

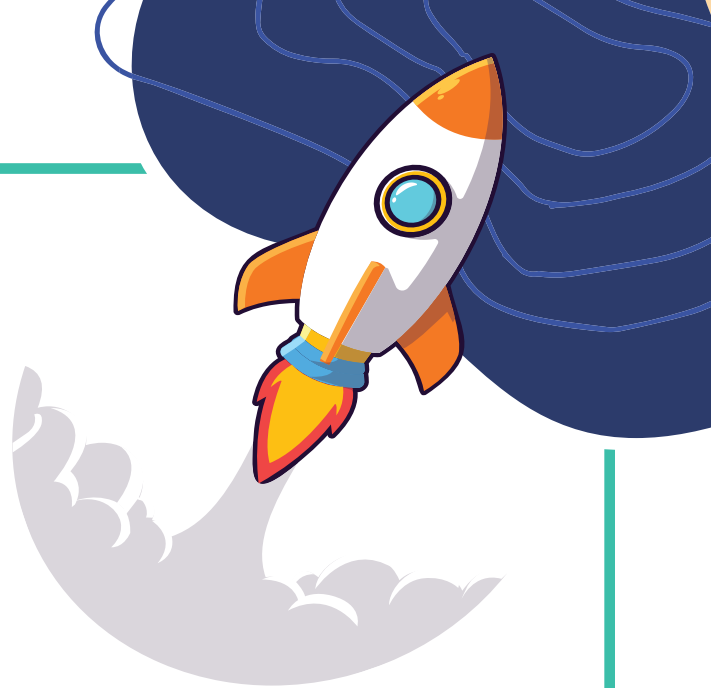
LELAND MELVIN'S

# BALLOON ROCKET

As an astronaut, Leland Melvin launched into space twice, riding a rocket that accelerated to 17,500 miles per hour to leave Earth and enter orbit.

Rocket science isn't easy, but anyone can play with the basic principles. In order for the rocket to go up, it needs to push lots of air downward to use Newton's Third Law that every action has an equal and opposite reaction. You can do that with a balloon rocket: push a lot of air in one direction and watch your balloon fly off the other way.

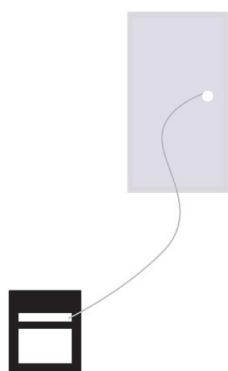
**Are you ready to be  
a rocket scientist?  
It's your turn in  
T-minus 3...2....1**



# Build Your Balloon Rocket Kit

## SUPPLIES

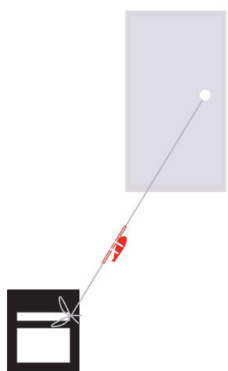
- A balloon (or, ideally, a few balloons of different sizes)
- A long string (in the range of 10-20 feet long)
- A plastic straw (or you can substitute the tube from a toilet paper roll)
- Tape



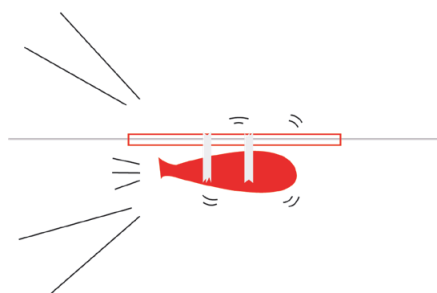
**1** Tie one end of the string to something stable (a doorknob or piece of furniture works well), and choose a second something-stable at about the same height that you'll tie the other end to (soon, not now)



**2** Tape your balloon to your straw or tube, and then thread the other end of the string through that tube.



**3** Tie the other end of the string to our second "something stable." Make sure the **string is pulled tight and straight** (the tighter the string, the faster the rocket!).



**4** Pull the balloon to one end of the string and blow it up (but leave it untied). When you let the balloon go, your rocket will take flight!

# ROCKET SCIENCE 101



## WHAT JUST HAPPENED?

You used Newton's Third Law of Motion: **every action has an equal and opposite reaction.** When the air pushed out the back of the balloon backward, the equal and opposite reaction propelled your balloon rocket forward.

**This is how rockets work:** they push massive amounts of air downward so that the rocket travels quickly upward.

## ROCKET SCIENTIST CHALLENGE

Did your balloon make it all the way to the other end of the string? If it didn't, there are a few possible reasons:

- **Resistance.** A tighter string will have less resistance and your rocket can go farther.
- **Propulsion.** More air or a larger balloon can give your rocket more power.
- **Weight.** Try a shorter or lighter tube so your rocket has less mass to carry.

Science is all about trying, learning, and improving. See if you can use the above suggestions to make your rocket go farther and faster!



"Our space shuttles were bolted down to the launch pad until the bolts exploded as we took off. That's what it means for a rocket to literally blast off."