International Rocket Engineering Competition Rules & Requirements Document

Revision History

REVISION	DESRIPTION	DATE
2026 Version 1.0	1. Baseline for 2026 – changes from the previous version below 2. Updated all references from 2025 to 2026 3. Updated website links for entire document to new ESRA Rocket website and removed all mention of HeroX. 4. Section 2.0: Clarified teams' ability to switch competition categories only downgrades are allowed and specified high altitude demo flights. 5. Section 2.2.1: Clarified guidance on two teams from same institution competing to include non-competing demo category. 6. Section 2.2.3: Updated guidance on Multi-School team. 7. Section 2.3.3: Specified location of payload for two-stage category. 8. Section 2.3.5: Added 5U&6U to Table 1 and reference to other CubeSat factors not accepted. 9. Section 2.3.5.2: Updated the allowed boiler plate mass. 10. Section 2.3.5.4: Clarifying teams who wish to change categories after technical report is submitted can only change to Demo Flight. 11. Section 2.5: Set a time limit teams have with a Judge in Post-Flight Data inspection and point penalty for unpreparedness. 12. Section 2.6: Removed late penalty and changed it to any late submission will result in disqualification from the competition. 13. Section 2.6.1: Included amount of point penalty for incorrect naming convention. 14. Section 2.6.2: Changed word count to page limit for technical reports. 15. Section 2.6.2.1: Do Not Share is not an option for any submission. 16. Section 2.6.2.3: Title changed from Abstract to Executive Summary and updated requirements for the summary. 17. Section 2.6.2.4: Updated content and listed out required topics. 18. Section 2.6.2.5: Updated content to provide clarity. 19. Section 2.6.2.9: Changed from System Weights, Measurements, & Performance Data Appendix to Technical Report Appendices 20. Section 2.6.2.9.1: Added Appendix A-System Weights, Measurements, & Performance Data and content. 21. Section 2.6.2.9.2: Added Appendix B- Project Test Report and content. 22. Section 2.6.2.9.3: Added Appendix C- Hazard Analyses and content. 23. Section 2.6.2.9.3: Added Appendix D- Risk Assessment and content. 24. Section 2.6.2.9.3: Added Appendix E- Checklists and content. 25. Section 2.6.2.9.3: Added Appendix F- Engineering Drawings and content. 26. Section 2.6.3:Included amount of point penalty for incorrect naming convention. 27. Section 2.6.4: Included amount of point penalty for incorrect naming convention. 28. Section 2.6.4.1: Included amount of point penalty for incorrect naming convention. 29. Section 2.6.6.1: Included amount of point penalty for incorrect naming convention. 30. Section 2.8.1: Clarifying teams who wish to change categories after technical report is submitted can only change to Demo Flight.	10/05/2025

REVISION	DESRIPTION	DATE
	31. Section 2.8.1.1: Removed late penalty and changed it to any late submission will result in disqualification from the competition. 32. Section 2.8.1.2: Removed late penalty and changed it to any late submission will result in disqualification from the competition. 33. Section 2.8.1.9: Added Poker Chips section and content. 34. Section 2.8.4.1: Removed all mention of Sportsmanship points. 35. Section 2.8.4.2: Corrected Team Sportsmanship to Team Spirit. 36. Section 2.9: Clarified limit of point deduction to 3 instances or 60 points in either safety or unsportsmanlike conduct. 37. Section 3.1:Updates to release timeline, PDF format of final score sheet and additional penalties can occur. 38. Section 3.5: Appendix B updated from word count to page limit. 39. Section 3.4: Changed Appendix C from Point Violation/Sportsmanship Point Form to Team Violation Point Deduction Form, removed all Sportsmanship Points and added additional info.	

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1.0 PURPOSE AND SCOPE

This document defines the rules and requirements governing participation in the International Rocket Engineering Competition (IREC). Additional guidance for collegiate teams entered in the IREC is contained in the *IREC Design, Test, & Evaluation Guide (DTEG)*, maintained on the ESRA website. The DTEG provides teams with project development guidance ESRA uses to promote flight safety. Departures from this guidance may negatively impact an offending team's score and flight status depending on the degree of severity.

Additional requirements for project deliverables can be found in the Integrated Master Schedule document, which is available on the ESRA website.

If any IREC team is unclear about competition rules and requirements, the spirit and intent of the rules or has a situation not specifically addressed by this document, they should contact ESRA via the Experimental Sounding Rocket Association Discord Server.

1.1 DOCUMENTATION

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

DOCUMENT	FILE LOCATION
IREC Design, Test, & Evaluation Guide	https://www.esrarocket.org/documents-and-forms
IREC Integrated Master Schedule Document (IMS)	https://www.esrarocket.org/documents-and-forms
IREC Range Standard Operating Procedures	https://www.esrarocket.org/documents-and-forms
IREC Team Video Challenge	https://www.esrarocket.org/team-video-challenge
IREC Live Rocket Video Challenge	https://www.esrarocket.org/live-rocket-video-challenge
IREC Project Technical Report Template	https://www.esrarocket.org/documents-and-forms

IREC Extended Abstract Template	https://www.esrarocket.org/documents-and-forms
TRA Unified Safety Code	https://www.tripoli.org/docs/Safety_Code
14 CFR, Part 1, 1.1 General Definitions	http://www.ecfr.gov/General_Definitions
14 CFR, Part 101, Subpart C, 101.22 Definitions	http://www.ecfr.gov/Part101_SubpartC

2.0 INTERNATIONAL ROCKET ENGINEERING COMPETITION OVERVIEW

Student teams competing in the IREC must design, build, and launch a rocket carrying a payload of no less than 4.4 lbs. to a target apogee of either 10,000 ft, or 30,000 ft, or 45,000 ft above ground level (AGL). Team Projects will be divided into one of the following nine categories based on the type of project attempted. Teams are permitted to switch categories/ downgrade from their original accepted category if required, teams are not allowed to upgrade categories. Teams shall switch categories prior to submitting their final Project Technical Report. The team must email prior to the submission of the Project Technical Report an e-mail entitled "TEAM <Your Team ID> FORMALLY SWITCHES CATEGORIES from Competition Year IREC" to general.info@esrarocket.org and must receive approval to this request . For example, a team assigned the Team ID "100" would switch categories from the 2026 IREC by sending an e-mail entitled "TEAM 100 FORMALLY SWITCHES CATEGORIES FROM THE 2026 IREC".

- 10,000 ft AGL apogee with commercial-off-the-shelf (COTS) solid or hybrid rocket propulsion system
- 30,000 ft AGL apogee with COTS solid or hybrid propulsion system
- 10,000 ft AGL apogee with student-researched and developed (SRAD) solid rocket propulsion system.
- 30,000 ft AGL apogee with SRAD solid rocket propulsion system
- 10,000 ft AGL apogee with SRAD hybrid or liquid rocket propulsion system
- 30, 000 ft AGL apogee with SRAD hybrid or liquid rocket propulsion system
- 30,000 ft AGL apogee Two Stage any propulsion type
- 45,000 ft AGL apogee Two Stage any propulsion type
- Non-competing demonstration flights (including high altitude demo flights (50k ft+)

2.1 GENERAL GUIDELINES FOR DESIGN AND FLIGHT OPERATIONS

SRAD propulsion systems are defined as those designed by and manufactured by students. Under no circumstances are the SRAD propellant components/energetic materials to be manufactured by a third party. This includes solid propellant grains.

Multistage launch vehicles and all chemical propulsion disciplines (solid, liquid, and hybrid) are allowed.

Note that all propellants used must be non-toxic. Ammonium perchlorate composite propellant (APCP), potassium nitrate and sugar (aka "rocket candy"), nitrous oxide, liquid oxygen (LOX), hydrogen peroxide, kerosene, propane, and similar substances, are all considered non-toxic. Toxic propellants are defined as those requiring breathing apparatus, special storage and transport infrastructure, extensive personal protective equipment, etc. (e.g., Hydrazine and N_2O_4).

ESRA uses the DTEG to define and promote flight safety. The IREC utilizes national standards including NFPA 1127, FAA and other regulatory organizations. The requirements are specifically

listed in the DTEG. Departures from the DTEG may negatively impact an offending team's score and flight status, depending on the degree of severity.

Competition Officials will evaluate competitors for Awards within each competition category based on the quality of required project documentation, a Poster Session held during the IREC Conference, the quality of their system's overall design and construction, and finally the program's overall operational efficiency and performance demonstrated at the IREC. Furthermore, Competition Officials will select no less than 24 teams to present a particular aspect of their work in a Podium Session held during the IREC Conference. These teams are eligible to receive certain Technical Achievement Awards.

2.2 TEAM COMPOSITION AND ELIGIBILITY

2.2.1 STUDENT TEAM MEMBERS

IREC Teams shall consist of members who were matriculated undergraduate or graduate students (i.e., Masters or Doctoral students) during the previous academic year (e.g., former students who graduated shortly before the competition remain eligible). Two teams may be accepted from the same academic institution if they utilize two different forms of propulsion (e.g. COTS and SRAD Hybrid), including the non-competing demonstration category. A team who wishes to enter into high altitude demo flights may have the same form of propulsion as their competing team.

There is no limit on the overall number of students per team, or the number of graduate students per team. Individual students may only compete on a single team.

2.2.2 TEAM ORGANIZATION AND SUBMISSION LIMITATIONS

Two teams may be accepted from the same academic institution if they are utilizing two different forms of propulsion (e.g. COTS and SRAD Hybrid). Furthermore, no project may be entered in more than one category at the IREC. However, as previously noted, teams are permitted to downgrade to 10k COTS, if necessary, before submitting their final Project Technical Report. The event organizers will track and evaluate each team separately. Each team has to be independent, no shared team members from each accepted team is allowed.

Acceptance into the International Rocket Engineering Competition is highly selective. Teams are strongly encouraged to participate with local rocketry programs to gain high power rocketry flight experience prior to the competition launch days. Teams with SRAD, hybrid, or liquid projects should have experience relevant to their project (ex: minimum of a static, full-scale hot fire). Teams are also encouraged to have an experienced mentor and flyer of record. Competition officials will evaluate the overall quality of the team's application, relevant experience team, outreach efforts, and previous competition experience to determine which teams will be accepted.

2.2.3 TEAM COMPOSITION AND MULTI-SCHOOL TEAMS

In general, the intent is that competing teams should represent one institution. However, when there are not enough capable students at a given institution to form a team, a team can be formed

using students from more than one institution. The team must email general.info@esrarocket.org and must receive approval to this request prior to formation of the multi-school team is allowed to compete. If an institution fields a team, students from that institution cannot join another team. Teams will document their institutional affiliation(s) via the School Participation Letter(s) specified in 2.6.6.1

2.3 PAYLOAD

2.3.1 PAYLOAD MASS

The launch vehicle shall carry no less than 4.4 lbs. of payload. Payload is defined as being replaceable with ballast of the same mass, with no change to the launch vehicle's trajectory in reaching the target apogee, or its successful recovery. This payload may be assumed present when calculating the launch vehicle's stability. There is no requirement for launch vehicles to be stable without the required payload mass on board.

Competition officials will "weigh" the launch vehicle's payload(s) at the International Rocket Engineering Competition with a scale they provide. Understanding there may be discrepancies between a team's scale and the official one used for weigh-in, competition officials will accept payload weigh-ins as much as 5% (~0.2 lb.) less than the specified minimum without penalty. For example, competition officials will not penalize a team whose payload measured 4.4 lbs. on the team's scale but 4.2 lbs. on the officials' scale. Any weight greater than the specified minimum is acceptable. Vehicle payloads must be mechanically robust and not be damaged or shifted in any phase of flight or during recovery. Poorly designed payload may cause a loss of payload score at judge's discretion as described in section 2.8.1.6.

2.3.2 INDEPENDENT PAYLOAD FUNCTIONALITY

Although non-functional "boiler-plate" payloads are permitted, teams are highly encouraged to launch creative scientific experiments and technology demonstrations. However, launch vehicles shall be designed to deliver the payload to the target apogee and recover themselves independent of any active or passive payload function(s). For example, an active launch vehicle stability augmentation system is a launch vehicle subsystem – not a payload. Such launch vehicle subsystems will contribute to competition officials' overall evaluation of a project and may be submitted to the IREC Conference Podium Session described in Section 2.6.4 of this document, but they are not payloads.

Scientific experiments and technology demonstration payloads entered in the IREC may be evaluated for awards. Representatives from the Space Dynamics Laboratory (SDL) host the SDL Payload Challenge – an Intercollegiate Payload Engineering Competition hosted at International Rocket Engineering Competition. Teams wishing to enter their payload(s) into the SDL Payload Challenge should consult the SDL Payload Challenge Page on the ESRA website. (https://www.esrarocket.org/sdl-payload-challenge).

2.3.3 PAYLOAD LOCATION AND INTERFACE

Neither the payload's location in the launch vehicle of a single stage category nor is its method of integration and removal specified; however, for a two-stage category the payload must be in the sustainer. Competition officials will weigh payload(s) independent of all launch vehicle associated systems prior to flight; therefore, the payload(s) submitted for weigh-in shall not be inextricably connected to other launch vehicle associated components (e.g., the launch vehicle's recovery system, internal structure, or airframe) while being weighed. If the payload's design prevents it from being weighed completely independent of the launch vehicle or interface with the launch vehicle (e.g., an adapter to mate the payload to the rocket), competition officials will impose a point penalty on the team in accordance with Section 2.8.1.6 of this document. Judges will also verify the payload’s capability to withstand launch and recovery loads. Teams with payloads that are not properly secured may shift in flight and will be denied launch access until the payload is properly secured. All payloads must be weighed, measured, and checked in by Space Dynamics Laboratory (SDL) before launch no matter the functionality of the payload or whether or not the payload is entered into the SDL Payload Challenge.

2.3.4 RESTRICTED PAYLOAD MATERIALS

Payloads shall not contain significant quantities of lead or other heavy metals. Additionally, payload shall not contain any hazardous materials that impact the health and safety of team members, staff, the general public, the convention center, or the launch site itself. Similarly, any use of radioactive materials shall be permitted only if operationally necessary and approved by competition officials. If approved, any such materials shall be fully encapsulated and are limited to 1 μC or less of activity. Finally, payloads shall not contain any live, vertebrate animals. Approvals shall be gained prior to attending the event and will not be granted on site. If teams have any questions about payload materials, they should seek clarification on the ESRA discord or via e-mail as early as possible.

2.3.5 PAYLOAD FORM FACTOR

The following sections concern the required shape and dimensions of payload(s) submitted for weigh-in. These requirements are different if the payload is a non-functional “boiler-plate” (aka mass emulator) or if it is a functional scientific experiment/technology demonstration (i.e., those entered in the SDL Payload Challenge). Section 2.3.5.1 defines the requirements for non-functional payloads. Section 2.3.5.2 defines the requirements for functional payloads. ESRA’s “Payload Cube Unit” is defined in Table 1 below. This definition applies throughout this document. The definition is inspired by the CubeSat standard but is not identical to it. No other CubeSat factors outside Table 1 will be considered for Payload Bonus Points.

Table 1: ESRA Payload Form Factor Definitions

Payload Cube Units	Dimensions (Length x Width x Height)	Length and Width Tolerance	Height Tolerance
1U	100 mm ×100 mm ×100 mm	± 2 mm	± 2 mm
2U	100 mm ×100 mm ×200 mm	± 2 mm	± 2 mm
3U	100 mm ×100 mm ×300 mm	± 2 mm	± 2 mm
4U	100 mm ×100 mm ×400 mm	± 2 mm	± 2 mm
5U	100 mm ×100 mm ×500 mm	± 2 mm	± 2 mm
6U	100 mm ×100 mm ×600 mm	± 2 mm	± 2 mm

Note: To be compliant with Payload Cube Unit dimensions, the payload outer mold line must be completely inscribed by a rectangle at the minimum tolerance condition and circumscribed by a rectangle at the maximum tolerance condition. For example, a 100 mm diameter rod is not compliant, but a 100 mm cube is.

2.3.5.1 NON-FUNCTIONAL PAYLOAD

Any launch vehicle carrying strictly non-functional payload mass (ie. ballast weight), as it's payload shall do so in the form of a 3U "Payload Cube Unit", listed in table 1 of this document.

2.3.5.2 SCIENTIFIC EXPERIMENT PAYLOAD

Any functional scientific experiment or technology demonstration payload and its associated structure (i.e. those entered in the SDL Payload Challenge) may be constructed in any form factor, provided the experiment/technology and its associated structure remain in compliance with Sections 2.3.1, 2.3.2, 2.3.3, and 2.3.4 of this document. With special regard to compliance with Section 2.3.1, the required minimum payload mass should be achieved primarily by the experiment(s)/technology and associated support structure. The payload design may incorporate up to 1.15 lbs. of non-functional "boiler-plate" mass to meet the required mass minimum while remaining exempt from Section 2.3.5.1 above. This non-functional "boiler-plate mass must be weighed separately from the rest of the payload to ensure it does not exceed the allowed mass as specified above. Competition officials may impose a point penalty on any team believed to be violating the spirit and intent of this rule in accordance with Section 2.8.1.6 of this document.

Finally, despite this exemption, ESRA highly encourages teams to adopt the Payload Cube Unit physical standard for their payload(s) whenever possible – either as the payload structure itself, or as an adapter which the payload is mated to prior to the combined assembly's integration with the launch vehicle (such an adapter could be included in the official payload mass). To promote this

encouragement, teams whose functional payloads do adopt the Payload Cube Unit physical standard will be awarded bonus points in the IREC in accordance with Section 2.8.1.7. To meet this requirement, a payload will have to fit completely in a Payload Cube Unit dispenser with nothing protruding or physically connecting outside as listed in the Table 1 of Section 2.3.5.

2.3.5.3 DEPLOYABLE PAYLOADS

Deployable Payloads that eject a payload out during the flight and or eject once they have landed with the rest of the rocket are allowed. GPS for tracking these deployable payloads is required by the DTEG .Teams are advised to evaluate their designs as deployable payloads will bring a significant project risk and high level of scrutiny to that team's entry. Deployable UAS payloads are prohibited.

2.3.5.4 NON-COMPETITING DEMONSTRATION FLIGHTS

Any team entering a rocket as a high-altitude demonstration flight (that may require a Class 3 waiver) shall coordinate with ESRA officials to ensure the team secures the needed airspace permissions. Teams who enter into the demonstration flight category are not eligible for podium sessions, category, or technical awards. They are still required to submit progress updates, technical report, school participation letter and insurance. Teams who submit the final technical report and wish to change their category can only switch to the non-competing demonstration category via ESRA permission.

2.4 GPS ROCKET TRACKING

All IREC launch vehicles shall carry a Global Position System (GPS) tracking system to expedite rocket recovery. GPS Tracking requirements are described in detail within the IREC Design, Test, and Evaluation Guide (DTEG), maintained on the ESRA website: (https://www.esrarocket.org/documents-and-forms).

2.5 OFFICIAL ALTITUDE LOGGING

Launch vehicles shall carry a COTS barometric pressure altimeter with on-board data storage, which will provide an official log of apogee for scoring. This may either be a standalone COTS product, or a feature of a COTS flight computer also used for launch vehicle recovery system deployment.

While the on-board log is considered the primary data source for official altitude reporting, telemetry – if implemented – may be accepted under certain circumstances defined in Section 2.8.1.4 of this document. If implemented, this telemetry data shall originate from the same sensor source as the official on-board data log.

All rocket recovery teams must report directly to the Postflight Inspection tent once they return with their rocket, along with any required equipment (e.g., laptop, cables and tools) to read the altimeter data to the Postflight Inspection team. The Postflight Inspection team will first listen to the beeps from the altimeter and/or then verify using the altimeter readout of the flight data. The

first COTS altimeter that students choose to connect to or listen to the beeps will be the official altitude data. The only exception is if the altimeter is damaged and data is unreadable. Altitude data is critical to providing a final score for your team. Teams will be required to open up/ take apart the electronics bays during this review. Teams are expected to come prepared with all the necessary tools and equipment for this and should expect not to have access to power or internet. Teams will have 45 minutes to complete this review with a Post Flight Data Inspection Judge. Once this time passes teams will incur a 20-point penalty for unpreparedness and holding up the line . The cutoff check-in time for teams with their rocket at Postflight Data Inspection during Wednesday-Friday is 20:00 local time. For Saturday, the cutoff check-in time for this inspection is 09:00 local time. Failure to report directly for the Postflight Inspection could cause your team to be penalized up to and including a zero-flight altitude score. ***Any team that has not received a recovery score by 10 am on Saturday will receive a zero-flight altitude score, no matter the circumstances***. ***DO NOT WAIT UNIT THE FINAL DAY TO LAUNCH OR RECOVER!***

2.6 PROJECT DELIVERABLES

The following sections define the deliverable materials (e.g., paperwork and presentation materials) competition officials require from teams competing in the IREC – including as appropriate each deliverable's format and minimum expected content. All deliverables will be submitted to ESRA per the instructions provided to the teams. Each relevant deliverable description will facilitate submission of that deliverable or will be communicated to teams as is determined by ESRA. Late submissions will disqualify the team from the competition. Incomplete, or incorrect submissions, including progress updates, will result in a loss of points in accordance with paragraph 2.8.1.1. Submissions are incorrect if data is incorrect, entered the wrong fields or not entered in accordance with submission guidance. This too includes entering units when only numerical data is requested.

The scheduled due dates of all required deliverables are recorded in the *Integrated Master Schedule Document*, maintained on the ESRA website (https://www.esrarocket.org/documents-and-forms).

2.6.1 ENTRY FORM AND PROGRESS UPDATES

Each team shall inform ESRA of their desire to compete in the IREC by registering as a new team on the Experimental Sounding Rocket Association website: (esrarocket.org). Teams shall submit progress updates via the esrarocket.org site on three specific occasions prior to the competition. The third progress will include a live video review to be held online. These progress updates will record progression in the project's technical characteristics during development. Competition officials understand not all technical details will be known until later in the design process. Therefore, the Entry Form and all subsequent Progress Updates prior to the final submission will be evaluated based only on their timeliness and completeness. Timeliness and completeness are defined as follows:

Total completeness of the entry form and subsequent updates is always required. Reasonable engineering estimates and approximations are expected during the application process but will be subject to progressive additional scrutiny in the subsequent Progress Updates. Teams should briefly mention their ongoing discussions and analysis in the comment fields for any numerical submissions that are known to be unreasonable or remain undecided. Teams may also respond to undecided criteria by demonstrating their understanding of any applicable event guidance or best practice governing the particular detail. In general, ESRA expects technical information to change, but information must always be provided. Only teams whose application meets this standard will be evaluated for entry into the competition. Accepted teams will be announced per the Master Schedule and each accepted team will receive a Team ID. Once assigned, any correspondence between a team and ESRA must contain that team's ID number to enable a timely and accurate response. **All submissions for the following progress updates shall follow the naming convention TeamID_Formal University Name_Purpose. Example: Team100_ESRA University_ Progress Report 1. Any other naming convention used will incur a 5-point deduction from the corresponding submission.**

2.6.1.1 ONLINE PROGRESS UPDATE AND SAFETY REVIEW

For the 3rd progress update, teams will submit information on esrarocket.org and discuss their rocket in an online session with safety reviewers. Specific instructions will be forthcoming, but teams should expect to create a short slide presentation reviewing their current progress and to discuss issues previously raised by the safety reviewers. Teams shall have their rocket available for review (realizing that the build should be mostly complete by this point in the competition). **Teams are responsible for coordinating and providing a meeting link to this online safety review with their established Flight Safety Reviewer(s) (as they have been providing feedback to teams in Progress Report 1 &2) , Flyer of Record and Mentor all must be invited and present. Teams are responsible for recording this safety review and sending it to ESRA to be uploaded onto ESRA's social media platforms.**

Note: Teams who have significant production work remaining by the 3rd progress update may be disqualified.

2.6.1.2 INITIAL SAFETY REVIEWS

Each progress update will be reviewed for safety, DTEG, and rules compliance. Safety reviewers will contact teams if necessary to resolve any issues or questions. Teams that are unable to satisfactorily resolve safety-related issues may be disqualified.

Note: these online safety reviews are not a substitute for the "hands-on" safety review and RSO process conducted during the actual competition.

2.6.2 PROJECT TECHNICAL REPORT

Each team shall submit a Project Technical Report that describes its project for the judging panel and other competition officials. The Project Technical Report shall be formatted similarly to the template provided below and shall use the American Institute of Aeronautics and Astronautics (AIAA) style guide, found on the AIAA website.
(https://www.aiaa.org/publications/journals/Journal-Author/punctuation-spelling-and-style)

The *Intercollegiate Rocket Engineering Competition Project Technical Report* template is available for download on the ESRA website (https://www.esrarocket.org/documents-and-forms). Always check the template maintained on the ESRA website before drafting your Project Technical Report to ensure you are using the latest version.

Teams are permitted to use other document preparation software, such as LaTeX, to prepare their Project Technical Report, but they must ensure that formatting is identical to the ESRA template.

For COTS teams, the main body of the technical report is limited to 25 pages, inclusive of all tables and graphics. For SRAD and Hybrid/Liquid teams, the main body of the technical report is limited to 35 pages, inclusive of all tables and graphics. Appendices may be of any length.

In accordance with the IMS dates, teams shall submit a single digital PDF copy of their Project Technical Report. Technical reports exceeding 50 Megabytes in size may need to be uploaded to a cloud server if the permissions allow the judges unrestricted access to the document. Teams shall submit their Project Technical reports using the esrarocket.org website (esrarocket.org). Teams should bring a limited number of hard copies to the International Rocket Engineering Competition so members of the judging panel and other competition officials may consult the contents at will during interactions with the team.
The Project Technical Report's main title page is left to the team's discretion, however; the paper shall be subtitled “Team <Your Team ID> Project Technical Report to the <Year> IREC". For example, a team assigned the Team ID "100", competing in the 2026 IREC, would subtitle their Project Technical Report "Team 100 Project Technical Report to the 2026 IREC".

2.6.2.1 PUBLICATION

All reports will be publicly published after the event concludes. Petitions for confidentiality will not be accepted. DO NOT SHARE is not an option for any technical report or extended abstract submission.

2.6.2.2 AUTHORSHIP AND CONTACT INFORMATION

The Project Technical Report shall list every author who has made a significant contribution to the report and include the team’s academic advisor. Each individual’s academic affiliation shall be specified in the format [Institution, City, State, Postal Code, Country]. Vary the address format as required if your country’s address format is different. The corresponding author shall be identified,

and email provided. The corresponding author shall be contactable at their provided email for at least two years after submission.

2.6.2.3 EXECUTIVE SUMMARY

The report shall contain an executive summary. This summary is limited to one page. This summary shall identify the competition category, identify the major rocket components, describe the payload mission (note: ballast is a mission!), describe any unique features of the design, and briefly summarize the testing required and the testing performed.

2.6.2.4 INTRODUCTION

The report shall contain an introduction. This introduction is limited to two pages and shall address the following topics:

1. Category in which the team is competing
2. Unique design characteristics of launch vehicle
3. Payload mission (even if it is only dead weight)
4. High-level project or program goals and objectives (this can be anything from "this is our first-year competing, so a nominal flight is the goal," to "fix what went wrong last year" to, for example, developing active apogee control)
5. Overview of the academic program (is this an extracurricular activity or part of a formal academic effort with credit given, etc.)
6. Overview of contributors to the project outside the team and academic advisor (this would include university and commercial facilities used for construction and testing, and funding sources)
7. The team structure presented as an organization chart (if the titles or position names are self-explanatory, no further description is needed)
8. Overview of the team management strategies
9. How the Project Technical Report was prepared (i.e., did one person do all the writing or did section leaders prepare their sections; was a single person in overall charge, how was the report edited, etc.)

2.6.2.5 SYSTEM ARCHITECTURE OVERVIEW

The Project Technical Report shall contain a System Architecture overview. This section shall begin with a top-level overview of the integrated system, including a cutaway figure depicting the fully integrated launch vehicle and its major subsystems – configured for the mission being flown in the competition. This description shall be followed by the following subsections. Each subsection shall include detailed descriptions of each subsystem, and reflect the technical analyses used to support design and manufacturing decisions. The Project Technical Report should not just discuss what the team did, but **the reasoning for the choices**. These may include, but are not limited to, design goals, limitations, potential trade-offs, anticipated component loads along with safety factors. Technical drawings of these subsystems shall be included in Appendix F.

- Aero-structures Subsystems
- Propulsion Subsystems

- Avionics
- Recovery Subsystems
- Telemetry
- Payload Subsystems
- Any other subsystems that are flight critical and will aid in evaluating the overall project. If there are none, then state none.

2.6.2.6 MISSION CONCEPT OF OPERATIONS OVERVIEW

The Project Technical Report shall contain a Mission Concept of Operations (CONOPS) Overview. This section shall identify the mission phases, include a figure, and describe the nominal operation of all subsystems during each phase (e.g., a description of what is supposed to be occurring in each phase, and what subsystem[s] are responsible for accomplishing this). Furthermore, this section shall define what mission events signify a phase transition has occurred (e.g., "Ignition" may begin when a FIRE signal is sent to the igniter and conclude when the propulsion system comes up to chamber pressure. Similarly, "Liftoff" may begin at vehicle first motion, and conclude when the vehicle is free of the launch rail). Phases and phase transitions are expected to vary from system to system based on specific design implementations and mission goals & objectives. No matter how a team defines these mission phases and phase transitions, they will be used to help organize failure modes identified in a Risk Assessment Appendix – described in Section 2.6.2.9 of this document.

2.6.2.7 CONCLUSIONS AND LESSONS LEARNED

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

2.6.2.8 ACKNOWLEDGMENTS

The Project Technical Report shall contain an acknowledgment section for key individuals, institutions, and funding sources.

2.6.2.9 TECHNICAL REPORT APPENDICES

The Project Technical Report shall contain the following appendices in the order listed.

2.6.2.9.1 APPENDIX A- SYSTEM WEIGHTS, MEASURES, AND PERFORMANCE DATA

Information can be reported using either Imperial or Metric units (inches, feet, pounds, Newtons, etc.). Do not mix unit systems except where the manufacturer uses a system different from the report, in which case, provide the converted parameter in the unit system of the rest of the report. This information shall include:

a. Basic rocket vehicle information

    1. Number of stages
    2. Length
    3. Airframe diameter
    4. Number of fins
    5. Fin semi-span
    6. Fin tip chord
    7. Fin root chord
    8. Fin thickness
    9. Weight on launch rail
    10. Propellant weight
    11. Empty motor case/structure weight
    12. Payload weight
    13. Liftoff weight
    14. Center of pressure
    15. Center of gravity
    16. Launch rail length

b. Propulsion information

    1. Motor type
    2. Whether it is COTS or SRAD
    3. COTS manufacturer and designation
    4. Motor letter classification
    5. Average thrust (N)
    6. Total impulse (Ns) and
    7. Motor burn time

c. Predicted flight data

    1. Liftoff thrust-weight ratio (X:1)
    2. Rail departure velocity
    3. Minimum static margin
    4. Maximum acceleration (G)
    5. Maximum velocity
    6. Fin flutter velocity
    7. Target apogee
    8. Predicted apogee (is this the same as the competition class)

d. Flight profile graph. (what information must be included)
e. Recovery information

    1. Altimeters used

i. COTS
ii. Redundant

2. Drogue parachute information
   i. Primary deployment charge
   ii. Backup deployment charges
   iii. Deployment altitude
   iv. Descent rate
3. Main parachute information
   i. Primary deployment charge
   ii. Backup deployment charges
   iii. Deployment altitude
   iv. Descent rate
4. Parachute shock cords
5. Mechanical links

2.6.2.9.2 APPENDIX B- PROJECT TEST REPORT

The second Project Technical Report appendix shall contain applicable Test Reports from the minimum tests prescribed in the *IREC Design, Test, & Evaluation Guide* (https://www.esrarocket.org/documents-and-forms). These reports shall appear in the following order. In the event any report is not applicable to the project in question, the team shall include a page marked "THIS PAGE INTENTIONALLY LEFT BLANK" in its place.

a. Recovery system testing: In addition to descriptions of testing performed in accordance with the DTEG sections 6.13 - 6.16 and the results thereof. This appendix shall include a figure and supporting text describing the dual redundancy of recovery system electronics.
   1. Recovery System [DTEG 6.13]
   2. Ground Test Demonstration [DTEG 6.13.4]
   3. Flight Test Demonstration [DTEG 6.13.5]
   4. Dual Redundancy of Recovery Electronics [R&R 2.6.2.10.a.]
   5. Stored-Energy Devices – Energetic Device Safing and Arming [DTEG 6.14]
   6. Arming Devices [DTEG 6.15]
   7. Arming Device Verification [DTEG 6.16]

b. SRAD propulsion system testing (if applicable): In addition to descriptions of testing performed and the results thereof, teams developing SRAD hybrid or liquid propulsion systems shall include in this appendix a fluid circuit diagram. This figure

shall identify nominal operating pressures at various key points in the system – including the fill system.

c. SRAD pressure vessel testing (if applicable)
d. SRAD GPS testing (if applicable)
e. Payload recovery system testing (if applicable)

2.6.2.9.3 APPENDIX C- HAZARD ANALYSES

This appendix shall contain a hazard analysis that addresses, as applicable, hazardous material handling, transportation and storage procedures of propellants, and any other aspects of the design which pose potential hazards to operating personnel. A mitigation approach – by process and/or design – shall be defined for each hazard identified. An example of such a matrix is available on the ESRA website at (https://www.esrarocket.org/documents-and-forms).

2.6.2.9.4 APPENDIX D- RISK ASSESSMENT

This appendix shall contain a risk assessment that summarizes risk and reliability concepts associated with the project. All identified failure modes which pose a risk to mission success shall be recorded in a matrix, organized according to the mission phases identified by the CONOPS. A mitigation approach – by process and/or design – shall be defined for each risk identified. An example of such a matrix is available on the ESRA website at (https://www.esrarocket.org/documents-and-forms).

2.6.2.9.5 APPENDIX E – CHECKLISTS

This appendix shall contain the following checklists that include detailed step by step procedures for

a. Final assembly
b. Preflight
c. Arming
d. Launch
e. Recovery
f. Off-Nominal (these checklists shall include alternate process flows for disarming/safeing the system based on identified failure modes [e.g., off-nominal situations]. These off-nominal checklist procedures shall not conflict with the *IREC Range Standard Operating Procedures*.)
g. Any other checklists required due to special design features such as payload

Teams developing SRAD hybrid or liquid propulsion systems shall also include in this appendix a description of processes and procedures used for fill and vent procedures (including fault procedures) along with procedures for cleaning all propellent tanks and other fluid circuit components.

Competition Range officials will verify teams are following their checklists during all operations for which checklists are provided. Therefore, teams shall maintain a complete, paper hardcopy of

these checklist procedures with their flight hardware during all range activities. Insufficient detail, failure to bring paper hard copies, and failure to use your team's detailed checklist will make your team ineligible for flight activities until conflicts are resolved.

2.6.2.9.6 APPENDIX F – ENGINEERING DRAWINGS

This appendix shall contain detailed engineering drawings including any revision-controlled technical drawings necessary to define significant subsystems and components. Drawings shall be provided for all SRAD subsystems or components. Each drawing shall include dimensions and any other specifications required to define the part.

To reduce file size, please do not embed full CAD models – just use a picture.

2.6.3 POSTER SESSION MATERIALS

Each team shall bring to the International Rocket Engineering Competition a poster display which overviews their project for industry representatives, the general public, other students, and members of the judging panel. The information provided should encompass the overall project's design, testing, CONOPS, and purpose. The poster shall measure approximately 36 inches × 48 inches and must be self-supporting on either an organizer provided table or team provided easel. No partitions or other structures for hanging posters will be provided. Finally, the poster shall prominently display the team's Team ID in the top, right corner, in bold, black, size 72 or larger, Arial font (or similar), on a white field.

These displays – as well as any practicable non-energetic project hardware – will be exhibited in a Poster Session held during the IREC Conference. One or more team members are expected to remain with the display throughout the day to answer questions and present their work to industry representatives, the general public, other students, and competition officials who will be coming to the individual tables to do the Design Build and Quality Judging. All teams shall participate in the Poster Session, regardless of whether or not they are additionally selected to participate in the Podium Session described in Section 2.6.4 of this document. Any team not present for Conference day will incur a 20-point unsportsmanlike conduct penalty.

On the specified date per the IREC Integrated Master Schedule Document, teams shall submit a digital, PDF copy of their poster display to International Rocket Engineering Competition website (esrarocket.org). Teams that do not submit these materials or follow the submission requirements outlined above will incur a 20-point administrative penalty. The event organizers will post these files in an online archive of the conference proceedings. The submission location and method for the Poster Session Materials is to be determined and will be communicated to the teams on esrarocket.org.

Note: All energetics including, but not limited to: initiators, fuel grains, ejection charges, and pressurized gas cylinders, are prohibited from entering the conference premises. Failure to follow this policy will incur a point penalty and possible disqualification.

2.6.4 PODIUM SESSION MATERIALS

Each team shall submit an Extended Abstract on a particular aspect of their work for competition officials and the judging panel to consider including in a Podium Session held during the IREC Conference. Teams whose topics are accepted into the Podium Session will be considered eligible for Technical Achievement Awards defined in Section 2.8.3 of this document. The Extended Abstract shall be formatted according to the style guide of the American Institute of Aeronautics and Astronautics (AIAA), using the provided Microsoft® Word document template.

The *Intercollegiate Rocket Engineering Competition Extended Abstract* template is available for download on the ESRA website (https://www.esrarocket.org/documents-and-forms). Always check the template maintained on the ESRA website before drafting your Extended Abstract to ensure you are using the latest version.

The Extended Abstract's main title is left to the team's discretion, however; the document shall be subtitled "Team Your Team ID Technical Presentation to the Year IREC". For example, a team assigned the Team ID "100", competing in the 2026 IREC, would subtitle their Extended Abstract "Team 100 Technical Presentation to the 2026 IREC".

The Extended Abstract shall be no less than 500 words long and shall not exceed two pages, not including footnotes, sources, or source endnotes. The Extended abstract shall not contain any tables, figures, nomenclature lists, equations, appendices etc. The submission must include sufficient detail to demonstrate its purpose, the technical foundation for the topic discussed, any preliminary results to date, and the expected results of flight testing at the International Rocket Engineering Competition.

The topic a team selects for their Podium Session submission should be an aspect of their launch vehicle development which they are particularly proud of, excited about, learned the most in the process of, creates new knowledge, advances the field's understanding of a particular area, presented a unique technical challenge they overcame, and/or otherwise best demonstrates the team's technical excellence and/or innovation in a particular aspect of their work. Note that podium sessions are limited to launch vehicle-related items (payloads are not eligible). A few examples of student work from past IRECs which would have made strong Podium Session submissions include the following. (This list is intended to be thought provoking only and is in no way intended to be either comprehensive, exclusive, or otherwise limiting.)

- Design, analysis, and testing of additively manufactured plastic fins for transonic and supersonic flight.
- Design, analysis, and testing of grid-fins
- Design, analysis, and testing of plasma based electrodynamic roll control actuators.

- Rigorous internal ballistics analysis of a large SRAD solid rocket propulsion system
- Design, analysis, and testing of a drag reducing aerospike equipped nosecone.
- Rigorous verification & validation testing of a SRAD ignition system for simultaneous activation of parallel rocket stages comprising multiple combustion cycles
- Design, analysis, and flight demonstration of automated, active telemetry transmitter tracking by a steerable, ground-based antenna.
- Rigorous verification & validation testing of a SRAD propulsion system, including propellant characterization and multiple hot fire tests
- Design, analysis, and testing of "rollerons" implemented for passive roll stability augmentation.
- Design, analysis, and testing of an additively manufactured liquid rocket engine combustion chamber.
- Design, analysis, and testing of a method to greatly minimize the amount of black powder needed to parachute ejection.
- Progress in a regimented iterative approach to developing and implementing an active stability augmentation system.
- Rigorous post-test analysis and characterization of a previously undefined hybrid rocket motor failure mode.
- Design, analysis, and testing of a regenerative cooling system.
- Structural design based on exquisite aerodynamic/aerothermal loads analysis.
- Exquisite trajectory analysis verified by flight demonstration.
- Manufacturing capabilities enabled by SRAD fiber composite filament winding technology.
- Structural analysis of fiber composite laminates using non-isentropic analytic techniques

On or before a specified IMS date prior to the event, teams shall submit a digital, PDF copy of their Extended Abstract to the ESRA website (esrarocket.org). Teams that do not submit these materials or follow the submission requirements outlined above will incur a 20-point administrative penalty. The event organizers will post these files in an online archive of the conference day proceedings. The submission location and method for the Extended Abstract is to be determined and will be communicated to the teams.

2.6.4.1 EXTENDED ABSTRACT PRESENTATION SLIDES

At the same time, they submit their Extended Abstract, teams shall also submit a digital, PDF copy of any Extended Abstract slides they wish to use in their presentation to the ESRA website. These slides shall contain the team number and any information they want to present to the audience if selected for a podium session . Teams that do not submit these slides or follow the submission requirements outlined will incur a 20-point administrative penalty. The event organizers will post these files in an online archive of the conference proceedings. The submission location and method for the Presentation Slides is to be determined and will be communicated to the teams.

No less than 24 teams will be accepted into the Podium Session. Each presentation will be allotted 20 minutes, with an additional five minutes reserved for Q&A with judges and other audience members. The teams selected shall bring a laptop computer with their completed slides to present. Whether accepted into the Podium Session or not, all attending teams should be prepared to participate in this activity. On the day prior to the conference day itself, competition officials may ask teams whose Extended Abstracts were considered "runners up" to take the place of any selected teams who fail to attend the International Rocket Engineering Competition. Any team that is selected for podium sessions who miss their allotted time slot will not be able to present and will forfeit this opportunity. Teams who lobby for exceptions will incur a penalty for unsportsmanlike conduct per section 2.8.1.5.

2.6.5 INTEGRATED MASTER SCHEDULE MILESTONES

Each team is required to meet the timelines in the IREC Integrated Master Schedule. Failure to meet required timelines will result in either a point penalty outlined in section 2.6 and 2.7 of this document or may prevent teams from flying. The Integrated Master Schedule Document can be downloaded from the ESRA website (https://www.esrarocket.org/documents-and-forms). If there are any conflicts the deadline will be 5pm CT(Midland, TX time) on the date located in the Integrated Master Schedule.

2.6.6 ADMINISTRATIVE DOCUMENTS

2.6.6.1 SCHOOL PARTICIPATION LETTER

Each team shall have the academic institution(s) in which its members are enrolled provide a signed letter to ESRA, acknowledging the team's participation in the IREC. The signature shall be that of a faculty member or other paid, non-student staff representative. This will affirm the team in question does in fact represent the academic institution(s) its members claim affiliation with. Each team has to be independent, no shared team members from each accepted team are allowed.

Teams shall follow the format provided below, which includes official school letterhead and names of students that are attending from each team. Teams that do not submit this letter or follow the submission or template requirements or will incur a 20-point administrative penalty. Any teams not following this will be contacted and a resubmission will be required.

An example IREC Participation Letter is available for download on the ESRA website (https://www.esrarocket.org/documents-and-forms).

On or before a specified date prior to the event, teams shall submit digital, PDF copy(s) of their signed school participation letter(s) to the ESRA rocket website. For example, a team from Starfleet Academy would submit the digital copy of their signed school participation letter. Similarly, if this same team were formed jointly by students from Starfleet Academy and the Vulcan Science Academy, they would submit two files.

2.6.6.2 INSURANCE

The event's insurance policy provides liability coverage for ESRA, and the host state. This liability coverage does not apply to the student team or the individual students. All student teams are required to obtain and provide proof of insurance coverage by the third progress report for all attending members prior to attending the International Rocket Engineering Competition

While some teams may choose to be covered by their college or university, there is one eligible alternative source of insurance coverage. Insurance Coverage for solid and hybrid propulsion rocket teams can be provided by Tripoli Rocketry Association (www.tripoli.org) (i.e. 10k/30k/45k COTS, 10k/30k/45k SRAD solid and hybrid categories). The coverage under Tripoli Launch Insurance comes at no additional cost (except Tripoli membership fees, see below).

If your team chooses insurance coverage through Tripoli Rocketry Association all team members present at the International Rocket Engineering Competition will be required to be registered as a dues paying Lvl 0 Member. Proof of membership will be requested at the registration desk on the first day of events and should be carried throughout the event in case participants lose their badge. All teams flying under Tripoli Launch insurance shall comply with the guidance in the DTEG, section 3.

Liquid category flights are **NOT COVERED** by Tripoli Launch Insurance. These teams are required to provide their own insurance coverage and to provide documentation of coverage by the 3rd progress report. The required documentation is written proof, in English, of comprehensive general liability insurance, including advertising liability and premises liability, of no less than $1,000,000 US Dollars. Note: individual, personal, or travel insurance policies do not qualify under this position. Teams without documented insurance coverage will not be allowed to fly. ESRA is not responsible for and cannot assist in finding suitable insurance policies.

Details for the Tripoli Insurance policy can be found at: http://www.tripoli.org/Insurance

2.7 TEAM MEDIA OBLIGATIONS

2.7.1 EVENT NAME

The event's name is the International Rocket Engineering Competition. Teams and their sponsors must use the correct event name whenever they refer to the event.

2.7.2 EVENT LOGOS AND STYLE GUIDELINES

- The event logos and required style guides are provided on the ESRA website: https://www.esrarocket.org/documents-and-forms

2.7.3 LINKS TO EVENT WEBSITE

Any team-controlled website shall contain a link to the event websites:

- https://www.esrarocket.org/

2.7.4 OBLIGATION TO RECOGNIZE EVENT SPONSORS

Teams shall acknowledge the event's Lead Sponsor in their own publicity. The sponsor list is maintained at https://www.esrarocket.org/rocketry-vendors

2.7.5 MEDIA PERSONNEL BADGING

Non-student personnel primarily concerned with media shall be badged as Media as described in the Range Standard Operating Procedure

2.7.6 TEAM RESPONSIBILITY FOR MEDIA CONDUCT

Teams are responsible for the conduct of media personnel dedicated to covering the team. Conduct penalties as described in 2.8.1.5 and disqualifications as described in 2.9 may be levied against teams for media personnel conduct.

2.7.7 DO NO HARM TO THE EVENT

Teams and team sponsors shall not engage in any activity that detracts from the standing of the event or event sponsors.

2.7.8 DIFFERENTIATE TEAM ACTIVITIES FROM ORGANIZER ACTIVITIES

Teams and team sponsors shall not imply they organize or sponsor the event as a whole.

2.7.9 TEAM RESPONSIBILITY FOR TEAM SPONSOR CONDUCT

Teams are responsible for the conduct of their sponsors. Conduct penalties as described in 2.8.1.5 and disqualifications as described in 2.9 may be levied against teams for team sponsor conduct.

2.8 AWARDS AND SCORING

2.8.1 CATEGORY PLACE AWARDS

A First Place Award will be granted to the highest scoring, eligible team in each of the eight scored categories defined in Section 2.0 of this document. A Second Place Award will be granted to the second highest scoring, eligible team in each scored category. A team is considered eligible for the place award(s) in its category after launching successfully to its 10,000 ft, or 30,000 ft or, 45,000 ft target altitude – depending on category and recovering successfully. In categories with sufficient teams competing in the category there will be a Third Place Award given. In the event no teams meet this definition in a given category, competition officials may issue Category Place Awards at their discretion based on multiple factors – including points accrued, launches attempted, and flight performance.

Teams are permitted to switch categories as necessary prior to submitting their final Project Technical Report. For example, if an SRAD propulsion system project encounters insurmountable difficulties at any point during the academic year, the student team is free to defer work on the SRAD system and opt for a near-term COTS solution without dropping out of the competition. For example, a single team may not compete in two categories in the same year by flying once using a COTS motor, then again using an SRAD motor. In the event such a possibility exists for

any team, the organizers highly encourage that team to compete in an SRAD rather than a COTS category. Once a team submits their final technical report the team's category is locked in, the only exception is if the team switches to the non-competing demonstration flight category. Teams still must receive ESRA approval to do this.

Competition officials will award points based on their evaluation of each team's required documentation (including the Entry Form, Progress Updates, and Project Technical Report), design implementation (observed through the team's poster display and a day in the field spent preparing for launch) and demonstrated flight performance (including reported altitude and successful recovery).

2.8.1.1 SCORING ENTRY FORM AND PROGRESS UPDATE DELIVERIES

The correct, complete, and timely delivery of a team's Entry Form and subsequent Progress Updates is awarded as many as 60 points – 6% of 1,000 total points possible. The Entry Form and subsequent updates are considered correct if they are submitted as specified in Section 2.6.1 of this Document. They will be considered complete if they are filled out in accordance with the online form on esrarocket.org. They will be considered timely if they are received by the deadline specified in the *IREC Integrated Master Schedule Document*.

The 60 points are divided evenly among the four submissions (i.e. the Entry Form and three subsequent Project Updates), making each submission worth 15 points. The submission is awarded these points on a pass/fail basis and must meet all three criteria – correctness, completeness, and timeliness – in order to "pass." Teams are highly recommended to submit their reports several days before the deadline to ensure there are no technical issues. There is no GRACE PERIOD for submissions, late submissions will disqualify the team from the competition

2.8.1.2 SCORING PROJECT TECHNICAL REPORT

Timely Project Technical Reports will be awarded as many as 200 points – 20% of 1,000 points possible – for their correctness, completeness, and analysis. Only timely Project Technical Reports will be evaluated and scored. A Project Technical Report is considered timely if it is received before the deadline specified in the *IREC Integrated Master Schedule Document*. Teams are highly recommended to submit their report several days before the deadline to ensure there are no technical issues. There is no GRACE PERIOD for submissions. Late submissions will disqualify the team from the competition. **All submissions for the technical report shall follow the naming convention TeamID_Formal University Name_Purpose. Example: Team 100_ESRA University_Progress Report 1. Any other naming convention used will incur a 5-point deduction from the corresponding submission.**

Feedback on Technical Reports is not guaranteed. Students are encouraged to ask their judges for any feedback on improvements during the Convention Days. Judges will not share their final

scores of the technical report at any time during the event. The final technical report score will be posted in the Final Score Sheet.

Correctness is worth 20% (40 points) of the Project Technical Report's overall point value. Correctness is defined by its adherence to the format/style guide specified in Section 2.6.2 of this document and upholding of basic technical editing standards. The report's correctness will be rated using the Technical Report Rubric in Appendix B.

Completeness is worth 10% (20 points) of the Project Technical Report's overall point value. The Project Technical Report is considered complete if it contains all minimally required content defined in Section 2.6.2 of this document. Points for completeness are awarded on a pass/fail basis, and only minor omissions or ambiguity of required information is tolerated in a passing evaluation.

Analysis is worth 70% (140 points) of the Project Technical Report's overall point value. This constitutes a structured, qualitative assessment by the evaluating competition officials of the analytic rigor demonstrated by the team during the iterative down-selection, refinement, and acceptance of all project aspects. The report's analysis will be rated using the Technical Report Rubric in Appendix B. Teams should note this score may be amended at the IREC itself, based on the evaluators' assessment of the team's conceptual understanding during any interactions.

2.8.1.3 SCORING DESIGN AND IMPLEMENTATION

Teams will be awarded as many as 240 points – 24% of 1,000 points possible – for the overall design quality, strategic design decisions, and build quality exhibited by their work. Competition officials will evaluate these criteria through interactions with the teams and their systems, occurring throughout the IREC Conference Poster Session and all during the following day – spent making launch preparations in the field.

Design quality is worth 50% (120 points) of the overall value assigned to Design and Implementation. This constitutes a structured, qualitative assessment by the competition officials of the team's relative competency in the physical principles governing their design (e.g., Did the team demonstrate they know what they're doing by designing something likely to work with a greater or lesser degree of success – provided it is sufficiently well constructed?). This also evaluates the team's due diligence in deciding how best to implement their design – in keeping with a strategic vision they can articulate clearly. In general, teams should set strategic goals for their project which extend beyond simply excelling in a particular category. ESRA places special significance on projects which leverage SRAD in a particular aspect, either to enhance the team's understanding of that subject, or to develop technology necessary for achieving a longer-term performance goal. The project's design quality and strategic design decisions will be rated using the Design Implementation Rubric in Appendix B.

Build quality is worth 50% (120 points) of the overall value assigned to Design and Implementation. This constitutes a structured qualitative assessment by the competition officials

of the team's quality with which that design was constructed (e.g., Is the finished product sufficiently well-constructed to meet the needs of the underlying design and reasonably expected variation in launch conditions). The project's build quality will be rated using the Design Implementation Rubric in Appendix B.

2.8.1.4 SCORING FLIGHT PERFORMANCE

Teams will be awarded as many as 500 points – 50% of 1,000 points possible – for their project's flight performance during launches at the International Rocket Engineering Competition, demonstrated by altitude achieved relative to the target apogee and successful recovery.

The accuracy of the launch vehicle's actual apogee achieved relative to the target apogee is worth 70% (350 points) of the overall value assigned to flight performance. Precise Trajectory planning is important. Points will be awarded for apogees within ±30% of the 10,000 ft AGL, or, 30,000 ft AGL, or 45,000 ft AGL target apogee according to the following formula.

$$Points = 350 - \left(\frac{350}{0.3 \times Apogee_{Target}}\right) \times \left|Apogee_{Target} - Apogee_{Actual}\right|$$

where $Apogee_{Target}$ *may equal either 10,000 ft AGL, or 30,000 ft AGL, or 45,000 ft AGL*

Teams shall report in person to Post Flight Data Recovery officials immediately after recovery of their rocket to report the official altitude in accordance with Section 2.5 of this document.

If telemetry data from the COTS altitude logging system is not immediately available, teams may report the apogee revealed in this telemetry to competition officials if and when a confirmation of nominal ascent and recovery system deployment events is possible. This information will be used for scoring only in the event the launch vehicle is not recovered prior to the end of eligible launch operations on the final scheduled launch day.

The successful recovery of the launch vehicle is worth 30% (150 points) of the overall value assigned to flight performance. A recovery operation is considered successful if it does not result in excessive damage to the launch vehicle. Excessive damage is defined as any damage to the point that, if the system's intended consumables (e.g., propellants, pressurized gases, energetic devices) were replenished, it could not be launched again safely. Zippers with a total length greater than one (1) caliber, crushed body tubes, significant damage to the avionics bay, significant damage to bulkheads or motor retention hardware, or damage such as crushing or fracturing of the nose cone all present significant safety concerns and therefore are considered excessive damage. At competition officials' discretion, replacement of damaged fins or boat tails specifically designed for easy, rapid replacement is allowed if such components are on hand and can reasonably be replaced within 30 minutes. Post Flight Data Recovery officials will visually inspect the launch vehicle upon its return to the designated basecamp area and award these points on a pass/fail basis.

2.8.1.5 PENALTIES FOR UNSAFE OR UNSPORTSMAN LIKE CONDUCT

Teams will be penalized 20 points off their total earned score for every instance of unsafe or unsportsmanlike conduct recorded by competition officials (e.g., judges, volunteers, or staff members). Unsafe conduct includes, but is not limited to, violating the *IREC Range Standard Operating Procedures*, failure to use printed checklists during operations, violating ESRA/local motor vehicle safety rules while on the range, and failure to use appropriate personal protective equipment. Unsportsmanlike conduct includes, but is not limited to, hostility or extreme frustration shown towards any IREC Participant, ESRA or other event staff, intentional misrepresentation of facts to any competition official, and intentional failure to comply with any reasonable instruction given by a competition official. See Appendix C for Point Violation sheet that will be used.

2.8.1.6 PENALTIES FOR VIOLATING PAYLOAD REQUIREMENTS

Teams will be penalized 100 points off their total earned score for any of the five payload requirements described in Section 2.2.3 of this document in spirit or intent. These include Mass, Independent Function, Location & Interface, Restricted Materials, and Form Factor. With regards to mass, due to the allowance made for differences in measuring devices, teams will not be permitted to modify their payloads with additional mass to avoid penalty at the event.

2.8.1.7 BONUSES FOR PAYLOAD CUBE UNIT BASED PAYLOADS

Teams whose functional payload(s) qualify for the form factor exemption described in Section 2.3.5.2 of this document, yet still adopt the Payload Cube Unit form factor, will be awarded 50 bonus points in addition to their total earned score. This promotes ESRA's encouragement that teams adopt the Payload Cube Unit for their payload(s) whenever possible – either as the payload structure itself, or as an adapter which the payload is mated to prior to the combined assembly's integration with the launch vehicle (such an adapter could be included in the official payload mass).

2.8.1.8 BONUSES FOR EFFICIENT LAUNCH PREPARATIONS

DELETED

2.8.1.9 POKER CHIPS

Poker Chips may be received by teams during the week of competition, these chips do not equate to any points towards the teams overall score, they are on the spot recognition by competition officials.

2.8.2 JUDGES CHOICE AND OVERALL WINNER AWARD

One team among the First Place Award winners in the eight categories defined in Section 2.0 of this document will be named the overall winner of the International Rocket Engineering Competition and will receive their own New Horizons trophy! The recipient of this prestigious award is determined by quantitative and qualitative assessments of the competition officials made throughout the entire event.

2.8.3 TECHNICAL ACHIEVEMENT AWARDS

ESRA presents four awards recognizing technical achievement to deserving teams competing in the IREC. Three of these are awarded based on the competition officials' qualitative assessments made during the Podium Session held during the IREC Conference, and interactions the following day – spent making launch preparations in the field. The final award is awarded to any IREC team based on flight performance.

2.8.3.1 JIM FURFARO AWARD FOR TECHNICAL EXCELLENCE

The Jim Furfaro Award for Technical Excellence recognizes a team which demonstrates exceptional overall engineering discipline and technical skill through their analyses and conclusions, project or program planning and execution, operational procedure, manufacturing processes, iterative improvement, systems engineering methodology, robust design, etc. A team is considered eligible for the Jim Furfaro Award if they are accepted into – and participate in – the Podium Session held during the conference day at the International Rocket Engineering Competition. Deference is given to eligible teams which complete a successful launch at the IREC. A launch attempt is minimally defined as an attempted ignition of the launch vehicle propulsion system with the intent of executing the launch vehicle's designed mission CONOPS.

2.8.3.2 DR. GIL MOORE AWARD FOR INNOVATION

The Dr. Gil Moore Award for Innovation recognizes a team whose project includes one or more features (including analytic or operational processes as well as components or assemblies) the judging panel finds genuinely "novel", "inventive", or solving a unique problem identified by the team. A team is considered eligible for the Dr. Gil Moore Award if they are accepted into – and participate in – the Podium Session held during the conference day at the International Rocket Engineering Competition. Deference is given to eligible teams which complete at least one launch attempt at the IREC. A launch attempt is minimally defined as an attempted ignition of the launch vehicle propulsion system with the intent of executing the launch vehicle's designed mission CONOPS.

2.8.3.3 CHARLES HOULT AWARD FOR MODELING & SIMULATION

The Charles Hoult Award for Modeling & Simulation recognizes a team demonstrating excellence in math modeling and computational analyses. A team is considered eligible for the Charles Hoult Award if they are accepted into – and participate in – the Podium Session held during the conference day at the International Rocket Engineering Competition. Deference is given to eligible teams which complete at least one launch attempt at the IREC. A launch attempt is minimally defined as an attempted ignition of the launch vehicle propulsion system with the intent of executing the launch vehicle's designed mission CONOPS.

2.8.3.4 JAMES BARROWMAN AWARD FOR FLIGHT DYNAMICS

The James Barrowman Award for Flight Dynamics recognizes a team demonstrating exquisite trajectory analysis. This will be evaluated by comparing the percent error between each team's actual and predicted apogee – the predicted apogee being a value declared prior to launch, based on a team's trajectory analysis. The award is given to the team with the smallest percent error. All teams with successful launch attempts that provide apogee data will be eligible for this award.

2.8.4 TEAM CONDUCT AWARDS

ESRA presents two awards recognizing teams competing in the IREC whose conduct throughout the International Rocket Engineering Competition exemplifies the goals and ideals of the event organizers. The International Rocket Engineering Competition should be an event where academia, industry, and the public may come together to preserve, popularize, and advance the science of rocketry in a collaborative environment energized by friendly competition.

2.8.4.1 TEAM SPORTSMANSHIP AWARD

The Team Sportsmanship Award recognizes a team which goes above and beyond to assist their fellow teams, and the event organizers assure the International Rocket Engineering Competition is a productive, safe, and enjoyable experience for all involved. They may do this in many ways, such as making themselves available to lend-a-hand whenever and however they can (whether they are asked to or not), being positive role models for their fellow teams, and generally being a "force for good" in every activity in which they involve themselves. A team is considered eligible for the Team Sportsmanship Award by being present at the IREC. Teams may earn Sportsmanship points throughout the event by following these guidelines outlined in this section.

2.8.4.2 NANCY SQUIRES TEAM SPIRIT AWARD

The Team Spirit Award recognizes a team which arrives at the International Rocket Engineering Competition with proverbial (or literal) smiles on their face, a school flag in their hand, and never lets either waver throughout the event. They show great pride in their work, learn from their mistakes, remain positive when things don't go their way, engage members of the general public with respect and enthusiasm, and show respect for invited guests by attending and participating guest speaker presentations whenever possible. A team is considered eligible for the Team Spirit Award by being present at the IREC.

2.8.4.3 TEAM VIDEO CHALLENGE AWARDS

The team video challenge award recognizes teams who do an exceptional job of communicating their team's culture, excitement, and achievements in video form. Teams use a combination of pre-prepared footage and launch footage to assemble their submission. The winner is chosen based on their narrative and production quality. All entries are eligible to be played throughout the awards ceremony. The submission method and deadline are outlined in the IMS.

2.8.4.4 LIVE ROCKET VIDEO CHALLENGE AWARDS

The live rocket video challenge recognizes teams who accept the technical challenge of providing live streamed video from rocket cameras or rocket telemetry. These teams provided never-before-seen views to showcase new aspects of rocket launches. The winner is chosen based on their technical and communication effectiveness. All entries are eligible to be played throughout the awards ceremony and on the livestream. The submission method and deadline are outlined by Section 2.6.5 of this document. The submission method and deadline are outlined in the IMS.

2.9 DISQUALIFICATION FROM CONSIDERATION FOR ANY AWARD

A limited number of criteria constitute grounds for disqualification from consideration for any award. These can include a failure to meet the defining IREC mission requirements recorded in Sections 2.0 through 2.5 of this document, failure to submit a Project Technical Report or third/final progress update at any time prior to the International Rocket Engineering Competition (or otherwise failing to provide adequate project details in required deliverables), and failure to send eligible team member representatives to the International Rocket Engineering Competition. Finally, any Team found to have accrued 3 instances or a total of 60 points in safety or unsportsmanlike conduct infractions at any time during the International Rocket Engineering Competition will be disqualified. Any individual observed committing a single, severe safety or unsportsmanlike conduct infraction may be summarily removed and barred from participation in the remainder of the IREC.

2.10 WITHDRAWAL FROM COMPETITION

Teams which decide to formally withdraw from the IREC at any time prior to the event must send an e-mail entitled "TEAM <Your Team ID> FORMALLY WITHDRAWS FROM THE Competition Year IREC" to general.info@esrarocket.org. For example, a team assigned the Team ID "100" would withdraw from the 2026 IREC by sending an e-mail entitled "TEAM 100 FORMALLY WITHDRAWS FROM THE 2026 IREC" to general.info@esrarocket.org.

2.10.1 APPLICATION AND PROJECT AND ROCKETEER FEE REFUNDS

Team application Fees are non-refundable. Team Project and Rocketeer Fees are refundable until the deadline listed in the Integrated Master Schedule. Teams who are late paying any fee may have points deducted or may be removed from the competition. Fee deadlines are in the IMS and will be announced on esrarocket.org.

3.0 INTERNATIONAL TRAFFIC IN ARMS REGULATIONS

Speakers and attendees of the International Rocket Engineering Competition are reminded that some topics discussed at conferences could be controlled by the International Traffic in Arms Regulations (ITAR). The International Rocket Engineering Competition is an ITAR-free event. U.S. persons (e.g. U.S. citizens and permanent residents) are responsible for ensuring all submissions and presented content are free of export restrictions. U.S. persons are likewise

responsible for ensuring that they do not discuss ITAR export-restricted information with non-U.S. nationals in attendance. Similarly, US person authors of IREC Project Technical Reports as well as Podium Session submissions and associated slide decks are responsible for ensuring the content of their materials does not exceed the interpretation of "fundamental research" and the ITAR established by their affiliated academic institution(s). More information in regard to ITAR can be found on (https://www.pmddtc.state.gov/ddtc_public)

3.1 FINAL SCORE SHEET

Competition officials will release the Final Score sheet no earlier than three weeks after the closing ceremonies. This score sheet will be located at https://www.esrarocket.org/2026irec in a PDF format. All inquiries regarding the final score sheet shall be emailed to general.info@esrarocket.org and comprules@esrarocket.org with "TEAM <Your Team ID> FINAL SCORE SHEET INQUIRES Competition Year IREC", for any considerations /changes or answers to be made, this includes inquiries from mentors, FORs, volunteers and any university officials. Any inquiries made outside these emails and not properly titled will not be considered. Teams have seven days after the score sheet is released to submit these inquiries; this is not the time the Director of Competition Operations has to respond to the inquiries . Any team who is rude or unprofessional with their inquiries or responses will incur a 20-point penalty for unsportsmanlike conduct to their final score and Section 2.9 will apply. After this time no changes will be made and the scores reflected will be the final scoring record.

3.2 APPENDIX A: ACRONYMS, ABBREVIATIONS, AND TERMS

ACRONYMS & ABBREVIATIONS	
AGL	Above Ground Level
AIAA	American Institute of Aeronautics and Astronautics
APCP	Ammonium Perchlorate Composite Propellant
APRS	Automatic Packet Reporting System
CFR	Code of Federal Regulations
CONOPS	Concept of Operations
COTS	Commercial Off-the-Shelf
ESRA	Experimental Sounding Rocket Association
FAA	Federal Aviation Administration
GPS	Global Positioning System
HPR	High Power Rocket *or* Rocketry
IREC	Intercollegiate Rocket Engineering Competition
IMS	Integrated Master Schedule
ITAR	International Traffic in Arms Regulations
LOX	Liquid Oxygen
NAR	National Association of Rocketry
SDL	Space Dynamics Laboratory
SRAD	Student Researched & Developed
STEM	Science, Technology, Engineering, and Mathematics
TBD	To Be Determined
TBR	To Be Resolved
TRA	Tripoli Rocketry Association

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".
Excessive Damage	Excessive damage is defined as any damage to the point that, if the system's 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 or boat tails specifically designed for easy, rapid replacement if such components are on hand and can reasonably be replaced within 30 minutes.
FAA Class 2 Amateur Rocket	14 CFR, Part 101, Subpart C, 101.22 defines a Class 2 Amateur Rocket (aka High Power Rocket) as "an amateur rocket other than a model rocket that is propelled by a motor or motors having a combined total impulse of 40,960 Newton-seconds (9,208 pound-seconds) or less."
Non-toxic Propellants	For the purposes of the IREC, the event organizers consider ammonium perchlorate composite propellant (APCP), potassium nitrate and sugar (aka "rocket candy"), nitrous oxide, liquid oxygen (LOX), hydrogen peroxide, kerosene, propane, and similar, as non-toxic propellants. Toxic propellants are defined as requiring breathing apparatus, special storage and transport infrastructure, extensive personal protective equipment, etc.

3.3 APPENDIX B: JUDGING RUBRICS

	Technical Report Rubric				
Criteria	**Ratings**				
	Outstanding	**Excellent**	**Satisfactory**	**Unsatisfactory**	**Score**
Completeness (20 pts)	20 pts All required items present	Pass/fail only	Pass/fail only	0 pts One or more required items missing	/20
Style and Format (40 pts)	36-40 pts	30-35 pts	20-29 pts	< 20 pts	
Style (20 pts)	18-20 pts Writing was exceptionally clear, understandable, and concise. Sentence and paragraph organization is exceptional. Writing is free of digressions or irrelevant information.	15-17 pts Writing was clear, understandable, and concise. Overall paragraph and sentence organization were very good. Digressions or irrelevant information do not significantly detract from the report.	10-14 pts Writing was generally clear and understandable. Paragraph and sentence organization were generally good. Digressions or irrelevant information detract from the report's analysis.	<10 pts Writing was repeatedly unclear, difficult to understand or wordy. Overall paragraph and/or sentence organization were ineffective or nonexistent. Digressions and/or irrelevant information consistently detract from the analysis.	/20
Mechanics (10 pts)	9-10 pts No grammar, spelling, or mechanics errors. Scientific terms correctly used, units and dimensions consistent and correct.	7-8 pts No more than a few grammar, spelling, or usage errors. Only a few minor errors with use of scientific terms or dimensions.	5-7 pts Significant spelling, usage, and grammar errors that did not detract from readability. Significant errors with use of scientific terms or dimensions.	< 5 pts Repeated grammar or spelling errors detracted from readability. Errors with use of scientific terms or dimensions detracted from report.	/10
Format (10 pts)	9-10 pts Completely follows required template. Meets word count limits.	7-8 pts Minor deviations from required template. Meets word limits.	5-7 pts Major deviations from required template. < 10% over page limits.	<5 pts No attempt at cohesive format or use of required template. More than 10% over page limits.	/10
Style and Format Total	(Rubric continues next page)			Total	/40

Analysis (140 pts)	126-140 pts	105-125 pts	70-104 pts	< 70 pts	
Depth of Analysis (50 pts)	45-50 pts Very complete and thorough analysis. All key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs.	38-45 pts Adequate analysis with minor weaknesses. Most key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs.	25-37 pts Adequate analysis with significant gaps or weaknesses. Some key design decisions are discussed and based on design targets, constraints, and appropriate tradeoffs. Some minor incorrect statements.	< 25 pts Inadequate analysis. Few, if any key design decisions were discussed. No discussion of tradeoffs. Parts of analysis conflict with general scientific knowledge.	/50
Assumptions and Sensitivity Analysis (30 pts)	27-30 pts All assumptions are clearly stated. Sensitivity analysis is performed to quantify uncertainty in variables and assumptions.	23-26 pts Most assumptions were addressed. Some sensitivity analysis.	15-22 pts Unstated assumptions. No sensitivity analysis.	<15 pts No stated assumptions or assumptions were unreasonable. No sensitivity analysis.	/30
Verification and Validation tests (40 pts)	36-40 pts All verification and validation tests were discussed, both for the final design and key iterations leading to that design. Complete and valid conclusions were drawn from the results.	30-35 pts Most verification and validation tests are adequately discussed. Appropriate conclusions were drawn from the results, but key iterations prior to final design were not discussed.	20-29 pts Some verification and validation tests are discussed but consistent. Unclear that conclusions and decisions were drawn from testing results and analysis.	< 20 pts Unclear whether verification and validation tests were performed. Decisions and conclusions were not drawn from the analysis.	/40
Use of Charts and Figures (20 pts)	18-20 pts Tables, figures, and appendices all effectively organize and communicate information.	15-17 pts Use of tables, figures, and appendices is mostly effective.	10-14 pts Use of tables, figures, and appendices is somewhat effective with significant issues.	< 10 pts Tables, figures, and appendices were incorrect or misleading.	/20
Analysis Total (140)	Total				/140

Completeness + Style & Format + Analysis Total (200 pts)		/200

	Design Implementation Rubric				
Criteria	**Ratings**				
	Outstanding	**Excellent**	**Satisfactory**	**Unsatisfactory**	**Score**
Design Quality & Decisions (120 pts)	108-120 pts	90-107 pts	60-89 pts	< 60 pts	
Team Design Vision, Goals and System Engineering (50 pts)	45-50 pts Clearly understood and achievable design vision for the rocket along with a coherent and well-understood set of design goals. All key elements of the project address clearly defined strategic goals for the team. Strong evidence of clear systems engineering discipline throughout all parts of design team.	37-49 pts Design vision is generally understood and mostly achievable with a generally coherent set of goals. Key elements of the project generally address strategic goals for the team. Generally good systems engineering discipline throughout development. Most of the design team works to support a generally coherent and understood set of goals.	25-36 pts Design vision is incompletely defined or questionably achievable. Unclear how elements of the project address team strategic goals. Some lapses in systems engineering discipline throughout development. Unclear that parts of the design support team goals. Some evidence of different parts of the design team working at cross-purposes.	< 25 pts Questionable or unachievable design vision for the rocket. Most elements of the project do not address team goals. Major lapses in systems engineering discipline. No team design goals, or parts of the team clearly ignore stated goals. Clear evidence of different parts of the design team working at cross-purposes.	/50
SRAD components (50 pts)	45-50 pts High use of SRAD components, which are clearly chosen to achieve design or strategic goals.	38-45 pts Significant use of SRAD components. Mostly chosen to achieve design or strategic goals.	25-37 pts Some use of SRAD components. Sometimes chosen to achieve design or strategic goals.	< 25 pts Minimal use of SRAD components. No clear idea how these achieve design or strategic goals.	/50
Team Knowledge (20 pts) (Rubric continues next page)	18-20 Strong team understanding of the physical principles governing design and reasoning behind the design. All members of team can clearly articulate reasoning for choices.	15-17 Generally good team understanding of the physical principles governing design and reasoning behind the design. Team members defer to a few team "experts" during discussion.	10-14 Some team understanding of the physical principles governing design and reasoning behind the design. Team members defer to one or two team "experts" during discussion.	< 10 pts Inadequate team understanding of the principles governing design and reasoning behind the design. Team members defer to their Mentor or Flyer of Record during discussion.	/20
Design Quality and Decisions Total				Total	/120

Build Quality (120 pts)	108-120 pts .	90-107 pts	60-89 pts	< 60 pts	
Design Quality and Robustness (30 pts)	27-30 pts Design and build quality are robust and more than sufficient to operate as intended under reasonably expected conditions.	23-26 pts Design and build quality are somewhat robust and sufficient to operate as intended under reasonably expected conditions.	15-22 pts Design and build quality are sufficient to operate as intended under specific conditions but are not robust to reasonably expected variations.	< 15 pts Design and build quality insufficient to operate as intended under expected conditions. No attempts at robust design.	/30
Manufacturing and Construction Methods (30 pts)	27-30 pts Construction methods completely understood and correctly applied. Manufacturing methods for SRAD elements are both appropriate and completely understood by the team, including cost, time, and performance.	23-26 pts Construction methods generally well understood and correctly applied. Manufacturing methods for SRAD elements are both appropriate and reasonably understood by the team, including cost, time, and performance.	15-22 pts Construction methods are appropriate, but not completely understood. Manufacturing methods for SRAD elements are appropriate, but not fully understood by the team.	< 15 pts Construction methods inappropriate or not understood. Manufacturing methods for SRAD elements are impractical or not well understood by the team.	/30
Consistent Design (30 pts)	27-30 pts Clearly consistent with team's vision. No evidence of key systems added as an afterthought.	23-26 pts Generally aligned with team's vision. No evidence of key systems added as an afterthought.	15-22 pts Somewhat aligned with team's vision. Some key systems were added as afterthoughts.	< 15 pts No apparent organizing vision. Key systems added as field modifications or afterthoughts.	/30
Compliance with DTEG (30 pts)	27-30 pts Completely complies with guidance in the DTEG	23-26 pts Complies with guidance in the DTEG with a few minor issues.	15-22 pts Minimally complies with guidance in the DTEG.	< 15 pts Does not comply with guidance in the DTEG. **NOTE: A team that does not comply with the DTEG can score no higher than 60 points for Build Quality.**	/30
Build Quality Total (120 pts)				Total	/120
Design & Build Quality (240 pts)					/240

Podium Session Rubric

Note: Judges should also review the Project Technical Report for additional detail, but the award must be based on the material covered in the Podium Session (e.g., if the Podium Session does not cover Modeling & Simulation, then the team is not eligible for the Hoult Award even if that is covered in the Technical Report).
Note 2: The rubric will be used as a guide to focus the discussion during the Judges' scoring deliberations and isn't the final word.

Rating Area	Rating Criteria	Specific Highlight	Award	Score:
Technical Excellence (Furfaro Award)	Overall engineering discipline and technical skill through analyses and conclusions, project or program planning and execution, operational procedure, manufacturing processes, iterative improvement, systems engineering methodology, robust design, etc.		(Y/N)	(0-30)
Innovation (Moore Award)	Project includes one or more features (including analytic or operational processes as well as components or assemblies) the judging panel finds genuinely "novel," "inventive," or solves a unique problem identified by the team.		(Y/N)	(0-30)
Modeling & Simulation (Hoult Award)	Mathematical modeling and computational analyses.		(Y/N)	(0-30)
Presentation Quality	Slides are professional and easy to read. Graphics add value and are not misleading. Presenter is easy to understand and did not just read the slides. Good responses to audience questions.			(0-10)

3.4 APPENDIX C: TEAM VIOLATION POINT DEDUCTION FORM

Date: 06/ /2026	Time: _____	Team #: _____

VIOLATIONS
(-20 PTS. For each box selected, if Team is found with 3 instances or 60 points in violations team is disqualified)

Unsafe Conduct:
☐Violating IREC Range Standard Operating Procedures.
☐Losing student badge and not having required TRA info to get a new badge.
☐Failure to use printed checklists during operations.
☐Violating ESRA / local motor vehicle traffic safety rules at launch site.
☐Failure to use appropriate personal protective equipment.
☐Failure to wait until DaVinci releases team to recover.
☐Failure to return directly to DaVinci tent to check in and return equipment.
☐Other:_____

Unsportsmanlike Conduct:
☐Hostility/ threats shown towards any IREC Participant or competition official.
☐Intentional misrepresentation of facts to any competition official.
☐Intentional failure to comply with any reasonable instruction given by a competition official.
☐Switching Teams Assigned Conference Table without ESRA permission, or having team member present on Conference Day
☐Team not attending Conference Day
☐Other: _____

Unpreparedness
☐Taking longer that 45 minutes in Post Flight Data Recovery with Judge failure to bring tools and needed equipment even after warnings.

Competition Official Observing Violation: ☐ESRA Judge ☐ESRA Range Safety ☐ESRA Postflight ☐Awards ☐ SDL☐ESRA Registration ☐ESRA Livestream ☐ ESRA Leadership ☐ DaVinci	**Print Name:** _____
Initals of Signoff In score sheet & Date:	**Total pts. Deducted:**