

Rocket car rules

The car is designed and built to be a rocket car, propelled by air or water-air supplied via a hand pump to the car when mounted on the launcher. The cars are launched parallel to the ground towards the target.

Rocket cars must abide by the following or they will be disqualified and not allowed to compete:

- 1.) The pressure vessel **MUST** be a carbonated beverage bottle with volume not greater than 1 liter.
- 2.) **Nothing can be glued to the pressure vessel.** Items may be taped to the pressure vessel, but glue cannot be applied to the pressure vessel.
- 3.) All cars must have at least 2 wheels.
- 4.) Total vehicle weight must be less than 8 oz.

ALL ROCKET CARS WILL BE INSPECTED PRIOR TO THE COMPETITION. ANY CARS THAT APPEAR TO HAVE DAMAGE TO THE PRESSURE VESSEL WILL NOT BE ALLOWED TO COMPETE.

Rocket cars will be judged based upon:

- 1.) The ability of the rocket car to impact the barrier.
- 2.) The ability of the rocket car to break the egg.

Construction of a basic rocket car:

Materials:

- 1 – liter carbonated beverage bottle (basic cylindrical shapes tend to be easiest to use).
- 4 – Wheels (11.5 g poker chips work well with a hole drilled in the center).
- 2 – Bic Roundstick pens with the ends and ink removed (or equivalent).
- 1 Cardboard base. Size can vary, but 2” X 8” inches works well.
- 2 – shishkabob skewers.
- Packing tape
- Glue (hot glue guns or fairly thick quick-drying glues work well).
- Other accessories: nuts/washers, small foam or rubber ball, cardboard scraps

Procedure:

- 1.) Tape the bottle to the cardboard base. Be sure when taping the bottle to the base to leave some space where near the neck so the bottle can integrate with the launcher system.
- 2.) Glue and tape the pens to the base
- 3.) Feed the skewers through the pens and glue wheels to the skewers. Be sure to not glue the skewers to the pens so the wheels can spin freely.
- 4.) This is the basic car. Additional items can be added such as fins, nosecones, bumpers, additional weight for balance, etc. Be careful not to glue anything to the pressure vessel (or get hot glue near it). This can damage the bottle and cause a safety hazard.



Pictures of Rocket cars made by students (for a distance competition)





Barrier Rules

Barriers must be constructed from popsicle sticks and glue. No other materials may be used. The structure must be designed to hold a raw egg (in a Ziploc bag to prevent a mess) with no other padding or material used to absorb the impact. The egg must be at least one inch off the ground when in the structure.

Barrier success will be determined by

1.) Whether or not it can protect the egg.

2.) A cost index. $CI = \frac{1}{m_a + 3m_s}$ where $m_s = \text{mass of popsicle sticks}$, $m_a = \text{mass of adhesive}$

a. Teams are responsible for determining both masses

i. m_s may be determined by taking the mass of one stick and multiplying by the number of sticks.

ii. m_a may be determined by subtracting m_s from the total mass.

b. Depending on the number of teams participating the CI may be multiplied by the number of times a barrier protects the egg (if multiple impacts are done). If the number of teams dictates only one launch, the winner will be determined by the largest CI among barriers that successfully protect the egg.

Rocket Car vs. Barrier competition

In order to compete, each team must construct a rocket car and a barrier.

Each team's car will be used to attempt to destroy the other teams' barriers.

Rocket cars will be launched with no more than 50 psi in the launcher towards the barrier. Teams may choose the launch pressure (below the max) and water amount based on their design and testing.

The barrier with the egg will be placed up against a solid surface 25 feet from the launcher.

Depending on the number of teams participating, the cars may only be launched against one barrier, or there could be a 'round-robin' type competition. Design of rocket cars and barriers that can be used multiple times is encouraged (and/or having multiple rockets and barriers).

Actual competition rules will be made available closer to the competition date.