

420 Tuning suggestions

College of Charleston 2012



Boat Setup on land:

- 1) Before sailing check that your shroud pin/ring dings are taped and secure, your tiller extension universal is solid, there's no wiggle in your pintles and your hiking straps knots secure.
- 2) Tie your main halyard to the head of your main with a figure eight through the headboard grommet and then a half hitch back around the halyard. (see picture)
- 3) Hoist your jib and tension the rig tightly by placing a foot on the bow and pulling on the head stay while your team mate tensions the jib halyard. Don't be afraid to over tension at this point as you'll double check and most likely reset the tension once on the water. It's easier to loosen once sailing than to tighten it!
- 4) Hoist your main and tension the halyard tightly. Use the 2:1 purchase to sock it up tight to the top of the mast. Again, it's much easier to set it up tight on the dock than to rehoist once sailing!

Set up on the water, before the start:

- 1) Trim your sails and head upwind.
- 2) Watch/study your leeward shroud as it is your guide to proper rig tension (through jib halyard tension).
- 3) Ideally the leeward shroud will just start to slacken to the point a slight wiggle (not more than ½") is visible when the main is sheeted to maximum trim for the breeze/conditions at that time.

Note: The advantage of using the "leeward shroud wiggle" is that you can gauge the amount of tension based on a given condition. Ie: in lighter lumpy conditions, where power is a struggle to develop, set the jib halyard so the leeward shroud goes slack a little earlier and a little more wiggle is visible. If sailing in breezy/puffy conditions where it's a struggle to depower in the puffs, set the rig a little tighter where the leeward shroud rarely goes slack and wiggle is difficult to see. Basically, a looser rig produces more power and a tighter rig will maintain a flatter jib and an easier boat to keep flat. *But don't over think it!* Set your tension as close/best you can and prepare for the race!

Mainsail Trim:

- 1) Outhaul setting
 - a) A good starting point is to set your outhaul tension so that there will be a gap of a fist width (2 ½-3") between the skirt of the main (our mains are loose footed) and the side of the boom. Place your fist sideways alongside the boom (palm against the boom) right above the mainsheet blocks and the skirt will just touch your hand.
 - b) When overpowered (full hike with heavy vang tension) tension the outhaul tighter but still show a gap of ½ a fist width (about 1 ½"). Be careful of over flattening the main by pulling the outhaul too tight.

- c) In light winds fight the urge to ease the outhaul more than a fist width. An overly deep main will stall easily and encourage backwind from the jib. There are other areas the sail plan will be powered up!
- d) Downwind it's not been found that easing the outhaul creates any increase in speed but certainly poses a distraction. It's just not necessary to adjust.

2) Boom Vang

- a) Upwind in light winds set the vang totally loose. This is important so that when hitting waves, accelerating out of a tack or just when ever power is needed, mainsheet ease will quickly allow the boom to rise up and twist open the upper leech for power. If the vang is set with the slack removed, this lower power gear may be totally eliminated.
- b) Upwind in breeze, and specifically when overpowered and you can no longer hold the boat flat and balanced by hiking, tension the vang hard so that when the mainsheet is eased to maintain the boat balance and flat heel the boom will literally move sideways with little/no movement up. This will help maintain proper mast bend and a flatter sail. When the breeze lightens up, or when rounding the weather mark, be sure to ease the vang.
- c) A great guide to setting the proper amount of vang upwind when overpowered is to the point where "overbend" wrinkles become evident. These are wrinkles that will appear in the lower $\frac{1}{4}$ of the main angling from the mast towards the clew of the main. When set properly (see picture) these wrinkles will dissipate nearly $\frac{1}{2}$ - $\frac{2}{3}$ back on the boom. (See picture) Once the vang is set and these wrinkles evident, the cunningham is tensioned (see below) so the wrinkles are just visible.
- d) Downwind the vang needs to be constantly adjusted as it acts more like the mainsheet sailing off the wind. The goal is to set the vang so the main shape and leech twist looks similar to the trim of the main when sailing upwind in lighter winds and the sail is trimmed for power. Be careful of overvanging in light winds and undervanging in big breeze. A good check guide is that the tell tale off the top batten (if there is one) should be nearly flying most of the time downwind indicating proper flow. Another guide is to imagine that the last 18" or so of the top batten is parallel to the boom (in a lateral plane if one was eyeballing up from under the boom). But the key message here is to constantly check and make sure the vang is set properly. The crew is in the ideal spot sitting to leeward to look up and verify the right settings.

3) Cunningham tension

- a) Upwind in light winds the cunningham should be totally loose. There should be horizontal wrinkles along the luff of the main from the tack nearly all the way to the head. But double check that the main halyard is fully hoisted. The tack, with the Cunningham totally slack will float above the boom almost 2-3".
- b) In medium winds when both crew are on the weather tank, set some tension on the cunningham so the wrinkles along the luff now are only as high as the spreaders. The upper $\frac{1}{2}$ luff of the main will be nearly smooth.
- c) When sailing in big breeze and overpowered with heavy vang tension, the Cunningham will be very tight. Other than the overbend wrinkles described above the luff of the main should be nearly smooth.
- d) Like the vang, the Cunningham needs to be constantly adjusted to match the breeze. In fact a change in vang tension will usually dictate a need for a change Cunningham tension.
- e) On older sails (tired sails more than 2 years old) it may be necessary to use a little more Cunningham tension in medium winds that described above. As sails age the draft (deepest

part of the main) will move too far aft in the sail so more tension may be needed to pull the draft forward and position the draft in the appropriate spot about 45-50% aft from the mast.

- f) Unlike the outhaul, it is valuable to ease the Cunningham when turning downwind. A full ease is fine and allowing the wrinkles to appear head to tack is appropriate. But remember to reset it back to where you had it positioned before you reach the leeward mark!

4) Mainsheet tension

- a) Your mainsheet is the most important adjustment on the boat and deserves constant and consistent movement to help maintain maximum speed and pointing.
- b) Although the telltale on the upper batten is a fine tool to aid in setting main vang trim downwind it is not used for upwind trim. 75% of the time it will show a stall (telltale flipping around the backside of the leech) when the mainsheet is trimmed properly. When it flies off the leech it indicates that the sail is trimmed for power and acceleration- like in “first gear”.
- c) Instead try to become accustomed to the main trim’s effect and feel on the balance of the boat. Tighter trim will lead to increased weather helm (and higher pointing capabilities) while an eased sheet will minimize the helm and help neutralize the “feel” on the tiller. This feel is ever changing and will require the sheet is constantly moved and the boat to be rebalanced.
- d) In very light winds (should we be out here??), when the boat is struggling to move and pointing is impossible, and the weight of the boom is just hanging on the sail closing the leech- ease the sheet so the boom is a good 12-24” to leeward of centerline.
- e) Once there is enough breeze that the boom will lift and the leech can be adjusted with the sheet, trim the main so that the boat is powered up if it’s choppy (an eased sheet so the upper batten is angled outboard from the parallel position described above). But maintain a balanced helm. If the sheet is eased enough that leeward helm develops (the tiller pushes towards you) sail the boat slightly heeled until the helm is balanced, (no pull/push on the tiller to windward or leeward) but never more than 10 degrees.
- f) In puffs when the boat feels like it can accelerate easily and point higher, trim the main harder, sometimes to the point where the last 12-18” of the top batten is well hooked to windward in relation to the boom. Excessive weather helm will develop so flatten the boat, even to the point where it almost feels heeled to weather to balance/neutralize the helm. It is very rare that the boat will sail fast with weather helm.
- g) When sailing upwind when the breeze is up and the boat is overpowered, set the vang hard as described above using the overbend wrinkle guide as the trim tool. Trim your mainsheet as needed (constantly) to maintain a balanced helm.
- h) If the boat is struggling with pointing, double check your mainsheet trim. Sailing with the mainsheet eased too much will increase power and acceleration at the expense of point.

Jib Trim

1) Leeward sheet trim

- a) Like your main sheet, the leeward jib sheet deserves constant and consistent attention. Ideally the sheet will be trimmed so that the shape of the leech (exit of the jib) will create a symmetrical slot with the main (the entry of the main). Of course this is difficult to view sometimes, especially in breeze.
- b) When exiting a tack, accelerating off the start, or finishing a 720, trim the leeward sheet until foot/skirt of the jib is smooth. There should, at this point, be no curl in the foot and no hard wrinkle. If the breeze is very light, or the water very choppy, hesitate a bit before trimming the leeward sheet to the final tighter trim until the boat is at top speed. Communication with

the driver is key here as they can dictate when it's ok to trim the remainder. If the water is flat and the breeze up where acceleration is not a concern, move very quickly to the final leeward sheet trim.

c) HOWEVER, before the final leeward sheet trim set the weather jib sheet trim...

2) Weather jib sheet trim

a) After the initial leeward sheet setting, quickly grab the weather sheet of the jib and trim 3-4" from the point where the sheet would just be taught. The clew should move to weather a good 2-3". This trim is important except in just a few exceptions that will be described below.

3) Back to the Leeward sheet

a) Once the weather sheet is set, immediately grab the leeward sheet and if fully accelerated and at near full speed, trim another 3-5" until the jib is at full trim. If sailing in lumpy conditions and the boat is still accelerating, hesitate on the final leeward sheet trim a few seconds or until the driver feels the boat is at speed.

b) Communication is important!! Leeward sheet trim can take place only when the boat is at top speed.

c) NOTES and EXCEPTIONS

In very light winds (the condition described above where the main is trimmed loose and the boom hangs on the leech) do not use any weather sheet but still be conscious of not over trimming the jib.

In very heavy winds (when the boat is very difficult to keep flat and balanced (near survival) do not use any weather sheet.

In light/medium conditions where an open leech on the jib would be beneficial (when acceleration is key), slide the tensioned weather sheet up the mast as far as it will take and stay. It will be necessary to push the sheet up after each tack.

While this trim trick is helpful to overall boat speed and acceleration, it certainly can be distracting without a little practice. Keep it in perspective.

In bigger breeze be careful of over trimming the leeward sheet. A slightly looser leeward sheet (while maintaining the same trim on the weather sheet unless it is near survival conditions) can open the slot and make the boat much easier to steer and therefore faster. If in big puffs the main breaks up and luffs, acting much like a flag, there is a very good chance the leeward sheet is too tight. In fact, in major puffs, a quick 3-6" ease on the leeward sheet, but then retrimming almost immediately, will help the boat quickly regain control, balance and track through puffy shifty conditions.

A GREAT final check on leeward sheet trim is the leech telltale on the jib- which should just fly at all times.

This a great shot of near perfect trim in light winds.

- 1) Flat boat and balanced helm
- 2) Outhaul set with "fistwidth" gap at the boom.
- 3) Weather sheet set so clew is to weather about 2-3"
- 4) Weather sheet is pushed up mast so leech is nice and open
- 5) Upper leech telltale on jib is flying showing perfect leeward sheet trim



This boat is sailing in low gear. His main is slightly eased, the upper leech twisted open. He sails with a slight heel to balance the helm- which is perfect with the tiller straight down the centerline.



To the right is a shot showing a slightly over trimmed jib in big breeze. The slot is closed up top (no longer symmetrical with the main) and the leech telltale stalled.

Another great shot of perfect outhaul setting. Notice how very flat the boat is sailed.



To the right, In big breeze ease the jib sheet in the puffs. Look at the very open slot in this shot.



This team above has nailed the vang well in this near survival shot. Note the overbend wrinkles indicating plenty of mast bend. Maybe a little more Cunningham to limit the wrinkles a bit could be even faster.

This boat is set up for high point here with max main trim. Outhaul and jib trim look great but a little more Cunningham so the wrinkles would stop at the spreaders might be a little faster. There's just a little helm that could be eliminated by sailing a little flatter.



Check out the different trim and different gears below. Middle boat is in point/hard trim, weather boat is in power/ease trim.



To the right, great vang tension is set for downwind sailing. The last 12-18" are almost parallel to the boom

