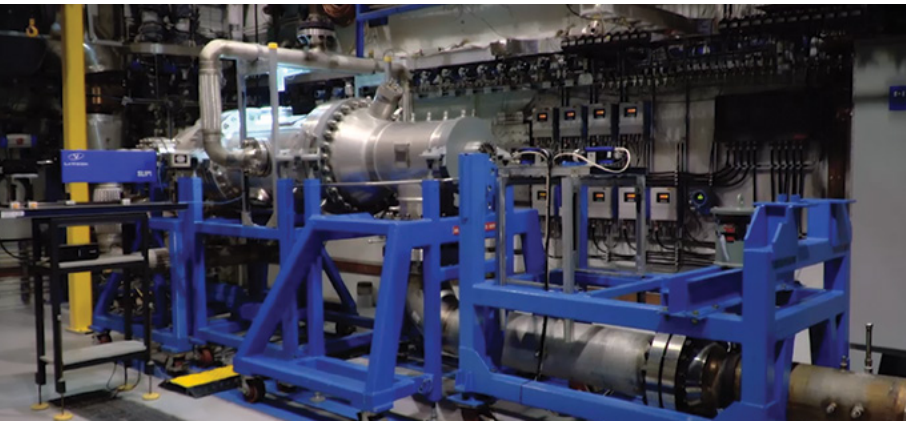


Combustion research facility

●●● Developing clean fuel combustion technologies for aviation and power

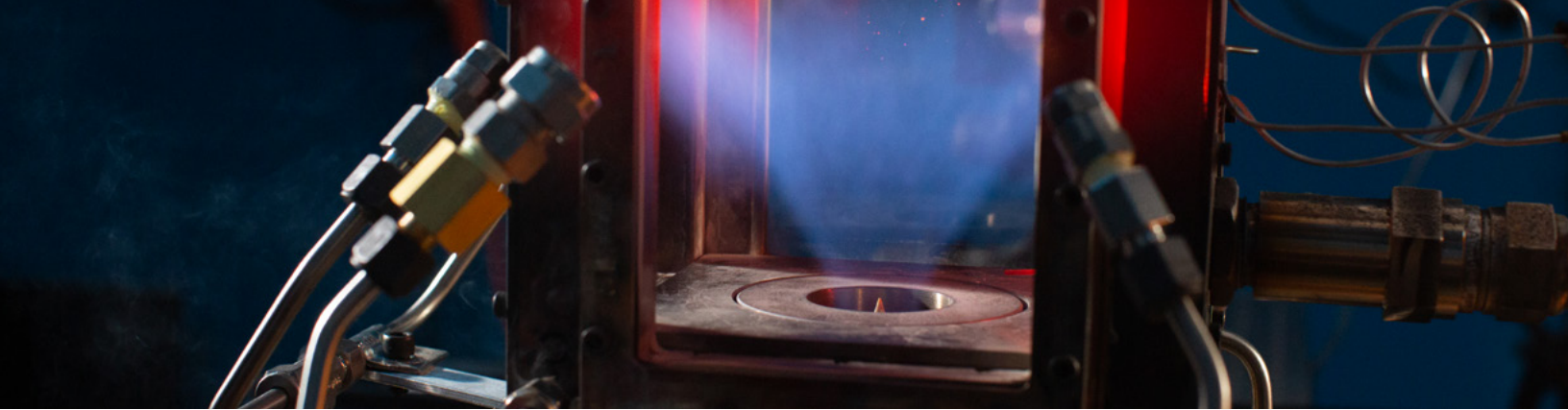


NRC combustion test cells outfitted with a customer-provided test rig.

The National Research Council of Canada (NRC) has a multitude of combustion and spray test facilities to support the research, testing and validation of low-emission, fuel-flexible combustion systems as well as fuel injectors at realistic high-pressure conditions. To support the development of multi-fuel and fuel-flexible combustion systems, the NRC can augment its conventional fuel capabilities (diesel, Jet A and biofuels) with alternative fuels such as sustainable aviation fuels and hydrogen.

Maximum capacities of high-pressure combustion test cells (TC)

Test cell	TC 1	TC 2
Air flow rate	47.5 lb/s (21.5 kg/s)	53 lb/s (24 kg/s)
Air pressure, absolute	315 psi (2,170 kPa)	315 psi (2,170 kPa)
Rig air temperature	922 K (1,200 °F, 650 °C)	922 K (1,200 °F, 650 °C)
Natural gas	1.4 lb/s (0.63 kg/s)	1.4 lb/s (0.63 kg/s)
Hydrogen	0.3 lb/s (0.14 kg/s)	0.3 lb/s (0.14 kg/s)
Instrumentation	Pressure sensors, thermocouples, strain gauges, noise, flow meters, emission analyzers	



NRC low-pressure optically accessible combustion rig.

Capacities of specialized spray facilities

Facility	Air flow rate	Rig pressure, absolute	Air flow rate	Fuel temperature	Fuels	Instrumentation
Atmospheric-pressure spray facility (APSF)	150 lb/h (68 kg/h)	Ambient	0.5 lb/s (0.23 kg/s)	Ambient	Mil-C (nozzle calibration fuel)	Non-intrusive optical diagnostics (PDPA, Malvern, PLIF, PIV, etc.) Physical probes
Optically accessible single-injector system (OASIS) facility	150 lb/h (68 kg/h)	150 psi (1,034 kPa)	0.3 lb/s (0.14 kg/s)	588 K (599 °F, 315 °C)	Jet -A, diesel and biofuels	

Atmospheric combustion rig

The atmospheric combustion rig is a specially designed facility to support highly collaborative, agile and cost-effective combustion innovation so that novel technology concepts can be tested, validated and accelerated to higher-pressure testing. The combustion rig is fully modular to facilitate integration of single- and multi-nozzle configurations. Various combustion performance parameters, including emissions, lean blow-off limits and ignition loops, can be evaluated for both gaseous and liquid fuels, including hydrogen and biofuels. Full optical access allows for advanced laser-based diagnostics such as particle imaging velocimetry, planar laser induced fluorescence, Rayleigh scattering and phosphor thermometry to allow for detailed measurement of combustion flow structures and chemical species as well as for emissions gas analysis.

Atmospheric combustion rig capacities

Air flow rate	6 lb/min (45 g/s)
Air pressure	120 psi (827 kPa)
CH ₄ flow rate	2 lb/min (15 g/s)
H ₂ flow rate	0.13 lb/min (1 g/s)

Optically accessible combustion rig

The NRC's high-pressure rated optically accessible combustion rig is capable of accommodating combustion hardware with a diameter of up to 18 inches (45 cm) and lengths of up to 47 inches (120 cm). This rig also provides five-way optical access to cater to any state-of-the-art laser-based combustion and fuel diagnostics.

Optically accessible combustion rig capacities

	Main air	Cooling air
Air flow rate	10 lb/s (4.5 kg/s)	7 lb/s (3.2 kg/s)
Rig pressure, absolute	300 psi (2,068 kPa)	300 psi (2,068 kPa)
Air temperature	922 K (1,200 °F, 650 °C)	Ambient
Fuels	Designed for various liquid and gaseous fuels	

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