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Flow Physics and Scaling for Discrete Jet Forcing on a Wall-Mounted Hump CHRISTOPHER OTTO, BENJAMIN CHAMPION, JESSE LITTLE, The University of Arizona, RENE WOSZIDLO, The Boeing Company — An experimental study is conducted to explore flow physics and scaling parameters (e.g., aspect ratio, exit area, spacing) for various types of fluidic oscillators in support of the development of active flow control technology. Various actuation modules are designed, built and tested on an existing model of the NASA hump geometry. Experiments are carried out at a Reynolds numbers of 1.0 x 10^6 (Ma = 0.09). Time-averaged pressure measurements are conducted along both the chord and span of the model. Stereoscopic PIV is performed downstream of the actuation location to investigate the underlying control mechanisms in detail. Flow control using various spatially distributed fluidic oscillators was applied for spacings of $\Delta z/c$ = 4.55% & 9.09%. Performance curves were compared based on a momentum, mass flow, and energy coefficient, and revealed regions of different efficiency. A higher slope of the performance curve was found for lower momentum inputs (separation control), whereas a smaller slope was found for higher inputs (circulation control). Counter-rotating vortex pairs in the time-averaged field are the main driver to enhance mixing and thereby reduce separation especially at low momentum input.

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