SPINNAKER TRIM FOR SPEED SAILING

by Mike Toppa and Gary Jobson

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Of all the boats we have raced on, we cannot recall one where the crew's knowledge of spinnakers equaled their knowledge of main- sails and jibs. Upwind there is constant chatter about sail shape and draft placement, halyard tension, and sheet leads, but after the weather mark, crews tend to relax and concentration wanes. No more grueling tacks and scrambles to the weather rail. The boat is on an even keel, and the foulweather gear comes off "Anyone want a beer?"

Compared to upwind sailing, downwind sailing is certainly more enjoyable—especially when the wind is blowing hard and the waves are high. But it is also a time when the distances lost and gained can be greater than when sailing upwind. One major problem in downwind sailing is that there is no definitive groove that the boat settles into. Success in this direction depends on the crew's attitude and aptitude.

To make big gains downwind, you need to have properly shaped spinnakers and know how best to use them in all wind ranges. So let us concern ourselves here with the correct spinnaker shape and trim techniques to put you in the passing lane.

Spinnaker Design

In designing the spinnaker, the sail- maker has two objectives: first, to build the fastest all-around shape into the sail, and second, to build a sail that flies in a stable manner and is easy to trim. A sail that has a fast shape will not produce speed if it is continually bouncing about and needs to be over trimmed to settle it down. Speed and stability go hand in hand.

Stability is determined by the overall depth of the sail and the shape of the leading edge. If the sail is too flat, or if the leading edge is too straight, the lift needed to support the sail and make it project will not be generated. The luff will "wash out" and to maintain a constant curl in the luff would be difficult. An unstable sail will collapse all most instantly when the sheet is eased and a slight curl is seen. If your sail shows these symptoms have your sailmaker take a look at it.

Trimming

Aerodynamically, the spinnaker be comes a foil, producing lift, whenever there is airflow across the sail. Unlike the main and genoa that are attached to a rigid stay or mast, the spinnaker is nearly free-flying and relies on its own lift to stay aloft. Because of this and the fact that spinnaker cloth is not as stable as a Dacron cloth, the shape of the chute can he changed more drastically than any other sail: the height of the spinnaker pole, sheet angle, and even bouncing over waves affects its shape.

Be aware of small changes in wind velocity and direction. The smallest change in either means a change in the way the spinnaker should be trimmed. Remember, that unlike upwind sailing, there is no perceptible groove when sailing downwind, and reactions to wind changes come slower in this orientation. The trimmer is responsible for changing the pole angle and its height to keep the angle of attack on the spinnaker constant. Do not be content with just keeping a slight curl in the luff the entire attitude of the sail must be considered.

Pole Height

First let us consider the spinnaker pole's use as a sail control. In addition to the mast, the pole is the only other fixed point to which the spinnaker is attached. Do not simply set the pole height to the old rule of keeping the clews level. If properly set, often the tack will be lower than the clew.

The up-and-down or vertical component of the pole determines the draft placement and leading-edge shape of the luff, while the fore-and-aft component determines the angle of attack. Remember, the spinnaker is a lift- producing foil just like the main and genoa, so the pole control should be used to achieve the desired shape.

Because the spinnaker has to be sym metrical in shape, the deepest part of the sail is in the middle. But since you want the cute to act as a foil, the draft has to be moved forward. The pole acts like a Cunningham in the sense that the more luff tension applied, the more the draft will move for ward. Draft placement through pole height is a factor in making the sail luff evenly. Just like the main or the genoa, you want the luff of the chute to break evenly. If the pole is too high, the top of the chute will lift and twist off, collapsing over itself. If the pole is set too low, the bottom of the chute will be pulled too tight, causing the break to be low. Adding telltales to the luff of the spinnaker will help you to see the wind flow across the luff, just as on the genoa, and telltales can be used to determine correct pole height and luff twist. A word of caution: the telltales will only read wind on a reach. When running, the sail is in a stalled configuration, and there is very little attached flow over the luff.

When the pole height is just right and the sheet is eased a bit, the sail will maintain a smooth, even curl throughout the middle of the luff. However, within the range of the sail, the pole height will be lowered and raised from this medium setting depending on the sea conditions and wind strength. When the wind strength is less, or decreases over the leeward leg, the pole has to be lowered to keep the luff tension and draft placement in the proper spot.

As the pole height affects luff tension and draft placement, it also affects the stability of the sail. When a sail is hard to fly, you can lower the pole and move the draft forward to give the sail more stability. In light air and sloppy sea conditions, this is most effective in getting the chute to settle down rather than oscillating with each roll of the boat.

To illustrate how pole height affects stability, try sailing with the pole a few feet on the high side and then lower it so it is too low. When the pole is too high, you will see that it is impossible to keep a constant curl in the luff. When the pole is too low, you can sail with a curl in the luff that is almost half the width of the sail.

Knowing how the sail reacts to different pole heights can be used in your strategy on the race course. Say you are on the reaching leg of a triangle and the current has forced you down below the reach mark. You can raise the pole, move the draft aft, and provide a finer entry to the spinnaker allowing you to point higher and get back up to the mark.

Pole height should also be adjusted during the jibe. As you bear away, the pole should be lowered to counteract the drop in apparent wind. After the pole is tripped away and you are on the new jibe, keep the pole low and draft forward for maximum acceleration out of the jibe.

Angle of Attack

Pole position, fore and aft, will deter mine just how effective your spinnaker will be. It controls angle of attack on the luff of the chute. If too far forward, the angle of attack will be too great, and there will be little attached flow. If the pole is too far back, the angle will be too narrow, causing you to over sheet the sail stalling it. Basically, the spinnaker luff should be vertical and at right angles to the pole. If the luff of the sail is angled toward the bow and away from the end of the pole, then the pole should be eased forward. If the luff is going to windward and away from the pole, the pole should be brought aft.

Proper trimming requires not only trimming the sheet when a slight header comes, but simultaneously easing the pole forward to maintain the proper angle of attack. The whole sail should be rotated around the boat when changes in the apparent wind occur. When doing this, it is important to realize that it is the luff of the chute that must be kept square to the wind—not the pole. In light air on a 90-degree reach with the pole on the headstay, the luff is too far to leeward. The pole should be brought back so the luff of the sail is even with the headstay. On the other hand, when going downwind in a big breeze, you can ease the pole forward slightly to decrease the efficiency of the luff and de-power the sail.

Spinnaker Sheet Leads

The positioning of the spinnaker sheet leads also has its effect on the shape and efficiency of the chute. Just like the genoa sheet, the spinnaker sheet leads control leech twist, and they should be adjusted for the different wind conditions. Most racers sheet the spinnaker to the back of the boat and leave it there, but by changing the sheeting angle, you can add power or de-power the sail as conditions warrant.

In lighter air, moving the lead forward decreases twist and moves the clew closer to the tack, making the sail deeper and more powerful. In medium and heavier air move the lead back to open up the leech and prevent any air from stalling. In the heaviest conditions you need to de-power the sail, so twist off the leech as you would a genoa. Of course, the aftermost lead position is limited by the length of the boat, but you can add more twist by running the sheet over the boom. This will elevate the clew, open up the leech, and spill air that might otherwise overpower the boat.

To make it easy to reposition the sheet lead under load, rig a tweeker line along the rail near the stem. A tweeker is a block on a line that is then secured to the rail. The block is attached to the spinnaker sheet, between the lead and the clew. To move the lead forward, pull down on the tweeker, and the block will redirect the sheet lead.

When running, the foot of the chute can get too deep (which is the opposite of what you want). When running you want to expose the maximum amount of sail cloth to the wind. However, the length of the pole limits how much of the foot you can spread out. The pole is usually the length of the "J" while the spinnaker's width is 1.8 x J. When the pole is out square to the boat, the sheet eased, and the clew near the headstay, the bottom of the sail will be too deep. You can open up the foot by putting the sheet up over the boom, getting the sheet farther outboard, and widening the sheeting base. This works well on most boats with high-aspect mainsails and short booms, but not vary well on fractional-rigged boats with longer booms, because you would be forcing the clew too far outboard What you can do in the latter case is to move the lead forward to the widest part of the boat.

Heavy-Weather Trimming

When trimming in heavy winds, the trimmer and the helmsman must work together to keep the boat at top speed, but not allowing it to become overpowered. A broach is often the result. Preventing broaching is difficult because the irregular waves and puffs come at random. The helmsman's job is to counter the waves; the trimmer's job is to handle the puffs. Both jobs must be done successfully to keep the boat on its feet. If the conditions that precipitate broaching are understood, the trimmer can fly the sail more effectively and reduce spinouts.

Imagine your boat on a puffy, heavy-air reach with the true-wind angle at 90 degrees. The speed at which the boat moves through the water increases the apparent-wind speed and also brings the apparent-wind angle forward. The helmsman is working hard to keep the boat on its feet, and the trimmer is trying to keep the chute on edge, rather than over-trimmed.

When puffs hit, the boat heels over, adding to weather helm. The helmsman tries to steer down, and the boom vang should be released, which causes the main to luff. The spinnaker trimmer should ease the sheet— not to luff the chute, but to keep it from being over-trimmed. Contrary to popular wisdom, the increased wind velocity in a puff draws the apparent wind angle aft. The boat is already going hull speed, so the forward component in the apparent-angle vector remains the same. As the puff hits, there is more wind velocity relative to boat speed, and the wind angle moves aft. It is as if the wind speed remained constant, and the hull speed decreased. So when the puffs hit, the trimmer should ease the sail out to stay in sync with the apparent wind going aft. This helps keep the boat from becoming over powered. It is good to have one of the crew situated on the weather rail to sight approaching puffs and warn the trimmer and the helmsman.

There are times when a broach cannot be avoided. Plan for that contingency by keeping someone on the boom-vang so when the boat starts to lose control, the vang can be released. This luffs the main and moves the center of effort in the sailplan forward, which helps to pull the bow down.