SPACE DEBRIS SYMPOSIUM (A6)
Poster Session (P)

Author: Mr. Zhenqi Niu
Beijing Institute of Aerospace Systems Engineering, China, niuzq07@163.com

Mr. Bing Zhang
China, niuzq07@163.com
Mr. Bo Tang
China, niuzq07@163.com
Mr. Hui Huang
China, niuzq07@163.com

ANALYSIS OF THE PROPELLANT SINKING PROCESS AT THE STATE OF WEIGHTLESSNESS FOR LIQUID ROCKET TANK

Abstract

Passivation process of last stage of launch vehicle is the main space debris mitigation measure among spacefaring powers. In order to achieve the task perfectly, the secondary start-up of the swing engine is necessary. The design of propellant sinking process is essential so as to improve the reliability of start-up. It is very difficult to conduct the experimental analysis of propellant sinking, so simulating calculation has become a very important way. In this paper, the nitrogen tetroxide tank was adopted as the object of study. A two-dimensional axisymmetrical model based on VOF (volume of fluid) method was set up to solve the unsteady process of propellant sinking. The validity of model was tested through the comparison with the experimental data. The acceleration of rocket was modeled through Fluent UDF, and the simulation results of propellant sinking process were attained, including several coefficients of surface tension and contact angles between solid and liquid. The scheme of propellant sinking design was proposed.