Numerical Simulation of Supersonic Open Cavity Flows

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Researching cavity flow characteristic, especially the open cavity, seems to be significant because it is increasingly widely used in the aerodynamic area. Simulations of the open cavity flow characteristics in supersonic free stream apply both steady and unsteady models with solving the three-dimensional Navier-Stokes equations. The cavity length to depth ratio is 5.1 and the Mach number is 1.5.The simulating results were compared with the experiment data from former researches to realize the differences among several turbulence models. For open cavities, one of the most serious problems is the aerodynamic noise. So in order to gain a suitable model which can more accurately reveal the unsteady effect of the flow, not only the pressure coefficient along the cavity floor but also the sound pressure spectrum got from FFT(Fast Fourier Transform) were analyzed in this paper. Finally the most proper turbulence model for the simulation about supersonic open cavity flows was determined.

Keywords: Numerical simulation, Open cavity, Length to depth ratio, Turbulence model, Sound pressure level