

Topic: N103-223

## Hydroacoustics, Inc.

### Very Low Frequency (VLF) Transducer

Low frequency sources play a role in anti-submarine warfare, ocean tomography, marine seismic exploration, undersea precision navigation and timing (UPNT), and acoustic augmentation for our submarines. The Acoustic Augmentation Support Project provides a temporary system used to produce acoustic signals across an operating band of 10Hz-44kHz but cannot completely satisfy Navy requirements below 60Hz. Making a source in the 5-1500Hz range with traditional transducer materials is not feasible. Hydroacoustics Inc. (HAI) has been designing and building sources in this range for 50+ years utilizing hydraulically actuated radiators, reducing source size and achieving required power levels. Our HLF-1D is in service on the Virginia-class submarine. HAI sources were used in DARPA's Positioning System for Deep Ocean Navigation experiments. HAI seeks partnership with Primes pursuing UNPT systems.

### Technology Category Alignment:

Survivability

Sensors

Acoustic, Seismic and Magnetic

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

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**SYSCOM:** NAVSEA

**Contract:** N00024-12-C-4135

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N00024-12-C-4135](https://navystp.com/vtm/open_file?type=brochure&id=N00024-12-C-4135)

# Department of the Navy SBIR/STTR Transition Program

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NAVSEA #17-518

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Very Low Frequency (VLF) Transducer

Hydroacoustics Inc.

## WHO

**SYSCOM:** NAVSEA

**Sponsoring Program:** PMS 415 – Acoustic Augmentation Support Project

**Transition Target:** Virginia Class Attack Submarine

**TPOC:**  
(401)832-5248

**Other transition opportunities:** Columbia Class SSBN (ballistic missile submarine - nuclear) and various Allied Navy Submarine Classes. Similar LF sources have been made to fit the 688 Class submarine and can be used on OHIO class submarines.

**Notes:** HLF-1 systems have been serving a vital role on US Navy submarines in support of anti-submarine warfare for decades. HAI has delivered a number of Diver Interdiction Systems (DIS) systems to the Worldwide Navy and Coast Guards.



Inset: VLF-1F Prototype Serial Number 2 - Courtesy of Hydroacoustics Inc.(2017); VA Class submarine photo courtesy of U.S. Navy (image 160801-O-N0101-110)

## WHAT

**Operational Need and Improvement:** The Acoustic Augmentation Support Program (AASP) system is used on all submarine classes. It consists of a series of acoustics sources and signal generation and analysis system used for supporting Naval exercises, testing, training and classified operations. The very low frequency (LF) spectrum of AASP is provided via the VLF-1 series of HAI transducers. Previous LF transducers were limited in output, large and drew a lot of power. The HAI HLF-1D transducer fulfills the basic AASP need but it does not meet the low-end bandwidth and source level requirements. The new VLF-1F transducer can generate broadband and narrowband acoustic signals down to 10 Hz with source levels of not less than 150dB.

**Specifications Required:** VLF-1F will have improved low frequency performance (down to 10 Hertz), have higher output levels, emit no appreciable acoustic signal when in the standby. VLF-1F will meet MIL-S-901D (Grade B) shock qualifies and be MIL-STD-461 EMI/EMC compliant. Refurbishment cycle will be extended to 60 months and refurbishment time reduced to 7 weeks.

**Technology Developed:** VLF-1F successfully passed the Critical Design Review (CDR) milestone and the first Engineering Development Model (EDM) passed Government Acceptance Testing at the NUWC Detachment at Seneca Lake, NY. the second EDM incorporates further improvements in capability and output. The second EDM is awaiting final EMI, implosion, shock and at sea testing. VLF-1F is at TRL 6. VLF-1F is not a radical departure from other hydro-acoustic devices, manufacturing challenges/risks are low. Manufacturing Readiness Level (MRL) is currently MRL 7.

**Warfighter Value:** Better LF range for the AASP system with reduced Total Ownership Cost (TOC). Applicability to all class of submarines. Other U.S. Navy programs in anti-submarine warfare, wide area ocean surveillance, acoustic communications, military deception, underwater tomography, and ocean science exercises. VLF-1F can towed by research vessels for strategic and tactical surface ship applications. Commercial applications include use in port and harbor security applications, protection of aquaculture facilities from predators and for low frequency augmentation of ocean observatories.

## WHEN

**Contract Number:** N00024-12-C-4135 **Ending on:** March 30, 2018

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete Pierside testing	Med	Meet EMI, Implosion & Shock Criteria	6	September 2017
Complete At-Sea Testing	Med	Meet PMS 415 / Fleet Requirements	7	November 2017
Deliver Final Production Version (SN #3)	Med	Meet NUWC Seneca Lake Test Criteria	8	March 2018
Start initial LRIP	High	Modify existing VLF-1D Contract	9	March 2018

## HOW

**Projected Business Model:** This technology is anchored in HAI's patents for producing low frequency transducers and therefore, HAI will maintain the design, modernization and assembly of the VLF-1F source for the Virginia and follow-on US Navy submarine classes. Should orders exceed HAI's capacity to assembly the transducer a licensing agreement will be sought to provide the extra capacity.

**Company Objectives:** Hydroacoustics (HAI) has been designing and building sources in this range for 50+ years utilizing hydraulically actuated radiators, reducing source size and achieving required power levels. Our HLF-1D is in service on the Virginia-class submarine. HAI sources were used in DARPA's Positioning System for Deep Ocean Navigation experiments. HAI seeks partnership with Primes pursuing UNPT systems and low range anti-submarine detection systems.

**Potential Commercial Applications:** HAI is the leading provider to the US Navy for HLF sound sources. HAI offers numerous HLF configurations serving a wide variety of commercial markets. HLF transmitters are capable of emitting continuous wave or impulse wave signals thousands of miles. Applications for HLF sources include; communications, seismic exploration, oceanographic data collection, ocean surveillance and many more.

HAI has identified domestic oil production as an industry ripe for successful translation of our acoustic source technology-specifically within the rapidly growing area of enhanced oil recovery (EOR). We are currently in development of the Oil Recovery Tool (ORT), an acoustic source-based down-hole tool for increased oil production and prolonged lifetime of existing wells. The ORT also has the potential for indirect reduction of the environmental footprint of the EOR operations through increased performance and yield per well.

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