Teams are allowed to build two versions of the AC72. Each team must design and build its own AC72, based on what it has learned from sailing the smaller AC45, which ORACLE TEAM USA designed on behalf of the America’s Cup community.

“It became clear that the complexity of the AC72 was far beyond what we had seen previously with older America’s Cup boats,” explained Christoph Erbelding, senior structural engineer with the team, who previously worked in the automotive and aerospace industries. “That complexity was what led us to 3DEXPERIENCE.”

Choosing the 3DEXPERIENCE Platform

“In America’s Cup racing, it has been typical for designers to use their own favorite software,” Russell Coutts, CEO of ORACLE TEAM USA, said. “After we won the 33rd Cup, we chose Dassault Systèmes because we wanted to have a fully integrated design program. This Cup campaign is the first time where we have had a coordinated approach to design technology.”

Instead of deploying individual software solutions, ORACLE TEAM USA uses Dassault Systèmes’ 3DEXPERIENCE Platform, including CATIA for virtual product design, SIMULIA for realistic simulation, and ENOVIA for collaborative innovation, which provides a shared database and design processes for ORACLE TEAM USA’s global group of designers and team members. “We’re using software from Dassault Systèmes to go all the way from conceptual design to production,” Coutts said.

The design team uses CATIA to model each aspect of the boat in the virtual world, quickly and efficiently. “What’s nice about using the 3DEXPERIENCE Platform as a designer is being able to quickly get from a concept to a finished part,” Aaron Perry, design engineer on ORACLE TEAM USA, explained. “It allows us more freedom in the initial stages of design to really explore what’s important.”

The world’s most avant-garde sailing race event has its roots planted firmly in history. The America’s Cup sailing competition dates back to 1851, when a race around the Isle of Wight in England was won by a radical looking schooner named America. Since then, the America’s Cup has become the sport’s most prestigious competition, attracting the world’s foremost sailors and yacht designers.

When ORACLE TEAM USA won the 33rd America’s Cup in February 2010, the team brought the America’s Cup home to the United States and automatically became the Defender of the 34th America’s Cup.

That is when one of the greatest technological challenges in the history of sailboat racing began.

Technology has transformed sailboat design and racing – and nowhere is that more evident than in America’s Cup racing. “The America’s Cup is a technology game today,” said Jimmy Spithill, helmsman and skipper for ORACLE TEAM USA. “There’s an incredible amount of technology that goes into designing and building the fastest, lightest, strongest boat we can.”

New design challenges

For the 34th America’s Cup, two new classes of boats were specified: the AC45, a smaller, wing-sailed multihull boat for the America’s Cup World Series regattas leading up to the 2013 America’s Cup; and the AC72, catamarans with a hull length of 72 feet, topped by a wing sail measuring almost 3,000 square feet (260 square meters), for the Louis Vuitton Cup challenger series and America’s Cup finals in the summer and fall of 2013.
That exploration is just one part of an ongoing, collaborative effort that involves everyone on ORACLE TEAM USA. The 3DEXPERIENCE Platform enables team members to share ideas through the virtual design process.

**Designers and sailors working together**

The 3D model developed in CATIA brings the design alive for the entire team. “In almost every meeting, we show our design to a room full of sailors, designers and builders, all of whom have their own perspectives about what the design needs to accomplish,” Perry said.

With the 3D model projected on a large screen, sailors feel like they’re on the actual boat. They can see if hydraulic hoses or other mechanical systems will interfere with their activity on the boat. Spithill concentrates on whether or not he can see the bows of the catamaran’s hulls, or see through the wing. He imagines where the crew members will be during actual critical maneuvers.

“Vision is very important on this sort of a boat,” Spithill said. “3DEXPERIENCE gives us vision into the realities of sailing a boat that doesn’t even exist yet.”

“The best way for the crew to evaluate what will – and what won’t – work is to use 3DEXPERIENCE,” he continued. “We can spin it around. We can see where everything needs to fit. You just couldn’t get that kind of vision without these tools.”

Erbelding added, “From concept to detail design to testing to manufacturing, the 3DEXPERIENCE Platform really eases and
inspires the process between what the sailor wants on the boat and what finally gets built down the road."

**Plan, manage, track and connect**
The collaborative value of the 3D EXPERIENCE Platform does not begin and end with the crew in San Francisco. It encompasses members of ORACLE TEAM USA from New Zealand, Europe and the U.S.

"America’s Cup teams typically are spread across multiple locations," Erbelding said. "We have people working in different time zones on different projects that are often overlapping. Without the integrated 3D EXPERIENCE design platform, it would be a big challenge to keep all the data synchronized and make sure everybody is working off the latest set of data."

The team uses ENOVIA for multi-site collaboration and design data management. "ENOVIA enables us to have everyone up to date, working from the most current designs and drawings, regardless of where they are around the world," Erbelding continued. All the details of the 3D model can be translated into the manufacturing process, ensuring precision and accelerating production.

The collaboration continues even after a day of sailing. Designers take the crew’s feedback, make changes to components, and start production immediately.

"We never stop looking for a better way," Spithill said. "3D EXPERIENCE enables us to keep going back and questioning things, looking at modifications. Continuing to develop the boat and make it faster is a never-ending quest."

**Realistic simulation saves time**
The three years between the 33rd and 34th America’s Cup did not give the designers and engineers a lot of time to design, build and test the boat. In fact, teams were allowed only 30 days of training and testing before February 2013 on their first AC72 design so ORACLE TEAM USA relied on virtual testing with SIMULIA to capture issues within the design prior to build.

"The America’s Cup allows such a small timeframe to design and build that you really can’t afford to do any real hardware testing on a large scale," Erbelding said. "SIMULIA is a strong tool to simulate and optimize all parts and systems in the boat to ensure they’re light, stiff and strong enough to stand up against anything they need to endure on the water."

**Improving the fan experience**
ORACLE TEAM USA is using the 3D EXPERIENCE Platform to enhance the experience of America’s Cup racing enthusiasts – and non-enthusiasts – around the world.

"The entire America’s Cup has focused on advancing our sport and engaging a younger audience with the hope of generating new fans," Coutts said. "Television production and high-quality images already coming from fixed cameras on board the AC45s have brought the sport closer to the public. So we designed the AC72 with the TV broadcast in mind."

Fans can go to the ORACLE TEAM USA website and see the 3D model of the boats. During the actual America’s Cup match, on-board cameras will enable viewers to see the crew at work during the races themselves.

"In the past, the America’s Cup has been pretty closed," Perry acknowledged. "But with our ability to share 3D renderings, we can expose more viewers to America’s Cup racing than ever before. It’s a fantastic educational tool that should help us reach out and build more interest in the Cup."

**Pushing boundaries in design, performance**
3D EXPERIENCE has helped ORACLE TEAM USA to build the fastest, strongest boat it could create, pushing the boundaries of sailing performance. “The public will be blown away by the performance and speed of these boats,” Coutts said. “They’ll be amazed that a sailboat can perform so efficiently.”

Indeed, the AC72 is expected to be among the fastest boats ever sailed around a racecourse. Members of ORACLE TEAM USA use the word *flying* — in part, because of the wing-like sail, and in part because at racing speed, the AC72 lifts almost entirely out of the water, referred to as *foiling.*
It is no small coincidence that Dassault Systèmes’ 3DEXPERIENCE applications were first developed and refined to serve the global aerospace industry, and that those solutions continue to drive aerospace innovation today. Dassault Systèmes’ expertise in aerospace design translates to two critical design elements of the AC72: the airfoil-like wing sail, and the high-tech carbon composite materials used throughout the rest of the boat.

“The composite modeling ability in CATIA, and testing in SIMULIA, were crucial to our ability to optimize the composite structures in our boats,” said Erbelding. “All parts on America’s Cup boats are optimized to minimize weight while still maintaining strength.” CATIA also enabled manufacturing engineers to map out both finished parts and layout in one step, which accelerated production.

The AC72 boats race at speeds approaching three times the speed of the wind that propels them. Stresses are enormous. “When the boat is sailing across the wind, lifting out of the water, there are enormous forces — 30 to perhaps 50 tons of compression load on some of the rigging elements,” Coutts explained. “There is just no room for error.”

Confidence and high expectations
ORACLE TEAM USA is confident in its AC72 designs, thanks to the collaborative, virtual design experience enabled by the 3DEXPERIENCE Platform.

“The design and engineering of our boats are right up there with aerospace design and engineering,” Coutts concluded. “We’re pushing the limits. But we’re also enormously confident in what we’ve built together. Working with Dassault Systèmes gave us confidence before we ever left the dock.”
Dassault Systèmes, the 3DEXPERIENCE Company, provides business and people with virtual universes to imagine sustainable innovations. Its world-leading solutions transform the way products are designed, produced, and supported. Dassault Systèmes’ collaborative solutions foster social innovation, expanding possibilities for the virtual world to improve the real world. The group brings value to over 150,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit www.3ds.com.