

# Sail Trim to Windward .. excerpt from Bob Sterne's

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## "How to Sail Fast"

In the previous articles, we talked about how to select a rig and find the proper position for it to produce a boat which is heeling about 30-35 degrees, and carries slight weather helm with the proper sail trim. Now, I will try to explain how to achieve this Trim.

The first step, after stepping your chosen rig, is to adjust the Backstay. In general, you need more tension in heavier winds, in order to keep the Jibstay tight enough to preserve the proper shape in the Jib Luff. If the Jibstay is too loose, it will sag too much, and the Jib will be very full in the front section, and the boat won't be able to point properly. In addition, the Backstay also bends the mast, which produces a flatter Mainsail shape, particularly in the upper 2/3rd of the sail. In a fractional rig, with adjustable jumpers, you have some control over the shape of the upper 1/3rd of the Mainsail. More Jumper tension will increase fullness, and vice-versa. By balancing the Backstay and Jumper tensions, you should be able to achieve sufficient Jibstay tension without too much mast bend. If not, your mast is either too flexible, the shrouds are too loose, they are not swept far enough aft at the deck, or there is insufficient luff round cut into the Mainsail. At the lake is not the time to find this out. This type of tuning should be done at home.

The next step is to adjust the Mainsail. First, set the luff tension, by means of either the Halyard or Cunningham, just tight enough to remove all puckers or horizontal wrinkles in the luff of the Main. Too much tension will cause a vertical fold just behind the mast, so beware of that. Next, adjust the outhaul at the clew of the Main so that the sail about a foot above the boom has the desired amount of fullness. Generally this is about 10% of the chord width at this point. Then, set the Main Sheet so that the boom is about an inch or so off the centerline with the winch all the way in. Adjust the Vang so that the Leach of the Main half way up is parallel with the centerline of the boat. Stand about 2 boat lengths behind the boat, and line the backstay up with the mast, so that your line of sight is on the centerline of the boat. You should see the leeward side of the bottom batten, and the windward side of the top batten, but the 2 center battens should be pointing nearly straight at you. The actual amount of twist is hard to describe, and varies with different wind conditions. In lighter air, or in puffy conditions, or in rough water, you need a bit more twist. Repeat the Sheet and Vang adjustments until you are satisfied with the result.

Now it is time to adjust the Jib. Again, the first thing to set is the Luff Tension. The same method is used as for the main, with only enough tension to remove wrinkles. Next, again, is the Outhaul, again a similar procedure. Now, if you have a Jib Trim, set it in the middle of its travel. Make sure that the winch is fully in, and adjust the Jib Sheet so that from your vantage point 2 lengths behind the boat, you can just see the reinforcing patch in the Clew of the Jib past the side of the Mainsail. Something like a .25" to a .5" outboard of the Main is about right. Next adjust the Leach Line (i.e. Jib Topping Lift) so that the twist of the Jib matches the twist of the Main. From behind the boat, you want the curve of the Jib Leach to match the curve of the side ' of the Mainsail. When you are satisfied, recheck the Jib Sheet. Check that the Jib Trim will bring the Jib in far enough to backwind the Main, and ease it far enough to open the slot so that you can -she about 1" or more of the Jib Leach past the Mainsail. Take one last look

at the rig as a whole, and try it out.

Once on the water, you have added one more variable. The boat moving through the water, and hence the air, is generating its own wind. This combines with the true wind to become the apparent wind, which is always coming more from the bow of the boat than the true wind. In addition, because of the velocity gradient, or the fact that the higher off the water, the stronger the true wind, the apparent wind is from different directions at different heights above the deck. At deck level, it is shifted more forward, because a greater percentage is due to boat speed. At the top of the rig, it is closer to the direction of the true wind, i.e. further aft, and it is also stronger. It is this difference in wind direction over the height of the rig that requires us to cause our sails to twist. Ideally, every part of the sail should be meeting the apparent wind at the same angle, so that the maximum drive is obtained. If there is not enough twist, the top of the sail will be stalled relative to the foot. If too much twist, the top of the sail will luff before the bottom. This is where the telltales come in.

Head the boat up, with the sails close hauled, just the way you set them on the dock, until it is pointing as high as possible without luffing. Check the helm on both tacks, and if it is grossly incorrect, relocate the mast or change rigs, and start again. If it is fairly close to neutral, or a slight amount of weather helm, you are ready to proceed. Sailing close hauled, watch the Jib Telltales closely. Without letting out the sails, bear off very slowly until the Leeward telltales just become - agitated. Take careful note if the upper or lower telltale is the first to be affected. If it is the upper, you need more twist in the Jib. If the lower, you have too much twist. You can double check by turning up slowly until the Jib just begins to luff. If the upper telltale stalled first, then the Jib should start luffing first at the bottom, and vice versa. Unless both telltales stall together, and the Jib luffs evenly from top to bottom, bring the boat back to the dock, and correct the Jib Twist. If necessary, reset the Main twist to match the Jib. Keep trying until you get it right.

Now that you have the Jib twist correct, it is time to check the Slot. The proper adjustment for moderate winds is to pull the Jib in until it just backwinds the Main, and then let it out a bit. Experience here is the key. If the Jib luffs a long time before the main, it is probably sheeted out too far, or the Main is over sheeted (i.e. in too close). If the boat feels lively but won't point high enough, the problem is usually the Jib. If the boat will point- reasonably, but feels slow, ease the Main. If the Main luffs before the Jib, you are way off, bring it back to the dock and check the basic settings. The Jib should luff just before the Main, but only just. If the boat will point OK, but feels sluggish, open the slot a bit. The more air through the slot, the more power, but if the slot is too large, pointing suffers. Now you have the relative sheeting angles correct, and the Slot is the proper width and shape.

Now check the mainsail. Is it luffing anywhere along its length. If so, the Twist is incorrect. With the boat close hauled, bear off slightly, and check to see that all the Leeward telltales stall together. If not, correct the twist. Now, look at the windward telltales on the Main. If all the other telltales lay flat on the sails, but one windward one keeps lifting, then the Main is a bit too full at that point. In theory, you should correct this, but when I get to the point that all the jib telltales, both leeward main telltales, and the lower main telltale are all flying, and the top of the Main is not luffing, I tend to leave the one remaining windward telltale which is halfway up the main, just agitated. If you bear off just a degree or so, it will lay down, and you can use this to keep you "in the groove".

Now that you have your sails set to provide the maximum speed consistent with the highest possible pointing ability, it is time to reassess the helm. Does the boat have too much weather helm, are you

constantly fighting it? If so, move the mast ahead and start all over again. If the problem is due to too much heel, then shift to a shorter rig. Does the boat have lee helm? Any amount of lee helm is bad news for pointing ability. Move the rig aft; or fit a taller rig, if the heel angle is too low. Ideally, the boat should be neutral helm in the lulls, slight weather helm in the constant wind, and controllable weather helm in the strongest gusts. One other thing: is the helm the same on both tacks? If not, your rudder is not properly centered.

Assuming that you now have your boat performing at its optimum, try it against someone that is consistently a good tuner. Play with the Jib Trim to see if you can get that little extra edge on boat speed and/or pointing ability. When you are making the best possible VMG, i.e. speed made good to weather, bring the boat ashore, and study it. Make notes. Be critical. Recheck everything. Test again. You want to be able to repeat these settings in a minimum of time the next time the wind conditions are like this. Try and get a mental picture of what the rig looks like when it is just right. You will be surprised how close you can come without even putting the boat in the water, after some experience. Often only one or two small changes are all that will be needed after first trials. When in doubt, look at the rigs of the better skippers, and try to emulate what you see. By the time you need to differ from what they are doing, you will have the experience to make those decisions. Ask questions if you are not sure, but try to make them specific, rather than general. Asking "Does my main have too much twist?" will usually get you a better answer than "How does this look?"

What do you do when the wind changes? If the change is relatively small, say a knot or 2, probably nothing. Any more than a 2 knot change will require retuning at least the Twist of the Rig, possibly more. If the heel exceeds 45 degrees, or is consistently less than 25 degrees, change rigs. If the helm becomes excessive, or if the boat won't point, moving the rig, and a major retune is in order. These are not really difficult decisions, because there are reasonably rigid guidelines to follow. The problems come in gusty conditions, when there really is no 'one proper rig or way to tune it. Then it becomes a compromise, in twist, rig position, even rig selection. Experience here is the key. The only advice I can give is that if control is a problem in the gusts, you should probably rig down, but if you can maintain control both off wind and to windward through sail trim and mast position, you can probably stay with the rig you have. It will be the right rig in the lulls. The mast position should be far enough forward to prevent excessive weather helm in the gusts, which you can further control with the Jib Trim, by back winding the Main. Added twist in the Main can also help. These items, and proper tuning for light airs will be covered in a future article.

In this article, I have tried to tell you how to tune a boat under optimum conditions, i.e. steady airs, smooth water, and with the proper rig size for the amount of wind present so that the boat is neither underpowered, or over powered. I realize that this is seldom the case, but unless you understand what is right, you can hardly be expected to make it wrong when conditions are less than ideal. Remember, too, that you may not be able to achieve exactly the degree of control over your sails you desire because the standing rigging is not properly adjusted. Overbend wrinkles in the Main, i.e. diagonal creases running up from the Clew to the Mast, are a common example. Remember, tuning begins at home, with a well prepared boat.