SUBSONIC AND TRANSONIC WIND TUNNEL TESTING OF TWO INFLATABLE AERODYNAMIC DECELERATORS

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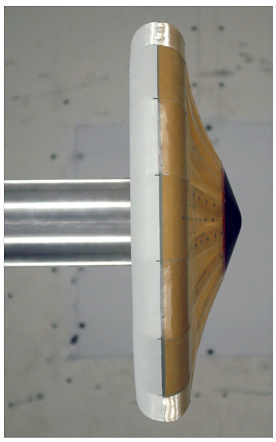
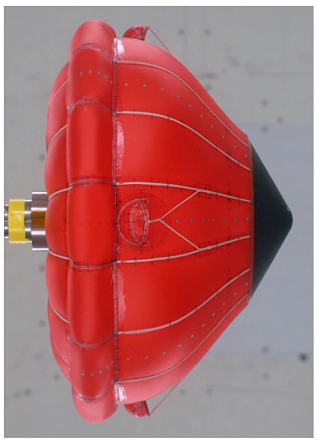
ABSTRACT

Two inflatable aerodynamic decelerator configurations were tested in the Transonic Dynamics Tunnel at the NASA Langley Research Center. The first configuration was a tension cone consisting of a textile tension shell attached to a rigid torus. Tension cone models were tested with and without a burble fence to determine the efficacy of the burble fence as a stabilization device. The second configuration was an isotensoid consisting of a textile, ram-air inflated envelope. Both models measured approximately 0.6 m in diameter. Tests were conducted at Mach numbers from 0.3 to 1.08 and Reynolds numbers from 0.59 to 2.46 million. The main objective of these tests was to obtain static aerodynamic coefficients at subsonic and transonic speeds to supplement supersonic aerodynamic data for these same two configurations. Results show that the axial force coefficients of both configurations increased smoothly from subsonic through transonic Mach numbers. Axial force coefficient of the tension cone increased from approximately 0.80 at Mach 0.3 to 1.27 at Mach 1.08. Axial force coefficient of the isotensoid increased from approximately 0.53 at Mach 0.3 to 0.87 at Mach 1.08. The tension cone experienced oscillations over the range of test conditions where as no significant oscillations were observed with the isotensoid model. Use of a burble fence on the tension cone did not appear to significantly reduce the oscillations. The torus of the tension cone tended to remain mostly aligned with the aeroshell (i.e., the rigid portion of the vehicle) whereas the envelope of the isotensoid tended to align itself with the oncoming flow.



Tension Cone Model Side View



Isotensoid Model Side View