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Performance Comparison of Sweeping/Steady Jet Actuators¹

DAMIAN HIRSCH, California Institute of Technology, JUSTIN MERCIER, FLAVIO NOCA, HEPIA - University of Applied Sciences Western Switzerland, MORTEZA GHARIB, California Institute of Technology — Flow control through the use of steady jet actuators has been used on various aircraft models since the late 1950's. However, the focus of recent studies has shifted towards the use of sweeping jets (fluidic oscillators) rather than steady jet actuators. In this work, experiments using various jet actuator designs were conducted at GALCIT's Lucas Wind Tunnel on a NACA 0012 vertical tail model similar to that of the Boeing 767 vertical stabilizer at Reynolds numbers ranging from 0.5 to 1.2 million. The rudder angle was fixed at 20 degrees. A total of 32 jet actuators were installed along the wingspan perpendicular to the trailing edge and the rudder shoulder of the vertical stabilizer. It is known that these types of flow control prevent separation. However, the goal of this work is to compare different jet designs and evaluate their performance. Parameters such as the number of actuators, their volumetric flow, and the wind tunnel speed were varied. The lift generation capabilities of steady and sweeping jet actuators were then compared. Another set of experiments was conducted to compare a new sweeping jet actuator design with one of the standard versions.

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