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Modelling and Analysis of Synthetic Jet Actuators: Multiphysics versus Analytical BARIS GUNGORDU, MARK JABBAL, ATANAS POPOV, Univ of Nottingham — This study concentrates on the modelling of piezoelectrical-diaphragm driven synthetic jet actuator. Two different models, analytical and CFD-type Multiphysics, were studied and then compared against two sets of in-house experimental data for their jet velocity one for opposite diaphragm-orifice configuration and the other for adjacent diaphragm-orifice configuration. Overall, both models have successfully predicted the shape of the velocity response. The Multiphysics simulation has estimated the peak jet velocity with a difference of 0.3 m/s and 0.8 m/s for Case 1 and 2, respectively. The analytical model has estimated the resonant frequency with a shift of 100 Hz for both cases. There is a difference in the peak jet velocity of 2.9 m/s and 1.2 m/s at the mechanical resonance for Case 1 and 2, respectively. Multiphysics simulation has the advantage of flow visualization including vortex formations and in-detailed flow physics investigation such as formation criterion and Stroke length. The analytical model has the advantage of producing fast results to give an idea of the expected jet velocity scale with a limited number of parameters.

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