



Hypersonic Aerodynamics and Heat Transfer of Re-Entry Space Vehicles and Planetary Probes (Hardback)

By S. V. Utyuzhnikov, G. A. Tirskiy

Begell House Publishers Inc., U.S., United States, 2013. Hardback. Condition: New. Language: N/A. Brand New Book. Presents the results of theoretical and experimental studies of the problems of super/hypersonic flows around the models of real space vehicle configurations such as Buran -orbiter, winged cone (airplane-like body), Clipper space vehicle, and the Martian planetary probe. Theoretical analysis is based on solution 2/3D Navier- Stokes equations and their simplified asymptotic models with account for equilibrium and nonequilibrium chemical reactions taking place at the background of relaxation of excited internal energy modes of the particles in the shock layer and on the vehicle surface. Exact and simple relationships for the transport of species mass and heat are derived from rigorous kinetic theory for multicomponent mixtures of gases and plasma with different diffusion characteristics of the species (governing relations - thermodynamic parameter gradients expressed through the fluxes) as well as velocity slip, temperature and species concentration jumps boundary conditions for the surfaces of finite catalycity in multicomponent chemically and thermally nonequilibrium gas flow. Phenomenological and kinetic models are developed for heterogeneous catalytic reactions on the thermal protection materials of the space vehicles entering Earth and Mars atmospheres along gliding trajectories. The problem of multicomponent thermally and chemically...

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