

Against the Wind



An activity adapted from the book, Family Engineering: An Activity Event Planning Guide, by Mia Jackson, David Heil, Joan Chadde, and Neil Hutzler

The Power of **Afterschool** and the Future of **Learning**

A Nebraska Afterschool Conference

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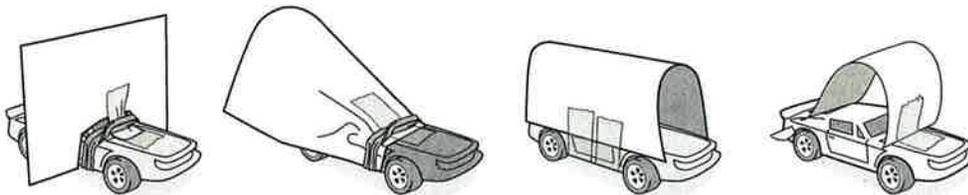
**Planning and Implementing Family Science Events : Presented by
Kathryn Phillips**

Curriculum Specialist, Lincoln Community Learning Centers

How can engineers save energy through design?

Advance Preparation

- Cut index cards in half so that they are approximately 2½" x 3".
- Attach a card piece to each car in a different design using rubber bands and tape (see illustration below). Make sure that the wheels are free so that they still roll smoothly. Have at least one car that will not be affected by the wind when placed in front of the fan, and at least one or two cars that will catch the wind and slow down.
- Place one end of the cardboard piece on the edge of the book to create a ramp and place the fan about 18-20" from the bottom edge of the ramp.
- Test out all the cars to make sure the fan will provide enough wind to slow down a few of the cars.



Engineering Fields

- *mechanical engineering*
- *aerospace engineering*

Engineering Concepts & Skills

- *optimization/tradeoffs*
- *sustainability*
- *modeling*
- *controlled experimentation and testing*

Supplies

- 3-5 identical toy cars of the same size that roll smoothly on a tabletop (Matchbox® cars work well)
- 2-3 small index cards (3" x 5")
- 12" x 20" piece of stiff, smooth cardboard
- large book, about 1-1½" thick
- small clip-on or box fan
- Against the Wind activity sign (Appendix A)

Advance Preparation Supplies

- *scissors*
- *rubberbands*
- *tape*

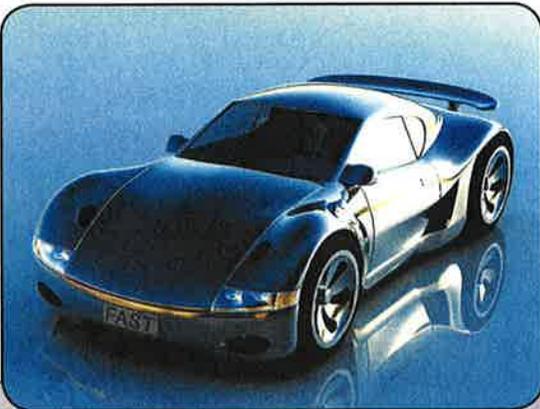
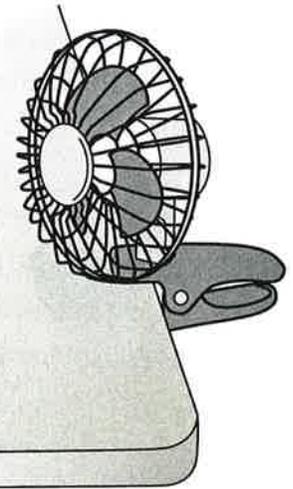
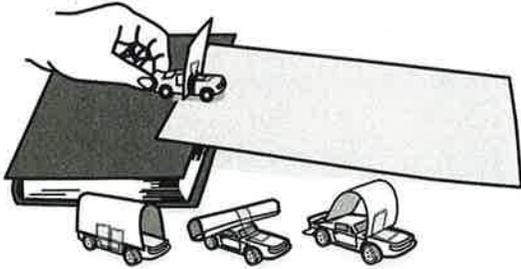


ENGINEERING CONNECTION

At highway speeds, most of the energy (fuel) needed to keep a car moving down the road is used to push air out of the way. Engineers can help us save energy by designing more **aerodynamic** cars and trucks. This means they have minimal air resistance and move through the air easily. Some strategies for making a car more aerodynamic include changing the shape of the car, making rearview mirrors smaller or placing them inside the car, covering the wheel openings, and lowering the car so that it is closer to the ground.

Activity Steps

1. Turn on the fan and hold one car at the top of the ramp. Let go of the car, allowing it to roll straight toward the fan. What happens?
2. Try again with another car until you have tested all the cars. What do you notice?
3. Which car is the most aerodynamic (moves easily through the wind)? Which car do you think would need to use the most energy (fuel) to move against the wind?



This car is designed to be aerodynamic and will experience minimal air resistance as it moves through the air.

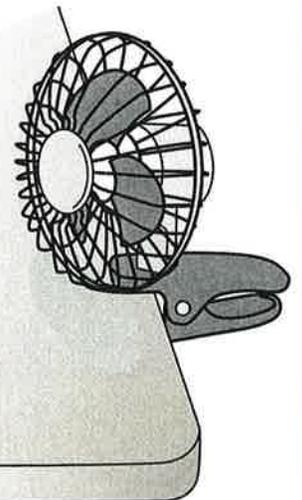
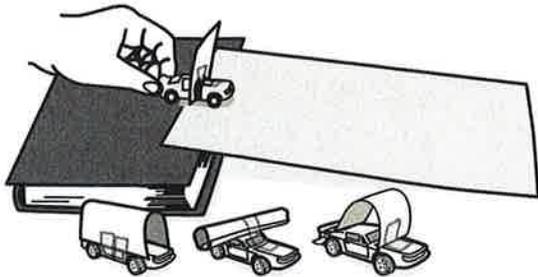


This car **is not** designed to be aerodynamic and will experience a lot of air resistance as it moves through the air.

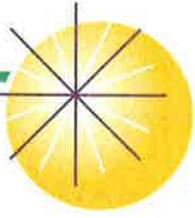
AGAINST THE WIND

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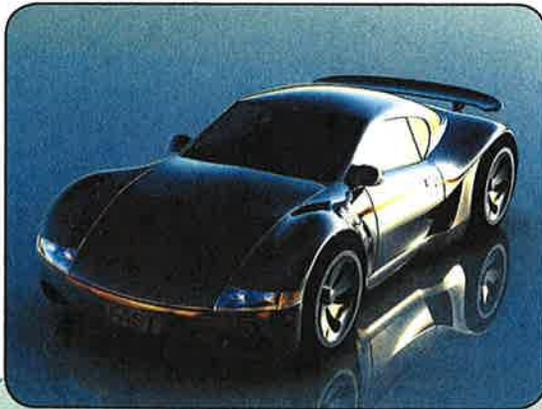
Want to know more? See back of sign.



ENGINEERING CONNECTION

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Some strategies for making a car more aerodynamic include changing the shape of the car, making rearview mirrors smaller or placing them inside the car, covering the wheel openings, and lowering the car so that it is closer to the ground.



This car is designed to be aerodynamic and will experience less air resistance as it moves through the air.



This car is **not** designed to be aerodynamic and will experience a lot of air resistance as it moves through the air.