The Orion Exploration Flight Test Post Flight Solid Particle Flight Environment Inspection and Analysis

Orbital debris in the millimeter size range can pose a hazard to current and planned spacecraft due to the high relative impact speeds in Earth orbit. Fortunately, orbital debris has a relatively short life at lower altitudes due to atmospheric effects; however, at higher altitudes orbital debris can survive much longer and has resulted in a band of high flux around 700 to 1,500 km above the surface of the Earth. While large orbital debris objects are tracked via ground based observation, little information can be gathered about small particles except by returned surfaces, which until the Orion Exploration Flight Test number one (EFT-1), has only been possible for lower altitudes (400 to 500 km). The EFT-1 crew module backshell, which used a porous, ceramic tile system with surface coatings, has been inspected post-flight for potential micrometeoroid and orbital debris (MMOD) damage. This paper describes the pre- and post-flight activities of inspection, identification and analysis of six candidate MMOD impact craters from the EFT-1 mission.