Space Robotics Society

SPACE ROBOTICS SOCIETY (SPROS)

INTERNATIONAL SPACE DRONE CHALLENGE

An Event of International Space Robotics Week (SPROS Week)

RULEBOOK

Dates
31 Jan - 2 Feb 2026

Venue
Udupi, Karnataka

@SpaceRoboticsSociety

PREFACE

Welcome to SPROS International Space Drone Challenge - 2026

The Space Robotics Society (SPROS) is proud to present the official rulebook for the SPROS International Space Drone Challenge (ISDC) 2026. The forthcoming edition will take place from 31 January to 2 February 2026 in Udupi, Karnataka, India.

Since its inception, the ISDC has rapidly established itself as one of the world's foremost platforms for aspiring space engineers. Alongside the other flagship events of the International Space Robotics Week (SPROS Week), the previous edition drew over 1,000 students, firmly cementing its place as the largest and most dynamic competition of its kind.

In response to feedback from the last edition, several important adjustments have been incorporated to further refine the competition. These improvements are intended to enrich both the learning outcomes and the scope for innovation for all teams involved.

The competition missions for 2026 have been enhanced to provide a more engaging experience. A greater emphasis has been placed on a pilot-and-spotter system to ensure improved safety: in addition to the base-station pilot, each team should designate a spotter who maintains VLOS, communicates effectively with the pilot, and is able to initiate an emergency landing and activate a kill switch. While it is not mandatory this year for the spotter to have control authority, teams that implement spotter-initiated control (with verified emergency landing capability) will receive a 50-point bonus.

As the previous edition marked the first large-scale involvement of many students in space-drone operations, it offered invaluable lessons in developing such systems. Building on that experience, fresh and creative designs are strongly encouraged for the upcoming edition. Fully autonomous operations are not permitted this year, and only manually controlled drones may be used. Teams are urged to prepare thoroughly and practise extensively before the event.

Alongside the ISDC, SPROS Week will also feature the International Rover Design Challenge (IRDC) and the International Rover Challenge (IRC). For more details, please visit:

IRDC: www.roverchallenge.org/IRDC IRC: www.roverchallenge.org/

Let us come together to shape a Brighter, Open, Limitless, and Developed (B.O.L.D) future through space advancement.

We extend our best wishes to all participating teams and look forward to an exceptional ISDC 2026.

ISDC Organising Committee

1.0 COMPETITION OVERVIEW

1.1 COMPETITION OBJECTIVE

SPROS International Space Drone Challenge (ISDC), also referred to as “the challenge” or “the competition,” is a leading space robotics engineering competition. It challenges university students to conceptualise, design, develop and operate astronaut-assistive, next-generation space drones.

Competing teams are required to demonstrate their drone systems through a series of mission-oriented tasks conducted in a simulated Martian terrain. These tasks are designed to test technical competence, innovation, and problem-solving abilities critical to advancing future space exploration.

The objective of the competition is to offer students a comprehensive, real-world interdisciplinary engineering experience that integrates practical engineering expertise with essential soft skills, including business planning and project management.

The idea behind the competition missions is to prepare humans for a future scenario in which a second-stage Mars settlement (in-settlement habitat) has already been established, and space drones are employed to support exploration and enable its expansion into a fully developed, post-settlement habitat. For a conceptual illustration of this vision, reference may be made to the accompanying hypothetical scenario, set in the year 2X9X, depicting a future Mars town. Mars’ First Human Habitat - www.roverchallenge.org/SprosNagar

1.2 COMPETITION PROCEDURE AND SCHEDULE

The competition is divided into two stages:

- Review Stage (Online)
- Finals (On-site)

MISSIONS/SUB MISSIONS	POINTS
QUALIFIERS (ONLINE)	
SYSTEM DESIGN AND DEVELOPMENT REVIEW	50
TOTAL (QUALIFIERS)	50
FINALS (ON-SITE)	
SCIENCE MISSION	200
TECHNOLOGY MISSION	200
ASSESSMENTS (ON-SITE)	
PROJECT IMPLEMENTATION AND MANAGEMENT ASSESSMENT (PIMA)	50
TOTAL (FINALS)	450
TOTAL (QUALIFIERS AND FINALS)	500

Figure 1.2 Points Distribution

1.2.1 Team Selection Criteria

All teams shall undergo a review and down-selection process during the qualifiers. Only the top 16 teams that successfully pass each milestone will be invited to participate in the on-site finals.

Detailed information regarding deadlines, deliverable formats, submission requirements, and judges' expectations will be published on the official SPROS website

(www.spaceroboticssociety.org) and the ISDC website (www.roverchallenge.org/ISDC). These details will also be communicated directly to the respective team leaders.

At any stage of the milestone evaluations, the officials reserve the right to request clarifications or seek additional information from teams.

The maximum number of students permitted in a team for participation in the finals is 20.

1.2.2 Registration

All teams must formally declare their intent to participate in the competition. The official registration form will be made available online via the ISDC website from 12 September to 29 October 2025.

No major deliverables are required at this stage, apart from the submission of the team details requested through the registration portal. Information regarding the registration fees for both the qualifiers and the finals will be published on the ISDC website.

Early Bird Offer: Teams that register and complete payment for the competition before 28 September 2025 shall be eligible for a discount on the registration fee for the finals.

1.2.3 Awards and Honours

- Grand Awards - These are presented to the ISDC's top three teams, i.e., the Champion, First Runner Up, and Second Runner Up.
- Mission Awards: These honours will be given to teams for their creative thinking in a specific subsystem and outstanding performance in any of the ISDC finals missions. This category also includes the PIMA awards.
- Depending on the judges' verdict, further types of awards might possibly be given out.

1.2.4 System Design and Development Review (SDDR)

Teams must submit a System Design and Development Review (SDDR) package before November 25, 2025. The SDDR package will focus on both technical and project management aspects of drone development and has a written report of 10 pages. In the Project Management aspects, teams shall include the organisational structure of the team, resource management, project planning, a PERT chart showing the project timeline, initial budget, fundraising plans, sponsorships, team recruitment process, and educational and public outreach. In the technical aspects, teams shall include the current state of the drone

development and prototypes, overall system design, and the team's prototype testing strategy. The top 16 teams will advance to the on-site finals based on their SDDR scores. All the teams qualified for the ISDC finals will have to confirm their participation by December 5, 2025. If a qualified team is unable to participate in the finals for a particular reason, then its spot will be transferred to the highest-ranked reserve team.

Competition Dates - ISDC finals will be held from 31 January to 2 February 2026 in Udupi, Karnataka, India.

The fees do not include the cost of travel or accommodation; participating teams are responsible for arranging and funding their own travel and lodging. Teams are strongly advised to secure accommodation and transportation promptly upon receiving the SDDR result, as the Coastal Karnataka region is a popular tourist destination and February constitutes peak season.

Note: Any change to the dates, venue, or rules of the finals, for any reason, will be communicated to all teams, and all such decisions rest solely at the discretion of the ISDC organising team.

Figure 1.2.4 KAUP, UDUPI, KARNATAKA

1.3 ADMINISTRATIVE REGULATIONS

1.3.1 Competition Information

The competition-specific rules and relevant information are defined in this rulebook, and the specific guidelines issued separately for various submissions/missions will be available on the competition website. All the questions in the FAQ section on the ISDC website will also be considered part of the rules and guidelines. In addition, any official announcement shall also be considered part of these rules. Any issues not covered by these published rule sets will be addressed on a case-by-case basis by the ISDC officials. If there is a discrepancy, the rulebook (this document) will take precedence over FAQs. The rules are designed to be as clear and specific as possible, but there may still be occasional errors or ambiguities. In these cases, the spirit of the rules takes precedence over the exact wording. The key terms "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as specified in RFC 2119, regardless of capitalisation.

1.3.2 Queries regarding the Rules

Queries concerning any rules or guidelines should be directed to the officials via email at contact@roverchallenge.org. The frequently asked questions (FAQ) section on the competition website must be checked before submitting a question. The officials will only answer questions that are not already answered in the rules or FAQs or that require new or novel interpretations. No response will be provided to email addresses other than the designated contact point, as these emails will be considered spam. The official language of the competition is English.

All official communications will be sent only to the registered team email or the team leader's email address. Teams must check this inbox regularly, including spam/junk folders, to ensure no updates or notices from the organiser are missed.

1.3.3 General Officials Authority

The officials reserve the right to revise the schedule of the competition and/or interpret or modify the competition rules at any time and in any manner that is, in their sole judgment, required for safe, fair, and efficient operation. Therefore, all team members are required to cooperate with and follow all instructions from the officials.

The judges have the authority to reschedule if unexpected events, like rain, occur, causing a delay or cancellation of a competition day. Teams must be prepared to participate in multiple missions in a day. If, despite a reschedule, it is not possible to complete all the tasks for all the teams due to time constraints or organising difficulties, those tasks will not count towards the overall scores. It is important to note that teams still able to perform will receive a score to

assess their performance, but it will not contribute to their points. If all field missions are cancelled, winners will be determined based on assessments and SDDR scores. Any issues with the drone or team absence (whatever the reasons may be) will not be valid reasons to reschedule tasks.

1.3.4 Official Instructions

Failure of a team member to follow an instruction or command explicitly directed to that team and/or member will result in a 20-point penalty, which will be deducted from their overall score. Multiple failures to follow an instruction may lead to the disqualification of the member or the team from the competition.

1.3.5 Conduct with Officials

Arguments with or disobedience to any official will result in the team being eliminated from the competition.

1.3.6 Unethical Conduct

In case of unethical conduct by a team member, a 20-point penalty will be deducted from the team's overall score. A second violation will result in the expulsion of that member and his/her team from the competition.

1.3.7 Appeals

During the mission, teams may clear their doubts and seek clarifications only from the designated field judge. Once the mission has been concluded from the field judge's side, no further interaction with them is permitted. Should any issue remain unresolved, a formal appeal may be submitted exclusively to the arbitrator. Such appeals may relate to matters of scoring, judging, policies, or the interpretation and application of rules contained within the Rulebook.

Appeals must be submitted in writing via email to the arbitrator's designated address (to be provided at the finals) within 30 minutes of the completion of the mission. Only appeals directly related to rules or official policies will be considered. Complaints concerning time delays, loss of communication, scheduling, task repetition, or any matter not governed by the rulebook shall not be entertained. Each appeal must include comprehensive details, together with all supporting material available to the team. The officials' written decision shall be final and binding, and no further protests on the same matter will be accepted.

The team leader and faculty advisor shall be the only representatives authorised to interact with the judges, officials, and arbitrators, and under no circumstances may any other team member be appointed or permitted to act in this capacity.

1.4 GENERAL REQUIREMENTS FOR TEAMS & PARTICIPANTS

1.4.1 Teams per University

There is no limit to the number of teams a university can send to the competition. Teams that are formed with members from two or more universities are treated as a single team. It is up to the members to decide if they want to represent one university or compete independently. Representing more than one university is not allowed.

1.4.2 Team Members

A person can be a part of only one team. Each team must have one team member identified as their team leader/captain. The team leader/captain is the main point of contact for the officials during the registration process and competition.

1.4.3 Student Status

Team members must be enrolled as degree-seeking undergraduate or graduate students at any university. Team members who have graduated before the competition are ineligible to participate.

Students seeking a PhD degree/PhD students or equivalent are not allowed to participate.

1.4.4 Age

Team members must be at least 18 years of age. Written permission from a parent or legal guardian is required for any team member who is under 18 years of age on 1 January of the finals year.

1.5 FINANCES

The maximum allowable budget that a team can spend on the project is 400,000 INR. It shall include components for the drone, drone module, drone power source, Drone communication equipment, and Drone base station equipment. Teams are encouraged to get financial and in-kind sponsorships and donations for their project. Teams should mention the sponsorship amount and donations in their SDDR.

1.6 DOCUMENTATION & SUBMISSION DEADLINES

Submitted documents may only be viewed by members of the submitting team, authorised judges, and officials. The official website of the competition will be used for all online submissions. By submitting documents via the competition website, the team agrees that these documents may be reproduced and distributed by the officials, in both complete and edited versions, for educational and marketing purposes. Teams should check the competition website regularly to keep track of the submission deadlines.

1.7 GENERAL RULES

1.7.1 Forfeit for Non-Appearance

It is the responsibility of each team to be present at the competition site with their drone at their scheduled timeslot, which will be communicated to them beforehand by the organisers. If a team is not present and ready to compete at the scheduled time, it forfeits its attempt at that mission/task.

1.7.2 Team Briefing

All team leaders/captains must attend the team briefing for that day. If any specific doubts are there regarding the mission, they can be cleared during the briefing. No doubts or clarifications will be entertained once the mission time has begun.

1.8 DRONE OPERATIONS

- Teams shall operate their drones wirelessly from designated base stations, which will be isolated to block the pilots' direct visibility of the competition site and the drone. These base stations may be tents or concrete rooms. Basic Indian-style power outlets (220V, 50Hz), tables, and chairs shall be provided.

- Teams shall operate their drones remotely with no time delay, utilising live video feeds from onboard cameras, engineering telemetry for navigation, and additional sensors for situational awareness and control; with or without a direct line-of-sight radio communication to the drone. Teams are allowed to use FPV, RC Controllers or any other hybrid RF arrangement which does not utilise cellular networks (4G/5G), or satellite internet.

- Drones are expected to travel 500m at most from the base station, and the maximum allowed elevation from the ground is 25 feet. The base station's controller screen must constantly display the drone's elevation from the surface during the final. Any drone that

exceeds 25 feet Above Ground Level (AGL) shall be immediately disqualified from the competition.

- Each team must designate a base-station pilot (Pilot A) and a spotter (Pilot B) who maintains VLOS and communicates effectively with Pilot A. Appointing a spotter is mandatory for every mission, but granting the spotter control authority, including emergency landing and kill-switch activation, is optional, and teams that implement and verify spotter-initiated control with an emergency-landing capability will receive a 50-point bonus. The spotter must remain within a designated open area marked on site by the organisers that provides an unobstructed view of the drone throughout the mission. The shortest distance between the spotter and the base station will always be at least 10 metres, so the spotter must communicate wirelessly with Pilot A. An illustration of this layout is provided below.

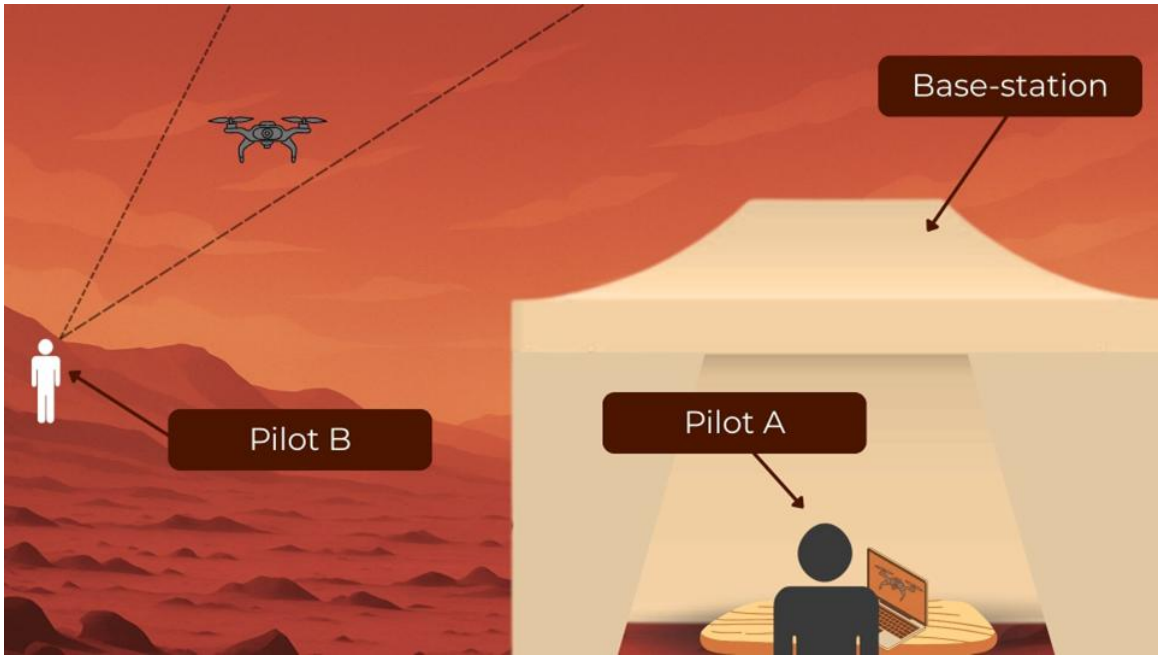

Figure 1.8 Pilot and Spotter System

- All the competition events will be held in full daylight or under adequate artificial light.
- The GPS coordinates provided shall adhere to the WGS 84 datum standard. The format for the same will be latitude/longitude in decimal degrees.
- Testing will not be allowed at the site during or before ISDC-2026.

2.0 DRONE GUIDELINES

2.1 FACULTY ADVISOR ROLE

- The drone entered into the competition must be entirely designed and built by the student team members without direct involvement from faculty advisors and industry professionals.
- The role of faculty advisor/coordinator/supervisor will be limited to mentorship and guidance. He / She may not make design decisions.
- Students should perform manufacturing and fabrication tasks themselves as much as possible. For cases where in-house manufacturing and fabrication are not possible, teams can approach contractors, but the amount charged will be considered in the team budget.

2.2 SIZE, WEIGHT, AND DESIGN

- The drone shall be a stand-alone, off-the-grid, mobile platform. A single connected platform must leave the designated start line. The drone must support vertical take-off and landing (VTOL) and be capable of stable hover.
- The weight of the drone must be less than 2 Kg.
- There are no restrictions on the dimensions of the drone.
- The drone must use power systems that may be applicable on Mars. Battery-powered systems can only be used for drones. Any potential hazardous material will require proper documentation to be submitted to the organisers before the competition.

2.3 COMMUNICATION EQUIPMENT

- The drone shall be operated remotely using wireless communications with no time delay. The operators will not be able to view the drone or the site directly as they will be operating from their base stations. Teams must power down communications equipment at the event sites while not competing to not interfere with other teams.
- During drone operations, a spotter must maintain visual contact with the drone at all times. The pilot will not have a direct view of the drone, so a designated team member in the field must act as a spotter.
- Both omnidirectional and directional antennae are allowed, but communications equipment must not rely on the team's ability to watch and track the drone firsthand. Steered directional antennae may use a mechanised antenna mounted outside that is

controlled via an electronic signal from the command station. Signal strength, relayed GPS, or other strategies may be used to give feedback on antenna direction, but it is not allowed to mount a camera on top of the antenna for visual feedback.

- Base station antenna height is limited to 3 metres. The complete communication setup, including antennas, computers, wires, and more, is entirely the responsibility of the participating team. While these components are not part of the drone itself, they are considered integral to the overall system design.

- Teams may position a communications antenna within a semicircular arc up to 3 metres directly in front of the base station to optimise signal quality, including achieving line of sight when possible. Teams must be prepared to operate in both line-of-sight and non-line-of-sight conditions, as line-of-sight communication may at times be unavailable due to terrain, structures, or other physical features.

- Any ropes or wires used for antenna stability purposes may be anchored within 3 meters of the command station.

- Teams are responsible for ensuring that they comply with the Indian regulations and DGCA Guidelines for the frequency band in which they operate.

- The design and reliability of communication systems form an integral part of this competition. Teams are expected to approach it as a core challenge, demonstrating innovation, resilience, and adaptability in their systems. The competition environment itself is deliberately demanding, designed to test how well teams can develop and operate robust communication links. No team will be permitted to cite interference as grounds for complaint. Missions will not be paused, repeated, or delayed to ensure an interference-free environment. Designing communication systems that can withstand interference is a core part of the competition challenge.

- Each team is solely responsible for establishing and maintaining its own communication link.

- The organisers will not allocate or manage communication channels.

- Teams have complete freedom to select channels within the permitted spectrum, encouraging innovative approaches to communication system design.

- Only unlicensed frequency bands, as designated by the Department of Telecommunications (India), may be used. If a team chooses to operate outside these bands, it is their responsibility to obtain the necessary licence.

- The competition venue will be a congested RF environment, with multiple teams likely transmitting simultaneously.
- All communication systems must be capable of assessing the RF environment before transmitting. Occupied frequencies should be avoided, and systems should dynamically select the clearest available channels.
- Automatic or manual switching between frequency bands is required, allowing systems to adapt quickly in the event of interference (including interference from unauthorised or innocent third-party transmissions).
- Teams should carefully account for the dense RF environment expected during the finals. Encryption and mitigation techniques must be incorporated into system design, ensuring reliable and secure links.
- Non-overlapping channels, particularly within the 5.8 GHz band, are strongly recommended as they typically experience less congestion.
- Obtaining an amateur (ham) radio licence is encouraged, as it may provide additional resilience in communications.
- Each team must submit a formal declaration of the communication standards, frequency bands, and channels they intend to use by 5 December 2025. During the finals, the organisers will actively monitor the frequency spectrum, and any team found operating in a manner inconsistent with their declared specifications will face immediate disqualification.

3.0 COMPETITION MISSIONS (FINALS)

- The ISDC finals will have two field missions and one assessment (presentation).
- Teams will get a maximum time of 15 minutes to complete a mission.
- All the penalties are additive: e.g. penalties of 10% and 20% would result in a score of 70% of the points earned during that particular mission. All the missions are scored independently, and it is not possible to score less than zero in a mission.
- Before the start of the mission, teams will get 10 minutes as the setup time to set up all necessary systems and equipment at the base station. After completing the mission, teams will have to switch off their radio communication equipment immediately, and they will have 5 minutes to pack up and vacate the base station.

- The drone is not required to be in the same configuration during the entire competition. Teams can change the configuration of the drone according to their needs and mission requirements. The drone will be accessible to the teams throughout the competition, and teams can make modifications and repairs between the missions.

- During drone operations, a spotter must maintain visual contact with the drone at all times. The pilot will not have a direct view of the drone, so a designated team member in the field must act as a spotter.

- In the event of an emergency, the spotter will use radio communication with the pilot to prevent the unsafe behaviour of the drone. In a dual-pilot setup, the spotter may take direct control of the drone if necessary. The spotter's intervention is limited to potential safety issues and should not otherwise participate in the mission.

- The spotter's primary responsibility is to ensure the safe flight of the drone and maintain a safe distance from people and structures. If the spotter intervenes with the drone, judges may consider it as a "kill switch." In this case, the drone will not be allowed to continue the mission.

3.1 INTERVENTIONS

An intervention can be called when a critical error hinders regular drone operation during a mission. Teams are allowed to take not more than one intervention during a mission. A 30% penalty for the total points scored in that particular mission will be imposed.

A request for intervention can only be initiated by team members (operators) who are present at the base station. A maximum of 4 members may be at the base station, including the pilot. To request intervention, the operator must enter the intervention circle located outside the base station and inform the field judge. Teams may designate any number of team members from the base station who may repair or retrieve the drone.

3.1.1 SPROSCAPE

- The ISDC 2025 finals will be performed within a specially designed simulated landscape called Sproscape.

- It will be the world’s largest arena of its kind. It will incorporate numerous Mars-like topographical elements, such as craters, mounts, rocky gardens, rifts, quarry fines, etc. Base stations will be positioned either along the outer edges of the Sproscape or at a suitable distance from it to ensure unhindered drone operations.

Figure 3.1.1 Sproscape (Reference)

3.2 SCIENCE MISSION – SCIENTIFIC EXPLORATION AND SENSOR DEPLOYMENT

Scenario: This mission simulates a critical Martian reconnaissance operation in support of future astronaut-led exploration. Using aerial systems, teams are tasked with gathering atmospheric data, capturing terrain imagery, and deploying an atmospheric sensor to a designated zone of scientific interest under partial positional uncertainty to reflect real Martian conditions. The maximum mission duration is 15 minutes.

3.2.1 Mission Objectives and Requirements

- Navigation: The drone shall navigate to three designated waypoints, each representing a distinct scientific-interest zone within the competition field.

- Atmospheric Measurements: At each designated zone, the drone shall conduct a minimum of two in-situ atmospheric measurements using its onboard sensor suite. The core parameters shall include temperature, humidity, or atmospheric pressure. Teams may incorporate additional atmospheric analyses or advanced sensing capabilities at their discretion to enhance mission outcomes.

- Altitude sampling: Measurements shall be collected at a designated height of either 10, 15, or 20 feet above ground level for each specified zone, with judges determining and assigning the appropriate altitude for each location before the mission.

- High Resolution Imaging and GPS Coordinates: At each zone, the drone shall capture high-resolution images suitable for detailed inspection of terrain features, ensuring they are well-framed, in focus, correctly exposed, and clearly attributed to the correct zone. Teams shall capture additional images from varied positions, including close to the site

while hovering or from the ground to enhance coverage and detail. Teams shall also record the GPS coordinates of the centre of each zone.

- Sensor Deployment: The atmospheric sensor must be deployed in one of three designated zones or at a separate fourth site chosen by the judges, with the deployment area potentially comprising a rift, a crater, or a narrow gap between rocks. Teams must execute this task in a precise deploy-and-leave manner while minimising risks to both the sensor and the drone.

- Field Markers: Each scientific-interest zone will be indicated by visible references such as 9-inch coloured traffic cones, approximate GPS coordinates, or other clearly identifiable objects to assist visual and positional acquisition.

3.2.2 Sensor and Handling

- The atmospheric sensor will be issued at mission start and will be represented by a standard AA battery. Teams must consider the sensor to be delicate and handle it with care.

- Teams may use any suitable carriage mechanism, such as a dedicated compartment or a mechanical gripper, that secures the sensor during flight and enables a controlled release.

3.2.3 Deployment Requirements

- Precisely deploy the sensor within a marked collection zone of 30 cm diameter.

- Judges will assess both the accuracy of the deployment and the method used, for example, a controlled release from a hover or landing to place.

- Teams are strongly encouraged to use deployment methods that minimise the risk of damage to the sensor during release, contact, and touchdown.

3.2.4 Sample Specifications

- Shape: Cylindrical

- Approximate Dimensions: 50 mm × 14 mm.

- Mass: 15–31 grams.

Figure 3.2.4 Sensor Sample – Standard AA Battery

3.2.5 Post-Mission Requirements

- Each team must prepare a 5-minute presentation for the judging panel after the mission, even if no data could be transmitted or recorded during the mission. Teams will have 15 minutes to prepare and submit it, so a pre-prepared template is recommended, with mission details and collected data added during this window. The presentation will be delivered to the judges either immediately after the mission or at a time decided by the organisers.
- The presentation must include:
    - Environmental data collected from each zone;
    - Analysis of imagery;
    - A sensor deployment overview with photo or video evidence;
    - A comparison of the collected data with known Martian atmospheric conditions and other relevant details.

3.3 TECHNOLOGY MISSION – SOLAR PANEL DUST MITIGATION

Scenario: After a severe dust storm on Mars, an uncrewed outpost has experienced significant dust accumulation on a rover that was previously deployed in the area, along with potential disturbances to nearby assets. A drone must be sent to the outpost to clean the solar panels of the rover using a safe and effective method. The drone is also required to document the conditions before and after the cleaning process and survey the surrounding area for any storm-related impacts. This information will help determine if further human intervention is necessary. The entire operation must be completed without damaging the panels or any hardware and within a maximum mission duration of 15 minutes.

3.3.1 Mission Objectives and Requirements

- Locate and navigate to the Mars outpost site, then proceed to the rover's solar panels for cleaning.
- Execute a cleaning operation on the rover's panels, which are pre-coated with simulated Martian dust, using a method that avoids damage and contamination.
- Capture and submit before-and-after photographs that clearly show the cleaned area and the condition of the panels.
- Map and analyse the area within a 50-metre radius of the solar panel, including nearby assets, damaged objects, and document each with photos or video.
- Return to the launch zone and land safely within the mission time limit.
- Teams may complete sub-tasks in any order. They may begin with the solar cleaning sub-task or with vicinity mapping at their discretion. Each sub-task will be scored independently and will award points toward the overall score.

3.3.2 Other Objects for Vicinity Survey

- A total of 3 to 5 dummy items will be placed for identification. Examples include a cube resembling a sensor module, a small instrument box, basic hand tools such as a hammer, a marker flag, or a short tripod stand. Teams must locate each item, identify it, and assess its condition.
- Teams must note that these objects will be on the surface, rather than at a height like the rover's solar panel, which needs to be cleaned.

3.3.3 Documentation Requirements for the Survey

- Provide at least one clear image or short video per object; include at least one image with a visible scale where practical.
- Associate each record with coordinates and a zone marker to support traceability.

3.3.4 Rover Panel Specifications

- Panel dimensions will be between 0.4 m and 1.0 m in both length and width.
- The panel height above ground will be between 0.4 m and 1.0 m, mounted on a table-like structure representing the top of a rover.
- The table surface will be covered with a flex-banner–type sheet printed with a solar-panel texture to represent solar cells
- Fine reddish-brown dust will be applied before each team's run.

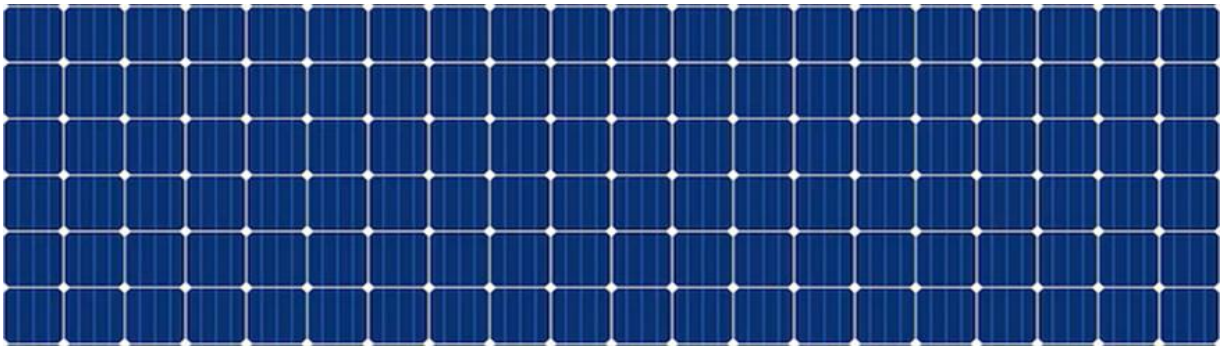

Figure 3.3.4 Solar Panel Texture (Reference)

3.3.5 Flight Constraints

- No damage, scratching, displacement, or undue mechanical stress to panels or nearby hardware.
- The cleaned area must be clearly visible in the submitted photographs.
- No residue, consumable debris, or device fragments may be left on the panel; violations incur point deductions.
- Non-liquid cleaning methods are strongly recommended; liquids risk contamination and add complexity for aerial payloads. They are particularly unsuitable for Martian conditions.

3.3.6 Post-Mission Requirements

- Prepare a 5-minute presentation for the judging panel. Teams will have 15 minutes to prepare and submit it; using a pre-prepared template is recommended, with mission details and collected data added during this window. The presentation must be submitted immediately after the mission as a soft copy only, and no in-person presentation will be conducted.

- The presentation must include:

    - Mission Overview: Objectives attempted, final outcomes, total time used, and any deviations from the plan.

    - Cleaning Method: Description of the non-damaging and effective cleaning approach in the Martian environment, tools or fixtures carried, contact or non-contact technique, and procedures used to avoid residue or debris on panels.

    - Evidence Package: Before-and-after images of the panels showing the cleaned area, with annotations indicating the boundaries of the cleaned region and any remaining dust

    - Vicinity Survey: Map and analysis of the area within a 50-metre radius of the solar panel.

    - Geolocation and Traceability: Coordinates or zone-marker references for the panel site, each surveyed object, and the launch or landing zone, including file associations for each record

    - Performance Metrics: Flight duration, distance covered, cleaning contact time, etc.

    - Lessons Learned: Effectiveness of the cleaning method, observed hazards, improvements for reducing mission time, and recommendations for future human intervention.

3.4 PROJECT IMPLEMENTATION AND MANAGEMENT ASSESSMENT (PIMA)

The objective of the PIMA is the assessment and review of the project and final drone design. PIMA will have one-to-one interactions between the teams and the judges. The teams will have to give a presentation to the judges about their drone development. This presentation will cover the lessons learned during the whole life cycle of developing a drone. It will include mostly system engineering and management aspects of the project, from the project plan to manufacturing and testing the drone. Teams may also include spin-offs that have emerged

from their drone project. Furthermore, this presentation offers the opportunity for the judges to ask some specific questions.

3.4.1 Project Implementation and Management Assessment Procedure

- More details about the format of PIMA will be provided separately in November.
- The details that are not covered in this rulebook will be shared in the form of separate guidelines and the FAQs section on the website.
- The organisers may update the rules at their discretion. A revised rulebook will be published if any rules are updated. All communications will be sent only to the official email address of the team.
- For any query related to the rulebook, contact us at contact@roverchallenge.org