

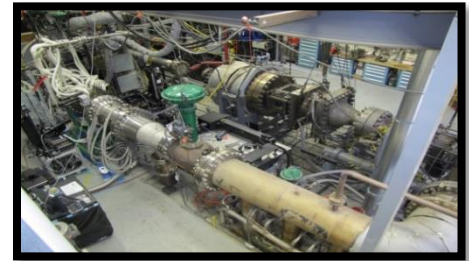


Facility Factsheet

High Pressure Combustion Research Facility (HPCRF)

Description:

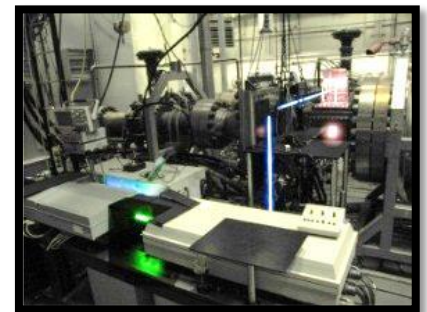
This facility is used for development and evaluation of advanced gas turbine engine combustor and augmentor concepts, laser-based diagnostics, and computer models. The facility provides the infrastructure to test small full-annular, full-scale, advanced augmentors as well as multi-cup and small full annular combustor sectors. A wide variety of instrumentation is available to measure pressures, temperatures, flow rates, exhaust gas species, particulates, transport and evaporation phenomena, fuel injection spray characteristics, and kinetics. Multi-side optical access through pressure vessels allow the use of laser diagnostics on both combustor and augmentor hardware. Laser techniques utilized include, Phase Doppler Anemometry for spray characterization, Laser Induced Fluorescence for temperature, species concentrations and for imaging flows and time-division-multiplexed hyperspectral absorption spectroscopy for temperature. Application of these advanced diagnostic techniques enables non-intrusive measurement of critical combustion parameters. The use of high-speed cameras allows the visualization and mapping of combustion flow characteristics, fuel spray patterns and ignition performance.



Research rigs vary in size from single cup combustor flame tubes, combustor and augmentor planar and arc sectors utilizing aircraft hardware, to full annular small engine combustor and augmentor systems. The facility is adaptable for advanced research applications replicating aircraft cycle conditions and possessing many characteristics of aviation gas turbine systems burning a wide variety of alternative, gaseous and liquid fuels from ambient to superheated delivery temperatures. The facility is capable of running natural gas, propane, JP-8, Jet-A, and a variety of alternative and specialty fuels. Alternative fuels can be blended with other liquid fuels real time during test for evaluation. Air flow rates, temperatures, and pressures are available up to 34 lbm/s, 1100 F (non-vitiated), and 0.25-40 atm, respectively. Vitiation is available for augmentor test sections, capable of running up to a uniform 2000° F inlet condition, with pressures ranging from 0.25-7 atm.

Purpose:

Perform basic and applied research in combustion sciences through exploratory development of combustor and augmentor concepts for turbine engine and advanced air breathing propulsion systems. Provide benchmark quality data to develop and validate combustion models and diagnostic techniques and use these tools to understand fundamental combustion processes. Aid engine companies in developing high-performance, low-emissions combustors for air breathing engines.



Products:

- Trapped Vortex Combustion (TVC) technology
- Inter-Turbine Burner (ITB) demonstration
- Ultra Compact Combustors (UCC)
- Small engine full-scale full-annular augmentor technology development
- Large engine full-scale sector technology development
- Prototype pulsed detonation engine technology
- NI LabVIEW data acquisition custom engineering platform

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-4100.