

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Experiments from Sub-orbital to Orbital Platforms (3)

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INVESTIGATION OF SLOSH DYNAMICS ON FLIGHT AND GROUND PLATFORMS

Abstract

The slosh dynamics in cryogenic fuel tanks under microgravity is a problem that severely affects the reliability of spacecraft launching. To investigate slosh dynamics and their effects on space vehicle dynamics three levels of testing are presently in progress. Platforms include a 3-DOF ground testing table, parabolic flights, sounding rockets and finally the International Space Station. Ground tests provide an economically viable platform for investigating rotational, translational, and coupled feed-back modes due to repeatable CNC motions. The parabolic flight campaign has conducted four successful flights aboard multiple aircraft using static and tethered slosh packages. Using the PANTHER II student designed rocket, a slosh package was launched as a payload. Finally with collaboration between Florida Institute of Technology and Massachusetts Institute of Technology SPHERES project, feedback tests using partially and fully filled propellant tanks will be conducted aboard the International Space Station. Motion data from all tests will be input to in house Dynamic Mesh Model to further establish confidence in the versatility and accuracy of the method.