

TEACHERS
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TEACHERS!®



Bernoulli Blaster (aka Amazing Air Dragger)

AIR-550

Your kit includes:

- ✓ Bernoulli Blaster
- ✓ 10 Ping Pong Balls



To start your demonstration:

You will need a bowl and a source of fast moving air, such as an electric leaf blower or a vacuum cleaner (Shop Vac) with the hose attached to the **exhaust** port.

Create a few layers of ping pong balls in a bowl. Hold the Bernoulli Blaster so the base of the tube is right above a ping pong ball. Position the hose so the air is blowing on the **top** side of the tube, but not directly over the mouth. It may take a few tries, but once you find the correct spot on the tube, the ping pong balls will begin to fly out of the tube.

If you'd like to review a video of the Bernoulli Blaster in action, check out our video:



Additional Notes

What's happening?



As the fast moving stream of air exits from the hose or blower, it drags some of the room air with it, just as a string moving through syrup drags some syrup with it.

When the moving stream is deflected by the top of the tube, it drags air upward and away from the top of the tube. This lowers the pressure inside the tube.

With lower pressure in the tube above a ping pong ball—and full room pressure below it—whoosh! The ball is pushed up the tube!

Extension:

Take two pieces of a wide drinking straw (like the kind McDonald's® uses). Place one end of the straw vertically into a cup of water. Position the second straw 90 degrees to the vertical straw so that the two openings are touching.

Blow through the horizontal straw in such a way that the air is moving directly across the opening of the vertical straw. The water from the cup will rise up and spray horizontally. A real world application for this would be a perfume atomizer.

Useful Reference Materials

See earlier articles in *The Physics Teacher* (e.g., Weltner, Feb. 1990; Smith, Nov. 1972) for further information on this matter. Also search online for “Klaus Welter, U. Frankfurt, Fluid Flow” for other helpful articles.

The Bernoulli equation is often incorrectly used to explain the observed pressure effects here. But the flow from the blower itself can't be at a lower pressure than the room air.

If it were, the room air would collapse the stream. Also, if the stream were at a pressure lower than room pressure, it could never leave the leaf blower!

If there were no viscosity and no drag, the balls would not be picked up. The moving fluid itself, undeflected, is at a pressure that is equal to room pressure. This is allowed by the Bernoulli equation.

Take Your Lesson Further

As science teachers ourselves, we know how much effort goes into preparing lessons. For us, “*Teachers Serving Teachers*” isn’t just a slogan—it’s our promise to you!

Please visit our website
for more lesson ideas:

www.TeacherSource.com

Check our blog for classroom-tested
teaching plans on dozens of topics:

<http://blog.TeacherSource.com>

To extend your lesson, consider these Educational Innovations products:

Bernoulli’s Principle Class Kit (AIR-500)



Is it Bernoulli's Principle or the Coandă Effect? Using high energy activities, your students will learn about air pressure and common but counter-intuitive phenomena. Our kit provides everything you need to demonstrate the relationship of air speed and air pressure for students in grades 4 to 8. The lessons can easily be adapted for younger or older students.

Hovercraft Class Kit (AIR-520)



The principle behind the Hovercraft's levitation is that when the air is released from the balloon, the air hits the ground and rushes outward in all directions. The air flowing from the balloon through the holes forms a layer of air between the Hovercraft and the table. This reduces the friction (the resistance that occurs when two objects rub against each other) that would have existed if the Hovercraft rested directly on the table. With less friction, your Hovercraft scoots across the table. This kit includes everything you need to make your

own balloon Hovercrafts, including one dozen pre-drilled film canisters, one dozen balloons, one dozen CDs, one strip of poster putty, and assembly instructions. Instructions can also be seen in our short video. Colors may vary.

Air Pressure Bundle (AIR-900)

Six air pressure demo goodies will certainly prove that science never sucks! Start with a Tornado Tube or Fountain Connection for hours of water play (and learning). Learn about lift with a balloon-powered helicopter. Your Harbottle is the perfect tool to demonstrate atmospheric pressure. How does that balloon stay inflated without being tied shut? The Pressure Pullers and Atmospheric Mat are guaranteed to baffle anyone who doesn't (yet) know about the pushing force of the air around us.

