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Control of the Aerodynamic Loads on a 3-D Wing using Distributed Active Bleed[1] M.E. DESALVO, D. HEATHCOTE, M. SMITH, A. GLEZER, Georgia Institute of Technology — The aerodynamic loads on a 3-D wing with a trailing-edge flap are controlled in wind tunnel experiments using active distributed bleed of ambient air that is driven through arrays of surface openings by the inherent pressure differences between the pressure and suction surfaces and regulated by integrated lateral louvers. Interaction between the bleed and the local cross flow over the surface induces large-scale changes in the global flow field which lead to direct modification of the aerodynamic loads and thereby can augment conventional electromechanical control surfaces without changing angle of attack or flap deflection. The present investigations focus on unsteady aerodynamic effects associated with temporal modulation of the bleed through different spanwise segments of the wing over a range of angles of attack and flap deflections. Stereo PIV measurements of the wake acquired phase-locked to the actuation in a streamwise- normal plane downstream of the model show the temporal effects of bleed on distributions of streamwise vorticity (including the tip vortex) and on the spanwise loading of the wing.

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