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A Comparison Between Oscillatory and Steady Suction for Airfoil Separation Control[1] AVRAHAM SEIFERT, BAR MIZRAHI1, Tel Aviv University — This paper presents a direct comparison between two classes of flow control actuators. The first actuator uses steady suction while the other actuator uses unsteady suction. Both use also pulsed blowing (PB) downstream of the suction locations. Both actuators were installed on a custom-designed and 3D printed airfoil, specifically designed to have two distinct separation locations. At the upstream location, four suction holes each are placed symmetrically to the chord and are connected either to steady or unsteady suction devices. Further downstream, where the boundary layer tends to separate again, a pair of PB slots are placed, connected each pair to each device, again symmetrically to the chord line. The airfoil is mounted on a load cell and aerodynamic forces are measured at low speeds. The actuators were previously calibrated on a benchtop setup. Tests are conducted first in the absence of actuation, at low Reynolds numbers (up to 200K), then the two actuation concepts are directly compared. The range of parameters in which unsteady suction has benefits over steady suction for separation control are identified. Actuation energy expenditure is shown to be significantly lower when using unsteady suction.

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