Our team, Long Flight Time Buoyant Drone, is designing a drone called The Barone to assist in research data collection. We are a senior design project team in the engineering department, and we have chosen this project to satisfy our major exit requirement. The team consists of six members, Dylan Harootunian, Chin Ming Ryan Wong, Leonid Shuster, Jeremy Germenis, George Hernandez, and Isaac Szu. George Hernandez and Chin Ming Ryan Wong are both Porter affiliates, and all members are seniors at UCSC in the Baskin School of Engineering.

Drones are incredibly useful tools for data collection due to their maneuverability and speed but suffer from a short flight time. In most cases, the factor limiting flight time is the weight of the drone, since a majority of the energy expended by the drone is to maintain its altitude, and adding larger batteries only increases the weight, so this solution is not feasible. For researchers, the flight time becomes even worse due to the drone needing to carry heavy sensors.

We are currently in contact with Jonathan Glen, a geophysicist and researcher for the United States Geological Survey, or USGS. They use drones to collect magnetometer data to identify hard-to-spot geological features, such as subterranean rivers. They currently use a DJI Matrice 600 Pro to gather data, but it can only make 15-minute-long flights. With our discussions with Jonathan, we’ve developed our project requirements to develop a drone with a long flight time to meet the needs of researchers to be able to take larger sets of data. Although we are primarily speaking with Jonathan about the needs of the drone for the USGS, the drone platform can be used for other research areas.

The primary goal of the drone is to increase flight time and to carry a magnetometer sensor that weighs approximately 1 kilogram. In our design, a buoyant force will be added using helium in order to achieve this goal. As we add more helium to the system, effective weight decreases, so the drone uses less energy to maintain its altitude, resulting in an increase in the drone’s possible flight time. As more helium is added, the size of the drone increases, which adds additional drag, making the drone harder to fly. We needed to strike a balance between using helium to generate maximum lift force while not increasing drag to a point where we lose controllability. Additionally our unique take on drones lets us find additional benefits from using buoyancy, such as a self correcting force making the drone almost impossible to tip over, and buoyancy also enables a smaller propulsion system which reduces interference for sensors and generates less noise. With our current design we expect to have a minimum flight time of 37 minutes, double that of many modern drones.

In the spring quarter we are manufacturing, assembling, and testing our project to determine its effectiveness and use. Currently, we have not acquired funding and we would appreciate the help of Porter College to fund our project. We plan to test in an indoor environment at 2300 Delaware Ave, and if able, perform a flight test outside. The tests will demonstrate whether or not a buoyant drone will be beneficial to researchers who require the ability to carry large sensor payloads for a long period of time to collect more data. We hope our project can introduce a more effective method of data collection for research purposes. Additionally, as our senior project, this is our first opportunity to get involved in an engineering project and has facilitated the development of our engineering skills by solving a real world problem. This quarter we would like to verify our work and learn where we succeeded in our project, and what areas we need to improve.

The creative idea of adding buoyancy to a drone brings innovation to the stagnant field of drones. People have overlooked gas-filled airships for many years due to the idea that they are old and outdated. Our team however takes a closer look and sees the many potential benefits of using a buoyant system over the modern quadcopter. By taking the best aspects from both older buoyant designs and modern drone designs we hope to assist researchers in a myriad of fields. Our unconventional design aims to bring out everyone's creative interests in technology and design. We hope to use our technical skills, creativity, and teamwork to introduce a new approach to data collection, as well as to help evolve the drone community as a whole, through our project, The Barone.