

2023

Catapult Competition



Description

A catapult is a mechanism used to forcefully propelling stones, spears, or other projectiles. It is mainly used as a military weapon since ancient times. Catapults were used by ancient Greeks, ancient Chinese and Romans so to be able to shoot arrows and darts as well as stones at enemy soldiers.

Team

A team is made of 2-4 members. There is a limit of one catapult team per chapter. All team members must be present during lunching/competition time.

Design Constraints

- Design Envelope is 30" (Length) x 18" (Width) x 24" (Height) with arm in locked/launching position. Throwing arm cannot unfold or transform during launch. The total weight of the unloaded catapult may not exceed fifteen (15) pounds.
- The catapult may have any type of spring mechanism to power the arm, but all parts must be contained in the design envelope stated above.
- The device must be a Mangonel style catapult (No Ballista or crossbow style catapults allowed). No trebuchet or catapult/trebuchet hybrids are allowed.
- No use of commercial catapult kits or components. The design and construction should demonstrate proof of the Team's efforts.
- Teams are allowed to use the following:
 - PVC
 - 3D Printed Components (a limit of 6 in³ of material)
 - Plastic
 - Wood
 - Hardware (nuts, bolts, washers, fasteners, etc...)
 - Paracord, Rope, etc.
 - Glue
- The following materials may not be used:
 - Glass
 - Flammable, corrosive, or explosive materials
 - Compounds that produce odors or gases.
- The catapult must be stable and remain stationary in its launch position (within reason). The base of the catapult must accommodate the provided ballast. Ballast will be in the form of two (2) 25 lbs. bags of sand.
- The triggering device, swing arm, and pivot must be constructed in a safe way, so as not to damage the device during launching, the testing area, or cause harm to others. This may result in an automatic safety disqualification.
- The catapult must have a pull cord that is a minimum of five (5) feet long. The pull cord must be attached to the triggering mechanism and used activate the launching of the catapult.
- The launch arm must have a sling or cup/basket to hold the projectile. No moving cradle or moving basket may be used. No parts other than the projectile or pull cord are allowed to become disconnected during launching
- The catapult cannot have wheels.

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Safety Requirements

- Safety is of utmost concern. Remember there is an element of danger with creating and operating a siege weapon. Catapults will be inspected for safety. Any loose parts must be tightened or the catapult will be deemed unfit and disqualified. No parts other than the projectile are allowed to become disconnected from the catapult at any time and must be securely attached prior to participating in the competition.
- After check in, teams are NOT allowed to modify their device, unless instructed to do so by the judge. If a device fails inspection the judge reserves the right to deem the device unsatisfactory and thus disqualifying the team. A device fails inspection by being a possible safety hazard or it violates any construction criteria.
- If the catapult becomes inoperable or unsafe, it must be removed immediately from the competition.
- When the catapult is on display/not in performance mode, it must be fully disabled and unable to be launched.
- Teams must wear OSHA approved safety glasses.
- If at any times an official declares "CEASE FIRE", all testing must stop and the timer will be stopped as well.

Projectile

Projectile is a hollow plastic practice golf ball (approximate weight of 14.5 grams each). Teams will be given a container of 3 dozen plastic golf balls as their ammunition. No further ammunition is allowed and no "re-firing" of projectiles that miss the target.

Target

The target is a collapsible chipping net golf target - Similar to the one found here:

[Amazon](#)

The center of the scoring net will be approximately 15' from the firing line. The scoring net will consist of 3 concentric circle. The outer circle is approximately 24" in diameter and the inner circle is 7" in diameter.

Procedure

- All catapults must be placed directly on the firing line with the front of the catapult being "ON" the line.
- All teams will be provided an opportunity to make 3 practice shots before the official testing begins.
- For official testing, each team will have 2 minutes (120 seconds) to launch as many shots firing one ball at a time as possible. The official signal to commence testing is "FIRE". The goal is to accumulate as many points as possible in the net target in the time provided. Teams must cease fire at the end of allotted time.
- If at any times an official declares "CEASE FIRE", all testing must stop and the timer will be stopped as well.
- Team members must collect all ammunition once the time limit is up and return it to the judges.

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Scoring

Center Circle/Inner Target= 5 points for each ball

Middle Circle/Middle Target= 3 points for each ball

Outermost Circle/Outer Target= 1 point for each ball

Ammunition (plastic golf balls) must enter the target the target on the fly. No "bounce in" points will be allowed/awarded. Ties will be broken as follows:

- the team with the highest score and least amount of ammunition pieces in the target.
- the team with the shortest time recorded to score the most points.

Documentation

- Student will provide an Engineering Portfolio that will be submitted in a three brad folder (no binders allowed). Place the State Contest sticker received at registration on the outside of the folder at the top right corner of the front cover. The Engineering Portfolio must include:
 - Cover page with Student ID#, Category #, and Category Name.
 - Table of Contents
 - Signed Liability Release Forms
 - Research Documentation – Details of the research done to determine the design
 - Sketches
 - Detailed construction plans
 - Bill of Materials used in the construction
 - Student explanation of their build process
 - Pictures documenting the build process
 - MLA Cited Sources for Research

Judging

- 25% Appearance: Quality of craftsmanship and appearance. Awarded 1st through number of valid entries.
- 25% Engineering Portfolio: Completeness and detail level of the Engineering Portfolio. Awarded 1st through number of valid entries.
- 50% Performance Results: Points will be awarded based upon points scored.

Each team will be awarded 1st through the number of valid entries for appearance, engineering portfolio and performance results. The lowest combined score wins 1st Place, the second lowest combined score wins 2nd Place, and so on. In case of a tie, the catapult with the better appearance and engineering portfolio will place higher.

Catapult Go/No Go Checklist

1. Does the team have the completed Engineering Portfolio?	Yes / No
2. Does the entire team have safety glasses on?	Yes / No
3. Is the catapult ballast ready?	Yes / No
4. Is the catapult made of the correct materials?	Yes / No
5. Does the catapult meet the size requirements?	Yes / No
6. Does the catapult launch with a pull cord of at least 5 feet?	Yes / No
7. Does the catapult have a safe launching mechanism?	Yes / No
8. Is the catapult safe to operate?	Yes / No