

# Talkin'bout

## the outhaul & leech cord

Welcome to the third in the series on Paper Tiger control systems for newcomers to the class, or for those who are isolated from the main fleets.

The aim is to describe the variations in PT rigs and the possible advantages and disadvantages of the different systems used. It is intended as a guide only. This time we'll examine the outhaul and leech cord, starting with the outhaul.

### THE OUTHAUL

#### What does it do?

The outhaul is used to alter the tension of the foot of the sail. This affects performance by changing the depth of the sail and therefore the power it produces (tight = flatter sail = less power; loose = fuller sail = more power). The depth of the sail also affects the amount of aerodynamic drag produced.

When beating to windward on flat water, the outhaul may be tightened in light breezes to flatten the sail, thus reducing drag and allowing the boat to point higher. If the wind increases it may then be eased to produce more power, then tightened again as the wind continues to strengthen if too much power is produced.

On a beat in rough water, the outhaul may be eased to provide the power required to punch through the waves, but tightened if strong winds produce too much power.



When reaching, the outhaul is generally eased to provide as much power from the sail as possible. As the wind

strength and boat speed increases, the outhaul may be tightened to reduce drag and also the power being developed higher up the sail, which could force the bows under water.

When running downwind, the outhaul is tightened to stretch the sail out to its full width, thus maximising the sail area presented to the wind.

### The configuration

Class rule No. 8 - SPARS, Part 13 states "**Outhaul control fittings shall be located on or within the boom only**", and Part 14 states "**The tails of control lines may be led to positions of convenience and the slack taken up, as long as the primary control load is taken by fittings positioned in accordance with the relevant class rule**". As with the downhaul (discussed in the last issue) these rules limit the variation in the systems that will be seen on PTs.



The sail clew can be attached to the boom via a roller mounted metal car, a nylon sail slug, or with rope or webbing. Whichever is used, the foot of the sail should be able to slide freely in the sail track. The clew is then pulled out along the boom by a system of blocks (usually located within the boom) and, when released, slides back under boltrope tension, wind pressure or by elastic attached to the boom and clew.



DOUBLE SWIVEL CLEAT WITH OUTHAUL AT THE REAR, AND LEECH CORD AT THE FRONT

The control rope can exit the boom through an elongated slot and is cleated below the boom by a swivelling cleat for ease of operation from either side of the boat. The cleat is located forward on the boom to avoid scalping the skipper when tacking or gybing. (see image above).

### DOUBLE SIDED SYSTEM

If the skipper wants to be able to adjust the foot tension whilst hiking, a double-sided system will be required. If fitted, the tails exit the boom near the mast via exit blocks and



are secured at fixed cleats on the boom. The cleats need to be angled down to allow easy adjustment whilst hiking (see image previous page). The tails are then led out to a convenient point near the gunwales (probably at the chainplates) and tied off. The tails can also be run through guides at the gunwale and the ends joined together in the centre of the boat to create an endless system.

When positioning the block system inside the boom, ensure that it will not snag on hound attachment rivets when operating over its full range of adjustment.

**The ratio**

A 2-to-1 purchase system is the most basic that should be considered (see diagram A). This provides enough power to fully stretch the foot of a sail which is fitted with an elastic boltrope, although it may take a bit of effort.

A 4-to-1 system is preferable if the sail has a rope boltrope as greater effort is required to stretch it out fully (see diagram B).

A double sided 4-to-1 system is shown in diagram C.

**The rope**

4mm diameter pre-stretched, braided, polyester rope is adequate for short lengths in the system that are under load. However, high strength, low stretch "Spectra" type rope is the best choice for any long lengths, as other rope types will stretch too much to allow fine adjustment of the foot tension.

**The blocks**

20mm diameter (or less) blocks are

adequate for this system and fit better within the limited width of the boom. The ball bearing types operate more freely, reducing friction in the system, but are more expensive than basic blocks.

**The cleats**

As stated previously, a swivelling cam cleat is preferable for a single tailed system as it is more convenient to operate. However, they are not cheap. If it is also to act as the cleat location for a leech cord, a double version is required (see image previous page). The cleat is usually mounted between the forward mainsheet block and the boom vang hound or between the hound and the gooseneck, whichever the skipper prefers.

If a double sided system is adopted, standard cleats can be mounted on brackets made from stainless steel or 3mm thick aluminium. It is preferable to mount them as far forward on the boom as possible so there is little pull on the rope tails when the boom swings across the boat.

**THE LEECH CORD**

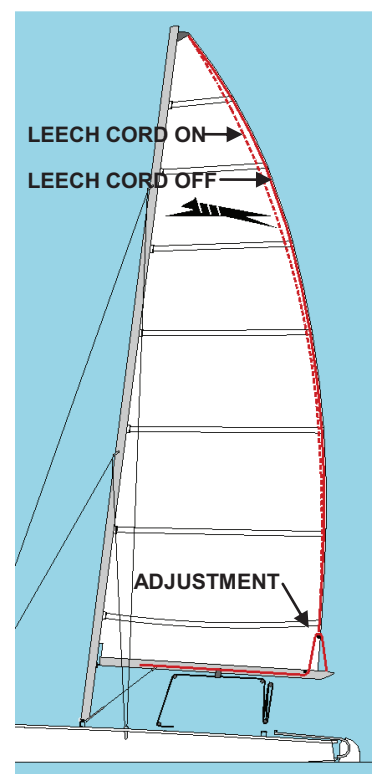
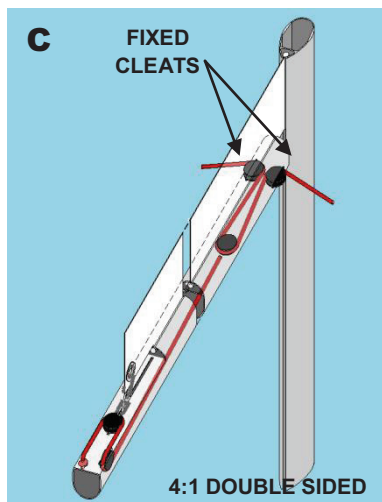
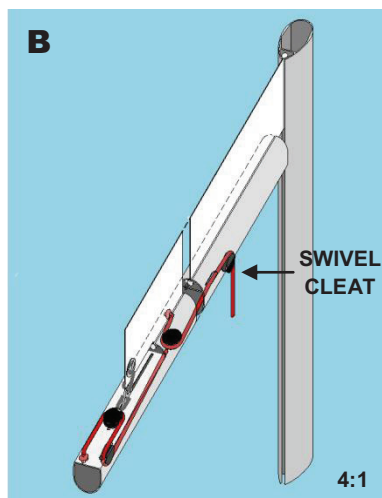
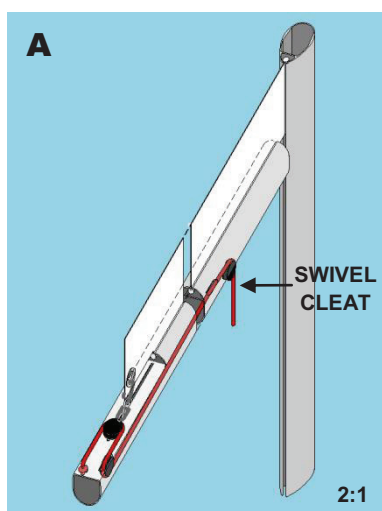
**What does it do?**

The leech cord is used to alter the depth of curvature of the sail battens. This affects performance by predominantly changing the depth of the upper part of the sail and by hooking the leech to windward, which can increase the power generated in this area of the sail.

The leech cord works by tensioning a cord running in the rear seam of the sail, which is attached at the headboard and is adjustable at the outer end of the boom. When tensioned, it tries to straighten out the sail leech and bends the battens in the process. It is most effective in the upper part of the sail because this is where the maximum leech curve exists.

In order for the leech cord to work the boom has to be held down tightly, either by mainsheet tension or the vang. If it isn't, the leech cord tension will simply hoist the boom in the air and have no effect on the sail.

The leech cord can be used on a reach to maximise power because the drag generated by the hooked upper leech is not as detrimental as it



is when beating upwind. Maintenance of effective air flow over the sail will determine the amount of leech tension which should be applied. In stronger winds, extra power in the top of the sail may drive the bows under water, outweighing any benefit from increased speed.

There may be some benefit for heavier skippers to use a little leech cord tension upwind in mid to heavy breezes if the leech is tending to lay off and the boat feels underpowered. Hooking the leech to windward, plus the extra fullness created in the head of the sail, may help break the windward hull clear of the water sooner. However, it is a balancing act between power and drag.

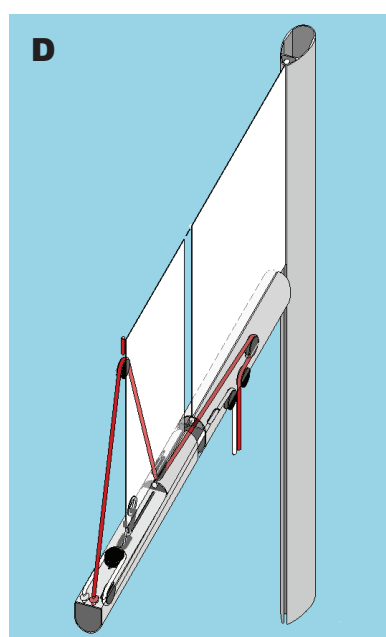
It is not likely to be beneficial to tension the leech when running square downwind.

### The configuration

Class Rule No. 10 - SAIL, Part 7 states "**Leech cord can be internal, external or non-existent**", and Part 8 states "**Leech cords shall be adjustable on the sail or boom only and control line tails not lead to another place**". This means that the systems adopted tend to be pretty basic.

The leech cord is usually fitted by the sailmaker at the time of manufacture. However, if one is not fitted, it can be added later. The lower end of the cord usually emerges from the sail at the lower batten pocket and a small block is attached to this. A control rope is attached to the boom, passed through the block, through another block attached to the boom, then forward to a cleat at a convenient location on the boom (diagram D). This rope may be run inside or outside the boom, but is neater and safer if internal (no rope sagging down to get hung up on).

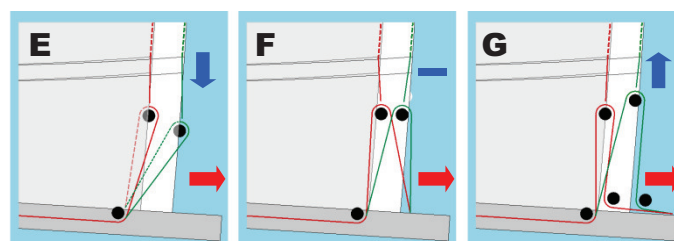
The arrangement of the tackle seen on PTs tends to vary a little. Something worth considering when planning the



system is the consequence of forgetting to release the leech cord when coming off a reach and onto a beat, as it can't be reached whilst hiking. Ideally the leech tension would ease automatically when the outhaul is tensioned, but at least the tension shouldn't be increased.

If both rope ends connect to the boom forward of the clew's position when the foot is eased, the leech will be tightened when the

the outhaul is tensioned (diagram E). If the connections straddle the clew's travel distance, the leech tension will stay roughly the same when the outhaul is tensioned (diagram F). If one end is located forward of the clew's travel and the other led through a block attached to the clew, then attached to the outer end of the boom, the leech will ease off when the outhaul is tensioned (diagram G).



### The ratio

A 2-to-1 purchase system is all that is required to adjust the tension.

### The rope

The leech line (if not already fitted) can be a 2mm diameter "Spectra" type rope. 3mm dia. "Spectra" type rope is suitable for the adjustment system as it won't stretch and the loads aren't great. A small plastic tie ball on the end of the cord may make it easier to grab hold of it.

### The blocks

20mm (or less) diameter blocks are suitable.

### The cleat

A swivelling cam cleat is easier to operate, but a fixed cleat would do the job as long as it is easily reached from both sides of the boat.

Locating it near the vang hound is preferable and combining the outhaul and downhaul cleats on the one fitting is convenient.



Next time we'll talk about the **boom vang**.

Ralph Skea 