

Topic: N171-053

McQ Inc.

SonoWatch: Navy Acoustic Situational Awareness System

SonoWatch is an autonomous acoustic lookout system designed to detect and identify navigation signals defined in the US Coast Guard Navigation Manual. The system detects, localizes, and determines the navigation meaning of the signal. The initial deployment for SonoWatch will be unmanned surface vessels (USV). SonoWatch is designed around a versatile hardware platform ruggedized for harsh maritime environments that can be expanded through future software updates. McQ will develop new sensing capabilities and features to meet the future requirements of the Navy and other potential customers. McQ specializes in low power electronics design, efficient communications, advanced algorithm development, and wireless video management solutions. McQ will transition this technology into acoustic array detection applications both maritime and land-based.

Technology Category Alignment:

Machine Perception, Reasoning and Intelligence

Networks and Communications

Unmanned Ground and Sea Vehicles

Sensors

Acoustic, Seismic and Magnetic

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SYSCOM: NAVSEA

Contract: N68335-19-C-0147



Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-19-C-0147



Tech Talk: <https://atsi.adobeconnect.com/p8xjo2gwo4ra/>

Department of the Navy SBIR/STTR Transition Program

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NAVSEA #2019-0571

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WHO

SYSCOM: NAVSEA

Sponsoring Program: Unmanned Influence Sweep Program

Transition Target: Autonomous Unmanned Surface Vehicles

TPOC:
(757)203-7247

Other transition opportunities: SonoWatch is a situational awareness enhancement for more than just USVs. It can provide additional collision avoidance information for all manned ships, including military, commercial, and private. SonoWatch can be installed on floating buoys and fixed structures for harbor and littoral situational awareness. Long-term, the rugged and versatile hardware can be upgraded with new processing capabilities to detect other targets of interest.

Notes: Primary application is intended for USV, but this is a safety system that can be deployed on any ship for additional situational awareness. The system processes acoustic data searching for Sound Signals produced from Vessels and Aids to Navigation (upper right and upper middle images) required under International Regulations for Preventing Collisions at Sea [72 COLREGS]. A conceptual prototype of SonoWatch was used to capture data on the Navy's Stiletto Maritime Demonstration Platform (lower left image). The concept is being further refined for development of the Phase II prototype (right image).

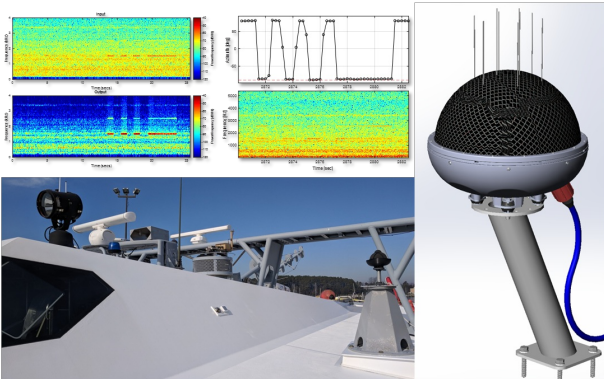


Image courtesy of McQ, Inc., Copyright 2019

WHAT

Operational Need and Improvement: For Unmanned Surface Vehicles (USV) to safely operate among other vessels, the Navy has defined a requirement for an automated acoustic lookout. USVs are outfitted with sophisticated sensor suites, allowing them to perceive obstacles in the surrounding environment. Adding the capability of a USV to detect and identify US Coast Guard (USCG) Navigation Signals greatly improves their situational awareness, improving safety in all operational environments. Navigation signals from nearby vessels will inform the USV about intended movements, providing valuable data for adjusting heading.

Specifications Required: The Navy's goal is the development of a system capable of localizing ships and identifying their navigational intent at ranges of one mile. To ensure that all ships are detected, the system requires 360 degree operation. Noise filtering must be performed to remove extraneous environmental and own-ship sounds. The system must be compact, sealed for operation in maritime environments, and ruggedized for the shock and vibration experienced on water.

Technology Developed: Leveraging a previous maritime acoustic sensor development, McQ has designed a ruggedized acoustic situational awareness system customized to the Navy's application. McQ demonstrated the feasibility of developing an autonomous acoustic lookout with a custom data collection microphone array and algorithms for localizing the source of signals. McQ will implement a complete hardware and software solution for the localization and identification of navigation signals. This system will provide great utility to all ship operators in improving their awareness to other vessels, particularly in times of low visibility.

Warfighter Value: SonoWatch will be a new standalone product that will provide an autonomous lookout capability for both manned and unmanned vessels. While acoustic sensor systems capable of localizing targets have been available for years, none of them are designed to operate in the harsh maritime environment and interpret navigation signals. McQ's concept is a design custom made for the environment and signals required for Navy operation. Currently, the Navy has no autonomous acoustic lookout for use during poor visibility conditions. The initial system has been designed to be a powerful platform that can support future capability enhancements through the addition of new algorithms.

WHEN

Contract Number: N68335-19-C-0147 Ending on: February 21, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I Preliminary Design Review (PDR) and Feasibility Demonstration	N/A	Concept Demonstration and Preliminary Design	3	March 2018
Phase I Option Critical Design Review (CDR)	N/A	Design Refinement and Algorithm Development	3	January 2019
Phase II Prototype Hardware Data Collection	Low	Data Collected with Prototype Hardware in a Representative Environment	5	October 2019
Phase II Option 1 System Integration	Low	Software and Algorithms Developed and Tested	6	May 2021
Phase II Option 2 System Refinements	Low	System Ready for Production	7	June 2022

HOW

Projected Business Model: McQ's goal is to productize the system for the Navy during Phase II Option 2 by implementing system refinements to streamline production processes and reduce costs. McQ's in-house production and marketing staff will be responsible for construction and distribution of SonoWatch for customers. Longer-term, McQ may work with ship builders to integrate the technology into their designs and license that algorithm software. McQ will also support custom algorithm development for the detection of specific targets.

Company Objectives: McQ's objective is to integrate SonoWatch with existing ship systems and transition the technology to the Navy, as well as continuously enhance the system with new target detection capabilities and increased performance. McQ will make SonoWatch available to shipbuilders for integration during the construction of a ship, and will also make it available as a standalone add-on to end-users on currently operational ships. McQ will also evaluate SonoWatch for application to other US Government customers (USCG, NOAA, USACOE) and commercial customers in Harbor Security, Shipbuilding, and Operation.

Potential Commercial Applications: This product can be incorporated into integrated bridge systems for a variety of ships. Whether commercially or privately operated, any ship can benefit from an autonomous acoustic lookout. Large cargo ships and cruise ships can potentially benefit from more than one unit. When multiple SonoWatch arrays are linked together, additional calculations can be performed regarding signal localization.

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