Egg Crash! Designing a Collision Safety Device

Purpose
- Design, build, test, and evaluate a landing pad or “safety device” to protect an egg during a collision with a hard surface.
- Describe a collision in terms of changing momentum, impulse, impact force, and impact time.

Materials for each group of 2 or 3 students:
- white copy paper, 10 sheets (8.5” x 11”)
- masking tape, 1.0 meter
- scissors, one pair

Procedure
Using no more than 10 sheets of paper and 1 meter of masking tape, and following the guidelines below, students will design, build, and test a collision safety device that will protect an egg when dropped from ever-increasing heights.

Guidelines
1. Groups will consist of a maximum of 3 students.
2. All construction will take place in class within a time limit of 20 minutes, with only the materials provided.
3. Groups may use less, but no more than, 10 sheets of paper. Report to the teacher the number of sheets used to build your safety device. In the event of a tie, the device constructed with the fewest sheets of paper will be declared the superior safety device.
4. The device must be free-standing. Teams cannot support their devices by holding them or taping them to another structure.
5. Nothing may be attached to the egg.
6. Scissors may not be part of the device.
7. Dropping height is measured from the bottom of the egg, at the release point, to the floor.
8. Eggs will be dropped by a member of the device’s design team.
9. Eggs will be inspected before and after each drop and must not show any cracks. Eggs that survive the initial impact but roll off their device and break are eliminated. Eggs that miss the device when dropped are eliminated. Teams that break their egg by accident or carelessness are eliminated.
10. In order to simulate collisions with greater and greater momentum, the eggs will be dropped from successively greater heights (1.0 m, 1.5 m, 2.0 m, 2.5 m – the classroom ceiling is 2.5 m)
11. Devices must be completed within the time limit of 20 minutes.

Grading
10 points: Complete written work on the following pages (due the day after the egg testing)
6 points: Device is completed on time and meets guidelines
  1 point: egg survives drop from 1 m
  1 point: egg survives drop from 1.5 m
  1 point: egg survives drop from 2 m
  1 point: egg survives drop from 2.5 m

20 points total
Before the Egg Crash (2 points, Due Wednesday):

1. Look over the guidelines on page 1 and circle at least **five** important details to keep in mind when you create your device.

2. Record your ideas for your device in the box below. This may include:
   - drawings
   - devices you have seen in real life, movies/television, or elsewhere that might be good models
   - information you learn from the Internet, our textbook, or elsewhere that might help

Keep in mind that your group members will combine ideas to make 1 device.
After the Egg Crash (8 points; Due the day after eggs are dropped):

1. Draw a large sketch of your group’s device in the box below:

2. Describe your group’s reasons for the device’s design.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. State how well your device performed during the egg crash. If the device failed, describe what happened.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

4. Describe how your device is similar to a car’s airbag in preventing injuries. Use these terms in your answer: momentum, impact time, and impact force.

   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
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Connecting to car safety

5. Compare the impact times and impact forces of Car #1 and Car #2:
   Car #1 crashes to a stop by hitting a wall head-on.
   Car #2 crashes to a stop by skidding a large distance along a wall.

6. List at least 2 safety devices in a car, other than airbags, that reduce impact force by increasing the time of impact.

7. Is it safe to rely on a car’s airbags and not use seat belts? Why?