Quicksilver Case Study

PTC Designs Support Quicksilver bid for World Water Speed Record

Inspired by Donald Campbell who held both the land and water speed records, before his tragic accident on Coniston Water on 4 January 1967, Nigel Macknight is now living his dream to bring the world water speed record back to the UK. Macknight has a relatively short window of opportunity to break the water speed record. Coniston is a challenge because the lake is only 5 miles long and he has only three miles to accelerate and two miles to decelerate.

His company Quicksilver (WSR) Ltd is designing, testing and building an innovative turbofan-powered hydroplane at its East Midlands Airport HQ. 46-year old Macknight intends to pilot the craft himself, which has been designed extensively using software solutions from PTC, the product development company.

Development has involved about £1.5 million worth of sponsorship and help in kind from over 30 firms, including technical participants Elite Consulting and PTC. Macknight plans to raise a similar sum to complete this extraordinary personal and technical challenge, which is considered to be one of the most dangerous speed feats.

Making it happen

Quicksilver's 100-strong, mostly voluntary team includes original Bluebird designer Ken Norris and Glynne Bowsher, design engineer of Richard Noble's recent supersonic land-speed breaking Thrust SSC car. A combination of world-beating design, test and advanced safety measures promises to put the UK team ahead once again.

Many of the early drawings were created in 2D. By taking these drawings from AutoCAD and some additional paper drafts and converting them to Pro/ENGINEER, the team were able to work on far more detailed 3D models.

These Pro/ENGINEER models were then fed to Northampton-based Elite Consulting where stress analysis was carried out using Pro/MECHANICA to create a shell model of the structure. Elite also modelled the upper structure, tail and sponsons, the four planes which touch the water, and the honeycomb sandwich panelled skin. Macknight says: "Use of Pro/ENGINEER also helped identify potential clashes between components during the design stage, and key parameters of the space-frame and associated features have been optimised through on-screen analysis and redesign."

Pro/MECHANICA perimeter and end weld facilities were used to connect together the frame members. Pro/MECHANICA also has a special beam fastener feature that can be used to represent bolts, rivets and spot welds. This was used to represent the bolts that attached the engine mounting plates to the frame.

Mass characteristics were also carefully simulated. The Pro/MECHANICA model was run using a Single Pass Adaptive convergence (SPA) of 3 hours 40 minutes, and further refining of the model is planned.

Elite to play a major role

Elite Consulting Managing Director Ray Ellender explains "The deployment of Pro/MECHANICA also helped us to create a combination of beams and shells to represent the engine and its mountings."

The engine mounting was particularly complex as it has to handle 11,000lbs of thrust and allow for thermal expansion generated by a Rolls-Royce Spey Mk101 turbofan engine that weighs 1.2 tonnes.

Elite expects to play a major role in the more detailed design stage. There are plans to share designs and test work online amongst team members using Pro/COLLABORATE, whilst Pro/DESKTOP is being used to convert paper legacy drawings into 3D.

Macknight says, "PTC products have played a key role in Quicksilver's design and development. We have achieved significant time savings and streamlined the design and production process. Working in 2D was not feasible as the data was not associative and did not permit analysis.

Going for the world water-speed record has been my lifelong ambition. We believe that Quicksilver can use modern design, rigorous scientific testing and technology to make it a far safer endeavour. Despite facing strong competition from Australia and the US, we hope to bring the record back to Britain."

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Nigel Macknight
Managing Director,
Quicksilver (WSR) Ltd

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