ELEKTRA: Sailplan Optimization

Sector

Sail - 2013

Project challenges

Optimise sails shape

Optimise trimming setting for each sailing conditions

Keys to success

Ability to run the aerodynamic, structural and aeroelastic analysis of the sail plan in the given sailing conditions

Ability to compare the performance improvements for sailplans realised in the previous year, thanks to the ability to mesh sailshapes available as 3DM files.

Greater collaboration between SMAR R&D team and customers

Results

Significantly improved base-line sail plan performance (drive force)

Provision of the trimming condition to the final customer

0 prototyping cost

Beaten sister boat, with competitors sails on

INTRODUCTION

The goal of this project was to optimize the upwind sailing performance and trim settings of the sailplan for a Sydney Yachts GTS 43, named 'ELEKTRA', based in Hong Kong.

Mr. Barry Hayes at UK Sailmakers Hong Kong, contacted the SMAR Azure team, when he was about to finalise a new suit of upwind sails for 2013. **Mr. Hayes says**: *'After the 2012 campaign, **we wanted to make our sails faster**. So, we developed new sail designs for the boat but we wanted to make sure the changes we had made were actually faster! We wanted to optimize the upwind boat speed as the boat came in a little heaver then we had wished."*

This project entailed the analysis of the previous sails (from the 2012 campaign) and the new designs as proposed by the client. These were then used as the benchmark for the SMAR Azure optimization process.

INITIAL INPUT

Mr. Barry Hayes at UK Sailmakers HK supplied the initial sail designs. The target sailing conditions were agreed with Mr. Hayes with the focus at 12Kts of TWS. The sails considered were the J1, J2 and mainsail, which were supplied in Rhino© 3dm files, since Mr. Hayes does not use AzureProject for sail design. The analyses of the 2012 sailplans were made by directly meshing the 3dm files. The 2013 designs were accurately recreated in AzureProject to allow the SMAR Azure team to modify the shape further.

ANALYSIS METHODS

The aerodynamic analysis technology developed by SMAR Azure Ltd makes it possible to run a significant numbers of tests automatically, via a batch mode tool. In this case, we were able to evaluate the maximum drive force in a range of possible trimming conditions (by varying the sheeting angles for headsails and mainsails). The first results available were the trimming conditions (sheeting angles) for which the 2012 and current proposed sailplan were developing the maximum driving force.

The drive force from the 2012, and 2013 designs were considered the baseline-sailplan performance.

The Customer VIEW:

Why SMAR Azure?

We were aware of their technology and seen their work, so we trusted their help. Besides that they are also able to analyse our sail-design, even if we do not use AzureProject

How was working with them?

It was great! I worked mostly with Donald, the SMAR Azure CTO, and he was excellent. They explained their process and the reasoning for changing the shapes.

Is the Elektra owner happy?

YES, he is, as we beat a North sails GTS 43, which was full of North guys!

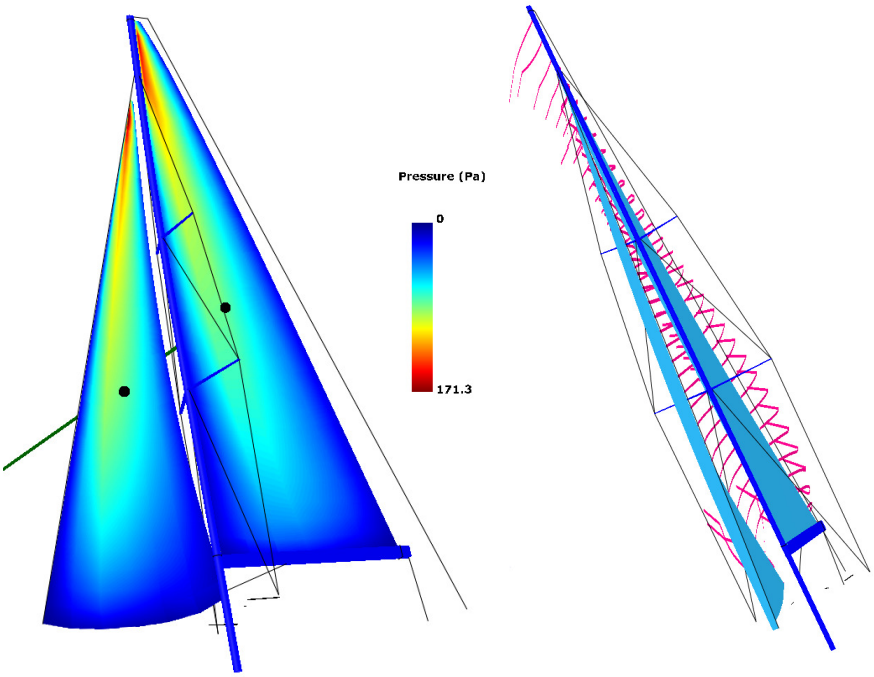
A final comment…

We beat North, and happy with the overall package, but still need more power in the boat..

Barry Hayes,

UK Sailmaker HK

www.uksailmakers.com



J2+Main: pressure map and wake shape

The aerodynamic analysis tools are combined with automated geometry manipulation to enable the SMAR Azure team to analyse a large number of possible sail shapes. In this mode we vary camber, twist, draft as well as sheeting angles. From these results we determine the design that results in the highest drive force, while keeping the heeling moment within the available righting moment

After studying the analysis results, the shape was refined further. The aerodynamic analysis tools are always used to verify and quantify the performance relative to any change made. In this case, modifications were applied on camber, draft, twist, entry and exit angle distribution.

Results

Significantly improved base-line sail plan performance (drive force)

For both optimized configurations J1+Mainsail and J2+Mainsail, the calculated increase in driving force is more than 30%. Additionally, in both case the sail plan is more stable as the heeling force has bee reduced by 15%.

Provision of the sails trimming condition

In addition to the sail geometry, the best sheeting angle for the specified sailing conditions were also delivered.

Zero prototyping cost

No sail prototype has been manufactured. The sail shapes are the result of a fully analytical and engineered process.

Informative process:

The whole process is documented. **Barry adds**: **"*yes I learned a lot about the boat and mostly about how smooth your draft set up is and where to have the draft to work at its most efficiency*'. *We beat North, and are happy with the overall package!*"**