

# Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2019-0536

Topic # N171-061

Blended and Advanced Decision GUI Environment for Reasoning Support (BADGERS)

Charles River Analytics Inc.

## WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** Program Executive Office Integrated Warfare Systems (PEO IWS) 1.0 –AEGIS Combat System

**Transition Target:** Technology will be transitioned into the CBM+ efforts for AEGIS surface combatants

**TPOC:**  
(805)228-6071

**Other transition opportunities:**

There is additional benefit and application across a number of military planning and visualization systems, including The Common Control Systems (CCS), the Theater Battle Management Core Systems (TBMCS), the Distributed Common Ground/Surface System (DCGS), and Global Command and Control System (GCCS).

**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.



[https://www.navy.mil/management/photodb/webphoto/web\\_190715-N-MW694-0085.JPG](https://www.navy.mil/management/photodb/webphoto/web_190715-N-MW694-0085.JPG)

## WHAT

**Operational Need and Improvement:** Today, equipment status reporting systems such as Integrated Condition Assessment System (ICAS) and Operational Readiness Test System (ORTS) collect large amounts of data, which require human interpretation on shore in order to be useful for Condition-Based Maintenance Plus (CBM+) and Prognostic Health Management (PHM). Additionally, these large data sets only present part of the picture; they only aid in understanding equipment condition. The Navy seeks a decision support graphical user interface (GUI) that is able to combine real-time equipment health results (created via advanced algorithms) with other large data sets of new and unstructured data in order to provide a comprehensive picture of shipboard operations.

**Specifications Required:** The solution would present data from disparate sources in different formats in order to provide a comprehensive view of situational awareness in order for these factors to weigh in on a decision to take maintenance action. It must take into consideration the development of maintenance algorithms that advance a definition of maintenance and operational need -- equipment may need repair, but the overall need of the ship dictates that the work shouldn't be completed because there is no mission need. Thus, the understanding of measuring the mission need would have to be included when offering the decision within the GUI. As part of the enhanced decision-support capability, PHM calculations of availability would need to include certain support elements such as logistics and could also include future mission need, providing multi-tiered results depending upon specific shipboard operating conditions.

**Technology Developed:** Blended Advanced Decision GUI Environment for Reasoning Support (BADGERS) decision-support system (DSS) will enable shipboard maintainers to rapidly analyze system status and predicted malfunctions, evaluate high-level mission impacts, and efficiently make maintenance decisions through intuitive and innovative data visualizations; identify the requirements for effective support tools for efficient maintenance operations.

**Warfighter Value:** An improved GUI to enable CBM+ and PHM prognostics will make use of the available data and allow shipboard maintainers to make data driven decisions about their systems. The right data at the right time via this GUI would make it easier to maintain a high operational availability, drive down the number of spares required shipboard, and enable just in time delivery of spares based on system status.

## WHEN

**Contract Number:** N68335-19-C-0173 **Ending on:** May 6, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Initial Proof of Concept Prototype	N/A	Completion and SME review	TRL3	January 2019
Expanded and Refined Integrated, Coordinated Workspace Design	N/A	Completion and SME review	TRL3	May 2020
Expanded Ecological Maintenance Visualizations Design	N/A	Completion and SME review	TRL3	May 2020
Expanded BADGERS' Decision Support System Prototype and Demonstration	Low	Completion and analysis	TRL4	May 2020
Formal Evaluation Plan Finalization and Execution	Med	Completion and analysis	TRL5	May 2021

## HOW

**Projected Business Model:** Charles River plans to use existing facilities and relationships to demonstrate our technology to potential transition customers, including pursuing opportunities for hosting and demonstrating capabilities on the AEGIS deck. We plan to work with the prime contractors for the relevant transition programs to identify the most suitable transition opportunities and to create a concrete transition plan.

**Company Objectives:** Charles River seeks to enter into discussions with Lockheed Martin, who is the Lead System Integrator (LSI) for the Navy's AWS system, who has expressed support for our approach and a profound interest in transitioning the BADGERS work to Phase III.

**Potential Commercial Applications:** Many private sector organizations are working to implement CBM+ as a means for reducing operating costs and increasing uptime; markets such as manufacturing and transportation will be able to exploit the results of this topic. Commercial applications include improved coordinated visualization capabilities developed through Charles River Analytics' Medusa web application framework.

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