



DUKE ENERGY SCIENCE NIGHT

Paper Flying Machines

Big idea

It doesn't have to look like an airplane in order to fly! Build different flying machines to experiment with the 4 forces of flight.

You will need

WHAT WE GAVE YOU:

- straws
- index cards
- masking tape
- transparent tape
- Flying Machine instructions

STUFF YOU PROVIDE:

- paper
- scissors
- tape measure or yard stick
- optional: stopwatches

Set it up

Lay out Flying Machine instructions, paper, straws, index cards, tape and scissors on table. Use masking tape to define a runway on the ground and use the tape measure or yard stick to mark distances.

It's showtime!

Encourage families to have fun making and flying their paper flying machines. Instructions are included for Straw Gliders and Whirligigs. They can use the instructions or create their own designs.

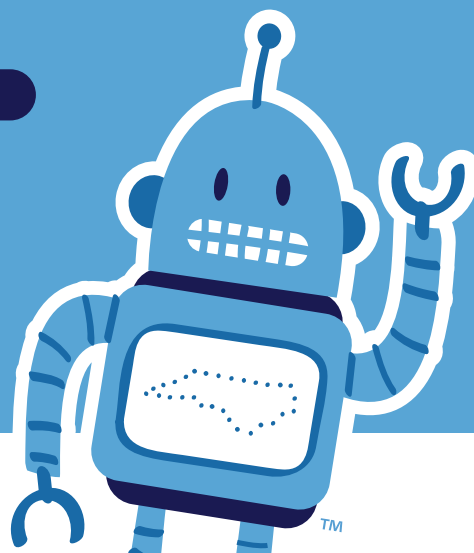
They can test how far the Straw Gliders fly using the runway, and see how accurately they can aim the gliders.

Whirligigs spin rather than fly, but families can use the stopwatches (or their own smart phones) to see how long they stay in the air.

If they love it...

Challenge families to adapt the designs – what's the biggest Straw Glider they can make that still works? What happens if they add more loops to the Straw Glider? What's the craziest Whirligig design that will spin? Try moving the location of the notches on the Whirligig, or cutting the ends of the strip into points. a building with a hole big enough for your arm to fit through.

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Paper Flying Machines

Fun options

AHEAD OF TIME

Provide markers and other art supplies for children to use to decorate their Flying Machines.

DURING SCIENCE NIGHT

Challenge them to invent their own flying machine design and teach it to someone else.

Why is this science?

In order to fly, a flying machine has to overcome the force of gravity. The earth's gravity pulls things down, so these flying machines have to take advantage of other forces that temporarily override gravity's pull. Lift is a force created by air flowing over the curved surfaces of the Straw Glider's paper loops, and thrust is the force given to the glider when you throw it. Both lift and thrust help keep the flying machine in the air. Drag is the resistance met when the machine moves through the air; it slows forward motion, which reduces lift. So if lift and thrust are stronger than drag and gravity, the machine will fly.

North Carolina Connection

North Carolina is the "First in Flight" state because the Wright brothers flew the first sustained, powered, heavier-than-air human flight in Kill Devil Hills in 1903. The Wright brothers' achievement began aviation as we know it today. People have always been fascinated with the idea of flying. While flying machines like these Straw Gliders and Whirligigs wouldn't work for carrying people, they help demonstrate that there are a huge variety of shapes that will fly.



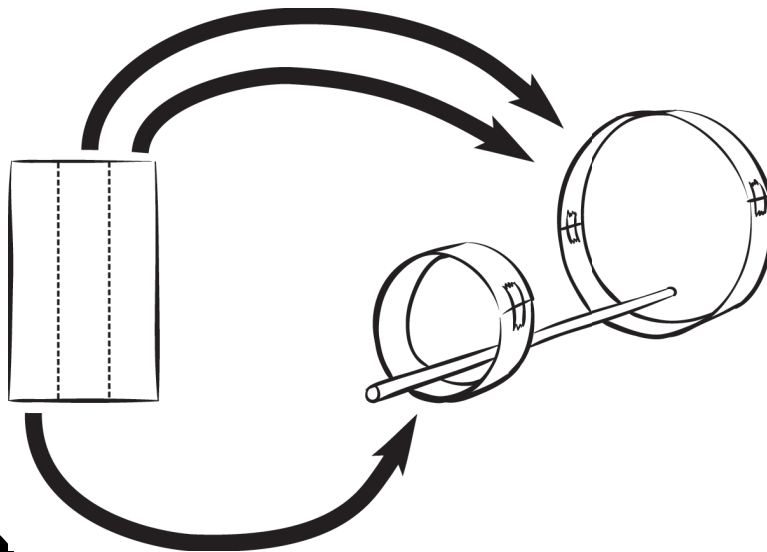
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Paper Flying Machines

Straw Glider

1. Cut an index card into three vertical pieces.
2. Roll one piece into a small loop and tape it shut.
3. Tape the other two pieces together, then make a large loop and tape it shut.
4. Place your straw inside the two loops.
5. Tape the straw to the inside of the loops.
6. To fly, hold the straw, then throw it like a spear with the little loop in front and both loops pointing up.



Whirligig

1. Cut a strip of paper longer than it is wide.
2. Cut notches near each end from opposite sides of the paper.
3. Fold the strip into a loop and connect the notches.
4. Hold your Whirligig high above your head.
5. Let go and watch it twirl as it floats down.
6. Experiment: how should you hold it to make it twirl?

