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### **WHAT IS PREBEND?**

Most everyone has heard of prebend, but most everyone has a difficult time defining the term. Simply put, prebend is the amount of bend induced into the mast after the backstay (or runner) is tensioned just enough to straighten the headstay. The amount of the prebend depends on several adjustments that will be examined in detail.

### **WHY DO WE USE PREBEND?**

There are several reasons to use prebend. The main benefit of prebend is to “match” the mast to the luff curve of your mainsail. If the prebend and luff curve are in sync, then the mast/sail combination will have a wider wind range potential. Net net is more speed. Another benefit of prebend is a more stable mast. In the early 80’s when the babystay was eliminated from most racing rigs, prebend became a necessity to keep the masts in the boat. The combination of low bend (prebend) and compression bend generated by backstay loads. Produced a stable rig. Basically, bent masts are more stable (pump less) than straight masts.

### **HOW TO DO IT:**

#### **KEEL STEPPED MASTS WITH STRAIGHT SPREADERS**

Three adjustments effect the prebend with this type of rig.

1. **HEADSTAY LENGTH-** This is the easiest way to change the prebend in your mast. Most headstays have turnbuckle adjustment. To increase prebend, simply lengthen the headstay by opening the turnbuckle more. Conversely, if your mast is over bending because you have too much prebend, tighten the turnbuckle to reduce prebend.

If, however, the balance of your boat is critical to exact mast rake, you should fix the length of the headstay and use a combination of the following adjustments to change prebend.

2. BUTT POSITION – No this is not where your crew sits on the rail. Butt position relates to the location of the mast step. Most mast steps have for and aft adjustment slots to facilitate adjustment. With the mast fixed at the deck with the wedging (preferably high durometer neoprene), a slight movement of the butt of the mast can change your prebend. When headstay adjustments are usually in increments of inches, butt adjustments are to be done in millimeters (or fractions of inches for those metrically challenged.)

To put things in perspective, if your mast bury is 6 feet (this is about average), your mast extends 45 feet above the cabin top, your fore triangle base is 14 feet. The effect of moving the butt back 1/2" is equivalent to lengthening the headstay 1-1/4 inches. Making this adjustment is not as easy as turning a turnbuckle. You should slacken your rigging (easy if you have a hydraulic step, but a pain if you do not), loosen the bolts in the step, and push or pull the butt to the desired location. This is easier said than done, especially if the mast is captivated by a small head compartment. You may have to resort to a 4 x 4 and a big hammer to "finesse" the mast step forward or aft. If you are sailing in a class, check with the fastest boats in the fleet on their butt position and headstay length. At least you will start off in the ball park and can tweak from there.

3. DECK POSITION – This is the third method to adjust prebend. Generally, the mast is chocked with wedges to position the mast to the designed (or rated) "J", you can re-arrange your wedging to change prebend. Moving the mast forward at the deck increases prebend just as lengthening the headstay or moving the butt aft. If you have an oval mast collar, moving the mast will necessitate "fashioning" your mast wedges to fit the new position. If you have a rectangular collar (more prevalent on custom race boats) the mast wedging process is much easier. Thin wedges (3/16" to 1/4") can be moved from the front of the mast to the back easily. The main hassle with changing the position at the deck is dealing with the mast boot, silicon seal and cranky mast wedges.

### ***MASTS WITH SWEEP SPREADERS***

Following the basic steps of headstay length, deck and butt position, you can adjust the prebend on a mast with swept spreaders. Prebend can also be induced by increasing the tension on the upper shrouds. Tensioning the lower shrouds will reduce prebend. If your mast is deck stepped, the only method of inducing prebend is by having swept spreaders or by using techniques described below.

### ***DECK STEPPED MAST WITH IN LINE SPREADERS***

Inducing prebend with a mast of this type is a bit more subtle. The only way to do this is to have the mast securely fastened to the mast step so that it cannot rock on the step. By doing this, the mast will act in a similar fashion to a keep stepped mast. Changing the headstay length or the angle cut of the butt of the mast will alter prebend. Again, lengthening the headstay will add or induce prebend.

If you trim the bottom of the mast shorter on the front edge, the relaxed mast will be leaning forward slightly. When you tension the backstay so the headstay becomes straight, the mast will then have prebend in it.

This is not recommended unless you are fairly sure of the results. Once you have cut the mast, you cannot go back without shortening the overall length of your mast.

## **MAKING USE OF PREBEND**

### **MAST STABILITY**

It is desirable to have some prebend simply for mast stability. Rigs with inline spreaders, inline lower shrouds and no babystay rely on prebend for fore and aft stability. Pumping is reduced with proper prebend and total mastbend. The size, shape and wall thickness of your mast section also are key factors in rig stability, but are something you can not change unless you replace your mast.

### **SAIL SHAPE/ BOAT SPEED**

The most important use of prebend is to match your mast to your mainsail. If you sail in a class that has an optimum rake and prebend, your sailmaker will construct a mainsail with a luff curve and an over all design to match this mast bend curve. If a main is built with too much luff curve, the sail will be too full in medium to heavy air conditions and cannot be de-powered. A main with too little luff curve will “blade out” too early when backstay pressure is applied. Ideally, a main will be deep and powerful with light backstay tension and flatten as more backstay pressure is applied. At full backstay the sail will be bladed out and de-powered.

Assuming your mainsail is built with the proper luff curve to optimize the speed and versatility of the sail, your prebend should be adjusted to best match the sail. For instance, if the lower portion of the main is too flat in medium air conditions, try reducing prebend by any of the methods discussed earlier. Working closely with your sailmaker to “match” the sail and mast bend will mean more speed on the race course.

To have consistently good boat speed through a wide wind range, you must shift gears to change sail shapes to suit the wind and wave conditions. If your sail and mast are “in sync” the sail shape transition is almost automatic simply with backstay tension, If your sail and mast combo are not in concert, you will “grind” your way through the wind range with less boat speed. Bottom line is – spend time getting your prebend right.... the results are dramatic on the race course.