



Students for the Exploration
and Development of Space

Alexander B. Thornton
alex.thornton@seds.org
417.231.3848

SEDS 2018 University Student Rocketry Challenge

SEDS-USA is pleased to announce the 2018 University Student Rocketry Challenge (USRC). This year, the USRC challenges students to design, build, and launch a **multi-stage** rocket with a standardized altimeter to the highest possible altitude A.G.L.

Competition Overview

The USRC is open to teams of students from any SEDS chapter in the United States. Teams are scored on design, engineering, and manufacturing processes in addition to the flight of the rocket. A panel of aerospace industry professionals will serve as judges. The competition will involve three engineering reports submitted to SEDS USA as well as monthly progress reports posted to your section's social media page. The first engineering report will be a design report and will focus on the design of the rocket. The second will be a preflight technical report to be submitted after the rocket is built. The third report will be a post-flight report to assess the results of the rocket's flight. The judging panel will offer feedback on each report and will be available to meet with teams to review the reports. Guidelines for each report will be released individually.

Winning teams as determined by the competition judges will be awarded a cash prize based on competition sponsorship as well as a set number of SEDS SpaceVision 2018 registration packages. Prize and funding opportunities will be added throughout the course of the competition as they become available.

In order to make the competition as accessible as possible, there will be several ways in which a team can launch their rocket for a competition flight. Teams may launch at a field local to their university and have the flight certified by an independent party. Depending on geographic proximity, teams from different universities may organize a regional launch in cooperation with SEDS-USA.

To register send an email to alex.thornton@SEDS.org stating your chapters intent to compete.

Competition Timeline

Please note the following applicable dates for the challenge. At the request of teams, these dates may be advanced to an earlier date (e.g., a team may submit their technical report for feedback in April in order to support an earlier launch date).

- Register by March 2nd, 2018 – Late applications will be accepted with a small score penalty.
- June 1st, 2018 - Design report due. Technical report guidelines released.
- September 14th, 2018 - Technical report due. Final Launch report guidelines released.
- October 12th, 2018 - Launch window closes, all launches must be completed.
- October 26th, 2018 - Final launch reports due; all documentation must be received by SEDS-USA.
- November 2018 - Competition winner announced and prize awarded at SpaceVision 2018 Conference.

Official Rules

1. This competition is open to participation at no cost to any team formed by a SEDS chapter within the United States. SEDS USA chapter status is required.
2. The objective of the competition is to design, build, and launch a **multi-stage rocket** to an altitude of at least **3000 feet** above ground level (AGL) and recover the rocket and stages in a "reusable" condition. To compensate for the effects of launches at high-altitude launch sites, 0.002 times the elevation of the launch site above sea level, in feet, will be subtracted from the recorded altitude (in feet) and is defined as the adjusted altitude. This offsets the reduced engine/vehicle mass necessary to achieve the target height at these higher altitudes. Scoring will be based on the team's adjusted altitude.
3. All rockets must contain two or more stages. A stage is defined as a distinct portion of the rocket which provides thrust independently from other stages. Stages must burn sequentially, e.g., the second stage must burn after the first stage burn has completed. Only the first stage is allowed to burn while on the launch rail and it must leave the rail before the second stage is ignited. Engine clusters burning simultaneously are permissible but will all be considered part of the same stage. There is no upper limit to the amount of stages that the rocket may contain; however, total combined impulse of all engines must not exceed **640.0 Newton-seconds** of total impulse.
4. All rockets must carry a standardized altimeter that has been selected by SEDS-USA. The altimeter must not detach from the rocket at any point during the flight and must be recovered intact. The interface procedure for the altimeter will be provided. Tampering with the payload outside of normal operating procedures (as defined by SEDS-USA) is prohibited and will result in disqualification from the competition.
5. The standardized altimeter will be used by all teams. Official altitude used in the competition scoring will be obtained only by the standardized altimeter. Teams may use additional altimeters, sensors, and data loggers but only the data collected by the provided payload will be considered for official scoring. The standardized altimeter can be found at -- <http://www.perfectflite.com/apra.html>
6. Destruction of the standardized altimeter (whether intentional or unintentional) will result in no altitude score being awarded to the team. Destruction of the standardized altimeter is not grounds for disqualification and teams are urged to still complete the post flight report.
7. All altitude gain must be achieved through rocketry. No specialty launch system (e.g., rockets launched from balloons or projectile launchers) will be permitted.
8. Teams may fly "commercial" motors or custom-built "research" motors. Research motors with an additional report that includes testing procedures photos/video and data will be awarded up to an additional 3 points based on the quality of the research paper but is in no way required to compete. There will be no report guidelines released for the research motor report.
9. Multimedia documentation – Video documentation of the launch and undisturbed recovery are required submissions as part of the post flight report. The recovery video should include undisturbed vehicle documentation of the altimeter beeps to verify altitude and proof of reusability.
10. The competition will be scored as follows:
 - a. Documentation
 - i. Design Report (10 points)
 - ii. Technical Report (15 points)
 1. Additional Research Motor Report (Bonus - 3 points)
 - iii. Post-flight Report (5 points)
 - b. Flight score

- i. 3000 foot altitude bonus - 5 points will be awarded to teams who achieve an adjusted altitude of 3000 feet or higher. No points will be awarded to teams who do not reach this minimum altitude.
 - ii. Altitude - 1 point will be awarded for every 200 feet of adjusted altitude above the initial 3000 ft AGL reached by the rocket during flight, as measured by the standardized altimeter.
 - iii. Staging bonus - Rockets that contain a third stage will receive a bonus of 4 points for a successful stage ignition (below points system regarding recovery still apply). Rockets that contain four or more stages will receive a bonus of 6 points for ignition of each successive stage.
 - iv. Payload recovery bonus - 7 points will be awarded to teams whose rocket, less any discarded stages, is recovered without damage. "Without damage" is defined as a rocket that could be flown again if the propulsion system is reloaded and the recovery devices re-packed, without any further repairs to the rocket.
 - v. Stage recovery bonus - 5 points will be awarded for each discarded stage that is recovered without damage.
 - vi. By submitting photos and videos to SEDS-USA, teams grant the right for SEDS-USA to use this media as promotional material.
- 11.** All competing flights must be certified by one of the following:
- a. The USRC Project Manager, Development Manager, or their designee
 - b. Prefects, members of the Technical Advisory Panel, or Board of Directors of the Tripoli Rocketry Association, Inc. (TRA).
 - c. An officer or trustee of the National Association of Rocketry (NAR) or a NAR section.
 - d. A student section adviser (FT professor/employee of the University that you attend). This is basically someone not on your team willing to verify your performance claims. An email sent to the USRC project manager that states the outcome of the launch will be accepted. Should none of these options be available, the team must contact the USRC Project Manager to arrange an alternate solution.
- 12.** All launches must abide by local, state, and federal laws and regulations. This includes but is not limited to FAR 101. It is the responsibility of the team to understand and abide by all applicable regulations. By entering this competition, teams agree that SEDS-USA shall not be held liable for any violations committed by the team. Teams must also follow any rules set forth by the Launch Director, Range Safety Officer, or other launch organizing authority.
- 13.** All teams are required to carry insurance, whether through their university, TRA, NAR, or elsewhere. By entering this competition, teams agree that SEDS-USA shall not be held liable in any way for injuries or damages that may occur as a result of participation in the competition. It is the responsibility of the teams to understand the inherent risks present in high-powered rocketry and to take adequate safety measures to mitigate these risks. If you have any questions or require help of any kind feel free to contact the SEDS USRC project manager at alex.thornton@seds.org.