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Characterization of counter-rotating vortices past trapezoidal tabs: simulations and visualization via 3D digitized reconstruction JEONGMOON PARK, Texas A&M Univ, AXY PAGAN-VAZQUEZ, University of Illinois at Urbana-Champaign, JORGE ALVARADO, Texas A&M Univ, LEONARDO P. CHAMORRO, University of Illinois at Urbana-Champaign, SCOTT LUX, CHARLES MARSH, US Army Construction Engineering Research Laboratory, CERL COLLABORATION, UIUC COLLABORATION, TAMU COLLABORATION — Characterization of the turbulence generated by passive vortex generators has been a matter of intense research due to their relevance in applications ranging from aerodynamic efficiency to turbulence mixing. The advection diffusion patterns of the induced vortical structures are heavily controlled by the topology of the vortex generators. In this study, self-sustaining counter-rotating vortex pairs (CVP) generated from a series of trapezoidal tabs have been characterized numerically and experimentally to understand the role of the tab geometries on the flow turbulence. The trapezoidal tabs were fabricated using a 3D printer and defined in terms of inclination and taper angles. Reynolds-Averaged Navier–Stokes (RANS) and Large Eddy Simulation (LES) were performed to quantify turbulence statistics and vorticity in the wake of the tabs. Flow fields were experimentally visualized via smoke technique and qualitatively compared with the numerical simulations. 3D vortices were digitally reconstructed by interpolating several 2D images taken at various spanwise planes. The role of the tabs geometry on the stability and features of the vortical structures is discussed for a Reynolds number of 2100 based on the channel depth.

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