**Component: NAVY**

**Topic #:** N201-079

**Title:** Extremely Accurate Star Tracker

**Technology Areas:** Sensors

**Acquisition Program:** Trident II (D5) ACAT I

**ITAR:** The technology within this topic is restricted under the International Traffic in Arms Regulation (ITAR), 22 CFR Parts 120-130, which controls the export and import of defense-related material and services, including export of sensitive technical data, or the Export Administration Regulation (EAR), 15 CFR Parts 730-774, which controls dual use items. Offerors must disclose any proposed use of foreign nationals (FNs), their country(ies) of origin, the type of visa or work permit possessed, and the statement of work (SOW) tasks intended for accomplishment by the FN(s) in accordance with section 3.5 of the Announcement. Offerors are advised foreign nationals proposed to perform on this topic may be restricted due to the technical data under US Export Control Laws.

**OBJECTIVE:** Design and develop a star tracker (using interferometry 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. The developed star tracker will be designed for potential deployment on the Trident II (D5) weapons system and for astronomical data collections (including measures of stellar photometry, variability, and astrometry) that are used by the Navy.

**DESCRIPTION:** 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-atmospheric astronomical data collections needed for Navy, DoD and other commercial utility. 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.

**PHASE I:** Develop and define a concept design for a star tracker that employs a NASA JPL interferometric fringes technique to measure stars extremely accurately. Ensure that the star tracker will be very small in size and will require low amounts of power. Work with the Navy to fully understand and document the star tracker SWaP and accuracy requirements since the star tracker is to be no bigger than 64 cubic inches, weigh no more than 500 grams, and powered for at least two hours, and that the accuracy of the star tracker to be up to 100 times more accurate than current technology with pointing accuracy of 0.04 arc seconds. Identify risks in the proposed concept. Develop Phase II plans that include ways to mitigate those risks.

**PHASE II:** Produce and deliver a prototype star tracker. Assist the Navy in setting up the prototype star tracker for Hardware-in-the-Loop (HWIL) testing that emulates missile and space craft environments; and includes trouble shooting plus resolving implementation and execution issues. Establish feedback loop with the Navy for implementing changes due to prototype testing.

**PHASE III DUAL-USE APPLICATIONS:** 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. 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 according the requirements matured in Phase I. Assist the Navy in setting up the star tracker manufacturing prototype for HWIL testing that emulates missile and space craft environments; and will include trouble shooting plus resolving implementation and execution issues. Support field qualification testing with Navy hardware and software applications. This product would support commercial aerospace space navigation, telescope pointing and tracking.
REFERENCES:


KEYWORDS: Star Tracker; Stellar Photometry; Astrometry; Missile; Spacecraft; Accurate Navigation