Project: The Effects of Gravity & Acceleration on Fragile Projectiles of Avian Origin (AKA "The Egg Drop")

Purpose: To develop a container to either slow down the acceleration, change the direction of impact, lessen the effects of the impact, or otherwise alter the natural course of events. The event is the dropping of an egg from a high place.

Requirements:
Your container's construction is limited to items from the following list in the quantities listed:

- 4 small paper cups (Dixie bathroom cups) OR 3 toilet paper rolls (not both—may not mix cups or paper rolls—cardboard roll NOT the toilet paper)
- 6 rubber bands (see display to show largest size possible)
- 1 sheet of 8-1/2 x 11 inch paper (may NOT be tag board….)
- 10 straws (regular size, no larger than the kind you get at Jack in the Box)
- 1 plastic coffee can lid
- 1 wire coat hanger
- 25 wooden toothpicks
- 1 sandwich bag
- string (one meter)
- masking tape (.5 meters; normal width tape, not extra wide)
- glue—only enough to secure joints or materials (not as a coating or for reinforcement)
- small washers (for weights), no more than 20.
- 1 egg (chicken; NOT hardboiled)

Your container may not be larger than 12 inches by 12 inches by 12 inches. Your container may have extensions from the container, but they may not exceed the 12 inch size requirement. These extensions may NOT be parachutes nor streamers.

Your container must contain an egg in the "natural" condition…that is…you may not alter the egg in any manner, by painting, wrapping, gluing, or anything that would make the shell more resistant to impact. The egg must be as large as a standard small chicken egg. It may be larger, but not smaller than this. The egg must be fresh, not hardboiled.

All containers will be opened and inspected as to the contents and condition of the egg immediately after impact. All eggs will be immediately handed over to the instructor for inspection. Eggs cannot be returned

You must submit a complete force diagram drawing of your contraption—done to scale on a separate sheet of paper. You must show all structures and label them. You must also include a one-page typed paper explaining:

- the forces acting on your contraption
- which force your contraption is trying to lessen or how your contraption changes the net effect of the force
- how your contraption lessens this force, or what feature of your contraption lessens this force
- how each of Newton's three laws applies to this assignment in general and your contraption in particular

Thus, you have 3 required parts of this assignment:

1. Your container
2. A scaled diagram of your container, labeled with features and forces
3. A one-page paper as detailed above

Disclaimer: It is expected that you provide your own materials as listed above (including the egg). If in doubt if any material is acceptable, it is your responsibility to ask. If you foresee difficulty obtaining materials for any reason, it is your responsibility to inform Mrs. Aker about these problems, WELL before the due date for the assignment.

Due Date for Your Container, Drawing, and Paper: _____

Grading Rubric:

Container Construction: (16 pts. total)

Container is turned in on time and completed (4 pts.) _____
Container is made of accepted materials (4 pts.) _____
Container is made of acceptable quantities of materials (4 pts.) _____
Container meets size requirements (4 pts.) _____
(if these three requirements are not met, your container will not be tossed)

Condition of egg (up to 8 pts.) _____
0 pts = projectile yolk streams at time of impact; explosive impact; or egg found to be hardboiled upon inspection
1 pt = complete and utter destruction of egg, with yolk exposed and shards of shell separated from egg
2 pts = leakage of a large amount of egg white, or small amounts of yolk
4 pts = small or larger cracks in egg, with leakage of small amount of egg white only
6 pts = hairline fracture cracks in egg
8 pts = eggshell has no cracks whatsoever

Points for container and drop: /24

Scaled Drawing and Force Diagram: (21 pts. total)

Drawing and force diagram completed and turned in on time (3 pts.) _____
Drawing is neat and reflects effort(3 pts.) _____
Drawing is scaled and shows key for scaling (3 pts.) _____
Drawing shows force arrows (3 pts.) _____
Drawing includes all force arrows that apply (3 pts.) _____
Drawing includes force arrows oriented correctly (3 pts.) _____
Drawing includes labels (3 pts.) _____

Points for scaled drawing and force diagram: /21

One-page paper: (25 pts. total)

Paper includes a description of the forces acting on your contraption (5 pts.) _____
Paper explains which force the contraption is trying to lessen or alter (3 pts.) _____
Paper identifies the feature of the container that lessens or alters the effect of that force (2 pts.) _____
Paper explains how the container serves to lessen or alter the effect of the force (5 pts.) _____
Paper relates EACH of Newton's three laws to the egg drop in general and the container in particular (10 pts) _____

Points for paper: /25

Extra Credit: After the egg drop has concluded, students who did not get full credit for the condition of the egg may either write 2 paragraphs (or discuss with me outside of class) why their container was not 100% successful. Points possible are equal to the points not earned from the condition of the egg portion of this rubric.

Extra Credit: