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Large-eddy simulation of a spatially-evolving turbulent mixing layer FRANCESCO CAPUANO, PIETRO CATALANO, ANDREA MASTELLONE, Centro Italiano Ricerche Aerospaziali (CIRA) — Large-eddy simulations of a spatially-evolving turbulent mixing layer have been performed. The flow conditions correspond to those of a documented experimental campaign (Delville, Appl. Sci. Res. 1994). The flow evolves downstream of a splitter plate separating two fully turbulent boundary layers, with $\mathrm{Re}_\theta = 2900$ on the high-speed side and $\mathrm{Re}_\theta = 1200$ on the low-speed side. The computational domain starts at the trailing edge of the splitter plate, where experimental mean velocity profiles are prescribed; white-noise perturbations are superimposed to mimic turbulent fluctuations. The fully compressible Navier-Stokes equations are solved by means of a finite-volume method implemented into the in-house code SPARK-LES. The results are mainly checked in terms of the streamwise evolution of the vorticity thickness and averaged velocity profiles. The combined effects of inflow perturbations, numerical accuracy and subgrid-scale model are discussed. It is found that excessive levels of dissipation may damp inlet fluctuations and delay the virtual origin of the turbulent mixing layer. On the other hand, non-dissipative, high-resolution computations provide results that are in much better agreement with experimental data.

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