A Novel Hybrid Rotating Detonation Combustor Optimized with Aerospike Nozzle for Rocket Applications

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- Industry Partners:
 - Aerojet Rocketdyne
 - Kulite Semiconductors

Approach

Dual expander rocket engine hybrid detonation chamber concept using methane/oxygen propellants at chambers pressures exceeding 1.0 MPa.



2. CFD analysis at Naval Research Laboratory

3. RDC design, development, instrumentation, and experimental validation with advanced intrusive probes and optical diagnostics techniques.

Research Objectives

Advance the TRL of rotating detonation combustion (RDC) for space propulsion from 2 to 4 by:

- Introducing a novel configuration that departs from the current proof-of-concept configurations
- Demonstrating an integrated design to naturally transition flow from combustion zone to nozzle
 - Quantifying performance improvements for space hardware and missions

Potential Impact

- Make space travel and exploration more effective, affordable, and sustainable
- Develop replacement for RL-10 in-space propulsion system with higher performance in the same physical envelop
- Produce advanced diagnostics capable of measuring the detonation event for multiple research and practical applications.



Conceptual Design of the Hybrid Rotating Detonation Combustor for Rocket Engine