Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Experimental Study of Airborne Contaminant Migration in an Aircraft Cabin Model[1] STEPHANE POUSSOU, PAUL SOJKA, MICHAEL PLESNIAK, Purdue University — The cabin air ventilation system in wide body jetliners is designed to provide a comfortable and controlled environment for passengers. Inside the cabin, the air flows continuously from overhead vents into sidewall exhausts, forming a circular pattern designed to minimize cross flow between adjacent seat rows. However, spreading of gaseous or particulate contaminants is possible when flight attendants or passengers walk along an aisle, perturbing the ventilation flow. Such unsteady flow perturbations have been found to alter the cabin air distribution and quality. A better fundamental understanding of the turbulent transport phenomena is needed to improve air quality monitoring and control systems and to validate numerical simulations. The velocity field in a 15:1 model of a simplified aircraft cabin is probed to investigate the wake of a rectangular body moving through a steady two-dimensional flow at a Reynolds number (based on body height) of the order of 50,000. Planar Laser Induced Fluorescence is used to visualize wake structure and scalar contaminant transport. The interaction between the wake and the ventilation flow is measured with PIV. The data are compared to numerical studies of cabin airflows in the literature.

[1]supported by Federal Aviation Administration.

Michael Plesniak
Purdue University

Date submitted: 29 Jul 2007 Electronic form version 1.4