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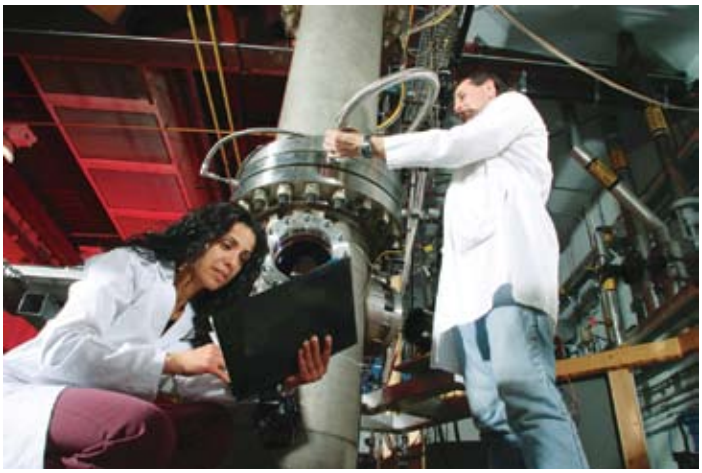
INFORMATION

GAS TURBINE RESEARCH

Applied Combustion - Mixing & Spray Characterizations

The Gas Turbine Laboratory (GTL) of the NRC Institute for Aerospace Research (NRC Aerospace) specializes in characterizing combustor components such as fuel injectors and pre-mixers using state-of-the-art, non-intrusive optical diagnostics with most of the major gas turbine manufacturers. Fuel injectors from small aero-engines as well as larger, dual-fuelled industrial combustors have been tested under atmospheric and high-pressure conditions. Sufficiently detailed data can be provided for use in conjunction with CFD simulations as well as design selections. Combustor aerodynamics and direct pre-mixer characterization have also been undertaken with a view to low-NO_x combustor design.



High-pressure (300 psig) spray facility

NRC Aerospace is ready to work with you to address your specific needs in the areas of spray and mixing characterization as well as in the development of new and innovative mixers and injectors. Our spray characterization expertise in analysis and testing has in the past been extended to non-aerospace applications such as agricultural sprays, pyrophoric sprays, spray cooling, and sprays in chemical reactors. Current research and development efforts are directed towards developing fuel-injectors and mixers for low-NO_x gas turbine combustors and enhancing the existing capabilities of the optical instrumentations.

The GTL management system has been registered to ISO 9001:2000

A unique, high-pressure spray facility with multiple optical windows for measurement access is used for high pressure fuel injector tests (up to 300 psi) capable of delivering up to 800 lb/hr of nozzle-calibrating fluid (MIL-C-7024) or water, and 10 lb/s of air to the nozzle up to 300 psig chamber pressure. This is complemented by an atmospheric pressure, fuel/air mixing rig that can be used for direct measurements of fuel-air ratio under steady and unsteady conditions

What we have to offer

Clients of NRC Aerospace benefit from:

- the availability of fully automated specialized test facilities
- the availability of laser-based, non-intrusive measurement technologies
- contributions by specialists in turbulent mixing and sprays, instrumentation, and operations during planning, execution and analysis phases of a project
- ISO 9001:2000 certified quality standards with calibrations traceable to national standards.

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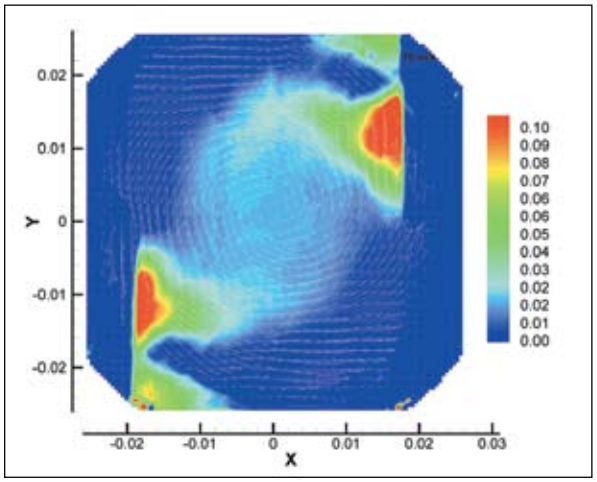
Facilities

- High pressure spray rig with optical access
  - Air flows of up to 10 lb/s at 300 psi
  - Liquid flows of MIL-C-7024C up to 120 gph at 4000 psi and of water up to 480 gph at 800 psi
- Atmospheric pressure spray booth with optical access
  - Air flows up to 0.5 lb/s at 100 psi
  - Liquid flows of MIL-C-7024C up to 550 lb/hr at 1000 psi and of water up to 150 lb/hr at 75 psi
- Atmospheric mixing rig with optical access
  - Air flows of up to 2 lb/s
  - Gaseous fuel surrogate flows (N_2 or CO_2) of up to 250 lb/hr at 3000 psi.

Flow visualization using laser sheet illumination from an industrial nozzle

Optical diagnostic equipment

- Tracer Planar Laser Induced Fluorescence (PLIF) for quantitative planar measurement of fuel fraction using acetone as a marker. Laser sheet size of up to 100 x 0.5 mm
- LaVision Particle Image Velocimetry (PIV) for planar 2-D velocity measurements
- 3-D TSI Laser Doppler Velocimetry (LDV) for point velocity measurements
- Aerometrics Phase Doppler Particle Analyzer (PDPA) for spatially resolved measurement of drop diameter (0.5 to 800 mm) and particle velocity (up to 1000 m/s)
- Malvern Particle Sizer for line-of-sight averaged measurements of drop size distribution (0.5-1100 mm)
- Flow visualization using laser-sheet illumination. Laser sheet size of up to 60 x 1 mm.



Average velocity vector measurements from PIV are superimposed on average fuel mass fraction measurements from PLIF from an air/fuel mixing test

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