High **P**erformance

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Intro To Engineering

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Purpose of this experiment:
We would like to determine if their is a temperature inversion occurring at the selected launch area between 0 and 1000 feet while attached to a helium balloon.

Research:

As you go higher up into the earths atmosphere the normal characteristics is that it gets cooler as you go higher. On an average of 6.5 celsius cooler for every 1000 meters that you are from starting area. The good news is that the cooling temperatures as you climb help mix the air keeping air pollution down. However when it is cold near the ground and warmer above it this causes a temperature inversion which results in keeping the pollution lose to the ground and to lower the mixing rate of the pollution in to the air. There are many reasons why a temperature inversion might occur. One situation in which a low level, or surface inversion, might take place is on a clear night, when the earth's surface radiates heat away rapidly. If the air is clear, the ground, and the air directly above it, can be cooler than the air at higher altitudes. This type of situation may occur on winter nights in California, and can be a problem for citrus growers, because if enough heat radiates away, the temperature at the ground surface can drop below the freezing level. Research From: Another type of inversion, called an advectional inversion, involves a horizontal inflow of cold air. This might be air blowing in from cold water to a coastal area. Along the California coast, winds frequently blow onshore, passing over the cold ocean waters before reaching land. When this occurs, the air at ground level may be colder than the air above it, and the air is stable. A third type of surface inversion takes place at night in valleys, when cold, dense air flows down slope under the influence of gravity, draining off the slopes and uplands, and into the valleys. The air in the valley bottoms is colder than the air above. Other types of inversions may also develop under various conditions. In California, upper air inversions develop because much of California is on the eastern edge of the subtropical high pressure cell in the Pacific Ocean. This high pressure cell develops in response to global patterns of atmospheric pressure and circulation, rather than local conditions. The presence of high pressure means that the air in the region is subsiding from high altitudes in the atmosphere. Subsiding air is compressed by the increasing pressure of the surrounding air as it descends, so the air warms up as it subsides. So not only is there cool air at ground level (from onshore flow of cool air), there is also a general subsidence of warm air aloft. The inversion layer acts as a lid to prevent air at ground level from rising and dispersing. If there are mountains inland, the mountains can also help trap the air. This means that any pollutants emitted accumulate in the trapped air. The bottom line is that conditions in California frequently favor the development of temperature inversions. The pollutants will continue to become more concentrated until a change in the weather leads to the breakup of the inversion layer.

http://en.wikipedia.org/wiki/Temperature_inversion
2. http://www.infoplease.com/ce6/weather/A0848126.html
3. http://www.tpub.com/content/neets/14182/css/14182_95.htm
4. http://daphne.palomar.edu/calenvironment/smog.htm
5. http://www.bbc.co.uk/weather/features/az/alphabet27.shtml

Design Brief:

We are trying to test if a temperature inversion is occurring at the launch site. We will know if this is happening if the temperature decrease then gets warmer over a 30 foot area. We will test this by launching a gondola attached to a balloon. On the gondola their will be our test that must way under 6 pounds. We will use a thermometer and a device that will calculate the height. The device we haven't determined this exact device yet. Every 5 feet we will test the temperature and height then store it on a Hard Drive. However, we need to build a device and program that will do this. If we have extra time we will add an hygrometer, Carbon dioxide detector, and oxygen detector. We also need to figure out how to make a system that will record the info and save it in

a format that a computer will be able to use. The program will need to be built to operate on a Mac or PC, preferably PC for functionality. This system will also need to be as cheap as possible, considering little funds. Their is also the possibility of sending the info by wifi to a Laptop.

Hypothesis #1:

We think that their is a temperature inversion occurring in Paso Robles and that's why we have poor air, its not the worst but its not the best. This would be occur if the temperature as we increased in height got cooler and then suddenly warmer. We also believe that it will be with in 1000 feet of the surface because the mountain and the cool wind from the ocean probably flows right over the temperature inversion layer and probably causes the whole thing.

Hypothesis #2:

The temperature inversion will get determined in one location. By using co2 [Carbon Dioxide] detectors and oxygen detectors to determine if the temperature inversion it will get a better result or in a similar pattern to the other data received.

Hypothesis #3:

The thermometer will measure temperature and an anemometer to tell us relative humidity. The temperature will be used to determine if a temperature inversion is occurring and the humidity will be compared to the other data to determine if there is any correlation to the other data. We are going to put this on a balloon with the wait of less those 6 pounds to meet federal standards. We are going to put this on a platform with a computer hard drive to record the information, which on returning we will extract from the hard drive and use to determine if a temperature inversion is occurring.

PDS:

This device that is called HP must weigh under 6 pounds for federal standards. The device must carry a thermometer to check for a temperature inversion. It must also carry something to measure height. It must also carry a Barometer and lab pro that will test the temperature accurately down too a hundredth of a degree in Fahrenheit every 5 feet. The device must also have a large enough storage to hold the information.