Particle Image Velocimetry Measurements in an Anatomically-Accurate Scaled Model of the Mammalian Nasal Cavity CHRISTOPHER RUMPLE, MICHAEL KRANE, JOSEPH RICHTER, BRENT CRAVEN, Penn State University — The mammalian nose is a multi-purpose organ that houses a convoluted airway labyrinth responsible for respiratory air conditioning, filtering of environmental contaminants, and chemical sensing. Because of the complexity of the nasal cavity, the anatomy and function of these upper airways remain poorly understood in most mammals. However, recent advances in high-resolution medical imaging, computational modeling, and experimental flow measurement techniques are now permitting the study of respiratory airflow and olfactory transport phenomena in anatomically-accurate reconstructions of the nasal cavity. Here, we focus on efforts to manufacture an anatomically-accurate transparent model for stereoscopic particle image velocimetry (SPIV) measurements. Challenges in the design and manufacture of an index-matched anatomical model are addressed. PIV measurements are presented, which are used to validate concurrent computational fluid dynamics (CFD) simulations of mammalian nasal airflow. Supported by the National Science Foundation.

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