

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Verification and In-Flight Experimentation (6)

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THE AERODYNAMIC DAMPING TEST OF ELASTIC LAUNCH VEHICLE MODEL IN TRANSONIC
FLOW**Abstract**

For control system design and dynamic load analysis, the aerodynamic damping of a hammerhead launch vehicle was tested at Mach numbers from 0.7 to 1.05 in transonic wind tunnel. A flexibly mounted scaled aeroelastic model which looks like a central aluminum tube was designed to simulate the full-scale vehicle mass ratio parameter and reduced frequency. The elastic model was supported on a sting by leaf springs at the node points of the first free-free mode. An electromagnetic shaker was used to excite the model in its elastic bending modes of vibration with the wind on. And the aerodynamic damping in each mode was determined by measuring the total damping with the wind on and subtracting from that value the structural damping ratio determined with the wind off. The ERA method was used to identify the damping of each mode with or without wind on. The experimental results showed that near mach 0.9 the aerodynamic damping became lower than the results of the mach number nearby.