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Influence of Cavity Shape on Synthetic Jet Performance[1] MARK FEERO, PHILIPPE LAVOIE, PIERRE SULLIVAN, University of Toronto — A synthetic jet is a fluidic actuator that transfers linear momentum to the surroundings by alternately ingesting and expelling fluid from a cavity containing an oscillating diaphragm. This work presents the first experimental effort to validate the limited number of numerical investigations that have postulated synthetic jets are insensitive to cavity shape. Three axisymmetric synthetic jets with different cavity shapes were used to examine jet performance while keeping other parameters constant such as cavity volume, nozzle length and orifice diameter. Cylindrical, conical and contraction shaped cavities were considered. The cavity pressure and velocity at the orifice exit plane were measured using a microphone and hot-wire, respectively. The results demonstrated that for several operating conditions near Helmholtz resonance of the cavity, noticeable differences were observed in the radial velocity profiles between the three geometries. The Reynolds number decreased sequentially from the cylindrical to conical to contraction cavity. The momentum flux, which is relevant in flow control applications, followed the same trend. In general, the experimental results showed that synthetic jet performance is, to some degree, dependent on cavity shape.

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