

Novel Active Combustion Control Valve

For high-frequency modulation of atomized fuel flow

This project presents an innovative solution for active combustion control. Relative to the state of the art, this concept provides frequency modulation (greater than 1,000 Hz) in combination with high-amplitude modulation (in excess of 30 percent flow) and can be adapted to a large range of fuel injector sizes. Existing valves often have low flow modulation strength. To achieve higher flow modulation requires excessively large valves or too much electrical power to be practical. This active combustion control valve (ACCV) has high-frequency and -amplitude modulation, consumes low electrical power, is closely coupled with the fuel injector for modulation strength, and is practical in size and weight. By mitigating combustion instabilities at higher frequencies than have been previously achieved (~1,000 Hz), this new technology enables gas turbines to run at operating points that produce lower emissions and higher performance.

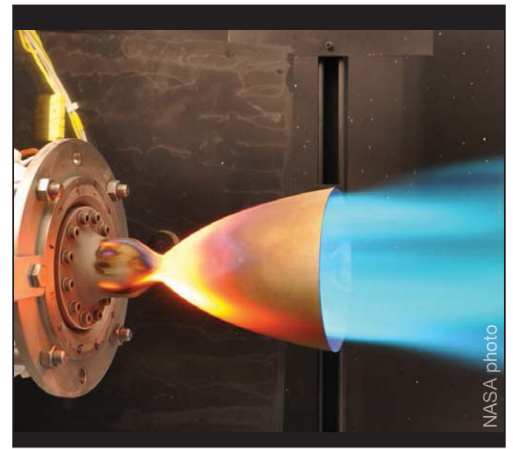
Applications

NASA

- ▶ This technology can be used in engine designs for higher performance and lower exhaust emissions for:
 - Prime propulsion
 - Auxiliary power
 - Power generation

Commercial

- ▶ Large-frame power generating gas turbine manufacturers
- ▶ Low-emission combustion systems



Phase II Objectives

- ▶ Use analysis and design tools to refine and optimize the ACCV and its associated components, including the motor, electronic controller, and proportional solenoid
- ▶ Finalize the design and generate hardware drawings
- ▶ Manufacture the ACCV components and assemble the various components into working prototype units
- ▶ Test the ACCV to validate its fuel flow modulation strength and frequency response up to 1,000 Hz
- ▶ Reduce the test data and determine the effectiveness of the ACCV at modulating fuel flow at 1,000 Hz
- ▶ Validate analysis models

Benefits

- ▶ Mitigates combustion instabilities at higher frequencies
- ▶ Can be close-coupled to the atomizer for high-modulation strength
- ▶ Consumes low electrical power
- ▶ Offers compact and lightweight design

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Proposal Number: 09-2: A2.02-9291