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The objective for this project was to design an egg drop that would successfully keep an egg from breaking from a 1 story drop. We were allowed to use up to 2 pieces of 14x17 bristol board and any adhesive.

We had to address the forces on impact when dropping our eggs which required a lot of research and many concepts. We tried to make our models as light as possible so it was more challenging and it didn’t matter if the models didn’t survive the egg just had to survive.
The first thing I did for the project was research past egg drop models to see what worked and what didn’t. I researched pressure points of eggs and where they are susceptible to crack the most.

I saw the idea of the triangle and how it moved the impacting forces away from the egg when it made contact with the ground. I decided to make a cone shaped concept that would do just that, but make sure it hit the ground at the exact angle so the egg couldn’t be damaged because of an error.
I was very intrigued with crumple zones in vehicles and other devices such as helmets and bulletproof vests.

Crumple zones damage easily, but contain the best chance of the person/object’s survival. Crumple zones operate in a way that they can take most of the impact and energy so the protected human or egg for this matter is still safe.

I researched how they can crumple so badly but keep the person safe and installed that into my own design.
Inspiration

I realized after my first 2 models that the only way my concept would work if the model hit at the tip so it would negate most of the primary force.

I researched other things that fall straight down and don’t tip over. A birdie in badminton was a good concept to research because it helped me come up with the idea for the wings in my final model.
Concept Sketches
Egg Drop Models

14.8 grams (Failure)
- Egg broke from tipping over in the air because egg was docked too high which caused the center of gravity to be off
- Needed model to make impact at the tip to absorb the force away from the egg

15.6 grams (Failure)
- Wings added to cause rotation in its dive, added more paper wads to soften fall
- Egg still broke from the impact after initial contact on its side, needed more support on its secondary contact
Egg Drop Models

18.01 grams (Failure)
- Added flipped wings to cause greater rotation so model would land at tip of cone.
- Egg still cracked because of weakness on the sides when the model tipped after initial contact, top cone was too strong

21.86 grams (Success)
- Smaller tube, reinforced wings and outer ring to protect from secondary contact
- Made egg tightly enforced inside smaller tube which caused sliding friction in longer tube
The final model didn’t change drastically from the beginning concepts, but I made some changes to better enable the egg’s safety in the drop. I cut slits out of the big cone so it would crumple easier when it made contact with the ground. I also made a stronger outer ring to stop any damage from the side of the egg where it was cracking easily.
Pattern

Industrial Design
Spring 2013
The Egg drop was a success!

The drop from the 2nd floor was executed perfectly and there were no scratches or cracks on the egg. It dropped straight down quickly with a lot of speed like I was anticipating which had the best chance of the egg surviving.
Force Diagram

- Instant Primary Impact Forces
- Crumple Zone Forces
- Secondary Impact Forces

Diagram showing force distribution in an egg-shaped object under impact forces.
Looking back on this project I realized it was very frustrating at times failing the amount I did, but it really helped in the end. Instead of just trying to slow down the model mid air I made the egg drop’s focus about absorbing the impact. It made it a lot harder to come up with a way to keep the egg safe, but in the end it was very rewarding to see the egg drop work.

I really had to research crumple zones and how forces on impact move throughout an object. I did it with a final weight of 21 grams which wasn’t the lowest weight, but it was a weight that made sense for the concept I was trying to accomplish. My egg survived on Drop Day and overall I am very satisfied with the work I was able to put together.