NUMERICAL ANALYSIS OF A COMPRESSIBLE FLUID FLOW OVER AN ASYMMETRIC GAP: A 2D CASE STUDY.

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Abstract.*The transition of the boundary layer on fluid flows holds significant implications in engineering. Recent research conducted by our group has delved into the boundary layer transition induced by a rectangular cavity. The findings have underscored the pivotal role of the interaction between two-dimensional unstable modes (Rossiter modes) and three-dimensional unstable modes (centrifugal modes) in triggering the transition to turbulence. In this project, we conducted a 2D case study of an asymmetric rectangular cavity with a trailing edge at a different height from the leading edge. We applied Direct Numerical Simulation (DNS) of the compressible Navier-Stokes equations and Linear Stability Theory (LST) using a code developed by our team. Existing research has demonstrated that variations in the trailing edge height significantly affect the flow's boundary layer. Consequently, controlling the trailing edge height has a direct influence on the flow stability over the cavity. These insights contribute to understanding the boundary layer transition phenomena in engineering applications.*

Keywords: *Asymmetrical Gap. Boundary Layer. Direct Numerical Simulation.*