

SYMPOSIUM ON SPACE DEBRIS (A6)  
Hypervelocity Impacts and Protection (3)

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MICROMETEOROID AND ORBITAL DEBRIS IMPACT HARDNESS ASSURANCE OF AN ORBITAL  
SPACEPLANE**Abstract**

At present time micrometeoroids and orbital debris (MMOD) particles pose one of the main threats for near-earth space missions, and there are no reasons to assume that situation will be improved in the foreseeable future. Significant efforts of the international community in implementing measures reducing orbital debris population have not been sufficiently effective mainly because of stable increasing of space launches quantity and defragmentation of failed satellites. MMOD impact poses direct and unavoidable threat for life and health of orbital spaceplane crew. Therefore the problem of crew's safety assurance in MMOD environment has the highest priority. The standard practice of orbital spaceplane crew safety assurance in MMOD environment provides careful analysis of vulnerability of the spaceplane structure to high-velocity impact of material particles. The probabilities of orbital spaceplane breakthrough or outer thermal shielding damage are usually used as criteria, characterizing safety level of an orbital spaceplane crew. The following works have been carried out to solve the problem in this formulation: - calculation of MMOD fluxes taking into account their angular distributions in azimuth and elevation planes; - calculation of MMOD particles damage probabilities with the use of the ballistic equations taking into account chemical composition and layout of orbital spaceplane structure elements. The developed tools allow formulation of recommendations to reduce risk of an orbital spaceplane damage by MMOD particles to the required safety limits.