Department of the Navy SBIR/STTR Transition Program

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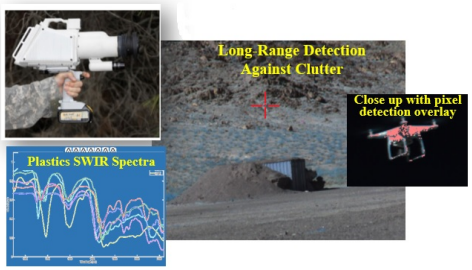
NAVAIR SPR 2024-0553

Topic # N202-118
Passive System for Detection and Identifiction of UAV's Using Multispectral/Hyperspectral Imaging Technologies
Surface Optics Corporation

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAWC-AD



Surface Optics Corporation

Transition Target: Transitioning Surface Optics Corporation (SOC) Multispectral/Hyperspectral Imaging (HSI) sensors to any land, or sea or air platforms would enable any one of those platforms to perform a wide range of surveillance, reconnaissance and targeting missions involving weak adversary signals of interest in highly cluttered environments, e.g. SOC HSI sensor is able to detect and track UAS/mortar targets as small as 1 pixel in cluttered and low Signal to Noise Ratio (SNR) environments . Any third party HSI detection, classification and targeting algorithms that utilize spatial and spectral target signature information can be operated with Surface Optics Corporation's HSI sensor resulting in a low false-alarm rate in different low SNR environments over a wide range of platform operating conditions. It is important to detect and track adversary targets and counter them before the adversary can inflict catastrophic damage.

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Other Transition Opportunities: Non-military transition opportunities include installation at civilian mass-gathering sites such as concert halls and performance theaters, sports facilities, airports and other transportation hubs. Protection of high-value, high-visibility civilian installations such as government buildings, corporate headquarters and research and development centers, power generation facilities, etc., is also an intended application of this systems.

Notes:

WHAT

Operational Need and Improvement: The proliferation of the use of unmanned aerial vehicles (UAVs) of various sizes and shapes for defense, commerce, monitoring, and other applications has increased at a very expeditious pace. Along with their advantages in ease of operation and low cost, the widespread availability of UAVs has posed significant security threats in both defense and civilian arenas. Straightforward adoption of currently fielded airspace surveillance technologies to detect and track these threats at long range will not suffice as UAVs are much smaller in physical size and fly slowly at lower altitudes.

Specifications Required: This program seeks to explore and develop MWIR and LWIR HSI technologies for the detection, acquisition and tracking of a UAV or UAVs during counter UAV surveillance that cannot otherwise be detected using more conventional imaging or radar. The goal is to perform an exploration and investigation of both MWIR and LWIR hyperspectral signatures of UAVs against various environmental backgrounds, such as sky backgrounds both in day time and night time, to design an effective detection and tracking algorithm with 90% probability of detection and 10% probability of false alarm at a range up to 10 km.

Technology Developed: Surface Optics' LightShift spectral imaging technology allows simultaneous acquisition of 32 spectral bands from 2 um to 12 um throughout a 320 x 180 image (640 x 360 with super resolution) at beyond video frame rates. An integrated, compact, spectral image processor executes spectral detection and tracking algorithms on the imagery to detect and track 2/3 m sized UAVs at ranges to 10 km, reliably detecting them based on their component material spectral signatures, which are distinct from background objects and confusants such as birds.

Warfighter Value: Reliably detecting small UAVs at ranges up to 10 km provides the warfighter many minutes to determine that the UAV or UAVs are a threat, to then deploy countermeasures to eliminate the threat. This capability improves both warfighter and targeted non-combatant safety.

WHEN

Contract Number: N68335-22-C-0209 **Ending on:** Sep 23, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prove LightShift spectral imaging technology for UAV detection	Low	Detect small UAVs moving against clutter	5	2nd QTR FY16
Develop concept for day/night UAV detection using LightShift technology	Low	Completed conceptual design	2	4th QTR FY21
Design small UAV detection system	Medium	Full design package for system prototype	3	2nd QTR FY23
Manufacture prototype system	Medium	Manufacture & integrate all components, test in lab	4	1st QTR FY25
Test/Demonstrate system during Costal Trident 2025	Medium	Long-range small UAV detection demonstrated	6	4th QTR FY25

HOW

Projected Business Model: Through this Phase I & II SBIR effort, Surface Optics will design, build, and test the prototype SUADS (Spectral imaging UAV Detection Sensor). Follow-on efforts will refine the design, incorporated any required changes discovered during testing, and begin transition to a mil-qualified, field-ready system. We then intend to license the technology to a prime contractor better positioned than we to supply the system to DoD and other government agencies for deployment. We will continue to sell SUADs and variants thereof both to low-volume government customers, e.g., government labs, and to commercial customers

Company Objectives: Our intent is to finish building and testing SUADS in preparation for full commercialization through a prime contractor. We then intend to use profits from that commercialization to fund additional system development first for non-military UAV detection applications, and then to adapt the spectral imaging technology at the heart of SUADS to non-UAV applications, thereby expanding our presence in the spectral imaging marketing and growing our business.

Potential Commercial Applications: With the proliferation of small UAVs that are difficult to detect at long range using current widely deployed techniques such as radar, the threat to any high profile civilian target such as mass gathering sites (concerts, sporting events, etc.) and to commercial / local government buildings is high. These small UAVs can be readily weaponized. To counter this threat, we will adapt SUADS for installation at such civilian sites to provide enhanced security. Further adaptation of the technology in SUADS also enables detection of explosives, chemical and biological agents, drugs, and other threat materials. The chemical identification technology is also appropriate for medical diagnostics, agricultural monitoring and fertilizer/water control, online manufacturing control, and more.

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