Experimental Studies and Control of Subsonic & Supersonic Flows

(Aerospace Research at Florida State University & Strategic Opportunities for Collaboration)

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This talk will consist of two parts: The first, and more technically in-depth component, provides an overview of some interesting and challenging problems that have been studied over the past three decades by my research group at Florida State University (FSU). These span subsonic and supersonic flows and often involve developing or applying advanced diagnostics in difficult environments allowing us to peer into complex, feature-rich flows and offering significant insight into the governing physics. I highlight a few, representative, complex flows. The first problem involves subsonic flow around a *cylinder with a slanted base*—a canonical bluff body geometry analogous to an aircraft fuselage that is often dominated by strong unsteady-meandering vortices. The second consists of supersonic *single and dual impinging jets* - canonical models of flows that occur in VTOL/STOVL aircraft during hover. They often produce highly unsteady aeroacoustics that are resonance driven resulting in extremely high noise levels, fatigue of structures and other issues. The third example is the three-dimensional flow field due to single and dual-fin generated swept *shock wave/boundary layer interaction (SBLI)*. Such interactions are ubiquitous in supersonic-hypersonic air vehicles where they can impact internal and external aerodynamics. If time permits, examples of implementing active flow control (AFC) for some of these problems will also be examined.

The research discussed in the first part is a limited subset of the broad array of advanced research being conducted at FSU by its faculty, researchers and students, using many unique and cutting-edge facilities. An introduction to some of FSU's core research strengths in STEM focused and capabilities is the focus of the second part of the talk. I hope to catalyze a dialogue between FSU and interested stakeholders in IIT Hyderabad to help identify frameworks and paths for *mutually beneficial partnerships*. Partnerships that enable and accelerate global exchange of ideas, accelerating discovery and enhancing national and international impact.



Short Bio

Farrukh Alvi is the Don Fuqua Eminent Scholar and Professor of Mechanical & Aerospace Engineering at Florida State University, where he also serves as Senior Associate Provost for Strategic Initiatives and Innovation. His research focuses on compressible flows, active flow and noise control, micro-fluidic actuators, and advanced diagnostics, with support from NSF, AFOSR, ONR, DARPA, ARO, and numerous industry partners. He has held several senior leadership roles, including Interim Dean and Senior Associate Dean for Research and Graduate Studies of the College of Engineering, founding Executive Director of FSU's InSPIRE initiative (*Institute for Strategic Partnerships, Innovation, Research, and Education*), and founding director of the Florida Center for Advanced Aero-propulsion, FCAAP. He is a Fellow of the Royal Aeronautical Society and American Society of Mechanical Engineers (ASME), an Associate Fellow of American Institute of Aeronautics and Astronautics, and has mentored more than 60 graduate students, postdoctoral researchers, and scientists.