Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Flow Structure of a Fully Modulated Inclined Jet in Crossflow
BERTRAND DANO, JAMES LIBURDY, Oregon State University — The mean and turbulent flow characteristics of a fully-modulated 45 degree streamwise inclined jet in crossflow are investigated. Results are obtained using 3D renderings of Stereo-Particle Image Velocimetry (SPIV) data for all three velocity components. The near field flow structure and the interaction with the crossflow are investigated based on ten streamwise slices of data ranging from the jet centerline spanning outward to two jet diameters. The effects of three parameters are studied: the jet Reynolds number, the pulsing frequency and the pulse duty cycle. The mean velocity ratio is defined as the mean jet exit velocity divided by the crossflow velocity, and is kept constant for all cases presented. The duty cycle is varied from 0.5 down to 0.125, such that the mean exit velocity increases in order to maintain the same average mean velocity ratio. The data are further analyzed using a vortex detection algorithm to locate the positions and strength of vortical structures in vertical streamwise plans. Results of the mean velocity field, vorticity, and Reynolds stresses, all combined with streamlines and vortex identification plots are presented. It is found that the duty cycle has a large effect on the general nature of the flow structure interaction between the jet and crossflow, which contributes to the vortex patterns identified within the flow.

James Liburdy
Oregon State University

Date submitted: 08 Aug 2005 Electronic form version 1.4