



The RS Aero – single-handedly reducing weight

Liz Nickels

Launched in early 2014, the RS Aero has fast become one of the sailing world's most beloved single-handed vessels. Its popularity is almost certain due to a design focus on strength, robustness and above all, light weight. Liz Nickels spoke to Sicomin, who provided epoxy materials for the hull, about what makes it so special.

With over 460 RS Aeros already sold, the single-handed dinghy is proving a popular choice for sailors all around the world. It is the product of a three year development program undertaken by UK sail boat manufacturers RS Sailing. The brainchild of sailboat designer Jo Richards, every aspect of its simple shape was considered in order to minimise weight and maximise cost efficiency without compromising looks or performance.

'The concept is to redefine sailing in its simplest form,' said RS Sailing's Riki Hooker. 'The Aero's development was an obsession with reducing sailing weight, which affects everything else.'

The right materials

Sicomin, a French supplier of epoxy and composite systems, was called upon to supply epoxy materials for the project. During the materials specification process, Sicomin's UK distributor, Matrix Composites, worked with RS technical director Alex Newton-Southon and Martyn Miller from the RS technical department to provide support and assistance from the outset of the project and throughout the prototyping and build program. The aim was to help achieve the main design focus of reducing weight whilst providing strength and stiffness to the laminated regions of the structure.

'Sicomin and Matrix always knew they had the right product for this particular application but, as ever, the challenge was to demonstrate the improved workshop properties and mechanical performance,' Tim Roden, technical sales manager at Matrix Composites, told *Reinforced Plastics*.

Sicomin's SR 8500 multi-purpose epoxy was recommended for the composite epoxy foam sandwich hull, deck, hiking region of the deck, gunwales and transom. Especially formulated for the construction of large components, SR 8500 is a popular choice for

many superyacht, racing boat and dinghy manufacturers and has achieved Germanischer Lloyds approval.

'Benefiting from a strong technical collaboration throughout the prototyping phase and constant technical support as the project progressed, Sicomin/Matrix has made sure that the SR8500/SD860x resin system was selected and specified for this build,' Roden added.

Sicomin says that SR 8500 remains crystallization free for up to two years and is categorised as a low toxicity epoxy. It has improved temperature resistance and does not contain reactive diluents or solvents that often weaken the silicon bags used during the vacuum infusion process.

Using hardeners, SR 8500 can be blended to different ratios to adjust working times and provide improved flexibility. When used with Sicomin's Ultra-fast Hardeners, this combination acts as an accelerator, while Sicomin's Ultra-Slow Hardener range has been adapted for large part manufacturing that requires a post curing process at 40°C before removal from the mold.

For the RS Aero, Sicomin's SD 8603 Slow Hardener was applied in the hull and deck areas whilst SD 8605 was used for the hull to deck joint and offered very rapid reactivity levels.

'Matrix provided our team with excellent technical support and shared their extensive knowledge of Sicomin's epoxy resins to produce the strongest, lightest most durable laminates possible,' reported Miller.

The SR 8500/SD 860x system makes it possible to manufacture multiple kinds of composite parts that can work up to 70°C continuously. It is solvent and reactive diluent free, without any aromatic or CMR amines. One resin and two hardeners are mixable in any proportions to achieve the wanted reactivity. It can be cured at ambient temperature and post cured at 40–60°C.



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The SD 8605 Fast Hardener has a reactivity adapted for the manufacturing of small parts and good mechanical properties after ambient curing while the SD 8601 Ultra Slow Hardener has reactivity adapted for big part manufacturing and should be post cured at 40°C before unmolding. They are suitable for hand laminating, injection, filament winding, cold or hot press molding, casting and adhesives.

Health and safety

'Sicom stands out because the SR 8500/SD 860x formulation uses a great selection of raw material, which has significant health and safety benefits for the build team with much lower chances of skin sensitization issues – even with prolonged exposure,' said Roden. 'The viscosity profile was perfectly suited to the hand lamination process as well, with no risk of drainage causing dry spots or resin lean areas when laminating vertical sections.'

'It's a less aggressive resin system than competitor products which helps to prolong the life of expensive re-usable silicon vacuum bags. As well as the continued challenge of improving health and safety in the manufacturing environment, boat builders are always under pressure to improve efficiency and process stability,' Roden added.

With its range of hardener speeds, the SR 8500/SD 860x system can be tailored to work at different speeds for different parts of the build process, reducing cycle times.

Boat design

During the RS Aero development period, four different hull variations were considered, along with numerous rig, foil and layout options. The company found through testing that a 4 m long hull would be long enough to support the larger helmsman, without being too much of a handful for small sailors to launch and recover.

The dinghy has an overall beam of 1.4 m and a chined (angled) hull for more stability. The flatter hull panels of a chined hull allow construction from normal flat sheets of polyurethane (PU) foam, reducing the weight of the core bond (cores designed to mold around tighter curves "absorb" more resin into their score cuts or honeycomb), while the "chine" angles on the deck add form



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stiffness without additional weight. The original prototypes had a higher chine, but through development the chine has dropped to just below the water line amidships. The low surface area reduces weight and material costs and the simple shape reduces time in the manufacturing process.

While woven glass matt is used throughout the hull and deck, biaxial and unidirectional carbon fiber is used in all high load areas such as both hull and deck around the mast step, the hiking region of the deck, all around the gunwales and the transom.

The RS Aero has a fine bow for upwind sailing, stable mid-ship sections and a relatively wide transom. While vertical bows are common in "box rule" dinghy classes and yachts built to rating systems, the company chose a raked bow because it is easier and more efficient during the lamination process, leading to cost and consistency efficiencies in volume production.

As the RS Aero is relatively narrow, RS Sailing adopted the modern approach of running the gunwale parallel to the centre-line in the aft half of the boat. This creates an important carbon laminate "box frame" around the boat and distributes rig loads through a light, efficient structure. It also makes righting the boat from inverted faster and safer, according to the company.

RS Sailing also included a chined flat panel deck to minimise weight and keep straight load-paths with structural corners. A range of deck profiles were tested to maximise comfort and a feeling of security.

The RS Aero is designed to stack – the hull above sits perfectly into the deck below. This allows three boats to be stacked on a conventional road trailer base with small carpet-type pads between them.

RS Sailing worked with a carbon fiber tube manufacturer to produce the three rigs using a common top-mast and boom and differing stiffness bottom sections that are still compatible with the top-mast. The differing bend at deck level and stiffness of the three rigs ensure the boat remains well balanced, without resorting to a permanently pre-bent lower section for the smallest sail.

Lightweight success

At just 30 kg, the RS Aero hull weighs less than the world-famous Optimist dinghy, which was designed in 1947 for sailors under the



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age of 15. 'Due to its ultra-light weight and the high elongation at break (shatter resistance) of the epoxy resin system, the RS Aero has proved to be remarkably durable,' said RS Sailing.

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'We are thrilled to accept such a prestigious award, the RS Aero is a real game changer for us as a brand and for the sailor,' said Newton-Southon. 'It's a revolution for single-handed sailing, and as a company we are so excited about its future and potential.'

It has also won *Sailing World* magazine's Best One-Design award at the Boat of the Year Awards.

The RS Aero earned the judges' highest praises for its meticulous design and its potential to become sailing's next great single-handed dinghy.

Sicomin; www.sicomin.com