

Topic: N181-023

## Polaris Sensor Technologies, Inc.

Multispectral/Hyperspectral Imaging System for Small Boat Detection under Wake Clusters

Polaris Sensor Technologies' (Hydra), a novel polarimetric camera that acquires, identify and tracks targets through wake and sea spray to detect fast moving low contrast threats. Using both wide and narrow field optics across all spectral bands this multispectral sensor called Hydra is designed to recognize fast attack boats obscured by water wake at long range. Using advance light scatter technology to reject "wake noise" in Hydra imagery. Using Hydra's mid to long-wave infrared sensor enables target acquisition and remote tracking at range, while its visible and short-wave infrared sensor collect radiometric and polarimetric data for improved target contact discrimination. Polaris applies our expertise with infrared electro-optical to turn concepts into prototypes. We leverage our relationships with Army's VISTA program, and Raytheon's Airborne FLIR Sensor Ball System on board Navy SEAHAWK. Polaris' Hydra meets the threat.

### Technology Category Alignment:

Sensors

Weapons Technologies

Command, Control, Communications, Computers, & Intelligence (C4I)

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**SYSCOM:** NAVAIR

**Contract:** N68335-20-C-0133

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N68335-20-C-0133](https://navystp.com/vtm/open_file?type=brochure&id=N68335-20-C-0133)

Department of the Navy SBIR/STTR Transition Program

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NAVAIR 2021-066

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Polaris Sensor Technologies, Inc.

WHO

**SYSCOM:** NAVAIR

**Sponsoring Program:** Naval Air Systems Command

**Transition Target:** PMA 299 (Rotary) H-60 Helicopter Program and SEAHAWK

**TPOC:**  
(301)342-3378

**Other transition opportunities:** The Navy's Agility office (NavalX) in Alexandria, Virginia facilitates the increased adoption of proven agility-enhancing methods across the Department of the Navy.

---The Department of the Army, Program Executive Office - Intelligence, Electronic Warfare and Sensors, Project Manager, Terrestrial Sensors (PM TS), Product Manager, Electro-Optic Infrared Payloads (PdM EO/IR Payloads), has a requirement for a Persistent Electro-Optic Infrared Sensor w/ SWIR for the Ground-Based Operational Surveillance System (Expeditionary) (G-BOSS(E)).  
---United States Special Operations Command (USSOCOM) has a requirement for Next Generation Identification and Awareness Initiative (NGIA) which integrates multiple domain sensors to derive high-fidelity information on identities, locations, and actions.  
---USCG Aviation Logistics Center is researching replacement solutions to the current EO/IR Sensor System on the MH-60 and MH-65 platforms. The current system provides a gyro-stabilized platform that houses a color camera, low light camera and infrared camera that has a 360-degree field of regard. The system houses a laser range finder and a laser illuminator. The system provides four video outputs for aircraft displays and recording. The USCG desires high definition (HD) cameras in future systems."



Hydra's Multi Spectral Sensor Fusion at range to enable situation awareness for Fast Inshore Attack Craft

WHAT

**Operational Need and Improvement:** Current Electro-Optical systems have been designed for groundbased operations, and do not consider the effect of high reflection from ship wakes. The Navy needs an improved Electro-Optical/Infrared (EO/IR) imaging system for detection, recognition, and identification of small, fast, agile boats.

**Specifications Required:** Fixed- and rotary-wing compatible, Visible to Long Wave Infra Red (LWIR), 360 degrees azimuth, multiple fields of view, image acquisition at range, able to be ruggedized to withstand airborne use.

Feature	Advantage	Benefit
Polarization (Visible to SWIR)	Reveals detail like Geometry through weather/spray. Discriminates at range.	Threat identification via detailed images day/night.
SWIR	Sees through wake and spray.	Eases recognition.
MWIR & LWIR	Sees through wake and spray. Increases range.	Acquisition at range and track.

**Technology Developed:** The Multi-Spectral Imaging Polarimetric system (MSIP) named Hydra is a three-camera system covering the Visible, Near InfraRed, Short Wave InfraRed, Mid Wave InfraRed, and Long Wave InfraRed sensor bands. Polarization sensing capability was added to each of these wavebands for enhanced performance. The sensor is the optimal combination of spectral and polarization multi-mode sensing for the highest probability of detection.

**Warfighter Value:** The Hydra system is a multispectral/hyperspectral imaging system capable of detecting, recognizing, identifying, and tracking fast-moving boats while either partially or completely obscured by highly reflective water wakes. Hydra is an EO sensor that enables early discrimination and track in time to meet the threat.

WHEN

**Contract Number:** N68335-20-C-0133 **Ending on:** December 1, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Complete Sensor Design	Med	successful simulations	3-4	August 2020
Acquire Custom Camera Cores	Med	build and acceptance testing	4-5	October 2020
Build Software & Firmware for Sensor Control	Med	successful simulations and	4-5	March 2021
Assemble and Test Final Sensor	Med	analysis of lab and field testing	6	September 2021

HOW

**Projected Business Model:** Spin the Short Wave InfraRed (SWIR) to a sister instrument with a lower SWAP-C. Develop the unit for testing on SeaHAWK and Apache platforms. License intellectual property and designs to Prime Contractors to be integrated at their site into larger platforms.

**Company Objectives:** Integrate our novel high tech sensors onto platforms for use by the warfighter in the field. Demonstrate the value of our technology by enabling mission success. We bridge technology gaps. We team, subcontract and license our intellectual property. As a prime we offer the speed and agility unavailable at large primes with similar expertise. Lower time to develop yields lower costs for customers and follow on business. We develop systems and intellectual property to obtain revenue through sell and licenses.

**Potential Commercial Applications:** Oil and Gas pipeline inspection/leak detection in industrial settings. Border/Asset Security along unprotected waterways (dams, water intakes, power generations, locks, ports) where threats can enter by water and there is a visualization gap at the water surface that radars cannot manage. UAS detection in clouds and among clutter like tree lines and buildings.

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