Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

The effect of orifice shape on synthetic jet efficiency BARTON SMITH, DAVID NANI, Utah State University Mechanical and Aerospace Engineering — Many studies have demonstrated that synthetic jets can be sensitive to the cavity or orifice shape. In most cases, the performance of the jet with different configurations is compared for fixed driver input voltage or fixed driver displacement. Neither of these quantities accurately reflect the efficiency of the actuator. A sharp inside edge of a synthetic jet orifice can result in separated flow and increased momentum flux (due to the decreased flow area) for a fixed driver displacement. This can lead one to believe that efficiency has been improved, when, in fact, much more power was required for the driver. Similarly, altering the driving waveform from a sinusoid has been reported to improve efficiency. Acoustic power, which is the time-average of volume flow rate through the orifice multiplied by the driving pressure, accurately accounts for the amount of power required to drive the actuator. In this study, we study the efficiency of a round synthetic jet actuator as a function of the radius of the inside of the orifice. Simultaneous PIV at the jet exit and cavity pressure measurements are used to compute the acoustic power required to drive the actuator. The resultant momentum flux of the jet is used as a measure of strength of the jet. Results are obtained for a range of Reynolds numbers and displacement amplitudes. Not surprisingly, it is found that rounding the inside of the orifice improves the efficiency of a synthetic jet.

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Date submitted: 03 Aug 2011 Electronic form version 1.4