Engineers devise shoe sampling system for detecting trace amounts of explosives

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The ability to efficiently and unobtrusively screen for trace amounts of explosives on airline passengers could improve travel safety – without invoking the ire of inconvenienced fliers. Toward that end, mechanical engineer and fluid dynamicist Matthew Staymates of the National Institute of Standards and Technology in Gaithersburg, Maryland, and colleagues have developed a prototype air sampling system that can quickly blow particles off the surfaces of shoes and suck them away for analysis.

The NIST engineers developed several different versions of the system. "One particular device is a kiosk-style instrument that people step into, never having to physically remove their shoes for sampling," Staymates explains. "Air jets are located in strategic locations and used to dislodge particles from the shoe surface, and a large blower establishes a bulk flow field that ensures all liberated particles are transported in the appropriate direction."

In order to be used commercially, the sampling system – which can collect particles in just 6 to 7 seconds – would have to be combined with a particle collection device and a chemical analyzer, Staymates says: "Incorporating a particle collection device and chemical analyzer would certainly be possible in the current prototype, but it was outside of the scope of the project. NIST's role was to uncover the fundamental connection between fluid dynamics and trace aerodynamic sampling, and use our findings to help in the development of next-generation sampling approaches."

Creating a finished marketable device, he says, is "a job for private industry."

More information: Staymates will describe the prototype device in a talk at the APS Division of Fluid Dynamics Meeting, which will take place Nov. 20-22, 2011, at the Baltimore Convention Center in the historic waterfront district of Baltimore, Maryland. Abstract: absimage.aps.org/image/MWS_DFD11-2011-000062.pdf

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