Altair Engineering Ltd Announces Award of Innovate UK Grant to Collaborate with Rolls-Royce for Design of Structural Components for the Next Generation UltraFan® Engine Architecture

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Multi-disciplinary Optimisation techniques to deliver Design Innovation with a focus on reduced weight and fuel efficiency

ROYAL LEAMINGTON SPA, UK, August 21, 2017 – Altair Engineering Ltd has today announced the award of a £1.998M Grant. This Aerospace Technology Institute (ATI) investment will enable Altair to collaborate with aero engine manufacturer Rolls-Royce plc to support the design of the company's next generation engine architecture, UltraFan ®. UltraFan forms part of Rolls-Royce's future vision for aircraft engines with a focus on weight reduction and fuel efficiency, together with reduced noise. Altair Engineering Ltd will develop and deploy virtual simulation tools and methods to assist with UltraFan weight reduction, to enable the development of an innovative product.

Ready for service from 2025, UltraFan is designed for use across the civil aviation sector, spanning a 25k-110k thrust range. For a typical large engine application, UltraFan will have the largest fan diameter making it the world's largest geared turbofan engine, delivering an estimated 25% improvement in efficiency over the first generation of Rolls-Royce Trent engines.

Following a series of successful studies to reduce weight, Altair Engineering Ltd was selected by Rolls-Royce plc to be their sole partner for the Physical Optimisation of Structural Topology for Integrating Engines (POSTIE) project which is supported by a grant from the Aerospace Technology Institute, through Innovate UK. POSTIE will develop engineering processes and methods to enable the rapid design exploration of the engine at component, sub-system and system levels.

"Continued investment in propulsion related research is essential to ensuring the UK remains a world leader in turbofan engines and components. Around 50% of the ATI R&T portfolio supports significant developments in new propulsion architectures, technologies and manufacturing capabilities to improve competitiveness and accelerate introduction of new turbofan engines," said Mark Scully, ATI's Head of Technology for Advanced Systems and Propulsion.

Andy Geer, Rolls-Royce, Chief Engineer and Head of Programme, UltraFan Technologies, said: "We are pleased to be working with Altair and welcome this ATI investment. We are making great progress with UltraFan, but we continue to examine ways we can make our engine even more lightweight and fuel efficient."

As part of POSTIE, Altair's Multi-disciplinary Optimisation (MDO) design software tool, established in the automotive sector, will be enhanced by Altair Engineering Ltd to take into account the highly complex, multi-physics nature of aero engine design, i.e. including structure, air flow, heat transfer & rotor dynamics. In addition, Altair Engineering Ltd will oversee a substantial deployment of its OptiStruct® optimisation technology and lead in-depth studies into the design of UltraFan® to identify where material can be removed to reduce weight without compromising performance.

Dr. Royston Jones, Exec VP European Operations and Global CTO at Altair Consulting, said: "Having the opportunity to collaborate with Rolls-Royce on one of their next generation products is very exciting and the support from Innovate UK is greatly appreciated. It's now the age of digital, for two decades Altair has pioneered the application of optimisation to deliver design innovation and we welcome the challenge to extend the technology to complex multi-physics systems."

About Altair Engineering Ltd

Altair Engineering Ltd is focused on the broad application of simulation technology to synthesise and optimise designs, processes and decisions for improved business performance throughout its client base in UK & Ireland. Altair Engineering Ltd, a wholly-owned subsidiary of Altair, is headquartered in Royal Leamington Spa, UK and operates 3 offices with 65 employees. Altair is headquartered in Troy, Michigan, USA and operates 67 offices throughout 23 countries. Privately held with more than 2,600 employees, Altair serves more than 5,000 corporate clients across broad industry segments. To learn more, please visit www.altair.com.

About Rolls-Royce Holdings plc

Rolls-Royce's vision is to be the market-leader in high performance power systems where our engineering expertise, global reach and deep industry knowledge deliver outstanding customer relationships and solutions. We operate across five businesses: Civil

Aerospace, Defence Aerospace, Marine, Nuclear and Power Systems. Rolls-Royce has customers in more than 150 countries, comprising more than 400 airlines and leasing customers, 160 armed forces, 4,000 marine customers including 70 navies, and more than 5,000 power and nuclear customers.

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