



TOPIC NUMBER: N05-054

SBIR INVESTMENT: \$849,857

PHASE III FUNDING: \$12,628,259

DEPARTMENT OF THE NAVY

NAVY SBIR/STTR SUCCESS STORY



DEVELOPMENT OF A STRUCTURAL DAMAGE ASSESSMENT SYSTEM

Materials Sciences LLC designed and developed a reliable SDAS that provides an enhanced automated structural damage assessment capability, while helping the Navy reduce costs and refocus manpower.

MATERIALS SCIENCES LLC

POC: Dr. Simon Chung
215.542.8400
Horsham, PA 19044
<http://www.materials-sciences.com>

THE CHALLENGE

The Navy sought a novel approach to provide reliable, quantitative structural health data for its platforms, such as damage state and damage locations, to aid integrated maintenance management planning functions and damage control decision making tools. They were looking for a way to measure crack growth and crack jump in metals, fiber breaks and kinks in fiber composites, and chemical changes, such as corrosion. Existing technologies required point-by-point measurement techniques and the erection of complex scaffolding to perform these assessments. Because of this, NAVSEA sought the development of an innovative method to assess the structural integrity of advanced materials, which is essential to the implementation of new advanced material concepts in ship manufacturing and the acceptance and utilization of new, multifunctional materials in the fleet.

THE TECHNOLOGY

Materials Sciences LLC, a composites engineering and manufacturing company with operations in Horsham, PA, Greenville, SC and Huntsville, AL, developed and demonstrated a structural damage assessment system (SDAS), designed to quickly provide data on the health of a composite structure. The technology integrates traditional and emerging wide-area inspection techniques with wireless devices that transfer data to specialty analysis software using an 802.15 protocol that processes the information and returns the health assessment.

THE TRANSITION

Materials Sciences LLC was awarded a \$24,526,386 indefinite-delivery/indefinite-quantity Phase III contract (N65540-15-D-0011) for the use of innovative technologies developed under the Phase I and II contracts to design, analyze, and fabricate a wide array of structure and mechanical components intended for use by the Navy. The structural and mechanical components are fabricated from a large selection of material systems from basic steel construction to advanced material systems that not only provide structural components, but also provide acoustic, thermal, radar cross-section and electrical solutions. The Naval Surface Warfare Center, Carderock Division, Ship System Engineering Station, Philadelphia, is the contracting activity.

THE NAVAL BENEFIT

The benefits of a validated and verified SDAS during inspections of U.S. Navy composite structures include lower costs due to reduced time and manpower required; more reliable results than point-by-point inspections can provide; and increased confidence that a critical flaw has not gone undetected. Automated structural health monitoring via sensing networks and wireless data acquisition, such as the ones developed under this SBIR, are essential to realizing integrated ship maintenance, improved decision tools and reduced shipboard manning. This technology provides an enhanced capability for automated structural damage assessment and control for surface ship structures by providing structural health information to support condition-based maintenance and mission readiness reporting.

THE FUTURE

Seemann Composites LLC, a leading supplier of advanced composite components for Department of Defense platforms, completed its acquisition of Materials Sciences LLC in 2018 for an undisclosed amount. This acquisition solidified the companies' 25-year relationship in solving customers' needs and bringing products to market. To date, SCI has fabricated and delivered thousands of advanced composite structures and products to all branches of the U.S. military, and many major defense and commercial customers. The equipment health and integrated maintenance management technologies developed under this SBIR have direct applicability to commercial civil and mechanical fields, particularly for use with large structures and composite pressure vessels. Within the Navy, the features and benefits of the SDAS can be applied to inspection of large-scale Navy composite structures.