Air Force SBIR STTR TRANSITION
EQUIPPING THE WARFIGHTER

REPLACES A TEDIOUS MANUAL TAPING PROCESS

TOPIC NUMBER:
AF153-004

TOPIC TITLE:
Additive Manufacturing of Masking to Support Turbine Engine Sustainment

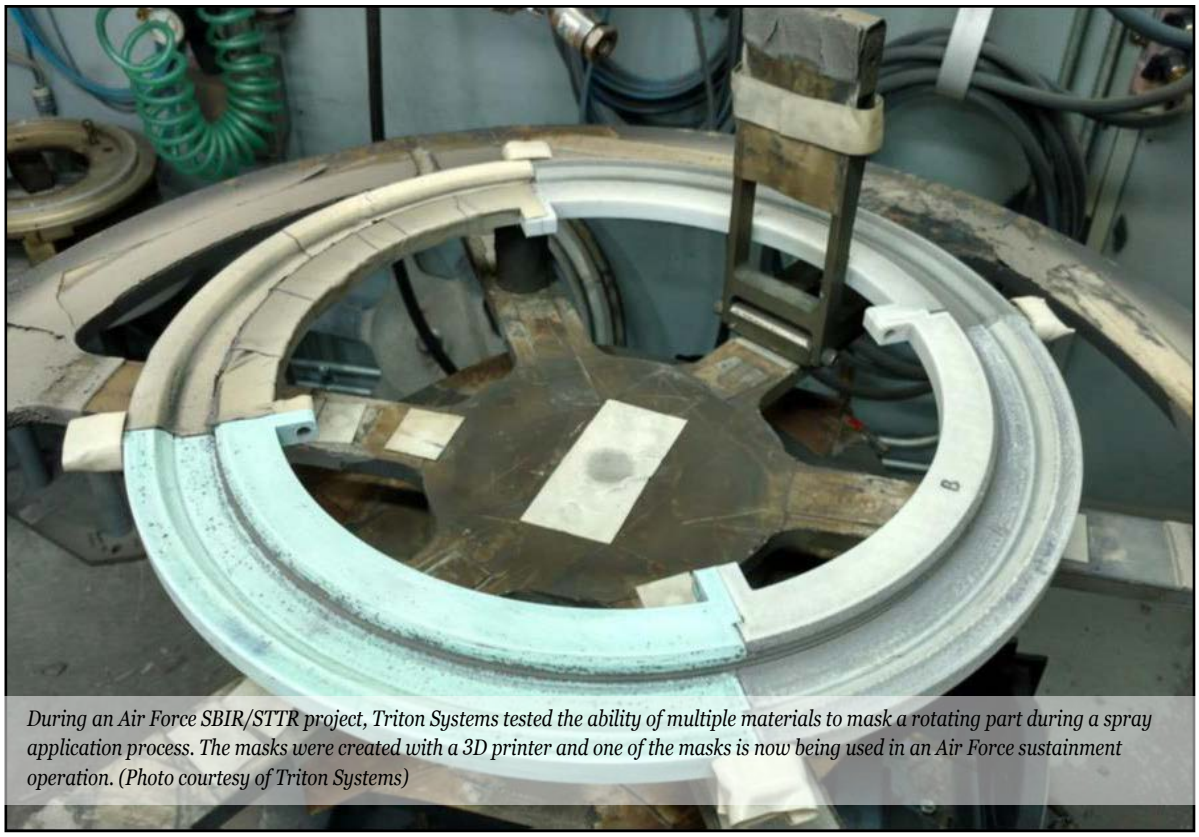
CONTRACT NUMBER:
FA8650-16-C-5242

SBIR COMPANY NAME:
Triton Systems Inc.
Chelmsford, MA

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

SPONSORING ORGANIZATION:
AFRL Center for Rapid Innovation

PUBLISHED:
June 2018



During an Air Force SBIR/STTR project, Triton Systems tested the ability of multiple materials to mask a rotating part during a spray application process. The masks were created with a 3D printer and one of the masks is now being used in an Air Force sustainment operation. (Photo courtesy of Triton Systems)

3D PRINTING SOLUTION PROVIDES
COST-SAVING SUSTAINMENT CAPABILITY

The Air Force has a new, time-saving tool in its ongoing effort to repair jet engines.

With support from the Air Force Small Business Innovation Research/Small Business Technology Transfer Program, Massachusetts-based Triton Systems Inc. developed a 3D printed mask for a specific engine component in need of treatment before it can be returned to service. The reusable mask replaces a tedious manual taping process, thereby reducing labor and costs while increasing reliability.

3D printing, also known as additive manufacturing, is the process of building layers of material to create an object based on a digital design. The technology is growing in popularity because it's good for making low-volume, custom parts to avoid large tooling and mold costs.

continued >

Under a special type of SBIR/STTR contract – known as a Direct-to-Phase II award, offered by the Air Force Research Laboratory Center for Rapid Innovation – Triton Systems worked with the AFRL Materials and Manufacturing Directorate to streamline the preparation process for rebuilding a particular component.

The 76th Propulsion Maintenance Group at Tinker Air Force Base in Oklahoma is using the mask developed by Triton Systems in its jet engine turbine sustainment operations, according to Glen Drebes, engineering branch chief for repair and development.

BEHIND THE TECHNOLOGY

Portions of metal engine components are worn away during use and must be rebuilt through the sustainment process. Typically those components are manually taped, leaving only the worn area exposed for smoothing the rough surface and applying material.

Some components take up to six hours of taping prior to treatment. The idea behind reusable 3D printed masks is that they could easily snap on to expose only the desired area – cutting the application and removal time to minutes – while providing more consistency. In addition to reducing sustainment costs by cutting labor, these masks would also replace the acquisition time and higher costs option of using metal or silicone masking in the process.

During the Air Force SBIR/STTR project, Triton Systems tested the ability of multiple materials to mask a rotating part during a nickel aluminide application. After finding several that were acceptable, it printed a mask to cover a test part.

"Then, the company improved the design and added removable edges," Drebes said.

At the conclusion of the project, Triton Systems delivered the appropriate 3D printing machine and model for the mask. The mask has since been implemented into production of a low-volume part and is expecting to be used over the long-term.

Under the Direct-to-Phase II award, Drebes said another company provided a solution that is also being used by the 76th Propulsion Maintenance Group.

SBIR SUPPORT WAS VITAL

Funding from the Air Force SBIR/STTR Program allowed Triton Systems to develop its approach and secure materials needed to fabricate and demonstrate masks. The company ultimately designed five types of masks.

After collaborating with its Air Force colleagues, Triton Systems settled on one of the masks and made adjustments based on feedback about fit and convenience. The final mask design was tested in a real application to show its utility.

Based on the transition success, the company is discussing 3D print masking technology with other sustainment organizations within the Department of Defense. Triton Systems is also looking to widen the potential use of the masks by investigating ways to increase their temperature capability and compatibility with other materials.