

Preface

spirits of independence, thoughts of freedom

The study dedicates to the understanding and controlling of flow transition from mild laminar to fully turbulent flows at high speed. This is the necessary condition and critically important to the beginning of an incredible era when hypersonic cruise vehicles become available for humanity.

This study, consisting of three major parts, first reveals the mechanism of the Görtler instability, and then a comprehensive investigation of the secondary instability is performed. With the understanding of Görtler vortices, they are used to control flow transition. Together with the Klebanoff mode (as a result of optimal disturbances), the study showed that both low-speed and high-speed flows can be either stabilized (suppress transition) or destabilized (promote transition) with finite-amplitude Klebanoff mode or Görtler vortices.

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Secondary Instabilities of Görtler Vortices in High-Speed
Boundary Layers

Mechanisms and Flow Control on Laminar-Turbulent
Transition

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