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Characteristics of Single Dielectric Barrier Discharge Plasma Actuators at Sub-atmospheric Pressures CHAN YONG SCHUELE, THOMAS CORKE, University of Notre Dame — Experiments were performed to determine the effect of static air pressure on the performance of single dielectric barrier discharge (SDBD) plasma actuators. This was motivated by the need for expanding the validity of numerical models for plasma actuators to include changes in air properties. The performance metric chosen for the actuator was the amount of the thrust force generated by the actuator. The experimental setup consisted of a plasma actuator mounted on a flat surface that was standing vertically on a digital scale placed in a vacuum vessel. The dependence of the generated thrust on the air pressure was then documented, for a range of input ac voltages and frequencies, the area of the covered electrode, and the dielectric characteristics. The pressures ranged from atmospheric to 10in-Hg absolute. As the pressure was lowered, the threshold voltage to ionize the air decreased, thereby generating thrust at lower voltages. Up to the maximum thrust limit, the thrust was proportional to the applied voltage to the 7/2 power previously observed at atmospheric pressure. The maximum thrust could be limited by having too small of a covered electrode area, or by a transition from a diffuse plasma to concentrated filaments. As the pressure was lowered, filaments occur at lower input voltages. A summary map of operation is presented.

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