

Talkin'bout

the lower forestay

This is the fifth 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 lower forestay.

One of the first things that newcomers to PTs notice is the extra mast rigging compared to cats of similar size. The 'surfcat' classes generally get away with only four wires holding up the mast. If you have ever picked up a mast from one of these boats you will notice that they are rounder than a PT mast, and heavier. This gives a stronger mast that requires less support, but its bend under load is uncontrolled and its weight affects boat performance.

Other small cat classes use lighter mast sections that are strengthened with 'diamonds', i.e. strutted out wires between the upper mast hounds and the mast base.

The PT uses upper stays and shrouds like all cats to support the mast, but uses lower shrouds and an adjustable lower forestay to control mast bend.

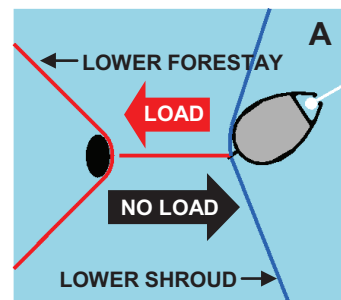
What does it do?

The lower forestay's primary function is to stop uncontrolled backward mast bend below the upper mast hounds. Actually it is sideways bend that it controls....I will explain.

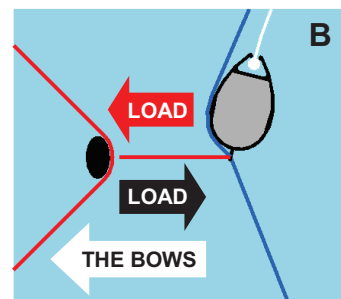
The current PT mast is teardrop shaped for better aerodynamics and is lightly constructed to save weight. Therefore it is stronger front to back than side to side and requires sideways support below the hounds in stronger breezes.

When the centreline of the mast roughly

aligns with the centreline of the boat (e.g. when sailing upwind) it is well supported by its fore and aft strength and the lower shrouds (see diagram A). When the mast is rotated away from the boat's centreline on a broad reach or when running downwind, it will require additional support from the lower forestay to prevent it bending backwards (actually sideways towards the stern of the boat) in the event of a nosedive or during a gybe (see diagram B).



UPWIND



DOWNWIND

In the early days the lower forestay was non-adjustable on the water under the class rules. This meant that it had to be tied off to suit the conditions anticipated throughout the race(s), i.e. loose for light conditions and firm for heavy conditions. This could leave the mast under-supported if light conditions turned nasty, or leave the sail underpowered if heavy conditions died out.

A subsequent change to the class rules allowed the lower forestay to be adjusted on the water. This immediately presented the opportunity for it to be used as a "gear changer".

The lower forestay can be used to:-

- Bend the mast when beating in light airs and flat water to flatten the sail, open the leach, reduce drag and give the sail a finer entry angle, thus increasing speed.
- Bend the mast when beating in strong breezes to achieve all of the above, but this time to reduce healing moment, especially when maximum downhaul, outhaul and eased traveller just aren't enough to keep the boat flat.
- Maintain the mast curve and sail shape upwind in a moderate breeze when easing sheet in a gust.



- Allow the mast to be curved backwards on a broad reach or a run in light/moderate winds to present a faster sail shape or maintain leeside airflow.
- Keep the mast straight for maximum strength on a broad reach or run in strong winds.

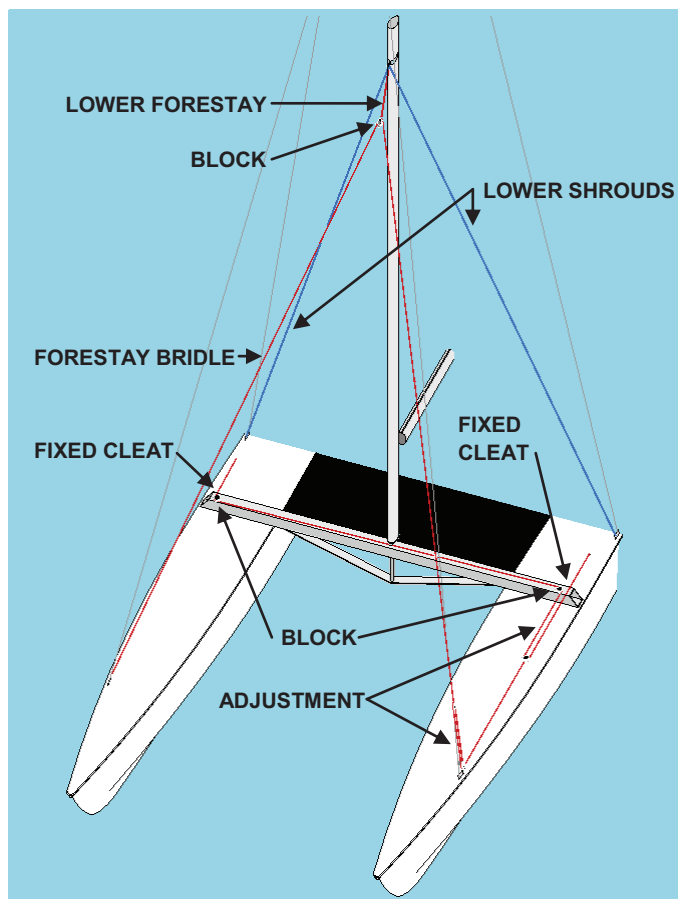
If the system is easy to access and adjust, then it can allow controlled manipulation of the mast in conjunction with the other sail adjustments to achieve maximum power at all times.

The configuration

Class Rule No. 9 - RIGGING states **"The rigging is to be in accordance with the plans except configuration of the lower forestays is optional.....Only the lower forestays may be adjusted while racing."**

Class Rule No. 12 - THE FOLLOWING ARE PROHIBITED states **"Any device for the adjustment of the bend in the mast while racing except for lower forestay, mainsheet system, downhaul and boom vang."**

The forestay system consists of two components - the stay and the stay adjustment system. Generally the stay consist of a single wire attached to the lower mast hound, with a small block fixed to its lower end, and a bridle of wire or rope rigged between the front chainplates which passes through the block on the wire. The length of the upper wire varies from boat to boat



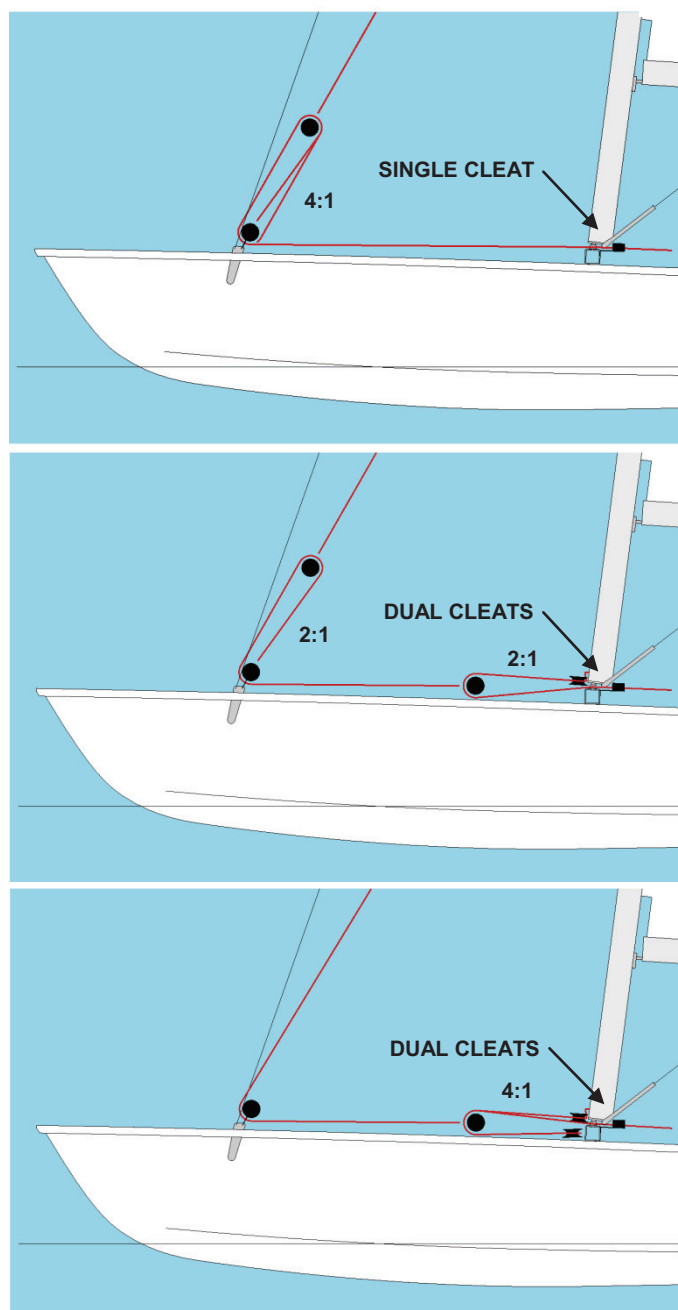
but the shorter it is the greater the power the adjustment component of the system can apply to the mast.

The adjustment component consists of a system of blocks that is usually attached to one end of the bridle with the tail/s of the system lead back to one or two cleats on or near the forebeam.

A number of variations of the block system commonly in use are:-

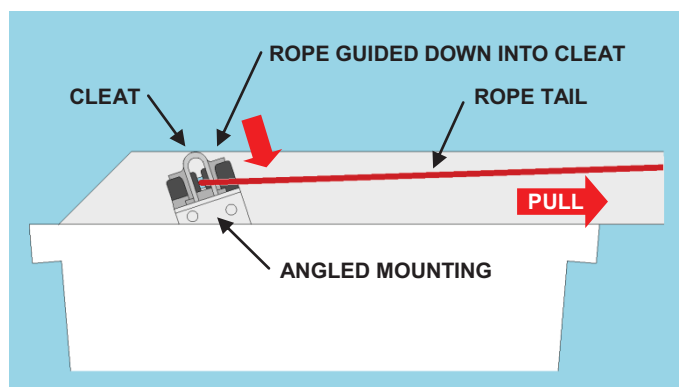
- A 4:1 system connected to one chainplate.
- A 2:1 system connected to one chainplate with a 2:1 system connected to the end of this on the foredeck.
- A 4:1 system on the foredeck.

A system located totally above the chainplate would normally be used with a single centrally mounted cleat.



The rope tail or tails of the tackle system are lead back to the main beam and secured at one or two fixed cleats. When dual cleats are fitted, one of the tails is lead to the opposite side of the boat via blocks mounted either externally or internally to the front beam. The rope tails are either tied off to the rear chainplates or joined together to make a continuous (tailless) system.

If a dual-cleat continuous system is fitted, it is worth angling the cleats down for ease of recleating an uncleated tail from the opposite side of the boat.



The ratio

A 4:1 block and tackle system is powerful enough to allow for significant mast bending. As the system is acting on one end of the forestay bridle, the power applied increases to almost 8-to-1 if the upper forestay wire is short. A longer wire reduces the available power.

If more power is wanted, upgrading to a 5:1 or 6:1 block system will provide more than enough grunt.

The rope

The stay is usually made of stainless wire, the same as the rest of the shrouds and stays. The bridle can be flexible stainless wire or 'spectra' type rope. If rope is used, it is essential that it is a minimum-stretch type of equivalent strength to wire as any give could allow the mast to over-bend in extreme conditions.

The block system only requires 4mm diameter rope, but also of a non stretch 'spectra' type.

Attachment

The forestay system is shackled to the front chainplates. If the boat is fitted with multi-hole chainplates, the lower forestay system can easily be left attached to the boat. If the boat has single-hole chainplates it may be a little more difficult to achieve this set-up if desired.

The blocks

19mm diameter blocks are adequate for the tackle system. The use of wire or rope for the bridle will determine the type of block (plastic or metal sheave) used on the end of the upper stay, but 19mm diameter is still adequate.

If the rope tail from the tackle system is lead inside the front beam, 20mm diameter exit blocks will be required.

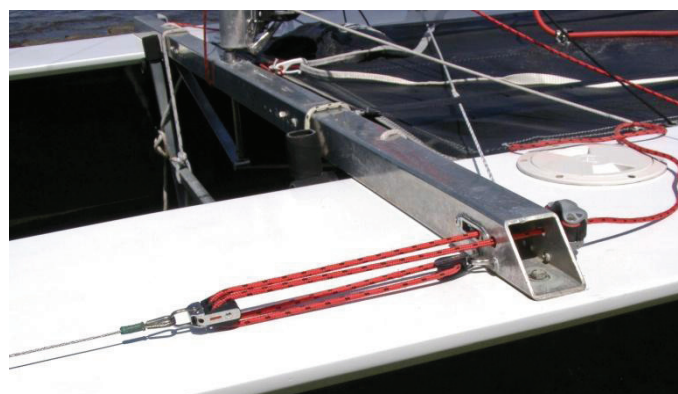
The cleats

There are generally two configurations for cleating the system.:-

- Single-tail - The rope tail is lead directly to a single cam cleat (either fixed or swivelling) mounted near the centre of the forebeam. This has the advantage of simplicity (and lower cost). It also avoids the system running out of adjustment, which can happen if a dual-tail system isn't always cleated off. However, it is not reachable when hiking and is therefore not practical for frequent 'gear changing'.
- Dual-tail - The rope is set up with two tails which are lead to cam cleats at the outer ends of the forebeam. The rope may be directed through blocks mounted externally on the beam or internally through exit blocks. The advantage of this system is that it is always in reach when hiking, allowing for ready adjustment in variable conditions. The disadvantage is as mentioned above, unless the tail ends are joined to make a continuous system.



Externally mounted 2:1 plus 2:1 system



Internally mounted 4:1 system

For more information on setting up the lower forestay and other systems, visit

http://www.papertigercatamaran.org/images/media/guide_-_front_lowers.pdf

Next time we'll talk about the **rudders**.

Ralph Skea 