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Large-eddy simulation of turbulent flow over a body of revolution[1] DI ZHOU, KAN WANG, MENG WANG, University of Notre Dame — The turbulent flow over an axisymmetric body of revolution (BOR) at zero angle of attack is computed using large-eddy simulation (LES). The BOR consists of an elliptic nose, a cylindrical midsection and a 20^o tail cone, and has a length-to-diameter ratio of 3.17. The Reynolds number based on the free-stream velocity and the BOR length is 1.9×10^6. Two simulations are carried out; one is a wall-resolved LES, whereas the other employs a wall model on the nose and centerbody sections to reduce the computational cost. Velocity statistics from both simulations are in agreement with each other in the tail-cone section where the boundary layer grows rapidly under adverse pressure gradient, indicating that the development of the tail-cone turbulent boundary layer is insensitive to the detailed near-wall structures in the upstream boundary layer. They also agree reasonably well with the experimental data from Virginia Tech. The space-time characteristics of pressure fluctuations on the tail-cone surface are investigated. The pressure frequency spectra agree well with experimental measurements except at high frequencies, and the two-point correlations show significant growth of length scales in the downstream direction.

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