

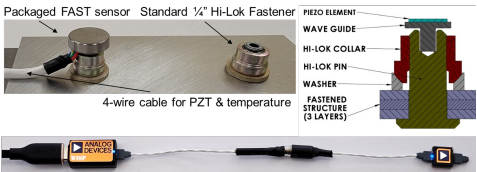
WHO

SYSCOM: NAVAIR
Sponsoring Program: CH-53K
Transition Target: CH-53K

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Other Transition Opportunities: Any aircraft, ship or ground vehicle that uses Hi-Lok/Lite style fasteners

Notes: Image illustrates packaged sensor (top left), sensor cross section (top right) and networked acquisition hardware (bottom).



Metis Design Corporation

WHAT

Operational Need and Improvement: Multiple materials joined together with fasteners provide for some of the most challenging locations for damage detection, while also often being the most prone to damage and are failure critical. Even conventional non-destructive inspection (NDI) tools have difficulty detecting cracks and corrosion that can be hidden under the fastener head or between layers without a time-consuming disassembly. New structural health monitoring (SHM) approaches are necessary to detect damage in these fastened joints quickly and reliably without the need for removing the fastener.

Specifications Required: The SHM method must be able to detect small fatigue cracks and corrosion without removing the fastener, and must be able to survive and maintain the certified resolution through the aircraft life-cycle without degradation in performance. MIL-STD-810, MIL-STD-461 and MIL-HDBK-1823A standards apply.

Technology Developed: Metis Design Corporation (MDC) had developed a piezoelectric sensor that mounts inside an already-installed Hi-Lok, essentially turning the fasteners into an ultrasonic resonant transducer. Very small changes to the structure caused by flaws near the fastener effectively results in boundary condition differences that can be detected through signal processing. These sensors are compatible with a distributed data acquisition architecture previously developed by MDC, which can be operated as a standalone system or communicate with rotorcraft health and usage monitoring systems (HUMS).

Warfighter Value: This novel sensor will shorten inspection times for fastened joints, resulting in reduced operating costs and improvements in asset availability. The benefits of HUMS for rotorcraft have already been well documented by the Navy for platforms like the MH-60R/S and CH-53E, and this type of sensor would just augment those capabilities already afforded to dynamic components, and extend them to monitoring static fastened joints.

WHEN

Contract Number: N68335-23-C-0280 **Ending on:** Apr 11, 2025

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Full-Scale Fatigue Test Integration	Low	Successful integration	6	4th QTR FY23
Probability of Detection Testing	Medium	Sufficient detection capability	6	4th QTR FY24

HOW

Projected Business Model: Metis Design Corporation has already engaged with Analog Devices Inc. (ADI) on multiple other technologies, including the distributed hardware they are fabricating on our behalf that is being used for the present effort. ADI has expressed interest in further licensing this FAST technology to add to their growing SHM portfolio.

Company Objectives: We are seeking additional transition opportunities, specifically programs of record who would be interested in using this technology on their platform. Those could be explored through Phase II.5 or Phase III contracts

Potential Commercial Applications: This sensor integrates with Hi-Lok/Lite style fasteners without any modifications, after they have been fully installed to fasten a multi-layer joint. The sensor provides a detection capability for both fastener health, and flaws in any layer directly adjacent to the fastener.