

Abstract Submitted
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Passive Boundary Layer Separation Control on a NACA2415 Airfoil at High Reynolds Numbers AGASTYA PARIKH, MARCUS HULTMARK, Princeton University — The design and analysis of a passive flow control system for a NACA2415 airfoil is undertaken. There exists a vast body of knowledge on airfoil boundary layer control with the use of controlled mass flux, but there is little work investigating passive mass flux-based methods. A simple duct system that uses the upper surface pressure gradient to force blowing near the leading edge and suction near the trailing edge is proposed and evaluated. 2D RANS analyses at $Re_c \approx 1.27 \times 10^6$ were used to generate potential configurations for experimental tests. Initial computational results suggest drag reductions of approximately 2 – 7% as well as lift increases of 4 – 5% at $\alpha = 10.0^\circ$ and $\alpha = 12.5^\circ$. A carbon composite-aluminum structure model that implements the most effective configurations, according to the CFD predictions, has been designed and fabricated. Experiments are being performed to evaluate the CFD results and the feasibility the duct system.

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