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Synthetic Jets Flow Control on a vertical stabilizer NICHOLAS RATHAY, MATTHEW BOUCHER, MICHAEL AMITAY, Rensselaer Polytechnic Institute — The vertical stabilizer on most commercial transport aircraft is much larger than required for stability and control. The tail is significantly oversized in order to maintain controllability in the event of asymmetric engine failure and meet flying qualities requirements related to dynamic motion. Using aerodynamic flow control techniques, it may be possible to reduce the size of the tail while maintaining similar control authority during inclement flight conditions. Reducing the size of the tail decreases the weight and the drag of the airplane, which results in considerable savings in fuel costs. In this work, it is shown that synthetic jet (zero-net-mass-flux) actuators are capable of reattaching the separated flow on the rudder and augmenting the performance of the stabilizer. Experiments were conducted in an open-return wind tunnel on a 1/25th scale model of a vertical stabilizer and a partial fuselage section. The surface pressure, aerodynamic loads and data acquired with a Stereo PIV system were used to investigate the effectiveness of this technology as well as provide a more detailed analysis of the flowfield and showed that the synthetic jets are capable of augmenting the side-force by up to 20%.

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