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Longitudinal Static and Dynamic Stability of a Typical Reentry Body in Subsonic Conditions Using Computational Fluid Dynamics

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Abstract : Reentry from orbit is a critical phase in the entry trajectory. For a non-propulsive ballistic entry, static and dynamic stability play an important role in the trajectory, especially for the safe deployment of parachutes, typically at subsonic Mach numbers. Static stability of flight vehicles are being estimated through CFD techniques routinely. Advances in CFD software as well as computational facilities have enabled the estimation of the dynamic stability derivatives also through CFD techniques. Longitudinal static and dynamic stability of a typical reentry body for subsonic Mach number of 0.6 is predicted using commercial software CFD++ and presented here. Steady state simulations are carried out for $\alpha = 2°$ on an unstructured grid using SST k-ω model. Transient simulation using forced oscillation method is used to compute pitch damping derivatives.

Keywords : stability, typical reentry body, subsonic, static and dynamic
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