Team Name

Long Flight Time Buoyant Drone

First Name, Last Name, Email Address, Field of Study/Department for each UCSC team member

George Hernandez, [gherna31@ucsc.edu](mailto:gherna31@ucsc.edu), Electrical Engineering  
Isaac Szu, [iszu@ucsc.edu](mailto:iszu@ucsc.edu), Electrical Engineering

Leonid Shuster, [lshuster@ucsc.edu](mailto:lshuster@ucsc.edu), Robotics Engineering

Dylan Harootunian, [dhharoot@ucsc.edu](mailto:dhharoot@ucsc.edu), Robotics Engineering

Jeremy Germenis, [jgermeni@ucsc.edu](mailto:jgermeni@ucsc.edu), Electrical Engineering

Chin Ming Ryan Wong, [cwong744@ucsc.edu](mailto:cwong744@ucsc.edu), Electrical Engineering

Phone number for team leader

(410) 861-7326

Team tagline / summary of what you do ( 8 words or less)

Engineering buoyant drones as tools of research

Problem statement: Your problem statement is a clear description and background information on the identified problem. An effective problem statement is well researched, shows a deep understanding of the issue, and builds a strong case to support why the project is needed. This includes but is not limited to: research/statistics on the problem, and/or research/statistics about the target community or market. (100 words or less)

Drones are extremely useful to research and data collection due to their maneuverability, speed, and customizability, but are primarily limited by their short flight times. The United States Geological Survey uses drones to collect magnetometer data and identify underground geological formations, but their drone is limited to a 15-minute flight. Due to the short flight time, researchers require return trips to swap out the battery, losing additional time from data collection. Most of a drone’s energy is used maintaining its altitude, so decreasing its effective weight saves energy and is the best option to increase flight time.

Overview: Your overview is of any existing services, programs, interventions, or products that have been designed or implemented to address this problem. Where applicable, applicants should discuss the limitations of these approaches, the gaps that still exist, and present research on what has been done in the past and where those solutions fell short. (100 words or less)

The United States Geological Survey currently utilizes the DJI Matrice 600 Pro. The drone is capable of 15-minute-long flights and has a purchase price of $6,600; additionally, the drone operates on six custom batteries that cost over $100 each, which rapidly increases the drone’s costs since multiple trips are required. A powerful propulsion system is required to carry the 1 kg magnetometer payload, but the high-powered electronics introduce electromagnetic interference for the payload. The H-Aero, a buoyant drone, is a potential option to reduce the flight time restriction but also costs more than $10,000, so it is cost-prohibitive.

Summary: Your summary of the innovative project (e.g. program, service, product, etc.) how it works, and its intended impact. This is the “nuts and bolts” portion of the proposal and focuses on what the project will look like. (100 words or less)

The Barone reduces its effective weight from 44N to 4.6N by using a helium lift bag, increasing the drone’s flight time to 32 minutes. Since the propulsion system needs less power to maintain its altitude, the drone also uses lower power electronics that produce less electromagnetic interference. The lift bag also stabilizes tilt angle. and the drone is maneuvered by changing the propeller directions using servos. The Barone’s increased flight time will enable researchers to collect more data at a time and more easily conduct their research.

Business Model: How this will be funded and/or make money? (100 words or less)

The drone enables researchers to collect larger sets of data at a time, and data collection in research is always required, so even though the market is small, it’s also stable. Also, since the components are 3D printed, the payload mount and drone upgrades can be implemented quickly and easily. Additionally, with the relatively low cost of manufacturing, ~$1500, the drone has the potential for large profit margins that help compensate for the small customer base. The stability of the market and the low costs can provide a steady flow in income to sustain the Barone’s further development and production.

Progress: How far along are you and what have you accomplished to date? (100 words or less)

The drone is currently in the simulation phase with plans to perform an indoor flight test. The drone is designed with accelerometer and gyroscope sensors to ensure stable Remote-Control flight, and the autonomous system is being developed to incorporate GPS and ultrasonics for autonomous flight. The Remote-Control controls system is currently being tested in simulation before the flight test is performed. Fabrication has also been started and the mechanical and electrical components are currently being integrated.

Unique value of your team. (30 words or less per person)

Dylan: Mechanical design lead and pursuing robotics engineer B.S., currently working as Hardware Engineer at SEADS lab in Baskin.

George: Electrical engineering major and control systems lead. He is also a transfer student, a first-generation student, an MEP student, a Renaissance Scholar, and an EOP student.   
  
Isaac: Simulation engineering lead in charge of creating a virtual working model for testing purposes.

Jeremy: First Generation undergraduate pursuing a B.S degree in Electrical Engineering overseeing power management of the system. Currently contracted to enter the U.S. Space Force as an Electrical Engineer.

Leon: Trilingual and multicultural. Pursuing B.S. degree in Robotics Engineering. In charge of sensor and device interfacing, as well as system communication.   
  
Ryan: Trilingual, pursuing PCB and IC design. In charge of PCB design and sensor array sourcing for autonomous flight. Designed a nixie tube clock as an independent project.