



## ELEMENTARY CLASSROOM ACTIVITY

# Transport Emissions

### OBJECTIVE

Students will investigate if weight contributes to the amount of energy needed to power an airplane.

### OVERARCHING QUESTION

How can aviation become more sustainable?

### WHAT'S THE PROBLEM?

- When fuel is burned for energy, it creates **carbon dioxide**.
- Carbon dioxide is called a **greenhouse gas** because it traps heat in the Earth's atmosphere and causes the Earth's temperature to rise.
- As the **Earth's temperature rises**, the world is seeing more extreme weather, changes in animal habitats and ecosystems, and the melting of ocean ice.
- **Transportation** is responsible for almost **one-quarter** of the carbon dioxide that the world produces, or *emits*.<sup>1</sup>

Because people around the world are traveling more often, the greenhouse gases that transportation emits are increasing too. It's therefore important for citizens to consider how to reduce their carbon dioxide emissions when they move from place to place!

### COLLABORATE AND BRAINSTORM

Airplane companies are also looking at other green options, like creating fuel out of natural substances, to reduce the amount of carbon dioxide that they emit!

Replacing driving with walking or riding your bike is one way to reduce the amount of carbon dioxide that you emit when you travel. But what if you have to travel a far distance? Walking or riding your bike isn't always possible.

Imagine that you are responsible for helping airplane companies figure out how to reduce the energy they need when they fly. When an airplane needs less energy, it uses less fuel and emits less **carbon dioxide!**

With a partner, brainstorm: What changes could you make to an airplane to help it fly more easily and use less energy?

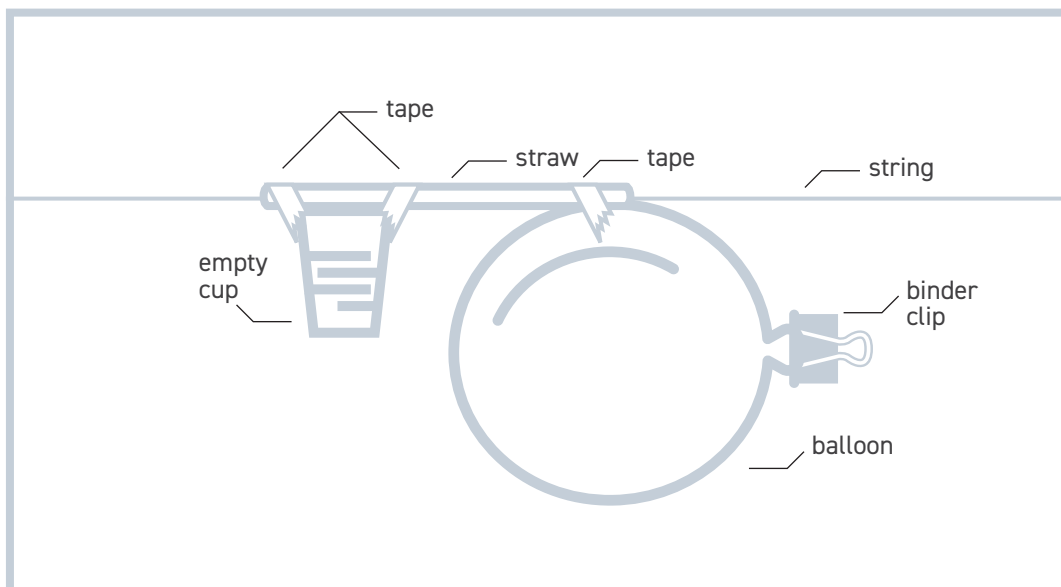
## DESIGN AND CREATE

Let's investigate if weight has an effect on how much energy is needed to power a plane.

### You'll need:

- String
- A paper straw
- A few balloons
- A paper cup
- Scissors
- Tape
- A binder clip
- Paper
- A marker
- Small weights: Coins, washers, pebbles, etc.

1. Tie one end of the string to an object on one side of the room, such as a doorknob or chair. Then thread the string through the straw and attach the other end of the string to an object at about the same height on the opposite side of the room.
2. Use the balloon, binder clip, paper cup, and tape to create an airplane model according to the diagram below. You may also create wings out of paper and tape them to the balloon to make your model look more like a real airplane!
3. Once your airplane is constructed, slide it along the string to one side of the room. Then release the binder clip and watch your airplane fly. How far does it travel? Use the marker to mark the string where it stops.
4. Then try the same experiment again, this time filling the paper cup about one-quarter full with the small weights. Once you mark how far the airplane travels, repeat at least two more times—each time filling the paper cup with a little more weight.



## MAKE IT BETTER

### Discuss:

- When an airplane is heavier, does it use more or less energy? How do you know?
- What suggestion(s) could you give to airplane manufacturers who are looking to create planes that use less fuel and emit fewer greenhouse gases?

## KEEP IT GOING

It's not just up to companies to reduce their **carbon footprint**. It's also up to communities and individuals like you! Think about all the ways you use energy, including electronics, heat, transportation, and electricity...in addition to the energy it takes to make the clothes you wear, the food you eat, and the materials you buy. How could you reduce your own carbon footprint?

Your carbon footprint is the amount of carbon dioxide that your activities emit into the atmosphere. The smaller your carbon footprint, the better!

## K-2 CONSIDERATIONS

Set up three airplane testing areas around your classroom and create the airplane models in advance. Instruct one group to test an empty cup, one group to test a cup that is half full of weights, and one group to test a full cup. Together, measure the distance that each airplane travels and analyze the results!

## STANDARDS

### Next Generation Science Standards

#### ETS1.B: Developing Possible Solutions

- Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.

### Source

1. "Health and Sustainable Development." World Health Organization. [who.int/sustainable-development/transport/health-risks/climate-impacts/en/](http://who.int/sustainable-development/transport/health-risks/climate-impacts/en/).