



Wind Tunnel

STEM Sims

Lesson 1: An Object's Shape and Air Resistance

Have you ever held your hand out when riding a bike and noticed that how you held your hand made a difference in how the air felt against your hand? In this investigation, you'll study how an object's shape affects how it moves through air. Start this experiment and get into shape.

Here are some definitions to help you in your investigation.

Force -	any push or pull on something
Friction -	a force that opposes the motion of something
Air Resistance -	friction due to something moving through the air
Fluid -	something that flows freely, like a gas or liquid
Drag -	friction due to something moving through a fluid
Gravity -	the downward pull on something due to Earth's large mass
Weight -	the force due to gravity's pull on an object
Mass -	the amount of matter in an object
Grams (g) -	a unit of measure of mass
Apparent -	something that seems true but may or may not be

Doing the Science

1. Start the Wind Tunnel Simulation by clicking on the "Simulation" tab.
2. Click on any of the objects on the table. The object moves to the spring scale above the wind tunnel. Note and record the shape and mass of the object in Table 1.
3. Slide the voltage lever on the wind tunnel to about halfway between 0 V and 28 V.

- Click the "ON" button to turn on the fan motor. Note and record the "new mass" on the spring scale. This new mass is a measure of the force due to air resistance in addition to the force of gravity.
- Calculate the "Apparent Mass Increase due to Air Resistance" by subtracting the original mass from the "New Mass on Scale." Record this value in Table 1.
- Click the "OFF" button to turn off the fan motor.
- Click on the object hanging on the spring scale to return it to the table.
- Click on a different object and repeat steps 4 - 7. Do this until you have tested all objects.
- Slide the voltage lever on the wind tunnel to 28 V and retest all shapes at this voltage.

Table 1.

Trial	Shape	Mass (g)	Voltage (volts)	"New Mass" on Scale (g)	Apparent Mass Increase due to Air Resistance (g)
1					
2					
3					
4					
5					
6					
7					
8					

Do You Understand?

1. What happened to the fan when you increased the voltage on the fan motor?
2. In which direction was the fan motor moving the air: from the top to the bottom or from the bottom to the top? Support your answer with evidence.

3. Was the spring scale really measuring the mass of each object or was it measuring the weight of each object?
4. Why could mass measures be used instead of weight measures in this experiment?
5. How would the experiment's results have changed if the wind tunnel was moved into the space station where there is air, but very little gravity?
6. Which shape had the smallest air resistance?
7. What is the relationship between an object's shape and air resistance?
8. What is actually causing the air resistance between the object and the moving air?

9. Which shape had the largest air resistance?
10. How does your answer to questions #6 and #9 affect how you would design the front-end shape of a car?