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An experimental study of low Re cavity vortex formation embedded in a laminar boundary layer[1] SASHANK GAUTAM, AMY LANG, JACOB WILROY, The University of Alabama - Tuscaloosa — Laminar boundary layer flow across a grooved surface leads to the formation of vortices inside rectangular cavities. The nature and stability of the vortex inside any single cavity is determined by the Re and cavity geometry. According to the hypothesis, under low Re and stable vortex conditions a single cavity vortex leads to a roller-bearing effect which results in a decrease in drag as quantified by velocity profiles measured within the boundary layer. At higher Re once the vortex becomes unstable, drag should increase due to the mixing of low-momentum fluid within the cavity and the outer boundary layer flow. The primary objective of this experiment is to document the phenomenon using DPIV in a tow tank facility. This study focuses on the transition of the cavity flow from a steady to an unsteady state as the Re is increased above a critical value. The change in boundary layer momentum and cavity vortex characteristics are documented as a function of Re and boundary layer thickness.

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