NASA STTR 2026B-I Solicitation

Proposal Details

Proposal Number: AERO.9.T26B-0070
Subtopic Title: Full-Scale (Passenger/Cargo) Advanced Air Mobility (AAM) and Vertical Takeoff and Landing (VTOL) Interdisciplinary Investigations
Proposal Title: Advanced Air Mobility VTOL Propulsion Design and Aerodynamic and Acoustic Investigations

Small Business Concern

Firm: Technology in Blacksburg, Inc.
Address: 265 Industrial Drive, Christiansburg, VA, 24073-2538

Summary Details

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

In response to NASA BAA 26B-I STTR topic AERO.9.T26B, the team of Techsburg and Virginia Tech propose interdisciplinary investigations utilizing a subscale test model of an eVTOL â€œPropeller+Wingâ€ model with low-noise, high disk loading propulsors. During Phase I, Techsburg will provide an updated design for their low-noise eVTOL proprotor, and build and test a reconfigurable semi-span model with three instrumented propulsion units. The test program will consist of static aerodynamic and acoustic data measurements for both isolated propulsors and the full propulsor array, in laboratory and outdoor environments. Virginia Tech will support with acoustic test measurements, along with multidisciplinary design analysis and optimization (MDAO) of propeller+wing configurations. Prior propulsor scaling studies by this team will be used to extend these results to full scale vehicles. Phase I high-fidelity PowerFLOW simulations by Techsburg will aid in this process and allow scaling investigations of aero and acoustic characteristics for single vs. multiple propulsors, along with investigations of rotor-rotor and rotor-airframe interaction aero and aeroacoustics. Phase II test plans include acoustic testing (Virginia Tech Anechoic Wind Tunnel and potentially in the Honda HALO acoustic tunnel), and full flight envelope aerodynamic testing in the UW Kirsten Wind Tunnel (UWAL). This complex test will involve a wing+propulsor model on the UWAL external balance subjected to non-axial flow

and reverse flow conditions to collect data relevant to approach and descent conditions. Ground effect and downwash/outwash testing is also planned during the project test campaign. Target markets include both small (unmanned) and large eVTOL aircraft OEMs and propulsion component suppliers, and in the near term, benefit development of US supply chains for sUAS components.

Duration: 13

Proposal Details

Proposal Number: AERO.9.T26B-0101
Subtopic Title: Full-Scale (Passenger/Cargo) Advanced Air Mobility (AAM) and Vertical Takeoff and Landing (VTOL) Interdisciplinary Investigations
Proposal Title: Simulation and Subscale Flight-Testing for Hybrid-Electrification of the NASA RAVEN Multi-Tiltrotor Configuration

Small Business Concern

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

Summary Details

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

Technology Purpose and Innovation: This joint STTR Phase I project between Design, Analysis and Research Corporation (DARcorporation) and Auburn Universityâ€™s Vehicle Systems, Dynamics and Design Laboratory (VSDDL) aims to accelerate the hybrid-electrification development spiral for the NASA Research Aircraft for eVTOL Enabling Technologies (RAVEN) multi-tiltrotor configuration. While the initial RAVEN testbed is all-electric, its operational limitations drive the need for a hybrid-electric variant. The innovation centers on integrating flight and hybrid-electric propulsion control laws to create an optimized, scalable control architecture alongside an in-flight variable-pitch propulsor mechanism to maximize power efficiency and bandwidth control. Intended Use of Funding: Phase I funding will be utilized for multidisciplinary design, analysis and optimization (MDAO) of full-scale and subscale configurations. Funding will support the development of

integrated flight/propulsion control systems, hardware-in-the-loop (HIL) mission simulations on a specialized test bench, the fabrication of a piston-engine powered 50% subscale aircraft (RAVEN-50) using rapid-prototyping methods and proof-of-concept hover/low-speed flight testing. Target Markets: The primary target market is NASA's Advanced Air Mobility (AAM) mission and Open eVTOL subprojects, supporting vertical lift vehicle development and production. Secondary commercial target markets include defense and commercial Advanced Air Mobility sectors looking to scale scalable vertical takeoff and landing (VTOL) aircraft families for cargo logistics, long-endurance ISR missions and disaster relief operations.

Duration: 13

Proposal Details

Proposal Number: AERO.9.T26B-0107
Subtopic Title: Full-Scale (Passenger/Cargo) Advanced Air Mobility (AAM) and Vertical Takeoff and Landing (VTOL) Interdisciplinary Investigations
Proposal Title: VISTA: VTOL Integrated Scaling, Testing, and Handling Qualities Analysis

Small Business Concern

Firm: Systems Technology, Inc,
Address: 13766 Hawthorne Blvd., Hawthorne, CA, 90250-7083

Summary Details

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

The team led by Systems Technology Inc. (STI) proposes to develop VISTA â€“ VTOL Integrated Scaling, Testing and HQ Analysis, a unified framework to allow scaling of flight control and HQs between full and sub-scale aircraft. While subscale demonstrators are extensively used to de-risk novel vehicle designs, a significant gap remains applying results to full-scale applications. VISTA will develop and validate scaling laws that can be easily applied to eVTOL/AAM aircraft, to decrease development time and risk, and increase safety. This will be shown through both simulation and flight testing, using both sub- and full-scale aircraft. Froude scaling

will be used and applied to determine objective criteria. VISTA will be TRL=3 by the end of the proposed Phase I effort, and TRL=6 by the end of Phase II, through application to full-scale eVTOL/AAM data. The team will use both subscale aircraft and full-scale equivalents. The scaling laws will be tested both in digital-twin simulations and deployed onto flight hardware and tested. Phase I funding will be dedicated to establishing methodology and conducting subscale flight evaluations. Key technical objectives include the development of high-fidelity digital twin simulations and preliminary design of a full-scale demonstrator intended for Phase II. The effort specifically seeks to closely align to ongoing NASA programs, providing meaningful feedback for future vertical lift research. Target markets for this technology include government programs, such as those concerning revolutionary vertical lift, providing essential data for safety and performance. Beyond this, the framework addresses critical needs for commercial manufacturers requiring validated methods of compliance for certification. The technology is intended to be commercialized as a software toolkit to support the rapidly growing urban air mobility ecosystem, providing a cost-effective path to vehicle certification.

Duration: 13

Proposal Details

Proposal Number: AERO.10.T26B-0050
Subtopic Title: Hybrid Powertrain Technologies
Proposal Title: Complementary Twin Filtering of Gallium Nitride Switching Noise

Small Business Concern

Firm: INGENIUM TECHNOLOGIES CORP
Address: 4216 MARAY DR, ROCKFORD, IL, 61107-4970

Summary Details

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

Motor drive power density has greatly improved over the past decade with the commercialization of affordable wide bandgap (WBG) semiconductors, however

additional improvements are required to meet electric aircraft propulsion (EAP) power density goals. The next great opportunity for improving motor drive power density is by reducing the mass required for the filtering of Electro-Magnetic Interference (EMI). Active EMI filters represent the most feasible technology for significant reductions in motor drive filter mass, because they trade copper and iron mass for transistor mass instead. Ingenium Technologies proposes the development of Complementary Twin Active Electro-Magnetic Interference (EMI) Filters as a means to reduce EMI energy at its source. The purpose of the Complementary Twin Active EMI Filter (CT-AEF) is to attenuate the noise sources of Gallium Nitride (GaN) power converters and to reduce the mass of passive magnetics required for electro-magnetic compliance. Phase 1 funding will be used to perform TRL 3 development, culminating in a proof-of-concept test. Target markets are weight and cost sensitive motor drive applications using GaN transistors, particularly those for future multi-megawatt Electric Aircraft Propulsion (EAP).

Duration: 13

Proposal Details

Proposal Number: AERO.10.T26B-0150
Subtopic Title: Hybrid Powertrain Technologies
Proposal Title: Cryogenic Power Electronics for Hybrid Multi-Megawatt Powertrains

Small Business Concern

Firm: Hyper Tech Research Inc
Address: 539 Industrial Mile Rd., Columbus, OH, 43228-2412

Summary Details

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

This SBIR proposal is submitted in response to solicitation Topic AERO.10.T26B: Hybrid Powertrain Technologies (STTR). This subtopic in general is intended to cover the range of hybridization for commercial aircraft. Specifically called out in this solicitation was the need for cryo-compatible power electronics that support

superconducting systems. The goal of this work is to develop improved cryogenic inverter solutions for multi-MW motors for superconducting and cryogenic electric aircraft propulsion motors. Our system will use GaN HEMT transistors, and we will explore various options for our drivers. A major aim of the work is the packaging of the inverters and drivers for compact and robust operation with high heat removal, and the exploration of the best operating points both from a point of view of device operation as well as heat removal. Designs for enhanced cooling directly on the chips will be used, while allowing the potential for temperature differences in transistor and gate drivers while both are integrated in a compact package. The capability to remove the required heat with both flowing cryogenic gas and cryogenic liquid will be explored in the context of an engineered enclosure will be explored. The Phase I will involve electrical and thermal modelling, as well as direct experiment. Phase II will continue to make design improvements, but also include full demonstration at a level greater than 1 MVA.

Duration: 12

Proposal Details

Proposal Number: AERO.10.T26B-0190
Subtopic Title: Hybrid Powertrain Technologies
Proposal Title: GaN-Based Scalable Cryogenic Current Source Inverter with Embedded Die Packaging for MW-Class Electric Aircraft Propulsion

Small Business Concern

Firm: CurrentEdge Power Semiconductor LLC
Address: 5 Graduate Court, East Setauket, NY, 11733-1079

Summary Details

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

This proposal develops a scalable 2 MW cryogenic GaN power converter for electrified aircraft propulsion at 20â€“40 K, directly addressing NASA subtopic AERO.10.T26B. Three interdependent innovations close critical gaps between the current state of the art and NASA's multi-megawatt superconducting motor drive

requirements. The converter uses a GaN-based Modular Current Source Inverter (CSI) organized as eight 250 kW parallel modules fully immersed at 20â€“40 K, delivering 1.5â€“2.5 kV output at 500â€“1000 Hz with THD below 3%. GaN HEMTs are selected for their 2DEG transport channel, which yields ~50% lower on-state resistance and ~62% lower switching energy at cryogenic temperatures. Embedded Die PCB packaging applies HDI multilayer PCB structures with copper microvia interconnects to eliminate wire bonds â€” removing the primary cryogenic failure mechanism and reducing switching loop inductance to below 1 nH. A fully optical cryostat interface combines Power-over-Fiber (PoF) for cold-side gate drive power and Signal-over-Fiber (SoF) for bidirectional PWM and sensor data, reducing cryogenic heat leak by over 90% versus copper wire bundles while providing complete galvanic isolation. Phase I funding will characterize GaN devices and passives at 20â€“40 K, design and simulate the 250 kW modular CSI, fabricate and test the first embedded die GaN half-bridge modules, validate the PoF+SoF interface, and demonstrate a 100 kW prototype at 40 K â€” advancing all three innovations from TRL 2 to TRL 4. Stony Brook University leads technical development; CurrentEdge Power Semiconductor LLC (CEPS) leads commercialization and NASA coordination. Target markets include cryogenic electric aircraft propulsion, space propulsion, medical imaging, and offshore wind energy conversion.

Duration: 13

Proposal Details

Proposal Number: COSMO.6.T26B-0016
Subtopic Title: Fundamental Physics Test Apparatus
Proposal Title: Octave-spanning, Low-SWaP Ytterbium Mode-locked-laser for Portable Ultra-Stable Frequency Combs

Small Business Concern

Firm: Octave Photonics
Address: 325 W South Boulder Rd, Louisville, CO, 80027-1130

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 2 - 4

Technical Abstract (Limit 2000 characters):

Octave Photonics proposes the On-chip Yb:alumina Ultrafast Comb Source (OLYMPUS): a self-referenced optical frequency comb built on a single photonic chip, addressing NASA subtopic COSMO.6.T26B's call for high-performance, rugged, low-SWaP octave-spanning combs and miniature self-referenced combs. Current combs that meet optical-clock noise requirements are fiber-based tabletop instruments poorly suited to miniaturization and mass manufacture, while existing chip-integrated alternatives (Kerr microcombs, electro-optic combs) operate at repetition rates above 10 GHz, complicating broadening, stabilization, and detection. OLYMPUS targets the pragmatic middle ground: a conventional saturable-absorber mode-locked laser architecture at sub-2-GHz repetition rate, implemented in chip-integrated form. The device combines a Yb-doped alumina (Yb:Alâ,,Oâ,*f*) waveguide gain section developed at Harvard, on-chip chirped Bragg mirrors providing dispersion compensation, Octave's tantala supercontinuum platform for f-2f self-referencing, and a semiconductor saturable absorber (commercial SESAM in Phase I/II, heterogeneously integrated in Phase III). Every passive and active building block has been independently demonstrated; the mode-locked oscillator is the central innovation. Phase I funding will retire key risks: develop a validated cavity model; design and fabricate Yb:Alâ,,Oâ,*f* gain chips with integrated chirped Bragg mirrors at Harvard; demonstrate CW lasing and study mode-locking feasibility in a hybrid on-chip/free-space cavity at Octave; and verify alumina-over-tantala platform compatibility for Phase II. Target markets include deployable optical atomic clocks for PNT in GPS-denied environments, optical time transfer, LIDAR, free-space optical communications, precision spectroscopy, and cold-atom quantum-sensing systems. The technology extends Octave's commercial comb product line and serves NASA flight programs, DoD optical-clock efforts, NIST metrology, and OEM partners.

Duration: 13

Proposal Details

Proposal Number: COSMO.6.T26B-0074
Subtopic Title: Fundamental Physics Test Apparatus
Proposal Title: Compact, Rugged Alkali-Line Semiconductor Laser Platform for Rb/K Quantum Sensors

Small Business Concern

Firm: Pendar Technologies, LLC

Address: 30 Spinelli Place, Cambridge, MA, 02138-1040

Summary Details

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

Pendar Technologies, with SRI International as the STTR Research Institution, proposes a compact, rugged alkali-line semiconductor laser platform for Rb/K quantum sensors. Phase I will demonstrate a 780 nm Rb D2 GaAs/AlGaAs buried-grating DFB master oscillator for narrow-linewidth, single-frequency operation with useful seed-level output power. SRI will provide MOCVD growth, regrowth, and material characterization; Pendar will lead device design, grating definition, processing, and optical characterization. The result will establish a domestic DFB seed-source path for NASA and DoD quantum sensing and commercial quantum instruments, with a follow-on path to higher-power laser modules.

Duration: 13

Proposal Details

Proposal Number: COSMO.6.T26B-0084
Subtopic Title: Fundamental Physics Test Apparatus
Proposal Title: Clock Lasers with Integrated Photonics (CLIP)

Small Business Concern

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

Summary Details

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

Vescent Technologies, Inc. (Vescent) in collaboration with the Massachusetts

Institute of Technology Lincoln Laboratory (MIT-LL) proposes to develop compact and deployable continuous-wave (CW) lasers based on photonic-integrated circuits (PICs) for timing and quantum applications. We will leverage a system of PICs comprised of ultra-low loss (ULL) silicon-nitride (Si3N4) waveguides and periodically poled thin-film lithium niobate (TFLN) waveguides to enable ultra-narrow linewidth laser performance with wavelength access spanning the visible to near-infrared for a host of quantum applications. Our work will advance chip-scale laser technology capable of supporting next-generation space-deployed NASA missions including optical clocks (e.g. Sr and Yb lattice and ion clocks), free-space timing and communications, and quantum sensors as called out in NASAâ€™s Decadal Surveys and Civil Space Shortfall Rankings. The size reduction of laser systems yielded with PIC integration 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 and timing applications. This technology, if funded, offers critical pathways for NASA to achieve high performance laser systems designed for space operation at dramatically lower size, weight, and power plus cost (SWaP+C) than commercially available systems as well as offering new commercialization pathways for optical atomic clocks and quantum computing.

Duration: 13

Proposal Details

Proposal Number: GO.4.T26B-0086
Subtopic Title: Modernization of CFD Tools for Advanced Propulsion Applications
Proposal Title: Multiphase CFD Framework for Hypergolic Propellant Injection and Combustion for RDRE Development

Small Business Concern

Firm: Combustion Science & Engineering, Inc.
Address: 8940 Old Annapolis Road , Columbia, MD, 21045-2129

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 3 - 4

Technical Abstract (Limit 2000 characters):

Rotating Detonation Rocket Engines (RDREs) represent one of the most promising next-generation propulsion architectures for space launch and hypersonic applications because they offer the potential for higher thermodynamic efficiency, pressure-gain combustion, and reduced system complexity relative to conventional rocket engines. Despite this promise, RDRE development remains limited by the inability of current design tools to accurately predict ignition behavior, detonation stability, combustion dynamics, and performance under highly unsteady operating conditions. Recent advances in numerical methods, high-performance computing, and experimental diagnostics have created an opportunity to address these challenges. The proposed Phase I effort directly addresses subtopic GO.4.T26B through development of an integrated multiphase CFD framework for large-eddy simulation of hypergolic injection and combustion including liquid-liquid hypergolic reaction kinetics under RDRE environments. Three tightly-coupled tasks constitute the core technical work: (1) development of a physics-based liquid-phase reaction mechanism for MMH/NTO; (2) validation of the resulting reaction pathways and rate constants against experimental data including ignition induction-time measurements; and (3) implementation of the validated mechanism within an Eulerian-Lagrangian multiphase CFD architecture as finite-rate source terms governing liquid-phase ignition and vaporization. The innovative contribution of Phase I lies in the coupling of hypergolic propellant experimentation, liquid-phase kinetic mechanism development, and CFD integration for ignition and flame propagation modeling.

Duration: 13

Proposal Details

Proposal Number: GO.4.T26B-0119
Subtopic Title: Modernization of CFD Tools for Advanced Propulsion Applications
Proposal Title: Multiphase Combustion Simulation Tool Based on Compressive VOF and Compressible Flamelet Methodologies

Small Business Concern

Firm: Streamline Numerics, Inc.
Address: 3221 NW 13th Street, Gainesville, FL, 32609-2189

Summary Details

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

The project will deliver a high-fidelity multiphase subcritical combustion simulation tool for liquid rocket engines from traditional chemical, hypergolic, to Rotating Detonation Rocket Engines (RDREs). The Loci-STREAM CFD code which has been in use at NASA for a variety of multiphase space propulsion applications for several years will be used as the base for this new capability. The technical objectives are: (i) accurate prediction of liquid propellant injection, shock/droplet interaction, detonation/droplet interaction, flame/ droplet interaction, propellent evaporation, mixing and compressible combustion in RDREs; (ii) a critical assessment of droplet breakup models to describe the high-Weber number catastrophic breakup regimes in RDREs, and (iii) an accurate prediction of complex combustion regimes, including detonation, deflagration and multi-regime parasitic combustion modes. An algebraic compressive VOF (CVOF) framework will be developed for compressible multiphase flows including phase change and chemical reaction, allowing miscible and immiscible simultaneously. Loci-STREAM has existing methodologies suitable for transcritical and supercritical flows. The key methodologies which will be further enhanced or integrated into the Loci-STREAM code to enable subcritical combustion simulations are: (a) CVOF methodology, (b) Adaptive mesh refinement (AMR), (c) Shock-droplet interaction interaction models, (d) Lagrangian particle tracking, (e) Phase change models, (f) RDRE-specific flamelet combustion models, and (g) GPU methodology. Additionally, compressible flamelet models will be developed for RDRE multiphase combustion, involving detonation, deflagration and multi-regime parasitic combustion modes. The efficiency improvement provided by the combination of CVOF and flamelet methodologies will allow for simulations of complex 3D geometries with fast turnaround times, enabling CFD simulations to have more impact on the design cycle at NASA.

Duration: 13

Proposal Details

Proposal Number: GO.4.T26B-0124
Subtopic Title: Modernization of CFD Tools for Advanced Propulsion Applications
Proposal Title: Modernization of CFD Tools for Advanced Propulsion Applications

Small Business Concern

Firm: Corvid ATEA, LLC
Address: 153 Langtree Campus Drive, Mooresville, NC, 28117-8723

Summary Details

Estimated Technology Readiness Level(TRL Begin - TRL End): 1 - 3
Technical Abstract (Limit 2000 characters):

Advanced propulsion systems, such as Rotating Detonation Rocket Engines (RDREs), increasingly rely on highly complex subcritical injectors. Modeling the multiphase processes of breakup, atomization, and chemical reactions that occur within these systems remains a severe performance bottleneck for traditional Lagrangian particle-tracking Computational Fluid Dynamics (CFD) solvers. To overcome this, Atea and UNCC propose the Scalable Segregated Eulerian Atomization Methodology (SSEAM). SSEAM is an operator-split Eulerian-Eulerian (E-E) multi-fluid framework that natively governs liquid-phase injection, aerodynamic breakup, and evaporation. It is designed to be cache-efficient, rendering the architecture highly amenable to massive GPU acceleration. The required dispersed-phase breakup closures are rigorously calibrated using first-principles, interface-resolved simulations from UNCC's IMPACT solver. The segregated approach permits straightforward integration in existing gas-phase reacting CFD solvers. In Phase I, the SSEAM framework will be modularly integrated into the RavenCFD solver, passing conservative multi-physics source terms without disrupting existing fully coupled gas-phase chemistry routines. Following rigorous verification, the integrated solver will be validated against experimental diagnostics of a 3D subcritical triplet impinging injector, establishing a highly scalable foundation for full-engine hot-fire simulations and liquid-liquid hypergolic modeling in Phase II.

Duration: 13

Proposal Details

Proposal Number: GO.5.T26B-0053
Subtopic Title: Very Low Earth Orbits (VLEO) Control Surfaces
Proposal Title: Simulation and Design of Satellite Control Surfaces for Maneuvering in VLEO

Small Business Concern

Firm: Viridian Space
Address: 120 Eucalyptus Dr, El Segundo, CA, 90245-4664

Summary Details

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

Viridian proposal is based on three key elements that, when combined, will produce a suite of tools to design and characterize the effects of control surfaces on flight performance of a satellite in VLEO. The first aspect is our SMRT tool that can compute drag and force moments on an arbitrary spacecraft geometry and configuration. Second, VESTA tool that can propagate spacecraft orbital elements in VLEO, taking into account atmospheric effects, as well as propulsion components. The final element, is experimental validation of the physical assumptions for SMRT simulation based on force measurements in VLEO-relevant environment at UW.

Duration: 13

Proposal Details

Proposal Number: GO.5.T26B-0108
Subtopic Title: Very Low Earth Orbits (VLEO) Control Surfaces
Proposal Title: Thermospheric Orbit Investigation

Small Business Concern

Firm: Echelon Orbital, Inc.
Address: 9035 E Pima Center Parkway, Scottsdale, AZ, 85258-4418

Summary Details

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

The Thermospheric Orbit Investigation (THORIN) investigates aerodynamic control surface concepts that enable spacecraft operation in the 120â€“160 km altitude band, a region orbital spacecraft have not systematically visited since the 1960s. The proposed research couples rarefied-flow aerodynamic analysis of candidate surface geometries and specular-reflective coatings with an integrated aero-propulsive vehicle concept built on an existing Very Low Earth Orbit (VLEO) spacecraft platform. Echelon's primary university research partner operates a hyperthermal atomic oxygen beam facility and will characterize gas-surface interactions of candidate coating materials at orbital-relative energies. A second university partner will provide independent Direct Simulation Monte Carlo aerodynamic modeling and validation using a published gas-surface scattering model. Funding supports concept definition and analytical and experimental proof-of-concept across five integrated tasks: mission concept and a VLEO environmental model for the target altitude band, material trade and down-select to a preferred coating, experimental gas-surface interaction characterization at the partner beam facility, rarefied-flow aerodynamic analysis with independent cross-method validation, and vehicle integration concept covering structures, deployable surface mechanism, propulsion integration, and guidance, navigation, and control architecture. Target markets are NASA Science Mission Directorate heliophysics, Department of Defense thermospheric characterization, and commercial thermospheric data services. The work advances THORIN from concept formulation to analytical and experimental proof-of-concept, targeting Technology Readiness Level 3 at completion, with a Phase II test article definition and hardware characterization plan as a primary deliverable.

Duration: 13

Proposal Details

Proposal Number: GO.5.T26B-0123
Subtopic Title: Very Low Earth Orbits (VLEO) Control Surfaces
Proposal Title: Very Low Earth Orbits (VLEO) Control Surfaces

Small Business Concern

Firm: Corvid ATEA, LLC
Address: 153 Langtree Campus Drive, Mooresville, NC, 28117-8723

Summary Details

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

The 80â€“160 km Very Low Earth Orbit (VLEO) regime is critical for understanding Mesosphere/Ionosphere/Thermosphere coupling. However, sustained flight in this region is currently unfeasible. Hypersonic (Mach 25) rarefied flow and intense atmospheric drag rapidly decay orbits, and existing electric propulsion systems lack the required thrust to overcome these aerodynamic forces. To solve this, Atea Technologies, with University of Kentucky, proposes Active Control Technologies for VLEO (ACT-V). ACT-V centers on steerable, high-temperature aerodynamic control surfaces that transition VLEO spacecraft into actively maneuverable vehicles. Rather than fighting drag solely with propulsion, ACT-V harnesses the transitional flow to actively fly the spacecraft into a desirable orbit. Phase I advances ACT-V to TRL 3 via high-fidelity environmental and aerothermal modeling, CFD/DSMC aerodynamic surface optimization, aerothermal survivability analysis, and hybrid aero-propulsive assessments. These models will feed a 6-DOF orbital simulation to quantify achievable orbital maneuvers, such as targeted aerobraking and continuous altitude maintenance. Ultimately, ACT-V bridges the critical gap between aerodynamic theory and aerothermal survivability, enabling a new class of long-duration, highly maneuverable "dipper" missions for NASA science, DoD tactical assets, and commercial Earth observation platforms.

Duration: 13

Proposal Details

Proposal Number: INSITU.7.T26B-0117
Subtopic Title: Combustion and Fluids Experiments
Proposal Title: CLASP: Cislune Low-Gravity Autonomous Science Platform

Small Business Concern

Firm: Cislune Inc.
Address: -

Summary Details

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

CLASP is a single-locker, autonomous cartridge platform for low-gravity gas/liquid/solid physical-science experiments using water, gas, and lunar-regolith-like fines. NASA's exploration architecture needs compact, repeatable, remotely operated experiment facilities that can quantify how bubbles, fines, clogging, recovery flow, capillary geometry, and safe-state logic behave when dirty fluids are handled in reduced gravity and lunar-surface-relevant operations. Current ISS capillary-fluid and phase-separation heritage provides strong clean-fluid foundations, but it does not provide an autonomous cartridge facility designed to compare particulate-laden water/gas flows, controlled porous-media and channel geometries, and lunar-fines transport in a form factor aligned to Commercial Low Earth Orbit Destination payload integration. In Phase I, Cislune, San Diego State University Research Foundation, and Honeybee Robotics will define and test the CLASP architecture. Cislune will build and operate a benchtop autonomous breadboard with baseline and treatment cartridges, metered flow, controlled bubble/fines injection, imaging, sensing, data logging, safe-state behavior, and repeatable run scripts. SDSU will anchor the science matrix, particle/fluid characterization, measurement metrics, multiphase and porous-media modeling, and reduced-gravity scaling rationale. Honeybee Robotics will strengthen the flight-forward path through cartridge architecture trades, pumps/valves/reservoirs/seals/containment assessment, gas-liquid/fines management review, safe-state and leak-containment review, and Phase II prototype/test-campaign planning. The Phase I result will be a quantified evidence package and Phase II engineering roadmap for a CLD-compatible autonomous cartridge facility that can support NASA physical-science, lunar ISRU, environmental control, sample handling, and dust/fines transport research.

Duration: 13

Proposal Details

Proposal Number: INSITU.7.T26B-0126
Subtopic Title: Combustion and Fluids Experiments
Proposal Title: Using Particle Image Velocimetry to explore Two-Phase Flows in Microgravity Environments

Small Business Concern

Firm: Spectral Energies, LLC
Address: 4065 Executive Dr, Beavercreek, OH, 45430-1062

Summary Details

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

NASAâ€™s mandate for a sustained human lunar presence and crewed missions to Mars relies on overcoming critical microgravity engineering challenges. Because future thermal management, life support, and propellant systems depend heavily on complex two-phase flows, establishing a fundamental understanding of fluid dynamics in low gravity is essential. As such, there is a need to perform fundamental fluid dynamic experiments in Low Earth Orbit (LEO) to help design and optimize these systems. To address this challenge, Spectral Energies (SE) and the University of Delaware (UD) propose to develop a fluid dynamic test system with Particle Image Velocimetry (PIV) and a series of experiments related to two phase flows. Specifically, the team will explore experiments related to phase change heat exchangers, electrolysis for O2 generation, and Liquid Slosh and Ullage Dynamics. This work will leverage SEâ€™s academic partnerâ€™s previous experiment that was successfully flown on the International Space Station (ISS). This experiment used PIV to understand the effect of turbulence and particle density. The proposed effort will modify and optimize this hardware to meet the stringent Size, Weight, and Power (SWaP) requirements of modern platforms like Commercial LEO Destinations (CLD), SmallSats, Artemis, lunar lander, etc. During Phase I, SE and UD will design a series of experiments related to two phase flows. The team will also modify the existing UD hardware to perform the selected experiments and identify potential flight opportunities. Finally, the team will prepare for environmental (ENV) and electromagnetic interference (EMI) testing. In Phase II, the team will finalize the design, build the hardware, perform benchtop testing, perform the ENV and EMI testing, and prepare for a flight test. Ultimately, the proposed LEO fluid dynamics test system will provide a means to study how complex fluid dynamics behave in low and microgravity environments and provide

data and knowledge

Duration: 13

Proposal Details

Proposal Number: INSITU.7.T26B-0204
Subtopic Title: Combustion and Fluids Experiments
Proposal Title: Autonomous Single-Molecule Measurement System for Interfacial Fluid Physics Across the Gravity Continuum

Small Business Concern

Firm: XGenomes Corp
Address: 750 Main St, Cambridge, MA, 02139-3544

Summary Details

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

Phase I delivers: (1) proof-of-concept Earth-baseline single-molecule measurements at required precision; (2) targeted experiments establishing the instrument design specification and Priority Probe Panel; (3) closed-fluidic autonomous prototype design with bench-tested components and preliminary SWaP estimates; (4) pre-specified Phase II analysis protocol; and (5) feasibility study with business case. The swappable cartridge architecture supports two mission modes: pre-loaded cartridges for autonomous fluid physics experiments, or robotically loaded cartridges for in-situ sample analysis during planetary surface operations, directly addressing the Moon to Mars Architecture. Target platforms: ISS, Commercial LEO Destinations, SpaceTango autonomous payload systems. Target markets: NASA Biological and Physical Sciences; commercial space research; XGenomes sequencing platform; hybridization-based diagnostic assay design for space and terrestrial applications. Addresses all INSITU.7.T26B critical hardware gaps: autonomous operation, gravity-independent fluidics, real-time measurement, bubble mitigation, and reagent storage.

Duration: 8

Proposal Details

Proposal Number: INSTALG.6.T26B-0134
Subtopic Title: Quantum Computing
Proposal Title: Q-BITS: Quantum-Inspired Bitstream Intelligence for Remote Sensing Science

Small Business Concern

Firm: Robust Intelligence LLC
Address: 1603 Capitol Ave Ste 415, Cheyenne, OH, 82001-4562

Summary Details

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

NASA's Science Mission Directorate faces an escalating data-processing crisis: modern Earth-observing, heliophysics, and astrophysics missions (NISAR, Sentinel-1, MODIS, SDO, JWST) generate petabytes of imagery, multi-spectral cubes, and interferometric SAR products whose pre-processing routinely consumes 100+ GPU-hours per problem class. Quantum computing has been advertised as a path past these limits, but today's NISQ and emerging LISQ processors cannot yet solve practical SMD problems, and a large gap persists between theoretical quantum algorithms and deployable science software. Q-BITS (Quantum-Inspired Bitstream Intelligence for Remote Sensing Science) closes this gap with a hybrid quantum-classical framework that fuses quantum computing (QC) with stochastic/bit-stream computing (SC). Scientific data are encoded as probabilistic bitstreams whose statistics can be generated on NISQ hardware or executed efficiently on classical supercomputers, letting a single toolchain run with consistent semantics on Qiskit/IBM-Q backends, simulators, and CPU/GPU clusters. Phase I funding will (1) formalize the quantum-stochastic bitstream representation and build ingestion adapters for Landsat-9/MODIS, Sentinel-1, and GOES; (2) develop hybrid QC+SC kernels for image-to-image translation, noise filtering, multi-sensor fusion, and 2D SAR phase unwrapping, benchmarked against U-Net, BM3D, attention-fusion, and SNAPHU; (3) deliver a resource and utility estimation module compatible with BenchQ and Rigetti's tools producing dollar-denominated comparisons to the classical state of the art; and (4) provide a Phase II hardware roadmap. Target markets include NASA SMD, federal Earth-observation programs (ASF DAAC, NOAA, USGS, NRO, NGA, AFRL), commercial SAR analytics (Capella, ICEYE, Planet, Maxar), climate-finance/ESG verification, defense ISR, and the quantum-software ecosystem (IBM, IonQ, Rigetti).

Duration: 13

Proposal Details

Proposal Number: INSTALG.6.T26B-0182
Subtopic Title: Quantum Computing
Proposal Title: Constraint-Aware Quantum Optimization for Satellite Data Acquisition and Scheduling

Small Business Concern

Firm: Offset Strategic Services
Address: 490 Discovery Dr NW, Huntsville, Huntsille, AL, 35806-2902

Summary Details

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

This Phase I effort develops and evaluates a hybrid quantum-classical optimization framework for satellite data acquisition and scheduling within NASA Science Mission Directorate (SMD) missions. Earth science, heliophysics, and astrophysics missions routinely solve large-scale scheduling problems involving observation prioritization, instrument activation, and downlink coordination under complex operational constraints. Existing classical mixed-integer optimization methods often struggle with highly symmetric solution spaces, weak LP relaxations, and rapid replanning requirements, while current quantum approaches rely heavily on penalty-based QUBO formulations that introduce substantial hardware overhead and poor feasibility performance. The proposed innovation, HybridQAOA, structurally enforces scheduling constraints directly within the quantum state preparation and mixer design rather than through large penalty terms. Assignment, capacity, and conflict constraints are encoded using resource-efficient quantum â€œgadgetsâ€ (quantum constraint implementations) and structure-preserving mixers that restrict algorithm dynamics to the feasible subspace, while large global resource constraints are coordinated classically using adaptive augmented-Lagrangian updates and sparse surrogate formulations. Preliminary results demonstrate a 2.2x improvement in feasible-solution sampling probability and a 3.1x improvement in optimal-solution sampling over penalty-based QAOA at shallow circuit depth.

Duration: 13

Proposal Details

Proposal Number: LIVEI.2.T26B-0061
Subtopic Title: Bulk Regolith Manipulation and Site Preparation
Proposal Title: Landing Pad Design for Lunar Innovation Park

Small Business Concern

Firm: Slate Geotechnical Consultants, Inc.
Address: 5727 Claremont Ave, Oakland, CA, 94618-1279

Summary Details

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

The proposed innovation focuses on developing a performance-based lunar landing pad design methodology for the proposed Lunar Innovation Park, proposed by NASA Kennedy Space Center Swamp Works. As Artemis missions transition toward sustained lunar surface operations, reusable landing infrastructure will be essential to support repeated CLPS and future HLS missions while mitigating hazards from plume-surface interactions. Rocket plume interactions with unconsolidated lunar regolith can generate ejecta, cratering, dust mobilization, and surface degradation, potentially damaging spacecraft, infrastructure, and nearby mission assets. Current lunar landing pad concepts largely focus on isolated material systems, without integrating PSI loading, geotechnical subgrade behavior, structural performance, site preparation, and operational construction and maintenance considerations into a unified infrastructure framework. The proposed Phase I effort seeks to address this gap by developing a preliminary landing pad design that integrates traditional civil and geotechnical engineering approaches with lunar surface construction and in-situ resource utilization concepts. The work will evaluate two candidate landing surface approaches, including a prepared and compacted regolith surface and a compacted regolith surface incorporating a low-energy electrothermal surface treatment intended to improve erosion resistance and reduce ejecta generation during repeated landing operations. The effort also investigates maintainable infrastructure strategies in which localized degradation or cratering may be repaired and recompacted through rover-enabled maintenance operations.

Duration: 13

Proposal Details

Proposal Number: LIVEI.2.T26B-0102
Subtopic Title: Bulk Regolith Manipulation and Site Preparation
Proposal Title: Lunar Site Preparation Geotechnical Instrumentation Suite

Small Business Concern

Firm: Apech Labs

Address: 1576 Sweet Home Rd, Buffalo, NY, 14228-2710

Summary Details

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

Apech Labs has partnered with Michigan Technological University and the University of Central Florida to develop a flight-ready lunar surface geotechnical measurement suite to support site evaluation, preparation, and quality assurance. MTU and UCF will combine their expertise in regolith mechanics with Apech Labsâ€™ experience in lunar mechanism development to develop a payload that enables rapid, high spatial resolution measurement of regolith geotechnical properties that must be known to safely achieve NASAâ€™s Moon Base goals. During the proposed Phase I program, MTU and UCF will select and size a set of instruments to acquire data including regolith shear strength, bearing strength, and penetration resistance while Apech Labs develops dedicated actuation solutions and a system-level payload design with the goal of immediately continuing to a Phase II STTR that will mature the payload into a set of CLPS flight-ready hardware. This program will rapidly develop and scale a capability to measure potential landing sites and understand the preparation work that must be done to develop safe foundations for lunar infrastructure. The instrument payload suite designed under this program is intended to be flown on a variety of CLPS landers to rapidly build up data sets.

Duration: 9

Proposal Details

Proposal Number: LIVEI.2.T26B-0178
Subtopic Title: Bulk Regolith Manipulation and Site Preparation
Proposal Title: High-Utility Surface for Kinetic Ejecta Reduction (HUSKER)

Small Business Concern

Firm: Cornerstone Research Group, Inc
Address: 8821 Washington Church Road, Miamisburg, OH, 45342-4449

Summary Details

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

The National Aeronautics and Space Administration (NASA) has put forth the goal to land two missions on the lunar surface by 2028 and establish the initial elements of a permanent lunar outpost in 2030. This â€œGo Doâ€ approach over a â€œGo Studyâ€ view requires proven material systems ready to overcome the numerous difficulties of landing on the regolith. One critical aspect is safely landing on the surface while reducing the ejecta and dust pluming. CRG Defense (CRGD) has previously developed a thin, lightweight, durable, and rollable landing pad material which showed excellent ablative characteristics in rocket engine testing on Earth. This high utility surface for kinetic ejecta reduction (HUSKER) material will allow for the easy transport and deployment of a landing pad which will enable the rapid development of a sustainable and steady US lunar presence. The lightweight and rollable characteristic of this proven material means that the cost of transport is drastically lower than incumbent solutions while also being compatible with any number of robotic placement solutions and platforms. CRGD will partner with Dr. Paul van Susanteâ€™s lab at Michigan Technological University (MTU) which has significant expertise in lunar condition testing. HUSKER will be evaluated in simulated lunar environments to ensure its deployability and consistency on the regolith. This effort will provide a key material necessary for the successful landing of a consistent moon presence, leading to a faster, safer establishment of necessary infrastructure.

Duration: 13

Proposal Details

Proposal Number: ORBECON.2.T26B-0018
Subtopic Title: Biotechnology Applications from Space for Earth
Proposal Title: Commercial-scale, FDA-compliant in space bioreactor

Small Business Concern

Firm: Opera Space LLC
Address: 3015 Birch Avenue, Boulder, CO, 80305-3456

Summary Details

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

This Phase I STTR effort advances the BioServe In-space Cell Expansion Platform (BICEP) toward a scalable, automated, FDA-compatible orbital biomanufacturing system for stem cell-derived therapeutics and regenerative medicine production in Low Earth Orbit (LEO). The proposed Automated GMP-Compatible Orbital Stem Cell Manufacturing Cartridge (AGOS-MC) directly supports NASA InSPA objectives by transforming research-oriented biotechnology hardware into a manufacturing-oriented platform optimized for automation, quality control, repeatability, and future FDA Good Manufacturing Practice (GMP) compliance. Opera Space, in partnership with BioServe Space Technologies at the University of Colorado Boulder, will develop a closed-loop microfluidic bioprocessing architecture enabling automated media exchange, nutrient delivery, reagent injection, waste management, and inline monitoring with minimal crew interaction. Building on BioServeâ€™s flight-proven BICEP hardware currently operating aboard the International Space Station, the project introduces modular cartridge-based manufacturing approaches capable of significantly increasing throughput relative to current experimental payloads. The Phase I effort will integrate sensing and imaging technologies for continuous monitoring of stem cell growth, environmental stability, and process health during orbital operation. Automated process-control software will support environmental regulation, anomaly detection, digital process traceability, and future electronic batch record generation required for FDA-compatible manufacturing workflows. The project will also evaluate modular scaling strategies and preliminary flight qualification approaches for future deployment. By combining flight-proven orbital biotechnology heritage with automated fluidics, integrated sensing, and GMP-oriented system design, AGOS-MC establishes a foundational platform for commercial in-space biomanufacturing.

Duration: 13

Proposal Details

Proposal Number: ORBECON.2.T26B-0044
Subtopic Title: Biotechnology Applications from Space for Earth
Proposal Title: Parkinsonâ€™s Drug Discovery Accelerated with Olfactory Brain-on-Chip on Earth and in Microgravity

Small Business Concern

Firm: OLFERA
Address: 49 Showers Dr., Mountain View, CA, 94040-0000

Summary Details

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

Parkinson's disease (PD) affects over 1 million Americans and 10 million globally, with no disease-modifying treatment in sight. Over 90% of CNS drug candidates fail in clinical translation because existing models lack human disease fidelity, and PD's decades-long progression makes early pathogenic mechanisms difficult to study within practical timelines. Smell loss affects 96% of PD patients years before motor symptoms appear, making the olfactory pathway the earliest site of PD pathology â€“ yet no model has recapitulated this full circuit. Olfera fills this gap with OChip, an olfactory brain-on-chip recreating the complete nose-to-brain neural circuit within a microfluidic system engineered for directional axonal connectivity. OChip V2 is the first platform to use primary human olfactory neurons collected non-invasively from living healthy and early-stage PD donors. Unlike animal models, iPSC-derived cells, or post-mortem tissue, these neurons retain native epigenetic landscapes, pathology, and aging signatures from living patients. Microgravity accelerates cellular aging, alpha-synuclein aggregation, and mitochondrial and dopamine pathway dysfunction in ways not reproducible on Earth â€“ compressing PD's multi-decade progression into an actionable research window. Olfera is uniquely positioned to leverage this. Phase I funding will support validation of OChip aboard the ISS in partnership with BioServe Space Technologies â€“ quantifying PD cellular signatures across the nose-to-brain circuit versus matched ground controls, and evaluating a PD-relevant environmental toxin and a clinical-stage therapeutic antibody within the same system. Completion will establish the first PD relevant olfactory organ-on-chip validated in microgravity, generating data to reduce CNS drug failure rates. Target markets include CNS pharma, biotech, and government programs focused on PD treatment â€“ to accelerate therapeutic options for the 10 million patients worldwide living with PD.

Duration: 13

Proposal Details

Proposal Number: ORBECON.2.T26B-0222
Subtopic Title: Biotechnology Applications from Space for Earth

Proposal Title: Complex Organoid Screening in Microgravity for Intractable Cancers

Small Business Concern

Firm: Exobiosphere, Inc.
Address: 8, The Green, STE R, Dover, DE, 19901-3618

Summary Details

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

COSMIC, this STTR Phase I program, develops and validates the ground-based scientific and hardware-integrated workflows required to conduct the first scalable, high-throughput drug screening of complex cancer organoids in microgravity. The project integrates Exobiosphere's Orbital High-Throughput Screening (OHTS) platformâ€”an autonomous laboratory capable of running over 2,000 simultaneous assays in standard 384-well pharmaceutical microplate formats with no crew involvementâ€”with the validated glioblastoma (GBM)â€“immune organoid model developed by Prof. Meenal Datta's TIME Lab at the University of Notre Dame, the most advanced GBMâ€“myeloid co-culture system flown in spaceflight (SpX-30, ISS, March 2024). Glioblastoma is universally fatal, with over 95% of CNS oncology drugs failing in clinical trials due to inadequate preclinical models. Microgravity-grown GBM organoids demonstrate superior reproducibility, accelerated development, and immunosuppressive phenotypes recapitulating human disease architectureâ€”validated by comprehensive multi-omics characterization. Phase I pursues three objectives: (1) establish a multi-component GBMâ€“myeloidâ€“astrocyte organoid model optimized for the OHTS 384-well automated format; (2) validate the end-to-end drug screening workflow on the OHTS terrestrial twin, generating dose-response curves, EC50/IC50 values, and myeloid repolarization metrics using benchmark clinical agents and AI/ML-selected compound candidates; and (3) synthesize results into a comprehensive flight implementation plan for Phase II orbital demonstration. Work is distributed approximately 50% Exobiosphere / 50% Datta Lab at Notre Dame. Phase I advances the integrated workflow to TRL 4â€“5, de-risking the science and platform integration before orbital deployment. Phase II will demonstrate high-throughput GBM organoid screening on OHTS in low Earth orbit, establishing a commercial orbital CRO oncology service addressing the $6.2B preclinical CRO market.

Duration: 13

Proposal Details

Proposal Number: ORBECON.3.T26B-0092
Subtopic Title: Advanced Materials Manufacturing Applications from Space for Earth
Proposal Title: Microgravity Synthesis of Perovskite Semiconductors for Tunable Light Emitting Technologies

Small Business Concern

Firm: Chromatic Lighting, LLC
Address: 6301 Gaston Ave, Dallas, TX, 75214-3914

Summary Details

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

Color-tunable light-emitting technologies form the basis of a new precision lighting paradigm with applications including measuring biometrics in smart watches and portable medical devices, chemical sensing, and optical spectroscopies. The goal of this project is to synthesize high-quality mixed-halide perovskite thin films under microgravity conditions to reach near-ideal, tunable light emission performance. Films synthesized in a microgravity environment, without the influence of buoyancy, convection, or sedimentation, will possess highly improved compositional uniformity, larger grain sizes, and long charge carrier lifetimes. All will greatly enhance the optical response of produced thin film emitters and will ultimately enable the creation of a color-tunable laser. Phase I efforts will develop the methods, materials, and instrumentation for perovskite blade coating in a microgravity environment.

Duration: 9

Proposal Details

Proposal Number: ORBECON.3.T26B-0109
Subtopic Title: Advanced Materials Manufacturing Applications from Space for Earth
Proposal Title: Microgravity-Enabled DNA-Semiconductor Memristors for Ultra-Low Power In-Memory Computing in Space Systems

Small Business Concern

Firm: PINWHEEL TECHNOLOGIES INC.
Address: 2433 High Ave, Vestal, NY, 13850-0000

Summary Details

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

Pinwheel Technologies is developing an encapsulated hybrid bio-memristor as a novel, non-silicon, non-volatile memory (NVM) storage device to enable advances in information technologies relevant to earth and space, such as internet of things (IoT), in-memory and neuromorphic computing, and artificial intelligence (AI). Prototypes of the device demonstrate exceptionally low operating voltage, a high resistive switching ON/OFF ratio, and excellent retention. Demand for advanced data storage and processing has driven the search for next-generation memory device architectures. DNA has both programmable structure and outstanding information density, opening pathways to powerful NVM storage devices. Our preliminary devices already display excellent performance due to the bilayer of synthetic DNA strands and organic-inorganic hybrid perovskite (OHP) acting as the active material. The DNA acts as a self-assembled scaffold that can have its properties tuned via synthetic parameters, the OHP layer acts as a resistive switching material, and their synergistic interaction and Ї€-Ї€ stacking weak interactions at the interface of these two layers facilitate enhanced charge transport through the device. Since microgravity improves the uniformity of structures formed through weak interactions (i.e. the DNA, OHP, and interface layers) via elimination of convective flows and sedimentation effects, Pinwheel has recognized that redesigning their space-compatible fabrication process for orbital compatibility can significantly improve their hybrid bio-memristor performance and reproducibility. Augmenting performance would further position our device as an early player in next-generation data storage. Fabrication of our device in a microgravity environment through partnering with NASA offers a pathway to an ideal manufacturing environment where the assembly of the structure-directing DNA strands will have minimal defect density.

Duration: 13

Proposal Details

Proposal Number: ORBECON.3.T26B-0215
Subtopic Title: Advanced Materials Manufacturing Applications from Space for Earth
Proposal Title: Automated Orbital Fiber Puller

Small Business Concern

Firm: Outpost Technologies Corporation
Address: 1601 Colorado Ave , Santa Monica , CA, 90404-3318

Summary Details

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

Outpost Technologies proposes development of the Automated Orbital Fiber Puller (AOFP), a fully autonomous microgravity manufacturing system for producing ultra-low-loss ZBLAN fluoride optical fiber aboard the International Space Station or commercial LEO platforms. ZBLAN fiber offers a theoretical attenuation minimum approximately 100x lower than silica, but gravity-driven crystallization, convective defects, and sedimentation during terrestrial manufacturing prevent realization of this performance. Prior ISS experiments confirmed that microgravity suppresses these mechanisms, yet no prior effort achieved autonomous, commercially scalable orbital production. Phase I funding will be used to establish the technical architecture and feasibility of fully autonomous ZBLAN fiber manufacturing, eliminating crew intervention for preform loading, threading, break recovery, and spool handling. Work includes COMSOL multiphysics modeling of microgravity melt dynamics and crystallization boundaries, definition of process control and contamination thresholds, preliminary autonomous system architecture development, and a Phase II transition roadmap. The effort is a collaboration between Outpost Technologies and the Indiana University FAMES Lab, led by Dr. Alexander Gumennik and supported by Dr. Kenneth Levin, a pioneer of U.S. fluoride fiber development with direct ISS ORFOM program experience. Target markets include photonic quantum computing, where reducing delay-line fiber attenuation from 0.14 dB/km to â‰¤0.02 dB/km enables significantly deeper computational circuits; defense mid-IR sensing and directed energy applications; and next-generation long-haul communications. Commercial demand is validated through MOUs with PsiQuantum and Xanadu. The fluoride fiber market is

projected to grow substantially as quantum computing scales, representing a market opportunity currently inaccessible through terrestrial manufacturing.

Duration: 13

Proposal Details

Proposal Number: SPWX.3.T26B-0056
Subtopic Title: Quantum Sensing Components for Space Environment Measurements
Proposal Title: Quantum-engineered Multispectral Array Platform for Trace Neutral Gas Monitoring

Small Business Concern

Firm: Nanohmics, Inc.
Address: 6201 E. Oltorf St., Ste.400, Austin, TX, 78741-0000

Summary Details

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

Q-MAPgas (Quantum-engineered Multispectral Array Platform for trace neutral gas monitoring) is a low-SWaP, quantum-enabled sensing platform for selective detection and monitoring of trace neutral gases in NASA-relevant environments. The technology integrates a spectrally programmable infrared quantum dot (QD) emitter array, a broadband free-space nonresonant cavity for enhanced photonâ€“gas interaction, and a thermopile detector within a multiplexed sensing architecture. Quantum-confined multispectral QD emitters generate wavelength-selective infrared emission matched to molecular absorption signatures, enabling quantum-engineered optical interrogation of target gases within the integrating cavity. The thermopile detector measures transmitted spectral signatures for gas identification and concentration analysis. This architecture eliminates the need for bulky spectrometers, moving optical components, and large gas cells, significantly reducing system size, weight, power consumption, and operational complexity. Phase I will validate the core sensing architecture, optimize QD emitter and cavity designs, demonstrate selective detection of representative NASA-relevant gases,

and establish a scalable pathway toward integrated prototype development. Q-MAPgas offers transformative potential for spacecraft environmental monitoring, planetary atmosphere characterization, ISRU process control, and distributed low-resource sensing, while establishing a new class of scalable quantum photonic sensors for future space missions.

Duration: 13

Proposal Details

Proposal Number: SPWX.3.T26B-0116
Subtopic Title: Quantum Sensing Components for Space Environment Measurements
Proposal Title: Non-Hermitian Coupled Laser Array Readout for Quantum Sensors

Small Business Concern

Firm: Opterro
Address: 46608 Landing Pkwy, Fremont, CA, 94538-6420

Summary Details

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

NASAâ€™s Space Technology Mission Directorate (STMD) has identified compact quantum sensing technologies and integrated photonic subsystems as critical enabling components for future distributed spacecraft, CubeSat, and resource-constrained sensing missions. Existing quantum sensing systems frequently rely on weak perturbation-induced optical signatures that must be extracted through spectroscopic interrogation, interferometric detection, microwave resonance tracking, or high-resolution frequency-domain measurements. Although such approaches can achieve high sensitivity, the associated optical interrogation and electronic readout architectures may increase system complexity, calibration burden, thermal stabilization requirements, and SWaP overhead, limiting scalability for compact integrated sensing platforms and distributed aerospace systems. Opterro and STTR Research Institute University of North Carolina, Charlotte (UNCC)â€™s Prof. M.P. Hokmabadi propose to investigate a new class of non-Hermitian laser-

array readout platforms in which coupled semiconductor laser arrays operating near second- and higher-order EPs are integrated with radiative diffraction gratings to generate enhanced perturbation-induced far-field beam patterns and spatial optical transduction. The Phase I effort will establish theoretical performance limits, sensitivity trends, perturbation-response scaling, and preliminary integration pathways for future low-SWaP quantum sensing platforms. In addition, Phase I will identify critical technical risks, fabrication tolerances, thermal sensitivity considerations, and future experimental requirements necessary for Phase II prototyping and hardware demonstration.

Duration: 13

Proposal Details

Proposal Number: SPWX.3.T26B-0181
Subtopic Title: Quantum Sensing Components for Space Environment Measurements
Proposal Title: Low-SWaP Quantum Magnetometry for Spaceborne Magnetic Field Measurements

Small Business Concern

Firm: Advent Innovations
Address: 1225 Laurel Street, Columbia, SC, 29201-5818

Summary Details

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

In this project, a plasma-engineered nitrogen-vacancy (NV) diamond quantum magnetometer is being developed for compact, low-SWaP magnetic field sensing in Heliophysics and space weather applications. As mission architectures shift toward small satellite constellations requiring simultaneous multi-point measurements, there are currently critical gaps in quantum magnetometers that are compact, room-temperature-operable, and space-qualifiable, which is precisely the technology this effort advances. NV-diamond sensors measure magnetic fields through optically detected magnetic resonance (ODMR), leveraging spin-state transitions tied to

fundamental physical constants. This yields improved long-term stability and reduced drift compared to classical fluxgate and optically pumped systems, without cryogenic cooling. Phase I funding supports: (1) COMSOL multiphysics modeling to optimize plasma-assisted NV-diamond growth parameters; (2) synthesis and characterization of NV-diamond materials for controlled defect density and spin coherence; (3) proof-of-concept ODMR-based magnetic field sensing benchmarked against state-of-the-art fluxgates; and (4) preliminary SWaP, thermal, and electromagnetic feasibility assessment for space deployment, culminating in a Phase II prototype roadmap. Target markets include NASA Heliophysics missions (CINEMA constellation, SMEX/MIDEX Explorers, Lunar Gateway HERMES suite), DoD/DARPA quantum sensing programs, NOAA and USGS geomagnetic monitoring networks, commercial small satellite operators, and the geophysical exploration industry.

Duration: 13