

Egg Drop!!

Your challenge is to design, evaluate, and refine a device that minimizes the force on an egg when it is dropped. Your device rests on the floor. The test for your design is to see if an egg dropped from 1 meter, landing on your device, cracks or stays whole.

Your more academic challenge is to define the collision in terms of force and elapsed time, leading to the use of the concepts of momentum and impulse. How can you use these concepts to describe designs here (and other real-world objects such as airbags in cars, gym mats, and football helmets) that are intended to minimize the force of a collision?

Your challenge is to protect the egg by encasing it in a combination of the paper and tape described below. You are to build one version of your “egg helmet,” evaluate it by testing it, and then refine your design and create an improved version. See how high you can go!

The materials for your device are as follows:

- Up to 10 standard-sized sheets of paper
- 1 pair of scissors (to be used solely for construction)
- Masking tape (up to 2 meters in length)

Other rules:

The tape roll cannot be used as part of the device.

Testing the device:

The egg is first dropped from a height of 0.5 meters. If it survives, it is dropped from 1.0 meter, and if it survives that test is dropped from 1.5 meters (for “bonus points”).

Physics analysis:

- Estimate or measure the mass of the egg.
- Create a data table:
 - What is the egg’s potential and kinetic energy before it is dropped (from each height)?
 - What are these values when it lands? Assume it accelerates at g , and ignore the effects of air resistance.
- Estimate its time of impact (the time that it takes to bring the egg to a complete stop), both with your device and without it.
 - Using the concept of impulse, estimate the average force on the egg.

Other (optional) designs:

As an alternative project, all teams, or some teams, can use tongue depressors, paper, and masking tape to make a collision-dampening device. In this case, the device rests on the floor underneath the egg. Each team is allowed 4 tongue depressors (which can be cut into pieces) and 4 sheets of paper. The same analysis of the collision should be conducted.

Or, instead of encasing the egg, design a landing pad for an egg. The landing pad is on the ground and cannot be attached to other objects (nor can a student hold it). Use the paper and tape as described above.