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Numerical simulations of a vertical tail of a commercial aircraft with active flow control[1] MICHEL RASQUIN, Argonne National Laboratory and University of Colorado Boulder, JEFFREY MARTIN, KENNETH JANSEN, University of Colorado Boulder — A series of numerical simulations of a realistic vertical tail of a commercial aircraft, with a tapered swept stabilizer and a rudder, is considered in this work with application of flow control. Flow control is known to have the capacity to augment the streamwise momentum near the rudder suction peak where separation is typically observed to limit rudder effectiveness for high deflection angles. Specifically, we use Delayed Detached Eddy Simulations (DDES) to study the interaction of a cross flow with an array of 24 synthetic jets for a 0° angle of attack, a 30° deflection angle and a Reynolds number of $7\text{x}10^5$. We concentrate our analysis on the influence of the spacing between successive active jets in the spanwise direction. Indeed, our current simulations suggest that doubling the number of active jets at a lower Reynolds number improves the lateral force while opposite effect is observed at the considered Reynolds number when using the same size jets. These simulations offer insight into the fundamental physics of the flow structures in the vicinity of the synthetic jets by accurately resolving the complete synthetic jet pathway and the vorticity plume where the jet structures interact with each other and with the primary flow.

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