ProtoFlow

Salasidis, David (School: Herzliah High School)

Flow meters that test lung function requires a device to measure airflow. Currently used devices are often flawed (vane anemometers) or are expensive and difficult to clean (pneumotachs). Pneumotachs use meshed screens or arrays of capillary tubes that maintain laminar flow as air passes through, creating a pressure difference linearly proportional to airflow. This project aims to design an innovative, low-cost pneumotach using aligned stacked prototype printed circuit boards (PCBs) that is easily dismantled and cleaned. A flow meter was built using 3D-printed input and output enclosures on either side of the PCBs. A pressure sensor was connected across the PCBs so the electronic board can register the pressures generated across the pneumotach when air is blown through it. To calculate the flow volumes and peak pressure, a correlation constant (flow versus pressure) had to be determined to allow the program to complete the calculations. The electronics were mounted onto the enclosure, including an LCD used to display the lung functions. A commercial flow meter was used to test and measure the airflow while the device measured the pressure generated. The pneumotach generated an appropriate pressure difference. A linear correlation between airflow and pressure was observed (R 0.998). This data was used to generate a more accurate correlation constant. In conclusion, stacked PCBs can be used to create a pneumotach, demonstrating a linear relationship between flow and pressure. This design is low cost, and easy to maintain.

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