Abstract Submitted
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A low-dimensional analysis of the axisymmetric jet:identification and control MARK GLAUSER, ANDRE HALL, JEREMY PINIER, Syracuse University — The endeavor of prediction and ultimate control of highly turbulent, non-linear, flow physics is undertaken using a 2-inch diameter, axisymmetric, jet nozzle operating at Mach 0.60 exit condition. With the aim of identifying the dominant source of the radiated aero-acoustic noise produced by high-speed, heated jets and developing control strategies to reduce it, two primary experiments are led in parallel: 1) A non-intrusive PIV investigation of the flow field (z/D=5-10) is performed, both for the heated jet (static temperature ratio T_r=1.72) and ambient temperature jet (T_r=0.93), simultaneously with near-field pressure and far-field acoustic measurements to assess the effect of heat on low-dimensional source identification 2) Dual-time PIV investigation of the sound producing region (z/D=3-10), (T_r=0.93), is performed to capture the instantaneous Eulerian acceleration field and used to derive an empirical low-order dynamical system (LODS) for eventual use in closed-loop flow control applications. This effort aims to acquire an extensive database that can be used to develop a greater understanding of the dynamics in a highly random, turbulent flow field. This understanding is vital in determining which features of the flow a control strategy will manipulate, or what signals to feed back in elaborate closed-loop applications.

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