

Abstract Submitted
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Experiment based Reduced-Order Modeling for Feedback Flow Control: Application to Flow Separation and Jet Aeroacoustics MARK GLAUSER, Syracuse University — Under AFOSR support we have been developing closed loop flow control methods for flow separation control over a NACA 4412 airfoil and for jet noise reduction. The methods employ the Proper Orthogonal Decomposition along with Stochastic Measurement to extract the low-dimensional flow characteristics. We have made substantial progress on the NACA 4412 problem wherein we have closed the loop using estimates (obtained from wall pressure via the Stochastic Measurement) of the first time dependent POD coefficient as our feedback signal in a simple proportional controller. Our results to date show that with the feedback we can delay separation from 15 degrees AoA (without any control) to greater than 18 degrees AoA with the feedback control. These initial exciting results will be presented along with our experimental based dynamical models that are being developed so we can incorporate some flow dynamics into the feedback as well as design controllers offline. For the jet aeroacoustics problem we are not yet at the stage where we are closing the loop. However, we will present results that show that substantial progress has been made in our understanding of the relationship between the low-dimensional velocity fields and the far field noise. This is providing us a starting point for eventual implementation of feedback flow control (of the near field jet plume) for far field noise reduction.

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