

# Trajectory

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**All National Rules apply with the following as more specific guidelines.**

## Impound:

- All devices (and stabilization weights if applicable), calibration table w/graph (minimum of 4), and projectiles will be impounded within the time frame set forth for the day of the event. Any school team member may impound the device & graphs-No parents/coaches can impound.)
- Any devices impounded after the allotted time will be ranked as a 2<sup>nd</sup> tier. \* Not in rules
- Make sure that each device is clearly labeled with the 1) division, 2) school name, 3) team color, and 4) name of team members. Failure to do so will be subject to a penalty for each missing detail.
- No parts may be shared by different teams (even if from the same school).
- Target distances and heights will be announced after the impound time frame has closed.

**Graphs:** Each team starts with a graph score of 400 points which can be reduced by turning in graphs.

- Graphs/Table combinations may be hand drawn on graph paper or computer generated.
- 4 graphs must be identified as the scoreable graphs; and 1 random graph will be chosen to score.
- More than 4 graphs or other notes may be included but will not count towards the graph score
- Each graph/table combination must be on a separate piece of paper BUT the TABLE AND GRAPH must be on the same side of a paper
- The graph score starts at 400 and each correct category satisfied reduces the graph score.
- Each graph score includes the following requirements:
  - 4 completed data tables with title, team name, identified variables and units (-20 each table)
  - 4 completed graphs (-20 each graph)
  - graph matches data table and is on the same side of one paper (-20 each paper)
  - graphs properly labeled (-40 each) (title, team name, x & y axis variables, & increments with units)

**Measurement:** All device measurements will be conducted after all impounds are entered.

This year's device measurements must be no more than 70 cm cubed (Div. B) or 60 cm cubed (Div. C) prior to the first launching. If applicable, device weights used for stabilization must also fit into the same ~~80 cm~~ cube. Launching force, non-metallic solids, which are considered part of the device, must also remain in the ~~80 cm~~ cube measurement requirement after the launch. The triggering device MUST extend out of the launch area by 50cm and does not need to return to launch area after launch. See Coaches Manual & Rules for more specifications, measuring guidelines and Launch Area information.

**Projectile:** Each team needs to bring with them unmodified (labeling is permitted) projectile/s. Tennis ball, racquetball, ping pong ball, or plastic practice golf balls are the only projectiles allowed this year. They are not required to use the same projectile for every launches.

## Competition Guidelines:

1. Each participant must bring and wear HIGH IMPACT GOGGLES RATED ANSI Z87+ (traditional sunglasses are not accepted). A 100 point penalty will be added each time a participant is not wearing the safety goggles correctly.
2. Once a team receives their device from the impound area, they may not leave the area or receive outside assistance, materials or communication until they are finished competing.
3. Once a team receives their device and are set up in the launch area, they will be reminded of the target distance and height. At this time the team will also be notified of any device specifications that would place it in a lower scoring tier. No modifications can be made to the device to bring it back into regulation size. It will be ranked in tier 2 for scoring purposes.
4. Teams have 10 minutes to make 4 launches (2 at each target in any order). Teams may make adjustments to their machine for performance and targeting reasons. Teams must notify the event supervisor WHICH target they are aiming at for each launch.
5. Students (Whole body) must launch the device from a minimum of 50 cm to the rear or sides.

6. Participants must give warning to supervisor prior to launching.
7. A time out will be conducted to measure the projectile impact/device after launch only if problems occur.
8. A "1 minute left" warning will be given by the supervisor.
9. All devices may be picked up after the last team competes.

**Scoring: Final Score** See Coaches Manual & Rules paragraphs for additional scoring information.

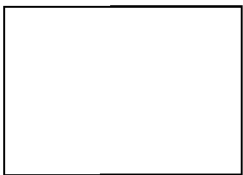
1. The winner is the team with the lowest final score and based on the ranking in the 2 tiers.
2. Final Score (FS) = best(lowest) Close Target score + best(lowest) Far Target score + Graph Score + Penalties (if any)- bucket score (if applicable). Objective is to get the lowest score
3. Close (raised) Target: distance measured in mm from center of the initial projectile impact to the center of the target. A miss or failure to launch at the close target = 800 points.
4. Far (ground) Target: distance measured in mm from center of the initial projectile impact to the center of the target even if it misses the target. If the device fails to launch due to breakdown or not enough time, the score will be the distance from the front of the launch area to the center of the target in mm.
5. NEW: BUCKET SHOT: If the first shot at a target hits the target, a bucket shot may be requested in place of the 2<sup>nd</sup> shot. See Manual 4 f. and 4 j. for more detailed description of scoring.
6. Tier violations (Size, late impound, improper projectile, Other than non-metallic elastic solid launch force, Triggering device min. 50cm from launch box/improper trigger device/unsafe launch
7. Penalties: 100 point penalty for each time any of the following occurs:
  - a. Warning for not correctly wearing proper eye protection
  - b. In the launch box, in the target area, or in front of the front line of the launch area when device is triggered or launch occurs
  - c. No warning by the participant prior to launch (even if device unintentionally goes through launch motion)
  - d. No warning to which target participants are aiming for.
  - e. Any part of the device ends up outside of the launch area before or after a launch.
8. Additional Penalties: \*Not in Rules
  - a. 10 point penalty for missing device labels. 1) division, 2) school name, 3) team color, and 4) name of team members.
  - b. Outside coaching - 100 points per incident

**NOT TO SCALE (Will be using Square targets filled with sand)**

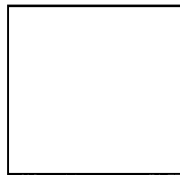
Launch Area  
1.5 meter long

Close target (1 m<sup>2</sup>)  
(up to 1 meter off the ground-B)  
(up to 2 meters off the ground-C)  
(height in 1 cm increments)

Far Target (1 m<sup>2</sup>)  
(on ground)

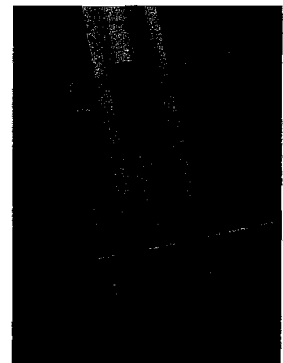
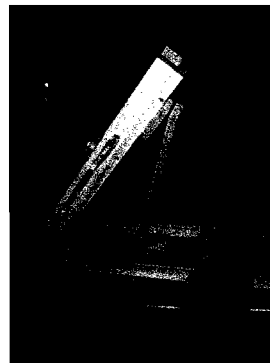


Distance from front of launch line minimum of 2m



distance from launch area - in 1 meter increments  
max of 8m for Div. B  
max of 10m for Div. C

Sample Device presented at S.F. Conference 2007  
(did not satisfy 80 cm cube requirements)



# Trajectory

Division: B / C    School Name: \_\_\_\_\_ Team Color: \_\_\_\_\_

Team Members: \_\_\_\_\_ & \_\_\_\_\_

**Impound:**

- |  |          |          |                       |                |
|--|----------|----------|-----------------------|----------------|
| 1. Size: L: _____  | W: _____ | H: _____ | Within limits: Y or N | Tier Violation |
| 2. Impound on time   |          |          | Y or N                | Tier Violation |
| 3. Projectile (Tennis ball, racquetball, ping pong ball, or Hackie sack)                     |          |          | Y or N                | Tier Violation |
| 4. Other than non-metallic, elastic solid launch force                                       |          |          | Y or N                | Tier Violation |
| 5. Device Labeled Correctly  |          |          | Y or N                | Penalty        |
| 6. 4 Calibration Tables and Graphs included (1 table/graph combination must be on same page) |          |          | Y or N                | Penalty        |

Close Target Score 1 (mm) miss = 800	Close Target Score 2 (mm) miss = 800	Far Target Score 1 (mm)	Far Target Score 2 (mm)
Hit/Miss	Hit/Miss	Hit/Miss	Hit/Miss

Penalty Type	# of occasions	Penalty Points Assessed
Device labels: division, school, color, team member names	x 10 each	
HIGH IMPACT Goggles not worn properly	x 100	
In launch target area or in front of launch line during launch	x 100	
Not notifying event supervisor of target aimed at	x 100	
Not notifying event supervisor of launch	x 100	
Parts not contained in 80 cm cube (except trigger)	x 100	
Outside coaching	x 100	
<b>Penalty Total</b>		

**Graph Score : 400 -**

Graph	data table (-20) title, team, units	graph (-20)	graph matches data table and on same page (-20)	graph labeled w/ title (-10)	graph labeled w/ team name (-10) (School & color)	graph labeled x & y axis (- 10)	graph labeled w/ units (-10)	Score = Total x				
								1	2	3	4	
1												

Lowest Close Target Score	
+ Lowest Far Target Score	
+ Graph Score	
+ Penalties (if any)	
- Bucket Deductions	

**Tier 1:**

Device w/in specs

**Tier 2:**

Device not w/in size specs

Impounded late

Triggering device min. 50cm from launch box/improper trigger device

Other than non-metallic elastic solid launch force

Improper Projectile

DQ Device operated in unsafe manner

**Rank:** \_\_\_\_\_

**Final Score:** \_\_\_\_\_