



Racing Shell Glossary

When you're buying a boat, there's a lot of technical jargon thrown around that probably isn't part of your every day vocabulary. Here's a list of common terms that you may hear or read from a boat manufacturer, and how they affect performance and longevity.

Shell Structure

Ribs: An internal skeleton structure inside the hull. A boat has multiple ribs that intersect the keel perpendicularly, and the riggers mount to the side of the boat at a rib location. Ribs can be made of wood, or some sort of laminate such as carbon fiber or fiberglass.

Shoulders: Same as ribs.

Monocoque: A construction where the materials of the hull provide the structural strength, and no ribs are necessary. (Another example of this type of design in nature is an eggshell.) Wing riggers are an important compliment to this hull construction since they provide lateral strength.

Ribless: Same as monocoque.

Bottom Line

When the rowers take a stroke, opposite forces are applied from both the starboard and port sides, literally twisting the hull. The joint where a rib attaches to the skin is particularly vulnerable to this type of wear and tear, and is usually the first place to show signs of degradation

Though most boat builders offer both ribbed and monocoque rowing shell models, monocoque hull designs have become popular because they eliminates these joints altogether. Particularly when paired with wing riggers, a monocoque hull tends to hold up to wear and tear longer than a ribbed hull. However, the monocoque design requires materials that are stronger (and more expensive) to ensure stiffness, so they are typically the higher price boats.

Riggers

Side-Mount Riggers: Tubular metal riggers that mount to the sides of the boat, typically with four bolts. The rigger mounts at a rib for maximum durability.

Euro-Style Riggers: Side mount riggers that have a block that holds the pin in place, and does not allow for easy forward and lateral pin pitch. Only the spread, oarlock pitch, and height can be adjusted.

Wing Riggers: Riggers that sit on top of the boat, bolting to the gunwales typically with four bolts. Commonly made of aluminum or carbon fiber.

Quick Release Riggers: Riggers that use cam locks instead of nuts and bolts to secure the rigger to the boat.

Airfoil: The cross section shape that is optimized for aero or hydrodynamics. It's often used to describe the shape of wing riggers and fins, and in these applications, refers to an elongated teardrop shape.

Bottom Line

Side mount riggers are usually lighter than wing riggers, but require additional hull material to reinforce bolt locations. Wing riggers are slightly heavier than side mount, but make a boat significantly stiffer since they act as a cross-brace to the hull. Additionally, a wing rigger boat requires less material to support the wing, so the bare hull is lighter.

Since wing riggers mount to the top of the gunwale instead of on the side of the boat, the sides of the boat must be 2-4" shorter to allow for enough clearance for the rowers' hands over the riggers. This leaves less protection from water being splashed in, particularly in choppy water.

Know which rigging adjustments are important to you before selecting your new riggers. Because of advancements in oars, many coaches do not require the same flexibility in rigger adjustment and opt for a simpler setup. More flexibility isn't necessarily better – it can take longer to make changes and rerig your boat since more measurements will need to be checked.

Our experience with quick release riggers is that the first few rigs/derigs are faster, but the fasteners wear quickly and fall out of tolerance.

Materials

Carbon Fiber: A fabric made up of extremely thin carbon atom fibers. Carbon fiber gets its strength from the way the atoms bond with microscopic crystals and align themselves along the long axis of the fiber, which by its nature provides a very strong bond. Strands are woven together to form yarn, which is then woven into fabric. The fabric is available in many different patterns depending on the intended use.

Fiberglass: A fabric made up of very fine strands of glass. The first composite boats were made entirely of fiberglass, though it's used in a more selective capacity now because it's heavier than carbon fiber. It has specific properties that make it very durable, and is much tougher than carbon fiber.

Composite: A combination of multiple materials engineered to attain a specific characteristic. In racing shells, it refers to the fabric or "skins" and the core.

Laminate: The product of combining two or more layers of materials together.

High Modulus: A grade of highly processed carbon fiber with fibers packed densely enough to yield an MSI of 33+. (MSI – million pounds per square inch; a measure of stiffness).

Unidirectional: A material that has fibers running in one direction only. It is most commonly used as carbon fiber, and can come in many different areal weights. It is used where specific reinforcement is required.

Kevlar: A woven synthetic fiber that's commonly used in body armor and tires. It's very strong, but extremely difficult to work with, and once damaged difficult to repair.

Pre-Preg Carbon: Carbon that comes with the resin already on it (or "pre-impregnated").

Wet Lay-Up: Epoxy is hand applied to the carbon fiber once it's laid in the mold.

Lay-up: The combination of materials used to create the racing shell. Each boat builder has their own proprietary lay-up schedule.

Epoxy: A resin that's mixed with a hardener. Combined in exact proportions, the epoxy is precisely applied to the carbon fiber in the mold. It cures at a specific temperature after a specific period of time.

Resin: A liquid substance that hardens to a hard or enamel-like finish. In this application, resin is applied to the composite material to create the hull of the boat.

Foam: A closed-cell, very strong, very light foam sheet.

Honeycomb: Solid sheeting that is made up of many small hexagonal (six-sided) tubes. It looks just like its namesake—a honeybee honeycomb.

Nomex: The trade name for the honeycomb most commonly used in rowing shells.

316 Marine Grade Stainless Steel: A grade of stainless steel that is resistant to corrosion. 316 refers to the chromium content. Steel is never completely rustproof, however the addition of chromium improves the metal's resistance. Marine grade stainless is particularly helpful in salt water since salt is a catalyst to the rusting process.

Aircraft Grade Aluminum: A high-grade aluminum alloy that is extremely light, and withstands heat and fracturing well. This is a somewhat broad term covering a wide range of alloys.

Anodized: A process that increases the thickness of the natural oxide layer on the surface of metal. It increases corrosion and wear resistance, and provides better adhesion for paint primers and glues. The process includes passing an electrical current through the alloy while soaking in an acid solution.

Bottom Line

Everyone wants four things in their racing shell. They want it to be stiff, light, durable, and affordable. It's impossible to get all of these at once, so the above listed materials are mixed and matched to try to optimize the shell for those characteristics.

We recommend deciding what is important to your program, then weighing the options. Depending on whether you're focusing on long fleet life, purchase price, hull stiffness, or shell weight, different materials are going to be advantageous.

Performance & Boat Feel

Wetted Surface: The area of the hull that is underwater.

Drag: The forces that act on the hull to slow down its speed.

Skin Drag: The force that slows down a hull due to the friction between the skin of the boat and the water.

Wave Drag: (Also called "parasitic drag") The drag that is a result of simply pushing the shape through the water. The faster the boat goes, the higher the drag.

Hull Shape: (As in: aggressive hull shape) The cross-section of the hull resembles a "U". Generally speaking, a boat that has a broader, flatter bottom (very U shaped) is going to be more stable than a boat that more closely resembles a V shape. However, the V shaped hull theoretically has more speed potential since it is more hydrodynamic. Boat designers work to create a hull shape that is stable, yet fast.

Pitching Hull: The longitudinal up and down rocking motion of a boat.

Roll: The side-to-side motion of a boat.

Stability: How much a boat pitches and rolls while being rowed.

Wet Sanded Hull: Some builders rough-sand below the waterline to reduce drag. The theory is that the “scratches” hold water, and water-on-water is slipperier, hence faster. The majority of builders obsessively shine the hulls of the boats.

Stiffness: The rigidity of the hull, or the extent to which it resists bending. It’s the opposite of flexible. A stiff boat will allow more of the rower’s force to contribute to the boat going faster, since less of the rower’s force will be absorbed by the flexing of the boat.

Torsional Stiffness: Refers to the boat’s resistance to twisting. When force is applied on both the starboard and port sides, the boat can twist. Wing riggers significantly improve torsional stiffness.

Bottom Line

Know whom you’re shopping for. The most expensive boat isn’t always the best fit. It’s easy to slow down a crew by over or under boating them. Because rowing technique plays such a large part of boat speed, a less experienced crew will most likely go faster in a more stable, training-type boat, as opposed to an aggressive, elite-level racing machine.

It’s also important to anticipate your lifetime use of the boat. Will you be reselling it in 2 years? Letting the varsity row it for a year then passing it onto the novice? Will it be your top racing shell (or learn to row shell) for 5+ years? Again, knowing who and how you’re planning on using the boat, and then shopping for an appropriate model will help ensure that you’ll get the best value.



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