

Abstract Submitted
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Large-eddy simulation of flow separation over an airfoil with synthetic jet control¹ DONGHYUN YOU, PARVIZ MOIN, Center for Turbulence Research, Stanford University — We have performed large-eddy simulation of separation control for flow over an airfoil and evaluated the effectiveness of synthetic jets as a control technique. The flow configuration consists of flow over a NACA 0015 airfoil at Reynolds number of 896,000 based on the airfoil chord length and freestream velocity. A small slot across the entire span connected to a cavity inside the airfoil is employed to produce oscillatory synthetic jets. Detailed flow structures inside synthetic jet actuator and the synthetic jet/cross-flow interaction have been simulated using an unstructured finite volume large-eddy simulation solver. Simulation results have been compared with the experimental data, and qualitative and some quantitative agreements have been obtained for both uncontrolled and controlled cases in terms of mean pressure coefficients and wake profiles. As in the experiment, the present large-eddy simulation confirms that the synthetic jet actuation effectively delays the onset of flow separation and causes a significant increase in the lift coefficient.

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