Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

LES prediction and analysis of the aero-optical environment around a 3-D turret[1] EDWIN MATHEWS, KAN WANG, MENG WANG, ERIC JUMPER, University of Notre Dame — Using wall-modeled large-eddy simulation, a Mach 0.4 flow over a hemisphere-on-cylinder turret at the experimental Reynolds number of $Re_D = 2.3 \times 10^6$ is simulated to study the aero-optical distortions caused by turbulent density fluctuations. The optical distortions are calculated at over 250 viewing angles during the simulation to thoroughly investigate the optical environment around the turret. Flow field and optical results show good comparisons with experimental measurements. A large database of three-dimensional velocity and density fields is generated for study of the connection between global flow dynamics and local optical distortions. Proper orthogonal decomposition and dynamic mode decomposition are applied to both the distorted wavefronts and the flow-field database. A method of reconstructing the optical wavefronts from the density field modes is investigated. Relations between prominent flow features and wavefront components including tip/tilt and higher-order effects will be discussed.

[1]Supported by HEL-JTO through AFOSR Grant FA9550-13-1-0001

Meng Wang
Univ of Notre Dame

Date submitted: 02 Aug 2015 Electronic form version 1.4