High Pressure Transcritical Combustion (HPTC Combustion)

Active Technology Project (2020 - 2024)

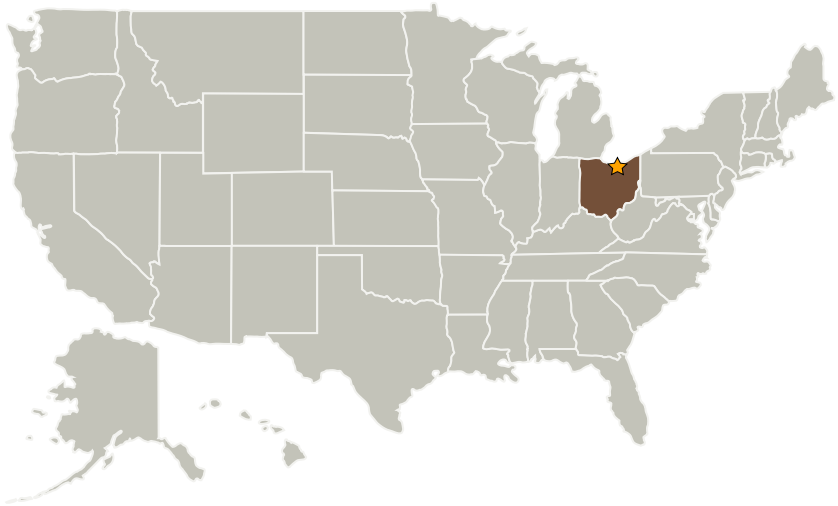
Project Introduction

Combustion is the predominant source of the energy in the US and worldwide, and an overwhelming majority in the transportation sector, particularly liquid hydrocarbons (i.e., gasoline, diesel and jet fuel). Engine manufacturers move to higher operating pressures, above and beyond the critical pressures of the fuel, in order to optimize performance, maximize efficiency and reduce pollutant formation. The design of the next generation of engines, however, are limited by a lack of fundamental understanding of the thermo-physical properties, fluid behavior and chemical kinetics at these high pressures. Terrestrial laboratory studies are hampered by the ubiquitous buoyant flow that renders fundamental experiments difficult and/or impossible to interpret. Studying high pressure transcritical phenomena in microgravity allows researchers to investigate the fundamental aspects of phase change, chemical kinetics and property evaluation in a simplified geometry without the complicating influence of a buoyancy-induced flow.

Anticipated Benefits

The fundamental information provided in the project will allow the development of detailed and simplified models of transport, phase change and chemical kinetics. This fundamental information will then feed into models of real engines that will allow for the rational design of future combustors that promise to deliver increased efficiency and performance while simultaneously decreasing the environmental footprint.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, OH

Primary U.S. Work Locations
Ohio

Organizational Responsibility

Responsible Mission Directorate:

Human Exploration and Operations Mission Directorate (HEOMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Physical Sciences Research Program

Project Management

Program Directors:

Craig E Kundrot
Diane C Malarik

Program Manager:

Devon W Griffin

Project Managers:

Daniel L Dietrich
Michael Hicks
Vedha Nayagam
Uday G Hegde

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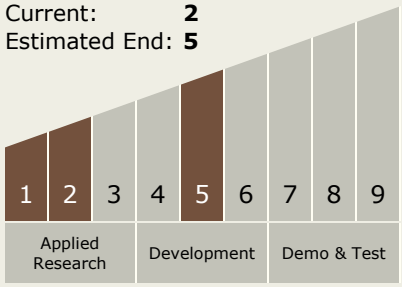
Technology Maturity (TRL)

Start: **1**
Current: **2**
Estimated End: **5**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion

Other/Cross-cutting:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.3 Waste Management

Target Destination

Foundational Knowledge

Supported Mission Type

Push