Space Robotics Society

Space Architecture League

Registration: 26 September 2025 Onwards
Submission: 30 November 2025

Space Architecture League — Challenge 1: Venus Base

1. Problem Description

In this challenge, participants are invited to design a floating habitat within the upper atmosphere of Venus, at an altitude of approximately 50–60 km above the surface. This region offers relatively Earth-like pressure and temperature conditions but remains highly challenging due to its corrosive atmosphere dominated by sulphuric acid, strong high-altitude winds, and limited solar availability.

The objective is to propose a safe and self-sustaining habitat concept that could function as a scientific outpost or long-term observation platform. Designs should consider the use of advanced materials, effective thermal control (both passive and active), autonomous operational systems, and innovative architectural forms adapted to Venus's extreme environment. Key aspects to address include energy harvesting, communication infrastructure, and scientific activities such as atmospheric sampling, solar studies, and cloud chemistry investigations.

2. Assumptions

- The habitat is situated within Venus's atmospheric "habitable zone" without any requirement for surface operations.
- Atmospheric density and wind circulation play crucial roles in buoyancy control and structural stability.
- Due to logistical isolation, the facility must be highly autonomous, with limited potential for crew rotation. The use of robotics and onboard artificial intelligence is strongly encouraged.
- Solar energy availability is intermittent due to dense cloud cover; therefore, hybrid or alternative energy generation methods should be explored.
- Emergency scenarios such as corrosive leaks, internal system malfunctions, or power failures must be carefully anticipated.
- Long-term sustainability and material resilience are essential considerations in order to minimise environmental risks and ensure operational integrity.

3. Format

Submissions must be prepared as a written report not exceeding 10 A4 pages in total. This page limit includes text, images, schematics, and tables. No appendices or supplementary documents are permitted. All diagrams and illustrations should be embedded within the report and appropriately labelled.

4. Eligibility

- Open to all undergraduate students aged 18 or over.

- Both individual and team entries are permitted, with team size limited to a maximum of 10 members.
- No restrictions apply regarding nationality or professional background. Participation is encouraged from students, academics, professionals, and space enthusiasts.

5. Requirements

Submissions must include the following elements:

- **Architectural concept** adapted to conditions within Venus's upper atmosphere, incorporating environmental and logistical considerations.
- **Mission scenarios and research activities** supported by the habitat, with realistic scientific objectives.
- **Logistics plan** addressing supply delivery, equipment management, energy generation, and waste handling throughout the mission period.
- **Sustainability strategy** outlining measures to limit ecological impact and ensure responsible resource use.
- **Crew welfare provisions** ensuring the safety, health, and psychological resilience of inhabitants in an isolated and hazardous environment.
- **High-quality visuals** (diagrams, schematics, architectural renderings) to communicate the design and its key systems clearly within the page limit.

6. Evaluation Criteria

- **Innovation and Creativity (30%)** — Originality and vision of the proposed design.
- **Technical Feasibility (25%)** — Practicality and realism of implementation given current or near-future technology.
- **Sustainability and Environmental Responsibility (15%)** — Responsible use of resources and long-term risk mitigation.
- **Relevance and Depth of Mission Scenario (20%)** — Strength and clarity of the research programme supported by the design.
- **Clarity and Presentation (10%)** — Organisation, readability, and visual quality of the report.

7. Timeline

- Challenge registration opens on 26 September 2025.
- Challenge duration: 1 October to 30 November 2025.
- All submissions must be finalised and submitted by 30 November 2025.

8. Submission and Contact

A submission form link will be activated on the website ahead of the submission deadline. For queries or clarifications, participants may contact the organising team via the official competition email address listed on the website: www.SprosTech.com

9. Awards

All participants will receive certificates of participation. Winners will receive certificates of achievement for each individual challenge, as well as for the overall league performance. Points earned in each challenge will contribute to a participant's or team's cumulative league score, with final awards and certificates presented to the top-ranking individuals and teams at the end of the season.

10. Rules

All participants must adhere to the general competition rules and ethical standards of the Astrobiology League, and are expected to read the problem statement thoroughly.

11. FAQ

A detailed FAQ section will be available on the official competition website, providing answers to common queries about eligibility, submission requirements, judging criteria, and technical details.