

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4521-18

Topic # N091-082

Replanning and Operator Situation Awareness Tools for Operation of Unmanned Systems in Complex Airspaces and Waterspaces

Charles River Analytics, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Not specified

Transition Target: Innovative Undersea Prototype Development Consortium (IUPDC) OTA

TPOC:

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Other transition opportunities:

Potential for integration of the software with an unmanned air system control station or some other unmanned docking platform.

Notes: As an example of an alternate SBIR transition path successfully pursued on another program, Charles River developed a tool to guide the warfighter through a formalized approach to assessing, analyzing, and forecasting human behavior (Contract Number FA8650-04-C-6403). The tool eventually underwent a successful Military Utility Assessment in 2008 and an Extended User Assessment with a Joint agency; it is now in use by DoD war-fighters worldwide.



Image owned by Charles River Analytics

WHAT

Operational Need and Improvement: The technical capabilities of unmanned surface, subsurface, ground, and aerial vehicles continues to develop, leading to an impressive array of agile assets capable of accomplishing a wide variety of tasks. However, one key limitation is the endurance of the assets. One solution is to develop unmanned logistics platforms to periodically provide energy replenishment, data access and management, and communications capabilities to support unmanned vehicles over longer-range and longer-duration missions.

Specifications Required: The solution needs to operate for extended periods of time without communication with a human operator and adapt to unpredictable events (e.g., uncertainty in vehicle arrival times, environmental changes, tolerance to hardware failure, evolving mission needs). The software must integrate effectively with the larger platform hardware and software system and support a series of Limited Objective Experiments (LOEs), assessing the capabilities and features.

Technology Developed: Charles River Analytics is addressing the need for planning resources and schedules for deployed unmanned logistics platforms by assessing the status of the assets and developing algorithms to execute operations with limited remote supervisory control access. The primary objective is to design, develop, and test a hierarchical C2 structure, process, and implementation to manage autonomous operations. Charles River Analytics is building a suite of tools that will enable dynamic planning and re-planning of service schedules and resource allocation for a scaled collection of unmanned docking platforms and unmanned vehicle clients; building real-time, highly autonomous, multi-vehicle coordination and management algorithms; and building a suite of unmanned vehicle orchestration services guiding unmanned vehicle clients through the ingress, docking, charging, data transfer, and egress phases of a servicing evolution.

Warfighter Value: The work can increase the DoD's capability to more effectively deploy unmanned vehicles and reduce the exposure of personnel to high-risk situations (e.g., removing the man from the minefield, increasing the standoff range of personnel from adversary positions).

WHEN

Contract Number: N68335-17-C-0169 **Ending on:** April 6, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype Unmanned Docking Platform Integration Test	N/A	Successfully dock, service, and undock an unmanned vehicle in a bench test	6	3rd QTR FY18
Prototype Unmanned Docking Platform Demonstration	N/A	Successfully dock, service, and undock an unmanned vehicle in a representative environment	6	4th QTR FY18
Communications Adaptation Simulation Test	Low	Successfully adapt behaviors based on availability of communications	5	1st QTR FY19
Autonomy Simulation Test	Med	Unmanned docking platform can autonomously adjust service schedules without human intervention	6	1st QTR FY20

HOW

Projected Business Model: Charles River Analytics is a leading customer-focused provider of innovative R&D solutions for increasingly complex and important human-systems challenges. The technology developed by Charles River Analytics under the Replanning and Operator Situation Awareness Tools for Operation of Unmanned Systems in Complex Airspaces and Waterspaces effort is slated for transition to the Innovative Undersea Prototype Development Consortium (IUPDC) OTA, managed by Battelle Memorial Institute. The technology will be further developed, tested, and improved. In that timeframe, a large system integrator will be necessary to transition the technology.

Company Objectives: Charles River would like to meet with government agencies and companies involved in unmanned vehicle logistics, unmanned platform deployment and operations, and unmanned vehicle mission planning.

Potential Commercial Applications: This capability could be used in a broad range of civilian applications of unmanned systems including use by first responders and homeland security and in other applications involving management of automated systems, such as industrial applications to include the oil and gas industry.

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