UNIVERSITY CONSORTIUM FOR APPLIED HYPERSONICS

PROJECT CALL
Announcement #: TEES/JHTO-RPP-2025-001

Project Call Release Date	July 21, 2025
Request for Project Proposal Questions Cutoff	September 5, 2025 (5:00PM EST)
Notice of Intent Deadline	October 1, 2025 (5:00PM EST)
Prototype Proposal Submission Deadline	October 31, 2025 (5:00 PM EST)
Agreement Award Notifications	March 3, 2026
Anticipated Project Start Date	October 1, 2026
Period of Performance	3 Years
Agreement Ceiling (Topics 1-6)	Approximately $500,000 per year/per award
Agreement Ceiling (Topics 7)	Approximately $1,500,000 per year/per award
Expected Agreement Classification	Controlled Unclassified Information (CUI)

TO APPLY TO THIS PROJECT CALL, YOUR UNIVERSITY'S AUTHORIZED ORGANIZATIONAL REPRESENTATIVE WILL NEED TO HAVE AN ACCOUNT AND SUBMIT PROPOSAL DOCUMENTS THROUGH THE UNIVERSITY CONSORTIUM FOR APPLIED HYPERSONICS WEBSITE: HTTPS://HYPERSONICS.TAMU.EDU

PROPOSALS WILL BE RECEIVED UNTIL THE ABOVE DEADLINE. IF YOU ENCOUNTER ANY ISSUES OR CONCERNS WITH YOUR SUBMISSION, PLEASE EMAIL: UCAH@TAMU.EDU. QUESTIONS REGARDING THE CONTENT OF THE REQUEST FOR PROPOSALS **SHALL** BE SUBMITTED THROUGH THE UNIVERSITY CONSORTIUM FOR APPLIED HYPERSONICS WEBSITE.

Contents

1. OVERVIEW

1.1 General Information

1.1.1 Request for Project Proposals Title

University Consortium for Applied Hypersonics (UCAH) Project Call, Announcement #: TEES/JHTO-RPP-2025-001.

1.1.2 Authority

10 U.S.C. § 4022, "Authority of the Department of Defense to Carry Out Certain Prototype Projects"

1.1.3 Description

The Office of the Under Secretary of Defense (OUSD), Research and Engineering (R&E) Joint Hypersonics Transition Office (JHTO), in partnership with Texas A&M Engineering Experiment Station (TEES) and the UCAH, is soliciting for Prototype Project Proposals (PPPs) supporting projects that will accelerate hypersonics technology development, develop the nation's future hypersonics workforce, and facilitate the transition of ready technologies into operational capabilities. The JHTO is seeking solutions that are considered Advanced Technology Development, which surpass the threshold of Basic or Applied Research. All results and publications will be subject to review for Controlled Unclassified Information and dissemination controls. The project topic descriptions are listed in Section **Error! Reference source not found.** of this document. The JHTO reserves the right to fund none, some, or all the submissions made in response to this Request for Prototype Proposals (RPP). Furthermore, JHTO may choose to fund a portion of a submission or a combination of submissions. No funding for direct reimbursement of PPP development costs will be provided. Any references within this document to the UCAH website, specific to this RPP Project Call, will utilize the following website: https://hypersonics.tamu.edu/project-call/.

1.1.4 Period of Performance

Three years from the agreement award date with an anticipated start date of October 1, 2026.

1.1.5 Estimated Project Ceiling

Each Project Sub-Agreement (PSA) for Topics 1-6 will be approximately $500,000 over the 3-year period of performance. Topic 7 will be approximately $1,500,000 over the 3-year period of performance.

1.1.6 Candidate Eligibility

Candidate must be a University Consortium Member prior to submitting a Notice of Intent (NOI), as described in Section **Error! Reference source not found.** of this document. All Awardees shall maintain their Consortium Membership, in good standing, for the duration of the PSA.

Affiliate Consortium Members are not eligible to respond to this RPP as the lead institution, but may team with an eligible University Consortium Member and be funded accordingly. Affiliate Consortium Members include industry, laboratories, University-Affiliated Research Centers (UARCs), Federally Funded Research and Development Centers (FFRDCs), and U.S. Military Academies. University Consortium
Candidates and team members are generally responsible for determining the extent to which their participation in PPP submissions is appropriate and consistent with their own entities' authorities and applicable laws, regulations, and policies. Submissions including an FFRDC, however, must include a statement from the FFRDC representing (1) that their participation in the competition is consistent with federal law and policy as well as their governing contract(s) (2) the rationale under which they are able participate in the competition given restrictions on FFRDCs competing with the private sector.

Candidates and teaming partners must be capable of safeguarding information and complying with export controls consistent with federal law and policy. Awarded PSAs are expected to include CUI; export-controlled items or information subject to Arms Export Control Act, the International Traffic in Arms Regulations, the Export Administration Act of 1979, as amended, and the Export Administration Regulations; and/or Distribution Statement C information.

As a general matter, all participants must be United States citizens. Participation of foreign member universities and individuals may be permitted on a case-by-case basis. However, a candidate and its teaming partners must be capable of complying with all safeguarding requirements and export controls associated with any such entities/individual's participation.

Candidates must disclose any actual or potential conflicts of interest. Failure to disclose a conflict of interest or conflicts of interest that cannot be satisfactorily mitigated may result in removal from the competition.

1.1.7 Security and Classified Information

Proposals shall not exceed CUI levels and shall be marked in accordance with DoDI 5200.48. Respondents shall outline the potential for their proposal to generate or involve access to classified information in the future while maintaining CUI levels.

If respondents may generate or request access to classified information in the future they must have or be able to obtain cognizant security agency approved facilities, information systems, and appropriately cleared/eligible personnel to perform at the classification level requested. All respondent personnel performing Information Assurance (IA)/Cybersecurity related duties on classified Information Systems shall meet the requirements set forth in DoD Directive 8140 and DoD Manual 8140.03. For 8140 inquiries, please contact the DoD CIO Workforce Innovation Directorate at osd.mc-alex.dod.mbx.cyberspace-workforce-tag@mail.mil.

1.1.8 Administrative and Evaluation Support

All submissions will be treated as "source selection information" as defined by 41 U.S.C. § 2101(7), and contents will be disclosed only in accordance with 41 U.S.C. § 2102. During the evaluation process, submissions may be handled by Government support contractors, TEES' personnel, and other Consortium Members for both administrative purposes and to support technical evaluations. Consortium Members that are proposing under this RPP will not be reviewers within the topic area that they proposed in. All persons performing these roles are expressly prohibited from performing sponsored technical research and are bound by appropriate nondisclosure agreements (NDAs).

1.1.9 Kick-off Meeting

Following the issuance of a PSA award, the Government will conduct a post-award orientation, or kick-off meeting, with the Awardee. The goal of this meeting is to ensure all parties fully understand the PSA terms and conditions, security requirements, inspection, acceptance, and invoicing procedures, and any other topics or requirements, as appropriate. NOTE: The kick-off meeting is not a substitute for Awardees to fully understand the requirements, nor is it to be used to alter the PSA.

1.1.10 Annual Technology Review

Each year, JHTO will hold an Annual Technology Review. The purpose of this event is to conduct a peer review of the current PSAs in an open technical environment. Attendance for current PSA Awardees is required. Attendees may come from current and former PSAs, academia, Government, and/or industry. JHTO will also hold an Annual Forum. Attendance at this event, although not required, is strongly encouraged.

1.1.11 Deliverables

Each PSA, topic notwithstanding, shall submit the following:

a. Quarterly updates.
b. Annual reports for year 1 and year 2 of performance.
c. A final report covering all three years at project completion.
d. A Technical Data Package (TDP) to include, but not be limited to, the following items:
    i. Deliverables outlined in the PPP and PSA.

ii. All raw and filtered test data.
iii. Algorithms, simulations, and models, including description documents and code for Government use.

The Project Technology Areas outlined in Section **Error! Reference source not found.** may have additional deliverables included in their description.

2. TECHNOLOGY AREA DESCRIPTIONS

2.1 TOPIC 1: IMPROVED SUB-SCALE HYPERSONIC AIR-BREATHING PROPULSION TEST CAPABILITIES

Introduction: The JHTO is soliciting proposals that increase the impact of sub-scale direct-connect wind tunnels toward full-scale hypersonic engine research. Currently, these laboratory-scale direct-connect tunnels provide significant scientific data regarding the physics of operating hypersonic engines, such as dual-mode ramjets (DMRJs) or scramjets. However, due to the operating conditions, timescales, and/or the size of the tunnel, the collected data is often of limited relevance for full-scale systems. These limitations require an engine developer to conduct large-scale ground tests and full-scale flight tests to achieve confidence that the engine will perform as desired. Bridging the gap between sub-scale data and full-scale system performance would help mitigate reliance on costly and time-intensive large-scale testing, thereby reducing the development cost of flight systems.

Background: Hypersonic air-breathing propulsion systems, such as DMRJs or scramjets, are a critical subsystem for hypersonic systems. Air-breathing propulsion systems are complex and require a comprehensive test campaign to qualify, which puts a strain on both cost and schedule. To alleviate this strain, there has been significant investments on understanding the correlation of critical physics, both transient and steady state, between the flight environment and hypersonic ground test conditions. These investments have primarily focused on larger government or industry-owned facilities, such as the work conducted though the AFRL Medium Scale Critical Components program [1,2], whereas small, sub-scale facilities remain underutilized for evaluating these critical technologies.

Description and Scope: The objective of this topic is to identify unique solutions that would increase the impact of sub-scale tunnels for DMRJ or scramjet testing. The proposed solution should:

- Identify challenges and uncertainties encountered in sub-scale test facilities when compared to a flight environment,
- Develop solutions to reducing the challenges and uncertainties identified,
- Implement the solutions real-time in a sub-scale test facility as a path for conducting future Hardware-in-the-Loop (HWIL) testing.

Facility modifications may be proposed as a part of a solution but should NOT be the entire focus or cost of the proposal. Solutions that could be realized through a wide range of facilities will receive a higher priority.

Milestones / Deliverables: The following milestones are examples of desired technical progress in this research area:

1. Identify critical parameters with quantified uncertainty
2. Develop models
3. Discretize models for real-time implementation
4. Final report, conclusions and recommendations

Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:

1. Barhorst, T., "AFRL achieves record-setting hypersonic ground test milestone," *Wright-Patterson AFB* Available: https://www.wpafb.af.mil/News/Article-Display/Article/1925549/afrl-achieves-record-setting-hypersonic-ground-test-milestone/.
2. Simones, R., "AFRL teams up with Aerojet Rocketdyne to make hypersonic history," *AFRL* Available: https://www.afrl.af.mil/News/Article-Display/Article/2446947/afrl-teams-up-with-aerojet-rocketdyne-to-make-hypersonic-history/.

2.2 TOPIC 2: DIGITAL TWIN ARCHITECTURE FOR HYPERSONIC AIR-BREATHING SYSTEM AND MISSION DESIGN TRADE STUDIES

Introduction: The JHTO is soliciting proposals to advance the state-of-the-art in Digital Twin Modeling for hypersonic systems that can be used to inform engineering decisions and impact the design cycle for future hypersonics programs.

Background: Developing a hypersonic system is a time-consuming and complex undertaking due to the intricate, coupled nature of the numerous system components. The development of dual-mode ramjet (DMRJ) propulsion systems for multi-Mach operation of an air-breathing hypersonic platform is a representative example. Not only is the physical system design complex, but scaling up DMRJs from laboratory or prototype designs for potential reusable systems introduces additional challenges especially with regard to applying test results. With limited facilities to accommodate larger scale experiments, reusable hypersonic vehicles will benefit from advanced digital engineering capabilities such as digital twins that could leverage data gathered on small scale systems. Current simulation tools, however, require extensive calibration against ground and flight tests [1], relying heavily on empirical data and struggle to model component-level physics that affect system performance, such as thrust, specific impulse, and vehicle range. To effectively design future hypersonic systems within the digital environment, digital twin tools will need to employ novel modeling approaches, multi-fidelity (MF) reduced-order models (ROM) [2], machine learning [3], and uncertainty quantification [4].

Description and Scope: The objective of this topic is to develop, evaluate, and deliver a digital twin environment for the representation of a DMRJ-powered hypersonic vehicle. Techniques should couple a variety of modeling strategies/fidelities as well as a clear data fusion approach to leverage relevant experimental data. Due to the budgetary constraints of the effort, proposals may leverage the assumption that data sets from existing government programs may be made available for the development and validation of digital twin models. As an example, the HiFire-2C (HF2C) flight test program has existing component-level ground test data and plans for both flight and free-jet testing for the entire configuration.
The proposed solution should utilize experimental ground test data—including sub-scale testing—and multiple modeling approaches to construct a digital twin environment that is broadly applicable; the ultimate validation of the digital twin model should come from flight test data. An example of a final objective of the HF2C digital twin could be to 'fly' the digital twin which uses the same flight test conditions as the HF2C flight test to predict the engine performance, which is then validated by the actual test data.
An important requirement for this topic is to develop a computational framework that is GPU/CPU-optimized to enable real-time studies of the system. Additionally, the proposed solution should have a clear path for utilizing the proposed digital twin development process for other engineering systems to ensure the ability to transition.

Milestones / Deliverables: The following milestones are examples of desired technical progress in this area:
1. Deliver a computational framework for a digital twin (GPU/CPU-optimized) of a DMRJ (or another relevant hypersonic system) based on experimental data from ground testing.
2. Validate the framework against applicable ground and/or flight test data.
3. Provide a description of how the digital twin framework could be translated to other hypersonic systems.
4. Final report, conclusions and recommendations

Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:
1. R.A. Baurle, "Modeling of High-Speed Reacting Flows: Established Practices and Future Challenges", AIAA Paper No. 2004-0267, 2004.
2. Mukhopadhaya, J., Whitehead, B. T., Quindlen, J. F., Alonso, J. J., & Cary, A. W. (2020). Multi-fidelity modeling of probabilistic aerodynamic databases for use in aerospace engineering. International Journal for Uncertainty Quantification, 10(5).
3. Brunton, S. L., Noack, B. R., & Koumoutsakos, P. (2020). Machine learning for fluid mechanics. *Annual review of fluid mechanics*, *52*(1), 477-508. '
4. Duraisamy, K., Iaccarino, G., & Xiao, H. (2019). Turbulence modeling in the age of data. *Annual review of fluid mechanics*, *51*(1), 357-377.

2.3 TOPIC 3: SHOCK PROPERTIES OF ADDITIVELY MANUFACTURED MATERIALS (AMM)

Introduction: The JHTO is soliciting proposals to advance the understanding of the dynamic response of Additively Manufactured Materials (AMM) under extreme thermal and mechanical load conditions of hypersonic flight and high velocity impacts relevant to hypersonic applications. The goal is to develop high-rate, high-pressure, large deformation constitutive models and equations-of-state [1] through robust and rigorous characterization [2] of AMM for the modeling and simulation (M&S) [3] of hypersonic systems during all phases of flight. Damage mechanisms and failure progress – preferably connecting both mesoscale and continuum scale behaviors – are particularly valuable. Materials of interest should focus on AMMs that have demonstrated potential for hypersonic applications. Research teams are encouraged to collaborate across disciplines in materials science, mechanical engineering, and computational modeling to address the challenges associated with quantification and modeling of shock properties in AMM.

Background: Hypersonic systems require materials with exceptional performance characteristics to withstand extreme thermal and mechanical stress during flight, including end of flight. Additive manufacturing offers the advantage of creating complex geometries and tailored material properties, but AMMs remain sparsely characterized, leading to great challenge in the M&S of AMMs. Research in this area is critical for informing the design of hypersonic vehicles and munitions that require enhanced performance in kinetic energy transfer and damage mitigation. Investigating the shock properties of AMMs will develop a deeper understanding of their behavior, which is essential for optimizing their application in hypersonic systems.

Description and Scope: The objective of this topic is to investigate shock properties in AMMs, encompassing:
- Experimental Material Characterization: Investigate shock wave propagation, examine the influence of microstructural features on AMM properties, parameterize equations of state, and develop constitutive models.
- Predictive Modeling: Develop and validate computational models that predict shock response based on microstructural properties,
- Novel AMM and Techniques: Explore additive manufacturing techniques and develop new materials with enhanced shock resistance,
- Application to Hypersonic Systems: Assess the implications of research findings for hypersonic endgame interactions and provide recommendations for material selection and processing techniques.

Milestones/Deliverables: The following milestones are examples of desired technical progress in this research area:
1. Literature review and preliminary analysis
2. Experimental design and setup
3. Data collection and analysis
4. Model development and validation

5. Final report, conclusions and recommendations

Final deliverables should be validated constitutive models and equation of states ready to be implemented in commonly used M&S packages for hypersonic flight and terminal impact applications in DoD community. Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:

1. Shulenburger L., CArpentar J., Debusschere B., Sandia Equation of State (EOS) Deep Dive. PEM Days. June 2015. Available: https://www.osti.gov/servlets/purl/1260525.
2. Petrovich C., Additive Manufacturing Material Characterization for Comparative Analysis. NIWC Pacific. October 2024.
3. Spear, D.G.; Palazotto, A.N.; Kemnitz, R.A. Modeling and Simulation Techniques Used in High Strain Rate Projectile Impact. Mathematics 2021, 9, 274.

2.4 TOPIC 4: EXPERIMENTAL & MODEL BASED ENDOTHERMIC FUEL PROPERTIES

Introduction: The JHTO is soliciting proposals for the development of models for endothermic fuels of interest. Hypersonic systems use chemical propellants to accelerate and sustain speeds that impose high thermal loads on the vehicle and propulsion system. Some systems utilize regenerative cooling with liquid hydrocarbon fuels to manage the heating. In this scheme, additional cooling capacity can be obtained from endothermic reactions as the fuel is thermally decomposed into lighter hydrocarbons. These endothermic fuels can increase the range of operability, durability, and performance of supersonic combustion engines, in turn advancing the state of the art in high-speed propulsion.

Background: Advanced fuels for high-speed air-breathing propulsion require careful consideration of their physical properties across a wide range of operating conditions, including liquid, vapor, and supercritical states. These fuels are often designed for high heat capacity, low carbon deposition, and high energy density, but their behavior in supercritical conditions, particularly with the added complexity of endothermic decomposition, introduces a significant uncertainty in predicting their properties. Accurate models of the supercritical behavior of these fuels, including the effects of decomposition, are crucial as they directly impact heat transfer, flow rates, and overall engine performance. Validated equation of state models for new fuels and fluid components are needed to generate condition-specific fluid properties needed by heat exchanger and fuel system designers for the development of reliable and efficient high-speed propulsion systems.

Description and Scope: The objective of this topic is to conduct experimental and analytical efforts for the prediction of the physical and chemical behavior of endothermic fuels used as working fluids for thermodynamic cycles, heat transfer, power generation, and combustion in high-speed propulsion systems. The desired outcome is to develop equation of state and transport property models for new fluids and/or components of decomposed fuel products using a Helmholtz energy equation of state or other method with equal or higher fidelity. The resulting fluid property models will be used to create surrogate mixtures for the generation of reduced order property models or tables for neat fuel and thermally decomposed fuel products that can be integrated with heat exchanger and fuel system analysis tools. The expansion of new or existing fluid/fuel property models or data tables to provide a broader range conditions or improved accuracy at higher temperatures, supercritical, and/or decomposed condition(s) is also of interest. Performers can select their own fuels of interest and industry/lab partnerships for supplying and testing fuel. Fuels of interest have high energy density and must be capable of safe storage, supportable with logistics that are compatible with forward deployed fuel storage (stable with minimal environmental controls), capable of behaving as a heat sink for hypersonic vehicle thermal loads and show repeatable endothermic performance. Alternatively, submissions can request that the government provide properties and a source of endothermic fuel of interest after selection as Government Furnished Information (GFI) / Government Furnished Equipment (GFE).

Milestones/Deliverables: The following milestones are examples of desired technical progress in this research area.

1. Design and conduct experiments with realistic fuel system conditions
2. Fuel/fluid property data at relevant conditions
3. Empirical or physics-based models
4. Equation of state modeling
5. Model validation & quantified uncertainty
6. Final report, conclusions and recommendations

Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:

1. Bruno, T. J., Huber, M. L., Laesecke, A., Lemmon, E. W., and Perkins, R. A., “Thermochemical and thermophysical properties of JP-10,” *NIST Interagency/Internal Report (NISTIR)*, Jun. 2006.

2.5 TOPIC 5: CERAMIC TESTING FOR HYPERSONIC VEHICLES

Introduction: The JHTO is soliciting proposals to advance ceramic material testing capabilities for reusable hypersonic systems. High-cycle fatigue (HCF) and creep behavior of high-temperature ceramics under the conditions relevant to reusable applications have not been significantly investigated. This solicitation aims to identify methodologies for testing and characterizing material performance across a range of operational conditions, load cycles, and service lifespans, ultimately enabling predictive modeling of performance under untested conditions.

Background: Predictable maintenance, robust evaluation routines, and clear return-to-flight procedures are crucial for the successful operation of reusable hypersonic vehicles. Materials subjected to extreme thermal and mechanical cycling, such as carbon fiber reinforced SiC (C/SiC), SiC fiber reinforced SiC (SiC/SiC), and oxide/oxide composites, are vulnerable to creep and high-cycle fatigue (HCF). Therefore, a thorough understanding of these materials performance and lifecycles is essential for ensuring the reusability of hypersonic vehicles.

Description and Scope: The objective of this topic is to develop material testing standards and procedures that prove design viability for reusable vehicle applications. Importance will be placed on learning from experienced high-temperature materials testing teams at government labs and partner facilities. Work should be focused on formulating material testing and analysis methods that help characterize material survivability for reuse. Simple load-bearing structure articles are suggested to be evaluated for this effort but could also include complex parts, such as those with regenerative cooling channels. The effort should be focused on describing methods for measuring high temperature creep and fatigue data and working with transition partners, such as industry and government test facilities. It is important to capture the following for testing and materials handling: temperatures conditions informed by ceramic material limits and application, temperature ramp rates in testing (up and down), cycle duration, cycle count and lifetime estimates. Another key goal would be to reduce the number of tests required to characterize material properties with sufficient data for predicting lifetime behavior. The use of modeling and uncertainty quantification to inform data collection and interpretation is encouraged.

Milestones/Deliverables: The following milestones are examples of desired technical progress in this research area:

1. Design experiments representing realistic flight enthalpy conditions
2. Standard test samples for evaluation should be 6”x6” or 12”x12”
3. Identify critical parameters with quantified uncertainty
4. Description of test setup and procedures for materials
5. Procurement of materials for evaluation

6. Develop models for material performance
7. Experimentation, validation, and test results
8. Final report, conclusions and recommendations, and results of proposed schema for use by government labs and industry

It is important that the testing capability is targeted toward establishing an enduring testing capability for the materials community to use. Priority should be placed on referencing relevant standards similar to American Society for Testing and Materials (ASTM) specifications and Metallic Materials Properties Development and Standardization (MMPDS) when possible or applicable. Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:

1. 2nd Lt. A. R. Cabri, "Fatigue of two oxide/oxide ceramic matrix composites at 1200 F in air and in steam. Effect of diamond effusion holes", WPAFB: Air Force Institute of Technology, March 2021.
2. Capt. Matthew T. Pope, "Creep behavior in interlaminar shear of a cvi sic/sic composite at elevated temperature in air and in steam", WPAFB: Air Force Institute of Technology, March 2021.

2.6 TOPIC 6: MITIGATION OF THERMAL DEGRADATION IN HYPERSONIC WINDOWS

Introduction: The JHTO is soliciting proposals for enhancing window interfaces. Sensor windows experience extreme thermal stresses during hypersonic flight, which reduces their performance. Optical windows have dissimilar material properties to the rest of the hypersonic vehicle, challenging the integration of the windows. This topic aims to develop and test mitigation strategies for thermally induced window degradation in flight-relevant environments (750°C-1500°C).

Background: Hypersonic vehicle sensor integration is challenged by extreme thermal stresses during flight, impacting window performance. Differing Coefficients of Thermal Expansion (CTE) between window materials and surrounding structures exacerbate this issue. The thermal protection system (TPS) is often made of high temperature ceramics, and the sub structure of the flight frame is made from metals. Furthermore, windows are often brittle and can break or distort images based on how stress is applied to the window at hypersonic flight conditions.

Description and Scope: The objective of this topic is to identify solutions for seals, interfaces, thermal standoffs, coatings, and other passive/active technologies to improve window performance under high thermal loads. The proposed solutions should focus on a 2" x 4" flat window made of hypersonic-relevant materials. The proposals should identify window materials of relevance, but the government may provide additional Government Furnished Information (GFI) to the performer.

Milestones / Deliverables: The following milestones are examples of desired technical progress in this area:

1. Design and demonstrate a CTE-compensating interface for a window and a pocket/inset made from a high temperature survivable material, such as densified carbon-carbon (C/C).
2. Conduct thermal testing of a flat window with the implemented solution and inset, measuring optical properties (changes in spectral transmission, optical distortions due to stress and temperature gradients, etc.) under realistic thermal cycling conditions (750°C-1500°C).
3. Develop a detailed test plan for the duration and thermal cycling rates representative of hypersonic flights.
4. Develop stress and distortion models for the material interface.
5. Identify critical parameters and quantify associated uncertainties.
6. Conduct post-test analysis and report results, including strategies for mitigating distortion and rupture.

Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

2.7 TOPIC 7: NETWORKING AND COLLABORATIVE COMMUNICATIONS

Introduction: The JHTO is soliciting proposals for networking solutions designed to facilitate collaborative hypersonic systems. The Department of Defense (DoD) has made significant investments in Networked Collaborative and Autonomous (NCA) systems capable of autonomous collaboration to achieve shared objectives. The extreme velocities of hypersonic systems pose unique challenges to established collaborative methods, particularly concerning interoperability with other systems of various speeds. This topic solicits solutions to these challenges, specifically for radio-frequency (RF) communications between a hypersonic system and other systems traveling at a variety of speeds.

Background: NCA systems provide benefits on a complex battlefield. Demonstrations, such as those conducted during the Air Force Research Laboratory (AFRL) Golden Horde program, have demonstrated the effectiveness of this capability with low-speed systems [1]. The capability developed for low-speed systems are applicable for hypersonic systems, but additional constraints will need to be considered. An important constraint limiting the use of NCA-capable hypersonic systems comes from the scale, both temporal and spatial, of the mission sets they will be deployed against. A hypersonic system will effectively have a vastly shorter timeline to network and collaborate with other systems. Consequently, the Size Weight and Power (SWaP), mission planning, network architecture, RF communication channel properties, and antenna design/integration for a collaborative hypersonic system will all be important considerations when developing this capability.

Description and Scope: The objective of this topic is to provide solutions for RF communications for hypersonic systems in a heterogeneous collaborative engagement. The proposed solutions shall:

- Develop and/or identify a robust network architecture for integrating a hypersonic system within a heterogeneous collaborative engagement, to include a timeline analysis between communicating platforms. The proposed solution should consider all factors that may limit a hypersonic system's ability to establish a network, to include contending with short connection time windows while maintaining acceptable bit error rates (BER) and maximum information transfer (bandwidth).
- Investigate the network architecture(s) selected through high-fidelity simulations. The investigations should examine all relevant phenomenological, system design, and mission engineering considerations that are required to evaluate a hypersonic system when establishing a network via RF communication with other systems of various speeds. The solution should address, but is not limited to: trajectory, SWaP, antenna configuration, antenna-platform interactions, Doppler shift, modulation type, signal-to-noise ratio (RF link analysis), BER, operating frequency, bandwidth, polarization, and other RF channel parameters (e.g., hypersonic platform-atmospheric interactions).
- Verify and validate the proposed network solution and simulations through testing relevant environments at an applicable complexity for the cost provided to retire the most stressing identified risks.

The proposed solution is not expected to develop new collaborative engagement algorithms but should be capable of providing the connectivity of systems during a collaborative engagement.

Milestones / Deliverables: The following milestones are examples of desired technical progress in this research area:

1. Conduct a thorough literature review on networking architectures and flight systems.
2. Development of a simulation framework for evaluating antenna properties and RF signal propagation.

3. Integration of network architecture into the simulation framework to evaluate communications between two or more systems along distinct trajectories.
4. Validate the results through testing.
5. Analysis of the system attribute requirements for hypersonic vehicles in a heterogenous collaborative engagement. Include requirements on the SWaP of the antenna, RF channel properties, Doppler shift, trajectory limitations (altitude, Mach, distance from other systems within the engagement), and any other parameters that are critical for fielding this capability.
6. Evaluation of key performance metrics of the proposed solution.
7. Final report, conclusions and recommendations

Milestones should be established that are commensurate with the proposed schedule of deliverables. A successful technical outcome may lead to the opportunity to seek follow-on funding.

References:

1. "Golden Horde Colosseum: Developing the Technologies for Networked, Collaborative and Autonomous Weapons," *Air Force Research Laboratory* Available: https://afresearchlab.com/technology/vanguards/successstories/golden-horde.

3. GENERAL SUBMISSION REQUIREMENTS

3.1 Questions

Questions regarding the Project Call may be emailed to UCAH@tamu.edu through **September 5, 2025 at 5:00 PM EST.** Answers to the questions will be posted on the UCAH website for this RPP Project Call. All questions and answers will be made available to all proposers, unless they involve proprietary or CUI material.

3.2 Submission Instructions

Proposals shall be submitted through the UCAH website for this RPP Project Call. Proposals cannot be submitted before an organization is fully registered on the UCAH website. **The UCAH website is the single point for submission.**

3.3 Eligibility

3.3.1 Notice of Intent

To be eligible to submit a PPP for consideration, a PPP Notice of Intent (NOI) shall be submitted no later than **October 1, 2025 5:00 PM EST,** through the UCAH website for this RPP Project Call. The submitted NOI shall include, on a cover page, the Topic Number and a full list of participants to include: 1) each person anticipated to support the proposed project (listed with their name and current institutions/organization), and 2) all institutions, organizations, laboratories, etc. anticipated to support the proposed project.

3.3.2 Prototype Project Proposals

PPPs shall be submitted through the UCAH website for this RPP Project Call and shall be received no later than **October 31, 2025 at 5:00 PM EST**. Submissions received after the deadline will not be considered. Each PPP is limited to a maximum of four PIs. No university shall exceed leading three PPPs.

TEES will assign a program specialist to assist each proposing University Consortium Member with the PPP documentation and submission process.

The PPPs shall follow the format described in Section **Error! Reference source not found.** of this document and will be evaluated based on the criteria described in Section **Error! Reference source not found.** of this document.

3.4 FORMATTING

PPPs shall be submitted in accordance with the instructions described in this document. All submissions shall be in English.

- A page is defined as one 8.5” x 11” electronic page with 1” margins.
- The font shall be Times New Roman single-spaced and no smaller than 11-point font size. NOTE: Smaller font size may be used in figures and tables but must be legible.
- Pages shall be in portrait orientation, except for figures, graphs, images, and pictures.
- Figures and tables shall be numbered and, when referenced in the text, shall be referenced by that number. Figures and tables shall be of a size that is easily readable and may be in landscape orientation.
- Pages shall be numbered sequentially, and all major sections shall begin on a new page.
- All PPP documents, to include a PDF version of the budget spreadsheets, shall be submitted as one PDF file.

For PPPs, the budget spreadsheet shall also be submitted as an excel document with formulas left available for evaluation purposes.

No classified information shall be submitted with the proposal. All information that is a trade secret or proprietary information shall be marked as such. NOTE: Government support contractors, TEES’ personnel, and other Consortium Members may have access to this information for the purposes of administrative support and/or evaluation(s). Each evaluator will be required to complete a NDA and to certify they have no Conflict of Interest (COI) that might impact the review process.

3.5 DOCUMENTS CONTENT

The purpose of these instructions is to prescribe the structure of PPPs and describe the approach for the development and presentation of PPP information.

3.5.1 PROTOTYPE PROJECT PROPOSAL SUBMISSIONS

Use of the Proposal Template and RPP Budget Template provided on the UCAH website for this RPP Project Call is required. In accordance with the PPP templates, each PPP shall contain the following:

<u>Cover Page (1 page maximum)</u>

<u>Participant List (1 page maximum)</u>

The Participants List shall include the University Consortium Member Institution, Topic Number and a full list of participants to include: 1) each person included in the PPP (listed with their name and current institutions/organization) and 2) all institutions, organizations, laboratories, etc. included in the PPP. This is to help us screen for conflicts of interest in evaluations.

<u>Table of Contents (1 page maximum)</u>

The Table of Contents shall include all documents requested below in Volumes I-X below.

<u>Volume I: Performance Work Statement (12 pages maximum)</u>

a. Abstract
b. Objectives Statement
c. Research Narrative
    i. Background and Overview of Proposed Project

   ii. Technical approach, including clearly defined prototype solution
   iii. Schedule and Deliverables

d. Workforce Development / Student Involvement
e. Place(s) of Performance
f. Government Furnished Property/Equipment/Materials/High Performance Computing (HPC) Requests. (Note: The JHTO does not have authority over HPC hour approvals through the HPC Modernization Program. Proposers should address potential backup plans and costs should a HPC request be denied)

Volume II: Bibliography and References (No page limit)

Volume III: Facilities (3 pages maximum)

The Facilities Volume shall address the following:

a. Identify any facilities required for the proposed solution and whether those facilities are organic to project participants' organization(s) or must be leased or purchased.
b. Indicate whether facility availability is likely to impact the project's cost/schedule/performance.

Volume IV: Key Participants (No page limit)

The Key Participants Volume shall address the following:

a. A resume for all listed Key Participants.
   i. Each resume shall be no more than two pages in length.
b. Description of significant contribution(s) to the proposed solution and what makes each significant.
c. The total level of effort, as a percentage of a 40-hour workweek, each participant will devote to this project.
d. Include all current and pending sponsored research projects for each PI.
e. Shall include a plan on how the candidate has addressed any potential or actual Conflicts of Interest.

Volume V: Security Requirements (No page limit)

The Security Requirement Volume shall address the following:

a. All participating universities and institutions shall be fully compliant with the following requirements:
   i. Capable of protecting CUI in accordance with the following DFARS clauses:
      1. DFARS 252.204-7012
      2. DFARS 252.204-7019
      3. DFARS 252.204-7020
      4. DFARS 252.204-7021
   ii. Registered with the Directorate of Defense Trade Controls (DDTC).
b. The PPP shall address any special security and classification requirements, as necessary. Awardees will have 180 days from the time the PSA is awarded to be fully compliant with applicable DFARS clauses.

Volume VI: Pricing (No page limit)

The Pricing Volume shall address the following:

a. The proposed prices shall provide sufficient detail to substantiate that the prices presented in the proposal are reasonable and complete for the work proposed.
   i. The burden of demonstrating price reasonableness rests with the proposer.
   ii. An assessment that the proposal price is not reasonable may result in the proposal being non-selectable for award.
b. The Pricing section shall also include a narrative to provide justification and formulae used in establishing the pricing.
c. At least 51% of the estimated price shall directly fund Consortium Member(s).
d. For all team members that do not have Government-approved rates, their proposed rates shall represent fair market value rates.

i. Labor Rates: Provide the basis for which the estimated total labor hours were calculated, including generic labor categories, estimated rates, and hours for those individuals.
ii. Fringe Benefits: Provide the rates and calculation of the costs.
iii. Annual Technology Review and Annual Forum: Provide the estimated costs for team travel for the Annual Technology Review and the Annual Forum.
iv. Travel: All travel, including the Annual Technology Review and the Annual Forum, shall align with the Joint Travel Regulation (JTR). The proposed travel cost shall include the following for each anticipated trip:
    1. The purpose of the trip.
    2. Trip origin and destination (if known).
    3. Approximate duration of the trip.
    4. The number of travelers.
    5. The estimated cost per trip (including mileage, parking, baggage costs, etc.).
v. Materials and Supplies: Provide a list of the materials/equipment required to meet the technical approach and the estimated cost.
vi. Sub-Agreements/Subcontracts: Provide a description of the work to be performed by the subrecipient/subcontractor and associated costs. For each PSA, a detailed cost proposal is required to be submitted by the subrecipient(s).
vii. Recipient Acquired Equipment or Facilities: Equipment and/or facilities are normally furnished by the Recipient. If acquisition of equipment and/or facilities is proposed, a justification for the purchase of the items shall be provided. Provide an itemized list of all equipment and/ or facilities costs and the basis for the estimate (e.g., quotes, prior purchases, catalog price lists). Allowable items normally would be limited to research equipment not already available for the project. General purpose equipment (i.e., equipment not used exclusively for research, scientific or other technical activities, such as personal computers, laptops, office equipment) shall not be requested unless they will be used primarily or exclusively for the project. For computer/laptop purchases and other general-purpose equipment, if proposed, include a statement indicating how each item of equipment will be integrated into the program or used as an integral part of the proposed project.
viii. Other Direct Costs – Provide an itemized list of all remaining proposed other direct costs, such as laboratory fees, report and publication costs, and the basis for the estimate (e.g., quotes, prior purchases, catalog price lists).
ix. Indirect Costs: Provide an estimate of the total indirect costs and provide data supporting how the estimate was calculated, including any estimated costs other than the labor and material equipment, i.e., overhead, G&A, etc.

Volume VII: Milestone Payment Schedule (1 page maximum)

The Milestone Payment Schedule Volume shall address the following:

a. Each PPP shall have a defined project schedule.
b. The Milestone Payment Schedule shall include the payable events for the prototype project.
c. Each event shall include a description and proposed price for the event.

Volume VIII: Affirmation of Business Status Certification (No page limit)

The Affirmation of Business Status Certification Volume shall address the following:

a. A certification for each institution shall be included in the PPP.
    i. Name of Business Entity
    ii. Proposed NAICS Code
    iii. Cage Code
    iv. SAM Expiration Date
    v. Address
    vi. Business POC Name, Title, Phone and Email

Volume IX: Data Rights Assertions (No page limit)

The Data Rights Assertions Volume shall address the following:

a. Identify any intellectual property, patents and inventions in the proposed solution and associated restrictions on JHTO/the Government's use of that intellectual property, patents and inventions. If the offeror intends to provide IP without restriction and has no assertions, state no restrictions are being asserted for IP/Data Rights.
b. The following information shall be presented for all assertions:
    i. Technical data, computer software, or patents to be furnished with restriction (If the assertion is applicable to items, components, or processes developed at private expense, identify both the data and each such item, component, or process).
    ii. Basis for assertion (Generally, the development of an item, component, or process at private expense, either exclusively or partially is the only basis for asserting restrictions on the Government's rights to use, release, or disclose Technical Data pertaining to such items, components, or processes. Indicate whether development was exclusively or partially at private expense. If development was not at private expense, enter the specific reason for asserting that the Government's rights shall be restricted).
    iii. Asserted rights category (limited rights, restricted rights, Government purpose rights, special license, commercial license, or unlimited rights). For "special license" rights, please elaborate.
    iv. Name of entity asserting restrictions (corporation, individual, or other person, as appropriate).

Volume X: Appendices (4 pages maximum)

The Appendices Volume shall address the following:

a. Include any supplementary material that may be helpful in providing a more comprehensive understanding of the proposal. Information included in the appendices will not be used for evaluation purposes.

4. AWARD

4.1 EVALUATION CRITERIA

PPPs will be evaluated using the criteria listed below.

1. **Contribution to workforce development.** The plan maximizes student involvement using numerous students from various degree levels and fields of study, assignment of students to meaningful work, and exposure and integration of students with partnering organizations.

2. **Soundness of the proposed approach.** A detailed and achievable technical plan is proposed which provides new or novel contributions toward the topic or subtopic solution. Appropriate analysis, design, and testing under relevant conditions is specified. Technical risks are well-defined and realistic mitigations are provided. Deliverables and milestones are outlined and clearly presented in a project plan.

3. **Potential for the solution to transition.** The proposal outline an achievable pathway for adoption into operational Government or private sector application. Thoughtful technology maturation and transition planning is bolstered by active coordination with transition stakeholder organizations to ensure buy-in.

4. **Qualifications of the investigators.** The proposed principal/key investigators, supporting staff, and consultants have relevant past performance and expertise in all relevant disciplines of the technical solution. The team is qualified to manage a project of this scale and complexity, perform the stated research and development, and transition the results.

5. **Reasonableness of the Cost Proposal.** Proposed price and cost elements are realistic for the work to be performed, reflect a clear understanding of the requirements, and are consistent with the unique methods of performance and materials described in the technical proposal. Cost elements shall include travel, materials, supplies, equipment, facilities, and other direct costs, if applicable. Distribution of funding to consortium members (i.e. at least 51% of the total proposed price)

4.2 Basis for Award

4.3 Prototype Project Proposal Evaluation Process

PPPs will be evaluated independently, based on the evaluation criteria in Section **Error! Reference source not found.** of this document, not against any other PPPs. The Government reserves the right to award all, some or none of the PPPs submitted. All submissions will be fairly evaluated; however, the Government reserves the right to limit the number of PPPs selected for PSA awards. Additionally, after evaluation, the Government may request and recommend a partnership between two or more submitted PPPs, which may include all elements or selected elements of those PPPs. Should the Government choose to do this, JHTO will provide direction that will enable the PPP leads to pursue a PSA that will meet the requirements of the technology area.

All PPP submissions will be valid for 365 calendar days. Upon completion of evaluations, the JHTO will notify the PPP lead that: (1) the proposed solution has been selected to pursue the award of a PSA, (2) the proposed solution is not of interest or (3) the proposed solution is of interest but has not been selected to pursue the award of a PSA and will be held for 365 days.

In the event additional funding becomes available, a PPP lead may be contacted within 365 calendar days from the PPP submission date with the possibility of a PSA. If after 365 calendar days from the PPP submission date (or earlier if notified by JHTO), the PPP lead has not been contacted to formally move to a PSA award, the PPP will no longer be eligible for an award under this RPP Project Call.