

# Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2019-1013

Topic # N122-110

Fatigue crack detection in rotorcraft structures

Acellent Technologies, Inc.

## WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** Light/Attack Helicopters (PMA-276)

**Transition Target:** H-1 Helicopter

**TPOC:**  
(301)342-8396

**Other transition opportunities:**

Military and commercial helicopter and fixed wing aircraft platforms.

**Notes:** Acellent harnesses Industrial Internet of Things (IIOT), a.k.a. Industry 4.0 technology to collect big data from sensors on structures. Acellent's on-board system transmits the sensor data to cloud services for storage. Customers can then monitor the health of their structures remotely anytime, anywhere.

Acellent provides real-time data from around the world, which makes for smarter structures and a safer world. Acellent can help you ensure quality control, safety, and maintenance cost efficiency.



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## WHAT

**Operational Need and Improvement:** Advanced composite materials are becoming more commonly used in modern aircraft structural components to reduce the overall weight, fuel expenditures and life cycle cost of the aircraft. Despite their high strength and flexibility in design, composite materials are susceptible to damage. The main sources of damage are fatigue and direct impact, causing cracking, crushing, or delamination of the composite material. The U.S. Navy is looking for an innovative structural health monitoring (SHM) system capable of detecting damage in composite aircraft structures.

**Specifications Required:** A potential system's sensors must be capable of operating in typically harsh aviation environments including wide temperature and humidity variation as well as high vibration. Proposed systems must minimize the number of sensors used while maintaining the ability to monitor globally and detect damage locally. Ideal systems will utilize wireless sensors and technology. The system must be able to detect damage events, localize where the damage occurred, and characterize the type of damage in critical components of the aircraft structure that if left undetected might lead to loss of the aircraft and crew. This program is aimed to demonstrate and validate the on-board SHM integration with the Advanced Digital Transfer System (ADTS) online data storage and processor system on-board a helicopter. In addition to increased safety, lower maintenance and sustainment cost of fleet aircraft by detecting damage early before it becomes more complicated and expensive to repair can be provided.

**Technology Developed:** Acellent's active Structural Health Monitoring and Management (SHM) system for helicopter tail booms will integrate with the ADTS and on-board helicopter data acquisition (DAQ) and storage system, like health and usage monitoring systems (HUMS). An off-board system solution for fleet inspector to perform maintenance task is also provided. Acellent provides 24/7 real-time health monitoring and predictive maintenance capabilities.

**Warfighter Value:** The ability to detect anomalies or damage in composite aircraft structures could significantly reduce the amount of inspection and testing required, resulting in greater aircraft availability and higher readiness rates. In addition to increased safety, lower maintenance and sustainment cost of fleet aircraft by detecting damage early before it becomes more complicated and expensive to repair can be provided.

## WHEN

**Contract Number:** N68335-18-C-0280 **Ending on:** June 26, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Sensor placement and support study for tail boom fatigue test and platform integration	Low	Nail down sensor placement to manufacture correct sensors	3	January 2019
ICD - Interface Control Document developed for both tail boom test and platform retrofit	Low	Complete then review ICD	3	July 2019
Interface with on-board ADTS	Med	Ensure communication protocol is set then functional	4	June 2019
Off-board application/software for data processing	Low	Ensure data is being received in real-time	5	September 2019
Functional testing of design prior to tail boom fatigue test on sub-scale level	Low	Prepare for functional tests	6	October 2019
Integration support, Technical support for Tail Boom fatigue testing, Reports and Deliverables	Low	Ensure integration is functional and reports have been reviewed	8	June 2020

## HOW

**Projected Business Model:** Acellent manufactures all our SHM products and is a system and service provider to our worldwide customers. We license our software on an annual basis with free upgrades and maintenance support within that year.

**Company Objectives:** Acellent is the global leader of sensor systems for products to provide Structural Health Monitoring (SHM) and Management solutions for Industry Internet of Things (IIOT) 4.0. Our mission is to be the world wide provider of embedded SHM products and our vision is to enable industrial IOT solutions for all structural assets anytime, anywhere.

**Potential Commercial Applications:** US Army, US Navy, Air Force, H1 platform, Bell Helicopters, commercial aircraft, military rotorcraft, business E jets.

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