

Topic: N122-125

Metis Design Corporation

Innovative Approach to Bondline Integrity Monitoring

Metis Design Corporation (MDC) is a leading provider of structural health monitoring solutions. MDC offers a novel approach to instrumentation through distributed data-acquisition, signal-processing and locally embedded algorithms. The MD7-Pro Acquisition Node provides high-speed digitization, an arbitrary-function-generator and 2Gbit of memory to accommodate a variety of detection methods in a miniature 15g package. When joined with the MD7-Pro Structural-Sonar, this system can actively map stiffness changes over large areas, or passively localize impact events. Devices can be synchronously networked over a single 8-wire power and data bus, thereby efficiently providing diagnostic coverage with little power or mass penalty. MD7 is slated to be integrated into the MQ-4C and CH-53K in production. MDC seeks program office support for other applications interested in testing and evaluating MD7.

Technology Category Alignment:

Ground and Sea Platforms

Air Platforms

Engineered Resilient Systems (ERS)

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SYSCOM: NAVAIR

Contract: N68335-20-C-0218



Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-20-C-0218



Tech Talk: <https://www.youtube.com/watch?v=gUSjtbwIFIY>

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2020-864

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WHO

SYSCOM: NAVAIR

Sponsoring Program: PMA-262

Transition Target: MQ-4C Triton UAS

TPOC:

(301)342-9229

Other transition opportunities: CH-53K

Notes: The MD7 system is presently at a TRL7. The hardware has been flight tested on a C-5, S-92, and CH-53K, undergone sea-trials on the LCS-2 and has been a part of 4 separate space launches. Additionally, The MD7 system has participated in the Triton full-scale static and fatigue tests, and has been installed for testing on the CH-53K full-scale fatigue article.

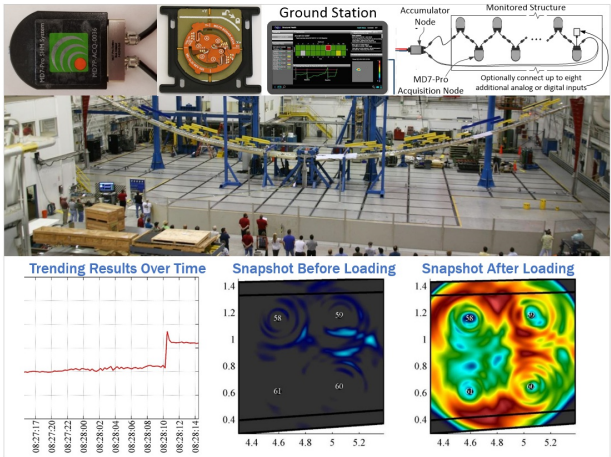


Image courtesy of Metis Design Corporation

WHAT

Operational Need and Improvement: The Navy has a need for fully-integrated and automated approach to accurately conduct non-destructive assessment of structural health for unmanned aerial systems. Current inspection practices can require significant down-time, breaking of factory seals, specialized equipment and trained personnel to evaluate structural integrity, and is prone to operator error. SHM sensors and hardware are permanently integrated into an asset to provide real-time detection capabilities without manual intervention.

Specifications Required: SHM systems need to maintain as good or better damage detection capabilities as current baseline practices, described by probability of detection (POD). Further, as SHM systems are permanently integrated, they must endure the environmental and loading requirements of the target platform.

Technology Developed: The MD7-Pro SHM system provides a digital solution for automated damage detection. Through embedded microprocessing, the MD7-Pro system offers distributed data acquisition, thereby minimizing quantity of cables and susceptibility to electromagnetic interference (EMI). Standard sensor packages facilitate guided wave tests for damage detection, acoustic emission for impact localization, and custom add-on cards can remotely capture temperature, strain and other differential voltage measurements. For every 20 grams of mass and 1.5 watts of power, the MD7-Pro system can continuously monitor roughly 1 square meter of complex metallic or composite structure.

Warfighter Value: Structural health monitoring (SHM) provides reliable mapping of damage within structural components without manual tear-down inspection. This approach increases asset readiness and reliability, while reducing costs associated with preventative maintenance and inspection. Northrop estimated as much as \$1.5B could be saved through the life of the Triton program by using SHM sensors to defer manual inspections.

WHEN

Contract Number: N68335-20-C-0218 **Ending on:** December 12, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Large-scale probability of detection (POD) assessment	Med	Demonstrate ability to reliably detect class B flaw	7	December 2020
Software package for data analysis	Low	Completed software compatible with fatigue test	7	December 2020
Full-scale fatigue test support	Low	Analysis of data from year 1, algorithm calibration	7	December 2021
Flight testing	Low	Instrumented system on a Triton LRIP vehicle	7	December 2022

HOW

Projected Business Model: Metis Design has exclusively licensed the MD7 system to Raytheon Technologies (formerly Goodrich/UTAS/Collins) for production and sales. Metis continues to participate in R&D and advanced integration, customization and evaluation efforts related to this technology, and receives royalties on hardware sales.

Company Objectives: We seek additional program office support for new applications of this technology, through Phase II, Phase II.5 or Phase III funding.

Potential Commercial Applications: SHM technology could be applied to nearly any DoD platform for in-situ damage detection. The MD7-Pro system is specifically suited for wide-area applications such as aircraft wings, rotorcraft skins, ship and submarine section hull and deck sections.