TEAM 001

First-Aid Drone with Live Medical Assistance (FAD-LMA)

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COE AE 4 ISE ME

Introduction

Problem Statement

There is a critical need for a rapid-response system like our FAD-LMA to deliver medical aid and live assistance to patients in hard-to-reach areas during emergencies.

Project Deliverables

1- Working First-Aid Drone
2- Drone stations optimization model

Constraints

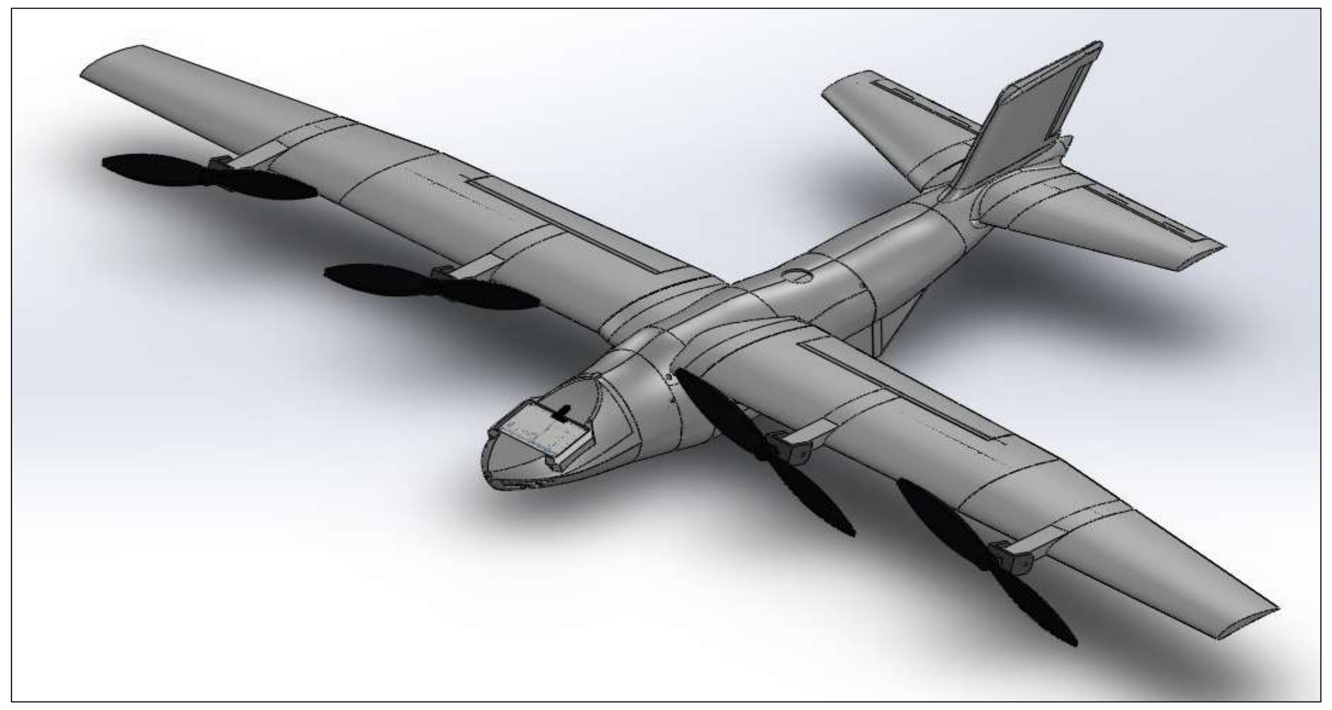
Total weight: ≤ 15kg
Payload weight: ≤ 5kg
Project Duration: 90 days
Budget: ≤ 8,000 SAR
Regulations: GACA UAV Category B & MOH clearance required

All specifications

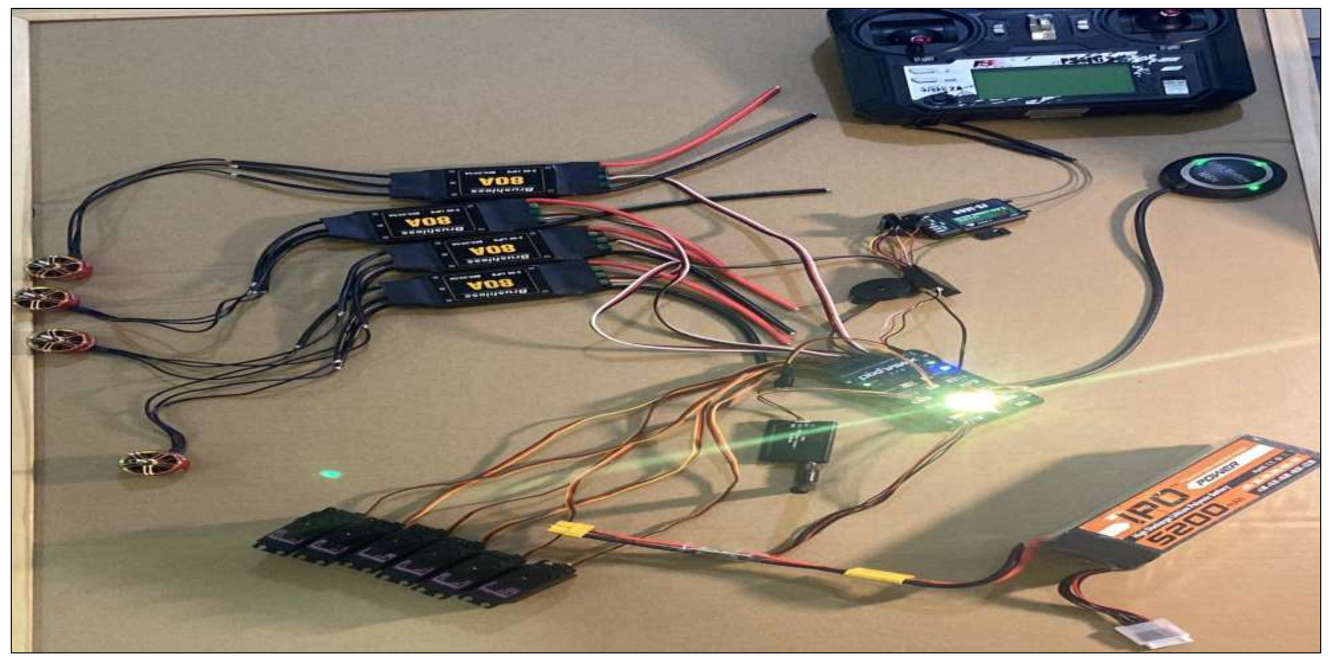
Battery Power: 115 watts
Speed: Can reach up to 60km/h
Range: Can travel a distance of 13.5km
Maximum Flight Duration: 13.5min
Network Latency: should be <200ms
Camera Quality: High-quality with 12MP
Mic. Quality: Clear audio, <65dB SNR

Prototype Design

Structural Design (ME)

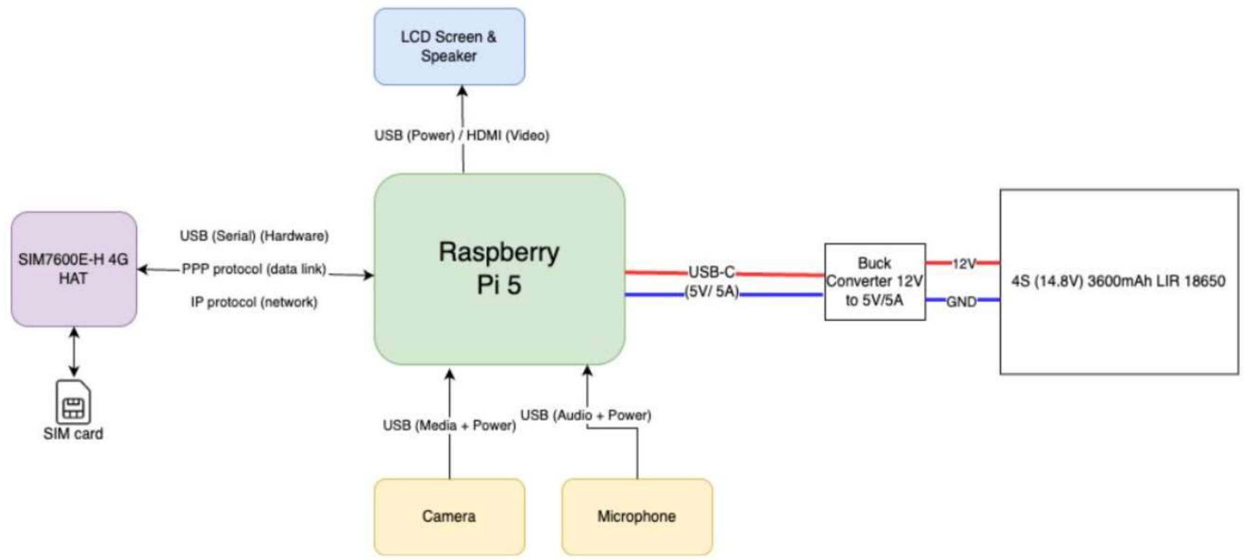


Control System (AE)



Communication (COE)

- Developed a doctor-patient communication system using Raspberry Pi.
- Integrated camera and microphone for audio/video interaction.
- Used a 4G module with a SIM card for internet access and phone calls.



Communication System Block Diagram

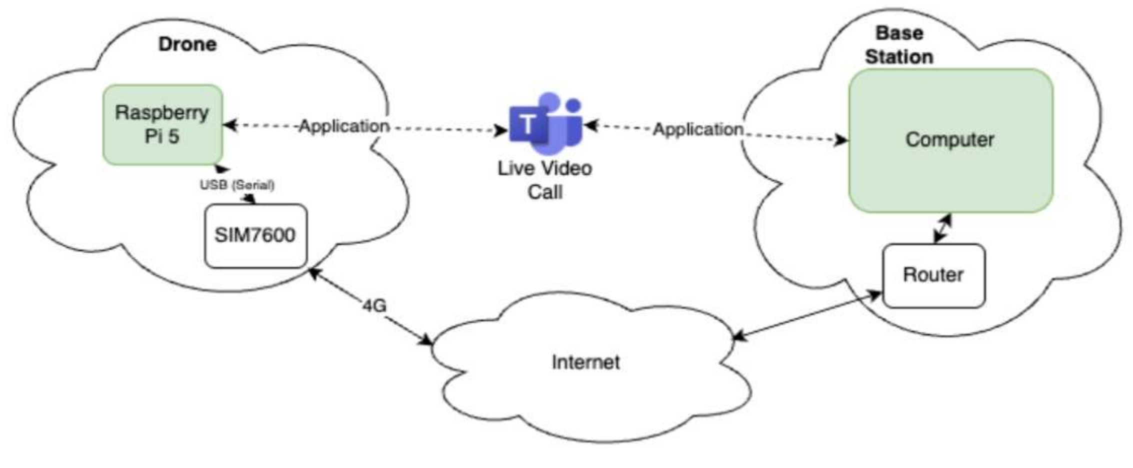
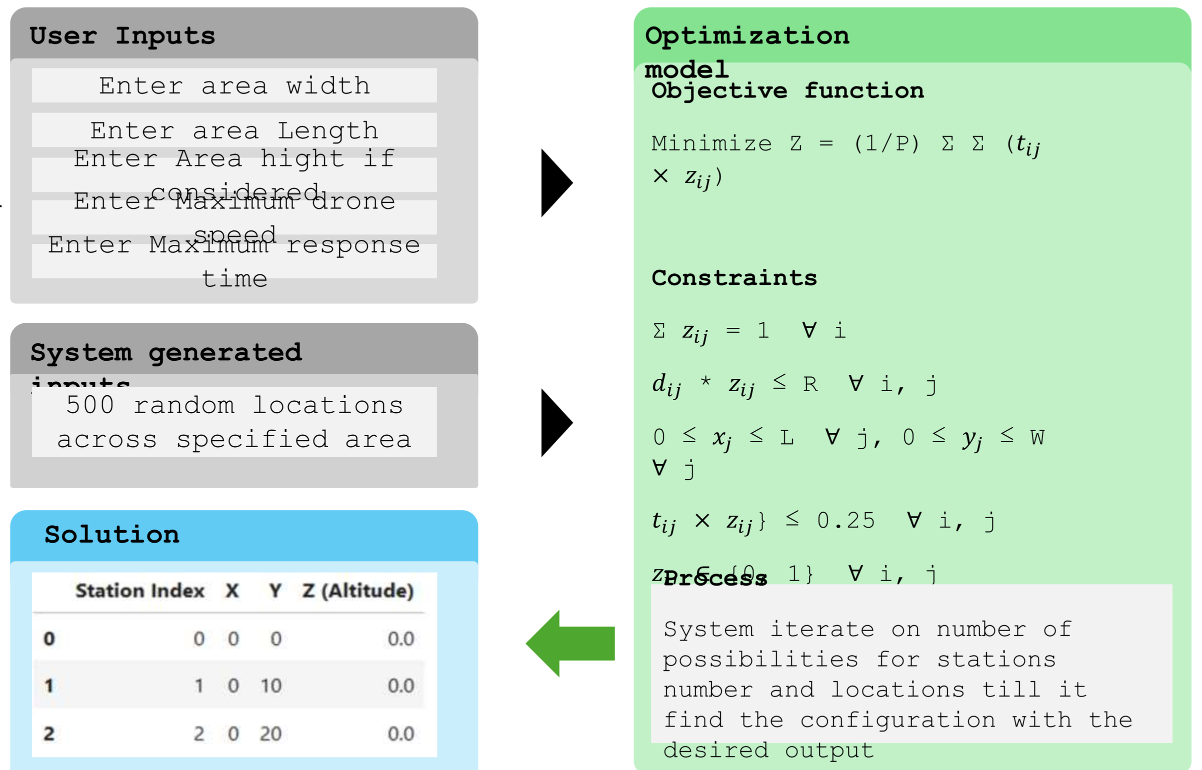


Figure 4 Video Call Communication

Drone stations optimization model

- Built an optimization model to optimize the number and locations of drone stations while meeting service level requirements.
- Applied the model in real scenarios using the professional open-source solver CBC.



Verification and Testing

For the Propulsion and control (AE):

- All motors and propellers are matched to the specifications' quality.
- The control power system is proper to reach the best flight performance.

For the Structure (ME):

- Verify the mechanical components by supervising the manufacturing process to ensure all parts meet specifications.

For Communication System (COE):

- All components were installed and verified to ensure functionality.
- Camera and microphone confirmed via media capture.
- 4G module validated through connectivity and call tests.

For the stations optimization model (ISE):

- Verified outputs on small test cases.
- Tested model behaviour with extreme input values.
- Checked constraint satisfaction and objective consistency.

Conclusion

The VTOL medical drone effectively meets its objective by delivering essential medical kits to remote patients while enabling real-time communication with doctors, marking a significant step toward accessible healthcare.