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Numerical modeling of the transitional boundary layer over a flat plate DIMITRY IVANOV, ANDREI CHORNY, Heat and Mass Transfer Institute, Minsk, Belarus — Our example is connected with fundamental research on understanding how an initially laminar boundary layer becomes turbulent. We have chosen the flow over a flat plate as a prototype for boundary-layer flows around bodies. Special attention was paid to the near-wall region in order to capture all levels of the boundary layer. In this study, the numerical software package OpenFOAM has been used in order to solve the flow field. The results were used in a comparative study with data obtained from Large Eddy Simulation (LES). The composite SGS-wall model is presently incorporated into a computer code suitable for the LES of developing flat-plate boundary layers. Presently this model is extended to the LES of the zero-pressure gradient, flat-plate turbulent boundary layer. In current study the time discretization is based on a second order Crank-Nicolson/Adams-Bashforth method. LES solver using Smagorinsky and the one-equation LES turbulence models. The transition models significantly improve the prediction of the onset location compared to the fully turbulent models. LES methods appear to be the most promising new tool for the design and analysis of flow devices including transition regions of the turbulent flow.

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