Project Title: Benchmark Turbulent, Compressible Mixing Layer Measurements

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Project Description:
The fundamental objective of this project is the acquisition of benchmark, CFD validation-quality data for the canonical fluid dynamics problem of compressible, turbulent mixing layers. This database will provide high-quality measurements, particularly of shear layer mean velocities and Reynolds stresses, which can be used for comparison against computational simulations of the flow by RANS, LES, and DNS methods. The acquired data will also help clarify the effects of compressibility, velocity ratio, and density ratio on important quantities such as the mixing layer thickness and growth rate, Reynolds stresses, Reynolds stress anisotropy, and the turbulent large-scale structure of the mixing layer. The measurement methods used include schlieren flow visualization, acetone planar laser-induced fluorescence (PLIF), stereo particle image velocimetry (SPIV; primary method), filtered Rayleigh scattering (FRS), and hot-wire anemometry (HWA). Important quantities that are derivable from these measurements are also determined and recorded. Examples include the mixing layer thickness, the shear layer growth rate, the anisotropy of the Reynolds stress tensor, which has been the source of some controversy, and so on. On this project you will obtain substantial experience with the acquisition and analysis of fluid dynamics measurements by advanced methods.

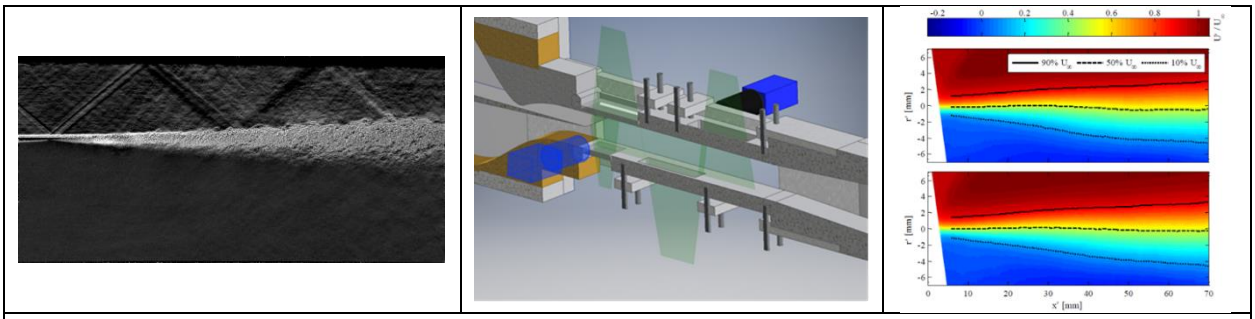

Fig. 1 Compressible mixing layer schlieren visualization, test section with SPIV cameras/laser sheets, and PIV measurements.

Student Background and Expected Research Activities:
We are seeking a highly motivated student who is interested in performing fluid dynamics *experiments*. Previous experience with advanced fluids measurement methods, such as stereo PIV, is not necessary. Previous fluid dynamics course work, especially in compressible flow, is desirable. The chosen student will be given a project of his/her own to help support this NASA-sponsored project and will interact with our NASA technical monitors.

Points of Contact:
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