Kemp Sails

Tuning the masthead rig

Rig tuning is an essential but often overlooked aspect of boat ownership. Not only will your sails be unable to work efficiently if the mast is leaning over sideways and bending the wrong way, but insufficient rig tension places unfair stresses on the mast, terminals and standing rigging. Many cruising sailors are frightened of winding their bottlescrews down as tightly as they should - believing that slack shrouds are kinder to the boat - and are consequently running a far greater risk of rig failure.

Fortunately, the principles of tuning are simple. Once you've applied them to your boat, you'll have better-setting sails with all the associated benefits - more speed, better balance, improved pointing ability, less heel and, significantly, a safer, longer-lasting rig.

Getting started

To do its job properly, the mast must be straight and upright athwartships. The right amount of rake and pre-bend are important too, to balance the helm and ensure efficient sail shape. Finally, adequate rig tension keeps the mast where it ought to be as the wind builds. It also reduces the damaging "snatch-loading" in a seaway that's a principal cause of rig failure. These principles apply to virtually any boat with a stayed mast, and though we're going to concentrate on the most popular type of masthead rig found on smaller boats - with a single set of spreaders and either fore-and-aft lowers or a babystay - we'll also touch on the subtleties of double-spreader rigs.

The right amount of rake

Rake is often associated only with racing yachts. In fact most boats perform best to windward with a few degrees of aft rake, though it's true that racing sailors generally prefer a little more than their cruising counterparts. As a rule of thumb, start with around 2º, measured at the gooseneck with a weight on the end of a halyard and the boat level on her lines. Since 1º is 1 foot in 60, 2º of rake on a 30 foot mast is 12 inches.

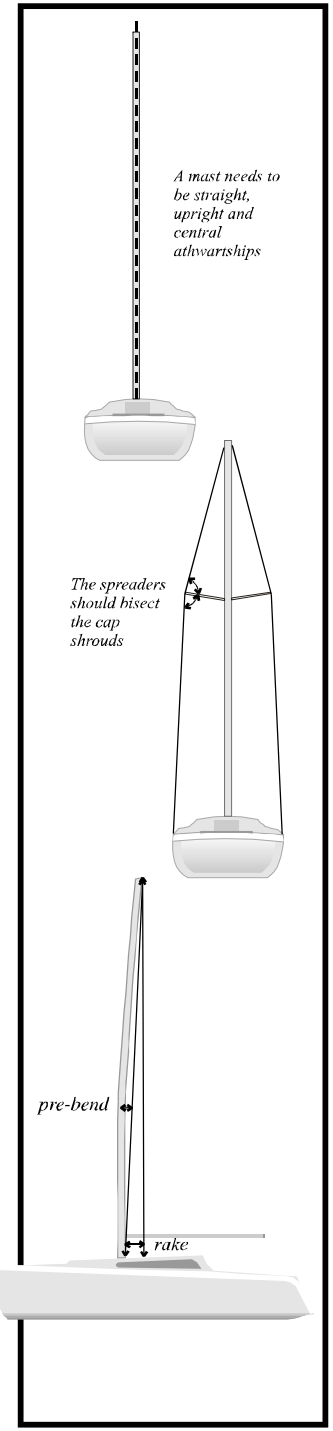
If you have a bottlescrew or rack adjuster on the forestay, you can experiment with different angles; it's the forestay's length that determines rake. You'll know that you've got it right when, sailing upwind under full sail in about 12 knots of wind, you're just beginning to feel a little weather helm.

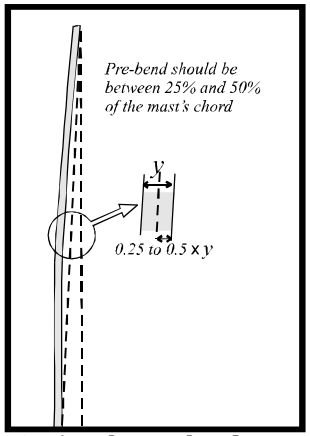
Angles aloft

Before you progress with setting up the rig, make sure that the spreaders bisect the cap shrouds. This means angling them slightly upwards towards the tips, which should be prevented from slipping down by, for example, a swaged fitting around the shroud. Droopy spreaders can lead to mast failure.

Standing straight

With the forestay set to the right length, check that the mast is upright athwartships: tighten each cap shroud by hand, then take a halyard from a central sheave to a fixed point on each side of the boat, like a chainplate or stanchion base. The same amount of tension on the halyard should be needed to make it touch both sides. You can normally feel this reasonably accurately by hand, but use a spring balance for greater precision. Like the rest of the tuning process, this is best done on a calm day. If the masthead is off-centre, adjust the cap shrouds until the halyard test tells you it's in the middle.





Tuning to perfection

With the mast upright and the rake set, it's time to tension the cap shrouds - but just how tight should they be? The answer is probably much tighter than you think! It's almost impossible to over-tighten the rigging using hand tools less than about 18 inches long, and in most cases it'll feel tight before you've reached the tension you're aiming for - about 15% of its breaking strain. If you're worried about straining the boat, bear in mind that the tension you apply on the mooring will be nothing compared with that taken by the rig when the boat starts heeling. The best way to see if you've got it right is to check under sail, as we'll discuss later. In the meantime, take the same number of turns on each bottlescrew to tension the caps equally before turning your attention to the lowers. Their purpose is to support the middle of the mast and determine the pre-bend - the slight forward curve your sailmaker will normally allow for when cutting the mainsail, and which ensures that the mast bends in the right direction when you apply backstay tension. An "inverted" bend is both dangerous and highly inefficient.

Setting the pre-bend

As a rule, the amount of pre-bend should be between 25% and 50% of the mast's chord (i.e. its fore-and-aft length) - a distance that can be judged from the deck if you pull the main halyard tightly down the gooseneck.

Tensioning the backstay first will make setting the pre-bend easier, then take up the forward lowers to put in a little more bend than you want. As you go, make sure the mast remains straight athwartships by sighting up the luff groove; any bends or kinks can be removed by balancing the turns on each bottlescrew. Next, take up the after lowers to remove some of the pre-bend, then add another turn or two on the forward pair to ensure that they're tighter than the after set, whose principal job is to limit the amount of bend when the backstay is wound down to its maximum. Finally, release the backstay to its normal position and check that enough pre-bend remains.

Checking afloat

Choose a day with flat water and about 15 knots of wind. With the boat sailing close-hauled under full sail, the leeward cap shroud should still be hand-tight; if you can easily deflect it more than an inch or two with your finger, take a couple more turns on the bottlescrew before tacking and doing the same the other side. Check and repeat as necessary, always adjusting the leeward (unloaded) bottlescrew.

Now look up the luff groove for kinks, removing them by adjusting the lowers. Remember that a slack lower on the weather side lets the middle of the mast fall away and makes it look as though the masthead is curving to windward.

Another check is to tension the backstay. This not only tightens the forestay to flatten the genoa as the wind builds, but bends the mast a little further to de-power the mainsail. If the mast bends too much, take up the aft lowers. With a double-spreader rig, treat the intermediates like the lowers to remove any kinks or S-bends. They should be tighter than the lowers but slacker than the caps.

Additional pointers

- New rigging stretches - check it after a few hours' sailing.
- Grease bottlescrews before adjustment.
- Make sure the mast doesn't bend aft in the middle when the mainsail is reefed.
- With a keel-stepped mast, remove the wedges from the partners before tuning.
- Treat a babystay like the forward lowers.
- Swept-back spreaders on modern rigs will induce pre-bend as the caps are tensioned. Intermediates will reduce pre-bend at the upper spreader level.
- Lock the bottlescrews with split pins and tape over them after adjustment.
- Many modern masthead rigs with swept-back spreaders and thin mast sections are tuned more like fractional rigs - see our fractional tuning guide.

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