

SUCCESS STORY

TOPIC NUMBER: N18A-T017

SBIR INVESTMENT: \$2,200,000

PHASE III FUNDING: \$4,300,000



TEMPERATURE SENSING SUBMARINE ISR BUOY / SURFACE SHIP SENSOR TOW CABLE

Makai has developed a tow cable system that can accurately measure in real-time the distributed seawater temperature along the length of the cable when towed from a surface ship, providing critical information to topside vessels.

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THE CHALLENGE

Navy ships and submarines equipped with SONAR arrays frequently also tow devices that span the upper part of the water column, whose temperature can be highly variable with time and platform location. That variation has substantial impact upon acoustic propagation and, therefore, upon whether some acoustic source of particular interest will be detectable by the SONAR. The objective of this SBIR solicitation was to leverage recent advances in the maturity, availability, and sensitivity of optical scanning technologies to embed a high fidelity real-time temperature measurement capability into tow cables which span the upper part of the water column.

THE TECHNOLOGY

Hawaii-based Makai answered this need and developed its Instrumented Tow Cable (ITC), a tow cable system that can accurately measure in real-time the distributed seawater temperature along the length of the cable when towed from a surface ship. To do this, the company developed a method of embedding the fiber optic cable into the tow cables and integrating the fiber to measure seawater temperature from the tow platform using distributed temperature sensing. Makai's ITC system provides a seawater temperature accuracy within +/- 0.5°C. This accurate real-time truth data assists with on-board operations. Makai's system also leverages existing tow cable deployment hardware and eliminates the need for expendable bathythermographs.

THE TRANSITION

Makai, building on its extremely successful history building towed array systems for the U.S. Navy, won a \$4.3M Phase III contract from the Office of Naval Research (ONR) to further develop its ITC technology. As part of this contract, the system's opto-electronics have been further developed and can now fit into different cable handling systems. Extensive system testing is also underway.

THE NAVAL BENEFIT

Knowledge of temperature distribution in seawater is important when understanding how sounds propagate in the ocean, and, therefore, where sounds are coming from. In performing a sonar search, operators need to know where one can and cannot hear a particular source of sound and that is important in being able to assess a ship's sonar search performance. With this technology, the accuracy is improved since temperature can now be sensed along the tow cable, and not just at a single depth.

THE FUTURE

Other transaction opportunities within the Navy include the Navy's surface fleets and other oceanographic applications. Makai is working with NAVOCEANO to identify additional oceanographic applications for the ITC that will benefit the Navy. These include tow cables for oceanographic vessels and buoys with distributed temperature sensing mooring cables among others. Other non-Navy transition opportunities include similar oceanographic applications for the National Oceanic and Atmospheric Administration (NOAA), research institutions, and other commercial applications.

"This SBIR was a no-brainer for me: The ability to measure the temperature distribution is a necessity. This technology substantially improves the form factors, avoids complexities in terms of optics, improves performance, and makes everything more compact on the ship."

Mike Traweek, Program Manager, Maritime Sensing Team, ONR Ocean Battlespace Sensing Department