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Transitory, Bi-Directional Control of the Aerodynamic Loads on an Airfoil in an Attached Flow¹ YUEHAN TAN, A. GLEZER, Georgia Institute of Technology, R. PATTERSON, P. FRIEDMANN, University of Michigan — The aerodynamic loads on a VR-12 airfoil are regulated bi-directionally to enable mitigation of structural vibrations when the base flow is fully-attached by using pulsed fluidic control upstream of the trailing edge. Actuation is effected using independently controlled high aspect ratio bi-stable, fluidically-switched actuation jets on the pressure and suction surfaces at nominally $0.88c$. The transitory actuation temporally manipulates the circulation around the airfoil and its Kutta condition yielding changes in the aerodynamic loads. For example, it is shown that time-invariant actuation on the pressure and suction surfaces can lead to respective lift increments CL of up to $+0.73$ and -0.65 with relatively low drag penalty. The transitory characteristics of the aerodynamic loads to pulsed actuation are investigated with specific emphasis on the initial response following the onset of the actuation along with corresponding unsteady vortex shedding near the trailing edge using phase-locked particle image velocimetry. Supported by

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