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EQUIVALENT MECHANICAL MODEL FOR PROPELLANT SLOSHING IN MICROGRAVITY

Abstract

A new method to establish the equivalent mechanical model of microgravity sloshing is investigated in this paper. A torsional spring is added to the traditional pendulum model to take into account the effects of surface tension. The parameters of the equivalent mechanical model are estimated by using the results of the engineering software Flow-3D. The numerical simulation is done at Bond numbers ranging from 0.001 to 100. The results indicates that the natural frequency of the first mode of the liquid is higher than that obtained by the traditional method without considering the capillary force, and the sloshing mass is smaller than that in high-g conditions. The accuracy of this method is verified by comparing the results calculated by the mechanical model to Flow-3D and previous studies.