Risk Analysis Decision Aid for TASW

Topic N192-117

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MARINE ACOUSTICS, INC.

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Marine Acoustics Inc.

- Significant Technical History
 - SBIR History
 - <u>Marine Assessment, Decision, and Planning Tool (MADPT) (N081-054):</u> Transition to Phase III (PEO IWS-5A)
 - <u>Multi-ship Sonar Bistatic Automatic Active Localization (N151-055):</u> Transition to Rapid Innovation Fund (PEO-IWS 5A)
 - Relevant IP
 - Acoustic Integration Model (AIM): Java based 4-D Monte-Carlo acoustic modeling and simulation software

Key Resources

- Key Personnel Principal Experts in the field of:
 - <u>Underwater Acoustics:</u> PhD acousticians, senior engineers, modelers
 - <u>Navy Anti-Submarine Warfare (ASW):</u> Navy officers, ACINT, trainers
 - <u>Marine Mammal Environmental Assessment (EA)</u>: PhD marine biologists
- Key Facilities 3 DCSA certified facilities:
 - <u>Middletown, RI:</u> Corporate HQ, next to NUWC Newport
 - <u>Arlington, VA:</u> Satellite office, supporting ONR and NAVSEA HQ
 - Gales Ferry, CT: Supporting UWDC Groton (SUB Base, New London)
- Key Contracting
 - Incorporated in 1987, Small Business, Employee Owned
 - GSA, SeaPort NXG
 - DOD, University, Commercial clients



Environmental Programs



Testing, Evaluation, and Training



Research and Development



Support Services (SETA)



The Navy Challenge/Interest

Objective

 Develop acoustic counter-detection risk analysis and assessment tools for incorporation in Anti- Submarine Warfare (ASW) mission planning

• Description

- Navy seeks innovative algorithms that incorporate
 quantitative evaluation of acoustic counter-detection risk
 when developing optimized ASW route plans
- Theater Undersea Warfare Commander (TUSWC) needs automated decision aids to assess the acoustic sonar counter-detection capability of threats associated with a specific route plan

Expected Transition Target

 AN/UYQ-100 Undersea Warfare Decision Support System (USW-DSS)

Requirements

 Develop and deliver a prototype for incorporating acoustic counter-detection risk analysis into a USW-DSS instantiation at a shore site



AN/UYQ-100 Undersea Warfare Decision Support System (USW-DSS)



Operational Use and Improvement

- This technology directly addresses the current lack of TASW watchfloor tools tuned to the needs of FUOPS planners, specifically:
 - Visualizing and quantifying acceptable TASW
 Commander's risk to future operations
 - Seaming with the Navy Planning Process
- This technology is designed to operate IAW PEO-IWS 5E initiatives for USW-DSS
 - The MAI's Java-based TDA software is ideally designed to integrate as an overlay with existin USW-DSS framework
 - Capable of operating complementary to existin USW-DSS overlays as well as leverage existing acoustic models and databases
- Meets the needs of capability not currently fielded by other USW-DSS tools
 - Effectively evaluates the appropriate active and passive acoustic counter-detection risk for an ASW mission plan
 - Allows understanding of the "acoustic return on investment" in order to make a more informed decision on asset allocation tradeoffs



Note: Mitigation assumes that a Target is sufficiently Detected, Classified, Localized, Tracked and (theoretically) Engaged

TASW Risk Assessment Concept



The Solution - Technology Developed

- In Phase I, MAI developed TRL-3 proof of concept capability for logic-based, 4-D Monte-Carlo acoustic simulation software which:
 - Utilizes Navy Oceanographic and Atmospheric Master List (OAML) acoustic model databases and sensor libraries.
 - Calculates Signal Excess (SE) for a spectrum of ASW active/passive sensors vs targets in a variety of environments
 - Tabulates Cumulative Detection Probability (CDP) along mission/evasion target track profiles
 - Presents results as a quantitive TASW risk assessment relative to range mitigation zones



TASW Risk Assessment Display Concept



Current Status



• Seminal Transition Event (STE)

- What it is: Government decision for incorporating TASW Risk Analysis TDA into a USW- DSS Program of Record (PoR)
- When it is: Q3FY23
- Approval: IWS 5.0, CAPT Cesari, Recommendation from IWS 5E (Mike Essig)
- Program of Record: PEO IWS 5, Undersea Warfare Systems, AN/UYQ-100 Undersea Warfare –Decision Support System (USW-DSS) B3 CD 24-1



Key Features / Advantages / Benefits

- Addresses lack of TASW watchfloor tools tuned to the needs of Future Operations (FUOPS) planners:
 - TASW planners may be overwhelmed by decisions regarding risk to future plans according to current asset allocation (mitigation) against potential threats (both known, unknown)
 - TASW planners require tools able to visualize, quantify and assess the risk to future operations to provide decision guidance

• Critical Issues Considered:

- Integration of capability within USW-DSS
- Integration with existing TASW TDA's
- Key Evaluation Metrics Identified:
 - Quantified TASW Residual Risk, as defined by unmitigated REDFOR submarine mission success to Future Operations (within the simulation)
- Navy needs are establishing the methodology for establishing the quality and efficiency of ASW Ops by:
 - Providing key tools necessary by TASW planners to conduct key steps in the NP-5 Joint Operational Planning Process (JOPP) (i.e. COA Development, Wargaming, COA Selection)



Transition to Fleet

- The overall transition strategy is to:
 - Focus on initial transition to AN/UYQ-100 Undersea Warfare –Decision Support System (USW-DSS)
 - Focus on integration with Build 3 (TASW build)
 - Additional integration with existing TASW TDA's within USW-DSS
 - Mission Optimization Configuration Item (MOCI) Developed by Danial H. Wagner and Associates (DHWA)
 - Battlespace Management Tactical Decision Aid (BaM-TDA) Developed by Metron
- MAI will develop the capability to a level of TRL maturity that can be transitioned to Phase III
 - Phase II Base (TRL-5)
 - Develop standalone surrogate DSS demo capability via TACSIT (L3Harris as partner)
 - Demonstrate technical feasibility in laboratory environment (L3Harris as partner)
 - Phase II Option I (TRL-6)
 - Integrate key capability in DSS cloud environment via MOCI (DHWA as collaborator)
 - Demonstrate technical feasibility at shore site instantiation (TASW CTF as goal)



Market Analysis

- <u>Foreign Military Sales (FMS):</u> TDA software for TASW sensor optimization planning in allied partner applications (i.e. NATO, INDOPACIFIC).
 - MAI utilizing small business incentive programs to explore this sector
 - Has the potential of ~20% of revenue increase for both US Navy sponsored Foreign Military Sales (FMS) programs as well as Direct Commercial Sale (DCS) applications
 - MAI is uniquely suited to benefit due to the lack of small business competitors with capability in this realm (supported by initial market research studies and trade missions)
- <u>Commercial Environmental:</u> Quantitative risk assessment-based capability to represent accumulated acoustic impact to sensitive marine mammal populations.
 - MAI has extensive experience in analysis in the Environmental Analysis realm,
 - Potential planning capability enhancement for the Navy's marine mammal mitigation needs, as well for commercial application in the offshore oil, natural gas exploration, and renewable energy sector
 - Expansion of capability enabled by this SBIR could represent significant increase in revenue in this sector (~20% of total at present), for relatively little investment of internal IR&D



Transition/Partnership Pitch

• Short Term Goals

Develop and demonstrate TRL-6 capability for inclusion into the USW-DSS planning process.

Long Term Goals

 Leverage advertisement of a successful SBIR transition (and lessons learned from this SBIR) in order to posture for future similar opportunities across the USW-DSS stakeholder community.

Enablers

- PEO IWS-5E sponsor advertisement, support and flexibility with transition schedule
- USW-DSS stakeholder working group participation, networking, and teaming opportunities



Come See Our Demo

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