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Reducing noise from twin supersonic jets using very-low-frequency control[1] SANDEEP MURTHY, DANIEL BODONY, University of Illinois at Urbana-Champaign — The intense jet noise radiated by closely-spaced, twin supersonic hot jets leads to sound-induced structural vibration, fatigue and operational difficulties for carrier-borne aircraft. Experimental, theoretical, and computational investigations into the physics and control of jet noise have identified several important sound sources, including wavepackets, screech, Mach wave radiation, and broadband shock associated noise. Reducing the loudest sources of jet noise has relied on intuition, parametric survey, or optimal control techniques. With the aim of developing a more general method of jet noise reduction (JNR), we present a physics-based approach that leverages very-low-frequency jet dynamics in order to achieve JNR whilst preserving propulsive performance. Our approach formulates the control problem using the very-low-frequency global modes of the compressible Navier-Stokes operator linearized about the jet mean flow to disrupt the non-modal transient growth processes. The presentation will showcase uncontrolled and controlled single and twin supersonic hot jets issuing from biconical nozzles, with conditions and geometries motivated by tactical Naval aircraft. The predictions utilize fully-resolved simulations whose data informs the control development and its performance.

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