

MECHANICAL ENGINEERING DEPARTMENT  
ME/IE 8773-8774

THERMODYNAMICS AND HEAT TRANSFER DEPARTMENT SERIES

Topic: PLASMA TECHNOLOGY

Host: Joachim V.R. Heberlein

**Can Plasma Improve High Speed High Altitude Aerospace Vehicle Design?**

by

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**Propulsion & Power Directorate**

**Air Force Research Laboratory**

**Wright-Patterson Air Force Base, OH 45324**

**Wednesday, March 8, 2006**

**3:30-5:00 p.m.**

**Room 1130 ME**

Coffee and refreshments will be available at 3:15 p.m. in Room 1130 ME before the seminar

**ABSTRACT** — A high speed, high altitude aerospace vehicle design requires optimization of aerodynamics drag, rapid actuation for flow control, and an efficient propulsion system, which can generate thrust to overcome drag and gain speed. For a flight path at a constant altitude, the aerodynamic drag increases as  $M^2$  and the airframe surface heating as  $M^3$ , where  $M$  is the flight Mach number. We will discuss some of the potential applications of gas discharges, which have recently shown considerable promise for boundary layer control, plasma assisted ignition, combustion enhancement, and flame holding for conventional combustors. We will also present some experimental results on plasma-shock interactions in short pulse excited dielectric barrier discharges. These measurements were performed to assess the potential application of plasma-shock interactions for boundary layer flow control. We will also discuss the effect of pressure scaling on volume distributed radical production efficiency by pulsed plasmas and its impact on both ignition delay reduction and flame holding under adverse flow conditions.

**BIO** — **Dr. Biswa Ganguly** has been working as a Research Physicist in the plasma physics group at the Propulsion & Power Directorate of the Air Force Research Laboratory for the past 25 years. The research areas include applied atomic, molecular and optical physics, low temperature plasma physics and plasmadynamics. Current research topics of interest are: scaling properties of high reduced electric field short pulse excited plasmas, flow control through plasma-shock interactions, rf, direct pulsed and dielectric barrier discharges for high flux photons, radicals and atom source development for aerospace applications.

Informal Faculty Luncheon: Wednesday, March 8, 2006, 12:00 noon. Meet in 1100 ME and walk to lunch with other faculty. Dr. Ganguly will be able to attend.