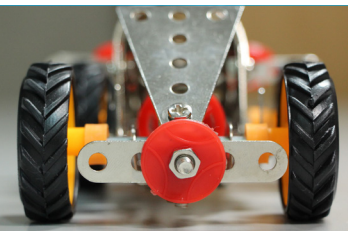


CURIOSITY AT HOME

CRASH TEST



How do you keep the inside of a car safe for its passengers? Create a crash test zone and a vehicle that is safe for a passenger in a crash. Make adjustments to improve your vehicle and test again and again.

MATERIALS

FOR VEHICLES:

- Supplies to create a vehicle (K'Nex, LEGOs, a toy with wheels)
- Crafting materials (paper, coffee filters, rubber bands, string, pipe cleaners, tape etc.)

FOR CRASH RAMP

- Cardboard (or another large flat material to create a ramp)
- A heavy object to crash the vehicle into (such as a box or stack of hardback books)

FOR PASSENGERS

- A few (about six) LEGO bricks snapped together,
OR a fragile but not valuable item (potato chip, figure made from clay etc.)
- Science notebook or paper
- Something to write with

PROCEDURE

The following steps will give you some ideas to create your crash test zone, vehicle frame, passenger, and passenger compartment. All of these parts will be used to test a vehicle in a crash, but can be created in any order.

MAKE THE TEST ZONE

- Find a long straight object that can be used as a ramp or track. A large piece of cardboard with one side propped against a chair can work great.
- At the end of the track, lay something large and sturdy (a stack of hardback books works well) that the vehicle will impact against. Just make sure you choose a hard object that you're not worried about getting damaged.



Experiment continued on next page...



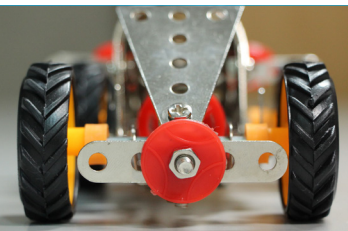
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CRASH TEST



PROCEDURE *continued...*

DESIGN AND MAKE THE TEST VEHICLE

- Draw a design for a vehicle in your science notebook, keeping in mind the materials you have to construct your vehicle. Think about how large you'd like the vehicle to be, what shape, how many wheels, and any other design choices you'd like to keep in mind.
- Build your vehicle. K'Nex, LEGO, or other building block systems are a great starting point, and many collections already have wheels. Otherwise, you can build a passenger compartment and attach it on top of a toy that already has wheels. Make sure your vehicle can travel down your ramp quickly so that it picks up speed before hitting the heavy object at the bottom of the ramp.



MAKE THE PASSENGER & PASSENGER COMPARTMENT

- Your passenger, also known as a crash test dummy, should be something that is breakable to show when it has experienced too much impact force. A few LEGO bricks attached together in the shape of a person work well and are easy to put back together, plus you can decide how sturdy or fragile to construct them to give yourself an extra challenge!
- Now you're ready to put everything together. Place your passenger inside the compartment and attach the compartment to your vehicle.

TEST HOW YOUR VEHICLE DOES IN A CRASH.

- Put your vehicle at the top of the ramp and let go!
- After the crash, look at your vehicle and crash test dummy. How safe was your passenger? How can you change your design to make the vehicle safer for your passenger? Make changes to your vehicle and test it out again and again.
- How you protect the passenger is up to you! Remember that you are trying to provide shock absorption, so materials that can cushion or stretch are perfect here. Seat belts and airbags work well, but maybe you'd like to see if a crash test dummy is safe in a cup of water aboard your vehicle, or in a tall tower above the crash! Use materials that you have around you that you think would fit your needs. Feel free to base this part of your vehicle on a real-world example, or make something completely unique. It's up to you!



Experiment continued on next page...

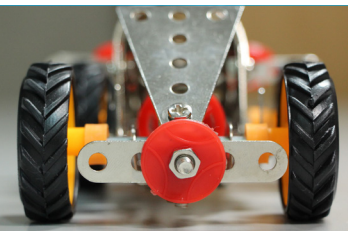


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CURIOSITY AT HOME

CRASH TEST



DID YOU KNOW

Car manufacturers put a lot of thought into how to protect passengers. Injuries during a crash can be reduced in a few ways. First, by making a passenger compartment that is strong and won't bend or break apart. An engine compartment or trunk can safely be bent out of shape in a crash (in fact, it's better for passengers if those parts of the car take the force of the crash!).

Second, the inside of the passenger compartment is designed to cushion impact. Seat cushioning and airbags soften impact by decelerating the passenger more slowly. Seat belts decelerate a passenger safely and slowly, and prevent them from hitting hard parts of the car or being ejected from the car.

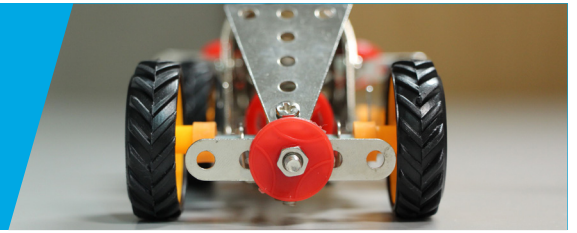


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CURIOSITY AT HOME

CRASH TEST



3–5 GRADE EXPLORATION

Explore the following questions and write your observations in your science notebook.

- Did your passenger stay safe during the crash? Why do you think that is? What are some adjustments you could make to make the vehicle safer?
- Would it be possible to change your vehicle to allow for more passengers? What if you were making a bus? How would you fit and protect as many passengers as possible? Draw a new design for this vehicle and try making it.
- Think about some changes you could make to test things out a little differently. Here are two suggestions, but can you think of more?
 - **Side Impact Testing:** You've tested how well your vehicle works in a frontal impact. How will passengers do if it is hit from the side? For this test, hang a weight of a few pounds from a stable frame so it hangs just an inch or two above the ground. A milk jug tied with rope to a broomstick laid across two chairs will work great. Being careful that no one is in the way of your wrecking ball, pull the weight back, place the vehicle on the ground, and let the weight swing into the side of the vehicle.
 - **Crash reconstruction:** Use the slow-motion recording capability of a smartphone, tablet, or camera to get a close look at exactly what happens at the moment of impact. Did the passenger move? What did they hit inside the passenger compartment? Is there a way to cushion them from this impact?



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