



Astranis SEDS SAT-2 Competition

Request for Proposal (RFP) and Official Rules

Revision 2.0

1.0 Introduction	3
2.0 Applicable Documents	3
2.1 NanoRacks and Government Publications:	3
3.0 Competition Overview	4
3.1 Judges and Judging	4
3.2 Phases of Competition	5
3.2.1 Notice of Intent and Design Proposal Phase	5
3.2.2 Team Selection Phase and SpaceVision 2019 Presentation	6
3.2.3 Satellite Delivery, Integration, and Launch Phase	6
3.2.4 Satellite Operation Phase	6
4.0 Competition Requirements and Rules	7
4.1 Eligibility and Registration	7
4.2 Competitor Team Responsibilities and Agreements	7
4.2 Launch and Schedule	8
4.3 Design Requirements	8
5.0 Deliverables	9
5.1 Notice of Intent	9
5.2 Team Proposal	10
5.2.1 Proposal Content	10
5.2.2 Proposal Formatting Standards	11
5.3 Additional Documentation	11
6.0 Proposal Judging Guidelines	11
7.0 Timeline	12

1.0 Introduction

The Astranis SEDS SAT-2 competition will call on SEDS chapters across the country to submit a design for a novel 1U CubeSat that will then be launched to the ISS and deployed by NanoRacks, LLC, with Astranis donating the cost of the launch.

This competition will serve not only as an opportunity for SEDS chapters to design, build, and fly orbital hardware, but will introduce the project management procedures commonly used in the space industry.

This competition is seeking proposals for new or novel uses for a 1U CubeSat. For example, while impressive in their own right, there are a large number of active CubeSats performing optical observations and downlinking the data. This competition is challenging teams to think bigger than these already-implemented ideas. Perhaps there is a technology demonstration, science experiment, or new piece of hardware that could be particularly well-suited to a CubeSat.

We are asking teams to seek out these new ideas and use this challenge not just as an opportunity to interact with orbital hardware, but to explore and push the boundaries of what has been done with CubeSats.

2.0 Applicable Documents

2.1 NanoRacks and Government Publications:

[NanoRacks CubeSat Deployer \(NRCSD\) Interface Definition Document \(IDD\)](#)

This document describes the interfaces between any design and the system that NanoRacks uses to deploy each CubeSat. If the standards in this document are not met, NanoRacks *cannot and will not* launch your design. As such, teams must follow any and all specifications detailed by this document.

[NASA-STD-6016: Standard Materials and Processes Requirements for Spacecraft](#)

A NASA document that provides standards for materials and processes in physical spacecraft design. The standards for material usage outlined in this document should be followed. Pay special attention to some of the sections describing how certain materials (tin, zinc, etc.) are especially problematic in the space environment and should be avoided in spacecraft design.

[NASA-STD-8719.14: Process for Limiting Orbital Debris](#)

This NASA document details how design teams should take considerations of orbital debris into their spacecraft designs. Note that some of the specific documentation and formal planning that this guide specifies will be directly utilized by the winning team closer to launch. In the context of writing the proposal for the competition, design teams should certainly address orbital debris, but do not need to follow all of the specific steps outlined in this document.

[NASA CubeSat Launch Initiative: CubeSat 101](#)

This is a guide put out by NASA as a part of its CubeSat Launch Initiative. This competition is not a part of that initiative, but some of the introductory information provided in this document is a very good starting point for design teams.

3.0 Competition Overview

3.1 Judges and Judging

The judges for the Astranis SEDS SAT-2 Competition will consist of a panel of judges from the following:

- (2) Astranis employees
- (2) NanoRacks employees
- (2) SEDS-USA Board of Advisors
- (1) SEDS-USA Board of Directors Member

These judges will review the proposals submitted by teams during the Design Proposal Phase, and will pick a winning team to advance to the further phases.

A more specific breakdown of judging criteria can be found in Section 6, but judges will be reviewing proposals based on:

- Engineering capability to develop design
- Non-technical capability to develop and support the design
- Professionalism of proposal and interactions with judges
- Novelty of the proposed CubeSat mission
- Team mentors identified in the proposal
- Demographic makeup of design team (undergraduate vs graduate, major diversity, underrepresented groups etc.)

3.2 Phases of Competition

The Astranis SEDS SAT-2 Competition will be split into phases, starting with the introduction and opening of the competition at SpaceVision 2018.

- Notice of Intent and Design Proposal Phase
- Team Selection Phase and SpaceVision 2019 Presentation
- Satellite Delivery, Integration, and Launch Phase
- Satellite Operation Phase

Descriptions for each phase are provided below, and a timeline is provided in Section 7 of this document.

3.2.1 Notice of Intent and Design Proposal Phase

This document serves as the official Request for Proposal (RFP) for the competition. This document will be officially released to teams at SpaceVision 2018 in San Diego, on November 2nd at 10:00am PDT. At the conference, teams in attendance will be given the opportunity to interact with Astranis and other judges for the competition. Astranis will host a workshop discussing the details of the competition and will host questions from teams in attendance.

This official release date and time also serves as the start of a period in which design teams can submit questions regarding the competition via the competition page on the SEDS-USA website.

All answers to these questions will be provided in a public, anonymous document that all teams will have access to. If there is a question that is competition-sensitive, or specific to a team's design, they can request that an answer is provided to their team individually, but unless such a request is made, the question and answer will be compiled into a document that will be released to all teams.

In addition to the SpaceVision release, this document will be posted to the SEDS-USA website, so teams are allowed to enter the competition and submit questions during the appropriate period regardless of their attendance of this initial workshop.

SEDS-USA will also be providing instructions on how to submit an official Notice of Intent (NOI). This document will serve as each team's official registration in the competition. Each participating team must submit their NOI at least 30 days before the proposal is due. Once the competition organizers receive a team's NOI, they will assign them a mentor to assist

during the drafting of the proposal. Note that because teams will not receive an official mentor until a NOI is submitted, it is in each team's best interest to submit their NOI well in advance of the proposal deadline.

With the release of this document, each team shall prepare a proposal detailing their design. More specific guidelines for the proposal are located in this document. In preparing their proposals, teams should develop their design to a maturity level appropriate for a Preliminary Design Review (PDR). Astranis or SEDS-USA will not be hosting PDR presentations, but it is required that teams work with their mentors to have a PDR internally before submitting their final proposal.

3.2.2 Team Selection Phase and SpaceVision 2019 Presentation

Once proposals are submitted, they will be judged based on the standards in this document. One winning team will be selected to develop their proposal into hardware and eventually have their design launched into orbit.

This winning team will develop their design further, and will be expected to present their design to the public at SpaceVision 2019 in Tempe, Arizona. By this presentation, it is expected that the team will have made demonstrable progress since the submission of their winning proposal 6 months prior.

3.2.3 Satellite Delivery, Integration, and Launch Phase

Once a winning team is selected, this team will continue to mature their design, and will begin the process of building hardware and performing system integration/testing. Towards the later stages of integration/test, direction coordination with NanoRacks will be required, as they require specific documentation from any CubeSat that they deploy.

Astranis and SEDS-USA will be able to assist the winning team in interacting with NanoRacks, but the team should ultimately be the primary point of contact.

Once integration and testing is complete, the CubeSat will be delivered to NanoRacks to be integrated into their system, and eventually launched. More specific information about the NanoRacks integration process can be found in the documents located in Section 2.

3.2.4 Satellite Operation Phase

There are multiple ground stations operated by universities and by commercial groups to communicate with CubeSats. The winning team should have an appropriate plan in place to operate the satellite once on-orbit. If necessary, Astranis and SEDS-USA can provide assistance in planning the logistics of these operations, although a very successful team will ideally have explored these possibilities for CubeSat operations by CDR.

4.0 Competition Requirements and Rules

In Section 4 of this document, “Competitor Team” refers to a single design team participating in the competition. “Competitors” refers to any individual member of a Competitor Team.

Competitor Teams are responsible for understanding, acknowledging, and complying with the Competition Rules, the requirements outlined in the Interface Definition Document for NanoRacks CubeSat Deployer, and other applicable requirements defined for operating space hardware.

The submission of an official NOI will include an acknowledgment of all competition requirements and rules.

4.1 Eligibility and Registration

Rule 1: The competition is open to teams meeting the following requirements

- The Competitor Team is registered on the SEDS-USA website by the appropriate deadline listed in the Timeline section below.
- The Competitor Team may be made up of any number of students (Undergraduate or Graduate) representing a currently registered SEDS-USA chapter.
- The Competitor Team must be primarily student-led. Teams are required to seek guidance from university faculty members or industry professionals, but this is to be a student-led team.

4.2 Competitor Team Responsibilities and Agreements

Rule 2: Competitor Teams are responsible for compliance with all applicable regulations and laws including obtaining any necessary approvals for foreign student or employee participation.

Rule 3: Prospective Competitor Teams shall submit their notice of intent (NOI) to compete within 30 days of the proposal deadline. The prospective Competitor Team will receive a formal acknowledgement receipt of their submission within 5 business days of submittal.

Rule 4: Compliance with Existing Laws

Competitors will comply with all U.S. laws, regulations and policies, including those relating to export control and nonproliferation, and the laws of relevant state and local jurisdictions that pertain to or govern any activities conducted by Competitors in connection with the Challenge.

Rule 5: Media Rights

The Competitor Team and Astranis retain all Media Rights related to the story of its participation in the Competition. The Competitor Team agrees that SEDS-USA and Astranis will retain all Media Rights related to the story of the Competition. Each Competitor agrees to let SEDS-USA and Astranis use the name and likeness of such Competitor (without charge) as may be reasonably required in connection with the media material prepared and distributed by SEDS-USA and Astranis relating in any way to the Competition. The Competitor Team agrees to provide SEDS-USA and Astranis reasonable amounts of video footage or access for recording activities related to participation of Competitor Team in the Competition and the right to use said footage for public affairs and/or educational purposes.

Rule 6: Intellectual Property Rights

Notwithstanding anything to the contrary in these rules, SEDS-USA and Astranis claim no intellectual property (IP) rights from the Competitor Team. All trade secrets, copyrights, patent rights, and software rights will remain with each respective Competitor Team.

Rule 7: Competitors shall submit required documents and data by the required timelines as outlined in this RFP.

Rule 8: Launch and Schedule

If any reason arises such that payload integration, launch, and deployment on the NanoRacks platform cannot take place as planned for the SEDS SAT-2 Competition, Astranis reserves the right to postpone, modify, or cancel the in-space portion of the Challenge.

4.3 Design Requirements

Rule 9: Any design **must** follow the CubeSat design standard, and follow all rules set by NanoRacks for CubeSat deployment.

- Read over the NanoRacks documents located [here](#), and **pay special attention to the Interface Definition Document for NanoRacks CubeSat Deployer**

Rule 10: Competitors agree that use of Radio Frequencies (RF) for any purpose, such as spacecraft tracking and control, information (data) transmission to and from the spacecraft, or active sensors, will be in accordance with all U.S. laws and regulations, and with the International Radio Regulations promulgated by the International Telecommunication Union (ITU). The controlling organization for each CubeSat shall obtain Federal Communications Commission (FCC) radio frequency authorization in accordance with the Rules and Regulations, Title 47, of the Code of Federal Regulations. FCC Public Notice DA: 13-445 (<http://www.fcc.gov/document/guidance-obtaining-licenses-small-satellites>) is useful in deciding authorization options to consider.

Rule 11: For all communications, including communications eligible for this Competition, any electromagnetic spectrum frequency (e.g., RF, infrared, visible light, etc.) is allowed, subject to all applicable RF licensing and spectrum allocation Rules.

Rule 12: Competitors are responsible for obtaining necessary RF operating licenses for both their CubeSat space stations and for all ground stations under their control, and are responsible for abiding by National and International Rules governing radio operators in their operating spectrum.

Rule 13: Before launch, the winning team shall submit Orbital Debris Assessment Reports (ODARs) and End of Mission Plans (EOMPs) that are compliant with NASA-STD8719.14 Process for Eliminating Orbital Debris, in order to be compliant with U.S. National Space Policy of the United States of America (June 2010), the U.S. Government Orbital Debris Mitigation Standard Practices (February 2001), and other National and International policies and guidelines for limiting Earth-orbiting debris.

5.0 Deliverables

5.1 Notice of Intent

The Notice of Intent is a simple document that will provide the following information:

- Team name.
- Team Leader(s) and contact information.
- List of team members.
- SEDS-USA chapter(s) represented.
- At a very high level, what experience the members of the team have on CubeSat projects. Note that information in the NOI will not be used directly for judging, but instead might be used in the assignment of mentors.
- Acknowledgment of Competition Rules

The Notice of Intent will be submitted via the competition webpage on the SEDS-USA website.

Due: April 1, 2019

5.2 Team Proposal

The Team Proposal should outline the team's design, and should address a number of specific points listed below. Note that by the time the Team Proposal is submitted, the design should be at or near an internal PDR.

5.2.1 Proposal Content

Specific items that should be addressed in the Team Proposal:

- **Mission Requirements:** Overall top-level goals of the proposed mission.
- **Systems Engineering:** How do the top-level mission requirements flow down to requirements for individual subsystems? What are the key subsystems of the design? What are the appropriate technical resource budgets for the design?
- **Payload Engineering:** What payload hardware will be required in order to fulfill the mission requirements? How will this hardware be housed in a 1U CubeSat?
- **Engineering Capability:** Defend that your team has the technical skills to develop your design. What experience does the team have with developing the hardware, software, and electronics required? Do you have access to the appropriate facilities for building and testing your design? Does your team have any personal mentors who can help you through the design process?
- **Non-Technical Capability:** Does your team have access to the necessary funding to potentially procure the hardware needed for your design? If not directly, do you have experience fundraising for technical projects?
 - Budget
 - Fundraising
 - Project Management
 - Communications and Marketing
- **Team Diversity:** Talk about the makeup of the team. Is it mostly undergraduates or graduate students? Is the entire team made up of engineering students? Has your team reached out to groups that are commonly underrepresented on STEM projects? How will the diverse skillset of your team lead your project to success?
- **Team Mentors:** What university faculty or industry mentors have you reached out to by the time that the proposal is submitted? Note that these mentors should have agreed to work with your team, and should help develop the proposal. Due to the complexity of this project, we are also asking each team to obtain up to three signed letters of commitment from their mentors, confirming that they intend on working with the team, potentially through hardware development and eventual launch. The team proposal *must* include an appendix containing these signed letters of commitment.

Note that unless stated below, the specific format of the Team Proposal can deviate from this outline, but it should serve as a guide for the topics that the judging team will be evaluating.

5.2.2 Proposal Formatting Standards

The submitted Team Proposal should adhere to the following standards:

- The Team Proposal should be written in 12pt font.
- The Team Proposal should be a *maximum* of 25 pages.
- All figures should be placed in an appendix to the document that will not count towards the 25 page limit. These figures can be referenced in the document.
- Signed letters of commitment from mentors should be placed in an appendix to the document that will not count towards the 25 page limit.

Please note that teams are judged on the content, not the length, of their Team Proposal. Teams should seek to be succinct as possible in their proposals beyond what is being requested for judging.

The Team Proposal will be submitted via the competition webpage on the SEDS-USA website.

Due: May 1, 2019

5.3 Additional Documentation

Additional documentation will be required for the winning team as they build their design and prepare it for launch. SEDS-USA, Astranis, and NanoRacks will work with the winning team directly to coordinate this documentation.

6.0 Proposal Judging Guidelines

Proposal submissions will be graded on the following criteria:

- | | |
|---|-----|
| • Engineering capability to build the CubeSat (hardware, testing, etc.) | 35% |
| • Non-technical capability to build the CubeSat (fundraising, visibility, etc.) | 20% |
| • Professionalism of submitted proposal. | 15% |
| • Novelty of the CubeSat mission. | 10% |
| • Demonstrated efforts to find quality and competent mentors | 10% |
| • Ratio of undergraduate to graduate students on the project | 5% |
| • Diversity of design teams | 5% |

7.0 Timeline

- **October 2018:** Competition announced.
- **November 2nd, 2018:** Competition workshop at SpaceVision 2018 in San Diego, Request for Proposals released, RFP questions and Notices of Intent can be submitted.
- **April 1st, 2019:** Last day for teams to submit a Notice of Intent.
- **May 1st, 2019:** Design proposals due.
- **June 1st, 2019:** Design proposals are judged, and winning team announced.
- **November 8-9, 2019:** Winning team presentation at SpaceVision 2019 in Tempe, Arizona.
- **By Late 2021:** SEDS SAT-2 Launch

Note: Schedule is subject to change, especially in regards to launch date. Due to the partnership with NanoRacks, who regularly deploy CubeSats from the Cygnus cargo vehicle and the ISS, the satellite is not tied to one specific launch, and can be slotted into any number of launch opportunities.