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Transient disturbance growth in flows over convex surfaces MICHAEL KARP, M. J. PHILIPP HACK, Center for Turbulence Research, Stanford University — Flows over curved surfaces occur in a wide range of applications including airfoils, compressor and turbine vanes as well as aerial, naval and ground vehicles. In most of these applications the surface has convex curvature, while concave surfaces are less common. Since monotonic boundary-layer flows over convex surfaces are exponentially stable, they have received considerably less attention than flows over concave walls which are destabilized by centrifugal forces. Non-modal mechanisms may nonetheless enable significant disturbance growth which can make the flow susceptible to secondary instabilities. A parametric investigation of the transient growth and secondary instability of flows over convex surfaces is performed. The specific conditions yielding the maximal transient growth and strongest instability are identified. The effect of wall-normal and spanwise inflection points on the instability process is discussed. Finally, the role and significance of additional parameters, such as the geometry and pressure gradient, is analyzed.

Michael Karp
Center for Turbulence Research, Stanford University

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