Symmetric or Asymmetric Spinnakers to Hawaii

by Kame Richards

This article is intended as an up-date to the excellent section in the Pacific Cup Handbook by Jim and Sue Corenman. If you haven't read that yet, I strongly urge you to get a copy and read it carefully. My attempt here is to consider the use of asymmetric spinnakers for the race to Kaneohe, which were in their infancy at the time of the Corenmans' book. If you are even reading this article, I assume you don't know if asymmetric spinnakers are correct for you. For several of the boats doing the race, asymmetric spinnakers are the only logical choice. But as we shall see, all those boats have a common characteristic.

If you are sailing in the PHRF division in PacCup, there is a rating issue that will have to be addressed: If you carry onboard both symmetric and asymmetric spinnakers, you will be assessed a 3-second-a-mile penalty (assuming the asymmetric is the same area or smaller than the symmetric). For a rated course length of about 2000 miles, this means you have to get there 6000 seconds (100 minutes or 1.67 hours) sooner for the sail to be a benefit. If your spinnaker inventory is of one type (either all symmetric or all asymmetric), then that 3-second-a-mile penalty does not apply. If you are sailing in the ORR division, different rules may apply for carrying both types of sails.

It is nearly universally agreed that asymmetric spinnakers reach better than symmetric spinnakers, particularly if they are set on an extended "sprit" pole that moves the luff of the sail well forward of the conventional location of the symmetric spinnaker. Moving the spinnaker area forward reduces the tendency to round up while reaching because it moves the combined center of effort of the main and spinnaker further forward, thereby unloading the helm. While there is some reaching in Pacific Cup, the race is predominately a run, sailing with the wind coming from astern. Optimizing for reaching may not be the best way to do well in this race.

The rules that define symmetric spinnakers are quite simple, but the essential part to this article is the left hand half of the sail is an exact mirror image of the right hand half. The luff lengths are the same and the distribution of curvature from the edge into the centerline must also be the same.

There are several different rules for measuring asymmetric spinnakers. Although these rules are not exactly the same, they all endeavor to determine the area of a 3-sided sail by measuring the 3 edges and one or more girths. In the land of asymmetric sails, one edge (the luff) is designed to be the leading edge. The luff and the leech lengths are not the same, and the curvature on the leading edge of the sail is not the same as the curvature on the trailing edge, just like on mains, jibs - and airplane wings for that matter. In general terms, the luff length of an asymmetric spinnaker is often around 3% to 10% longer than the luff on a symmetric sail for a conventional boat. The leech is shorter and the girths are manipulated to get to the desired area.

There are many boats with "Cruising Spinnakers." These are asymmetric spinnakers that are not well-defined. A cruising spinnaker from one sailmaker for an Islander 36 for

example, will not likely be the same size as a cruising spinnaker from a different sailmaker. One might be bigger or smaller, fuller or flatter. About the only thing that would be agreed upon is that no rule was considered when designing the sail.

One thing that will affect this discussion is what type of spinnaker pole will be used. Certainly the most common pole will be the conventional J-based pole which attaches to the mast and can be trimmed fore and aft (squared back), as well as up and down. This pole is based on rating rules that go back more than 50 years. You may set either symmetric or asymmetric sails on this type of pole, as long as your PHRF certificate makes it clear that this is what you are doing.

This is our Express 37, sailing a run in the 2011 Rolex Big Boat Series. Note how far to weather the spinnaker pole is holding the luff of the symmetric spinnaker.

Some boats use what are called “Sprit Poles.” Generally these are telescoping poles that extend out from the hull or deck. Examples of these are many of the J-Boats and sport boats such as the Antrim 27’s, Melges Boats and others. Although the Antrim 27 is an exception, most sprit boats cannot articulate the pole once extended. The front end of the pole sits on the centerline. As mentioned above, the sprit pole moves the luff of the spinnaker out in front of the bow, moving it further away from the mast and the turbulent air flow caused by the mainsail. This style of pole supports asymmetric spinnakers only.

This is a J-105, an example of a sprit boat. The sprit telescopes out from the hull and is limited to pointing straight forward.

Cruising spinnakers are often purchased looking for simplicity. These sails are most often used with no pole at all. During the reachy portion of the race course they will perform fairly well, but when it comes time to run downwind, they will suffer compared to spinnakers that are set on a pole and squared back. The problem is that the sail will be stuck trying to fly in the turbulent air behind the mainsail. For a sail to pull well, it needs to be set in nice clear air, away from the other sails on the boat.

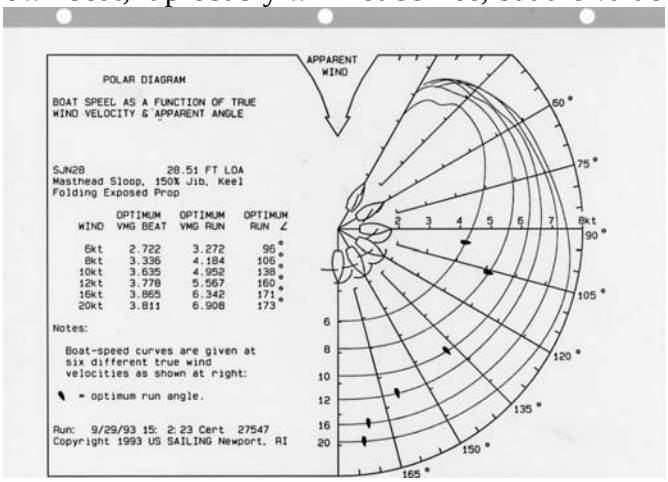
Whatever kind of spinnaker pole you may have, the Racing Rules of Sailing and the handicapping system you are sailing under place restrictions on how the pole may be used. You need to familiarize yourself with these restrictions and sail accordingly.

The weight, shape and length of your hull have a very large impact on whether asymmetric or symmetric sails will work better for you. Generally heavy boats sail only slightly faster downwind than upwind, while light boats sail substantially faster downwind than upwind. Boats that can sail really fast downwind do some very strange things to the apparent wind angle. The faster the boat sails downwind, the more the wind comes from the side, so instead of running, the boat is actually reaching. In 2004, Mari Cha IV, a giant 140 foot long ketch, raced in the Pacific Cup. It had an elapsed time of 5 days, 5 hours and 38 minutes. This boat is so fast it carries a limited selection of spinnakers, all quite flat, and some big furling reaching headsails that are set on a fixed bow sprit. If you have had a chance to see any of the new America's Cup multihull videos, you will see a more extreme version of the same thing. They sail "down wind" using a furling headsail that looks like a jib and nothing like a spinnaker, with the apparent wind well ahead of the beam.

These two Transpac 52's are sailing a RUN! Look how far forward the wind is. Due to their high boat speed, they pull the apparent wind angle far forward.

Exceptionally fast boats like these are examples of why fast boats tend to use asymmetric spinnakers. The asymmetric sails do reach better.

But what if your boat is not one of these speed machines? What if your boat is a conventional displacement boat? How can you tell how fast your boat is "supposed" to go? Obtaining a set of polar diagrams is a good way to start. Begin your search at USSailing.com/offshore. What you are looking for is something like this, but for your own boat; it probably will not be free, but the value of the information is very high.


POLAR DIAGRAM

BOAT SPEED AS A FUNCTION OF TRUE WIND VELOCITY & APPARENT ANGLE

SJN28 28.51 FT LOA
Masthead Sloop, 150% Jib, Keel
Folding Exposed Prop

WIND	OPTIMUM VMG BEAT	OPTIMUM VMG RUN	OPTIMUM RUN ∠
6kt	2.722	3.272	96°
8kt	3.336	4.184	106°
10kt	3.635	4.952	138°
12kt	3.778	5.567	160°
16kt	3.865	6.342	171°
20kt	3.811	6.908	173°

Notes:

Boat-speed curves are given at six different true wind velocities as shown at right:

= optimum run angle.

Run: 9/29/93 15: 2:23 Cert 27547
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Example of a polar diagram

This example graphs boat speed at various apparent wind angles, verses true wind speed for a San Juan 28, a perfectly reasonable conventional boat. Find the arc with the label 10 to its left on the vertical axis. This represents 10 knots of true wind speed. The distance out from the origin represents how fast the boat goes at each of the apparent wind angles around the polar diagram. The boat speed is labeled on the horizontal axis.

So at 10 knots of wind, at 165 degrees apparent, the boat should be going around 4.8 knots. For Pacific Cup we are largely interested in the optimum run angle, represented by the little boats on the curves. The optimum run angle represents the correct wind angle to sail to move the boat straight down wind as fast as possible. Yes, you will have to gybe to come back, but the speed gain more than offsets the extra distance sailed. For optimum running in 10 knots of breeze the polar diagram shows we should be sailing at 135 to 140 degrees apparent, and the boat should be going around 5.3 knots. The diagram indicates that sailing at 165 degrees apparent is sailing to low (too far down wind), and too slow. We should be sailing a closer reach, and sailing a half a knot faster. Look briefly at the 16-knot arc, and notice how different the apparent wind angle is. The boat is going 6.3 knots, and consequently needs to be sailed on a lower heading.

For running, you will definitely want a pole that can be squared back so you can project the spinnaker well to weather, away from the mainsail. On conventional boats, I would not recommend a sail with a really long luff length. That will require the pole be set extra-low, as in closer to the water. When you are running, with the pole squared well aft, this will limit your ability to sail extra deep, even by the lee (while trying to catch waves), because the boat will heel to weather and you risk sticking the pole in the water. (Very Bad! Good news: you only break the pole. Bad news: you break the mast.)

Looking like un-planned weather heel! If the spinnaker luff was 5 feet taller, and the pole 5 feet lower, the tip of the pole would be in the water right now. (They successfully recovered from this event…)

So we now find ourselves comparing theory and practice. Given that asymmetric sails are designed with a leading edge shape and a trailing edge shape that are not the same, then they have to be "better," right? Well, the answer (as it nearly always is!), is sometimes yes and sometimes no.

Pacific Cup has an uncommon characteristic: You will likely sail for several days on starboard pole. It is not like a buoy race where you need to gybe for inside overlaps at an approaching mark, and then gybe back again. For the Pacific Cup, you can make a case that "special" asymmetric spinnakers might just be he ticket. In this case, "special"

means similar luff and leech lengths to the conventional symmetric spinnaker, but not mirrored port and starboard halves. This means the sail would have a leading edge and a trailing edge by design. And when you gybe over to port pole, the sail needs to be flipped over so the leading edge is on the port side. This will certainly make the gybes take longer, but "in theory" it would be a faster sail.

So, what should you do?

Money: If your sail budget is fairly large and the value of the sails at the end of the race is perceived to be low, then buying a few of these "special" asymmetric spinnakers might be a good plan. As we have already discussed, if your whole inventory is asymmetric, that will save you 1.67 hours if you are sailing under PHRF. If, on the other hand, your sail budget is low, and you will not be buying 5 new spinnakers for this race, and you are hoping you can continue to use the sails in other events after Pacific Cup, and your boat already has some (one?) symmetric sail onboard, then buying new symmetric spinnakers out of a modern low porosity spinnaker cloth is probably the right thing to do. Symmetric spinnakers do sail runs very well.

Fun: It may be hard to realize it right now, when in the thick of planning and deciding things, but: This race will be a whole lot of fun. If you have never gone, you will see and experience things that are indescribable. Sunrises, sunsets, rainbows by moon light, phosphorescent trails in the wakes of dolphins coming by for a visit, the interdependence of your crew. Here, in the present, do what you can do, don't do what you can't do. While racing, sail your boat as best as you know how, using only the equipment you have onboard. Whoever wins the race will be doing exactly that.

Enjoy.

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