

Topic: N151-038

Intellisense Systems, Inc.

Submarine-Deployable Weather Sensor

Intellisense Systems Inc (ISI) has developed a new Submarine-Deployable Weather Sensor (SDWS) based on a new design that integrates ISI's miniature weather sensor electronics with proven deployable buoy systems. Specifically, the innovation in ISI's compact and robust weather sensor design integrated through novel packaging within a mature deployable buoy architecture will enable a low-cost, small sensing device. This device will accurately measure weather parameters above the ocean's surface after deployment at depth. ISI has demonstrated the feasibility of SDWS by integrating and packaging a basic sensor buoy prototype that can be deployed from underwater and accurately collect weather data leveraging multiple designs from existing weather sensor products to reduce risk. As a final product, the SDWS will provide a simple means for submerged submarines to measure real-time surface weather parameters to aid in both navigation and to define the current atmospheric state.

Technology Category Alignment:

Space and Terrestrial Environmental Monitoring

Information Collection/Management

Guidance, Navigation & Control (GN&C) and Data Links

Survivability

Contact:

Jeffrey Norell

jnorell@intellisenseinc.com

(310) 320-1827

<http://www.intellisenseinc.com>

SYSCOM: NAVSEA

Contract: N00024-17-C-4035

WHO

SYSCOM: NAVSEA

Sponsoring Program: PEO-SUB

Transition Target:

TPOC:

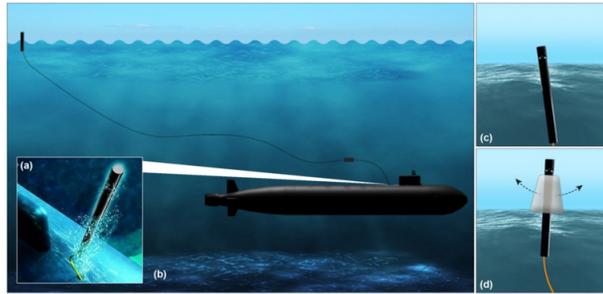
(401)832-7032

Other transition opportunities:

Military applications of the SDWS can include both short and long-term real-time ocean weather monitoring, improving sea vessel and aircraft navigational safety, situational awareness with added imaging capability, and potential monitoring of the ocean environment for bio-chemical and radiological hazards.

Notes: The buoy is ejected from the existing launch tube (a) of a submerged submarine (b) and the buoy rapidly floats to the surface as the tether uncoils. The buoy sensor compartment remains closed during ascent (c) and opens automatically upon reaching the surface (d) to inflate a float and allow for real-time weather measurements above the water surface.

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WHAT

Operational Need and Improvement: The Navy is developing tools requiring access to meteorological data, such as humidity, wind, and temperature, for use aboard submergible vessels. The capability proposed would be part of a command tool that would improve targeting, command and control of mission payloads, and situational awareness while reducing submarine exposure and detection risk.

Specifications Required: The Navy desires an innovative approach to obtain the following weather information in real time – humidity, wind speed and direction, atmospheric pressure, and sea/air temperature. Any sensors used have to be survivable on a deep-diving vessel, although data could be collected on the surface. Current state-of-the-art sensors are not able to survive deep submergence. Cost-effective disposable buoys, which make use of the existing ability to launch expendable buoys, are a viable solution.

Technology Developed: The Submarine-Deployable Weather Sensor (SDWS) is based on ground-breaking micro-integration of a wide range of ISI-developed and commercial off-the-shelf (COTS) sensor technologies into a buoy platform. The sensor will consist of a compact buoy that can be deployed using existing submarine launching systems with a full solid-state (no moving parts) weather sensing suite on board, including a humidity sensor, sea and air temperature sensors, a barometric pressure sensor, a wind velocity and direction sensor, and sea state sensors. All sensors are either ISI-developed mature components or commercial off-the-shelf (COTS) components with proven reliability and accuracy.

Warfighter Value: The innovative SDWS device will directly meet the needs of military, defense, and commercial contractors in a variety of ways beneficial to their operational abilities. The SDWS will provide a simple means for submerged submarines to measure real-time surface weather parameters to aid in both navigation and to define the current atmospheric state. The buoy provides a cost-effective, maintenance-free, on-demand solution that only needs to be deployed when the need arises.

WHEN

Contract Number: N00024-17-C-4035 **Ending on:** April 6, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Benchmark sensor demonstrated	N/A	Sensors reporting to laptop	TRL-3	February 2016
Sensor prototype tested	Low	Accurate weather reporting	TRL-5	September 2018
Fully assembled buoy demonstrated	Med	Accurate reporting in ocean environment	TRL-6	October 2018
TEMPALT testing completed	Med	TEMPALT certification	TRL-7	January 2020

HOW

Projected Business Model: Intellisense System Inc's (ISI's) technical, business development, and corporate teams will determine the best course of action for manufacturing the SDWS product with the assistance of a buoy OEM subcontractor. The sensor module, with precise electronics and mechanical sensor assembly, aligns well with ISI's internal production capabilities which include multiple weather sensing products. ISI envisions building, testing, and qualifying the weather sensors and supplying them to a buoy OEM who will integrate them into the buoy for final assembly and distribution. With this clear division between ISI's weather sensor experience and the specialized experience of an established buoy manufacturer, product quality is ensured and production cost is minimized.

Company Objectives: With ISI's critical involvement in weather sensing technologies, as well as our track record of transitioning prototype technologies into production-level hardware for military and commercial applications, we are uniquely positioned to successfully develop and commercialize the SDWS technology. The proposed buoy design heavily leverages ISI's specific experience in developing and integrating a vast array of miniature sensor components for our ruggedized micro weather sensor (MWS). The MWS is a fully autonomous, highly integrated sensor device that possesses measurement capabilities greater than that of the highly capable TMQ-53, a \$250k, 250 lb device currently used as the "portable" weather station by the military. At ~3 lb, the MWS is packaged in a ~5.5 in. long x 5.5 in. wide x 6.5 in. tall housing, contains no moving parts, and has a production cost an order of magnitude less. The MWS was initially developed through a Phase I/II AF-SOCOM SBIR program beginning in 2010 and is now in production as an Air Force program of record.

Potential Commercial Applications: The SDWS will bring to market a low-cost, compact sensing device that can accurately measure meteorological and oceanographic (METOC) data. Governmental, commercial, and nonprofit organizations will benefit from SDWS by having the ability to perform ocean-based weather forecasting, enhanced navigation, air pollution monitoring, air quality control, security, and surveillance with a single, integrated, relatively low-cost sensing device.

Contact: Jeffrey Norell, Director, Integrated Sensors
jnorell@intellisenseinc.com 310-320-1827