D.R.O.P.

Delivery Robot with Otonomous Parachute

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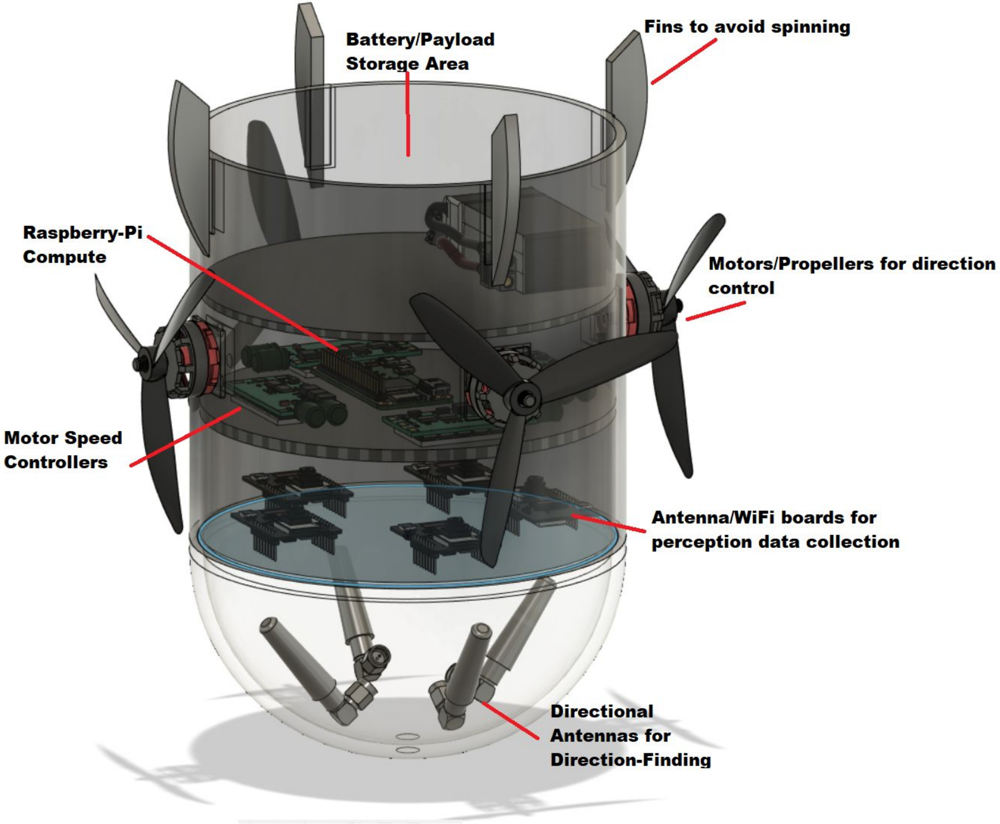
Use Case

- Scenario: Emergency delivery of medicine or blood to remote areas
- Solution: Self-guided airdrop device
  - Precise
  - Cost-Effective

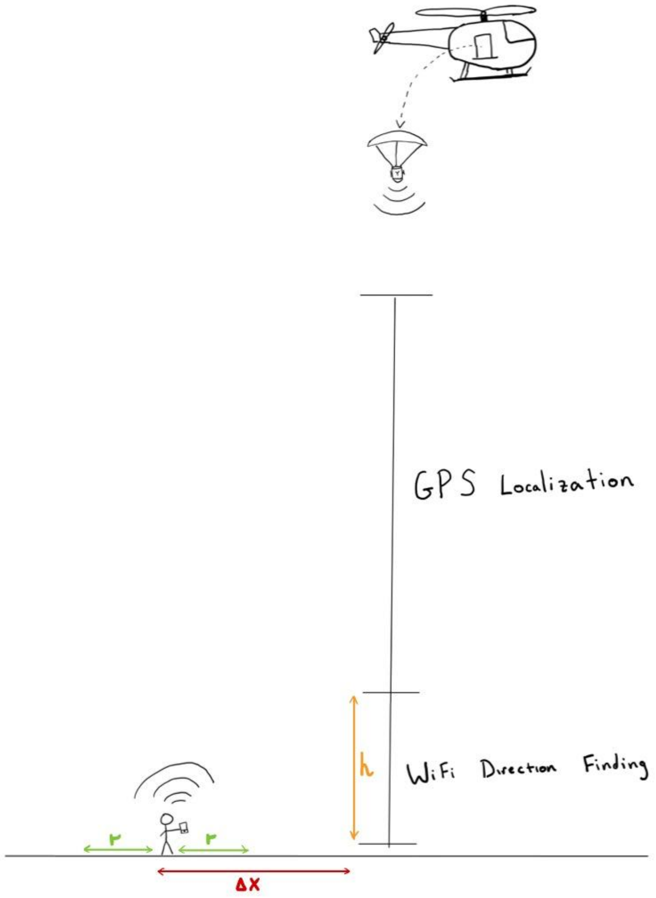
Solution Approach

- Compact Device Containing:
  - Perception system
  - Propulsion System
  - Payload

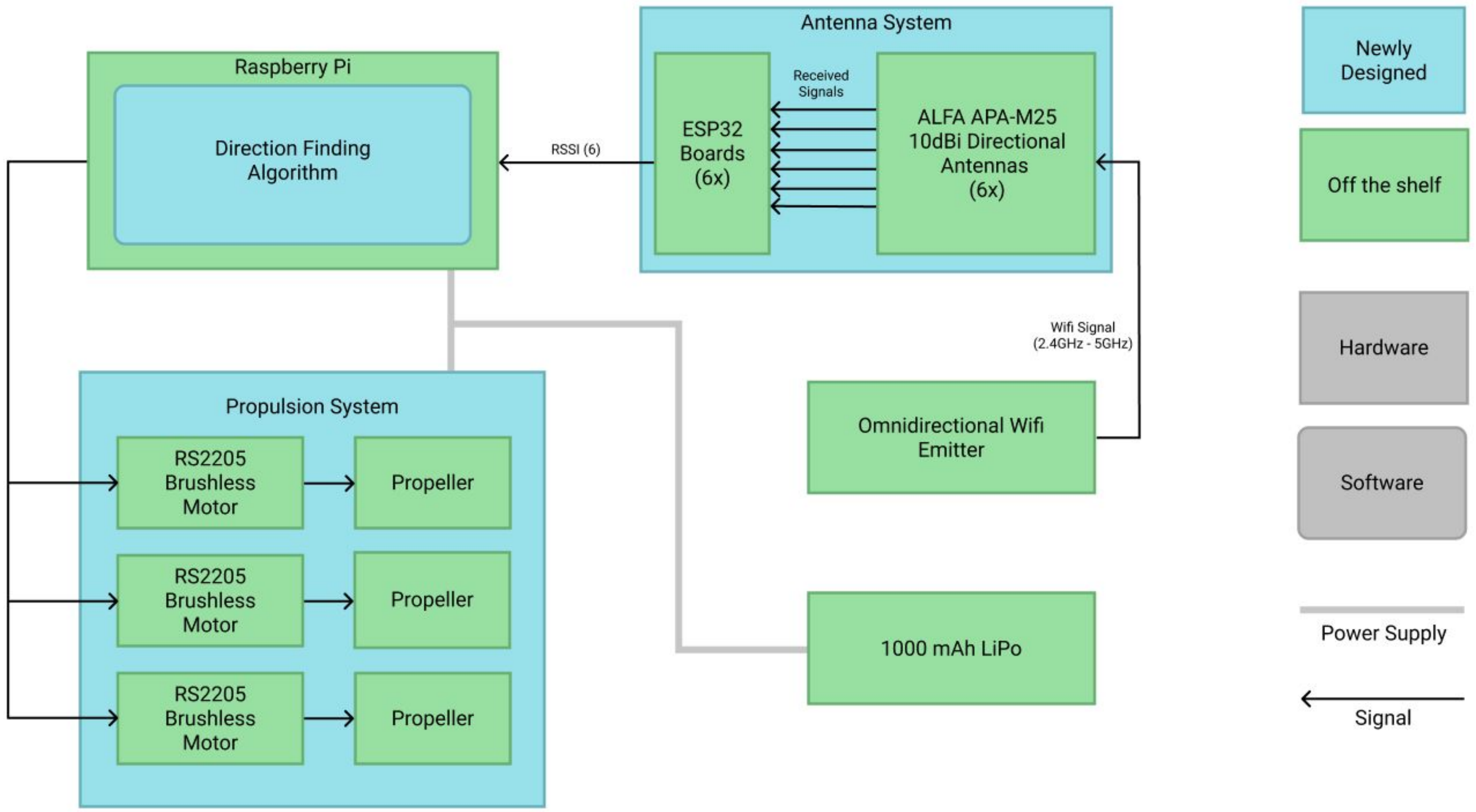


Quantitative Requirements

- Payload weight: 450 grams
  - Standard blood bag unit
- Lateral Drop Distance, $\Delta x = 3$ meters
  - Scaled version of past airdrops (link)
- Landing distance from target, $r < 2$ meters
  - WiFi direction finding after GPS localization



Block Diagram



Implementation Plan

- Hardware off-the-shelf
  - Antennas
  - Raspberry Pi
- Assembly and Software newly designed
  - Direction finding algorithm

Design Choices

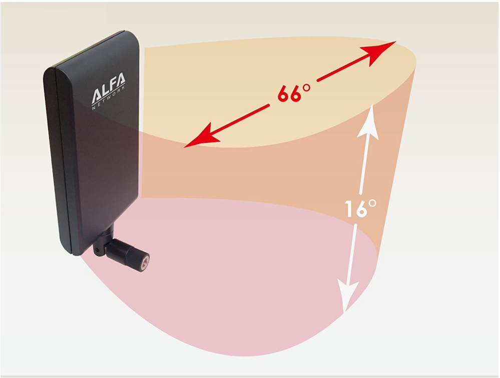
Propulsion:

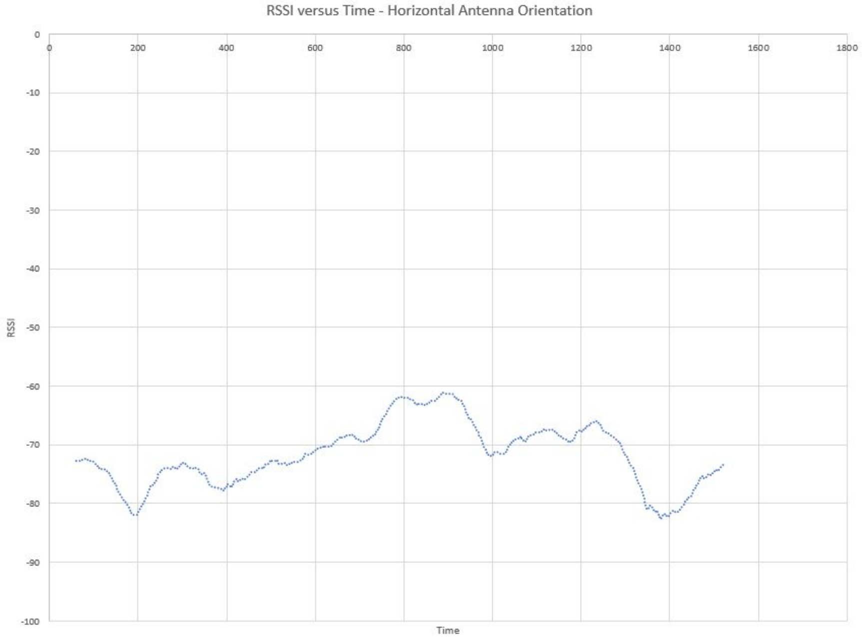
- Compressed gas
- Steerable Parachute
- **Brushless Motors + Propellers**

Design Choices

Perception:

- RTK
- Camera
- LoRA
- UWB
- **Directional WiFi Antennas**





Design Choices

Compute Unit

- FPGA
- Jetson Nano
- **Raspberry Pi**

Design Choices

Housing Material:

- Metal
- Carbon Fiber
- Non 3D printed plastic
- **3D printed Plastic**

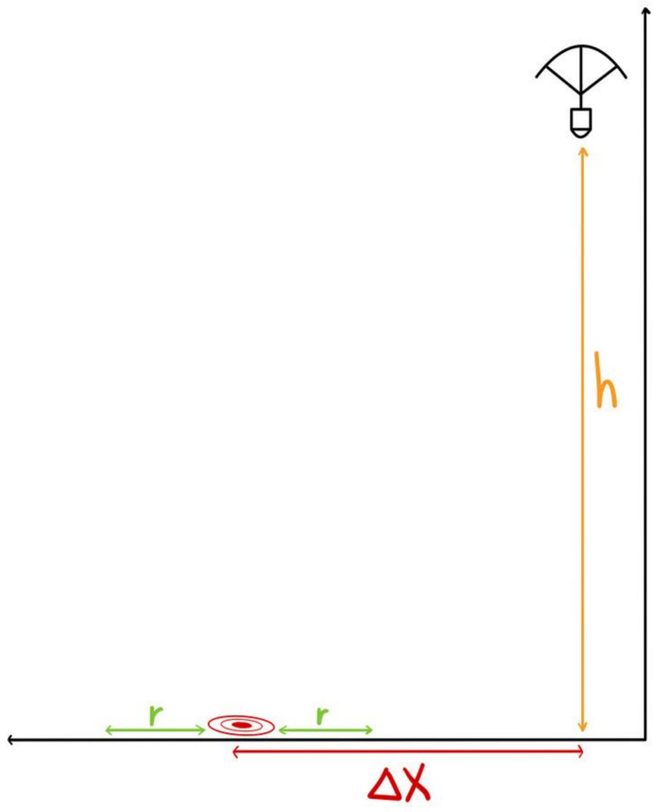
Parachute Size:

- 1 x 64 inch
- 1 x 72 inch
- **2 x 54 inch**

Metrics and Validation

- Final measurement
  - Landing distance from target, r
  - Within 2 meters

- Test inputs
  - Drop height, h
  - Lateral Drop Distance, Δx



Project Management