Air Force SBIR STTR TRANSITION
EQUIPPING THE WARFIGHTER

MANUFACTURING ADVANCEMENTS LEADING TO A TITANIUM REPLACEMENT

TOPIC NUMBER:
AF121-115

TOPIC TITLE:
Fabrication and Process Optimization of Thick Laminates from High-Temperature Polyimide/Carbon Fiber Composites

CONTRACT NUMBER:
FA8650-13-C-5025

SBIR COMPANY NAME:
PROOF Research
Moraine, OH

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

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PROOF Research Advanced Concepts Division engineers work on a polyimide composite structure. Composite structures are commonly used on a variety of aircraft applications, including F135 and F110 engines; B-2, F-117 and F-22 aircraft; missile structures; and sixth-generation engines. (Courtesy photo)

NEW COMPOSITE MATERIALS

WILL PROMOTE BIGGER FUEL SAVINGS AND BETTER FATIGUE RESISTANCE IN AIRCRAFT

The Air Force and a small business partner are pushing the boundaries of high-temperature material production to cut fuel costs and boost the service life of aircraft.

Moraine, Ohio-based PROOF Research is working with Air Force Research Laboratory to further computationally derived materials, manufacturing and engineering solutions, which includes the development of high-temperature polymer matrix composites as a replacement for titanium.

Also known as PMCs, the advanced materials can trim the weight of some parts and systems in aircraft by as much as 40 percent - resulting in annual fuel savings of hundreds of dollars per kilogram of titanium replaced – while offering increased service life and improved fatigue resistance.

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SBIR SUPPORT

The advanced composites division of PROOF Research, formerly Performance Polymer Solutions Inc., was backed by the Air Force Small Business Innovation Research (SBIR) Program to develop and mature the PMC technology. This was in support of the Air Force's Technology Program for Integrated Computational Methods for Composite Materials.

In addition to the SBIR funding, this effort attracted more than $1.6 million in funding from industry partners including Lockheed Martin, GE Aviation and Triumph Aerostructures. These funds are helping to ensure the technology successfully transitions into the military or private sectors.

STRONG POTENTIAL

Applications for these advanced materials exist on the F135 and F110 engines; B-2, F-117 and F-22 aircraft; missile structures; and sixth-generation engines.

Developing better, faster, stronger, and more sustainable aircraft requires the discovery and successful manufacturing of advanced, high-temperature materials. Additionally, the best new materials solutions will meet environmental, health and safety regulations and are non-toxic alternatives to their predecessors.

"This maturation effort supports the warfighter by providing new capabilities and performance at a reduced cost," said Dr. Brent Volk, the AFRL researcher managing the effort. "It completes development of an advanced materials 'toolbox' that includes a higher temperature polyimide matrix composite, a computational process model for the material integrated into a commercial, off-the-shelf software package, validation of the process model on complex geometries, and a materials design-allowable database."

The Air Force SBIR and STTR programs provide more than $300 million in funding for research and development activities by small businesses annually.

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