**Problem Statement:**

The United States Geological Survey maps the magnetic field of the earth using drones that carry magnetometers. Currently, the hexacopters in use require seven different fifteen-minute flights for one survey of data collection, due to the drone’s energy expenditure, and the hexacopter also introduces a source of magnetic interference for the magnetometer. Therefore, a new drone is needed with an increased flight time and the ability to maintain a low magnetometer interference.

**Purpose & background:**

The purpose of this project is to design a multifunctional drone with prolonged flight time capable of carrying sensors. The main focus is on light weight design, which can be helped with a helium balloon to add buoyancy, without having to use as much power to maintain flight. Currently consumer drones have a limited flight time of around 20-30 minutes on average. *Lighter than air* systems are appealing since the energy required to keep them airborne is small. The lift of the *lighter than air* drone is mainly aerostatic. Consequently, *lighter than air* drones spend the most energy moving and compensating for wind disturbances, rather than trying to keep themselves airborne. By implementing a system that keeps the drone naturally buoyant, the flight time of the drone could be extended from dozens of minutes to multiple hours. Long flight time will allow the drone to be better for data collection and other scientific and commercial purposes.

**Solution:**

The use of a helium lift bag will decrease the energy needed to maintain flight and increase flight time, and reduce the size of the onboard electronics, reducing the magnetic interference of the drone.

**Goals:**

* Use a helium lift bag that can off-set the weight of the magnetometer of around 3kg
* Ensure the on board drone electronics generate minimal magnetic interference with the magnetometer. This will be measured with a gauss meter in Teslas
* PCB design with less than 100g of mass
* Raspberry Pi Zero microcontroller as the main interface between onboard sensors and motor control using I2C and SPI protocols
* Feedback control system software onboard Raspberry Pi to provide millisecond control to flight motor

**Stretch goals:**

The helium lift bag drone could be outfitted with a camera tripod mount for modularity. This mount can extend the use case beyond carrying the magnetometer.