



VICTORY THROUGH INNOVATION

WINNING THE RACE AND STAYING SUSTAINABLE WITH ALTAIR SOLUTIONS

About the Customer

Elisava Racing Team was born in 2018 at [ELISAVA Barcelona School of Design and Engineering](#), as a project with final year students with the challenge of designing and developing an electric motorcycle to compete in the Barcelona Smart Moto Challenge, an international competition held annually in Catalonia. With a focus on sustainable mobility, university teams from around the world compete in an off-road race using self-engineered electric motorcycles. The students achieved outstanding race results by using Altair solutions to optimize several structural parts of their bike. In 2019, the team won five awards with the electric motorcycle “ERAY” and continued its success in 2020 with the motorcycle “Dayna”.



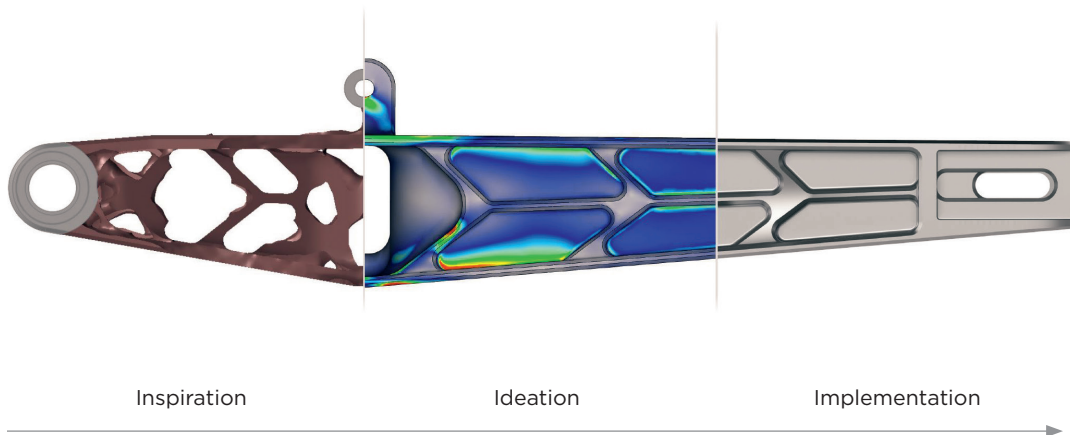
We are convinced that the Altair Academic Program was key for the success of our e-Mobility project. The collaboration with Altair empowers the project development team with a comprehensive portfolio of engineering solutions, which maximizes product quality.”

Marta Janeras, Head of the Simulation and Development Area at ELISAVA



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Their Challenge

While with “ERAY” and “Dayna,” the team had already optimized important structural parts, it wanted to take its latest design “Dayna EVO” a step further. In the new design, the team wanted to combine a 100% electric off-road motorcycle, an IoT connection, and a medical service capable of reaching where it’s needed. With “Dayna EVO,” the team sought to improve the bike’s safety, comfort, and structural behavior. Overall, they wanted a lighter, simpler bike. To do so, the teams needed simulation tools to generate shapes, predict material behavior, and optimize manufacturing processes for the fully electrified motorbike.

Our Solution

Topology optimization using Altair® Inspire™ enabled the team to optimize the design of several structural parts while achieving maximum weight reduction. The team began the process by analyzing the original chassis’ performance.

For the aluminum subframe, the team applied Inspire to minimize the structural assembly’s weight. They used Altair® Inspire™ Print3D to optimize the manufacturing process by identifying the required support structures and by minimizing the residual stresses of the printing process itself. To design the bike’s swingarm, the team studied three main load cases and focused on the vertical load (the most dominant load in a motorcycle swingarm). Performing various iterations with Inspire, the team generated the geometry with an optimal shape to minimize the bike’s mass while still supporting the occurring loads and keeping overall stress low. For the carbon fiber handlebars, the students had to dimension the parts to ensure driver safety. Using Altair® HyperWorks®, the team optimized the composite material by modifying the number of layers to achieve the desired performance. Finally, the team used HyperWorks to simulate the new parts and complex assemblies and evaluate their performance in different racing scenarios.

Results

Using Altair solutions, the student team improved the motorcycle’s parts and created a lighter, more efficient design. The team also optimized complex assemblies while ensuring maximum performance, comfort, and safety. The optimization of the “Dayna EVO” frame to achieve an optimal package for an electric powertrain also shows that electrification can save costs.

In all, the team created a fully electric motorbike that’s suitable for rugged terrain while giving drivers the speed, comfort, and control they demand in great bikes. “Dayna EVO” is a great step forward for the ELISAVA team and will help them improve future designs as well.

To learn more about the Altair Academic Program, please visit altair.com/academic-program

LEFT: Simulation helps teams generate shapes, predict material behaviors, and optimize products and manufacturing processes. **TOP:** The Dayna Evo is the first 100% electric off-road motorcycle for rescue service and assistance in mountain sports events. **BOTTOM:** As a result of the successful collaboration between Altair and the ELISAVA Racing Team, the Dayna EVO, a reference vehicle for technology, innovation and creativity is a reality.