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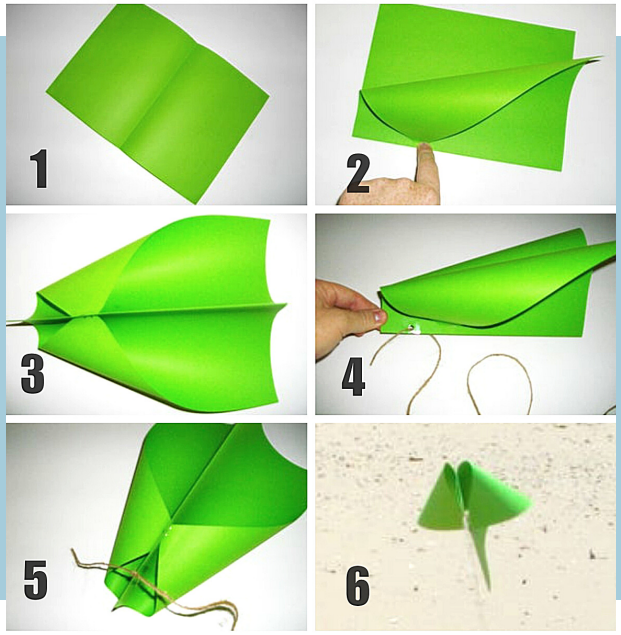
STEAM STOP: FLIGHT
MAKE & FLY A KITE

SIMPLE KITE

SUPPLIES
- 1 piece of paper (8.5x11)
- String
- Hole punch or pencil/pen

OPTIONAL
- Tape or Stapler
- Stick (for handle)



OPTION A: No tape or stapler

STEP 1: fold the paper in half width-wise.

STEP 2: bend (do not crease!) one of the corners back to the fold.

STEP 3: holding the first corner, bend the other corner back until symmetrical.

STEP 4: use hole punch or pen/pencil to put a hole through corners and body.

STEP 5: thread the string through the hole and tie a knot, letting one end of the string hang down from the kite.

OPTION B: Using tape or a stapler

STEP 1: fold the paper in half width-wise.

STEP 2: bend (do not crease!) one of the corners back to the fold and use tape or the stapler to secure it to the body of the kite.

STEP 3: repeat for the other side, bending the corner back until symmetrical.

STEP 4: use hole punch or pen/pencil to put a hole through the body.

STEP 5: thread the string through the hole and tie a knot, letting most of the string hang down from the kite.

What happens if you change where the corners meet the fold?
Why does this happen?

References

Verdantic. *Very Simple Kite*. Instructables. Retrieved May 20, 2020 from https://www.instructables.com/id/Very-Simple-Kite/

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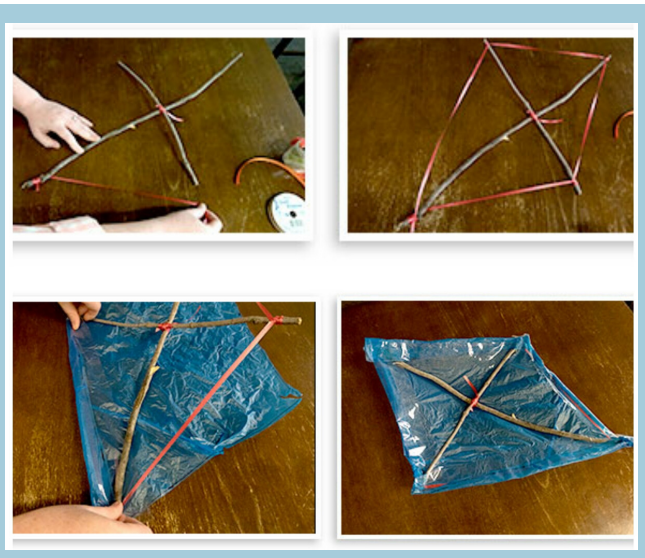

DIAMOND KITE

SUPPLIES

- 1 newspaper, 1 garbage bag, or 2 plastic grocery bags
- String or ribbon
- Glue or tape
- 2 straight sticks (one slightly shorter than the other)
- Scissors

STEP 1: use scissors to cut a notch about 1 inch in from the ends of each stick.

STEP 2: use the string to tie the sticks together at the center, so they are shaped like a "t" (horizontal stick a bit shorter) and meet at a 90 degree angle.

STEP 3: starting at the end of one stick, wrap the string around the notch. Then link the string to the end of the next stick and wrap around the notch there, repeating until the string makes a diamond frame around the sticks. Tie it off on the last notch.

STEP 4: unfold the newspaper or garbage bag and cut it an inch or two larger than the frame, all the way around. If you're using plastic bags, cut the handles and sides off to make a flat sheet. Lay the kite frame on the sheet of plastic to make sure it fits. If your frame is too large, cut up a second bag and tape the two sheets of plastic together. Cut a one inch slit into the paper at each corner of the diamond shaped newspaper or bag.

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DIAMOND KITE (CONTINUED)

STEP 5: place the frame on top of the newspaper or plastic, fold the edges over the string, and tape or glue them along the entire length of the frame. The sticks should protrude a little from each end.

STEP 6: Cut two pieces of string that are about 4-6 inches longer than each stick. Tie each piece of string to both ends of the corresponding stick so that the strings intersect each other like the sticks. Use glue or tape to secure the knots.

STEP 7: Where the strings meet, tie a long piece of string - this is what you'll use to fly the kite.

STEP 8: Take it outside and try it out!

EXPERIMENT & OBSERVE: ADDING A TAIL

Make a tail out of a household material such as ribbon, plastic bags, strips of paper or fabric, paper towels, etc. and attach it to the bottom corner of your kite.

Does adding a tail change the way your kite flies?

Do tails made out of different materials work better or worse?

Does you kite fly better with a short tail or a long tail?

Does your kite fly better with a lighter tail or a heavier tail? Why do you think this is?

References

Paynter, Meghan. (2018, June 12). *How to make a kite from a recycled plastic bag*. Budget Dumpster. Retrieved May 20, 2020 from https://www.budgetdumpster.com/blog/how-to-make-plastic-bag-kite/

Take flight with a DIY kite. PBS Kids. Retrieved May 20, 2020 from https://www.pbs.org/parents/crafts-and-experiments/take-flight-with-a-diy-kite

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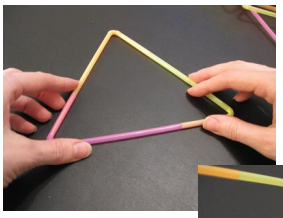
STEAM STOP: FLIGHT
MAKE & FLY A KITE

BELL TETRAHEDRAL KITE

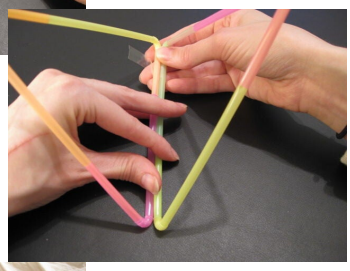
SUPPLIES (LESS THAN $10)

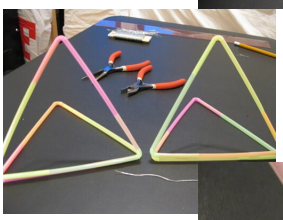
- bendable drinking straws (a pack of 200 works great)
- craft or floral wire (thin wire) cut into 3" lengths
- small pliers for bending and cutting ties
- sail material: 2 yards of tyvek, tissue paper, or mylar
- thin wood dowels (4 or 5 total)
- transparent tape
- craft glue

A tetrahedron is a triangle with 4 faces.

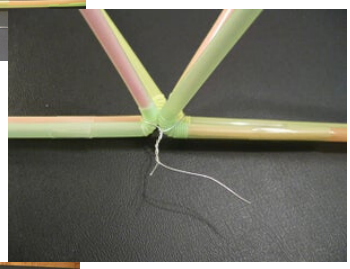


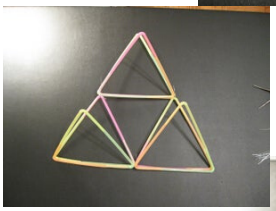
STEP 1: To build the individual tetrahedral cells that make up the kite, start with three straws. Flatten the long end of each straw and insert it into the short end of another straw. Make a triangle.



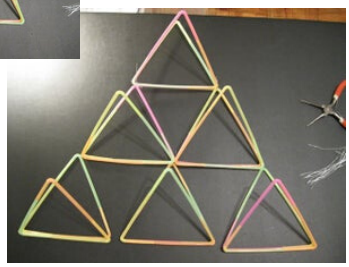


STEP 2: To make a cell, simply tape two straw-triangles together. Angle the wings slightly as shown, but don't worry about making an exact 105-degree angle: the bend in the corners will flex for you. Unlike other drinking straw "tetras", this kite only needs two straw-triangles per cell.





STEP 3: Make the bottom of the kite first. Connect several tetra cells together by twisting 3" bits of wire. Clip the twisted ends off; you'll get poked later on if you don't. Keep connecting, making a larger triangle out of the small cells, using 3 or 4 rows as shown.



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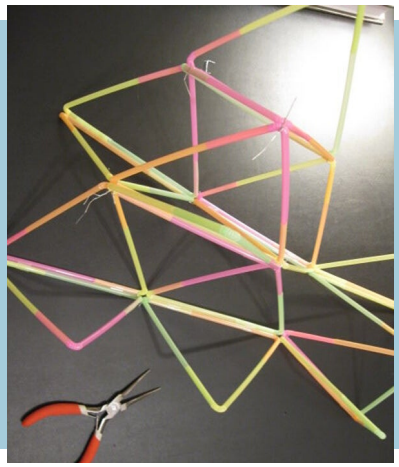
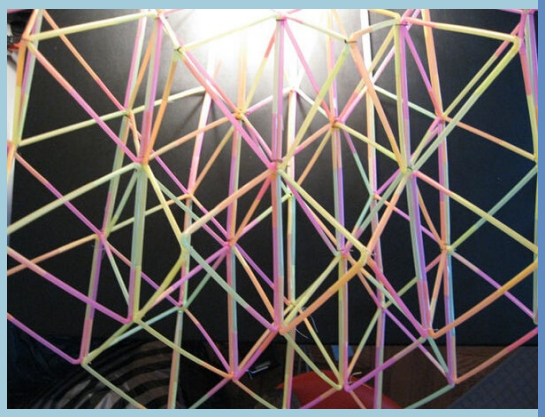
BELL TETRAHEDRAL KITE (CONTINUED)





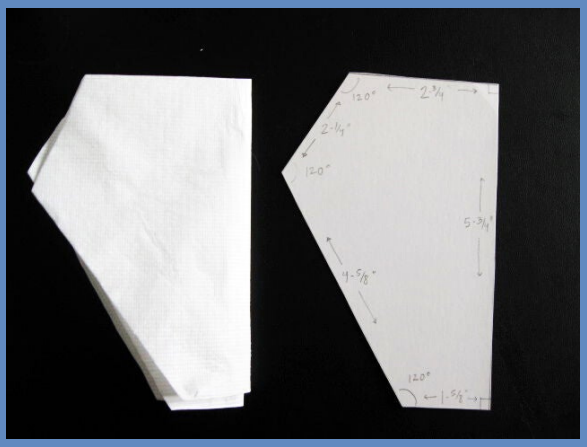
STEP 4: Now that you've made several larger cell groups of 6 or 9 cells each, start making connections 3-dimensionally. The joints at the bottom will have 4- and 8- point connections; keep using the wire to secure the cells together.

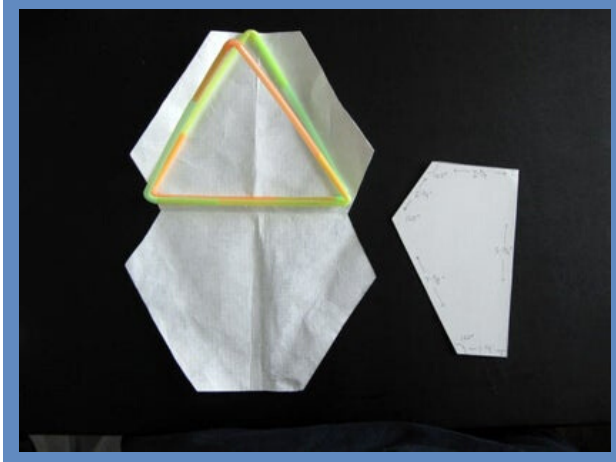
STEP 5: Use Tyvek, tissue paper, mylar, plastic bags, or any lightweight sheet material to make the sails. Start with a sheet roughly 20" x 30" in size. Fold in half four times. Make a template out of cardboard (use a cereal box, poster board, etc), and position it on the folded sail material at the closed outer corner, matching a perfect right angle. Cut the material on the 3 angled sides. When you unfold the paper you will have 8 individual sails. Make as many sails as you need for your kite.

EXPERIMENT & OBSERVE:

How would using different materials the build the cells affect the kite's ability to fly?

How would changing the angle (the degree of bend in the straw) on the tetrahedrons affect flight ability?





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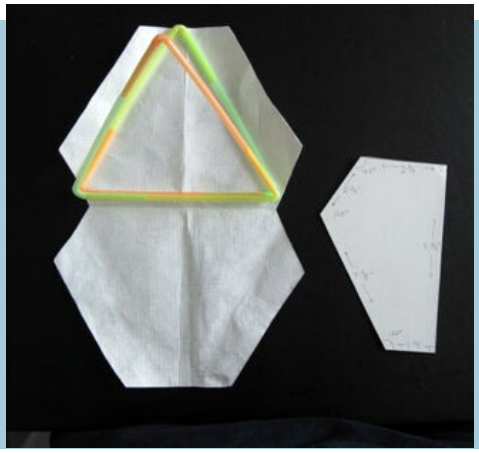
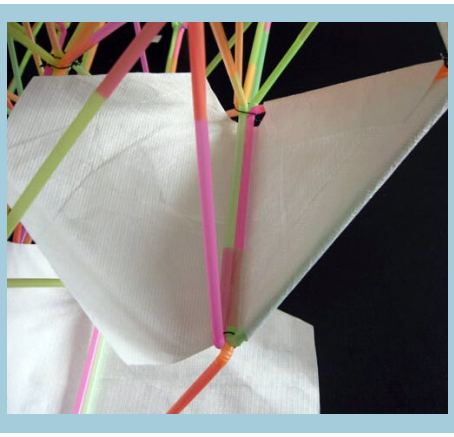
BELL TETRAHEDRAL KITE (CONTINUED)





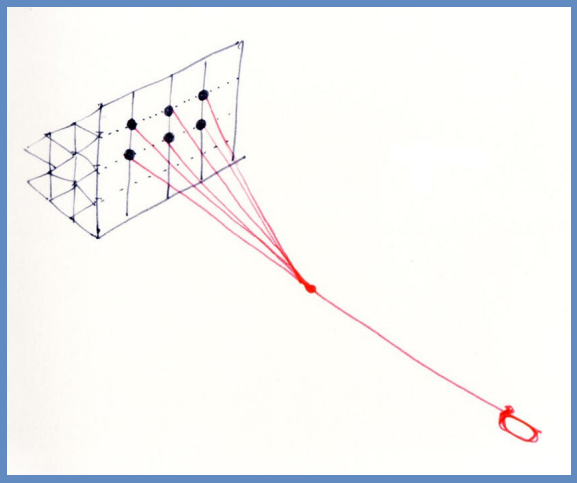
STEP 6: Use a tiny bit of craft glue to secure the sails to each cell, folding the material around the bottom taped edge. Though a bit counter-intuitive, the kite flies with the sails oriented like a flock of "V"s. Trim any access sail material for a good, tight fit.

STEP 7: tie your nylon line at points 1/3 the way down on the "bottom" edge or widest section of the kite ("bottom" is the taped edge of the tetrahedral cells). You'll have a bundle of lines- tie them off at a point roughly 1.5 times the width of your kite, making sure there is no slack in the lines. From this tie-off or bridle point, attach the main flying line. Use a figure-8 knot for tying: it's easy and much stronger than a square knot.

EXPERIMENT & OBSERVE:

How does the shape of the kite affect flight? For example, having more rows and fewer columns (a narrower shape) or vice versa?

What is the fewest number of tetrahedrons you can use to make a kite that flies?



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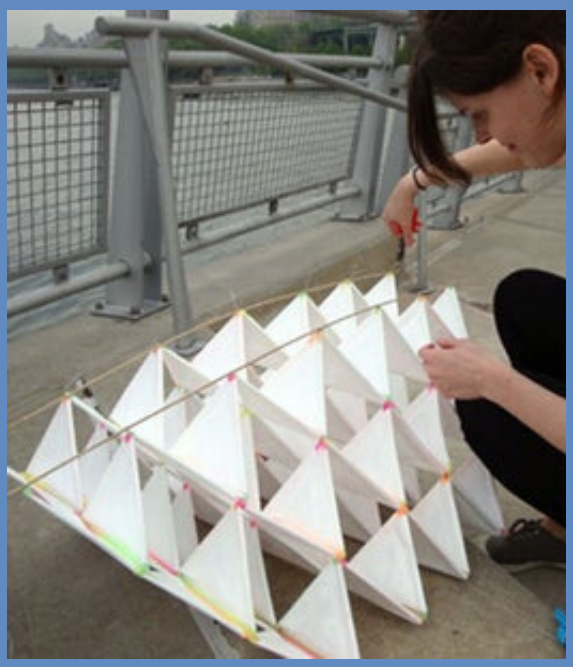
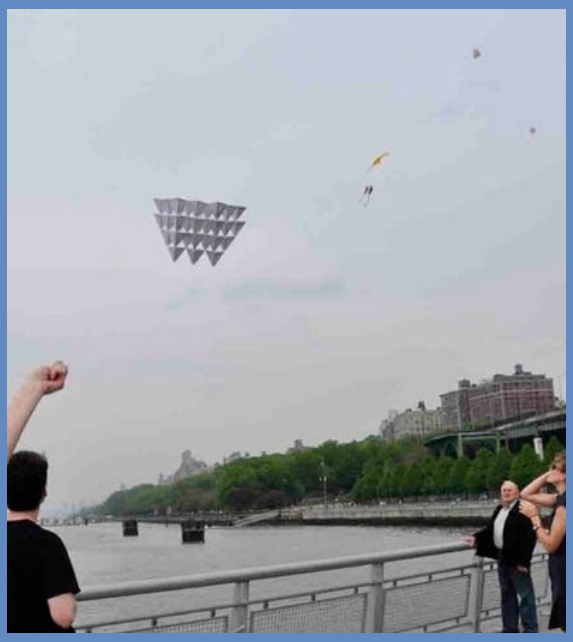
BELL TETRAHEDRAL KITE (CONTINUED)

What famous historical figure used a tetrahedral kite to experiment with the physics of flight?





STEP 8: The kite is collapsible for portability, but before flying use the wire to attach a few thin wooden dowels across the top-most cells. Make sure to keep the sails spread into equal widths. The rigidity of the wood along the top is critical, without cross-bracing, your kite will fold up like an accordion and crash to the ground.

Try it out! Your kite should take off in about 10mph winds. It's helpful to have a friend to get it off the ground- stand about 30-50 feet away from one another, with the kite facing the wind. Once the sails catch the wind, the kite should soar straight up in the air.

References

emilyfis. *Bell tetrahedral kite*. Instructables. Retrieved May 20, 2020 from https://www.instructables.com/id/Bell-Tetrahedral-Kite/