FLYING MACHINES

MAGNUS GLIDERS

MOREHEAD PLANETARIUM & SCIENCE CENTER AFTERSCHOOL

BIG IDEA

To build a flying machine that works based on the Magnus Effect.

TIME

30–45 minutes

WHY WE LOVE IT

Students create an unconventional-looking flying machine that moves in a fun and interesting way.

READY...

Gather materials (per student):

- 2 Styrofoam cups (16-oz. size)
- 12"–18" of ¾" masking tape
- 4 #19 rubber bands (3½" x 1/16") OR any combination that measures over 12" in total when placed together. Make sure the rubber bands are thin. If they are too thick, they will break the cups.

SET...

Prepare the scene. The gliders work best when dropped from higher places. (Balconies are ideal.) Find a location that will work for your group. Build and experiment with a demonstration Magnus glider so that you will better be able to assist when it comes time to soar the gliders.

GO!

1. Hold up a pre-constructed Magnus glider. Ask students to predict how they think it will fly. Do a demonstration to see if their predictions are correct.
2. Explain the **Big Idea**.
3. Have students tape the bottoms of two cups together by wrapping several layers of tape around where they join. The open mouths of cups face away from each other. **(Figure 1)**
4. Have students create a chain of rubber bands. **(Figure 2)** They can start by putting one rubber band around another rubber band and then pulling it back down through its own center, tightly, until it forms a link. Have students repeat this until they have a chain that is about a foot long.
5. Have students put one end of the rubber band chain at the part where the cups meet and hold it down with one finger. **(Figure 3)** Then have them wrap the chain around the center, on top of the layers of tape, tighter and tighter (but not too tight, or it will break the cups or cut the tape). Eventually, students can remove their fingers and continue wrapping. They should wrap until they only have an inch-long piece of the rubber band chain sticking out, and pinch it between their fingers.
6. Take the class to the space you chose to drop the gliders.
7. Tell students to hold the glider horizontally up high in the air. They should throw the glider forward and angled upward while pulling down on to the rubber band chain, holding onto it as the glider flies. The cups should spin and slowly glide to the ground.

Figure 1: Taped cups

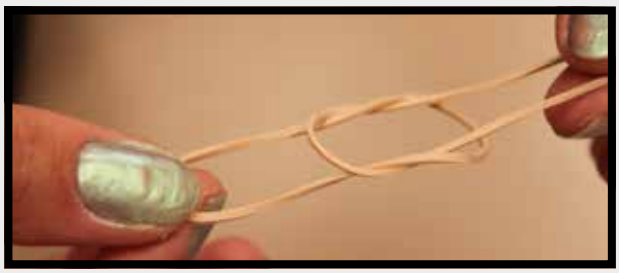

Figure 2: Rubber band chain

Figure 3: Rubber bands around cups

[continued on back]

[continued from front]

DIFFERENTIATION

- **K–1:** Construction of the rubber band chain for the launch can be a difficult task for this age group, so you may want to make enough for your students before the activity begins.
- **2–3:** Sometimes students in this age group like to use the rubber bands to shoot at people. Keep an eye out for that and articulate safety rules at the beginning of the activity.
- **4–5:** Challenge this age group to see whose glider can stay afloat the longest.
- **6–8:** Students can research other effects that manifest themselves in their favorite sports. *How do soccer players bend the ball into the goal?*

TRY THIS

1. Have students try using different types of cups to see if results vary.
2. Students can try to add more cups to the ends of the gliders.
3. *What happens when students cut the ends of the cups to make fins like the wings of an airplane?*

WHY IS THIS SCIENCE?

The Magnus effect is what enables this structure to fly. The spinning of the cups creates a kind of whirlpool in the air, causing differences in air pressure on the top and the bottom. That difference is enough to give the cup lift, so it gently glides to the ground instead of dropping.

We can see other examples of this in golf, in ping-pong, and when a pitcher throws a curveball!

WITH THANKS AND FOR MORE INFORMATION, VISIT:

http://www.instructables.com/id/Magnus-Glider/
http://www.cmhoustonblog.org/2010/04/26/make-your-own-magnus-glider/

THE UNIVERSITY *of* NORTH CAROLINA *at* CHAPEL HILL