



Federation of Galaxy Explorers
Central Virginia Tripoli
Praxis Corporation
Presents

***2012 AIAA Young Professionals
Rocketry Competition***



The World's Forum for Aerospace Leadership

Introduction

The AIAA “Young Professionals” Competition is designed to allow Region 1 AIAA “Young Professional” members (and colleagues) to participate in a fun hobby rocketry competition to learn new skills, enhance old skills, and to meet their fellow AIAA members. This competition is run as an event in the Battle of the Rockets.

Dates

- Registration for the competition is due by January 31, 2012. Pre-registration is encouraged by November 30, 2011.
- Each team is to submit a design safety review document by February 29, 2012.
- The competition will be held on March 31, 2012¹.
- Sunday April 1, 2012 is reserved as an alternate flying day. If the competition cannot be safely conducted on either day, the competition will be decided based upon the reports submitted by the teams.

The Competitions

Teams may enter one or both of:

- Design and build an eggloft rocket to carry a fresh hens egg and an altimeter (from the list below) to 2,000'. Along with the RSO, pick a safe landing spot. A successful flight is one that successfully launches and safely returns in flyable condition with an unbroken egg and a valid altimeter reading. Teams must minimize the following score:

$$\begin{aligned} \text{Score} = & \|2000\text{-rocket maximum height}\| \\ & + 0.5 \text{ (time of flight)} \\ & + 1.2 \| \text{pre-approved landing spot position} - \text{rocket's actual landing position} \| \end{aligned}$$

Distances are expressed in feet [ft] and time is expressed in seconds [s]. The time of flight is computed from the ignition time to when the portion of the rocket containing the egg and altimeter lands.

- Design and build a “Mars resupply mission.” The rocket must safely and successfully carry a robotic lander to 2000'. The lander must carry a fresh hens egg and an approved altimeter. The team must supply a “base station” and the team shall pick a location (approved of by the RSO) to place that station. After a safe flight and safe landing the lander must make its way to the base station. Teams must minimize the following score:

¹ The launch is scheduled for March 30 to April 1, 2012. Test and sport flights may be made subject to the rules and fees specified at the <http://www.battlepark.org/> web site.



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$$\begin{aligned} \text{Score} = & \|2000\text{-rocket maximum height}\| \\ & + 1.5 \| \text{pre-approved landing spot position} - \text{rocket's actual landing position} \| \\ & + 2 (\| \text{rover landing position} - \text{base station position} \| - 3) \\ & + 3 \| \text{rover position at the end of the mission} - \text{base station position} \| \end{aligned}$$

Distances are expressed in feet [ft].

Judging and Scoring

Teams must recover the rocket after the flight and present the rocket to the judges for review. The motor, egg, and altimeter must not be removed from the rocket/rover or the team will be disqualified from the event. The altimeter must remain turned on until the judge records the altitude. The judge will inspect the rocket for damage, record landing distances, record the altitude indicated by the altimeter, and calculate the score. Decisions by judges and range personnel are final. Violating safety codes, regulations, or the directions of launch or judging personnel will result in a disqualification.

Application

Each team must submit the application form Team_AIAA_YP_2012_Registration_Form.PDF and each team member must fill the application form Single_AIAA_YP_2012. These forms will be available on TBD website. The application form requires participant information and a signed release form from each team member. No information will be released or sold. All applications will be destroyed after the competition. The information requested is for administrative and insurance purposes only. The application fee for the event is \$65 and is non refundable.

Team Requirements

Teams shall have at minimum 2 members and no more than 10 members. The team captain must be an AIAA YP member. All team members are encouraged to be current members of the AIAA.

If using high power motors, at least one team member must be a current NAR or TRA member and be certified to the correct level to utilize the motors.

If team members do not have current hobby rocketry experience it is **highly recommended** that they find a mentor from a local NAR or TRA club (see appendix) for help in safely designing hobby rockets and for test launch support. The flying season at Battle Park starts on October 29, 2011 and flights may be conducted there pursuant to the rules and fees as stated on the <http://www.battlepark.org/> web site.

Only team members can work on any aspect of the competition including the design, simulation, construction, repair, and launching. Mentors, companies, and any non team members cannot help with the design, construction, or flight of the competition rocket unless they note a potential safety hazard.

All rockets must carry the AIAA logo that can be found at



<http://www.aiaa.org/images/industry/logos/pritag2.jpg>. The rover's base station must also have the AIAA logo. The width of AIAA logo must not be less than 7 cm and its height must not be smaller than 3 cm.

Safety Review Documentation

For each competition entered teams are to submit a simulation file from RASAero, RockSim, or SpaceCad for review. The file must include at least one simulation showing the flight from launch to landing. A section shall discuss stability: location of Cg and Cp, and showing a safe rail exit velocity. A photo of the rocket must also be submitted. A list of materials contained in the rocket and used for construction must also be submitted. Motor retention information must be included in the materials list. A preflight checklist must be submitted. The checklist is a list of a sequence of activities or actions required to prepare the rocket up to and including completely readying the rocket for motor ignition.

The safety review documentation package shall be submitted electronically via email to the aiaa1.yps@gmail.com address by February 29, 2012.

Rules

1. All competitors must follow the Tripoli High Power Safety Code. The safety code can be found on the Tripoli website:
<http://www.tripoli.org/Launches/Safety/HighPowerSafetyCode/tabid/185/Default.aspx>
2. Violation of safety codes or directives by competition or range personnel may result in disqualification. Decisions by competition and range personnel are final.
3. Any change of launch rail orientation from vertical must be approved by the RSO.
4. The rocket must have been successfully flown at least once before the contest.
5. The rocket construction and usage must conform to the Tripoli High Power Safety Code.
6. Metal fasteners and small metal components are allowed.
7. Composite materials are allowed.
8. Launch lugs may not be used as the primary launch guidance.
9. Teams may provide their own launch pad. These must pass safety inspection by the launch site range crew.
10. Teams must make their own arrangements for GSE if they choose to use hybrid motors. These must pass safety review.
11. A positive motor retention is required. Motor retention must pass RSO approval before the flight will be allowed.
12. Only currently certified NAR/TRA commercial motors are allowed. No modifications are allowed to any of the motors. Teams may use manufacturer approved instructions for delay length modification.
13. The following commercial altimeters are allowed for altitude measurements:
 1. Any Perfectflite altimeters
 2. Raven Altimeter
 3. ARTS



4. JollyLogic AltimeterOne or AltimeterTwo
14. Electronic deployment devices are allowed.
15. Electronic deployment devices must be disarmed until the rocket is placed on the launch pad. Giant Leap Rocketry Slimshot and EFC are allowed as is.
16. Recovery aids such as radio beacons/trackers and audible beacons are allowed.
17. A recovery system is required so that the rocket lands and is immediately flyable without the need for any repairs or alterations. Rockets not meeting this definition will be disqualified.
18. The egg and altimeter must return in the same portion of the rocket but recovery may be in multiple, safe, portions, if the team desires.
19. Any structural part of the rocket recovery system, or motor that free falls will result in a disqualification. Pop rail guides are considered part of the ground support equipment. Any components that are supposed to be safely released or discarded for launch purposes are allowed. The competitor must specify what gets released or discarded for launch purposes before the launch and get safety approval from the RSO.
20. The word of the safety and contest committees and range safety officer is final. The safety team and/or RSO are the ultimate judges in determining a safe or unsafe flight.
21. Up to three attempts per team are allowed. Exceptions are due to malfunctioning launch equipment or faulty rocket motor due to manufacturer defect.
22. The competition launch window opens at 10AM and closes at 4PM. Rocket loading may proceed up until 4PM but any flights from 4PM until the closure of the FAA waiver at 5PM will be made on a “best effort” basis.
23. Rockets may not use any externally-generated signals such as radio or computer control for any purpose, including flight termination, after liftoff. Autonomous on-board control systems can be used.
24. Boosted darts are not allowed.
25. Motor igniter(s) are to be installed at the launch pad only.
26. Install motor igniter(s) *after* any electronic recovery systems are armed.
27. Competitors attempting unsafe recovery from trees or power lines will be disqualified. If a rocket lands in a tree or power line, an official needs to be notified and will work with the team to make a safe recovery.
28. No external “assistance” is allowed with rovers. This includes, but is not limited to, removing obstacles from the path of the rover, adding surfacing materials in front of a rover, or human “spotters” for remotely controlled rovers.
29. If a rover is remotely controlled then the driver must be in a secluded location without external visual cues: all sensory input must come via systems emplaced on the rover or base.
30. The rover must be functional after landing. If it lands so close to the base station that no movement is triggered, the team will be required to demonstrate rover functionality by having a judge move the rover by hand to a new location. The team may pick the new location subject to approval by the judge.
31. The altimeter used for altitude measurement must not be removed from the rocket or turned off until in the presence of a judge.
32. If a team chooses to use a hybrid rocket motor, the team must provide all ground support equipment.



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33. All electronics power must support up to an hour delay on the launch pad.
34. The organizers reserve the right to modify these rules or restrict the number of teams entering the competition.

Launch Systems

Launch pads will be provided and have six foot long 1 inch aluminum rails. 1.5 inch rails will also be available.

Teams may provide their own launch pad. Team supplied launch equipment must be inspected before use for safety.

Practice Flights

Teams can perform test flights any time during the year up to the competition. If testing with high power rocket motors, a team member must be certified to an appropriate level. Teams must follow all rules, regulations, and safety codes when flying.

Disqualifications

A team will be disqualified for the following reasons:

1. Recovery system does not deploy and the rocket free falls or comes in ballistic.
2. One or more parts of the rocket free fall from the rest of the rocket.
3. Rocket motor separates from the rocket during any part of flight.
4. Rocket is damaged beyond field repair after flight.
5. Team acts in a dangerous manner.
6. Team misbehaves and interferes with another team's progress.
7. Team does not launch before the end of flying window.
8. Team attempts an unsafe recovery. An unsafe recovery is defined as attempting to remove any part of a rocket out of power lines or trees that require climbing. Rockets can be pulled out of trees or other vegetation if the team member can reach any part while standing on the ground.

Competition Operations

The opportunity to launch begins at 10AM and ends at 4PM. All contestants must be on the launch pad no later than 4pm. All flights must return to the judges by 5PM.



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Resources

Find a launch or mentor: www.nar.org

Find a launch or mentor: www.tripoli.org

Launch site sponsor: <http://battlepark.org/>

www.rocketryforum.com particularly the “getting started information” in
<http://www.rocketryforum.com/forumdisplay.php?f=41> and the list of vendors in
<http://www.rocketryforum.com/showthread.php?t=110>

www.rocketryonline.com

www.rocketryplanet.com

www.jcrocket.com

Rocket part suppliers:

www.pratthobbies.com

Rocket simulation software:

RASAero: <http://www.rasaero.com/>

RockSim: <http://www.apogeerockets.com/rocksim.asp>

SpaceCAD: <http://spacecad.com/>

Altimeter Suppliers:

<http://www.perfectflite.com/>

<http://www.featherweightaltimeters.com/>

<http://www.ozarkaerospace.com/>

<http://www.jollylogic.com/>

Invited Finals competition on site motor vendors:

<http://performancehobbies.com/>

<http://www.thedragonshoard.com/>