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Flow Visualization Experiments in a 4:1 Scale Model of the Canine Nasal Cavity MICHAEL HARGATHER, MICHAEL LAWSON, GARY SETTLES, Penn State Gas Dynamics Lab — An anatomically-correct 4:1 scale model of the canine nasal cavity is used to study flow patterns in the complex nasal airways through dye-streak flow visualization. The nasal cavity geometry was obtained from magnetic resonance imaging (MRI) scans and the model was constructed in sections from a transparent material using a rapid prototyping technique. We believe this model represents the first anatomically-realistic reproduction of the canine nasal cavity, allowing the nasal flowfield to be experimentally studied at a level of detail not previously possible. Olfactory and respiratory flows are observed to take separate paths through the nasal cavity. Respiratory flow through the maxilloturbinates completely bypasses the olfactory region, which amounts to a "side-sampler." A single airway conducts airflow into the olfactory region, whence it slowly filters forward and eventually exits the nasal cavity. The residence time of airflow in the olfactory region varies significantly depending on the specific flowpath taken. The results compare well with computational fluid dynamics (CFD) simulations performed using the same nasal geometry.

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