

Topic: N093-183

Prime Photonics, LC

Innovative Foreign Object Damage (FOD) Detection and Identification Technology for Military Turbine Engines

Prime Photonics was founded in 1999 and specializes in advanced sensor systems for military and industrial turbomachinery. The Foreign Object Damage (FOD) Detection System identifies and characterizes compressor rotor blade impacts during engine operation. Military gas turbines on fixed and rotary wing aircraft, and ground vehicles, are susceptible to performance-reducing FOD damage. This patented technology provides real-time on-wing diagnostics, improving operational readiness and reducing costs associated with current schedule-based visual inspection maintenance activities. A prototype was demonstrated in F402 engine testing performed May-July 2017. The company seeks engine companies and Defense program office(s) with engine diagnostic or condition-based maintenance applications for the technology.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)

Aircraft Propulsion, Power and Thermal

Rotary Wing Vehicles

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SYSCOM: NAVAIR

Contract: N68335-15-C-0316

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-15-C-0316

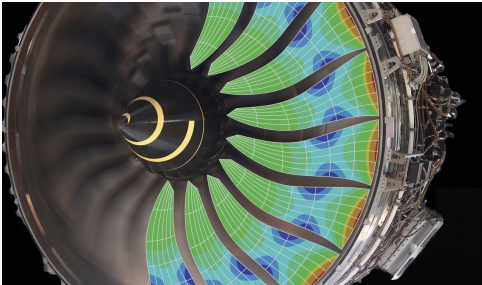
Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: NAVAIR
Sponsoring Program:
Transition Target:
TPOC:
(301)757-0472
Other transition opportunities:



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WHAT

Operational Need and Improvement: Foreign object damage (FOD) is the primary driver for unscheduled engine removals in the fleet environment of today. To maintain affordability and fleet readiness, there is a need for identifying the occurrence of FOD events and assessing rotor damage while the engine is still on wing.

Specifications Required: A novel sensor technology that can integrate FOD detection with vibration, clearance and blade/vane mode identification

Technology Developed: Optical sensor instrumentation hardware and software technology that identifies the occurrence of foreign object damage. Provides data about non-catastrophic FOD without an extended examination by a highly skilled technician. The ultimate approach to FOD damage detection is to replace most visual inspections with the measurements of the automated system.

Warfighter Value: Technology enables a dramatic cost reduction for the operators of turbine engines by reducing the number of unnecessary visual inspections. Will yield large cost savings for the DoD, improve operational readiness, as well as offering the potential to prevent the needless loss of life and assets caused by undetected damage.

WHEN

Contract Number: N68335-15-C-0316 Ending on: July 30, 2017

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Flutter Rig Demonstration	High	Detect and characterize damage in a flutter test rig	3	June 2010
Rotor FOD test campaign	Med	Detect, locate and characterize FOD events in spin rig testing.	4	November 2014
Vacuum spin pit rotor test	Med	Detect and locate FOD impacts on rotor with mid-span dampers.	4	July 2015
F402 engine ground test	High	Detect non-damaging FOD events during engine test	5	August 2017
F402 flight test	Med	Detect non-damaging FOD events during flight test	6	December 2018

HOW

Projected Business Model: Sell flight test systems to the Navy and sell ground and flight test systems to Original Equipment Manufacturer (OEM) engine manufacturers and end users. Then adapt the system for integration onto the production engines which will ultimately become part of the fleet. Prime will provide hardware (sensors, cables, instrumentation, software) to engine OEMs and/or license some or all of these to the OEM. Engine OEMs and/or engine control companies will integrate the system with the aircraft engine and potentially other aircraft health monitoring systems and deliver to the prime contractor. The system will provide health monitoring capability to pilots and ground support personnel.

Company Objectives: Partner with turbine engine OEMs GE Aviation, Pratt and Whitney and Rolls Royce, Honeywell, Williams and the other gas turbine manufacturers to develop full health monitoring capability of the system for ground and flight test and eventually incorporation into new engine bill-of-material usage.

Potential Commercial Applications: Every branch of the United States (US) military that uses turbine engines. This includes NAVAIR, the Air Force, Army Aviation and Tanks, and the Marine Corps. Each of these organizations operates their turbines in regions which represent a high risk of the ingestion of debris which can lead to undetected FOD. An exacerbating factor in this situation are vertical lift platforms which have increased probability of debris ingestion and undetected FOD. The system may also find use for diagnostics and condition monitoring in commercial engines.

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