Eggstronaut Elementary

Grade Level: **3-4th**

Suggested Time: **60 minutes**
10 minutes – Introduction
30 minutes – Parachute Design & Build
15 minutes – Parachute Testing
5 minutes – Discussion

Challenge: Teams of 2-3 students will design and build parachutes to safely land an egg, or "eggstronaut."

Objectives:

Following this activity, students will be able to:

- Demonstrate the Engineering Design Process
- Explain the effect of parachute design on the ability to slow the descent of a falling object

Materials:

- ☐ Parachute material (examples include plastic bags, plastic tablecloths, tissue paper, etc.)
- ☐ Hard boiled eggs (1 per team, 1 for the class) Optional: plastic eggs (approx. 4 g) weighted to the mass of a real egg (57 g) using coins, washers, or sand with cotton balls to fill empty space inside the egg
- ☐ Meter stick
- ☐ String
- ☐ Scissors
- ☐ Stopwatch
- ☐ Paper cups
- ☐ Tape/glue for parachute assembly
- ☐ Student Activity Sheet
- ☐ Drop Zone: At least 2m high (examples include playground, second story balcony, stairwell, etc.)

For safety:

- ☐ Safety cones for drop zone

Next Generation Science Standards (NGSS):

3-5-ETS1-3. Engineering Design: *Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.*

NASA Connection:

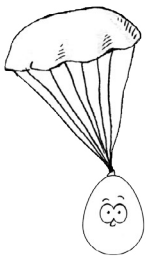
NASA's Commercial Crew Program (CCP) was formed to facilitate the development of U.S. commercial crew space transportation capable of achieving safe, reliable and cost-effective access to and from the International Space Station. Crew safety is paramount in the return of human spaceflight launches from NASA's Kennedy Space Center, and parachute testing provides valuable data to help commercial partners meet NASA's requirements for certification and safety. Find more educational resources for the Commercial Crew Program with NASA's Commercial Crew Program Next Generation STEM Pilot.

Procedure:

1. Discuss the Engineering Design Process.
2. Put students into groups of 2-3.
3. Introduce the challenge. As a class, predict what will happen when an egg is dropped from 2 meters above the ground. Using the stopwatch, record how long it takes the egg to drop 2 meters without a parachute.
4. Show students the available materials to construct their parachute.
5. Explain the Student Activity Sheet to the students, emphasizing the importance of gaining teacher approval, or 'certification.' Remind students they only have one hard-boiled egg to use during testing, so they must be careful with attaching it to the parachute.
6. Allow students to work in their teams to complete through number 4 on the Student Activity Sheet.
7. After 30 minutes, bring the students back together to discuss parachute testing guidelines.
8. Have an adult drop each of the parachutes with the attached eggstronauts from 2m or higher while students watch from a safe distance. Record each team's Eggstronaut drop time.
9. Allow time for students to complete the remainder of the Student Activity Sheet.
10. Bring the students back together to discuss the successful components of each teams design, as well as any improvements that could be made.
11. Optional Extension: *If time allows, have each team refine their design for another iteration of the Eggstronaut drop.*

Eggstronaut Student Activity Sheet

Directions: For each step in the Engineering Design Process, complete the required task to get approval from the teacher to move on to the next step.



1. Ask: What problem will you be solving in your Engineering Design Challenge today?

_____

_____

_____

_____

✓ Teacher Initials: _____

2. Imagine: Draw an idea of what you think your parachute should look like.

✓ Teacher Initials: _____

3. Plan: Make a list of the materials you will need to gather to construct your parachute. Take this list to your teacher for approval before gathering the materials to build your parachute.

_____

_____

_____

_____

_____

_____

_____

✓ Teacher Initials: _____

4. Create: Build and draw an image of your parachute below. Take this drawing and your parachute to your teacher for your final approval before testing.

✓ Teacher Initials: _____

5. Test: With your teacher's permission, test your parachute design with the eggstronaut. Was your parachute successful? Why or why not?

_____

_____

_____

_____

Parachute Drop Time: _____

6. Improve: What changes could you make to your parachute design to improve it?

_____

_____

_____

_____

_____

7. Share: During the group discussion, share your parachute results and improvements with the class.