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Effect of a Directionally Porous Wing Tip on Tip Vortex

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Abstract

This paper presents an experimental study of the effect of a directionally porous wing tip on the tip vortex using particle image velocimetry (PIV) on a half wing model with NACA 653218 as its airfoil section. Four different configurations of the directionally porous wing tip are tested. The vortex generated by the wing tips are examined at four different measuring planes downstream perpendicular to the flow axis. The flow field over the porous wing tip surface along the streamwise direction is obtained as well to understand the effects of the porosity on the flow which in the end affects the vortex downstream. Furthermore, the aerodynamic performance of all different configurations is compared to study their effects on the aerodynamic coefficients of the wing. The results show a high reduction in vorticity, up to 90%; tangential velocity reduction up to 67% and a significant reduction in vortex circulation in the near-far field. Effect on the lift to drag ratio is up to 20 %.

Keywords

Author Keywords: Porosity; Porous wing tip; Wing tip; Aerodynamics; PIV

KeyWords Plus: DIFFERENTIAL SPOILER SETTINGS; REDUCTION; LIFT; DRAG; SLOTS

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