Fling-A-Thing Challenge

Introduction

Throughout history people have sought methods of propelling objects faster and farther. Sometimes the motivation is survival, like in the case of the bow and arrow or the sling. Sometimes it's to overcome an engineering challenge, you can see with the launchers used on aircraft carriers to help get jets up to take-off speed from a short runway. And sometimes it's just for fun, like in the case of pumpkin chucking.

Whatever the reason, designing and building a device to launch something over a distance is a fantastic engineering challenge and a lot of fun. Your challenge will be to design your own "thing-flinger" to be built out of cardboard and whatever other resources you have at your disposal.

The Challenge

STEP ONE: Inventing

A. Before you begin designing your thing-flinger you need to know what your device is going to do.

1.) It must remain on the ground or floor. This cannot be a hand held device.

2.) It must be made mostly of cardboard. Making a flinging device out of wood or metal is too easy!

3.) It must launch a small object into the air in a specific direction.

You can choose a projectile (what it's supposed to launch). Here are some suggestions:

- Coins- quarters, nickels or pennies.
- Ball of aluminum foil- made from crumpling up a 12in. x 12in. sheet**.**
- Small toys- Marble, Matchbox/Hot Wheels toy cars, or other similar size objects**.**

  Note: you may choose larger objects to launch, but your device will have to be large enough and strong enough to handle the increased size and weight.

B. Next, think about the additional materials you have to work with. The device should be made mostly out of cardboard, but you may add other items as well. Here are some suggestions:

- White glue, hot-melt glue, tape**.**
- Rubber bands, springs, elastic**.**
- Used up pens, pencils or markers**.**
- Tooth picks**.**
- Nails, screws, nuts and bolts**.**

  (Rubber bands are great elements to add spring action to a device. The other options listed can create pivot points between pieces of cardboard that will need to move.)

C. With your flingable things and your materials in mind, start thinking of different ways to launch your item. Draw your ideas. Make notes of how different parts of your design are supposed to work.

** This design will be referred to as **Rev-1**.*

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STEP TWO: Making

A. Start building! Using your drawings as a guide, build your device.

- As you build different parts, test pieces to ensure that they fit the way you want.
- Check to see if pieces that move are moving as you need them to.
- Look for places where parts of your design get in the way of other parts.
- Make corrections as you go.

B. Once you have your thing-flinger built, test it out in a safe location.

Make sure there is nothing nearby, especially any people or pets that could be hurt by your device.

(If possible, go outside and stay away from people and property.)

1.) Distance test:

- Launch your projectile.
- Measure the distance from your thing-flinger to the spot where your projectile first hit the ground.
- Record the results.
- Do this test at least ten times.

2.) Accuracy test:

- Set up something as a target like a cup, plastic bowl, or a bucket.
- See if you can land your object into your target.
- Record each attempt with either “hit” or “miss”.
- Do this test at least 10 times.

If you have access to a camera, take pictures or video as you go to show the results.

C. Evaluate your thing-flinger.

- Ask yourself the following questions:
  - Did your design work as you expected?
  - What did you try that did NOT work?
  - What did you try that DID work?
  - What could you do to improve your design?

D. Improve or rebuild your thing-flinger.

You may attempt to improve your existing thing flinger or you may choose to build a new one from scratch. Go back through the steps listed in STEP TWO using what you learned and observed from your first design to make improvements.

(You may want to sketch out your planned changes first!)

This NEW design will be referred to as **Rev-2**.

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STEP THREE: Storytelling
Report your findings. There are two options that we suggest:

Option A: Write a written report with three sections: Rev-1, Rev-2, & Conclusions.
In the Rev-1 section, list the following items that refer to your FIRST design:

- Show the sketches you made from STEP ONE, Part C.
- List questions and the answers to the questions from STEP TWO, Part C.
- Show any pictures taken during the tests you did in STEP TWO, Part B.

In the Rev-2 section, list the following items that refer to your NEW design:

- Any sketches you made from STEP TWO, Part D.
- List questions and the answers to the questions from STEP TWO, Part C.
- Show any pictures taken during the tests you did in STEP TWO, Part B.

In the Conclusions section, answer the following questions:

- Which version of your design worked better? (Rev-1 or Rev-2)
- Why do you think the newer version (Rev-2) performed as it did?
- What would you do differently if you were to make a THIRD version of the device, and why?

Option B: Record a video. In your video, you should:

- Show the sketches you made from STEP ONE, Part C.
- State the answers to the questions from STEP TWO, Part C.
- Show any sketches you made from STEP TWO, Part D.
- State the answers to the questions from STEP TWO, Part C.
- State which version of your design worked better? (Rev-1 or Rev-2)
- Talk about why you think the newer version (Rev-2) performed the way it did?
- Talk about what you would do differently if you were to make a THIRD version of the device, and why?

Lesson Learned

Building a cardboard device that performs a function adds another dimension of difficulty to typical cardboard building challenges by introducing mechanical reasoning into the challenge. Cardboard performs differently as a dynamic load is put on it during the process of performing a mechanical function. Students use their creativity to come up with a design and critical thinking to observe problems and enact solutions.

The organizational structure of the challenge leads students through the processes of problem identification, solution execution, testing, observing, and revising. These disciplines are applicable to most professional positions regardless of whether they involve engineering or not.

Finally, prototyping with cardboard is a staple skill of professional industrial designers. Used effectively, it's a powerful tool for visualizing a concept early in the design phase with a minimum or resources.