Crack toughness testing of spacecraft carrying planes

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The study shows the results of testing high-speed impact interaction between the particle flux of the cosmic space meteoric background and satellites and finds it crucial to use materials with increased tear resistance. In our research we substantiated strength parameters of the spacecraft outer cover, those which are able to withstand the conditions of the space environment. To determine the duration of spacecraft safe operation, we determined the probabilities of meteor particles entering it. Findings of the research helped describe the effects arising from the movement of microparticles in the material, and present models of interaction between a solid particle and spacecraft shielding. The study provides experimental and analytical dependencies, identifies the main factors that are responsible for destruction of the spacecraft carrying planes structure, and estimates the effect of these factors on the spacecraft surface wear. To assess the crack toughness of superhard material for spacecraft, we used linear fracture mechanics in a wide temperature range.

Keywords: *penetration, microparticles, impact, structure, destruction, erosive wear, flow, spacecraft*

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