

# BUILD YOUR OWN ALTIMETER: MASTER CLASS



The following materials and tools will be required:

## MATERIALS AND TOOLS

Plastic bottle with lid  
Duct or electrical tape  
Red food colouring  
Plastic tubing  
Rubber cement  
Scissors



**\*This activity should be carried out under adult supervision\***

## ACTIVITY STEPS



**STEP 1** Using a pair of scissors, make a hole at the bottle of your plastic bottle slightly smaller than the outside diameter of the plastic tubing at the base of the bottle: this is to ensure that you get a tight seal.



**STEP 2** Insert the plastic tubing until the tip is halfway into the plastic bottle and is resting at the bottom of the bottle. Remember: it must be a tight fit.

**STEP 3** Fill the bottle with enough water to come up 3cm – 4cm on the bottle. If the water leaks around the plastic tubing, pour the water out and apply the rubber cement around the tubing on the bottle, along with a layer of electrical tape.



**STEP 4** Using the tape, attach the plastic tubing to the top of the bottle, making sure you do not put pressure on the tubing. Then screw the lid back on to the top of the bottle.



---

## STEP 5

Pour water into the plastic bottle until it fills up half of the bottle. Colour the water with enough red food colouring to make the water bright red. Now place your altimeter in an area where it will not be disturbed too much. Each time you move the bottle, unscrew the lid, and re-tighten it.



---

You will notice that when the water level in the plastic tubing is low, this is due to high air pressure experienced at lower elevations. However, when the water level in the plastic tubing is above the water level in the plastic bottle, then a low pressure is in effect due to higher elevations.

## THE FUNCTIONS OF AN ALTIMETER

An altimeter is a device that measures altitude or distance above sea level. Most altimeters are barometric, which means that they can measure altitude by calculating the air pressure. Air pressure decreases as altitude increases, and vice versa. This is due to the fact that the air is thinner at high altitudes, exerting less pressure on the area directly beneath.

Altimeters are imperative navigation instruments for aircrafts and spacecrafts to monitor their height above Earth's surface. An altimeter's readings change as elevation changes. Altitude readings can also change due to weather, as air pressure decreases during storms.

Not all altimeters depend on air pressure to calculate altitude. Radar and laser altimeters found on several aircrafts and spacecrafts, function similarly to sonar measurements of the seafloor. These altimeters calculate altitude by sending a radio or laser signal toward Earth's surface, measuring the time it takes for the signal to bounce back and then translating that information into an elevation.

When used in satellites, radar and laser altimeters are able to combine altitude measurements to create accurate topographic maps of both land and ocean surfaces.

Satellites that carry radar altimeters are able to record the surface topography of certain areas of the Earth's surface. These altimeters precisely measure a satellite's height above water, land, or ice by timing the interval between the transmission and reception of very short radar pulses. This is the only technology that can measure changes in the height of the ocean and is therefore essential to monitoring rise in sea-levels.

This technology has been able to demonstrate that the sea level has been rising at an average rate of about 3mm per year since 1993. However, recent re-analysis of these records has shown that the rate at which sea-levels are increasing is now accelerating due to global warming.

Skyrora's weather balloons are used to measure the speed and direction of the wind at different heights. An altimeter tells us the heights at which specific speeds and directions are measured. Barometric altimeters can also be used in rocket recovery systems, controlling the release of the main parachute at a particular height above the ground.