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INFORMATION

# GAS TURBINE RESEARCH

## *Numerical Simulations*

Numerical simulation has become an essential tool in the R&D of advanced reacting and non-reacting systems. It enables researchers to complement and sometimes substitute expensive experimental tests with equivalent numerical simulations.

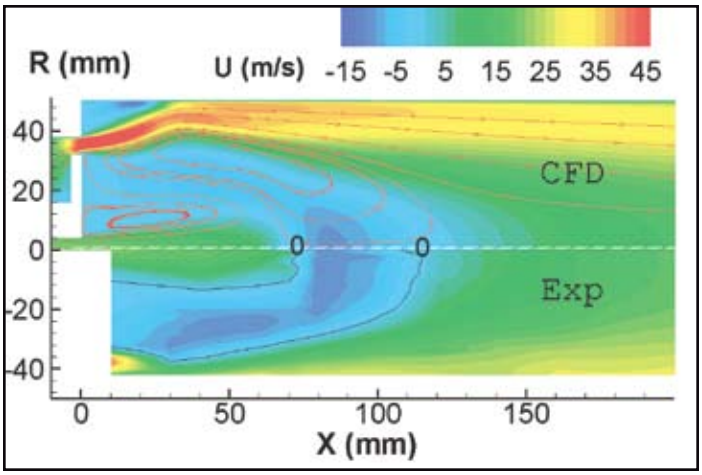
The Gas Turbine Laboratory (GTL) of the NRC Institute for Aerospace Research (NRC Aerospace) has expertise and comprehensive modeling capabilities to allow researchers to investigate a broad spectrum of reacting and non-reacting flows or product design options. These advanced techniques have been successfully applied to various R&D programs, such as:

- $NO_x$ emission in a diffusion flame combustor
- noise reduction of a modern burner unit
- lobed fuel/air mixers
- failure analysis of gas-sampling probes
- vortex shedding behind turbine cascade trailing edges, and
- flow characteristics in the exhaust section of a combustor test rig.

Substantial contributions have been made to Canadian companies and internal R&D projects.

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

NRC Aerospace is ready to serve you in the areas of premixed or diffusion combustion modeling, alternative fuel combustion, combustion instability study, large eddy simulation, fuel/air mixing, as well as other industrial flow problems. Our numerical and experimental expertise with the solid background in propulsion and combustion science and technology will adequately address your specific needs. In addition, the development of physical sub-models, such as fuel atomization models, is also among our research interests.




*Comparison of CFD and experimental results for a test combustor*

**Technical capabilities**

***Third-party and in-house software***

- Third-party code, Fluent, a general purpose CFD code with an extensive range of physical sub-models and multi-physics capabilities
- In-house codes:
  - 3-D, multi-block, turbulent, multi-phase reacting flow code in curvilinear orthogonal coordinates
  - Boundary, turbulent, reacting flow code with a number of turbulence and combustion models
  - Unstructured, implicit, unsteady, coupled solver
- Pre-processing software:
  - Pro-Engineer and I-DEAS, CAD software for generating or modifying computational geometry
  - Mesh generator, Gambit, an unstructured mesh generation package applicable to complex geometry

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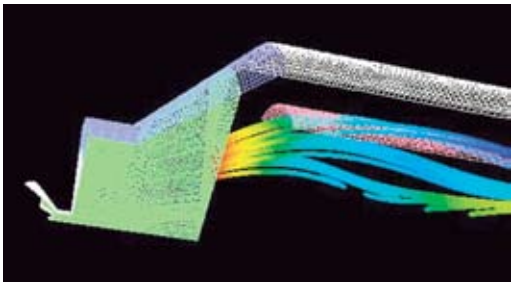

*Combustor flow field*

- Post-processing software:
  - Tecplot
  - Ensight, a leading-edge 3-D visualization and animation package.

**Hardware**

- Linux 64-bit, 8-CPU cluster with 6 GB RAM for two CPUs and 2 GB RAM for the rest
- Linux PC server with two Pentium 2.8-GH CPUs and 4 GB RAM
- Linux PC server with two Pentium 1-GH CPUs and 2 GB RAM
- Silicon Graphics ORIGIN 2000 with 32 processors and 16 GB RAM (accessible)
- Printers, including a 24”-width, HP DesignJet 500 color printer.

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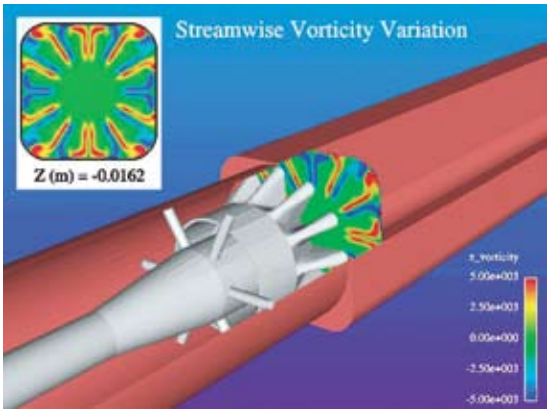
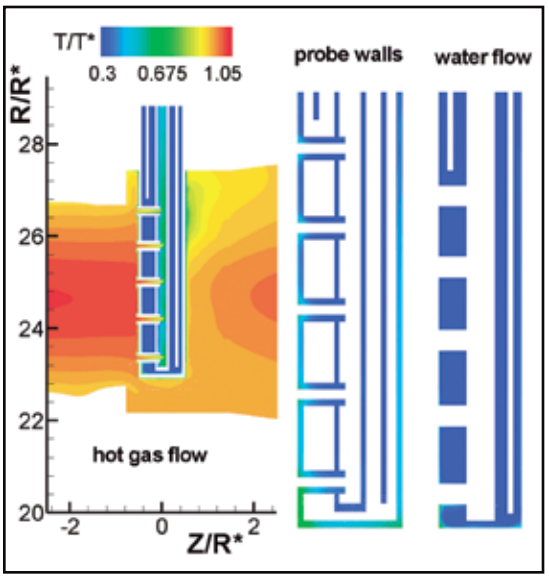
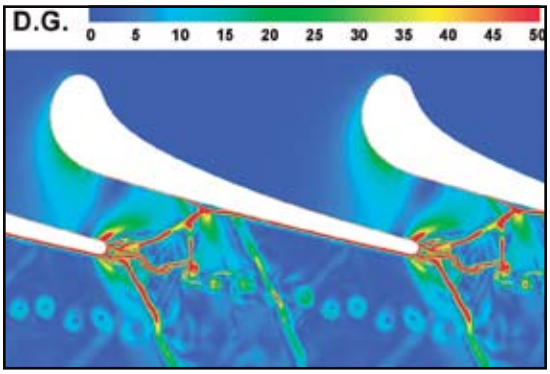



*Fuel-air mixing results*




*CFD study of gas sampling probe design*

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