Short:

Although drones are useful tools, they are loud, heavy, and have limited flight time. This is mainly due to their reliance on batteries to power propellers for lift. By creating a small drone that is neutrally buoyant in the air due to a helium (or hydrogen) balloon, the drone will cost much less and have a much longer flight time. The applications are many of a drone that could stay in the air for a long period of time at a low cost. Detailed surveying of dangerous areas or creating a portable network for outdoor events are two potential uses.

Extended:

Drones are useful tools for many applications. However because they are heavy from large batteries, the flight time is often limited and most of the power is drawn to keep the drone in the air and not to move around. Most drones at a consumer level only have flightimes of less than 20 minutes before needing to be recharged. By decreasing the weight of the drone and making it neutrally buoyant in air due to a helium balloon, the battery life can be extended much longer even with a smaller battery since the drone will not need to expend energy to keep on its same trajectory or remain stationary in the air. This will benefit companies that want to use drones over an extended period of time at a lower price than what is currently available on the market.

The build of this drone would be created using helium balloons made of Mylar, carrying a raspberry pi zero for on board controlling the drone, as well as an adjustable propeller and fin in order to steer the drone. Since the lift strength of Helium is around 92.5 grams per cubic meter, and since the weight of a raspberry pi Zero is about 9 grams, I estimate that the overall weight of the drone could be kept to under 30 grams total, and therefore the balloon could be around the size of ⅓ cubic meter. I also know that by using Mylar the strength of the balloon could be relatively high for its weight. Mylar would also keep the price low since Mylar only costs less than $3 for a square meter. One subject I still need to know more about is how the temperature and pressure changes of increasing and decreasing the altitude of the balloon will affect the lift strength of it. Will keeping the helium at the same temperature as the outside air be enough to keep the balloon naturally buoyant? I also need a greater understanding of the size and strength needed on the propeller and fin in order to keep the drone stable and controllable against winds it may encounter at high altitudes.

This project will require a lot of skills and knowledge of a variety of subjects. The members of the project will need a solid understanding of basic physics in order to make sure that the neutrally buoyant aspect of the project behaves as planned. The project team would also need skills in CAD (such as solidworks), UAV design, and embedded systems for the Raspberry Pi zero. I personally have a decent understanding of the physics for this project as well as of all the other topics listed. I have worked with solidworks a good amount of time and should be able to CAD at the level required for this project. I also have written a good amount of code for embedded systems and am currently taking a UAVs class that will teach me the design aspects of the UAV that I may be currently lacking. I also bring strong leadership and a creative vision for the project that will help the team navigate through problems that may arise. From this project I hope to learn how to combine many of the skills I have learned throughout college into something larger and more impactful, as well as mastering skills that I am already proficient in.