Optimizing Your Sail Plan for IRC
By David Armitage, Quantum® Head Sail Designer

For as long as there have been rating rules, sailors have been looking to exploit them. IRC is no exception. Over the past few years, my colleagues and I at Quantum Sail Design Group have identified several opportunities for optimizing the sail plan.

The **square-top mainsail** has been a major development in sail design over the past five years. In order to make the most of this feature, your boat needs split backstays, or no backstay. Your rig manufacturer, or a local rigging expert, should also be consulted to ensure your upper mast section is strong enough to withstand the additional sail area. Most rigs are; the safety factors are usually fairly generous.

There are several reasons why this feature works well in IRC. Firstly, the rule doesn't measure the headboard. The top girth measurement is done seven-eighths of the way up the leech, which allows you to tack on some extra sail area above this measurement without taking a rating hit (see drawing below). Secondly, a square-top main has a nicer twist profile and better endplate effect for the top of the sail plan.

For mainsail measurement, IRC considers the luff and foot lengths, as well as girth—leech to luff—measurements done halfway, three-quarter, and seven-eighths of the way up the leech.

IRC compares these girth measurements [as a percentage of the foot length] to some standard numbers—65 percent, 38 percent, and 22 percent, respectively. Deviating from these standard numbers will likely impact a boat's rating.

The default numbers do not generate an optimal roach profile, so regardless of whether your boat can support a square-top main, your sail designer may choose to deviate from these slightly to create a smoother leech profile and a more balanced twist profile.

We typically size square-top mainsails slightly under the default IRC mid girth, which provides some compensation for the fact we are over the defaults at the upper two girths. This provides a generous increase in sail area and better mainsail profile for very little rating penalty.

Our research over the last few years has shown that, for **upwind headsails,** IRC favors a relatively short luff length relative to the rated forestay length. It also disproportionally penalizes LP (luff perpendicular, measured from the clew to the closest point on the luff).

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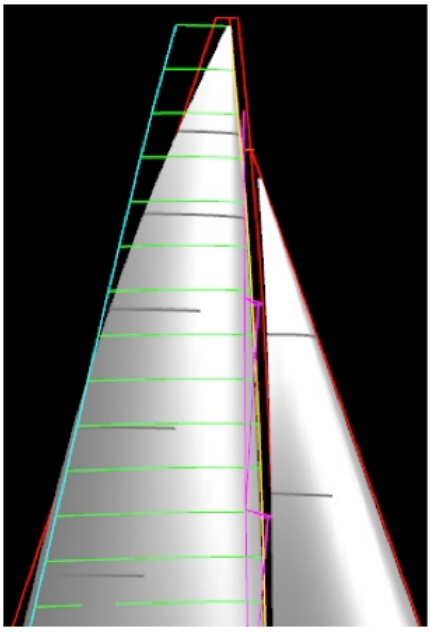

A moderate square-top main (light blue outline) can provide extra horsepower and a better twist profile, all for a relatively modest rating increase.

This prompts most teams to go with the smallest No. 1 jib—IRC measures the largest jib in the inventory—they can use without significantly impairing their light-air performance.

IRC allows a fairly generous head width on headsails, up to .8 percent of the luff length. On a typical IRC 52, the jib head can be as much as six inches wide. A moderate reduction in hoist can lower your rating, while a maximum jib head width will help make up for any lost sail area.

If you think more jib area is needed for light air, you are better off adding a moderate amount of jib roach as opposed to increasing the LP. Just don't forget to take into account the spreader profile when adding roach.

Jib size is something that can be tailored to specific venues. The ideal sail plan for the Rolex Big Boat Series on windy San Francisco Bay would likely have a jib with a smaller LP and luff length than a sail plan optimized for an IRC event in Long Island Sound or off Newport, R.I.

Spinnaker sail area is relatively inexpensive in regards to rating under IRC. As a result, almost all new IRC designs come with masthead spinnakers—asymmetric or

symmetric—and the first modification made on many older, fractionally rigged boats is to move the spinnaker hoist to the top of the rig. However, there's more to the modification than simply piling on as much sail area as possible. It's important to focus on finding the correct aspect ratio—height over width—and making sure the spinnakers are the optimal size.

The last decade has seen a strong trend toward bowsprits (retractable or fixed) and asymmetric spinnakers. Lighter, high performance boats where the apparent wind angles are mostly forward of 90 degrees benefit the most from this development. Unfortunately, IRC tends to favor heavier displacements in boats under 50 feet long. So the best IRC configuration for a 30- to 40-foot racer/cruiser is usually a conventional pole-flown spinnaker, as the optimal true wind angles downwind in over 10 to 12 knots are often as deep as 150 to 165 degrees. In the 40- to 50-foot size range, a blend of asymmetric and symmetric spinnakers is effective: a VMG asymmetric used in 10 knots or less, when the apparent wind angle is still forward of 90 degrees; a symmetric runner for 10 to 18 knots, squared back with the pole; and a heavier symmetric runner for above 18 knots. Lighter displacement boats, like the current crop of IRC 52s, benefit most by going to a fixed bowsprit with asymmetric spinnakers.

Seeing IRC 52s planing downwind at 20 knots may tempt owners of smaller boats to consider a fixed bowspirt. But it's important to consult the boat's designer and sailmaker to see if this option really makes sense.

There are quite a few misconceptions as to what an **IRC code zero** sail is and at what angles it can be used. An IRC code zero is measured as a spinnaker, so it must have a mid-girth measurement that is at least 75 percent of the foot length and a leech length that is no more than 95 percent of the luff length. Volvo 70s are often seen sailing upwind with what many people call a code zero. However, these upwind sails have mid-girth measurements that are 55 to 65 percent of the foot length. Because these sails don't have to support all this extra area, they can be designed flatter and used at tighter angles.

A typical IRC code zero needs a lot of additional shape in order to support the large mid girth. These sails are difficult to design; you want to build in just enough depth to support the girth and prevent the leech from flapping while still getting the sail as flat as possible so it can be carried at a tight angle. If done right, however, a code zero can be quite advantageous for boats with non-overlapping jibs in point-to-point races. But don't think for one moment that it will sail upwind; 90 degrees true wind angle is as high as they'll go.

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