Egg Drop #2

NASA's Mars Pathfinder

How will you choose to approach this project?

- ❏ I, *(write your name)* _____,choose to do this project as an individual. I understand that all of the work and materials are my responsibility. I acknowledge that the work will be time consuming and I choose of my own accord to take on the challenge alone.

- ❏ We, *(fill in your group members names) (no more than three people can be in a group)* _____ _____, are choosing to work in a group for this project. We understand that at no time may we switch, drop or add group members. This project will be completed by only our group members with no other outside help. We understand that the work and materials may not be divided equally and we understand that our choice to work as a group does not lessen the work or responsibility of each member. We freely choose to

work as a group, of our own accord and with no outside influence. *(group member initials)*

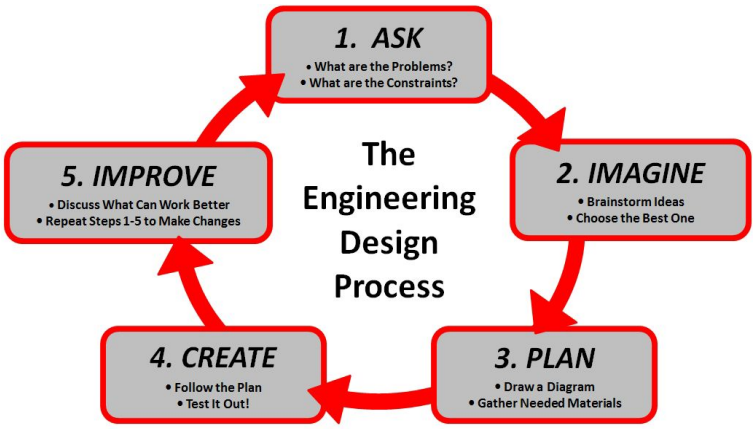
_____, _____, _____

Background information:

Mars Pathfinder entered the upper atmosphere of Mars at 7.6 kilometers per second at a 14.2 degree angle (90 degrees would be straight down). It met its peak atmospheric shock, encountering forces 25 times Earth's gravity, at 32 kilometers above the surface. At 10 kilometers above the ground, a parachute deployed at nearly twice the speed of sound (400 meters per second). Rockets inside the back shell fired to further slow the lander's descent. Shortly before landing, a set of airbags inflated to cushion the impact. After a few seconds, the tether attaching the lander to the backshell and parachute severed, and with 90 percent of the fuel expended, the rockets carried the shell and other debris away from the landing area. Then, protected by its airbags, Pathfinder bounced on the Martian surface, as high as a 10-story building, before finally coming to rest after its 8-month journey.

Objective:

You will demonstrate an understanding of the Engineering Design Process through the design, build, testing and evaluation of a device; that will safely protect **two eggs,** when dropped from the top of the bridge onto a 1 meter diameter landing zone, 5.75 meters below.



Design Rules:

- The egg must remain raw and cannot be altered in any way.
- **You or your team are responsible for supplying the eggs. A minimum of 6 eggs is recommended.**
- The containers may be made from any material, except that no food or food products may be used in the construction of the device.
- You may NOT add parachutes or other aerobraking devices to slow the descent of the payload.
- The egg drop device must be dropped, by hand, from a height of approx. 5.75 meters.
- Because the container must be able to be opened before and after the testing, to check on the condition of the egg, the device and the inside materials must be designed to allow raw egg to be easily inserted and removed.
- The device must fit inside a 27000 cubic cm box *(approximately 30cm x 30cm x 30cm).*
- The mass may be no greater than 1000g *(or ≈2.2 lbs).*

Vocabulary:

Complete the attached & modified word maps **for each of these vocabulary** words.

- atmosphere
- deploy
- payload
- prototype

- descent
- jettison
- volume
- momentum

Ask:

Come up with3 - 5 questions that will help you guide your planning and design process.

1.

2.

3.

4.

5.

Brainstorm:

- In this brainstorming session you are to come up with three different and unique ideas, which you may want to try.
- After considering the pros and cons of each idea, you will choose one to move forward with on the planning stage. As you are considering each idea, also keep in mind the cost and/or availability of each of these materials.
- Remember that each design should contain multiple materials.
- *You must also be able to justify **how and why** you believe each of these designs will succeed.*

Idea #1	**Pros(+)**	**Cons(-)**

Idea #2	Pros (+)	Cons(-)

Idea #3	Pros(+)	Cons(-)

Choosing your idea:
Please write one or two sentences explaining why you chose idea 1, 2 or 3.

_____

_____

_____

_____

Materials:
Once you have chosen a design to move forward with, use the table below to create a materials list. Fill out the materials sheet completely. If you need more space, you may attach a separate sheet. *You will have class time to assemble the device; therefore bring all supplies to class for construction.*

Material	Quantity/ Size	Person Responsible	Function/Purpose

Planning:

Use this space to draw a very detailed plan of your egg drop container. You must include three views of your device, showing all materials used and labeled neatly. Anyone looking at your plan should be able to recreate your design. Also, label each view with the approximate height or length of each section, using meters or centimeters.

Front or Back View:

One Side View:

Top or Bottom View:

Create:

Remember that the **Engineering Design Process** is not a straight line and you may need to revisit the **Imagine Stage** and **Planning Stage** many times before you are complete. You will be testing the device, before the final assessment *(which is why you must include the ability to easily remove your egg).*

Improve:
Before the final test, you will be doing three trial drops. Please use the table below to guide your improvements. *Be detailed in your notes. Include all adjustments and improvements that were made after each trial.*

#	What needs improvement? *(ie. case, padding, etc.)*	What change did you make? *(be specific! ie. added more tape to outside so padding doesn't fall out.)*
1		
2		
3		

Record Data:
Use the table below to record all the data for . Add the egg before determining the total mass of the device.

	Pre-Test	Pre-Test	Pre-Test	Pre-Test	Pre-Test	**Post-Test**	**Post-Test**
#	mass of device (kg)	length of device (cm)	width of device(cm)	height of device(cm)	volume of device(cm^3)	**time of drop (s)**	**Distance from target (m)**
1							
2							
3							
F							

Final Materials List:

List all supplies used in the final product below.

-
-
-
-
-
-
-

Final Design:
Draw or attach a image of your final design. This should be a very clear image to represent what you will be dropping on the testing day.

Descriptive Essay: Reflecting on the Final Design and Revisions

Use the space below to begin a rough draft or take notes for your descriptive essay. The goal is to describe your experience of the egg drop project. Use colorful words and sensory details to show the reader what it was like to participate in this project. The best descriptive essays appeal to the reader's emotions.

The final draft will be completed on **Google Classroom.**

Use the checklist below to ensure you have all of the information to Include in your essay:

- ❏ Background information about how this project relates to what we studied (*NASA Pathfinder Mission and Its technology)*
- ❏ Your experience with the project, either good or bad.
- ❏ Describe all the materials used during construction of the device and justify why each of them were used.
- ❏ Did your egg survive?
- ❏ What were the strengths of your design or what would you change to be successful next time?
- ❏ Overall what is the one, most valuable, thing you learned during this project.

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