Numerical and experimental investigation of LEX and LEVCON on fighter aircraft aerodynamics

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Abstract

The manuscript presents an investigation of the aerodynamic influence of Leading-Edge Vortex Controllers (LEVCONs) on a custom delta wing fighter aircraft configuration. By using a combination of computational fluid dynamics (CFD) and low-Reynolds water tunnel experiments, the study examines how forebody-to-wing configurations, including LEVCON geometry and deflection angles, affect normal force and lift force coefficients. The CFD results demonstrated clear trends, such as by increasing LEVCON deflection angle, a measurable increase in lift or normal force appears. Complementary water tunnel experiments confirmed that even at low Reynolds numbers, LEVCONs effectively manipulate the aerodynamic envelope, confirming their effectiveness in enhancing post-stall performance. In comparison with conventional LERX and strake configurations, LEVCONs provided improved performance.