

Nimble'17

Aqua Missile



1. Introduction

Challenge gravity and find your rocket remains in air for maximum duration of time. Use all your knowledge and apply hands-on changes to make your rocket to stay in air for maximum time. A simple rocket can be made using a plastic bottle filled with a volume of water and pressurized air. When opened, the air pressure pushes the water out of the bottle. This causes an increase in the bottle momentum so that it can be propelled to fairly long distances or heights. Water rockets are widely used as an educational activity, and several mathematical models have been proposed to investigate and predict their physics. However, the real equations that describe the physics of the rockets are so complicated that certain assumptions are usually made to obtain models that are easier to use. It is an example of Newton's third law of motion.

2. Problem statement

Now comes the exciting part. This part tests the abilities of your rocket to hit the given target and the time of flight it can achieve. You have to hit the target, with maximum accuracy. Use all your knowledge of physical laws to land it on specified target area which is away from your launching point. The competition will be performed in two rounds.

3. Event Rules and Specifications

3.1. Team Size

- A team should not exceed more than 2 members.

3.2. Eligibility

Any student can participate in this event.

3.3. Rules

1. Participants will be allowed to launch their model only 1 time in first round. This will count the total time of flight of model.
2. In the second round 2 chances will be provided which will all be considered for judging. Participants have to hit the target in this round.
3. In case there is hindrance by tree/building or any such source, participants will not be given any additional trial. Same distance or time will be counted for judging.
4. Only water and air can be used as propellants.
5. Maximum pressure range allowed is 60-70 psi. It is compulsory for the participants to bring their own launchers. No launcher will be provided from our side.
7. An electric compressor will be provided on the spot for pressurizing the water rocket.

8. The team will be disqualified in case the bottle bursts while pressurizing and still mounted on the launcher.
9. Any part of rocket should not separate from it during launching till landing.
10. Participants are allowed to use only one model through all the rounds.
11. The launch pad is provided and if the participant is willing to use their own launch pad, the power of allowing/disallowing the participant to do so rests with the organizing team.
12. The organizers reserve all rights to change any or all of the above rules. However, you are suggested to keep checking the website regularly.

3.4 Specifications

1. Water Rocket and any of its components should be handmade. Ready-made models are strictly not allowed. NOTE: Teams will not be provided with any kind of resources and no extra time will be given for any kind of modification after the event starts.
2. Your model can be of any size or shape and can be made of any material. But, it should not damage the arena or hurt any person. If your model is found dangerous, you will not be allowed to participate in the event.
3. You can add parachute mechanism to your water rocket. 4. No multistage mechanisms or thrust boosters are allowed. If found you will be disqualified from the competition.

3.5 Points distribution

Number of points granted = $10 \times$ Time of flight (in sec) pts, scored as given below:

1. The circular arena is divided into 3 concentric circular regions.
2. The centre of the innermost circle is 50 meters away from launching point. The inner Region A (radius 2 m) holds 150 points.
4. The next Region B (radius 2-4 m) holds 100 points.
5. The last Region C (radius 4-6 m) holds 50 points.
6. The position of the rocket will be the first point of impact of the rocket on the ground.
7. Best score in all three attempts will be taken as final score for round -2.

NOTE: NO points will be awarded if the water rocket lands outside the arena. NO pts will be awarded regarding to time of flight if rocket lands outside arena.

A stopwatch will be used to measure the time of flight. The duration shall include the time when the rocket is launched and until it touches the ground in the first instance. The time for the motion of the rocket after touching the ground once is not included.

4. Judging Criterion

The team with greater points will be awarded superior rank.

All decisions taken by the organizing team will be deemed as final, and no more changes will be encouraged, thus holding the full authority to change any of the above rules as per circumstances.

5. Contacts

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