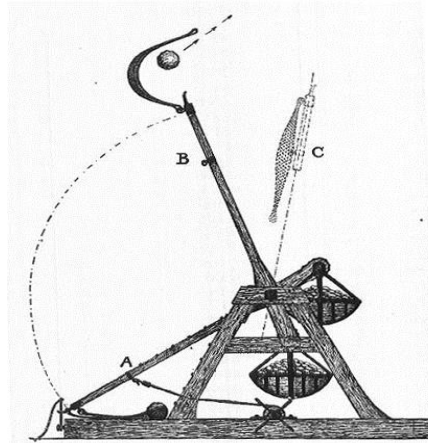


Please submit by April 10, 2014

Eighth Annual Trebuchet Competition at Ole Miss

Thursday April 24, 2014



The School of Engineering and the Center for Mathematics and Science Education at the University of Mississippi cordially invite Mississippi high school students and teachers to participate in an exciting science and engineering event! On April 24, 2014, The Eighth Annual Trebuchet Competition will be held in the Vaught Hemingway Stadium at the University of Mississippi. In the event of rain the competition will be moved to the Ole Miss Indoor Football Practice Facility (IPF). The day will begin at 9:00 a.m. and conclude with an award ceremony at 2:00 p.m.

The morning begins with registration, followed by a demonstration of trebuchets. At this time, trebuchets will be reviewed to ensure they were constructed within the rules and specifications of the competition. Each team of students designing and constructing a gravity-driven catapult (trebuchet) that meets the specified criteria will be given the opportunity to launch tennis balls in Vaught Hemingway Stadium. Faculty members and staff from Ole Miss School of Engineering and the Center for Mathematics and Science Education will manage the competition.

The area for the competition will be open from 9:00-10:30 for each school to set up and test the trebuchets. During this time, each school will determine the two trebuchets to represent the school in the afternoon competition. **Trebuchets competing in previous Ole Miss Trebuchet Competitions will not be allowed to compete in the 2014 competition.**

- *Teams will compete in Design, Distance, Accuracy, and Set-Up-and-Fire events.*
- *Professional engineers will meet with the student participants and judge each trebuchet for the design competition.*
- *Various awards will be presented*

As soon as possible, teachers should submit an *Intent to Participate E-mail* with the school name, contact information, and an approximate number of teams and participants to:
Susan Peterson, shpeters@olemiss.edu, at the Center for Mathematics and Science Education.

Registration forms with a list of students participating and t-shirt sizes must be submitted by April 10, 2014. There is a \$50 per team registration fee.

You may register online at <http://cmse.olemiss.edu/outreach>

For additional information and to register for the event, contact Susan Peterson, shpeters@olemiss.edu.

The School of Engineering
<http://www.engineering.olemiss.edu/>

The Center for Mathematics and Science Education
<http://cmse.olemiss.edu/>

Please submit by April 10, 2014

**SPECIFICATIONS FOR DESIGNING AND CONSTRUCTING A TREBUCHET
FOR THE 2014 –EIGHTH ANNUAL TREBUCHET COMPETITION
AT VAUGHT-HEMINGWAY STADIUM AT THE UNIVERSITY OF MISSISSIPPI**

1. Each team will consist of 3 - 5 high school students, with a teacher sponsor and/or an engineer mentor. (Teachers and mentors may sponsor more than one team.)
2. Each team must provide a **to-scale drawing** of their trebuchet (*Required for discussion during the Design Competition*).
3. Each team must submit a **Trebuchet Value Assessment - list of materials, including cost** (if donated, approximate cost) required to construct their trebuchet.
4. The trebuchet will not exceed **7.5 feet in height**, measured from the ground with the throwing arm at rest in its vertical position; no more than **5 feet wide** and may not weigh more than **100 pounds** (total weight of structure and counterweight).
5. The trebuchet will solely utilize the gravitational energy of a counterweight to rotate the throwing arm about a horizontal axis. For example twisted ropes, rubber bands/straps, springs, or any material to provide tensional or torsional energy **are not allowed**.
6. Lubricants of any kind, ball or roller bearings, and sand **are not allowed**.
7. **The trebuchet must have a safe secure mechanism to hold the throwing arm in the cocked position.**
8. The release mechanism for the throwing arm must be triggered with one motion, such as pulling a pin with a wire or rope. Students will not be allowed to pull the throwing arm to accelerate the projectile.
9. The trebuchets will be on a soft artificial turf surface throughout the competition, therefore wheels are not allowed. The bottom surface of the base of the trebuchet must be smooth so as not to damage the turf.
10. The base of the trebuchet must be substantially constructed for easy positioning once the trebuchet is set up and to keep the trebuchet upright.

Please submit by April 10, 2014

This project has limited specifications to give the students opportunities to BE ENGINEERS! Students must research and experiment with their designs to learn the relationships and interactions of all the parts of the trebuchet. Part of the engineering experience is adjusting the trebuchet to achieve maximum performance. Students will decide on:

- A creative design of the trebuchet
- The materials to be used for the construction of the trebuchet
- The base for the trebuchet
- The length of the throwing arm
- The pivot mechanism
- The location of the pivot on the trebuchet structure
- The location of the pivot on the throwing arm
- The material, size, and weight of the counterweight
- How the counterweight is attached to the arm
- The safe secure mechanism to hold the throwing arm in the cocked position
- The release mechanism for the throwing arm
- The material and length of the sling
- The attachment and release mechanism of the sling to the throwing arm
- How the sling will release the tennis ball at the proper angle for distance, height, and accuracy
- A dedicated place on the front of the trebuchet to post a placard with the team number
- And everything else that is not specified in 1–10 of the *Specifications for Designing and Constructing a Trebuchet*

Please consider SAFETY FIRST! Take proper safety precautions and wear safety glasses when constructing the trebuchet. Although the trebuchet will launch whatever you put into the sling, we are launching tennis balls for this competition. Your trebuchet may have the ability to throw objects farther than you expect, so please make sure you have adequate space to test your trebuchet.

The ENGINEERING PROCESS (included in packet) will guide you through the design, construction, and testing of your trebuchet.

Please submit by April 10, 2014

*Eighth Annual Trebuchet Competition at Ole Miss
Vaught Hemingway Stadium
April 24, 2014*

Schedule of Events

- 9:00 – 9:30 Registration Vaught-Hemingway Stadium (rain location will be the Indoor Practice facility.)
**Please bring consent forms and any fees to be paid*
- 9:30 – 10:30 Trebuchet testing in Vaught Hemingway Stadium
- 9:30 – 10:30 Team photos with the trebuchets will be taken.
- 9:30 – 10:30 Meeting with engineers for judging of design in the Design Competition
- 11-12 Lunch
- 12:00 – 1:45 Launching Competitions: Distance, Accuracy, and Set-Up-and-Fire
- 2:00 – 2:30 Award Ceremony (participation required)

*At the end of the competition, students may begin dismantling and loading trebuchets.

****Students are responsible for the cleanliness of the competition area.**

Please submit by April 10, 2014

Permission to Participate

This form must be completed for every student participating in the Eighth Annual Trebuchet Competition at Ole Miss on April 24, 2014.

I give permission for my child to participate in the Eighth Annual Trebuchet Competition at Vaught Hemingway Stadium at The University of Mississippi on Thursday, April 24, 2014.

Yes No (please circle one)

Parent/Guardian Signature

Date

Parent/Guardian Printed Name

Date

Child's Full Name

City/Town

State

Zip

Name of School

Emergency Contact Information (Name and Phone)

Please submit by April 10, 2014

Photograph & Video Release Form

In attendance at a special program sponsored by the University of Mississippi and hosted by or partnered with The Center for Mathematics and Science Education (CMSE), I hereby grant permission to the rights of my image, likeness, and sound of my voice as recorded on audio or videotape without payment or any other consideration. I understand that my image may be edited, copied, exhibited, published or distributed and waive the right to inspect or approve the finished product wherein my likeness appears. Additionally, I waive any right to royalties or other compensation arising or related to the use of my image or recording. I also understand that this material may be used in diverse educational settings within an unrestricted geographic area.

Photographic, audio or video recordings may be used for the following purposes:

- conference presentations
- informational/educational presentations or courses
- on-line educational courses
- educational videos
- websites
- research publications

By signing this release I understand this permission signifies that photographic or video recordings of me may be electronically displayed via the Internet or in the public educational setting.

I will be consulted about the use of the photographs or video recording for any purpose other than those listed above.

There is no time limit on the validity of this release nor is there any geographic limitation on where these materials may be distributed.

This release applies to photographic, audio or video recordings collected as part of the sessions listed on this document only.

By signing this form I acknowledge that I have completely read and fully understand the above release and agree to be bound thereby. I hereby release any and all claims against any person or organization utilizing this material for educational purposes.

Full Name (Student) _____
Street Address/P.O. Box _____
City _____ State _____ ZIP _____
Phone _____ Email Address _____

Signature _____ Date _____

If participant is under the age of 19, then the signature of that participant's parent or legal guardian is also required.

Parent's
Signature _____ Date _____

Name and City of Local Newspaper(s) _____

*Please note: Providing this information does not guarantee local newspaper publication of your child from this event. Each newspaper uses its own discretion on what they decide to publish.

The School of Engineering
<http://www.engineering.olemiss.edu/>

The Center for Mathematics and Science Education
<http://cmse.olemiss.edu/>

Please submit by April 10, 2014

Registration Form

Eighth Annual Gravity-Driven Catapult (Trebuchet) Launching Competition

Thursday, April 24, 2014

9:00 A.M. – 2:30 P.M.

Vaught-Hemingway Stadium at The University of Mississippi

Name of School _____

Address of School _____

School Phone Number _____

Teacher/Sponsor _____

Teacher/Sponsor Phone Number _____

Teacher/Sponsor E-Mail Address _____

All students attending must have participated in the design, construction and/or testing of the trebuchet.

All students attending must have a signed Permission to Participate Form.

Number of **Teams** Participating in the Trebuchet Competition

Names of Students and Teachers – Please group students according to Teams.

Include **t-shirt sizes** (individually or total number of each size; include teacher t-shirt size).

QUESTIONS? Contact Susan Peterson, shpeters@olemiss.edu, phone 662-915-6621, fax 662-915-1762.

ENGINEERING PROCESS vs. SCIENTIFIC METHOD

GENERAL SCIENTIFIC METHOD	ENGINEERING PROCESS
State the question or problem	Define a need or requirement
Define purpose	List engineering goals
Conduct background research	Conduct background research
Formulate the hypothesis	Develop design criteria (physical constraints, economical feasibility, performance, accuracy, environmental concerns, etc.)
List materials needed for the experiment	List materials needed to build the engineering project
Establish procedure with one variable and at least three trials or repetitions	Prepare preliminary designs using paper, model, or computer graphics
Test hypothesis by conducting an experiment with a control group (the constant used for comparison, not subjected to influence by the variable)	Build a prototype of one of the designs
Record observations and results	Test the prototype and analyze how it meets or fails to meet the engineering goals
Analyze the results	Redesign and retest the prototype as necessary to accomplish engineering goals. This process, known as <i>iteration</i> , involves repeating a sequence with minor adjustment to move progressively closer to the actual goal.
Draw conclusions based on the experimental data only	Present results, implement and commercialize

NOTE: Scientists use the process of experimentation to seek to understand cause and effect relationships in nature. The work of an engineer is applying scientific principles in the design and production of physical products.

DESIGN

2014

Trebuchets must meet all required specifications to participate in the Competitions.

The Design portion of the competition is broken down as follows:

The competition this year is being held on a soft surface, therefore wheels will not be allowed.

Design: 25 points

To-scale drawing (may be hand drawn or computer modeled)

List of Materials - Each team must submit a **Trebuchet Value Assessment** (**list of materials, including cost** (if donated, approximate cost) required to construct their trebuchet).

Total Cost \$

Safety Features: 15 points

Is the throwing arm secure in the cocked position?

Is the frame designed for stability?

Do students know where not to stand when firing the trebuchet?

Construction: 20 points

Is the trebuchet structurally sound?

Creativity and Originality: 20 points

Interview with Team: 20 points

Use and knowledge of the Engineering Design Process

Understanding of the engineering principals pertaining to the trebuchet and the launching process

Research?

DISTANCE

2014

Trebuchets will line up with the leading edge of the trebuchet structure on the 0 Distance line. Team members should stay within their 9 foot wide area during the competition.

When the Competition begins, trebuchets will fire only when their team number is called. Numbers will be called out in numerical order. Teams should have their trebuchets cocked and ready to fire when their number is called.

All trebuchet teams will be allowed to launch for distance twice. This will be accomplished by firing once in the first round and then again in the second round. All teams will launch one tennis ball before the second round begins. Team members may make adjustments to the trebuchet between throws. Officials on the field will mark the spot where the tennis ball first hits the pavement. Distances will be measured by official Measuring Teams on the field and will be recorded by the official Scorekeeper.

After the second round, the 6 trebuchets launching a tennis ball the greatest distance *down the field* will be recognized for further competition. If there is a tie for 6th place, all teams with that score will participate in the final round. The final round is to emphasize that in engineering, a device must demonstrate sustained reliability, not just the random lucky launch.

Scores earned from the first and second rounds qualifies teams (top 6 ranked) for the final round. During the final round, all 6 teams will begin with a score of zero. Each team will launch once. The team launching the greatest distance will be declared the winner. If there is a tie, the tie will be broken with an additional launch.

ACCURACY

2014

The target will be set up at a distance of 20 yards from the trebuchets. The target is a bull's eye on a 4' x 4' piece of plywood. The target will be placed flat on the field directly in front of each trebuchet.

Each team will launch two tennis balls, one in round I and one in round II. Adjustments to the trebuchet may be made between throws.

To score a "hit" the tennis ball must hit the target before hitting the ground. If the ball does not hit the target, the official Measurement Team will measure the distance the ball lands from the center of the target.

If at least three teams hit the target with both tennis balls, they will compete in round III. Otherwise, all teams hitting the target with at least one ball will continue to round III. If at least 3 teams do not hit the target, the 6 teams that landed closest to the target will compete in round III.

The target will remain set up 20 yards away from the trebuchets for round III. Each team will launch one tennis ball. The 3 teams scoring a hit or the closest to the target continue to round IV.

If no team hits the target, the distance the ball lands from the target will determine the winner. If two teams score a "hit", the team missing, but closest to the target will be awarded third place. The two teams will launch again to determine first and second place.

Throughout this competition the target will remain at the same distance from the trebuchets.

SET-UP-AND-FIRE

1-minute challenge

2014

The trebuchets will be set up with the leading edge of the structure on the Goal Line. This event will be timed and all teams attempt to fire 3 tennis balls during the 1-minute challenge. The trebuchet will be in the rest position when the time begins. The sling will not be loaded and the trebuchet will not be in the cocked position until after the timed challenge begins.

Teams will attempt to launch 3 marked tennis balls into containers placed 10 yards, 15 yards, and 25 yards from the firing line. Once a tennis ball is launched forward of the firing line, it cannot be retrieved and launched again.

The team with the most tennis balls in the containers will be the winner. If multiple teams have 3 tennis balls in the containers, they will compete in a tie breaker round, to determine 1st, 2nd, and 3rd place. If no team, or only one team has three tennis balls in the containers, the ones with two will be considered for a tie breaker. The teams with one tennis ball in the containers will be considered if three teams do not score two or more tennis balls in the containers.

The number of tennis balls in the containers will be counted by the official score keepers.