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Experimental Model of Contaminant Transport by a Moving Wake Inside an Aircraft Cabin[1] STEPHANE POUSSOU, PAUL SOJKA, MICHAEL PLESNIAK, Purdue University — The air cabin environment in jetliners is designed to provide comfortable and healthy conditions for passengers. The air ventilation system produces a recirculating pattern designed to minimize secondary flow between seat rows. However, disturbances are frequently introduced by individuals walking along the aisle and may significantly modify air distribution and quality. Spreading of infectious aerosols or biochemical agents presents potential health hazards. A fundamental study has been undertaken to understand the unsteady transport phenomena, to validate numerical simulations and to improve air monitoring systems. A finite moving body is modeled experimentally in a 10:1 scale simplified aircraft cabin equipped with ventilation, at a Reynolds number (based on body height) of the order of 10,000. Measurements of the ventilation and wake velocity fields are obtained using PIV and PLIF. Results indicate that the evolution of the typical downwash behind the body is profoundly perturbed by the ventilation flow. Furthermore, the interaction between wake and ventilation flow significantly alters scalar contaminant migration.

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