



## Technology Advancement and Applied Research Leveraging the ISS National Lab

### ISS National Lab Research Announcement (NLRA) 2025-5

#### Instructions to Offerors

#### Center for Advancement of Science in Space

1005 Viera Blvd., Suite 101, Rockledge, FL 32955

#### Cycle 1:

Issuance Date: January 7, 2025

End Date of Step 1: Concept Summary submission period: March 3, 2025

Due Date for Step 2: Full Proposal submission: May 19, 2025\*

(\* by invitation only)

*Note: For any updates regarding submission deadlines, please visit <https://www.issnationallab.org/research-and-science/research-opportunities-and-results/current-and-upcoming-opportunities/>. For general questions related to this research announcement, please email [info@issnationallab.org](mailto:info@issnationallab.org).*

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## I. SUMMARY

Since 2000, the International Space Station (ISS) has enabled humans to live and work in space, supporting research and technology development that is not possible anywhere on Earth. Since its designation in 2005, the ISS National Laboratory has expanded access to this orbiting laboratory to research communities from U.S. academic institutions, government agencies, and the private sector. ISS National Lab-sponsored research seeks scientific discovery and technology advancement on the ISS that directly benefits humanity by increasing fundamental knowledge, scientific application, education outreach, workforce development, and demand creation for sustainable, scalable innovation and production in low Earth orbit (LEO).

As managers of this national laboratory in partnership with NASA, the Center for the Advancement of Science in Space (CASIS) awards access to funding and resources on the ISS via competitive grant solicitations to support non-exploration science and technology development as well as science, technology, engineering, and mathematics (STEM) education initiatives from U.S.-based institutions.

As a U.S. taxpayer-funded organization, CASIS only contracts with U.S. Persons<sup>1</sup>. Submitted proposals must comply with all U.S. Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR). This document will assist offerors in the development of concepts and proposals to leverage the ISS National Lab for applied research and technology development and demonstration.

## II. DESCRIPTION OF RESEARCH

This ISS National Lab Research Announcement (NLRA) solicits flight proposals that seek to advance technology for use-inspired research and development (R&D) in space across a broad range of existing or emerging technology areas. Flight projects must justify access to space for development, demonstration, or technology maturation that improves knowledge and enables improved performance, novel solutions, or the creation of new products and business opportunities. The objective is to leverage the unique ISS environment to develop, test, and mature products and processes that have a demonstrated potential to produce near-term, positive economic impact on Earth.

The ISS National Lab enables scientific research and technology demonstrations within a persistent microgravity environment in orbit. When gravity is no longer a dominant physical force, a myriad of effects on physical and biological systems and chemical and biological processes are elucidated. In some cases, these unique effects may enable the discovery of new phenomena that can be leveraged to improve existing or create new technologies. Technology demonstrations may be conducted using facilities within the crewed habitat of the ISS to take advantage of microgravity or the radiation environment. Technology demonstrations may also be conducted using external facilities attached to the ISS, including platforms for materials exposure testing, to take advantage of the harsh conditions of space. Offerors' proposals may also seek to develop new ISS National Lab facilities for technology development applications.

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<sup>1</sup> U.S. Person - a natural person who is a lawful permanent resident as defined in 8 U.S.C. 1101(a)(20) or who is a protected individual as defined by 8 U.S.C. 1324b(a)(3). It also means any corporation, business association, partnership, society, trust, or any other entity, organization or group that is incorporated to do business in the U.S. It also includes any governmental (federal, state, or local) entity.

## Background

The ISS National Lab offers the opportunity to conduct months-long experiments in persistent microgravity, where gravity-driven forces are negligible. Results from space station research have been shown to uncover new practical insights and tangible benefits to multiple, cross-cutting science and engineering fields and areas of industrial application.

The ISS National Lab supports a variety of facilities and hardware to exploit the extreme LEO environment for development and testing of new materials, devices, and subsystems. Such testing provides a mechanism for rapid failure mode analysis, thereby accelerating the qualification and commercial readiness of these new devices and products.

## ISS National Lab Implementation Partners, Facilities, and Capabilities

Offerors should be familiar with the capabilities of flight hardware for in-orbit studies that are relevant to their proposed scientific and technical objectives. Multiple facilities and services for research and technology development are available on the ISS. Facilities and services may be provided by NASA or by ISS National Lab [Implementation Partners](#). Existing flight hardware can be found using the ISS National Lab [ISS Research Facilities Directory](#) or referenced on NASA's [Space Station Research Explorer website](#). Additional information is also provided in NASA's [ISS Researcher's Guide Series](#).

The ISS National Lab partners with a variety of Implementation Partners—organizations that provide research, engineering, and technical services, and in some cases, operate and maintain commercial payload facilities on the ISS—to support and facilitate flight projects. For details about these providers and their specific hardware/services, visit our [Implementation Partner database](#). Where applicable, the ISS National Lab encourages contact between offerors and Implementation Partners prior to the submission of a Step 1: Concept Summary in order to obtain accurate and current information required for budget and schedule estimates. If requested, the ISS National Lab can facilitate contacts between Implementation Partners and offerors. Proposals to utilize commercial facilities owned and operated solely by international partners on the ISS will not be considered for this research announcement.

## Research and Technology Development Objectives or Priorities

ISS National Lab applied research and technology development is intended to accelerate and/or validate technological advancements and rapidly advance the development of new Earth or space-based products to bring value to our nation and drive a robust, sustainable, and scalable LEO economy. These objectives will be achieved by successfully executing flight experiments utilizing microgravity, the harsh environment of space, or the vantage point of the ISS.

This NLRA is open to a broad range of technology areas, including, but not limited to, chemical and material synthesis in space, bonding and joining, translational medicine, advanced materials testing, In-space Servicing, Assembly, and Manufacturing (ISAM) technologies, communications technologies, remote sensing technologies, and the application of ISS remote sensing data to improve geospatial analytics with commercial use as an intent.

Any proposed research or technology demonstration with applications focused solely on the health and performance of crew during spaceflight (including wearable sensors) is considered not responsive to this solicitation and will be declined without review.

Emphasis will be placed on proposals for testing and space-qualification of hardware prototypes and on advancing process improvements. Suggested concepts under these areas, and other areas of interest, are described below:

- **Hardware prototype testing:** Innovations addressing hardware product development gaps and emerging technology proliferation in the following areas: artificial intelligence-enabled technologies, electronics, nanotechnologies, advanced robotics and automation, re-use and recycling of in-orbit capabilities, advanced manufacturing, in-orbit refueling and fluid transfer, in-space assembly, RPODU (rendezvous, proximity operations, docking, and undocking), sensors and measurement technologies, communications, space-based quantum communication, space domain awareness, and remote sensing. Proposals of interest in this area will typically feature ground-tested, ready-to-fly hardware prototypes that require space qualification to capture new market opportunities. ISAM R&D efforts are of interest.
  - Sensors are either hosted on external platforms or mounted inside the ISS where targets on Earth or in space may be viewed through observation windows. Past and current remote sensing instruments include commercial off-the-shelf (COTS) high-resolution cameras and prototypes of a variety of sensor technologies including hyperspectral, multispectral, and light detection and ranging (lidar). Sensor data have been used to demonstrate several commercial and practical applications, such as the monitoring and mitigation of environmental pollutants (methane and carbon dioxide) from chemical processing facilities; measurement of atmospheric carbon dioxide; monitoring of cloud and aerosol characteristics to aid understanding of climate and weather patterns; monitoring and optimization of agricultural practices; analysis of ocean and forest ecosystems; and assistance with disaster relief. Proposals for remote sensing should indicate novel features of new sensors to be tested and describe how the data acquired from new or existing sensors will be used to generate products of commercial value. For more information on the remote sensing features of the ISS, see NASA's [A Researcher's Guide to Earth Observations](#).
- **Process improvements:** Use of the ISS as a test bed for advancing development of facilities for high-throughput research, testing, and screening (e.g., multiuser/autonomous platforms, analytical capabilities); use of space-based data to facilitate modeling or operations of industrial systems; and demonstrating new methodologies for spaceflight research and development, including the use of robotics/automation and artificial intelligence.
- **Advanced materials:** Current advanced materials research that addresses the development of next-generation production methods, the synthesis and testing of novel materials, and the exploitation of mechanisms involved in material transformations for production of new materials with unique properties. Potential topic areas of interest under this NLRA include but are not limited to material bonding and joining (e.g., soldering, brazing, or welding); biomaterials; soft materials (e.g., emulsions, foams, or liquid crystals); metamaterials; and hard, functional materials with unique microstructure (e.g., metal alloys, semiconductors, ceramics, glassy alloys, metallic foams, or composites).
- **Translational medicine:** Potential topics for consideration in translational medicine include validation of accelerated disease models using cell- or organism-based models, analyzing macromolecular structures for structure-based drug design, and demonstration of novel drug delivery and diagnostic devices.
- **Energy and environmental sustainability:** Potential topics for energy and environmental sustainability include testing photovoltaic cells or next-generation batteries outside the ISS,

environmental measurements or monitoring via Earth remote sensing, improving recycling processes and technologies, synthesizing or testing biodegradable and green materials, synthesizing or improving materials or processes for greenhouse gas separation or removal, and improving sustainable agricultural processes.

Proposals must include a statement defining how the scientific or technical aims will benefit from execution in space and why the proposed investigation can only be performed in space. Offerors must explore the literature for prior research on the ISS, space shuttle, MIR, and Skylab that may help improve their experimental design and deliver novel, high-impact results.

Responsive proposals must describe investigation success criteria, milestones for successful space-based experiments, and the projected timeline to mature the technology or advance a product toward a viable market offering. Technologies proposed for testing should generally be well beyond basic concept validation and instead focus on seeking technological maturity through development and/or demonstration in the space environment. Desirable flight experiments will have an initial TRL of 4 or higher and target increasing the TRL (see Appendix A for a description of TRL).

The ISS National Lab strongly recommends obtaining and submitting letters of support from commercial partners and/or potential users of new technologies or products to demonstrate commercialization feasibility and commercial interest.

Projects that may require multiple flights to the ISS will be accepted for submission. However, offerors seeking multiple flight opportunities must provide an estimate of the projected number of flights required and include sufficient detail in their concept to justify the expected R&D outcome of each flight or phase of the project leading to a complete solution.

### III. SUBMISSION AND SELECTION PROCESS

This research announcement will follow a two-step proposal submission process. Before being invited to submit a full proposal, all interested investigators must complete and submit a Step 1: Concept Summary for review. The purpose of the Step 1: Concept Summary is to provide information for an initial evaluation of the offeror's concept. **Please note that a maximum of two submissions per PI will be accepted.**

#### Step 1: Concept Summary Submission

- Concept summaries must be submitted electronically using the concept summary portal (a link to the portal is provided on the research announcement webpage). Offerors must complete all sections of the online concept summary form and attach requested documents.
- No concepts will be accepted after the Step 1: Concept Summary close date for a given cycle. Offerors may revise and resubmit the concept within the same cycle if received by the Step 1: Concept Summary close date.
- Concepts will be evaluated based on scientific and technical merit, business and economic merit, operational feasibility, and compliance with the research announcement.
- Concepts approved based on Step 1: Concept Summary evaluation will proceed to Step 2: Full Proposal by invitation only.
- Concepts not invited to submit a Step 2: Full Proposal will receive feedback.
- Proposals that are a resubmission from a previous research announcement must be identified as

a resubmission in the Step 1: Concept Summary and must address the feedback provided in the prior submission(s).

Step 2: Full Proposal Submission

- The process for developing Step 2: Full Proposals is outlined below and in greater detail within the Proposal Instructions available from the research announcement webpage.
- Full proposals will be evaluated in accordance with proposal evaluation documents provided as attachments.
- At the end of Step 2: Full Proposals, the proposals recommended for selection will be presented for final determination to the CASIS chief executive officer, who is the selecting official.

Further details and requirements on Step 1: Concept Summary and Step 2: Full Proposal submission, including instructions and templates, can be found in the Proposal Instructions document available on the research announcement webpage.

Award Information

CASIS may award a funded or unfunded agreement for a selected proposal. All awarded proposals will receive ISS National Lab sponsorship of ISS resource utilization, payload launch to the ISS, in-orbit ISS crew time, data return, and payload return, if required. Grant funding is not available for efforts that are solely ground-based efforts.

Funds Availability: The obligation of CASIS to make an award is contingent upon the availability of funds from which payment can be made. The number of grants awarded and the amount of grant funding for each award will depend on the number of meritorious applications received and favorably reviewed.

Funding for this Research Announcement: The total funding allocated for this research announcement is approximately \$650,000 with an expectation to make two to three awards. Funding is allocated to support Implementation Partner mission integration and operations costs only. No funding to cover the offeror's internal project costs will be available through this research announcement. Proposals that include matching funds from the PI or a PI funding partner will be reviewed more favorably than those that request full funding from CASIS. It is anticipated that CASIS will execute task orders and/or subcontracts directly with the Implementation Partner on behalf of the awarded principal investigator. No funding will be granted to cover the offeror's internal project costs. Requesting funding for cost elements not covered by this NLRA is grounds for disqualification. CASIS reserves the right to refuse award of grant if no meritorious offers are received.

Indirect Cost Rates: CASIS will allow any previously approved federal indirect cost rate that has been negotiated between the grantee and a U.S. government agency. If no such rate has been negotiated with a U.S. government agency, CASIS shall apply a *de minimis* indirect rate of ten percent (10%) for those seeking indirect costs in a grant award. Also, CASIS will allow a grantee to voluntarily waive indirect costs or charge less than the full *de minimis* indirect cost rate should they choose to do so.

All proposal submissions seeking funding from CASIS are subject to this policy. All grantees are required to provide satisfactory written evidence in or accompanying their proposal submission of a previously approved federal indirect rate. Such evidence shall demonstrate the existence of an approved federally recognized indirect cost rate negotiated between the grantee and a U.S. government agency. In the absence of this evidence, CASIS will apply the *de minimis* indirect cost rate stated above.

**Notice of Award:** For selected proposals, a CASIS official will contact the principal investigator named in the proposal. Offerors have the right to be informed of the major factor(s) that led to the acceptance or rejection of their proposal.

**Period of Performance:** It is anticipated that the period of performance will be no longer than three (3) years from the date of award.

CASIS assumes no liability (including bid and proposal costs) for cancelling this NLRA or for any entity's failure to receive notice of cancellation.

#### IV. PROPOSAL PREPARATION AND CONTENT

Before submission of a Step 1: Concept Summary, offerors are encouraged to identify and begin working with an Implementation Partner—organizations that work with the ISS National Lab to provide services related to payload development. There are two ways to identify an Implementation Partner:

- Visit <https://www.issnationallab.org/implementation-partners/> to browse, select, and contact an Implementation Partner.
- Email the ISS National Lab Payload Operations team at [Ops@ISSNationalLab.org](mailto:Ops@ISSNationalLab.org) for guidance.

Offerors are strongly encouraged to talk with an Implementation Partner about any aspects of their experiment that they deem out of scope and/or not within their standard statement of work.

**Before finalizing proposals, offerors are strongly encouraged to consult with the ISS National Lab Payload Operations team** for feedback regarding feasibility and compliance with flight requirements and capabilities. Please reference NLRA 2025-5 in the subject line and note that questions and answers will be posted on the ISS National Lab website.

##### Offeror Qualifications

Proposals must be submitted by a Principal Investigator or an authorized official of the proposing organization. In addition, any business entity or institution capable of executing the proposed research may submit a proposal. However, CASIS will **ONLY** consider proposals from U.S. Persons (business and individual) as defined above. Regardless of who submits the proposal, all individuals listed as either the Principal Investigator or Co-Principal Investigator must be U.S. persons. In addition, the Principal Investigator's CV must demonstrate relevant expertise necessary to lead the investigation.

#### V. PROPOSAL EVALUATION AND SELECTION

Proposals will be evaluated under the ISS National Lab's review and selection criteria for its technology development and demonstration line of business. The proposal evaluation factors are scientific and technical merit, business and economic merit, funding and resource commitment, implementation and commercialization feasibility, and operations and ISS utilization. Each factor is numerically weighted and scored. Project cost is not scored but is a factor in the final selection. All submitted proposals must express a commercial purpose or intent. Proposals that are determined to better fit other CASIS research announcements will be redirected to those areas.

Please note that CASIS will not accept or consider proposals submitted by NASA or NASA civil servants.

The proposal review is guided by an overall assessment of expected project impact upon successful

completion of proposed objectives. CASIS has overall responsibility for conducting and facilitating reviews, presenting information for final determination, and ensuring compliance with CASIS-defined processes. For further information on the proposal evaluation and selection, including the relative importance of each evaluation factor, refer to the ISS National Lab Proposal Evaluator Instructions in the information package linked to the research announcement webpage.

## **VI. CONTRACTING**

Offerors will be required to enter into either a User Agreement (unfunded or Implementation Partner costs only) or Grant Agreement (funding granted to proposing organization to cover other costs, not only Implementation Partners) with CASIS, at the sole discretion of CASIS. CASIS is required contractually by the NASA Cooperative Agreement and by United States federal law, rules, and regulations to flow down various contractual terms and conditions to any award recipient. These terms and conditions, which are included in both CASIS Grant Agreements and CASIS User Agreements (regulated in part by the Federal Acquisition Regulations (FAR), 48 C.F.R., as well as by NASA-specific rules, regulations, and policies), are non-negotiable. If invited to submit a full proposal, offerors will be required to agree and accept these non-negotiable flow-down terms and conditions by completing and returning a cover page and a supplemental sheet during the proposal submission stage. Offerors that do not accept or fail to comply with these terms and conditions will not be considered for award, and may be rejected, at CASIS' sole discretion, for non-compliance with any other terms and conditions. If the Proposing Organization will be unable to agree to these terms and conditions and requires any changes, they must attach an addendum to their proposal entitled "Requested Revisions to Terms and Conditions" identifying the proposed change(s) and including clear and detailed reasoning for each requested change. The addendum must follow the format guidelines of the proposal and be submitted as a separate document attached as an addendum to the proposal submission (excluded from page count). There is a checkbox on the proposal cover page template and the online proposal submission form to indicate this request.

Failure to reach an agreement on requested revisions prior to the CASIS project selection date (typically 60 days after proposal submission) may result in the rejection of this proposal with CASIS retaining the sole right to select the next favorable proposal. Additionally, if the offeror's organization intends to work with any collaborators, the offeror must contract with those collaborators and include the CASIS flow-down clauses. These terms and conditions from the NASA Cooperative Agreement will apply to all Grant Agreements and User Agreements. The User Agreement and Grant Agreement templates are provided as part of the Step 2: Full Proposal zipped documents made available to offerors via the ISS National Lab web page for this research announcement.

## Appendix A: Technology Readiness Level Descriptions

Actual system “flight proven” through successful mission operations	<b>TRL 9</b>	<p><b>COMMERCIALIZATION</b></p> <ul style="list-style-type: none"> <li>▪ Product manufacturing</li> <li>▪ Product sales               <ul style="list-style-type: none"> <li>• Roll out for real-world application/deployment</li> </ul> </li> </ul> <hr/> <p><b>TRIALS/SCALE-UP</b></p> <ul style="list-style-type: none"> <li>▪ Regulatory approval/certification</li> <li>▪ Business analysis</li> <li>▪ Market testing               <ul style="list-style-type: none"> <li>• Testing on subjects/commercial target</li> </ul> </li> <li>▪ Manufacturing development/scale-up</li> </ul> <hr/> <p><b>DESIGN/PRODUCT REFINEMENT</b></p> <ul style="list-style-type: none"> <li>▪ New Applications, Product Improvements, and Line Extensions (NAPILEX; existing products)</li> <li>▪ Product development/testing in advanced models</li> <li>▪ Production development/optimization</li> <li>▪ Product design/market research</li> <li>▪ Business/market definition</li> </ul> <hr/> <p><b>DISCOVERY/BASIC RESEARCH</b></p> <ul style="list-style-type: none"> <li>▪ Testing in validated early models (optimization to candidate)</li> <li>▪ Science development (model development/market understanding)</li> </ul> <hr style="border-top: 1px dashed black;"/> <ul style="list-style-type: none"> <li>▪ Fundamental research               <ul style="list-style-type: none"> <li>• Research leading to understanding of natural phenomena</li> <li>• Screening and testing in basic models to identify the target</li> </ul> </li> </ul>
Actual system completed and “flight qualified” through test and demonstration (ground or space)	<b>TRL 8</b>	
System prototype demonstration in a space environment	<b>TRL 7</b>	
System/subsystem model or prototype demonstration in a relevant environment (ground or space)	<b>TRL 6</b>	
Component and/or breadboard validation in a relevant environment	<b>TRL 5</b>	
Component and/or breadboard validation in a laboratory environment	<b>TRL 4</b>	
Analytical and experimental critical function and/or characteristic proof-of-concept	<b>TRL 3</b>	
Technology concept and/or application formulated	<b>TRL 2</b>	
Basic principles observed and reported	<b>TRL 1</b>	