

Department of the Navy SBIR/STTR Transition Program

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Topic # N204-A01

Miniaturized End Effectors (Microelectronics)

Compass Systems Inc.

WHO

SYSCOM: ONR

Sponsoring Program: NAVSEA
Portsmouth Naval Shipyard

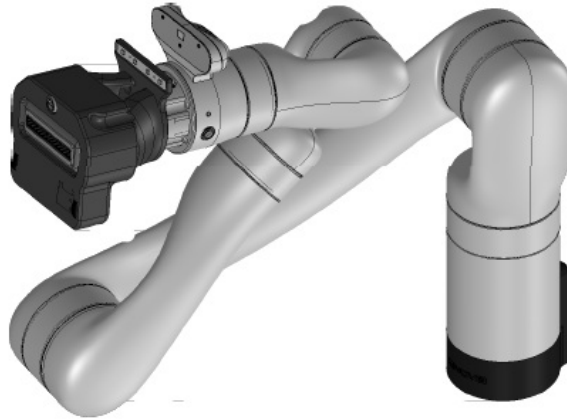
Transition Target: Submarine ballast tanks

TPOC:

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Other transition opportunities: Navy and other Department of Defense storage tanks or confined spaces.

Notes: M-EEF and Robotic Arm



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WHAT

Operational Need and Improvement: The DoN has placed surface maintenance and corrosion prevention requirements as a high priority and their initiatives are geared towards fostering innovation through automated and robotic product incubation. The developmental Miniaturized-End Effector (M-EEF) will provide more effective, accurate and safer NDI solution on an automated robotic platform.

Specifications Required: The M-EEF prototype system shall demonstrate increased capability, precision, speed and efficiency that is difficult to achieve with current manual systems while creating a safer work environment by drastically reducing the need for confined space entry. The developmental M-EEF will be used to perform autonomous tasks, such as, non-destruction inspections (NDI) / metal thickness testing and corrosion detection across a wide range of water based tanks on Navy submarines and ships. Integration and miniaturization of end effectors seeking minimal change-out times.

Technology Developed: The developmental system will innovate the inspection process through automation and robotic product incubation. The Phase II M-EEF prototype will be attached to a robotic manipulator arm as an end-of arm NDI tool and integrate with current DoN Remote Operated Vehicles (ROVs) that will be used to provide inspections in small and confined space areas. By developing a miniaturized end effector inspection capability for a robotic vehicle we have enhanced the inspection process of internal tanks and provided a solution to hard to reach confined space areas. A phased array nondestructive inspection head coupled with the capacity to capture real time data has been provided to allow complex contoured surface inspections in small restricted areas.

Warfighter Value: This unique M-EEF technology will allow internal NDI tank inspections to be performed in both dry conditions, where the tanks are drained, or while in-service where the tanks remain full of water. The value of the M-EEF systems is intended. This technology provides a new capability to inspect into hard to reach confined spaces which previously might not have been accessible to the human inspector. This will significantly improve the inspection thoroughness and provide a digital record of the findings for data mining. Improvements in the maintenance and sustainment activities of ballast tanks will greatly increase.

WHEN

Contract Number: N68335-21-C-0235 **Ending on:** March 1, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
End of Phase I	Low	Demonstrated prototype successfully. Inspection detection data gathered and verified on multiple substrate materials, curved surface, wet & dry environments.	3	1st QTR FY21
Final M-EFF Prototype Design and Production	Med	This effort will provide schedule drivers, design plans, critical interfaces, bill of materials (BOM), and other manufacturing details. Design decisions, calculations, tradeoffs and Size Weight And Power (SWAP) will be finalized. This effort will transi	6	TBD
M-EEF Factory Acceptance Test	Med	This will be lab testing to evaluation of all the functional components of the M-EFF. Testing will be performed phases, Alpha and Beta testing. The testing will evaluate operational and functional aspects the M-EFF in simulated environments.	8	TBD

HOW

Projected Business Model: Compass Systems business model is primarily direct sales to the government. We have a fully capable manufacturing facility. The transition of this technology expected to be accomplished via close interaction with the Naval Undersea Warfare Center (NUWC) customer base and the ability to adapt the miniaturized end effector (M-EEF) to multiple robotic systems. The automated/smart M-EEF system will increase performance, speed and accuracy that are unattained with current manual practices. However, the business model of the robotic M-EEF is not designed to replace the current maintainer, but expand their abilities to perform current maintenance practices.

Company Objectives: We will expand the usage of our technology to address readiness and maintenance process issues facilitating agile inspection and robotic actions to augment existing capabilities. Our short-term objective is to transition the Phase II development efforts into Phase III to advance the product maturity that will enable us to provide more NDI solutions for ballast and/or water storage tanks on NAVY ships and submarines. We anticipate that the Navy SBIR/STTR transition program (STP) forum will help us make connections within other areas within the Navy (i.e. NAVAIR), other DOD groups and commercial or external industry customers. Our long-term objective will be to develop new end effector systems that can perform additional functions beyond on-board water based tanks, such as, robotic NDI solutions with fuel storage tanks.

Potential Commercial Applications: The potential big target market would be the commercial ships our product would provide NDI/NDI services for inside their on-board ballast and water storage tanks.

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