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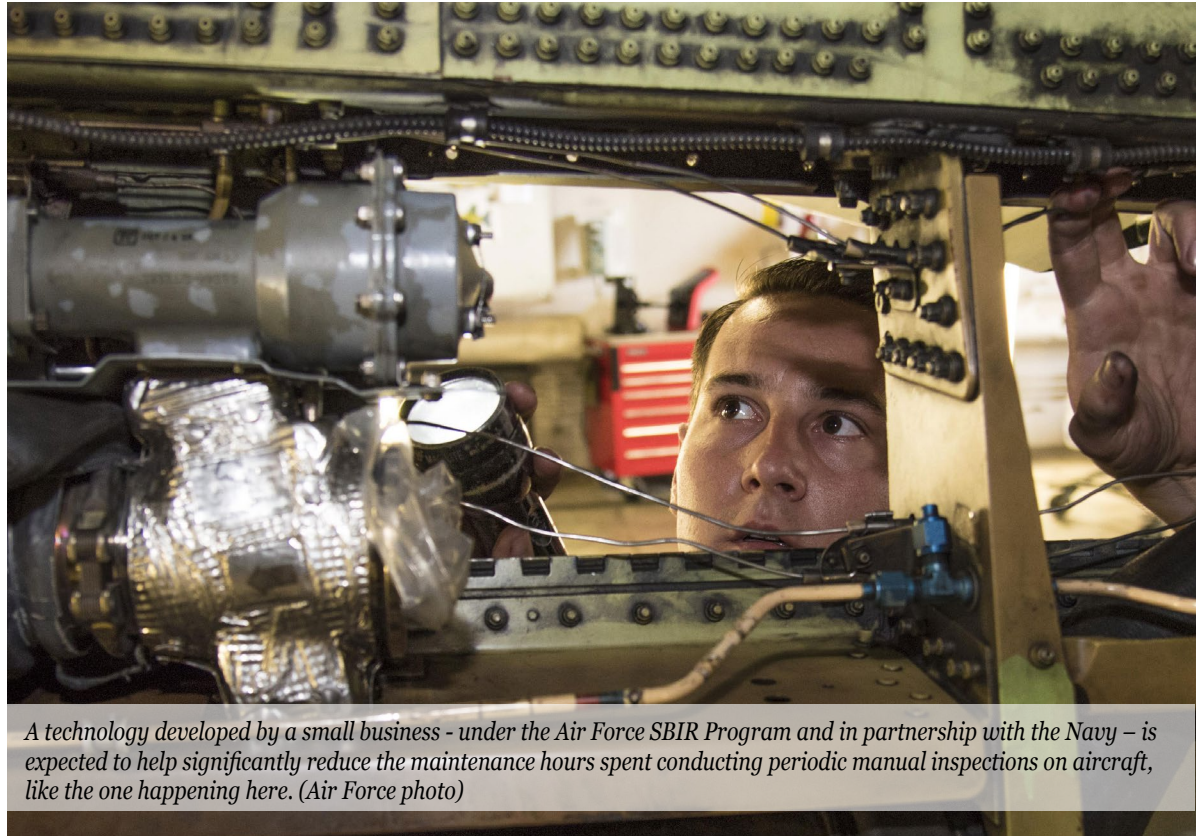
TOPIC TITLE:
Intelligent Structural
Health Monitoring
Infrastructure

**CONTRACT
NUMBER:**
FA8501-15-C-0025

**SBIR
COMPANY
NAME:**
Metis Design Corp.
Boston, MA

**TECHNICAL
PROJECT
OFFICE:**
Air Force
Sustainment Center
Robins AFB, GA

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A technology developed by a small business - under the Air Force SBIR Program and in partnership with the Navy – is expected to help significantly reduce the maintenance hours spent conducting periodic manual inspections on aircraft, like the one happening here. (Air Force photo)

SBIR-BACKED AIRCRAFT HEALTH MONITORING TECHNOLOGY POISED FOR WIDESPREAD USE

One of the world's largest aerospace companies is looking to revolutionize the industry with new technology developed by a small business in partnership with the Air Force and Navy.

UTC Aerospace Systems, a unit of United Technologies Corp., recently signed an agreement to license the MD7-Pro digital structural health monitoring system from Boston, Massachusetts-based Metis Design Corp. This newer sensing technology offers on-demand structural health data collection and analysis for aircraft components and systems. When integrated with the UTC Aerospace Systems' Pulse Health Monitor, the MD7-Pro will provide an accurate and timely assessment of aircraft component life expectancy, significantly reducing the maintenance hours spent conducting periodic manual inspections.

Having this visibility into an aircraft's health will improve logistics efficiency through better planning of maintenance actions; offer better scheduling of spare parts to their point of use; and result in higher rates of aircraft readiness.

Metis developed hardware for the MD7-Pro with support from the Air Force Small Business Innovation/Small Business Technology Transfer (SBIR/STTR) Program and guidance from the Air Force Research Laboratory. Naval Sea Systems Command also supported development of the Metis system software, including its damage detection and quantification algorithm features.

UTC Aerospace Systems secured an exclusive license to the MD7 Pro, positioning Metis for growth as the capability is adopted by military and commercial customers. For Metis, the license will provide funding for many years to come, which can be used to improve the technology and pursue research in other areas, such as multifunction materials.

"Of most importance, however, it gives us real credibility," said Dr. Seth Kessler, president and CEO of Metis. "A technology we invented and developed from scratch is now going to be commercially produced and used in programs of record, which will help us secure future projects and funding."

While the Air Force and Navy have been supporting this effort for years, their more recent investments to transition the technology to programs of record helped attract the interest of UTC Aerospace Systems, Kessler added.

UTC Aerospace Systems is enhancing the MD7-Pro system to enable aircraft structure checks in less than five minutes, thereby reducing manual inspection time and cost while maximizing fleet availability. Kevin Hawko, Vehicle Health Business Development Manager for UTC Aerospace Systems, said the new system will be capable of identifying crack size and location, loose fasteners and corrosion. The fully integrated system will provide high quality data through digitizing sensor signals at the point of measurement.

BEHIND THE TECHNOLOGY

Versatility is one of the keys to MD7-Pro digital structural health monitoring system, as it can be integrated into new aircraft designs or retrofitted into existing aircraft. The system allows repeatable, highly accurate evaluation

of aircraft structural health. The structural sonar can be applied to composite or metallic structures, find new damage, track the growth of existing damage or be applied as part of a bonded repair to check effectiveness in crack arrest.

During the early stages of the Air Force SBIR/STTR Program, Metis focused on the design of sensor hardware by making use of infrastructure distributed throughout an aircraft. Next, the company worked on fabrication and testing of a prototype.

For the system to be practical, it had to be able to acquire data at very high sampling rates and be networkable over large distances while still being compact.

"Those were the biggest hurdles, fitting the high performance in such a small and lightweight package, and getting many of them to network without adding a lot of cable weight," Kessler said.

TRANSITION TO A PROGRAM OF RECORD IN PROGRESS

In addition to its commercial potential, the Metis technology behind MD7-Pro is being transitioned to the C-5 program through cooperation between the Air Force Sustainment Center and Air Force Life Cycle Management Center.

During this process - with funding from the Air Force SBIR Commercialization Readiness Program - Metis is working to mature, integrate and test the structural health monitoring system on the C-5. Those tasks will focus on sensor placement optimization and the algorithm calibration for these locations; a probability of detection assessment; an airworthiness assessment; and demonstration of the integrated system.

Since the engineering budgets of most program offices are limited, technologies like this rarely get far out of the gate.

"The biggest benefit of the SBIR program is provide funds and be a champion for new technologies that otherwise would not be investigated, researched or funded by the program offices because of higher priority projects," said David Wilkinson, C-5 ASIP Manager.



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AIR FORCE SBIR/STTR PROGRAM

AFRL/SB | 1864 4TH STREET | WRIGHT-PATTERSON AIR FORCE BASE | OHIO | 45433
800-222-0336 | AFSBIRSTTR-INFO@US.AF.MIL | WWW.AFSBIRSTTR.COM