

EXPANDABLE SHIELDING FOR ORBITAL DEBRIS PROTECTION OF ROBOTIC SPACECRAFT

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ABSTRACT

Space debris is a growing threat to orbiting satellites. The current situation on Low Earth Orbit (LEO) necessitates the development of debris shielding technology for the protection against centimeter-sized objects. This paper summarizes the conceptual design of expandable shielding capable of protecting the robotic satellite against the debris of this size range. The development of shielding included the simulations of hypervelocity impact on the shielded configuration using the combination of smooth-particle hydrodynamics (SPH) technique and the Finite Element Method (FEM). The feasibility study was performed using the RADARSAT Space Mission (RCM) satellite. A deployment mechanism was designed that allows the multilayer Nextel shield to be expanded at 2630 mm from the ram-facing side of the RCM satellite as the satellite's synthetic aperture radar antenna unfolds. The numerical hypervelocity impact testing confirmed the feasibility of the preliminary design.