

# Adjustable Backstays

By Jack and Alex Wilken

Sailing is a sport, or lifestyle, really, that is about your interaction with Mother Nature. The principle element is, of course, the wind. What you present to it in the form of sail shape and relative direction to its path is what makes your boat go. Increasing the options you have for shaping your sails means making your interaction that much more personal. For that reason, this month we want to examine backstay adjusters. Those of us more dedicated to formal racing are typically more acquainted with these, but a backstay adjuster is a good addition to most sailboats. Every fractionally rigged boat will have (or should have) a means of adjusting backstay tension. Its main purpose is to flatten

and depower the mainsail in stronger winds, putting off the time at which a reef will be required. Masthead rigs can also gain advantage, since increasing tension on their backstay goes directly to increased tension in the headstay and a better set to the headsail in windy conditions.

If you sail, you could probably use a backstay adjuster. Racers will consider them indispensable, but all sailors will benefit from the ability to retune your mast in the fore/aft plane in real time. You can change sail shape and control forestay tension for improved upwind and downwind performance. With the right backstay tension, you can not only increase boat speed, but your headsail furling system will work better with a taunt headstay, and the boat's hull is happier to have excess tension on the stays relaxed when sitting at the dock. After all, tightening up the headstay via the backstay is great for going upwind, but the boat probably spends most of its time doing something else that does not require trying to turn it into the shape of a banana. The kind of tension that is necessary to keep the headstay from bowing excessively puts tremendous stress on the hull and deck. We often see boats whose hull is deformed from being under continuous strain. This, of course, could be attributed to over tight shrouds, too.

Whether your boat is a masthead or a fractional rig, good sail shape is important for both speed and handling. The headsail and the main can cause excessive heeling when going to weather if they are too full. By increasing the tension on the headstay of a masthead rig you can flatten the headsail and this will allow the boat to sail more upright. With a fractional rig you can change the shape of the main, again, allowing the boat to sail more on her lines and maybe postpone reefing. It should be noted that on many



Figure 2: Mechanical backstay adjusters come in many configurations: "A" uses a winch handle to get you plenty of leverage, and, then, when the handle is removed, you have a snag free backstay. "B" has a ratcheting handle that tucks out of the way. In "C" the wheel is snag free, but the length of the mechanical advantage is less than some others. "D" has two folding handles that are not much longer than that of "C". They all aim for snag free mechanical advantage.

fractional rigs, increasing the tension on the backstay does not increase the tension on the headstay as much (if at all), but instead changes the shape of the mainsail. The tension on the headstay on these boats is normally controlled by the runners, so a tighter headstay means cranking in on them. There are variations on the fractional rig which make the exact geometry of things differ from one to another, but that is beyond the scope of this article.

There are various ways to accomplish the job of adjusting the backstay. On larger boats, 35' plus, you can replace the backstay turnbuckle

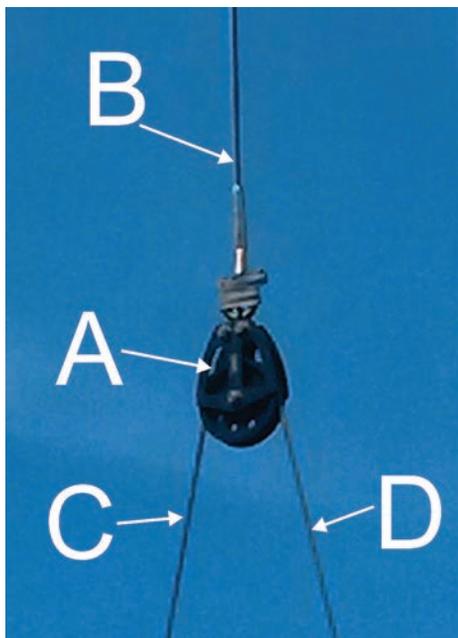


Figure 1: Mounting a hydraulic backstay adjuster on a larger ketch or yawl with the backstay "B" being split by the addition of a block, "A", that is as strong or stronger than "B". "C" and "D" are the parts of the flexible 7 x 19 wire that lead to the port and starboard rails. One connects to the hydraulic cylinder and the other directly to the chain plate.

with a hydraulic tensioner. These either have the pump integrated or is standalone. In both cases, they should be fitted with a gauge and safety valve so that you can monitor the tension, expressed in pressure, and that you cannot over tension and cause damage to the rig and/or boat. The pressure reading on different hydraulic adjusters may not translate into the same tension as it depends on interior dimensions of the pump and cylinder. It is also possible to mount the adjuster so you cannot over tension it. For this you need a rigging tension gauge you can trust. Set up the backstay so it is at maximum tension, 25% of the wire's breaking strength, and install the adjuster so it bottoms out when the backstay terminal is in this position. This may require the addition of toggles, or, if you are already shortening the backstay, you adjust

the new length to accomplish this. There is the story about the proud new owner of a new racer/cruiser who invited his friends down to celebrate. As each one drooled over all the new gadgets and sipped the bubbly, they pumped the hydraulic backstay adjuster until finally just one more pump caused the rig to collapse under the massive tension that had accumulated. Well, maybe it is just a story.

Hydraulics on ketches and yawls are sometimes mounted through a block that is high above the deck (Figure 1, page 30) on the backstay with the hydraulic cylinder mounted to a chain plate on one rail and the wire bridle terminating on a chain plate at the opposite rail. This wire bridle must be flexible, so, not 1 x 19 standing rigging wire, but, typically, 7 x 19 stainless steel wire.

Next, let us look at what is really just a special turnbuckle. These come in many forms. Some have handles which fold out to give you leverage, others have wheels, and there are those that employ a winch handle to make the adjusting easy but maintain the backstay as sleek and compact with nothing to snag on (Figure 2, page 30). These are not, nor should they be, normal rigging turnbuckles with handles. Backstay adjusters are designed to be tightened and loosened constantly under tension. The materials that they are made from and the precision with which they are made makes them suitable for their task. They can be mounted much like their hydraulic cousins. They are cheaper than hydraulics but cost in the energy you have to put into

them to tighten things up. Whichever of the above adjusters you choose, if they are too short for your present backstay, you can add a toggle or link plates, and, if too long, you can shorten your backstay and install a compression fitting with the backstay in place.

Moving on now to systems for smaller boats: The systems we are going to write about are, for the most part, simple and less expensive than the two above. They all have one thing in common; they use a block and tackle in some way, either directly or indirectly, to adjust the tension of the backstay. The indirect method is accomplished through the use of a block and tackle that pull two parts of a split backstay closer together when downward tension is applied (Figure 3). A system using the split backstay is safe in that if it fails the backstay is still intact. We do not recommend replacing

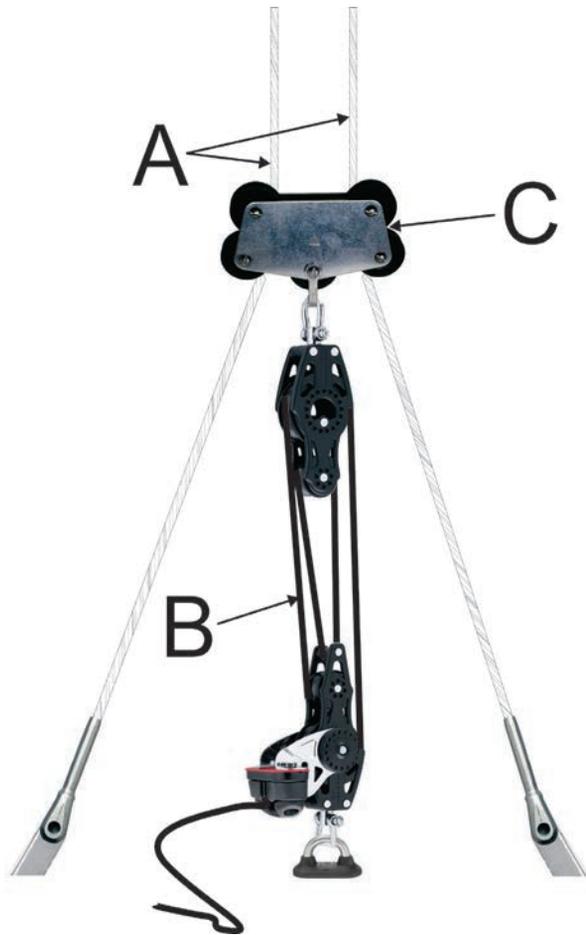


Figure 3: "A" is the split backstay on a smaller boat that can be pinched together by "C" to create more tension on the backstay. This indirect method uses a block and tackle, "B", with 4:1 advantage to pull the two parts of a split backstay, "A", closer together when downward tension is applied to, "C", a double pulley car. "C" can also be two blocks or a car with single pulleys.

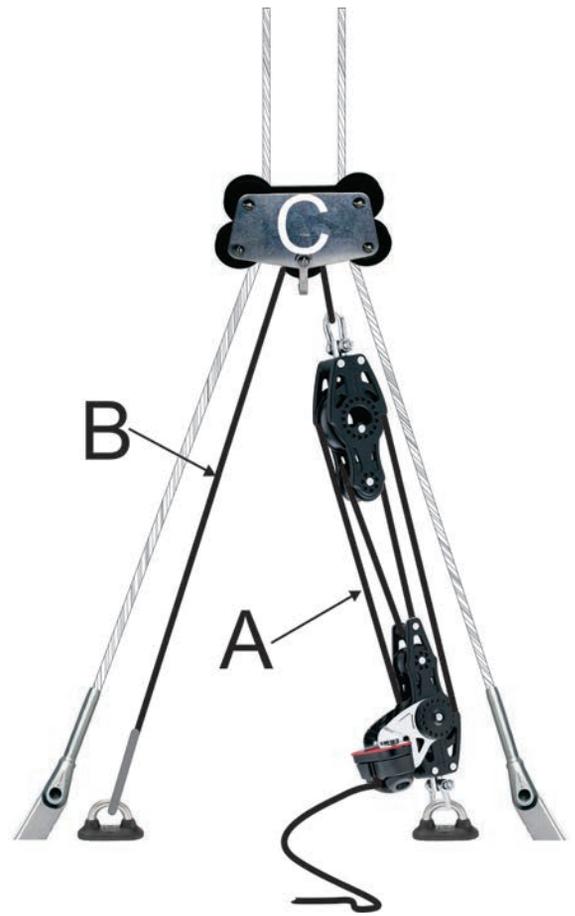


Figure 4: If you want more mechanical advantage, mount a doubling line or wire, "B", and your 4:1, "A", becomes 8:1. "C" has a pulley mounted in it, but this could be done with two blocks for the backstay parts and one for the doubling line. It does not need to be one fitting as shown here.

one leg of the split backstay with the direct block and tackle because as you tighten and loosen it, you move the masthead off center. With this method the block and tackle are connected to two pulleys, each of which has one of the parts of the split backstay running through it. As these two pulleys are drawn downward, they draw the two parts closer together thereby increasing the tension on the backstay. There are many configurations for this: usually, they employ from 4:1 to 8:1 advantage. As you pull down, especially, if the split starts too close to the deck, the force needed to draw them together

increases enormously, so you may need more mechanical advantage. If you started with less advantage, it is easy to compound it by using a doubling wire (Figure 4, page 31).

The direct system is a block and tackle that is part of the backstay and so by tightening or loosening it, the backstay is affected directly. The direct method, where the block and tackle replaces the turnbuckle, is typically from 6:1 to 12:1 advantage. In both systems the adjustment can be held by a cam or jamming cleat. This should all be within easy reach of the helmsman whenever possible.

One consideration on this design that replaces the turnbuckle is that there needs to be a knot or some limiter as to how much line can be let out so that the backstay cannot become dangerously slack. Since the block and tackle do not provide the same level of security for the backstay/mast as the turnbuckle, it is prudent to have a safety strap, line, or wire that would come into tension should the block and tackle fail. The blocks and line that you are going to use need to have a breaking strength equal to or greater than the backstay and should be low friction so the system works with as little effort as possible.

Adjustable backstays increase performance, comfort, and safety. Performance and comfort in this case go hand in hand as having the best performing sail shape also means the boat will heel less going to weather. Off the wind this should decrease weather helm so the boat will steer easier in both situations. When tuning the rig, if you have a backstay adjuster, make sure the mast can move fore and aft and stay in tune with the masthead in different positions. This usually means the aft lowers must be slacker with the backstay tension eased.

The tension on the headstay, backstay, and mast position or bend are not the only factors in weather and lee helm or boat performance or speed, but control of backstay tension is a big factor, and it affects the other factors. It is possible to put too much tension on the backstay, so whatever type of adjuster you install, do it in such a way that this cannot happen. Do not exceed 25% of wire breaking strength in any case. If you do not feel confident to do this installation, contact a local rigger. The backstay adjuster is all about being able to change the backstay tension at a moment's notice and without the use of tools. Not leaving your boat in a condition of over tension at the dock is something that is often overlooked. So, release your tension by having an easy way to adjust your backstays.

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