

WHO

SYSCOM: SSP
Sponsoring Program: Strategic Systems Programs
Transition Target: Motor Environment Monitoring
TPOC: SSP.SBIR@ssp.navy.mil

Other Transition Opportunities: The Generalized micro Multimodal Monitor (GμMM) is a rugged environmental sensor for long term monitoring applications that can be adapted for other purposes. The primary operational mode will capture environmental measurements every half hour and update the display once per day for well over 10 years. The secondary operational mode will capture environmental measurements and update the display once per minute for several months of operation. The primary long life mode is well suited for any long term storage application where conditions are relatively stable and little or no change is expected. The secondary rapid update mode is well suited for transport applications where conditions may change rapidly.

Notes: The primary application is intended for monitoring the aging of rocket motors, but this is a rugged and long life environmental sensor that can be applied to a variety of needs. An initial prototype survived simulated 10 year exposure to a caustic environment in Navy testing. A detailed design has been completed and prototypes built.



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WHAT

Operational Need and Improvement: The Navy is searching for solutions to better evaluate rocket motor health and aging trends. Key factors to the aging process are the environmental conditions in which the motor exists. By monitoring and recording the environmental conditions, the Navy can better assess motor condition to optimally manage its lifecycle maintenance. Environmental data of interest are temperature, pressure, humidity, shock, vibration, and several volatile chemicals, all of which the Navy would like to monitor and record over the course of a minimum of 10 years with a small, lightweight, low cost, accurate, and HERO compliant sensor.

Specifications Required: The sensor should be self-powered and operational for at least 10 years. It must measure temperature, pressure, and humidity at a minimum, but shock, vibration, strain, and chemical vapor are also of interest. The sensor must meet Hazards of Electromagnetic Radiation to Ordnance (HERO) requirements for off-shore use, and be capable of intermittent use while maintaining calibration within 1% for an extended period of at least 10 years.

Technology Developed: Leveraging previous work in health monitoring devices and experience in the design of low power sensors, McQ has created a rugged long-life environmental monitor that will support the Navy's requirement of capturing the necessary environmental data to construct reliable models of motor health and aging. The Generalized micro Multimodal Monitor (GμMM) has been designed to exceed all Navy measurement and survivability objectives, broadening its market applicability.

Warfighter Value: GμMM will be a new standalone product that will provide a continuous environmental monitoring capability, capturing data for use in better understanding motor aging trends and enabling the Navy to optimize maintenance cycles. There may also be interest in future product options or enhancements to include additional modalities for specific deployments. The core environmental monitoring technology has a wide range of uses and can be re-purposed to specific applications or distilled down to a low cost multimodal environmental monitor for broad commercialization. McQ will pursue applications from munition monitoring to logistics management and any other Government organizations or commercial customers interested in capturing environmental data.

WHEN

Contract Number: N68335-22-C-0839 **Ending on:** Jun 30, 2023

| Milestone | Risk Level | Measure of Success | Ending TRL | Date |
|--|------------|--|------------|--------------|
| Phase I Preliminary Design Review (PDR) and Component Testing Analysis | N/A | Component Data and Preliminary Design | 3 | 1st QTR FY21 |
| Phase I Option Initial Prototype Built | N/A | Functional Prototype | 4 | 4th QTR FY21 |
| 10 Year Simulation with Initial Prototypes | N/A | Sensor Survival and Data Capture for Full Simulation | 4 | 4th QTR FY21 |
| Phase II Critical Design Review (CDR) | N/A | Design Refinement Ready for Build | 4 | 2nd QTR FY22 |
| Phase II Prototype Built and 10 Year Simulation | Low | Functional Prototype and Simulation Survival | 6 | 4th QTR FY22 |
| Design Refinements for First Article | Low | First Article Design Ready for Build | 6 | 1st QTR FY23 |
| Phase II Option First Article Built and 10 Year Simulation | Low | Functional Sensor and Sensor Survival | 6 | 3rd QTR FY23 |

HOW

Projected Business Model: McQ's goal is to productize the system for the Navy during Phase II 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 GμMM for customers. McQ will continue working with big primes to identify feature improvements and future performance needs.

Company Objectives: McQ's objective is transition the technology to the Navy, as well as big primes that support Navy SSP objectives. The GμMM sensor has been designed to exceed the requirements of motor monitoring and also be usable for general munitions environmental monitoring as well as support logistics operations by providing historical environmental data that military components experience during transport. McQ will also evaluate GμMM for application to other US Government customers munitions monitoring and transport monitoring.

Potential Commercial Applications: McQ's in-house marketing staff will work with current DoD customers to identify need for this technology and work to identify new customers. Several commercial applications have been identified for variants of this technology, such as high end consumer applications, shipping markets for ISO containers and long haul trucking, and industrial applications. McQ will continue to research other applications as Phase II development of the system progresses.