

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Structures I - Development and Verification (Space Vehicles and Components) (1)

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THE EQUIVALENT MECHANICAL MODEL FOR SOLVING SPACECRAFT LARGE AMPLITUDE
LIQUID SLOSHING PROBLEM

Abstract

The development of vehicle capability brings growing command on large liquid tank. The disturbance brought by the liquid sloshing that generated in this kind of large liquid tank plays a non-negligible role to the spacecraft. In this paper, we illustrate a changing structure liquid sloshing probability model based on fluid dynamics under microgravity state, and use it as an equivalent model for large amplitude liquid sloshing. Then, the tank and the spacecraft are modeled together according to Lagrange method, in order to simulate dynamic disturbance during the spacecraft thruster working progress. The results prove the accuracy of this method by comparing it with the result of CFD method. This proposed equivalent dynamic model take less time to solve to the theoretical method and also requires less storage versus computational fluid dynamics, due to its lower complexity.