Project Name   **Rescue Delivery (RED) System**

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Drones are increasingly being used as innovative tools in the healthcare field. RED (Rescue-Delivery) system is a project that is designed to help in emergency situations by utilizing unmanned aerial systems to deliver medical supplies. Although multiple air-based delivery methods are currently available, they all have certain limitations. Dropping a package from a fixed wing aircraft using a parachute is limited by its accuracy while using a drone on its own to deliver a package is limited by the low endurance and range of the multirotor drone. Thus, a need exists for an air-based delivery system that is both accurate and can deliver a payload to a distant location. By using a combination of a fixed-wing mothership and a multirotor drone, the RED system will be able to conduct fast, accurate and autonomous delivery of a payload from a base to the rescue location and then return to the starting position.
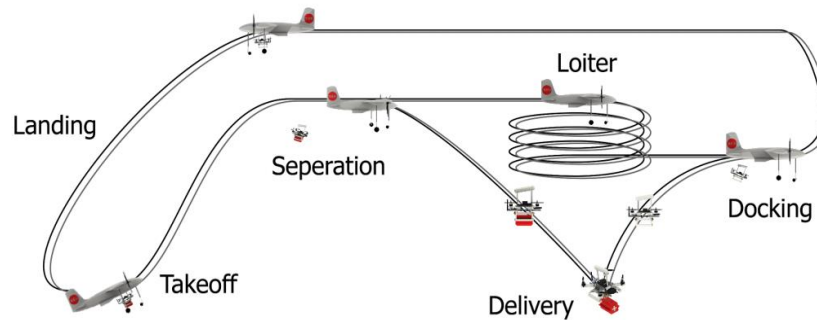

Figure 1. Concept of Operation

The mothership is first loaded with the payload and the coordinates of the delivery location. Upon reaching the pre-selected area, the multirotor and payload detach from the mothership. The multirotor quickly reaches the coordinates and delivers the payload. Once the delivery is accomplished, the multirotor rendezvous and docks with the mothership. Both drones then return to the base with complete autonomy. The communication between mothership and multirotor is accomplished through a high-speed cellular network system. A Raspberry Pi is placed in each UAV and they communicate with one another using a Secure Shell (SSH) connection, which also encrypts the communication between both UAVs and the ground station. One of the hardest parts of the project is to create a reliable docking system and flight procedure for the UAVs. The final docking maneuver is initiated by the image tracking system which captures real-time video and processes it frame by frame. By using an open source python library, each video frame's data can be captured and manipulated to achieve the desired results using OpenCV.

Figure 2. RED System