MUREP Small Business Technology Transfer (M-STTR) Planning Grants

Title: M-STTR Planning Grant: Towards Enabling Advanced Non-Intrusive Measurements of Hypersonic Air-Breathing Propulsion Systems
Institution: **University of Texas, San Antonio**
City/State: San Antonio, TX
PI: Dr. Christopher Combs

SUMMARY: In the hypersonic testing community, the spatial (< 1mm) and temporal (< 1μs) resolution demands of hypersonic flows underscore the need for the development of advanced diagnostic techniques for use in high-speed wind tunnels and combustion environments. In the proposed effort, UTSA will work with small business partner Spectral Energies to develop plans for SBIR/STTR submissions that will address the need for advanced diagnostic measurements in hypersonic flow and hypersonic airbreathing propulsion test environments. By combining the expertise of the PI Combs (hypersonics, wind tunnel testing, diagnostic development) with that of Co-I Thul (combustion, diagnostic development, SBIR/STTR management and technology transition) the team will be well-positioned to compete for future SBIR/STTR awards while developing a long-lasting partnership.

The unique test capability afforded by the Mach 7 wind tunnel, detonation tube facility, and shock tube facility at UTSA coupled with the advanced diagnostic equipment at both UTSA and Spectral Energies will enable the development & implementation of a suite of novel measurement techniques for hypersonic combustion environments. With this planning grant, the collaborative team will develop proposal concepts to provide time-resolved 2D and 3D (often referred to as 4D) visualization and quantitative measurements of key physical quantities of hypersonic reacting flows. These measurements will be the first of their kind in a hypersonic fluid flow and will provide validation-quality data for computational models. The measurements have potential applications in many other flows of interest to NASA including in studies of turbulent transition, external shock-wave/boundary-layer interaction unsteadiness, plume/jet interactions, and non-equilibrium flows. These tools will also be developed with an eye towards future implementation in large-scale NASA & DoD test facilities with future technology transition being a key long-term goal of this research thrust.