

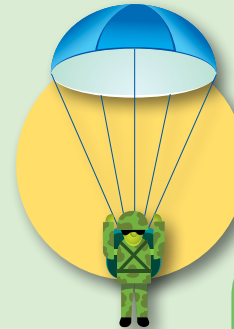
# How Toys Fly



Helen Whittaker

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When a word is printed in **bold**, click on it to find its meaning.

# Toys and forces

Forces make toys work. Forces make toys start moving, change direction, speed up, slow down and stop moving. Forces also change the shape of some toys.



None of these toys would work without forces.

## What is a force?

A force is a push or a pull. When you push something it moves away from you. When you pull something it moves towards you.



When this boy applies a pushing force to the paper aeroplane, it moves away from him.

When this girl applies a pulling force to the balloons, they move towards her.



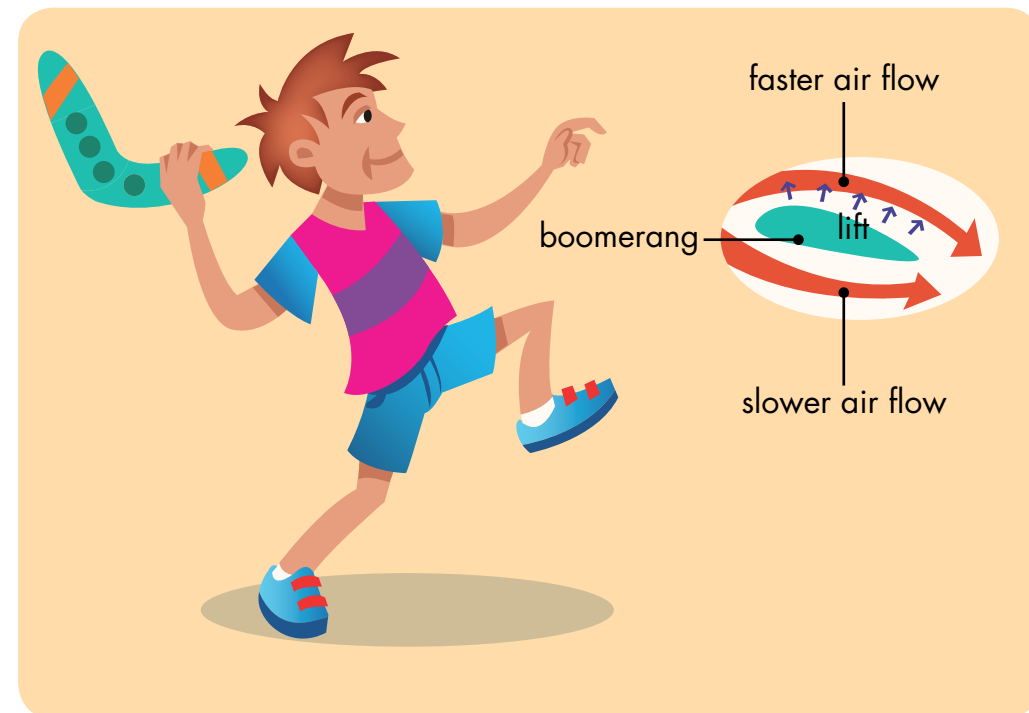
# How does a flying toy work?

A flying toy works by moving through the air. A flying toy has a special shape, which creates an upward pushing force called **lift**. Lift keeps the toy in the air.



Boomerangs can fly because their shape creates an upward pushing force called lift.

A flying toy can fly because its special shape creates lift. When a flying toy moves, the air above it flows faster than the air below it. This air movement creates lift and the toy flies.



A boomerang creates lift because the air above it flows faster than the air below it.

# How do forces make flying toys work?

Different forces make flying toys work. Pushes and pulls make the toys work in different ways. Forces can make flying toys work in these ways.



Forces can make flying toys start flying.



Forces can make flying toys change direction.



Forces can make flying toys speed up.



Forces can make flying toys slow down.



Forces can make flying toys stop moving.

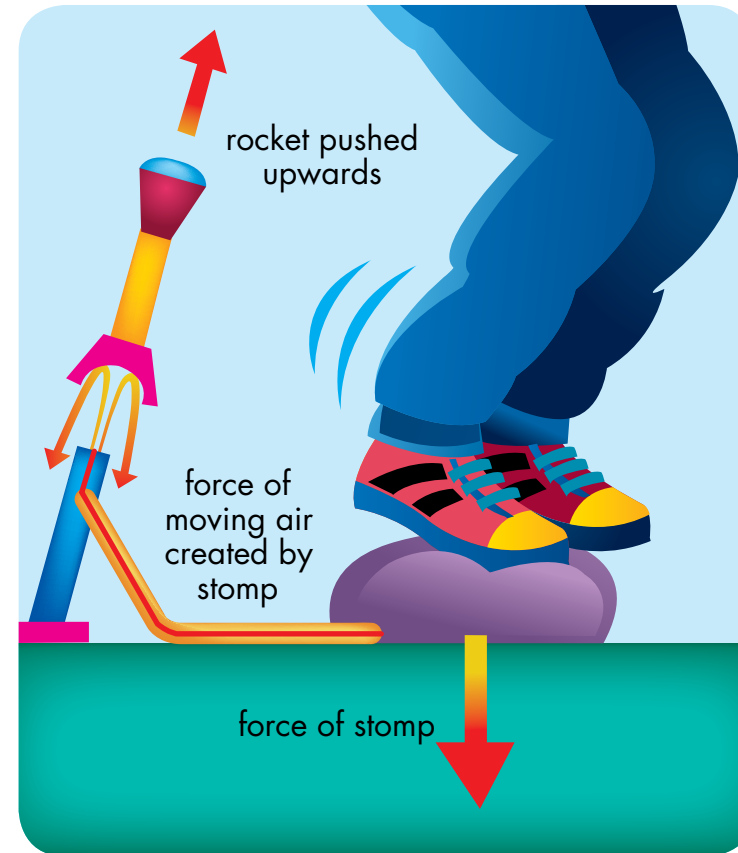
## What makes a flying toy start flying?

When forces act on a flying toy they can make it start flying. One force that can make a flying toy start flying is a pushing force.



A Stomp Rocket<sup>®</sup> flies when you apply a pushing force with your feet.

You can make a flying toy start flying by applying a pushing force to the toy. The force pushes the toy up into the air. In the air, its special shape allows it to fly.



A Stomp Rocket<sup>®</sup> flies after a pushing force created by moving air sends it upwards.

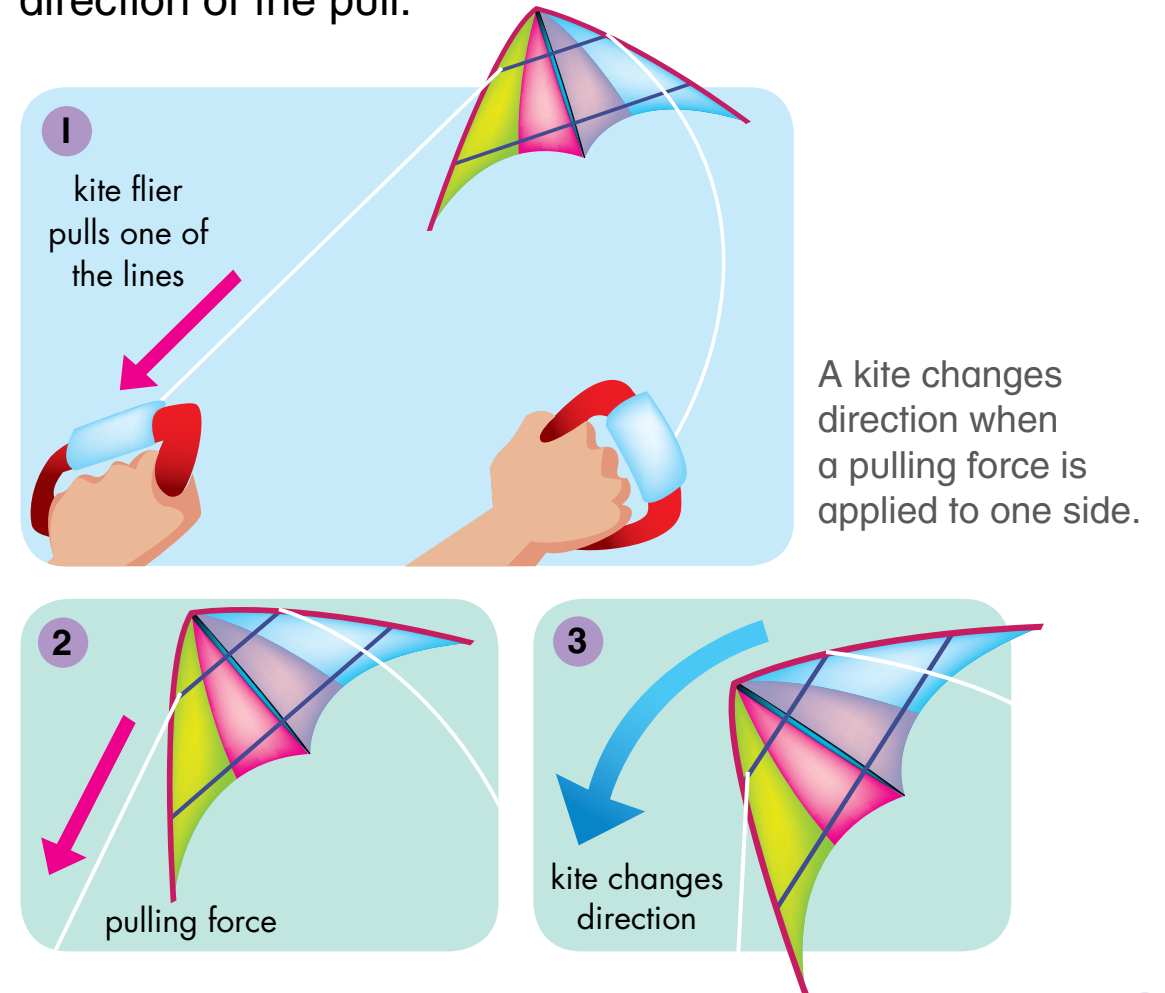
## What makes a flying toy change direction?

When forces act on a flying toy they can make it change direction. One force that can make a flying toy change direction is a pulling force.



A pulling force can make a kite change direction.

Applying a pulling force to one side of a flying toy will make it change direction. The toy will turn in the direction of the pull.



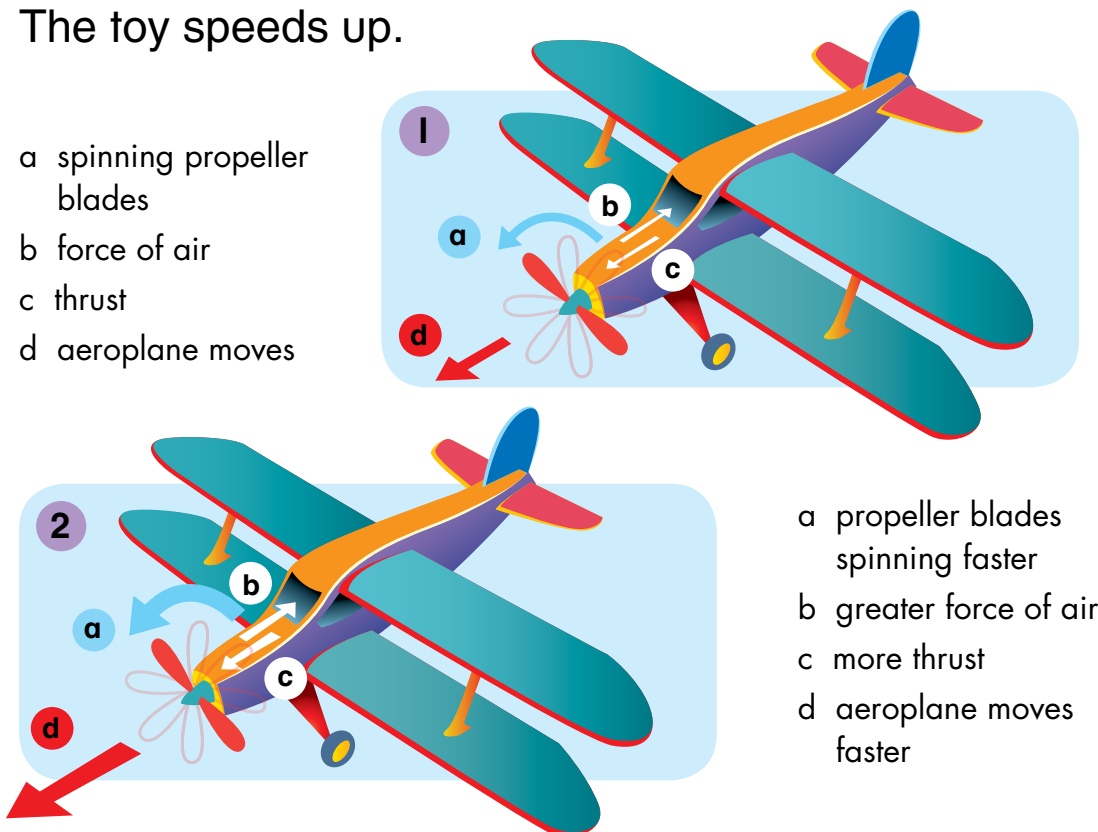
## What makes a flying toy speed up?

When forces act on a flying toy they can make it speed up. One pushing force that can do this is **thrust**. Some flying toys have **propellers**, which create thrust.



A toy aeroplane has a propeller that creates a pushing force, which makes the toy speed up.

As propeller blades spin, they push air backwards. This creates thrust, which pushes the toy forwards. When a propeller spins faster, it creates more thrust. The toy speeds up.



A radio-controlled aeroplane speeds up when its propeller spins faster and creates more thrust.

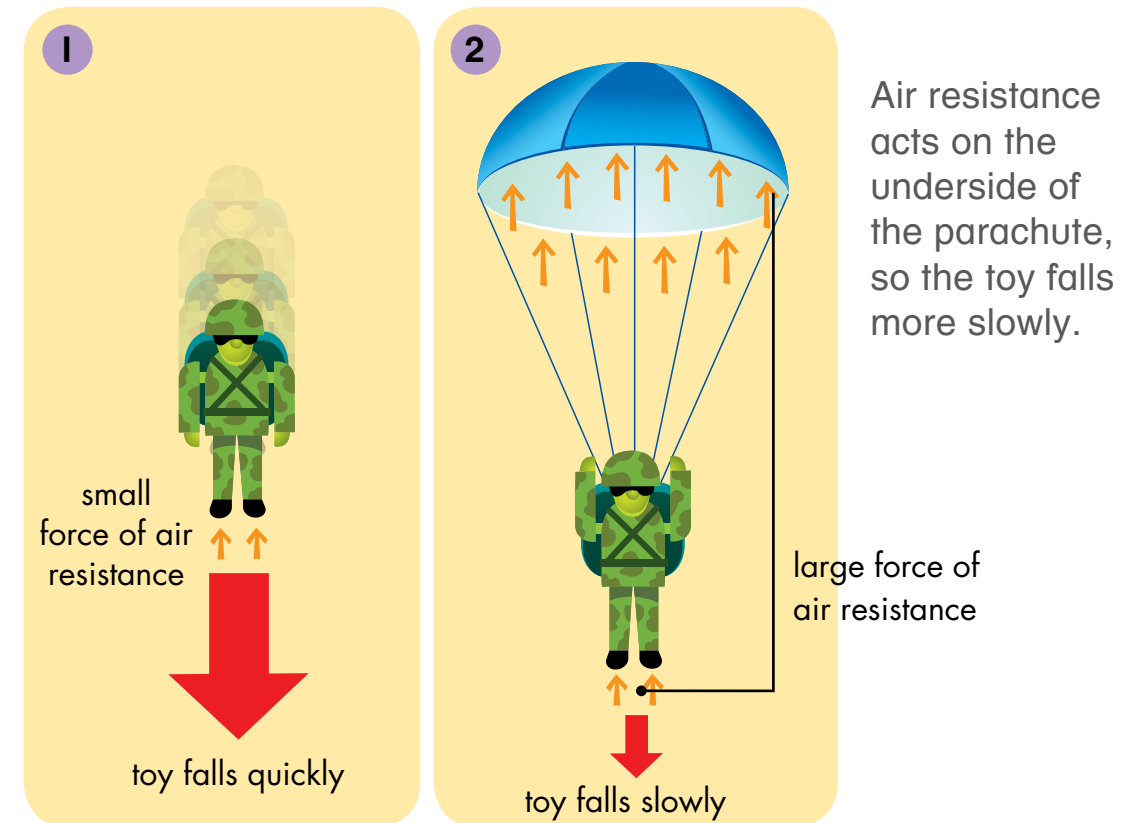
## What makes a flying toy slow down?

When forces act on a flying toy they can make it slow down. One pushing force that can make a flying toy slow down is **air resistance**.



The force of air resistance makes this toy parachute slow down.

Air resistance is a pushing force that acts on objects as they move through the air. Air resistance pushes against a flying toy, which makes it slow down.



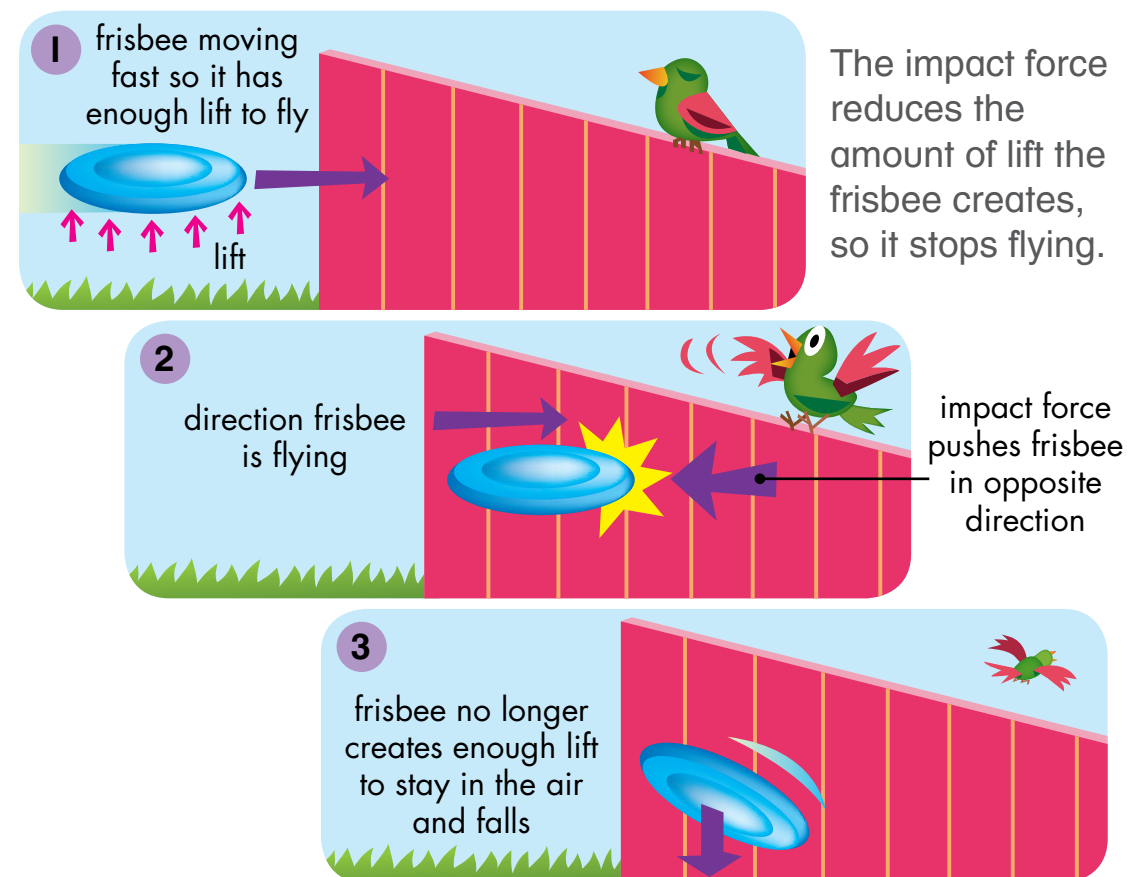
## What makes a flying toy stop moving?

When forces act on a flying toy they can make it stop moving. One force that can make a flying toy stop moving is an **impact force**.



If this frisbee hits a fence it will receive an impact force.

When a flying toy hits an object, the object applies an impact force, which slows the toy down. If the toy moves too slowly it will not create enough **lift** to stay in the air.



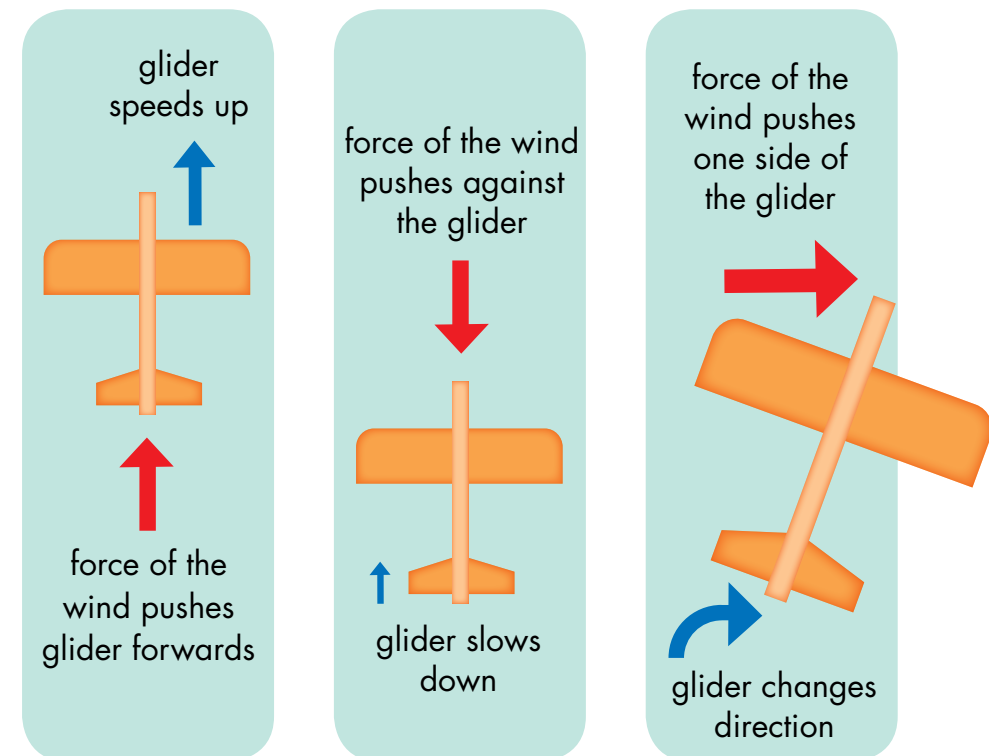
# What else affects how a flying toy moves?

Wind can affect how a flying toy moves through the air. Wind is moving air. It creates a pushing force in the direction that it blows.



The direction that the wind is blowing will affect how this glider flies.

The pushing force of the wind can make a flying toy slow down, speed up or change direction. The effect of the wind depends on which direction it is blowing.



The pushing force of the wind can make a glider speed up, slow down or change direction.

# Make a flying toy: Rainbow flyer

This rainbow flyer is easy to make and fun to play with.

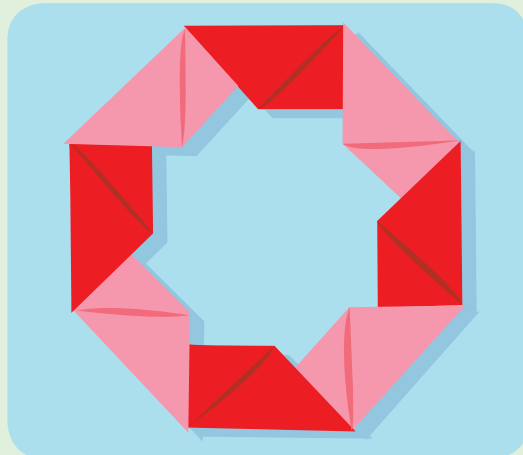
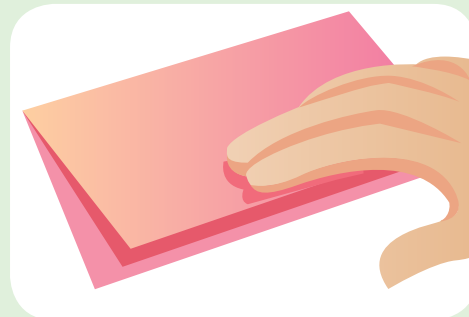
## What you need:

- 8 square sticky notes in bright colours
- scissors
- pencil
- glue stick.



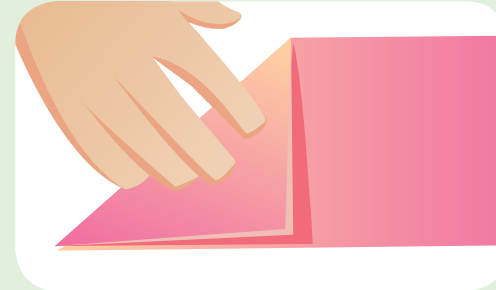
## What to do:

- 1 Take one square sticky note. Fold it in half with the sticky strip inside and the fold at the top.

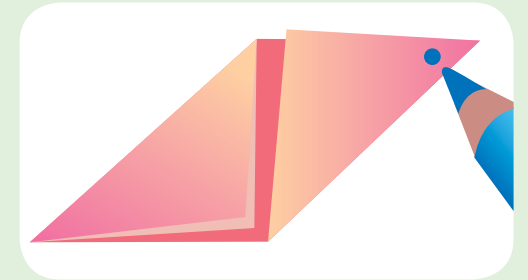


This rainbow flyer relies on the pushing force of your arm to make it fly.

- 2 Fold down the top left corner.



- 3 Fold up the bottom right corner. Mark the right-hand fold with a dot.

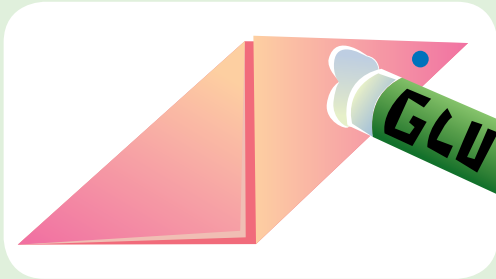


- 4 Unfold the two diagonal folds, then apply glue and stick them back down to where they were folded.

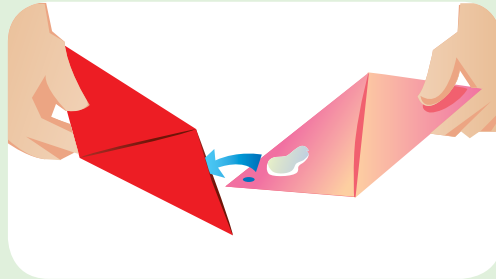


- 5 Repeat steps 1 to 4 with the other seven sticky notes.

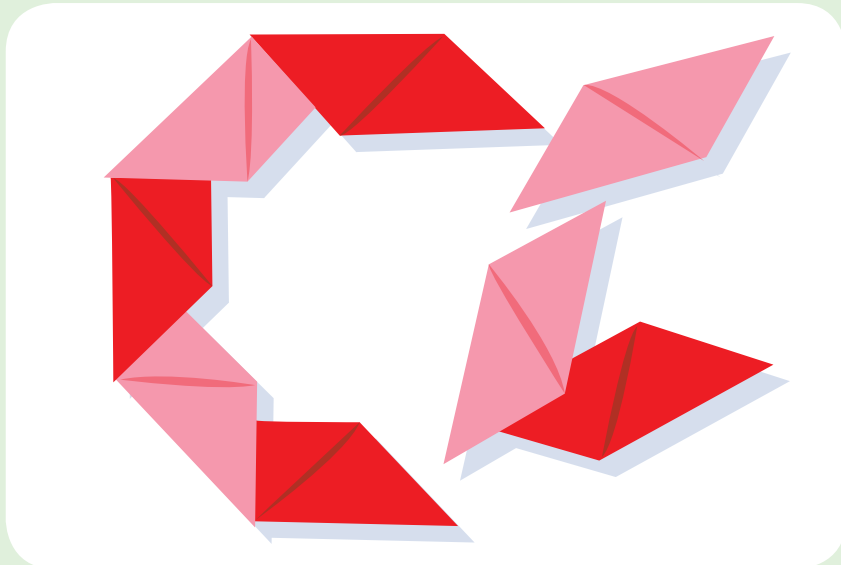
6 Take one of the folded sticky notes. Put glue on the triangle that has the dot on it.



7 Put the glued triangle inside the non-dotted triangle of another folded sticky note.

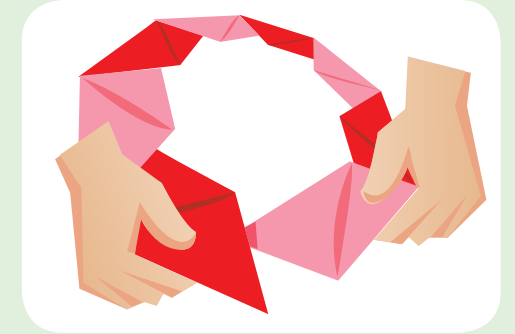


8 Repeat steps 6 and 7 until you have glued together all the folded sticky notes.



9 Glue the end of the last sticky note and put it inside the end of the first sticky note.

10 To throw your flyer hold it flat, with the folds facing upwards. Flick your wrist to make it spin!

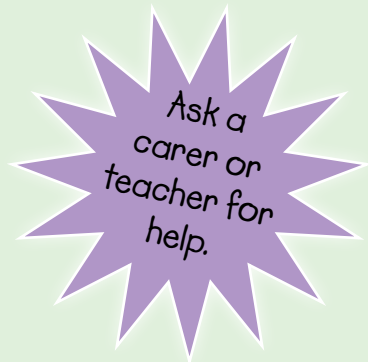


# Experiment: Does the size of a parachute affect how fast it falls?

Try this experiment to find out how **air resistance** affects parachutes of different sizes.

## What you need:

- 2 plastic bin bags
- scissors
- hole puncher
- nylon thread
- 2 tablespoons.

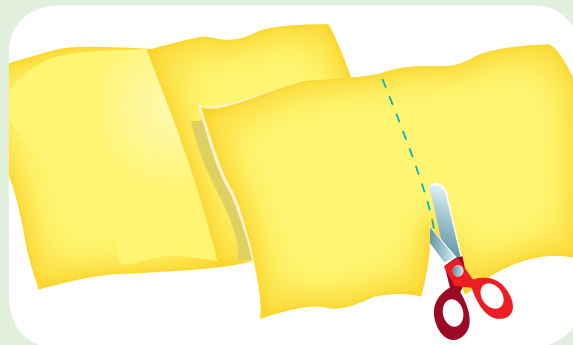


## What to do:

1 Cut down two joined sides of both bin bags and open them up.



2 Cut one bin bag in half and throw one half away.

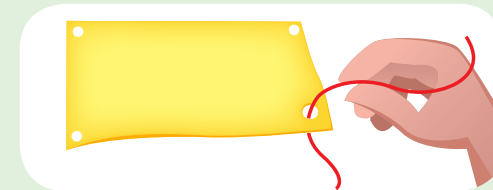


3 Punch a hole in each corner of the two bin bags.

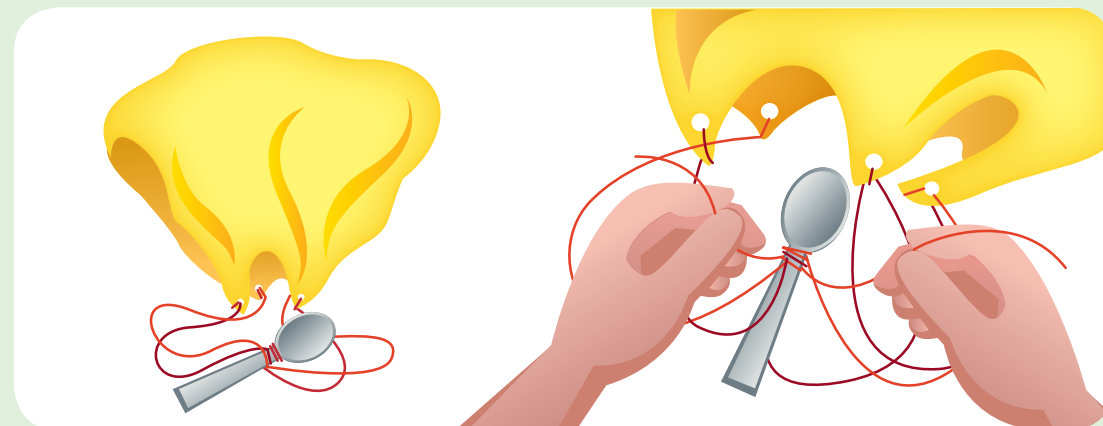


4 Cut eight pieces of thread all the same length.

5 Put a piece of thread through every hole. Tie it in place.



6 Tie the loose ends of the threads on each bin bag to a tablespoon.



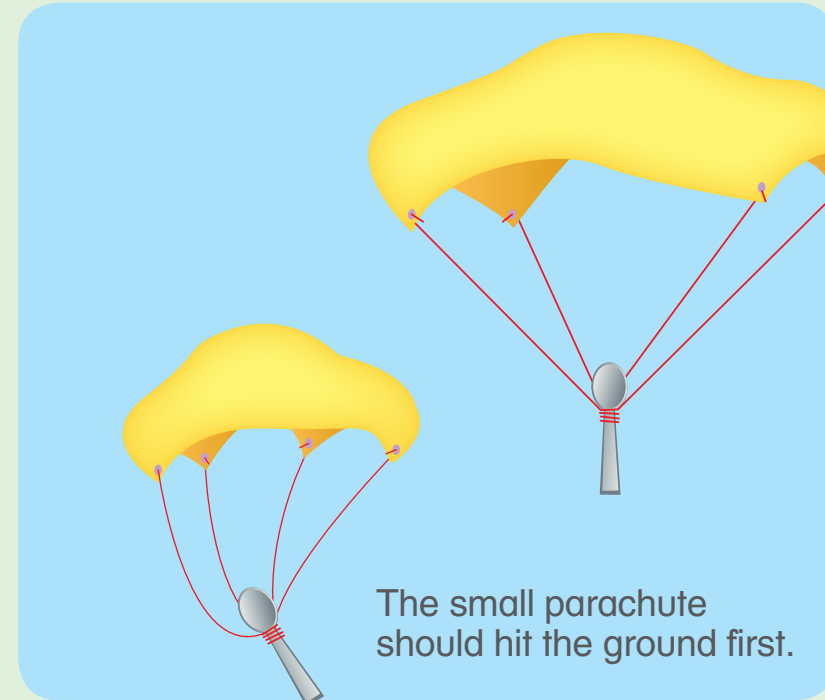
## Testing your parachutes



- 1 Hold the parachutes in the middle. Make sure the spoons are at the same height.
- 2 Let go of both parachutes at the same time.
- 3 Make a note of which spoon hits the ground first.
- 4 Repeat the test several times.

## What should happen?

The large parachute should fall to the ground more slowly than the small parachute.



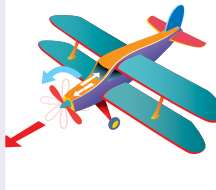
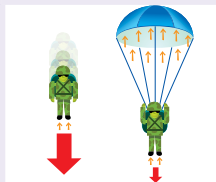
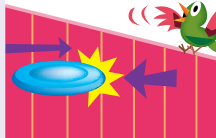


## What do you think?

- Which parachute created more **air resistance**? How do you know?
- Why do you think this parachute created more air resistance?

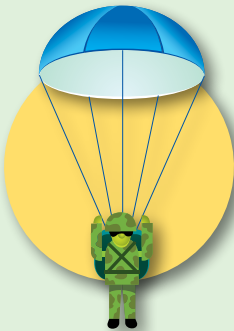
# How forces make flying toys work

This table shows some of the pushing and pulling forces that act on flying toys.

Forces make toys ...	Pushing or pulling force?	Example of the force acting on a toy
start moving	pushing force	A Stomp Rocket® starts flying when a pushing force acts on the bottom of the rocket. 
change direction	pulling force	A kite turns when a pulling force acts on one side of the kite. 
speed up	pushing force	A radio-controlled aeroplane speeds up when its <b>propeller</b> spins faster and creates more <b>thrust</b> . 
slow down	pushing force	A parachute slows down when the pushing force of <b>air resistance</b> acts on its underside. 
stop moving	pushing force	A frisbee stops flying when an <b>impact force</b> acts on it. 

# Glossary

- air resistance** a pushing force that acts on an object as it moves through the air and slows down the object
- impact force** a force that acts on a moving object when it hits something
- lift** an upwards pushing force that acts on objects moving through the air, where the air above the object flows faster than the air below it
- propellers** blades attached to axles, which spin and push air backwards
- thrust** a pushing force created when air is pushed in one direction



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