Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Computational Fluid Dynamics Study of the Effect of Turbulence and Two-Phase Flow on Flow Blurring Atomization[1] JORGE RAMON, Florida International University, WILLARD SCHREIBER, University of Alabama
— A novel atomization mechanism known as Flow Blurring (FB) mixes air with liquid to produce a fine spray. While the geometry of Flow Blurring is simple, the fluid mechanics of the two-phase mixing is complicated. CFD modeling of the Flow Blurring injector has been attempted previously assuming laminar one phase mixing between two different density gases. The objective of the present work was to study the effect of adding turbulence and two-phase flow to the previous CFD model. The k-ε, k-ω, and Reynolds stress models were investigated for representing turbulence. The k-ε realizable model produces the best results both from the standpoint of physical realism and numerical convergence and allows the Reynolds number based on flow characteristics of the FB injector to be increased by a factor of six. Three models of two-phase flow were examined: Volume of Fluid, Mixture, and Eulerian, none of which satisfactorily simulated two-phase mixing in the FB atomizer.

[1]Work performed under REU site sponsored by NSF grant EEC0754117.

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Date submitted: 23 Jul 2009 Electronic form version 1.4