Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Large eddy simulation with periodic forcing of low-frequency flow oscillation near airfoil stall. JABER ALMUTAIRI, Assistant Professor, College of Technological Studies, Shuwaikh,70654, IBRAHEEM ALQADI, ELTEYEB ELJACK, Assistant Professor, King Abdulaziz University, Jeddah, Saudi Arabia, 21589 — The effect of periodic forcing on the airfoil performance is investigated in the present study. A large eddy simulation with a flow control technique of periodic forcing is used to remove the low-frequency flow oscillation of the NACA-0012 airfoil at a Reynolds number of 130,000 and incidence of 11.5° and thus enhancing the performance of the airfoil. The periodic forcing is introduced into the laminar boundary layer just upstream of the natural flow separation to produce perturbations in the near wall region. The amplitude of the forcing is set to be 0.3% of the freestream velocity while several different frequencies based on the detected frequency of the vortex trailing edge revealed from the simulation of the natural low-frequency flow oscillation are used. It was found that periodic forcing removes the low-frequency flow oscillation, and as a consequence improve the performance of the airfoil. It has been seen that the large fluctuation of the lift and drag coefficients are entirely eliminated and the enlargement of the turbulent boundary layer that usually occurs after separation and the associated increase of the normal velocity component are reduced sharply when the periodic forcing is added.

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Date submitted: 23 Jul 2013 Electronic form version 1.4