

Abstract Submitted
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Large Eddy Simulation of Film-Cooling Jets IOULIA IOUROKINA¹, SANJIVA K. LELE², Stanford University — Large Eddy Simulation of inclined jets issuing into a turbulent boundary layer crossflow has been performed. The simulation models film-cooling experiments of Pietrzyk et al. (J. of. Turb., 1989), consisting of a large plenum feeding an array of jets inclined at 35 to the flat surface with a pitch 3D and L/D=3.5. The blowing ratio is 0.5 with unity density ratio. The numerical method used is a hybrid combining external compressible solver with a low-Mach number code for the plenum and film holes. Vorticity dynamics pertinent to jet-in-crossflow interactions is analyzed and three-dimensional vortical structures are revealed. Turbulence statistics are compared to the experimental data. The turbulence production due to shearing in the crossflow is compared to that within the jet hole. The influence of three-dimensional coherent structures on the wall heat transfer is investigated and strategies to increase film-cooling performance are discussed.

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