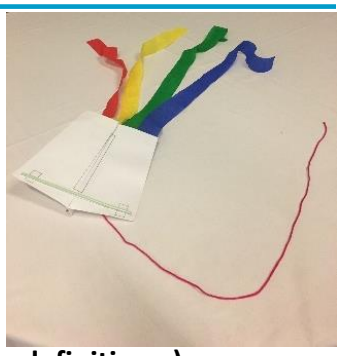
Adapted to STEMAZing ECE Format by
Amanda McPherson and DaNel Hogan

DaNel.Hogan@schools.pima.gov
Director of The STEMAZing Project

One Page Kite



Materials

Kite Template	Flexible Straw
¼" Standard Hole Punch	¾" Wide Transparent Tape
String (Baker's Twine from Dollar Tree)	Crepe Paper (party streamer)

Vocabulary (See *What the heck? Explanation of Science* section below for definitions.)

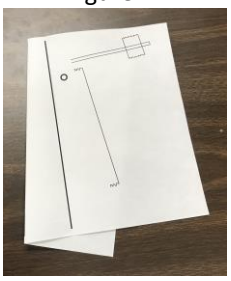
Flight	Lift	Thrust
Force	Weight	Drag

Assembly

STEP 1: Keeping the print on the inside, fold kite template in half along the middle solid black line.

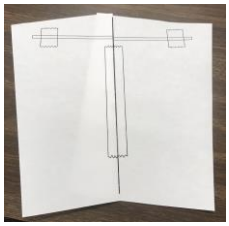
STEP 2: Open up the kite template all the way flat. Now, fold backward along the diagonal solid black line so you can still see the print, as shown in Figure 1.

Figure 1



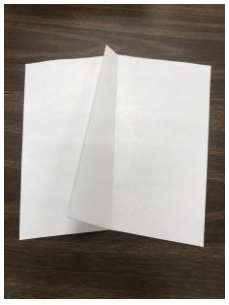
STEP 3: Bring diagonal fold on paper together so the lines match up in the middle. Tape along the middle line with transparent tape where shown with the outline of the piece of tape, as shown in Figure 2.

Figure 2



STEP 4: Flip the kite template over and crease the flap the other direction so it now stands up straight, as shown in Figure 3. (NOTE: At this point you could let children decorate either side of their kites. The side with the flap will be visible from the ground while the side with the printing on it will be visible from above the kite.)

Figure 3



STEP 5: Flip the kite template back over and tape a flexible straw across the top of the kite where outlined. See Figure 4.

STEP 6: Along the flap, place a transparent piece of tape on either side of the circle you can see through the paper. This is where the flap will be hole punched. The tape will help strengthen the hole so the string does not rip through it. See Figure 5 which has a line drawn around the piece of tape so you can see where it is.

STEP 7: Tie a string through the hole with a double knot to secure it in place. See Figure 6. For younger children, you make want to cut the string at about 8 feet long. This keeps the children from getting the string tangled and make it easier for them to carry the kite around. For older children, you could leave the string attached to the spool.

Figure 6

Figure 5

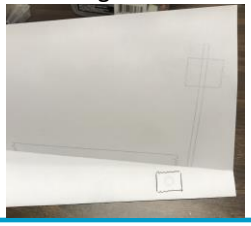
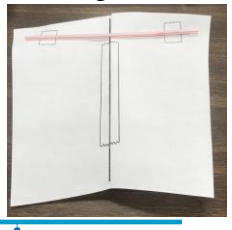


Figure 4



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STEP 8: Secure streamers to the bottom of the kite as shown either in Figure 7 to the right or like the kite shown at the top of the first page.

Figure 7

What do you notice?

STEP 9: Fly the kite! (Children may have to run around to get their kites to fly if there is no wind or only a light breeze.)

NOTICE BREAK: What do you notice?

What do you wonder?

Children use their senses to observe by looking, touching, and listening. Curiosity about the natural world leads children to ask questions. They ask: Why? Where? What if? How? Who?

Ask "What do you wonder?" Write down ALL their questions on a Wonder Wall or in a Wonder Journal.

Read Aloud

Kite Flying by Grace Lin

Let's Fly a Kite by Stuart J. Murphy

Play to Learn

Some questions may have come up already in "What do you wonder?", but now engage children to complete the phrase "I wonder what would happen if…"

For example, they might ask:

- I wonder what would happen if I added two tails?
- I wonder how long we can make the tails and still have the kite fly?
- I wonder how many tails we could add?
- I wonder if the tails could be different lengths?
- I wonder if the color of the tails matter?
- I wonder if we could make a bigger kite?
- I wonder if we could make a smaller kite?
- I wonder what would happen if the length or size of the straw was different?
- I wonder what would happen if we used a different type of string?
- I wonder what would happen if we used a different type of paper for the kite template?
- I wonder what would happen if we used fabric instead of paper for the kite template?
- I wonder what other items we could use to make a kite?

As much as possible and within reason, let the children test their questions by trying the experiments they are proposing. Ask children if one kite works better or worse than the other. Let them compare and contrast their kites to observe what is the same and what is different. Let them play to learn while they make their observations about the kites they build.

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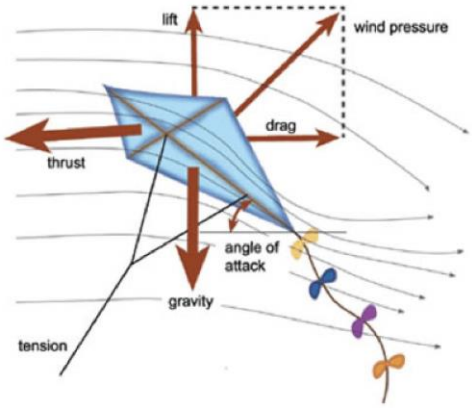
Additional Engagement Ideas

- Tell a story about the journey a kite might take if it was released.
- Have children find another kite with a similar characteristic.
- Engage children to decorate their kites with patterns or shapes.
- Engage children with other wind related activities and lessons.
- Teach a lesson about symmetry and have the children decorate their kites with patterns that are symmetric.
- Reference the engineering design process as the children make modifications to their kites.

What the heck? Explanation of the Science



A **force** is a push or a pull on an object. The four forces of flight (i.e. Lift, Weight, Drag, and Thrust) affect kites in the same way they affect airplanes, and anything else that flies. Lift is the upward force that pushes a kite into the air. **Lift** is generated by differences in air pressure, which are created by air in motion over the body of the kite. Kites are shaped and angled so that the air moving over the top moves faster than the air moving over the bottom. Daniel Bernoulli, an 18th century Swiss mathematician, discovered that the pressure of a fluid (like air) decreases as the fluid speeds up. Since the speed of the air above the kite is greater than the speed of air below, the pressure above is less than the pressure below and the kite is pushed into the air and — Tada — lift! **Weight** is the downward force generated by the gravitational attraction of the Earth on the kite. The force of weight pulls the kite toward the center of the Earth. **Thrust** is the forward force that propels a kite in the direction of motion. An airplane generates thrust with its engines, but a kite must rely on tension from the string and moving air created by the wind or the forward motion of the kite flyer to generate thrust. Drag is the backward force that acts opposite to the direction of motion. **Drag** is caused by the difference in air pressure between the front and back of the kite and the friction of the air moving over the surface of the kite. To launch a kite into the air the force of lift must be greater than the force of weight. To keep a kite flying steady the four forces must be in balance. Lift must be equal to weight and thrust must be equal to drag.

Wind is obviously a big part of kite flying. But what do you do if you don't have any wind or you're trying to fly your kite inside? Kite flyers create lift, drag, and thrust with various walking patterns, arm movements, and spinning to make kites fly when there is no wind or to fly them indoors. Whether inside or out it doesn't matter whether the wind moves over the surface of the kite or the kite is pulled through the air — lift must overcome weight and thrust must overcome drag to keep the kite soaring.

Reference: https://airandspace.si.edu/stories/editorial/how-kites-fly

SAFETY CONCERNS

- Be sure children have enough room to run around if there is no wind outside or you are flying the kites indoors.
- Always be sure to fly kites FAR away from power lines!

AZ Early Learning Standards

Science Standard - Strand 1: Inquiry & Application - Concept 1: Exploration, Observation & Hypotheses
The child observes, explore, and interacts with materials, others, and the environment.

Science Standard - Strand 1: Inquiry & Application - Concept 2: Investigation
The child researches their own predictions and the ideas of others through active exploration and experimentation.