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THERMAL SHIELDING OF A SPHERE-CONE REENTRY VEHICLE

Abstract

The sharp nose of the fuselage will endure high heat flux when the reentry vehicle flies at high Mach number. Theoretical calculations and numerical computations are performed to obtain the heat flux distribution for the sphere–cone nose vehicle, and the results are compared with the experimental data from a wind tunnel at different flow conditions and attack angles. It can be shown that the present results agree well with the experimental data, and the proposed theoretical method for the sphere-cone nose vehicle is accurate and viable. The Ultra High Temperature Ceramics (UHTCs) are chosen as the materials for the nose thermal protection of the proposed hypersonic vehicle. And the thermal protection design requirements are identified by analyzing the material thickness limits and characteristics of several UHTCs along a trajectory, and finally the thermal protection system for the sphere–cone nose vehicle is optimized for the specific trajectory.