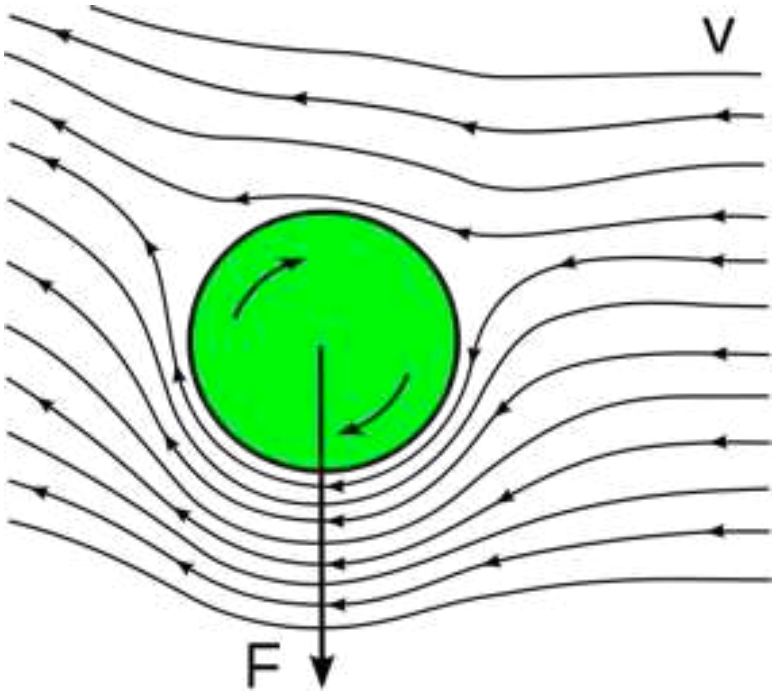
MAGNUS GLIDER

Duration: 2-10 minutes
Institution: Science Museum of Minnesota
Skill level/Age Level: All Ages
Group size: 1-on-1

INTRODUCTION

This is a fun alternative to paper airplanes. It demonstrates the “Magnus” effect. This is the effect that makes a ball curve in baseball with a curveball pitch. When the ball is thrown, it is also spun. With the Magnus glider you created a glider by taping two foam or paper cups together, then wind a long rubber band around them that will be released when you pitch your glider model forward. This spins the cups while you are throwing them. This tends to make the glider move slightly away from the direction you throw it.



http://en.wikipedia.org/wiki/Magnus_effect

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KEY CONCEPTS AND/OR SUBJECT AREA

Physics

The spinning ball in air (a fluid around the ball) will lower the pressure on the ball in the direction its headed which will increase the pressure on the opposite side—this "pushes the ball" and makes the ball curve.

Aerodynamics

The glider works like an airfoil—when in an airflow there is increasing pressure on the front of the cups moving forward and pressure is dropping right behind it as it moves (this area also becomes turbulent).

Connections to the Nature of Science

Studying the world around them scientists will create and use instruments to interact with phenomena to help them make observations. The Magnus glider lets us experience and explore the Magnus Effect.

MATERIALS AND TOOLS

Essential Materials:

- Styrofoam cups (2 each), variety of sizes let the learner explore how sixe and weight affect the flight.
- Masking tape (variety of colors)
- Rubber bands—3-4 thin rubber bands 2-4 inches in length

SET UP

It is important to have room for throwing the gliders—young and old alike get very excited to fling the gliders as hard as they can, so be sure to test your area out to see if you have the proper amount of room.

HOW TO OR STEP-BY-STEP

1. You'll need two cups, tape and rubber bands (Skinny stretch kinds, not think)


2. Rip off a piece of masking tape that can wrap around the cups. Hold cups bottom to bottom then tape them in the center
3. Next, you'll create a chain of rubber bands to make one long rubber band that you will wind around the cups to be able to spin them as you fling your Magnus glide


   a. To chain the rubber bands lay them out overlapping a bit then you want to tuck one of the ends back though the center loop.

   b. Then pull the ends tight to chain them together. Add two or three more rubber bands to make the chain about 10-12 inches.

4. Now you want to wind the band around the center of the cups you just taped.

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5. Holding the start down, when you wind the band over the start it will hold it in place for you to wind it all the way without unwinding.
6. Holding the end with a finger, stand with some room around yourself and "fling" the glider away. If it works it should spin and float away from you. (If you hold it the opposite way, it might even float back at you!)
7. Play with the glider to see if you can get it to float in directions you choose.

FACILITATION PROMPTS AND QUESTIONS

- Do you play baseball, gold, Ping-Pong, billiards/pool or any other ball games?
- What is it called when the ball has the Magnus effect in your sport?
    a. In golf its called a slice
    b. In baseball its called a curveball
    c. Tennis? Does this happen in Basketball?
- Can you get it to fly back to you instead of away?
- How does your throw need to change?
- When is the effect good?
- When is it a problem?

GENERAL FACILITATION TIPS

Having the facilitator making and flinging the Magnus Gliders seems to attract learners to trying themselves. WE also add a variety of colors of masking tape as learners like to decorate with color.

This can be a great indoor or outdoor activity. It would seem that throwing things inside might be a problem but if the Styrofoam cups are used, an adult can throw this width full force and the cups will still gently spin away.

MORE INFORMATION

You can find more instruction on the How to Smile website
http://www.howtosmile.org/record/891

This is a great video: Magnus Glider (Science Short)
YouTube— https://www.youtube.com/watch?v=I5itTLwCxms

Aeronautics discussion of the Magnus effect
http://www.pilotoutlook.com/glider_flying/magnus_effect

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Science for all Americans: The Nature of Science
http://www.project2061.org/publications/bsl/online/index.php?chapter=1#bm_1AM4c

KEYWORDS

- Indoor/Outdoor
- Activity/game