RMetS
Royal Meteorological Society

Marshmallows in a bottle

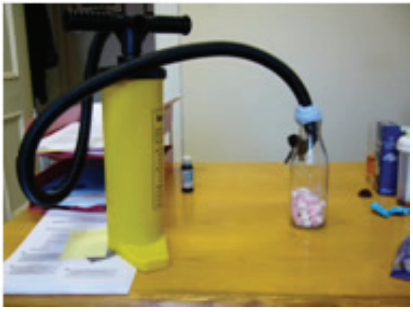
Learn about air pressure

Equipment

- Small marshmallows
- A bottle (a clear wine bottle would be best)
- A bottle pump such as is used to keep the fizz in fizzy drinks, or to keep an open bottle of wine good.

Method

1. Tip some of the marshmallows into the bottle.
2. Attach the pump to the top of the bottle, making sure there are no air leaks; (use blue tac if necessary).
3. Start to pump, stopping to shake the marshmallows occasionally.



4. If you are pumping air out of the bottle, the air trapped in the marshmallows will expand as the pressure of the air in the bottle falls. The marshmallows will look like they are growing!
If you are pumping air into the bottle, the air trapped in the marshmallows will be compressed (squashed) as the pressure of the air in the bottle falls. The marshmallows will look like they are shrinking!

What is the pressure in the atmosphere?

The pressure at the Earth's surface is usually approximately 1000mbar/100,000Pa. That is the equivalent of about 3 elephants on each square metre!
When weather systems pass over the pressure varies between 970-1040mbar. Pressure also falls with height; near the surface it falls by about 1mb for every 10m we go up. For example at the top of Mount Everest the pressure is only about 330mbar, so climbers need oxygen. Aeroplanes must have pressurized cabins for this reason.

Where can I find more information?

Watch a video of the experiment here:
http://www.physics.org/interact/physics-to-go/amazing-marshmallows/index.html

Read about pressure here:
http://kids.earth.nasa.gov/archive/air_pressure/index.html

Be introduced to atmospheric pressure here:
http://www.physicalgeography.net/fundamentals/7d.html

Learn about air pressure with the BBC weather team here:
http://www.bbc.co.uk/weather/features/understanding/airpressure.shtml