Emergency Management Drone

Team 307

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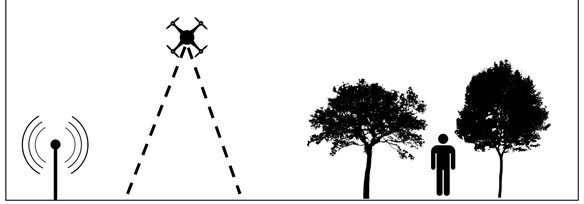
FSU EMERGENCY MANAGEMENT & HOMELAND SECURITY PROGRAM

Introduction

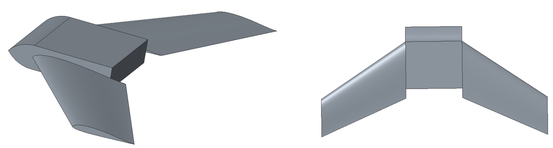
Emergency management drones are used countrywide in searches where foot searches are neither efficient nor safe. The purpose of this project is to design a unmanned autonomous vehicle (UAV) capable of assisting search and rescue teams in finding targets.



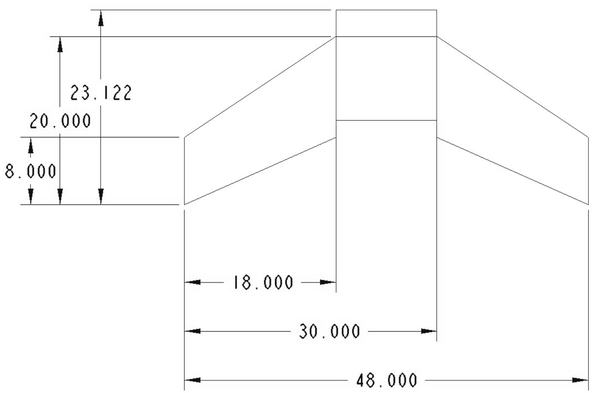
Objectives

- Design a vehicle with the goals of increasing flight time, flight range, improving camera stabilization, and adding more user interface options.
  - Minimum 20 min flight time
  - Minimum 1km flight range from ground source – Optimal range of 2km
  - Maximum 2kg weight
  - Automatic pathfinding
  - Object detection

Mechanical Design



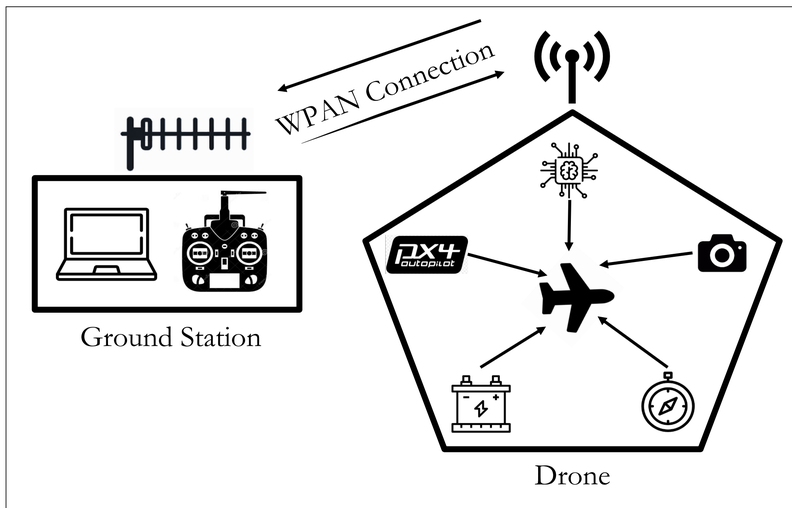
- The UAV was designed as a fixed-wing drone.
- The vehicle totaled a 4 ft lateral length.
- Wings and fuselage were constructed with Expanded Polystyrene (EPS) foam and reinforced with packaging tape.
- Vehicle is powered by a single pusher motor equipped with a 10” propeller.

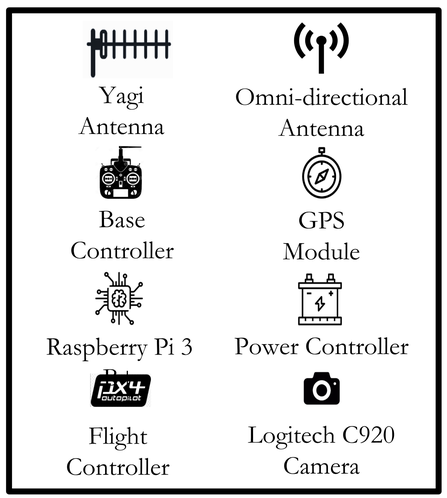


Object Detection

A neural network will be used to detect targets in hazardous environments where the drone will be deployed. The model used for this purpose will be the YOLOv3 (You Only Look Once) retrained only to find “persons”. The image below was labeled using a software called Labelbox. More training will be needed for the neural network to fulfil its purpose.

Electrical Design





Results

- Theoretical flight time
  - Calculations led to an estimated flight time of 30 minutes at 80% throttle.
- Theoretical range
  - The communications system range was calculated to reach a maximum of 12.65km.
  - Survey area on one battery was calculated as 4.7km^2 at 200ft with no images being sent.
- Final weight
  - The weight of all components was 0.9kg, allowing the use of clay to correct the center of gravity.

Acknowledgements

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