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Supersonic Flow Past a Bi-Conic Nose Cone: A Computational Parametric Study

The paper presents a complete computational study of a flow passed over a bi-conic nose cone at a Mach number of 2 at a zero angle of attack. This research focuses on optimizing the bi-conic nose cone design parameters to minimize the aerodynamic drag and heating. It has been found that bi-conic nose cones with a lower semi-cone angle and a cone base ratio of 0.25 produce the least amount of drag. To ascertain its impact on aerodynamic drag, a thorough comparison of the flow/shock characteristics for different cone base ratios as well as semi-cone angles of bi-conic nose cone was carried out. A regression study for a bi-conic nose cone led to derive an empirical correlation, which shows that the overall drag coefficient is mostly dependent on the cone base ratio as well as semi-cone angles of first and second nose cones. Overall, this study shows that in order to achieve greater drag reduction and heating in hypervelocity vehicles, bi-conic nose cones at lower cone base ratio with a lower semi-cone angle are favored.

Bi-conic nose cone, supersonic flow, drag, cone base ratio, aerodynamics