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Stability study of flows around an airfoil based on energy gradient method JADE JUNQUA[1], HUA-SHU DOU[2], Zhejiang Sci-Tech University, FLUID MECHANICS RESEARCH TEAM — Numerical simulation is carried out to study the turbulent flow around an airfoil and the energy gradient theory is used to analyze the stability of the flow. The governing equations are the Reynolds averaged Navier-Stokes equations for compressible flow and the k-epsilon turbulent model is used to close the system. The finite volume method and the time marching scheme are used to solve the unsteady governing equations. The simulation and calculation have been completed for various attack angle of the airfoil, from 0 and 8 degree. The Reynolds number is about 3.5X10**6 for all situations, and the Mach number is about 0.15. The flow is considered as shear driven flow and the distribution of the energy gradient function K around the airfoil is calculated with the simulation data. The results shows good agreement between the distribution of the energy gradient function and the experimental observations in regard of the turbulent intensity, while there is little relation between the distribution of the vorticity and the turbulent intensity. It is concluded that energy gradient function dominates the flow stability and the sustenance of turbulence rather than the magnitude of vorticity.

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