National Aeronautics and Space Administration

Parachutes

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Lesson 3: Parachutes

Parachutes are an opportunity to teach young students about **fluid thickness** and for them to learn about early concepts of **drag**. In this module, students are read *Egg Drop*, a story about an adventurous egg that dreams of flying. The egg considers all of the ways that it could fly, but finally settles on climbing a large tower and jumping from it. Unfortunately, the egg had not thought ahead to use a parachute – it breaks and becomes someone's breakfast meal. Children then use this story as an inspiration to create a parachute for their own "egg" (plastic egg, or ping pong ball) while learning about how surface area, shape, and weight affect the fall time of the egg and parachute.

Focus Storybook

Egg Drop
Cover and illustrations from EGG DROP by Mini Grey

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Knopf Books for Young Readers

Learning Goals

Language	• Vocabulary: Parachute, friction, up, down, fast, slow. • Writing: Practice writing the letters "U" and "D."
Math	• Time a parachute fall. • Identify shapes.
Science / Engineering	• Describe air resistance. • Identify variables that might affect air resistance. • Compare the time of fall for different objects. • Design a parachute.

Key Q's

What makes some objects fall faster than others? What slows objects down as they fall? What is drag?

Primary Materials

Coffee filters

Viscous fluids
(water, soap, corn syrup, or combinations thereof)

Tubes/cylinders
(large syringes used for basting turkeys are best)

Plastic eggs/ping pong balls

String

Tape

Parachute materials
(tissue paper, wrapping paper, plastic bags)

Resources

High Flyers e-Book

Science / Engineering: Pre-Reading Activities

Experiment: Coffee Filters and Marbles

In the book *Egg Drop*, an egg wants to fly, and ultimately jumps from a tower and breaks upon hitting the ground. The key idea is that the egg could have slowed itself down if it had a way to take advantage of drag, a concept very closely related to friction generated through air. To help students understand drag, give students as many experiences as possible:

a. Compare the fall time for one coffee filter (light) versus multiple coffee filters in a single stack (heavy). Make sure that students drop the coffee filters from shoulder height, and that they are released at the same time. **The heavy coffee filter stack should hit the ground much more quickly than the single coffee filter.** (*Note: Children are often erroneously taught that all things fall toward the Earth at the same rate. While this is true when there is no (or negligible) drag, this is not the case when the object falls through a fluid such as air*).

b. Compare the fall time for a regular coffee filter (large surface area) versus a crinkled coffee filter (small surface area). Make sure students drop the coffee filters from shoulder height, and that they are released at the same time. Consider allowing children to modify their own single coffee filter by crunching it or folding it to decrease its total surface area. *The crinkled/balled-up coffee filter should hit the ground much more quickly than the single coffee filter.*

c. Compare the fall time for a marble (or other sinkable object) through a clear tube/tall cup/bottle of water, soap, and/or honey. Alternatively, use test tubes or large syringes (like turkey basters) to make "viscosity tubes" to observe the speed of air bubbles or marbles traveling through the fluid. Use hot glue to close off the ends of the syringes so that fluid does not come out. For small children, it is best to use a totally enclosed container so that the children can turn it over and upside down again and again. *Children should find that some fluids are thick and other fluids are thin. Marbles or other heavy objects take a long time to travel down a tube of very thick fluid (like soap, corn syrup, or honey), while they travel very quickly through thin fluids (like water).* Help students to understand that air produces drag on falling objects, so it does have some thickness, but it is not as thick as liquids such as water or corn syrup.

d. Hold a plastic bag by its handles in front of or above a fan on the floor that blows air. Students can feel the upward push of the air on the "parachute" bag

Science / Engineering: Book-Based Activities

Application Lab: Parachute Building

Help students create parachutes – try to have the slowest fall possible!

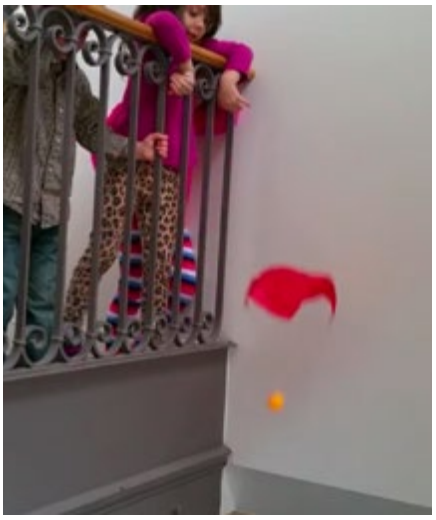
1. Provide students with string, tape, scissors, and a variety of types of paper or thin plastic, and allow students to choose the size and shape of their parachute. For younger children, prepare in advance rectangles (quarters) of tissue paper, four strings, and four bits of tape to attach the strings to the corners of the rectangle.

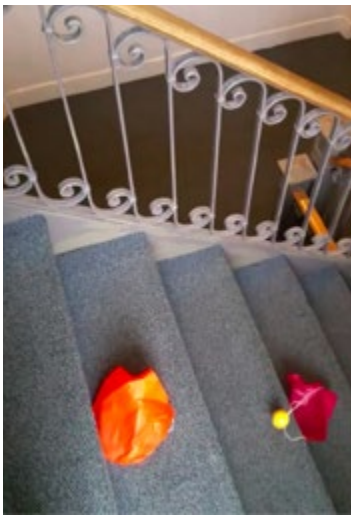
2. Allow students to attach strings with tape.

3. Allow students to choose the type of parachuter – in line with Egg Drop, consider using plastic Easter eggs, filled with varying amounts of coins or sand, and sealed with tape. Children should think about what kind of parachute would result in the slowest fall (Should it be light or heavy? Big or small?) Encourage students to personalize their egg by adding a face/eyes/goggles, etc.

Egg Dro, pg. 9 © Mini Grey

4. Drop the parachutes from a stairwell, window, or ledge. Caution: Ensure that there is no risk of children falling, and that it is safe to drop the parachutes on the ground below. Ideally, choose a location in which it is easy for all children (the droppers and the observers) to see the parachute as it falls the entire way. Have students identify the slowest parachute.





Interactive Demonstration: Group Parachute

Many libraries, schools, and informal education centers have very large parachutes for circle time. Although typically used as an opportunity to have students learn to follow instructions, cooperate, and sing songs, the parachute also gives teachers and leaders the chance for young children to experience the impact of air on an object that is falling.

1. Have children lift and lower the parachute with tall strokes (not just "shaking" the parachute, but actually lifting it.) Is this easy or hard to do? Why? Students should notice that it is actually rather difficult – the parachute might be a little bit heavy, but it is even difficult to lower the parachute more quickly than it wants to fall on its own, because air gets in the way, and air is actually quite viscous! (This is how parachutes work – but "capturing" some air as it falls).

2. Have half of the children go under the parachute while the remaining children hold onto the parachute. Ask the children under the parachute to explain what they feel (wind). Then, take turns.

Reading: Egg Drop

Cover and illustrations from EGG DROP
by Mini Grey

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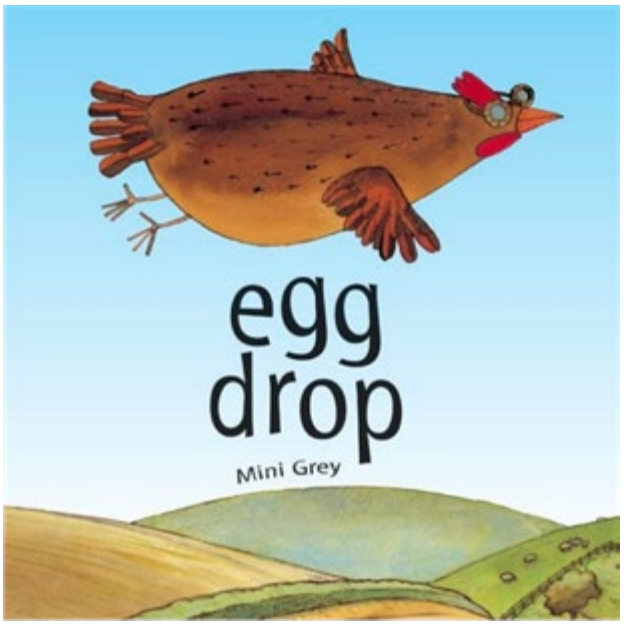
Read Egg Drop. As the story is read, encourage children to think about how the egg could have safely flown using drag to its advantage.

Additionally, to engage the listeners, consider using the following strategies:

- Point out the scientific/technical pictures as the egg considers the many ways to fly. Ask students to list the images they see – helicopters, airplanes, parachutes, gliders, wings, rockets, blimps, etc.

Egg Dro, pg. 10-11. © Mini Grey



© Mini Grey

- Have students explain why the egg broke. *Help children to understand that most things speed up as they fall. The egg fell from a very high tower, and because it didn't have a parachute, it sped up throughout its fall, and crashed into the ground at a very high speed. Although a fairly large, light egg could potentially reach terminal velocity before hitting the ground, this concept is likely beyond Pre-K children.*

- Have students explain what the egg could have done to keep itself from breaking. *It could have used a parachute to slow itself down, or some other device to help it to float upward (such as a hot air balloon, blimp, or helicopter propellers).*

Writing: “D” and “U”

Practice writing the letters D and U. Use NASA’s High Flyers Alphabet Activity Book.

Dd Dd

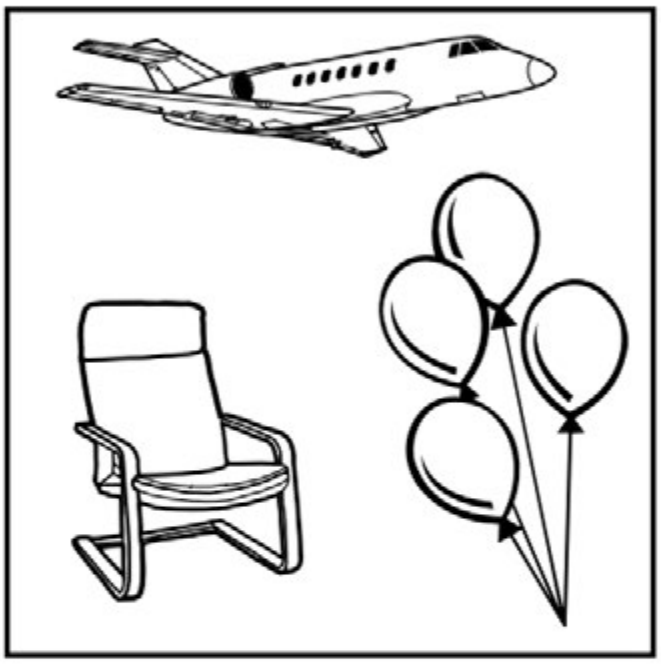
down

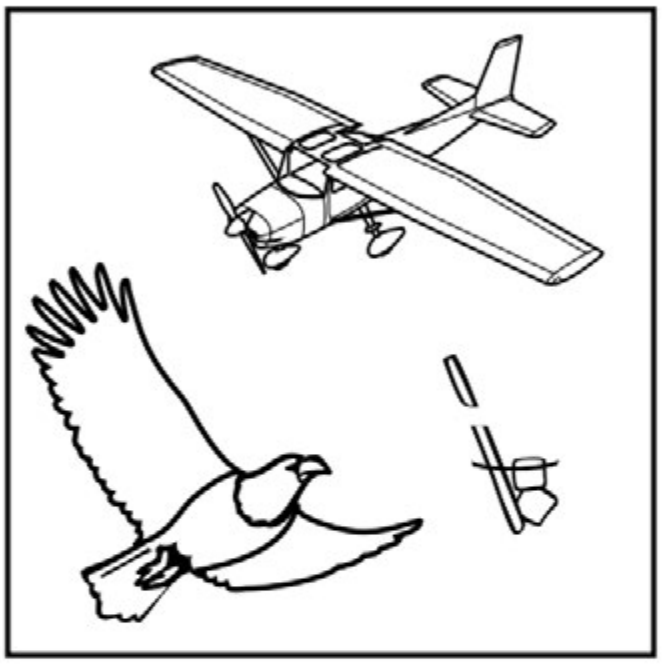
Follow the line and help the skydiver guide the parachute **down** to the target.

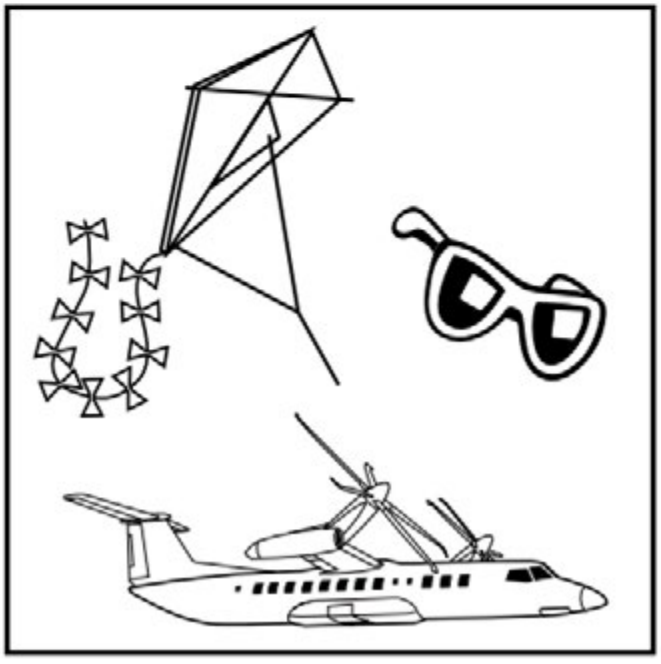
Uu U u

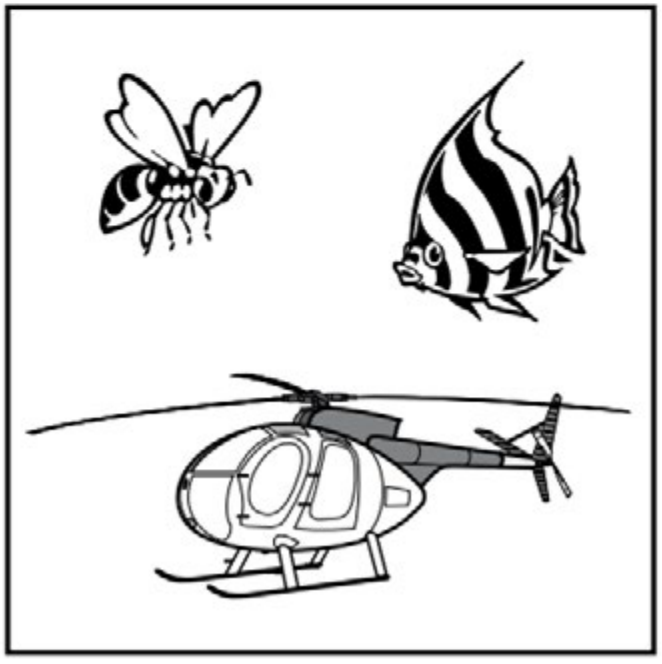
up

Circle the object in each group that does not go **up** in the air.









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