

## Optimal Energy Growth and Optimal Control of the Swept Attachment-Line Boundary Layer

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The amplification of perturbations near the leading-edge of swept wings is known to play a major role in boundary layer transition. Optimal perturbations and their optimal control in swept attachment-line boundary layers are addressed in the context of the swept Hiemenz base flow, under the Görtler–Hämmerlin assumption. An adjoint formulation is used to determine the initial condition that experiences the strongest energy growth over a given time interval; amplification as high as one thousand is observed at high Reynolds numbers. The optimal control sequence of wall-normal blowing and suction leading to the lowest energy at a given time is then computed by implementing an analogous adjoint method. Optimal control leads to a drastic reduction of the maximum energy by several orders of magnitude. Two-dimensional mechanisms are found to be responsible for most of the transient energy amplification. Control inhibits energy amplification at a given time by accelerating these processes.

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