Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Experimental Investigation of Optical Beam Propagation through a free Shear Layer STEFAN SIEGEL, JUERGEN SEIDEL, CASEY FAGLEY, THOMAS MCLAUGHLIN, US Air Force Academy — The performance of airborne platforms emitting or receiving light beams is severely hampered by the flow field around the turret mounted on the air vehicle. From a fluid dynamics point of view, the flow separating from the turret develops large, coherent structures. From an optical point of view, these structures due to their associated density variations, cause large optical distortions since the index of refraction is a function of density. The goal of this research is to reduce optical distortions by mitigating these structures using feedback flow control. For the canonical flow of a shear layer behind a backward facing step, both experimental measurements using hot film and Malley Probes and high resolution simulations are used to provide input data for model development. Based on the time coefficients obtained from Proper Orthogonal Decomposition of multiple open loop forced reference cases, the design of a global neural network based model of the flow field will be presented. A comparison between experiments, simulations and reduced order model will be presented.

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Date submitted: 04 Aug 2008 Electronic form version 1.4