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Turbulent Flow past High Temperature Surfaces[1] IGBAL MEHMEDAGIC, U. S. Army ARDEC, Picatinny Arsenal, NJ, SIVA THANGAM, Stevens Institute of Technology, Hoboken, NJ, PASQUALE CARLUCCI, LIAM BUCKLEY, DONALD CARLUCCI, U. S. Army ARDEC, Picatinny Arsenal, NJ
— Flow over high-temperature surfaces subject to wall heating is analyzed with applications to projectile design. In this study, computations are performed using an anisotropic Reynolds-stress model to study flow past surfaces that are subject to radiative flux. The model utilizes a phenomenological treatment of the energy spectrum and diffusivities of momentum and heat to include the effects of wall heat transfer and radiative exchange. The radiative transport is modeled using Eddington approximation including the weighted effect of nongrayness of the fluid. The time-averaged equations of motion and energy are solved using the modeled form of transport equations for the turbulence kinetic energy and the scalar form of turbulence dissipation with an efficient finite-volume algorithm. The model is applied for available test cases to validate its predictive capabilities for capturing the effects of wall heat transfer. Computational results are compared with experimental data available in the literature. Applications involving the design of projectiles are summarized.

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