

Bungee Drop

Div. C

Georgia Tech Event Workshop Series
2024-25



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- The Westminster Schools
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01

RULES SHEET

02

PHYSICAL PRINCIPLES

03

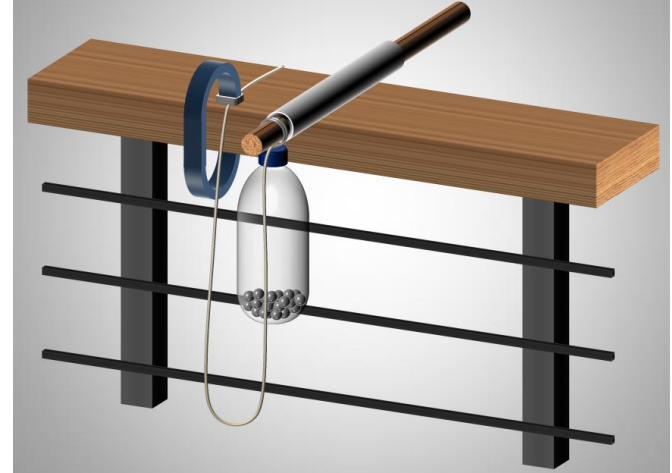
COMMON DESIGNS

04

TIPS FROM A VETERAN



05

OTHER FREE RESOURCES



The Rules Sheet

- Device: elastic cord which meets elasticity test
- Goal: Have the bottom of the drop as close to ground as possible without touching
- Weight 50-300 g and same between drops
- Distance 2-5 m or 5-10 m depending on competition level
- Penalty for touching landing surface
- Bonus multiplier: try and hit

**BUNGEE DROP C**

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. DESCRIPTION: Each team will design, construct and calibrate a single elastic cord to conduct two separate drops at a given height(s) and attempt to get a drop mass placed in a bottle as close as possible to, but without touching, a landing surface.

A TEAM OF UP TO: 2
IMPOUND: Yes

EYE PROTECTION: B
APPROXIMATE TIME: 10 minutes

2. EVENT PARAMETERS:

- Each team must impound only one elastic cord to be used for both drops that terminates with a closed metal ring approximately 1/2 to 1 inch in diameter (e.g., a key ring) that will not open. Each team must also impound calibration data (if prepared), which are the only papers or notes that the competitors may bring into the competition area. Any tools used by teams to confirm heights, lengths, or mass during the time given for preparing their two drops must also be impounded.
- Supervisors will supply a drop mass that will consist of mass that will be placed in a 500-591 mL plastic bottle and an attachment mechanism (hook, clasp, carabiner, etc.) that will connect the team's bottom cord ring to the bottle. This drop mass will be the same for all drops. The drop mass will have a total mass between 50.0 g and 300.0 g and be in increments of 25.0 g at Regionals, 10.0 g at State, and 1.0 g at Nationals. The total drop mass value and length, including the attachment mechanism, will be posted immediately after impounding. Supervisors will also provide a top anchoring system/extended platform with a release mechanism (e.g., a clamp) to attach the top end of the elastic cord, which all teams must use.
- Supervisors must provide an accurate system for determining how close drop mass gets to the landing surface during a drop, and whether or not it touched.



3. THE COMPETITION:

- No physical alterations may be made to elastic cords after impound (with the exception of marking drop locations on the cord before each drop).
- The Elasticity Test:** While being suspended vertically, the bottom meter of the cord must stretch to at least 1.25 meters when a single 500 g mass is attached to this section and return to approximately its original length after the mass is removed. Any team that fails this elasticity test will be allowed to compete, but will be ranked behind all teams which pass the test. The cord may consist of more than one material (contest rubber, nylon, latex tubing, thread, sewing elastic, metal springs, etc.) and more than one strand as long as it meets the elasticity test. "Self-limiting-brake" mechanisms such as a separate, parallel, non-elastic strand that "breaks" the fall of the mass with little to no rebound are not permitted.
- The Drop: Teams will be given a total of 5 minutes to prepare their **elastic cord** in the holding area, followed immediately by 5 minutes to complete both drops.
- The Drop Heights:
 - At Regionals both drop heights will be the same and will be between 2 and 5 meters inclusive at an interval of 25.0 cm.
 - At State both drop heights will be different and will be between 2 and 5 meters inclusive at an interval of 10.0 cm.
 - At Nationals both drop heights will be different and will be between 5 and 10 meters inclusive with all heights within the interval allowed.
 - The drop height values and drop instructions will be posted immediately after impound.
- The Bonus Drop:** Teams with a drop distance within the following parameters (30.0 cm at Regionals, 20.0 cm at State, 10.0 cm at Nationals) for either of their drops will be awarded a bonus drop. The bonus drop will consist of using the same mass and dropping into a window determined by the Event Supervisor with a height dependent on the level of competition (30.0 cm at regionals, 20.0 cm at state, 10.0 cm at nationals). If the bottom of the mass in the bonus drop is in the window at its lowest point then the team earns a 0.80 multiplier on their final score. Teams can earn a maximum of one bonus drop and are given no additional time to complete the bonus drop.

4. SCORING:

- Low score wins. Final Score = (Drop distance 1 + Drop Distance 2) x Bonus Multiplier (if earned)
- The drop distance for a drop that does not strike the surface will be the distance between the lowest point of the bottle and the surface.

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**BUNGEE DROP C (CONT.)**

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

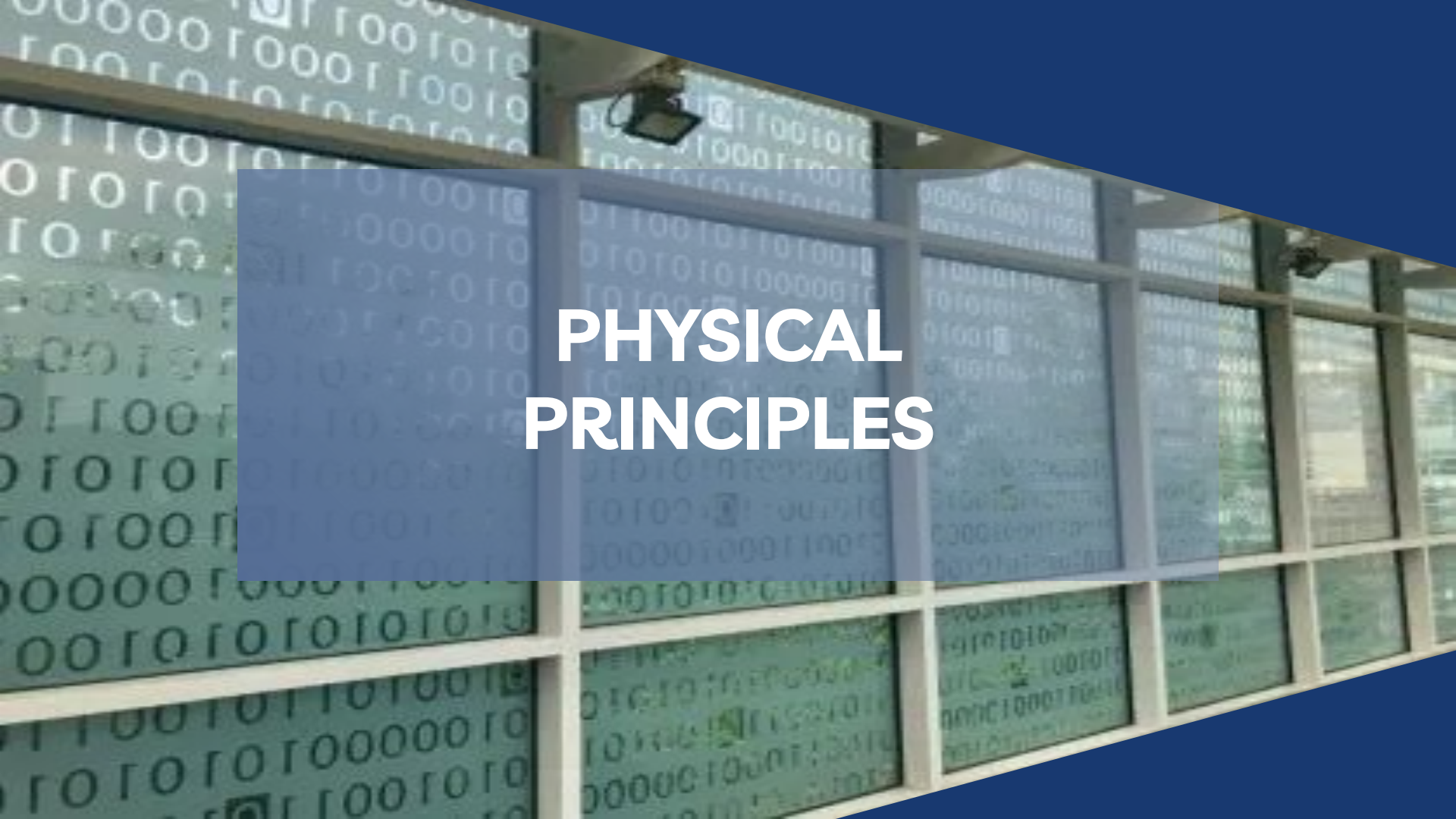
c. A drop that strikes the landing surface will be awarded a drop distance of one half of the drop height.

d. Teams that failed the elasticity test will rank below all those that passed the elasticity test.

e. Bonus Multiplier: 0.80x multiplier to final score if the team completes a Bonus Drop meeting the criteria in 3.e.

f. The first tiebreaker will be whether a team succeeded in the bonus drop. Second tiebreaker is the team with the lowest individual drop distance for either of their drops. Third tiebreaker is the team with the longest measurement for the elasticity test.

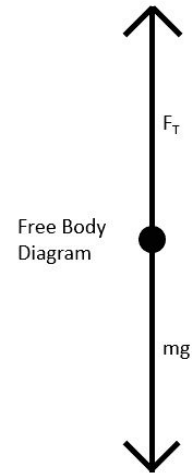
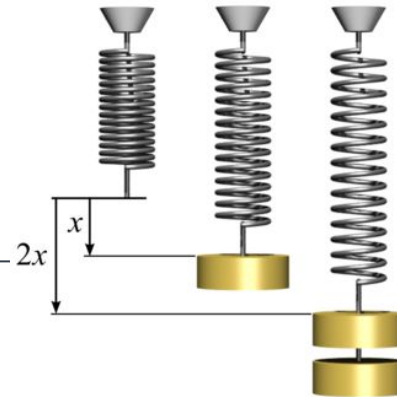
Recommended Resources: The Science Olympiad Store (store.soinc.org) carries a variety of resources to purchase; other resources are on the Event Pages at soinc.org.

The background of the slide is a blue gradient. Overlaid on this is a grid of rectangular panels, resembling a window or a display screen. Each panel contains a pattern of white and green binary code (0s and 1s) that appears to be floating or moving. The panels are separated by thin white lines. In the center of the grid, the words "PHYSICAL PRINCIPLES" are written in a bold, white, sans-serif font.

PHYSICAL PRINCIPLES

Topic 1: Testing/Physics

- Math can be found on wiki: https://scioly.org/wiki/index.php/Bungee_Drop
- Experimentally determine modulus of elasticity for device
 - Differs by height
- $F=k*x$, $x=1/2$ bottom distance=equilibrium position
- Balance with $F=m*g$



Topic 3: Competition Day

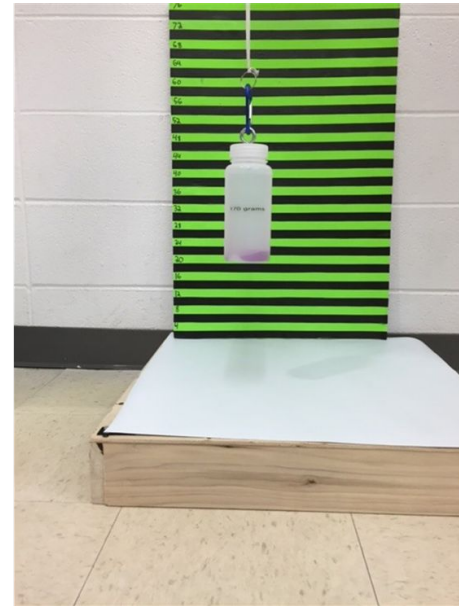
- Impounded event!
- Using testing determine where along the cord to drop from



COMMON Designs

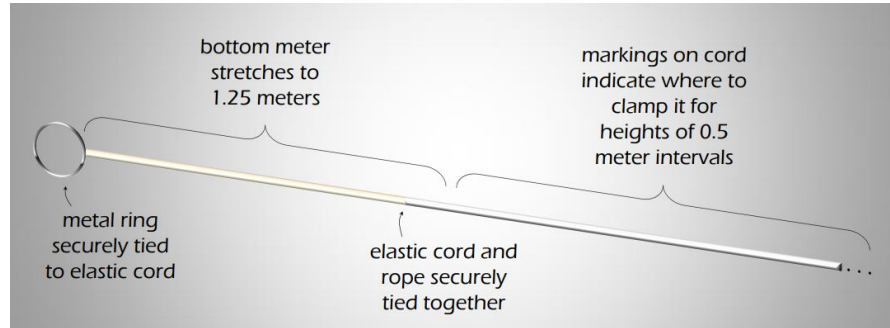
Topic 1: Test Stand

Found on: <https://www.soinc.org/bungee-drop-c>



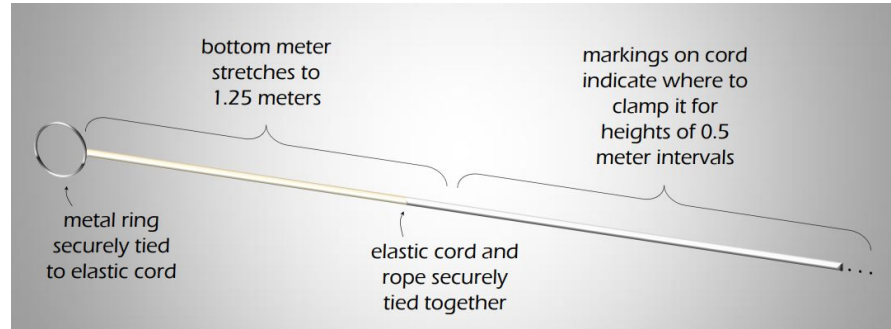
Topic 2: Partially Elastic

- First of two main designs



Topic 3: Fully Elastic

- Second of two main designs



Topic 4: Material Choice

- Material: Tan super sport rubber
 - Bigger cross section the better
 - Stay away from weak springs that permanently deform

Tips from a Veteran

- Temperature and humidity will affect elasticity
- Springs will stretch out over time
- Springs will become less elastic over time

Additional Resources

Scioly.org:

<https://www.soinc.org/bungee-drop-c>
https://scioly.org/wiki/images/6/63/Bernard%27s_Bungee_Drop_Notes.pdf

Soinc.org:

<https://www.soinc.org/bungee-drop-c>

THANKS!

