OBJECTIVE: Design and develop a combined, compact, multi-function, lightweight, expendable, low-cost surface ship countermeasure capable of countering ever-increasing adversarial threats.

DESCRIPTION: All key U.S. Navy surface combatants require expendable countermeasure protection from adversarial torpedoes. The current Program of Record (PoR) uses submarine variant countermeasures for surface ship deployment, of which the submarine devices are overdesigned for surface ship requirements (i.e., temperature, shock, hydrostatic pressure). The Navy desires to tap into existing innovative form-factor reconfiguration and/or miniaturization capabilities and develop a lower-cost surface ship countermeasure that meets the surface ship environmental requirements while maintaining the notional acoustic and functional requirements of the current acoustic device countermeasure (ADC) Mk 2 Mod 6. Key surface ship environmental requirements that the device must withstand include, in general, resiliency to temperature shock, shipboard-launched water impact, and hydrostatic pressure up to 250 feet depth. Further testing details are listed below. It is expected this redesign of the existing submarine countermeasure adopted for surface ship use will reduce unit item cost while reducing overall lifecycle costs compared to the existing PoR. As a goal, a 20% to 25% reduction in unit cost, and a similar life-cycle cost reduction, is desired to facilitate installation aboard a wider range of surface platforms. As an added benefit to the warfighter, the devices ultimately resulting from a successful SBIR effort will not only provide the same mission capability and performance, but also have the potential of providing an innovative sailor-friendly form-factor.

In terms of test and evaluation throughout the Phases of this SBIR topic, Phase I is intended to develop a concept for an end-to-end design of a redesigned ADC Mk 2 Mod 6 that meets the operational requirements of the current device, but only meets the environmental requirements for over-the-side shipboard launch. Phase II is intended to evaluate three to five prototype systems and their abilities to acoustically perform both before and after exposure to primary environmental stress screening involving temperature shock (-54°C in air to 2°C in water, and +71°C in air to 15°C in water), shipboard-launched water impact of 80g radial acceleration and 25g axial acceleration, and hydrostatic testing to 250 feet depth. Environmental stress testing, including pre- and post-acoustic testing, will take place at facilities maintained by the Naval Undersea Warfare Center in Newport, Rhode Island. These Phase II tests will be the responsibility of the proposer with assistance and test facilities provided by the Navy. Phase III is intended to evaluate further matured devices against more formal environmental and operational tests, including storage temperature thermal cycling (-54°C to +71°C), lightweight shock testing (MIL-S-901D), vibration testing (MIL-STD-810, Section 528.1), in addition to operational in-water acoustic testing in a demonstration on a Navy instrumented test range. There is potential for some of this extended testing to occur in Phase II if the Phase II prototype design is a mature representation of a potential low-rate initial production design that is expected during Phase III.

Work produced in Phase II will likely become classified. Note: The prospective contractor(s) must be U.S. Owned and Operated with no Foreign Influence as defined by DoD 5220.22-M, National Industrial Security Program Operating Manual, unless acceptable mitigating procedures can and have been be implemented and approved by the Defense Security Service (DSS). The selected contractor and/or
subcontractor must be able to acquire and maintain a secret level facility and Personnel Security Clearances, in order to perform on advanced phases of this contract as set forth by DSS and NAVSEA in order to gain access to classified information pertaining to the national defense of the United States and its allies; this will be an inherent requirement. The selected company will be required to safeguard classified material IAW DoD 5220.22-M during the advance phases of this contract.

PHASE I: Develop a concept for an end-to-end design of a redesigned ADC Mk 2 Mod 6 that meets the operational requirements of the current device, but only meets the environmental requirements for over-the-side shipboard launch, of which are noted in the description. Include, in the design, details of the modularized reconfiguration of the existing acoustic projector, electronics, and thermal lithium power supply, which notionally can be provided as Government Furnished Information (GFI). Establish the feasibility of the design through modeling and simulation pitted against known environmental requirements enabling surface ship launch capability. The Phase I Option, if exercised, will include the initial design specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Develop and build three to five prototype devices for testing and evaluation. Further refine the prototype systems that can be transitioned to the Navy. Conduct evaluation and testing of the prototypes based on the environmental requirements for over-the-side shipboard launch, including but not limited to, temperature shock (-54°C in air to 2°C in water, and +71°C in air to 15°C in water), lightweight impact shock testing, and hydrostatic testing to 250 feet depth, as well as the performer’s low-level subassembly performance tests. Further details of the testing requirements are noted in the Description. Include acoustic evaluation, which will take place both before and after environmental stress testing at facilities maintained by the Naval Undersea Warfare Center Division Newport. Ensure final delivery of three (3) to five (5) prototypes. Perform initial testing with assistance and test facilities provided by the Navy. Assist the Navy with follow-on testing. It is probable that the work under this effort will be classified under Phase II (see Description for details).

PHASE III DUAL-USE APPLICATIONS: Support the Navy in transitioning the technology for Navy use in the form of follow-on Low-rate initial production (LRIP) units using any lessons learned from the Phase II prototyping and testing efforts. Provide engineering support for full environmental testing, which will expand on the testing that was performed within Phase II. The primary applicable NAVSEA program office is PMS 415, which resides within PEO SUBS. Some alternative Naval applications include active sonobuoys, training targets, and alternative acoustic sound sources. Perform testing that includes long-duration storage temperature thermal cycling between -54°C and +71°C, lightweight shock testing in accordance with MIL-C-901D, vibration testing (shipboard and transportation in accordance with MIL-STD-810, Section 528.1), and all associated acoustic evaluation testing (source level, duration, and frequency content), both before and after environmental stress testing. (Note: There is potential for some of this extended testing to occur in Phase II if the Phase II prototype design is a mature representation of a potential low-rate initial production design.) Launch at least five LRIP units from a U.S. Navy surface ship to assist in the full circle environmental evaluation of the design.

Some commercial applications include marine mammal acoustic diversions and geological exploration.

REFERENCES:

KEYWORDS: Surface Ship Torpedo Defense; Acoustic Countermeasure; Soft-kill Torpedo Countermeasure; Anti-submarine Warfare; Lightweight Shock Testing; Environmental Qualification Testing