Low-Gravity, Six Degree of Freedom Slosh Dynamics Experiment

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The Launch Services Program at the NASA Kennedy Space Center has identified the modeling of liquid propellant slosh in the upper stages of launch vehicles as a critical action item to ensure successful mission planning and execution. Slosh modeling and experimental results can not be found in the open literature for the scales and conditions relevant to upper-stages. The proposal seeks to develop a low-cost, yet highly instrumented slosh dynamics experiment, and to work with Sierra Lobo's CryoTracker thermal tape to make the first detailed measurements of slosh dynamics in appropriately sized containers under flow gravity conditions. The low gravity conditions will initially be simulated from a 4 story drop-tower and then with additional support from NASA KSC, the experiment will be flown on a specially equipped aircraft (Zero-G) to establish 30-60 seconds of highly reduced gravity levels (10^{-2}-10^{-3} of the value experienced on Earth). If awarded, this grant will be used solely to support 3-4 undergraduates and 1 MS level student. A cost match will be provided by NASA KSC and Florida Tech for hardware and software purchases.