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Control and Visualization of a Shear Layer Over a Weapons Bay

RYAN SCHMIT, Air Force Research Laboratory, GANESH RAMAN, Illinois Institute of Technology, LUIS LOURENCO, Florida State University, VALDIS KIBENS, The Boeing Company — In July 2005, the AFRL program Flow Control Analysis Development (FlowCAD) tested the High Frequency Excitation Active Flow Control for Supersonic Weapons Release (HIFEX) generic weapons bay model in the Boeing's Polysonic windtunnel facility. The 10% scaled weapons bay with an L/D of 5 was tested at Mach 1.82. Several flow control devices were tested, including: the goalpost, a wedge and pin configuration, and the splash jet, to determine their effectiveness at reducing the sound pressure levels inside the weapons bay. The results show the wedge and splash jet are equally effective at reducing the peak Rossiter tone by 20 dB . The main objective of this test was to visualize the shear layer over the weapons bay cavity. By examining the cavity shear layer with a $10kHz$ Focused Schlieren system the effects from the flow control devices can be understood to produce a more effective flow control device in the future.

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