Rigging a Paper Tiger Catamaran

Paper Tiger Catamaran
GUIDES

Step-by-step Guide - Mast

Warnings/Cautions

- Before attempting to raise the mast, check thoroughly to ensure there are no overhead power lines that could be touched by the mast when it is being raised. Contact with overhead power lines could result in serious injury or death.
- It is a good idea to practice this process with someone else helping for the first few times, just in case assistance is needed quickly.
- Ensure the stays are not twisted in any way when attaching them to the mast and to the boat.
- Read through this entire document first before deciding on which methods to use and before attempting any part of the process.

Definitions

Battens	The seven fibreglass (usually) strips used to give the sail stiffness.
Bolt Rope	Rope sewn into the Luff and Foot of a sail.
Chainplate	Fitting (usually stainless steel plate) fixed to the hulls for attaching the stays.
Foot	Bottom edge of the sail.
Halyard	Rope used to hoist (raise) a sail.
Hounds	Fitting (usually stainless steel) where the stays attach to the mast.
Leech/Leach	Rear edge of the sail.
Lower Stays	The set of stays that attach to the lower hounds.
Luff	Front edge of the sail.
Mast Foot	Bottom end of the mast.
Mast Head	Top end of the mast.
Rig Tension	The tightness of the stays holding the mast up when fully rigged.
Shackle Key	Tool used to tighten and undo shackles. It usually has a screwdriver tip on one end and a cup-type tip on the other to cope with the two most common types of shackles used in sailing.
Stays	Wires used to hold the mast upright on the boat.
Turnbuckle	A device for enabling fine adjustment of the length of a stay.
Upper Stays	The set of stays that attach to the upper (or higher) hounds.

Sort out the pieces

As it is a good idea to remove the stays from the mast when de-rigging (this avoids salt corrosion between the stainless steel wires and the aluminium mast and also damage from them rubbing when towing), you will likely be faced with a bare mast and a set of stay wires. This can be very confusing for a person the first time they attempt to rig a Paper Tiger, especially as these boats have two sets of stays consisting of an upper and a lower set.

Obviously, it is very important to make sure that you are putting the correct stays in each position, so this needs to be determined before attaching the stays to the mast. Keep in mind that this will become much easier after a couple of times and you will soon be doing it with ease.

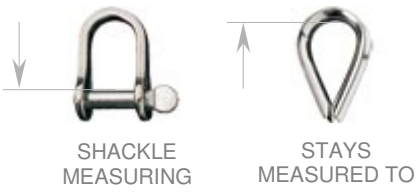
For a typical rig setup, there are usually nine (9) lengths of wire, as per this list below:

Stay/Wire	No. Off	Approx. Length	Adjustment Method
Rear Upper stays	2	5320mm	Usually by turnbuckle
Rear Lower stays	2	2810mm	Usually by turnbuckle
Front Upper stays	2	4770mm	Usually non-adjustable
Front Upper Strop	1	795mm	Turnbuckle, vernier plate or shackle size
Front Lower Strop	1	1035mm	Non-adjustable
Front Lower flexible wire	1	3880mm	By a block and pulley system

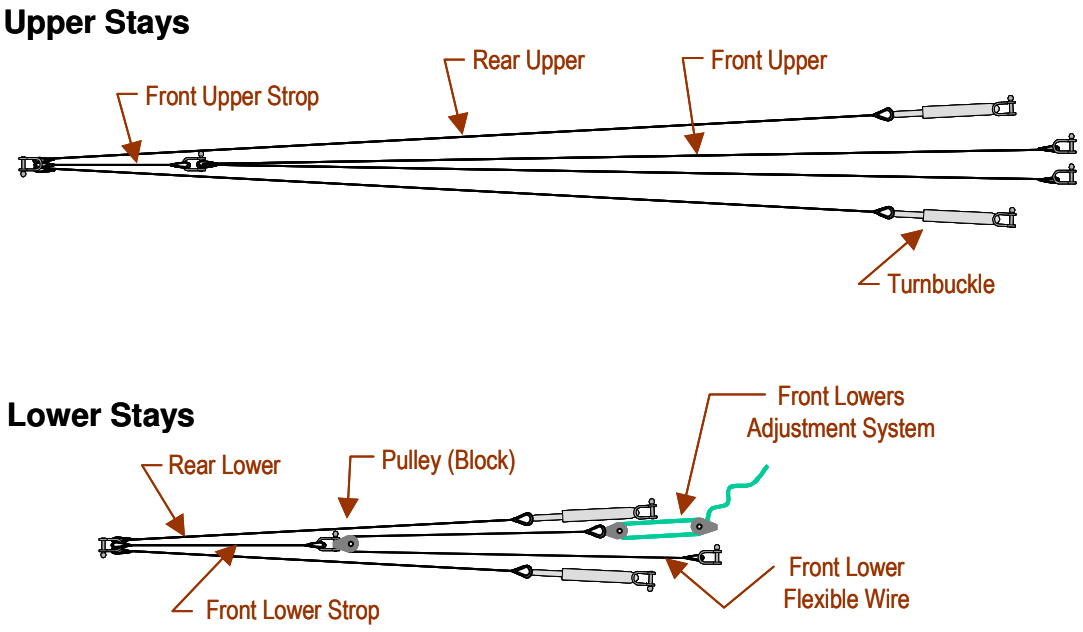
Note:

- Stay lengths are approximate only and can vary based on different hound positions (there is a legal range of 80mm in positioning for each hound) and chainplate positions (distance from beam is minimum only).
- The lengths quoted include the turnbuckle or other adjustment device and also the shackle at the lower end of the stay.
- Where there are two stays the same, these should be a matched pair and be set to be the same length.
- For further details on stay material and lengths, please refer to the Paper Tiger Guide titled "Stay Lengths".

Measurement of stays is usually to the inside edge of the shackle pin or the thimble, as shown at right.



Realistically, you can only fit three stays onto a sensible sized shackle to connect the stays to the mast's hounds. This is one of the reasons for the short wires known as "strops", as they connect two wires into one allowing only one thimble to be attached to the shackle on the hound. The wires should appear and be arranged like those in the diagram shown below before being attached to the mast.



Note: Whenever you are using shackles, ensure the shackles are tightened with a shackle key, but do not over tighten them as this could damage the thread in the shackle and/or on the shackle pin.

Note that some turnbuckles use a pin and split ring arrangement (rather than a shackle) to attach the turnbuckle (end of the stay) to the chainplate (see pictures below). The advantage of this is that it can be fitted quickly by slipping the pin in and then inserting the split ring after that. The disadvantage is that split rings can be awkward to undo, especially after you have been sailing (cold and wet fingers).

^ Two types of turnbuckle in common use. At left is the Ronstan Sea-Loc (uses a shackle to attach to the chainplate). At right is a vernier plate type turnbuckle (uses a pin and split ring to attach to the chainplate).

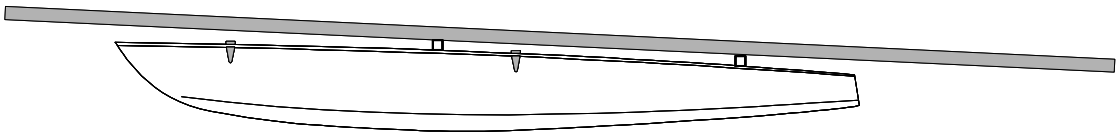
^ These are StaMaster turnbuckles (which use a pin and split ring to attach to the chainplate). This type allows adjustment of the turnbuckle by hand (note that this is not allowed while racing).

Connect the stays to the mast

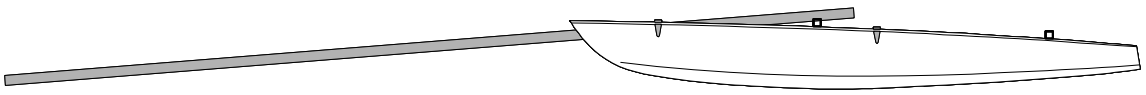
Once you are sure the stays are connected correctly to each other, it is time to connect them to the mast. The shackle at the top of each set of stays (where the three stays come together) will need to be slightly larger than the others. These shackles are then attached to the hounds on the mast, obviously the longer Upper stays are attached to the hound closer to the top of the mast and the shorter Lower stays are attached to the hound closer to the bottom of the mast. The hounds will likely look like the one in the picture at right.

Some people connect the stays to the mast while the mast is lying on the ground and then lift the mast and attached stays together and lay them on the on the boat (my preferred method). Others prefer to have the mast lying on the boat already and then attach the stays (this is more popular when rigging on sand as it can help in keeping the fittings out of the sand, as sand can wear the fittings out very quickly).

There are two main ways to lay the mast on the boat. The most common is with the mast lying on both beams with the bottom of the mast out the front of the boat (as shown below). I would suggest that you use this method initially as it seems to be more convenient and takes up less room in the rigging area. This is the method I will assume in the rest of this document.



The alternative method is to lay the top of the mast out the front of the boat with the bottom end of the mast resting on the front beam (as shown below). However, this method requires more room in the rigging area and can be more difficult to achieve, so I won't reference this method throughout the rest of this document.



Either way, once in this position, the stays can then be attached to the boat.

Connect the stays to the boat

It is important that you take care when attaching the stays, as it is easy to get the stays confused at first. Take the time to trace the stay down from the hound to the point of attachment to ensure you have the correct stay rather than guessing. As mentioned elsewhere, once you've done this a few times, it will become much easier.

The stays are connected to the boat by shackling them to the chainplates. Chainplates vary in appearance, but the ones shown below are fairly typical, with most variation occurring around the number of holes in the top of each chainplate.

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The Front Chainplate will usually have two holes (as shown, but may have only one or as many as four.

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The rear chainplate may have two holes or as many as four holes. Sometimes other systems or fittings use the additional holes.

When there are two holes in a chainplate, the upper stays usually attach to the hole that is furthest from the mast (ie the front hole on the front chainplate and the rear hole on the rear chainplate). Accordingly, the lower stays attach to the hole that is nearest the mast.

If the front chainplate has only one hole, both the front upper stays and the front lower stays will have to be attached to the chainplate using just one shackle. This means you will most likely be able to attach only one of the rear stays (preferably a lower) in order to be able to raise the mast.

Rear chainplates rarely have only one hole. When there are more than two holes, sometimes the additional hole is used to attach another system to, such as the loose tail of the vang or downhaul control line (rope).

In any case, if there are more than two holes in either chainplate, you will need to determine which ones are used for the stay attachment. A good guide to this on a previously used boat is that the holes most commonly used will show signs of wear or scuffing from regular use. Some people use different holes in different wind conditions, allowing them to apply different tension to the stay by virtue of the position of attachment. Note that changing of this position should only be attempted ashore and is not allowed while racing.

For methods of attaching stays to chainplates, see the pictures of the various turnbuckle types in the first section of this document.

When connecting the stays to the boat in preparation for raising the mast, there is again more than one method you can choose from.

- **Fit all four lower stays first, and then hoist the mast.**
  - This may need some experimenting to ensure you have a suitable setting for the adjustable lower forestay. It needs to be loose enough to allow the mast to be lifted into position and into the cup on the beam. However, it also needs to be tight enough to avoid the mast leaning too far backwards when raised.
  - A possible disadvantage of this method is trying to ensure the adjustable lower forestay is not tangled when fitting it while the mast is down.
  - The advantage of this method is that once raised, the mast is already secured from falling down.

- **Fit the two front uppers and one rear lower and then hoist the mast.**
  - The risk of this method is that when the mast is raised it is still not secured and requires the other lower rear stay to then be attached.
  - Care need to be taken to ensure the lower stay you connect is not over the top of the upper stay.
  - If the boat is on any amount of slope, connect the rear lower that is slightly "uphill".

Once the appropriate stays are attached to the mast you are then ready to lift the mast into position.

You always ensure that the boat is pointing into the wind before attempting to raise the mast. This is even more critical once you begin to hoist the sail. Pointing the boat in any other direction will make the job harder and runs the risk of dropping the mast (when raising the mast) or blowing the boat over (when hoisting the sail).

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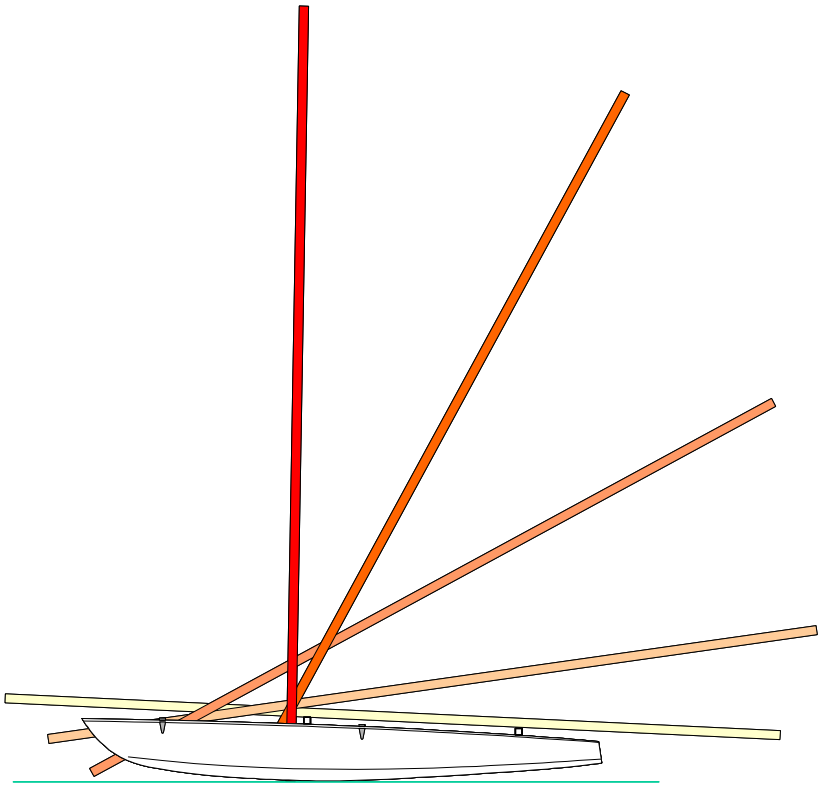
Here the sailor has positioned the boat so that it is pointing into the wind and has the mast resting on the two beams. He is in the process of attaching the front and rear lowers to allow him to hoist the mast. Note that the bottom of the mast is pointing out past the front of the boat.

Lift the mast into position

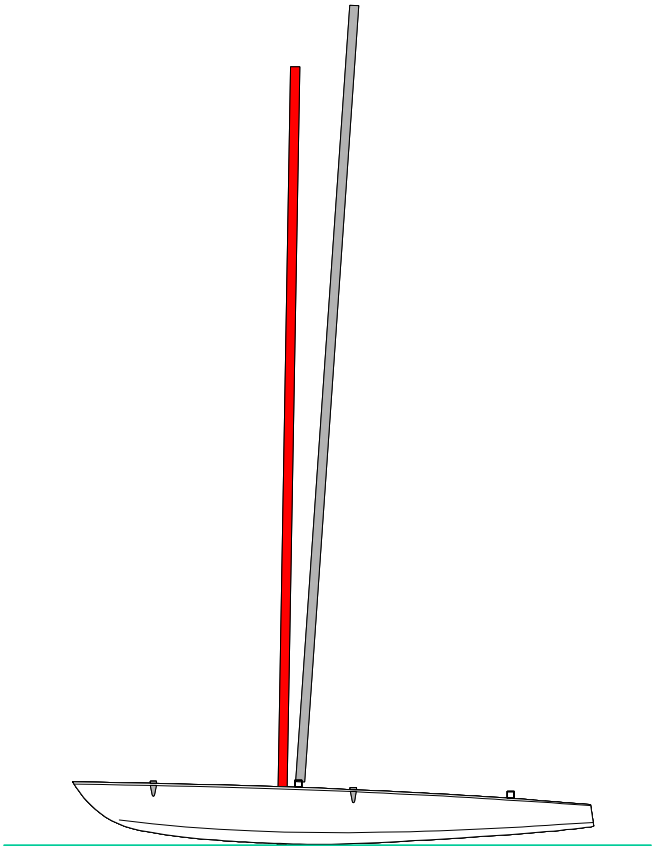


With the mast lying roughly in the position as indicated by the yellow mast (left), stand near the front beam and hold the mast so that it is fairly well balanced, usually in the area of the lower hound.

Lift the mast by pushing it away (towards the back of the boat) ensuring that you are retaining control of it at all times by holding it in a balanced way and by adopting good posture.

Once the mast is vertical, rest it on the ground just in front of the front beam, as per the red (left).

Have a look all over to ensure no stays are twisted, looped around or caught on anything.



You are then ready to lift the mast onto the beam.

Lift the mast into position taking care to ensure the pin at the bottom is correctly positioned in the cup on the beam.

Depending on the method used, you may then need to ensure the mast will not fall in the direction of the attached stays by leaning it away from them and toward the unattached stays (refer to the relevant procedure below).

Note that the mast is not able to support itself until a stay is attached from each chainplate.

Connect the remaining stays

Follow the process below (choose from the two options).

- **Fit all four lower stays first, and then hoist the mast.**
  - Ensure you have sufficient tension on the front lowers to prevent the mast falling.
  - Apply more tension to the front lowers so that the front uppers can then be attached to the front chainplates. It is important that you don't over tighten the lowers, so try a bit at a time until you are used to the amount required.
  - Attach one rear upper and then the other.

- **Fit the two front uppers and one rear lower and then hoist the mast.**
  - NOTE: Mast is still at risk of falling at this point.
  - Find the unattached rear lower and, while applying tension to it in a direction away from the mast (pull towards the side and back of the boat), step over the hull to the chainplate where it is to be attached.
  - Attach this rear lower. The mast will now be supported and unable to fall.
  - Attach one rear upper and then the other.
  - Attach the front lowers system.

When attaching the final rear upper stay (whichever method is used), if the boat has any amount of rig tension, there may be some additional effort required to get the shackle down to the chainplate.

This can be done by grasping the lower stay with one hand and pulling it towards the back of the boat. This bends the mast backwards in the middle, allowing you to reach further with the upper stay. With the other hand, guide the shackle of the unattached stay towards its hole and attach it, tightening it to finger tight. Final tightening can then be done with the shackle key either while you are still applying tension to the stay or after you have released it, depending on the rig tension.

This process of attaching the final stay can be tricky but will become a lot easier with some practice. It can be handy to have someone else around if the rig is quite tight. If it appears to be very tight, ensure no stays have become tangled in the process, preventing the stay reaching its required position. If any are tangled, you may need to undo them to rectify it. Ensure the mast will not fall down if undoing a stay. Again, having someone to assist is the best option.

Once all the stays are attached, you are ready to hoist the sail. Refer to the procedure:
"Rigging a Paper Tiger – Step-by-step Guide – Sail"

^ Here the boat has all the lowers attached, with just enough tension on the front lowers to keep the mast in position. The sailor is about to attach the other stays.

^ Attaching the final stay. If the boat has any amount of rig tension, use the method described above to help.

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This boat is pictured with all the stays attached.

For assistance with your Paper Tiger Catamaran, or suggestions for this or other Guides, please contact the Paper Tiger Catamaran International Association:
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