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Boundary Layer Driven Cavity Flow: Effect of Aspect Ratio[1]
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— A 2-D, square, transverse cavity model with variable aspect ratio, embedded below a laminar boundary layer, was used to study the formation of Taylor-Gortler like (TGL) vortices through fluorescent dye flow visualization and Digital Particle Image Velocimetry (DPIV). The length to width aspect ratio was varied from 22:1 to 1:1 to evaluate how this affected the formation of secondary TGL vortices within the primary cavity vortex flow field. The results show that for the same freestream velocity, weaker TGL vortices were observed for the lower aspect ratios. In the 1:1 aspect ratio case, no TGL vortices were observed even at the highest freestream velocity. Using the aspect ratio of 22:1, dye visualization was used to study the flow within several adjacent cavities. TGL vortices were not evident in the first two cavities while the third cavity showed definite signs of the beginning stages of TGL vortex formation. Further downstream boundary layer transition was observed, which induced larger velocities inside the cavities and stronger TGL vortices.

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