Use of active control for elimination of flow separation with estimation of energy costs

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Abstract

Problems were posed and solved concerning the aerodynamic computation of the flow past an airfoil with an active boundary layer control device used to prevent flow separation. A moving wall, suction, or tangential blowing in the boundary layer was used as a flow control device. The turbulent boundary layer was computed by directly solving the boundary layer equations using an implicit difference scheme with adaptive grid generation and the determination of the computational domain size. A software code was developed, and numerical simulations were performed taking into account the energy costs related to the flow control device. The numerical results showed that the active flow control devices can be used to prevent flow separation. © Pleiades Publishing, Ltd., 2009.

Keywords

Active control, Airfoil, Moving wall, Separation, Suction, Tangential blowing, Turbulent boundary layer, Viscous incompressible fluid