Introduction

JAMZ Automated Delivery is a drone delivery service focused mainly on the shipment of food from restaurants to the client. Their drones are ready for use, however, some essential features, like an anti-theft system, an emergency beacon, a climate sensor inside the package, and a violent shake alarm are not functional yet. The main goal of this project is to develop a reliable solution that generates information about the content of the package during delivery. The device should provide valid and consistent data on the temperature and humidity of the food and communicate via radio with an operator from JAMZ.

Problem statement: JAMZ Automated Delivery needs accurate data on their product's temperature and humidity to be constantly transmitted to their drone operator in all stages of the order from the payload to customer reception.

Client's needs (from the meeting)

- The drone delivery service operates in various rural regions of Ottawa, during the summer, spring, and fall. However, it also depends on the weather conditions (for instant rain, intense wind, extreme heat in the summer)
- The route for delivery is in the least densely populated areas.
- The most important criterion: reliability and consistent data, frequently transmitted.Communication via a radio transmitter/receiver. Hardware uses solid connections, no clip-in hardware/wiring.
- Approval by regulatory bodies: Transport Canada, Nascan, RCMP, National defense.
- Max payload weight of the drone: 10 -15kg.
- Singular, detachable module. Located next to payload-drop with a sensor on the payload-drop hook, securely fastened to the drone body.
- The drone can operate in a temperature range:-5 to 25 degrees Celsius.
- The drone is operable at an altitude 61m above ground.
- Climate sensor capable of operating within the drone's power consumption budget

Need statements

Structure of the drone
- The drone carries up to 15kg
- The drone operates in multiple weather conditions
- The drone has a 24 hour battery life
- The maximum altitude the drone can fly to is 61 meters
- The route of delivery is on unpopulated areas
- The drone delivery service is approved by all needed regulatory bodies

Climate sensor
- The data transmitted from the device to the operator is consistent and reliable
- The device that tracks temperature and humidity is compact.

- The sensor operates within the drone's power consumption budget.

Benchmarking

	Drone Delivery Canada https://dronedeliverycanada.com/	Wingcopter https://wingcopter.com	Amazon Prime Air https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011
Drone model	Robin XL	Wingcopter 178	Amazon MK27 UAS
Maximum range	60 Km	40 Km	24 Km
Maximum speed	105 km/h	130 km/h	80.5 km/h
Max payload	11.3 kg	6 kg	2.26 kg
Safety features	Wing's unmanned traffic management (UTM) tools and flight planning software	Computer software is capable of complex flight planning.	Combination of thermal cameras, depth cameras, and sonar to detect hazards

New Issues or Need

- The drone requires forecast weather with hyperlocal precision to determine where severe weather is occurring so the routes can be planned accordingly.
- Cold weather impacts the sensors causing less response on the drone controls
- Cold temperatures can shorten flight times since chemical reactions in the batteries slow down, lowering their capacity consequently shortening the flight time.
- Motors work harder on high temperatures, generating more lift and reducing flight times
- Tall buildings create channels of winds that can clash and twist into tight eddies.
- Shaded sidewalks oppose the sun-baked ones that can produce uneven heat waves, causing unforeseen updrafts and downdrafts.

Conclusion:

The data obtained from the climate sensor is essential for the company since it guarantees that the food arrives in good condition, maintaining the reputation of a reliable service, and possibly attracting more customers.