Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

**Impact of Liquid Fuel Boundary Condition and Nozzle Geometry on Liquid Jet in Crossflow Atomization**[1] SINA GHODS, MARCUS HERRMANN, Arizona State University — The atomization of a liquid jet by a high speed cross-flowing gas has many applications such as gas turbines and augmentors. The mechanisms by which the liquid jet initially breaks up, however, are not well understood. Experimental studies suggest the dependence of spray properties on operating conditions and nozzle geometry. Detailed numerical simulations can offer better understanding of the underlying physical mechanisms that lead to the breakup of the injected liquid jet. In this work, we present detailed numerical simulation results of turbulent liquid jets injected into turbulent gaseous cross flows for different liquid fuel boundary conditions and injector geometries. We employ a finite volume, balanced force fractional step flow solver to solve the Navier-Stokes equations coupled to a Refined Level Set Grid method to follow the phase interface. To enable the simulation of atomization of high density ratio fluids, we ensure discrete consistency between the solution of the conservative momentum equation and the level set based continuity equation by employing the Rescaled Conservative Momentum method. We analyze the impact of liquid jet turbulent fluctuations and injector geometry on different jet properties such as jet penetration and generated drop sizes.

[1]This work was supported by NSF grant number CBET-0853627

Sina Ghods
Arizona State University

Date submitted: 02 Aug 2012 Electronic form version 1.4