

Tech Review

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UPGRADES BY DAVE REED

A Calculated IRC Adjustment

George Petrides and his talented amateur crew have had an excellent run with their J/120 *Avra* over the years, knocking off top finishes at their big target events—Key West Race Week and the Bermuda Race—and establishing themselves as a formidable team on their home waters of New York's Long Island Sound. But with fewer J/120s now racing one-design in his neck of the woods, and with the establishment of IRC racing in the Northeast, Petrides found himself scratching his head. What to do with his beloved *Avra*?

As a stock one-design J/120, the boat was simply wrong for short-course IRC bouy racing in Long Island Sound's typically light-air. But after carefully reviewing more than a dozen of the latest IRC orientated designs, Petrides and his teammates decided to stick with the boat

they know best and do something about improving its unfavorable IRC rating.

"Rather than spend up to \$600,000 for a boat we knew little about," says Petrides, "we determined we could get a boat that was in the same competitive IRC ballpark by investing \$50,000 in *Avra*."

The boat's IRC Time Correction Coefficient in its one-design status was 1.097, says Petrides. The goal was to get to below 1.090, saving at least 25 seconds per hour while making the boat faster in most conditions, and do so within the \$50,000 budget.

In the end, it took some pretty radical modifications, including the removal of the keel bulb, lengthening the rig, building a big-roach mainsail, and dropping more than 600 pounds out of the boat.

The logical sounding board for *Avra*'s turbo job was, of course, Rod Johnstone,

George Petrides' *Avra*, a J/120 that regularly competes under IRC on Long Island Sound (N.Y.), underwent drastic, but low-cost upgrades to make it more competitive in light-air, removing nearly 600 pounds from the boat's keel bulb, extending its mast, and powering up the sail plan.

the 120's designer. As options were tabled, Johnstone crunched the numbers on his VPP software, applying his own observations of what makes a boat a good IRC boat.

The 120 is more of a heavy-air boat and excels at the top end, he says. Light-air windward-leeward handicap racing has never been its strength. "The 120 doesn't have a good IRC rating because of the way they give credits and penalties depending on what type of keel you have on the boat. One thing that has become obvious to designers is that the IRC gives a huge credit for not having any kind of a bulb on your keel."

Losing the bulb, says Johnstone, and going with a fin keel, would reduce the rating to a point where the boat had a chance of being competitive under IRC.

"The high-cost option, which Rod

suggested, was to create a new custom-designed and custom-poured keel,” says Petrides. “It would be 8-foot deep [compared to the existing 7-foot keel], higher aspect, thinner side-to-side, and 670 to as much as 1,000 pounds lighter than the existing keel: a modern design that generates more lift and accelerates faster out of the tacks.”

But the new keel was priced out at \$16,000 and Petrides estimated at least another \$10,000 in yard work to remove the old keel and fair, paint, and mount a new keel.

The low-cost option, of course, was to simply do away *Avra's* existing lead, and, *voila*, nearly 600 pounds vanished after John McGrane and his team at Oyster Bay (N.Y.) Marine Center reshaped *Avra's* keel by planning of its “whale tale” bulb.

Reducing the keel weight and eliminating the bulb, Johnstone estimated, would reduce stability by roughly 10 percent below that of a standard J/120. There's also a beneficial reduction of wetted keel surface by about 5 square feet.

“The reduced stability and absent bulb will enhance the kinetic effect of crew movement and reduce the turning drag in tacks and jibes,” he added, “and there would also be a significant reduction in hull displacement and hull wetted surface area.”

With this one alteration, Johnstone assured him the boat would be faster in the low to middle wind ranges, and that keel lift would not be noticeably different. But



The mainsail is 32-square-feet larger than the one-design main, with all of the new area piled on up high. The new spinnaker is a 1,600-square foot IRC chute that is expected to be about as fast as the larger, wider one-design chute but is easier to jibe, better in light air, and better on reaches. It is marginally slower in straight-line downwind sailing. Petrides intends to eventually have a full-hoist headsail inventory, but for 2009 he will use his existing headsails without the roller-furling gear and have foot panels bonded on to make them deck sweeping.

the boat's stability would most definitely be affected, particularly in heavy-air upwind sailing and on tight reaches.

“That's a big issue for me,” says Johnstone who feels a boat like the 120 should be capable of being sailed shorthanded and not require a 10-man crew on the rail. “I cautioned about losing too much stability on this boat.”

Petrides understands the implications of losing a modest amount of stability, and says that he would not take the same

measures in San Francisco, or any other windy venue. “The crew size is increased from seven in one-design to 10 in IRC, so this additional weight on the rail helps add back righting moment. Another way we offset the loss of righting moment is by taking weight out of the backstay and the headfoil.”

“The boat will not be as stiff as it used to be,” admits Petrides' sailmaker Kerry Klingler, of UK-Halsey's City Island (N.Y.) loft, noting that the 120 is woe-

FINE TUNING WITH TRIAL CERTIFICATES

Avra's owner, George Petrides, and his team started with the J/120s base one-design rating, which is 1.097, and by using IRC's trial certificate allowance, experimented with various modifications to come up with the following comparisons.

CERTIFICATE	NOTES	ESTIMATED TCC	SEC./HR. +/- OD TCC
One-Design	161 sq.m. asym, furler genoa (154% LP)	1.097	
Fall 2008	142-sq.m asym, furler No. 2 headsail (143% LP)	1.085	-43.2
Trial 1	Sprit shorter by 1 foot, 141-sq.m asym, furler genoa	1.089	-28.8
Trial 2	Symmetric 141-sq.mt spin, furler genoa	1.095	-7.2
Trial 3	Mast taller by 1.60m, 167 sq.m. asym, full hoist masthead No. 2 headsail (141% LP)	1.112	54.0
Trial 4	Mast taller by 2.00 m, 171 sq.m. asym, full hoist masthead No. 2 (141% LP)	1.115	64.8
Trial 5	One-Design base with custom 8-foot keel	1.095	-7.2
Trial 6	One-Design base, shaved keel, 145 sq.m asym	1.092	-18.0

Editor's note: Trials 1 and 2 had no mast or keel changes. All others included various mast and keel modifications. To run trial certificates for your boat (at \$2.68/ft LOA per certificate), contact an IRC measurer in your area or US SAILING's Offshore Office at www.ussailing.org/offshore.

fully underpowered as it is, particularly for crewed racing. "On a 120 it can be blowing 18-knots true and you're sailing upwind with the No. 1 genoa."

Klingler has been tasked with managing the aero component of *Avra's* turbo-job: the sail plan, which includes a 20-inch top-section extension to the existing mast, has a new mainsail shape with significantly more roach.

The rig extension, however, didn't sit well with Johnstone, and it was here that

designer and sailmaker had to come to terms with the owner's intentions.

"I would have left the rig alone," says Johnstone. "It's a question of trading speed for rating, and maybe the extra speed he gets downwind with the taller main will more than make up for the little increase in rating he'll have for that."

More sail area up high, where it's most useful in light air, however, was necessary, says Klingler. "Optimizing for IRC and what we were doing go hand in hand;

making it a better light-air boat and giving it more horsepower."

But there was the issue of how to push the rig up and carry that extra area up high without dropping \$80,000 on a new carbon mast. After much back and forth with Ben and Nan Hall at Hall Spars, the economical solution was to splice on a 20-inch extension above the hounds.

Initially, says Klingler, they tossed around the idea of adding split running backstays and going with a fat-head main, but issues of handling running backstays nipped that idea in the bud. The J/120's deck layout isn't conducive to adding a set of backstay winches, either.

The middle ground was a less aggressive roach profile and a permanent PBO backstay (replacing rod). "We went over IRC girths a fair amount and configured it so we can get the roach through the backstay," says Klingler. "There's a big whip. I also played around with how the battens set up. The battens in the main are partial battens so that when you tack, and the backstay is on hard and the leech hangs up, you just burp the mainsheet and the luff will give enough to get the roach around the backstay.

Considerable thought was put to headsails as well, and the most obvious weight-saving solution, in addition to swapping in a Harken carbon headfoil, was to ditch the roller-furling gear altogether. And with this, there's an extra benefit: with the standard roller-furling unit, the headsail tacks set 14 inches off the deck. Rather than ordering new headsails, Petrides had Klingler update his inventory by rebuilding the tack and adding a laminate panel at the bottom of each to make them deck sweepers.

The only other new sail (in addition to the main) Petrides will add to his inventory is a non-class standard asymmetric spinnaker. The 120's one-design spinnaker is notoriously big for the boat, says Klingler, so they've designed a narrower sail that he says should allow them to sail equal to or above the targets that the boat had with the class sail. Plus, for short course racing, the narrower kite will be much easier to handle and quicker through jibes.

As the spring season drew near at the time of this writing, Petrides had yet to put all the various pieces together and get the boat on the scale, but he was confident the changes would make the season a whole lot more exciting for the team.

"I'm looking forward to having a boat that's competitive in the IRC game,"