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



Propulsion:

- Compressed gas
- Steerable Parachute
- Brushless Motors + Propellers



Perception:

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



RSSI versus Time - Horizontal Antenna Orientation



Compute Unit

- FPGA
- Jetson Nano
- Raspberry Pi



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



	10/3 - 10/9	10/10 - 10/16	10/17-10/23	10/24 - 10/30	10/31 - 11/6	11/7 - 11/13	11/14 - 11/20	11/21 - 11/27
Pre-Tests								
-Drop Speed								
-Propellor Thrust								
Housing								
-CAD								
-3D Printing								
Antennas								
-Assemble Antenna Array								
Propulsion								
-Assemble Motors and Propellers								
Controller								
-RSSI Filter Design								
-Direction Finding from RSSI								
-Propulsion Vectorization								
Integration								
-Antennas w/ Raspberry Pi								
-Raspberry Pi w/ Propulsion								
-Assemble Parts in Housing								
Testing								