Curiosity Guide #601
Collisions

Accompanies Curious Crew, Season 6, Episode 1 (#601)

Designing Better Bumper Cars, a Collision Conundrum

STEM Challenge

Description

Bumper cars are more fun when their collisions are spectacular! Design a bumper car that moves a long way backwards upon impact.

Materials

- Air pump
- Plastic Air Chargers cars
- Concrete block
- Measuring tape
- Rubber strips
- Balloons
- Cotton balls
- Popsicle sticks
- Coil springs
- Bubble wrap
- One car with clay on the front

Procedure

1) Set up a launch track so that on one end there is a concrete block. Place the air-pump launch pad 4 feet away.
2) Extend the measuring tape from the block toward the launch area.
3) Using the available materials, add things to the car so that the collision is the most elastic possible.

4) Attach the car to the pump. Use the same number of air pumps with each launch to establish better comparisons on the bumper designs.
5) Measure the distance the car traveled backwards from impact to determine how elastic the collision was.
6) Launch the car with clay to see how the material affects the collision.
7) Measure and record all modifications to your bumper car. Describe the effect of each modification.

My Results

Explanation

Some materials will provide a spring result that softens the collision as the material gets transferred into elastic potential energy and then back into kinetic energy. These items will roll back further after the collision. Other materials may compress too much and transfer the kinetic energy into the reshaping of the bumper or noise that the bumper makes upon impact. In this case, the collision may be more inelastic. The clay bumper car is inelastic because the clay deforms on impact and transfers most of the kinetic energy.

Think about this: Bumper cars are a lot of fun to drive, especially when the rubber bumpers compress and spring back, making a better elastic collision. It's interesting to notice how the cars move after the collision, too. Imagine a big person in one car bumping a small person in another. After the collision, the smaller person's car moves a lot, while the other car keeps going forward at a slower speed. If the smaller person wants to move the bigger person's car, they need a lot more speed in the collision to increase their momentum. Boing!

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