REQUEST FOR INFORMATION:

Solutions to Enhance US Rocket-Based Combined Cycle (RBCC) Propulsion Technologies

Industry input on the areas to enhance US Rocket-Based Combined Cycle (RBCC) Propulsion Technologies

THIS IS A REQUEST FOR INFORMATION (RFI) ONLY. This RFI is issued as market research and issued solely for information and planning purposes - it does not constitute a Request for Proposal (RFP) or a promise to issue an RFP in the future. This request for information does not commit the Government to contract for any supply or service whatsoever. Further, the Air Force is not at this time seeking white papers or proposals and will not accept unsolicited white papers or proposals. Responders are advised that the U.S. Government will not pay for any information or administrative costs incurred in response to this RFI; all costs associated with responding to this RFI will be solely at the interested party's expense.

The Government does not intend to award a contract on the basis of this request or to otherwise pay for the information solicited. While the Government intends to use this information for future acquisition planning purposes, it will not release any information about your approach that might in any way compromise your competitive posture or proprietary information. All information received in response to this RFI shall be safeguarded adequately from unauthorized disclosure. All information received in response to this RFI that is marked PROPRIETARY will be handled accordingly. The Government will not be liable for or suffer any consequential damages for any proprietary information not properly identified. Proprietary information will be safeguarded in accordance with the applicable Government regulations. Responses to this RFI will not be returned. Respondents will not be notified of the result of the review.

Failure to respond to this RFI does not preclude participation in any future associated request for proposal or white papers that may be issued. Information provided in no way binds the Government to solicit or award a contract. If a solicitation is released, it will be synopsized on the SAM.gov. It is the potential vendor's responsibility to monitor this site for the release of any follow-on information.

HOW TO RESPOND:

Interested parties shall respond with solutions that meet all or a subset of the aforementioned attributes. Written responses should target maximum of five (5) pages in length for each of the Responsive Scenarios included in the RFI. Using Microsoft Word, 11 point font for a not to exceed total of 10 pages for the response. Responses can be for any or all areas of interest included in this RFI. Administrative information is not included in this page count limitation.

All responses shall included the following information:

1. Company Name
2. Business Size for subject NAICS
3. Cage Code/SAM UEI

Responses will also include administrative information and shall include the following as a minimum: organization name, address, and name and e-mail of designated point of contact. Respondents should submit, at a minimum, their qualifications and any other information considered pertinent to the requirement to the Contracting Officer no later than 30 days after the publication date of this notice.

Information considered to be relevant to this RFI should be sent electronically to:

DISTRIBUTION STATEMENT A: Approved for public release. Distribution is unlimited. PA# AFRL-2026-2528

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DETAILS
The Air Force Research Laboratory's Rocket and Space Propulsion Division at the AFRL Rocket Laboratory, Edwards AFB, is soliciting information and comments from industry on their ability to identify specific investments in US technology development and demonstration of Rocket-Based Combined Cycle (RBCC) propulsion with application to high-speed systems. As such, the goal of this RFI is to identify current technologies, US industry base, and government subject matter expertise and test facilities that industry could leverage, as well as technology areas requiring further investment.

AFRL is particularly interested in developing and leveraging Rotating Detonation Rocket Engine (RDRE) technologies operating with storable propellants, particularly High Test Peroxide (HTP) or any other appropriate liquid non-cryogenic oxidizer that meets the constraints described below, in combination with Rocket Propellant (RP) or Jet Fuel. RDREs offer several advantages over traditional rocket engines in terms of operability, size, and performance, thereby having potential to result in an RBCC performance boost.

For the purposes of this RFI, AFRL is interested in RBCC technologies that address the following aspects:

a. Minimize weight: The weight of the RBCC system for a given thrust class is key in enabling missions and shall be minimized. *For the purposes of this RFI – turbine based combined cycles (TBCC) are not considered.*
b. Maximize scalability: The envisioned RBCC system shall be affordable and mass producible. *For the purposes of this RFI - RBCC systems requiring extensive sustainment, logistics, and supply chain, or extensive amounts of exotic materials and exquisite manufacturing techniques, are not considered.*
c. Maximize mission utility: Useful missions further require propulsion systems to be fueled and fielded for long periods prior to activation. *For the purposes of this RFI – cryogenic propellants are not considered.*
d. Maximize propulsion-airframe integration: The RBCC propulsion system outer mold line shall be minimized for a given thrust class.
e. Minimize logistics: The RBCC system shall be operationally sustainable, storable, transportable, integrable, and shall minimize propellant logistics, propellant supply chain risks, and propellant safety requirements for handling in austere environments. This may involve having a common fuel for the rocket propulsion system and the air-breathing propulsion system.
f. Candidate RBCC solutions shall:
    I. Incorporate a liquid storable rotating detonation rocket engine (RDRE) as the primary rocket combustor.
    II. Support ignition, throttling, and relight at relevant RBCC flight conditions.
    III. Support RBCC mission-relevant burn times and therefore have appropriate thermal management subsystems for prolonged operations.

IV. Operate with a dedicated liquid storable oxidizer that minimizes logistics.
V. Have a viable path to RBCC demonstration in relevant flight conditions, including flight-testing the RBCC system at relevant velocities, altitudes, and downrange (TRL-6).

g. Maximize operational range: Utilization of RBCC across a broad range of relevant flight conditions requires integration of a robust air inlet and flowpath to enable multi-Mach operability, with smooth mode transitions and to prevent inlet unstart.
h. Maximize compactness and minimize complexity: The design and manufacturing of the air inlet and flowpath shall be compact and minimize complexity in order to maximize RBCC system scalability (i.e., affordability and mass-producibility).
i. Following ignition, acceleration, and attainment of appropriate cruise conditions, the primary RBCC thrust shall be delivered by the air-breathing propulsion system, with the rocket propulsion system providing supplemental performance through ejector and/or rocket-burn augmentation effects.

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INFORMATION REQUESTED:

The Government is contemplating executing development and demonstration activities to enhance US RBCC propulsion technologies. This RFI is seeking input from industry on the following RBCC areas of interest:

1. Identify overall RBCC system characteristics:
    a. Identify RBCC flowpaths that would best couple an RDRE with an air-breathing propulsion system.
    b. Consider the role and performance of the RDRE and air-breathing propulsion systems when operating concurrently in the air flowpath, including the expected maximum operating speed of the propulsion system, and the approximate inlet conditions for mode transition from RDRE to air-breathing propulsion.
    c. Identify potential thermal management solutions to support the desired operating characteristics.
    d. Identify RBCC size, weight and power considerations associated with feeding, regulating, and igniting liquid propellants.
    e. Provide rationale for RBCC system scalability (i.e., affordability and mass-producibility) based on cost, performance, sustainment, logistics, integration, concept of operations, and material and manufacturing techniques.
    f. Identify the liquid propellants for the RBCC system as well as their potential logistics, supply chain, and safety footprints for handling and operation of RBCC systems in austere environments.
    g. Provide ROM costs and schedule to develop and demonstrate the RBCC system in relevant flight conditions within relevant timeframes, as described above.
2. Identify state of the art (SOA) propulsion systems and investment areas to enhance US RBCC technologies:
    a. Include existing RDRE and air-breathing propulsion technologies that could be leveraged as well as improvements or developments needed to augment RBCC system performance, mission capability, and system scalability.
    b. Include existing high-speed inlet and air flowpath technologies and their potential for utilization in RBCCs, including variability in inlet geometry or other methods to mitigate unstart and enable a broad range of flight conditions.
    c. Identify technology developments needed to improve air flow path, increase inlet performance, reduce combustor size and weight, enable coupling between rocket and air-breathing propulsion systems, maximize specific fuel consumption, minimize cost, and increase scalability (i.e., affordability and mass-producibility) relative to the SOA.
3. Identify propellants for RBCC:
    a. Identify storable oxidizers that could be considered for RBCCs and characterize the SOA of these oxidizers for utilization in RDREs.
    b. Identify storable fuels that could be considered and characterize the SOA of these fuels for RDREs and high-speed airbreathing propulsion systems.
    c. For the propellants identified above, identify challenges associated with logistics, safety, sustainment, supply chain, transportation, material compatibility, handling, storability, content, purity, and performance.
    d. Identify research and development (R&D) activities needed to increase the TRL of RDREs fueled by storable propellants.
4. Identify experimental and test resources for RBCC:
    a. Identify ground test facilities (including direct-connect and freejet) and flight test ranges able to support relevant investigations of RBCC systems, including ROM cost and schedule.
    b. Identify key experimental measurements needed to inform RBCC full-system and subsystem performance, including inlet and flowpath design considerations preceding incorporation into the RBCC full system.

5. Identify computational tools for system design, analysis, and engineering prediction of RBCC full systems and their subcomponents:
    a. Identify existing computational modeling and simulation tools that could be used for design of RBCC full systems and their subcomponents, including their physical fidelity (RANS, URANS, DES, LES), as well tool capabilities for internal aerodynamics, combustion, structures, complex moving geometries, multi-physics, and conjugate heat transfer.
    b. Identify rapid-turnaround low-dimensional analysis tools that could be used for design of RBCC components and integrated flowpaths.
    c. Identify existing systems engineering and configuration management tools that could be used for RBCC design and integration of subcomponents.
    d. Identify existing system analysis tools that could be used to address overall RBCC system performance and utility of RBCCs in relevant flight missions.
    e. Identify strategies for mining experimental data and reduced-order models (AI/ML) to supplement, anchor, and validate computational findings, including uncertainty quantification of computational predictions.
    f. Provide ROM costs and schedule to influence RBCC design with these tools.
6. Identify opportunities to demonstrate RBCC systems in flight tests:
    a. Provide ROM and notional time required from start of concept development to flight test of the RBCC system at relevant velocities, altitudes, and downrange (TRL-6).
    b. Identify government or commercial flight test platforms and programs that could be leveraged for flight test of RBCC systems within relevant timelines, as described above. Considerations could include cost, schedule, RBCC system integration with boost stages or launch platforms, operations security, test cadence, test envelopes, key telemetry data, and flight environment.