

# 49erclass

## **Carbonising the 49er**

*It's one of the fastest growing Olympic classes, with over 1000 yachts sailed in over 40 countries. The 49er is a One Design class known for its high performance, adrenaline pumping speeds. And it's only going to get better given the latest development in moving to a carbon rig.*

The new rig is a result of rigorous research and development, a contest between two mast manufacturers to deliver the best, and on-the-water testing by sailors. The final call as to who would manufacture the mast was made at the 49er Europeans; it was decided that the 49ers will now be powered by a Southern Spars carbon rig after the 2008 Olympic Games.

"The benefits of carbon rigs have revolutionised performance among larger grand-prix type racing yachts over the years and it's exciting to now see this knowledge transferred into an exciting one design class such as the Olympic class 49er," comments John Clinton, General Manager of One Design Southern Spars.

So why move to carbon? What are the benefits for the class? How did Southern research and develop the new rig design? What is the new product? How will it be made? How does it impact the sail design?

John Clinton answers these questions:

### **Why move to using a carbon rig?**

We want to keep the 49er the most advanced and exciting class in Olympic competition. The move to carbon is about modernising the rig, utilising recent advances in materials and yachting and ensuring all rigs are consistent.

### **What are the benefits for the class?**

Weight savings, reduced windage through smaller sections and greater flexibility in laminate design will provide real performance gains for the class. We should also see improved consistency in the way the masts are produced.

A big plus for the class is the 'dynamic' way carbon spars respond. Dynamically carbon spars behave differently from aluminium and as a result stiffer spars can be used along with totally different sail-rig configurations. When using carbon, the dynamic response in gusts makes the rig easier to handle which means a sailor can use a stiffer rig through the range they need power for.

### **How did Southern Spars research and develop the new rig design?**

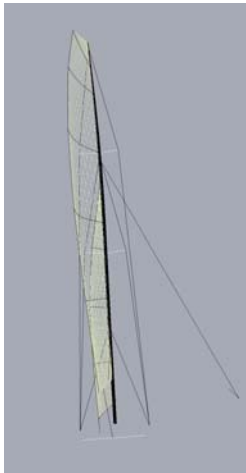
The goal was to develop a rig that is easily and accurately reproduced with an emphasis on the details that affect performance. The development of the rig was a collaborative effort between Julian Bethwaite, the boat's designer, and Southern Spars.

We began by identifying the factors that affect performance, and then studied the best way to design and manufacture these factors so they could be reproduced identically.

We focused on how to achieve consistency with: bend, weight and CG. 'Bend' is determined by the tube stiffness, spreader angle and spreader stiffness, while weight and CG are controlled through strict quality control of materials.

It was also important to ensure the rig retained its ability to perform through the full wind range while targeting an ideal crew weight of 155 – 160kg. With most classes that have changed to carbon rigs, the ideal weight has decreased.

Before building the first prototype rig, many hours were spent running finite element studies of the mast – sail combination to ensure the rig performed properly throughout the full wind range.



Theoretical rig set up (dock tune) was established and then the boat was run through a range of conditions using the software to simulate real sailing loads to output the deformed sailing shapes of the mast and sail. The mast stiffness and sail design was changed many times and fine tuned using the finite element software before it was made and sent sailing. Independent on-the-water testing was conducted by Julian Bethwaite and his team, using the first prototype rig in conditions ranging from 5-30 knots along with a range of crew weights.

### **What is the new product?**

The three piece male moulded mast is made from 100% standard modulus carbon and is a simple round section shape which helps ensure consistency along with keeping costs down. The longest section is just less than 4m in order for easy freighting around the world.

The new mast is about 61mm OD and uses a plastic track as this has the least variable effect on the overall bend.

Both sets of spreaders are identical and interchangeable. A unique spreader concept was designed to ensure the spreaders line up automatically when the mast sections are fitted together.

All sections are bend tested and certified that they are within a range agreed with the class.

### **How does it impact the sail design?**

A new square head main will be introduced with the new rig. Taking cues from the current AC rig - sail thinking, the move to a square head main is thought to provide a better aerodynamic solution, as well as automatically depowering better in gusts. Under the current setup, the tip of the mast does the job of depowering through gusts.

Interest in Southern skiff rigs is growing, with the top Australian teams in the 18ft skiff class also working with Southern. The difference with this class is that rigs will be custom designed and built to a team's requirements, making the possibilities endless.