

The Flow Separation Delay on the Aircraft Wing

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Abstract : A series of experiments involving the particle image velocimetry technique are carried out to analyse the quantitative effectiveness of the synthesized vortical structures towards actual flow separation control. The streamwise vortices are synthesized from the synthetic jet actuator and introduced into the attached and separating boundary layer developed on the flat plate surface. Two types of actuators with different geometrical set up are used to analyse the evolution of vortical structures in the near wall region and their impact towards achieving separation delay on the actual aircraft wing. Firstly a single circular jet is synthesized at varying actuator operating parameters and issued into the boundary layer to evaluate the dynamics of the interaction between the vortical structures and the near wall low momentum fluid in the separated region. Secondly, an array of jets has been issued into the artificially separated region to assess the effectiveness of various vortical structures towards achieving the reattachment of the separated flow in the streamwise direction.

Keywords : boundary layer, flow separation, streamwise vortices, synthetic jet actuator

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