How NACRA developed their new F18

In November 2004 NACRA joined forces with well known multihull experts Morrelli & Melvin to develop their new Formula 18 racing catamaran. Morrelli & Melvin have previously designed the NACRA ***A2*** - the current A Class Catamaran World Championship winning design, the 125' racing catamaran PlayStation, and the 60' Americas' Cup winning catamaran for Dennis Conner.

Hull Design - The New F18 benefits from the latest developments in Wave Piercing Technology (WPT). After extensive experience in the A Class Catamaran class with their 2005 World Championship winning ***A2*** design, and their prior experience designing wave piercing catamaran hulls for fast ferries and yachts, Morrelli & Melvin have developed a third generation of racing catamaran wave piercer specifically for the new F18. These hulls maintain the low drag and pitch dampening characteristics of their previous work with increased resistance to pitchpoling. Since F18's are frequently driven to the limit in high winds and steep seas, pitchpoling resistance was a primary goal in this design.

Canted hulls - The hulls are canted outward by four degrees about their longitudinal centrelines. Canting the hulls increases righting moment, reduces resistance, improves steering response, and reduces pitchpoling downwind.

Hull construction - The hull laminate is produced with a resin-infusion system. Resin-infused hull construction technology vastly improves hull laminate quality. Laminates are very light, stiff, and fatigue resistant due to the high fiber content and low void content that this system produces. Another benefit of this system is that it creates far less air pollution than standard hand-laminating systems. Instead of manually saturating fiberglass cloth with paint brushes and squeegees, resin infusion uses vacuum pressure under a vacuum bag to automatically pull resin into the laminate.

The entire "sandwich" laminate consisting of dry inner and outer fiberglass skin plies, and a center foam core are placed into the female mold. Then a vacuum bag is placed over the dry laminate and a vacuum is applied which evacuates all the air and compresses the laminate stack. Once the vacuum is complete, resin is pulled into the dry laminate by the vacuum pressure through a labyrinth of tubes and "feed strips" which help distribute the resin evenly throughout the laminate. No excess resin is allowed to saturate the fiberglass fibers, and this results in a lightweight but stiff structure. This system is highly repeatable, resulting in consistent high quality parts.

As a test, NACRA built several of their previous F18 designs with the resin infusion system in 2005. These boats weighed significantly less than the stock hand-laminated boats. Additional fiberglass was added to the structure to bring the hull weights up to the class weight minumum, further improving strength, stiffness, and durability!

Wing shaped mast section - A CFD (Computational Fluid Dynamics) program was used to perform aerodynamic flow analysis around the mast and sail combination. A new lower drag mast section was designed after reviewing the performance

characteristics of existing F18 masts. Our team of sailors, sailmakers, and designers performed a thorough review of existing F18 mast stiffness and have designed a new section with optimized stiffness, minimum weight, and which incorporates the new aerodynamically improved shape.

Sails - In 2005 Performance Sails (Holland) started a test program to test sail designs for wing shaped mast extrusions. They made and tested sails for the Capricorn F18 and AG Plus wing mast sections. Some Capricorn, NACRA, and Hobie F18 teams helped with this effort and sailed the 2005 racing season with Performance Sails with impressive results. Performance Sails are the stock sails on the new NACRA F18 world wide.

Tilted back beam - aligns the mainsheet with the traveler car, reducing traveler car friction and improving bearing life.

Front beam sunken in deck – significantly reduces spray drag by deflecting water smoothly over the top of the beam. Wave piercer hull designs tend to penetrate through waves so this is an essential feature of the deck.
Canted front beam – Aligns mast compression forces with the mast ball and dolphin striker, reducing stress and deflection in the beam components.
Low bridle attachement point – Allows for a lower jib luff and shorter leach, which improves the aerodynamics of the sail.

High aspect ratio rudder blades and daggerboards – New rudders and daggerboards were designed as a "package" to optimize lift to drag ratio, provide improved maneuverability over existing designs, and eliminate rudder ventilation. Morrelli & Melvin used their extensive experience designing multihull foils, along with advanced CFD flow analysis tools to optimize the foil cross sections and planforms. Input from the NACRA sailing team was crucial to the success of this effort.

Computer cut aluminium molds, created from highly accurate 3D CAD models ensure the designed shape and produce extremely accurate parts.