DASSAULT SYSTEMES

MARINE & OFFSHORE CASE STUDY

GROUPAMA TEAM FRANCE

Groupama
TEAM FRANCE

Challenge:
To prepare for the 35th edition of the America's Cup, Groupama Team France needed to design, build and test their flying catamaran within a very short timeframe.

Solution:
Groupama Team France adopted Dassault Systèmes' **3D**EXPERIENCE platform and its industry solution experience *Designed For Sea* for virtual design, simulation and collaborative innovation.

Benefits:
Using the **3D**EXPERIENCE platform, the team has accelerated design time, improved collaboration and produced designs of superior quality and precision.

FOILED BY THE AMERICANS

On a summer day in 1851, a yacht representing the New York Yacht Club, the America, sailed to victory over the British team in the Royal Yacht Squadron's 100 Pound Cup. The win was a blow to Britain's maritime supremacy. Thus, began sailing's oldest and most prestigious competition, the America's Cup. The 35th edition will be disputed in 2017 off the coasts of Bermuda.

Among this edition's five challengers and one defender is Groupama Team France, comprising top sailors such as Franck Cammas, winner of numerous sailing competitions including the Volvo Ocean Race in 2012, Michel Desjoyeaux, multiple winner of some of the world's most prestigious single-handed sailing races, and Olivier de Kersauson, multihull pioneer. Three generations of sailors, three men with the same ambition: to win sailing's most prestigious prize.

"Groupama Team France is a group of 85 passionate designers, engineers, mathematicians, physicists, communications specialists, medical crew, sailors and people responsible for the financial and logistics aspects of the project," said Michel Desjoyeaux, co-founder of Groupama Team France. "My contribution is to bring an external point of view based on my many years of experience navigating in sailing competitions, and not always under the mildest of conditions. Every role is essential, even though the public only sees the tip of the iceberg, the skipper and crew. Without the skilled people who diligently work behind the scenes to design and build the catamaran, Groupama Team France would simply not exist."

TESTING THEIR DESIGN ON A TIGHT SCHEDULE

To comply with the rule stating that the boats can only be water-tested starting from December 26, 2016, each team built prototypes to test and fine-tune their designs. Yet with budget and timing being tight, Groupama Team France could only build one prototype catamaran, unlike some of the other challengers that have two or three boats. Their prototype, the Class AC Test, was exclusively built for training purposes and to validate design concepts. The design approach and technologies will simply be transferred from the test boat to the Class AC, the boat the team will use for the race in 2017. 90% of the test boat is the same as the race boat but with shorter hulls.

From a technical standpoint, this America's Cup edition boats will be smaller than those used in previous competitions. "The boat went from a 62-foot (19-meter) flying catamaran with very open rules to a 50-foot (15-meter) flying catamaran with many restrictions," explained Martin Fischer, head of the design team at Groupama Team France and designer of the Flying Phantom, the first catamaran with foils. "We had to use the construction plans of certain components that were designed once for use by all the teams (called one-design components). This meant that we had to spend time analyzing all the plans to understand every detail of these "one-design" components before preparing the construction plans. Eliminating this analysis phase and following these drawings blindly would have been too risky. Meanwhile, we also had to address the areas impacted by the new rules - the foils, the structure of the wing and the aerodynamic fairings of the catamaran," he said. "There was a lot to do in a very limited period of time. We began designing the boat in October 2015 and had basically 18 months compared to many of the other teams that started earlier and had nearly three years to do the same thing."

"So, everything is more or less done on a just-in-time basis," Desjoyeaux continued. "We finish the plans, send them off to production, and during this time we are already planning the next step. It takes a lot of effort, which is why, to meet our deadlines, we needed the right technology to streamline development and the flow of information between the different project actors."

To meet all these challenges, Groupama Team France adopted the **3D**EXPERIENCE® platform and the *Designed For Sea* industry solution experience from Dassault Systèmes. "Building a catamaran for the America's Cup requires us to comply with some new and very strict protocols concerning the hull, the wings and the transverse structures in terms of geometry and weight as well as the quantity of materials used," Desjoyeaux said. "These are the elements we cannot modify. With some parts, however, we had more freedom, for example, with the arm fairing support brackets, the two main foils, the dagger board geometry and trimming systems, the steering gear, and the system for the manipulation of the wing. We are on a perpetual quest for excellence and time is running out. A project like this is not like a traditional industrial project where we have time to perform preliminary studies, draw up the plans, build a prototype and then proceed with mass production. With the race only a few months away, there is a level of urgency."

"The **3D**EXPERIENCE platform has, therefore, enabled us to accelerate the development of our two catamarans," Fischer said. "In the past, we used different software for each task; one for 3D modeling, one for structural analysis and another for flow simulations and optimization. With the **3D**EXPERIENCE platform, we have all these applications integrated into one environment. Consequently, we no longer need to worry about exchanging files in different formats with the risk of losing information in the process. It really helps to speed things up and we make fewer errors," he said.

MAKING MUSIC TOGETHER

"Collaboration between the design team and the crew is essential particularly since we are on a very tight schedule," Fischer said. "With *Designed For Sea*, we model everything in 3D, design the foil

"The **3D**EXPERIENCE platform is an important asset in our quest for leadership. It enables our designers to express their expertise to build a boat of superior craftsmanship and technological prowess."

— Franck Cammas
Skipper, Groupama Team France

using the composites features, analyze the structure, and simulate the boat's behavior in the water. The resulting 3D virtual mockup provides the crew with a precise idea of the future boat before construction even begins. We can represent details of the deck plans such as where the winches and buttons are for the different control systems early on in the process. Having this preliminary view allows them to become familiar with the boat and for us to make the necessary adjustment before we're too far downstream when it becomes financially prohibitive to make modifications."

Franck Cammas is the skipper leading the Groupama Team France crew. "My other role is to assemble the right talents - designers, skippers, shore team and supporting functions – and to make sure they're able to collaborate and communicate throughout the project like a well-tuned orchestra," Cammas said. "Everyone must be attentive to each other's requirements. The designers must foresee what the skipper will experience when navigating, and design the boat accordingly, and the skipper must work hand-in-hand with the architects and engineers as early as possible so that the components are correctly designed from the start. As we are on a tight budget and schedule the **3D**EXPERIENCE platform enables us to seamlessly communicate throughout the project."

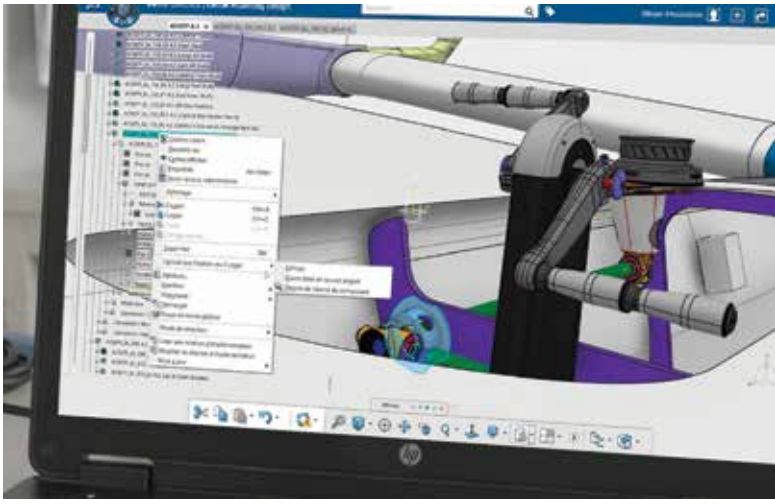
While internal collaboration between Groupama Team France members is important, so is communication with external partners participating in the design effort. "Our foils are built, by an external partner that also uses the **3D**EXPERIENCE platform," Fischer said. "This allows us to easily exchange 3D models and construction plans with them and, if there are issues to resolve, our communication is more efficient, new ideas flow and errors that might otherwise go unnoticed are more easily corrected. It all boils down to time. If communication is streamlined, the design process is quicker leaving more time to run tests and optimize our boat."

KEEPING THE CREW SAFE

One of the design team's major challenges was to design a rigid and strong boat that is also lightweight. "Having an extremely light and stiff structure is somewhat of a contradiction," Fischer said. "It's difficult to have both so we needed to analyze the entire structure in detail to identify areas where we can reduce weight, without losing stiffness and strength. With the **3D**EXPERIENCE applications, we were able to quickly test many different options, within a given timeframe, before choosing the best one," he said.

When sailing downwind, boats that race in this type of competition can reach up to three times the speed of the wind. Upwind, or against the wind, they go almost twice the wind speed. "As a comparison, downwind, we are much faster than the speed attained at a water ski world championship," Fischer said. "A foiling catamaran like the Class AC can "fly" at 80 km per hour. This poses some serious safety issues. The hydrofoils must be reliable and not break at full speed because if they do, a crew member can be injured or killed, and that's definitely not something we even want to think about," Fischer said.

"Designing a foil is a difficult task because it's always a compromise between performance and stability. Therefore, the structure must be engineered with the utmost precision. Basically, it's a piece of carbon, which should be as small as possible to reduce the wetted surface yet at the same time, be strong enough to carry a boat travelling at great speeds and that weighs more than three tons," Fischer continued. "We modeled the composites layout layer by layer, ply by ply including the glue between the layers. We then analyzed the 3D model in detail using the **3D**EXPERIENCE platform's finite element analysis applications, to zero in on the best configuration. It is reassuring to be able to do these iterations in the virtual world before drawing up the construction plans," he said. "In the end, we had a precise and error-free digital model. We definitely



Top image: Virtual model of a winch

Bottom image: The team is testing the winch

Focus on Groupama Team France
French sailing team to race in the 2017 America's Cup sailing competition.

Products: 50 foot Class AC Foiler catamaran and 45 foot Class AC Test

Employees: 85

Headquarters: Lorient, France

For more information
www.groupamateamfrance.fr

would not have been able to succeed without the modeling and engineering applications of the **3D**EXPERIENCE platform."

PUTTING THE PIECES OF THE PUZZLE TOGETHER

When the team built the boat based on the 3D model designed with the **3D**EXPERIENCE platform, everything fell into place the first time around. "A boat like this is the sum of many complex mechanical and electrical systems each comprising components of all sizes fabricated either in house or by third parties," Fisher said. "The moment of truth came during assembly. All the pieces of the puzzle fit just like they did in the 3D virtual mock-up. It was a great moment."

For Franck Cammas, advances in boat construction, sailing techniques and technologies that enable the public to share in the excitement of experiencing such an impressive event, all contribute to the sport's increasing popularity. "The America's Cup is a contest of know-how and technology, maybe even before being a race," Cammas said. "This is because over the past few years, the boats competing in this race have evolved dramatically," Desjoyeaux explained. "They have gone from big and heavy monohull boats with a very big ballast to provide stability, and which were not very fast, to spectacular vessels with multiple hulls connected to one another and capable of flying above the water, supported only by two foils. It's a revolution in boat design and the reason for much of the thrill felt by the crew and the spectators watching a race like the America's Cup," he said.

"Technology has allowed us to take a giant leap forward not only in boat construction but in the way we share our experiences with the general public," Cammas added. "Real-time feedback from the skipper and crew while they're navigating and footage of their exploits all contribute to generating enthusiasm for this sport, even among people who have no sailing experience whatsoever. But we never lose sight of the fact that there is only one winner of the America's Cup. The very essence of a race like this is to achieve excellence and for this, we need the best technology has to offer. The **3D**EXPERIENCE platform is an important asset in our quest for leadership. It enables our designers to express their expertise to build a boat of superior craftsmanship and technological prowess."

Martin Fischer added the importance of innovation. "Innovation can be unleashed when designers are not limited by their design tools," he said. "They can explore more options and be more creative," he said. "The **3D**EXPERIENCE platform enlarges the design space that we can explore, enabling us to find better and more innovative solutions."

"I believe we have the skill, motivation and sailing experience in France needed to win this race," Cammas said. "The America's Cup is the sailing world's most renowned competition and the most difficult to win. As a skipper, as a competitor, the incentive to bring this trophy home is very real. It's a source of national pride," he said.

Our **3D**EXPERIENCE® platform powers our brand applications, serving 12 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3D**EXPERIENCE® 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 210,000 customers of all sizes in all industries in more than 140 countries. For more information, visit **www.3ds.com**.

3DEXPERIENCE®

DASSAULT SYSTEMES | The **3D**EXPERIENCE® Company

Americas
Dassault Systèmes
175 Wyman Street
Waltham, Massachusetts
02451-1223
USA

Europe/Middle East/Africa
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan