

Satellite Design Competition : The Guardian Competition Guidelines

Link for Registration:

<https://www.brahmandexploration.com/event-details/satellite-design-competition-the-guardian-1>

Earth Observation Satellite Design Competition: The Guardian

This competition challenges university students to design a theoretical Earth Observation (EO) satellite, focusing on environmental monitoring and sustainability solutions.

Competition Goal: Design a small satellite (CubeSat format) to gather critical data to address a specific environmental challenge.

Challenge Categories:

1. **Climate Change Monitoring:** Design a satellite to track greenhouse gas emissions, monitor deforestation, or measure global ice cap health.
2. **Natural Disaster Management:** Design a satellite to predict and monitor wildfires, floods, or landslides to improve disaster preparedness & response.
3. **Sustainable Resource Management:** Design a satellite to monitor water resources, track illegal deforestation, or map land cover changes for sustainable development.

Team Formation:

- The team should not be more than **4 students and there is no restriction on minimum number of students.**
- Every person on the team must be a university student.
- We encourage interdisciplinary teams (engineering, physics, environmental science).

Phase 1: Proposal Submission (1 page max)

- Define the chosen environmental challenge.
- Explain how the satellite design addresses the challenge.

Phase 2: Design Submission (15 pages max)

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- Detail the chosen CubeSat format (e.g., 1U, 3U, 6U).
- Describe the proposed payload instruments (cameras, spectrometers, etc.).
- Explain the data collection plan (resolution, frequency, etc.).
- Discuss the chosen orbit and its suitability for the mission.
- Include preliminary power, communication, and thermal management plans.
- Briefly explain the data analysis and dissemination plan.
- Briefly elaborate on the debris management at the end of the mission.

Phase 3: Presentation Submission (15 minutes for each group to present)

- Shortlisted teams will present their detailed design along with the simulation and supported graphs in front of the judging panel.
- The presentation should cover technical details, innovation, mission feasibility, and potential impact.
- Judging criteria will focus on:
 - Scientific merit and alignment with the chosen challenge category.
 - Technical feasibility and design rationale.
 - Innovation and uniqueness of the proposed approach.
 - Clarity and effectiveness of data collection and analysis plan.
 - Presentation quality and team communication

Awards & Recognition

- Cash prizes for the top teams in each challenge category.
- Opportunity to present winning designs at a relevant conference, industry event, or Journal.
- Opportunity to work with the company.
- Certificates for every participant.

Key Dates for Different Phases of Competition:

15/3/2024	Competition Registration Opens
21/4/2024	Competition Registration Closes
20/4/2024	Competition Launch Event
30/4/2024	Submission for the Phase 1
30/7/2024	Submission for the Phase 2.

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15/8/2024	Presentation Submission
20/8/2024	Winner Announcements

Additional Considerations:

- Allow teams to submit a one-page budget breakdown (not mandatory for judging but if submitted get bonus points).
- Encourage the use of open-source satellite design tools and software.
- Provide online resources and workshops on CubeSat design basics (optional).

This competition design is focused on theoretical aspects, fostering creativity and technical problem-solving skills in students. By focusing on environmental challenges, it also connects space exploration with real-world issues, making it an engaging and relevant competition for university students.

Guidelines:

Phase 1: Proposal Submission Guidelines

1. Team Information:

- Provide the team name and list the names and university affiliations of all team members.
- Ensure that all team members are university students and adhere to the competition's eligibility criteria.

2. Chosen Environmental Challenge:

- Clearly define the environmental challenge category your team has selected (e.g., Climate Change Monitoring, Natural Disaster Management, Sustainable Resource Management).
- Briefly explain the significance and urgency of the chosen challenge within the context of environmental sustainability.

3. Environmental Challenge Definition:

- Provide a concise overview of the specific environmental issue your team aims to address.
- Highlight key aspects of the challenge, such as its global impact, current trends or problems, and potential consequences if left unaddressed.

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4. Satellite Design and Approach:

- Outline the primary objectives and goals of your proposed satellite design in relation to the chosen environmental challenge.
- Explain the rationale behind selecting a satellite-based approach to address the challenge, highlighting its advantages over alternative methods.

5. How Our Satellite Addresses the Challenge:

- Clearly articulate how your satellite design intends to tackle the chosen environmental challenge.
- Identify specific features, technologies, or instruments incorporated into the satellite design to achieve the desired outcomes.
- Provide a brief overview of the data collection, analysis, and dissemination methods employed by the satellite.

6. Significance of the Proposal:

- Emphasize the potential impact and importance of your proposed satellite design in addressing the chosen environmental challenge.
- Discuss how the data collected by your satellite could contribute to scientific research, policy-making, or practical interventions aimed at mitigating or adapting to the challenge.

7. Next Steps:

- Indicate your team's readiness and commitment to advancing to the next phase of the competition.
- Briefly mention any specific areas or aspects of the satellite design that your team plans to focus on during the subsequent phases.

8. Contact Information:

- Provide contact details for the team leader or designated representative, including email address and phone number, for any follow-up inquiries or communication.

9. Length and Formatting:

- Ensure that the proposal submission does not exceed one page in length.

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- Use clear and concise language, avoiding unnecessary technical jargon or excessive detail.
- Format the proposal submission neatly and professionally, paying attention to readability and organization.

Phase 2: Design Submission Guidelines

1. CubeSat Format Specification:

- Specify the chosen CubeSat format (e.g., 1U, 3U, 6U) and justify its suitability for the mission objectives.
- Provide details regarding the dimensions, mass, and other relevant characteristics of the CubeSat platform.

2. Payload Instruments:

- Describe in detail the payload instruments integrated into the satellite design.
- Specify the types of sensors (e.g., cameras, spectrometers, SAR) and their functionalities.
- Justify the selection of each payload instrument based on its relevance to the mission objectives and technical feasibility.

3. Data Collection Plan:

- Outline the data collection strategy, including spatial and temporal resolution requirements.
- Specify the frequency and duration of data acquisition cycles, considering factors such as orbit characteristics and mission duration.
- Address how the satellite will manage and prioritize data collection from multiple payload instruments.

4. Orbit Selection and Suitability:

- Explain the rationale behind selecting the proposed orbit for the satellite mission.
- Discuss how the chosen orbit parameters (e.g., altitude, inclination) align with the mission objectives and enable optimal data collection.

5. Power, Communication, and Thermal Management:

- Provide preliminary plans for power generation, storage, and distribution onboard the satellite.

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- Describe the communication subsystem, including frequency bands, data rates, and ground station requirements.
- Outline thermal management strategies to ensure the satellite's components operate within acceptable temperature ranges.

6. Data Analysis and Dissemination Plan:

- Briefly describe how the collected data will be processed, analyzed, and interpreted to extract meaningful insights.
- Discuss plans for data storage, compression, and transmission to ground stations or other receiving platforms.
- Address how stakeholders will access and utilize the processed data for decision-making or further research.

7. Debris Management:

- Include a brief overview of the debris management plan to mitigate space debris generation at the end of the satellite's mission.
- Discuss potential strategies for deorbiting the satellite or ensuring its safe disposal to minimize the risk of collision with other space objects.

8. Presentation of Technical Details:

- Ensure clarity and comprehensiveness in presenting technical specifications, diagrams, and schematics related to the satellite design.
- Use appropriate terminology and notation to facilitate understanding by the judging panel and other stakeholders.

9. Innovation and Uniqueness:

- Highlight any innovative features, technologies, or methodologies incorporated into the satellite design.
- Emphasize how your design offers unique advantages or improvements over existing Earth Observation satellite systems.

10. Feasibility and Sustainability:

- Demonstrate the technical feasibility and practical viability of the proposed satellite design.
- Consider factors such as cost-effectiveness, scalability, and environmental impact in evaluating the sustainability of the mission.

11. Compliance with Guidelines:

- Ensure that the design submission adheres to the specified page limit (15 pages maximum) and formatting guidelines.
- Include appropriate citations and references to acknowledge sources of inspiration, prior research, or technical specifications.

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Phase 3: Presentation Submission Guidelines

1. Presentation Content:

- Provide a comprehensive overview of the satellite design, including technical specifications, mission objectives, and key features.
- Highlight the innovation, uniqueness, and feasibility of the proposed approach in addressing the chosen environmental challenge.
- Emphasize the potential impact of the satellite mission on scientific research, environmental monitoring, and sustainability initiatives.

2. Technical Details and Design Rationale:

- Present detailed technical information about the satellite design, payload instruments, orbit selection, and onboard systems.
- Explain the rationale behind design decisions, including trade-offs, constraints, and optimizations considered during the design process.

3. Simulation and Graphical Representation:

- Include simulations, models, or graphical representations to illustrate key concepts, design elements, and mission scenarios.
- Utilize charts, graphs, and diagrams to visualize data, trends, and performance metrics related to the satellite mission.

4. Mission Feasibility and Impact:

- Demonstrate the technical, operational, and financial feasibility of the satellite mission.
- Discuss the potential societal, environmental, and economic impact of the proposed satellite design on addressing the chosen environmental challenge.

5. Data Collection and Analysis Plan:

- Present a detailed plan for data collection, processing, analysis, and dissemination throughout the satellite mission lifecycle.
- Highlight any innovative methods or algorithms employed for data fusion, pattern recognition, or anomaly detection.

6. Mission Execution and Risk Management:

- Address strategies for mission execution, including launch, deployment, operation, and end-of-life disposal.

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- Identify potential risks and mitigation measures associated with satellite operations, environmental conditions, and system failures.

7. Presentation Quality and Team Communication:

- Ensure clear and effective communication of ideas, findings, and recommendations to the judging panel.
- Maintain professionalism, enthusiasm, and confidence throughout the presentation.
- Encourage active participation and collaboration among team members during the presentation.

8. Question and Answer Session:

- Prepare to respond to questions from the judging panel regarding technical aspects, design choices, mission objectives, and potential challenges.
- Demonstrate a thorough understanding of the satellite design and its relevance to the competition's goals and objectives.

9. Time Management:

- Adhere to the allocated presentation time and prioritize the most critical aspects of the satellite design and mission plan.
- Practice and rehearse the presentation to ensure a smooth and engaging delivery within the time constraints.

10. Professionalism and Etiquette:

- Maintain professionalism and respect towards the judging panel, organizers, and fellow participants throughout the presentation.

Submission Guidelines:

Format Requirements:

- All submissions must be in electronic format, preferably in **PDF**.
- Ensure that the file name clearly identifies the team and the phase of submission (e.g., TeamName_Phase3_Presentation.pdf).

Submission Deadline:

- Submissions must be received by the specified deadline as outlined in the competition guidelines.
- Late submissions may not be considered for evaluation.

Submission Contents:

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- Include all required components specified for the respective phase of the competition (e.g., Proposal Submission, Design Submission, Presentation Submission).
- Ensure that the submission is complete and complies with the prescribed page limits, formatting guidelines, and content requirements.

File Organization:

- Organize the submission document logically, with clear headings, sections, and subheadings for each component.
- Use consistent formatting, font styles, and font sizes throughout the document for readability and professionalism.

Document Structure:

- Begin the submission with a cover page containing the team name, phase of submission, and date.
- Provide a table of contents to facilitate navigation through the document.
- Number all pages sequentially, including appendices, if applicable.

Language and Clarity:

- Write the submission in clear, concise, and grammatically correct language.
- Avoid using technical jargon or terminology that may be unfamiliar to the judging panel.
- Ensure that all information presented is accurate, relevant, and effectively communicates the team's ideas and proposals.

Graphics and Visuals:

- Include relevant diagrams, charts, graphs, images, and simulations to enhance understanding and visualization of key concepts.
- Ensure that all graphics are clear, legible, properly labeled, and directly related to the content being discussed.

References and Citations:

- Provide citations and references for any sources, studies, or data used to support the team's proposals, analyses, or arguments.
- Follow a consistent citation style (e.g., APA, MLA) throughout the document.

Team Information:

- Include a section with information about the team members, their university affiliations, and contact details.

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- Clearly identify the team leader or primary contact person for correspondence.

Submission Method:

- Submit the electronic document through the designated email address **brahmandexploration@gmail.com**.
- Ensure that the submission is uploaded or sent successfully and that confirmation of receipt is obtained.

Confidentiality and Intellectual Property:

- Do not include any proprietary or confidential information in the submission without appropriate consent or authorization.

Compliance with Guidelines:

- Review the competition guidelines and requirements carefully to ensure full compliance with all instructions and specifications.
- Seek clarification if any aspect of the submission guidelines is unclear or ambiguous.

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brahmandexploration@gmail.com

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