



Latin American Space Challenge (LASC)

Range Standard Operating Procedures

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

Revision History

REVISION	DESCRIPTION	DATE
00	Baseline of the document.	07/07/2019

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1. INTRODUCTION

The *Latin American Space Challenge* (LASC) is a three-day series of events that will set the background and provide structure for the Latin America's largest experimental rocket engineering competition.

2. BACKGROUND

The noise, fire, high speeds, and the adrenaline of launching a rocket encourage people to pursue science, technology, and mathematics based careers and for the progress of the science and technology of their countries. A space competition motivates them to extend themselves beyond the classroom to design and build the rockets themselves. Students enrolled in this challenge also could learn to work as a team, solving real world problems under the same pressures they will experience in their future careers.

The *Latin American Space Challenge* (LASC) has a mission to motivate people from all Latin American countries to develop and launch a rocket with a smallsat as a payload. The vision of the LASC is provide motivation to Latin American students and enthusiasts to pursue their dream despite their countries conditions.

3. PURPOSE AND SCOPE

This document promotes flight safety at the Latin American Space Challenge by defining the overarching "run-rules" governing rocket launch related activities (i.e. "the launch") occurring on the *Cape Canavial* property during the event – to include all LASC launches as well as all non-competing, demonstration launches. These activities include the Flight Safety Review process, the final launch setup and countdown procedure(s), and safe rocket retrieval practices.

This document's intended audience includes all participants in the launch – to include the roles and responsibilities of team members (aka "rocketeers") as well as the launch organizers. It is not the purpose of this document to dictate how these roles are assigned to people but to share some examples of how others have organized launches. Understanding no single document can encompass the full range of unique technical and environmental considerations possible at the Latin American Space Challenge, the launch facilitators reserve the right to adapt and amend this document's guidance in real time as necessitated by "real-world" conditions.

This document incorporates the Experimental Sounding Rocket Association (ESRA) document called "*IREC Range Standard Operating Procedures*", which is our baseline event, Tripoli Rocketry Association (TRA) Safety Code, and all observations on student launch initiatives collected by the American non-profit organization Experimental Sounding Rocket Association (ESRA).

Departures from these rules and procedures or from any tailored instructions by event staff and volunteers may negatively affect an offending team's flight status or result in ejection from the

launch – depending on the degree of severity or frequency of infraction. Furthermore, the competition related penalties for unsafe or unsportsmanlike conduct by LASC participants are defined in Sections 6.7.6 and 6.8 of the LASC Rules & Requirements Document.

4. REVISION

It is expected the LASC Range Standard Operating Procedures may require revision in the months leading up to a competition. In addition, major revisions will be accomplished by complete document reissue. Such revisions will be reflected in updates to the document’s effective date.

5. DOCUMENTATION

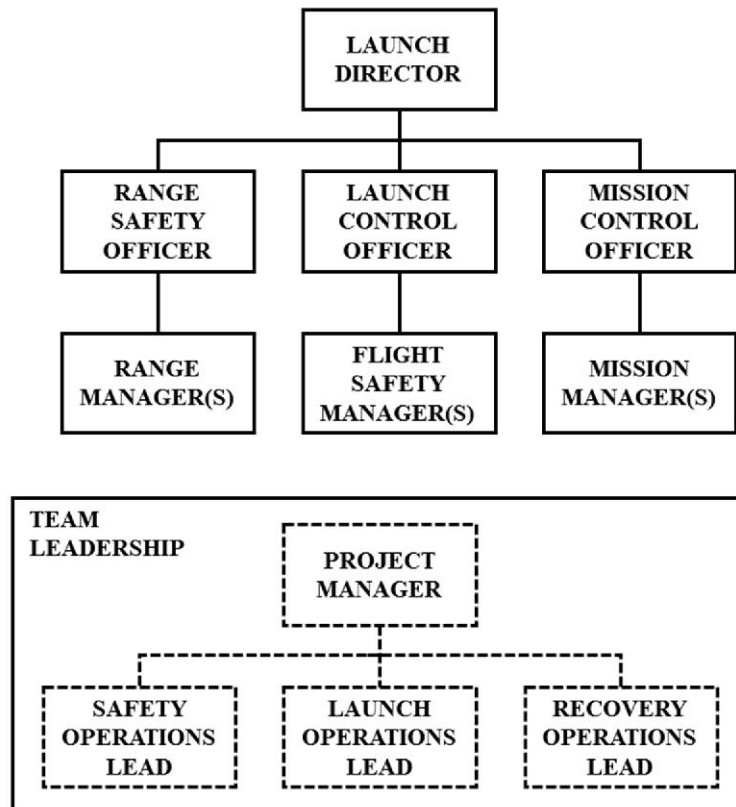
The following documents include standards, guidelines, schedules, or required standard forms. The documents listed in this section are either applicable to the extent specified in this document, or contain reference information useful in the application of this document.

DOCUMENT	FILE LOCATION
LASC Design, Test, & Evaluation Guide	http://lasc.space/documents-and-rules/
LASC Master Schedule Document	http://lasc.space/documents-and-rules/
LASC Rules and Requirements Document	http://lasc.space/documents-and-rules/
LASC Entry Form & Progress Update	http://lasc.space/documents-and-rules/
LASC Flight Card and Post Flight Record	http://lasc.space/documents-and-rules/
TRA Safety Code	http://www.tripoli.org/SafetyCode
14 CFR, Part 1, 1.1 General Definition	https://www.ecfr.gov/cgi-bin/text-idx?SID=795aaa37494b6c99641135267af8161e&mc=true&node=se14.1.1_11&rgn=div8
14 CFR, Part 101, Subpart C, 101.22 Definitions	https://www.ecfr.gov/cgi-bin/text-idx?SID=795aaa37494b6c99641135267af8161e&mc=true&node=se14.2.101_122&rgn=div8

6. ORGANIZATION OF LAUNCH ROLES AND RESPONSIBILITIES

While safety is the responsibility of all participants, there are certain roles that require different sets of specialized skills and focus – listed and overviewed as a hierarchy in the figure below. Those roles will be defined in more detail in the following sections and referenced throughout the rest of this document.

- Launch Director and Launch Logistics Team
- Range Safety Officer (RSO) and Flight Safety Managers
- Launch Control Officer (LCO) and Range Managers
- Team Members (i.e. Rocketeers)



Before reading further, users of this document should consider the following. Although this functional decomposition of roles and responsibilities may be clearly defined on an org-chart, it is almost certainly true that when assigning these roles to actual individuals, most launches will have functional overlap. For example, the Range Safety Officer may also be the Launch Control Officer. Similarly, while every person in a leadership position – including Team Leadership – should identify a deputy for him/herself (to assume his/her full role/ responsibilities during shiftwork, to take over if the primary becomes unavailable), this may not always be possible due to staffing limitations. Finally, any roles' authorities can be delegated to any other reasonably qualified individual(s).

6.1. LAUNCH DIRECTOR

The Launch Director has responsibility for facilitating the launch in its entirety. The Launch Director's primary responsibility is continually ensuring all conditions required for a safe and legal launch activity are being followed. The Launch Director is empowered to terminate the launch at any time, for any reason (e.g. general safety concerns, weather conditions, change in governing authority approval). The Launch Director shall nominally delegate specialized, subordinate role responsibilities to three officer appointees of his/her own choosing – a Range

Safety Officer, a Launch Control Officer, and a Mission Control Officer. It is the responsibility of the Launch Director to assign/delegate people to the roles necessary to organize and run the launch. If the Launch Director chooses not to delegate a particular role to a subordinate, then the Launch Director will assume that role by default. The Launch Director will also be aided in running an orderly event by multiple unspecialized assistants, collectively referred to as the Launch Logistics Team.

6.2. RANGE SAFETY OFFICER AND RANGE MANAGER(S)

The Range Safety Officer (RSO) is a Launch Director appointee responsible for minimizing the risks to personnel and property involved in the handling, preparation, and launch operations of HPR launches. A qualified RSO must have greater than entry-level experience in HPR practices, be knowledgeable in rocketry theory, and well versed in foundational safety regulations and guidelines. The spirit and intent of the RSO's responsibilities are: limit the exposure to hazardous situations to a minimum number of persons for a minimum time, consistent with safe and efficient operations.

- **Site Inspection:** The RSO shall make an examination of all rocket assembly and launch areas to ensure adequate barriers, markings, and other safety measures exist to prevent unauthorized persons from entering, and alert authorized persons to hazardous conditions. Furthermore, the RSO shall be aware of the largest propulsion system that may be supported by each launch area.
- **Range Operations and Status:** The RSO is responsible for determining the status of range operations, communicated using Range Status Flags defined in Section 9.1 of this document, and the Public Address System. The RSO shall reassess the range status prior to any launch salvo and immediately following any mishap. The RSO is empowered to alter the range status at any time, for any reason (e.g. general safety concerns, weather conditions, change in governing authority approval).
- **Airspace:** The RSO must have knowledge of the launch is authorized by authorities governing the affected ground and airspace – including any provisions that come with that authorization (e.g. time windows and altitude ceiling).
- **Weather:** The RSO must have clear and convincing evidence the conditions at the launch site do not violate any weather-related go/no-go criteria defined in Section 10.1.1 of this document.
- **Launch Pads:** The RSO shall familiarize him/her-self with the types of launch pads available at the launch and make a cursory inspection to ensure all pads are located appropriately.
- **Launch Control Systems:** The RSO should become familiar with the launch control systems at the launch and ensure that sufficient safety interlocks are in place to prevent unauthorized ignitions.
- **Emergency:** The RSO shall confirm adequate safety equipment exists at the launch site – to include sufficient firefighting equipment, first aid supplies, and reliable means of communication with other facilitators. Furthermore, the RSO has personal access to reliable means of communication with local fire departments, emergency medical, and security/protective services.
- **Rocketeers Meeting:** The RSO shall conduct at least one Rocketeers Meeting every day any activities occur on the *Cape Canavial*, reminding representatives from all teams of

the run-rules for the day, general safe conduct principles, and communicating any necessary updates to standing instructions.

The Range Safety Officer shall nominally delegate a portion of his/her responsibilities to one or more appointees of his/her own choosing – the Range Manager(s). These assistants are empowered to perform FSRs but are expected to consult with the RSO for input as needed. The RSO may similarly consult with the Launch Director in making determinations. Together, the RSO and his/her Range Manager(s) constitute the Range Safety Team.

Like the Launch Director, the RSO is empowered to terminate the launch at any time, for any reason (e.g. general safety concerns, weather conditions, change in governing authority approval). A decision to terminate by only one of these individuals is required to cease operations, such that in the case of disagreement, the decision to terminate always takes precedence.

6.3. LAUNCH CONTROL OFFICER AND FLIGHT SAFETY MANAGER(S)

The Launch Control Officer (LCO) is a Launch Director appointee responsible for coordinating actual flight operations at HPR launches. It is the responsibility of the LCO to set the tempo of the flight operations, to make sure that launches occur in a timely manner and in accordance with foundational safety regulations/guidelines. The LCO will carry out this coordination through his/her monitoring and execution of the roles outlined below.

- **Site Access:** The LCO (or his/her delegate) shall control personnel access to the rocket assembly and launch areas to include operating the Range Status Flags defined in Section 9.1 of this document based on the RSO's guidance.
- **Flight Cards:** The LCO (or his/her delegate) shall issue Flight Cards to rockets once it is determined any/all issues identified during the FSR are resolved, manage the Cards' use to coordinate each flight with a unique launch pad assignment, and disseminate relevant information recorded on each Flight Card with all participants and spectators using the Public Address System.
- **LCO Inspection:** The LCO (or his/her delegate) shall perform a cursory, final safety inspection of each rocket shortly before sending it to a launch area – intended to verify (with little-to-no disassembly) such criteria as the fins being securely mounted and properly aligned, the launch lugs securely mounted and properly located, the airframe joints being sufficiently stiff, the nosecone properly secured, etc.
- **Launch Pad Integration:** The LCO (or his/her delegate) shall assist Rocketeers as needed with mating and erecting their rocket on the launch rail – while assuring the pad area is cleared of combustible material, and the launch azimuth and elevation are set according to the constraints described in Section 9.4 of this document.
- **Situational Awareness:** The LCO shall promote situational awareness of each flight by communicating the status of a particular rocket – including any associated safety hazards it may pose – to all participants and spectators using radio communications or the Public Address System.
- **Launch Control Systems:** The LCO shall configure, test, and operate the LASC provided launch control system, as well as supervise the use of any rocketeer provided launch control systems.

- Countdown: The LCO shall perform a countdown procedure prior to every authorized ignition using radio communications and the Public Address – including all status checks, readiness polls, announcements defined in Section 10 of this document.
- Flight Safety Review: The LCO (or his/her delegate) shall perform a Flight Safety Review (FSR) of all rockets intended for launch, as described in Section 8.1 of this document.

Only the Flight Safety Team may conduct FSRs, and only the Flight Safety Team may approve the resolution of "major" issues identified during the FSR. It is important to note the LCO has more responsibilities than his/her assistants that perform FSRs.

The LCO shall nominally delegate portions of his/her responsibilities to one or more appointees of his/her own choosing – the Flight Safety Manager(s). Together, the LCO and his/her Flight Safety Managers constitute the Launch Operations Team. The Launch Operations Team may approve the resolution of "minor" issues identified during the FSR. The LCO may choose to hold flights temporarily at any time, for any reason (e.g. general safety concerns, weather conditions, change in governing authority approval).

6.4. MISSION CONTROL OFFICER AND MISSION MANAGER(S)

The Mission Control Officer (MCO) is a Launch Director appointee responsible for enabling and coordinating command, control, and communications (C3) for the Flight Safety and Launch Operations Teams, as well as student teams engaged in rocket search and recovery at the Latin American Space Challenge. The MCO will facilitate these capabilities through his/her monitoring and execution of the roles outlined below. The reader may assume any role specifying the MCO his/herself – as opposed to “the MCO or his/her delegate” – is executed by the Deputy MCO on duty during shift work.

- Radio Communication Networks: The MCO shall establish and manage the use of long-range radio communication networks supporting launch operations and recovery operations, assuring uncluttered communications within these two domains.
- Public Address System: The MCO shall establish and manage the use of a public address system which extends the LCO's situational awareness announcements to personnel in remote locations.
- Command and Control: The MCO shall maintain command and control (C2) of teams engaged in search and recovery of their rocket by authorizing each team's deployment, maintaining two way status communications with each team over radio, persistent tracking of each team through GPS if possible, and compelling each team return – as described in Section 11 of this document.
- Weather Monitoring: The MCO will monitor local area weather reports and data feeds from wind measurement instruments at each launch area, immediately disseminating actionable information on any unsafe condition defined in 10.1.1 of this document to the LCO, RSO and Launch Director – until a decision is made to codify this role in either the MCO's official responsibilities or with another position at the launch.

The MCO shall nominally select of his/her own choosing, or have assigned to them, one or more assistants – the Mission Manager(s). Together, the MCO and his/her Mission Managers constitute the Mission Operations Team. The MCO may hold a flight temporarily by

responding in the negative to a countdown readiness poll or otherwise aborting a countdown, as described in Section 10 of this document, but a decision to hold flights at any other time must be requested of the LCO.

6.5. TEAMS

Individuals and organizations attempting to fly rockets at HPR launches are commonly referred to as "Rocketeers". Rocketeers at the Latin American Space Challenge are assumed to be project teams and their individual members – including advisors and other mentors. The term Rocketeer may be used interchangeably, in reference to either a Team or its individual members. Regardless of each organization's unique internal division of responsibilities and leadership structure, each Team shall provide a member to fulfill each of the following roles. Although these should be separate individuals, it is understandable for these roles to be shared among as few as two or three team members.

Furthermore, while each individual in a leadership position should identify a deputy for him/herself (to assume their full role and responsibilities to facilitate shift-work, to take over if the primary person becomes unavailable), launch organizers understand this may not always be possible due to staffing limitations.

- **Project Manager:** Each Team shall designate a Project Manager for itself, ultimately responsible for all the team's actions and activities at the Latin American Space Challenge, similar to the Launch Director's responsibility for organizing the overall launch.
- **Safety Operations Lead:** Each Team shall designate a Safety Operations Lead for itself (other than the Project Manager), to assist the Project Manager in assuring the team's actions meet the spirit and intent of this document, and account for any unique hazards associated with the team's particular project.
- **Launch Operations Lead:** Each Team shall designate a Launch Operations Lead for itself, responsible for the physical act of launching the rocket, as well as understanding and familiarizing the Launch Control Officer with any countdown procedures unique to the team's particular project.
- **Recovery Operations Lead:** Each Team shall designate a Recovery Operations Lead for itself, responsible for organizing and leading the team members who will recover the rocket after it launches.

While there may be various launch organizers guiding Teams through the launch processes at the Latin American Space Challenge, it is ultimately the Team's responsibility to ensure its rocket launch is safe. Each Team's Project Manager and Safety Operations lead shall attend each Rocketeers Meeting, hosted by the RSO on each day launch are scheduled to occur. These two individuals will in turn be responsible for briefing the rest of their team. Finally, each Team is responsible for ensuring its members are sufficiently well versed (as a collective, if not necessarily as individuals) in their project, to address questions or concerns raised by the Flight Safety Team during the FSR – described in Section 8.1 of this document.

Each Team is responsible for its own members actions, assuring their actions adhere to the spirit and intent of this document as well as any additional direction given by those facilitating

the launch. Therefore, it is very important that all Rocketeers are familiar with this document, and bring departures observed during the event to the attention of launch organizers.

Important: All official written and verbal communications at the Latin American Space Challenge, including all launch operations, are conducted entirely in English or, if applicable, in Portuguese. Inability to understand and react to these communications in a timely manner can create significant safety hazards for all participants. Therefore, it is very important for (at a minimum) the leadership of each student team to have a high degree of fluency in both written and spoken English or Portuguese. For the safety of all participants, the launch organizers strongly recommend against the participation of any student teams unable to meet this requirement

7. PROCEDURE FOR ACQUIRING CREDENTIALS

All participants at the Latin American Space Challenge shall bring an acceptable form of government issued, photo ID and proof of the team's fee payments to access the *Cape Canavial*. A valid passport, *Documento Nacional de Identidad* (any country of Mercosul), or Brazilian driver's license are all considered acceptable forms of government issued photo ID.

Team members will receive their event badges at either one of the two sign-in sessions specified in the LASC Integrated Master Schedule Document. To receive the badges, one team representative must check in and provide the following:

- The team's proof of fee payments. In many cases, the LASC Organization will already have this information, but it is highly recommended to have a printed copy in case there was a technical issue.
- A complete list of attending team members' names and contact information (i.e. phone number and email address where they may be reached during the Latin American Space Challenge) – including faculty team members. This information will be collected for use in contingencies.
- The complete list of attending team members' names will be checked with the list of names who signed the liability waivers before the event. If any names are missing, the person(s) must fill out the release of liability form immediately.

Once given these materials, event staff will issue the team's representative the requisite number of Rocketeer Badges. They will also issue one or more (as needed) Vehicle Placards. Finally, they will receive any gift bags or "swag" items being offered that year.

Any team members arriving late to the Latin American Space Challenge – while scheduled events are occurring on the *Cape Canavial* – must make separate arrangements with their team to receive their Rocketeer Badge from a teammate at the *Cape Canavial* property.

Late arriving team members who attempt entering the *Cape Canavial* without first picking up their Rocketeer Badge from a teammate should expect significant delays before being granted access.

All participants at the LASC shall wear their badges at all times while on the *Cape Canavial* property. Badges shall be worn above the waist, where they are clearly visible – clipped either to a garment or to a provided lanyard. Only vehicles (not including trailers) with a Vehicle Placard will be admitted into *Cape Canavial* property. Placards shall be displayed prominently – on top of either the dashboard or hanging from the rearview mirror.

Finally, all participants shall also carry their respective form of government issued photo ID with them at all times, while on the *Cape Canavial* property.

The following sections describe the access granted to participants issued Rocketeer Badges, as well as the access granted to other badged personnel at the Latin American Space Challenge. All personnel have a shared responsibility for maintaining situational awareness and assuring that only appropriately badged personnel enter a given area.

7.1. “ROCKETEER” BADGED PERSONNEL

All Rocketeers at the Latin American Space Challenge will be issued a light blue themed badge, marked with the word "Rocketeer". This badge grants them access onto the *Cape Canavial*, and unescorted access within the LASC Parking Area, Spectator Area(s), and Rocket Assembly Area(s). During launch operations, Rocketeers are granted access to the Launch Area(s) in accordance with the LCO and RSO's latest instructions – provided at least one Launch Operations or Flight Safety Team member is supervising those area(s) at the time.

7.2. “STAFF” BADGED PERSONNEL

All members of the Launch Logistics Team, Flight Safety Team, Launch Operations Team, and other Competition Officials will be issued a dark-blue themed badge, marked with the word “Staff”. This badge grants them access onto the *Cape Canavial*, and unescorted access within the designated LASC Parking Area, Spectator Area(s), and Rocket Assembly Area(s).

All competition officials at the Latin American Space Challenge who are not also members of the Launch Operations or Flight Safety Teams will be issued the same dark-blue themed badge, marked with the word “Staff”. During launch operations, such Competition Officials are granted access to the Launch Area(s) in accordance with the LCO and RSO's latest instructions – provided at least one Launch Operations or Flight Safety Team member is supervising those area(s) at the time.

7.3. “SPECTATOR” BADGED PERSONNEL

Friends and family of LASC Rocketeers, and members of the general public are welcome to come spectate the launch. These individuals will be asked to pay a spectator fee at the entrance to the *Cape Canavial* in exchange for a gray themed badge, marked with the word “Spectator”. This badge grants them access onto the *Cape Canavial*, and unescorted access within the designated LASC Parking Area and Spectator Area(s).

8. PROCEDURES FOR RECEIVING APPROVAL TO ATTEMPT FLIGHT

Prior to attempting flight at the Latin American Space Challenge, each rocket must pass an FSR and a subsequent final LCO Inspection. Furthermore, LASC competitors are responsible for submitting their payload(s) to inspection prior to fully integrating their launch vehicle for the LCO Inspection – when it is expected the payload(s) may no longer be easily removed. By completing these processes, the rocket's Flight Card will be issued to the Rocketeer, completed by the Rocketeer, and ultimately received by the LCO.

No rocket will be allowed to depart the Rocket Assembly Area (RAA) for the *Cape Canavial* Launch Area (CCLA) without an associated Flight Card in the LCO's possession. The following sections overview each of these processes in the Flight Attempt Approval Procedure. Rocketeers seeking re-approval to attempt flight following any on-pad abort which forced the rocket's return to the Rocket Assembly Area (RAA) must begin the approval procedure over from the beginning; however, the FSR may be abbreviated in such situations at the Flight Safety Team's discretion.

8.1. FLIGHT SAFETY REVIEW AND INITIAL DETERMINATION OF FLIGHT STATUS

The Flight Safety Review (FSR) is the first and most important step in the Flight Attempt Approval Procedure. This review assesses the quantitative and qualitative aspects of the proposed rocket flight, in an attempt to prevent any flight mishaps that might endanger human life or cause damage to property. Although the risk of such incidents can never be completely eliminated, the review process reduces these inherent risks while simultaneously enhancing the probability of a successful flight. In addition to checking for overall compliance with the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – the FSR considers the rocket's general implementation of best practices and safety guidelines in the areas of rocket structures, payloads, propulsion, flight profile, and recovery systems. Ultimately, the Flight Safety Review ensures any residual risks are understood and within reasonable limits.

A more detailed overview of the complete FSR is recorded in Appendix B of this document. Whether a particular FSR rises to the full level of detail possible is at the discretion of the inspector. The inspector may choose to abbreviate his/her review based on the quality of verification & validation testing performed by a particular Team and/or the flight safety history of that Team known to the inspector.

The Flight Safety Team will nominally complete all FSRs during the Poster Session held throughout the LASC Conference day. Any FSRs not completed by the end of the Poster Session will be completed the following day, during launch preparations in the Rocket Assembly Area (RAA). Upon completion of the FSR the inspector will make a flight readiness status decision of either "nominal", "denied", or "provisional" in accordance with the definitions recorded in Section 4 of the LASC Design Test & Evaluation Guide. This decision will be recorded on the 3-part (i.e. 3-carbon copies) FSR Resolution Form.

8.1.1. NOMINAL FLIGHT READINESS STATUS

If the inspector determines the proposed rocket flight is "nominal", he/she will complete the FSR Resolution Form appropriately and initial both its "determination" and "resolution", making sure to record the date and time in the appropriate field of each row. The inspector may also list amended launch condition criteria (e.g. reduced launch elevation or lower permissible ground wind speed) for the Launch Operations Team to implement on this flight attempt. The inspector will leave one part with the Rocketeer and retain the other two copies. The inspector maintain custody of one of these copies as notes for him/herself and deposit the other at a designated "LASC Office" location for official record keeping. For Flight Safety Reviews performed during the conference component of the Latin American Space Challenge, this copy for official record keeping will be given to the RSO at the end of the day for he/she to deposit at the "LASC Office" on the morning of the first launch day. At this point, the FSR is considered "resolved", and the Rocketeer may continue launch preparations.

8.1.2. DENIED FLIGHT READINESS STATUS

If the inspector determines the proposed rocket flight is "denied" based on unacceptable risks, which the Rocketeer stands no reasonable chance of correcting within the time and resource constraints available, he/she will complete the FSR Resolution Form with the rationale for "grounding" and initial both its "determination" and "resolution", making sure to record the time and date in the appropriate field of each row. If the individual issue "Description" lines are insufficient to explain the reason(s) for grounding, the inspector may use the "Instructions to LCO" section to fully describe their rationale in paragraph form. The inspector will leave one part with the Rocketeer and retain the other two copies. The inspector will take maintain custody of one of these copies as notes for him/herself and deposit the other at a designated "LASC Office" location for official record keeping. For Flight Safety Reviews performed during the conference component of the Latin American Space Challenge, this copy for official record keeping will be given to the RSO at the end of the day for he/she to deposit at the "LASC Office" on the morning of the first launch day. At this point, the FSR is considered "resolved", and (if a LASC competitor) the Rocketeer is disqualified. The Rocketeer will make no further launch preparations.

The Rocketeer may choose to appeal such a determination one time only to the RSO – provided the RSO him/herself was not the original inspector. The RSO's decision, once made, is final and supersedes all others. In the event the RSO chooses to overturn the original inspector's determination, he/she will generate a new FSR Resolution form and destroy the Rocketeer's original.

8.1.3. PROVISIONAL FLIGHT READINESS STATUS

If the inspector determines the proposed rocket flight may proceed on a "provisional" basis once the Rocketeer corrects one or more issues, he/or she will complete the FSR Resolution Form by listing these issues and categorizing each as either "minor" or "critical". The inspector may also list amended launch condition criteria (e.g. reduced

launch elevation or lower permissible ground wind speed) for the Launch Operations Team to implement on this flight attempt. The inspector will only initial the FSR Resolution Form's "determination", making sure to record the time and date in the appropriate field of this row. The FSR Resolution form shall not be initialed as "resolved", and (if a LASC competitor) the Rocketeer will be considered temporarily disqualified, until all listed issues have been corrected. The inspector will leave one part with the Rocketeer and retain the other two copies. The inspector will take maintain custody of one of these copies as notes for him/herself and deposit the other at a designated "LASC Office" location for official record keeping. For Flight Safety Reviews performed during the conference component of the Latin American Space Challenge, this copy for official record keeping will be given to the RSO at the end of the day for he/she to deposit at the "LASC Office" on the morning of the first launch day.

8.2. RESOLVING ISSUES IDENTIFIED DURING THE FLIGHT SAFETY REVIEW

Following a determination of "provisional" flight status, the inspector will inform the Rocketeer of the issues requiring correction, and instruct the Rocketeer to request re-inspection only after taking appropriate corrective actions. Re-inspection and FSR "resolution" may be accomplished either by a member of the Flight Safety Team or the Launch Operations Team, depending on whether the issues identified on the FSR Resolution Form are categorized as "minor" or "critical".

- **Minor Issues:** These issues are easily remedied with quick fixes, which mitigate any associated flight safety concerns the issue had caused. A Rocketeer whose FSR Resolution Form lists only "minor" issues may request re-inspection from either a member of the Flight Safety Team or the Launch Operations Team. If the inspector is satisfied the listed issues have all been corrected, he/she will initial the FSR Resolution Form's "resolution", making sure to record the time and date in the appropriate field of this row. At this point, the FSR is considered "resolved", and the Rocketeer may continue launch preparations.
- **Critical Issues:** These issues pose major operational and/or flight safety concerns, the correction of which may be difficult and time consuming. A Rocketeer whose FSR Resolution Form lists any "critical" issues may only request re-inspection from a member of the Flight Safety Team. If the inspector is satisfied the listed issues have all been corrected, he/she will initial the FSR Resolution Form's "resolution", making sure to record the time and date in the appropriate field of this row. At this point, the FSR is considered "resolved", and the Rocketeer may continue launch preparations.

The FSR Resolution form shall not be initialed as "resolved", and (if a LASC competitor) the Rocketeer will be considered temporarily disqualified, until all listed issues have been corrected. Proposed rocket flights deemed unsafe will not be launched under any circumstances. The Flight Safety Team, acting under the RSO's direction, reserves the right to reduce any determination (e.g. from "nominal" to "provisional", or from "provisional" to "denied") based on real-world events, observations, and interactions during the Latin American Space Challenge. In the event such a reduction is made, the notifying official will generate a new FSR Resolution form and destroy the Rocketeer's original.

8.3. PAYLOAD INSPECTION

The LASC competitors are responsible for submitting their payload(s) to inspection prior to fully integrating their launch vehicle for the LCO Inspection – when it is expected the payload(s) may no longer be easily removed. After receiving their Flight Safety Review Resolution Form from the Flight Safety Team, the LASC teams will bring both the FSR Resolution Form and their payload(s) to a designated payload inspection station.

A Competition Official there will assess compliance with Section 6.2 of the LASC Rules & Requirements Document and any penalties or bonuses in accordance with Sections 6.7.7 and 6.7.9 of the same.

Information pertinent to the PION Labs Payload Challenge may also be collected at this time. When finished, the inspector will issue the Rocketeer a Consolidated Flight Card and Post Flight Record Form. The inspector will initial the Flight Card's "Issuance", making sure to record the time and date in the appropriate field of this row.

The Rocketeer is responsible for filling out the Flight Card side of this form prior to submitting their rocket for LCO Inspection. Rocketeer's with a "provisional" flight readiness status determination should not wait for their FSR re-inspection to perform payload check-in.

8.4. FLIGHT CARD ISSUANCE AND LCO INSPECTION

Rocketeers with "resolved" FSR Resolution Forms showing either "nominal" or "provisional" flight readiness status will bring their "resolved" FSR Resolution Form, their filled-out Flight Card, and their flight ready rocket to a designated LCO Inspection station. Range Managers there will perform a cursory, final safety inspection of each rocket – intended to verify (with little-to-no disassembly) such criteria as the fins being securely mounted and properly aligned, the launch lugs securely mounted, and properly located, the airframe being sufficiently stiff and strong, the nosecone properly secured, etc. Questions about shock cords, parachute attachments and motor retention may also be asked.

The Rocketeers will present the inspector with a hard copy pre-flight checklist and an appropriate number of motor/engine igniters. In an attempt to reduce misfires, all solid rocket motors shall use two igniters.

- Important: In this context, "flight ready" does not mean in any way "armed". The flight ready rocket shall be presented for inspection with all motor/engine igniters removed and in an otherwise "safed" configuration, in accordance with the definitions of "armed" and "safed" recorded in Section 9.1 of the LASC Design Test & Evaluation Guide. Exemption from motor/engine igniter removal requirement may be granted only for designs implementing head-in ignition systems, and only at the discretion of the Flight Safety Team – sought by the Rocketeer during the FSR. Similarly, Rocketeer with SRAD ignition configurations believed to obviate the requirement for two igniters, may seek exemption from this requirement during the FSR.

At the start of the LCO Inspection, the inspector will take possession of the Rocketeer's FSR Resolution Form and Flight Card. Upon completing his/her inspection, the inspector will verify with the Rocketeer that all required information on the Flight Card is recorded clearly and correctly before initializing the inspection's "Completion". In the event the LCO Inspection reveals a "minor" issue, the inspector will record the issue in the Flight Card margin (including the time and date of discovery) and return the form to the Rocketeer's possession while they work to correct issue. If the inspector believes any issue revealed to be "critical", he/she will seek the advice of a Flight Safety Team member before proceeding. If the Flight Safety Team Member confirms the issue is "critical", he/she will generate a new FSR Review Resolution Form and destroy the Flight Card as well as the first FSR Resolution Form.

Once an LCO Inspector is satisfied any "minor" issues revealed by the first LCO Inspection attempt are corrected, he/she will initial the inspection's "completion" and take possession of the Flight Card – stapling it atop the FSR Resolution Form already received from the Rocketeer. The Rocketeer will either be cleared to enter the *Cape Canavial* Launch Area (CCLA) with their rocket, or be instructed to hold-short while they're queued in the next available salvo.

No rocket will be allowed to depart the Rocket Assembly Area (RAA) for the *Cape Canavial* Launch Area (CCLA) without an associated Flight Card in the Launch Operations Team's possession. It is the responsibility of the Launch Operations Team member(s) staffing the LCO Inspection Station to deliver the Flight Cards and attached FSR Resolution Forms associated with the upcoming salvo to the on-duty LCO at a designated Launch Control Center (LCC).

- Note: In rare exceptions, where bringing the rocket to the inspection station is deemed completely impractical, a Rocketeer bearing the completed forms may request an LCO Inspector accompany them back to their individual preparation area and conduct the inspection there. Such exceptions will be granted only by the Launch Operations Team member performing the inspection.

9. PROCEDURES FOR RECEIVING APPROVAL TO ATTEMPT FLIGHT

Range Managers will be present in the *Cape Canavial* Launch Area (CCLA) to assist Rocketeers as needed in loading their rockets on the launchers, inserting igniters, and otherwise making final preparations for flight; however, it is the Rocketeer's ultimate responsibility to assure the rocket's launch is safe. The following guidelines and directives shall be followed by all Rocketeers and Range Managers alike.

9.1. RANGE STATUS FLAGS

The RSO is responsible for determining the status of range operations, communicated using Range Status Flags. At least one Range Status Flag will serve the *Cape Canavial* Launch Area (CCLA), located at the entrance to the area typically manned by the on-duty RSO or one of his/her Range Officer Managers. The color of the flag will indicate the range status as either "open", "limited", or "closed".

All personnel shall check-in at a designated LCC at the entrance to the *Cape Canavial* Launch Area (CCLA) before entering or exiting the Launch Area while they are in a controlled state.

A lack of any flag will indicate an uncontrolled state. An uncontrolled state will exist only at the beginning and end of each launch day, when the Launch Director and Governing Authority deem flight activities have not yet commenced or are terminated until the next day.

- *Green: The Cape Canavial Launch Area (CCLA) is “open” to those that have business out on the range;*
- *Yellow: The Cape Canavial Launch Area (CCLA) is “limited” to those essential to arm electronics and install igniters;*
- *Red: The Cape Canavial Launch Area (CCLA) is “closed” due to either imminent rocket launches or the existence of a similar hazardous condition elsewhere in the Launch Area.*

The RSO is empowered to alter the range status at any time, for any reason (e.g. general safety concerns, weather conditions, change in governing authority approval, etc.). The RSO shall reassess the range status prior to any launch salvo and immediately following any mishap.

These visual indicators are intended to augment, but not to override, announcements made over the Public Address System, or any other means of verbal communication available to the Flight Safety and Launch Operations Teams.

Any personnel in the *Cape Canavial* Launch Area (CCLA) who receive a verbal instruction from Flight Safety or Launch Operations Team members in conflict with the current Range Status Flag shall act in favor of the verbal instruction. It is the responsibility of all personnel in the *Cape Canavial* Launch Area (CCLA) to monitor and act on all LCO and RSO directed safety instructions.

9.2. REQUIRED PERSONAL PROTECTIVE EQUIPMENT

Personnel performing arming operations on stored-energy devices, working near armed stored-energy devices, or handling hazardous substances shall use appropriate personal protective equipment (PPE). The following table provides guidance on PPE appropriate to some common stored-energy devices and hazardous substances.

The Section 9 of the LASC Design Test & Evaluation Guide provides basic definitions for when these common stored-energy devices may be considered “armed” - as opposed to “safed”, or “non-energetic”. The appropriate Material Safety Data Sheet (MSDS) should always be used as the definitive resource when selecting appropriate PPE for hazardous substance handling.

The LASC Organization will provide a pair of face shield for the teams while working on their rockets at the *Cape Canavial* Launch Area (CCLA). Teams shall return the face shields before leaving the CCLA.

DEVICE OR SUBSTANCE CLASS	REQUIRED PPE
Armed Igniters/Squibs	Face shield
Armed Pyrogens (e.g. black powder)	Face shield
Armed Mechanical Devices	Face shield
Armed Pressure Vessels	Face shield
Nitrous Oxide, Cryogen, or similar cold fluid lines and valves handling	Leather gloves (or similar insulating protection approved for use with liquid oxygen); Safety glasses or face shield;
Liquid Oxygen (LOX) handling	Leather gloves (or similar insulating protection approved for use with liquid oxygen); Safety glasses or face shield; NOTE: It is especially important to avoid LOX contamination from synthetic material such as from synthetic cloth garments.
Kerosene or similar liquid hydrocarbon handling	Chemical resistant gloves (e.g. PVC, neoprene, Viton, etc.), safety glasses or face shield
Hydrogen Peroxide handling	Chemical resistant gloves (e.g. PVC, neoprene, Viton, etc.), safety glasses or face shield

9.3. REQUIRED PERSONAL PROTECTIVE EQUIPMENT

The number of personnel accompanying a particular rocket into the *Cape Canavial* Launch Area (CCLA) shall not exceed the minimum number absolutely necessary to make whatever final preparations are necessary at the launch pad. Nominally, this number should not exceed four. The Rocketeer may seek an exception for additional personnel from either the Flight Safety Team or the Launch Operations Team, during either the FSR or the LCO Inspection. Exceptions granted during the FSR will be recorded on the FSR Resolution Form as "instructions to the LCO".

The number of personnel accompanying a particular rocket at the launch pad should be further reduced to no more than two once "arming" flight computers, installing motor/engine igniters, and beginning fill procedures (if applicable) are the only tasks remaining to be completed – with all other personnel evacuating back to either the Flight Safety Team's forward deployed location or the Rocket Assembly Area (RAA) based on Range Manager instructions. The Rocketeer may seek an exception for additional personnel from either the Flight Safety Team or the Launch Operations Team, during either the FSR or the LCO Inspection. Exceptions granted during the FSR will be recorded on the FSR Resolution Form as "instructions to the LCO".

9.4. LAUNCH PAD PREPARATION AND LAUNCHER ERECTION

The Rocketeer and any assisting Flight Safety Manager(s) will inspect to make sure all combustible materials have been removed from the ground immediately surrounding the launch

pad. Personnel should avoid pointing the rocket towards either the Rocket Assembly Area (RAA) or *Cape Canavial* Launch Area (CCLA) while loading it on the launch rail. Once loaded, the Rocketeer and any assisting Flight Safety Manager(s) will erect the launcher in accordance with azimuth and elevation requirements recorded in Section 13.1 of the LASC Design, Test, & Evaluation Guide. A Flight Safety Manager will use an angle-meter to verify the launch elevation is set correctly.

9.5. ARMING AVIONICS, INSTALLING MOTOR IGNITERS, AND PROPELLANT LOADING

"Arming" flight computers, installing motor/engine igniters, and beginning fill procedures (if applicable) shall be the final tasks performed before prior to the launch pad being completely evacuated. Electronics will always be "armed" before igniters are inserted or fill procedures are begun (if applicable). The Rocketeer may use a stable platform (e.g. ladder) to reach electronics, if needed. Ladder use should always be a two person operation, with one individual at the base stabilizing and safety-spotting for the other ascending the ladder.

When ready, the Rocketeer shall seek permission from a Flight Safety Manager to install the motor igniters - leaving them shunted for a Flight Safety Manager to either be present while the Rocketeer connects the firing line, or perform this final process him/herself. The installer shall verify the firing line is not "hot" before connecting to igniters, by touching the leads together and checking for sparks. Finally, the installer shall verify all non-essential personnel have evacuated the launch pad before connecting the firing line to the igniters and coordinating a continuity check with the launch control unit. Fill procedures (if applicable) may begin after this step.

In the event the rocket must be removed from the launcher for any reason, the firing line shall be disconnected, the igniter shunted and removed, flight computers disarmed, and any other onboard energetic devices "safed" before the launcher is lowered. The Rocketeer shall consult with a Flight Safety Manager before initiating these steps.

10. PROCEDURES FOR LAUNCH COUNTDOWN, SCRUB, AND MISHAP

Each salvo of flights shall be preceded by a Launch Readiness Poll conducted among the various officers facilitating the flights, coordinated by the LCO. Similarly, each flight in a salvo shall be preceded by a Final Countdown. These processes assure each officer and his/her support staff are prepared to support the flights, as well as to interrupt or terminate the procedure if any launch commit criteria within his/her area of responsibility are violated.

The LCO may revise or amend these baseline processes as needed for unique flight attempts, based either on his/her personal experience or using information recorded on the FSR Resolution Form's "instructions to the LCO". Although he/she is not included in the formal Launch Readiness Poll process, the Launch Director is responsible for monitoring the entire procedure, and may command its interruption or termination at any time for any reason.

10.1. LAUNCH READINESS POLL

The Launch Readiness Poll begins when the RSO informs the LCO that Yellow Flag conditions are in effect at the *Cape Canavial* Launch Area (CCLA) - due to avionics arming, igniter installation, and propellant loading (if applicable) being underway.

While it is understood by both parties the poll process will generally start at this time, the RSO should include a formal instruction for LCO to start the poll process – or to wait for further instructions, if the RSO believes these particular preparations will take longer to complete than typically expected. When instructed, or in the absence of instructions to wait, the LCO will initiate the Launch Readiness Poll Process by taking the following actions.

- 1. Instructing available members of the Launch Operations Team or Launch Logistics Team to raise Yellow Range Status Flags at the appropriate location(s);*
- 2. Announcing over Public Address System the location(s) where Yellow Flag Conditions are in effect, and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for further announcements on launch status while continuing to go about their business;*
- 3. Instructing the MCO over the long-range radio communication network to begin advising deployed rocket recovery teams on the status of launch preparations, as well as directing any returning teams either around the Cape Canavial Launch Area (CCLA), or to hold their position (whichever is safest based on their current location);*
- 4. Announcing over Public Address System the rockets attempting flight in the upcoming salvo, by reading the associated Team ID, Project Name, and School Name(s) from the Flight Cards – received from the LCO Inspection Station – once again concluding by asking all personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for further announcements on launch status while continuing to go about their business.*

If instructed by the RSO to wait before initiating the Launch Readiness Poll Process, the LCO will stand by after completing Step 4 before continuing on to Step 5, otherwise the LCO will proceed without pausing.

- 5. Announcing over Public Address System the Launch Readiness Poll has begun, and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for further announcements on launch status while continuing to go about their business;*
- 6. Instructing the MCO over the long-range radio communication network to advise deployed rocket recovery teams on the status of launch preparations, as well as directing any teams requesting permission to return to instead maintain a safe distance from the Cape Canavial Launch Area (CCLA) until the upcoming salvo has concluded;*
- 7. Instructing the MCO over the long-range radio communication network to respond whether his/her position is "Go for Flight" once he/she verifies the launch commit criteria defined in Section 10.1.1 of this document are met.*

The LCO will stand by while awaiting the MCO's positive response to Step 7, before proceeding to Step 8. During this time it is also expected the RSO will inform the LCO that preparations are complete, final launch pad evacuations are underway, and Red Flag conditions are now in effect in the *Cape Canavial* Launch Area (CCLA). At whatever time the LCO receives this notification from the RSO, he/she will:

(A) Instruct available members of the Launch Operations Team or Launch Logistics Team to raise Red Range Status Flags at the appropriate location and (B) Announce over the Public Address System the location(s) where Red Flag Conditions are in effect, and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for further announcements on launch status while continuing to go about their business.

If after receiving the MCO's positive response to Step 7, the LCO has yet to receive word from the RSO of Red Flag Conditions being in effect, the LCO will query the RSO on the status of launch preparations – reminding him/her to report when preparations are complete, final launch pad evacuations are underway, and Red Flag conditions are in effect.

Note: The LCO may consider announcing a status update over the Public Address System, and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for further announcements on launch status while continuing to go about their business.

The LCO will proceed to Step 8 only after being informed by the RSO that Red Flag conditions are in effect, and taking the appropriate actions defined above.

8. Instructing the RSO over the long range radio communication network to respond whether his/her position is "Go for Flight" once he/she verifies the launch commit criteria defined in Section 10.1.2 of this document are met.

The LCO will stand by while awaiting the RSO's positive response to Step 8, before proceeding to Step 9.

9. Announcing over the long-range radio communication network to whether his/her own position is "Go for Flight" once he/she verifies the launch commit criteria defined in Section 10.1.3 of this document are met.

10. Announcing over Public Address and Giant Voice Systems the Launch Readiness Poll is complete, all positions are "Go For Flight", and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for the start of each flight's Final Countdown Procedure defined in Section 10.2 of this document – reminding these personnel that only during the verbal "ten count" announcement is everyone on the range asked to stop what they're doing, and observe the flight. No need to move or go to a flight line, but you should be listening and heads up. If physically able, people should step outside of their tent so that can see above them.

10.1.1. MISSION CONTROL OFFICER'S LAUNCH READINESS CRITERIA

The MCO will verify the following launch commit criteria are met before responding to the LCO's request for launch readiness status with a "Go for Flight" message.

- Receive positive confirmation over the long-range radio communications network that there is not deployed Recovery Teams;
- Confirm ground level winds in the *Cape Canavial* Launch Area (CCLA) do not exceed 5 m/s or 18 km/h;
- Confirm no wind gust is detected around the *Cape Canavial* Launch Area (CCLA);

- Confirm no lightning is detected within ten miles of the range.

10.1.2. RANGE SAFETY OFFICER'S LAUNCH READINESS CRITERIA

The RSO will verify the following launch commit criteria are met before responding to the LCO's request for launch readiness status with a "Go for Flight" message.

- Confirm that all personnel in the *Cape Canavial* Launch Area (CCLA) who remained to make final launch preparations have now retreated to safe location(s);
- Confirm no hazardous weather conditions – other than the MCO's criteria – exist in the *Cape Canavial* Launch Area (CCLA) in accordance with the "Good Sense Rule", which permits the RSO to hold a launch at any time based on the instability of the weather.

If a flight is deemed unsafe, the RSO has authority to stop preparations, hold a launch, or terminate a launch. A flight deemed unsafe must not be launched under any circumstances.

10.1.3. LAUNCH CONTROL OFFICER'S LAUNCH READINESS CRITERIA

After receiving a "Go for Flight" status confirmation from both the MCO and the RSO, the LCO will verify the following launch commit criteria are met before concluding the Launch Readiness Poll.

- Receive positive confirmation over the long-range radio communications network that all Range Managers, and other authorized personnel under the LCO' control, are aware of impending flights and have retreated to safe locations;
- Confirm no unauthorized personnel are in the *Cape Canavial* Launch Area (CCLA);
- Confirm the sky is clear of aircraft;
- Confirm any cloud cover will not interfere with visual tracking of the rocket in accordance with the five tenths cloud cover rule, which advises against launching a rocket when more than five tenths of the expected trajectory will be blocked by clouds.
- Confirm connection and full operation of the *Remote Launch Control Unit (RLCU)*.

10.2. FINAL COUNTDOWN AND LAUNCH

Each flight in a salvo shall be preceded by a Final Countdown process. The LCO will initiate the Final Countdown process by taking the following actions.

1. *Verifying the associated Team's Launch Operation's Lead – whose name is recorded on the Flight Card – is present at the LCC to perform the physical act of launching the rocket;*
2. *Announcing over Public Address System the rocket about to attempt flight, by reading the associated Team ID, Project Name, School Name(s), and Mission Description from the Flight*

Card (The LCO reserves the right to abbreviate the mission description at his/her discretion in the interest of time management);

- 3. Re-verifying the launch commit criteria defined in Section 10.1.3 of this document are met;*
- 4. Verifying any previously launched rockets in the salvo no longer pose any safety hazards;*
- 5. Arming the Remote Launch Control Unit (RLCU) and verifying continuity with the appropriate launch pad;*
- 6. Announcing over the Public Address System the flight attempt is imminent, and those able in the Rocket Assembly Area (RAA) and Spectator Area should stop what they're doing and observe the flight;*
- 7. Announcing over the Public Address System a countdown from "ten" to "one";*
- 8. Instructing the associated Team's Launch Operations Lead to enter the launch command into the Remote Launch Control Unit (RLCU);*
- 9. Monitoring the flight attempt until it no longer poses any safety hazards, and entering into launch scrub or mishap procedures – defined in Sections 10.3 and 10.4 of this document respectively – if necessary;*
- 10. Safe-ing the Remote Launch Control Unit (RLCU), and quickly completing the Post Flight Record's "LCO Description of Launch Attempt", located on the reverse side of the Flight Card (The LCO's "additional comments" should strive to include a rough bearing of the rockets impact location or last observed drift direction).*

The LCO will repeat Final Countdown process from Step 1 until each rocket in the salvo has either achieved ignition, scrubbed, or he/she terminates the salvo due to a contingency.

10.3. LAUNCH SCRUB

A launch "scrub" occurs when a particular rocket's ignition system fails to trigger the motor/engine start process (i.e. "misfire"), or any other circumstance(s) which prevent a rocket from attempting ignition without risking either of the following occurring:

- *Non-catastrophic mission failure: A non-destructive event which prevents achieving one or more critical mission criteria (typically due to on-board consumable resources depletion) as determined by the Rocketeer;*
- *Catastrophic failure (CATO): A destructive event (due to depletion of on-board consumables or an off nominal configuration change occurring since the time of launcher erection) resulting rocket loss.*

Following any scrubbed flight attempt, the LCO may take any one of the following courses of action. The LCO may revise this guidance as needed for unique flight attempts, based either on his/her personal experience or using information recorded on the FSR Resolution Form's "instructions to the LCO".

- *Press: Continuing the salvo without pause by starting the Final Countdown process, defined in Section 10.2 of this document, at Step 1 for the next flight attempt;*
- *Recycle: Re-attempting ignition by pausing to re-verifying continuity with the appropriate launch pad and re-entering the Final Countdown process, defined in Section 10.2 of this document, at Step 7;*

- *Hold: Implement as long as a two minute hold before continuing to "Press" – in order to eliminate the possibility of a "hangfire" being "mistaken" for a misfire (A "hangfire" describes an ignition attempt whose success is not immediately obvious due to a longer than anticipated delay preceding thrust generation and first-motion).*

After facilitating all remaining flight attempts in the window, the LCO may choose again whether to reattempt ignition of any "misfires" at his/her discretion. Each re-attempt shall be preceded by the complete Final Countdown process defined in Section 10.2 of this document.

The LCO will only record a "Pad Abort" or any "Other" scrub event on the Post Flight Record's "LCO Description of Launch Attempt" once either the Launch Director, RSO, LCO, or Rocketeer determine the rocket should be removed from the launcher and returned to the Rocket Assembly Area (RAA).

The LCO will retain any *Consolidated Flight Card and Post Flight Record* which records a "Pad Abort" or any "Other" scrub event in a file located at the LCC, marked "Non-Events".

A Rocketeer whose rocket returns to the Rocket Assembly Area (RAA) must begin the approval procedure defined in Section 8 of this document over from the beginning; however, the FSR may be abbreviated in such situations at the Flight Safety Team's discretion.

10.4. LAUNCH MISHAP

A launch mishap occurs when a flight attempt results in a CATO event, or any other condition rendering it potentially unsafe to continue the salvo without pause. In the event a launch mishap occurs, it automatically triggers the start of a hold period lasting no less than two minutes, during which time the LCO and RSO will take the following actions.

The RSO may revise this guidance as needed based on his/her past personal experience or observations on events unfolding in "real world".

1. *The LCO will safe the Remote Launch Control Unit (RLCU);*
2. *The RSO will begin using the resources at his/her disposal to assess the condition of the launch areas, and whether any unsafe conditions continue posing either hazards to personnel or risks to further flight attempts;*
3. *The RSO will provide initial guidance to the LCO over the long range radio communications network, updating later as needed. At a minimum this guidance should include the RSO's anticipated hold duration, specifically whether this is more or less than two minutes;*
4. *The LCO will announce the start of the hold over Public Address System, and for personnel in the Rocket Assembly Area (RAA) and Spectator Area to listen for more information while resuming normal activity – reminding these personnel that only during the verbal "ten count" announcement are those able asked to stop what they're doing, and observe the flight;*
5. *The LCO will instruct the MCO over the long-range radio communication network to advise deployed rocket recovery teams on the status of the mishap and any impacts it will have on their activities (if any);*
6. *The LCO will complete the Post Flight Record's "LCO Description of Launch Attempt", located on the reverse side of the Flight Card while awaiting further instructions from the RSO;*

7. When he/she determines the affected Launch Area is secure, the RSO will instruct the LCO to resume the salvo in one of the following ways;

- a. If the hold has not exceeded five minutes, the LCO may resume the salvo by beginning at Step 1 of the Final Countdown Process defined in Section 10.2 of this document;
- b. If the hold has exceeded five minutes, the LCO should resume the salvo by starting at Step 7 of the Launch Readiness Poll Process defined in Section 10.1 of this Document.

Depending on the available time, resources, and the overall severity/impact of the launch mishap the RSO should strive to collect additional records of the incident (e.g. photographic/video records, eyewitness accounts, physical evidence, etc.) which may benefit any subsequent investigation.

The primary purpose of investigating mishaps is to determine the cause, identify corrective actions and take preventative measures in future rocket launch operations. Removing and protecting personnel from danger shall always take priority over any investigative concerns.

11. PROCEDURES FOR ROCKET RECOVERY

The Rocketeer, LCO, and MCO shall engage in the following processes facilitating the safe location and recovery of rockets after any flight attempt not resulting in a "Pad Abort", CATO, or any "Other" scrub event. In addition to promoting the safety of those participating in the search and recovery of the rocket, these processes also assure information relevant to scoring the LASC is recorded, and competitors receive all the credit they deserve for their flight attempt. Although they are not included in the formal process, either the Launch Director or RSO may command the interruption or termination of any recovery operations in progress for any reason.

11.1. FLIGHT CARD RETRIEVAL AND RECOVERY CHECK-IN

There will be individual windows for Recovery Activities. Teams shall not be permitted to recover its rocket during launch activities and the Green Flag does not mean a window for rocket recovery activities.

The number of individuals permitted on a recovery team is no less than two team members. The Mission Managers will append one or more Continuation Sheets to the Rocketeer's document set to facilitate multiple teams being formed or multiple excursions. The Rocketeer may request a modification to these general provisions from the MCO based on their unique situation. In the event the MCO refuses such a request, the Rocketeer may make a one-time only appeal to the Launch Director. The Launch Director's decision, once made, is final and supersedes all others.

1. Upon arriving at the MCC, the Rocketeer will be given their documentation to fill out the "Recovery Personnel Information" and "Measured Apogee as reported by telemetric data (if available)" on the Flight Record;

2. *Once all individuals in the recovery team are present at the MCC, the Mission Manager will verify the completeness of the Post Flight Record with the team members and queue the team for the next available Communications & Tracking Pack (The recovery team members are asked to remain at the MCC while waiting for authorization to depart).*
3. *Once issued, the Mission Managers will record the "Cellphone #" on the Post Flight Record's "Contact Information";*
4. *When authorized to depart, the Mission Managers will record and initial the team's departure time on the Post Flight Record's "Acknowledgement of Recovery Team Departure". The MCO will also convey any possibly useful information on the rocket's location collected by launch organizers.*

No Rocketeer will be permitted to depart the Launch Site – including all areas under the direct supervision of launch organizers – in search of their rocket without the MCO's authorization. Furthermore, no individual will be permitted to engage in recovery operations without proper attire defined in Section 12.4 of this document.

11.2. DEPARTURE FROM THE MCC AND GENERAL COMMUNICATIONS

Shortly after departing from the MCC, the recovery team will make an initial cell phone call to the MCO to verify the Communication is functioning properly. The MCO will respond that communications features are functioning nominally, otherwise the team is required to return to the MCC. Every call to the MCC shall include the following information.

- *Unique Identification: The calling team's Cell Phone #";*
- *Walk Direction: The calling team's current direction of travel using eight-point cardinal coordinates (The MCO will assist the team in orienting themselves prior to their departure from the MCC);*
- *Health & Status: Any other comments relevant to the team's progress and capacity to proceed.*

Every 15 minutes, or as requested by the MCO, the recovery team shall initiate a cell phone call to the MCO with the above information. Any failure to do so may be interpreted by the MCO as an emergency, who may deploy the Emergency Services to the team's last reported location and compel their return.

11.3. EMERGENCY COMMUNICATIONS

If an emergency occurs at any time, the affected team shall initiate a cell phone call to the MCO immediately – beginning with the words “MAYDAY - MAYDAY - MAYDAY” and followed by the following information.

- *Unique Identification: The calling team's Cell Phone #";*
- *Estimated Bearing: The calling team's estimated bearing relative to the MCC using eight-point cardinal coordinates (The MCO will assist the team in orienting themselves prior to their departure from the MCC);*

- *Nature of the Emergency: A summary of the team's situation to assist first responders (If the situation makes it unsafe for the team to return from their current location, the MCO may deploy the Emergency Services).*

11.4. RETURNING TO THE MCC AND POST FLIGHT PROCESSING

The recovery team shall return directly to the MCC either after locating their rocket, or after being compelled to return by the MCO.

- 1. Once the recovery team locates the rocket, they shall initiate a regular radio call to the MCO as described in Section 11.2 of this document;*
- 2. Once the recovery team has secured the rocket and is ready to return to the MCC, they shall initiate a regular radio call to the MCO as described in Section 11.2 of this document.*
- 3. The recovery team will continue to make the regular 15-minute check-in calls described in Section 11.2 of this document as they make their way back to the MCC.*
- 4. Upon arriving at the MCC the Recovery Team will present their rocket for post-flight evaluation.*
- 5. A Mission Manager will record and initial the team's return time on the Post Flight Record's "Acknowledgement of Recovery Team Return";*
- 6. With the team's assistance, the Mission Manager will record the "Measured Apogee as reported by the onboard official altitude logging system";*
- 7. A Mission Manager will make a determination on whether or not the rocket is "excessively damaged" in accordance with Section 6.7.5 of the LASC Rules & Requirements Document and make any "additional comments" they believe pertinent to the Post Flight Record;*
- 8. Once the recovery team and the Mission Manager agree all information has been recorded, the team may depart, while the MCO maintains custody of the stapled document set.*

If the recovery team was unable to locate the rocket on the first attempt, the MCO may append one or more Continuation Sheets to the Rocketeer's document set to log subsequent attempts.

12. GENERAL PROVISIONS FOR OPERATING ON THE CAPE CANAVIAL

The following sections overview a combination required codes of conduct, through which participants retain the privilege of being authorized access to the *Cape Canavial* during the Launch.

12.1. ITEMS AND INDIVIDUALS PROHIBITED

The possession of weapons, open or concealed, is prohibited within the *Cape Canavial*. Smoking and all alcoholic beverages are prohibited, and any open container will result in the person's immediate removal from the *Cape Canavial*. Animals are prohibited. Finally, children under the age of fourteen are discouraged from attending events on the *Cape Canavial* due to potentially harsh conditions and rough terrain.

12.2. CAMPING, COOKING, AND TRASH DISPOSAL

LASC participants are prohibited to camp onsite at the Cape Canavial Area. LASC Organization will not provide accommodations or the permit for camping at *Cape Canavial*, which is a private property. Also, cooking will be not permitted in the Cape Canavial Area by the Teams. Any use of charcoal is prohibited.

All attendees are responsible for preventing littering. All trash will be disposed of in provided waste receptacles or bagged by the participants themselves, and disposed of at the indicated areas. Chemical latrine facilities (i.e. “porta-potties”) sufficient for roughly 400 attendees will be provided and serviced every day.

12.3. VEHICLE USE AT THE CAPE CANAVIAL PROPERTY

LASC participants are permitted to use all classes of vehicles on designated roads, trails, and aprons, as well as designated parking, observation, and rocket assembly areas. This includes vehicle use to access the designated launch area. Furthermore, limited use of all-terrain-vehicles (ATV), “quad-bikes”, “4-wheelers” and similar may be implemented for recovery operations off designated roads and trails with the permission of launch organizers.

The permission will be granted on a case by case basis at the launch itself. No vehicle may operate in excess of 30 km/h while on the *Cape Canavial*, and should not exceed 10 km/h when in close proximity to personnel or their equipment. Persons found to be operating vehicles in an unsafe manner will have their on-site vehicle use privileges revoked, and may be subjected to immediate removal from the *Cape Canavial*, depending on the frequency and severity of infraction.

12.4. RECOMMENDED AND REQUIRED DRESS

Rocketeers will dress appropriately for the harsh environment – including sun exposure, terrain, and wildlife – by using the following guidance.

- *The average daytime temperature during August at the Cape Canavial is 25°C. At night, the temperature may drop to 17°C;*
- *Rocketeers should protect themselves from sunburn, reapplied regularly as directed by the manufacturer;*
- *Rocketeers should protect themselves from eye damage due to sun exposure with UV protection sunglasses;*
- *Rocketeers are required to wear closed toe footwear – which may include closed toe sandals – at all times in the Rocket Assembly Area (RAA) and Launch Area, as well as while engaged in rocket recovery. No individual wearing open toe sandals will be permitted to engage in rocket recovery.*

12.5. UNMANNED AERIAL SYSTEM POLICY

This section pertains to unmanned aerial systems (UAS, drone, quadcopter, multi-copter, unmanned aerial vehicle, UAV, radio-controlled airplane or helicopter, etc.) other than those

deployed by rocket flights at the LASC. The latter are considered payloads, and not subject to the contents of this section.

UAS not deployed by rocket flights at the Latin American Space Challenge – typically flown for the purpose of launch photography/videography, or to assist recovery operations – will adhere to the following rules. The launch organizers reserve the right to deny or terminate the operations of any UAS at any time, if the planned operations or conduct of the operator run counter to the overall goal of promoting flight safety.

- *The UAS or pilot shall be certified by the Agência Nacional de Aviação Civil (ANAC);*
- *The UAS shall weigh no more than 55 lb;*
- *The UAS shall not be flown over 400 ft above ground level (AGL);*
- *The UAS shall not be flown outside the event flight waivers without individual flight approvals from the Agência Nacional de Aviação Civil (ANAC);*
- *The UAS shall not be flown beyond the pilot's visual line-of-sight, nor using first-person-view (FPV);*
- *The UAS shall not be flown over any crowd, designated rocket assembly area, or launch area;*
- *The UAS shall be launched away from the crowd and from a location such that a "return-to-home-point" feature will not carry the UAS over any of the aforementioned areas;*
- *The UAS pilot shall submit for approval in person his/her flight plan(s) to the Launch Director (or his/her delegate) prior to conducting their first flight;*
- *The UAS flight operations shall not interfere with rocket launch operations.*

APPENDIX A: ACRONYMS, ABBREVIATIONS, AND TERMS

ACRONYMS & ABBREVIATIONS	
AGL	Above Ground Level
APCP	Ammonium Perchlorate Composite Propellant
CG	Center of Gravity
CP	Center of Pressure
CONOPS	Concept of Operations
COPV	Composite Overwrapped Pressure Vessel
COTS	Commercial Off-the-Shelf
GPS	Global Positioning System
LASC	Latin American Space Challenge
LOX	Liquid Oxygen
TBA	To Be Announced

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 (93.2 statute miles) above the earth's surface".
Body Caliber	A unit of measure equivalent to the diameter of the launch vehicle airframe in question.
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.

APPENDIX B: FLIGHT SAFETY REVIEW OVERVIEW

Introduction

Before any Rocketeer may request an LCO Inspection to receive a Flight Card, both the rocket and the Rocketeer must pass a preliminary FSR. The FSR shall only be performed by a member of the Flight Safety Team – consisting of the RSO and his/her appointed Flight Safety Manager(s).

In addition to checking for overall compliance with the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – the FSR considers the rocket's general implementation of best practices and safety guidelines in the areas of rocket structures, payloads, propulsion, flight profiles, and recovery systems. Ultimately, the Flight Safety Review ensures acceptable risks are understood and within reasonable limits.

The Flight Safety Team will nominally complete all FSRs during the Poster Session held throughout the LASC Conference day. Any FSRs not completed by the end of the Poster Session will be completed the following day, during launch preparations in the Rocket Assembly Area (RAA). Upon completion of the FSR the inspector will make a flight readiness status decision of either "nominal", "denied", or "provisional" in accordance with the definitions recorded in Section 4 of the LASC Design Test & Evaluation Guide.

This decision will be recorded on the 3-part (i.e. 3-carbon copies) FSR Resolution Form. The inspector will provide one copy to the Rocketeer and retain the other two for official record keeping. If the Rocketeer loses their copy of the FSR Resolution Form during the Latin American Space Challenge, they may request one of the two extra copies from the Flight Safety Team.

- *Nominal: If the inspector determines the proposed rocket flight is "nominal", he/she will complete the FSR Resolution Form appropriately and initial both its "determination" and "resolution". At this point, the FSR is considered "resolved", and the Rocketeer may continue launch preparations.*
- *Provisional: If the inspector determines the proposed rocket flight may proceed on a "provisional" basis once the Rocketeer corrects one or more issues, he/or she will complete the FSR Resolution Form by listing these issues and categorizing each as either "minor" or "critical". The inspector may also list amended launch condition criteria (e.g. reduced launch elevation or lower permissible ground wind speed) for the Launch Operations Team to implement on this flight attempt. The inspector will only initial the FSR Resolution Form's "determination". The FSR Resolution form shall not be initialed as "resolved", and (if a LASC competitor) the Rocketeer will be considered temporarily disqualified, until all listed issues have been corrected. "Minor" and "critical" issues are defined as follows:*
 - *Minor: These issues are easily remedied with quick fixes, which mitigate any associated flight safety concerns the issue had caused. A Rocketeer whose FSR Resolution Form lists only "minor" issues may request re-inspection from either a member of the Flight Safety Team or the Launch Operations Team.*

- *Critical: These issues pose major operational and/or flight safety concerns, the correction of which may be difficult and time consuming. A Rocketeer whose FSR Resolution Form lists any "critical" issues may only request re-inspection from a member of the Flight Safety Team.*
- *Denied: If the inspector determines the proposed rocket flight is "denied" based on unacceptable risks, which the Rocketeer stands no reasonable chance of correcting within the time and resource constraints available, he/she will complete the FSR Resolution Form with the rationale for "grounding" and initial both its "determination" and "resolution". At this point, the FSR is considered "resolved", and (if a LASC competitor) the Rocketeer is disqualified. The Rocketeer will make no further launch preparations.*

Stability Characteristics

The rocket shall demonstrate overall compliance with the spirit and intent of the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – guidance pertaining to rocket stability. Similarly, the Rocketeer shall demonstrate a reasonable degree of competence in generally accepted best practices and safety guidelines pertaining to rocket stability.

The following are examples of topics an inspector is almost certain to inquire on during a typical FSR. They are designed to supplement and reinforce guidance recorded in the LASC Design Test & Evaluation Guide, and should not be considered comprehensive. There are absolutely no limitations on the depth and breadth of inquiry an inspector may make during an FSR.

- *Flight Simulation: Upon request, the Rocketeer can either provide a hard copy, or demonstrate on a portable computer, a 3-degree-of-freedom (3DoF) simulation (or better) of the rocket's nominal trajectory.*
- *Thrust Profile: The propulsion system provides adequate thrust to assure the rocket achieves stability by the time it leaves the intended launcher.*
- *Fin Alignment: The fins mounted parallel to the roll axis of the rocket, or (if canted or otherwise roll inducing) the Rocketeer demonstrate cognizance of the predicted roll behavior and its effects.*
- *Static Margin: The overall design achieves the required 1.5 calibers of stability or greater.*
- *CG/CP Location and Movement: Upon request, the Rocketeer can identify the location of the rockets center of gravity (CG) and center of pressure (CP) at various phases of flight – demonstrating cognizance of anticipated CG shifting due to consumables depletion (e.g. propellant consumption) and CP shifting due to wave drag effects.*
- *Test Criteria: The Rocketeer has met or demonstrated obviation of all stability related testing or simulation recorded in the LASC Design Test & Evaluation Guide.*

Construction Techniques

The rocket shall demonstrate overall compliance with the spirit and intent of the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – guidance pertaining to rocket construction and mechanical

design. Similarly, the Rocketeer shall demonstrate a reasonable degree of competence in generally accepted best practices and safety guidelines pertaining to rocket construction and mechanical design.

The following are examples of topics an inspector is almost certain to inquire on during a typical FSR. They are designed to supplement and reinforce guidance recorded in the LASC Design Test & Evaluation Guide, and should not be considered comprehensive. There are absolutely no limitations on the depth and breadth of inquiry an inspector may make during an FSR.

- *Checklist: Upon request, the rocketeer can provide the inspector with hardcopy checklist procedures for the rocket's assembly and integration for flight – including self-inspection/verification steps which make individual team members accountable to one another for having completed the preceding process(s);*
- *Column loading: The "motor mount" is capable of transferring the anticipated thrust loads to the rest of the rocket structure, and the overall rocket is capable of withstanding these loads;*
- *Slip-fit Joints: Joints intended to separate in flight do not become separated when loaded by their own weight alone, and the Rocketeer demonstrates cognizance of shear pin design (if implemented);*
- *Joint Stiffness: All joints – both separating and non-separating in flight – are "stiff", so as to eliminate any visible airframe bending;*
- *Rail Guide Type: Any Rocket designed for integration with LASC provided launch rails implements rail guides compatible with 40x40 Aluminum Profile;*
- *Rail Guide Attachment: The rail guides are firmly attached to the rocket without evidence of cracking in the joints, and the aft most rail guide attachment is sufficient to bear the rocket's entire mass when erected;*
- *Fin Attachment: The fins are firmly attached to the rocket without evidence of cracking in the joints ("Hairline" cracks may be acceptable if the fins are not at all loose or, if the fins are mounted using the "through-the-wall" [TTW] construction technique);*
- *Fin Stiffness: The fins exhibit no shifting and minimal deflection (i.e. bending) when handled;*
- *Fin "Warp-age": The fins exhibit little-to-no indication of damage due to moisture penetration or excessive thermal cycling during storage or transport – leading to out of tolerance dimensional changes in the part;*
- *Adequate venting: Airframe compartments not specifically designed to pressurize during flight implement an adequately sized vent hole to relieve altitude induced pressurization.*
- *Test Criteria: The Rocketeer has met or demonstrated obviation of all construction and mechanical design related testing, or simulation recorded in the LASC Design Test & Evaluation Guide.*

Propulsion Systems

The rocket shall demonstrate overall compliance with the spirit and intent of the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – guidance pertaining to rocket propulsion system(s) design and implementation.

Similarly, the Rocketeer shall demonstrate a reasonable degree of competence in generally accepted best practices and safety guidelines pertaining to rocket propulsion system(s) design and implementation.

The following are examples of topics an inspector is almost certain to inquire on during a typical FSR. They are designed to supplement and reinforce guidance recorded in the LASC Design Test & Evaluation Guide, and should not be considered comprehensive. There are absolutely no limitations on the depth and breadth of inquiry an inspector may make during an FSR.

- *Checklist: Upon request, the Rocketeer can provide the inspector with hardcopy checklist procedures for the propulsion system's safe handling, assembly, disassembly, and operation (both nominal and off nominal/contingency flows) – including self-inspection/verification steps which make individual team members accountable to one another for having completed the preceding process(s);*
- *Pre-flight and Countdown Procedure: Upon request, the Rocketeer can provide the inspector with hardcopy checklist procedures for any of the propulsion system's unique final on-pad preparations, pre-flight, and launch (both nominal and off-nominal/abort/mishap flows) – including self-inspection/verification steps which make individual team members accountable to one another for having completed the preceding process(s);*
- *Total Impulse: The rocket impulse either does not exceed 9,208 pound-seconds (40,960 Newton-seconds), or the Rocketeer previously consulted with LASC on provisions for launching a larger rocket;*
- *Motor retention: The design provides for positive retention of the propulsion system within the airframe – leaving no possibility for the propulsion system to shift from its retaining device(s) and jettison itself;*
- *Thrust Structure: A "structural chain" exists that transfers the propulsion system thrust to various points on the rocket structure and is capable of withstanding these loads;*
- *Thrust Curve: Upon request, the Rocketeer can provide the inspector with hardcopy thrust curve data for each individual rocket motor or engine implemented;*
- *Test Criteria: The Rocketeer has met or demonstrated obviation of all construction and mechanical design related testing, or simulation recorded in the LASC Design Test & Evaluation Guide.*

Recovery Systems

The rocket shall demonstrate overall compliance with the spirit and intent of the LASC Design Test & Evaluation Guide – or for proof of design, analysis, testing and/or safety mitigations in instances of deviation from the guide – guidance pertaining to rocket recovery system(s) design and implementation. Similarly, the Rocketeer shall demonstrate a reasonable degree of competence in generally accepted best practices and safety guidelines pertaining to rocket recovery system(s) design and implementation.

The following are examples of topics an inspector is almost certain to inquire on during a typical FSR. They are designed to supplement and reinforce guidance recorded in the LASC Design Test & Evaluation Guide, and should not be considered comprehensive. There are absolutely no limitations on the depth and breadth of inquiry an inspector may make during an FSR.

- *Checklist: Upon request, the Rocketeer can provide the inspector with hardcopy checklist procedures for the recovery system's safe handling, assembly, disassembly, and operation (both nominal and off nominal/contingency flows) – including self-inspection/verification steps which make individual team members accountable to one another for having completed the preceding process(s);*
- *Pre-flight and Countdown Procedure: Upon request, the Rocketeer can provide the inspector with hardcopy checklist procedures for any of the recovery system's unique final on-pad preparations, pre-flight, and launch (both nominal and off-nominal/abort/mishap flows) – including self-inspection/verification steps which make individual team members accountable to one another for having completed the preceding process(s);*
- *Inspect for Damage: If previously flown, any used parachutes, shock chords, and suspension lines exhibit no signs of damage which threatens the safe recovery of this rocket;*
- *Parachutes and Parafoils: Any parachutes or parafoils used are rated for the weight of the vehicle and the expected conditions at deployment;*
- *Safe Descent Rate: Parachutes or parafoils intended for the final descent phase to the ground do not allow a decent rate that would represent a safety hazard;*
- *Mechanical Attachment: Shock chords are securely affixed to the rocket structure at sufficiently reinforced locations using hardware of appropriate size/rating for anticipated loads, and any knots will not loosen/slip;*
- *Threaded Attachments: The design implements means for preventing thread walking, stripping, or tear-out;*
- *Personnel Safety: The arming/disarming process does not place the operator in the predicted path of any hot gases, ejecta, or deployable devices which might result from an unintentional triggering event;*
- *Activation devices: The electronics controlling recovery events are activated by externally accessible switches, and do not require any disassembly of the rocket to either activate or deactivate.*
- *Positive State Indication: Each independent set of electronics controlling recovery events provides a sensory (i.e. visual or auditory) indication of its activation;*
- *Hot Gas Management: If applicable, adequate protection is provided to prevent any hot ejection gases from damaging retaining cords, parachutes, and other vital components;*
- *Acceleration Effects on Electronics: Heavy items – most notably batteries – are adequately supported to prevent them from becoming dislodged under anticipated flight loads.*

Conclusion

The Flight Safety Team, acting under the RSO's direction, reserves the right to reduce any determination (e.g. from “nominal” to “provisional”, or from “provisional” to “denied”) based on real-world events, observations, and interactions during the LASC. In the event such a reduction is made, the notifying official will generate a new FSR Resolution form and destroy the Rocketeer's original.

A Rocketeer whose flight status is “denied” may choose to appeal this determination one time only to the RSO – provided the RSO him/herself was not the original inspector. The RSO's

decision, once made, is final and supersedes all others. In the event the RSO chooses to overturn the original inspector's determination, he/she will generate a new FSR Resolution form and destroy the Rocketeer's original.

Source Material

The Flight Safety Review Overview is not an original work done by the Latin American Space Challenge. It summarizes best practices recorded in the TRA Safety Code and by the Experimental Sounding Rocket Association (ESRA). Furthermore, it should be considered as incorporating the LASC Design, Test, & Evaluation Guide in its entirety.

Users of the Flight Safety Review Overview should do so in combination with the LASC Design, Test, & Evaluation Guide, whose entire contents constitute inspect-able criteria and possible grounds for unfavorable FSR determinations.