



S.T.E.A.M.

2017 CHAMPIONSHIP — BATTLE OF THE ROCKETS

Model rocketry was developed during the “space race” era. Due to increased publicity in aerospace companies such as Space X, Virgin Galactic, and NASA, there is an increased interest in hobbies related to aerospace. Building and flying model rockets is a logical extension. Students who have flown model rockets will have an increased understanding of the design requirements and forces for powered flight which will provide concrete examples when these topics are covered in their STEAM classes.

JSerra Catholic High School and its Engineering Magnet Program (EMP) are hosting a model rocket contest. This unique competition will be judged based on the criteria described below. The contest is open to 7th and 8th grade middle-school students. Each school may enter one 7th grade team and one 8th grade team with a maximum of three students on each team. These teams will be competing for academic scholarships and trophies offered by JSerra on **Friday, December 1st**.

Overview

JSerra will supply each school with two rocket packages. Each package will consist of all construction materials necessary to build and launch a model rocket. Engines and recovery wadding will be supplied by JSerra on launch day. On launch day, each team’s rocket will undergo an aerodynamic stability test to determine its flight worthiness. Contest teams will use their own ingenuity to design and paint their rocket.

Prizes

The winner of the competition will be based on a combination of the rocket’s performance and team’s performance predictions of their rocket’s behavior. The team’s score is based on the following:

1. Altitude (25% of score): Height will be determined at each launch. This will consist of the average value of two measurements made by two judges.

2. Predicted Altitude (25% of score): Teams will predict the altitude their rocket will fly. Using the actual height determination and the team's predicted height, a percent difference value in predicted height versus actual height will be calculated.
3. Predicted Time in the Air (25% of score): Teams will predict the total time in the air of their rocket compared to its actual time in the air. A percent difference value in predicted time in the air versus actual time in the air will be calculated.
4. Space-X Return (25% of score): Rockets will be scored based on how close they return to the launch pad.

Judges' decisions relating to safety, launch, tiebreakers, and scoring are final.

1st Place Prize –\$20,000 Scholarship

- Each team member will receive \$5,000 off tuition per year for all four years of high school at JSerra, and automatic acceptance to the Engineering Magnet Program.

2nd Place Price - \$10,000 Scholarship

- Each team member will receive \$2,500 off tuition per year for all four years of high school at JSerra, and automatic acceptance to the Engineering Magnet Program.

3rd Place Prize - \$5,000 Scholarship

- Each team member will receive \$1,250 off tuition per year for all four years of high school at JSerra, and automatic acceptance to the Engineering Magnet Program.

Trophy – Best Design

- The judges will award one rocket for best design and appearance. Creativity is highly encouraged!

Eligibility

In order to qualify for the JSerra STEAM Championship, you must meet these requirements:

1. Each team must consist of students in 7th or 8th grade currently enrolled at one of these schools: Mission Basilica, St. Edward the Confessor, St. Catherine of Siena, Our Lady of Fatima, St. Junipero Serra, St. Mary's, and St. Anne's.
2. Each contestant must sign a JSerra media release.

JSerra Catholic High School may disqualify prior to or during competition any competitor who is not in compliance with any of its eligibility requirements; and it may require any competitor who is found to have not been in compliance with any of the eligibility requirements to forfeit the prizes accorded to the competitor as a result of participation in the competition.

Timeline

Check-in – Rockets Submitted to Judges	11:00 AM - 11:15 AM
Rocket Walk-Around	11:15 AM - 11:30 AM
Lunch	11:30 AM - 12:00 PM
Launch Prep (done by JSerra)	11:30 PM - 12:15 PM
Round 1 (launch all rockets)	12:15 PM – 1:00 PM
Round 2 (final four)	1:00 PM – 1:20 PM
Round 3 (finale)	1:20 PM – 1:40 PM
Awards and Closing	1:40 PM - 1:55 PM

Contest Rules

1. All rockets must be submitted to the judges (Dr. Kilduff and Dr. Maffia) prior to the start of the competition at check-in. Rockets will undergo a stability test by JSerra in order to be approved. **Only approved rockets may be launched.**
2. Rocket set up and launch will be handled by JSerra. Student teams under the supervision of JSerra will be permitted to launch their rocket. Only team members are allowed near the rocket launch pads. Teams will be escorted to and from the launch area. Spectators will not be allowed near the launch area.
3. Weather conditions will determine launch parameters. Parameters include launch direction and parachute area. Rockets will be equipped with 'A' class engines. All rockets start with an unaltered 12" parachute. Wind levels will determine size of parachute center hole. Cutting of parachute opening will occur prior to stability testing. Contestants will then load recovery wadding and the parachute.
4. The winning rocket must be able to withstand multiple launches. Only minor repairs can be made to a previously launched rocket. Repairs include: parachute tears; shock cord re-attachment and fin re-gluing. Other repairs are at the judges' discretion. **Rockets that have been damaged and are not safe to fly will not advance to the next round regardless of their prior score. Judges have final discretion on whether the rocket can sustain another launch.**
5. There will be at least three launches to determine the winner. The top four rockets will be determined after the initial round of launches. In round two, the first-place rocket will compete against the fourth-place rocket and the second-place rocket will compete against the third-place rocket in a bracket style format. The two winners of this round will then go head-to-head in a final round to determine first and second-place. Third-place is determined by the third best score in round two.

6. Prior to the second round of launches the top four teams can update their predicted launch values (altitude and time aloft). Values will be submitted to the judges in a timely fashion after the announcing of the top four rockets. The final two teams will also be able to update their predicated launch values before the championship launch.

Rocket Design Parameters

1. Rockets will be constructed only from parts supplied by JSerra.
2. The main body tube of the rocket must be no smaller than 25.0 cm. This does not include the nose cone.
3. Rockets may have three or four stabilizer fins.
4. Rockets with engine, parachute, and recovery wadding must pass a stability test.
5. Rockets must be minimally rugged that they survive a minimum of three launches using an A class rocket engine.

Students are encouraged to purchase additional rockets for testing purposes. You can purchase the rocket packages at <http://www.acsupplyco.com>.

Below are YouTube videos that can provide useful direction if you have never built a rocket.

[Part 1: How Model Rockets Work](#)

[Part 2: Components of a Rocket](#)

[Part 3: Construction](#)

[Part 4: Finishing the Rocket's Fins](#)

[Part 5: Assembling the Rocket](#)

[Part 6: Painting the Completed Rocket](#)

JSerra will follow the NAR safety code listed below. JSerra officials and judges will make final determinations on rulings, measurements and awards.

Questions? Please contact Dr. Blase Maffia at bmaffia@jserra.org or Zach Brogdon at zbrogdon@jserra.org.

NAR: MODEL ROCKET SAFETY CODE
EFFECTIVE AUGUST 2012

1. Materials. I will use only lightweight, non-metal parts for the nose, body, and fins of my rocket.
2. Motors. I will use only certified, commercially-made model rocket motors, and will not tamper with these motors or use them for any purposes except those recommended by the manufacturer.
3. Ignition System. I will launch my rockets with an electrical launch system and electrical motor igniters. My launch system will have a safety interlock in series with the launch switch, and will use a launch switch that returns to the "off" position when released.
4. Misfires. If my rocket does not launch when I press the button of my electrical launch system, I will remove the launcher's safety interlock or disconnect its battery, and will wait 60 seconds after the last launch attempt before allowing anyone to approach the rocket.
5. Launch Safety. I will use a countdown before launch, and will ensure that everyone is paying attention and is a safe distance of at least 15 feet away when I launch rockets with D motors or smaller, and 30 feet when I launch larger rockets. If I am uncertain about the safety or stability of an untested rocket, I will check the stability before flight and will fly it only after warning spectators and clearing them away to a safe distance. When conducting a simultaneous launch of more than ten rockets I will observe a safe distance of 1.5 times the maximum expected altitude of any launched rocket.
6. Launcher. I will launch my rocket from a launch rod, tower, or rail that is pointed to within 30 degrees of the vertical to ensure that the rocket flies nearly straight up, and I will use a blast deflector to prevent the motor's exhaust from hitting the ground. To prevent accidental eye injury, I will place launchers so that the end of the launch rod is above eye level or will cap the end of the rod when it is not in use.
7. Size. My model rocket will not weigh more than 1,500 grams (53 ounces) at liftoff and will not contain more than 125 grams (4.4 ounces) of propellant or 320 N-sec (71.9 pound-seconds) of total impulse.
8. Flight Safety. I will not launch my rocket at targets, into clouds, or near airplanes, and will not put any flammable or explosive payload in my rocket.
9. Launch Site. I will launch my rocket outdoors, in an open area at least as large as shown in the accompanying table, and in safe weather conditions with wind speeds no greater than 20 miles per hour. I will ensure that there is no dry grass close to the launch pad, and that the launch site does not present risk of grass fires.
10. Recovery System. I will use a recovery system such as a streamer or parachute in my rocket so that it returns safely and undamaged and can be flown again, and I will use only flame-resistant or fireproof recovery system wadding in my rocket.
11. Recovery Safety. I will not attempt to recover my rocket from power lines, tall trees, or other dangerous places.