2024 Argonia Cup Rules

SUMMARY

The goal for the 2024 Argonia Cup is to launch a two-stage rocket containing any number of golf balls as a payload in the sustainer to the highest altitude possible. The sustainer must not exceed 45,000' AGL. Both stages of the rocket must recover safely and in flyable condition.

RULES

1. There must be at least one (1) TRA certified Level 2 member per team. This team member must be present at the competition and will be considered the flyer of record of the rocket. All team members must currently be enrolled at the competing university or college. Team members accessing the high-power pad area must be members of the Tripoli Rocketry Association. Multiple teams from the same university or college are permitted.
2. The maximum total installed impulse for this competition will be 5,120.0 Newton Seconds. All motors must be commercially certified motors. Spark emitting motors (Skidmark type motors) are prohibited.
3. A commercially manufactured and tested altitude recording altimeter with onboard data storage shall be used for altitude determination. If two or more altimeters are used, the averaged apogee height of each altimeter will be used for determination of rocket apogee.
4. Ignition of the sustainer motor will utilize commercially manufactured electronics capable of inhibiting sustainer ignition if the flight is not vertical. See sustainer Motor Inhibit Logic section below for details.
5. All motor igniters shall be installed at a safe location out on the range. Any team found installing ignitors in the team camp/spectator area will be disqualified.
6. Rockets shall be launched at an elevation angle between 90 and 85 degrees (vertical to 5 degrees off vertical). All flights will be angled away from the flight line regardless of wind direction.
7. All rockets must have a minimum of a 5:1 thrust to weight ratio at liftoff.
8. Launch configuration flight stability shall be achieved by maintaining a minimum CP/CG static margin of no less than 1 body caliber during flight.
9. All launch vehicle components must be recovered in a "re-flyable condition" after flight. Zippers in the body tube, loose fins, stripped parachutes are all disqualifying.

SUSTAINER MOTOR INHIBIT LOGIC

Sustainer motor ignition will be inhibited in the event the flight is not vertical. This can be done in one of two ways.

1. Use flight computers capable of inhibiting sustainer motor ignition based on tilt angle.

- Examples include the Altus Metrum Telemega and EasyMega. Other devices also exist which can sense tilt angle and use this information as a check prior to igniting the upper stage.
- The following logicals should all be true before firing the upper stage:
- Tilt angle less than 20 degrees.
- Velocity greater than 200 ft/sec

2. Time/altitude lockout

- Devices without tilt measurements are allowed, but should follow all of the following guidelines:
- Velocity greater than 200 ft/sec
- Time since liftoff less than (intended staging time + 2 sec)
- Altitude greater than (75% of the intended staging altitude)

The sustainer recovery system should be sized to allow a safe descent of the sustainer in the event that it does not ignite. Keep in mind that unburned propellant will make the rocket heavier. A descent rate of no more than 35 ft/sec will be allowed under the main parachute with an unburned rocket motor.

VIDEO

Each team will be required to produce a video (six (6) minutes or longer, hosted on YouTube) introducing each member of the team and providing a detailed overview of the project with an emphasis on the payload recovery system. This video must be submitted to the launch organizers on or before February 23, 2024.

FLIGHT SIMULATIONS

Team information, detailed rocket description, flight simulations and sustainer logic information must be submitted to the contest committee by February 23, 2024. The information submission form can be found **here**. Failure to submit this information will be grounds for disqualification.

LAUNCH OPERATIONS

1. TRA Unified Safety Code will be followed for all launch activities. Any team member accessing the launch pad area must be a member of TRA.

2. The launch organizers will provide all launch pads, launch rails, and the launch control system. All rockets must utilize 1.5" x 1.5" (commonly known as 1515) rails. The rails provided will be 12' in length. A minimum of two (2) rail guides must be used.
3. All rockets will be subjected to a rocket safety inspection before the teams will be cleared to fly their projects. Any safety of flight issues noted in this inspection will be resolved before flight. These safety inspectors have the final say regarding any project's suitability for flight.

SCORING

1. The flight score for this competition will be as follows:

$$\boldsymbol{Score} = Apogee_{Sustainer} * \left(\frac{n}{10} + 1\right)$$

Where n is the number of golf balls contained in the sustainer of the rocket.

2. Teams must supply all golf balls they intend to use in the competition. All golf balls must conform to USGA specifications and cannot be modified in any way.
3. The minimum number of golf balls flown is one.
4. Competition golf balls may only be loaded under the supervision of the contest appointed safety monitor.
5. Only golf balls flown and recovered in the sustainer will be considered for scoring.
6. Any altitude 45,000'AGL or higher will be disqualifying.
7. All rockets must be presented to the scoring table by 4:45PM on Sunday, March 24, 2024. Flights returned after this time will be disqualified.