

# AMAZING SKYDIVERS

## Background Information for Activity Leaders

### Overview

Children will build and test a parachute to explore air resistance and the force produced by the weight of an object.

### Key Concepts

- As an object falls, it has to push its way past air molecules. Collisions between the object's surface and air molecules produce the force of air resistance. Air resistance slows down falling objects.
- Air resistance affects objects with larger surface areas more than objects with smaller surface areas.
- If two objects are dropped from the same height and at the same time and there is no air resistance, both objects will hit at the same time. This was demonstrated by astronauts on the Apollo 15 moonwalk in 1971 when a hammer and feather were dropped simultaneously. They fell to the moon's surface at the same time, because there is almost no air on the moon. You can view the video at:

[http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo\\_15\\_feather\\_drop.html](http://nssdc.gsfc.nasa.gov/planetary/lunar/apollo_15_feather_drop.html)

- The extended surface area of an open parachute creates a large area for air molecules to hit. The force of gravity pulls the parachute down, while air resistance holds it up.
- The force produced by the weight of an object is a result of its mass and the force of gravity.
- If the mass attached to a parachute is increased then the downward pull of gravity is also increased. Adding paperclips to a parachute will increase the parachute's speed. More paperclips add to the downward force without changing the air resistance of the parachute.
- When the parachute is not extended there is less surface area exposed to air resistance, so the parachute falls faster.

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## Background Information for Activity Leaders

### What to Expect

- When children describe and manipulate objects they learn to describe and measure the position and movement of objects.
- Children can use charts to compare the speed of objects, using words like as fast, faster, or fastest in the earliest grades. As children get older, they can represent motion on simple grids and graphs and describe speed as the distance traveled in a given unit of time. By recording data and making graphs and charts, older children can search for patterns in their work and that of their peers.

### Common Misconceptions

- *Children may think: "Since air is nothing, it has no effect on falling objects."*

As an object falls, it has to push its way past air molecules. Collisions between the object's surface and air molecules produce the force of air resistance. Air resistance slows down falling objects.

# AMAZING SKYDIVERS



## Data Collection Sheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**WONDER** Why do you think some things fall faster than others?

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**RECORD** What did you notice about the way parachutes work?

trial #	# of paperclips	release height	fall time

**CONCLUDE** As the number of paperclips added to the parachute increased, what happened to the fall time?

\_\_\_\_\_

\_\_\_\_\_

## Set Up the Expedition

### Materials

#### For the activity leader:

- (2) sheets of notebook paper

#### For each group:

- **Amazing Skydivers** Learning Cards
- (1) ruler
- (1) meter stick
- (1) stopwatch
- (1) roll of masking tape
- (1) sturdy chair

#### For each child:

- (1) **Amazing Skydivers** Data Collection Sheet
- (1) lightweight plastic trash bag
- (10) small paper clips
- (1) 1.5 m length of string
- (1) pair of scissors

### Prepare the demonstration

1. Place two identical sheets of notebook paper in the demonstration area.
2. Create a parachute testing area. Along a wall that all the children can see, use a meter stick to measure a distance of two meters. Start at the floor and measure up the wall. Mark the two-meter mark with a piece of masking tape.

### Prepare the exploration

1. For younger children, cut the plastic bags into 30 cm squares. Make one per child.
2. Older children may use a ruler to measure and cut their own 30 cm square.
3. Create a parachute testing area for each group.

# AMAZING SKYDIVERS

## Activity Leader's Guide

**Group Size:** 4-6 children

**Time:** 45 minutes

## Engage

- 1** Gather the children together. As the children observe, crumple up two identical pieces of paper.

### Ask:

**“Which of these two sheets of paper will fall faster to the ground?”** Allow the children to predict which will reach the floor first. Drop both sheets at the same time from the same height. Both sheets will reach the floor at the same time.

Uncrumple one of the sheets of paper.

### Ask:

**“Now which of these two sheets of paper will fall faster to the ground?”** Allow the children to predict which will reach the floor first. Drop the uncrumpled sheet and the crumpled sheet at the same time, from the same height. The sheet that is crumpled will reach the ground faster.

- 2** **Say:**  
**What did you notice?** Allow children to discuss what they noticed. As things fall, they have to push their way past the particles that make up air. The *air resistance* created by air particles hitting the larger surface area of the smoothed-out paper causes it to fall more slowly.

# AMAZING SKYDIVERS

## Activity Leader's Guide

### Explore/Expand

- 3** If working with more than 4-6 children, divide the children into groups. Distribute the Data Collection Sheets and the Learning Cards.

**Say:**

*“Follow the instructions on your Learning Card to investigate how parachutes work.”*

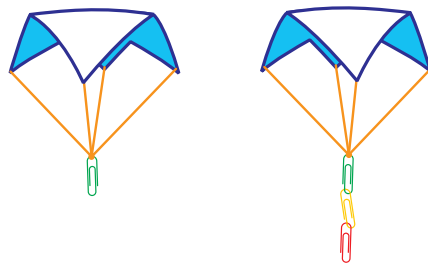
- 4** Allow children enough time to complete the WONDER, EXPLORE, RECORD, EXPAND and CONCLUDE sections of their Learning Card.

### Conclude

- 5** Gather the children together and ask the following questions:

**Ask:**

*“What did you notice about how parachutes work?”* As the parachute falls, air particles are trapped inside the chute. The chute inflates and slows down. When the parachute does not open, it falls faster towards the ground.



*“What happened when you added paperclips to the parachute?”* When paperclips are added to the parachute, it falls to the ground faster.

*“Why does the parachute with more paperclips fall faster?”* The added weight produces a greater force which causes the descent of the parachute to speed up.

*“What would happen if you took away paperclips from the parachute?”* When paperclips are removed, the parachute has less weight and therefore less downward force, so it falls more slowly to the ground.

*“As the number of paperclips added to the parachute increased, what happened to the fall time?”* The fall time decreased.

*While doing this lesson, what did you discover about how weight affects the time it takes a parachute to fall?* The greater the weight suspended on the parachute strings the less time it will descend to the ground.

**7** **Say:**


*“Congratulations! You have earned your ‘Ask Me About Air’ stamp. Now you are ready to tell people about air.”*

# AMAZING SKYDIVERS

## Expedition Learning Card

? What makes some things fall faster than others?

 particles  
parachute  
force

 Explore how falling objects interact with air.

**1 WONDER** Why do you think some things fall faster than others?

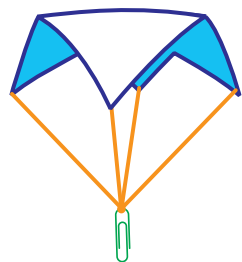
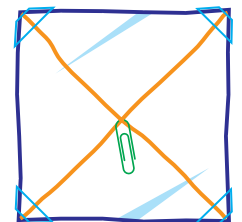
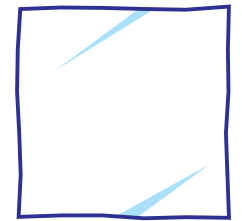
 Record your ideas on your Data Collection Sheet.

**2 EXPLORE**

1. Use a ruler to measure a 30 cm square piece from the plastic bag to use as the parachute. Carefully cut out the square.
2. Use a ruler to measure two pieces of string, 60 cm long. Cut the two pieces of string.
3. Lay the string out in a cross pattern over the plastic square.
4. Tape the string to the plastic square at each of its four corners.
5. Attach a large paper clip, by looping at the center of both pieces of string.

Test your parachute at the parachute testing area.

- Carefully stand on a chair.
- Hold the parachute by pinching the top of the parachute. Hold 2 meters above the floor.
- Release the parachute.



# AMAZING SKYDIVERS

## Expedition Learning Card

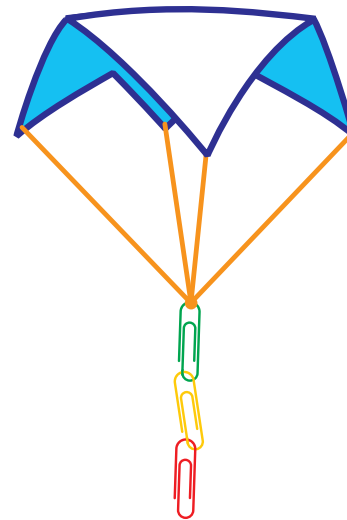
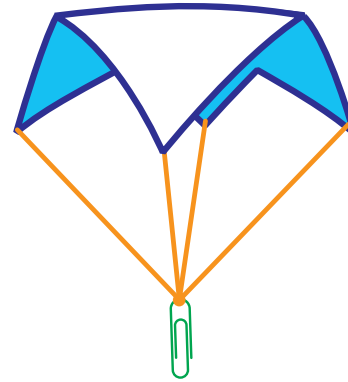
- 3 RECORD** Notice everything you can about how the parachute works. Have a partner use a stopwatch to record the time it takes for the parachute to drop to the ground carrying one paperclip.

 Draw or write your observations on your Data Collection Sheet.

- 4 EXPAND** What happens when you add more paperclips to the parachute? Experiment by attaching 2, 3, 4, 5 or more paperclips to your parachute. Each time you add paperclip, ask a partner use a stopwatch to record the time it takes for the parachute to drop to the ground.

 Draw or write your observations on your Data Collection Sheet.

- 5 CONCLUDE** As the number of paperclips added to the parachute increased, what happened to the fall time?



## Discovery

### Why did we do that?

- Air takes up space. When an object falls it has to move air particles aside to go down.
- A parachute traps a lot of air particles as it falls. These particles cause it to slow down.

## Congratulations!

You have earned your "Ask Me About Air" stamp! Now you are ready to tell people about air!

