

Supersonic Research Facility

Description:

This is a continuous flow supersonic tunnel, specifically designed for optical diagnostics of fuel injection (for mixing and penetration), shock boundary-layer interactions, flameholder operation, and other hypersonic-flow components. The facility is housed in a climatically controlled, clean laboratory and allows continuous flow operation at air mass flow rates up to 30 lbm/s. A variety of facility nozzles (2-D and axisymmetric) are on hand to generate a range of Mach numbers, from Mach 1.5 to 5; a facility heater allows clean pre-heating of the air up to stagnation temperatures of 1200 F. The tunnel back pressure can be remotely controlled, from a minimum value of 3.5 psia. Side and top walls (for the 2-D configuration) are composed of high-grade fused silica, allowing the application—and when needed development—of a variety of laser/optical diagnostics. Planar laser-induced fluorescence of hydroxyl (OH), nitric oxide (NO), and acetone are routinely applied, and a number of other laser diagnostics techniques have been employed, including vibrational Raman scattering, tunable diode laser absorption spectroscopy, molecular tagging velocimetry, particle image velocimetry, pressure sensitive paint, etc. The facility is also fully instrumented with conventional diagnostics (including aerothermodynamic probes) and is computer controlled.



Purpose:

Conduct fundamental research on compressible flow necessary to develop high speed, air breathing propulsion devices.

Develop advanced non-intrusive optical flow diagnostics in a realistic scale flow field at high speed flight conditions.

Products:

- Flush wall scramjet fuel injector
- Micro optical mechanical pressure instrumentation
- engine isolator design
- Cavity Flameholder fuel entrainment data base
- Boundary layer-angled injector fuel penetration correlation

Availability:

Primarily in-house research, U.S. Government agency use, DoD contractors and dual use/defense conversion use-limited on an as available basis.