Abstract Submitted
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LES study of aero-optical distortions over a cylindrical turret with passive flow control[1] KAN WANG, MENG WANG, University of Notre Dame — Large-eddy simulations are carried out for compressible flow over a cylindrical turret with a flat optical window to study the aero-optical distortions and their mitigation by passive control devices in the upstream boundary layer. The control devices consist of long and thin pins as in an experiment conducted at the University of Notre Dame. A comparison with the experimental data for the baseline case without pins shows overall agreement in terms of velocity statistics and the optical distortion magnitude. The root-mean-square of optical path difference (OPD_{rms}) caused by the separated shear layer above the optical window is found to be five times as large as that caused by the attached boundary layer upstream of the turret. Simulation results for the passive-control case confirm key experimental observations. A second shear layer above the main shear layer is observed, which reduces the turbulence intensity of the main shear layer and widens the turbulence region over the optical window. The combined effect of the two shear layers leads to slightly reduced optical distortions compared with the uncontrolled flow with a single strong shear layer. Control strategies for reducing optical distortions without suppressing flow separation will be discussed.

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