

NAME _____

LESSON
18

Twisty T

FOCUS Flight

OBJECTIVE To explore how forces allow flight

OVERVIEW You've discovered that nothing moves without forces. But how do forces help things fly? This activity provides an answer with a "twist!"



WHAT TO DO

STEP 1 Remove the "Twisty T" page from the back of your worktext (page 171). Cut out the Twisty T flyer using the solid blue lines. (Do not cut any red lines. Red lines are for folding only!)

STEP 2 Carefully cut along the dotted blue lines (A, B, C). Cut only as far as the lines go! Now fold along line D one way, and along line E the other. If you look at your Twisty T from the side, it should now look like the letter T.

STEP 3 Fold in the sides at lines F and G so your Twisty T has a smaller shaft. Now fold the bottom up at line H to make a tab at the bottom. (Make sure the wings are tipped up slightly.) Now examine your Twisty T and make notes about what you see.

STEP 4 Here comes the fun part! Toss your Twisty T into the air. It should wobble skyward, stop, and begin spinning to the ground in a graceful spiral. Now carefully review each step in this activity. Share and compare observations with your research team.

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Category

Physical Science
Forces

Focus

Flight

Objective

To explore how forces allow flight

National Standards

A1, A2, B1, B2, E1, E2, E3, F5, G1

Materials Needed

Twisty T worksheet
(student worktext,
p.171)
scissors

Safety Concerns

4. Sharp Objects

Remind students to exercise caution when using scissors.

Additional Comments

After the activity is over, encourage students to modify their **Twisty T** flyers in order to further explore cause and effect relationships. In addition to trying different folds to modify the rotor's length and shape, suggest adding weight (a paperclip) to the bottom to see what happens.

Remind your students that to be true scientists, they must use the scientific method. This means they can change only one variable each time they run a test. They must also record their results carefully. Such experiments are the essence of scientific inquiry!

Overview

Read the overview aloud to your students. The goal is to create an atmosphere of curiosity and inquiry.

WHAT TO DO

Monitor student research teams as they complete each step. Don't let students stand on chairs or tables to launch their Twisty T flyers!

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WHAT TO DO

STEP 1



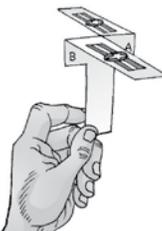
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STEP 2



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STEP 3



Fold in the sides at lines F and G so your Twisty T has a smaller shaft. Now fold the bottom up at line H to make a tab at the bottom. (Make sure the wings are tipped up slightly.) Now examine your Twisty T and make notes about what you see.

STEP 4



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Teacher to Teacher

The Bernoulli Principle states that the faster air moves, the lower the air pressure. The flight of all fixed-wing aircraft is based on this principle. Faster air over the curved upper surface of a wing lowers the air pressure, causing the higher air pressure under the wing to push up. This is known as "lift."

As we learned in an earlier lesson, force comes in couples (or oppos-

ing forces). There are two couples acting on any winged aircraft. The forward push from the motor (thrust) struggles against air resistance pushing back (drag). The upward push of higher air pressure (lift) fights against the downward pull of gravity. For a safe flight and landing, the pilot of the aircraft must balance and control these four forces.

WHAT HAPPENED?

Forces always come in **pairs**. Every force has an **opposing force**. For instance, when you stand up, the force of your muscles fights against the force of **gravity**.

In this activity, gravity was trying to pull your Twisty T flyer down. But your Twisty T flyer resisted gravity by spinning like a top and slowing its fall. This showed us that there was another force in action, too. So what happened?

As it fell, your Twisty T flyer's wing flaps were given a slight **twist**. The twist turned those strips of paper into wings, creating **lift** (a backwards **push** against gravity). Lift is a force that's caused when air rushes over the top of a surface faster than it does the bottom. It's the force that allows for flight. Although gravity will eventually triumph, the force of lift allows us to slow the descent of the Twisty T.

WHAT WE LEARNED

1 Describe the Twisty T flyer after you cut it out in Step 1. Would it fly like this? Why or why not?

a) descriptions should include shape and form

b) no, because it has no wings yet

2 Compare the Twisty T flyer at the end of Step 3 with what it looked like at the end of Step 1. How was it similar? How was it different?

a) similar: same material, same weight, etc.

b) different: shape, angles, more like a wing, etc.

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3 What were the two forces demonstrated in this activity? How did they interact with each other?

Gravity and lift.

Gravity pulled down; lift pushed up.

(Note: thrust and resistance are also factors, but not mentioned in the student worktext.)

4 What kind of aircraft does the Twisty T flyer remind you of? How are they similar? How are they different?

a) a helicopter

b) similar: rotary motion, spinning, etc.

c) different: no motor, doesn't fly long, etc.

5 Compare the flight of your Twisty T flyer with the flyers made by other teams. List some factors that might make them fly differently.

a) answers will vary

b) possible answers include shape, smoothness, weight, form of wing, direction of folds, etc.

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What Happened

Review the section with students. Emphasize bold-face words that identify key concepts and introduce new vocabulary.

*Forces always come in **pairs**. Every force has an **opposing force**. For instance, when you stand up, the force of your muscles fights against the force of **gravity**.*

*In this activity, gravity was trying to **pull** your Twisty T flyer down. But your Twisty T flyer resisted gravity by spinning like a top and slowing its fall. This showed us that there was another force in action, too. So what happened?*

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What We Learned

Answers will vary. Suggested responses are shown at left.

