NASA STTR 2025-I Solicitation

Proposal Details

Proposal Number: T3.05-1003
Subtopic Title: Lunar Orbital Power Beaming Technology Development
Proposal Title: System with Ultra-staBle Magnetic Inertial Control Regulation for Orbital beaming (SUBMICRO)

Small Business Concern

Firm: Volta Space Technologies U.S., LLC
Address: 8641 Old Dominion Dr, Mc Lean, VA, 22102-1100
Phone: 760-855-9504

Principal Investigator

Name: Kailas Mehta
E-mail: kailas@voltaspace.co
Address: 8641 Old Dominion Dr, Mc Lean, Virginia, 22102-1100
Phone: 301-768-2925

Business Official

Name: Kailas Mehta
E-mail: kailas@voltaspace.co
Address: 8641 Old Dominion Dr, Mc Lean, Virginia, 22102-1100
Phone: 301-768-2925

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

This proposal presents an innovative attitude determination and control system to enable sub-micron-accuracy laser power transfer to the Lunar surface from Lunar orbit. This proposal leverages the world-renowned expertise in pointing control architectures built in decades of groundbreaking research by Dr. Mason Peck's work at Cornell University and the innovative work pioneered by Volta Space Technologies in the field of spaceborne optical payloads for laser power transmission. The system hereby proposed makes use of a closed-feedback loop approach to determine the position of a laser power receiver on the surface of the Moon with high resolution, and of a highly collaborative interaction between spacecraft bus and payload to ensure accurate and reliable tracking, mediated by magnetic reaction wheels.

Duration: 12

Proposal Details

Proposal Number: T3.05-1018
Subtopic Title: Lunar Orbital Power Beaming Technology Development
Proposal Title: Optical Gyro Distributed Temperature Compensation for Precision Orbital Power Beaming

Small Business Concern

Firm: Intelligent Fiber Optic Systems Corporation
Address: 1533 California Cir, Milpitas, CA, 95035-3022
Phone: 669-288-0029

Principal Investigator

Name: Behzad Moslehi
E-mail: bm@ifos.com
Address: 1533 California Cir, Milpitas, CA, 95035-3022
Phone: 408-565-9004

Business Official

Name: Behzad Moslehi
E-mail: bm@ifos.com
Address: 1533 California Cir, Milpitas, CA, 95035-3022
Phone: 408-565-9004

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

IFOS and STTR RI Rose Hulman Institute of Technology (RHIT) propose to develop an innovative, optical temperature-compensating astronomical adaptive optics and data optimization system for lunar orbital power beaming: Thermal Fiber Optic Stabilization Distributed Temperature Compensation system or ThermaFOS™. ThermaFOS features a high-performance Inertial Reference Unit (IRU) and distributed temperature sensing (DTS) within and outside of the power beaming satellite structure to provide high-resolution, high SNR, Raman distributed temperature compensation (R-DTC) data. Our IRU will use R-DTC to improve bias stability of onboard gyroscopes to improve their positioning capabilities. DTS will provide crucial temperature data that will be used to reduce data error due to changes in temperature. IFOS is leveraging a breakthrough in temperature sensing via optical means inside a fiber coil with its extensive expertise in custom photonics integrated chips to produce a new miniaturized fiber optic gyro capability that could match the performance of much larger systems. IFOS' PIC interrogator is currently smartphone-sized device with a clear roadmap to further miniaturization, via its space-qualified Photonic Integrated Circuit (PIC), to almost the size of a matchbox, but with the same functionality. The innovative use of R-DTC inside the coil allows for far greater resolution than a current solution of using handful of discrete electronic temperature sensors mounted in proximity to the sensing fiber coils. Space-rated FOGs are few in number and very expensive. Given the lack of competition, existing manufacturers have little incentive to innovate. IFOS has developed a technology concept that could dramatically reduce SWaP-C required to achieve high-precision angular rate sensing. This technology would be of benefit to numerous NASA missions as well as many commercial satellite manufacturers.

Duration: 13

Proposal Details

Proposal Number: T3.05-1021

Subtopic Title: Lunar Orbital Power Beaming Technology Development
Proposal Title: Radiation Resistant Solar and Laser Power Converter for Lunar Applications

Small Business Concern

Firm: MicroLink Devices, Inc.
Address: 6457 W Howard St, Niles, IL, 60714-3301
Phone: 847-588-3001

Principal Investigator

Name: Anastasia Soeriyadi
E-mail: asoeriyadi@mldevices.com
Address: 6457 W Howard St, Niles, IL, 60714-3301
Phone: 224-522-9774

Business Official

Name: Anastasia Soeriyadi
E-mail: asoeriyadi@mldevices.com
Address: 6457 W Howard St, Niles, IL, 60714-3301
Phone: 224-522-9774

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 4 - 5
Technical Abstract (Limit 2000 characters):

The 3T concept enables the development of a dual-function solar-laser power system. Which can be optimized for terrestrial applications, ensuring continuous operation regardless of weather conditions or time of day. This technology supports both ground and aerial applications, leveraging a high-power, lightweight array that reduces weight and size constraints. Advancements in radiation-resilient structures further expand its applicability to space-based systems, including commercial space operations. Specifically, the high-performing laser power converter component unlocks power-by-light applications in autonomous vehicles, telecommunications, disaster relief, and power grid transmission. The smart-switching array configuration enhances the adaptability of any photovoltaics array application by optimizing performance under non-uniform illumination.

Duration: 12

Proposal Details

Proposal Number: T3.05-1023
Subtopic Title: Lunar Orbital Power Beaming Technology Development
Proposal Title: Scalable Beamed Energy Laser Concentrator

Small Business Concern

Firm: Oxford Defense North Carolina, LLC
Address: 3697 Hugh Davis Rd, Youngsville, NC, 27596-7757
Phone: 919-626-2625

Principal Investigator

Name: Jonathan Suen
E-mail: jon@odnc.us
Address: 3697 Hugh Davis Rd, Youngsville, NC, 27596-7757
Phone: 919-626-2625

Business Official

Name: Jonathan Suen
E-mail: jon@odnc.us
Address: 3697 Hugh Davis Rd, Youngsville, NC, 27596-7757
Phone: 919-626-2625

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

Oxford Defense North Carolina and the Lubin Lab of the University of California, Santa Barbara will develop a diffractive optical element (DOE) for concentration and homogenization of laser beamed energy, as would be delivered to the lunar surface from orbiting transmitters. When compared to an unconcentrated solar array, concentrating optical flux on smaller photovoltaic (PV) cells from an estimated beam of 180 W/m2 to 10 kW/m2 spots significantly increases electrical power, reduces mass, and provides higher quality heat for thermal storage. The use of flat optics enables optimization for wide acceptance angles with techniques such as afocal optics. Reducing or eliminating tracking mechanisms further reduces mass and moving parts, and enables rovers where an orientation cannot be guaranteed. The Phase I effort will produce an optical design and select a scalable fabrication technology to meter-scale DOE arrays, which may include replication/roll-to-roll nano-imprinting technology. In developing a fabrication plan, both polymer and glass DOEs will be considered. A polymer DOE can provide a solution to lunar dust accumulation by rolling and exposing a new section when transmission is impaired. There is a broad range of markets beyond the lunar power beaming, including concentrators for terrestrial PV systems, and meter-scale apertures for free-space optical communication and remote sensing.

Duration: 13

Proposal Details

Proposal Number: T5.06-1000
Subtopic Title: Non-Earth Orbit Conjunction Risk Analysis
Proposal Title: Deep-space Risk Assessment for non-Gaussian Operations and Navigation

Small Business Concern

Firm: Advanced Space LLC
Address: 1400 W 122nd Ave, Westminster, CO, 80234-3440
Phone: 720-545-9191

Principal Investigator

Name: Justin Spurbeck
E-mail: justin.spurbeck@advancedspace.com

Address: 1400 W 122nd Ave, Westminster, CO, 80234-3440
Phone: 720-545-9191

Business Official

Name: Justin Spurbeck
E-mail: justin.spurbeck@advancedspace.com
Address: 1400 W 122nd Ave, Westminster, CO, 80234-3440
Phone: 720-545-9191

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Advanced Space, LLC (Advanced Space) and Research Institution Utah State University (USU) propose fundamental enhancements to space traffic management beyond Earth's orbit to augment NASA's Multi-mission Automated Deep-space Conjunction Assessment Process (MADCAP). The deep-space regime is characterized by nonlinear dynamics and a sparsity of observations – both of which can cause linear, finite conjunction assessment assumptions to break down and Gaussian uncertainty representations to lose realism – which make it more challenging to maintain object state estimates and prevent an accurate evaluation of collision risk. The proposed solution features 1) enhanced uncertainty realism using Gaussian Mixture Model (GMM) and Directional State Transition Tensor (DSTT) propagation; 2) comprehensive collision risk quantification enabled by adding Probability of Collision (P_C) and Hamiltonian dynamics-based Mahalanobis distance metrics that use the enhanced uncertainty representations; and 3) a data-fusion catalog maintenance architecture that leverages non-traditional tracking techniques and autonomous onboard navigation that augments current ground tracking infrastructure. The proposed approach assesses existing non-traditional observational data sources to track debris and uncooperative satellites to extend current catalog maintenance capabilities. Part of the solution for the growing population of cooperative objects will require distributed catalog maintenance via autonomous onboard navigation techniques leveraging satellite-to-satellite tracking (SST) enabled by Advanced Space's Cislunar Autonomous Positioning System (CAPS™). Advanced Space owns and operates the first commercial satellite operating at the Moon, CAPSTONE, which verified CAPS on orbit. Augmented tracking with CAPS will reduce the aggregate uncertainty of the object catalog and improve spaceflight safety.

Duration: 13

Proposal Details

Proposal Number: T5.06-1003
Subtopic Title: Non-Earth Orbit Conjunction Risk Analysis
Proposal Title: Non-Earth Orbit Conjunction Analysis

Small Business Concern

Firm: Triton Systems, Inc
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440
Phone: 978-250-4200

Principal Investigator

Name: Jeffrey Gilbert
E-mail: jgilbert@tritonsys.com
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440
Phone: 978-856-4211

Business Official

Name: Jeffrey Gilbert
E-mail: jgilbert@tritonsys.com
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440
Phone: 978-856-4211

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

Triton Systems, Inc. is developing innovative methods for locating the minimum distance and location of the closest approach with reduced run times and increased accuracy during non-earth conjunction analysis. Our algorithms will be used to study cislunar orbits and resolve issues related to hyperbolic or weak-stability orbits. We will also develop collision risk thresholds and mitigation

recommendations for non-earth orbits.

Duration: 13

Proposal Details

Proposal Number: T5.06-1007
Subtopic Title: Non-Earth Orbit Conjunction Risk Analysis
Proposal Title: Guardian of the Orbits: Non-Earth Orbit Conjunction Risk Analysis Framework (NEO-CRAF)

Small Business Concern

Firm: Vista Techwerx LLC
Address: 500 Dan Reneau Drive #3159, Ruston, LA, 71272-0000
Phone: 937-272-1893

Principal Investigator

Name: Brian Chaney
E-mail: brian.chaney@vistatechwerx.com
Address: 500 Dan Reneau Drive #3159, Ruston, Louisiana, 71272-0000
Phone: 334-590-4164

Business Official

Name: Brian Chaney
E-mail: brian.chaney@vistatechwerx.com
Address: 500 Dan Reneau Drive #3159, Ruston, Louisiana, 71272-0000
Phone: 334-590-4164

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

The Non-Earth Orbit Conjunction Risk Assessment Framework (NEO-CRAF) by Vista Techwerx LLC enhances space safety by improving conjunction risk assessment for cislunar and deep-space missions. As NASA's Artemis program and commercial lunar operations increase space traffic, traditional Earth-based risk models fail to address sparse tracking data, multi-body gravitational effects, and non-Keplerian orbits. This project develops an advanced probabilistic framework integrating machine learning, Bayesian inference, and uncertainty modeling to improve collision risk prediction. Phase I funding will support key innovations, including Delaunay triangulation-based proximity modeling, particle filtering for dynamic state estimation, and Dempster-Shafer theory for probabilistic conflict resolution. These will enhance NASA's MADCAP tool, refining deep-space trajectory predictions and multi-source data fusion. A Non-Earth Orbit Conjunction Risk Assessment Dashboard (NEO-CRAD) will provide real-time risk visualization and classification, supporting NASA Procedural Requirements (NPR 8079.1) for conjunction assessment. Target markets include NASA, commercial lunar operators, and international space agencies, with applications in autonomous deep-space navigation and on-orbit servicing. Phase I lays the foundation for scalable, AI-driven risk assessment, ensuring safer, more sustainable space operations.

Duration: 13

Proposal Details

Proposal Number: T5.07-1002
Subtopic Title: Communications Quality of Service (QoS) Optimization Through Network Autonomy
Proposal Title: Hybrid DTN QoS Control System

Small Business Concern

Firm: SPATIAM CORPORATION
Address: 1200 Conroe Dr, Allen, TX, 75013-5814
Phone: 469-525-1496

Principal Investigator

Name: veronica acosta
E-mail: vero@spatiam.com
Address: 1200 Conroe Dr, Allen, TX, 75013-5814
Phone: 469-525-1496

Business Official

Name: veronica acosta
E-mail: vero@spatiam.com
Address: 1200 Conroe Dr, Allen, TX, 75013-5814
Phone: 469-525-1496

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

NASA STTR Phase 1 Solicitation Topic T5.07 Communications Quality of Service (QoS) Optimization Through Network Autonomy specifies “Quality of Service Policy Management” as scope, and network service management as “key technology focused on enabling the future interplanetary internet” to “enable increase science data return, providing high-quality multimedia capabilities essential for human space exploration, and serve as trunk lines connecting Earth to the Moon”. It establishes that “NASA Space Communication and Navigation (SCaN) program is focused on infusing DTN into space networks and science missions”. To accomplish this, “network management capabilities are required to administer and configure DTN nodes and must operate within and complement existing spacecraft scheduling and management systems.” Our innovation, the SPATIAM Hybrid DTN QoS Control System, is focused on addressing a significant gap in the state of the art, the operationalization of application of quality of service on DTN networks, supporting missions to the Moon, and beyond. The system delivers a standards-based QoS architecture targeting interplanetary networking, inclusive of Lunar and Martian missions, with Hybrid Delay Tolerant QoS management algorithms leveraging autonomy. This system constitutes a complete operational system, ready for deployment and use in upcoming missions, meeting a key objective of the STTR solicitation, the delivery and enforcement of network policy management for QoS, including applications for automated configuration management, monitoring and analyzing network performance. The main objective of this STTR Phase 1 is to progress the Technology Readiness Level (TRL) of the SPATIAM Hybrid QoS Control System, from TRL 2 to TRL 3 through the delivery of a System Requirements specification, the design and results analysis of the Hybrid DTN QoS Control System algorithms and methods, a System Architecture and Design specification, and a Phase 2 prototype development plan.

Duration: 12

Proposal Details

Proposal Number: T5.07-1006
Subtopic Title: Communications Quality of Service (QoS) Optimization Through Network Autonomy
Proposal Title: Autonomous QoS Optimization for Delay-Tolerant Mobile Edge Cloud and Content Delivery

Small Business Concern

Firm: Satlyt Inc.
Address: 605 Tasman Drive, Sunnyvale, CA, 94089
Phone: 650-931-5728

Principal Investigator

Name: Gloire Rubambiza
E-mail: gloire@satlyt.ai
Address: 605 Tasman Drive, Sunnyvale, CA, 94089
Phone: 616-329-7270

Business Official

Name: Gloire Rubambiza
E-mail: gloire@satlyt.ai
Address: 605 Tasman Drive, Sunnyvale, CA, 94089
Phone: 616-329-7270

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

This proposal introduces an autonomous Quality of Service (QoS) optimization framework for delay-tolerant mobile edge cloud (MEC) and content delivery networks (CDNs) in space. As NASA's Artemis program and other deep-space missions expand, there is a growing need for high-volume, latency-sensitive data transmission and real-time computing capabilities in extreme environments. Our technology enhances edge computing, adaptive caching, and dynamic task offloading in lunar, Martian, and orbital networks, optimizing network efficiency and reducing reliance on Earth-based infrastructure. This research will focus on developing QoS-driven MEC and CDN architectures to enable: - Autonomous content caching for high-definition multimedia streaming on the lunar surface. - Adaptive edge computing for mission-critical applications, such as rover navigation, astronaut support, and science data return. - Scalable multi-hop caching and routing algorithms to enhance connectivity in intermittent space networks. The requested funding will support the design, prototyping, and validation of these architectures in simulated space environments. Our target markets include NASA, commercial space companies, and defense organizations looking to improve data processing and delivery for remote operations.

Duration: 13

Proposal Details

Proposal Number: T5.07-1008
Subtopic Title: Communications Quality of Service (QoS) Optimization Through Network Autonomy
Proposal Title: Secure Delay-tolerant Routing, Efficient Algorithms for Multi-hop Scheduling

Small Business Concern

Firm: Stottler Henke Associates, Inc.
Address: 1650 South Amphlett Blvd., San Mateo, CA, 94402-2516
Phone: 650-931-2700

Principal Investigator

Name: Richard Stottler
E-mail: stottler@stottlerhenke.com
Address: 1650 South Amphlett Blvd., San Mateo, CA, 94402-2516
Phone: 650-931-2714

Business Official

Name: Richard Stottler
E-mail: stottler@stottlerhenke.com
Address: 1650 South Amphlett Blvd., San Mateo, CA, 94402-2516
Phone: 650-931-2714

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Stottler Henke Associates, Inc. proposes S-DREAMS (Secure-DREAMS). This effort both furthers our understanding of security for interplanetary networks, as well as pushes the state of the art in interplanetary routing. We will investigate two DTN security requirements: network key management and security policy. Both areas are unsolved problems in the DTN community, and different studied approaches have applications for different network architectures, topologies, etc. Both are also critical to establishing a security context for establishing secure communications, which is a key requirement for network service providers. In this Phase I effort, we will identify use cases, advantages, and disadvantages of a variety of techniques. These include hierarchical, reputation-based, and self-healing key management. Additionally, identity-based, gossip-based, and trust-threshold policies for security. With support and feedback from the DTN stakeholders and community–such as the IETF DTN Working Group and CCSDS–we aim to identify key core components of different techniques, and present an associated specification. This specification will serve as a foundation for future DTN security research. In Phase II, we will create a reference implementation of this specification, and integrate it into DREAMS, our advanced DTN network routing and scheduling algorithm. We additionally propose further development work for DREAMS in order to align with key service provider requirements such as varying user policies (e.g., bandwidth sharing) and video streaming. This investigation and development ultimately envisions developing key components that are employable by network service providers. These range from NASA, other government agencies, and commercial providers. We will thus work closely with DTN stakeholders and researchers, and by working with DTN security expert Dr. Edward J. Birrane of Applied Physics Lab, we will be able to stay closely tuned to the community and stakeholders.

Duration: 13

Proposal Details

Proposal Number: T6.09-1000
Subtopic Title: Human-Autonomous System Integration for Deep Space Tactical Anomaly Response in Smart Habitats
Proposal Title: Verifiable Success in handling Unknown Unknowns in Space Habitat Simulations and a Cyber-Physical System

Small Business Concern

Firm: Affekta LLC
Address: 1 Hermann Museum Circle Drive, Houston, TX, 77004-7184
Phone: 857-928-7240

Principal Investigator

Name: Hedinn Steingrimsson
E-mail: hedinn@affekta.com
Address: 1 Hermann Museum Circle Drive, Houston, TX, 77004-7174
Phone: 857-928-7240

Business Official

Name: Hedinn Steingrimsson
E-mail: hedinn@affekta.com
Address: 1 Hermann Museum Circle Drive, Houston, TX, 77004-7174
Phone: 857-928-7240

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

We propose a layered approach which is, adaptive to different levels of computational resources: 1. Formal Methods – Prof. Kristin Yvonne Rozier expands upon NASA's R2U2 framework, integrating proactive strategies for handling "unknown unknowns" by embedding learning and exploration directly into formal verification methods ensuing compliance with NASA's verifiability requirements. 2. Physics-Based Bayesian reasoning – Prof. Ilias Bilionis takes the next step with the goal to improve resilience and computational efficiency, strategically targeting challenges presented by unforeseen events ("unknown unknowns"). The models are currently one of the practical approaches for handling a dynamic environment with unforeseeable changes. enabling dynamic adaptation autonomous space habitat operations. 3. Large Language Model (LLM)-Driven Deep Reasoning – Hedinn Steingrimsson and his team tailor cutting-edge deep reasoning architectures utilizing LLMs to bolster system resilience, especially for root-cause analyses involving unknown-unknown scenarios. In close collaboration with Prof. Rozier, we leverage the strength of recent advances in neural reasoning while integrating formal verification constraints and where formal models provide safety guarantees. 1. Cyber-Physical Space Habitat Integration – Prof. Shirley Dyke applies and adapts our multidisciplinary and multimodal approach. We rigorously evaluate the practical applicability of our models in real world space habitat. With realistic experimental conditions we to rigorously evaluate our models for both fully autonomous and also crew on board scenarios. Funding directly supports theoretical advancements, experimental validations aimed at fundamentally improving "unknown unknowns" capabilities in a manner that can be fully integrated with NASA's current operational systems. With subsequent domain adaptation valuable assets can be created for performance in dynamic operational environments across different domains.

Duration: 13

Proposal Details

Proposal Number: T6.09-1014
Subtopic Title: Human-Autonomous System Integration for Deep Space Tactical Anomaly Response in Smart Habitats
Proposal Title: Deep-space Anomaly Solution for Habitat Assistance and Resolution Aid (DASHARA)

Small Business Concern

Firm: Paragon Space Development Corporation
Address: 3400 E. Britannia Drive, Tucson, AZ, 85706-9998
Phone: 520-382-1790

Principal Investigator

Name: Ryan Griffith
E-mail: rgriffith@paragonsdc.com
Address: 3400 E. Britannia Drive, Tucson, AZ, 85706-9998
Phone: 520-382-1790

Business Official

Name: Ryan Griffith
E-mail: rgriffith@paragonsdc.com
Address: 3400 E. Britannia Drive, Tucson, AZ, 85706-9998
Phone: 520-382-1790

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Future deep space smart habitats will need to balance human and autonomous system intervention during anomalies, with onboard autonomous systems collecting sensor data, diagnosing faults, predicting maintenance needs, and recommending resolutions. To support anomaly response, smart habitats must integrate data from multiple sensors, analyze large datasets onboard, and provide astronauts with decision-support tools that enhance situational awareness and predict potential upcoming failures. In response to this need, Paragon and ASU propose to develop an AI framework called Deep-space Anomaly Solution for Habitat Assistance and Resolution Aid (DASHARA). In Phase I, the DASHARA framework will be designed and applied to a relevant space habitat system to focus the project's scope while enabling in-depth development and virtual and physical demonstration. DASHARA will be applied to a “smart” CO2 removal system. The project will build upon proven methodologies in intelligent decision-making, environmental adaptation, and predictive analytics, and apply them to the vacuum swingbed CO_2 removal hardware Paragon has developed for space exploration and deep-space habitation. Paragon’s hardware and ASU’s AI will be combined for virtual and experimental testing. The project will virtually simulate human-in-the-loop and autonomous space habitat operations and utilize development hardware to conduct

physical lab experiments, ensuring a validated, scalable, and mission-ready prototype for future lunar and Martian exploration. Paragon and ASU will target customers developing commercial space stations and permanent lunar habitats. This currently includes the Starlab space station, Blue Origin and Sierra Space's Orbital Reef, and Lockheed Martin's lunar habitat.

Duration: 13

Proposal Details

Proposal Number: T6.09-1021
Subtopic Title: Human-Autonomous System Integration for Deep Space Tactical Anomaly Response in Smart Habitats
Proposal Title: Hyperdimensional AI for Autonomous Anomaly Response in Smart Habitats

Small Business Concern

Firm: Robust Intelligence LLC
Address: 1603 Capitol Ave Ste 415, Cheyenne, Wyoming, 82001-4562
Phone: 337-366-8270

Principal Investigator

Name: Sercan Aygun
E-mail: sercan.aygun@louisiana.edu
Address: 301 E Lewis St, Lafayette, LA, 70503-0000
Phone: 337-257-5026

Business Official

Name: Sercan Aygun
E-mail: sercan.aygun@louisiana.edu
Address: 301 E Lewis St, Lafayette, LA, 70503-0000
Phone: 337-257-5026

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 6
Technical Abstract (Limit 2000 characters):

This proposal introduces a novel brain-inspired anomaly detection and response framework based on Hyperdimensional Computing (HDC) for deployment in autonomous deep-space smart habitats. Unlike conventional AI models that require high-power GPUs and retraining for new anomalies, the proposed HDC-based system enables ultra-low-power, real-time, and explainable fault detection, isolation, and recovery (FDIR) capabilities. HDC's distributed, symbolic vector representations provide exceptional robustness to noise, adaptability to previously unseen failures, and human-interpretable reasoning—critical for supporting astronaut-autonomy collaboration in long-duration space missions. Phase I funding will be used to design, implement, and validate an HDC prototype that performs onboard anomaly detection across multi-modal spacecraft telemetry, supports one-shot learning, and operates on reconfigurable hardware like FPGAs and embedded processors. The system will undergo rigorous fault injection testing and hardware-in-the-loop validation using NASA-relevant datasets to ensure operational resilience and real-time responsiveness in spaceflight conditions. Target markets include NASA, DoD, and commercial space companies requiring intelligent onboard health monitoring systems, as well as broader terrestrial markets in industrial IoT, aerospace, and critical infrastructure. This innovation aims to enhance mission autonomy, reduce operational costs, and extend AI-driven fault management to edge devices in both space and Earth-based applications.

Duration: 13

Proposal Details

Proposal Number: T6.09-1024
Subtopic Title: Human-Autonomous System Integration for Deep Space Tactical Anomaly Response in Smart Habitats
Proposal Title: XOSS Aware: Human-Autonomy Integration for Real-Time Anomaly Response in Digital Twin Smart Habitats

Small Business Concern

Firm: Buendea
Address: 24 SW 22nd Road, Miami, Florida, 33129-1507
Phone: 305-510-7868

Principal Investigator

Name: Julian Reyes
E-mail: julian@buendea.com
Address: 24 SW 22nd Road, Miami, FL, 33129-1507
Phone: 305-510-7868

Business Official

Name: Julian Reyes
E-mail: julian@buendea.com
Address: 24 SW 22nd Road, Miami, FL, 33129-1507
Phone: 305-510-7868

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Buendea, in partnership with Harvard University, proposes XOSS Aware, an AI-powered anomaly response and decision support system integrated into Buendea's existing XR Operations Support System (XOSS). Designed for future lunar and Mars habitats, XOSS Aware models key habitat systems and subsystems such as power, thermal, and ECLSS and combines them with real-time fault detection, diagnosis, and resolution by combining digital twin modeling, explainable AI, and real-time human cognitive workload and performance assessment in immersive XR. The system supports crew autonomy in deep space missions where real-time ground

support is limited or unavailable. Funding will support the development of a modular anomaly engine simulating faults across interdependent habitat subsystems (e.g., power, thermal, ECLSS), an AI assistant that recommends corrective actions with transparent reasoning, and biometric-driven cognitive modeling to adapt AI behavior based on user stress and workload. The solution adheres to NASA's STMD 3001 standards and builds on previous XOSS deployments in analog missions like CHAPEA and HERA as well as studies forming part of Earth Independent Human Operations (EIHO). Target markets include NASA and commercial space operators including SpaceX, Axiom, Blue Origin for astronaut training, mission assurance, and autonomous system verification. By advancing human-autonomy teaming in smart habitats, this technology aims to enhance resilience, safety, and operational efficiency for long-duration spaceflight and beyond.

Duration: 13

Proposal Details

Proposal Number: T7.04-1003
Subtopic Title: Lunar Surface Site Preparation
Proposal Title: Ground Technologies for Surface Operation Risk Mitigation

Small Business Concern

Firm: CFD Research Corporation
Address: 6820 Moquin Dr NW, Huntsville, AL, 35806-2900
Phone: 256-361-0811

Principal Investigator

Name: Manuel Gale
E-mail: Manuel.Gale@cfd-research.com
Address: 6820 Moquin Dr NW, Huntsville, AL, 35806-2900
Phone: 256-361-0811

Business Official

Name: Manuel Gale
E-mail: Manuel.Gale@cfd-research.com
Address: 6820 Moquin Dr NW, Huntsville, AL, 35806-2900
Phone: 256-361-0811

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

Unprepared lunar site surface regolith mechanics poses a significant operational risk in the development and sustainability of lunar infrastructure. Heavy loads, constant or transient, can affect the stability of the regolith and might cause stresses that are higher than the regolith yield strength, resulting in undesired regolith movement or bearing capacity failures. A geocell concept is proposed to lower the risks to future Lunar and Martian infrastructure that is associated with regolith surfaces that may be unstable under static and dynamic loads. Geocell or cellular confinement has been used for terrestrial applications with a high degree of success in enhancing the soil lateral and longitudinal strength for a variety of conditions. In this Phase I project, CFD Research Corp will demonstrate the feasibility of using geocells for ground stabilization using a combination of simulations and experimental tests at University of Illinois Urbana Champaign. The utility of geocell structures in assisting the regolith ground layers in resisting erosion, destabilization and trafficability of ground operation paths will be assessed and the sizing and spatial frequency of geocell structure placement will be estimated. Phase I will focus on demonstrating the benefits of geocell structures for landing area applications where plume-surface interactions (PSI) induce a complex transient load that can result in extreme erosion and bearing failure. In Phase II, the team will refine the geocell design and evaluation process for a wide variety of applications and configurations with a focus on prototyping and manufacturing, and will develop a comprehensive surface-operation plan for making effective use of regolith reinforcement structures.

Duration: 13

Proposal Details

Proposal Number: T7.04-1009
Subtopic Title: Lunar Surface Site Preparation
Proposal Title: Scalable Implement for Lunar Trenching

Small Business Concern

Firm: Interlune Corporation
Address: 5601 6th Ave S, Seattle, WA, 98108-2544
Phone: 650-931-5341

Principal Investigator

Name: Gabriella Blackner
E-mail: gblackner@interlune.space
Address: 1201 3rd Ave, Seattle, WA, 98101-3047
Phone: 650-931-5341

Business Official

Name: Gabriella Blackner
E-mail: gblackner@interlune.space
Address: 1201 3rd Ave, Seattle, WA, 98101-3047
Phone: 650-931-5341

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

This project advances lunar trenching capabilities through the development of a new analytical model and testing of a TRL 4 undercutting auger prototype, called Scalable Implement for Lunar Trenching (SILT). The analytical model investigates high-throughput regolith trenching with SILT for NASA's Artemis program by characterizing key performance metrics, including excavation force, regolith throughput, tractive force, and plunge characteristics for trench initiation. A TRL 4 prototype will be tested in representative lunar regolith simulant to validate model predictions and refine design parameters. Furthermore, a trench stability analysis will be completed to ensure construction of the 3-meter deep trenches are properly modeled for the lunar environment and the undercutting auger.The findings from this work will inform future trenching implement designs to directly support Artemis mission objectives and NASA’s long-term lunar sustainability goals under the Space Technology Mission Directorate (STMD). Beyond NASA programs, the SILT trenching technology support broader lunar surface operations and commercial applications. Its capabilities for high-throughput regolith processing (100 metric tons per hour) supports processing of lunar-derived volatiles such as helium-3,

hydrogen, and water. These volatiles are primarily targeted for terrestrial markets, ensuring commercial viability independent of in-space demand. Additional commercial applications include lunar site preparation and in-situ resource utilization (ISRU), such as trenching for feedstock supply in 3D printing of roads and berms. The scalability of the SILT design allows integration into diverse lunar excavation architectures, ensuring long-term utility across multiple lunar programs.

Duration: 7

Proposal Details

Proposal Number: T7.04-1013
Subtopic Title: Lunar Surface Site Preparation
Proposal Title: Lunar Construction Site Mapping for Exploitation of Geotechnical Features

Small Business Concern

Firm: X-Hab 3D, Inc
Address: 1344 South Atherton Street, State College, PA, 16801-0000
Phone: 814-880-7665

Principal Investigator

Name: Goncalo Duarte
E-mail: gduarte@xhab3d.com
Address: 1344 S Atherton St, State College, PA, 16801-0000
Phone: 814-880-7665

Business Official

Name: Goncalo Duarte
E-mail: gduarte@xhab3d.com
Address: 1344 S Atherton St, State College, PA, 16801-0000
Phone: 814-880-7665

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

X-Hab 3D and Penn State propose an integrated Ground-Penetrating Radar/ Multispectral Sensor (GPR/MSS) module that integrates a total station for precise localization. This innovation targets robotic lunar construction, where it is critical to identify hazards, map resource-rich areas, and autonomously prepare construction sites. By combining high-resolution subsurface scanning (GPR) with precise positioning and real-time control (total station and robotic arm), the system can detect rocks or voids, gauge regolith thickness, and locate potential water-ice deposits. Such real-time subsurface awareness bolsters safety, reduces mission risks, and aligns with NASA's broader in-situ resource utilization (ISRU) strategies. Phase I funding will be allocated to integrating the GPR and total station within a single operational platform, constructing a controlled sandbox environment for testing, and developing software to acquire and analyze sensor data in real time. Experiments will show how GPR data can inform autonomous site preparation and regolith-based construction. This early-stage effort will validate key performance metrics including sensor accuracy, data reliability, and integration robustness, thereby paving the way for future scaling and refinement in Phase II. Beyond lunar applications, this GPR/MSS solution holds significant commercial and governmental potential on Earth, enabling geotechnical surveys, construction site evaluations, and non-destructive testing in diverse environments. Such versatility positions the technology as appealing to both space and traditional industries where rapid, high-fidelity subsurface data is paramount.

Duration: 13

Proposal Details

Proposal Number: T7.04-1019
Subtopic Title: Lunar Surface Site Preparation
Proposal Title: Precision Regolith Emplacement, Compaction, and Integrated Smoothing Equipment

Small Business Concern

Firm: Blueshift, LLC
Address: 155 Commerce St, Broomfield, CO, 80020-2243
Phone: 850-445-3431

Principal Investigator

Name: Andrew Brewer
E-mail: abrewer@outward.tech
Address: 155 Commerce St, Broomfield, CO, 80020-2243
Phone: 303-953-0297

Business Official

Name: Andrew Brewer
E-mail: abrewer@outward.tech
Address: 155 Commerce St, Broomfield, CO, 80020-2243
Phone: 303-953-0297

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

Outward Technologies, with Colorado School of Mines, proposes development of Precision Regolith Emplacement, Compaction, and Integrated Smoothing Equipment (PRECISE) for lunar surface site preparation. PRECISE addresses NASA STTR 2025 T7.04 and Civil Space Shortfall 662, enabling critical infrastructure development. The system combines controlled regolith deposition, smoothing, and vibratory compaction in a single, rover-mounted platform. A trough hopper with a regolith feeder ensures uniform regolith dispensing, with novel methods applied to mitigate clogging issues common to regolith and low-gravity conditions. A height-adjustable, rotating drum immediately follows, simultaneously

smoothing and compacting the deposited layer. This integrated approach minimizes operational complexity and robotic assets, improving efficiency. Phase I funding will be used to design, fabricate, and test a sub-scale prototype. Experiments with lunar highlands regolith simulant CSM-LHT-1 will validate deposition control, quantify compaction performance (targeting densities defined by CSM based on civil engineering requirements), and measure reaction forces. A force-torque sensor will characterize rolling resistance and downward pressure applied to the regolith. A cone penetrometer will evaluate in-situ compaction. Results will inform a preliminary space system design and Concept of Operations (ConOps) for lunar applications, including landing pads, habitat foundations, roadways, and berms. The technology leverages existing TRL 5 (advancing to TRL 6) regolith handling hardware developed by Outward, reducing risk. Target markets include NASA, other space agencies, and commercial lunar construction entities. Terrestrial applications include replaceable compactor surfaces for high-wear environments like mine tailings compaction, and variable compaction for time savings. Phase I will advance PRECISE from TRL 3 to 4. A preliminary SWaP analysis and multi-track interaction study are included.

Duration: 13

Proposal Details

Proposal Number: T8.06-1002
Subtopic Title: Quantum Sensing/Measurement and Communication
Proposal Title: High-Speed Photonic Integrated Analyzer for Unconditionally Entangled and Noise Squeezed Quantum States

Small Business Concern

Firm: Relative Dynamics Inc.
Address: 14400 Sweitzer Lane, Laurel, MD, 20707-2924
Phone: 240-241-4721

Principal Investigator

Name: Vladimir Grigoryan
E-mail: v.grigoryan@relativedynamicsinc.com
Address: 5227 Grovemont Drive, Elkridge, MD, 21075-5558

Phone: 443-801-2278

Business Official

Name: Vladimir Grigoryan
E-mail: v.grigoryan@relativedynamicsinc.com
Address: 5227 Grovemont Drive, Elkridge, MD, 21075-5558
Phone: 443-801-2278

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

The current proposal aims at the development and a proof-of-concept demonstration of a novel type of high-speed photonic integrated analyzer for unconditionally entangled and noise squeezed quantum states. The key feature in the proposed analyzer is that it operates without use of an optical phase-locked loop (OPLL) relying on the phase diversity architecture, in which the local oscillator for the homodyne detection operates as a free-running laser without its optical carrier phase and frequency controls. This results in a dramatic simplification of both the squeezed states analyzer (SSA) and the unconditionally entangled states analyzer (ESA) setups and opens a path toward a truly practical photonic integrated SSA and ESA devices satisfying the SWaP (Size, Weight and Power) constraints. In Phase 1, Relative Dynamic Inc., led by Dr. Vladimir Grigoryan, will undertake over 50% of the project work. The remaining tasks will be distributed almost equally among our STTR partners, with Prof. Hamed Dalir at the University of Florida playing a significant role. The budget has been meticulously prepared to reflect this distribution of work, ensuring that Relative Dynamic Inc., will actively participate in and spearhead all project tasks. Our target customers include technology companies like IBM, Microsoft, Google, SpaceX, and Amazon, as well as government agencies such as the U.S. Department of Defense (DoD) and the Department of Energy (DoE), which are focused on quantum computing and cybersecurity advancements. The go-to-market strategy involves forming strategic partnerships with these organizations, securing government contracts, and licensing breakthrough technologies to private sector companies. Relative Dynamics Inc. initial customers require high performance telescopes for military and satellite applications. This includes all branches of the US military, US DoD Agencies, NASA and all DoD and commercial aerospace companies.

Duration: 13

Proposal Details

Proposal Number: T8.06-1018
Subtopic Title: Quantum Sensing/Measurement and Communication
Proposal Title: Efficient Narrowband Entangled Photon Sources for Interfacing with Quantum Memory

Small Business Concern

Firm: AdvR, Inc.
Address: 31948 Frontage Road, Bozeman, MT, 59715-8642
Phone: 406-522-0388

Principal Investigator

Name: Bradley Slezak
E-mail: bslezak@advr-inc.com
Address: 31948 Frontage Road, Bozeman, Montana, 59715-8642
Phone: 406-522-0388

Business Official

Name: Bradley Slezak
E-mail: bslezak@advr-inc.com
Address: 31948 Frontage Road, Bozeman, Montana, 59715-8642
Phone: 406-522-0388

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

Scalable, long-distance quantum networking will require quantum repeaters, and quantum memories are an essential component of scalable quantum repeaters. This Phase I STTR will work to develop a photon pair source with sufficiently narrow photon pair generation enabling efficient interfacing to a Silicon vacancy (SiV)

center quantum memory. The bandwidths of the downconverted photons are much broader (> 100GHz) than required for efficient interfacing to quantum memories (< 1GHz). SPDC photon spectra can be efficiently narrowed by cavity enhancement. We propose the development of a commercial source of cavity enhanced SPDC using a monolithic waveguide chip as the cavity itself. This combines the benefits of waveguide-based SPDC and cavity-enhancement without the need for external optics, resulting in stable and efficient operation.

Duration: 13

Proposal Details

Proposal Number: T8.06-1019
Subtopic Title: Quantum Sensing/Measurement and Communication
Proposal Title: SHIPS: Scalable Heterogeneous Integration for Photon-entanglement Sources

Small Business Concern

Firm: Aeluma, Inc.
Address: 27 CASTILIAN DR., SANTA BARBARA, CA, 93117-3026
Phone: 805-351-2707

Principal Investigator

Name: Bei Shi
E-mail: bei.shi@aeluma.com
Address: 27 CASTILIAN DR., SANTA BARBARA, CA, 93117-3026
Phone: 805-351-2707

Business Official

Name: Bei Shi
E-mail: bei.shi@aeluma.com
Address: 27 CASTILIAN DR., SANTA BARBARA, CA, 93117-3026

Phone: 805-351-2707

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

This proposal focuses on advancing heterogeneous integration of AlGaAsOI materials with silicon photonics to enable high-performance quantum photonic integrated circuits (QPICs). The primary objective is to develop a scalable, foundry-compatible platform that leverages the strong optical nonlinearity of AlGaAsOI integrated on silicon photonics for high brightness and high entangled-photon pair generation rate, and adding nonlinear optical functions to the PDK for QPICs. Key innovations include wafer-scale bonding of AlGaAsOI micro-rings with silicon photonics and an advanced bonded selective regrowth process for monolithic integration of quantum dot pumps onto the AlGaAsOI material platform. Funding will support the development of epitaxy and material characterization, device design, simulations and modelling, layout and fabrication, and micro-ring resonator quality factor as well as on-chip entangled-photon generation measurements to establish a robust pathway toward a scalable platform. The proposed technology aligns with NASA's long-term vision for quantum-enabled space communication, high-precision remote sensing, and scalable LiDAR systems by providing scalable, energy-efficient, low CSWaP quantum light sources. Target markets include government and commercial sectors focused on quantum photonic integration for secure communications & computing, autonomous navigation & LiDAR for aerospace and planetary exploration, and commercial quantum photonic processors & AI computing.

Duration: 13

Proposal Details

Proposal Number: T8.06-1024
Subtopic Title: Quantum Sensing/Measurement and Communication
Proposal Title: Robust, Narrowband, Bichromatic Entanglement Source Natively Compatible with Atomic Systems

Small Business Concern

Firm: Qunnect, Inc
Address: 141 Flushing Ave Bldg 77, Brooklyn, NY, 11205-1005
Phone: 646-342-3369

Principal Investigator

Name: Alexander Craddock
E-mail: sandy@quconn.com
Address: 141 Flushing Ave Bldg 77, Brooklyn, New York, 11205-1005
Phone: 646-342-3369

Business Official

Name: Alexander Craddock
E-mail: sandy@quconn.com
Address: 141 Flushing Ave Bldg 77, Brooklyn, New York, 11205-1005
Phone: 646-342-3369

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 5
Technical Abstract (Limit 2000 characters):

We propose developing a robust, narrowband bichromatic entanglement source designed for direct compatibility with atomic systems. This source generates polarization-entangled photon pairs where one photon is at a telecom 1324 nm wavelength and the other at 795 nm, resonant with rubidium atoms. Unlike existing sources that require lossy frequency conversion, our approach ensures seamless integration with both fiber-based and free-space quantum networks. A key innovation is the use of an optical cavity around the vapor cell, which enhances the heralding efficiency, boosting it from 25% to near 100%, while maintaining a narrow spectral linewidth. This improvement increases entanglement distribution rates, reducing loss and noise in quantum communication protocols. The cavity also allows tunability of the output photons, ensuring optimal interfacing with various quantum devices. This technology is highly relevant to NASA's interests in space-based quantum communication. It supports hybrid quantum networks where ground-based atomic memories link with satellites via entangled photons, a critical step toward global quantum networking. The source's compatibility with both optical fibers and free-space links makes it ideal for secure communication, distributed sensing, and fundamental quantum experiments in space. Commercially, this source fills a gap in the market for high-brightness, high-efficiency

entanglement sources with narrow bandwidths, making it valuable for secure networks, quantum cryptography, and metrology. Our Phase I effort will focus on designing and testing a prototype to validate performance, laying the groundwork for a scalable, field-deployable device.

Duration: 12

Proposal Details

Proposal Number: T8.07-1001
Subtopic Title: Photonic Integrated Circuits
Proposal Title: Rare Earth Amplifier Chips (REACh)

Small Business Concern

Firm: Vescent Technologies Inc.
Address: 14998 W 6th Ave, Golden, CO, 80401-5025
Phone: 303-296-6766

Principal Investigator

Name: Jennifer Black
E-mail: jblack@vescent.com
Address: 14998 W 6th Ave, Golden, CO, 80401-5025
Phone: 303-296-6766

Business Official

Name: Jennifer Black
E-mail: jblack@vescent.com
Address: 14998 W 6th Ave, Golden, CO, 80401-5025
Phone: 303-296-6766

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

Vescent Technologies, Inc. in collaboration with the Massachusetts Institute of Technology Lincoln Laboratory proposes to develop on-chip amplifiers for the optical telecommunications C-band based on silicon-nitride photonic-integrated circuits (PICs) doped with erbium to advance chip-scale laser and optical amplifier technologies capable of supporting next-generation space-deployed NASA missions including optical clocks (including Sr and Yb lattice and ion clocks), free-space communications, and quantum sensors as called out in NASA's Decadal Surveys and Civil Space Shortfall Rankings. Importantly, though we will initially focus on erbium due to the robustness of telecommunications infrastructures, this work is extendable to other rare-earth ions (e.g. Yb, Tm, Nd) that support optical gain from ~1000 to 2000 nm wavelengths and can be integrated with existing nonlinear PICs to extend the optical spectrum into the visible. The size reduction of chip-scale laser systems is critical for space-deployed applications because temperature control and radiation shielding of critical technology elements are often required to achieve the laser performance levels required by quantum applications. This technology, if funded, offers critical pathways for NASA to achieve high performance laser systems at dramatically lower size, weight, and power plus cost than commercially available systems with an ability to operate in space.

Duration: 13

Proposal Details

Proposal Number: T8.07-1007
Subtopic Title: Photonic Integrated Circuits
Proposal Title: Heterogeneous integration of infrared single mode lasers with photonic integrated circuits

Small Business Concern

Firm: Pendar Technologies, LLC
Address: 30 Spinelli Place, Cambridge, Massachusetts, 02138-1040
Phone: 617-588-2128

Principal Investigator

Name: laurent diehl
E-mail: diehl@pendar.com
Address: 30 Spinelli Place, Cambridge, MA, 02138-1040
Phone: 617-501-3482

Business Official

Name: laurent diehl
E-mail: diehl@pendar.com
Address: 30 Spinelli Place, Cambridge, MA, 02138-1040
Phone: 617-501-3482

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

Our team consisting of Pendar Technologies, MIT campus, and MIT Lincoln Laboratory, proposes to develop a mid-infrared (MIR) laser platform based on photonic integrated circuits (PICs) and relevant to critical NASA gas sensing instruments based on tunable laser spectroscopy (TLS). As demonstrated by the Mars Curiosity rover, TLS sensors play a unique role for planetary exploration but are currently too large. Our Phase I goals will be to demonstrate the feasibility of a miniaturized optical source with multiple MIR lasers meeting the requirements of a TLS instrument for the exploration of Uranus's atmosphere. At the core of the proposed development is the hybrid integration of multiple III-V DFB lasers onto a Germanium on Silicon (GOS) PIC. The benefits of our approach include not only a drastic reduction of the laser transmitter size (>10x) but also a clear path for its ruggedization for space flights. Additionally, since all the laser elements are mounted on the same PIC platform, a single thermal management solution is needed, significantly reducing the SWaP of the transmitter.

Duration: 13

Proposal Details

Proposal Number: T8.07-1030

Subtopic Title: Photonic Integrated Circuits
Proposal Title: Optomechanical Photonics on a Commercial Foundry Platform

Small Business Concern

Firm: memQ Inc
Address: 5235 S Harper Ct. 9th Floor, Chicago, Illinois, 60615-4241
Phone: 505-795-4382

Principal Investigator

Name: Skylar Deckoff-Jones
E-mail: skylar@memq.tech
Address: 5235 S Harper Ct. 9th Floor, Chicago, IL, 60615-4241
Phone: 505-795-4382

Business Official

Name: Skylar Deckoff-Jones
E-mail: skylar@memq.tech
Address: 5235 S Harper Ct. 9th Floor, Chicago, IL, 60615-4241
Phone: 505-795-4382

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

To address the NASA need for advanced integrated photonic components, memQ proposes to create acousto-optic devices on a commercial thin film lithium niobate MPW platform. Acousto-optic devices, as enabled by lithium niobate's strong piezoelectric effect, would allow for the creation of acousto-optic modulators, non-magnetic isolators, beam steerers, and RF-to-optical transducers. This new class of component would benefit PIC based technologies such as LiDAR, communications, quantum systems, and sensing. In phase I, the primary focus will be on developing interdigitated transducers for efficient acoustic wave coupling onto the PICs. Initial designs for the above listed devices will also be included. In phase II, the devices will be designed for specific performance targets given the results from phase I. At the end of phase II, this technology is expected to be ready (TRL-6) for development as a standard PDK component - which will be the focus of a Phase III

type effort.

Duration: 13

Proposal Details

Proposal Number: T8.07-1031
Subtopic Title: Photonic Integrated Circuits
Proposal Title: Rapid Low-Loss Polymer PIC Platforms Using High-Index Nanoimprintable Materials

Small Business Concern

Firm: HighRI Optics, Inc
Address: 5401 Broadway Terr , Oakland, CA, 94618-1767
Phone: 360-402-4112

Principal Investigator

Name: Adam Legacy
E-mail: al@highrioptics.com
Address: 5401 Broadway Terr , Oakland, California, 94618-1767
Phone: 360-402-4112

Business Official

Name: Adam Legacy
E-mail: al@highrioptics.com
Address: 5401 Broadway Terr , Oakland, California, 94618-1767
Phone: 360-402-4112

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

HighRI Optics, in collaboration with Lawrence Berkeley National Laboratory (LBNL) Molecular Foundry, proposes an innovative approach to photonic integrated circuits (PICs) utilizing proprietary, patternable high-refractive index polymers (HRI). By combining HRI materials with a low-cost, rapid fabrication method, we will establish an affordable prototyping platform for low-loss polymer waveguides. This platform will serve as a foundational waveguide foundry, enabling efficient PIC component fabrication. Additionally, incorporating nonlinear polymers and quantum dots into HRI materials will facilitate the development of active photonic devices, expanding the functionality and applications of polymer-based PICs. Our proprietary optical coupling method achieves a remarkable 0.5 dB per facet optical coupling loss.

Duration: 13

Proposal Details

Proposal Number: T8.07-1032
Subtopic Title: Photonic Integrated Circuits
Proposal Title: PIC-Based Physical Sensors with Low Noise and Extreme Dynamic Range

Small Business Concern

Firm: Silicon Audio Seismic LLC
Address: 2113 Riverview St, Austin, TX, 78702-5530
Phone: 512 389 2224

Principal Investigator

Name: Neal Hall
E-mail: nahall@utexas.edu
Address: 2501 Speedway, Austin, TX, 78712-1077
Phone: 512-773-7684

Business Official

Name: Neal Hall
E-mail: nahall@utexas.edu
Address: 2501 Speedway, Austin, TX, 78712-1077
Phone: 512-773-7684

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 6
Technical Abstract (Limit 2000 characters):

The proposed PIC-based physical sensor platform leverages advanced integrated photonic circuits and MEMS structures to achieve ultra-low noise and extreme dynamic range. By integrating a silicon nitride waveguide on a flexible silicon cantilever—with a bulk proof mass—and employing on-chip acousto-optic modulation (AOM), our design enables heterodyne detection that converts minute mechanical displacements into measurable optical phase shifts. The sensing arm, which undergoes phase modulation due to cantilever vibrations, is combined with a frequency-shifted reference arm, allowing demodulation of the phase over many optical fringes. This innovative approach extends the intrinsic dynamic range (IDR) well beyond the limits of conventional interferometric sensors—targeting an IDR of up to 160 dB—while maintaining a displacement noise floor on the order of 10 fm$\sqrt{\text{Hz}}$. The compact chip-size sensor package reduces size, weight, and power (SWaP) compared to traditional systems with similar performance. Phase 1 will focus on developing a laboratory prototype using PICs with integrated cantilevers and off-chip AOMs to validate the heterodyne detection concept, model system nonidealities (including oscillator and mixer noise), and establish a solid foundation for full integration in Phase 2. This work promises to bridge the gap between high-sensitivity optical sensors and the demanding dynamic range requirements of next-generation inertial measurement applications.

Duration: 12

Proposal Details

Proposal Number: T8.08-1002
Subtopic Title: Lunar Imagery
Proposal Title: Video Compression for Lunar Imaging

Small Business Concern

Firm: Creare LLC
Address: 16 Great Hollow Road, Hanover, NH, 03755-3116
Phone: 603-643-3800

Principal Investigator

Name: Christopher McKenna
E-mail: CMcKenna@creare.com
Address: 16 Great Hollow Road, Hanover, NH, 03755-3116
Phone: 603-643-3800

Business Official

Name: Christopher McKenna
E-mail: CMcKenna@creare.com
Address: 16 Great Hollow Road, Hanover, NH, 03755-3116
Phone: 603-643-3800

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

NASA seeks a novel technique for transmitting high-quality imagery from the Moon to Earth. Currently, both the quality and quantity of imagery is limited due to the difficulty of imaging a lunar scene; restricted size, weight, and power (SWaP) on the Moon; and low available bandwidth. We propose to develop the Lunar Event System (LES), which incorporates an event camera to reduce overall power requirements, identify scenes of interest, automate acquisition settings, reduce transmitted data size, and increase the quality of the final imagery product. In Phase I, we will prove the feasibility of this approach through software development, representative data acquisition, and algorithm validation. We will acquire data with both traditional and event cameras of scenes representative of the Moon for

algorithm development and validation. We will compress the data streams from both cameras using state-of-the-art techniques with low-SWaP hardware. Finally, we will develop novel techniques for combining imagery and event data to enhance imagery quality and validate these techniques on the acquired data.

Duration: 13

Proposal Details

Proposal Number: T8.08-1010
Subtopic Title: Lunar Imagery
Proposal Title: Novel Imaging Technologies for Optimized Lunar Surface Navigation

Small Business Concern

Firm: Alphacore Inc.
Address: 304 S. Rockford Drive, Tempe, AZ, 85288-3052
Phone: 480-494-5618

Principal Investigator

Name: Laurent Blanquart
E-mail: laurent.blanquart@alphacoreinc.com
Address: 304 S. Rockford Drive, Tempe, AZ, 85288-3052
Phone: 480-494-5618

Business Official

Name: Laurent Blanquart
E-mail: laurent.blanquart@alphacoreinc.com
Address: 304 S. Rockford Drive, Tempe, AZ, 85288-3052
Phone: 480-494-5618

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 4 - 6
Technical Abstract (Limit 2000 characters):

Alphacore, Inc proposes a novel imaging technology tailored for lunar applications, focusing on optimizing motion imagery under extreme environmental constraints. Our solution addresses bandwidth limitations, harsh lighting conditions, radiation exposure, and thermal fluctuations by integrating advanced adaptive compression, AI-driven automated camera control, and low-SWaP modular imaging systems. The key objectives include ensuring high-resolution video transmission within limited bandwidth, utilizing AI for autonomous adjustments, and creating resilient hardware solutions capable of enduring harsh lunar conditions. Our proposed introduces AI-driven automation that dynamically optimizes imaging parameters in response to environmental changes. Additionally, our adaptive compression algorithms enable efficient data transmission within NASA's constrained lunar communication infrastructure, ensuring that high-definition motion imagery can be streamed in real time without excessive bandwidth consumption. By developing a scalable, low-SWaP imaging solution, our technology aligns with NASA's goals of reducing payload size and weight while maximizing performance. The integration of multi-modal sensor fusion enhances navigation, hazard detection, and terrain mapping, making our imaging system a key enabler for both robotic and human missions. Leveraging radiation-hardened FPGA technology combined with advanced event-based and intensity sensors and adaptive algorithms, our system aims to significantly reduce risks associated with navigation inaccuracies, this capability extends beyond NASA's immediate exploration efforts and into potential collaborations with commercial lunar payload services and defense applications. Our solution supports NASA's strategic objective of inspiring future generations through visually compelling, scientifically meaningful lunar content, and contributes to the broader vision of sustained human presence on the Moon and beyond.

Duration: 13

Proposal Details

Proposal Number: T8.08-1011
Subtopic Title: Lunar Imagery
Proposal Title: MoonCast: Space-Rated Codec for Ultra-Low Delay, True Color Capture Lunar Broadcasting T8.08 Lunar Imagery

Small Business Concern

Firm: TRL11 Inc
Address: 5251 California Avenue, Irvine, CA, 92617-3231
Phone: 949-375-4001

Principal Investigator

Name: Ryan Barber
E-mail: ryan.barber@trl11.com
Address: 5251 California Avenue, Irvine, CA, 92617-3231
Phone: 949-375-4001

Business Official

Name: Ryan Barber
E-mail: ryan.barber@trl11.com
Address: 5251 California Avenue, Irvine, CA, 92617-3231
Phone: 949-375-4001

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 4 - 6
Technical Abstract (Limit 2000 characters):

This Phase I effort proposes the development of MoonCast™, a modular, low SWaP-C, lunar-rated codec that can do true color capture and ultra-low delay broadcasting (< 250 ms added to distance latency between earth and moon) in space environments. Its flexible form factor enables both Intravehicular (IVA) and Extravehicular (EVA) applications. MoonCast™ is a significant improvement from the current state-of-the-art, which struggles to capture true color fidelity and is unable to transmit real-time video under tight bandwidth constraints. The effort will be accomplished through a strategic partnership between Texas A&M University (TAMU), a university with a strong record in supporting NASA missions, 6P Color, a company building a system called Full Color Range (FCR) to maintain color integrity captured from a camera, and TRL11, a privately-funded, revenue-generating early stage company with expertise in building low-latency full motion video solutions for space environments through its novel video edge processing software VIPOnly. Key personnel for this effort include experts in customized video compression/codec, real time visualizations, space imagery, resilient information systems and content distribution, and commercialization of video systems/codecs.

The funding for this effort will be spent on assessing the feasibility of integration between the multiple subsystems (mainly FCR and TRL11's VIPOnly software with the Nikon Z9) and building its design to advance it from TRL 4 to TRL 6. This will strongly position the team to develop a working flight-like ground prototype unit in the follow-on Phase II. The technology developed in this Phase I has applications for the lunar, spacecraft, and drone markets, where low delay video streaming plays a role in system health monitoring, situational awareness, scientific documentation, and facilitating safe operations. These markets are worth billions of dollars today and are growing rapidly.

Duration: 13

Proposal Details

Proposal Number: T11.05-1005
Subtopic Title: Model-Based Enterprise
Proposal Title: Regulatory Ontology and Compliance Assessment Suite (ROCAS)

Small Business Concern

Firm: Mosaic ATM, Inc
Address: 540 Fort Evans Road NE, Leesburg, VA, 20176-3379
Phone: 800-405-8576

Principal Investigator

Name: Josh Noble
E-mail: jnoble@mosaicdatascience.com
Address: 540 Fort Evans Road NE, Leesburg, VA, 20176-3379
Phone: 814-262-5343

Business Official

Name: Josh Noble
E-mail: jnoble@mosaicdatascience.com

Address: 540 Fort Evans Road NE, Leesburg, VA, 20176-3379
Phone: 814-262-5343

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 4 - 6
Technical Abstract (Limit 2000 characters):

Developed by Mosaic ATM in collaboration with George Mason University, the Regulatory Ontology and Compliance Assessment Suite (ROCAS) is an AI-driven Model-Based Enterprise (MBE) framework designed to streamline regulatory gap and compliance analysis for use cases in Advanced Air Mobility (AAM) and beyond. ROCAS enhances regulatory compliance analysis by leveraging advancements in natural language processing (NLP), including large language models (LLMs) and graph-based retrieval augmented generation (GraphRAG). Through an ontology-based knowledge representation, it assesses compliance between standards and source documentation, improving accuracy and efficiency. To ensure document traceability, ROCAS generates an exportable report that identifies well-defined, poorly defined, ambiguous, or conflicting aspects between regulatory standards, high-level policies, and source documents. Its unique graph representation of regulatory documents can be visualized and exported for closely related applications and use cases. Designed by aviation experts for aviation experts, ROCAS is not a fully automated replacement but a hybrid model that integrates subject matter expert (SME) knowledge through structured ontologies and decision-making. This approach eliminates repetitive manual parsing and tracing of standards to documentation, providing SME-in-the-loop decision support. Phase I will develop a use case in AAM to demonstrate a real-world mock scenario. For scalable implementation and integration, Phase I will expand the initial proof-of-concept into a mock AAM use case and develop the infrastructure for broader integration into other NASA Model-Based Anything (MBx) scenarios in Phase II. This effort will include enhancements such as graph export capabilities, simplified user interfaces, and local hosting models to maximize data governance.

Duration: 6

Proposal Details

Proposal Number: T11.05-1007
Subtopic Title: Model-Based Enterprise
Proposal Title: Comprehensive MBE Approach to Regulations and Standards Gap Analysis of AAM Platforms

Small Business Concern

Firm: Crossflow Technologies, Inc.
Address: 600 Boulevard South SW, Huntsville, AL, 35802-2113
Phone: 256-274-0220

Principal Investigator

Name: Dale Thomas
E-mail: ldt0001@uah.edu
Address: 301 Sparkman Drive, Huntsville, AL, 35899-0001
Phone: 256-824-4243

Business Official

Name: Dale Thomas
E-mail: ldt0001@uah.edu
Address: 301 Sparkman Drive, Huntsville, AL, 35899-0001
Phone: 256-824-4243

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 6
Technical Abstract (Limit 2000 characters):

Crossflow and UAH CSIL's proposed effort leverages a federated open-architecture framework that enables integration of existing Model-Based Systems Engineering (MBSE) applications with advanced simulation capabilities. This framework creates an integrated environment for regulatory gap analysis specifically tailored to AAM designs. Our approach also adapts a proven FMECA-based MBSE reliability assessment methodology, which moves the safety considerations left in the timeline, thereby making these considerations an early lifecycle design factor.

Duration: 13

Proposal Details

Proposal Number: T11.05-1012
Subtopic Title: Model-Based Enterprise
Proposal Title: Hierarchical AI System for Advanced Air Mobility Regulatory Gap Analysis

Small Business Concern

Firm: Microsurgeonbot Inc.
Address: 2355 Westwood Blvd, Los Angeles, CA, 90064-2109
Phone: 310-954-2049

Principal Investigator

Name: Allan Grosvenor
E-mail: allan.grosvenor@microsurgeonbot.com
Address: 2355 Westwood Blvd, Los Angeles, CA, 90064-2109
Phone: 425-829-9123

Business Official

Name: Allan Grosvenor
E-mail: allan.grosvenor@microsurgeonbot.com
Address: 2355 Westwood Blvd, Los Angeles, CA, 90064-2109
Phone: 425-829-9123

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

MSBAI proposes a hierarchical AI system, MBE-GURU, to transform regulatory gap analysis for Advanced Air Mobility (AAM) vehicles. This innovation uses a three-tier agent architecture—planning, grounding, and control—to systematically identify, analyze, and prioritize gaps in existing airspace regulations (e.g., 14 CFR Parts 23, 25, 27) for novel AAM designs like eVTOLs and hybrid-electric aircraft. Unlike traditional expert-driven methods, MBE-GURU leverages graph-based knowledge representation and dynamic adaptation to enhance efficiency, accuracy, and scalability. Phase I funding will develop a prototype, advancing from TRL 2 to 4 over 13 months, by creating a regulatory knowledge graph, integrating with NASA's AAM tools, and validating use cases. This supports NASA's Model-Based Enterprise (MBE) goals for agile decision-making in mission and programmatic development. Target markets include aircraft manufacturers needing certification clarity, regulatory agencies evolving standards, and standards organizations like SAE and ASTM. By reducing analysis time by 70% and enabling adaptive gap prioritization, MBE-GURU accelerates AAM deployment while ensuring safety and compliance, positioning it for broad aerospace adoption.

Duration: 13

Proposal Details

Proposal Number: T12.01-1000
Subtopic Title: Additively Manufactured Electronics for Space Applications
Proposal Title: High Operating Temperature Spaceborne Electronics

Small Business Concern

Firm: Micro-Precision Technologies, Inc.
Address: 10 Manor Parkway, Salem, NH, 03079-4864
Phone: 603-893-7600

Principal Investigator

Name: Matthew Erdtmann
E-mail: me@micropt.com
Address: 10 Manor Parkway, Salem, NH, 03079-4864
Phone: 603-893-7600

Business Official

Name: Matthew Erdtmann
E-mail: me@micropt.com
Address: 10 Manor Parkway, Salem, NH, 03079-4864
Phone: 603-893-7600

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

Micro-Precision Technologies, Inc. (MPT), in partnership with the Center for Advanced Microelectronics Manufacturing (CAMM) at Binghamton University, will develop a commercially-ready process for high operating temperature (HOT) spaceborne electronics, combining the ruggedness and reliability of MPT's thick film ceramic technology with the design freedom of CAMM's aerosol jet printing technology. The combination of these technologies allows the production of additively manufactured HOT electronics for use in space and terrestrial applications that require extended operation at extreme temperatures up to 800°C.

Duration: 13

Proposal Details

Proposal Number: T12.01-1007
Subtopic Title: Additively Manufactured Electronics for Space Applications
Proposal Title: Materials and Manufacturing Reliability for Extreme Environment Structural and Additive Electronics

Small Business Concern

Firm: Contour Circuits LLC
Address: 4815 Todd Dr Unit 64, Ames, IA, 50014-7744
Phone: 515-341-7870

Principal Investigator

Name: Jeremy Rurup
E-mail: jerurup@gmail.com
Address: 4815 Todd Dr, Ames, IA, 50014-7744
Phone: 515-341-7870

Business Official

Name: Jeremy Rurup
E-mail: jerurup@gmail.com
Address: 4815 Todd Dr, Ames, IA, 50014-7744
Phone: 515-341-7870

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Integrating electronics onto structural 3D objects for extreme environments poses many challenges, but doing so is necessary to meet requirements for NASA missions to Venus, solar probes, and propulsion applications. Contour Circuits, together with STTR partner Iowa State University, will provide both a material system and a manufacturing process capable of fabricating components for sustained operating temperatures of 500-800°C. Specifically, we will develop platinum nanoparticle inks with inorganic binders for aerosol jet printing (AJP). The selection of platinum is based on its favorable melting temperature, electrical conductivity, redox potential, and coefficient of thermal expansion, which closely

matches structural materials such as alumina and titanium. The addition of inorganic binders is an established strategy to improve metal adhesion to ceramic substrates and mitigate CTE mismatch. The use of off-the-shelf platinum inks and binders will accelerate materials development, permitting more time to address the manufacturing challenges posed by AJP to de-risk implementation and scaling. Although well-suited for printing electronics onto 3D objects, industry acceptance of AJP has been slowed by shortcomings with manufacturing reliability and repeatability. The key personnel at Contour Circuits and Iowa State University have developed a real-time deposition rate monitoring system for AJP and demonstrated robust closed-loop process control to maintain stable deposition rate over shift-length prints. Addressing AJP's core manufacturing challenges will speed development of this platinum-alumina material system and others relevant to NASA applications in extreme environments. At Contour Circuits, we will provide fabrication services for 3D structurally integrated electronics efficiently serving NASA and other stakeholders at varying TRL for materials development, prototyping, and eventually production of additively manufacturing electronics.

Duration: 13

Proposal Details

Proposal Number: T12.01-1009
Subtopic Title: Additively Manufactured Electronics for Space Applications
Proposal Title: Additive Cofired Ceramic Electronics for Space Systems (ACCESS)

Small Business Concern

Firm: EngeniusMicro
Address: 1300 Meridian Street North, Huntsville, AL, 35801-4605
Phone: 256-261-1260

Principal Investigator

Name: Brian English
E-mail: brian.english@engeniusmicro.com
Address: 1300 Meridian Street North, Huntsville, AL, 35801-4605
Phone: 256-261-1260

Business Official

Name: Brian English
E-mail: brian.english@engeniusmicro.com
Address: 1300 Meridian Street North, Huntsville, AL, 35801-4605
Phone: 256-261-1260

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Reliability in extreme environments is a critical challenge to realizing part consolidation and rapid manufacturing of electronics and multi-material components in space vehicles. Meeting this challenge will greatly increase the performance, lifetime, and reliability of NASA exploration vehicles. Reducing existing tooling costs will ensure systems are commercially viable and thereby available for future NASA and government needs. Engeniusmicro (EGM) and University of Florida (UF) propose to develop additive manufacturing materials, tooling, and DFAM for multi-material electronics and sensor structures. The team will down-select commercially available additive materials based known past performance in similar environments and based on new simulations of expected performance. The team will develop additive manufacturing processes specific for down-selected materials in single- and multi-material test coupons. Coupons will be tested for relevant mechanical, thermal, and electrical properties. Results of the material study will define process and design rules for future prototypes. The STTR will further develop EngeniusMicro's hybrid additive manufacturing tooling and software for the new material characteristics. The hybrid tooling includes multi-material and multi-process additive manufacturing heads, milling spindle, surface treatment tools. The control software will integrate process and design rules into DFAM procedure to output unified machine codes and process flows. The system will be a compact, affordable system with 50 μm resolution.

Duration: 13

Proposal Details

Proposal Number: T12.01-1018
Subtopic Title: Additively Manufactured Electronics for Space Applications
Proposal Title: High-Temperature, Substrate-Agnostic Fine-Line Additive Metallization with Advanced Interconnects

Small Business Concern

Firm: International FemtoScience, Inc.
Address: 179 Belle Forest Circle, Nashville, TN, 37221-2159
Phone: 615-530-0750

Principal Investigator

Name: David Huitink
E-mail: dhuitin@uark.edu
Address: 1 University of Arkansas, Fayetteville, AR, 72701-1201
Phone: 479-575-6263

Business Official

Name: David Huitink
E-mail: dhuitin@uark.edu
Address: 1 University of Arkansas, Fayetteville, AR, 72701-1201
Phone: 479-575-6263

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

High-temperature electronics are crucial for NASA missions involving extreme environments. The field of Additively Manufactured Electronics shows potential in providing enabling capability for future NASA missions that have very severe or unique volume constraints. Specifically, NASA has identified a specific need to be able to deposit conductor material on high-temperature, compatible insulating substrates. Manufacturing methods are able to print conductors and dielectrics at

needed resolutions. However, there is a lack of data demonstrating operational reliability in extreme high temperature environments. Further, the effectiveness of material adhesion and material behavior at elevated temperatures should be understood given the extreme temperature target environments as well as demonstrating the capability of repeatable processing. International FemtoScience is proposing the development of an extreme environment electronics system for enabling field deployment of advanced Additive Manufacturing technologies. This technology will utilize novel Active Diamond Metal Matrix Braze conductors applied to any type of high temperature ceramic substrate, thus substrate-agnostic. This is accomplished via Aerosol Jet Printing that can deposit 10-micron wide conductors onto oxides, carbides, and nitrides, and can do so on 3-D geometries. 2-micron interconnect technology achieved with novel method of laser writing conductors inside nanodiamond films will also provide further interconnection capabilities for high power, Wide Bandgap devices such as Silicon Carbide and Gallium Nitride semiconductors. International FemtoScience, University of Arkansas, and University of Tennessee Spece Institute will perform research and development to demonstrate that the materials selected in the proposed extreme environment additive manufacturing electronics system have the capability to perform repeatable processing to demonstrate integration methods for extreme performance conductors.

Duration: 13

Proposal Details

Proposal Number: T12.01-1021
Subtopic Title: Additively Manufactured Electronics for Space Applications
Proposal Title: HEAT: High-temperature Electronics in Advanced Thermostructures

Small Business Concern

Firm: AsterTech LLC
Address: 1333 East 2nd Street, Dayton, Ohio, 45403-1020
Phone: 937-912-1317

Principal Investigator

Name: Santanu Bag
E-mail: sbag.astertech@gmail.com
Address: 2951 White Water Ct, Beavercreek, OH, 45431-5684
Phone: 517-282-7238

Business Official

Name: Santanu Bag
E-mail: sbag.astertech@gmail.com
Address: 2951 White Water Ct, Beavercreek, OH, 45431-5684
Phone: 517-282-7238

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

The HEAT (High-Temperature Electronics in Advanced Thermostructures) project addresses NASA's critical need for additively manufactured electronics (AME) capable of operating in extreme thermal environments (500°C–800°C). Future missions to Venus, solar probes, and high-temperature propulsion systems require structurally embedded electronics that can withstand prolonged exposure to extreme conditions without bulky shielding or cooling systems. Traditional space-grade electronics degrade at these temperatures, necessitating innovative AME solutions for long-duration survivability. HEAT leverages Direct Ink Writing (DIW) and laser-etched vias to integrate high-temperature conductive pathways such as tungsten into ceramic matrix composites (CMCs) and carbon-carbon (C/C) structures. This enables sensor integration, power distribution, and signal transmission directly within spacecraft materials, eliminating failure-prone mechanical interconnects. Unlike conventional wire-bonded electronics, HEAT's embedded architecture provides superior thermal stability, mechanical robustness, and reduced mass, allowing mission-critical electronics to function in Venus-like and solar probe conditions.

Duration: 13

Proposal Details

Proposal Number: T12.10-1005
Subtopic Title: Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)
Proposal Title: Novel Single-Phase Refractory-Metal Alloy for Reusable Thermal Protection Systems

Small Business Concern

Firm: Precision Materials Engineering LLC
Address: 5548 Water Avens Dr, Castle Rock, CO, 80104-8039
Phone: 303-910-8463

Principal Investigator

Name: Frank Kustas
E-mail: fmkustas.pme@gmail.com
Address: 5548 Water Avens Dr, Castle Rock, CO, 80104-8039
Phone: 303-910-8463

Business Official

Name: Frank Kustas
E-mail: fmkustas.pme@gmail.com
Address: 5548 Water Avens Dr, Castle Rock, CO, 80104-8039
Phone: 303-910-8463

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

NASA wants to support the formation of a sustainable Low Earth Orbit economy, which requires the development of lower-cost, readily-available, robust, and reusable Thermal Protection System (TPS) solutions. Precision Materials Engineering LLC (PRIME) proposes to leverage the ground-breaking research being performed at Ames National Laboratory in the field of high-temperature refractory-materials, including: 1) Fundamental-physics-based materials modeling, 2) Ultrasonic-atomization powder production, and 3) Novel additive manufacturing (AM). Their work has produced a unique single-phase refractory-metal alloy that

offers an unparalleled combination of properties; high melting temperature (~2200C), high strength (1 GPa (145 ksi)), high ductility (>25%), and formability (60% rolling reduction)/weldability. Proposed research by PRIME to advance the TRL of this material includes fabrication of material coupons at Ames to measure thermophysical properties (by outside vendors), application of oxidation-protective coatings (by pack-cementation (Ames) and high-voltage plasma-electrolytic-oxidation anodize (PRIME)), screening high-temperature oxygen-acetylene plasma testing (PRIME), and AM demonstration of arc-jet test articles (Ames). Key plans for Phase II include: 1) Hot-rolling reduction of the new refractory-metal alloy to representative acreage TPS facesheet thickness, 2) Concepts for man-made orbital debris mitigation such as AM methods to add geometry on the vehicle-side TPS facesheet, and 3) Simulated re-entry testing in an arc-jet environment. Candidate applications include: 1) Nose-cones, wing leading-edges, and acreage TPS facesheets for reusable space and hypersonic vehicles / weapons, 2) Cladding materials for valve and pump parts (or entire parts by AM) for molten-salt nuclear reactors (MSR), 3) Components used in waste-to-energy conversion systems, 3) Components used in transportation-engine exhaust systems, and 4) Components for gas-turbine engines.

Duration: 13

Proposal Details

Proposal Number: T12.10-1007
Subtopic Title: Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)
Proposal Title: Cost-Effective Reusable Thermal Protection System for Re-Entry Vehicles

Small Business Concern

Firm: Lynntech Inc.
Address: 2501 Earl Rudder Fwy S, College Station, TX, 77845-7384
Phone: 979-764-2200

Principal Investigator

Name: Vinh Tung Le

E-mail: vinhtung.le@lynntech.com
Address: 2501 Earl Rudder Fwy S, College Station, TX, 77845-7384
Phone: 979-764-2200

Business Official

Name: Vinh Tung Le
E-mail: vinhtung.le@lynntech.com
Address: 2501 Earl Rudder Fwy S, College Station, TX, 77845-7384
Phone: 979-764-2200

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4
Technical Abstract (Limit 2000 characters):

This proposal addresses the long-standing challenge of high-cost, labor-intensive, and low-scalability thermal protection systems (TPS) currently derived from Space Shuttle heritage. As reusable spacecraft become essential for a sustainable low-Earth orbit economy, the need for an innovative, cost-effective TPS is critical. Our project seeks to revolutionize the design, manufacturing, and integration of TPS by leveraging advanced material systems, streamlined production methods, and efficient operational practices. The proposed solution involves developing a multilayer TPS that combines a high-temperature, oxidation-resistant outer layer with an underlying lightweight insulating substrate. By exploring alternative materials such as novel ceramics and metallic composites, our approach aims to achieve superior thermal performance while reducing overall mass and cost. Key to our strategy is the integration of modern manufacturing techniques including additive manufacturing, automation, and microwave sintering. These methods promise not only to reduce lead times and supply chain vulnerabilities but also to facilitate a seamless integration process with the vehicle's structural components. Phase I will focus on conceptual design, small-scale fabrication, and rigorous testing to validate material properties and thermal performance under simulated reentry conditions. The project will also include a comprehensive analysis of cost reductions relative to heritage systems, ensuring that the final TPS design is both robust and economically viable. Ultimately, this research is poised to deliver a next-generation reusable TPS that meets the demanding thermal, mechanical, and operational requirements of future spacecraft, thereby supporting NASA's broader goals of sustainable space exploration and commercial spaceflight.

Duration: 13

Proposal Details

Proposal Number: T12.10-1010
Subtopic Title: Low-Cost Manufacturing and Integration of Reusable Thermal Protection Systems (TPS)
Proposal Title: Low-Cost Manufacturing of Reusable Thermal Protection Systems (TPS)

Small Business Concern

Firm: Sporian Microsystems, Inc.
Address: 515 Courtney Way, Lafayette, CO, 80026-8821
Phone: 303-516-9075

Principal Investigator

Name: Kevin Harsh
E-mail: kharsh@sporian.com
Address: 515 Courtney Way, Lafayette, CO, 80026-0000
Phone: 303-516-9075

Business Official

Name: Kevin Harsh
E-mail: kharsh@sporian.com
Address: 515 Courtney Way, Lafayette, CO, 80026-0000
Phone: 303-516-9075

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Commercial space needs lower cost and robust thermal protection system (TPS) solutions for current and next-generation reusable transportation vehicles to support the formation of a sustainable low-Earth orbit (LEO) economy. The current state of

the art for reusable TPS is largely derived from Space Shuttle heritage; however, these are constrained by high costs, long lead times, supply chain challenges, and performance limitations. There is a need for new solutions for reusable TPS suitable for return from LEO with reduced costs and feasible, scalable paths for manufacturing and integration. A cohesive and effective TPS solution should be considered for the underlying bulk materials, manufacturing processes, integration and attachment methods, and the long-term operational requirements of a vehicle equipped with such a system. The long-term objective of this proposed work is to leverage novel polymer-derived ceramics (PDCs) materials development and existing larger-format Additive Manufacturing (AM) processes to develop and implement processes, optimized materials, and integration design strategies, that can ultimately be used quickly and cost effectively to manufacture optimized reusable TPS solutions. The Phase I effort will focus on: 1) working with stakeholders to define key metrics and guide development, 2) formulating application specific PDC precursors for compatibility with large format AM processes, and 3) demonstrating technical feasibility through prototyping and materials property testing If successful, Sporian will be well positioned for Phase II efforts focused on producing full demonstration units for stakeholder testing, addressing vehicle integration, and meeting benchmarks required for technology transition and commercialization. Work will be done through a collaboration between Sporian Microsystems and the National Institute for Aviation Research (NIAR).

Duration: 13

Proposal Details

Proposal Number: T12.11-1005
Subtopic Title: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments
Proposal Title: Conformal coatings to enhance biocarriers for rapid-startup of biofilm reactors

Small Business Concern

Firm: GVD Corporation
Address: 45 Spinelli Place, Cambridge, MA, 02138-1046
Phone: 617-661-0060

Principal Investigator

Name: Sean You
E-mail: syou@gvdcorp.com
Address: 45 Spinelli Place, Cambridge, MA, 02138-1046
Phone: 503-776-0789

Business Official

Name: Sean You
E-mail: syou@gvdcorp.com
Address: 45 Spinelli Place, Cambridge, MA, 02138-1046
Phone: 503-776-0789

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

The resupply of essential resources is a critical constraint for long-duration space missions. Biomanufacturing, employing microbes to recycle life support system waste into usable materials, presents a viable solution. Biofilm reactors, which cultivate microbes on biocarrier supports like plastic or membranes, are central to this approach. However, a significant hurdle is the extended startup time required for these reactors. In terrestrial wastewater treatment plants, startup can take weeks or months, a prohibitive timeframe in space, especially during necessary reconfigurations or reactor failures. GVD Corporation, partnering with Boston University's el Microbial Integration Group (elMIG), aims to evaluate the feasibility and design of a rapid-startup biofilm bioreactor. GVD will develop specialized coating chemistries to accelerate microbial proliferation, employing high-throughput screening methods facilitated by elMIG's expertise. Subsequently, elMIG will characterize acetogen biofilm growth dynamics, resource needs, and productivity, providing critical data for GVD's prototype bioreactor design. This technology has applications beyond NASA, including advanced coating chemistries for enhancing wastewater treatment systems and biofilm reactors for pharmaceutical production.

Duration: 12

Proposal Details

Proposal Number: T12.11-1009
Subtopic Title: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments
Proposal Title: A discovery platform to optimize the production of nutrient rich food via solid state fermentation of feedstocks relevant to spaceflight.

Small Business Concern

Firm: Mycsology Foods Inc.
Address: 303A College Rd East, Princeton, NJ, 08540-6608
Phone: 818-297-0440

Principal Investigator

Name: Yekaterina Tarasova
E-mail: kat@mycsology.com
Address: 303A College Rd East, Princeton, NJ, 08540-6608
Phone: 818-297-0440

Business Official

Name: Yekaterina Tarasova
E-mail: kat@mycsology.com
Address: 303A College Rd East, Princeton, NJ, 08540-6608
Phone: 818-297-0440

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

To address the nutritional requirements of astronauts, Mycsology Foods aims to develop an AI-driven discovery and optimization platform aimed at advancing solid state fermentation (SSF) technology to transform feedstocks relevant to space environments into nutrient rich food ingredients using bacterial and fungal biofilms. Mycsology will benchmark and de-risk our platform through this Phase I STTR project, with an initial focus on the production of vitamin B9/folate by various yeasts, including GRAS, halo- and thermo- tolerant yeasts such as K. marxianus and I. orientalis. SSF is inherently suitable for space flight applications and offers

significant advantages over precision fermentation which involves high water and energy consumption and generates multiple waste. Through this Phase I project, Mycsology will generate structured data on biofilm development, stability, and inhibitor tolerance, and overall productivity. The SSF platform will serve as a high-throughput testbed for profiling bacterial and fungal communities that form productive biofilms, with an initial proof-of-concept optimization of protein and folate production. The insights gained will inform the development of robust biofilm-based fermentation systems capable of thriving under resource-limited conditions, such as those encountered during space missions. For terrestrial use, Mycsology has identified solid state fermentation (SSF) as a promising avenue to improve the nutritional value of snack foods and serve as a source of sustainably sourced, cost-effective ingredients to tackle malnutrition. Our beachhead market are food brands and manufacturers within the packaged convenience foods sector. The global protein ingredients market is valued at USD 77.69 billion in 2022 with 0.707 million metric tons of soy protein isolate and concentrate produced in 2021. We expect to capture a significant portion of this market share.

Duration: 6

Proposal Details

Proposal Number: T12.11-1010
Subtopic Title: Biomanufacturing for Space Missions: Harnessing Microbial Communities for Sustainable Production in Moon and Mars Environments
Proposal Title: Extraterrestrial Fungal Brickworks

Small Business Concern

Firm: Luna Labs USA, LLC
Address: 706 Forest Street, Charlottesville, VA, 22903-5231
Phone: 434-220-9449

Principal Investigator

Name: Nikolai Braun
E-mail: Nikolai.Braun@LunaLabs.us
Address: 706 Forest Street, Charlottesville, VA, 22903-5231
Phone: 434-220-2504

Business Official

Name: Nikolai Braun
E-mail: Nikolai.Braun@LunaLabs.us
Address: 706 Forest Street, Charlottesville, VA, 22903-5231
Phone: 434-220-2504

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

Mycelia-based construction materials offer a sustainable, low-mass alternative for extraterrestrial habitat development. These fungal-derived composites leverage mycelium's ability to grow into structured. By cultivating mycelium on available feedstocks such as biowaste and in situ resources, mycelia bricks provide a regenerative and self-sustaining approach to space architecture. This project aims to develop and optimize mycelia-based building materials for lunar and Martian habitats, addressing key challenges of fungal growth using in situ resources. We will define growth parameters for mycelium in simulated regolith and space-compatible substrates, evaluate mechanical properties such as compressive strength and fracture resistance, and explore scalable biomanufacturing strategies. By integrating mycelia bricks into in situ resource utilization (ISRU) frameworks, this research will provide NASA with critical data on fungal biofabrication in space. These findings will support future space missions by reducing reliance on Earth-based construction materials and enabling sustainable habitat infrastructure.

Duration: 9

Proposal Details

Proposal Number: T12.12-1000

Subtopic Title: Spray Processing of Oxide Dispersion Strengthened (ODS) Alloy GRX-810
Proposal Title: Solid-State Cold Spray Additive Manufacturing (CSAM) of GRX-810

Small Business Concern

Firm: HAMR Industries LLC
Address: 1300 Clinton Rd., Clinton, PA, 15026-1946
Phone: 724-921-0030

Principal Investigator

Name: Michael Schmitt
E-mail: m.schmitt@hamrindustries.com
Address: 1300 Clinton Rd., Clinton, PA, 15026-1946
Phone: 724-921-0031

Business Official

Name: Michael Schmitt
E-mail: m.schmitt@hamrindustries.com
Address: 1300 Clinton Rd., Clinton, PA, 15026-1946
Phone: 724-921-0031

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

New propulsion and vehicle concepts continue to push the boundaries of material performance at extreme environments. Traditional materials and alloys have struggled to meet these new demands, however, a promising new class of alloys has been developed which combines multi- principal element alloys (MPEAs) with dispersion strengthening (DS). Uniquely amenable to additive manufacturing (AM), these alloys can produce incredible elevated temperature performance relative to incumbent Ni-superalloys. However, thus far, their fabrication has largely been limited to laser powder bed fusion (L-PBF), which is generally not scalable to the demands of large propulsion and vehicle concepts, while other melt-based modalities struggle to attain the performance of L-PBF due to slower quench rates.

Therefore, this work proposes utilization of a novel solid-state thermal-spray based manufacturing method: cold spray additive manufacturing (CSAM). This method overcomes the scaling limitations of L-PBF to enable buildup of large components at economically feasible rates, ameliorates quenching challenges by never melting, provides the capability for coatings and repair work, and potentially enables a faster route to new alloy development.

Duration: 10

Proposal Details

Proposal Number: T12.12-1003
Subtopic Title: Spray Processing of Oxide Dispersion Strengthened (ODS) Alloy GRX-810
Proposal Title: Spray Processing of Oxide Dispersion Strengthened (ODS) Alloy GRX-810

Small Business Concern

Firm: Triton Systems, Inc
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440
Phone: 978-250-4200

Principal Investigator

Name: Jack Grubbs
E-mail: JGrubbs@tritonsys.com
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440
Phone: 978-856-1935

Business Official

Name: Jack Grubbs
E-mail: JGrubbs@tritonsys.com
Address: 330 Billerica Road, Chelmsford, Massachusetts, 01824-2440

Phone: 978-856-1935

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4
Technical Abstract (Limit 2000 characters):

Triton Systems, Inc. (Triton) is developing a high-rate, solid-state spray processing approach for oxide dispersion strengthened (ODS) materials—specifically GRX-810—to enable superior mechanical, thermal, and oxidation performance in extreme service environments, such as rocket engines. Currently, GRX-810's maturation is limited to laser powder bed fusion, which faces inherent scalability constraints in part size and build rate. By contrast, Triton's proposed spray-based technique will accommodate larger part sizes, faster production rates, and both coating and bulk part applications. In Phase I, Triton will focus on powder engineering and early-stage process validation for producing fully dense GRX-810 coatings and bulk forms. This effort will include optimizing commercially available and Triton-customized powder formulations, conducting coupon-level spray trials, and performing microstructural and mechanical evaluations. Successful completion of Phase I is expected to advance the technology to TRL 3/4. During Phase II, Triton will build upon these results to mature the process toward TRL 5/6 by refining the spray methodology, enhancing throughput, and expanding scale-up capabilities. The requested funding will support Triton's development of scalable manufacturing routes for high-temperature, high-performance ODS components. Key tasks include powder formulation research, process optimization, and validation testing in relevant operating conditions, all aimed at de-risking the technology for commercial and government stakeholders. Immediate applications include rocket engine components, turbine parts, and other extreme environment systems. Beyond aerospace and defense, high-temperature industrial sectors—such as power generation and chemical processing—can also benefit from Triton's spray-based manufacturing of advanced ODS alloys for superior durability and performance.

Duration: 13

Proposal Details

Proposal Number: T12.12-1010
Subtopic Title: Spray Processing of Oxide Dispersion Strengthened (ODS) Alloy GRX-810
Proposal Title: GRX-810 for Cold Spray Additive Manufacturing, Coating, and

Repair

Small Business Concern

Firm: Elementum 3D, Inc.
Address: 400 Young Ct, Erie, CO, 80516-8441
Phone: 720-545-9016

Principal Investigator

Name: Anthony Manerbino
E-mail: anthony@elementum3d.com
Address: 400 Young Ct, Erie, CO, 80516-8441
Phone: 720-545-9016

Business Official

Name: Anthony Manerbino
E-mail: anthony@elementum3d.com
Address: 400 Young Ct, Erie, CO, 80516-8441
Phone: 720-545-9016

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

The goal of the proposed Phase I project is to understand and evaluate the feasibility of processing GRX-810 material by cold spray through systematic spray trials on both bulk and single particle scales. Elementum 3D, the project lead, has a co-exclusive commercial license for GRX-810 production and to our knowledge is currently the only licensee capable of successfully blending the yttrium oxide nanoparticles with base alloy powder at large scales (10-100 kg per batch) relevant for industrial processing needs. Elementum 3D will use their large capacity, high energy blending process to provide feedstock powder for bulk and single particle cold spray experiments for this effort. Bulk spray studies will be carried out using semi- and fully-robotic cold spray systems at Penn State University's Applied Research Laboratory, while single particle impact studies will be performed at the University of Utah on a Laser Induced Particle Impact Testing (LIPIT) system. Adhesion characteristics of uncoated base alloy and coated GRX-810 finished

material will be compared to assess the effects of the nano-yttria coating. Blends of various particle size distributions and oxide loading will be evaluated to assess the impact of each on bulk deposition or coating. For each spray trial resulting in successful deposition, characterization via SEM, EDS, EBSD, and/or optical metallography will be performed, and high density samples will be further subjected to hot isostatic pressing to maximize density and assess any changes in microstructure or oxide distribution. The findings will be compiled in a final report. Should Phase I prove successful, Phase II work will focus on optimizing the cold spray process and characterizing the thermal and mechanical characteristics (up to 1300 deg C) of GRX-810 in bulk and coated forms.

Duration: 8

Proposal Details

Proposal Number: T13.02-1000
Subtopic Title: High-Efficiency, Reliable Electrical Subsystems for Cryogenic
Proposal Title: High-Efficiency, Reliable Electrical Subsystems for Cryogenic Pumps

Small Business Concern

Firm: Beacon Industries Inc
Address: 549 Cedar Street, Newington, CT, 06111-1814
Phone: 914-525-3794

Principal Investigator

Name: Suresh Mirchandani
E-mail: ap@beacongp.com
Address: 549 Cedar Street, Newington, CT, 06111-1814
Phone: 914-525-3794

Business Official

Name: Suresh Mirchandani
E-mail: ap@beacongp.com
Address: 549 Cedar Street, Newington, CT, 06111-1814
Phone: 914-525-3794

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 5
Technical Abstract (Limit 2000 characters):

Beacon Industries Inc. proposes a high-efficiency motor drive and control system designed to improve the performance and reliability of cryogenic pumps used in deep-space and planetary exploration. The system combines a superconducting motor drive using ReBCO-based coils with Ga_2O_3-based high-frequency switching devices and an advanced field-oriented control (FOC) system. The superconducting motor eliminates resistive losses at cryogenic temperatures, reducing power consumption and increasing efficiency. Ga_2O_3-based transistors provide faster and more efficient power modulation, improving load response and reducing switching losses. The FOC system dynamically adjusts motor speed and torque based on real-time load changes, ensuring stable performance even under extreme conditions. This solution is designed for use in NASA's lunar and Martian surface operations, the Lunar Gateway, and deep-space transport missions. The proposed technology will reduce operational costs, increase system lifespan, and improve reliability in harsh space environments.

Duration: 13

Proposal Details

Proposal Number: T15.04-1010
Subtopic Title: Full-Scale (Passenger/Cargo) Electric Vertical Takeoff and Landing (eVTOL) Scaling, Propulsion, Aerodynamics, and Acoustics Investigations
Proposal Title: Simulation and Flight-Testing of Pitch & RPM Thrust Control for eVTOL Aircraft

Small Business Concern

Firm: Design, Analysis and Research Corporation
Address: 910 E 29th Street, Lawrence, KS, 66046-4926
Phone: 785-832-0434

Principal Investigator

Name: Wanbo Liu
E-mail: wanbo.liu@darcorp.com
Address: 910 E 29th Street, Lawrence, KS, 66046-4926
Phone: 785-832-0434

Business Official

Name: Wanbo Liu
E-mail: wanbo.liu@darcorp.com
Address: 910 E 29th Street, Lawrence, KS, 66046-4926
Phone: 785-832-0434

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

The DAR-VSDDL team proposes to accelerate the development of full-scale eVTOL aircraft configurations. • The research proposed by the team is intended to accelerate the development timeline of full-scale eVTOL aircraft via subscale flight testing, with aerodynamics, propulsion, flight dynamics, and controls being the primary areas of focus. • In Phase I, the team will perform flight tests to expand the flight envelope of the RAVEN-RRTV to include transitions between vertical flight mode (VFM) and forward flight mode (FFM). This cost-effective, easy-to-manufacture, and easy-to-repair subscale platform will provide the team with valuable flight test data while minimizing financial cost and risk. It is anticipated that NASA Langley researchers will publish results from RAVEN-SWFT flight tests in the Phase I timeframe, offering the opportunity to compare flight data between two similarly sized vehicles, one using variable-pitch propulsors and the other fixed-pitch. • To demonstrate the applicability of the technical approach to more than one vehicle configuration, the team will modify the RAVEN-RRTV to give a 4+1 lift-plus-cruise configuration, which will also be flight-tested during Phase I to yield additional flight data for subsequent analysis. • During Phase II, DARcorporation will use vehicle with a higher maximum takeoff weight (MTOW) of 55 lb and correspondingly larger dimensions which matches the Phase I

configuration. The design work for this larger configuration will occur in Phase I. The flight data from the flight tests in Phase II will allow the team to develop and verify scaling relationships between the two subscale vehicles. These relations and the results from the Phase I and Phase II flight tests will allow for prediction of performance and dynamics of larger vehicles. • For each subscale vehicle, as well as the full-scale configurations, time-domain flight simulation models will be

Duration: 13

Proposal Details

Proposal Number: T15.04-1015
Subtopic Title: Full-Scale (Passenger/Cargo) Electric Vertical Takeoff and Landing (eVTOL) Scaling, Propulsion, Aerodynamics, and Acoustics Investigations
Proposal Title: Full-Scale eVTOL Aircraft Flight Dynamics Testing, Modeling and Simulation

Small Business Concern

Firm: Continuum Dynamics, Inc.
Address: 34 Lexington Avenue, Ewing, NJ, 08618-2302
Phone: 609-538-0444

Principal Investigator

Name: Daniel Wachspress
E-mail: dan@continuum-dynamics.com
Address: 34 Lexington Avenue, Ewing, NJ, 08618-2302
Phone: 609-538-0444

Business Official

Name: Daniel Wachspress
E-mail: dan@continuum-dynamics.com
Address: 34 Lexington Avenue, Ewing, NJ, 08618-2302

Phone: 609-538-0444

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 4 - 5
Technical Abstract (Limit 2000 characters):

Electric-motor driven Vertical Takeoff and Landing (eVTOL) vehicles have the potential to transform short-range VTOL flight, offering benefits in quietness, simplified flight control, redundancy, and speed. However, they also pose considerable design challenges in terms of rotor-rotor and rotor-airframe interaction effects on performance, flight dynamics, vibratory loads, and noise. Computational models under development to analyze these characteristics lack enough high-quality, full-scale flight test data for validation. To address this gap, NASA is seeking proposals for technology that will "accelerate the development timeline of full-scale eVTOL aircraft via simulation or flight test" targeting the design and execution of experiments on relevant, full-scale AAM systems to generate "research-quality data to build up flight dynamics modeling and simulation of full-scale, multi-rotor eVTOL aircraft, with an emphasis on high/increased-fidelity real-time aerodynamics." This proposal presents a plan to address these goals through the acquisition of valuable, new flight test data for a representative full-scale eVTOL aircraft and utilizing this test data to improve upon the aerodynamic model fidelity currently available within real-time, piloted eVTOL flight simulations.

Duration: 13

Proposal Details

Proposal Number: T15.04-1022
Subtopic Title: Full-Scale (Passenger/Cargo) Electric Vertical Takeoff and Landing (eVTOL) Scaling, Propulsion, Aerodynamics, and Acoustics Investigations
Proposal Title: Geared Motor Exploration for the Research Aircraft for eVTOL Enabling techNologies (RAVEN)

Small Business Concern

Firm: Wingborne Aeronautics Corporation
Address: 865 Saint Charles Ave NE, Atlanta, GA, 30306-4128

Phone: 404-353-5601

Principal Investigator

Name: Brian German
E-mail: brian@wingborne-aero.com
Address: 865 Saint Charles Ave NE, Atlanta, GA, 30306-4128
Phone: 404-353-5601

Business Official

Name: Brian German
E-mail: brian@wingborne-aero.com
Address: 865 Saint Charles Ave NE, Atlanta, GA, 30306-4128
Phone: 404-353-5601

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 3
Technical Abstract (Limit 2000 characters):

In the past several years, a number of large-scale prototype electric Vertical Takeoff and Landing (eVTOL) aircraft have been flight tested by aircraft manufacturers to achieve their commercial product development goals for the Advanced Air Mobility (AAM) market. Owing to intellectual property and propriety information concerns, however, relatively few large-scale eVTOL aircraft have been flight tested for research purposes to produce data that can be published to benefit the broader aeronautics community. The corresponding lack of available flight test data makes it difficult for researchers to validate and improve computational tools that are needed for advancing the state of the art in eVTOL aircraft design. The proposed Phase I effort will advance the development of the Research Aircraft for eVTOL Enabling techNologies (RAVEN). RAVEN is an eVTOL aircraft with a gross weight of over 1000 lbs that is being developed to conduct flight research related to acoustics, flight dynamics and control, interactional aerodynamics, and autonomy for AAM aircraft. The work in Phase I will focus on conceptual design of a geared drive system to enable hovering flight at reduced proprotor rotational speeds, thereby further increasing RAVEN's applicability for eVTOL acoustics research. An additional goal in the design of the geared drive system is to enhance RAVEN's operational robustness by reducing aircraft weight and power consumption to increase range and endurance, lower heat loads, and increase margin for weight growth.

Duration: 13