OSD Foreign Comparative Test – Magellan RSO

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Product: Tracking and Characterization of Resident Space Objects (RSO) Using COTS Star Trackers
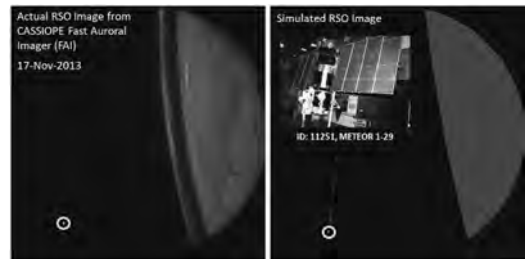

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Short Description: Machine-learning algorithms that enable commercial off-the-shelf (COTS) star trackers to detect and characterize resident space objects (RSO) in orbit.

Technology Readiness Level (fielded, lab tested, operational test): TRL 5. Demonstrated on the ground using downlinked images from the CASSIOPE satellite with algorithms running on a flight-representative processor board.

Countries Using This Product: None operationally. R&D was supported by funding from the Department of National Defense and the Canadian Space Agency.

Application: (the so what?) RSO detection and characterization using COTS star trackers supports modernization in space pre-eminence. Most satellites are already equipped with star trackers for the purpose of attitude determination. Enabling these commonly deployed sensors to also detect and characterize RSOs would strengthen the resiliency of space situational awareness capabilities and complement dedicated systems such as SBSS (Space-Based Surveillance of Space).

Science (how it works): COTS star trackers are small aperture, high-FOV optical devices used for determining satellite orientation based on star patterns. Magellan has developed analytical and machine-learning algorithms to detect and characterize RSOs in star tracker image sequences on-orbit. RSOs captured in star tracker images can be matched against objects in the NORAD catalog. Characteristics such as attitude (e.g. controlled vs. tumbling) can be inferred based on light curves.

Data (key tested performance metrics):
>80% detection accuracy achieved in prototype algorithms
>90% detection accuracy projected with planned upgrades

U.S. Partners: None

Previous Work with DoD: None