EGG LAUNCH **CONTEST**

TYPE OF CONTEST: Individual (team)

Date of competition: Thursday, December 1, 2005 - AFTER SCHOOL (ask off of work)

OVERVIEW: To build a container of restricted size which will keep an egg from breaking after being launched from the roof.

LEGAL	ILLEGAL
Large, fresh, raw, white chicken eggs	*"Treated"* or hard-boiled eggs. Rotten eggs.
Paper tape, transparent tape, masking tape, scotch tape	No duct tape, reinforced tape, or shipping tape will be allowed inside or outside the container.
You may work with others but each person must submit one entry for the contest.	The container also may not include: peanut butter, jell-o, liquids or any other substance that will splatter, fruits or vegetables (popcorn is okay), powdered soap, flammable substances of any kind or glass; WINGS or PARACHUTE; or any substance which may cause harm to a person or school property.

RULES:

- Students must design and construct a container. Commercially constructed containers are illegal.
- Egg may not be ***"treated"*** in any manner (e.g. hard-boiled as stated above).
- No more than one entry per person is permitted. YOUR NAME MUST APPEAR CLEARLY ON THE OUTSIDE OF YOUR CONTAINER
- No dimension of a container shall measure more than 15 cm (approx 6 inches). ***The container (with egg) must pass through a 15-cm diameter rigid hoop when turned at all angles,*** **including diagonals.**
- All entries must be clearly labeled with entrant's name and any special instructions regarding how to launch. For example if you have a preference on which side you want to point forward, please indicate clearly.
- The container, with egg, will be launched from the roof of the boiler room and catapulted to the concrete roadway behind the school (service entrance).

SPECIFICATION CHECK

- Immediately upon submission for competition, the containers receive a specification check to determine whether it conforms to dimensions, materials, and construction rules. Any container which fails the specification check will be disqualified (container may not be modified for competition during of after judging). **Please put your name on your container.**

- Judges **<u>may disqualify</u>** any entry if, in their opinion, the launching of the container might create a safety hazard for spectators or property.
- Container is weighed and its weight recorded.

JUDGING:

- Containers and ***<u>egg</u>*** will be inspected after the drop. Surviving eggs may be broken to insure that they are fresh and have ***NOT*** been hard-boiled. A loss of points will be earned if the egg cannot be **retrieved from the container <u>within 1 minute</u>**.
- Container which traveled the farthest will win. If a tie exists, the lightest container shall win.

AWARDS: Additional points will given for 1st, 2nd and 3rd place. The winner in each class will also receive bonus points.

GRADING:

1. You can earn 100 points constructing the device. A, B, or C will be given based on appearance and if it looks like time was spent constructing the container.
   Originality/creativity/craftsmanship may earn a higher score.

   An F will be earned if the container **AND FORMS** (this means the paper) are not completed and turned in by the class period of the day of the event. The percentage of the F will depend on how late.

2. Another 100 points can be earned based on the neatness and completeness of the diagram, calculations and typed page of **what was learned & key physics concepts** involved. (Include topics like conservation of mechanical energy, projectile motion, air resistance, & impulse-momentum.)

3. BONUS:

   If you are within 3 meters of your predicted distance you will earn +10

5 meters	+5
10 meters	+2

If yours travels the farthest out of all the classes AND THE EGG DOESN'T BREAK.

1st place	+25
2nd	+10
3rd	+5

Then after these scores have been removed, the top distance in each class will get +5.

* Points can be deducted if you do not clean up any mess your container left.

<u>NOTE</u>: If you are unable to attend the competition AFTER SCHOOL, Thursday, December 1, 2005, give me a note explaining why and who will observe your launch for you.

Container Grade:_____  _____ bonus Paper & Form Grade: _____

bring this form Thur, Dec 1st

Covenant Christian High School

OFFICIAL CERTIFICATION FORM FOR EGG LAUNCH MATERIALS

NAME: _____

1. List ALL materials used inside container:
2. Draw a diagram of your container. Label the components.
3. **On the back** show all of your calculations to determine the range. Circle this answer. Then factor in some air resistance and make your prediction. Circle this answer 3 times.
4. Attach a typed page explaining (1) what you learned in constructing your container and/or what concepts went into your design, i.e. (2) what were you thinking. (3) List and define key concepts, including conservation of mechanical energy, vertical and horizontal motion, air resistance, impulse, and momentum. How do these apply to the egg-launch. Make each concept a paragraph with the term italicized as a subheading at the beginning of the paragraph.

Materials:

Diagram:

*Show all of your calculations to **determine the range**. Circle this answer. Then factor in some air resistance and make your prediction for where it will land. Circle this answer 3 times. You will do this work in class under a quiz situation on the day of the event just after you turn in you container.*

ASSUMPTIONS

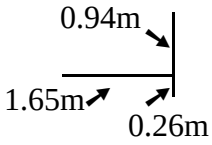
y_1 = height of the building down to the curb = 4.40 m
y_2 = height of the launcher = 1.20 m
y = total = 5.60 m

mass, *m* = _____
measured using balance
in class Dec 1st (beware sig dig)

We know Hooke's Law, $F = k\,x$. So what are the *k* and *x*.
k = spring constant for yellow launcher = 232 N/m.
x = pull it back about = 1.45 m

From conservation of mechanical energy,

PE_{spring} = KE
$\Rightarrow \frac{1}{2} k x^2 = \frac{1}{2} m v^2$ What units should you use for mass? _____. The equation becomes ⇒



$\theta = \tan^{-1}(\_\_\_\_\_ / \_\_\_\_\_)$

Don't forget to break the velocity up into its components.
Use the following to find the range.

x-dir	y-dir
$v_x = d_x/t$	$d_y = d_{yo} + v_{yo}\,t + \frac{1}{2} a_y t^2$