

New Laser Welding Tools for Titanium Aerospace Components

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CAV, Leonardo and TISICS have partnered up with TWI, the MTC, and the NITC at Queen's University, Belfast, in an Innovate UK project: OLIVER (Optimised Laser welding Implementation Via Enabling Research). The OLIVER project has, through a series of case studies supported by IPG Photonics, helped these aerospace supply chain companies to develop their understanding of how laser welding can fabricate new, lightweight, near-net-shape, titanium (Ti) alloy and titanium metal matrix composite assemblies. As vital supports to this, digital manufacturing, new fixturing solutions, new in-process NDT techniques and new cost models have also been developed.

This project has confirmed laser welding as a promising fabrication route. Using sheet structures, laser welding can result in new, lighter weight and – if needed – larger designs, at the same time bringing opportunities for time- and cost-savings during manufacture. Example cost models have highlighted how the number of manufacturing steps may be able to be halved in such cases, and associated manual labour reduced by up to 90%. Laser welding is also a means to introduce novel materials in to designs, such as metal matrix composites.

This paper has gone on to illustrate these manufacturing advantages in demonstrators representative of firewalls, bulkheads, leading edges and struts. Welding procedure developments have been carried out in these four cases, resulting in high quality welds. Furthermore, to assure this quality, laser ultrasonic testing (LUT) has also been shown capable of in-process non-destructive inspection.