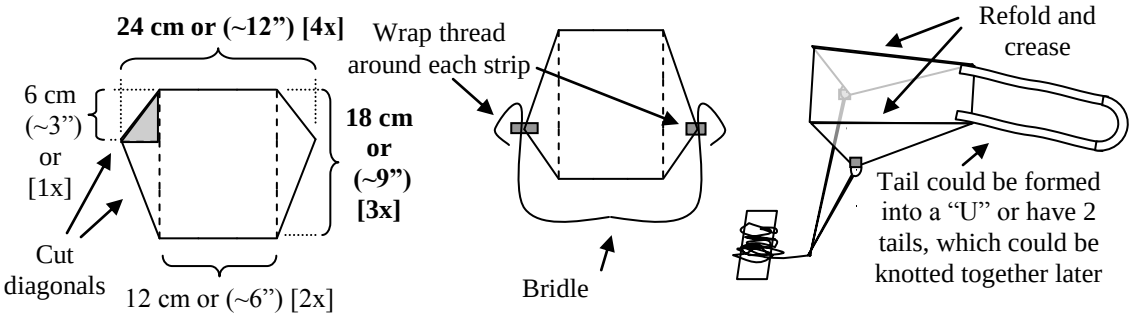
Envelope Kite

Turn a large envelope into a colorful kite!



Make a kite to explore the wind, lift, and stability from an envelope or sheet of paper.

Topics: Wind, Lift, Ratios

Materials List

- ✓ Envelope, 23 cm x 30 cm (9" x 12"), paper or (better) Tyvek (a non-woven, fibrous material, strong and water resistant), or a sheet of paper
- ✓ Thread, thin string or equal (**must not contain metal or metallic fibers!**)
- ✓ Card or cardboard for winding thread
- ✓ Ruler
- ✓ Pencil
- ✓ Scissors and/or paper cutter
- ✓ Tape or glue
- ✓ Optional: markers, crayons, and/or stickers

This activity can be used to teach:

Common Core Math:

- Measurement (Grade 4, Measurement and Data, 1)
- Ratios & Proportions (Ratios & Proportional Relationships, Grade 6, 1; Grade 7, 2)

Next Generation Science:

- Wind (Middle School, Earth and Space Science 2-5)

Assembly

1. Cut a rectangle from the smooth side of a big envelope using the bolded dimensions, or ratios, listed above. Find the middle of a long side by folding or measuring.
2. Fold the narrow sides to the middle, creating 2 creases (the dotted lines). Unfold.
3. Fold 2 corners so a side aligns to a crease made in step 2, as in top left illustration.
4. Unfold corners and cut the diagonals as shown (could mark the long diagonal first).
5. Cut a 1 m (3 ft) length and a 5 to 10 m (15 to 30') length of thread. Securely attach the longer length to a piece of cardstock or cardboard and then wind on the rest.
6. Cut two 4 cm (1½") strips from the envelope's adhesive area; and cut 6-8 longer strips, each with an adhesive end. Attach half of a short strip to 1 side of the kite, as shown; wrap the end of the short length of thread around the strip; fold the strip over and attach to the kite. Repeat for the other side as shown. Use tape or glue if needed.
7. Attach the longer strips together to make a "U" tail or pair of tails. Attach as shown.
8. Optional: Decorate the kite surface with colored markers, crayons, or stickers.
9. Attach the loose end of the wound up thread from step 5 to the center of the bridle. See http://members.aol.com/goodheavens/lark.html for an adjustable attachment.
10. Refold the creases made in step 2 to create the 3-D shape of the sled kite.

To Do and Notice (Never fly a kite near power lines or in the rain!)

1. Pick a suitable day and time to launch the kite in an area without power lines or other kite hazards. (The kite can be flown indoors by pulling the kite along briskly)
2. In which direction is the wind blowing? Is the kite stable (not spinning)? Does the tail(s) need to be made shorter for more lift or longer for more stability?

The Science Behind the Activity

Kites will go up when the **lift** (the upward force on a kite due to the kite's surface area, shape, inclination, and the wind) is greater than the kite's **weight** (the downward force of gravity on the mass of the kite). **Drag** for the sled kite is provided either by vents cut into the body of the kite or by a tail. Drag will help keep the lower end of the kite downward so the kite faces into the wind and is less likely to spin.

Taking it Further

Change and evaluate a variable in the kite design (size, shape, attachment, or tail/vent).

Web Resources (Visit www.raft.net/raft-idea?isid=138 for more resources!)

- Forces on a kite - http://www.grc.nasa.gov/WWW/K-12/airplane/kite1.html
- Experiments - http://www.sciencebuddies.org/mentoring/project_ideas/Aero_p016.shtml
- Flight simulator - http://www.grc.nasa.gov/WWW/K-12/airplane/kiteprog.html

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