

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

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DAMAGE OF 5A06 WHIPPLE SHIELD CAUSED BY HYPERVELOCITY IMPACT OF AL 2017
SPHERE**Abstract**

Abstract: All long duration spacecraft in low-earth-orbit are subject to high speed impacts by meteoroids and space debris. Especially the menace by those particles which can not be observed should be put more importance. In order to get the damage mode and resist character of spacecraft shield structure by the high-velocity impact of space debris, numerical simulations of Al 2017 sphere projectiles impacting on 5A06 aluminum alloy Whipple shield at normal angle were carried out using the smoothed particle hydrodynamics (SPH) technique of AUTODYN hydro-codes. The results of 2D and 3D simulation were given. Compared with the high-velocity impact experiment in impact velocity (2-5.2 km/s), projectile diameter (4 mm, 6.35 mm) and bumper thickness (0.5 mm, 1.5 mm, 2 mm and 3 mm), the laws of penetration hole of bumper and damage of bulkhead were obtained. By analyzing the shapes and velocities characteristics of debris clouds in contrast with X photographs, the explanations for damage of bulkhead from the view of debris clouds were purposed. It is shown that the results of numerical simulations are in agreement with those of experiment. Furthermore, the high-velocity impact numerical simulations that velocities are up to 10 km/s were investigated. Key words: space debris; damage mode; high-velocity impact; numerical simulation; Whipple shield