16th IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations - 16th IAA SYMPOSIUM ON SPACE DEBRIS (IP)

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DEBRIS FALLING FORECAST METHOD FOR SPACECRAFT DISINTEGRATION SEPARATION

Abstract

Spacecraft would reenter the atmosphere in the end of its lifetime which may disintegrate into small pieces in the atmosphere. The space debris generated after the disintegration would lead high risk when the survived debris touched the ground. To simulate the spacecraft disintegration separation process and accurately forecast the falling area is one of the way to reduce the damage risk. The aerodynamic affects the reenter process seriously, especially in the continuous flow regime. The aerodynamic force and heat are the chief factors that lead to disintegration, and the high dynamic pressure would lead to sharp attitude change or complex falling trajectory during the debris falling The numerical method based on the unstructured Cartesian gird has been found. which solved the N-S equations that coupled with the 6DOFs trajectory equations to simulate the disintegration separation problems. The method combined the numerical method for dynamic process and numerical emulation based on the static aerodynamic/dynamic characteristic database has been developed for the falling area forecast. A Mach 20 spacecraft disintegration separation at 60km was simulated by the method, the multi-bodies aerodynamic interference and the separation trajectory were predicted. The falling process was forecasted by the numerical emulation method based on the static aerodynamic database dynamic characteristic database when the debris went out of the influence domain. The method has well efficiency at the same time with the aerodynamic interference take into account, which is an high-efficiency disintegration separation and debris falling forecast method.