HYDROFOIL ASSEMBLY

THE UNIVERSITY OF ADELAIDE AUSTRALIA

WINGBORNEHYDROFOIL

AIMS

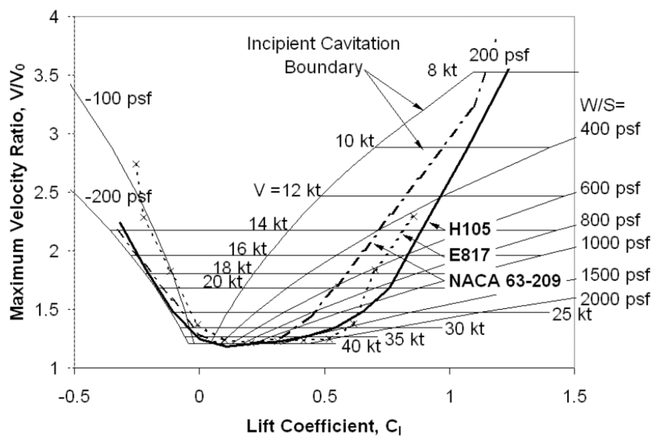
- Complete detailed design of the entire assembly
- Complete construction of all components
- Undertake preliminary testing

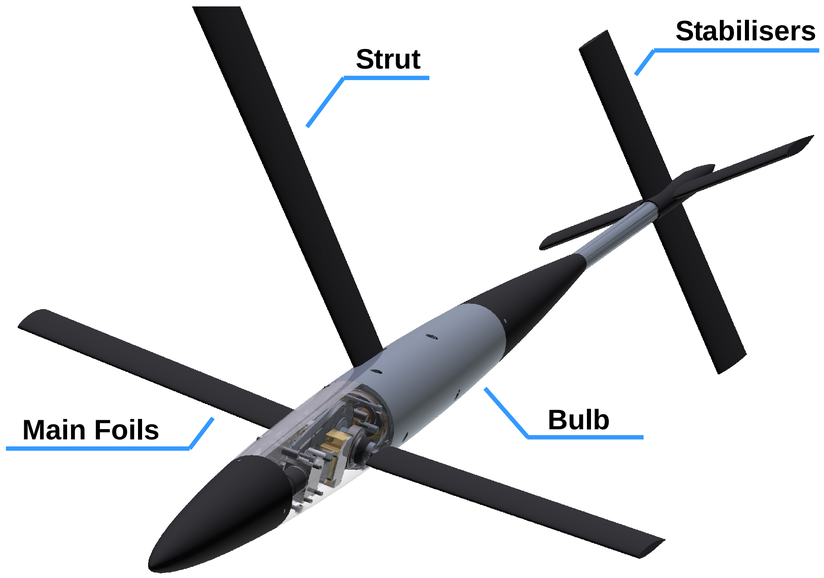
DESIGN GOALS

- The main foils were designed to generate 120 kg of lift force at 15 knots of craft speed
- The bulb was designed to operate at a depth of 1.2 metres underwater
- All components were designed to resist cavitation
- A 30 kg weight goal was set for self-righting

METHODS

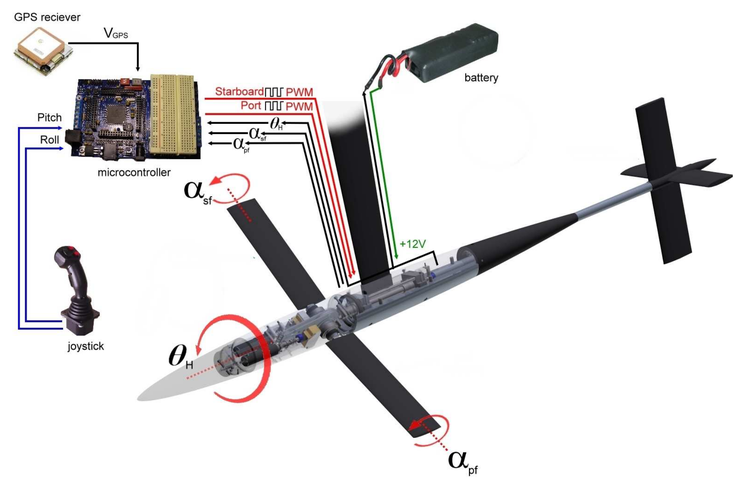
- H105 hydrofoil profiles were selected based on cavitation characteristics, seen below [1]
- The internal control mechanisms were designed for reliability and robustness
- Electronics for the control system were integrated into the bulb to facilitate control of the main foils





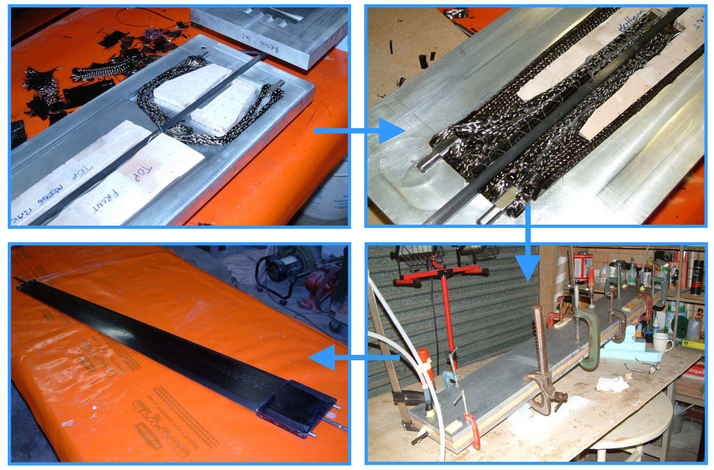
CONTROL

- The two main foils pitch independently of one another to vary the magnitude of the lift force and the front section of the bulb rolls to vary the direction of the lift force
- Pitch and roll angles are specified by the pilot using a joystick and feedback control, as seen below:



MANUFACTURE

The bulb was manufactured from aluminium and mild steel using a CNC machine. The strut, stabilisers and main foils were all manufactured from carbon fibre using vacuum mould infusion processes. Manufacture of the strut can be seen below.



OUTCOMES

- A robust and reliable control mechanism design has been achieved
- The main foils have been designed to resist cavitation up to 40 knots
- The bulb, main foils, strut and stabilisers have been constructed
- Total assembly weight is 32 kg

CONCLUSION

The hydrofoil assembly is fully designed and constructed. Future work will include hydrostatic seal testing and water tow testing.

REFERENCE: [1] Speer, 2000, http://www.foils.org/hysecdes.pdf

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