Department of the Navy SBIR/STTR Transition Program

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ONR Approval #DCN# 43-10509-22

Topic # N111-067
Underwater Structural Health Monitoring of Composite Navy Propellers
Metis Design Corporation

WHO

SYSCOM: ONR

Sponsoring Program: SSN(X) - Next Generation Attack Submarine

Transition Target: Future Attack Submarine

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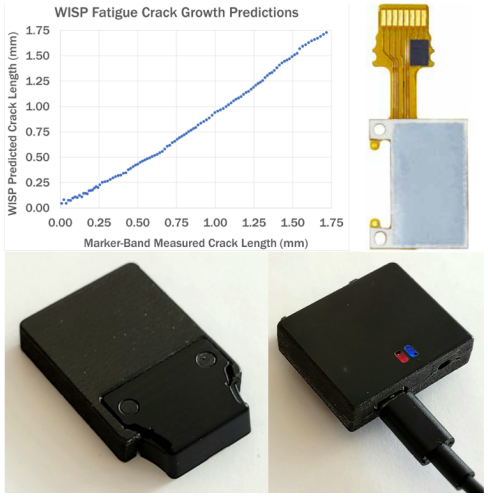
Other Transition Opportunities: Independence Class Littoral Combat Ship (LCS), Columbia-Class Submarine, Constellation Class Frigate

Notes: In addition to marine applications, there are several aircraft including military (F-15) and commercial applications



Example fatigue crack length tracking (top left), nanoengineered fatigue crack gauge (top right), WISP Solo standalone data acquisition unit (bottom left), WISP Reader wireless data/power transceiver (bottom right)

WHAT

Operational Need and Improvement: Present inspection of naval structure is only conducted on shore by qualified experts. This requires the complex logistics of taking the asset out of service, brining it to a port, flying-out the necessary inspection personnel and equipment, and often a tear-down procedure to allow access to the areas to be inspected. Improved methodologies are desired to make this process more efficient.

Specifications Required: A distributed integrated sensor network placed in strategic locations could allow much of the inspectors' duties to occur remotely without taking the asset out of service. The network must be durable and cost effective such that the additional cost burden does not exceed the sustainment costs being avoided. The inspection results must be at least as reliable as those conducted by traditional on-site inspectors.

Technology Developed: The Witness Integrity Sensor Platform (WISP) is a novel sensor network architecture. Lightweight (~10 g), small footprint (~10 cm2) microelectronic units can be distributed throughout key areas to be monitored, with minimal-to-no cables or connectors necessary for integration. A standardized interface provides data acquisition capabilities for many COTS analog & digital sensors, in addition to a line of advanced nanoengineered sensors for monitoring fatigue cracks, corrosion and erosion.

Warfighter Value: Conditional based maintenance (CBM) has the potential to reduce sustainment costs while improving asset availability.

WHEN

Contract Number: N68335-21-C-0290 **Ending on:** Mar 15, 2024

Milestone	Risk Level	Measure of Success	Ending TRL	Date
LA-Class Submarine Demo	Low	Installation of WISP hardware/sensors, collection of representative damage data	5	2nd QTR FY22
Self-Defense Test Ship Demo	Low	Installation of WISP hardware/sensors, collection of representative damage data	6	3rd QTR FY22
Environmental Qualification Testing	Medium	Pass all environmental testing requirements	6	4th QTR FY22
CNT-base Acoustic Emission	High	Demonstrate fatigue crack detection using CNT sensors	6	1st QTR FY23
Detection Sensitivity Study	Medium	Quantify detection reliability using CNT sensors	6	1st QTR FY24

HOW

Projected Business Model: Metis Design Corporation (MDC) focuses on the maturation of novel technologies from concept through field-testing. MDC has established a robust IP portfolio to protect our innovations, and have successfully licensed several products to large companies who can provide marketing, sales and manufacturing expertise. Specifically, the WISP technology has been licensed to Analog Devices Inc. (ADI), and MDC continues to provide engineering support for development and evaluation of advanced custom nanoengineered sensors.

Company Objectives: We are seeking additional program office support for evaluating, qualifying and deploying this technology, in addition to opportunities for development of new advanced application-specific sensors compatible with the system.

Potential Commercial Applications: Commercial aviation, marine and automotive applications, in addition to the potential for monitoring civil infrastructure and energy market assets.

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