DALHOUSIE UNIVERSITY
FACULTY OF ENGINEERING

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Merivale
SERVICE IS OUR PASSION, PEOPLE OUR STRENGTH

Department of Electrical And Computer Engineering

Development of a Medical Ambulance Drone

Project Background

- Limited access to medical centers in many parts of NS.
- Unique fleet of drones to support communities with medical supplies and incident response.
- Drones already exist on market for transporting medical supplies.

Deliverables

- Technical Statement of Requirements with sub-system breakdown.
- Proof of Concept Demonstration.
- Market survey of medical supply delivery drones and capabilities.

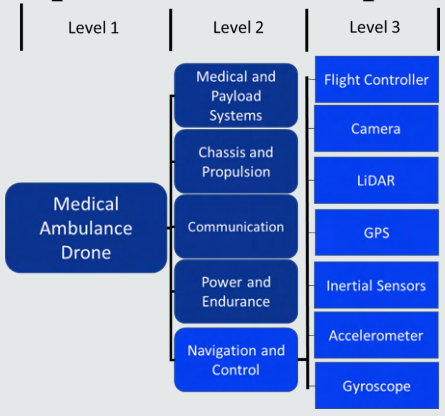
Concept of Operations

- Create a fleet of Ambulance Drones at medical centers with helipad facilities.
- Additional smaller drones are used for distributing medical supplies.
- Need drone for transporting paramedic and patient with capabilities of an ambulance.
- The map shows coverage of Nova Scotia with proposed Ambulance Drone range of 30km in the statement of requirements.
- Ground stations and replaceable batteries would extend coverage.
- An operational network for coordinating drone responses is needed.

Unique Challenges

- Rigorous safety systems for operation in populated areas.
- Landing in unknown accident environments
- Human interaction systems for paramedics and patients.
- Long range operational intelligence network needed.
- Large lift and power capabilities compared to current drones on the market. Hydrogen fuel cells could fulfill endurance needs.
- Adaptive control systems for handling variable patient weights.

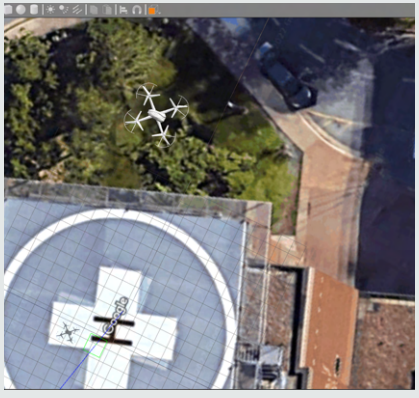
Requirements Development



- Three levels of sub-systems created.
- Defining technical requirements for systems and addressing unique aspects of the Ambulance Drone.
- Focusing development efforts on navigation and control systems.

Winter 2022

Simulation



- Developing control and navigation systems.
- Using Hector UAV systems in ROS as basis.
- Models can be set with approximate drone weight to evaluate lift requirements.
- Drone endurance can be tested to evaluate power requirements.

Summer/Fall 2022

Scaled Model Prototype

- Physical testing and demonstration of control systems using Pelican UAV.
- Complete access to onboard systems of the Dalhousie developed drone.
- Demonstration of obstacle avoidance and handling variable payload weight.

Fall 2022

Design Specifications

Vertical Takeoff and Landing: Capable of ascending and descending vertically.
Drone Intelligence: Drone must be capable of surveying accident area for landing site.
Passenger Stability: Control systems adapt to unknown weight distribution for safety.
Payload Capacity: 260kg for 2 persons and medical equipment.
Range of Operation: 30km to make the drone useful for rural communities.

Future Work

- Build on ROS Hector UAV model to represent larger ambulance drone.
- Implement additional sensors and systems.
- Evaluate lift and endurance requirements through simulation.
- Demonstrate obstacle avoidance and adaptive control systems with physical testing.