AEROTHERMODYNAMIC ANALYSIS OF SPACE RECOVERY EXPERIMENT CAPSULE AT MACH 6

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Abstract

The main focus of this paper is to compute the flowfield and assess the aerodynamic drag of Space Recovery Experiment (SRE) modules at freestream Mach 6 at zero angle of incidence. Time-dependent Compressible axisymmetric Navier-Stokes equations are numerically simulated using a finite volume discretization method with a three-stage Runge-Kutta time-stepping scheme. The computed shock stand-off distance, pressure ratio across normal shock and stagnation point heat flux are showing satisfactory results with the analytical solutions.Available wind tunnel data such as Schlieren images, oil flow pictures and fore-body aerodynamic drag are compared with numerical results.Influence of various ramp angles of the SRE modules on surface pressure, flow separation, skin friction coefficient, wall heat flux and fore and base aerodynamic drag coefficients are investigated using present numerical data.

Keywords: CFD, Compressible Flow, Reentry Module, Shock Wave, Hypersonic Flow, Boundary Layer, Base Flow