

MAXIMUM SAIL POWER

CHAPTER 7

THE DEVIL IS IN THE DETAILS - Part 2



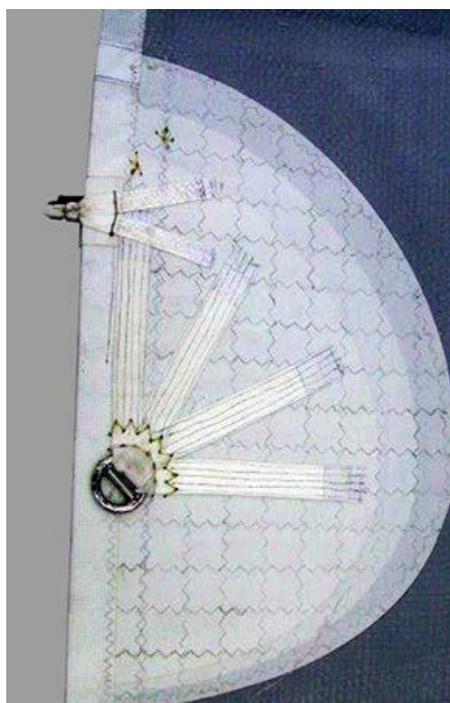
MAINSAIL DETAILS FOR THE CRUISING SAILOR

It used to be simple. In the old days your sailmaker offered you one kind of mainsail and sailors were generally happy with the result. You got a sail with a moderate roach, four battens to support that roach, a few reefs and some sail trim devices like a cunningham and flattening reef. Today, mainsails seem to come in all shapes and sizes with a wide variety of options: You can get a “regular” mainsail with short battens; a full-batten mainsail or a 2-plus-2 mainsail with two full-length battens up

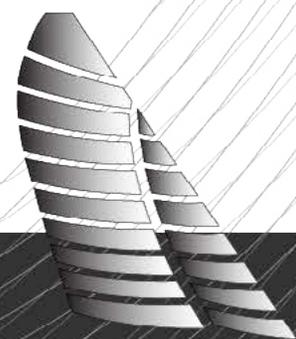
high and two regular-length battens down low; a mainsail that rolls up into the mast or a mainsail that rolls into the boom; a mainsail with a small roach, a moderate roach, or a massive roach like those found on performance catamarans or many offshore solo racers; a mainsail with inflatable battens, vertical battens, or battens that “swing away” when not needed; or a mainsail with a single “conventional” reef, a single deep reef, or two or even three reefs. You can also have a flattening reef, overhead leechline, double overhead leechline, a cunningham, and either a loose foot or a foot shelf. And then there is the issue of whether to go with or without a headboard and the question of luff attachment hardware. If all this is starting to sound like something from Dr. Seuss—you have them with a luff, you can sail them in the buff—my point is that the options are almost infinite. Your problem is to decide what kind of mainsail is right for your particular sailing application. Before we look at the different mainsails and compare their strengths and weaknesses, let’s look at some of the features that come standard with most mains.

The Cunningham

Located a small distance up the luff from the tack is the cunningham, generally a pressed-in ring reinforced with webbing straps that is used to adjust the amount of



tension on the luff of the mainsail, which in turn controls the location of the camber in the sail. You can also use the main halyard to adjust luff tension, and indeed some racing sails on smaller boats no longer have cunningshams. But it is easier and less likely to cause a problem if you take up on the cunningham, since among other things, adjusting the luff with the halyard requires a lot more tension, not only because you have to raise the whole sail fighting against gravity and the tension of the mainsheet, but also because there is friction in the luff attachments. The



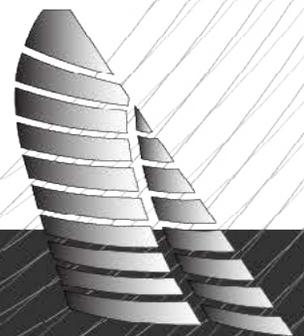
compression load exerted by the main halyard on the mast is also something many sailors wish to minimize. In short, feeding a line through the cunningham ring achieves the same results as taking up on the halyard without the complications.

Foot Shelf

The foot of the sail is one of the most versatile edges of the sail when it comes to manipulating sail shape, since small adjustments can make big changes in the overall depth of the sail. In moderate winds or choppy conditions you can ease the foot out to add shape to the bottom of the sail, thereby providing more power. Or you can tighten it up to flatten the sail in either light air or heavy conditions. The foot shelf is shaped like a lens and once you pull on the clew it collapses and flattens out, pulling down on the middle part of the sail, removing shape from the bottom of the sail and flattening the overall profile. Many conventional mainsails are still attached to the full length of the boom by a foot shelf. And in fact, old sailing rules such as the IOR rule dictated that the sail had to be attached to the boom using either a bolt rope or slides, but that has changed. With more modern booms and hardware it's no longer necessary to have the sail attached unless you are a cruising sailor that plans to use the foot shelf for collecting rain water. Not only that, modern sailing rules like IMS and PHRF no longer require the sail to be attached to the boom, which has resulted in many more mainsails being loose-footed, that is they are attached at the tack and the clew only. This allows for more versatility in the sail and omits a potential problem area, i.e., the foot attachment. In the past the bolt ropes would chafe through and slides break allowing the sail to rip free. Today, simply applying tension to the outhaul achieves the same result as collapsing a foot shelf. Many sailmakers still add a piece of light, lens-shaped fabric to the foot of these loose-footed sails, but this only serves to add sail area when sailing downwind. Once the shelf is not needed it can be rolled up and secured with a light Velcro strap.

The Flattening Reef

This "reef" is found only on cross-cut sails and is located a short



distance up the leech from the clew. When cross-cut sails are designed they have a very important seam originating just above the tack of the sail called a “tack seam” that runs perpendicular to the leech and plays an important role in adding shape to the sail by feeding a large amount of sail shape into the body of the sail. Once you take up on the flattening reef by winding up on the reef line, it cinches the leech and effectively removes the tack seam from the overall shape characteristics of the sail. Once the tack seam is removed, the rest of the sail is much flatter and more appropriately shaped for stronger winds.

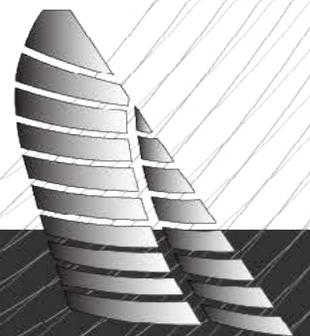
Edge Treatment

In years past sailmakers would simply table, or fold over the edges of sails and sew them down in order to keep them from fraying. These days, however, the edges of the sail are trimmed with fabric, usually a single or double Dacron tape, which serves to finish the sail cosmetically and add some stability to the edges of the sail. The tapes are also there for strength, and it's often the size and number of tapes on a sail that indicate the quality and durability of that sail. Most boats up to 40 feet, for example, will have a single tape running around the sail. But above 40 feet there should be a second, larger tape sewn under the first one, and if the sail is being built for offshore passagemaking, then boats as small as 32 to 35 feet might have a second tape around the edges. These tapes are also for housing leechlines.

Leechlines

Wind exiting a sail creates small vortices, and these vortices can set up a reverberation along the leech causing the leech to flutter. Although the leech tape goes a long way toward solving this problem, on most boats you will still need a leechline installed down the very edge of the sail, i.e., a small-diameter, low-stretch line that can be adjusted and fastened off in heavier conditions.

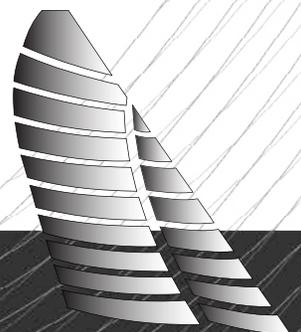
This way, when the wind increases and the sail begins to flutter, all you have to do to correct the problem is tighten the leechline. In light winds it can be eased off again so that the extra tension won't



cause the trailing edge of the sail to cup inward when there is less pressure on the sail. On small boats where the boom is easy to reach, the adjustment for the leechline is normally at the clew of the sail. But on larger boats where trying to make an adjustment at the clew would be impossible or impractical, the leechline is fastened at the clew and led over the top of the sail and down a pocket along the luff to an adjustment point at the tack. This way you can make the necessary adjustments safely and conveniently. A leechline installed using this arrangement is called an overhead leechline. Some larger yachts will even have double overhead leechlines, one running down either side of the sail. This way you will always be able to make an adjustment from the windward side of the mast instead of having to reach around to the low side on a sloping deck. With this setup you will also have a backup in case one of the leechlines fails.

Reefs

The size and number of reefs you need depends on your boat and the type of sailing you plan to do. There is really no point in having three large reefs in your mainsail when all you do is daysail on Long Island Sound since the winds are rarely that strong and there are plenty of places to find shelter in the event of a blow. The reef points add weight to the sail and expense. On the other hand, if you are heading for the open ocean you need at least two, if not three, reef points in case of severe weather. In fact, it would be poor seamanship to attempt an ocean crossing with a single reef. There are also other variables that need to be taken into consideration, for example, the stability of your boat and the way you like to sail. Some boats are very tender, i.e., they heel over easily, in which case a second or third reef would be important. Some sailors like to keep their boats on an even keel even when it is not blowing hard, so additional reef points will be important to them. No matter your preference, you need to remember that the reefs add weight to a sail, especially along the leech where it will affect your light-air sail trim. They also add cost to the sail. Making the reef patches and sewing them onto the sail, plus the tie-down patches running across the sail, requires time, effort, and additional materials.



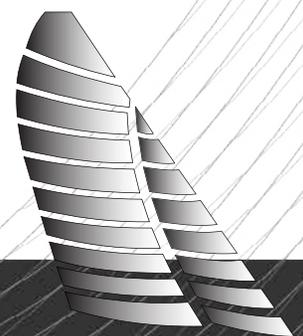
Finally, bear in mind that the size and number of reefs in your mainsail will be influenced by the basic design of your boat and its sailplan, in the sense that the designer has planned the rig in such a way that you can reduce sail while keeping the center of effort where you want it relative to the keel. In other words, each sail change or reef is calculated to keep the boat balanced. Some boats, for example, need a number of small reefs in the main to compliment the reduction of headsail size, while others, usually sea-kindly cruising boats, are not as affected by balance, so large reefs are quite acceptable. Most offshore cruising sailors will tell you that they like the first reef to be deep, since when the time comes to take off sail area, they really want the boat to feel the difference. But many racing sailors, especially those who race inshore, prefer smaller reefs because a small reduction in sail area will allow them to keep their boats from being overpowered without slowing them down appreciably. In fact, many racing sails do not have any reefs at all. These sailors prefer to change headsails rather than reef the main because the result is a more efficient sailplan. They are also able to depower the mainsail in other ways, for example, by bending the mast, until the next mark rounding when they can change headsails. Knowing your boat and knowing your sailing plans will help you decide just how large each reef should be, how many you need, or if you need them at all.

Battens

Battens are another area of considerable debate among sailors with the result that it often comes down to personal choice. If you already have experience with and are comfortable with a certain batten configuration, then maybe that's the best solution for you. On the other hand, you may want to consider other options.

Conventional Battens

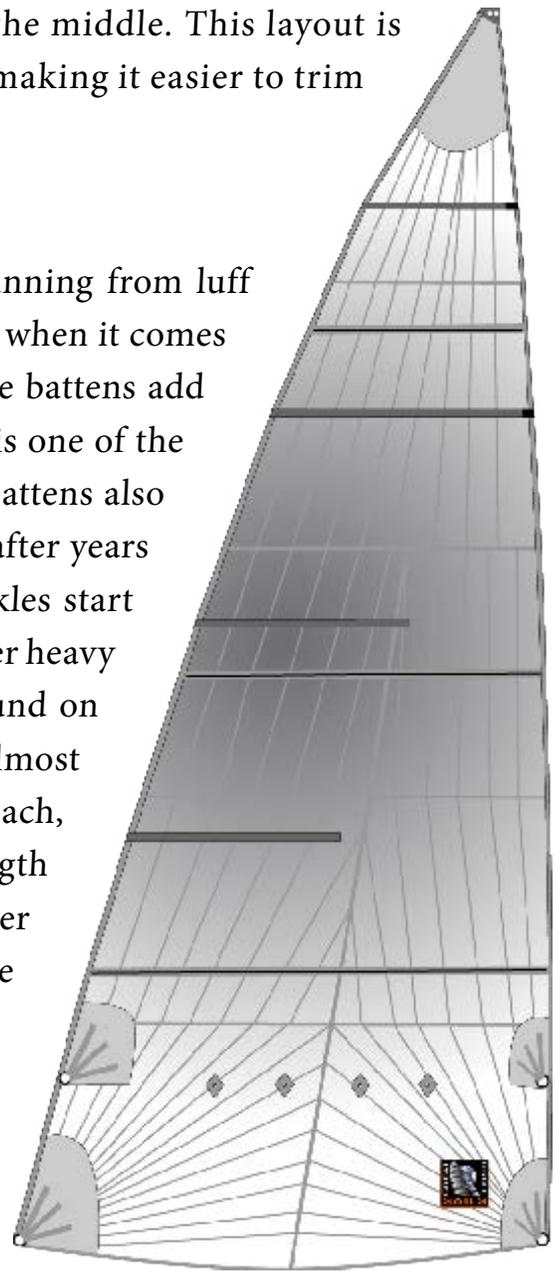
The simplest batten layout is one with four short battens equally spaced along the leech, with the length of the battens dictated by the amount of roach the sailmaker is attempting to support. As a general rule, the batten length is the amount of roach, times two, plus a little bit extra. Because there is less roach at the top and at the bottom of the



sail, these battens will be shorter than the two in the middle. This layout is not only the least expensive, it is also the lightest, making it easier to trim the sail in light air.

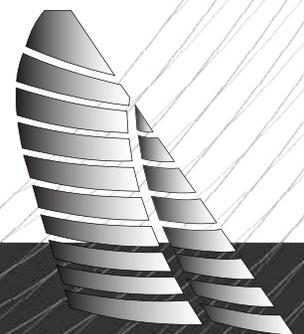
Full-length Battens

Full-length batten mainsails have all the battens running from luff to leech. There is one important thing to remember when it comes to battens: they will extend the life of your sail since battens add support to the fabric and dampen the flogging that is one of the principal causes of fabric degradation. Full-length battens also assist in keeping the shape of the sail looking good after years of service, whereas with conventional battens wrinkles start to appear at the inboard end of the batten pockets after heavy use. Mainsails that have a large roach like those found on Open Class race boats or cruising catamarans almost always have full-length battens to support the roach, especially near the head. On the down side, full-length battens add weight and cost to a sail, so the number and spacing should be judiciously considered. One possible solution is a 2-plus-2 arrangement with two full-length battens up high and two longer-than-normal battens down low. This gives you the support and sailhandling benefits provided by full-length battens, i.e., support for the roach up high, while avoiding weight and expense in other areas. Full-length battens also present a problem when sailing downwind, especially if the boat has swept-back spreaders, since when the sail lays up against the shrouds and spreader ends the hard spot created by the battens rubs up against an equally hard spot on the rig, which leads to chafe.



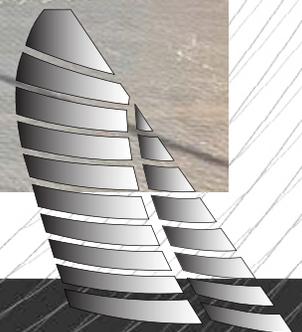
Two full length - two standard length

Another drawback of full-length battens that you should be



aware of is the fact that they can dictate sail shape in light air since they are not very responsive to standard sail shape controls like mast bend and adjusting the cunningham. This can especially be a problem if the battens are not properly tapered or are more rigid than they need to be. Let's say, for example, that you are sailing through a moderate chop and want to add depth to the lower third of the sail. Normally you would do this by easing off the foot, but if you have rigid full-length battens throughout the sail, they might end up dictating the sail shape down low regardless of what you do with your outhaul.

Another problem with full-length battens is that on mainsails with a larger-than-normal roach there is a lot of compression in the inboard ends of the battens, especially the upper battens where the bulk of the roach is located. When you sheet the mainsail on tight the load on the leech of the sail forces the batten in toward the mast loading up the slide. A good mechanical batten car system alleviates most problems, but just using "regular" slides may result in them jamming.



In the end it may come down to the size of your sail and type of sailing you are doing. Much of my own sailing has been done singlehanded and my last boat had an enormous mainsail with a huge roach. I relied on lazy jacks to manage the sail and lazy jacks work best with full-length battens since the battens help keep the sail material lined up with the boom. The added weight and expense was a worthwhile trade-off. If the sail had been smaller and more manageable, there would have been less need for full-length battens down low.

In Part 3 of *The Devil is in the Details* we will continue to look at the various parts of a sail including a look at the details that make good in-mast furling and in-boom furling mainsails as well as all the various details that comprise a good headsail.

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