Abstract Submitted
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Aerodynamically-Adaptive Wings using Flow-Interactive Control[1] G. PEYREDIEU DU CHARLAT, L. DE BENI, M. RUZZENE, A. GLEZER, Georgia Institute of Technology — Controlled interactions between a wing surfaces and the embedding flow are explored to effect tunable structural (e.g., stiffness, damping) and aeroelastic (bending and twist) properties through the aerodynamic load distributions. These interactions and therefore the aerodynamic loads, are regulated using actively-distributed air bleed that is driven through the wings surfaces by the flow-induced pressure differences and is regulated by integrated louvers. Wind tunnel investigations using a modular 3-D half-span flexible wing model have explored quasi-static and time-dependent, transitory coupling between bleed-induced aerodynamic loads and wings aeroelastic properties. The flow structure is investigated using particle image velociometry (PIV) and the structural response of the wing model is assessed over a broad range of angle of attack using a motion analysis system and an array of accelerometers. It is shown that bleed actuation which leads to significant modifications of the aerodynamic loads and of the near-wake flow field and can be exploited for temporal control of its dynamical bending characteristics.

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