Steady Propagation Speed for Ram Accelerators[1]

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Abstract

The work of Grismer and Powers [5], which considered the flow of an inviscid, supersonic, reactive, calorically perfect ideal gas over an unconfined symmetric planar double wedge configuration is extended to model flows over such double wedges which are also confined by a surrounding cowl. Such a geometry better represents the physical characteristics of experimental ram accelerators, in which projectiles have been accelerated to over 3000 $\frac{m}{s}$. The model employs finite rate chemistry with simple one-step Arrhenius kinetics. An unsteady numerical code which uses an explicit Roe scheme for shock capturing is used to solve for the entire flow field surrounding the wedge configuration. Flow speeds which give rise to a force balance on the wedge configuration are identified as the upper bounding terminal velocity.

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[5]Grismer, M. J., and Powers, J. M., 1995, "Calculations for Steady Propagation of a Generic Ram Accelerator Configuration," *Journal of Propulsion and Power*, Vol. 11, No. 1, pp. 105-111.