

# Functional Area 15 - Measurement Facilities, Range, and Instrumentation

**PSI Contract N00167-02-D-0038 DO 16:** The Naval Surface Warfare Center Carderock Division (NSWCCD) is upgrading the measurement capabilities of the South East Alaska Acoustic Measurement Facility (SEAFAC) to measure modern quiet submarines. PSI is supplying a wide range of engineering support to this effort. As discussed under Functional Area 3, PSI is performing rigorous mathematical modeling of array performance to determine the optimum array design for the SEAFAC ambient noise characteristics and frequency coverage requirements. Also, as discussed under Functional Area 7, PSI is performing RM&A analyses on data processing and storage systems planned for use in the SEAFAC lab.

By far our largest area of support to the SEAFAC upgrade is in measurement system development. PSI is developing many of the systems used to convert raw hydrophone data into calibrated submarine SPL measurements. In this task, we are working closely with system developers from other companies as well as NSWCCD's internal development teams.

Our tasking covers development of range instrumentation systems that run the gamut of data handling and storage, environmental and hardware monitoring, and signal processing. Our familiarity with radiated noise and target strength measurement facilities makes it easy for us to work closely with NSWCCD range engineers. We have encountered the same problems they see every day and have engineered solutions to them. Our measurement facility experience goes back to the Research Vessel MONOB, for which we specified a new narrowband processing system and for which we built the control and QC interfaces. We have also supported USNS HAYES measurement facility operation, maintenance, and upgrades, as well as the Mobile Deep Range (MDR) and South Florida Test Facility (SFTF) development and operation.

**PSI Contract N00173-98-D-6003:** PSI has been tasked to develop a Tactical Acoustic Simulator (TAS) and RF transmitter for use in the Aircraft Sonobuoy Simulation/Stimulation (AS3) system and to develop a TAS for P-3C aircraft. A subset of PSI accomplishments includes the following:

- Prior to taking delivery from General Dynamics Canada (GDC) of a T502 acoustic trainer, PSI produced target signature models and compiled a list of contacts to build according to NUWC requirements.
- Identified acoustic processor needs at the Mayport, FL. site for building and testing targets. Built Minimum Detectable Source (MDS) scenarios to establish baseline values for frequency vs. amplitude for target development for the T502 and acoustic processor suite. Prepared a document outlining objectives and procedures for MDS testing.

- After taking delivery of the T502 and spares from GDC, PSI began the MDS test and participated in the First Article Test at the GDC site.
- Combined several different targets within different simulated ocean environments to evaluate the source level outputs of each target and adjust the source levels accordingly to simulate real conditions.
- Prior to an experiment at the Atlantic Undersea Test & Evaluation Center (AUTECH), participated in testing of the radio transmitter and other components for mutual interference.
- Contributed to a description of helicopter-centric scenario concepts for the concept of operations document produced by NUWC.
- Used the Integrated Multi-Sensor Acoustic Training (IMAT) program to construct simulated ocean environments.
- Developed test plans for AUTECH testing and participated in all field experiments.
- Compiled a list of accomplishments and lessons-learned for future AS3 operations and identified a list of issues that cause delays in testing.

**APS Contract N00164-03-D-0007:** APS is conducting detailed investigations to consider the use of vector hydrophone arrays for the SEAFAC upgrade package. Analytic estimates of vector sensor array directivity index and beampatterns were developed including ambient noise fields with different vertical power distributions. APS planned and conducted acoustic tests in the Explosion Pond at NSWCCD in collaboration with NSWCCD Code 70 to measure free-field voltage sensitivity, beampatterns, and sensor- and array-level electronic noise floors. Matlab software and algorithms were developed to process measured data and compare it with analytic estimates and performance requirements. Array layout and support design concepts were developed and APS assisted in the fabrication of a test array module. Flow noise and flow-induced vibration estimates were performed. Analytical methods and computer algorithms to process omni, dipole, cardioid, and intensity response of vector sensors were developed to support a proof-of-concept SEAFAC test.

**AAC Contract N00024-00-D-6106:** See description under Functional Area 14.

## **Additional Contracts:**

NTI Contract N00167-01-D-0016, Contact S. Finley, 208-683-2321, x4210