



The SHOCK of the OLD

Part 33: Sheeting the Mainsail

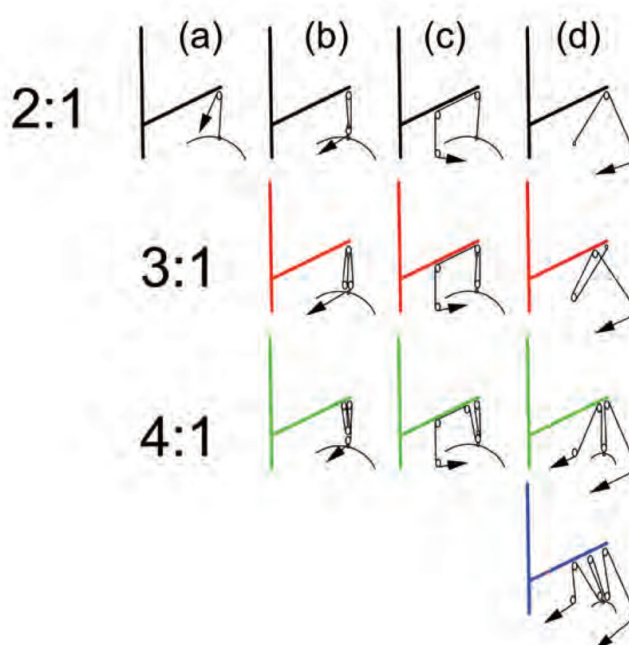
Moray MacPhail continues his series on refining traditional rigs with advice on gaff mainsails and how to tame them.

The rope arrangement which you choose to control the mainsail certainly has as much to do with layout and ease of handling as anything else but it's useful to review other options.

The simplest and for very small sails the most effective is to have the mainsheet led directly to hand from the boom. For very small craft – like the 7'9" (2.4m) Eastport Pram from Fyne Boat Kits, above – this works fine but for a larger sail – or any sail without a boom – you'll need a system with blocks in it. This diagram shows some arrangements.

2:1 Options

The scheme on the left (a) is very effective for small lugsails, with the sheet led to hand. It is awkward to cleat but in a small dinghy that may be a good thing. A knot in the sheet





Facing page: With small boats the simplest system is best, as on this John C Harris designed Eastport Pram. Photo: CLC Boats

Above left: A real movie star – see W160 – with a traditional 2:1 arrangement on a rope horse. Photo: Val Khambatta.

Above right: Andrew Wolstenholme's Coot has a 3:1 system falling easily to hand from along the boom. Photo: Kathy Mansfield

some 16" (50cm) from the end is helpful in preventing the whole lot disappearing through the sheave. I have shown it on a horse, which if fitted could be either rope or metal, in order to clear the tiller.

Option (b) in the 2:1 range is often used in old-school dinghies, like Mirrors and Enterprises and for modern ones of that style. It has the advantage that you can hold the mainsheet in the hand which is holding the tiller – which is fine until you use a hinged tiller extension. The picture of *Amazon*, above left, shows the idea

This option can be used for boomless sails, with the attachments and/or horse set well back from the

clew to tension the foot of the sail.

For a different layout, option (c) applies, with the slight disadvantage that there is another sheave in the system – more friction and/or expense – but has the distinct advantage that the sheet can be cleated at the lower forward block, likely to be accessible all the time.

Finally, option (d) is the scheme proposed by the august Mr E F Knight, much quoted in W167. I am not convinced; although it obviates the need for a horse, having the sheet on just one side of the boat seems to me potentially awkward. You could make it double ended – but that does seem a great deal of string and gear for such a simple job.

For A Little More Oomph

We need to look at one of the 3:1 options, for example on Mr Wolstenholme's Coot, above right. In all cases, it is possible as shown in (d) to spread the load along the boom by attaching the end of the mainsheet some wayway from the block. This can be useful in spreading the loads on the boom to reduce bending on it.

Moving on to 4:1 arrangements, an aft arrangement, seen on my own Orwell Corinthian over the page, leads the final part of the tackle to hand via the lower block, often being cleated there. If incorporating a horse, you get a wide range of sheeting angles. You may think that you'll get problems with the lower



*Above: The author's Orwell Corinthian. A larger mainsail needs more purchase: here a 4:1 system on a horse. Photo: Kathy Mansfield.
Below: Loose-footed boomless sails, like these on the St Ives Lugger Barnabas, need to be sheeted well aft. Photo: Cat Holman.*

block flopping about and getting jammed, particularly if sliding on a horse but I have not found this to be a problem, as long as I am able to adjust the orientation of the cleat.

This arrangement can also be used as a centre mainsheet, perhaps on a track or horse. This is fine if the boom is sized for it and it tends to be better if the sail is laced or in a track on the boom so that the loads are distributed along it. The good bit about this arrangement is that you get a wide sheeting angle fairly easily. The drawback is that it can foul up the interior arrangement of an open boat. It is also currently unfashionable

on cruising boats because the track usually runs on the bridge deck, so inconveniencing those tucked into the forward corners of the cockpit while tacking or gybing. It is good from the point of view of sail control and it does free up plenty of space at the aft end of the boat. Unfortunately for traditional rigs with typically long booms, a centre main is not often a practical option.

In which case what you can do with the final part in option (c), is lead it forward along the boom and then either to hand or to a deck-mounted block, again perhaps incorporating a cleat and thus more comfortable to use

than an aft-sheeted arrangement.

Option (d) is the traditional double ended mainsheet, incorporating two quarter blocks, blocks on the boom, and one or more blocks mounted on the centreline, perhaps on a horse or on very large craft, a buffer. I don't understand why it is so popular. It is always rove to disadvantage, the sheeting angle is narrow since one part is always led to windward and I always find the sheet is awkward to pull on. It is also a permanent invitation to trouble; just when you need to ease the sheet in a hurry, it is on the other side of the boat. Would someone tell me the advantages of this arrangement?



Boomless 'loose-footed' sails may also demand a 4:1 arrangement – like that on the Cornish lugger *Barnabas* across the page – but of course must be sheeted as far aft as possible.

Finally there's the 6:1 system, which tends to be the most used on a conventional rig, lending credence to the old bargeman's advice that three sheaves is a sensible maximum. On larger yachts, it was common practice to mount the boom blocks on their own wire span. The whole arrangement is equivalent to a treble and becket at the lower end of the tackle and a treble at the top. This arrangement is used for traditional craft with boomless sails, like barges, bawleys and luggers. In practice, though, whichever system you choose and the size of the sheet itself is as much to do with ergonomics as anything else.

Estimating Sheet Loads

It is still worthwhile taking a look at the anticipated loads to see what sort of purchase you might need. Harken have helpfully produced a couple of formulae for sheet loads, reproduced here. Before getting too excited, a few caveats are in order. The stated range of validity is medium displacement monohulls of between 30' to 60' (9–18m), using 'conventional' materials in the rig and Bermudan sails, so not intended for gaff rigs. And it can only give a guide as to whether you are likely to be able to take the sheet to hand, need a cleat or need a winch.

Despite the caveats above – and on Harken's website – I have used their formula for mainsails on boats as small as 15' (4.6m) and still found sensible answers. I usually reckon that if the mainsheet load divided by the purchase gives you more than 44lbs (20kg) – ignoring all the frictional stuff – then you need a cleat and more than 110lbs (50kg), you will need a winch.

As for wind strength, I usually use 20 knots for a full main on a yacht, unless I want to reef early. For example, for my Orwell Corinthian with

MAINSHEET FORMULA: $M = \frac{(E^2 \times V^2 \times P^2 \times F)}{(\sqrt{(P^2 + E^2)} \cdot (E - X))}$			
Item	Description	Units (English)	Units (Metric)
M	Mainsheet Load	Pound	kg
E	Foot Length	Feet	Metres
P	Luff Length	Feet	Metres
V	Wind Speed	Knots	Knots
X	Aft end boom to mainsheet take-off	Feet	Metres
F	Factor	0.00431	0.02104

an ample rig, 10 knots is better for the full sail, since after that I put in a reef or feather the sail.

Horses

The final element of the mainsheet is the horse. For small craft, a rope horse is fine and is nicely adjustable. Set tight, it allows the sheet to run wide; set slack and it tends to centre. The real problem comes if it is set too loose and snags on something. For example, an easy way to capsize a Laser is for the rope horse to catch on the after corner of the hull during a gybe, trapping the mainsheet on the newly-windward side of the hull.

Metal horses overcome most of these problems but at a cost. The wider and higher they are, the more robust they need to be for a given load so some moderation in width is sensible. On a larger boat, if you don't need to clear a tiller then either run them close to the deck – but why not use a track

in this case? – or make them stand about 6" (150mm) clear. Lower horses around 3" (75mm) high are potentially dangerous since a wandering foot can get stuck under them with nasty consequences. The design load for a dinghy horse is also relevant because the likelihood is that a small boat will be picked up and carried using the horse as a handle!

Looking Forward – Literally

The other Harken formula, offered below, is for headsail sheets, which I will be dealing with next time. I have included it here because the calculations are also relevant for the purposes of sizing the mainsheet for boomless sails. Bear in mind that this formula was never intended to be applied to mainsails and treat the answers with caution. However it should still indicate the magnitude of the forces involved.

www.moraymacphail.com

HEADSAIL SHEET FORMULA: $SL = SA \times V^2 \times F$			
Item	Description	Units (English)	Units (Metric)
SL	Sheet Load	Pound	kg
SA	Sail Area	Square Feet	Square Metres
V	Wind Speed	Knots	Knots
F	Factor	0.00431	0.02104