AUTOMATED MANUFACTURE OF A SHAPE-ADAPTIVE LARGE HYDROFOIL

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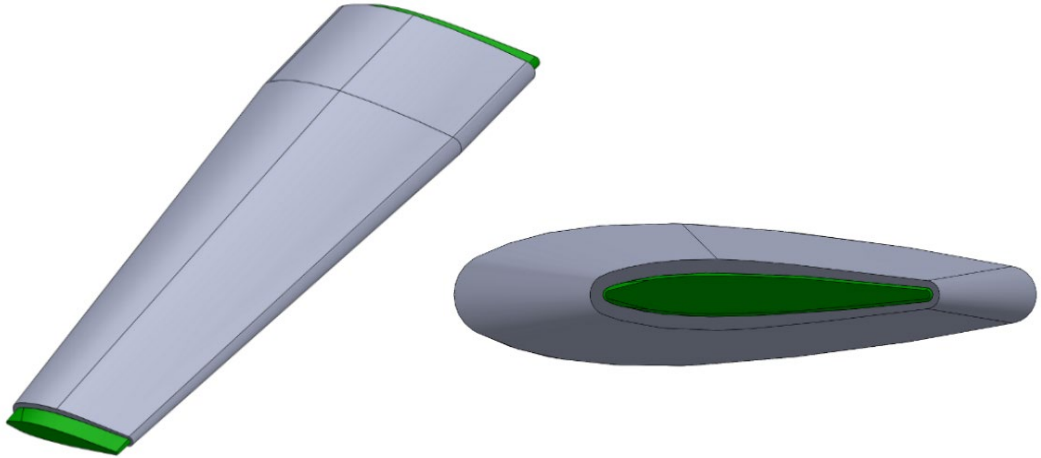
EMship+ Advanced Design

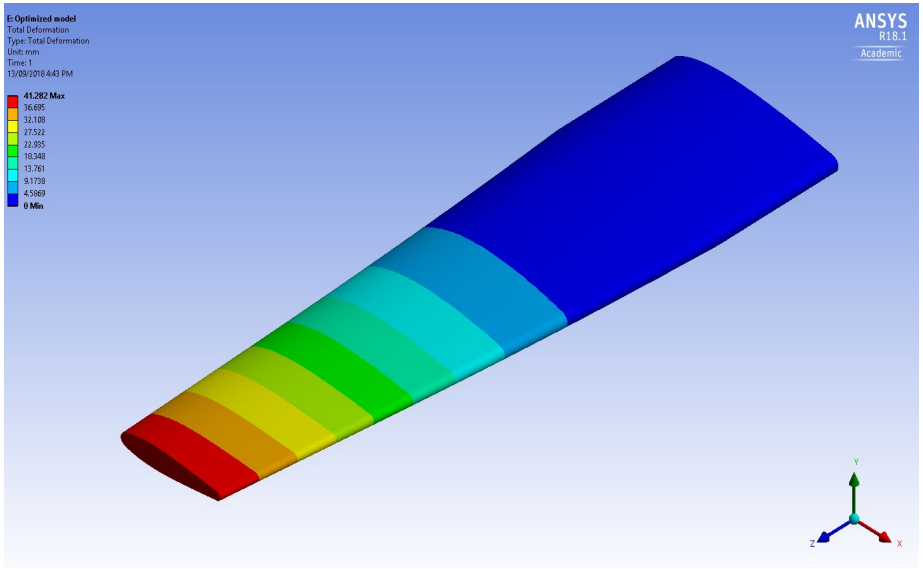
Introduction

- Shape adaptive
- Change on twist
- Wider efficiency range
- Noise reduction
- Less cavitation



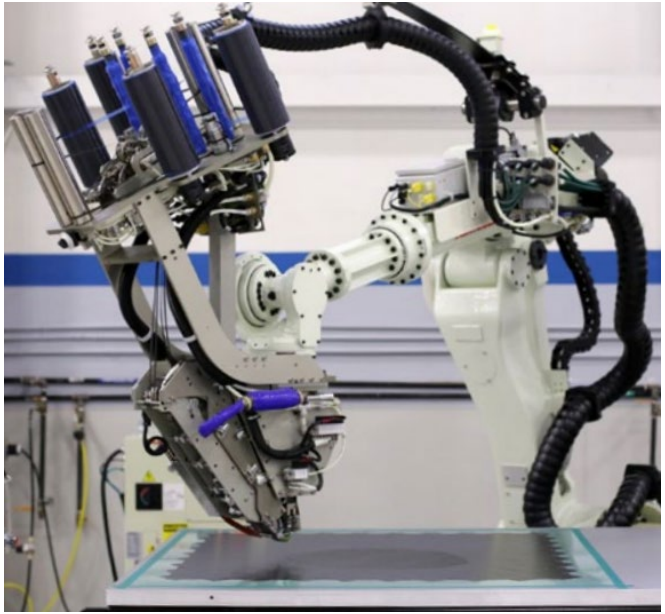
Design and Optimization

- Solid Element model (SOLID186)
- Max deflection of 41 mm
- Error of 2.4% with reference



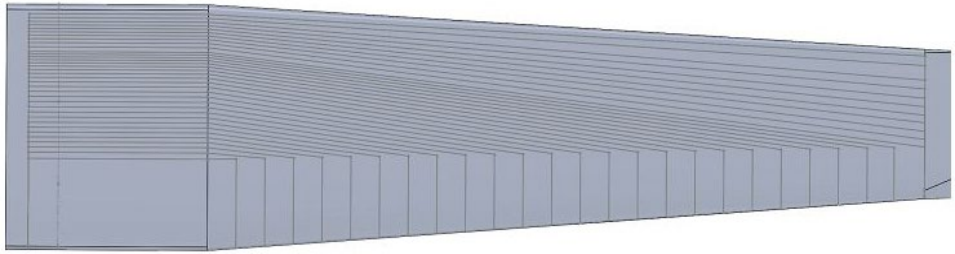
Introduction to AFP technique

- Automated Fibre Placement (AFP)
- Advanced manufacturing technique
- Fully automated
- High quality laminations
- Increase productivity
- Can use thermoset or thermoplastic

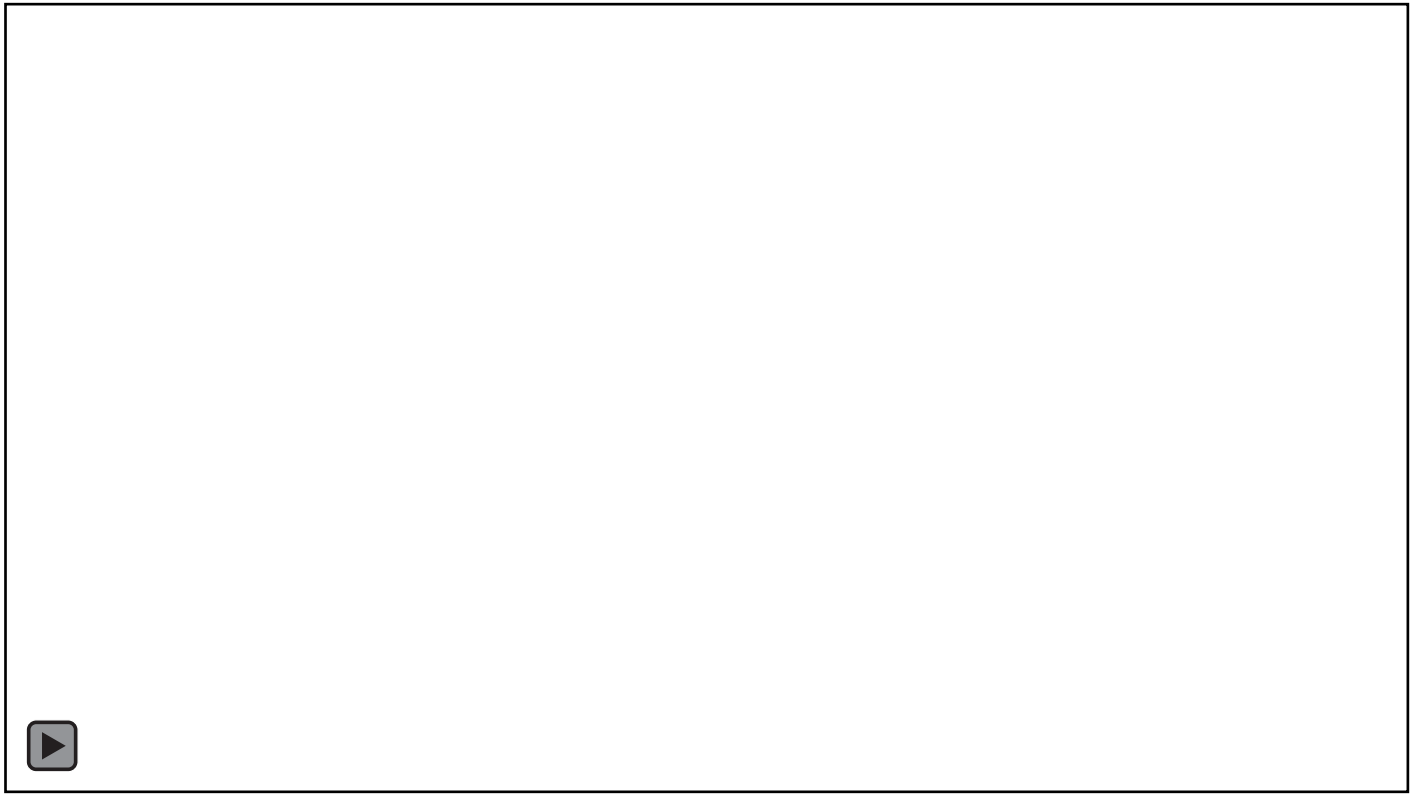


Generation of the G-Code

- Based on FEM model
- Non uniform thickness
- Boundary definition
- Orientation on each boundary
- Total of 36 boundaries
- Last 20 plies, complete wrapping



Manufacturing of the Large Hydrofoil



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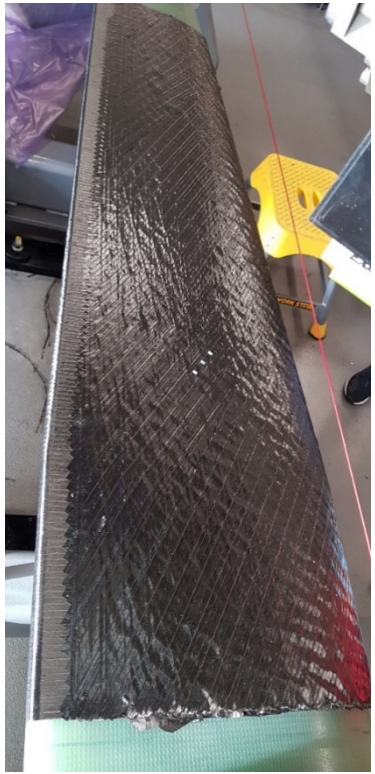
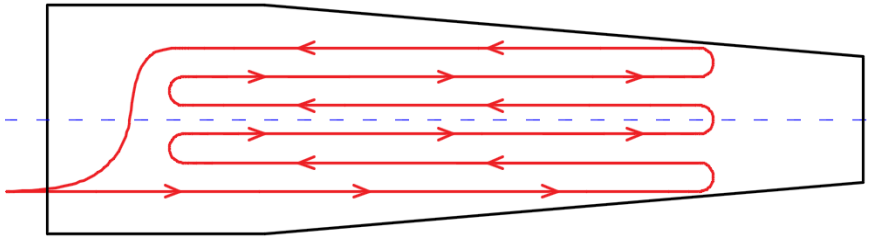
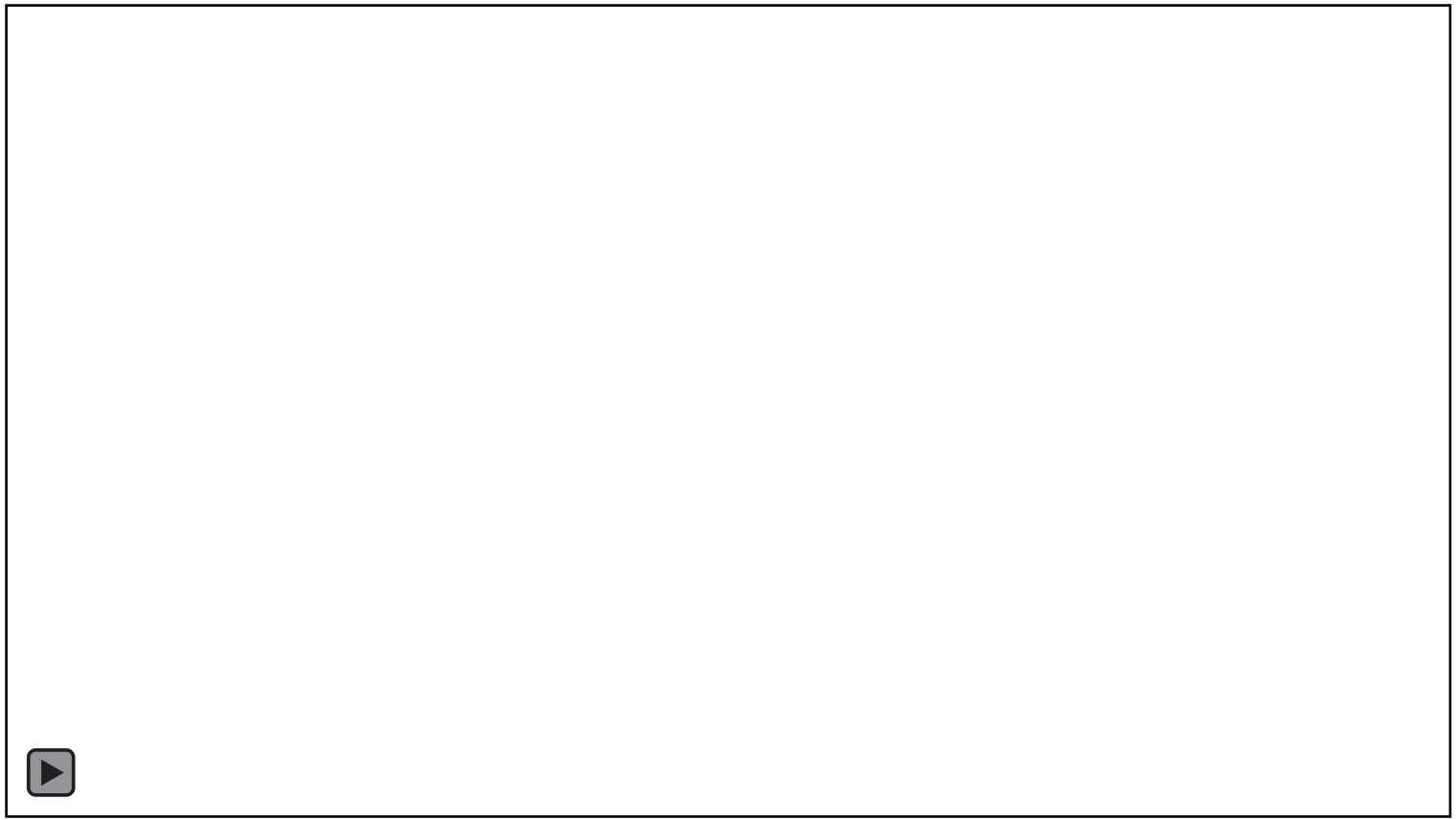


Sensor and monitoring

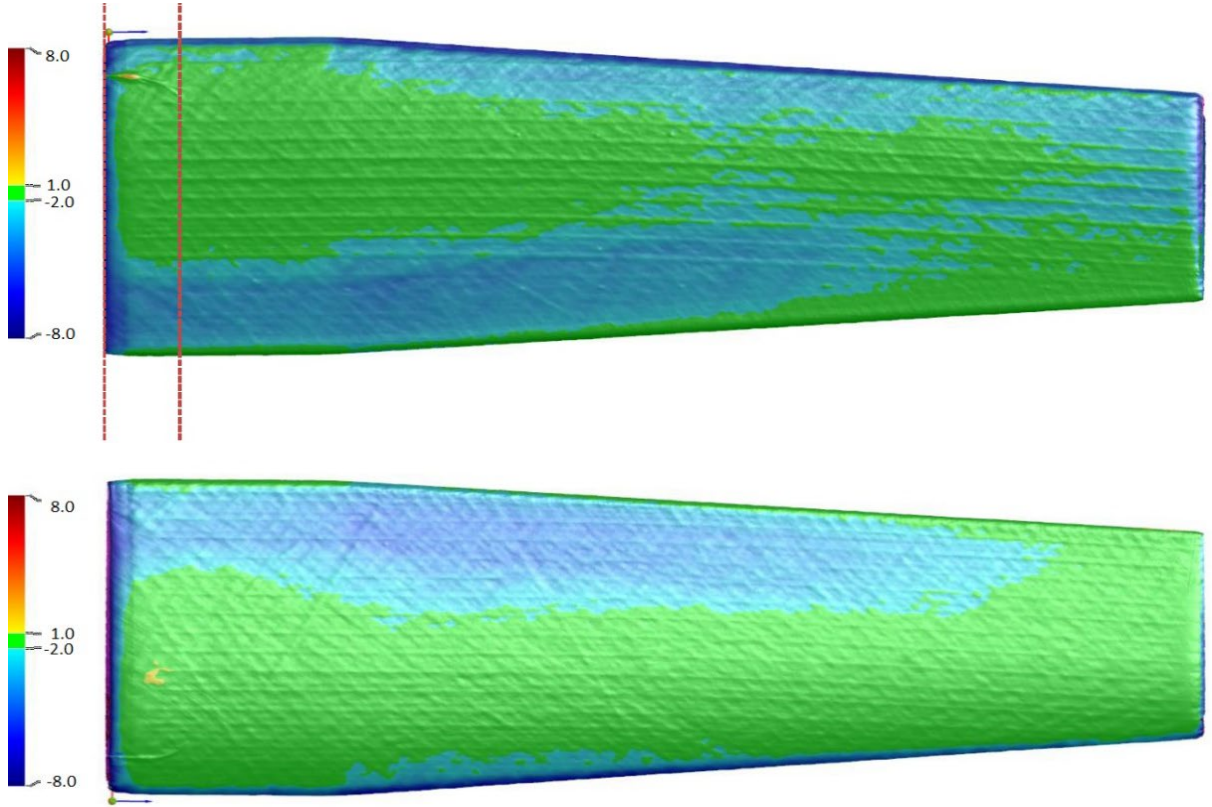
- Distributed fibre sensor
- Embedded on the laminate (Ply 92)
- Manually placed
- Fixed with epoxy bonding agent
- Total of 5.7 m of measurement length



Distributed Fibre sensor



3D Scan



Conclusions

- Advanced manufacturing techniques improves quality on laminations
- AFP techniques are potential improvements on the construction of high performance components like propellers and hydrofoils
- Distributed fibre sensors are suitable measurement techniques to monitor laminates without disturbing their performance