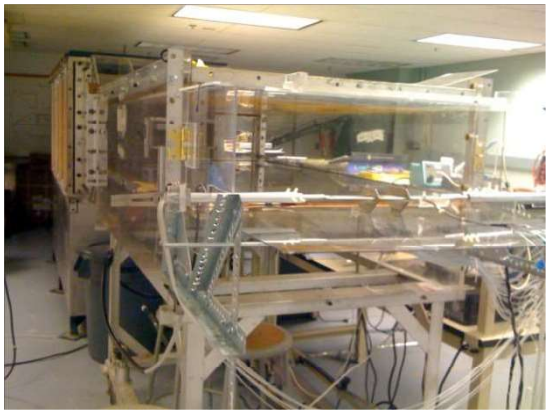
Mechanical/Aeronautics Sustainability Project

Ion Flow

Mission Statement

The mission was to characterize ionized gas induced flow devices to re-energize boundary layer flow over a curved surface and prevent flow separation.



Synopsis

The complete understanding of air flow in turbines and jet engines is an important area of interest in achieving fuel efficiencies. The elimination of air turbulence, separation, over surfaces is highly desired. This team's primary objective was to take extensive data to characterize the relationship between flow separation and the use of a plasma *actuator* to prevent this separation over a curved and flat surfaces.

Wind tunnel equipment was fabricated that employed a positive bias constant voltage DC plasma *actuator* to prevent flow separation over surfaces. Experiments were conducted to investigate the relationship between separation points along a constant curvature, free stream velocity, actuator current density, electrode spacing, and distance of an electrode stage to an unmodified separation point.

Experiments consistently showed decreases in static pressure along the surface with the actuator on when compared to the values of an unmodified boundary layer. Separation is inevitable; however anything done to delay the separation would have positive effects on any flow device. The data collected demonstrated which parameters affected a delay.

Adding additional stages of actuators to prevent separation will be the focus of the research for the 2010-2011 academic year

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