

# Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2020-0400

Topic # N18A-T015

Full Featured Low-Cost HMS for Combatant Craft

Qualtech Systems, Inc.

## WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** PEO Ships, PMS 325

**Transition Target:** PMS 325G, Support Ships, Boats and Craft

**TPOC:**

**Other transition opportunities:** QSI's low-cost Health Management System (HMS) in a box can provide automatic diagnosis, guided troubleshooting and Condition Based Maintenance (CBM+) capabilities to any platform for which traditional HMS is simply too expensive. During Phase II, we will demonstrate the benefits to PMS 325G, Support Ships, Boats and Craft by developing and delivering a sea-worthy prototype to the Navy for evaluation. In Phase III, we will support the Navy in transitioning the technology for Navy use. Marine, air, and land vehicle and OEMs of high-value equipment will also benefit from this HMS.



**Health Management In a Box**

Image Courtesy of QSI, Copyright 2020

### Logged Data:

- Shock/Vibration
- Engine Data
- Oil Quality
- Battery Health

### Operational Mode

- Real-time System Health

### Maintenance Mode

- Class V IETM
- CBM+

## WHAT

**Operational Need and Improvement:** Bring Aviation-grade Diagnosis and Prognosis to PB-34 at an affordable cost. Such a solution will improve system readiness, reduce unscheduled downtime, and provide Total Asset Visibility.

**Specifications Required:** Develop and implement a state-of-the-art Health Management Solution that includes real-time logging, monitoring and data analytics, diagnostic, and prognostic capabilities leveraging Industrial grade COTS hardware at a target cost of about \$10,000 for Combatant Crafts.

**Technology Developed:** The HMS will provide real-time diagnostics and prognostics capability resulting in improved operational readiness and lower life-cycle costs.

Key features include:

1. Low Hardware cost - leveraging rugged Industrial components
2. Low Development cost - leveraging QSI's TEAMS® model-based reasoner
3. Real-time onboard monitoring and diagnosis: Leveraging QSI's TEAMS-RT® COTS product
4. Anomaly detection and prognostics combined with Diagnosis and Health Management to deliver an optimized CBM+ solution

**Warfighter Value:** The anticipated key benefits include:

1. Increased Availability: Since most, if not all, of the diagnosis will be performed during operations, ground crew will not have to spend valuable time running maintenance checks and tracing symptoms while trying to troubleshoot the system.
2. Reduced Unscheduled Downtime: Monitoring of the engine health, oil quality, and batteries health will be automated.
3. Improved total asset visibility (TAV): Will allow easy access to information regarding the location and readiness of every patrol boat in the fleet.

We expect the savings from less-frequent oil changes, battery condition monitoring and other CBM+ benefits will pay for the ~\$10K hardware cost in short order.

## WHEN

**Contract Number:** N68335-19-C-0794 **Ending on:** September 19, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Test prototype on PB-34 Marine Diesel Engines	Med	Successful interface with Engine Data	6	June 2020
Sea Trial with initial version of Health Management Box	Med	If Option 1 exercised, Demonstrate real-time diagnosis of Engine, Oil Quality Assessment and Battery Health Assessment	8	July 2021
Ground station data analysis and Guided Troubleshooting	Low	If Option 1 exercised, Demonstrate Guided Troubleshooting and Data Analysis	8	September 2021
Final Integrated solution	Med	If Option 2 exercised, Demonstrate integrated onboard/ground solution with CBM+ capabilities and help quantify cost-benefit ratio	8	June 2022

## HOW

**Projected Business Model:** The solution consists of two parts:

1. The hardware - comprising of rugged industrial components. We expect to identify primes or contract manufacturers who would be able to build the hardware to our specifications in volume and achieve an even lower price.
2. The model-based reasoner software - comprising of TEAMS reasoner products, that enable the health management box to perform diagnosis and health management of any system without any custom software development. Much like a GPS can navigate in any country given the right maps, our box only needs the appropriate model data files to perform health management for any system. This is the "magic sauce" that makes the overall solution affordable, and we will license this to the Government via Prime/OEM or directly.

**Company Objectives:** We have successfully tested a prototype to monitor real-time engine data on the PB-34. Version 1 of our solution capable of monitoring battery health, oil quality, shock and vibration and engine data is awaiting sea trials. If we are granted the Phase II options, we should be able to demonstrate TRL of 8+.

**Potential Commercial Applications:** Potential commercial applications include:

1. Autonomous and self-driving cars, which need to be aware of its own health in order to ensure safety.
2. Offshore wind-turbines, which need to self-diagnose and identify needed parts since multiple service visits is simply too expensive
3. Offshore drilling and remote installations, which need to operate for extended periods with minimal external support.
4. Any mission critical or safety critical system where downtime is too expensive. Examples include Medical Diagnostics Equipment, Life support systems, Power and Communication systems and Smart grids.

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