

# Need for Speed

## Experiment: String Vehicle

**Not all superheroes can fly or teleport, sometimes you just need to hop in the car to go save the world. Build a vehicle and see how fast you can race it along a string path.**

### MATERIALS

- 30-foot piece of string (or longer)
- Paper towel tube
- Four 16-ounce plastic cups
- Scissors
- Markers
- Art and craft supplies
- Small boxes, cups or other lightweight items (optional)

### INSTRUCTIONS

Start by decorating the paper towel tube and making it a vehicle fit for a superhero. Add wheels, rocket fins or whatever creative touches you want, just make sure both ends of the tube are uncovered.

Make the hand guards. Use scissors to poke a hole in the bottom of each 16-ounce cup. The cups should be large enough that your hand can fit inside. You'll need a friend for this activity, so make four hand guards.

Fold the string in half and cut it so you have two equal pieces. Thread both strings through the paper towel tube. Insert the end of one piece of string through the hole in one of the cups so that the string is inside the cup. Tie a knot (or add tape on the end) to prevent the string from slipping through the hole. Do this for each cup.

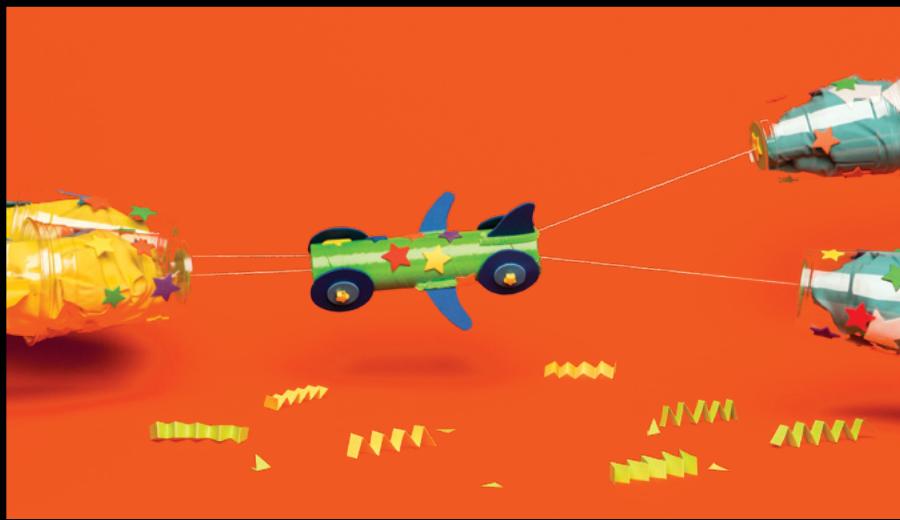
With your friend, stand across from each other and hold an end of the string in each hand, with your hands inside the cups for protection. Try not to cross or twist the strings. Hold the string so it's almost tight and parallel to the floor. Your hands should be next to each other, with little to no space between them.

Position the paper towel tube vehicle so it's closest to the handles on one end. To make it go, move your hands apart quickly—the vehicle should zip forward on the string. The faster the strings are pulled apart, the quicker the vehicle will go! By alternating turns, the vehicle can move back and forth between people.

If you are trying this by yourself, don't cut the string. Instead, fold it in half and tie the folded end to something firmly anchored like a doorknob on a closed door. Stand back with the string tight and parallel to the floor, and make the vehicle move away from you by quickly pulling your hands apart.



# VRRROOOOMMM!!



## WHAT'S HAPPENING?

When the strings are pulled apart on one end, they create a triangle shape in front of the paper towel tube because the opposite end of the string is still held together. Once the strings are pulled apart wider than the paper towel tube, the tube vehicle is forced to move forward. The string pushes on the tube to create a force. A force is a push or pull and can be used to create motion. The quicker you pull the strings apart, the greater the force that is put on the tube and faster it moves forward.

## SAVE THE DAY!

Build a city of small boxes or set up a stack of cups around the path of the string. Make your vehicle zip through the obstacles and knock them down. Or try altering your vehicle's body to see if you can make it travel farther. What happens if you add fins, or use a plastic bottle for the body?

## LEARN MORE

Explore the history and science of transportation in MSI's Transportation Gallery.

## RECOMMENDED READING

*All Kinds of Cars*, by Carl Johanson

*Batmobiles and Batcycles: The Engineering Behind Batman's Vehicles*, by Tammy Enz