

PURDUE
UNIVERSITY



COLLEGE OF TECHNOLOGY

The Sixth Annual

**Iron Egg Launch
Design Competition
2009**

Hosted by

**Purdue University's
College of Technology
Anderson/Muncie Location**

Offering Programs in

**Mechanical Engineering Technology
Electrical and Computer Engineering Technology
Computer and Information Technology
Organizational Leadership and Supervision
Industrial Technology**

GENERAL GUIDELINES AND RULES

GENERAL INFORMATION

OBJECTIVE

The objective of this competition is to have teams of students use the knowledge they have acquired in a wide range of classes and apply it to a practical project. The project is to design a device that launches a container airborne at a specific target. The container must be designed to hold a raw egg and to preserve the integrity of the egg shell throughout the launch and landing sequence. In accomplishing this objective, teams will need to demonstrate the use of sound research, design, construction and safety principles while working within the guidelines outlined in the following pages. **Projects must be an original design by the team members this year. No device from previous years may be re-used even if modified. Each project must be designed and constructed from scratch. (We have pictures from previous years' projects.)**

DATE

Friday, April 24, 2009 (rain date, Friday, May 1, 2009)

TIME

9:15a.m. until 2:00p.m. (Depending on the number of entries)

Note: The first team will begin assembly at 9:45am (see Design, Construction and Launch Rules).

A brief meeting with the Team Advisors will be at 9:40am.

LOCATION

The competition will take place in Anderson, IN at the Anderson University Flagship Center, 2705 Enterprise Dr., Anderson, IN (This is along I-69 at exit 22).

ENTRY

Complete the attached entry form (last page of package) and return it by **Monday, March 23, 2009** to the address on the form. (Make copies to use for additional team entries from your school)

SAFETY

The competition officials reserve the right to disqualify any team's project at any time due to safety concerns whether directly addressed in the guidelines or not. Remember, when it comes to safety, MORE IS BETTER.

ASSISTANCE

Included in this information package is a list of people who have agreed to serve as resources for the students (contestants) and teachers (advisors) involved in the competition. They include individuals from Purdue University's College of Technology at Anderson/Muncie and members of Purdue at Anderson/Muncie's Advisory Committee. Their names and email addresses are included so the students and teachers can contact them directly with questions that may come up in any phase (research, design and construction) of this project. In addition to contacting the resource individuals with questions it is also possible to arrange for one or more of them to visit your school to work directly with the students for a class period or two to help them with the design and construction phases of the competition. We can bring a couple of table top models to your school to help students with possible design ideas. To arrange a visit to your school, contact David Riegle (email and phone number are on the list) and he will coordinate the visit with the teacher(s) involved and the appropriate resource individual(s). We strongly encourage the teams to take full advantage of the assistance we are offering. Through this project we are hoping to build relationships between our programs and the participating students, teachers and schools that extend beyond this competition.

COST

There is no entry fee. Cost associated with the design and construction of the launch device and container is the responsibility of each team. (See **Penalties** section for more cost guidelines.)

AWARDS

Plaques will be awarded to at least the three overall top teams. In addition, the overall top team will receive the Iron Egg Launch traveling trophy to be displayed at their school until the next competition. The top scoring team on the performance portion and the report portion of the contest will also receive a plaque. Awards will also be given to the team with the best design and the team with the best brochure or website.

SCORING:

General Scoring Breakdown:

Performance Points Possible	120
Report Points Possible	<u>130</u>
Total Points Possible	250

Performance Points Breakdown:

Each team will have 3 launches. Points are awarded for each launch as follows:

Bulls eye	40 pts.
Lands in 1 st Ring (outside of bulls eye)	32 pts.
Lands in 2 nd Ring (outside of 1 st ring)	24 pts.
Lands on target square outside of rings	16 pts.
Successful launch (airborne min. of 5m) that misses square	10 pts.

Container performance will be scored as follows:

After each launch the egg will be inspected by judges.

Egg shell is not compromised (unbroken and no cracks)	0 pt. deduction
Egg shell is cracked but no leaks	5 pt. deduction
Egg shell is cracked and leaks	10 pt. deduction

(See **Competition Rules** for more specific target information)

Report Points are broken down as follows:

Written Presentation:

(Section 1) Project Brochure or Website	25 pts.
(Section 2) Scale Drawings, Diagrams or Sketches	20 pts.
(Section 3) Formulas/Calculations	25 pts.
(Section 4) Testing Data (Spreadsheet)	25 pts.
(Section 5) Bill of Materials (including cost)	5 pts.
(Section 6) References	5 pts.
Overall Written Presentation (neatness, spelling, thoroughness, understandability, completeness, etc)	<u>15 pts.</u>

Total Written Presentation Points 120 pts.

Oral Presentation: 10 pts.

PENALTIES

Total Project Cost: \$150.00 or less	0 pt. deduction
\$150.01 - \$160.00	2 pt. deduction
\$160.01 - \$170.00	4 pt. deduction
\$170.01 - \$180.00	6 pt. deduction

This pattern of \$10 increments continues to a maximum 40 pt. deduction.

Failure to include a Bill of Materials showing the project cost will result in a 40 pt. deduction. Any other missing report section will result in a 10 pt. penalty deduction.

DESIGN, CONSTRUCTION AND LAUNCH RULES

No explosive material allowed. The competition officials have the right to disqualify any entries at any time for safety concerns whether explicitly covered in this information and rules package or not.

TEAMS

Members: 4 to 7 students per team from representative school.

Advisors: 1 or more teachers per team from representative school.

Note: Schools may enter more than one team and teachers may serve as advisors for more than one team.

LAUNCH ORDER

To be determined by random draw the day of the event.

LAUNCHER SETUP

Teams will assemble their launcher in a designated assembly zone.

Time: 10 minutes

Tools: Typical hand tools (non-powered) furnished by the team

After assembly the team will move the launcher to the designated holding zone. The launcher must be able to be moved by hand and only team members (no advisors) may assist in moving it from one zone to another (no motorized power of any kind). The cost of any equipment (eg. a cart) used in moving the launcher counts in the total project cost and must be included in the Bill of Materials section of the report. **NO SHARP POINTS OR EDGES ON DEVICE! Release pins, or other loose components, must be tethered to the device so they cannot fly outside of the launch zone.**

HOLDING ZONE

Teams will wait with their launcher in the designated holding zone.

Time: 5 minutes

Judges will be in the holding zone with each team. While in the holding zone the teams will give the oral presentation. A safety inspection will also take place at this time so teams must delegate one or more team members to work with the inspector while other team members conduct the oral presentation. Advisors may assist team members with the safety inspection but not the oral presentation (we want to see what the students have learned from this project).

LAUNCHING ZONE

Teams will move their launcher into the designated launching zone from the holding zone.

Size: The launching zone will be a 3 meter square (3m x 3m) area. The base of the launcher must fit within the zone (this includes any braces or balance devices that are grounded).

Time: 10 minutes to conduct 3 launches.

LAUNCH PROCEDURE

Team will place grade a large egg (provided by officials) into egg container.

Team will load container into (onto) launcher.

Team will arm remote trigger.

Team will leave launch area & wait in observation area.

Contest official will actuate remote trigger from outside the launching zone.

Launcher must release the container through the air toward the target. (Container must be released from launcher within 3 meters of the front edge of the launch zone.

Contest officials will record container landing for each of the 3 trials. (Landing will be recorded as the initial point of contact with the ground following the launch)

Contest officials will evaluate the egg status after each trial. (Cracked eggs will be replaced before the next launch)

The container must only be able to travel down range upon launch. If necessary, safety features must be included to insure that container cannot travel in any direction other than down range.

NO SHARP POINTS OR EDGES ON ANY PART OF THE DEVICE OR CONTAINER.

LAUNCHER REMOVAL

After 3rd launch the team will move their launcher to the display area.

TARGET ZONE

Dimensions: 7m by 7m square target plane laying flat on the ground.

Bulls eye: 1m diameter circle in the center of the square plane.

1st ring: 3m diameter circle (concentric about bulls eye center)

2nd ring: 5m diameter circle (concentric about bulls eye center)

(See target drawing below)

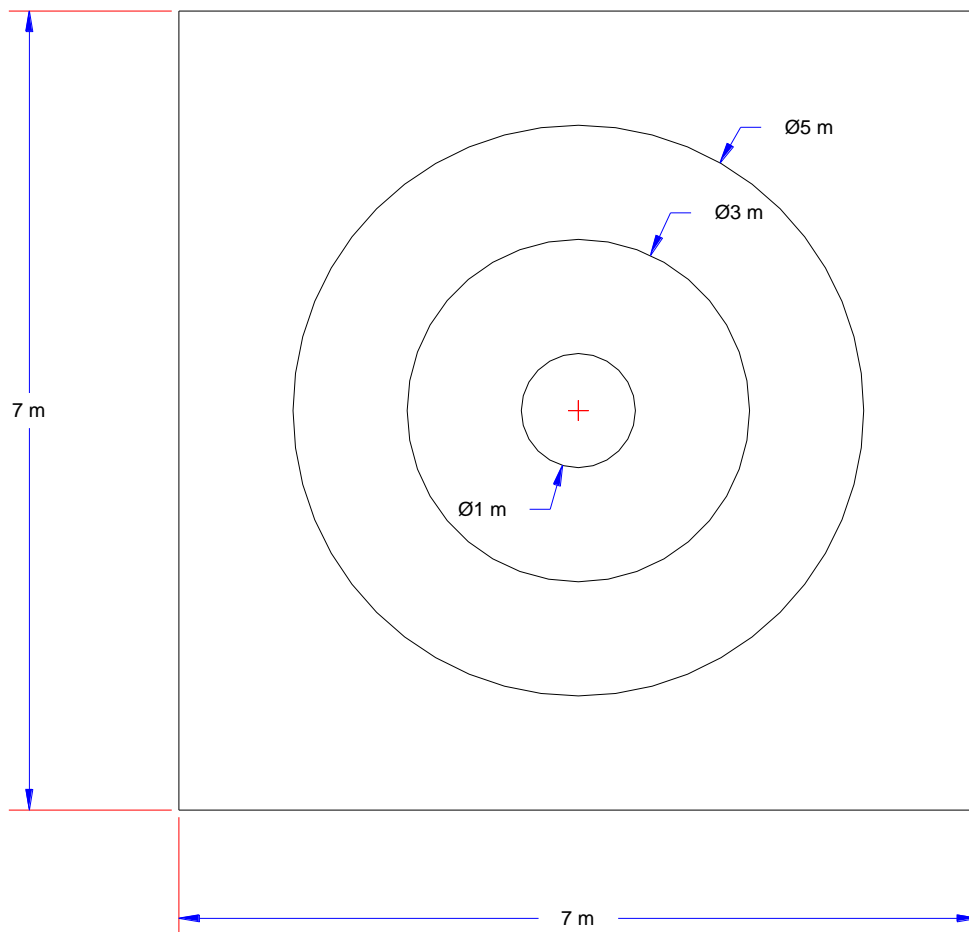
The center of the bulls eye will be 25 meters from the front edge of the launching zone.

Note: Any container traveling more than 50 meters in the air on any single launch will result in immediate disqualification of that teams entry.

EGG CONTAINER

The container should be designed to protect the integrity of the egg's shell. The shape and material are up to the teams to determine. However, any leakage from the egg should be kept within the container and not splattered on the target plane. Also, remember that each team has 10 minutes to perform their 3 launches and the egg must be inspected after each launch. It is important to make sure that access to the egg is easy enough to be done quickly after each launch.

TARGET DRAWING



REPORT GUIDELINES

GENERAL FORMAT

The report must contain the six sections outlined below. Each section should be clearly marked and the report should be enclosed in a cover of your choosing. Due to time considerations the day of the competition (4/24/09) the reports are to be received no later than **April 20, 2009**. They should be sent to:

David Riegle
Purdue College of Technology
2705 Enterprise Drive
Anderson, IN 46013

This will allow the judges to score the written presentations and prepare questions for the oral presentations before the day of the competition. The reports are to be typed (word processor). Note: The drawing section does not have to be typed. See that section for the options allowed.

Tip: When preparing the written presentation, remember your audience. You are communicating with engineering and technical professionals. They only want essential information so be concise when preparing each section. The judges won't be scoring by weight.

COMPUTER GRAPHIC COMPONENT (section 1)

Design a brochure or a website that describes how your project works, and the major mechanical principles you believe were important in determining how to design and build your apparatus. Use a combination of images and text. You may use any computer software to design the computer graphics component.

PROJECT DRAWING (section 2)

The drawing can be a CAD, board or hand sketched diagram, to scale, of your apparatus showing dimensions and labeling all major parts. The diagram may be done on either B size paper or A size paper.

FORMULAS/CALCULATIONS (section 3)

List and give a general explanation of the various mathematical and mechanical formulas/calculations that your team used and believed were important and germane to the design of your project. Also include a detailed description of the formulas/calculations and the iterative process you used to determine the final design parameters for at least one major design feature of your project (for example, the force required to propel the egg to various distances).

TEST DATA (section 4)

Using a spreadsheet format, show the results of test launches (including egg container performance) and the adjustments made before each test. (A graph would be a nice addition to this section) **TEAMS MUST HAVE AT LEAST 15 TEST LAUNCHES INCLUDED IN THIS SECTION.**

BILL OF MATERIALS (section 5)

List the materials used in the final version of your project and their cost. Remember, equipment used to move your project between zones the day of the competition must be included in this section along with the cost of that equipment. Small items like nuts and bolts etc. can be included together on a miscellaneous hardware line. Items that are donated at no cost to the project must be included on the Bill of Materials and have a cost assigned to them just as if they were purchased (you may have to call or visit a business that sells those goods to get an accurate cost). "Scrap" items must be included here with a cost just like donated items. Remember, cost counts when companies bid for projects out in industry.

REGERENCES (section 6)

List the sources that your team used for information on the idea, design and construction of your project (for example, books, websites, individuals, etc).

Remember, assistance is available. Our intent is to stretch the teams on this project. We want you to feel challenged, but not abandoned. You may email individuals on the list with questions and you may also call or email Dave Riegle to arrange a visit to your school by one or more of our competition officials. We look forward to the opportunity to work with you and we want to make this a fun learning experience.

COMPETITION ASSISTANCE LIST

TECHNICAL ASSISTANCE

Prof. Alan Jordan	Purdue-Mechanical Engineering Tech.	ajordan@bsu.edu
Mr. Dale Weiss	TractorStuff-Owner/Operator	tractorstuff@aol.com
Mr. Gary Lee	Ball State-Human Performance Lab Tech	glee3@bsu.edu
Mr. Tom Jarvis	Purdue-MET Technician	tjarvis@bsu.edu
Prof. Russ Aubrey	Purdue-Electrical/Computer Engineering Tech.	aubreyr@purdue.edu
Prof. Dennis Owen	Purdue-Computer & Information Tech.	doowen@purdue.edu
Prof. Gary Randolph	Purdue-Computer & Information Tech.	gbrandolph@purdue.edu
Prof. Chad Laux	Purdue-Industrial Technology	claux@purdue.edu
Prof. Jody Pierce	Purdue-Organizational Leadership/Supervision	pierceja@purdue.edu
Mr. Jeff Dyer	Purdue-ECET Technician	jldyer@purdue.edu

For questions about the contest in general or to set up a visit to your school

Mr. Dave Riegle, Purdue-Student Services Coordinator
riegled@purdue.edu or call **765-648-2903**

**HIGH SCHOOL
EGG LAUNCH DESIGN COMPETITION
ENTRY FORM**

Team Name: _____ **High School:** _____

Team Members:

Name	Grade	T-Shirt Size
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1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

Advisors:

Name	Subject Area	Shirt size	Email
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1) _____

2) _____

3) _____

Since travel to and from the competition is involved, please include your Principal's signature indicating their approval for this field trip.

Principal's Signature

Please complete and return by March 23, 2009 to:

Dave Riegle
Purdue College of Technology
2705 Enterprise Drive
Anderson, IN 46013

Please make copies as needed and complete for each team entered from your school.