Amaero

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ADDITIVE MANUFACTURING

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The engine, shown at the 2015 Australian International Airshow, is the product of a SIEF-funded collaboration between Amaero, Monash University, CSIRO, Deakin University and Microturbo of the SAFRAN Group.

It has captured the attention of major international aerospace players, including Safran, Boeing and defence contractor Raytheon, who are now travelling halfway around the world to access Amaero's laser-based additive manufacturing (3D printing) expertise.

Business development manager Ben Batagol said the ability to print in one step designs that would otherwise require multiple parts to be assembled together, reduced weight and costs is a potential game-changer for defence and aerospace manufacturers.

The Melbourne-based, privately held company was created in 2013 as the commercial arm of Monash University's Centre for Additive Manufacturing (MCAM). It is well-positioned to lead the way in 3D printing of metallic components, with a capability to provide both commercial production and research.

All manufacturing and development is done at its Melbourne premises using state-of-the-art technology. The metallurgical expertise comes from researchers at MCAM where around 20 PhD researchers and students are examining materials for use in 3D printing and working with Amaero on the development of production know-how.

"Monash University is at the cutting-edge of material science," Mr Batagol said. "Amaero is fortunate that we can access this knowledge and apply it commercially. The Monash team has the ability to develop new sets of production parameters as well as modifying existing ones. This gives us a leading edge in being able to work with new materials and build parts faster with material properties close to traditionally manufactured parts."

MCAM's international standing was acknowledged with the 2014 Safran Award for Global Innovation for its work with Microturbo in creating the 3D-printed components for a jet engine that passed the most stringent operating tests. Work is now underway to reduce the weight of the engine without compromising on either safety or performance.

"That's done with a lot of wizardry from the team here," Mr Batagol said. "The research that is happening and the work that we are doing is certainly pioneering."

MELBOURNE
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Australia

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Amaero, through MCAM, has access to the southern hemisphere's only Concept Laser XLine powder bed selective laser melting (SLM) machine – the largest of its type in the world. Components up to 630mm x 400mm x 500mm deep can be produced by selectively melting fine metallic powder, layer upon layer, using a high-powered laser scanned across each layer driven directly from a computer-aided design (CAD).

The same process is used by Amaero's two, smaller EOS INT 280M powder bed SLM machines.

Components with highly complex shapes can be produced and these components can incorporate honeycombed internal structures to reduce weight and cost. Material waste is minimal compared with conventional casting, forging and machining processes, which means significant savings when using expensive materials such as titanium alloys.

"It's an efficient process," Mr Batagol said. "All the powder not used is sieved and recycled for the next part to be produced."

Amaero also has access to one of only two Trumpf Laser Cell 7040 machines in Australia, which it uses to show how additive manufacturing technology can repair worn or damaged parts. The Trumpf uses a high-powered laser on a robot arm to blow or inject metallic powder onto the part to build up surfaces.

The metallic powders are produced by gas atomisation. At present, Amaero purchases these from overseas suppliers but would like to see local producers set up to manufacture powders.

Mr Batagol said additive manufacturing technology had the ability to reinvigorate the Australian manufacturing industry, particularly when catering for high-value, low-volume production of bespoke parts.

Amaero has used additive manufacturing to create six prototype automotive heat exchangers for Geelong-based company Conflux, which is now in discussions with European Formula 1 teams who are keen to learn more about the lighter-weight, higher efficiency 3D parts. Several Australian bio-medical manufactures are also in talks with Amaero about making surgical instruments and implants locally.

"A lot of people say that manufacturing is dying in Australia, but I think it's just morphing into a new phase," Mr Batagol said. "Local manufacturing companies that are utilising the technology are doing amazing work that is world leading and globally competitive.

"When we started in 2013 we received a grant from the Federal Government's Commercialisation Australia program that runs until September 2015. This has enabled us to develop relationships with several companies in the US and Europe that could lead to major opportunities for expansion. The next stage for us is to build capability so that we can pursue this potential.

"We're moving beyond the prototyping stage and are establishing the processes and procedures so that we can repeatedly produce those same parts and provide full traceability that aerospace and defence customers require."

Amaero received ISO 9001 certification in July 2015 and is working towards AS 9100 – the aerospace standard.

At present, a majority of Amaero's work comes from overseas, from Europe and the US. The company would like to work with local companies to build knowledge and capability of Australian manufacturers in this emerging technology.