Mainsheet Trim- Angle of Attack vs. Leech Tension

Dave Kirkpatrick

One of the basic fundamentals of mainsail trim is the division between leech tension and angle of attack. This applies to nearly every boat you will sail throughout your life.

To easily illustrate what I mean when talking about leech tension versus angle of attack, picture a boat with a mainsheet and a traveler track. The traveler track is used to control how close the boom is to the centerline of the boat. The mainsheet is used to pull the boom down towards the deck, tightening the leech. While traveler tracks may be a rare sight on dinghies, this concept works no matter what deck gear your boat has. The issue just becomes how to manipulate the controls to get the effect you want.

What are the advantages of angle of attack versus leech tension? A basic explanation is that when you are easing the mainsheet in order to power the boat up, you primarily want to ease the leech tension. Conversely, when you are easing the mainsheet to release power, you want to change the angle of attack without easing leech tension.

Think of a Laser sailor going upwind. In light air, the mainsheet principally gets eased in the light spots and brought on in the puffs. There is neutral to no vang pressure. In the case of the Laser, the vang is the primary control of leech tension when you ease the mainsheet. So in light air, the slack vang allows the boom to rise when the mainsheet is eased, easing the leech tension. If you watch a Laser with a slack vang in light air, you will notice that when the mainsheet is eased, the boom primarily goes up. Now let's turn on the breeze so that the Laser is fully powered up. The vang is brought on so that it is quite firm. Now the sailor will be easing the mainsheet in the puffs, and keeping it in when the breeze is less strong. The purpose of putting so much vang pressure on is to cause the boom to go out, rather than up, when the sheet is eased. In these conditions, your mainsheet actually acts like the traveler track above, controlling the in and out movement of the boom, while the vang acts like the mainsheet above, controlling the up and down movement of the boom. Often you will hear reference to 'vang sheeting.' This is what is meant by vang sheeting – to control the leech tension with the vang and control angle of attack with the mainsheet.

In 420's, everyone has started to use a mainsheet bridle. This is merely a rope that extends the mainsheet 'traveler' block (not the ratchet) off the deck. The reason for this bridle is to improve the angle of attack. When the mainsheet block is attached to the traveler bar down deep in the boat, an enormous amount of mainsheet tension is needed to get the boom even close to the centerline. By raising this block, the amount of mainsheet tension needed to centerline the boom is decreased. Sailors often have a hard time adjusting the bridle so that it is the correct height. Too low and you will point poorly from the effects of a bad angle of attack, too high and you will have poor pointing because of too little sheet tension. How can you tell which is which?

In a 420, the mainsheet should be trimmed very hard in most conditions. Therefore, as an easy rule, I would say that when you are trimmed as tight as you can be, there should be just a little bit of space (perhaps 1") between the traveler block and the boom blocks. If you trimmed 1" more, the blocks would touch. This adjustment level leaves enough space so that you can always get enough leech tension, but puts the boom close to the centerline all o the time. In lighter air, you will want the boom to rise when you ease the main, so that the sail powers up. In heavier air, you will pull the vang on and vang sheet, so that the boom goes out and not up when you ease the sheet. Easing the mainsheet with a tight leech spills air out of the sail effectively, while maintaining the flat mainsail shape that is effective in windy conditions. Easing the mainsheet to loosen the leech makes the sail more full overall, which may momentarily decrease your pointing ability, but will give you the power you need to get through chop.

Another good quick check of bridle height in a 420 is to see whether the leeward part of the traveler is tight when the mainsail is trimmed all the way. If the leeward part of the traveler is slack when you are fully trimmed, the bridle is too high. You should only check this when the mainsheet is fully trimmed, as

the leeward part of the bridle will go slack when the mainsheet is eased, even when the bridle is at the correct height.

What about in a boat like a Vanguard 15, where there is no traveler at all? Vang sheeting is the best technique to use. In light air, you will sail with a relatively loose vang, which allows the boom to rise and the sail to power up when you ease. As you get more powered up, the vang comes on, causing the boom to go out and not up when the mainsheet goes out.

Angle of attack and leech tension are both critical facets of good speed and pointing. To understand their effects on the mainsail is a great step in developing good sail trim.