Plasma-Based Control of High-Speed Airflow and Combustion

Thursday, May 1, 2014, 3:30P.M.

Lower Level Auditorium, Geddes Hall

Refreshments served at 3:00 p.m. in the Geddes Hall Coffee House

The seminar will address key results of recent experimental studies demonstrating successful use of nonequilibrium plasmas for efficient control of flow structures, flow parameters, and rates of chemical reactions in high-speed reacting flows. This field is commonly referred to as Plasma Aerodynamics.

The principal focus of this work is on the effect of high-speed flows on specific properties of electrical discharges, as well as on the phenomena controlling the reverse effect of the plasma on the flow. The general approach to this class of problems is based on identification and use of several key physical mechanisms of interaction of electric discharges with the flow: Joule heating, body forces (including electrostatic and magnetohydrodynamic interactions), and plasmachemical activation of reacting gas mixtures. Controlling the plasma properties, such as strongly inhomogeneous spatial structures, non-equilibrium chemical composition, and unsteady behavior allow considerable reduction of required plasma energy budget while still producing a significant effect on the flow.

The results of several laboratory experiments are discussed, with specific emphasis on three major issues: (1) specific properties of weakly-ionized plasma relevant to flow control; (2) plasma-based flameholding in supersonic flows; and (3) mixing enhancement by highly transient electric discharges. Unresolved critical issues in the field of plasma-flow interaction, as well as potentially promising approaches, are also discussed.

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If you are interested in meeting individually with Dr. Leonov, please contact Linda at 631-5431.