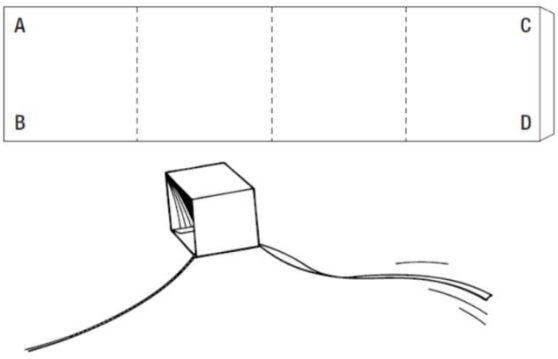
Wizards of Wright

Lesson: Testing Lift with Paper Box Kites

Use WOW! Lesson Intro to begin.

Background Info for Wizards:	Students will experiment with weight and lift causing a homemade box kite to fly.
Materials:	- templates - thread/string - scissors - tape - pencil - electric fan
Lesson Time: 45-50 minutes	Introduction: 3 minutes Guided Lesson: 3-5 minutes Student Activity: 5-7 minutes Guided Lesson continued: 3 minutes Student Activity continued: 20-30 minutes Conclusion: 5 minutes
Learning Targets:	Students will review the force of lift. Students will learn about the Wright Brothers and their testing with kites, and how kites are lifted.
Introduction for Students: 3 minutes	Ask students what they already know about the force of lift. Remind students that there are 4 forces of flight (lift, thrust, drag and weight) and lift and weight work opposite of each other. When the forward motion of an object, through the air, is greater than the object's weight pulling it down, there is lift. Remind students that pushing and pulling are also forces, and those are forces that can change the direction an object moves. The amount of change in direction is related to the amount of push or pull. When they are testing their box kites, they should pay attention to those forces.
Guided Lesson #1: 3-5 minutes	Ask the students if any of them have flown a kite before? And more specifically, a box kite. Ask students if they knew that before inventing the airplane the Wright Brothers experimented with gliders and kites. It was 1899 and Wilbur Wright discovered that if he brought together the opposing corners of a long, narrow box, the box would twist. He had the vision and idea that this same

	reaction could control a biplane, twisting the wings to turn one side up and the other down and causing the biplane to roll. He built an experimental kite to test that idea and it worked. Let's use what we know about lift and figure out how a kite works. When the force of the air is greater than the weight of the kite, there will be lift, and the kite will leave the ground and fly. When you pull on the attached string, the kite exerts an equal but opposite force on the air. (Which of Newton's Laws is this?) The kite will stay in the air if the force of the air and the force of the kite string are equal. The correct angle of a kite allows the wind to deflect downward, causing an upward force, which causes lift, and makes your kite fly.
Student Activity #1: 5-7 minutes	Pass out materials and the Data Sheet. Help students follow the steps on the handout to build their box kite. You may want to build a model first, to use as an example. a. Cut out the box kite pattern along the solid lines. b. Fold down along the dash lines so edge A-B touches edge C-D. c. Apply a piece of tape to the TAB to join edge A-B to edge C-D. d. Cut out the tail. e. Tape one end of the tail to the kite at corner B-D. f. Tape the end of the thread to corner A-C. g. Adjust the edges of the kite to form a box. 

<table>
<tr>
<td>Guided Lesson continued:
use this information as you are checking on groups</td>
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<table>
<tr><th colspan="2">Teacher Tip: Box Kite Flight Problems and Solutions</th></tr>
<tr><th>Flight Path</th><th>Correction</th></tr>
<tr><td>Flies straight and smooth</td><td>Do not make any changes</td></tr>
<tr><td>Does not fly</td><td>Shorten tail</td></tr>
<tr><td>Bobs up and down</td><td>Lengthen tail</td></tr>
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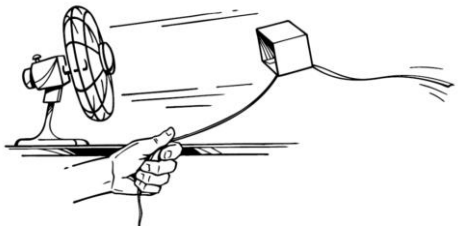
<tr>
<td>Student Activity continued:
20-30 minutes</td>
<td> 

Time to test our Kites:
1. If in the classroom, in front of a fan, launch gently.
If outside, students can run to launch the kites if there’s a slight breeze. (If going outside, have clipboards for the students data sheets.)

Further testing will involve changing a variable:
As they make the changes, they should record results on their Data Sheet.
a. Change where the tail is connected to the box kite.
b. Add an additional tail.
c. Shorten or lengthen the tail.
d. Change the speed of the fan, or how fast you are running.
e. Change the length of the kite string.
f. Make a larger box kite.</td>
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<td>Conclusion:
5 minutes</td>
<td>Ask students if there are other changes they can make.
Ask them if they could make a heavier kite, and how could they keep that in the air?
stronger wind or greater air surface.</td>
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Lesson credited to: https://amaflightschool.org/sites/default/files/classroomactivity-indoorpaperboxkite.pdf