Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2016-906

Topic # AF141-205

Non-Destructive Inspection (NDI) technique for Sub-Surface Crack Characterization for Non-Ferrous Metals in Propulsion System Components

Prime Photonics, LC

WHO

SYSCOM: NAVAIR

Sponsoring Program:

Transition Target: Titanium alloy component inspection

TPOC:
(301)757-0472

Other transition opportunities: 3D-SMIS can also be applied to non-destructive subsurface and surface crack inspection for Inconel and other non-ferrous materials (additional development may be required).

Notes: 3D-SMIS technology allows in situ crack detection on rotor blades and hubs.
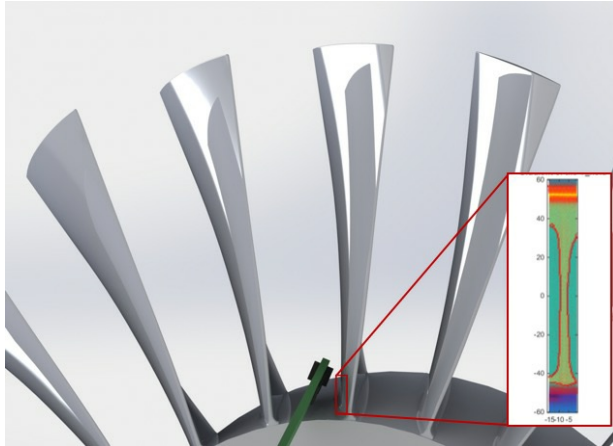
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WHAT

Operational Need and Improvement: The fatigue cracking potential of a propulsion component drives inspection intervals, greatly impacting total ownership cost and operational readiness. Surface cracks are often preceded by subsurface cracking; however there are no practical solutions for performing subsurface inspections on non-ferrous materials in depot environments.

Specifications Required: Accurately and reliably characterize subsurface cracks in root fillet of non-ferrous (titanium) IBRs to a depth of 0.02" and accuracy of 0.01".

Technology Developed: 3-Dimensional Synchronous Magnetic Imaging System (3D-SMIS) is a robust patent- pending technology that generates three-dimensional (3D) maps of defect geometries and stress fields in non-ferrous materials, allowing the detection of subsurface cracks. The system includes an instrumentation unit that can be cart- or rack-mounted, one or more ultrasonic transducers that are attached to the part under test, and a highly sensitive magnetometer-based probe that detects minute changes in the magnetic signature of a material or part.

Warfighter Value: 3D-SMIS™ can used to detect subsurface cracks in a depot environment without having to completely disassemble the engine. the technology will support improved lifing of critical rotating components, thereby improving operational readiness and reducing total cost of ownership.

WHEN

Contract Number: N68335-16-C-0172 **Ending on:** March 24, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Crack detection in ferrous material	High	Detect surface crack	4 (non ferrous)	February 2015
Subsurface crack detection in non-ferrous material	Med	Detect subsurface crack	4	September 2016
Subsurface crack detection on aircraft component	Med	Detect subsurface crack	5	September 2017
Detect subsurface crack in depot environment	Med	Validate system in depot	6	March 2019

HOW

Projected Business Model: Prime Photonics currently manufacturers instrumentation used for engine test and evaluation. The 3D-SMIS product will be manufactured by Prime Photonics and sold to engine OEMS, the Government and DoD service providers. Licensing of the technology will also be considered.

Company Objectives: Our goal is to transition 3D-SMIS™ into DoD and prime contractor systems for applications that can reduce the frequency of component inspections. Prime Photonics is seeking to connect with Navy and DoD program managers, engine manufacturers and aircraft and mobile platform maintainers with unmet NDI needs.

Potential Commercial Applications: 3D-SMIS non-destructive inspection technology is for application in aerospace propulsion systems and structures, ground-based propulsion systems, power generation and industrial equipment health monitoring uses where the potential for undetected surface and sub-surface cracks drive lifing requirements, compromise safety or reduce operational readiness.

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