve so that the lower, aft part, near the sheet is parallel with the centreline of the boat.

**Slack leech?**
If the foot sheets first, and becomes tight with creases, with the leech hanging open, move the fairlead forward. Alternatively, If the leech is too straight and the foot too deeply curved and hooking to windward near the sheet, then move the fairlead aft.

**Tell tales**
The ideal is for the jib luff to exactly split the slipstream all the way up the sail. Therefore a finer check on the fairlead position is with two sets of tell tales near the luff of the jib. One set in the normal sailing position and the other at the top.
Sail to windward with the lower tell tales streaming as normal. Glance at the top tell tales to see if that part of the sail is also sheeted right. If not, first try a fraction on the sheet, in or out as appropriate. The reason for this is that the sail is tall and narrow making the upper part rather sensitive to the last ½ in on the jib sheet. Where the problem remains, if the upper windward tell tale droops (most likely because the upper sail is not sheeted enough) then shift the fairlead forward to get a fraction more downward component on the sheet.

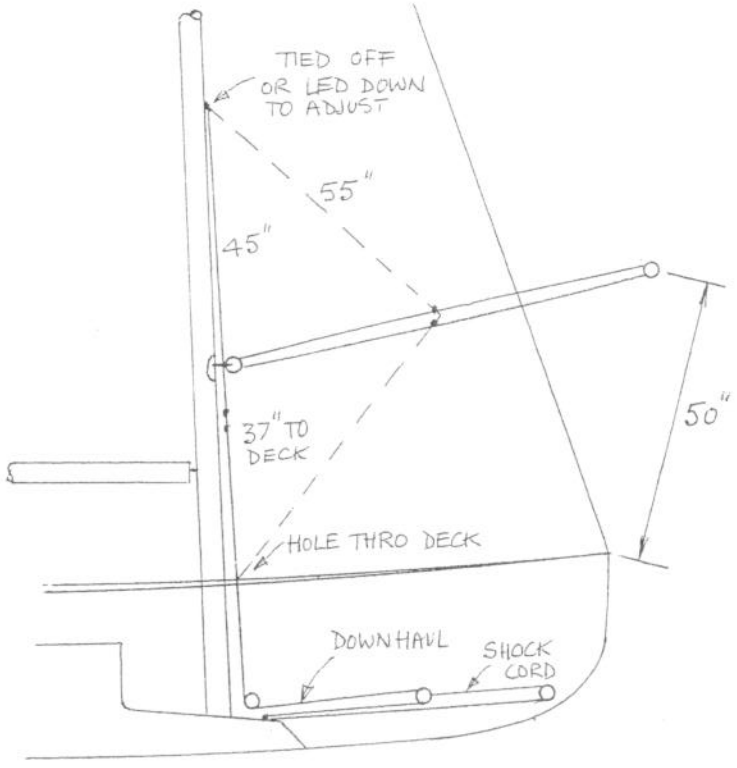
**Very accurate test.**
A last and very accurate test, is when all the tell tales are streaming, bear away and all the leeward ones should stall out at the same instant, a beautiful sight!

**Tuning the fairleads for the wind**
Moving the fairleads aft a fraction in stronger wind to get a flatter jib may pay, but accurate setting of the jib sheets as conditions vary is more important.
For example, upwind in lighter winds of varying strength, you would need to constantly ease and recover the sheets just to keep the sails the same. Plus an amount to actually change the shape since it will pay to romp a fraction in the lighter spells and squeeze up again in more breeze.
Similarly if the breeze eases upwind in choppy conditions so that the crew has to move inboard, the boat will stop unless the sails are eased a little.

## SPINAKER

The spinnaker when flying is suspended from only three points which are easy to describe and fix, most of any additional complication is to facilitate easier and quicker handling.

**Spinnaker pole uphaul downhaul**
The position of the outer end of the spinnaker pole (at around 50" from the bow, depending on the spinnaker design) is critical and can be set up as below, measured with the pole touching the forestay. Almost any system / geometry can be used to achieve this measurement, including the one shown here.



**Spinnaker pole**
The combined uphaul downhaul can be arranged to allow additional minor pole height adjustment, either with knots as shown or any suitable system. One main feature being that the shock cord should only tidy the slack when the system is idle. Make the uphaul downhaul line only just long enough to engage in the cleat on the side of the spinnaker pole at full stretch. Any longer and the shock cord will come back into play allowing the pole to sky.

**Fairleads**
The spinnaker fairleads or first running blocks will need to be on the outer deck edge around 54" from the transom. Then the continuous spinnaker sheet will lead either over or under the deck and across the boat.

**Guy**
Twin lines just aft of the lower, aft shrouds or snatch cleats in the same area will be necessary to convert the windward sheet into the guy when gybing. (The really ideal position for catching the guy is at the main/ forward shroud. Leading the twin lines to here is complicated by the washboards but hooks or snatch cleats will work).

The halyard is best led back to the helmsman, low down on the opposite side of the centre case from the centre plate uphaul.

**Stowage of spinnaker**
Stowing the spinnaker into bags under the deck is open to two schools of thought. Both with snags. The sail can be brought in over the foredeck, either side, between the forestay and shrouds, where re-setting on the opposite gybe is hampered by the kicking strap. Or it can be brought in between the shrouds and the back stays where stowage is more accessible but hampered by the movement of the backstays.

**Spinnaker design**
In general, for running, a large broad, slightly fuller spinnaker is better, and for reaching, one that is flatter and narrower. The BOD spinnaker rule restricts the sail to a reasonable width and although a very wide bursting beauty would flatter the appearance of the boat when dead running it might introduce the dilemma of choice. (maybe it could be a fraction wider in the top though?)

The BOD only planes under severe provocation and is therefore particularly suited to windward / leeward courses rather than reaching. If we see greater use of these, and competition increases then we are also likely to see more development of the slightly windward-heeled, deep running offwind technique.

Use of the leech line to deepen the mainsail, with the boom squared right away and the spinnaker luff held to windward on the verge of collapsing could receive as much close attention as upwind tuning and sailing currently does.

## CONCLUSION

There is nothing like the excitement of realising pored over plans for the first time. I hope you find something useful, but don't be a slave to all this stuff!

The Brightlingsea One Design is a good racer, but a lot more besides, -- good sailing.

**Malcolm Goodwin**

**BOD C1 Jean**