Ohio Federal Research Network

Driving Innovation Through Strategic Partnerships

Round 7

Opportunity Announcement

Issued February 4, 2025

Parallax-25-053

Ohio Federal Research Network (OFRN) Opportunity Announcement Pre-Release

1 OPPORTUNITY DESCRIPTION

1.1 General Overview Information

State Program:	Ohio Federal Research Network (OFRN)
Funding Opportunity Title:	Round 7
Announcement Type:	Opportunity Announcement
Funding Opportunity Number:	Parallax – 25-053

1.2 Key Dates (tentative)

Event	Key Date
Opportunity Announcement Formal Release	February 4, 2025
Webinar: Informational Session and Q&A with AOI SMEs	February 10, 2025* (10:00am – 11:30am ET) February 25, 2025* (1:00pm – 2:30pm ET)
Offerors Conference and Proposal Training	March 6, 2025* (8:30am – 11:30am ET) *Mandatory*
Webinar: Informational Session and Q&A with AOI SMEs	March 20, 2025* (8:30am – 10:00am ET)
Proposal Questions Accepted Through	April 18, 2025, by 5:00pm ET
Round 7 Solicitation Due date	April 28, 2025, by 5:00pm ET
Notification of Finalists	May 30, 2025
Finalists Sessions with TRC	June 16-20, 2025
Awards Announced	July/August 2025
Projects Start	September/October 2025

Information for sessions will be posted to *https://ohiofrn.org

Offerors Conference and Proposal Training on March 6, 2025 is mandatory. At least one member of the proposal team needs to register/attend.

1.3 Description of the Funding Opportunity

The OFRN Round 7 Opportunity Announcement is focused on expanding Ohio's research and development capabilities across the state's academic institutions and business in support of Ohio-based Department of Defense federal partner needs, which ultimately promotes Ohio's economic growth.

OFRN Round 7 is seeking applied research only at a Technical Review Level (TRL) of 3 or higher. Areas of Interest (AOIs) include topics in **Hypersonics; Health and Human Performance; Aerospace Power Management, Materials, and Distribution; Commercial Space in Low Earth**

Orbit; Quantum Technologies; Autonomy; and Advanced Materials Technology – Critical Materials Supply for Aerospace. This announcement seeks to leverage Ohio's unique research capabilities and its federal partner's expertise to accelerate technology development and innovation by increasing collaboration across government, academic, and industry organizations and promoting student experiential learning. OFRN Round 7 will not fund projects for fundamental or basic research. All Primary Applicants must obtain any export control license needed and must only propose employees that meet such criteria.

1.4 Funding Availability

The Round 7 Opportunity Announcement is ***subject to funding availability*** based upon a pending review and final determination of the Program Objectives from the Ohio Department of Higher Education (ODHE). OFRN will not reimburse interested parties for any costs incurred in the review and/or response to this document.

Anticipated individual awards:	**$800k to $1.25M each**
Cost share:	Cost share is optional, but favored
Project Period:	18 Months from Contract Signing
Award Type:	Cost Reimbursable Contract

1.5 Program Contacts

Title	Name	Email
Executive Program Director	Mark Bartman	mark.bartman@parallaxresearch.org
Contracting Questions	Paul Dungan	contracts@parallaxresearch.org
Administrative Questions	Becky Mescher	OFRN-Question@parallaxresearch.org

1.6 OFRN PURPOSE

The Ohio Federal Research Network (OFRN) is a state-funded, Parallax-administered program designed to enhance the Ohio industrial base while also increasing research funding, talent, and capabilities development in Ohio to support future federal, state, and industry acquisition requirements. The State is investing in Ohio's Innovation Economy, and furthering Ohio's position as a national leader in both the defense and commercial sectors.

Bi-annually, OFRN releases an Opportunity Announcement to identify and fund research projects that are of interest to the federal partners and are likely to later be funded by a federal partner. During the OFRN contract cycle, awardees are also exposed and educated on federal acquisition processes and regulations. Further, awardees are prepared to compete for federal research opportunities.

OFRN Round 7 is funded by the Department of Higher Education (ODHE). This allows Ohio's academic faculty and their students the opportunity to advance their research alongside other cutting edge research projects.

The OFRN established a novel approach to technology-based economic development with a focus on aggregating, integrating, and leveraging federal, academic and private sector capabilities and resources in Ohio to develop proactive and innovative solutions to address emerging federal and state requirements as well as emerging market opportunities. OFRN research projects are intended to advance priority research thrust areas of the Ohio Federal Partners: Air Force Research Lab (AFRL), National Air and Space Intelligence Center (NASIC), Naval Aerospace Medical Research Unit – Dayton (NAMRU-D), and National Aeronautics and Space Administration Glenn Research Center (NASA-GRC). OFRN also engages with the Ohio National Guard (ONG) regarding its organizational mission needs.

1.7 Program Description

1.7.1 Introduction

OFRN Round 7 focuses on applied research and technologies that will further enable and accelerate Ohio's national leadership role in both the defense and commercial sectors.

OFRN has used input from federal and state stakeholders as well as industry guidance to develop research focus areas/Areas of Interest (AOI) that reflect defense mission priorities and shape commercial opportunities that will create job growth in Ohio.

Also included in this funding Round is the continuation of the Student Experiential and Engagement (SEE) initiative. This initiative is intended to provide experiential learning for students enrolled within any STEM-related 2-year or 4-year program in any Ohio college or university.

OFRN Round 7 organizational structure and Review Teams are shown in Figure 1.

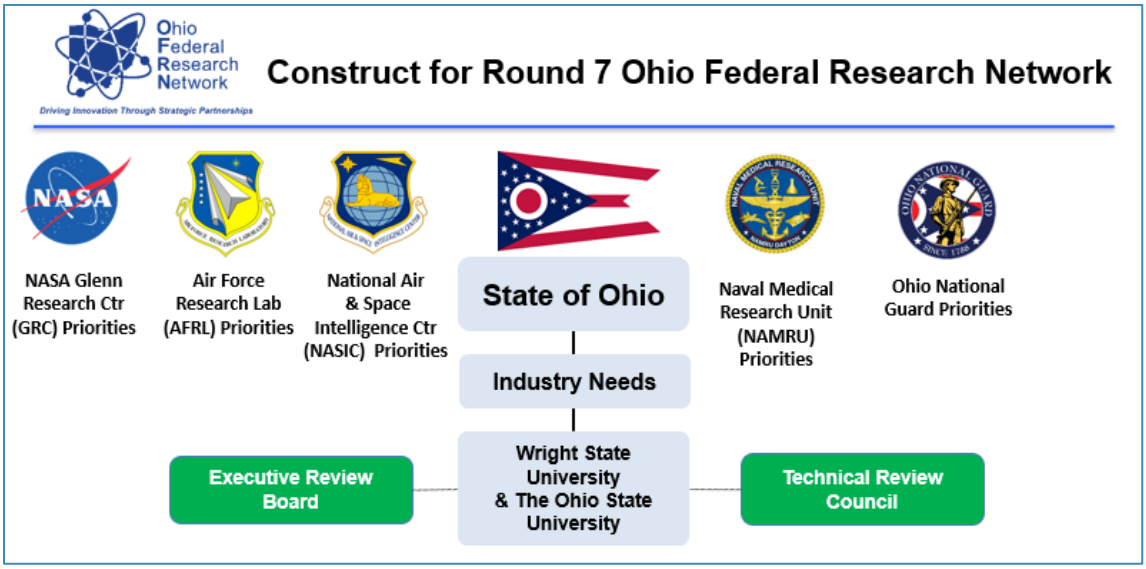

Figure 1: OFRN Round 7 Organizational Structure and Review Teams

OFRN and our Federal Partners spent considerable time developing and refining the Areas of Interest (AOIs). The focus was on fewer, higher priority research needs and topics that had cross-organizational interest/application. This enables maximum impact of OFRN investment by the Federal Partners. Commitments were made to ensure that each AOI would have organizational Subject Matter Expert(s) (SME) available to support project development and evaluation throughout the Round 7 Program. Scheduled sessions for technical questions and answers will be developed and communicated as part of the proposal process.

The following information is provided as an overview of each of the organizational missions of the OFRN partners.

<u>NASA Glenn Research Center (NASA GRC)</u>

NASA GRC's mission is to drive research, technology, and systems to advance aviation, enable exploration of the universe, and improve life on Earth. They do that through the following core competencies: Air-Breathing Propulsion; In-Space Propulsion and Cryogenic Fluids Management; Communications Technology and Development; Power, Energy Storage and Conversion; Materials for Extreme Environments; and Physical Sciences and Biomedical Technologies in Space.

Air Force Research Laboratory (AFRL)

The Air Force Research Laboratory (AFRL) is a scientific research organization operated by the United States Air Force Materiel Command dedicated to leading the discovery, development, and integration of aerospace warfighting technologies, planning and executing the Air Force science and technology program, and providing warfighting capabilities to United States air, space, and cyberspace forces.

National Air and Space Intelligence Center (NASIC)

The National Air and Space Intelligence Center (NASIC) is the United States Air Force unit for analyzing military intelligence on foreign air and space forces, weapons, and systems. NASIC assessments of aerospace performance characteristics, capabilities, and vulnerabilities are used to shape national security and defense policies and supports weapons treaty negotiations and verification.

Naval Aerospace Medical Research Unit – Dayton (NAMRU-D)

The Naval Aerospace Medical Research Unit Dayton is a major DoD medical research command, as well as the home of the Naval Aerospace Medical Research Laboratory and the Environmental Health Effects Laboratory. As a subordinate command to Naval Medical Research Center, NAMRU-D conducts aerospace medical and environmental health effects research to enhance warfighter health, safety, performance, and readiness. NAMRU-D's research addresses identified Fleet needs, and results in products and solutions ranging from basic knowledge to fielded technologies.

The Ohio National Guard

The Ohio National Guard serves the citizens of Ohio and the nation by fulfilling the state and Federal military role of providing public safety when directed by the Governor or supporting the national military strategy when requested by the President. In either scenario, its focus is "Always Ready, Always There." Its unique mission encompasses protecting the homeland by responding to natural disasters or cyber-attacks here and by consistently answering the call of duty to defend the nation at home and abroad. Ohio National Guard - https://ong.ohio.gov/.

1.7.2 Federal Partner Requirements

OFRN Round 7 seeks to fund projects that align with needs identified by its Federal, State, and commercial stakeholders.

1. Projects must be Applied Research, 6.2 or 6.3. Technology Readiness Level should be 3 or higher.
2. Projects must submit / collaborate with at least two universities and one industry.
3. Projects must be focused on the Areas of Interest addressed in this document.
4. Projects must have a Student Experiential Engagement plan included
5. Technology Control Plan (TCP) – University/college-based Primary Applicants must develop a TCP within forty-five (45) days of notice of award.
6. Export Control - Primary Applicants are responsible for export control compliance, including identifying the export control classification(s) of any projects and only utilizing employees that are U.S. persons or eligible to obtain the necessary export license to participate in the project.

   Proposers must submit a comprehensive compliance plan that addresses the following:

   a. ITAR and EAR Compliance: A detailed plan for complying with Export Control Regulations, including ITAR and EAR, and managing foreign involvement.

   b. NIST 800-171: A plan outlining how the proposer will comply with NIST 800-171 standards for protecting CUI, including the status of current compliance and any steps needed to achieve full compliance.

1.7.3 Areas of Interest

1.7.3.1 Hypersonics

1.7.3.1.1 Materials and Technology to Enable Variable Geometry of Aerodynamic Surfaces

Future reusable hypersonic aircrafts require vehicle and system designs that operate across multiple flight environments, and the associated aero-thermodynamics challenges. Challenges include aerosurfaces and propulsion systems capable to operate from low-Mach (take-off and landing speeds) thru high-Mach (cruise condition Mach 5+). Moving surfaces and actuation will be required to enable the full flight envelope of a hypersonic aircraft, and enabling technology in the following areas are sought to address these challenges:

- Functional Metastructures for Thermal Management, Vibration Damping, and CTE Matching
- High Temperature, Durable Dynamic Seals, Gaskets, and Preload Devices
- High Temperature Actuators
- High Temperature Materials and Manufacturing

Solutions to these technical problems should enable reusable hypersonic vehicles and a broader catalog of design tools and methods.

1.7.3.1.2 High Speed Aircraft Thermal Management and Heat Rejection Technology

As high-speed aircraft aim to reach higher Mach numbers and provide greater range, extreme temperatures and heat fluxes limit the ability of the vehicle reject heat. With aerodynamic stagnation temperatures exceeding 2500 degrees and significant heat generation within the propulsion and vehicle systems, current structural and mechanical materials are not able to withstand the induced stresses without advanced thermal management technologies. Innovations are sought in areas such as: modeling and analysis trades and tools for advanced thermal management cycles, alternative thermal management working fluids, structural or low size, weight and power (SWaP) heat exchangers, and heat rejection to high-temperature free stream air flow.

1.7.3.2 Health and Human Performance

1.7.3.2.1 Predictive AI to support medical triage, life-saving interventions, and medical logistics utilization across the continuum of En route care

Resource limitations in remote or austere environments across geographically dispersed non-linear battlespace (e.g., prolonged casualty care) require solutions to help medics make the most efficient use of scarce medical resources. Specifically, the use of AI solutions assisting medics in identifying patients requiring life-saving interventions, rapid evacuation, and immediate medical re-supply are required for decision advantage across all echelons of care. To support this, medics and operators need new medical logistics models compatible with gov platforms to identify patients with a high risk of medical decompensation and track the utilization and status of medical equipment and depletable medical items used to provide medics recommendations on alternative care opportunities (e.g., depletion of opiate analgesics and consideration of alternative pain dose ketamine). This data can help inform medics at the point of need with recommendations on employing scarce resources in their organic medical kit.

Current practices do not track supply status or medical logistics needs based on dynamic casualty flows, injury severity levels, and anticipated medical supply consumption rates. This data is needed at the point of need to help inform caregivers of the risk of medical equipment depletion and help them make decisions on the most effective utilization of scarce medical resources in which patient demand may outstrip medical resource capacity. Work must be

pursued to develop a series of AI algorithms specifically designed to identify decrements in depletable medical equipment based on documented variables by medics rendering care.

The proposed solution will use Artificial Intelligence (AI)-enabled algorithms integrated with existing and emerging joint battlefield technologies to generate flexible recommendations to providers based on current supplies (i.e., anticipatory medical logistics). An example could be a decision aid that identifies patients at high risk of decompensation from physiologic data and uses a medical logistics module to track the utilization and status of medications, fluids, blood products, depletable medical items, and medical equipment across various medical teams to help identify time-sensitive contested logistics requirements informing changes in utilization of organic assets.

Further considerations must be made for how to support providers with different levels of expertise (e.g., differences in baseline knowledge or reasoning/decision-making processes) and consider how the AI will assess what type of user is interacting with the system and push/pull information accordingly (e.g., role defined recommendations based on organic expertise of caregiver)

Deliverables would include a prototype software implementation of the algorithm, relevant training data sets, software documentation, and a technical report or publication.

1.7.3.2.2 AI supported logistics planning for operational commanders

Rapidly changing battlefield conditions and limited in-theater transport options can make resupply planning difficult. In addition, competing needs may be difficult to balance (e.g., medical supplies vs. ammunition). At its core, dispersed medical care and evacuation in a contested environment is a contested logistics problem with medical equities. Thus, there is an immediate and urgent need for medical logistics solutions to integrate with the overarching joint force logistics architecture to support predictive and anticipatory logistics. This integration is needed to improve patient survival by informing decision support and fueling medical logistics resupply of items critical to keeping patients alive during prolonged casualty care and patient evacuation. Optimally, this solution would be interoperable with existing data ontologies and semantic knowledge layers to support Joint and Combined interoperability to ensure the realization of transient synergies with ISR, Fires, Air Ops, and national missions predicated on successful logistics.

Current practices do not track supply status or medical logistics needs based on dynamic casualty flows and anticipated medical supply consumption rates. This is required to improve patient survival by informing decision support and fueling medical logistics resupply of items critical to keeping patients alive during prolonged casualty care and patient evacuation. Work must be pursued to develop a series of AI algorithms specifically designed to identify decrements in depletable medical equipment based on documented variables by medics while rendering care.

The proposed solution will use Artificial Intelligence (AI)-enabled algorithms integrated with existing and emerging joint battlefield technologies to track the utilization and status of medications, fluids, biologics, depletable medical items, and medical equipment across various medical teams. This data will be consolidated across geographically dispersed sites and integrated with higher echelon cloud architecture to enable predictive logistics/resupply and realization of transient synergies to perform resupply and evacuation.

Further considerations must be made to convey the practical implications of current/projected resource levels to operational planners in a valuable way (e.g., the number of patients with different needs that can be supported).

Deliverables would include a prototype software implementation of the algorithm, relevant training data sets, software documentation, and a technical report or publication.

1.7.3.3 Aerospace Power Management, Materials, and Distribution

1.7.3.3.1 Aerospace Electrification – Relevant, HV/HP, Fault-Smart Switch Gear

Electrical system failures have been linked to 55% of all Class A mishaps of remotely piloted vehicles. As the aircraft electrification trend continues, emphasis must be placed on resolving these failures. Technologies that enable the control, protection, isolation, and reconfiguration of electrical power systems (EPS,) such that they are safe and mission capable, is an immediate interest of both military and commercial sectors.

Historically, slow mechanical contactors were used as building blocks to address the need for resettable circuit protection and EPS control. Over time, solid state devices were introduced to take advantage of their lack of cycle limits, faster switching, and built-in smart protection. Currently, there is a lack of available switchgear meeting the voltage, current, and built-in protection requirements in this emerging electrified aircraft market. Opportunities exist for enterprises within Ohio to address this need. The federal government is interested in the development of switchgear targeted at branch circuit applications utilizing nominal voltages of 270Vdc, +/- 270Vdc, and 600Vdc to 1000Vdc, 100-400A continuous distribution, with integrated adjustable trip settings and other smart fault detection features.

1.7.3.3.2 Safe Partial Discharge Corona Aware High Voltage Cable for Aerospace

Electrical system failures have been linked to 55% of all Class A mishaps of remotely piloted vehicles. As the aircraft electrification trend continues, emphasis must be placed on resolving these failures. Technologies that enable the control, protection, isolation, and reconfiguration of electrical power systems (EPS) such that they are safe and mission capable, is an immediate interest to both military and commercial sectors.

Partial discharge (PD) and corona are physical phenomena where there is a localized breakdown of electrical insulation in high voltage and high voltage transient operation. As defined by Paasschen's curve, the voltage level that PD begins to occur (PD Inception Voltage) decreases at lower pressures. Therefore, as aircraft adopt higher voltage distribution with high switching frequencies, the potential effects and damage to electrical wiring at altitude becomes a challenging problem. Approaches utilizing high voltage cable and insulation exists to design out the problem, but solutions are ultimately subject to the physics of the breakdown phenomenon. There exists an opportunity to sense when physics wins and react to a PD breakdown in the insulation. The federal government is interested in the development of either: a high voltage aerospace electrical cabling system that is aware when PD is occurring and be able to use and/or pass on that information to act and preserve vehicle safety, or a highly fault resistant and qualified design that completely mitigates the corona and PD breakdown issue.

1.7.3.4 Commercial Space in Low Earth Orbit

1.7.3.4.1 Low Leakage Cryogenic Valves

Cryogenic Fluid Management (CFM) refers to a set of technologies designed to store, transfer, and measure ultra-cold fluids like liquid hydrogen, liquid oxygen, and liquid methane. These cryogenic propellants are central to space exploration, making CFM technologies essential for NASA's future missions in both exploration and science. However, NASA has identified several gaps in current CFM technologies, including issues with valves that exhibit high leakage rates. These challenges are particularly critical for long-duration missions, which are likely to rely on cryogenic-based chemical and nuclear propulsion systems to meet mission needs. Ground systems for these missions could also be improved. Propulsion test and launch facility cryogenic fluid systems are volume limited and leakage results in test or launch delays, decreased test duration, reduced test time, longer test turnaround, and impact to personnel safety. Emerging propulsion concepts for deep-space missions and their associated facilities are expected to require valves with sizes ranging from 3" to 10" and leakage rates

that are orders of magnitude lower than those used in traditional launch vehicles. Leakage at the valve actuator stem, packing, seats, and connections can result in the loss of cryogenic propellants, which not only wastes valuable resources but also poses significant risks. Leaks can lead to contamination, create harmful thermal gradients, and potentially cause hazardous propellant accumulation in unintended areas, jeopardizing both the mission and personnel safety. The goal of this initiative is to identify and develop innovative valve technologies that reduce cryogenic leakage, as well as to design and test prototypes of these new technologies for future aerospace applications.

1.7.3.4.2 Space-Based Space Situational Awareness

The United States performs Space Domain Awareness for all objects currently in orbit above the earth. It also publishes an open, free to use catalog of Resident Space Objects. This is important for commercial space operations, human space flight, and defense. Current Space Domain Awareness relies heavily on ground-based sensors. Given the global nature of orbital assets, this creates coverage problems. It is impractical to place either radar or optical sensors in areas covered by ocean and often difficult or diplomatically impossible to place sensors at ideal locations on land outside of United States territory. The geographic separation of sensors can also pose challenges to transmission of data which is further exacerbated by legacy hardware limitations. Space-based SDA solutions have the potential to solve many of these issues, but also pose technical challenges. The goal of this initiative is to identify and develop methods for performing Space Domain Awareness observations, and making sense of those observations, using on-orbit sensors. Ideal proposals would demonstrate a convincing path to performing real-time SDA catalog updates and RSO tracking using a network of on-orbit sensors.

1.7.3.5 Quantum Technologies

1.7.3.5.1 Sensing, timing, and absolute calibration systems with reduced bias error or increased sensitivity

Quantum Information Science (QIS) is a growing area of interest, where reference to fundamental physical constants enables the unique benefits of reduced bias instability and increased sensitivity. The focus of this topic is to stimulate the development and integration of quantum sensing, timing, or absolute calibration technologies that leverage the unique benefits of quantum over classical systems. The topic is seeking the development of quantum systems that can measure environmental or physical phenomena (e.g., magnetic and electrical fields, gravity, acceleration, rotation, or time) with quantifiable benefit over conventional systems.

The system should be developed with an application identified that can guide and inform system performance metrics. System development should include the clear definition of system metrics, a design concept, prototype development and a demonstration that validates system performance relative to a meaningful baseline.

1.7.3.5.2 System component or integration technologies to enable miniaturization, increased function, or operation in mission relevant or extreme environments.

To enable increased proliferation of quantum systems it is essential to develop and mature integration and manufacturing techniques that will lead to smaller, more robust, lower cost, and more functional systems. Current generation systems with state-of-the-art performance tend to be large, making them difficult to operate outside of a laboratory environment. Quantum systems incorporate multiple components (lasers, optical interconnects, transducers, vapor cells, non-linear optical components, detectors, etc.) leading to a various constraint. This topic is soliciting integration, component or subsystem development that leads to miniaturization, ruggedization, increased functionality, or operation in extreme environments. Proposals should identify the current maturity of quantum system, how this approach would be integrated into said technology, and the expected implications of that integration.

1.7.3.6 Autonomy

1.7.3.6.1 Autonomous Systems Operations

The federal government has many complex tasks that support core intelligence, surveillance and reconnaissance (ISR) missions. These missions require careful analysis of the operating conditions (e.g., space, atmospheric, geography), sensing, and decision making. Increasingly, due to scaling and operations with limited communications availability, these tasks and missions are performed by edge assets that necessitate sophisticated autonomous capabilities. In these missions, timeliness, adaptation, and analyzing large trade spaces for actions are key to providing responsive capabilities. For this problem of interest are advances in both low Size, Weight, and Power (SWaP) algorithms, i.e. running Commercial Off The Shelf (COTS) hardware, and combined low-SWaP software/hardware solutions, such as neuromorphic computing with spiking neural networks. To address the challenges implicit in edge autonomy, we need to develop flexible algorithmic solutions that can operate in real time at the edge and assist human operators and/or machines in completing complex planning tasks and provide interactive simulation capabilities driven by these advanced algorithms (e.g., prompt-based interfaces, real-time visualizations, explainable solutions and decisions).

Developed products will significantly reduce reliance on humans and support autonomy at the edge by providing real-time decision making and coordination of autonomous systems, including planning, scheduling, information processing, and platform path (re)planning. The developed products will result in flexible tools to enable human and machine agents to collaborate effectively, in support of dynamic command and control of operations. Through the extension of cooperative and collaborative autonomous methods, the developed products will enable distributed, aligned, and emergent operational pictures that support novel and legacy assets. Ultimately, autonomous systems can provide significant efficiency gains in representation and execution, leading to improved mission outcomes and reduced operational costs. Additionally, the products developed provide further synergies beyond DoD focused applications and include direct impacts to other industries in Ohio, including as precision agriculture, automobile control, electronics production, and large system planning/operating.

1.7.3.6.2 Operator defined metrics for trusted autonomy

Currently adoption of autonomous technology is slow due to general stakeholder lack of trust in artificial intelligence (AI) and autonomous solutions. Human operators have years of specialized expertise and innate abilities to adapt to the work of other human operators; however, current AI solutions are lacking in reliable and consistent operations and this needs to be improved to ensure trust is gained with human operators as well as safe and reliable operations. Trust is defined as a willingness to accept vulnerability in situations characterized by uncertainty, and safety is freedom from harm during operations. However, autonomous AI systems will certainly encounter operational conditions beyond what they were trained on; the result will be potentially unanticipated and unpredictable results. To reduce these risks, and thus accelerate time to autonomous system adoption, we need to develop scientifically grounded AI trust calibration tools. Establishing and maintaining trust in an autonomous system requires continual feedback between human (developers, operators, and commanders) and machine during the entire lifecycle of the system. Trust calibration requires a focus on the human(s), the context, and the dynamic nature of trust. Beyond metrics, we further need to develop flexible interfaces that are consistent with other forms of metrics, such as readiness levels, and enable human-machine representation alignment and knowledge sharing. Ultimately, these tools will help ensure that autonomous systems are safe, reliable, and trusted by stakeholders.

Developed tools to monitor trust in autonomy will provide a scientifically grounded approach to calibrating trust in autonomous systems, ensuring that they are safe, reliable, and trusted by all stakeholders. These tools will include metrics and their presentation to operators to enable human-machine representation alignment and knowledge sharing. Beyond tools themselves, the development of these tools will lead to a cultural shift that facilitates adaptive trust

calibration through a unified bi-directional model and dynamic measurements. Ultimately, these tools will help ensure that autonomous systems are adopted more quickly and widely, enabling many real-world use-cases and transforming the way we operate in uncertain and complex environments. Beyond general utility of the tools, the development of these tools will provide a spiral effect across autonomy and related industries through expertise, interface development, and application of the methods which further reduce time to adoption of autonomous technologies.

1.7.3.7 Advanced Materials Technology – Critical Materials Supply for Aerospace

1.7.3.7.1 Methods for Production, Joining, and Modeling of Oxide Dispersion Strengthened (ODS) Alloys

Oxide Dispersion Strengthened (ODS) alloys offer exceptional high-temperature performance due to the dispersion of nanoscale oxide particles within a metal matrix. However, their full potential for applications in advanced energy systems, aerospace, and nuclear power remains untapped. Key challenges hindering their widespread adoption include:

- Limited Production Methods: Current production techniques, such as mechanical alloying, often result in inhomogeneous microstructure and limited scalability.
- Joining Difficulties: The unique microstructure of ODS alloys poses significant challenges for joining processes, compromising the integrity of components.
- Modeling Complexity: Accurately predicting the behavior of ODS alloys under extreme conditions requires advanced modeling techniques that capture the intricate interactions between the matrix and oxide particles.

Specific Research Questions:

- Production:
    - How can advanced manufacturing techniques, such as additive manufacturing or severe plastic deformation, be employed to produce ODS alloys with tailored microstructures and improved properties?
    - What are the optimal processing parameters for these techniques to ensure the uniform dispersion of oxide particles and minimize defects?
- Joining:
    - What joining techniques are most suitable for ODS alloys, considering their unique microstructure and high-temperature properties?
    - How can the elevated temperature properties and mechanical integrity of joints be optimized through tailored joining processes?
- Modeling:
    - How can multi-scale modeling approaches be developed to accurately predict the mechanical behavior of ODS alloys under various loading conditions and temperature regimes?
    - What experimental techniques can be used to validate and refine these models, providing insights into the underlying deformation mechanisms?
    - By addressing these challenges, this research aims to significantly advance the development and application of ODS alloys, enabling the next generation of high-performance materials for extreme environments.

The development of advanced methods for the production, joining, and modeling of Oxide Dispersion Strengthened (ODS) alloys holds significant potential to revolutionize various industries. By addressing the current limitations in these areas, researchers can unlock the full

potential of ODS alloys, leading to enhanced high-temperature performance, improved manufacturing capabilities, reliable joining solutions, and accurate predictive modeling. This will ultimately result in the development of more efficient, durable, and sustainable products for critical applications in aerospace, energy, automotive, and industrial manufacturing.

1.7.3.7.2 Thermally Conductive, Electrically Insulating Materials

Increasing electrical needs in both aeronautics (e.g. electric aircraft propulsion) and space applications (return to the moon and Mars) require electrical components to carry increasingly heavy power loads. Losses (heat generated) in these electrical components is largely trapped due to the thermally insulating nature of most electrical insulation. Increasing thermal conductivity while maintaining or improving dielectric strength (kV/mm) is a significant priority. There need for this technology both at ambient earth temperatures (300- 520 Kelvin) and cryogenic temperatures (at or below 20 Kelvin). There is also a need for low viscosity potting/impregnation materials capable of infiltrating Litz wire. The temperature ranges reflect terrestrial application (ambient or cryocooled) and space environments.

Key Challenges:

- Thermal Conductivity: The material must have a thermal conductivity of at least 0.6 W/m-K to effectively dissipate heat.
- Dielectric Strength: The material must withstand high voltages, with a dielectric strength exceeding 100 kV/mm.
- Potting/Impregnation: For applications involving Litz wire, the material should have a low viscosity to ensure proper infiltration.
- Durability: The material must have a long lifespan, ideally exceeding 50,000 hours, even at high temperatures (220°C) or cryogenic temperatures (20K).

Specific Research Questions:

- Scalability: How can we develop a scalable manufacturing process for these materials?
- Temperature Performance: How does the material's performance change across different temperature ranges?
- Integration: Can the material be successfully integrated with other components like electric machines, power electronics, and cables?
- Thermal Cycling: How does the material withstand repeated cycles of heating and cooling?
- Aging: How does the material's electrical and mechanical properties change over time?

By addressing these challenges and answering these questions, we can develop innovative materials that significantly improve the performance and reliability of electrical components in critical applications.

1.8 End of Project Final Report & Federal Partner Presentation

Each program will be required to:

- Present their applied research/program to the Federal Partner(s) that supported the project for closeout.
- Produce a final project report with an executive summary that will be posted on the OFRN website.

- Produce Annual Metrics reports for three (3) years following the final reporting period. Annual metrics shall include but is not limited to follow on funding, jobs, spinouts, intellectual property (IP), publications, etc. A template will be provided upon award.
- Primary Applicants shall deliver all data, software, and knowledge products (reports, etc.) in digital format with meta data descriptors.

This is an opportunity to verify performance and completion of a project, and to showcase the technology to stakeholders and potential customers for follow-on funding.

2 AWARD INFORMATION

2.1 Estimated Funding and Availability of Funds

Contingent upon and subject to receiving appropriated funds from the State of Ohio. OFRN intends to fund projects between $800,000 - $1,250,000 each, exclusive of any cost share proposed.

2.2 Number of Awards

The exact number and size of awards will depend on the number of meritorious proposals and the availability of funds.

2.3 Anticipated Award Date and Notice to Proceed

Per the cover page of this announcement, OFRN expects to announce awards in August 2025 Note: OFRN is not obligated to make any awards.

After award notification and contract execution, the project will begin. Parallax Contracts may then provide a Notice to Proceed (NTP) authorization with a limitation of funds or a Contract Award. The Applicant may not begin work until after the NTP or Contract Award is formally executed.

Awardees should not expect a No Cost Extension (NCE) to the contract period. Any delays caused by the project members (industry or academia) will be borne by the party that caused the delay. Delays caused by external factors (i.e., supply chain) will be addressed on a case-by-case basis.

2.4 Contractual Arrangement

All Subcontract(s) issued under this announcement will be cost reimbursable contract(s). Appendix 1A and 1B of this announcement provide terms and conditions for the proposed contract(s).

Note that two versions of terms and conditions are provided: Appendix 1A for private universities/colleges and industry (either for-profit or not-for-profit organizations); and Appendix 1B for Ohio public colleges and universities. These terms and conditions will become contractual upon OFRN's acceptance of the Applicant's proposal. Please see Section 3.8.3 of this Opportunity Announcement regarding taking exception to these terms and conditions.

2.5 Eligibility Information

A Primary Applicant is the entity that submits a proposal for OFRN Round 7. Primary Applicants are legally and financially responsible for the administration of any resulting award of OFRN funds. Proposed projects may be led by either an industry in Ohio (either for-profit or not-for-profit) or an Ohio college or university. Regardless of the leading organization, project teams must include:

- At least two Ohio colleges or universities.
- At least one commercial/ industry organization with a physical presence in Ohio (either for-profit or not-for-profit); this organization must be incorporated in the U.S. and be at least 51% owned and controlled by U.S. citizens or permanent resident aliens.

- At least one partner from an Ohio-based Federal lab (Please do not solicit letters of support from Federal Centers).
- Proposals must include a Student Experiential Engagement (SEE) program in accordance with Section 3.2.
- Foreign nationals (individuals who are not U.S. citizens or legal permanent residents) are strongly discouraged from involvement in the performance of work under on this opportunity. If required the offeror is subject to the following conditions:

    - Access to Export-Controlled Technologies:
    - If the project involves export-controlled technologies, data, or materials, foreign nationals may only participate if the appropriate export licenses or authorizations are obtained from the U.S. government (e.g., Department of State for ITAR-controlled technologies or Department of Commerce for EAR-controlled technologies). The offeror is responsible for ensuring that no export-controlled information is shared with foreign nationals unless the necessary approvals are in place.
    - A Technology Control Plan (TCP) must be submitted as part of the proposal if foreign nationals will have access to export-controlled technologies or data. This plan should detail the safeguards to control foreign access and ensure compliance with export control laws.
    - The Offeror shall disclose in their proposal if foreign nationals (including employees, subcontractors, or collaborators) will have access to the program.

- Note: Project teams that include the Air Force Institute of Technology (AFIT) are eligible to submit a response to this Opportunity Announcement. However, Primary Applicants must demonstrate how funding for AFIT research will directly support job creation across Ohio. For example, a Primary Applicant may propose to non-Air Force researchers in the AFIT graduate education system in order to foster “outside the fence“ opportunities for collaboration.

Primary Applicants that become contract awardees must maintain eligibility while the contract is open. A contract awardee that loses eligibility forfeits its award and may be required to repay OFRN the full amount of the monies it has received, plus interest.

Note: When requested, OFRN staff will help facilitate the formation of teams through an online matchmaking tool to assist individuals or organizations interested in participation with teams. The online matchmaking form is available at https://ohiofrn.org on the current solicitation/Round 7 information page https://ohiofrn.org/ohio-federal-research-network-round-7.

2.5.1 Cost Share Requirements and Guidelines

OFRN Round 7 projects are not required to have a cost share contributed by the project team, but it is highly encouraged.

Cost share may directly demonstrate the level of commercial and academic support for a project; meaningful cost share proposals will be viewed favorably in the evaluation of proposals. Factors in assessing cost share can include:

- Magnitude
- Any conditions associated with the cost share
- Type of cost share

2.6 Limitation on Submissions

There are no limits on the number of proposal submissions that a Primary Applicant or a project team member may submit.

2.7 Public Information

Primary Applicants are reminded that all information submitted in response to this Opportunity Announcement is considered public information unless a statutory exception exists that exempts it from public release (See Ohio Public Records Act, O.R.C.§149.43; see Uniform Trade Secrets Act at O.R.C. §§133.61-1333.69).

Exempted information (i.e., trade secrets, etc.) shall bear the marking "Proprietary Information". To the extent possible, proposals shall contain this marking in the header and footer of each page where proprietary information is included.

Applicants are strongly discouraged from including any trade secrets or otherwise exempted information in their proposal(s). If it is included, the proposal must contain an attachment listing all instances of exempted information. Further, all trade secret or otherwise exempted information shall bear the marking "Trade Secret," or “Ohio Public Records Act Exempted Information” with a description of the exemption.

2.8 Export Control and Foreign Participation

The applicant must comply with all applicable U.S. export control laws and regulations, including the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR). Proposals that involve the export of sensitive technologies or technical data, including but not limited to technologies related to defense, aerospace, or dual-use products, are subject to these regulations.

If the proposed project involves export-controlled technologies or data, the applicant must obtain the necessary export authorizations from the U.S. government. Failure to comply with these regulations may result in the rejection of the proposal or the termination of the award.

3 OPPORTUNITY ANNOUNCEMENT

3.1 Submission Instructions:

Applicants shall submit information to the OFRN general inbox: OFRN-Submission@parallaxresearch.org. with a carbon copy (CC) to Becky Mescher at becky.mescher@parallaxresearch.org and contracts@parallaxresearch.org.

Full Proposal must be submitted no later than 5:00pm Eastern Time on April 28, 2025.

Proposals received after the due date and time will be rejected. It is the responsibility of the Primary Applicant to ensure submission of a complete proposal based on all requirements of this Opportunity Announcement. If possible, Primary Applicants are encouraged to submit their proposals early.

3.2 Submission Guidelines:

For Round 7, OFRN is requesting the following documents:

- Technical Proposal consisting of the following (see Appendix 3A for template)
    - Main Technical Proposal (no more than 8 pages)
    - Proposer Prepared Statement of Work (no page limit)
    - Student Experiential Engagement (2 pages)
    - Technical Proposal Supplement (2 pages)
    - Quad Chart (example/template (1 page)
    - Technology Readiness Level (1 page)
    - Full Length Resumes (max 5 pages each): principal investigator, subcontractors and consultants, if any.

- Subcontractor Letters of Intent (LOI)

- Business & Cost Proposal (See Appendix 4 for template) (no page limit)
  - Cost Worksheet
  - Vendor Profile & Attestations
  - Data Rights Assertions
  - OCI Certification

In the sole determination of OFRN, Proposals that exceed this page limitations may be disqualified from further review.

The top projects selected will proceed to the next phase and may be scheduled to present their technical quad chart and financials to the Technical Review Council. Project teams should be prepared for questions. The Technical Review Council will down select the finalist(s) from here, depending upon funding availability.

NOTE: OFRN projects must be TRL 3 and higher, and applied research rather than basic or fundamental research. Primary Applicants are required to provide information demonstrating that the scientific and technical merit and feasibility have been established. Proposals will not be evaluated if the proposal fails to demonstrate that technical merit and feasibility has been established or the Applicant has failed to demonstrate that work submitted in the feasibility documentation was substantially performed by the Applicant and/or the principal investigator (PI), or that the project utilizes commercial-off-the-shelf (COTS) components in an innovative configuration or application.

3.3 General Formatting Requirements:

The Proposal must be written in English and adhere to the following format. Noncompliant proposals shall be rejected without review:

- Proposals are to be submitted on 8.5 x 11-inch page size with type no smaller than 10-point, single spaced.
- Margins must not be less than one (1) inch on all sides,
- Fonts used must be one of the following: Arial, Helvetica, or Times New Roman, and used uniformly throughout.
- All pages must be numbered consecutively using the format “Page [#] of [total number of pages]” (e.g., Page 2 of 6).
- The proposal title and Primary Applicant organization name must appear in the footer of each page.
- Technical Proposal shall include the area(s) of interest (AOI) in the header of each page
- Proposals should not include color figures that cannot be understood when photocopied in black and white.
- The first page of the proposal must be the Application Information Cover Page using the template. This Application Information Page does NOT COUNT toward the page limit for the Technical Proposal.
- Do not include a cover or cover letter other than the Application Information Cover Page.
- Proposals must be submitted in PDF format.

3.4 Amendments:

Should there be any changes to this Opportunity Announcement, a formal Amendment will be issued. All Amendments to the Opportunity Announcement will be published on the OFRN website.

3.5 Parallax Points of Contact:

Contractual	Non-Contractual
Joelynn Laux, Parallax Contracts Director	Becky Mescher, OFRN Program Coordinator
937-705-1006	937-705-1047
contracts@parallaxresearch.org	Becky.mescher@parallaxresearch.org

3.6 Questions:

All questions are to be submitted to the OFRN general inbox: OFRN-Question@parallaxresearch.org by **no later than 5:00pm Eastern Time, ten (10) days prior to the formal proposal submission date**. FAQs will be posted to the OFRN website, and Primary Applicants should review carefully.

3.7 Technical Proposal (Appendix 3A Technical Proposal Template)

3.7.1 Technical Proposal Main Document (no more than 8 pages)

Unless otherwise noted, the proposal must address all the elements listed in the Technical Proposal Template in the order given. Appendix 3A Technical Proposal Template

3.7.2 Student Experiential Engagement (SEE) (Appendix 2, 2 pages)

Student Experiential Engagement (SEE) program information should be a maximum of 2 pages and packaged with the Technical Proposal as indicated in Appendix 3A Technical Proposal Template.

3.7.3 Technical Supplement (2 pages)

The bulk of the Technical Proposal requirements are meant to mimic the requirements of an SBIR Direct to Phase II. A 2-page Technical Proposal Supplement is also necessary to address OFRN-specific concerns including:

- Projected economic impacts,
- Technology demonstration plan, and
- A budget narrative and table.

The Technical Supplement should be a maximum of 2 pages and packaged with the Technical Proposal as indicated in Appendix 3A Technical Proposal Template.

3.8 Quad Chart (Appendix 3B)

3.9 Business and Cost Proposal (Appendix 4)

Unless otherwise noted, the proposal must address all the elements listed in the Appendix 4 – Business and Cost Proposal Template in the order requested.

3.9.1 Cost Worksheet (Appendix 4 Attachment 2)

Offeror shall utilize Appendix 4 Attachment 2 Excel Cost Worksheet.

3.9.2 Vendor Profile & Attestations (Appendix 4 Attachment 1)

3.9.3 Data Rights Assertions (Appendix 4 Attachment 3)

3.9.4 OCI Certification Form (Appendix 4 Attachment 4)

3.9.5 Exceptions

Exceptions to the terms and conditions of the Opportunity Announcement, including Appendix 1A and 1B, Contract Terms and Conditions, are **NOT** sought and OFRN/Parallax is under no obligation to enter into negotiations related to such exceptions. However, if the Applicant choses to take exceptions, such exceptions shall be clearly listed as an Appendix to the Business and Cost Proposal. Exceptions provided after submission may not be considered by Parallax.

4 EVALUATION CRITERIA (OFRN)

4.1 Go/No Go Criterion: Federal Alignment

- The proposal demonstrates how applications/user driven requirements are derived from and aligned with the emerging mission and research focus areas of the Federal Partners outlined in this document.
- The project has an identifiable Federal Government Collaborator. There is a demonstrated relationship with the Federal Government Collaborator and Project Lead Organization, either as the result of documented development meetings or previous relevant working engagements.

4.2 Award evaluation criteria

- Only the most meritorious proposals are sought for funding.
- Proposals will be evaluated by the OFRN's Technical Review Council based on responsiveness to all the requirements of this Opportunity Announcement. Implicit in those requirements and evaluation criteria is the quality of the statement of work and budget, as well as supporting documentation.
- All proposals MUST be based on Applied (6.2 & 6.3) Research. Basic (6.1) or Fundamental research WILL NOT be funded. The Technology Review Council will make the determination if the proposal meets the applied research criteria.
- Parallax is under no obligation to award any contracts.

5 APPENDICES

Download appendices documents from OFRN Round 7 website

https://ohiofrn.org/ohio-federal-research-network-round-7

5.1 APPENDIX 1A: Subcontract Terms and Conditions – Private Universities or Colleges and Industry (Either For-Profit or Not-for-Profit Organizations)

5.2 **APPENDIX 1B:** Subcontract Terms and Conditions – Public Universities or Public Colleges

5.3 **APPENDIX 2:** Student Experiential Engagement (SEE)

5.4 **APPENDIX 3A:** Technical Proposal Template (includes SOW, SEE, Technical Supplement)

5.5 **APPENDIX 3B:** Quad Chart Template

5.6 **APPENDIX 4:** Business & Cost Proposal Template (includes Vendor Profile & Attestations, Excel Cost Worksheet, Data Rights Assertions, and OCI Certification)