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Airway Resistance and Energy Budget of Airflow in a CT-Based Human Lung Model.[1] CHING-LONG LIN, Dept. of Mechanical and Industr. Engr., IIHR-Hydroscience & Engr., Univ. of Iowa, MERRYN H. TAWHAI, Bioengineering Inst., Univ. of Auckland, ERIC A. HOFFMAN, Dept. of Biomedical Engr., Medicine and Radiology, Univ. of Iowa — An in-house characteristic-Galerkin finite element code is utilized to study airway resistance and energy budget of airflow in 5-7 generations of a CT-based human lung model. The energy budget of airflow in the trachea and main bronchi is further analyzed and compared with Pedley's airway resistance formula. The results show that most airways exhibit an asymptotic relationship of pressure drop proportional to mass flux with a power varying from 2 to 1.6. The maximum predicted airway resistance is found at the fourth airway generation with a value of 0.09 cm-H2O/l/s at peak inspiration. This is in excellent agreement with existing experimental data. According to the pressure drop-mass flux relationship, the five lobes have similar collective flow characteristics in the studied normal subject. The effect of turbulent laryngeal jet on the energy budget and airway resistance is also discussed.

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