Facility Factsheet

Sub-scale Direct Connect Supersonic Combustion Facility (Research Cell 18)

Description:

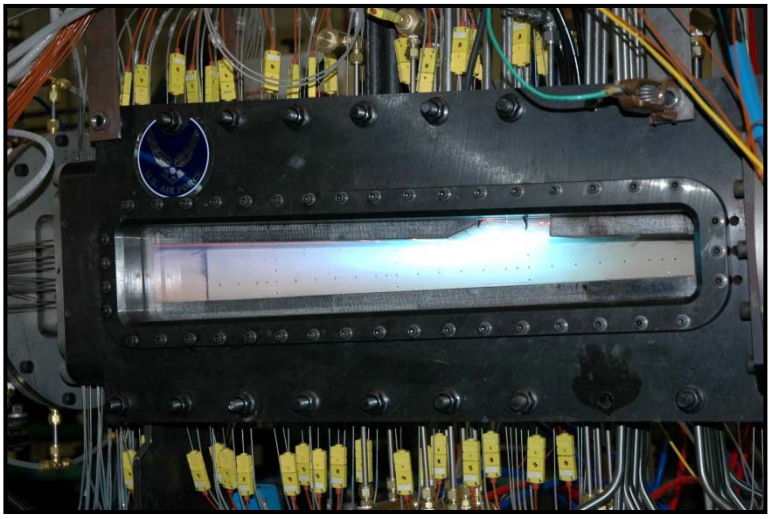
RC18 is a continuous-flow, direct-connect, supersonic-combustion research facility that is capable of simulating flight conditions from Mach 3.0 to Mach 7. The facility is supplied with air at up to 30 lbm/s, 750 psia, and 1660 °R as well as 3-psia continuous exhaust. Compressed natural gas is used to fuel the in-stream combustion heater, and a gaseous oxygen system provides makeup oxygen to the combustion-heated air stream. Liquid- and gaseous-hydrocarbon fuel systems deliver fuel to the research combustor. An electric fuel heater heats the combustor fuel to the required temperatures for various combustor-simulation conditions. A 1.2-MW DC power supply energizes an Inconel 625 coil that serves as the resistive element of the fuel heater. A recirculating cooling-water system provides 2500 gpm at 70 psia; raw dump water at 350 psia is also available. The entire flowpath is secured to a thrust stand for making direct measurements of the thrust generated by the combustor. These measurements are combined with wall-static-pressure measurements and a performance-analysis routine to deduce combustion efficiency and other performance parameters. Optical access is available at multiple locations within the flowpath to allow visual monitoring and the application of laser based diagnostic techniques. Two dimensional and axi-symmetric flowpaths are available.

Instrumentation:

A CAMAC-based control and data-acquisition system consists of 128 channels of analog input, 48 channels of digital input, 32 channels of digital output, and 16 channels of analog output. A Pressure Systems Incorporated (PSI) pressure-scanning system consisting of 256 channels and a 64-channel thermocouple scanning system complete the data-acquisition capabilities. Data update rates of 1 Hz are typical with a limited number high speed channels are available.

Purpose:

The overall mission includes: (1) enhance the understanding of supersonic combustion flowpaths and their operability ranges, (2) provide an environment to develop high-speed combustion components, materials, control concepts, and laser diagnostic techniques, (3) investigate cold start, liquid atomization techniques to enhance low Mach number operability of supersonic combustion engines and components.



Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency and DoD contractors upon request. Contact: 937-255-7354 for information regarding this facility.