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MULTI ARM EXTERIOR SURVEYOR (MAES): A SEMI-AUTONOMOUS SOLUTION TO PROVIDE
MMOD PROTECTION IN LEO**Abstract**

MMOD (Micro-Meteoroid and Orbital Debris) pose a significant risk to space assets and crew. The resulting impacts can result in degraded performance, reduced mission life, mission loss, or even catastrophic events such as Crit 1 failure (loss of vehicle and inhabitants). Therefore, providing effective and efficient MMOD protection is essential to ensure safety and longevity of space missions and operations. The International Space Station (ISS) currently uses MMOD Shielding and Detection system in addition to regular inspections of the external surface by the crew. This adds additional workload and scheduling challenges for crew and mission control. We propose to develop a semi-autonomous system, called Multi Arm Exterior Surveyor (MAES), that can provide autonomous monitoring, inspection, and repair (scheduled and on-demand). MAES is advantageous compared to current methods as it provides increased efficiency and speed of repairs, reduced risk to astronauts, and improved mission performance. It also has the capability to operate in Human-In-The-Loop (HITL) mode for MMOD inspection and repair. The MAES system hosts several sensors and robotic limbs to scan and maneuver on the surface of the ISS or any other orbital station. The paper provides a detailed overview of the MAES system, its design, operational use-cases and modes, and human-robotic interaction from inside the ISS as well as during the EVAs. MAES is designed with an intent to provide significant contribution to space exploration by improving the safety of operations and longevity of space missions.