RED (Rescue Delivery System)

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NORTHROP GRUMMAN

ENGINEERING & SCIENCE STUDENT DESIGN SHOWCASE

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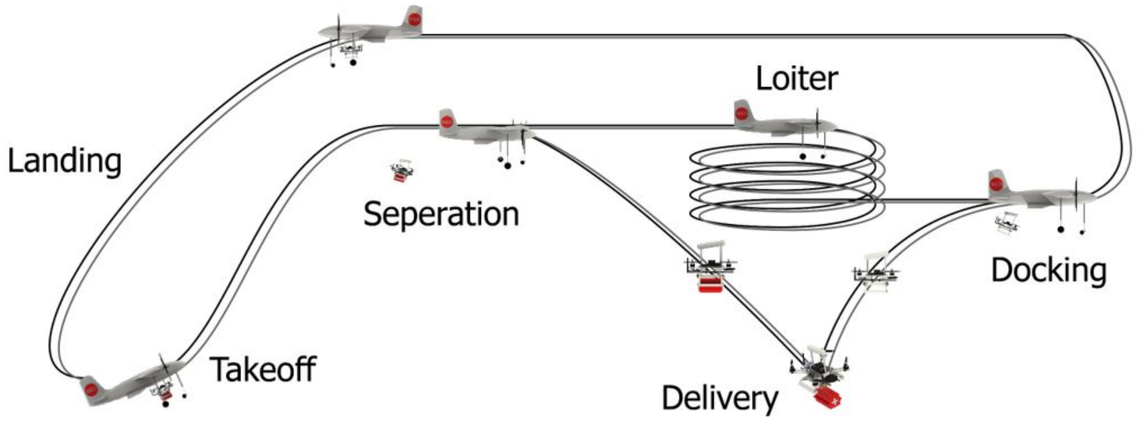
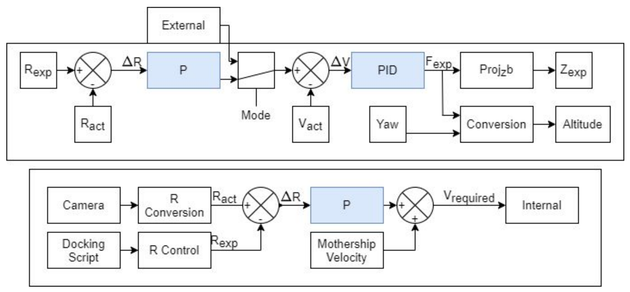
Overview

RED is a two stage delivery system consisting of a fixed wing mothership and a quadcopter. It is designed for fast and precise emergency rescue by delivering medical supplies.

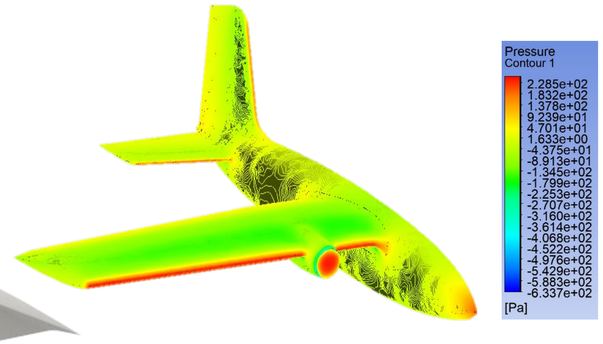


Controls



Propulsion

- Thrust to weight ratio: 0.9
- Mission flight time: 10 min



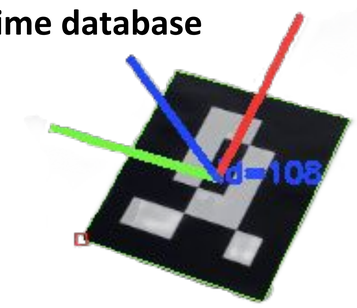
Aerodynamics & Stability

- CFD simulations on ANSYS Fluent and MATLAB were used to compute flight performance
- Static Margin: 15%
- Take Off Distance: 18 m
- Landing Distance: 25 m
- Stall Speed: 11 m/s

Software & Avionics

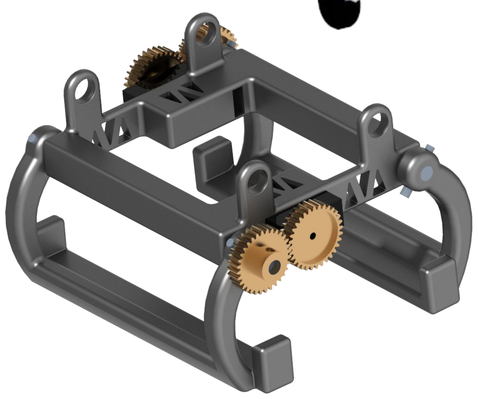
- Autonomous mission-based state machine
- Analyzes GPS, camera, and sensor input
- Sends custom flight commands to Pixhawk flight controller

- Detects ArUco Marker to determine absolute position for precise docking
- Aircraft communication via real time database



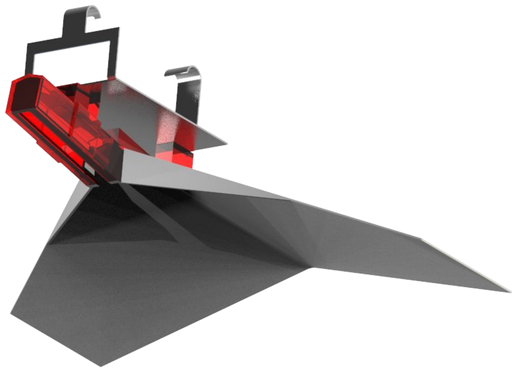
Docking System

- Plate manufactured using foam facilitates docking procedure
- Rail manufactured using 3D printing secures the multirotor
- Pressure sensor locks and release multirotor



Deployment System

- Designed to carry and deploy 400g medical supply payload
- Housing and claws are 3D printed with PLA plastic
- Servos and gears are commercially bought



Structures

- Max. Take off weight: 6.5kg
- Analysis performed using hand calculations and ANSYS Workbench
- Landing gear manufactured to accommodate multirotor beneath mothership

Acknowledgments: We would like to thank Mark Moffett (PhD Student) and Ferruccio Rossi (Graduate Student) for their guidance throughout the course of the project.