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INFORMATION

GAS TURBINE RESEARCH

Applied Combustion – Emissions Reduction

Expertise within the Gas Turbine Laboratory (GTL) of the NRC Institute for Aerospace Research (NRC Aerospace) is used extensively by clients and collaborators to help develop the next generation of combustion technologies. Such expertise is prerequisite for more efficient, environmentally clean industrial combustion processes for gas turbine engines. The highly trained staff of its gas turbine aerodynamics and combustion program combine strong research abilities with state-of-the-art facilities to help clients advance their knowledge of combustion processes, emissions, and gaseous and liquid spray systems, that are required for the successful pursuit of the next generation of low emission combustors.

NRC Aerospace has specialists with knowledge in the following areas:

- industrial and aero gas turbine combustors, using either gaseous or liquid fuels
- liquid sprays and fuel/air mixing
- numerical simulation of three-dimensional turbulent reacting flows
- emissions measurement.

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

Currently, our internally funded combustion research program focuses on:

- characterizing combustion systems when fired with non-standard gaseous fuels
- fuel-air mixing
- characterizing liquid sprays at elevated pressures
- developing equipment for holographic interferometric tomography to study fuel/air mixing processes.

High-pressure (300 psig) test rig

NRC Aerospace staff are ready to work with clients and partners who recognise the benefits of using our intellectual resources and research facilities to advance their technological capabilities and jointly find creative solutions to their problems. Partnering can be either as collaborative or on a fee-for-service basis. We welcome the opportunity to discuss your specific needs.

What we have to offer

Combustion system development

Full instrumentation for measuring and recording gas and liquid temperatures, pressures and flow rates, wall temperatures, and combustor exit gas temperatures and gas composition profiles, using water-cooled rakes.

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Air supplies
- Air flow up to 27 lb/s at 7 atm. pressure
- Air flow up to 46.5 lb/s at 21 atm. pressure, preheated to 650ºC using NG-fired preheaters.

Fuel supplies
- Liquid fuels (available in bulk quantities) include No. 2 Diesel and Jet A1
- Natural gas flow up to 1.5 lb/s at 38 atm.

Emissions control and measurement
- Online equipment to analyze exhaust gases including O_2, CO_2, CO, NO_x, unburned hydrocarbons and smoke
- Water injection up to 10 gpm and 600 psi for NO_x control.

Optical diagnostic equipment
- Planar Laser Induced Fluorescence (PLIF) for quantitative planar measurement of fuel fraction using acetone as a marker. Laser sheet size of up to 10 cm long and 0.5 mm thick
- Particle Image Velocimetry (PIV) for planar 2-D & 3D velocity measurements
- Laser Doppler Velocimetry (LDV) for point 3-D velocity measurements
- Phase Doppler Particle Analyzer for spatially resolved measurements of drop diameter (0.5 to 800 µm) and particle velocity (to 1,000 m/s, 2-D correlated)
- Malvern Particle Sizer for ensemble-averaged measure-ments of drop size distribution. Diameter range: 0.5 to 1 100 µm
- Flow visualization using laser-sheet illumination. Sheet size up to 60 mm (height) by 1 mm (thickness).

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January 2006
Aussi offert en français
IAR-GT09e