



*Used with permission from Fives Machining Systems.*



*Our deep understanding of heat transfer enables us to develop and implement innovative processing methods that improve product quality, reduce cost, and increase system performance.*

## ADVANCED MANUFACTURING

### CREARE DEVELOPS NEW MATERIALS PROCESSING AND FABRICATION TECHNIQUES.

We develop improved manufacturing methods that increase product performance, improve quality, and decrease processing time. This work is comprised of programs in Machining, Grinding, Additive Manufacturing, Composites Fabrication, Non-Contact Metrology, and Inspection. We combine our strengths in fluid flow, heat transfer, and the physics of materials with our experience in hardware design, control and sensing expertise. The outcome is novel solutions for fabrication operations. We consistently focus on the development and implementation of our solutions in real world manufacturing environments. Examples of our results include:

- Cryogenic Machining for aerospace manufacturing
- Precision casting of metallic rods for nuclear fuel
- Handheld laser scanner for precise inspection of aircraft fasteners
- Fabrication of miniature thin-film sensors
- Additive manufacturing using friction stir processing
- Computer-controlled laser welding of heat exchanger plates
- Laser-assisted consolidation system for improved composites manufacturing

Creare brings a sound analytical basis to our efforts and an appreciation for the practical considerations inherent in any manufacturing process.

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Technologies ranging from thin film processing to additive manufacturing



### Cryogenic Machining

Using a small flow of liquid nitrogen, Creare achieved amazing results in machining of advanced materials like titanium. By applying through-tool cooling near the cutting edge, we were able to speed-up machining by a factor of two with reduced tool wear. Our innovations included supply of the cryogen through the rotating spindle so that use of the tool is otherwise unchanged. This revolutionary technology was approved for use on the Joint Strike Fighter program. The company 5ME has licensed the technology and sells specially designed tooling to retrofit existing machines for cryogenic cooling.

### High Impact

Creare's Advanced Manufacturing technologies are having a real-world impact on key Department of Defense programs. For example, our technologies are projected to save \$500 million or more on the Joint Strike Fighter program alone.



*Our non-contact methods decrease the time required for inspections and increase the inspection accuracy and repeatability. These systems are currently being used in the production of the Joint Strike Fighter.*

### Consolidating Composites

Carbon-based fibers used in next-generation products need improved means of consolidation during the fiber placement process. Creare has developed a laser-based technique with full feedback control that replaces outdated hot gases or infrared lamps to increase tape-laying rates — dramatically cutting costs — and improves the precision and quality of the final part.



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