FM13S_12381

XXI International Congress of Theoretical and Applied Mechanics
Warsaw, Poland, August 15–21, 2004

Gortler Vortex Secondary Stability: Varicose Mode

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The growth of Goertler vortices in boundary layers over concave surfaces is responsible for the strong distortion of the velocity profile in the normal and spanwise directions. The resulting inflectional velocity profiles are subject to secondary instability which may result in the development of horseshoe vortices. This type of secondary instability is known as the varicose mode. In the present study the varicose mode is investigated using direct numerical simulation. The governing equations based on the vorticity-velocity formulation are solved using compact finite differences in the normal and longitudinal directions. In the spanwise direction the flow is assumed periodic. A Runge-Kutta time marching scheme was use to integrate in time. The results obtained were compared with secondary stability theory results from other authors, and with experimental results. The results were in good agreement with secondary stability theory and experimental data.

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