



**Leveraging the ISS National Lab to Enable Digital Engagement for K-12 and
Higher Education**

ISS National Lab Research Announcement (NLRA) 2022-7

Instructions to Offerors

Center for Advancement of Science in Space, Inc.

6905 N. Wickham Road, Suite 500, Melbourne, FL 32940

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Due Date for Step 2: Full Proposal Submission: July 19, 2022

*Note: For any updates regarding submission deadlines, please visit
<http://www.issnationallab.org/research-on-the-iss/solicitations/nlra2022-7>*

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I. SUMMARY

The International Space Station (ISS) is a one-of-a-kind laboratory that enables research and technology development not possible on Earth. As a public service enterprise, the ISS National Lab allows researchers to leverage this multiuser facility to improve quality of life on Earth, mature space-based business models, advance science literacy in the future workforce, and expand a sustainable and scalable market in low Earth orbit (LEO).

Through this orbiting national laboratory, research resources on the ISS are available to support science, technology, engineering, and mathematics (STEM) education initiatives from U.S. government agencies, academic institutions, and the private sector. The Center for the Advancement of Science in Space, Inc. (CASIS) manages the ISS National Lab, under a Cooperative Agreement with NASA, facilitating access to its permanent microgravity research environment, a powerful vantage point in LEO, and the extreme and varied conditions of space.

As a U.S. taxpayer-funded organization, CASIS only contracts with U.S. Persons, as defined by the Code of Federal Regulations at [22 CFR §120.15](#). Submitted proposals must be compliant with all U.S. Export Administration Regulations (EAR) and International Traffic in Arms Regulations (ITAR). This document will assist offerors in the development of quality proposals to leverage the ISS to enable digital engagement with students in grades K-12 and higher education.

II. DESCRIPTION OF RESEARCH

The ISS has enabled a revolution in educational access to space. The same assets that make the ISS a powerful laboratory for scientists also make it an invaluable platform for student research investigations and educational outreach. Accessible through frequent launches, real-time connectivity to data streams from in-orbit experiments, and crew member activities, the ISS offers access to a unique perspective of Earth, persistent microgravity to explore its effects on living and nonliving things, and the environmental extremes of LEO. Moreover, a global cadre of scientists, engineers, educators, and entrepreneurs are committed to pushing the envelope to convert innovative research and development (R&D) ideas realized in space into realities that improve life on Earth—including those that support STEM education.

Currently, the ISS National Lab partners with more than 25 educational programs through Space Station Explorers. Space Station Explorers is a community of educators, learners, and organizations that leverage the unique platform of the ISS National Lab to provide valuable STEM educational experiences. The ISS National Lab collaborates with these and other partner organizations on innovative learning programs and resources for K-12 students, educators, higher education institutions, and the public, including opportunities to design student-led experiments that launch to space, function as ground controls for flight experiments, or utilize data generated from flight experiments. The ISS National Lab seeks to expand on this programming, extend the learning community to include opportunities in higher education and workforce development, and improve digitization and/or online access to space-based programming for everyone.

Program Objectives and Priorities

The purpose of this ISS National Lab Research Announcement (NLRA) is to solicit applications directed toward utilization of the ISS National Lab from principal investigators and educators associated with any U.S.-based institution (academic, government, commercial, not-for-profit) in the field of STEM

education. Applications must seek to expand education programs, projects, or public-private partnerships that leverage the ISS or space-based research to engage K-12 students; enhance higher education, promote diversity, inclusion, and outreach into underrepresented demographics; or seek to expand online educational engagement via existing or new programming.

To be competitive, responsive proposals must explicitly state how programming will target and reach underrepresented demographics and must address at least one of the following goals:

- Expand the content and impact of Space Station Explorers by developing digital engagement platforms to increase student and educator participation in existing or new partner programs, including online education products.
- Create higher education initiatives that deliver opportunities for students enrolled in U.S. colleges and universities to increase diversity, equality, and inclusion in space-based research, technology development, and the commercialization of LEO.
- Digitize space-based K-12 or higher education programming.

Background

The ISS enables students to think differently and explore thought-provoking questions in novel ways that not only sharpen their STEM tools but also shape and inform their ability to think critically. For example, how do plants grow on an orbiting platform free of the physical forces that shaped their evolution? What aspects of a dynamic world and changing climate can be seen from the ISS? How do gases and liquids behave differently in microgravity, and how do these changes in fundamental physical forces affect how machines and living organism function? How do fluctuations in radiation and temperature affect the function of solar panels, energy transfer, and communication systems?

For the past 20 years, students have investigated these and other questions—designing, building, launching, and operating experiments on the ISS. They program and control robots, select targets for Earth photography and analyze space imagery, operate experiments in chemistry and physics, plant seeds exposed to the space environment, communicate via radio from ground to space and back, and even conduct cutting-edge genetic research. For more information on actual student experiments (excluding activities in which students passively learn about the ISS or participate in lessons that present results of experiments done by others), see the ISS National Lab report “[20 Years of Student Experiments Using the ISS](#).” For information on all ISS National Lab educational programming, visit www.issnationallab.org/stem.

Typically, in-orbit activities focus on the following benefits of performing research and technology development in space.

Microgravity: The ISS National Lab offers the opportunity to conduct long-duration research and technology development investigations in persistent microgravity, where gravity-driven physical forces are nearly absent. Results of research inspired by microgravity-driven phenomena have been shown to provide new practical insights and tangible benefits to multiple, cross-cutting life science, physical science, and engineering fields and areas of industrial application.

LEO Extreme Conditions: In addition to microgravity, the extreme conditions of the space environment are demonstrably hostile to many materials. In LEO, these conditions include:

- Atomic oxygen, which is highly reactive with plastics and some metals, causing severe erosion.

- Ultraviolet radiation, which deteriorates and darkens many plastics and coatings.
- Vacuum conditions, which alter the physical properties of many materials.
- Impact from meteoroids and orbiting man-made debris, which can damage materials exposed in space.
- Continuous cycling between extreme high and low temperatures, which can result in accelerated thermal degradation of materials.

Vantage Point: The ISS offers a vantage point in LEO with unique opportunities for technology development and demonstration in remote sensing:

- The ISS orbits at an average altitude of 400 km (250 miles), offering a wide range of Earth viewing geometries and spatial resolutions for sensors mounted on the externally attached platforms. Sensors may also be mounted inside the ISS with access to observation windows offering Earth-facing or other orientations.
- The orbital inclination of 51.6 degrees covers approximately 90% of Earth's populated area every 90 minutes and allows revisits of the same targets every 3-5 days.
- The ISS offers variable illumination conditions for Earth viewing and similar solar illumination conditions approximately every 63 days.
- The ISS provides power, communications, and data handling infrastructure to hosted payloads.
- Payloads may be returned for post-mission analysis; however, this is a heavily constrained resource, so payload return requests should include a strong rationale for this experiment requirement.

For more information about the benefits of R&D in space, see www.issnationallab.org/research-on-the-iss/areas-of-research.

ISS National Lab Implementation Partners, Facilities, and Capabilities

If proposing a flight project, offerors should be familiar with the capabilities of flight hardware for in-orbit studies that are relevant to their proposed STEM engagement and outreach objectives. 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 [Implementation Partner database](#). Where applicable, the ISS National Lab encourages contact between offerors and Implementation Partners prior to concept or proposal submission in order to obtain information that may be useful for budget and schedule estimates. If requested, the ISS National Lab can facilitate contacts between Implementation Partners and offerors. Proposals to utilize facilities owned and operated by international partners will not be considered for this research announcement.

Proposals must include a statement defining how the scientific aims will benefit from being executed in space and why the proposed investigation can only be performed in space.

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 first complete and submit for review a Step 1 Concept Summary. The purpose of Step 1 is an initial evaluation of the offeror's concept for operational

feasibility, scientific or technological scope, compliance, and alignment with the research announcement scope.

Step 1: Concept Summary Submission

- Concept summaries must use the template provided on the research announcement webpage.
- Concept summaries may be submitted and will be received, evaluated, and potentially approved continuously during the research announcement open period.
- A CASIS internal review team with representatives from science, business, operations, and compliance will evaluate each concept summary. Approved concept summaries will be invited to submit a full proposal.
- Concepts approved based on Step 1 evaluation will proceed to Step 2 by invitation only.
- Concepts not invited to submit a full proposal will receive feedback.
- Any proposal that is a resubmission from a previous research announcement must be identified as a resubmission in the Step 1 Concept Summary.

Step 2: Full Proposal Submission

- The process for developing full proposals is outlined below and set forth in greater detail within the Proposal Instructions published on the research announcement webpage.
- Any proposal that is a resubmission from a previous research announcement must address the feedback provided in your prior submission(s).
- Full proposals will be evaluated in accordance with proposal evaluation documents provided as attachments.
- At the end of Step 2, 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 concept summary and 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 flight 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 available for 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.

Funding for this Research Announcement: The total set aside funding for this research announcement is approximately \$400,000, with an expectation to make four to eight awards, for either ground-based programming or, potentially, programs that require flight resource allocation. CASIS reserves the right to refuse award of grant if no meritorious offers are received. Matching funds are not required, but proposals that contribute resources (money or in-kind) will be favorably reviewed.

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 10 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 officer 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 date of award.

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

IV. PROPOSAL PREPARATION AND CONTENT

The Step 1: Concept Summary instructions and the Step 2: Full Proposal submission guidelines can be found in the Proposal Instructions available on the ISS National Lab research announcement webpage.

Offeror Qualifications

Proposals must be submitted by a principal investigator or an authorized official of the proposing organization. Any individual 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 or individual), as defined by the Code of Federal Regulations (22 CFR §120.15).

V. PROPOSAL EVALUATION AND SELECTION

Proposals will be evaluated under the ISS National Lab's review and selection criteria for its STEM Engagement and Educational Outreach line of business. The proposal evaluation factors are STEM engagement and educational outreach and, if substantial flight operations are involved, implementation feasibility, and operations and ISS utilization. Project cost is not scored but is a factor in the final selection, and a clearly defined proposed budget for the project is helpful in the proposal review process. 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 and/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 proposal evaluation and selection, including the relative importance of each evaluation factor, refer to the ISS National Lab Proposal Evaluator Instructions in the

information packet linked to the research announcement webpage.

VI. CONTRACTING

To be considered, proposals must be received from U.S. persons and U.S. entities, as defined in the Code of Federal Regulations ([CFR](#)), and must be compliant with ISS National Lab export control programs and policies.

Award recipients will be required to enter into a User Agreement or Grant Agreement with the Center for the Advancement of Science in Space, Inc. (CASIS). As a nonprofit corporation doing business with the federal government via a Cooperative Agreement with NASA, CASIS is contractually bound, and bound by federal procurement law and regulations to flow down to award recipients' various contractual obligations that are in the CASIS Cooperative Agreement. The obligations are regulated in part by the Federal Acquisition Regulations (FAR), 48 C.F.R., as well as NASA-specific regulations. Mandatory clauses are non-negotiable and cannot be removed from CASIS user agreements or grant agreements. If an award recipient does not desire to, or cannot, comply with mandatory flow down clauses, the awardee should not accept the award opportunity. These terms and conditions from the CASIS Cooperative Agreement will apply to all Grant Agreements (funded) and User Agreements (unfunded). The documents listing the mandatory flow down provisions contained in a User Agreement and Grant Agreement are provided as part of the Step 1 and Step 2 zipped documents made available to offerors via the CASIS web page for this research announcement. For further information on contracting, see the document, "Submission Instructions and Evaluation Overview for Proposals in STEM Engagement and Educational Outreach."