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## 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](http://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.

## **Hover Racer** (AIR-625)

Build your own motorized Hover Racer and watch it skim smoothly across the floor on its cushion of air. A fun science project and fantastic science fair idea. This kit includes a detailed instruction manual plus relevant information about the history and science behind the hovercraft.



## **WindTubes** (WIN-600)



Fantastic for teaching the properties of air, Bernoulli's Principle, and even for building structures! WindTubes are like balloons that don't stretch. About 8 feet long and 10 inches in diameter, they are huge! It takes as many as 70 breaths of air to fill a WindTube or as few as one breath if you use Bernoulli's Principle. Amazing to watch. Their inventor, Doron Gazit, suggests connecting them together with simple rubber bands to create space frames or even Buckminster Fuller structures. Packs of four come in assorted colors.

## **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.

