Department of the Navy SBIR/STTR Transition Program

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Topic # N201-079
Extremely Accurate Star Tracker
IERUS Technologies, Inc.

WHO

SYSCOM: SSP

Sponsoring Program: Trident II (D5) ACAT I

Transition Target: Trident II (D5) weapons system

TPOC: SSP.SBIR@ssp.navy.mil

Other Transition Opportunities: The star tracker may be used for astronomical data collections (including measures of stellar photometry, variability, and astrometry) that are used by the Navy such as the Naval Observatory.

https://media.defense.gov/2021/Sep/18/2002857201/-1/-1/0/210917-N-JS726-0148.JPG

Notes: IERUS has supplied hardware components to Raytheon Missiles & Defense for the Lower Tier Air and Missile Defense Sensor (LTAMDS) program. The LTAMDS is a new, next-generation radar designed for the U.S. Army's Integrated Air and Missile Defense system.

WHAT

Operational Need and Improvement: Current commercial star trackers' size, weight, and power (SWaP) needs preclude the Navy from considering deploying these star trackers to the Trident II weapon system. Acquisition of an accurate, low-weight, small, and power-efficient star tracker would allow strategic weapon systems to be deployed with less expensive maintenance cost while also providing weapons system designers options to increase weapon system performance with less expensive hardware cost and maintenance. Furthermore, the new developed star tracker could assist in exo-atmosheric astronomical data collections needed for Navy, DoD and other commercial utility.

Specifications Required: The innovation needs to leverage already developed techniques by NASA JPL into a hardware electronics instruments package that is portable for missile and spacecraft environments. The Navy expects the star tracker to be no bigger than 64 cubic inches, weigh no more than 500 grams, and powered for at least two hours, and that new technology will demonstrate calibration of star tracker focal planes up to 100 times more accurate than current commercial capability. The star tracker will be expected to interface with navigation systems that will be matured through the proposal cycle. Power range for the star tracker should be 5W, or under, of navigation system power.

Technology Developed: The technology is a focal plane metrology technique developed by the NASA Jet Propulsion Lab (JPL) that enables the location of pixels in a focal plane array to high precision combined with a precision telescope that measures the the location of stars on the focal plane to better than 100 milli-arc-seconds. The system is capable of detecting a sufficient number of stars to calculate its orientation over >99% of the celestial sphere.

Warfighter Value: The extremely accurate star tracker enables the precision attitude determination for space vehicles; it is anticipated to result in a greater than two orders of magnitude increase in accuracy to many of todays COTS star trackers.

WHEN

Contract Number: N68335-22-C-0840 **Ending on:** Jul 31, 2023

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Original Development	High	FPA Calibration	3	3rd QTR FY0
Adaptation to Star Tracker	Medium	FPA Calibration	3	4th QTR FY21
Breadboard Prototype	Medium	System Calibration	7	3rd QTR FY23
Brassboard Prototype	Low	System Calibration	7	1st QTR FY25
Pre-production Prototype	N/A	System Performance	8	3rd QTR FY25

HOW

Projected Business Model: IERUS is a growing, technology-focused business established in the area of engineering, research, and development. We have experts in Electromagnetics Phenomenology, Analytical Computing, and Weapon System Engineering under one roof that have provided our customers with quality, novel solutions over the past decade.

We will deliver to NSWCDD/USNO a refined star tracker manufacturing prototype that the Navy can test for its function and portability in their land-based HWIL testing facilities. In addition we will provide design and test cases that demonstrate that the star tracker's accuracy is 100 times current technology (based on JPL's techniques); and is small, lightweight, and portable. IERUS will assist the Navy in setting up the star tracker manufacturing prototype for Hardware-in-the-Loop (HWIL) testing that emulates missile and space craft environments; and will include trouble shooting plus resolving implementation and execution issues. IERUS plans to support field qualification testing with Navy hardware and software applications.

Company Objectives: We seek to meet/speak with those that are interested in q star tracker (using interferometery fringe methodology developed by NASA's Jet Propulsion Laboratory (JPL)) that is extremely accurate, light weight and consumes little power as compared to current commercial products.

Potential Commercial Applications: The market for high accuracy star trackers is anticipated to increase in parallel with the continuing acceleration of the utilization of space. This product would support commercial aerospace space navigation, telescope pointing and tracking.

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