Informações essenciais do “IREC Rules & Requirements Document”

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Documento base: Intercollegiate Rocket Engineering Competition Rules & Requirements. Revision: Draft. Effective Date: 10/09/2016

**Observação: fortemente recomenda-se que os membros da equipe que irá aos Estados Unidos leia o documento original.**

# Objetivo geral do IREC

Lançar um foguete carregando pelo menos 3,9916 kg (8,8 lb) de carga útil com um objetivo de apogeu de 3,048 km (10000 ft) ou 9.144 km (30000 ft) acima do nível do terreno. Fonte: Seç. 2.0.

# Categorias

Existem seis categorias:

* 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.

AGL = above ground level.

COTS = commercial-off-the-shelf.

SRAD = student researched and developed.

As equipes podem mudar de categoria antes da submissão do Relatório do Projeto Técnico (26 de maio de 2017). Fonte: Seç. 2.0.

# Equipes e projetos

* As equipes devem ser formadas por estudantes em graduação ou recém-graduados (graduados em 2016). As equipes podem ter membros de uma ou mais instituições. Não há limite para o número de membros. Fonte: Seç. 2.1.
* Cada equipe não pode submeter mais que um projeto para o IREC. No entanto, os estudantes podem participar em mais que uma equipe, desde que o líder seja diferente. Fonte: Seç. 2.2.

# Foguete

## Carga útil

* O foguete lançador não pode carregar menos que 3,9916 kg (8,8 lb) de carga útil (Seç. 2.3.1).
* Não há problema se o foguete não for estável sem a carga útil (Seç. 2.3.1).
* A carga útil não precisa ser funcional (pode ser um lastro). No entanto, há um prêmio para cargas úteis funcionais (Seç. 2.3.2) (<http://www.soundingrocket.org/sdl-payload-challenge.html>).
* Para fins de medição da massa da carga útil pelos ficais, ela deve ser removível do foguete e não pode conter partes integrantes do foguete, como o sistema de ejeção, por exemplo, (Seç. 2.3.3).
* As dimensões externas da carga útil devem seguir o padrão do QubeSat ou do PocketCube, que são aproximadamente 10cm x 10cm x (n . 10 cm) e 5cm x 5cm x (n . 5 cm), respectivamente, onde n é um número natural. (Seç. 2.3.4).

## Rastreador de trajetória

Veículos lançadores e cargas úteis destacáveis devem ter um sistema de emissão de rádio para auxiliar na localização após o lançamento. Recomenda-se usar GPS ou APRS (Automatic packet reporting system). (Seç. 2.5)

## Registrador de altitude

Os veículos lançadores devem carregar um altímetro barométrico comercial com armazenamento interno de dados que será utilizado para registrar o apogeu oficial. (Seç. 2.6)

# Documentos a serem entregues (Seç. 2.7)

Segue abaixo a lista de documentos que devem ser enviados para a organização do IREC. Nos próximos dias enviarei mais instruções sobre o preenchimento destes documentos.

* ENTRY FORM AND PROGRESS UPDATES
* PROJECT TECHNICAL REPORT
  + SYSTEM ARCHITECTURE OVERVIEW
  + MISSION CONCEPT OF OPERATIONS OVERVIEW
  + CONCLUSIONS AND LESSONS LEARNED
  + PROJECT TEST REPORTS APPENDIX
  + HAZARD ANALYSIS APPENDIX
  + RISK ASSESSMENT APPENDIX
  + ASSEMBLY, PREFLIGHT, AND LAUNCH CHECKLISTS APPENDIX  
    Os membros da equipe devem manter consigo uma cópia deste documento para apresentar aos ficais do evento.
  + ENGINEERING DRAWINGS APPENDIX
* POSTER SESSION MATERIALS
* PODIUM SESSION MATERIALS
* Documentos administrativos
  + SCHOOL PARTICIPATION LETTER
  + SPACEPORT AMERICA CUP NMSA WAIVER AND RELEASE OF LIABILITY FORM
  + SPACEPORT AMERICA CUP ESRA WAIVER AND RELEASE OF LIABILITY FORM
  + CONSENT TO LIMITED PERSONAL IDENTIFYING INFORMATION RELEASE FORM

# Prêmios e pontuações

## Categoria Prêmio por melhor pontuação (Seç. 2.8.1)

Para cada uma das seis categorias haverá a premiação da equipe com a maior pontuação. Caso haja cinco ou mais equipes em uma categoria, haverá a premiação da equipe com a segunda maior pontuação. Uma equipe será considerada elegível para a premiação se o desvio do apogeu real do foguete com relação à meta da categoria não for superior a 609,6 m (2000 ft).

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| --- | --- | --- | --- |
| **Seç.** | **Pontos** | **Item** | **Descrição** |
| 2.8.1.1 | 100 | 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 100 points – 10% of 1,000 total points possible. |
| 2.8.1.2 | 200 | PROJECT TECHNICAL REPORT | **Correctness is worth 20% (40 points)** of the Project Technical Report's overall point value. A rating of 40 points indicates exemplary quality. *The paper requires no substantial correction of grammatical mistakes, misspellings, mistyping, incorrect punctuation, inconsistencies in usage, poorly structured sentences, wrong scientific terms, wrong units and dimensions, inconsistency in significant figures, technical ambivalence, technical disambiguation, statements conflicting with general scientific knowledge, etc... Furthermore, the paper contains no stylistic errors deviating from the prescribed style guide.* **Completeness is worth 20% (40 points)** of the Project Technical Report's overall point value. **Analysis is worth 60% (120 points)** of the Project Technical Report's overall point value. *A rating of 120 indicates exemplary quality. The paper provides adequate discussion of all key design decisions, including relevant trade space descriptions, constraints, and overall rational. Furthermore, the paper provides adequate discussion of all key verification & validation tests performed on the final design – as well as any significant progenitors – and demonstrates complete, valid conclusions were drawn from the results. Finally, the paper makes appropriate use of tables, figures, and appendices to effectively organize information and communicate it to the reader.* |
| 2.8.1.3 | 200 | DESIGN IMPLEMENTATION | Teams will be awarded as many as 200 points – 20% of 1,000 points possible – for the overall competency of design, quality of construction, and degree of SRAD featured in their project. The judging panel will evaluate these criteria through interactions with the teams and their systems, occurring throughout the conference day Poster Session and all during the following day – spent making launch preparations in the field. **Competency of design and quality of construction are worth 50% (100 points).** *A rating of 100 indicates exemplary quality. All features of the project hardware reflect strong competency in the physical principals governing their design, and are of more than sufficient quality to operate as intended without risk of premature failure due to fatigue or reasonably expected loading. Wherever possible, the project hardware exhibits robust design characteristics – which decrease it's sensitivity to reasonably expected variations in "real-world" operations. Furthermore, the overall system exhibits evidence of a strong systems engineering discipline maintained throughout development (eg lacking any features which are both critical systems, and yet clearly implemented as "afterthoughts" to the intended system). Finally, the overall system complies with all expectations set by the IREC, Design, Test, & Evaluation Guide (TBD\_direct URL).* **The degree of SRAD featured in a project is worth 50% (100 points).** *A rating of 100 indicates extensive SRAD throughout the project. All the following launch vehicle systems/components meet the SRAD definition: fins (including associated mounting structures); airframe; aerodynamic fairings (including nosecones, tail cones, skirts, transitions and similar structures ); any parachutes (including parafoils, or similar recovery devices). SRAD of systems/components beyond those listed here may be used as positive points-of-differentiation between similarly rated projects.* |
| 2.8.1.4 | 500 | FLIGHT PERFORMANCE | **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 ±2,000 ft of the 10,000 ft AGL or 30,000 ft target apogee according to the following formula. Points = 350 − 350 × (Apogee Target − Apogee Actual)/2,000 where Apogee Target may equal either 10,000 ft AGL or 30,000 ft AGL. **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 systems intended consumables were replenished, it could not be launched again safely. The evaluating judge(s) 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 | **-20** | **PENALTIES FOR UNSAFE OR UNSPORTSMANLIKE CONDUCT** | Teams will be penalized 20 points off their total earned score for every instance of unsafe or unsportsmanlike  conduct recorded by competition officials (eg judges, staff, volunteers, or staff members). Unsafe conduct includes,  but is not limited to, violating the IREC Range Standard Operating Procedures (TBD\_direct URL), failure to use  checklists during operations, violating NMSA motor vehicle traffic safety rules, and failure to use personal  protective equipment prescribed in the IREC Design, Test, & Evaluation Guide (TBD\_direct URL). Unsportsmanlike conduct includes, but is not limited to, hostility shown towards any Spaceport America Cup Participant, intentional misrepresentation of facts to any competition official, intentional failure to comply with any reasonable instruction given by a competition official. |

## Prêmio geral (Seç. 2.8.2)

Uma das seis equipes vencedoras de cada categoria será selecionada para ser a vencedora geral da competição.

## Prêmios de excelência técnica e inovação (Seç. 2.8.3)

* JIM FURFARO AWARD FOR TECHNICAL EXCELLENCE  
  *The Jim Furfaro Award for Technical Excellence recognizes a team which demonstrates exceptional 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 Spaceport America Cup, and if they complete at least one launch attempt at the Spaceport America Cup. 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.*
* 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", "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 Spaceport America Cup, and if they complete at least one launch attempt at the Spaceport America Cup. A launch attempt is minimally defined as an attempted ignition of the launch vehicle propulsion system with the intente of executing the launch vehicle's designed mission CONOPS.*

## Prêmios de conduta da equipe (Seç. 2.8.4)

A team is considered eligible for the Team Sportsmanship Award by being present at the Spaceport America Cup.

* 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 Spaceport America Cup: Intercollegiate 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*.
* TEAM SPIRIT AWARD

*The Team Spirit Award recognizes a team which arrives at the Spaceport America Cup with proverbial (or literal) smiles on their face, a school flag in their hand, and never lets either waiver 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.*

# Participação com Exibição e Demonstração (Seç. 3.0)

Sponsoring industry groups, colleges, universities, and high schools are all also welcome to participate in the Spaceport America Cup with projects intended for non competing, exhibition/demonstration flights. These groups must either restrict their flight activities to the maximum altitude set for the IREC, or pursue their own waiver. Otherwise these groups are generally exempt from the rules and requirements defined in Section 2.0; however, they must contact the event organizers, who will inform them what rules and requirements they are required to follow as they proceed.