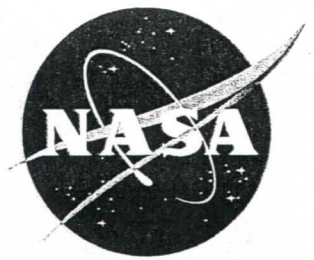


ON TARGET



as built on TV.

Thanks to NASA, the moon is getting a new crater! NASA is sending a spacecraft hurtling into the moon's surface. Why? To see if there's water below the surface. This collision will send up a plume of dust and gas over 6 miles (10 km) high. To tell if there's any water, scientists will look for ice crystals and water vapor in this plume.

WE CHALLENGE YOU TO...

...modify a paper cup so it can zip down a line and drop a marble onto a target.

BRAINSTORM AND DESIGN

Think about how you might design a way to carry and launch a marble:

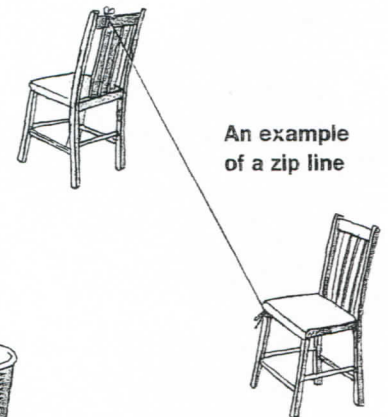
- How will you modify the cup so it can carry a marble down a zip line and also drop it onto a target?
- How will you remotely release the marble from the cup?
- When do you need to launch the marble so that it will hit the target?

BUILD

1. **First, set up a zip line.** Tie 6 feet (1.8 m) of the smooth line to two objects (e.g., two chairs or a table and chair). Make sure it's stretched tight and that one end is about 20 inches (50 cm) below the other.
2. **Next, figure out how to modify the cup to carry the marble down the zip line.** Will it travel inside the cup? Outside the cup on a platform? Underneath?
3. **Then, add a remote release.** Decide how you will tip the cup at just the right instant to launch the marble toward the target.
4. **Finally, clip the cup to the zip line.** Figure out how to hook the cup onto the zip line so it slides easily.

MATERIALS (per zip line)

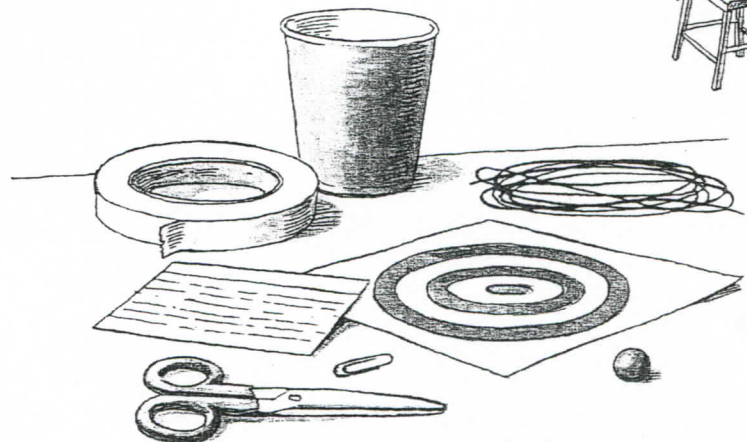
- 9 feet (3m) of smooth line (e.g., fishing line or kite string)
- index card
- marble
- masking tape
- paper clip
- 1 medium-sized paper cup
- scissors
- target drawn on a piece of paper



An example of a zip line

TEST, EVALUATE, AND REDESIGN

Ready for a test run? Place the target near the end of the zip line. Send down the cup and try to hit the target with the marble, using the remote release. How close did you get? See a way to improve your design? Engineers improve their designs by testing them. The steps they follow are called the design process. Try your idea and build an improved version.



Materials to make a zip line, carrier, and target