

Boat Clinic

Tuning the Masthead Rig

My father was a rarity: he really did not care at all how well the boats he sailed performed. Perhaps this was because, in his youth and young manhood, he had been both a tremendously aggressive and a wonderfully successful athlete and thus had wrung out his competitive needs. Perhaps it was because for him the water and sky, wind and weather were more important than the boat. But, whatever the reason, Dad was a rarity. Most of us — whether day sailors, racers, or cruisers — value good performance. We like our boats to sail reasonably fast, and we like the helm to be light and responsive.

Tuning the rig of a boat is one of the necessary — and pleasant — tasks which must be done to achieve good performance. In an untuned boat, the mast bends in odd ways, and this in turn causes the sails to set badly. By contrast, on a well tuned boat, the rig bends in a controlled fashion, allowing the sails to do their best. For this reason, an avid racer will be constantly fiddling with the tune of his boat, while for most of us a one time job during commissioning may suffice.

The first thing to realize is that for a mast to stand well, it should not be straight when in a static, no load situation. This was something I realized nearly thirty years ago when conventional advice was to tune rigs so that masts were indeed straight when static, and while that advice is still sometimes given, most of the sailing world has realized that a controlled static bend is needed.

The problem with a statically straight mast is that when loaded, it is too easy for the mast to invert, or bend backwards (fig. 1). This can happen when the boat is beating in a seaway or reaching with the spinnaker pole up. Most mast sections can accommodate a significant amount of forward bend without failure, but very little aft bend.

An afternoon spent on a poorly tuned boat a couple of seasons ago

left me a nervous wreck. Each time the boat came off a wave the mast pumped and wriggled so much that you could see it changing shape from the tiller. The owner, happy man, was ignorant and oblivious to the danger of losing his rig.

In contrast, if you set up the rig so that it has “prebend”, that is, the center of the mast bends forward when in a static condition, the loaded mast will flex in the proper direction. What flex there is will then tend to flatten the main, rather than bagging it, and the boat should balance better, particularly in heavy air, when most boats start to develop helm problems.

The first job is to get the mast straight athwartships. Leave the lower shrouds hand slack during this procedure. Use the main halyard as a measurer. Take the shackle end of the halyard a measured distance aft of the bow along the gunwale, then have someone take up the slack while you hold the shackle firmly to that point. Cleat off the halyard.

Then take the end of the halyard to the same point on the other side of the boat. If the mast is straight athwartships, the halyard shackle will just kiss the same point on the gunwale on either side of the boat.

Because chainplates are rarely put on perfectly symmetrically on the two sides of the boat, it is best to go to the trouble to measure back from the stemhead on each side for your reference mark, rather than using the chainplates as the reference.

If the halyard doesn't touch the same point on both sides of the boat, adjust the cap shrouds (upper shrouds) until the mast is straight. Be sure to loosen one side as you tighten the other, and sight up the mast to make sure that you haven't put any sideways bend in. The sailtrack should be straight athwartships when you sight up the mast, unless it has been put on crooked.

It should be noted that if your deck is slightly crooked — a fairly com-

mon problem — the mast may not be perfectly centered athwartships in the partners when it is vertical to the hull.

Don't attempt to make the mast vertical by putting a level on the side of the mast. Almost no boat floats without a list to one side or the other, and your weight alone is enough to put a slight list on a surprisingly large boat.

At this point, on boats up to about 35', the cap shroud turnbuckles should be hand tight. What's hand tight? Just what it says: as tight as you can get a well-lubricated turnbuckle with your bare hands. Later, when testing under sail, you'll find the leeward shrouds slopping around by a few inches; then, and only then, you can take the slack out of the leeward shrouds. If you have absolutely no slack in the leeward capshroud when the boat is going upwind in 1.2 knots of wind, the shrouds are probably too tight for most boats.

Next set the rake of the mast using the fore and back stays, again only hand tight. If you don't know from experience what the proper rake should be, begin with a modest rake of no more than the fore and aft diameter of the mast. Use the main halyard as a plumb bob. Later you may wish to modify this rake. Utilize the facts that increasing mast rake

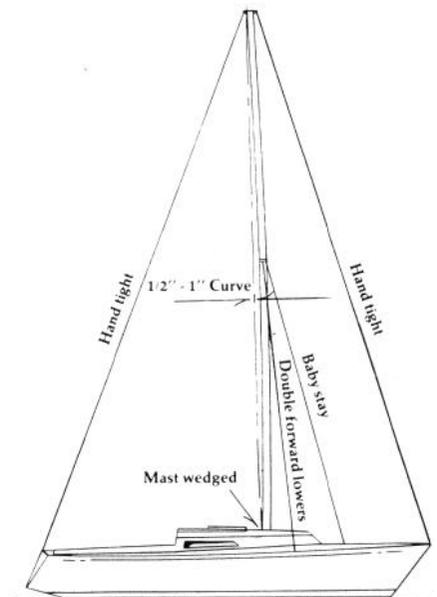


Figure 1:

Pre-bend the mast slightly before loading the headstay and backstay

and/or moving the mast aft increase weather helm, while decreasing mast rake and/or moving the mast forward decrease weather helm.

Now that the mast is properly straight athwartships and properly raked, it's time to start the controlled bends. These are accomplished with the forward lowers, babystay, backstay, and mast wedges. Whether your boat has double forward lowers or a single, centerline babystay doesn't matter. Both systems accomplish the same end.

First, take up the babystay or double forwards until you've pulled a forward bend of 1/2" to 1" into the middle section of the mast (Fig. 1). Again use the main halyard — this time pulled tight against the lower, aft edge of the mast — as a measuring reference. If using double lowers, make sure the mast remains straight athwartships.

Next crank up on the backstay until you've got a curve in the mast equal to 1/2 to 1 times the fore and aft dimensions of the mast (Fig. 2).

Finally, take up the aft lowers hand tight.

If your mast is stepped on the keel you need at this point to wedge it at the partners. Wooden wedges are easiest to make, but they can dent an aluminum mast if the shrouds are set so loosely that the mast leans to

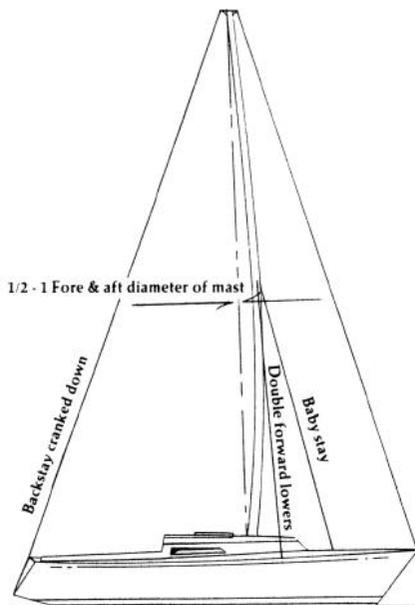


Figure 2:

The full amount of pre-bend won't be apparent until backstay and headstay are fully loaded

leeward significantly when sailing upwind. A fairly firm rubber wedge works better with looser rigs, and is probably the safest to use. Rubber wedges are usually harder to make, however.

Your boatyard or chandlery may sell special rubber for mast wedges. If not, try to buy something in the nature of thick inner tubing. In a real pinch, sections cut from old auto tires will do, but will have to be rasped to thickness. Don't use a foam material; it's too soft. You'll need two wedges, one fore, one aft. The width of each should be about 35% to 40% of the mast's circumference. Thus, they'll curve around both the front and sides of the mast. Since the rubber wedges must be under compression, their thickness should be slightly greater than the gap they need to fill. You may have to cement together several layers of thin rubber to achieve the proper thicknesses.

The first step in wedging is to trim the wedges so they do not push the mast out of column sideways. As noted earlier, many decks are slightly off center, so there may not be equal space on both sides of the mast, even when it is in the proper position.

When the wedges are properly trimmed for the sides of the partners, you are ready to insert the aft wedge. To support the prebend, put a line around the mast a foot or so above the partners, and run it forward to a fixed point — a snatch block on a mooring cleat or a bridle between the cleats — then aft to a cockpit winch. Now slip the aft wedge into place. Release the load on the line, and insert the forward wedge. A little soap on the wedge will ease a tight fit.

Now you're ready for a sailing trial.

Choose a day when you can comfortably carry a genoa. About eight to 15 knots of wind will do for most boats.

Put the boat hard and full on the wind and check the mast. It should be retaining the same fore and aft curve you put in while tuning. If not, adjust the babystay or forward lower shrouds. Next check the athwartships shape of the mast. It should be straight. Any necessary adjustments should be carried out with the leeward shrouds, then the boat should be tacked to check the effect of the adjustments.

If the mast is straight athwartships, tack and hand tighten all the leeward shrouds by an equal number of turns. If the center of the mast bends to

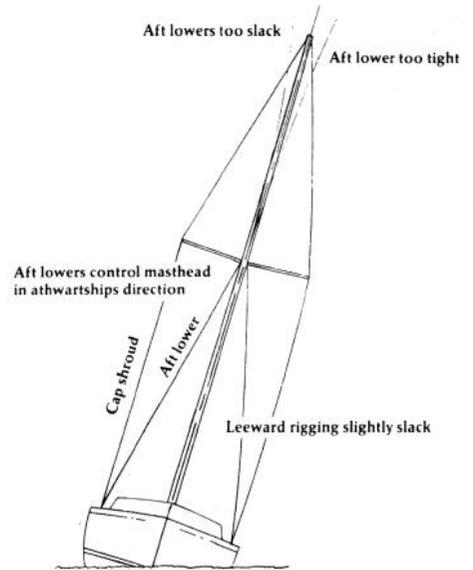


Figure 3:

The mast must be checked for straightness when sailing upwind. Fine tuning may be required here

weather, tighten the capshrouds more than the lowers. (Fig. 3) If the center of the mast sags to leeward, tighten the lower shrouds more than the capshrouds.

You should also check the athwartships bend of the mast in varying wind strengths, adjusting the aft lowers until you've achieved the best compromise between a straight mast and one which falls off or hooks. A masthead which hooks to windward should be avoided.

When, after a few sailing trials, you're satisfied, pin the turnbuckles, then tape everything that could catch a sail or sheet.

We've dealt with what might be called traditionally rigged masts, those with spreaders which sprout essentially at right angles to the mast. Nothing we've said, however, isn't also true of fractional rigs with aft raked spreaders. The only difference is that on such a rig the cap shrouds, as they load up, work on the spreaders to increase forward mast bend, but that's all to the better.

— J. Pazereskis