

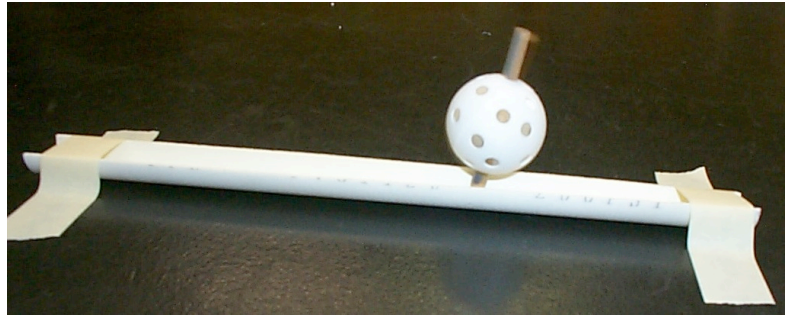
Spin Doctor

What is this about?

In any professional baseball game you can watch pitchers fool batters with their magic. The magic is done by the “Magnus force” induced by spin the pitcher imparts to the ball. The Magnus force is exerted perpendicular to the plane defined by the axis of spin and the axis of the velocity of the airflow over the ball.

What do I need?

You need to make a top out of a practice golf ball, the kind with holes, and a short dowel. You will also need a $\frac{3}{4}$ ” PVC pipe cut in half lengthwise. A bit of tape to hold the pipe in place can be helpful.



What will I be doing?

The idea is to study the force caused by air moving over a spinning object. This force is called the “Magnus force.” You will start the top spinning in the half-pipe, then blow on it parallel to the table and perpendicular to the pipe.

What do I think will happen?

Take a minute and write down a description of what you think will happen and why you think it. Make sure you consider what will happen if you spin the top the other direction, or blow from the other side.

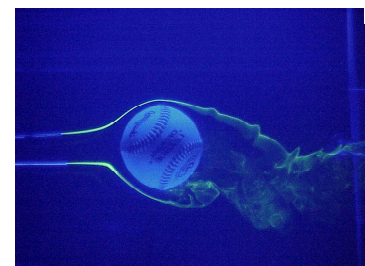
What really happened?

1. Get the top spinning and blow across the pipe. What do you notice?
2. Get the top spinning the opposite direction and blow on it again. What happens now?
3. Repeat the experiment for both directions of spin but blow on the top from the opposite side.

Write a description of your results. What was the launch angle that was the best?

What did I learn?

When an object spins and air moves around it, it feels a force perpendicular to the airflow. The direction of the force depends on the direction of the spin. This is called the “Magnus force.” Can you tell which way the ball is spinning from the smoke trails in the photo at the right?



source: www.kqed.org

What else should I think about?

If you play tennis or ping-pong, you probably know that a ball hit with “top spin” drops more rapidly and a ball hit with “back spin” drops more slowly. The same is true for a baseball. A skilled pitcher can put enough spin on the ball to get it to “break” on its way to the plate. Examples of spinning pitches are curve balls, sliders, split-finger fastballs, and screwballs.



Catch it in the Web!



The Physics of Baseball - Flight of the Ball

(<http://www.youtube.com/watch?v=oph9BP4IKjs>)

This video describes the forces that act on a ball in flight.



Major League Physics – Dr. Baseball – The Secret of Pitching

(<http://phys.csuchico.edu/baseball/DrBaseball/Pitching>)

This humorous video describes the forces that act on a pitched ball.



NASA's Aerodynamics of Baseball Site

(<http://www.grc.nasa.gov/WWW/K-12/baseball/index.html>)

With the CurveBall software you can study how a big league pitcher throws a curveball by changing the values of the factors that affect the aerodynamic forces on the ball. The HitModeler software, does the same thing for a batted ball.