National Aeronautics and Space Administration

PROPOSAL GUIDELINES

Student Payload Opportunity with Citizen Science

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National Aeronautics and Space Administration
Lyndon B. Johnson Space Center
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1. Overview

NASA has supported humans living on the International Space Station since November 2000, hosting more than 2,600 experiments from 3,900 researchers. The station is the sole space-based proving ground for reaching the Moon in 2024 through NASA's Artemis lunar program. To celebrate 20 years of continuous human presence on the space station, STEM on Station will fund five payloads to the space station, including return, through the Student Payload Opportunity with Citizen Science (SPOCS). This opportunity is co-designed and executed through Nanoracks and its sister company, DreamUp, who will provide payload integration support and training.

Teams of college students will propose research related to bacteria resistance or sustainability research, topics which are critical to the space station and future deep space exploration. All experiments must fit into a 1.5U NanoLab (10 x 10 x 15 cm) enclosure. Payloads will operate via USB powered connection to Nanoracks Nanode platform and remain on the space station for approximately 30 days without any interaction or observation from the station crew. Data transfer occurs through the USB connection. Selected student teams will have access to NASA mentors to help build and design experiments.

Selected teams will involve K-12 students (or a subset) as citizen scientists as part of their experiment. Citizen science allows students to meaningfully contribute to real-world research. Examples include providing baseline data, sorting data or comparing ground data to experimental data from the space station. Teams are also expected to conduct educational outreach to engage communities in their work.

Up to 10 teams will be selected as finalists. Finalists will present proposals and answer questions from subject matter experts during a webinar. From there, five teams will be selected to build experiments to launch to the space station.

STEM on Station will provide travel and lodging to the launch of the experiment for the faculty advisor and up to eight students from each team which meets the experiment handover deadline. Only U.S. citizens who are at least 18 years old may attend the experiment launch.

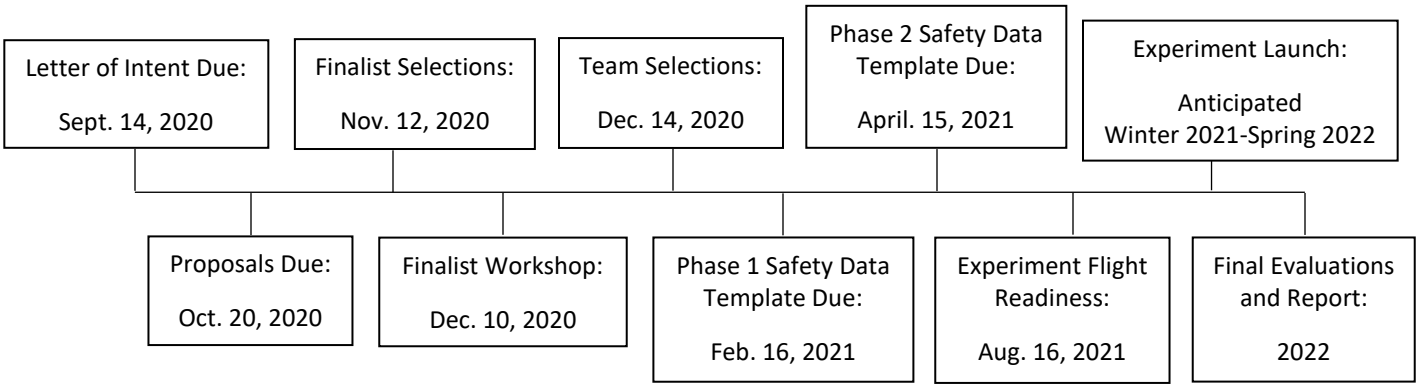
Learn more by attending the SPOCS Overview Webinar, Thursday, September 3, 5-6 p.m. EST. Recordings of previous webinars are available on the SPOCS webpage.

- Space Station Research
- Bacteria Resistance
- Sustainability Research

2. Eligibility

- Each prospective team member must be enrolled in an accredited U.S. institution of higher learning (junior college, community college, college or university) at the time the proposal is submitted.
- Teams may include any college students and may include students from multiple institutions.
- Multi-disciplinary teams are strongly encouraged. Teams need to be well-rounded to address design, data analysis, citizen science and educational outreach. Large teams, where team members have defined roles, typically perform best.
- All teams must have a supervising faculty member who is a U.S. citizen or permanent resident.
- Student team members may change throughout the duration of SPOCS, but the supervising faculty member must remain committed for the entire project.
- Team members attending the launch must be U.S. citizens or permanent residents and must be at least 18 years old by the date of travel for the launch.

3. Key Milestones



Teams must submit a final written report within 90 days of return of the experiment to the institution. A virtual final report presentation will be required shortly after written reports are due. The final written report format is similar to that of a standard scientific paper but also includes a section to report on the citizen science and outreach component of SPOCS. We encourage teams to repurpose all or parts of this report in submissions to appropriate scientific journals. Virtual report presentations will be 15 minute symposium presentations made by all teams during a webinar. In addition to the final reports, SPOCS participants must complete a final evaluation survey of SPOCS within 90 days of return of the experiment to the institution.

4. Letter of Intent

Each team must **submit a Letter of Intent by September 14, 2020** indicating the team's intention to submit a written proposal. The Letter of Intent should follow the format below and be written in the body of an email. Send the email directly to jsc-stemonstation@mail.nasa.gov

a. Provide contact information for a team lead. This should be a student team member. Sample: Doe, Jane (DoeJ@institution.edu) Junior / Chemical Engineer
b. Provide contact information for the faculty advisor.
c. Provide the Academic Institution name (military academy, technical college, community college, or university) you represent
d. State: "*We plan to submit a proposal for the Student Payload Opportunity with Citizen Science.*"

All team members participating in SPOCS will need to submit a virtual registration packet, consisting of a survey, a media release form, and a consent/participation form. Completing the registration packet will take about 10 to 15 minutes.

5. Proposal Requirements

Proposals are due **October 20, 2020** at 5 p.m. EDT. The proposal consists of three sections: technical, citizen science and outreach, and administrative.

- Each team must submit one electronic copy of an original proposal
- Each section addressed in these guidelines must be included in the submitted proposal; a sample template is found on the SPOCS webpage
- Sections or components may not be skipped/omitted under any circumstance
- All information on title page must be completed
- Figures and tables must be labeled and referenced within the text
- The proposal must be original and **may not be shared or posted on any social media**

6. Technical Section

The technical section of the proposal should include information on the experiment. This section should include any information that a technical reviewer might find informative or instructive in understanding the aims and goals of the experiment design. Evaluators ranking the proposal for its scientific merit will read only this section, so teams should be sure to address all relevant factors as listed below.

a. Team Name

b. Full Title of Experiment

c. Short Name for Experiment (2-4 Words)

d. Science

This section should include a description scientific/technical question addressed by the experiment, why the environment on the space station is required, assumptions made, how the experiment relates to furthering spaceflight or improving life on Earth and a hypothesis stating expected results. This section will require references to previous research either on the International Space Station or on Earth that suggests the experimental design will be a useful and interesting to study on the space station.

e. Experimental Design

i. Data

Describe the data you intend to measure and how measurements will be taken. Indicate the data rates for uplink and downlink. Describe how data is collected and if needed how samples are preserved.

ii. Environmental Constraints

Describe any environmental constraints needed for the experiment (level of microgravity, temperature, pressure, etc.) and if any specific facilities or equipment on the International Space Station are required for the experiment. If there are no constraints, state “No Environmental Constraints” for this section.

iii. Procedures

Include numbered procedures detailing manual and automated processes for the experiment while loading the experiment, while aboard the station and after the payload is returned if applicable. All processes while on orbit must be automated.

iv. Experiment Time Line

Include information on what starts your science clock, methods used to prolong or suspend your science and what ends your experiment.

f. Experiment Build

i. Materials

List the materials that are part of the experiment and any additional instruments required to gather data. **The materials for your experiment must fit inside the 1.5U NanoLab enclosure (external dimensions: 10 x 10 x 15 cm)**.

ii. Manufacturing/Fabrication

Describe facilities, equipment and techniques the team will use for any necessary manufacturing or fabrication to build the experiment.

iii. Electrical

Describe the electrical supplies (Rasberry Pi Zero, camera, etc.), expected electrical consumption of the experiment (in Ah or Wh) and any special electrical needs for the experiment (Components with high inrush currents—estimate current, auxiliary power before or during launch, etc.) You will be provided with USB power and data connection via the Nanoracks Nanode platform

iv. Estimated mass of experiment—do not include mass of container (enclosure is provided by Nanoracks)

v. Include a screen capture of the block diagram of the experiment – the screen capture submitted should be clear and easy to read.

g. Safety Concerns

Does your experiment include or create any of the following? If so, provide details:

i. Liquids, gases, or other hazardous materials (How do you plan to contain it?)

ii. Wireless devices (Wi-Fi, Bluetooth, infrared, data transmitters, etc. Describe device and frequency used) *data transmissions must be contained within the NanoLab enclosure with the exception of the provided hardwired connection

iii. High voltages (indicate voltage, its use and any expected protection devices; any step up from the provided 5V USB power should note both voltage and amperage)

iv. Electric or magnetic fields that can cause disruptions

v. Lasers (which class? is the path securely contained?)

vi. Moving parts (do they cause noise, vibrations or shaking?)

vii. Flammable, explosive, radioactive, corrosive, magnetic or organic products

viii. Hot (above 50°C) parts—include electronics that may heat up

Is the experiment or any parts of the experiment (explain in detail):

i. Sensitive to light

ii. Sensitive to vibrations

iii. Sensitive to temperature

iv. Pressurized (what pressure level?)

v. Any other potential safety concerns not previously addressed

h. Technical References

Referenced works should be cited in text and in the Technical References section. Standard APA format should be used. Make sure that references are relevant. The number of references included should indicate a thorough review of literature to provide understanding of the experiment.

7. Citizen Science and Outreach Section

The citizen science and outreach section of the proposal should detail plans to engage K-12 students as citizen scientists for the experiment and share information with the public about the experiment, space station science and SPOCS. Evaluators for the citizen science and outreach section will read only this section and have backgrounds in education and communications; teams should address all relevant factors listed below.

a. Citizen Science Plan

Selected teams are required to involve K-12 students (or a subset) as citizen scientists in a substantial part of their experiment. Examples include providing baseline data, sorting data or comparing ground data to experimental data from the space station. Detail what grade level or levels will be targeted and how they will be involved in the research. The expectation is for the K-12 students to have significant involvement in the experiment. Outreach to schools is not considered Citizen Science.

The plan should be organized to achieve a specific objective. Random activities, even good activities, do not constitute a plan. For maximum point value, the plan should include the following:

- Specific grade levels involved and number of students targeted
- Interactions between college research team and citizen science team (training, data sharing, etc.)
- Detailed plans on scientific activities performed by citizen scientists

b. Outreach Plan

The outreach section of the proposal will include the team's plan for engaging the public throughout the experience. Information contained in this section focuses on what outreach

activities the team intends to do and what audience will be addressed. The outreach plan is in addition to the citizen science requirement and must be original to the team.

The plan should be organized to achieve a specific objective. Random activities, even good activities, do not constitute a plan. For maximum point value, the plan should include the following:

- The team's objectives in each outreach activity
- A description of the outreach audiences (K-12 class or school groups, research symposiums, university outreach to local schools, informal groups such as Boy/Girl Scouts, after school clubs, church groups, etc.)
- Specific activity ideas for audiences
- A plan to reach out to media outlets
- A social media plan

8. Administrative Section

a. Funding and Budget

This section should include an itemized list of expected expenditures associated with the institution's proposed experiment (materials, fabrication, operating, testing, and shipping) as well as expected expenditures for citizen science and outreach activities and products. It is imperative that teams anticipate all costs involved and if needed, actively work to seek funding. Potential sources for funding should be listed and can include institutional grants, state Space Grant funds, corporate sponsors, etc. NASA STEM on Station will provide flight of the research experiment to and from the International Space Station and travel costs to attend the launch of the experiment. STEM on Station will also provide up to $20,000, as a subcontract to the institution, which is used for equipment or supplies to build the experiment and perform outreach.

Selected teams are required to complete and submit a subcontracting worksheet to Oklahoma State University Grants and Contracts office to receive subcontracting funds and must provide documentation and/or receipts for expenditures. A representative from the fiscal office of the faculty advisor's institution must be involved in completing and submitting the subcontracting packet. More information will be given upon selection.

b. Institutional Letter of Endorsement

This letter must be on the endorsing institution's letterhead and must come from the institution president, dean of college, or department chair. It indicates that the team's institution has knowledge of the team's interest in participating in this activity and endorses the team's involvement. Teams will not be considered if their institution does not approve of their involvement. If a team consists of multiple institutions, only the institution providing the faculty supervisor must submit an institutional letter of endorsement.

c. Statement of Supervising Faculty

A statement of support from a supervising faculty member indicates a willingness to supervise and work with the team during all stages of the activity. Teams working without a faculty advisor will not be considered. The faculty advisor must also sign off on the cover of the proposal as evidence that he/she has seen the proposal and approves of the submission. The following statement should appear on institution letterhead and be signed:

As the faculty advisor for an experiment entitled "_____" proposed by a team of students from _____ university/college, I concur with the concepts and methods by which this project will be conducted. I will ensure that all reports and deadlines are completed by the student team members in a timely manner. I understand this project will continue through expected flights in 2022.

d. Proposal Scoring Method

Each proposal will be evaluated using the scoring guide on the following page. The required title page, institutional letters of endorsement, statement of supervising faculty, statement of rights of use and funding and budget statement must be included in the application for the application to be evaluated.

Please send questions or responses to JSC-STEMonStation@mail.nasa.gov. ***To submit your proposal, visit*** https://go.nasa.gov/2BAqYaE.

Student Payload Opportunity with Citizen Science Proposal Scoring Guide

Factor 1: Science (20% Weighted Value)

- ✓ Scientific/technical objective is clear
- ✓ Compelling argument that results of the experiment will either further spaceflight or improve life on Earth
- ✓ Previous research referenced validates value of the experiment being performed on the space station.
- ✓ Describe expected results

Factor 2: Experimental Design (20% Weighted Value)

- ✓ Data to measure and collection method clear
- ✓ Data downlink/uplink rate indicated
- ✓ Clear instructions for conducing experiment and collecting data including instructions for comparison study on Earth if needed

Factor 3: Experimental Build (20% Weighted Value)

- ✓ Materials listed
- ✓ Fabrication and manufacturing facilities, equipment and techniques described
- ✓ Electrical supplies, consumption and needs described with detail
- ✓ Mass of experiment estimated
- ✓ Sketch or block diagram details physical setup of experiment

Factor 4: Citizen Science Aspect (15% Weighted Value)

- ✓ Detailed plan to involve K-12 students as co-experimenters
- ✓ Specifics on grade levels involved, numbers of students involved and interaction between students and research team

Factor 5: Safety (10% Weighted Value)

- ✓ All potential safety concerns addressed
- ✓ Details explaining indicated safety hazards included

Factor 6: Outreach (10% Weighted Value)

- ✓ Diverse list of events and activities planned
- ✓ Includes projected audience type and number of participants
- ✓ Detailed implementation plan

Factor 7: Technical References (5% Weighted Value)

- ✓ Referenced works are cited in text and are relevant to the proposal
- ✓ Technical references are presented in APA format