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Exploration of Piezoelectric Bimorph Deflection in Synthetic Jet Actuators KEVIN HOUSLEY, MICHAEL AMITAY, Rensselaer Polytech Inst — The design of piezoelectric bimorphs for synthetic jet actuators could be improved by greater understanding of the deflection of the bimorphs; both their mode shapes and the resulting volume change inside the actuator. The velocity performance of synthetic jet actuators is dependent on this volume change and the associated internal pressure changes. Knowledge of these could aid in refining the geometry of the cavity to improve efficiency. Phase-locked jet velocities and maps of displacement of the surface of the bimorph were compared between actuators of varying diameter. Results from a bimorph of alternate stiffness were also compared. Bimorphs with higher stiffness exhibited a more desirable (0,1) mode shape, which produced a high volume change inside of the actuator cavity. Those with lower stiffness allowed for greater displacement of the surface, initially increasing the volume change, but exhibited higher mode shapes at certain frequency ranges. These higher node shapes sharply reduced the volume change and negatively impacted the velocity of the jet at those frequencies. Adjustments to the distribution of stiffness along the radius of the bimorph could prevent this and allow for improved deflection without the risk of reaching higher modes.

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