RED Delivery System
(Recovery and Deployment System)

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Client: Markus Wilde - mwilde@fit.edu

Client Meetings: Weekly meetings with faculty advisor (Dr. Wilde) and or the Aerospace Senior Design Professor (Dr. Demoret) to discuss purpose, requirements, funding, and functionality of the RED System. Typically held on Mondays, but are subject to weekly change.

Goal and Motivation: RED (Recovery and delivery) system is a project that is designed to help others in need by delivering medical supplies utilizing unmanned aerial systems. It is a two stage delivery system which consists of a fixed wing mothership (parent) and a multirotor (child). The main objective of this project is to develop a system which accurately delivers goods from one place to another in a very short period of time. The project was originally envisioned to deliver medical kits to people trapped in emergency situations; thus, to achieve this objective, we plan on having an autonomous flight of both the UAVs and building an autonomous package deployment system to make precise deliveries.

Approach: The key features of the RED Delivery System that allow the delivery of emergency assistance for victims, are a constant exchange and analysis of GPS data, control systems to initiate the deployment of the drone from the mothership, the implementation of flight commands sent from a Raspberry Pi to a Pixhawk Radio to direct the drone to a precise location. The constant data exchange will consist of using either the Pixhawk radios GPS feature, or an additional GPS device attached to the Raspberry Pi's to let each UAV know where the other is, which will also determine which stage of the mission the system is in. The hardware for the control systems will consist of sensors that determine successful deployment and docking, so the system can determine the next step of the mission to complete. The flight command implementation will send the appropriate flight commands based on the current mission stage and GPS coordinates, so the system can act autonomously.

Novel Features/Functionality: The RED Delivery System is completely autonomous system that completes a mission based on only a precise GPS coordinate as an input.

Technical Challenges: Some major challenges are understanding how the flight commands and Pixhawk Software works, communicating between a Raspberry Pi on the mothership and a Raspberry Pi on the multirotor without a shared network connection on the ground, understanding how to implement error handling for a docking system that is based on aerial performance of two Unmanned Aerial Vehicles (UAV'S). There is also a challenge in understanding the Pixhawk radios' capability to communicate with each other and using the Raspberry Pis as processors. If the radios can communicate with one another while using the Raspberry Pis to identify mission stages and error handling, there is no need for a shared network on the mothership.

Milestone 1 (September 30):

- Compare and select technical tools for communication between single board computers and hardware sensors to identify system phases to the software through the single board computers.
- Provide a demo to display communication between a Raspberry Pi and a Pixhawk Radio
- Compare and select collaboration tools for software development, documents/presentations, communication, task calendar
- Create Requirement Document
- Create Design Document
- Create Test Plan

Milestone 2 (October 28):

- Constant GPS data exchange with reasonable performance.
- Create functional custom Pixhawk flight commands for success and flight failure/error handling.
- Efficient state machine for phases of mission.

Milestone 3 (November 25):

- Autonomous deployment of drone within certain GPS proximity of target GPS coordinate.
- State machine capability to recognize success/failure of docking

Task	Andrea	Miguel	Marley
Compare and select Technical Tools	Research network capabilities and options for data exchange	Select hardware for sensors to identify phases	Research network capabilities and options for data exchange
Communication Demos	Make decision for approach to communication and prepare demonstration	Look into options for establishing communication without modifying Pixhawk open source code	Look into options for establishing communication using Pixhawk open source code
Resolve Technical Challenges	Flight Commands	Network Communication Solution	Error Handling
Compare and select Collaboration Tools	Documents/Presentations	Programs	Communication, Task Calendar
Requirement Document	Write 50%	Write 25%	Write 25%
Design Document	Write 25%	Write 50%	Write 25%
Test Plan	Write 25%	Write 25%	Write 50%

Approval from Faculty Sponsor

"I have discussed with the team and approve this project plan. I will evaluate the progress and assign a grade for each of the three milestones."

Signature: _____ Date: _____