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Experimental observations of a complex, supersonic nozzle concept[1] ANDREW MAGSTADT, MATTHEW BERRY, MARK GLAUSER, Syracuse Univ, CHRISTOPHER RUSCHER, SIVARAM GOGINENI, Spectral Energies, LLC., BARRY KIEL, Air Force Research Laboratory, WPAFB, SKYTOP TURBULENCE LABS, SYRACUSE UNIVERSITY TEAM, SPECTRAL ENERGIES, LLC. TEAM, AIR FORCE RESEARCH LABORATORY TEAM — A complex nozzle concept, which fuses multiple canonical flows together, has been experimentally investigated via pressure, schlieren and PIV in the anechoic chamber at Syracuse University. Motivated by future engine designs of high-performance aircraft, the rectangular, supersonic jet under investigation has a single plane of symmetry, an additional shear layer (referred to as a wall jet) and an aft deck representative of airframe integration. Operating near a Reynolds number of 3×10^6, the nozzle architecture creates an intricate flow field comprised of high turbulence levels, shocks, shear & boundary layers, and powerful corner vortices. Current data suggest that the wall jet, which is an order of magnitude less energetic than the core, has significant control authority over the acoustic power through some non-linear process. As sound is a direct product of turbulence, experimental and analytical efforts further explore this interesting phenomenon associated with the turbulent flow.

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