

## Atmospheric Investigations – Temperature and Pressure

Note: The balloon launch site is around the area of Mount Barker. The proposed launch site is at a farmer's property in Wistow. Pictures of the launch site are at: [http://pipe2.darklomax.org/pics/2012-10-07\\_Horus\\_29/](http://pipe2.darklomax.org/pics/2012-10-07_Horus_29/) and the location is: <https://www.google.com.au/maps/place/35%C2%B007'39.2%22S+138%C2%B050'51.4%22E/@-35.1279687,138.847769,388m/data=!3m1!1e3!4m2!3m1!1s0x0:0x0>. The proposed launch is scheduled for the third week in September.

### Description of problem

A range of measurements can be collected while the balloon travels through the atmosphere, including in this instance temperature and air pressure. This activity will investigate why such measurements can be useful.

### Background

Research and find a diagram of the various layers of the atmosphere, and identify which parts of the atmosphere will the balloon fly through.

The pressure sensor measures atmospheric pressure in hectopascals (hPa), which can be converted into altitude using the formula ( $p_0$  is air pressure at sea level):

$$\text{altitude} = 44330 * \left( 1 - \left( \frac{p}{p_0} \right)^{\frac{1}{5.255}} \right)$$

It is easier to use an online calculator such as: <http://www.endmemo.com/physics/pressurealtitude.php>. Calculate air pressure at the burst height of the balloon.

### Investigation

The experimental design will need to take into consideration how the collected data can be presented and analysed after the flight. Atmospheric pressure, altitude and temperature will be taken at regular intervals, which will allow the time to be calculated (the GPS data may also be able to be used). As part of your investigation describe how you can plot temperature versus altitude, and altitude versus time of flight. You may be able to determine how quickly the balloon rises to maximum altitude, and explain unexpected temperature variations as it rises. Investigate how you can determine the balloon altitude for particular pictures, and how we can match altitude and time in flight with the images (either still or video) from the camera.

### Report

Prepare a report which:

- Describes the goals of your task
- Describe the various atmospheric layers and predict where the balloon will travel
- Describe how you will graphically represent your results once the data has been retrieved after the flight and how altitude, pressure, temperature and images can be synchronized with the inflight times.