Autonomous Lighter Than Air Unmanned Aerial Vehicle

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OBJECTIVE

Create a lighter than air unmanned aerial vehicle (drone) that is maneuverable indoors with enough airlift capacity for a camera.

BACKGROUND

- Lighter than air systems provide sustained airlift capabilities
- Drones can be built smaller than traditional aircraft
- Drones provide a degree of safety by removing human pilots
- Cameras are needed for long distance control
- Sustained flight can be used for the survey of large areas
- Lighter than air flight allows for non-traditional propulsion
- Lighter than air flight is stable even without propulsion

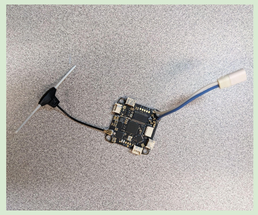
EXISTING SOLUTIONS / PROJECTS

- Current drones are loud and operate continuously
- Drones require high amounts of feedback systems to maintain stability
- Stationary balloons limit equipment mobility
- Existing LTA drone solutions involve extensive work with high learning curves.
- Approachable LTA drones are simplistic such as children's toys

Our Design Approach

- We combined off the shelf whoop drone hardware with a Mylar envelope to obtain the base of a modular system.
- This system is currently remote controlled but has room for additional systems to automate its flight
- Include an approachable system where the propulsion and attachment methods are flexible and adaptable to other envelope styles
- Open-Source software used to modify the flight controller functionality allowing user customization

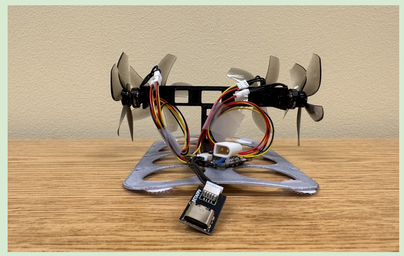
Mylar Envelope



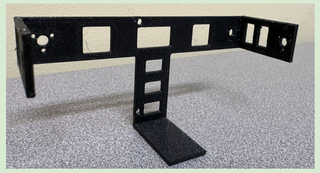
Whoop Drone Flight Controller Board

PROTOTYPING

- Using our 3D printed custom designed propulsion mounting system we achieved controllable lighter than than air flight
- We paired our 3D design with user-friendly drone parts from BetaFPV.com
- The flight controller firmware is modified using BetaFlight software, and controlled with a handheld remote control
- Creating a custom motormix in Betaflight allowed control of the motors in our designed configuration
- 3D printing allows quick design changes, facilitating high variability in motor mounting designs
- Use of velcro allowed design changes without risk of damage to the envelope



PROTOTYPE



3D PRINTED CUSTOM DESIGNED PARTS

FINAL RESULTS and FUTURE WORK

- Flies reliably for approximately one hour
- Maneuverable within an indoor space
- Able to carry up to 155g after a full fill of 80% helium mixture
- Helium fill lasts at least 1 week while maintaining basic functionality
- Next steps
  - Add a camera for long distance control
  - Improve the 3D printing design
  - Extend battery life
  - Improve stability
  - Add new functionality or systems (in-office snack delivery?)

OUR FINAL MOUNT DESIGN

OUR FINAL RESULT

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