

Marshmallow Launcher Competition

Fall 2007 Competition Rules

Objective

The objective is to launch a free flying marshmallow at a target 50 feet away and land it on the target's bulls-eye. The 50 feet will be measured from the designated launching area to the target's bulls-eye. The final resting place of the marshmallow on the target will be recorded as your team's attempt. An average of your team's three attempts will be used to score the team. The team with the most points wins.

Rules

1. You must design a device to launch the marshmallow, i.e. the marshmallow cannot be thrown.
2. The total cost of the device may not exceed \$40.00. Receipts must be attached to the report and available at the judging station. If you cannot provide the receipts, or the receipts are not from a local retail store, your team will not be allowed to compete.
3. The items used in the construction of the device must be purchased at local retail stores, such as Home Depot, Target, Wal-Mart, etc. (The company name will be labeled on the receipt.)
4. No online purchases will be allowed in an attempt to allow everyone equal opportunity at building materials.
5. The marshmallow will be provided at the competition site. The marshmallow will be the large type of marshmallow (versus the miniature type).
6. Once launched, the marshmallow may not be subjected to any additional force other than gravity and the wind, and it cannot be in a powered vehicle.
7. Other than limited reshaping, you may not alter the physical or chemical state of the marshmallow. Also, you may not increase or reduce the weight or mass of the marshmallow. The marshmallow must be completely edible at all times.
8. When the marshmallow comes to rest, it must be in direct contact with the competition surface and must be completely detached from any foreign object.
9. The final location of the marshmallow is defined as the location on the target where the marshmallow comes to rest (no longer moves).
10. No chemical reactions using fire or explosives may be used.
11. No AC current will be allowed.
12. The marshmallow must travel with no solid connection to the ground.
13. If each launch uses disposable items (i.e. CO₂ cartridges, etc), then the cost must be calculated as the total of all 3 launches.
14. On the day of the competition, any competition judge may disqualify your team based on safety issues.
15. Ties will be determined by least cost.
16. The entire launch mechanism must originate from the launching area prior to launch.
17. The launching device cannot be in contact with the ground in the target area and launch area, simultaneously, at any time.

Scoring

Final competition grades will consist of three categories (Total of 1000 points): Pre-competition Evaluation (300 points), Distance and Accuracy (350 points), and Technical Paper (350 points). Once a team receives a point total (i.e. 935 points), each team member will have that score multiplied by his/her peer evaluation score. The overall competition winner will be decided using the Pre-Competition Evaluation and Distance and Accuracy scores, minus any deductions. In the case of a tie, the team whose single launch measured closer to the bulls-eye will win. If there is still a tie, the team with the highest “Design” score will win. If there is still a tie, the team with the least cost will win (with proof by receipts). Evaluation will occur as follows:

Pre-Competition Evaluation (Design) (300 Points)

This category is worth a possible 300 points and is divided into five sections. You will receive a maximum of 60 points for each subcategory.

1. *Creativity* – Creativity is based on the individuality and innovativeness of the device.
2. *Professionalism* – Based on the overall quality of the device and behavior of the team during the competition.
3. *Operational Soundness* – This is based on your vehicle’s overall functionality and repeatability, and that the vehicle’s design is fundamentally safe.
4. *Design Specifications* – This category will gauge your vehicle’s compliance with the non-performance engineering design specifications set forth by the team, and rules of the competition.
5. *Receipts and Materials List* – A list of **all** materials used must be submitted on competition day along with receipts to assure compliance with the spending limit of \$40. Both of the aforementioned items should be attached to the competition form.

Distance and Accuracy (350 Points)

This category is worth a possible 350 points and is divided into two sections. You will receive a maximum of 250 points for the distance score and a maximum of 100 points for the accuracy score.

1. *Distance* – Points will be awarded based on the maximum distance a marshmallow travels given the following formula:

$$P_d(d) = 5 \cdot d$$

Where P_d is the point total for this category and d is the distance that the marshmallow traveled in feet. Please note that the distance used in the calculation can be a maximum of 50 feet (i.e. if your marshmallow travels farther than 50 feet, you will only receive 250 points since this is the maximum). For example, if your farthest marshmallow travels 20 feet, then you will receive 100 points out of a maximum 250 points (20ft x 5). If your marshmallow

travels farther than 50 feet, you will not receive “extra” points. The maximum number of points possible is 250 points, which is $(50 \text{ ft} \times 5) = 250$ points.

2. *Accuracy* – Points will be awarded based on how far away your marshmallow is from the target’s bulls-eye. For every inch your marshmallow is away from the bulls-eye, 1 point will be deducted from the maximum 100 possible points. For example, if your marshmallow lands 50 inches away from the bulls-eye, then you will be awarded $100 - 50 = 50$ points. However, you will not receive a negative score. For instance, if your marshmallow lands 144 inches away, then you will receive a score of 0 points, not -20 points.

Technical Paper (350 Points)

The report is worth 350 points, and these points will be awarded by your mentor based on your team’s paper. EVERY GROUP MUST SUBMIT A TECHNICAL PAPER ON THE DAY OF THE COMPETITION IN THE FILE WITH THEIR MENTOR’S SECTION NUMBER ON IT. Papers should be written in a professional manner and must follow the template online. A sample grading sheet is also provided online in an effort to facilitate your understanding of the grading criteria.

Grading and Peer Evaluations

When you combine the scores from the three scoring categories: Design (300 points), Distance & Accuracy (350 points), and Technical Paper (350 points) you will receive a score out of a total possible 1000 points ($300 + 350 + 350 = 1000$), thus your group’s final score is determined by the following formula:

$$\text{Group Final Score} = \text{Design Score} + \text{Distance and Accuracy Score} + \text{Technical Paper Score}$$

This is not what you will receive as a grade. Your grade will take into account a peer evaluation. Each member in your group must fill out a peer evaluation. The peer evaluation form is posted on WebCT in the same area that this document was posted. Be sure to download it, fill it out, and submit it along with your copy of the technical paper. If you don’t do a peer evaluation, you will receive a 100 point deduction. Team members will “grade” each other on the following:

1. *Attendance* – You will grade your teammates’ attendance on a scale of 0-10 where 10 should be awarded if that member attended all meetings and a 0 should be awarded if that member attended no meetings.
2. *Reports Contribution* – You will grade your teammates’ contribution to the group reports on a scale of 0-10 where 10 should be awarded if that member contributed their fair share to the reports produced by the team.
3. *Intellectual Contribution* – You will grade your teammates’ mental contribution on a scale of 0-10 where 10 should be awarded if that member contributed their fair share to the design and other intellectual aspects of your project.
4. *Physical Contribution* – You will grade your teammates’ physical contribution on a scale of 0-10 where a 10 should be awarded if that member contributed their fair share to building your design and other physical aspects of your project.

Your peer evaluation score is computed by adding all of your peer evaluations together. For example, if you receive a 20/40 from teammate 1, a 30/40 from teammate 2, a 40/40 from teammate 3, and an overall raw score of 950 from your reports and competition performance, your peer evaluation will be $(20+30+40)/(40+40+40)=90/120=0.75$, and your score final score will be $0.75*950=712.50$. It is possible to get a final score of 0 if a member does not participate in the design and fabrication of the vehicle and/or the writing of the report.

Peer Evaluations can dramatically change your grade, so please be fair when you're evaluating your teammates. This system is used to ensure teamwork and fairness among teammates. If you feel that you've been treated unfairly in your group, please talk to your mentor. Your mentor will act as an arbitrator.

Competition Day Schedule

On the day of the competition, you will go to the competition area instead of going to lecture and lab. Please arrive at the competition area on time for your scheduled heat! If you miss your assigned heat time, your team will not be allowed to compete and will not receive any points for competing. At least three members of your team must be present for your score to be recorded.

Competition Instructions:

1. Fill out your team's competition form (available online, must be typed) prior to signing in (60 point deduction for forms that are not typed.)
2. Go to the sign-in area; bring your device, competition form, receipts, and report.
3. Sign-in with the design judges at the sign-in area; you must sign-in prior to your team's heat time in order to qualify, so make sure you have all required materials to sign-in. To sign-in, you must present your device, competition form, and the receipts. Your device will then be judged by the design judges and your score will be recorded on your competition form.
4. Once you have signed in, wait for your heat to start.
5. When your heat is called to the competition area, walk to the competition area and setup your device in your assigned lane. The heat will begin at its scheduled time, so if your device is not setup in time, you will miss your heat and will not be able to compete! (This should be a consideration in your design, make sure you can setup your device in less than 2 minutes!)
6. At the scheduled time for your heat, an announcement will be made to launch your marshmallows using your devices. If your device is not setup in time, or if it fails, your team will not receive points for competing. The distance judges will then take measurements and record your scores on your competition form.
7. Take your device, marshmallow, report, and competition form to the sign-out area. Your team must sign-out to receive a grade. This is to ensure that your marshmallow, and optionally your device, is disposed of properly to keep the field clean. The sign-out judge must witness the disposal.
8. An observation area will be setup for those who wish to observe the competition. Due to safety reasons, please stay within the observation area.