AMGC
ADVANCED MANUFACTURING GROWTH CENTRE LTD

ELECTRIC VERTICAL TAKE-OFF AND LANDING AIRCRAFT – AMESRF

amsl aero

AMSL was formed in 2017 and is designing a two-seat autonomous aircraft in conjunction with new production processes for its advanced composite-based components. This project will take the Vertiia aircraft closer to commercial reality through the design, build and testing of its wings and fuselage, culminating in test flights.

How the Growth Centre helped?

The Advanced Manufacturing Growth Centre is contributing $400,000 in co-investment to the project through its Advanced Manufacturing Early Stage Research Fund.

What's changed?

AMSL expects to grow its team of engineers and technical staff from nine to 50 by 2021. The project will increase the knowledge intensity within the company. Plus, what is learned during this project will be applied to a final prototype and production systems.

Success story overview

AMSL Aero is a start-up established in 2017 and based in Bankstown, NSW. It is attempting to develop and commercialise Vertiia, a two-seat electric vertical take-off and landing (VTOL) aircraft.

The company was founded by Andrew Moore and Siobhan Lyndon. Moore began his aeronautical engineering career at the Royal Australian Navy in 1998. Since then he has held a variety of roles, including senior positions at defence contractor Raytheon and Yamaha Motor Australia.

Moore, the son of a Navy pilot, started sketching planes at age seven, and grew up around Grumman Tracker and Douglas Skyhawk airplanes. He is currently studying a PhD at University of Sydney based on his radical new approach to aviation.

"Australia has longer distances than anywhere else in the world, and so I designed something that is useful for Australia," he says of Vertiia.

"We needed a design with the potential to be made at very low costs. Getting all of those things to work together is what I've been working on now for a very long time and I've managed to pull it together with this particular configuration."

Borrowing from existing aircraft designs and production techniques would not do. Passenger aircrafts from 50 years ago look similar to those of today, as there is a lot of IP tied up in these companies, believes Moore.

"I see that as a disadvantage to them and an advantage to me, because I'm not caught up with their past history," he adds.

This project will design, build and test a filament wound wing structure and an advanced composite fuselage. It includes prototype manufacturing methods for these structures and finally assembly for test flights.

The Vertiia concept is highly promising with an independent report showing its superiority in terms of battery and overall weight, cost, power consumption and range. The path to certifying and commercialising a new passenger aircraft is difficult, especially when using new production methods.

The challenges in manufacturing Vertiia are being addressed through a collaborative project between AMSL, University of Sydney, CST Composites, and Innovation Composites. University of Sydney's contribution will include use of its supercomputer for complex, processing-intensive, "Pareto Optimality" modelling. This is a method "to get good solutions to multiobjective problems[1]" and will be applied to design optimisation and detailed design of parts. The university will also provide its wind tunnel for testing.

CST Composites, a filament winding specialist and the largest user of carbon fibre in Australia and New Zealand, will help establish constraints to manufacturability, as well as produce prototype wing components.

Innovation Composites will help establish constraints for the fuselage components, manufacture these, and provide quality inspections and tests.

Successful completion of the project will raise Vertiia to Technology Readiness Level 5, or prototype demonstration in an operational environment.

"We will continue to test that particular prototype and expand what we can do with it," says Moore, adding that knowledge gained would be applied to a final prototype, then developing production systems, and then certification from Australia's Civil Aviation Safety Authority.

The electric VTOL market is one predicted to grow considerably as such transport is adopted. One estimate is a global value of $US 27 billion by 2032[2], and companies including Uber, Boeing and Airbus are currently developing various types of flying taxis[3].

The Advanced Manufacturing Growth Centre has supported this collaborative project with $400,000 in co-investment through its Advanced Manufacturing Early Stage Research Fund.

Moore believes AMGC has been valuable in moving his ambitious venture forward, and says its membership base enables valuable connections between companies who are being more innovative in how they design and manufacture things.

"They have a strong voice that is useful and have established a strategy which makes a lot of sense."

"We can't just have factories building simple, low-cost things, because those factories will be cheaper and lower-cost somewhere else in the world. We need to do smart, high-value manufacture, and it is good to see that we have an organisation championing this."

1 https://web.stanford.edu/group/sisl/k12/optimization/MO-unit5-pdfs/5.8Pareto.pdf

2 https://exchange.telstra.com.au/amsl-aero-flying-car-canberra-demo-5g-iot/

3 https://www.digitaltrends.com/cool-tech/all-the-flying-cars-and-taxis-currently-in-development/