

How to Build a Rubber Band Boat

Goal: Build a boat that uses energy transfers to "go."

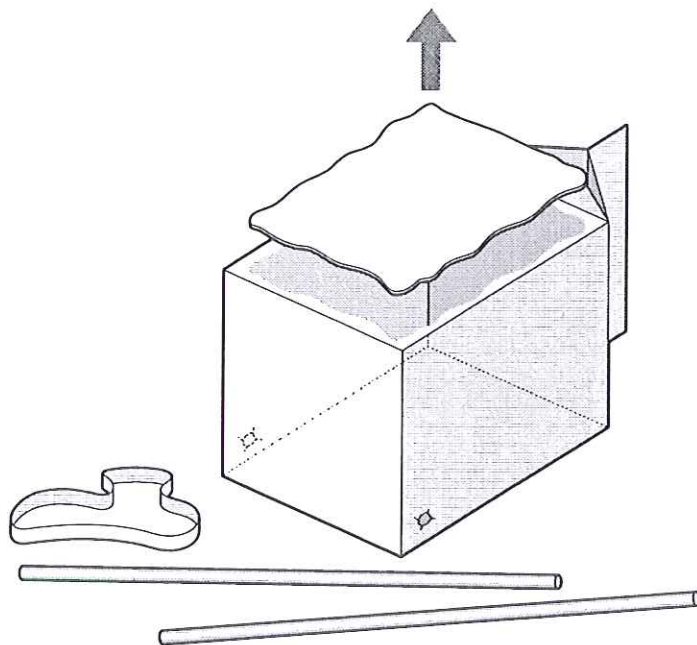
Materials:

- Basin
- Empty milk carton, pint-size
- 2 chopsticks
- Scissors
- Tape
- Rubber bands, assorted sizes
- Paper towels, several sheets (to clean up any water spills)

Directions:

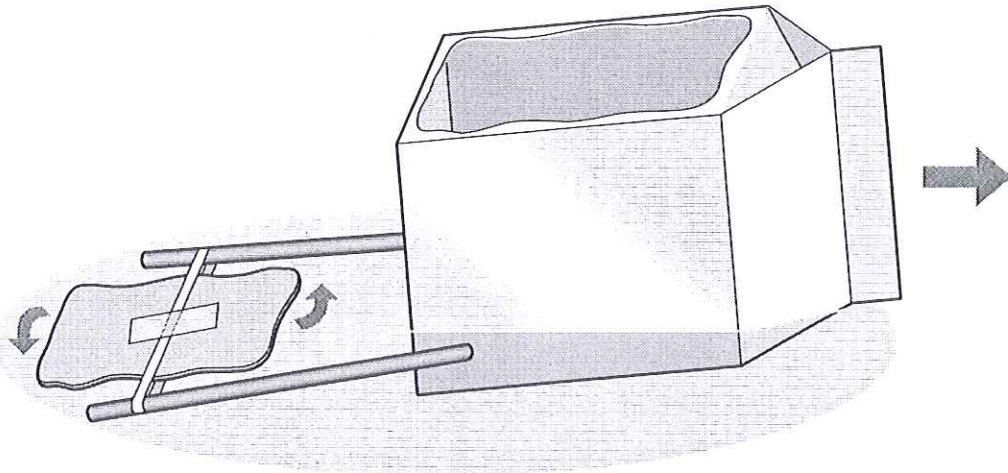
Follow these steps to build your boat. You can make changes to these directions if you need to in order to make your boat go.

1. Make a watertight seal by taping the top of the milk carton shut so it looks unopened. (Then return the tape to the supply area for other groups to use.)
2. Lay the empty milk carton on its side. The taped edge of its top should go up and down vertically.
3. Cut out the side of the milk carton that faces up so that you have a large rectangular opening. Save the cut-out rectangular piece for a paddle.
4. Make a small hole in the lower back corner of one of the sides of the milk carton. Make it 1 cm ($\frac{1}{2}$ in) from the bottom and 1 cm ($\frac{1}{2}$ in) from the side and slightly smaller than the diameter of a chopstick.



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5. Make a second hole on the opposite side of the milk carton that mirrors the location of the first hole.
6. Working from the outside of the boat, put a chopstick into each of the holes until they hit the front of the boat and can't move any further.
7. Loop a rubber band around the two ends of the chopsticks sticking out of the carton. Make sure the rubber band is large enough—the chopsticks should stick straight out from the back of the boat and be parallel to one another.
8. Cut the rectangular piece of milk carton you saved to make a paddle. Make it wide enough to move the water, but not so wide that it hits the chopsticks when it spins between them.
9. Put the paddle inside the stretched rubber band and tape it in place as shown.



Operating your boat:

1. Use a water pitcher to fill the basin halfway with water. (Then return the pitcher to the supply area for other groups to use.)
2. Twist the upper part of the paddle away from the milk carton a few times until the rubber band is tight.
3. Hold the paddle so it doesn't spin back in the other direction while you put the boat in the water at one end of the basin. (Be sure to point the milk-carton end of the boat in the direction you want the boat to go.) Let go of the paddle and watch the boat go.

Challenge: Modify your boat to improve its performance. Try out different rubber band sizes and tensions and any other changes you can think of. What happens when you wind the paddle in the other direction?