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Simulations and Modeling for Shock Driven Turbulence FERNANDO GRINSTEIN, JUAN SAENZ, RICK RAUENZAHN, LANL — Transition can be captured by a large eddy simulation (LES) strategy, but not by a Reynolds-Averaged Navier-Stokes (RANS) approach based on equilibrium turbulence assumptions and single-point-closure modeling. However, with suitable initialization around each transition – e.g., reshock, RANS can be used to approximately predict subsequent near-equilibrium flow statistics. We demonstrate state-of-the-art 3D RANS performance in one such flow regime [1]. We simulate the CEA planar shock-tube experiments by Poggi et al. (1998) with an implicit LES (ILES) strategy. CEA turbulence mixing and velocity data are used for benchmarking ILES; in turn, ILES generated data is used to initialize and as reference to assess state-of-the-art 3D RANS. ILES is based on the xRAGE code run on the 'clean' mode, whereas RANS uses xRAGE with activated BHR3. We find that by prescribing physics-based (ILES generated) 3D initial conditions and allowing for 3D flow convection with just enough resolution, the additionally computed dissipation in 3D RANS effectively blends with the modeled dissipation – rather than multiple-counting effects – to yield significantly improved statistical predictions. *[1] F.F.Grinstein, Computers and Fluids 151 (2017) 58–72.*

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