Blast-Off

Grades 6 – 8 Time: 30 min

TEKS: Science Concepts. The student knows there is a relationship between force and motion.

We have been flying in space for more than 40 years. A lot of things have changed. Flying on the Shuttle is a treat compared to earlier spaceflights. Forty years ago, people would not have thought Americans and Russians would live together in space. Now, they are! Space probes have visited every planet except Pluto. And a mission there is being planned.

One thing has changed very little. That is the way rockets work. Different fuels have been used. Rocket engines are more high-tech. But, the basic ideas are about the same. NASA is working on a way to change that. What should a new engine do? It needs to be faster. Rockets go the same speed as 40 years ago. A new engine would make space travel faster. It would do other amazing things, too. It could go to Mars faster or get fuel there.

But, have you ever wondered how a space rocket blast off in to space? Or what makes is move in the right direction? In this activity you will be learning about Newton's Third Law of Motion which says:

For every force there is an equal and opposite force

Things You Need

17 ft of string	Scissors	Yard stick	Balloons
Plastic straw	Tape	Marker	Paper

What to Do?

1. - Cut a piece of string 15ft long. Mark the string at every 6 inches. Thread the string through the straw and tie the ends of the string to the back of two different chairs. Push the straw in to one of the far ends of the string.

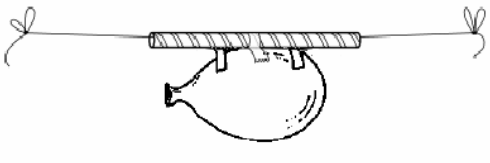
2. - With the other piece of string (about 2 ft long), mark the string at half inch intervals. This string will be used to measure the circumference of the inflated balloon.

3.-You or your child can blow-up the balloon, but don't tie it up. Have your child measure the balloon around the widest part of it (circumference), and write down your answer.

4.-While still holding the balloon shut, tape it to the straw and then release the balloon.

5. - Measure the distance that the balloon traveled across the string and right down your results.

6. - Repeat step 3 to 5, blowing up the balloon to different sizes. Remember to record the circumference and the distance the balloon travel every time.



Questions to Think About

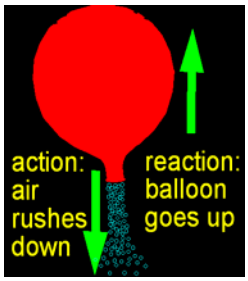
Once your experiment is done ask yourself and your child questions like these to draw up some conclusions.

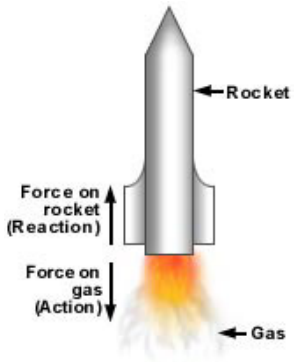
What is making the balloon move?
What happens to the balloon when you let go of it?
What direction is the air moving?
How will the balloon move farther?

What is Going On?

According to Newton's third law, for every action force there is an equal (in size) and opposite (in direction) reaction force. Forces always come in pairs - known as "action-reaction force pairs." These actions are two separate forces. A force is a push or a pull upon an object which results from its interaction with another object. An action force pushes in on direction while a reaction force pushes equally in the opposite direction.

In this activity, the air moves out of the balloon in one direction and the balloon moves in the opposite direction. Forces are equal because the balloon moves according to how much air there is in it to propel it.





Where Does This Happen in Real Life?

Consider how a fish moves through water. The fish uses its fins to push water backwards and the push causes the fish to move in the opposite direction, forward. The size of the force on the water equals the size of the force on the fish.

Imagine a rocket being launched by NASA. A rocket can liftoff from a launch pad only when it expels gas out of its engine. The rocket pushes on the gas, and the gas in turn pushes on the rocket. With rockets, the action is the expelling of gas out of the engine. The reaction is the movement of the rocket in the opposite direction

Extensions: You may repeat the experiment but this time use a stop watch you measure how much time the balloon took to travel. With the data collected you can create a table composed of the time (seconds) the balloon took to move and the distance (inches) it traveled. With this information you can find out the speed the balloon was traveling

$$\text{Speed} = \text{distance/time}$$
(inches/seconds)