Creare®
Innovative Technology and Product Development

Fastener Measurement Tool

A Case Study

Challenge

To achieve effective stealth performance, the outer surfaces of advanced military aircraft must be very smooth. The surface panels are attached with more than 40,000 threaded fasteners. Accurate measurement of the fastener depth profile at different stages of manufacturing is therefore critical. Existing measurement methods are unable to provide the required accuracy and speed, are difficult to use in tight areas, and demand skilled operators. To reduce inspection time and cost, a measurement tool is needed that is fast, easy to use, and very accurate.

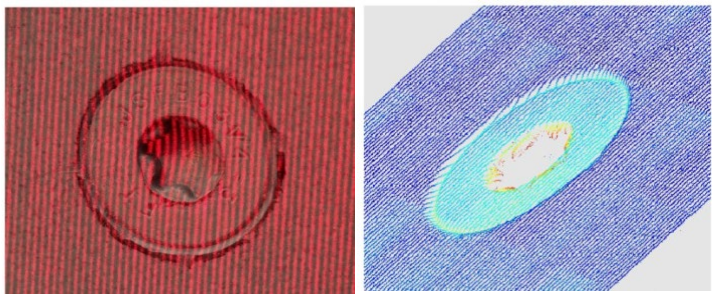
F-35 Joint Strike Fighter (courtesy Lockheed Martin)

Creare Solution

Creare has developed an automated Fastener Measurement Tool (FMT) to meet the exacting requirements of the F-35 Joint Strike Fighter program. The underlying FMT technology was developed using Air Force and Navy SBIR funding. The Creare FMT uses a multi-line laser scanner to create a 3-D point cloud representation of the fastener and aircraft surface. Advanced data processing algorithms then calculate the fastener depth relative to the aircraft mold line. The device works reliably on curved surfaces, and provides a pass/fail indication in less than two seconds. FMT measurements are faster, have greater reliability, and improved repeatability compared to previous manual methods.

The FMT consists of a high-fidelity handheld measuring head and a data processor that is worn as a belt pack and contains the rechargeable system battery and host computer. The lightweight measuring head includes a digital readout screen. Measurement data is stored in the belt pack and can be recalled later for additional analysis. The FMT can be used with fasteners both before and after application of the conformal fill material. The portable nature of the tool facilitates its use on any part of the aircraft.

Fastener Measurement Tool (FMT) developed by Creare



A projected laser pattern (left) is used to create 3-D representation of fastener (right)

Fastener Measurement Tool

Impact

The Creare FMT provides these important advantages over existing inspection methods: greatly improved accuracy, significantly reduced dependence on operator skill, and reductions in both inspection time and cost. The FMT enables a 50% reduction of the hand touch labor associated with fastener inspection. An initial evaluation by Lockheed Martin showed that the technology can reduce lifecycle program costs by more than $13M for unfilled fasteners alone. Further savings will be realized by applying FMT to filled fastener flushness measurement.

The FMT technology has been transitioned to our manufacturing partner, Edare Inc., for production, delivery and end-user support. The FMT is now in widespread use on the F-35 production floor. More than 100 operators have been trained on the use of the tool.

Handheld measuring head and calibration plate

About Creare

Founded in 1961, Creare LLC is an innovative technology and product development company located in Hanover, New Hampshire. We serve government and industrial clients with engineering R&D services that include analysis, prototype design, fabrication, and testing. Our clients include large and small companies and government agencies in the aerospace, defense, medical, energy, and process industries. Creare means "to create" – we create value for our clients when we solve their most difficult problems. We also help integrate new technologies into their products, systems, and processes.

Our technology helps enable F-35 production to reach cost and schedule targets (courtesy Lockheed Martin)

The FMT team stands behind units ready for delivery

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