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More Insight of Piezoelectric-based Synthetic Jet Actuators[1]
KEVIN HOUSLEY, MICHAEL AMITAY, Rensselaer Polytechnic Institute — Increased understanding of the internal flow of piezoelectric-based synthetic jet actuators is needed for the development of specialized actuator cavity geometries to increase jet momentum coefficients and tailor acoustic resonant frequencies. Synthetic jet actuators can benefit from tuning of the structural resonant frequency of the piezoelectric diaphragm(s) and the acoustic resonant frequency of the actuator cavity such that they experience constructive coupling. The resulting coupled behavior produces increased jet velocities. The ability to design synthetic jet actuators to operate with this behavior at select driving frequencies allows for them to be better used in flow control applications, which sometimes require specific jet frequencies in order to utilize the natural instabilities of a given flow field. A parametric study of varying actuator diameters was conducted to this end. Phase-locked data were collected on the jet velocity, the cavity pressure at various locations, and the three-dimensional deformation of the surface of the diaphragm. These results were compared to previous analytical work on the interaction between the structural resonance of the diaphragm and the acoustic resonance of the cavity.

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