**Component:** NAVY  
**Topic #:** N201-043  
**Title:** Holistic Integration of Air Anti-Submarine Warfare Capability for Effective Theater Undersea Warfare  
**Technology Areas:** Info Systems  
**Acquisition Program:** PEO IWS5: Undersea Systems Program Office, AN/UYQ-100 Undersea Warfare - Decision Support System (US)  

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**OBJECTIVE:** Develop a toolset to integrate aviation assets into Theater Undersea Warfare (USW) operations through data and information exchange and sharing between air platforms, ground support Command and Control (C2) nodes, and shore-based Theater USW C2 systems.

**DESCRIPTION:** Theater USW watch floor C2 planning currently contains limited information regarding Anti-submarine Warfare (ASW) mission planning and execution performance for Maritime Patrol and Reconnaissance Aircraft (MPRA), which conduct Air ASW, such as the P-3 [Ref. 1] and P-8 [Ref. 2] naval aircraft. The data available is often limited to the Area of Interest (AOI). The MPRA unit’s mission is to search for planned locations for buoy fields.

The TacMobile Program provides expeditionary ground support for MPRA assets, but there are no data exchange requirements between TacMobile and Theater USW C2 systems. Therefore, in-situ information sharing is currently limited to chat, voice, and tracks passed via Link-16.

The Navy seeks innovative data sharing and information exchange technologies to achieve holistic integration of MRPA assets into Theater USW C2 decision making and execution tracking to support future Theater USW C2 operations. This decision making and execution tracking is performed using the AN/UYQ-100 USW Decision Support System (USW-DSS) [Ref. 3]. This integration will become increasingly critical as unmanned air vehicles (UAVs) performing ASW sensing missions [Refs. 4, 5] augment operated MPRA assets. While some commercial tracking capability exists, no available capabilities encompass the scope and breadth of data sharing and information exchange sought by this SBIR topic.

For this integration to be effective, all aspects of MPRA mission planning, communication of in-situ observation, and reporting, as well as post-mission replay and assessment, are necessary. Naval Air tactical operations centers (TOCs (shore based) and MTOCs (mobile)) will need to produce mission planning products that layer all sensor predictions, and then feed those models to the Theater USW operations center via USW-DSS.

Data to be exchanged or shared include the following:

1) Sensor performance predictions for all sensors. Example sensors include passive and active sonobuoys (SSQ-53, SSQ-62, SSQ-101, SSQ-125), radars, magnetic anomaly detection (MAD), electro-optical and infrared (EO/IR), and electronic support measures (ESM).

2) Mission planning data. Data to be shared include routes, search areas, and predicted cumulative detection probabilities (CDPs) for sensors employed during a planned search over time.

3) Mission execution data. Data to be shared include calculated CDPs during mission execution based on in-situ environmental
4) Contact and track data. This data includes information such as lines of bearing, positional information, and tracks passed via Link-16.

5) Mission readiness data. This includes information regarding aircraft sensors available for use, availability of flight crews, fuel stores, available weapons, and remaining stores of expendables (e.g., sonobuoys).

6) Common tactical picture (CTP) data. This would include area search performance for individual air assets and fused information across multiple sorties.

7) Environmental measurements. This would include measurements of atmospheric conditions, bathymetric measurements to infer sound speed profiles, and ambient noise measurements.

8) Intelligence data. This includes acoustic intelligence (ACINT) and signal intelligence (SIGINT).

9) Geographic plot and air tasking order (ATO) or flying program (FLYPRO) data. These data include search areas, routes, Weapon System Manager (WSM) acknowledgements, and geographic overlays.

Integration of MPRA data into USW-DSS will produce a fully informed USW common tactical picture to enable effective decision making when planning and executing employment of MPRA and ASW UAVs in a Theater or Operational Level of War environment. This addition to a more fully informed USW tactical picture will reduce acquisition costs to develop similar technologies with a lower level of confidence. Unit and individual sortie-level data across all applicable sorties will be needed to build a comprehensive MPRA picture to integrate with tactical pictures produced by surface combatants, submarines, surveillance systems, and unmanned assets when confronting a peer adversary. The result of this integration effort will reduce the level of effort required for coordination between Theater USW watch floors and TOC/MTOC sites.

Work produced in Phase II may 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 a module for the holistic integration of MPRA planning, execution, and state data with the USW-DSS system. Use modeling and simulation to demonstrate the feasibility of the concept to convey all the categories of data listed in the Description. The Phase I Option, if exercised, will include the initial system specifications and capabilities description to build a prototype solution in Phase II.

PHASE II: Develop and deliver a prototype of the Air ASW module. Demonstrate prototype performance through the required range of parameters given in the Description. If needed, coordinate with the Government to conduct testing at a Government- or company-provided facility to validate the prototype capability. It is probable that the work under this effort will be classified under Phase II (see Description section for details).

PHASE III DUAL-USE APPLICATIONS: Support the Navy in transitioning the technology to an integrated element of USW-DSS. Demonstrate and report on performance during laboratory testing or at-sea trials.

Commercial use could be in industries involving vehicle tracking and status. Tracking vehicles on a site-specific map, level of readiness for deployment, and the preventative maintenance each vehicle may need would provide situational awareness to reduce costs and provide safe vehicles for the customer (e.g., rental cars, school bus systems).

REFERENCES:


KEYWORDS: Anti-submarine Warfare; Air ASW; Theater USW Command and Control; Maritime Patrol and Reconnaissance Aircraft (MPRA); MPRA Mission Planning; Post-mission Replay and Assessment