CONCEPT SAILRACING

CK01

FINN MAST

INTRODUCING A NEW GENERATION OF FINN MASTS

CONCEPT SAILRACING

After 20 months from the start of the project, we are proud to introduce the new Concept Sailracing CK01 Finn Mast.

CK01 Finn Masts' outstanding performances are due to a skilful mix of engineering developments, on-the-water top sailors' experience and special high-tech manufacturing technologies.

The key challenge for our team was to make these three factors converge together, and give birth to a new, modern, generation of Finn masts which embodies our mission of *Excellence in Olympic Classes*

Rafael Trujillo sails CK01 Finn mast at 2010 Sail For Gold regatta in Weymouth

Giorgio Poggi wins 2010 Italian Nationals with CK01 Finn mast

Carbon look bottom part, incl. Halyard exit hole detail

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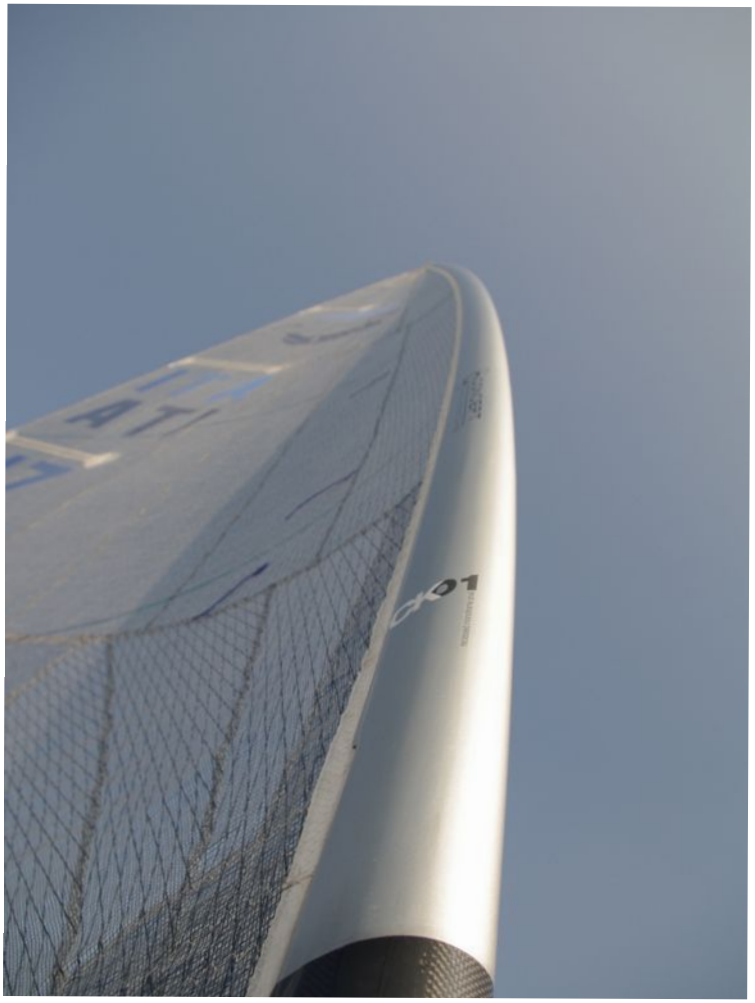
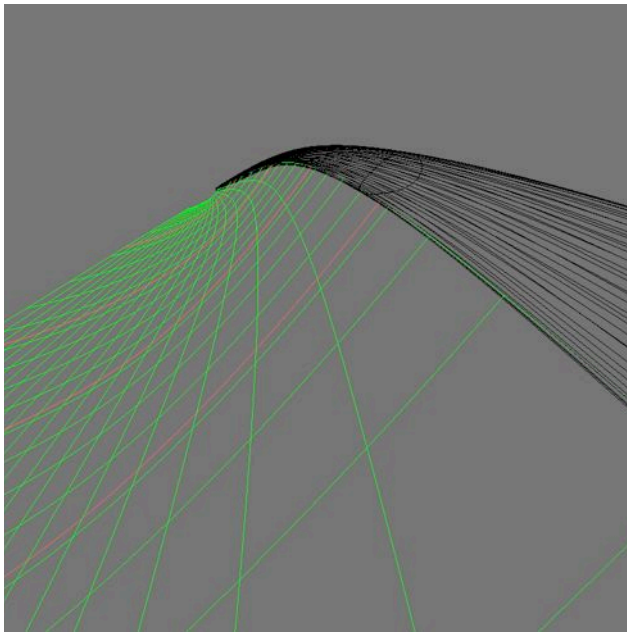
CK01 Flow Dynamics





Finite Element Modeling (FEM), coupled with modern sails flying shapes was used for exhaustive Computational Fluid Dynamics (CFD) analysis

Roland Kleiter

Concept Aerodynamics Design Director:

"To get the maximum aerodynamic performance from a mast it has to work perfectly together with the sail, this is influenced by a number of variables combining aero shape, dynamic bend and torsion.

The mast bending characteristics have to support the sail to provide the best sail shape over the wind range and must also achieve the best possible aerodynamic of the combination mast and sail.

The task we had for the new Concept CK01 mast was to design a wing within the rules which provides those characteristics.

To get a better understanding of the flow around the mast and sail we have run exhaustive CFD flow simulations and tested different profile shapes to evaluate the effect on the lift and drag parameters for different lift conditions. This in all wind speed ranges and under laminar, semi-turbulent and turbulent air flows.

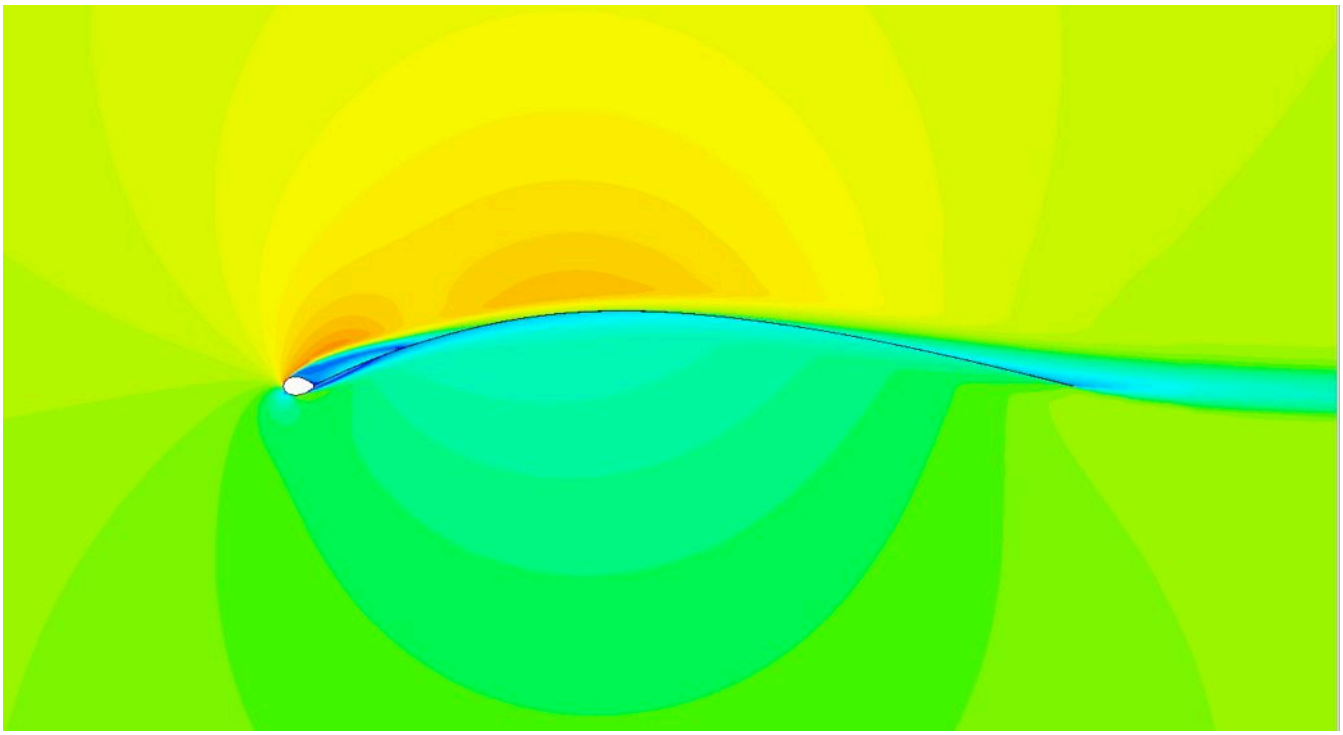
New design wing shape was through the process tested under differently bent and twisted FEA models in order to streamline performance and achieve what at CSR we call High Efficiency Flow Dynamics - HEFD

In light winds our CK01 mast, combined with modern Finn laminated sails, produces higher lift with a smaller separation bubble on the leeward side and no virtual stall.

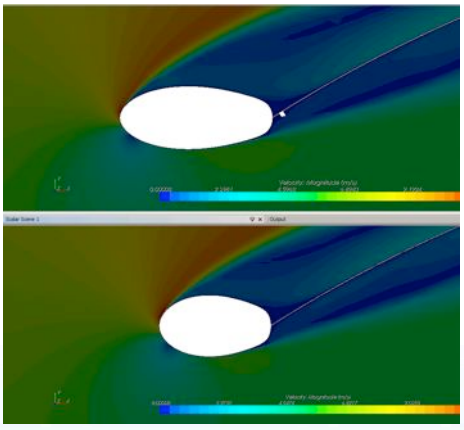
In the mid range the achieved lift to drag ratio ensures best performance.

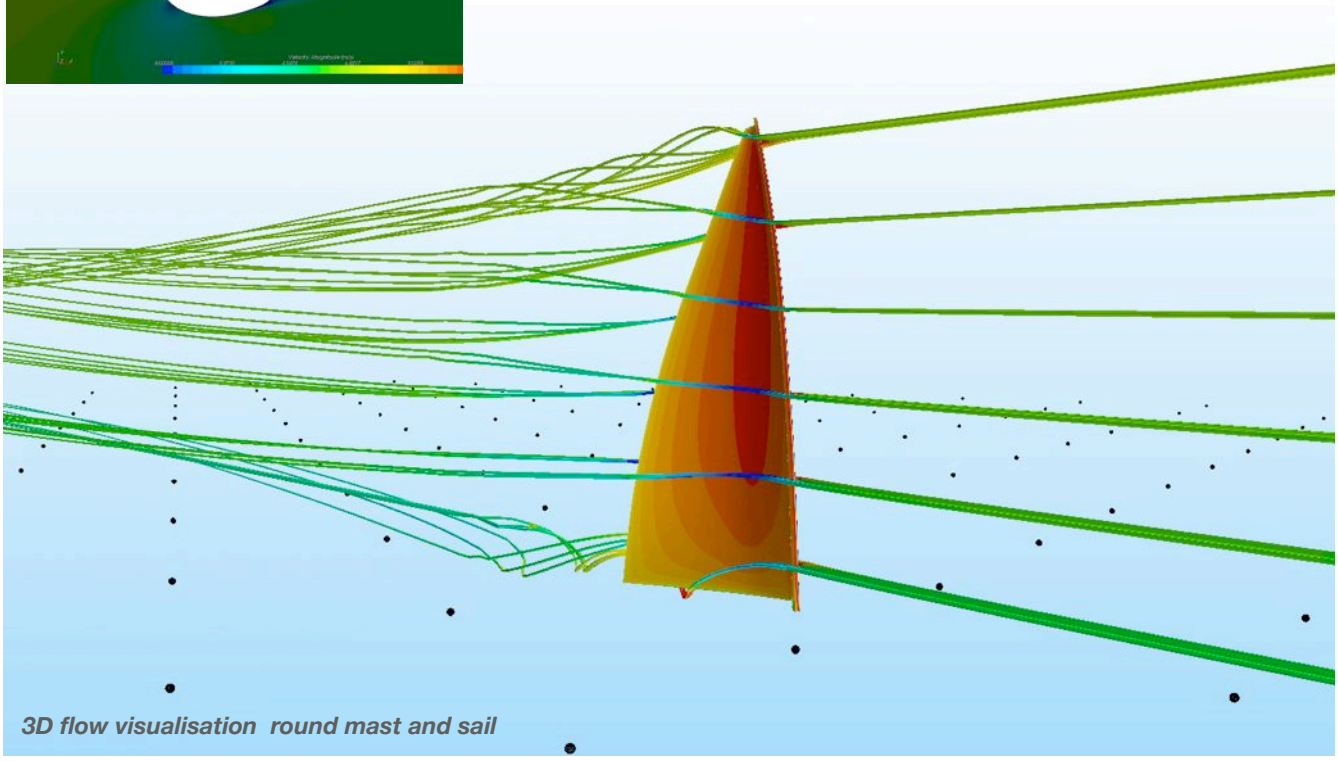
In high winds the mast sail combination produces significant lower drag and allows easier helm and better speed.

The High Efficiency Flow Dynamicsof our CK01 teardrop shaped profile give the best performance in all wind conditions".



2D cut - analisys of velocity round mast section and sail





3D flow visualisation round mast and sail

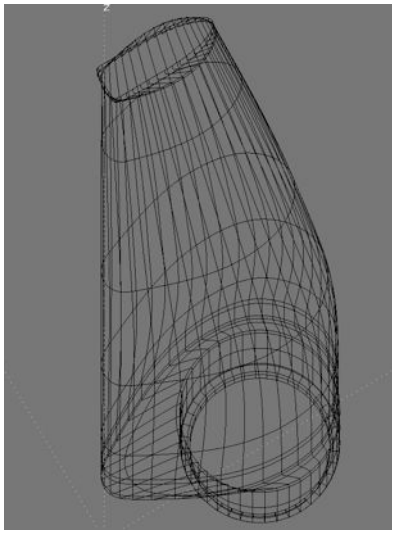
CK01 Structure

Francesco Cipolloni, Structure Engineering, states:

"The design process of Concept Sailracing Finn mast followed what we defined a 'total review approach', consisting in a new way of thinking, more than a different outlook of existing benchmark products. In other words, we started from basics: International Finn Class Rules, mechanics, fluid-dynamics, best available technologies and priceless feedbacks from top sailors.

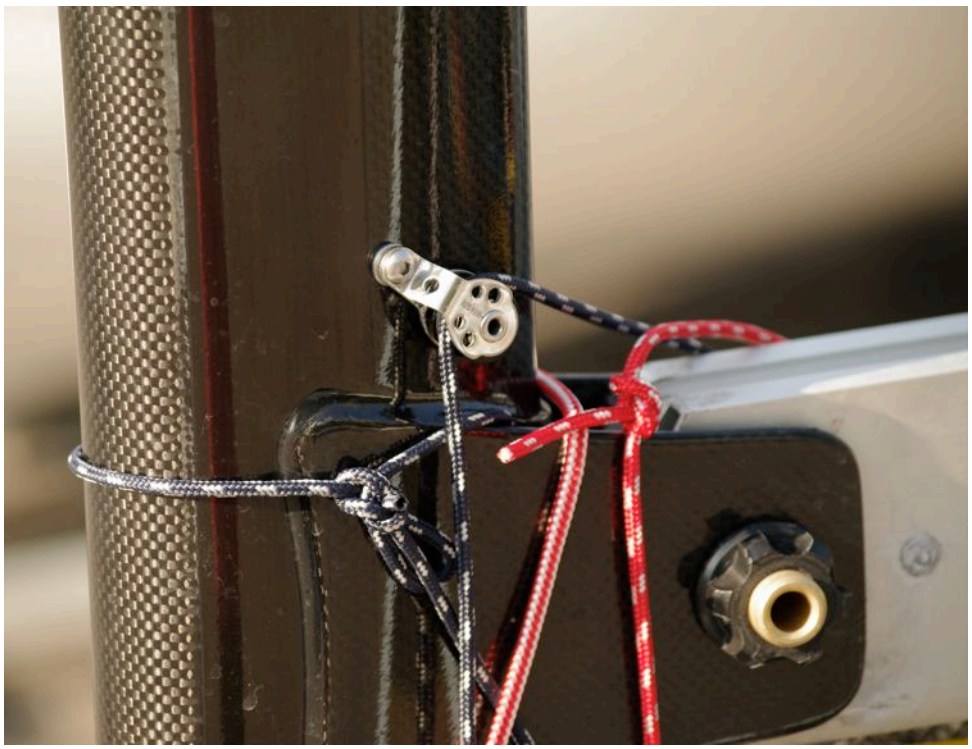
We decided to work out a special finite element code for better managing the complex amount of inputs without losing contact with experimental data. It has been hard, but we have got the expected result: this new software represents an invaluable tool for tuning mast behaviour, enhancing performances and taking off unnecessary weight.

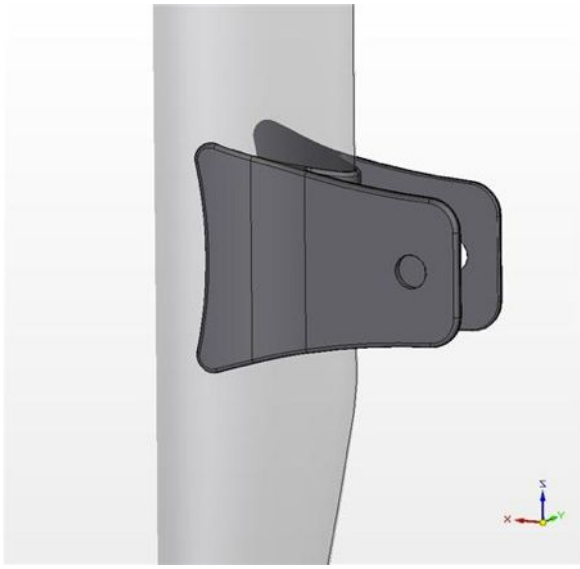
Our CK01 Finn mast is somehow 'alive', every single carbon fiber in its' construction is important, and affects its dynamics significantly, as we are in the tangled bound of large elastic deformations coupled with aero-elastic equilibrium".



Nicola Cigolotti, composite engineer:

"A large part of this challenge related to the development of the special manufacturing processes. When dealing with new production technologies, characterisation of materials can't be based only on datasheets, but needs extensive testing of mechanical properties, to feed designers with the most accurate values for their calculations."





Performance design gooseneck is built from plotter cut carbon fibre pre-pregs and post cured in autoclave

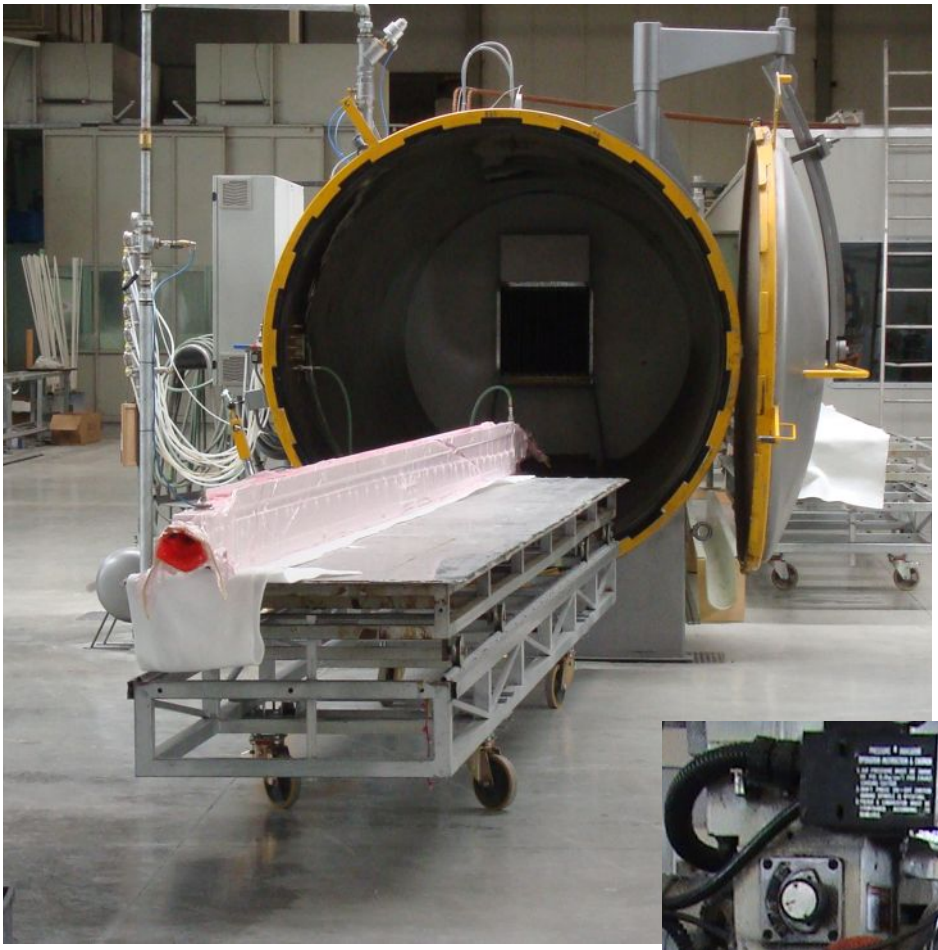
RMS – Recessed Mono-frame Shell is the result of an intensive structural analysis stage which ran parallel to the aerodynamic developments, for best aero-elastic design of the mast. This innovative recessed shape of the body lets the designer tune the mechanical behaviour, placing high-modulus fibres conveniently, saving weight and introducing new torsional parameters under sailing.

Concept Sailracing masts are built with the most advanced technologies available in composites' construction: full autoclave curing cycle and aeronautical quality standards ensure top performances, reliability and consistancy of the product. This was possible thanks to the collaboration of Vega, an established Italian company specialising in composite structures who lead the way in the production of high technology parts and special fittings and has wide experience with custom projects too.

Armando Casazza,
aircraft engineer at Vega:

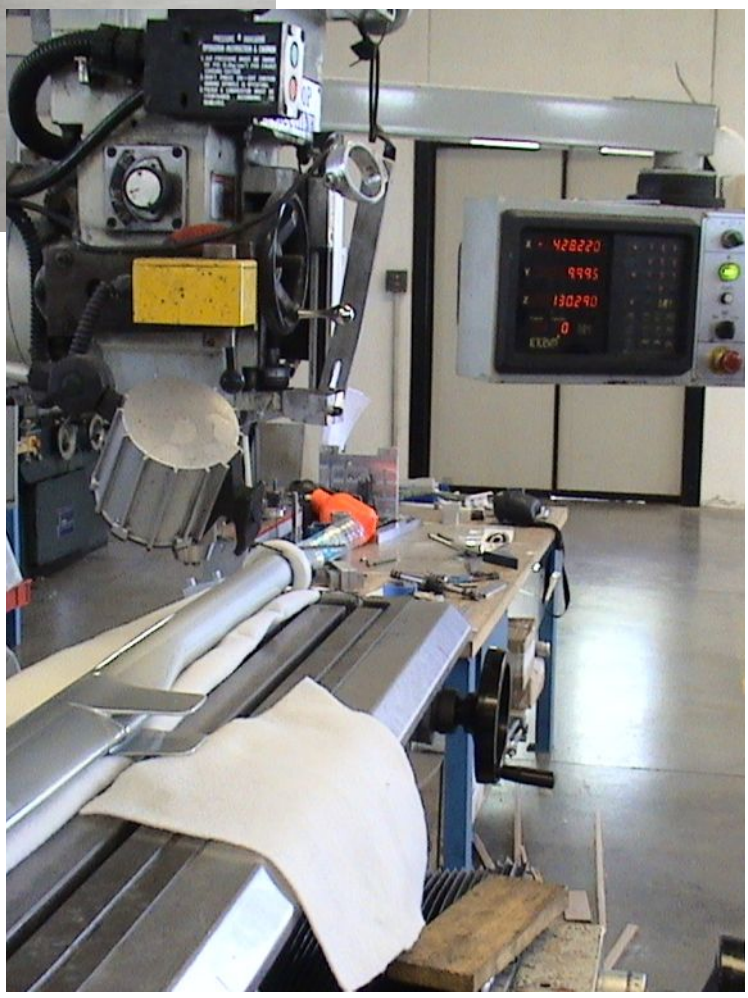
"Besides the complex design phase, we focused on the production stage. Every single mast passes through the hands of specialised workers, therefore accuracy and quality checks are crucially important. Superior quality results are achieved through a skilful mix of automated and manual processes".

CK01 Featured Technologies



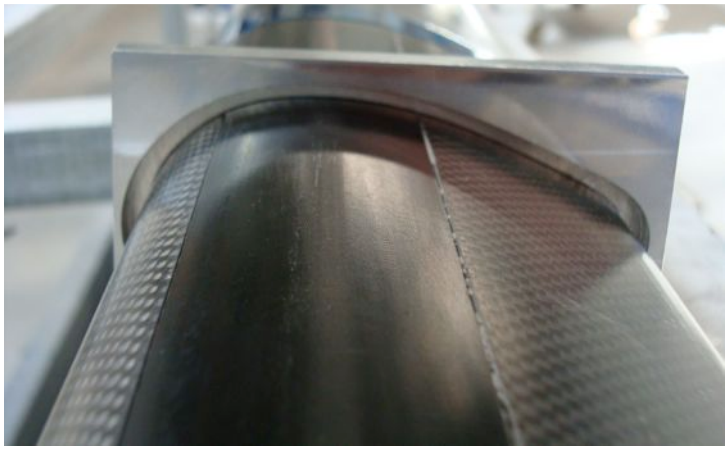
After lamination in White Room, the mast is fully post-cured in autoclave

The boom pin hole is formed by a computer controlled drilling machine



- Full CNC aluminium female moulds
- CNC cut pre-preg composite layers
- Top quality High modulus carbon fibres
- Lamination inside a temperature and humidity controlled “white room”
- Full Autoclave Curing Cycle : 120°C / 248°F at 6 bar pressure
- Aeronautical standard epoxy adhesives
- CNC machined fittings
- Female aluminium moulded carbon gooseneck

CK01 Concept Design Team



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