

Resolution and Experimental Validation of the Asymptotic Model of a Viscous Laminar Supersonic Flow around a Thin Airfoil

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Abstract : In this study, we are interested in the asymptotic modeling of the two-dimensional stationary supersonic flow of a viscous compressible fluid around wing airfoil. The aim of this article is to solve the partial differential equations of the flow far from the leading edge and near the wall using the triple-deck technique is what brought again in precision according to the principle of least degeneration. In order to validate our theoretical model, these obtained results will be compared with the experimental results. The comparison of the results of our model with experimentation has shown that they are quantitatively acceptable compared to the obtained experimental results. The experimental study was conducted using the AF300 supersonic wind tunnel and a NACA Reduced airfoil model with two pressure Taps on extrados. In this experiment, we have considered the incident upstream supersonic Mach number over a dissymmetric NACA airfoil wing. The validation and the accuracy of the results support our model.

Keywords : supersonic, viscous, triple deck technique, asymptotic methods, AF300 supersonic wind tunnel, reduced airfoil model

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