Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2021-0390

Topic # N192-115

Durable Foreign Object Debris (FOD) Screens for Air Cushion Vehicles - MSC P4579

Materials Sciences LLC

WHO

SYSCOM: NAVSEA

Sponsoring Program: PMS 377

Transition Target: Ship to Shore Connector (SSC)

TPOC:
(850)234-4411

Other transition opportunities:
Landing Craft, Air Cushion (LCAC)

Notes: The FOD screen is the structure protecting airborne debris from damaging the aft Propulsor Blades and rudders on the US Navy Air Cushion Vehicles (ACV), consisting of a frame structure with attached netting to prevent objects larger than 4" from contacting the blades.

https://www.navsea.navy.mil/Media/Images/igphoto/2002490801/

WHAT

Operational Need and Improvement: The Current SSC and LCAC FOD screens are welded stainless steel structures with a stainless-steel wire rope net, which is both heavy and costly. The improved FOD screen will use a composite structure and synthetic netting assembled using novel, low-cost fabrication methods to reduce weight up to 50% and maintain or reduce cost.

Specifications Required: The function of the FOD screen is as critical to the function of the Craft as any component of the propulsion system. The screen must primarily protect the propulsor blade and assembly from impact events including bird strike and airborne debris from improperly secured payload without restricting air flow. The screen must resist saltwater, Ultraviolet light, and sand spray without physical erosion or performance degradation. Finally, the screen must be as easily installed and serviced as the existing structure.

Technology Developed: The technology MSC is developing is designed to match the impact performance of the steel structure with a lightweight material. Steel structures are well known for their ability to absorb enormous amounts of energy through their inherent material ductility through plastic deformation, which is vital in vehicle crash protection and other catastrophic events. Although the impact and static loads that the FOD screen must protect against are challenging, MSC has shown analytically that a lighter weight structure can resist repeated impact events without damage.

Warfighter Value: The lighter FOD screen allows for increased performance of the SSC in terms of payload, but also the lighter weight FOD screen will be easier to install and uninstall, making it safer for propulsor maintenance.

WHEN

Contract Number: N68335-21-C-0119 **Ending on:** November 17, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Composite Basic Structural Feasibility and Weight Comparison	High	Preliminary Composte Designs met requirements and compared favorably to steel strcture	3	February 2019
Fabrication Method Demonstration	Med	Demonstration Prototype Completed	3	February 2019
Refinement of feasible Designs	Med	Detailed Composite Designs analytically exceed requirements	3	July 2021
Lab Test Prototypes Fabricated and Completed (expected)	Med	Successful Drop-Testing on Full Scale Prototype	4	November 2021

HOW

Projected Business Model: MSC maintains a growing composites manufacturing facility that is AS9100 certified, and currently has capabilities to meet prototype and production quantities for the Navy and the Prime Contractor for the SSC and retrofits of the LCAC. MSC will be the manufacturer and supplier of the composite FOD screens, with the necessary facilities and capabilities in-place. The near-term plan is for PMS 377 to procure directly from MSC, with a longer term scenario involving MSC supplying the FOD screens to Textron, who is the integrator of the LCAC and SSC.

Company Objectives: The business objective of MSC is to continue to grow as a supplier of composite structures for the Navy as well as other DOD and commercial customers, leveraging our history of analysis, design, and testing of composite structures to meet unique applications for our customers. MSC seeks to be the go-to developer and producer of innovative composite components where other suppliers may lack the materials engineering experience.

Potential Commercial Applications: The analytical tools and manufacturing methods developed in this SBIR are applicable to impact-resistant lightweight structures which can be broadly applied to protect marine and land structures subjected to repeated impact loads. The lightweight nature can be used to deploy protective screens in remote locations.

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