Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Velocity and Scalar Measurements of Strut-Based Hypermixing Geometries in a Mach 3 Flow[1] ROSS BURNS, NOEL CLEMENS, The University of Texas at Austin — Strut-based fuel injection with hypermixing exhibits great potential as a fuel-injection strategy for future scramjet engine design. Hypermixing entails the introduction of strong streamwise vorticity by means of geometrically-induced pressure gradients at the trailing edge of the strut; however, these complex flowfields are not well understood. An experimental investigation is being conducted on the flowfield characteristics of several strut-based hypermixers in a Mach 3 freestream. The hypermixing flowfields are generated from an injection pylon with interchangeable trailing-edge geometries including compressive and expansive wedges. Particle image velocimetry (PIV) in conjunction with two scalar visualization techniques are used to obtain velocity and scalar field data. The scalar imaging techniques include two-photon absorption planar laser-induced fluorescence (PLIF) of krypton gas, which simulates fuel injection into the wake, and planar laser scattering (PLS) from condensed carbon dioxide fog, which marks the outer flow structures. The velocity and scalar data reveal details of the underlying flow physics as well as the turbulent mixing characteristics.

[1]This work was supported by NASA under cooperative agreement NNX08AB41A.

Ross Burns
The University of Texas at Austin

Date submitted: 05 Aug 2011 Electronic form version 1.4