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Control of dynamic stall using zero-net-mass-flux oscillatory jets SEONGHYEON HAHN, DONGHYUN YOU, PARVIZ MOIN, Center for Turbulence Research, Stanford University — Recently, the zero-net-mass-flux oscillatory jets or synthetic jets have proven to be a promising tool for controlling various separated flows. The objective of the present study is to explore the applicability of synthetic jets for attaining lift enhancement of a pitching airfoil suffering from dynamic stall. For this purpose, numerical simulations of flow over a sinusoidally pitching NACA0015 airfoil are conducted at the chord Reynolds number of 90,000. The uncontrolled flow in this case shows mild stall and is dominated by a series of small shear-layer vortices from leading-edge separation, where synthetic jets actuated at the 12% chord downstream location from the leading edge lead to mean lift enhancement. At a higher Reynolds number of  $3 \times 10^5$ , unsteady RANS employing the  $v^2-f$  model predicts deep stall with the generation of a large-scale leading-edge vortex. In this case, synthetic jets are deficient in controlling the grossly moving separation and necessitate a more sophisticated actuation algorithm. Results from an ongoing large-eddy simulation at  $Re = 3 \times 10^5$  and the predictive capability of URANS in synthetic-jet control applications will also be discussed.

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