Graduate research opportunities involving experimental and computational fluid dynamics

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Available PhD/Postdoctoral positions:
Aerodynamic optimization of inter-turbine ducts and lobed mixers in gas-turbine engines using computational and experimental techniques

Available MASc and MEng research positions:
1- Aerodynamic optimization of inter-turbine ducts in gas-turbine engines
2- Aerodynamic optimization of lobed mixers in gas-turbine
3- Passive wake control techniques for drag reduction on bluff bodies with application to road transportation
4- Passive control of boundary-layer turbulence for drag and noise reduction (stealth flight)
5- Physics of heat transfer in channel flows of heated supercritical fluids, including surface roughness effects –
application: Generation-IV nuclear reactors

All projects involve both experimentation and computational modeling.

Experimentation includes: design and manufacturing of test sections; setting up of the relevant instrumentation (e.g., pressure probes, pressure-sensitive paint, interferometry, thermal anemometry, laser-based techniques) and data acquisition systems; commissioning of the test setup; development of a test matrix; execution of the measurements; data post-processing; and, interpretation of the results.

Computer simulations go well beyond the mere use of a software package. Through such simulations, knowledge is acquired on: (1) discretization schemes applied to the differential equations being solved and their impact on accuracy and numerical stability; (2) optimization of the iterative solution algorithm for solution numerical stability and convergence rate; (3) post-processing techniques for effective interpretation of the simulation results.

Learning outcomes:
a) Physics of fluid flows with a focus on flow instabilities, transition and turbulence
b) Instrumentation and measurement techniques
c) Data acquisition and signal processing
d) Numerical solution of partial differential equations
e) Data analysis techniques
f) Engineering design

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