Latin American Space Challenge
2023 LASC Edition

Rules & Requirements Document

The electronic version is the official, approved document.
Verify this is the correct version before use.

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LIST OF REVISIONS

REVISION	DESCRIPTION	DATE
00	• Baseline of the 2023 LASC Rules & Requirements Document.	16/01/2022
01	• Revised Sections 6.2 and 6.2.1 turning Mission IDs a primary means of identifying and tracking each team's project. • Revised Section 8 to incorporate the term "Joint Mission". • Section 9.2 was revised, turning 50 points for Mission Patch submission as "extra points". Also, the possibility to submit on the 2nd Progress Update was added. • Annex C was revised for mistypings and to adequate total score for bonus and extra points.	21/05/2023
02	• Section 9.3. was updated changing from Team ID to Mission ID the correct form of the video title.	22/05/2023

1. INTRODUCTION

The Latin American Space Challenge (LASC), hosted at the Cape Canavial area in Brazil, is Latin America's largest experimental rocket and satellite engineering competition.

It is widely recognized that such STEM competitions foster innovation and motivate students to extend themselves beyond the classroom, while learning to work as a team, solving real world problems under the same pressures they will experience in their future careers.

The event seeks to stimulate students, startup entrepreneurs and enthusiasts to complete a simulated space mission, by designing and building the rockets and satellites themselves. is a combination of the Rocket Challenge and the Satellite Challenge.

Since LASC's first edition, in 2019, where more than 350 students were present to 2022, with 1,600 students participating, the growth of the competition is visible with an increasing number of interested teams applying to the competition.

This document defines the rules and requirements governing participation in LASC. Revisions of this document will be accomplished by document reissue, marked by the version number.

2. DOCUMENTATION

The following documents include standards, guidelines or required standard forms. The documents listed in this section (Table 1) are either applicable to the extent specified herein or contain reference information useful in the application of this document.

Table 1: Documents file location.

DOCUMENT	FILE LOCATION
LASC Rules & Requirements	http://www.lasc.space/
LASC Design, Test & Evaluation Guide	http://www.lasc.space/
LASC Launch Operations	http://www.lasc.space/
LASC Waiver & Release of Liability Form	http://www.lasc.space/
LASC Flight Card and Postflight Record	http://www.lasc.space/
LASC Master Schedule	http://www.lasc.space/

3. LASC CHALLENGES OVERVIEW

The **2023 Latin American Space Challenge** will be composed of two challenges: the Rocket Challenge and the Satellite Challenge. The main objective of LASC is to maximize the teams that develop satellites to fly on its sounding rockets.

Figure 1: 2023 LASC Official Event Patch.

The **2023 LASC** will be an on-site event at the Cape Canavial area, located less than 20 km from downtown Tatuí, São Paulo, Brazil. The Cape Canavial is a private property and all information about the entrance, location, areas and other relevant information will be published by LASC in the website http://www.lasc.space/.

For the **Rocket Challenge**, teams will be challenged to develop, simulate, present and launch their experimental rocket projects submitting progress reports, simulation results, project technical reports and videos describing their project.

For the **Satellite Challenge**, teams will be challenged to develop, simulate, present and test their satellite projects submitting progress reports, simulation results, project technical reports and videos describing their project.

Additional guidance for teams entered in the LASC is contained in the **LASC Design, Test, & Evaluation Guide (DTEG)**. The DTEG provides teams with project development guidance LASC Organization uses to promote overall safety. Departures from this guidance may negatively impact an offending team's score.

LASC teams should avoid feeling constrained before seeking clarification and may contact LASC Organization with questions or concerns regarding their project plans' alignment with the spirit and intent of this document.

4. OFFICIAL LANGUAGES

The official languages of the Latin American Space Challenge are **English, Portuguese and Spanish.** Reports, presentations, correspondence with the LASC Organization, or other documentation, shall be prepared in one of these official languages.

5. TEAM COMPOSITION AND ELIGIBILITY

5.1. TEAM MEMBERS

A **LASC Team** may consist of one or a group of student members, non-students members (i.e. enthusiasts, researchers, startup teams, amateurs and hobbyists) or mixed.

Teams consisted only by students members who were matriculated in high school, undergraduate or graduate students (i.e., Masters or Doctoral students) during the previous academic year (e.g., former students who graduated shortly before the competition remain eligible) from one or more academic institutions (e.g. "joint teams" are eligible) may receive bonus points in addition to their total score.

There is no limit on the overall number of people per team. Each individual is free to participate on multiple teams, so long as each team is led by a different individual.

Each team shall assign a team leader when applying to LASC. The team leader must be the point of contact with LASC for all matters, meaning that LASC Organization will always and only directly contact the team leader, and that the team leader must be the only one contacting the LASC LASC Organization.

5.2. TEAM ORGANIZATION AND SUBMISSION LIMITATIONS

Teams shall submit no more than 3 (three) projects into the 2023 LASC. Each project shall be in a different category. Teams can participate in both challenges and are encouraged to do so by earning bonus points.

For example, Team ABC may register a project for the 1 km AGL apogee with hybrid/liquid propulsion system category, a cubesat-style satellite project, and another rocket project for the 0.5 km AGL apogee project.

Therefore, no team may be entered in the same category twice at the LASC. Although, as previously noted, teams are permitted to switch categories as necessary prior to submitting their final Project Technical Report. The event organizers will track and evaluate each project separately, regardless of common student membership or academic affiliation.

6. APPLICATION AND REGISTRATION PROCESSES

Although the organizers wish to admit all applicants, it is necessary to have a process in place to down select participating teams from all applicants. This will not be a first-come-first-served process and applications throughout the whole of the application period will be considered.

All teams will be contacted about the outcome of the selection process. Requests for entries made after the application deadline will not be accepted.

6.1. ENTRY FORM

Each team shall inform LASC of their desire to compete by applying on the **HeroX** website. Total completeness of the entry form is required. The **2023 Latin American Space Challenge HeroX** website is https://www.herox.com/SpaceChallenge2023.

6.2. TEAM ID

The Team ID is the competition officials' primary means of identifying and tracking each team. Once assigned, any correspondence between a team and the organizers must contain the respective Team's ID number to enable a timely and accurate response.

6.2.1. MISSION ID

All registered teams will receive a Mission ID to identify each project and its associated category and challenge. For example, A Team with a Team ID #3 and participating with two projects will have two Mission ID's: #3-A and #3-B.

A correspondence between a Team and the LASC Organizers shall contain the respective Team's ID number and Mission's ID number to enable a more timely and accurate response.

6.3. ACADEMIC INSTITUTION PARTICIPATION LETTER

Only **Students Teams** willing for bonus points are required to ask the academic institution(s), in which its members are enrolled, to provide a signed letter to LASC, acknowledging the team as the institution's representative and its intention to participate in the event. The signatory shall be a senior faculty member or senior staff representative (e.g., professor).

Academic institutions sending more than one team to the LASC need only to write one participation letter, covering all their teams, but each included team must submit an individual copy of that letter.

In the case of a Joint Team, which is composed of students from multiple academic institutions, each affiliated institution must provide its own signed letter to the team. On or before a specified date prior to the event, teams shall submit digital, PDF copy(s) of their signed participation letter(s) through the LASC website.

6.4. TEAM REGISTRATION FEES

All accepted LASC Teams shall purchase 1 (one) Team Ticket independently on the number of submitted projects.

- **Team Ticket:** The Team Ticket is necessary for the LASC Organization to make down payments on trophies, certificates, web services, launch pads, event structure and additional services before the event.

- **Rocketeer & Satelliteer Ticket:** All team members willing to participate in the onsite event shall have a Rocketeer & Satelliteer Team to access specific areas of the event. Also, this ticket is mandatory for those willing to receive a digital certificate of participation.

- **Spectator Ticket:** Spectators will be welcomed to join the 2023 Latin American Space Challenge. There will be a “Spectator Area'' for parents, friends and people interested in Science, Technology and Space Activities.

All people at the Cape Canavial shall have a valid ticket emitted by the LASC Organization. Prices and payment methods will be available on the LASC website in due course.

7. ROCKET CHALLENGE

Teams competing in LASC must design, build and launch a rocket to a target apogee of 500 meters, 1000 meters or 3000 meters above ground level (AGL) carrying a satellite or a general-purpose payload.

Teams submitting a rocket project containing a satellite registered for the Satellite Challenge will receive bonus points.

Projects will be divided into one of the following five categories based on the type of project attempted – defined by the target apogee and selected propulsion system:

- **500 meters** AGL apogee with a solid rocket propulsion system;
- **1,000 meters** AGL apogee with solid rocket propulsion system;
- **1,000 meters** AGL apogee with hybrid or liquid rocket propulsion system;

- **3,000 meters** AGL apogee with solid rocket propulsion system;
- **3,000 meters** AGL apogee with hybrid or liquid rocket propulsion system.

Table 2: Flight categories: target apogee vs. minimum payload.

Target Apogee		500 meters	1,000 meters	3,000 meters
Propulsion System	Solid	250 grams	800 grams	4,000 grams
	Hybrid/Liquid		800 grams	4,000 grams

Teams can use either commercial off-the-shelf (COTS) or student researched and developed (SRAD) propulsion systems, with SRAD propulsion systems being defined as those designed by students – regardless of whether fabrication is performed by students directly, or by a third party working to student supplied specifications – and can include student designed modifications of COTS systems.

LASC reserves the right to change the category in which a project is initially entered based on the design presented.

For teams participating in the Rocket Challenge and **not** registered for the Satellite Challenge, the Section 7.1 must be followed by the team.

All chemical propulsion types (solid, liquid, and hybrid) are allowed. Note that all propellants used must be non-toxic. Ammonium perchlorate composite propellant (APCP), potassium nitrate and sugar (aka "rocket candy"), nitrous oxide, liquid oxygen (LOX), hydrogen peroxide, kerosene, propane and similar substances, are all considered non-toxic. Toxic propellants are defined as those requiring breathing apparatus, special storage, transport infrastructure, extensive personal protective equipment, etc. (e.g. Hydrazine and N2O4).

Launch vehicles entered the LASC Event shall not exceed an installed total impulse of 40,960 Newton-seconds.

Note that multistage launch vehicles and/or propulsion systems containing PET-bottles or water-based rockets are **not** allowed. Teams with propulsion systems based mainly on gunpowder/black powder, **will be penalized** half points off their total earned score.

Competition Officials will evaluate competitors for Place Awards within each competition category based on the quality of required project documentation, the quality of their system's overall design and simulation, and finally the team's overall excellence, efficiency and performance demonstrated at the Project Technical Report.

7.1. PAYLOAD

Event officials encourage the teams to launch functional payloads as satellites registered in the **Satellite Challenge** or in the form of creative scientific experiments and technology demonstrations. Nevertheless, non-functional "dummy-mass" payloads are also permitted, if these comply with the Payload Required Form Factor and Mass.

7.1.1. PAYLOAD DEFINITION

A payload is defined as an independent component that is replaceable by a ballast of the same mass, with no change to the rocket's functionality and trajectory in reaching the target apogee, or its successful recovery.

Teams are required to carry payload(s) on their vehicle, which can be of the following type:

- ➔ **Non-functional** (i.e., dummy mass) OR **functional payload** (i.e., a purposeful device, e.g., an experiment or technology demonstrator);
- ➔ **Non-deployable** OR **deployable payload** (e.g., deploying a CanSat to the ambient).

If a functional payload is chosen, it can either be:

- ➔ Passive (i.e., non-powered/non-energetic) OR active (i.e., powered/energetic).

This payload may be assumed present when calculating the launch vehicle's stability. In other words, launch vehicles entered in LASC need not to be stable without the required payload mass on-board.

The payload must comply with the Payload Required Form Factor and with the Payload Required Mass, presented in the next sections.

7.1.2. DEPLOYABLE PAYLOADS

Deployable payloads are characterized by the payload being ejected or separated from the main vehicle during flight. Therefore, deployable payloads require their own recovery system.

All deployable payloads payloads are allowed to utilize a single-stage 10 m/s descent velocity recovery system from apogee, on a case-by-case approval from the LASC Organization, since elaborate active deployable payloads will generally benefit from as much airborne time as possible.

If teams plan to develop a deployable payload that requires a specific unique recovery system, they shall contact the event officials prior to the event to clarify if the payload satisfies all requirements.

7.1.3. PAYLOAD REQUIRED FORM FACTOR

All payloads, whether they are non-functional or functional, non-deployable or deployable, must fulfill the requirements for the form factor as detailed below, which are generally based on common CanSat, CubeSat and PocketSat form factors. The basic form factors are defined as follows:

- ➔ **CanSat:** Cylindrical shape with 115 mm height and 66 mm diameter;
- ➔ **PocketQube:** Cubic shape with 50 mm x 50 mm x 50 mm; and
- ➔ **CubeSat:** Cubic shape with one CubeSat Unit (1U) being defined as a 100 mm x 100 mm x 100 mm cubic structure.

The form factors are given not including a parachute, if applicable as in the case of deployable payloads. "Point masses" with odd form factors are not allowed.

The volume of the payload may be a multiple/stack of the basic payload form-factors, e.g., 3 CanSats (345 mm height x 66 mm diameter), 2U (200 mm x 100 mm x 100 mm), 5 PocketQubes (250 mm x 50 mm x 50 mm) or likewise.

Teams intending on carrying payloads, which do not fulfill the payload required form factor, require prior case-by-case review and LASC approval.

7.1.4. PAYLOAD REQUIRED MASS

The launch vehicle shall carry no less than the required mass for each category for the Rocket Challenge:

- ➔ **250 grams** of payload for 500 meters AGL apogee;
- ➔ **800 grams** of payload for 1,000 meters AGL apogee;
- ➔ **4,000 grams** of payload for 3,000 meters AGL apogee.

There is **no** upper limit on payload mass. Teams are responsible for conducting a “weigh-in” on site in the presence of the competition officials. The weigh-in can be done prior to, or during the Flight Readiness Review.

Competition officials will accept payload weigh-ins as much as 5% less than the specified minimum. If this requirement is not met, “nominal” flight status for the payload may be denied by the officials, resulting in an action item to increase

payload mass. Any payload unit weight greater than the specified minimum is acceptable.

If a functional payload is chosen, with the functional part itself not providing enough mass to reach the minimum requirements, additional dummy-masses may be added to the functional payload until the minimum mass requirement is reached.

7.1.5. INDEPENDENT PAYLOAD FUNCTIONALITY

Launch vehicle recovery systems shall be able to bring the vehicle down in a safe and controlled manner, as per the recovery system requirements, independently of whether the payload is active, passive, deployable or fixed inside the launch vehicle.

An independent payload cannot be a part of the launch vehicle functionality (such as a guidance and control system).

The functionality must be completely independent of the launch vehicles' ability to bring the payload to the designated apogee.

7.1.6. LOCATION AND INTERFACE

Neither the payload's location in the launch vehicle nor its method of integration and removal is specified. Therefore, teams must ensure that the payloads shall not be inextricably connected to other launch vehicle associated components (e.g., the launch vehicle's recovery system, internal structure, or airframe) while being weighed.

If the payload cannot be removed for weigh-in, the teams will not get points for an on-board payload.

7.1.7. RESTRICTED MATERIALS

Payloads shall not contain significant quantities of lead or any other hazardous materials (e.g. radioactive materials). Finally, payloads shall not contain any live animals.

8. SATELLITE CHALLENGE

The **Satellite Challenge** is a competition for teams to design and build a small satellite. The satellites will undergo environmental qualification testing, with the goal of launching the best satellites into an apogee between 500 and 3,000 meters in order to collect data and conduct scientific research.

Teams competing in the Satellite Challenge must design and present a satellite project. LASC will accept registrations for the Satellite Challenge of teams competing only with a satellite project (i.e. a rocket project is not mandatory for this challenge), but Teams are encouraged to participate in both challenges or partner with other Team ("Joint Mission") for a complete space mission (i.e. rocket launch carrying a satellite).

Projects will be divided into one of the following two categories based on the type of project attempted:

- **PocketQube** or **CanSat**-styles satellite project; and
- **CubeSat**-style satellite project.

Each PocketQube project shall be no less than 1P in size. One PocketQube Unit (1P) is defined as a 50 x 50 x 50 mm cubic structure. Similarly, three PocketQube Units (3P) constitute either a single structure or a stack measuring 50 x 50 x 150 mm.

Each CanSat project shall be defined as 66 mm of diameter and 115 mm height. Similarly, two CanSats Units (2C) constitute either a single structure or a stack measuring 66 mm diameter and 230 mm height.

Each CubeSat project shall be no less than 1U in size. One CubeSat Unit (1U) is defined as a 100 x 100 x 100 mm cubic structure. Similarly, three CubeSat Units (3U) constitute either a single structure or a stack measuring 100 x 100 x 300 mm.

Teams may use Commercial Off-the-Shelf (COTS) educational satellites for the Satellite Challenge. For the 2023 LASC, only educational satellites from the PION Labs Engenharia Ltda. are approved as a COTS. More information on COTS educational satellites may be accessed on http://www.pionlabs.com.br/.

Competition Officials will evaluate competitors for Place Awards within each competition category based on the quality of required project documentation, the quality of their system's overall design and simulation, the team's overall excellence, efficiency and performance demonstrated at the Project Technical Report.

8.1. MISSION OBJECTIVE

In 2023, the Satellite Challenge will have a basic mission for each category. The basic mission can be the only mission or part of a large and/or more complex mission. The goals for each mission is established below:

- **PocketQube or CanSat:** The mission shall at least collect air temperature, humidity and pressure. The data may be stored on-board or transmitted by radio, and is analyzed after landing.

- **CubeSat:** The mission shall at least collect air temperature, humidity, pressure, inertial, and GPS data. The data may be stored on-board or transmitted by radio, and is analyzed after landing.

8.2. SATELLITE LAUNCH

The best satellite projects will be invited to be launched during the 2023 LASC to an apogee between 500 and 3,000 meters. The satellite project combined with an experimental rocket of the Rocket Challenge will receive bonus points.

The Latin American Space Challenge reserves to cancel any satellite launch at its discretion.

9. TECHNICAL DELIVERABLES

The following sections define the deliverable materials competition officials require from teams competing in the LASC – including as appropriate each deliverable's format and minimum expected content.

All deliverables will be submitted to LASC per the instructions provided to the teams. Each relevant deliverable description will facilitate submission of that deliverable or will be communicated to teams as is determined by LASC Organization.

The scheduled due dates of all required deliverables are recorded in the LASC Master Schedule Document, maintained on the LASC website.

9.1. PROGRESS UPDATES

Teams shall submit **Progress Updates** via the Latin American Space Challenge HeroX website (https://www.herox.com/SpaceChallenge2023) on 2 (two) specific occasions prior to the competition: the 1st Progress Update and the 2nd Progress Update.

These Progress Updates will record progression in the project's technical characteristics during development. Competition officials understand not all technical details will be known until later in the design process. Therefore, the Progress Updates prior to the final submission will be evaluated based only on their timeliness and completeness – defined as follows.

Total completeness of the Progress Update form is required at all times. Reasonable engineering estimates and approximations are expected during the application process, but will be subject to progressive additional scrutiny in the subsequent Progress Updates.

Teams should briefly mention their ongoing discussions and analysis in the comment fields for any numerical submissions that are known to be unreasonable or remain undecided.

Teams may also respond to undecided criteria by demonstrating their understanding of any applicable event guidance or best practice governing the particular detail.

In general, LASC expects technical information to change, but information must always be provided. Accepted teams will be announced by the release of a Team ID list after the end of the application deadline.

The Team ID is the competition officials' primary means of identifying and tracking all the many teams. Once assigned, any correspondence between a team and the organizers must contain that team's ID number to enable an accurate response.

9.2. MISSION PATCH

Mission patches are emblems designed and worn by astronauts and people affiliated with a mission, such as Rocketeers and Satelliteers. The patches depict an image associated with the mission. A **Mission Patch** shall be submitted during the 1st or 2nd Progress Updates.

Teams that submit an appropriate mission patch will not receive **50 extra points** in their final score of the LASC. *Note: Team's Logo will not be accepted as a Mission patch.*

For more information on Mission Patch and examples, please access: https://www.nasa.gov/audience/foreducators/stem_on_station/ncas_microalgae/patch/index.html and https://en.wikipedia.org/wiki/Mission_patch

9.3. READINESS REVIEW VIDEO

Each team shall submit a **Readiness Review Video (RRV)** explaining the rocket or satellite project in a context of the mission, concept of operations, systems, projected cost, schedule constraints and the basis for proceeding with detailed design.

For the **Rocket Challenge**, the following topics are suggestions be covered:

- Overall Mission: flight profile simulations, altitude predictions with simulated vehicle data and rocket weight.
- Propulsion Subsystem: selection process, design, simulation, static tests (if available), and simulated motor thrust curve;
- Recovery & Avionics: ConOps, main components and dimensions; and

- Airframe and Structures: stability margin, simulated CG and CP.

For the **Satellite Challenge**, the following topics are suggestions be covered:

- Design of the mission and relation to the objectives of the 2023 LASC Satellite Challenge;
- Satellite concept features and systems: power system, command and data handling, communication system, antenna system, payloads; and
- Project planning: budget, timeline and status.

The RRV shall be no longer than **3 (three) minutes** of total duration. On or before a specified date prior to the event, teams shall submit the YouTube link of the video using the appropriate location indicated on LASC website.

The video shall be uploaded on YouTube with a title as “Team *Your_Mission_ID* Readiness Review to the 2023 LASC". For example, a team assigned the Mission ID "19-A", competing in the 2023 LASC, would subtitle their YouTube Video as "Team 19-A Readiness Review to the 2023 LASC".

9.4. PROJECT TECHNICAL REPORT

Each team shall submit a **Project Technical Report** for each project accepted in the 2023 LASC which overviews their project for the judging panel and other competition officials. The Project Technical Report shall be formatted according to the style guide of the American Institute of Aeronautics and Astronautics (AIAA), using a provided Microsoft® Word document template or LaTeX template.

The Latin American Space Challenge Project Technical Report template will be available for download on the LASC website. Always check the template maintained on the website before drafting your Project Technical Report to ensure you are using the latest version.

On or before a specified date prior to the event, teams shall submit a digital, PDF copy of their Project Technical Report, with the file name "Your Team ID_Project Report". For example, a team assigned the Team ID "19" would submit a digital copy of their Project Report using the filename "19_Project Report".

The Project Technical Report's main title is left to the team's discretion, however; the paper shall be subtitled “Team Your Team ID Project Technical Report to the Year Latin American Space Challenge". For example, a team assigned the Team ID "19", competing in the 2023 LASC, would subtitle their Project Technical Report "Team 19 Project Technical Report to the 2023 LASC".

The Project Technical Report shall be no longer than **30 pages**, including figures, footnotes, sources, source endnotes, nomenclature lists, equations, explanations of variables etc. This does not include the Appendices. However, appendices can have additional pages but are not necessarily read in detail by the officials.

Further information is given in Appendix B: Details for the Technical Report, including an overview of the required minimum Technical Report sections and appendices. Additional sections, subsections, and appendices may be added as needed.

9.5. WAIVER AND RELEASE OF LIABILITY FORM

It is mandatory that every individual attending LASC – including team members, faculty advisors, and others – signs the Waiver and Release of Liability Form. Individuals who do not sign this form will be **unable** to participate in any activities occurring at the Cape Canavial Launch Area.

The Waiver and Release of Liability Form can be downloaded on LASC website and must be signed, in handwritten form or digitally (qualified signature).

On or before a specified date prior to the event the teams should send the totality of such documents in a package format (e.g., zip/rar folder) to the email lasc@lasc.space, respecting the following file name format “Team[Your Team ID]_Waiver_[Year]LASC".

For example, a team assigned the Team ID "12" competing in the 2023 LASC, would name the Waiver and Release of Liability Form package file "Team12_Waiver_2023LASC".

10. MILESTONES

There are several events, briefings, and reviews, mandatory or optional, that form the LASC milestones.

All mandatory milestones in the sections below shall be completed in order to qualify for Place Awards.

10.1. ONSITE REGISTRATION AND CHECK-IN

Teams are expected to arrive in time so they can register, receive their event badges, and be assigned their respective areas. It is expected of every team to attend with all team members from day one.

If individual team members cannot attend from the start due to reasons related to travel restrictions or similar, event officials should be notified before the event.

10.2. WELCOME BRIEFING

During the morning of the first event day, a welcome briefing will be given to the teams to introduce the event officials, announce on-site details, and kick-off all activities. Attendance is expected.

10.3. SAFETY BRIEFINGS

During the event, safety briefings will be given by range safety officials to all team members. Attendance is mandatory for all team members and advisors, without exception.

10.4. FLIGHT READINESS REVIEW (FRR)

A major milestone to get the clearance to transfer the vehicle to the launch site and start the dedicated launch preparations is the **Flight Readiness Review (FRR).** Within this review, the technical evaluation board will visit the team area and go through a detailed Flight Readiness Review Checklist that **all rockets and satellites** need to comply with.

All criteria can be scored "**red**" (Denied), "**yellow**" (Provisional), "**green**" (Nominal), or "**gray**" (Not Applicable).

If any single criterion is scored "**red**", the overall Flight Status is "Denied". This will cause the teams to FAIL the FRR and not be allowed to launch their vehicle.

If any single criterion is "**yellow**", while no criterion is "red", the overall Flight Status is "Provisional". Any criterion that is scored "yellow" will result in an Action Item (= a mandatory task) that needs to be resolved by the team.

Any Action Items preventing a "Nominal" flight status can be addressed by the teams after FRR and before the subsequent Launch Readiness Review (LRR). Providing all Action Items have been addressed accordingly, the flight status can then be raised to "Nominal" by the jury during LRR.

The FRR will take place at the Rocket Assembly Area (RAA) by the request of the Team Leader. The teams should ensure that the vehicle is in an FRR-ready state. This means, the vehicle will be without energetics or propellants, will be disassembled at the joints, with the avionics system, payload, and recovery system outside of the body tubes, so that the officials can have a good look at all subsystems.

If all criteria of the FRR is scored "**green**", the overall Flight Status is "Nominal", and the team will be requested to prepare their rocket or satellite for the Launch Readiness Review (LRR).

10.5. LAUNCH READINESS REVIEW (LRR)

For a team to be accepted to proceed to the **Launch Readiness Review (LRR),** *meaning to start the LRR, not to pass it*, the following conditions need to be met by the teams:

- The team has **completed** the FRR with at least "Provisional" Flight Status;
- Following the FRR, the team has addressed all issues scored as "**yellow**" (Provisional);
- The rocket and/or satellite is loaded with all energetics, but in a safed state (e.g. with remove before flight pins).

During the LRR, the teams will be expected to explain:

- How they resolved the FRR Action Items, if applicable;
- Explain any changes on documentation/checklists they made prior to launch, if applicable;
- Why their rocket can now be considered ready to launch verification.

Furthermore, the launch officials will conduct the following steps:

- Re-inspect Action Items if necessary;
- Final inspection of the vehicle; and
- Issuance of the Flight Card.

For a team to successfully pass the LRR, the officials will have to raise all criteria to "**green**" and the flight status to "Nominal". They will do so if they are convinced all Action Items have been resolved by the teams and there are no further criteria preventing a safe and successful launch.

At the end of the LRR, the issuance of the **Flight Card** by the officials to the team certifies that the LRR has been passed successfully.

The LRR will take place at the Rocket Assembly Area (RAA) by the request of the Team Leader. Teams should provide proof that Action Items given at the FRR have been closed. For most (minor) action items pictures and videos suffice as proof, especially if otherwise an assembly of the vehicle would be unreasonably delayed.

10.6. POSTFLIGHT DEBRIEFING

Debriefing session after recovery of the vehicle for the officials to assess the condition of the vehicle. This debriefing will serve as a baseline for the evaluation team to score the success of the recovery operation. During the Postflight Debriefing, the Postflight

Record will be filled out by officials and the Team Leader after the launch and will contain flight information data, such as flight performance and recovery.

10.6.1. POSTFLIGHT REPORTING OF APOGEE AND RECOVERY

During the Postflight Debriefing, teams will need to fill out the Postflight Record with the competition officials, which will among other things include the following information that needs to be passed on to the officials:

- ➔ For the Rocket Challenge, the apogee of the official altitude logging system(s) to determine the actual apogee above ground level;
- ➔ For the Satellite Challenge, the raw data of the data collected and science researched during the flight;
- ➔ Status of the systems after recovery by showing hardware to officials.

Teams shall report in person to competition officials this information after retrieval and return to the designated event area, prior to the end of eligible launch operations on the respective launch day.

Only in the special case that recovery operations cannot be concluded during the respective launch day, teams are allowed to provide this information before the end of the respective next eligible launch day.

For the Rocket Challenge, the telemetry provided apogee information recorded in flight may be utilized in case no apogee data is retrievable from any onboard systems after “landing”. A minimum criterion is however that a GPS lock has been maintained around apogee and that the apogee trajectory is visible in the recorded data.

10.7. AWARD CEREMONY

The Award Ceremony, to be held on the last day of the event, will be the final milestone of LASC where winners will be announced.

11. SCORING AND AWARDS

11.1. ANNOUNCEMENT OF WINNERS

The winners will be announced at the Award Ceremony. The evaluation team will document their judgment in individual scoring sheets for each team and the LASC Organization will consolidate a main scoring sheet using a Simple Average Method.

The final scoring sheet will be distributed to the teams after the event to give them feedback regarding strengths and weaknesses in main aspects of their performance in the competition.

11.1.1. HANDLING OF QUESTIONS & COMPLAINTS REGARDING SCORING

Teams are welcome to approach the officials to ask for specific, non-binding, oral feedback regarding their perception of the teams' work during all points of the competition to provide the teams with an opportunity to learn and improve.

In the case the teams have more detailed questions or specific complaints regarding the scoring after the scoring has been announced, such as they would like to receive elaborate feedback on a particular aspect of the score for clarification, e.g., to improve upon for the next competition, or if they identify an honest mistake made by the jury, the following process applies:

Only the team leader can submit a written feedback request once to lasc@lasc.space. Submissions of the feedback are accepted until no later than one week (7 days) after official announcement of the score. To keep the workload on the officials to a reasonable amount, teams are asked to limit their questions plus complaints to 3 (three) in total. Competition officials will then review these three questions and/or complaints and provide written feedback.

If an honest mistake in scoring is apparent, competition officials will review the score provided to the team and decide on a case-by-case basis if and how to account for this, especially and only if this would significantly affect the overall score and placement of the team.

It should be noted that teams are expected not to abuse this possibility of questions and complaints for bagatelle. Officials will not partake in a discussion questioning the evaluation team principal reasoning of the score given.

11.2. ROCKET CHALLENGE SCORES

Teams will be scored in five different scoring categories or areas, which are (1) Team Effort, (2) the Technical Report, (3) the Design Implementation, and (4) the Flight Performance. These are weighted according to the following table.

In each scoring category, a set of grading criteria is established. These criteria will be evaluated by the jury for each team individually. Each grading criterion has several, more detailed, topics that establish what the jury will look for during the grading process.

These detailed topics are weighed equally within each criterion, while the main criteria are weighted differently within each competition category. The details of the grading criteria can be found in Appendix C: Detailed Grading Criteria.

Table 3: Weight of the Scoring Categories for the Rocket Challenge.

Scoring Categories	Possible Points	% of Total Points
Team Effort	100	10%
Project Technical Report	200	20%
Design Implementation	200	20%
Flight Performance	500	50%
TOTAL	**1000**	**100%**

Bonus Points may be awarded for Student Teams by **20 points** and LASC Teams participating in both LASC Challenges by **50 points.**

Also, Bonus Points may be awarded for Teams which launch in the first and second days of competition. **30 points** will be awarded for Teams which launch on the first day of competition, **15 points** on the second day and **no points** on the last day.

11.2.1. SCORING FLIGHT PERFORMANCE

Team's will be awarded as many as **500 points** – 50% of 1,000 points possible – for their project's flight performance during launches at the Latin American Space Challenge, demonstrated by altitude achieved relative to the target apogee and successful recovery.

The accuracy of the launch vehicle's actual apogee achieved relative to the target apogee is worth **80% (400 points)** of the overall value assigned to flight performance. Precise Trajectory planning is important. Points will be awarded for apogees within ±50% of the target apogee according to the following formula:

$$Points = 400 - \left(\frac{400}{0.5 \times apogee_{category}}\right) \times \left|apogee_{category} - apogee_{actual}\right|$$

Where *Apogee Target may equal either 500 m, 1,000 m or 3,000 m AGL.*
If *the score equation returns a negative number, it will be zeroed.*

Teams shall report in person to competition officials as defined in Section 10.6 of this document.

The successful recovery of the launch vehicle is worth **20% (100 points)** of the overall value assigned to flight performance. A recovery operation is considered successful if it does not result in excessive damage to the launch vehicle. Excessive damage is defined as any damage to the point that, if the systems intended consumables were replenished, it could not be launched again safely.

11.3. SATELLITE CHALLENGE SCORES

Teams will be scored in three different scoring categories or areas, which are (1) Team Effort, (2) the Technical Report, and (3) the Design Implementation. These are weighted according to the table below.

In each scoring category, a set of grading criteria is established. These criteria will be evaluated by the jury for each team individually. Each grading criterion has several, more detailed, topics that establish what the jury will look for during the grading process.

These detailed topics are weighed equally within each criterion, while the main criteria are weighted differently within each competition category. The details of the grading criteria can be found in Appendix C: Detailed Grading Criteria.

Table 4: Weight of the Scoring Categories for the Satellite Challenge.

Scoring Categories	Possible Points	% of Total Points
Team Effort	100	10%
Project Technical Report	200	20%
Design Implementation	200	20%
Satellite Performance	500	50%
TOTAL	**1000**	**100%**

Bonus Points may be awarded for Student Teams by **20 points** and LASC Teams participating in both LASC Challenges by **50 points.**

Also, Bonus Points may be awarded for Teams whose satellite project passes the LRR in the first and second days of competition. **30 points** will be awarded for Teams which receive the satellite approval Flight Card on the first day of competition, **15 points** on the second day and **no points** on the last day.

11.3.1. SCORING SATELLITE PERFORMANCE

Team's will be awarded as many as **500 points** – 50% of 1,000 points possible – for their project's satellite performance during tests (*on the test bench during*

the FRR/LRR) and launch in the 2023 LASC, demonstrated by data collected during the flight until touchdown and successful recovery.

If a satellite successfully integrates with a rocket, but for a reason beyond the Satellite Team's control the rocket is not launched, the Team will receive points if the Flight Card for the launch vehicle is issued.

After launch, Teams shall report in person to competition officials as defined in Section 10.6 of this document. A satellite recovery operation is considered successful if it does not result in excessive damage to the satellite and science data collected during the flight is available to analyze.

Excessive damage is defined as any damage to the point that, if the systems intended consumables were replenished, it could not be launched again safely.

Table 5: Weight of the Scoring Science Performance for the Satellite Challenge.

Satellite Performance Score Criteria	Points	% of Total Points
Satellite Fully Assembled *(On the bench)*	100	20%
Satellite Collecting Reliable Data *(On the bench)*	100	20%
Satellite Integrated to a Rocket *(Flight Card Issued)*	50	10%
Science Performed during Flight *(Reliable Data Collected)*	200	40%
Satellite Successful Recovery *(No Excessive Damage)*	50	10%
TOTAL	**500**	**100%**

11.4. AWARDS

The 2023 LASC will award teams in the First Place and Second Place of each Category for both challenges, the two Technical Achievement Awards, the Team Awards and the Overall Winners for the Rocket and Satellite Challenges. There will be a total of 21 awards.

11.4.1. OVERALL WINNER AWARD

One team among the First Place Award winners in each challenge defined in this document will be named the Overall Winner Award.

The recipient of this prestigious award is determined by qualitative assessments of the competition officials made throughout the entire event.

11.4.2. CATEGORY "PLACE" AWARDS

A First Place Award will be granted to the highest scoring, eligible team in each of the Challenges and Categories defined in this document. A Second Place Award will be granted to the 2nd highest scoring, eligible team in each category. A team is considered eligible for the place award(s) in its category after participating in the 2023 LASC submitting all documents, reports and activities.

In the event no teams meet this definition in a given category, competition officials may issue Category Place Awards at their discretion based on multiple factors – including points accrued, participation and engagement, and overall performance.

11.4.3. JOÃO B. G. CANALLE AWARD FOR TECHNICAL EXCELLENCE

The João B. G. Canalle Award for Technical Excellence recognizes a team which demonstrates exceptional overall engineering discipline and technical skill through their analyses and conclusions, project or program planning and execution, operational procedure, manufacturing processes, iterative improvement, systems engineering methodology, robust design, etc. A team is considered eligible for the João B. G. Canalle Award for Technical Excellence if they are accepted and submit the Project Technical Report.

11.4.4. RICK MASCHEK ENGINEERING AWARD FOR INNOVATION

The Rick Maschek Engineering Award for Innovation recognizes a team whose project includes one or more features (including analytic or operational processes as well as components or assemblies) the judging panel finds genuinely "novel", "inventive", or solving a unique problem identified by the team. A team is considered eligible for the Rick Maschek Engineering Award for Innovation if they are accepted and submit the Project Technical Report.

11.4.5. TEAM CONDUCT AWARD

LASC presents one Team Conduct Award recognizing a team competing in the LASC whose conduct throughout the Latin American Space Challenge is exemplary of goals and ideals held by the event organizers.

The Latin American Space Challenge should be an event where academia, industry, and the public may come together to preserve, popularize, and advance space science in a collaborative environment energized by friendly competition. The Team Conduct Award will be awarded to a single team chosen by the LASC Organization.

11.4.6. TEAM SPORTSMANSHIP AWARD

The Team Sportsmanship Award recognizes a team which goes above and beyond to assist their fellow teams and the organizers assure the event is a productive, safe, and enjoyable experience for all involved. They may do this in many ways, such as making themselves available to lend-a-hand whenever and however they can (whether they are asked to or not), being positive role models for their fellow teams, and generally being a "force for good" in every activity in which they involve themselves. The Team Sportsmanship Award will be awarded to a single team chosen by the LASC Organization.

11.4.7. TEAM SPIRIT AWARD

The Team Spirit Award recognizes a team that has displayed an outstanding effort as working as a unit towards a common goal, by being exceptionally organized, reliable, and prepared in all aspects of the competition, be it deliverables, communication, or operation, and goes above and beyond to display a great sense of team spirit and sportsmanship. The Team Spirit Award will be awarded to a single team chosen by the LASC Organization.

12. UNRULY BEHAVIOR, DISQUALIFICATION, WITHDRAWAL

12.1. PENALTIES FOR UNSAFE OR UNSPORTSMANLIKE CONDUCT

Teams will be penalized for every instance of unsafe or unsportsmanlike conduct recorded by competition officials (e.g., judges, volunteers, staff members, etc.) depending on the severity of the incident. Unsafe conduct includes, but is not limited to, violating any of the established principles stated on LASC documents, failure to use checklists during operations, violating motor vehicle traffic safety rules, and failure to use appropriate personal protective equipment.

Unsportsmanlike conduct also includes, but is not limited to, hostility shown towards any LASC participant and staff, intentional misrepresentation of facts to any competition official, intentional failure to comply with any reasonable instruction given by a competition official.

12.2. DISQUALIFICATION

A number of criteria constitute grounds for disqualification from consideration for any award and continuation at the competition. These can include a failure to meet the defining LASC mission requirements as recorded in this document, failure to submit any Legal or Technical Document and failure to send eligible team member representatives to the LASC.

Substance abuse and intoxication (or after-effects thereof) during the event and purposeful endangering behaviors severely compromising the safety of LASC and respective participants will make the entire team immediately and without further warning, eligible for expulsion from the LASC event in disgrace. If one or more members of a team fails to be utterly sober and clear-headed, this is regarded as outright contempt of the LASC spirit and safety guidelines. The consequence is the immediate and irrevocable removal of the team from the LASC event.

LASC Organizers reserve the right to assess any misconduct/mismanagement case by case and to take the necessary proper actions leading to disqualification of specific team members or the entire team.

12.3. WITHDRAWAL FROM COMPETITION

Teams that decide to formally withdraw from the LASC at any time prior to the event must send an e-mail entitled “TEAM Your Team ID FORMALLY WITHDRAWS FROM THE Competition Year LASC'' to lasc@lasc.space.

For example, a team assigned the Team ID "19" would withdraw from the 2023 LASC by sending an e-mail entitled “TEAM 19 FORMALLY WITHDRAWS FROM THE 2023 LASC''.

13. INSURANCE

The organization of the event will **NOT** be responsible or pay for any accidents, damaged property, and injuries related to the event and caused by enrolled teams; including if a team’s activity damages a person or property. Also, if the person or property owner decides to sue the team, the event’s policy does **NOT** protect the team from the additional lawsuit.

APPENDIX A: ACRONYMS, ABBREVIATIONS, AND TERMS

ACRONYMS & ABBREVIATIONS	
AGL	Above Ground Level
AIAA	American Institute of Aeronautics and Astronautics
APCP	Ammonium Perchlorate Composite Propellant
APRS	Automatic Packet Reporting System
CG	Center of Gravity
CONOPS	Concept of Operations
CP	Center of Pressure
FRR	Flight Readiness Review
GPS	Global Positioning System
LASC	Latin American Space Challenge
LOX	Liquid Oxygen
LRR	Launch Readiness Review
RAA	Rocket Assembly Area
STEM	Science, Technology, Engineering, and Mathematics

TERMS	
Amateur Rocket	14 CFR, Part 1, 1.1 defines an amateur rocket as an unmanned rocket that is "propelled by a motor, or motors having a combined total impulse of 889,600 Newton-seconds (200,000 pound-seconds) or less, and cannot reach an altitude greater than 150 kilometers above the earth's surface".
Excessive Damage	Excessive damage is defined as any damage to the point that, if the systems intended consumables were replenished, it could not be launched again safely. Intended Consumables refers to those items which are - within reason - expected to be serviced/replaced following a nominal mission (e.g. propellants, pressurizing gasses, energetic devices), and may be extended to include replacement of damaged fins specifically designed for easy, rapid replacement.
Non-toxic Propellants	For the purposes of the LASC, the event organizers consider ammonium perchlorate composite propellant (APCP), potassium nitrate and sugar (aka "rocket candy"), nitrous oxide, liquid oxygen (LOX), hydrogen peroxide, kerosene, propane and similar, as non-toxic propellants.

APPENDIX B: DETAILS FOR THE TECHNICAL REPORT

B.1. ABSTRACT

The Project Technical Report shall contain an Abstract. At a minimum, the abstract shall identify the mission/category in which the team is competing, identify any unique/defining design characteristics of the project, and provide whatever additional information may be necessary to convey any other high-level project or program goals & objectives.

B.2. INTRODUCTION

The Project Technical Report shall contain an Introduction. This section provides an overview of the academic program, stakeholders, team structure, and team management strategies. The introduction may repeat some of the content included in the abstract, because the abstract is intended to act as a standalone synopsis if necessary.

B.3. SYSTEM ARCHITECTURE OVERVIEW

The Project Technical Report shall contain a System Architecture overview. This section shall begin with a top-level overview of the integrated system, including a cutaway figure depicting the fully integrated project and its major subsystems or modules – configured for the mission being flown in the competition. This description shall be followed by the following subsections.

Each subsection shall include detailed descriptions of each subsystem, and reflect the technical analyses used to support design and manufacturing decisions.

Technical drawings of these subsystems should be included in the specified appendix.

B.4. MISSION CONCEPT OF OPERATIONS OVERVIEW

The Project Technical Report shall contain a Mission Concept of Operations (CONOPS) Overview.

This section shall identify the mission phases, including a figure, and describe the nominal operation of all subsystems or modules during each phase (e.g. a description of what is supposed to be occurring in each phase, and what subsystem[s] are responsible for accomplishing this).

No matter how a team defines mission phases and phase transitions, they will be used to help organize failure modes identified in a Risk Assessment Appendix – described in this document.

B.5. CONCLUSIONS AND LESSONS LEARNED

The Project Technical Report shall contain Conclusions and Lessons Learned. This section shall include the lessons learned during the design, manufacture, and testing of the project, both from a team management and technical development perspective. Furthermore, this section should include strategies for corporate knowledge transfer from senior team members to the rising underclassmen who will soon take their place.

B.6. WEIGHTS, MEASURES, AND PERFORMANCE DATA APPENDIX

The first Project Technical Report appendix shall contain Weights, Measures, and Performance Data. This requirement will be satisfied by appending the Final Progress Report as the first appendix of the Project Technical Report.

B.7. HAZARD ANALYSIS APPENDIX

The second Technical Report appendix shall contain a Hazard Analysis Report. This appendix shall address as applicable, hazardous material handling, transportation, storage procedures, and any other aspects of the design which pose potential hazards to operating personnel.

A mitigation approach – by process and/or design – shall be defined for each hazard identified.

B.8. RISK ASSESSMENT APPENDIX

The third Technical Report appendix shall contain a Risk Assessment. This appendix shall summarize risk and reliability concepts associated with the project.

All identified failure modes which pose a risk to mission success shall be recorded in a matrix, organized according to the mission phases identified by the CONOPS.

A mitigation approach – by process and/or design – shall be defined for each risk identified. A common description of the Risk Assessment is FMECA (Failure Mode and Effect Criticality Analysis). A Risk Assessment/FMECA is often represented as a spreadsheet matrix. The input to the matrix is listed as follows:

- A description of the identified failure mode.
- The likelihood of the failure mode occurring.
- The severity and impact of the failure mode occurring

The likelihood of a failure mode occurrence and the severity of the occurrence is assigned values according to the following tables:

Table B.0: Likelihood of Failure.

Failure Probability	Value	Assessment of Risk
Remote	1	This is unlikely to happen.
Occasional	2	This might happen.
Probable or likely	3	This is likely to happen.

Table B.1: Severity of Occurrence.

Mishap Severity	Value	Effect of Failure Mode
Minor or negligible	1	Minor impact on mission.
Critical	2	Deterioration of performance and mission.
Catastrophic	3	Safety hazard and/or likely loss of mission

The "Criticality Ranking" is the product of the Failure Probability and the Mishap Severity. The criticality rating is a measure of how urgent and how severe mitigation actions will have to be taken, to reduce the Criticality Ranking.

Table B.2: Criticality Ranking.

Mishap Severity	Value	Effect of Failure Mode
1	Minor	This failure mode is not a concern.
2	Minor	This failure mode is of very minor concern.
3	Medium	Justification needed. Jury may decide to review.
4	High	Technical jury approval needed before launch.
6	Critical	Action required to reduce ranking before launch.
9	Critical	Action required to reduce ranking before launch.

The output of the matrix is highlighting and ranking failure mode liabilities to the mission, and the justifications and mitigations to reduce the Criticality Ranking.

A typical FMECA scale for the complexity of projects attending LASC should feature no less than 10 identified, ranked, commented, and justified failure modes – these should address at the minimum all important and critical failure modes. An illustrating excerpt is given below:

Table B.3: Risk Matrix.

Failure Mode	Mission Phase	Failure Probability	Mishap Severity	Critically Ranking	Team's Comments
Ignition failure	Ignition phase	1	1	1	COTS solid motor with COTS igniter is highly reliable and consequences of a misfire are very minor.
Antenna Deployment failure	Deployment phase	2	3	6	Antenna deployment is mandatory for communication. A redundant system is required.

B.9. ENGINEERING DRAWINGS APPENDIX

The final Project Technical Report appendix shall contain Engineering Drawings. This appendix shall include any revision controlled technical drawings necessary to define significant subsystems or components.

B.10. OPTIONAL APPENDICES

Other optional appendices can include, but are not limited to further Subsystem Details, Launch Support Equipment Details, Detailed Structural and Mechanical Calculation, Detailed Logical Process Diagrams, Detailed Software Architecture, and Detailed Electrical Architecture.

APPENDIX C: DETAILING GRADING CRITERIA

The grading will be conducted by the jury based on the individual grading criterion in the respective competition categories. This is meant to be an intuitive and transparent scheme for the jury to follow and the teams to understand. A summary and overview of the grading scheme is given below for clarity.

Table C.0: Grading Scheme.

Count	For Countable/Relative Criteria
91 to 100%	Outstanding Quality/Conformity
76 to 90%	High Quality/Conformity
51 to 75%	No Greater than Average
Up to 50%	Unsatisfactory

Count	For Absolute Criteria
100%	Yes
0%	No

C.1. TEAM EFFORT

Team Effort will be graded up to 100 points (10% of 1,000 points possible). The total points for Team Effort is a combination of countable, relative and absolute criteria.

Table C.1: Team Effort Grading Criteria.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
1st Progress Report	*10 points* Compliant to Session 9.1	-	-	*0 point* One or more required items missing.	**/10**
2nd Progress Report	*10 points* Compliant to Session 9.1	-	-	*0 point* One or more required items missing.	**/10**
Readiness Review Video	*64-70 points* Completely complies with guidance. Excellent quality, & clarity,	*53-63 points* Complies with guidance in the DTEG with a few minor issues. High video and/or sound quality.	*36-52 points* Minimally complies with guidance in the DTEG. Medium video and/or sound quality. < 10% over time limit.	*< 35 points* Does not comply with guidance. Low video and/or sound quality. More than 10% over time limit.	**/70**
Organization & Comms	*10 points* Clear, open, honest, reliable, timely, and efficient comms prior and during the event.	-	-	*0 point* Unclear, unreliable, repeated and dishonest comms.	**/10**
Team Effort					**/100**

C.2. PROJECT TECHNICAL REPORT

The Project Technical Report will be graded **up to 200 points** (20% of 1,000 points possible) divided into three criteria: Completeness (20 points), Correctness (up to 40 points) and Analysis (up to 140 points). The Completeness Criterion will be scored using Absolute Criteria. The Correctness and Analysis Criteria will be scored in a mix of Countable and Relative Criteria.

Table C.2: Project Technical Report Grading Criteria - Completeness Criterion.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Completeness	*20 points* All required items of the Appendix B present.	-	-	*0 point* One or more required items missing.	**/20**

Table C.3: Project Technical Report Grading Criteria - Correctness Criterion.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Style	*18-20 points* Writing was exceptionally clear, understandable, and concise. Sentence and paragraph organization is exceptional. Writing is free of digressions or irrelevant information.	*15-17 points* Writing was clear, understandable, and concise. Overall paragraph and sentence organization were very good. Digressions or irrelevant information do not significantly detract from the report	*10-14 points* Writing was generally clear and understandable. Paragraph and sentence organization were generally good. Digressions or irrelevant information detract from the report's analysis.	*< 10 points* Writing was repeatedly unclear, difficult to understand or wordy. Overall paragraph and/or sentence organization were ineffective or nonexistent. Digressions and/or irrelevant information consistently detract from the analysis.	**/20**
Mechanics	*10 points* No grammar, spelling, or mechanics errors. Scientific terms correctly used, units and dimensions consistent and correct.	*8-9 points* No more than a few grammar, spelling, or usage errors. Only a few minor errors with use of scientific terms or dimensions.	*5-7 points* Significant spelling, usage, and grammar errors that did not detract from readability. Significant errors with use of scientific terms or dimensions.	*< 5 points* Repeated grammar or spelling errors detracted from readability. Errors with use of scientific terms or dimensions detracted from the report.	**/10**
Format	*10 points* Completely follows the required template. Meets page limits.	*8-9 points* Minor deviations from required template. Meets page limits.	*5-7 points* Major deviations from required template. < 10% over page limits.	*< 5 points* No attempt at cohesive format or use of required template. More than 10% over page limits.	**/10**
Correctness					**/40**

Table C.4: Project Technical Report Grading Criteria - Analysis Criterion.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Depth of Analysis	*46-50 points* Very complete and thorough analysis. All key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs.	*38-45 points* Adequate analysis with minor weaknesses. Most key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs.	*25-37 points* Adequate analysis with significant gaps or weaknesses. Some key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs. Some minor incorrect statements.	*< 25 points* Inadequate analysis. Few, if any key design decisions were discussed No discussion of tradeoffs. Parts of analysis conflict with general scientific knowledge.	/50
Assumptions and Sensitivity Analysis	*27-30 points* All assumptions are clearly stated. Sensitivity analysis is performed to quantify uncertainty in variables and assumptions.	*23-26 points* Most assumptions were addressed. Some sensitivity analysis.	*15-22 points* Unstated assumptions. No sensitivity analysis.	*< 15 points* No stated assumptions or assumptions were unreasonable. No sensitivity analysis.	/30
Verification and Validation Tests	*36-40 points* All verification and validation tests were discussed, both for the final design and key iterations leading to that design. Complete and valid conclusions were drawn from the results.	*30-35 points* Most verification and validation tests are adequately discussed. Appropriate conclusions were drawn from the results, but key iterations prior to final design were not discussed.	*20-29 points* Some verification and validation tests are discussed but consistent. Unclear that conclusions and decisions were drawn from testing results and analysis.	*< 20 points* Unclear whether verification and validation tests were performed. Decisions and conclusions were not drawn from the analysis.	/40
Use of Charts and Figures	*18-20 points* Tables, figures, and appendices all effectively organize and communicate information.	*15-17 points* Use of tables, figures, and appendices is mostly effective.	*10-14 points* Use of tables, figures, and appendices is somewhat effective with significant issues.	*< 10 points* Tables, figures, and appendices were incorrect or misleading.	/20
Analysis					**/140**

Then, the *total score* of the Project Technical Report will be the sum of the points for Completeness, Correctness and Analysis.

C.3. DESIGN IMPLEMENTATION

The Design Implementation will be graded **up to 200 points** (20% of 1,000 points possible) divided into two criteria: Design Quality & Decisions (100 points) and Build Quality 100 points). Both will be scored in a mix of Countable and Relative Criteria.

Table C.5: Design Implementation Grading Criteria - Design Quality & Decisions Criterion.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Team Design Vision, Goals and System Engineering	*64-70 points* Clearly understood and achievable design vision for the project along with a coherent and well-understood set of design goals. All key elements of the project address clearly defined strategic goals for the team. Strong evidence of clear systems engineering discipline throughout by all parts of the design team.	*53-63 points* Design vision is generally understood and mostly achievable with a generally coherent set of goals. Key elements of the project generally address strategic goals for the team. Generally good systems engineering discipline throughout development. Most of the design team works to support a generally coherent and understood set of goals.	*35-52 points* Design vision is incompletely defined or questionably achievable. Unclear how elements of the project address team strategic goals. Some lapses in systems engineering discipline throughout development. Unclear that parts of the design support team goals. Some evidence of different parts of the design team working at cross-purposes.	*< 35 points* Questionable or unachievable design vision for the project. Most elements of the project do not address team goals. Major lapses in systems engineering discipline. No team design goals, or parts of the team clearly ignore stated goals. Clear evidence of different parts of the design team working at cross-purposes.	**/70**
Team Knowledge	*27-30 points* Strong team understanding of the principles governing design and reasoning behind the design. All members of the team can clearly articulate reasoning for choices.	*23-26 points* Generally good team understanding of the physical principles governing design and reasoning behind the design. Team members defer to a few team “experts” during discussion.	*15-22 points* Some team understanding of the physical principles governing design and reasoning behind the design. Team members defer to one or two team “experts” during discussion.	*< 15 points* Inadequate team understanding of the principles governing design and reasoning behind the design.	**/30**
Design Quality & Decisions					**/100**

Table C.6: Design Implementation Grading Criteria - Build Quality Criterion.

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Compliance with DTEG	*27-30 points* Completely complies with guidance in the DTEG	*23-26 points* Complies with guidance in the DTEG with a few minor issues.	*15-22 points* Minimally complies with guidance in the DTEG.	*< 15 points* Does not comply with guidance in the DTEG.	**/30**
Design Quality and Robustness	*27-30 points* Design and build quality are robust and sufficient to operate as intended under reasonably expected conditions.	*23-26 points* Design and build quality are somewhat robust and sufficient to operate as intended under reasonably expected conditions.	*15-22 points* Design and build quality are sufficient to operate as intended under specific conditions but are not robust to reasonably expected variations.	*< 15 points* Design and build quality insufficient to operate as intended under expected conditions. No attempts at robust design.	**/30**

Criterion	Outstanding	High	Average	Unsatisfactory	Points
Fabrication and Construction Methods	*18-20 points* Fabrication and assembly methods completely understood and correctly applied. Manufacturing methods for SRAD elements are both appropriate and completely understood by the team, including cost, time, and performance.	*15-17 points* Fabrication and assembly methods are generally well understood and correctly applied. Manufacturing methods for SRAD elements are both appropriate and reasonably understood by the team, including cost, time, and performance.	*10-14 points* Fabrication and assembly methods are appropriate, but not completely understood. Manufacturing methods for SRAD elements are appropriate, but not fully understood by the team.	*< 10 points* Fabrication and assembly methods inappropriate or not understood. Manufacturing methods for SRAD elements are impractical or not well understood by the team.	**/20**
Consistent Design (30 pts)	*18-20 points* Clearly consistent with the team's vision. No evidence of key systems added as an afterthought.	*15-17 points* Generally aligned with the team's vision. No evidence of key systems added as an afterthought.	*10-14 points* Somewhat aligned with the team's vision. Some key systems added as afterthoughts.	*< 10 points* No apparent organizing vision. Key systems added as field modifications or afterthoughts.	**/20**
Build Quality					**/100**

C.5. FINAL SCORE

The **maximum points** possible are up to 1,000 points *excluding bonuses and extra points*. The bonus points and extra points could reach up to 150 points. The sum of maximum points possible and bonus points is limited to 1,150 points.

- **Bonus Points:** Teams may be awarded with bonus points during the Latin American Space Challenge. The maximum bonus points a team could achieve is 100 points. The following table states all bonus and extra points:

Table C.7: Bonus Points.

Description	Bonus	% of Bonus	Notes
Rocket & Satellite Challenges	50	33,3%	Team participating on both Rocket and Satellite Challenges.
Verified Student Team	20	13,4%	School Letter submitted according to the 2023 LASC Rules & Requirements.
Early Operations	30	20%	Launching on the first day gets 30 points, 15 on second and 0 on third.
Mission Patch	50	33,3%	Submitting a Mission Patch during the 1st or 2nd Progress Update.
TOTAL	**150**	**100%**	

The following equations show how teams should expect the total points of its participation during the Latin American Space Challenge.

- **Equation for the Rocket Challenge:**

Final Score = (Team Effort + Project Technical Report **+**
Design Implementation **+** Flight Performance **+** Bonus **-** Penalties)

- **Equation for the Satellite Challenge:**

Final Score = (Team Effort **+** Project Technical Report **+**
Design Implementation **+** Satellite Performance **+** Bonus - Penalties)

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