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Effects of flow control over a 3D turret – Part I M. ANDINO, Syracuse Univ., R. WALLACE, Sryacuse Univ., R. SCHMIT, R. CAMPHOUSE, J. MYATT, AFRL, M. GLAUSER, Syracuse Univ. — Turbulence causes losses in the performance and effectiveness of optical systems and separated turbulent flow in particular is a phenomena present in several aero-optics applications. In an attempt to reduce the adverse effects of separated turbulent flow on such systems, we are exploring the use of both open and closed-loop flow control. In this presentation results from an experiment performed in Syracuse University's 2' x 2' wind tunnel of the flow over a 3D turret at a Reynolds number of 300,000 and Mach number of 0.1 will be presented. The 3D turret used has a diameter of 6in with a flat aperture of 2.8in diameter. Our actuation system consists of 11 synthetic jets created by 22 piezoelectric disks. The actuation system was placed 0.4in upstream from the leading edge of the aperture and two different actuation cases were tested to then evaluate the effects of the flow control over the aperture area. Simultaneous surface pressure and PIV velocity measurements in the separated region were performed, both with and without flow control. The PIV results suggest that with the open-loop control the separation zone above the aperture is reduced spatially and the mean square velocity fluctuations reduced in amplitude by 15 – 20 percent. We are currently applying the successful POD/LSE based NACA 4412 closed-loop separation control work of Pinier et al (2007) to the 3D turret. Pinier, J.T., Ausseur, J.M., Glauser, M.N. and Higuchi, H., (2007), "Proportional Closed-loop Feedback Control of Flow Separation", AIAA Journal, Volume 45, Issue 1, pp 181 - 190.

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