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Turbulent Flow past a Blunt Nosed Body with Spinning Base[1] IGBAL MEHMEDAGIC, U. S. Army, ARDEC, DONALD CARLUCCI, U. S. Army, ARDEC, SIVA THANGAM, Stevens Institute of Technology — Turbulent flow over blunt-nosed cylinders that are spinning about their axis is analyzed with applications to the development of projectiles. In this study, computations are performed using an anisotropic two-equation Reynolds-stress model to study the flow past spinning projectiles of circular cross-section at zero angle of attack. The model utilizes a phenomenological treatment of the energy spectrum to include the effects of rotation and compressibility. The resulting set of modeled form of transport equations for the turbulence kinetic energy and the scalar form of turbulence dissipation are solved along with the time-averaged equations of motion using an efficient finite-volume algorithm. The model is applied for several test cases to validate its predictive capabilities for capturing the effects of curvature, swirl and compressibility. Computations for the flow past axially rotating cylinders are performed and the results are shown to be in agreement with the experimental results of Carlucci & Thangam (2001). Both the cases of axial flow past single rigid cylinder as well as that of flow past cylinders with a free-spinning and finned base are analyzed. The model performance and its potential for applications involving the design of projectiles are discussed.

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