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Modeling Forced Jets with Parabolized Stability Equations ANIRUDDHA SINHA, TIM COLONIUS, California Institute of Technology — The theory of parabolized stability equations (PSE) is employed to model the forcing response of high-speed and high Reynolds number round jets. Recently, this theory has been successfully applied to unforced subsonic and supersonic jets to predict the dynamics of the wavepackets implicated in noise radiation to aft angles. The effect of some unsteady actuation mechanisms (e.g. those based on plasma, fluidic injection, etc.) may be practically considered to be impulsive in nature rather than sinusoidal. As a first approximation, linear PSE modes, computed as instabilities of the unforced jet, are suitably combined to simulate the impulse response. The predictions from this procedure compare reasonably well with experimentally determined phase-averaged near-field pressure in subsonic jets forced with localized arc filament plasma actuators. The model can be improved by incorporating the nonlinear interactions between the excited modes in the jet. Such a model is being applied to predict the changes to the dynamics of a supersonic jet actuated by pulsed air injection. The end goal is to use the validated PSE model to understand noise source mechanisms, and propose novel actuation strategies for their mitigation.

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