AMAERO
ADDITIVE MANUFACTURING
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ASX Release **18 May 2020**

International Patent for Amaero's new High Performance Titanium Alloy enters National Phase (Final Phase) of Approval

Highlights:

- **International patent application for Amaero's high performance titanium alloy, "Amalloy Beta Ti" enters final stage of approval, with three out of four stages of patent application already completed.**
- **The new high-performance titanium alloy achieves ultra-high strength and fatigue performance.**
- **Amaero has applied for broad patent coverage in nations strategic to the global aviation, defence and space supply chain.**
- **Titanium is used in multiple applications across the aviation, defence and space industries, all markets which are experiencing significant long term growth in value, presenting a significant opportunity for Amaero.**
- **Developed by Monash University, Amaero has exclusive global commercial licence rights to the patented alloy.**
- **The development and patent application aligns with Amaero's long-term strategy of expanding its offering through the commercialisation of metal alloys developed by research partners. This is one of two patented alloys and powders that Amaero holds exclusive global commercial license rights to.**

Amaero International Limited (**"Amaero"**) (the "**Company"**) (**ASX:3DA**), a leader in metal additive manufacturing, is pleased to provide an update on its patent applications for its high performance titanium alloy "Amalloy Beta Ti", as the Company has applied for broad international patent coverage, for the new heat treatable titanium alloy, which has entered its final approval stage, the national phase of the Patent Co-operation Treaty ("PCT").

The PCT is an international treaty with more than 150 Contracting States, allowing patent protection for an invention simultaneously in a large number of countries by filing a single "international" patent application, instead of filing several separate national or regional patent applications. The granting of patents remains under the control of the national or regional patent offices in what is called the "national phase"[1], which Amalloy Beta Ti has now entered.

Process for Filing a Patent under the Patent Co-operation Treaty



[1] https://www.wipo.int/pct/en/faqs/faqs.html

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The new high performance titanium alloy, a heat treatable version of a beta Titanium alloy, achieves ultra-high strength and fatigue performance via homogeneous precipitation and removal of grain boundary alpha.

Known for the highest strength to weight ratio of any structural metal[2], Titanium is used in multiple applications across the aviation, defence and space industries, all markets which have been experiencing significant long term growth in value, presenting a significant opportunity for Amaero. The aviation industry supports $2.7 trillion in world economic activity (3.6% of global gross domestic product)[3], with the global aerospace and defence market estimated to be valued at US$1600 billion in the year 2025, growing at a CAGR of 3.5% in the period 2019 to 2025.[4]





Titanium is used in multiple applications across the aviation, defence and space industries, all markets which are experiencing significant growth in value.

The alloy was developed by researchers at Monash University, Australia's largest university, with which Amaero collaborates for the development of additive manufacturing technology.

Amaero has exclusive global commercial license rights to the patented alloy, and it will form an important part of the Company's offering to its aviation, defence and space clients in the future.

The development and patent application aligns with Amaero's long-term strategy of expanding its offering through the commercialisation of metal alloys developed by research partners. In addition to additive manufacturing, the alloy can also be processed using a number of conventional methods for high volume manufacturing including extrusion, forging and casting.

A second new high performance alloy developed by Monash University for Amaero will also enter national phase in June 2020.

Amaero CEO, Barrie Finnin, commented: "The new heat-treatable titanium alloy "Amalloy Beta Ti" has amazing and compelling mechanical properties for applications such as structural components and fasteners widely used in the aviation, defence and aerospace industries."

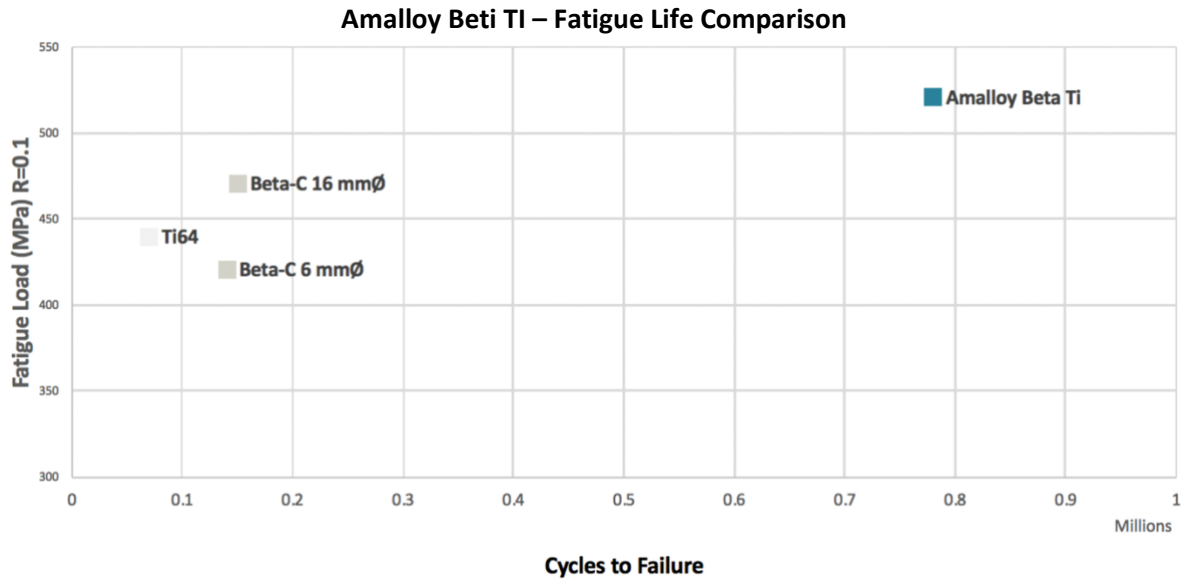
"Conventional alloys have limitations and are prone to fatigue failures, which is a risk if used in aircraft. The team at Monash designed a heat treatable beta titanium alloy with a novel composition resulting in significant improvements to yield strength of around 30%, as well as enhancing Ultimate Tensile Strength (UTS), shear strength and fatigue life. In an aerospace context, being able to deliver improved durability, performance and saving weight makes a strong case for this new alloy to be used in place of the traditional options".

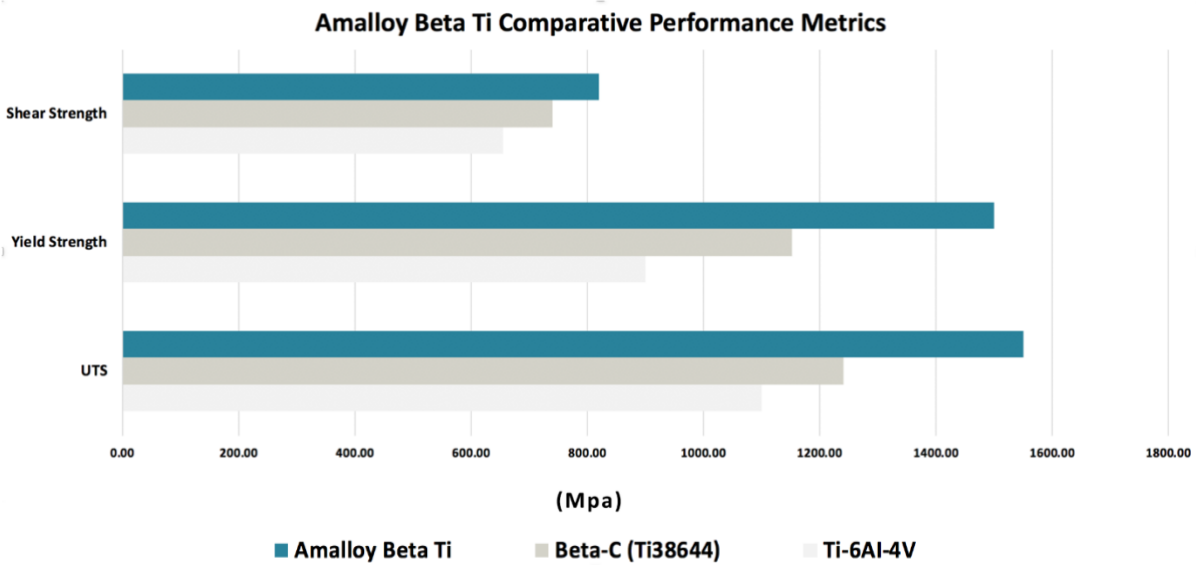
[2] https://titanium.com/the-most-fascinating-titanium-uses/

[3] https://aviationbenefits.org/economic-growth/adding-value-to-the-economy/

[4] https://www.prnewswire.com/news-releases/global-1600-bn-aerospace--defence-market-outlook-to-2025-boom-in-commercial-aircrafts-surge-in-global-airline-traffic-rise-in-military-expenditure-300930703.html

Comparison of mechanical properties between conventional alloys and the new alloy:





Alloy	Ti-6Al-4V	Beta-C (Ti38644)		Amalloy Beta Ti
Diameter, mm	≤19.1	6	16	≤ 30
UTS, MPa	1100	1240		1550
Yield Strength, MPa	900	1152		1500
Shear Strength, MPa	655	740		820
Fatigue Life, R=0.1	440MPa, 60,000 cycles	421MPa, 130,000 cycles	471MPa, 130,000 cycles	521MPa, 764,000 cycles

Data Source: Monash Centre for Additive Manufacturing Presentation 01/05/2019, Monash University, Clayton.

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This ASX release is approved by the Board of Amaero International Ltd.

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About Amaero International Limited:

Amaero International Limited is an Australian based company that manufactures large format complex components in metal with laser-based additive manufacturing processes, commonly known as 3D printing.

The principal activity of Amaero is the provision of end to end additive manufacturing solutions in terms of services, equipment and technology to its key clients in the Aviation Defence and Space sectors and the Tool and Die industry.

Amaero has worked with many of the world's leading manufacturers of aerospace and defence products in both an R&D and manufacturing capability and has a demonstrated ability to deliver aviation and military specification 3D printed alloy critical operation components.

Amaero was established with the support of Monash University in 2013 to take advantage of commercial opportunities identified by the Monash Centre for Additive Manufacturing (MCAM). Amaero is co-located with MCAM in Melbourne Australia. It operates two additional facilities, in Adelaide, South Australia, and El Segundo, California, USA.