

On the weekend one of our sailors, let's call him Ian, asked me to help rid him of weather helm (when the boat wants to round up into the wind).

The problem is the side force from his sails had its centre of effort too far aft seeing the stern pushed to leeward turning the boat to windward.

His forestay was attached to the forward position on the deck and his mast was leaning a tad forward if anything so neither of those were the problem.

I thought his jib leech was too open and sure enough his forestay was softer than mine. If you are unsure what is meant by that I hope the photo shows what I mean by the leech opening or curve/billowing if you like.



The way this is controlled on the soling is via the forestay tension. Because the forestay actually runs down to the tip of the jib boom (and the attachment to the deck meets the boom behind that point), tightening the forestay lifts the forward tip of the boom which in turn depresses the aft tip and it is this that increases the distance the leech must cover from top to bottom thus tightening it.

So what did this actually do? If you look at the photo you should be able to imagine tightening / straightening the leech will make the aft part of the sail point more aft (than off to leeward) making the perpendicular force from the sail direct itself more sideways than forwards thus

counteracting the leeward force from the mainsail at the stern and helping to diminish the weather helm. So Ian tightened his backstay (adjust the forestay length to set your mast rake – then use the backstay to adjust the tension – I rarely adjust the forestay setting) and found it did the trick.

Interestingly perhaps, in the early races that day I was experiencing a bit of lee-helm, the opposite of weather helm. It was only a small amount and I looked at my leeches but they seemed OK and then I realised it was probably caused by having put new sheets on and so I may need to tweak the sheet lengths. So I shortened the mainsheet a tad and that worked.

Getting the leeches right is very important and the setting I change the most between races. Upwind you are looking for the main and jib to work together, as one if you like. I look at the line coming off the back of the jib as needing to flow parallel to where it meets up with the main. I don't want it hooked into the main nor loose and flowing away from the main. Looking from behind the boat I want to see the leeward sags of the two leeches matching. I don't want one leech open and the other closed.

Maybe you've heard that medium wind conditions are when you sail the boat powered up. Sails are as close hauled as you ever have them without the foot of the sail pulled tight. Curve in the sail and tight leeches. Power and pointing. Power from depth in the sail and pointing – well that's quite interesting.

As a kid we all thought it was the leading edge of the jib for pointing. Pull the jib tight, making the front of the jib point more fore and aft and therefore you should be able to point up. It was surprising to me to hear this kid getting told by his knowledgeable older brother that it was the main that made you point and it took me a long time to figure out why that was. Why is having the main on hard good for pointing? It's not because of the lee-weather helm issues mentioned above, that doesn't mean you can point higher, that's basically about stopping to need to use the rudder (brake) to point in the right direction.

Turns out aerodynamics is about a circulation and that means changes at one place get balanced at another.

With low pressure on the leeward side air is pushed around the front of the jib. This means the direction of the air ahead and to windward of the boat is pushed / curved to leeward, before the sail, then sweeping around the leeward side of the sail (and hopefully remaining attached in laminar flow because those leeches are lined up well!). This curve ahead of the sail is known as upwash and to balance it out you get downwash aft of the sail where the air hooks back. If you like, upwash is a lifted direction for the tack the boat is on and downwash is a knocked direction. Upwash is why it's good to be sailing on someone's lee bow and bad for the other guy in that scenario (who is suffering the knocked downwash).

So it turns out that pulling the main on, tightening the main's leech, hooks the exiting flow, increasing downwash and the balancing factor then becomes an increase in upwash giving a lifted angle of attack.

The other week also someone else, let's call him Ian, pointed out to me that my sail arm in the boat was not pointing fore and aft when my sails were close hauled and this was causing me to

be draining battery. Good point thought I but I'm sure I've been through adjusting the arm before. And on reflection that was correct. My arm is set so that it is fore and after when I have the sheets on as tight as I ever would. In my normal close hauled position the arm is about 10-15 degrees off centre. I may pull that in another 5 degrees trying to lay a mark (not much is needed because the closer the main boom gets to the centre line the more the sheet is pulling the boom down rather than "in" and thus is doing exactly what is wanted, closing / tightening the leech and increasing that downwash). The remaining degrees left I use when tacking. Minimising sail flapping going through head to wind is important. Its mentioned in this video I think <https://www.youtube.com/watch?v=gxPWK6WzrPg>

The biggest problem with leeches being fairly tight, in powered up mode, is the sail is more solid, less malleable. This can be a big negative when the winds are light, variable and when waves are an issue. It's all about maintaining laminar flow. If you get a gust and your sail doesn't change, the flow will likely detach. So a puff hits and with say not much boom vang on then in response the sail can lift the boom, let the leech lay off and allow the air ripping around the leeward side to find sailcloth coming out to meet it maintaining attachment and laminar flow.

Similar changes in airflow speed and direction over the sails can be induced by hobby horsing through waves and again a solid sail is not conducive to keeping laminar flow.