Department of the Navy SBIR/STTR Transition Program

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ONR Approval #2026-9-3-2817

Topic # N23A-T023
Integrated Optical Imaging of the Environment on Underwater Autonomous Vehicles
Arete Associates

WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 32 - Physical Oceanography

Transition Target: CNMOC, OPNAV N97 and related programs

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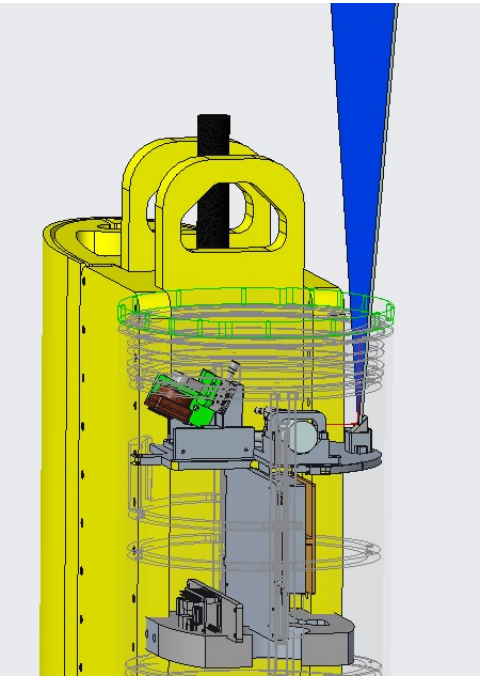
Other Transition Opportunities: Academic research, environmental consulting and engineering, marine service companies

Notes: Areté develops advanced undersea sensors to measure ocean parameters that impact Navy operations. We specialize in rugged sensors which stand up to Navy operational conditions and provide enhanced capabilities.

AQuIS (Autonomous Quantitative Imaging System) is a new optical sensor designed to provide long-endurance autonomous measurements of ocean interior turbulence, particle detection and classification. AQuIS is designed and built around low-power, energy efficient electronics and processing techniques including a low-power microcontroller for image acquisition and a GPU with a specialized processor for motion estimation to reduce processing times to seconds. This efficiency should allow AQuIS to operate for up to 6-months in the ocean on battery power.



CAD model rendering of prototype hardware developed by Areté

The figure shows a CAD model of our prototype AQuIS hardware mounted to a vertical ocean profiler. This configuration will be tested in August 2026 during our first field test. A diode laser is formed into a light sheet to illuminates a 2D slice of the ocean. A camera equipped with Scheimpflug optics images the light sheet, providing direct mapping from image space to physical space because of the 2D illumination.

Areté is partnered with Princeton University to develop AQuIS under a Phase 2 STTR.

WHAT

Operational Need and Improvement: The Navy seeks to enhance its underwater imaging capabilities to study processes such as marine snow deposition and near-surface bubble concentrations from autonomous, long-endurance platforms like profiling floats. This new optical sensor will resolve both near and mid-field objects at scales from millimeters to a meter while delivering near real-time data products via low-bandwidth satellite telemetry.

Specifications Required: The system should allow for two-way communication between the sensor and platform microcontrollers; and software architecture should be tunable to specific parameters, e.g., adaptive capability to turn on imagery collection at target locations or times (e.g., within a set distance from the surface or bottom). Onboard processing and file reduction should allow for near-realtime data delivery of select low-resolution imagery and/or analysis products via satellite communications.

Technology Developed: AQuIS, the Autonomous Quantitative Imaging System, is an underwater imaging system with the primary goals of measuring turbulence using Particle Tracking and Particle Imaging Velocimetry (PTV, PIV) techniques. AQuIS also provides detection and classification of particles (e.g., bubbles, microplastics, marine snow) and is adaptable to other uses such as large object scanning. The AQuIS electronics and processing are optimized for energy efficiency to achieve long deployment durations in the ocean while the physical size is made as small as possible to allow mounting on a variety of platforms.

Warfighter Value: AQuIS expands the Navy's underwater imaging capabilities by providing new, long-term measurement capabilities for observing and studying the ocean environment. AQuIS provides value to Naval oceanography to enhance predictive capabilities and signal propagation models. AQuIS also enhances capabilities for studying ocean and air-sea interaction processes which affect surface vessel and submarine security.

WHEN

Contract Number: N68335-25-C-0055 **Ending on:** Feb 08, 2027

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Build and Test Prototype	Low	Data quality assessment and comparison to measurement expectations	4	3rd QTR FY26
Demonstrate autonomous data collection	Low	Successful data collection; post-processing analysis verifies measurment quality	5	4th QTR FY26
(Option) Produce custom Single Board Computer	Medium	Working boards with successful operation in lab and field	5	2nd QTR FY27
(Option) Final Prototype Sensor Test	Medium	Autonomous data collection and processing; realtime data product transmission	6	4th QTR FY28

HOW

Projected Business Model: Direct sales to end users, potential for customization for specific measurement needs. If sufficient interest from end users, work with platform/vehicle manufacturer on direct integration.

Company Objectives: Transition technology to low-rate production internally, supporting primarily Navy and Navy funded researchers studying physical oceanographic processes.

Potential Commercial Applications: Use by oceanographic research and scientific communities for process studies, environmental assessment, and ecosystem monitoring.

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