Air Force SBIR STTR INNOVATION
TECHNOLOGY WITH DEMONSTRATED RELEVANCE
COMBINES ESTABLISHED TECHNIQUES TO ENABLE RAPID PROTOTYPING

TOPIC NUMBER:
AF06-114

TOPIC TITLE:
Advanced Manufacturing of Ceramic Cores for Casting Turbine Blades

CONTRACT NUMBER:
FA8650-14-C-5008

SBIR COMPANY NAME:
Mikro Systems Inc.
Charlottesville, VA

TECHNICAL PROJECT OFFICE:
AFRL Materials and Manufacturing Directorate
Wright-Patterson AFB, OH

SPONSORING ORGANIZATION:
AFRL Aerospace Systems Directorate

PUBLISHED:
October 2017

A formation that includes the A-10 Thunderbolt II, F-35 Joint Strike Fighter, F-15 Strike Eagle and F-16 Fighting Falcon. In the near future, engine turbine blades made for aircraft such as these may be produced better, faster and cheaper than traditional components because of advancements made by a small business under the Air Force SBIR/STTR Program.
(Air Force photo by Tech Sgt. Larry Reid Jr.)

TECHNOLOGY SHOWS PROMISE

TO CUT COSTS AND MAKE BETTER ENGINE BLADES

A new generation of aircraft engine turbine blades that can be produced better, cheaper and faster than traditional components may soon be available to the Air Force.

With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer Program, Virginia-based Mikro Systems Inc. demonstrated a molding technology that allows rapid prototyping of blade designs and shows promise to be applicable to full-scale manufacturing operations.

Mikro Systems worked with Air Force Research Laboratory's Materials and Manufacturing Directorate to conduct multiple trials of the new technology to produce highly-complex cores and castings. Because of its success, the company attracted a Rapid Innovation

continued >

Fund award from the Air Force to further industrialize the technology and position it for a transition to the market.

BEHIND THE TECHNOLOGY

The demand for higher performing turbines that last longer and can be made cost effectively puts tremendous pressure on the supply chain.

Mikro Systems developed the TOMO manufacturing platform – short for Tomo-Lithographic Molding – to address manufacturing for next generation products. It combines established tooling techniques from machining, lithography and molding in a unique way to create lower-cost, faster and highly-complex tooling.

TOMO technology can be leveraged to support advanced designs while dramatically reducing the cost of high-end components that are at the limit of the current supply chain production capability.

The company touts that TOMO can typically cut the cost of highly-cooled airfoils by as much as 30 percent, which would have a significant impact on the engine costs if applied to high-profile aircraft programs. Additionally, the lower-cost, quicker-turnaround tooling can be used for end-of-life product needs or cold-start production.

THE IMPACT OF SBIR/STTR

Air Force SBIR/STTR support was critical in maturing the technology and demonstrating its use in aerospace applications.

Mikro Systems was able to attract original equipment manufacturers in the aerospace industry to participate in development programs. Those OEMs were able to view the capabilities of the technology and support the effort as part of the Air Force SBIR/STTR stakeholder group.

Mikro Systems then used the TOMO to quickly and cost-effectively produce complex components as part of an iterative development program, which significantly mitigated risks and helped position the technology to meet market needs.

The company leveraged its success under the Air Force SBIR/STTR Program, applying the technology to additional aerospace applications for complex components, component cost reductions, and development cycle time reductions. As a result, Mikro Systems has expanded its facilities, added jobs and is projecting growth in the coming years.

A close up showing a layer of a generic TOMO master tool. (Photo courtesy of Mikro Systems)