AMOS 2014 Abstract as submitted April 1, 2014

NASA's Newest Orbital Debris Ground-based Telescope Assets: MCAT and UKIRT

S. M. Lederer[1*], J.M. Frith[2], L. F. Pace[1], H. M. Cowardin[2], P. Hickson[3], T. Glesne[4], R. Maeda[5], B. Buckalew[2], D. Nishimoto[5], D. Douglas[5], and E.G. Stansbery[1]

[1]NASA Orbital Debris Program Office, NASA/JSC, Houston, TX 77058, USA
[2]JETS Jacobs Technology
[3]University of British Columbia
[4]Schafer Pacific Corporation
[5]Integrity Applications Incorporated

ABSTRACT

NASA's Orbital Debris Program Office (ODPO) will break ground on Ascension Island in 2014 to build the newest optical (0.30 – 1.06 μm) ground-based telescope asset dedicated to the study of orbital debris. The Meter Class Autonomous Telescope (MCAT) is a 1.3m optical telescope designed to track objects in orbits ranging from Low Earth Orbit (LEO) to Geosynchronous Earth Orbit (GEO). Ascension Island is located in the South Atlantic Ocean, offering longitudinal sky coverage not afforded by the Ground-based Electro-Optical Deep Space Surveillance (GEODSS) network. With a fast-tracking dome, a suite of visible wide-band filters, and a time-delay integration (TDI) capable camera, MCAT is capable of multiple observing modes ranging from tracking cataloged debris targets to surveying the overall debris environment.

Access to the United Kingdom Infrared Telescope (UKIRT) will extend our spectral coverage into the near- (0.8-5μm) and mid- to far-infrared (8-25μm) regime. UKIRT is a 3.8m telescope located on Mauna Kea on the Big Island of Hawaii. At nearly 14,000-feet and above the atmospheric inversion layer, this is one of the premier astronomical sites in the world and is an ideal setting for an infrared telescope. An unprecedented one-third of this telescope's time has been allocated to collect orbital debris data for NASA's ODPO over a 2-year period.

UKIRT has several instruments available to obtain low-resolution spectroscopy in both the near-IR and the mid/far-IR. Infrared spectroscopy is ideal for constraining the material types, albedos and sizes of debris targets, and potentially gaining insight into reddening effects caused by space weathering. In addition, UKIRT will be used to acquire broadband photometric imaging at GEO with the Wide Field Camera (WFCAM) for studying known objects of interest as well as collecting data in survey-mode to discover new targets. Results from the first stage of the debris campaign will be presented.

The combination of these ground-based telescope assets will yield spectral coverage ranging from 0.3 – 25 μm, allowing orbital debris to be studied in depth across a wider wavelength range in the visible and IR than ever previously studied by ODPO. Located on opposite sides of the world and in opposite hemispheres, they offer access to nearly the entire GEO belt on any given night, allowing immediate coverage of nearly any time-critical break-up event. By expanding the methods for surveying, detecting,

and characterizing orbital debris, we can better model the debris environment and ultimately gain insight into how to mitigate potential collisions for future missions.

Acknowledgments: Special thanks to Matt Bold, Rick Kendrick, the UKIRT staff, the Joint Astronomy Centre, Lockheed Martin, and the University of Arizona, for their collaborative efforts toward modifying UKIRT to boldly venture inward in space to track tiny man-made objects orbiting the Earth.