Non-Optimum Conditions .. excerpt from Bob Sterne's "How to Sail Fast"

I have explained how to tune a rig when the conditions were the optimum for the rig, i.e. the boat was neither underpowered or overpowered.. Now, I will attempt to explain how to set up your boat for conditions which are not ideal.

It is an interesting fact that the type of tune that you use for very light conditions and when you are overpowered is very close to the same. The reason for this is that you wish to create a tune that puts the boat in a "low leeway" mode, i.e. where the side force is at a minimum, and more of the force is directed forward. In brief, this means flatter sails, with more twist, and sheeted out further.

In light conditions, there is very little energy in the moving air, and if your sails are too full, the flow will not stay attached to the leeward side of the sails, but will separate causing at least part of the sail to stall. The same thing occurs if you operate the sails at too high an angle of attack to the wind. This is why the sails must be flatter, and sheeted further out. In addition, the wind gradient is more important, with a larger portion of the apparent wind being generated by boat speed down low on the sails, and therefore the sails will need increased twist. You should still strive to have the Jib telltales stall together, as they did in normal conditions, however, this will require more twist to achieve. Also, check the upper, leeward telltale on the Main, and make sure that it is not stalling before the Jib telltales. If so, increase the twist in the Main. You want either all three leeward telltales (both Jib and upper Main) to stall together, or in very light conditions, even a bit more twist so that the lower Jib telltale stall slightly before the others.

The optimum sheeting angle in light airs will depend a lot on your boat, but the best advice is don't pinch. Keep the boat moving as fast as possible. It is better to sail slightly further at higher speed in light winds. You want to keep the slot open, so that you have lots of air flowing through it to increase the power of the main, and indeed having more difference in the sheeting angles of the Jib and Main in effect increases the camber of the entire rig, if you view both sails as working together, without having either sail set too full.

When you are attempting to carry a rig just a bit longer than you probably should (don't we all!), then you have a quite different problem, too much power and heeling force. As the wind speed increases, a flatter sail will generate sufficient power to drive the boat, and at the same time, it will generate less heeling force, and therefore less leeway. The place to start is with the Mainsail. Increase the backstay tension until you just start to get diagonal creases running from the clew of the Main to some point halfway up the mast. Notice where these creases are running to. It is this point where the mast is bending too much for the luff curve cut into your sails. If the jibstay tension is sufficient, decrease the backstay tension until these wrinkles just disappear. If you want more jibstay tension (club is lifting in the puffs), then you need more control over the mast in the fore and aft direction.

If the wrinkles point at the spreaders, try moving the shroud attachment back at the deck, to pull the centre of the mast aft. If the top of the Main, at the Jibstay attachment point is too flat, try tightening up the jumpers. You may have to do both. You are trying to achieve enough Jibstay tension that: a) the Jib doesn't get too full right behind the luff in the puffs, and b) the clew of the jib doesn't lift too much in

the puffs, depowering the jib and causing excess weather helm.
One note here about sails. The shape of the luff curve in the sails is one of the most important parts of how the sails will work as a “team”. In light winds, the Jib luff must be cut essentially straight as there will be no sag in the Jibstay. However, as wind speed increases, the Jibstay WILL sag, and it is up to you and your sail maker to come up with the right combination. Since on a fractional rig the Jibstay tension is directly related to the mast bend, obviously the amount of luff round in the Main must work properly with the amount of luff hollow cut into the Jib. You must experiment with things like jumper tension, spreader lengths and angles, shroud attachment points, etc. to get the optimum from your sails.
Once you have the Main set as flat as possible without getting “overbend” wrinkles, with lots of backstay tension and the Main outhaul set at full flat, you will undoubtedly have to tighten the boom vang to reset the twist. Try to achieve a twist so that in the lulls, the top, leeward telltale of the Main is stalling along with the Jib, but that in the puffs, which are trying to overpower the boat, the Main leech twists off more, even to the point of luffing a bit in extreme puffs. Note, however, that if you are sailing this way all the time, you have the wrong rig on the boat!
Now that you have the Main set at full flat, adjust the Jib. If the water is relatively flat, you can set the Jib relatively flat as well, and you won’t have to have too big a slot. Close the slot up until the Main is just being back winded in the puffs, but not in the lulls. This will help to control excess weather helm in the puffs. If the waves are quite large, however, then you must adjust the Jib fuller, to maintain the power to punch through the waves. The bigger the waves, the fuller the Jib. As you make the Jib fuller, you must sheet it out further, or you will backwind the Main, causing it to collapse just behind the mast. This is extra drag, and should be avoided, except as mentioned to depower the boat in extreme.. puffs.
All through this range of adjustment for the Jib, you should always strive to set the twist so that the upper and lower telltales stall together. The Jib pulls you through the water, please make sure that ALL of it is working!
Now that you have set the sails properly for heavy winds, just a brief word on what to do in extreme puffs. When you are trying to weather hard puffs with the wrong rig on the boat, you will experience extreme heel, and therefore extreme weather helm. If you have to correct this with the rudder, you will be going SLOW, so try to do it with the sails. If you have a Jib trim, try pulling it in, while simultaneously easing the sheets. In effect what you are doing is keeping the Jib sheeted “normally” and easing the Main in the puffs. The Main will be back winded more, and the top of it will luff a bit, both of which-will decrease the angle of heel, and therefore the leeway, while increasing your control over the boat. If you don’t have a Jib trim, just ease the sheets a bit and bear off slightly in the big puffs.
One further non-optimum condition bears mention, and that is light winds and waves, a killer combination. The waves bounce the boat all over the place, robbing what little precious drive the sails can deliver. Under these conditions, try a LOT of twist in both sails. The idea is that at least PART of the sail will be working all the time, and some skippers claim a sort of “propeller” effect from the extra twist. I don’t know the exact reasons, but it does work! Don’t flatten the sails too much in these conditions.
I hope that these four articles have helped you improve your boatspeed in all conditions. One passing thought….. if you aren’t using telltales on your sails, WHY NOT?