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Interaction of a Dynamic Vortex Generator with a laminar Boundary Layer ERICA CRUZ, WILFRED CHAN, SHELBY HAYOSTEK, CHIA MIN LEONG, Rensselaer Polytechnic Institute, DAN CLINGMAN, The Boeing Company, MICHAEL AMITAY, Rensselaer Polytechnic Institute — The effectiveness in delaying boundary layer separation by vortex generators (VGs) is well established. However, there could be a drag penalty when the flow it attached. Therefore, in this study, a piezo-based dynamic vortex generator was developed with the goal of mitigating any additional drag that might occur when not in use. The dynamic VG (DVG) was driven by bimorph piezoelectric motor and was designed to operate at frequencies up to 300 Hz. Experimental studies were performed on the interaction of the laminar boundary layer over a flat plate with a DVG placed at a skew angle of 18° with respect to the free-stream direction. The experiments were conducted for different height of the DVG, where the Reynolds number based on the local boundary layer thickness was about 2000. In addition, the DVG was oscillating at different frequencies and amplitudes and its effect of the flow field was compared to a steady VG. Simultaneous measurements of the DVG performance and the flow field behind it were accomplished using a laser displacement sensor and Stereoscopic Particle Image Velocimetry (SPIV), respectively. The SPIV data were taken at multiple downstream locations and the flow structures formed in the wake of the DVG will be discussed.

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