Abstract Submitted
for the SHOCK09 Meeting of
The American Physical Society

Development and Evaluation of the Next Generation of Meteoroid and Orbital Debris Shields SHANNON RYAN, USRA Lunar and Planetary Institute, ERIC CHRISTIANSEN, National Aeronautics and Space Administration (NASA) — Recent events such as the Chinese anti-satellite missile test in January 2007 and the collision between a Russian Cosmos satellite and US Iridium satellite in February 2009 are responsible for a rapid increase in the population of orbital debris in Low Earth Orbit (LEO). Without active debris removal strategies the debris population in key orbits will continue to increase, requiring enhanced shielding capabilities to maintain allowable penetration risks. One of the more promising developments in recent years for meteoroid and orbital debris shielding (MMOD) is the application of open cell foams. Although shielding onboard the International Space Station is the most capable ever flown, the most proficient configuration (stuffed Whipple shield) requires an additional ∼30% of the shielding mass for non-ballistic requirements (e.g. stiffeners, fasteners, etc.). Open cell foam structures provide similar mechanical performance to more traditional structural components such as honeycomb sandwich panels, as well as improved projectile fragmentation and melting as a result of repeated shocking by foam ligaments. In this paper, the preliminary results of an extensive hypervelocity impact test program on next generation MMOD shielding configurations incorporating open-cell metallic foams are reported.

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Date submitted: 24 Mar 2009 Electronic form version 1.4