Sovereign Shape-adaptive Sensor-integrated Composite Marine Propeller (S^3CoMP)

Challenge

Marine propellers convert rotational motion into axial thrust and are traditionally manufactured from Nickel-Aluminium-Bronze (NAB). However, conventional metal propellers are relatively heavy and susceptible to corrosion, while their magnetic and acoustic signatures can increase detectability. Their high mass also contributes to greater propulsion energy and maintenance demands.

Solution

Fibre-reinforced polymer (FRP) composite propellers offer a lightweight, corrosion-resistant alternative to conventional metal propellers, with the potential for improved propulsive efficiency and reduced maintenance. We have developed the world's first automated fibre placement (AFP)-made novel shape-adaptive marine composite propeller, progressing TRL from 1 to 6. Advanced design optimisation enables shape adaptivity, while AFP reduces manual intervention and improves manufacturing consistency and scalability. The technology also enables embedded sensors for in-situ structural health monitoring, supporting condition-based maintenance and further reducing lifecycle costs.

Impact

- Up to 75% weight reduction, improving fuel efficiency and propulsion performance
- Reduced acoustic and magnetic signatures, enhancing stealth in defence operations
- Lower maintenance requirements, delivering long-term lifecycle cost savings
- Rapid design and manufacture of full-scale propellers, enabling field implementation
- Tailored structural performance, optimising strength, stiffness and flexibility for specific operating conditions

S^3CoMP
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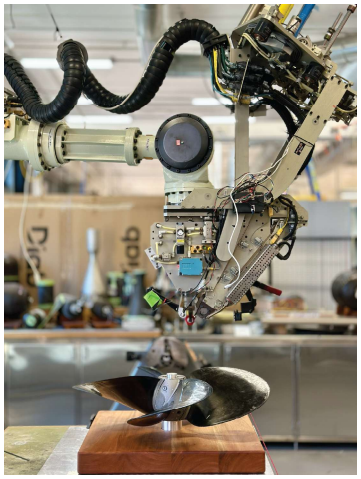

Opportunity

With over 20 years of R&D, this technology is ready for scale-up. Automated composite blade manufacturing with metal hubs supports next-generation defence platforms, including submarines and autonomous underwater vehicles (AUVs), with a clear pathway to industrialisation through advanced tooling, manufacturing trials and full-scale prototypes.

Funding Stage:
> Pre-seed

Industries:
Marine, Aerospace, Wind and Tidal turbine

Market Size*:
- USD 5 billion (2025)
- USD 10 billion (2034) with CAGR of 9%

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*Fortune Business Insights (2025)

Stages of Development

PHASE 0	PHASE 1	PHASE 2	PHASE 3	PHASE 4
Vessel identification with a larger propeller	Propeller design and numerical validation	Advanced manufacturing of Carbon composite propeller	Sensor embedment for real-time SHM	Sea trials