Modification of Low-Reynolds-Nunber Turbulence Model for Compressible Flow

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ABSTRACT

This study is to find the comparison between Low-Reynolds-Number turbulence model and High-Reynolds-Number Turbulence model for compressible flow using the tool of CFD(Computational Fluid Dynamics). In order to overcome the difficulty of complex geometry and complexity within the boundary layer , the robust Low-Reynolds-Number turbulence model is used. Due to the viscous sublayer , the near wall grid is very fine . This causes the problem of convergence. Therefore the numerical scheme and the grid generation are extremely important. As the numerical scheme is concerned , MUSCL Schem、LU-SSOR、time marching and finite volume method is taken for the laminar flow part. For turbulent flow, the finite difference、explicit method is used to figure out the turbulent viscous effect. The turbulent viscous effect is then employed to modify the original governing equation. The final convergent result is the turbulent flow solution. In making grid, the orthogonal H type grid is employed to solve a 2D flat plate flow. The convergence of Low-Reynolds-Number turbulence model, depends upon the number of grids within the boundary layer and the grid size near the wall. Some clustering grids are employed to meet the requirement of convergence for supersonic flow. Then the velocity and drag coefficient of numerical results are compared with that of experimental one. The final goal of this study is to achieve a better and more satisfactory Low-Reynolds-Number turbulence model.

Keywords : compressible flow ; turbulence flow ; robust Low-Reynolds-Number turbulence model ; turbulence model

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