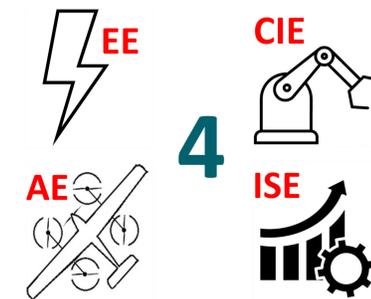**TEAM 25**

Landmine Detection Using Autonomous Unmanned Aerial System (LD-UAS)

Saud Almalki, Aseel Mufawwaz, Alwaleed Alqurashi, Abdullah Almuqbil, Nawaf Alotaibi, Hashim Alhayfani
**Coach: Sultan Ghazzawi**

Introduction

• **Problem Statement:**
Millions of landmines remain buried in conflict zones like Yemen, posing serious threats to civilians. Traditional demining methods are slow, costly, and dangerous.

• **Project Summary:**
The project introduces an autonomous UAV equipped with Ground Penetrating Radar (GPR) and AI-based detection to locate landmines safely and efficiently without human involvement.

Category	Specification / Constraint
Flight & Power	≥ 20 min endurance, < 10 kg total weight, < 0.5 kg fuselage
Detection System	< 2.5 kg, dimensions < 500×350×200 mm, detects up to 150 mm depth, ≥ 95% accuracy
Environmental & Stability	Operates at 35°C, handles 26 km/h wind, fully stabilized, ≤ 80% CPU load, ≤ 50 ms latency
Navigation & Coverage	100% autonomous, ≤ 10% scan overlap, unique area per UAV
Data & Processing	Sensor synchronization ±5 ms, real-time processing, AI accuracy ≥ 95%
Compliance	GACA regulations (< 10 kg), flight license obtainable within 2 months

Prototype Design
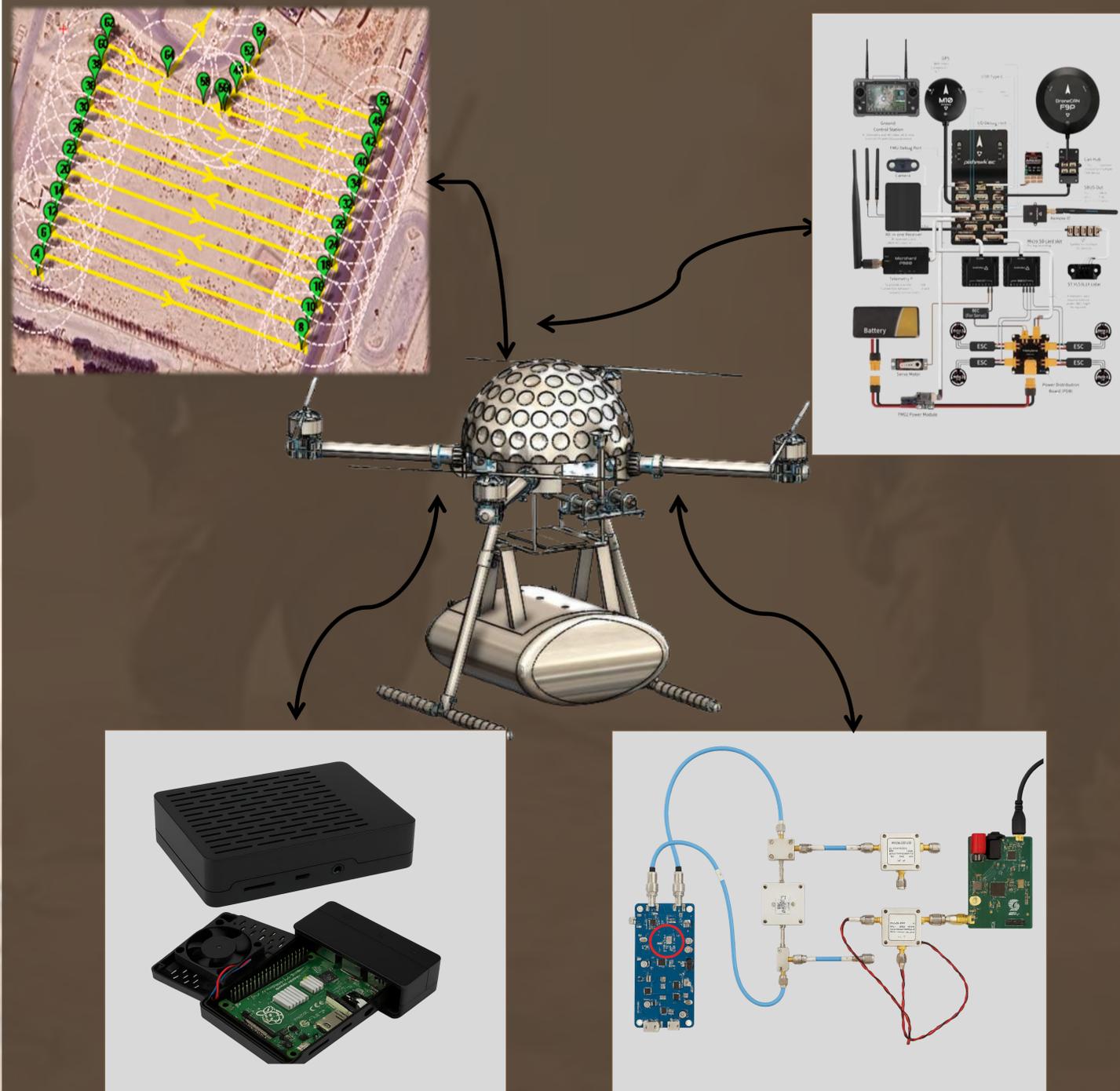
Testing / Validating

Discipline Area	Key Achievements	Highlights
Flight Performance	Exceeded endurance and maintained stability	• 30.4 min flight time (target: 20 min) • Hover drift < ±0.3 m • ~40% drag reduction via CFD-verified tuning
Detection Accuracy	High accuracy in subsurface detection	• GPR detected mines up to 180 mm depth • >95% classification accuracy • Antenna gain & S11 matched theoretical predictions
Control & Synchronization	Stable control with low latency	• PID-tuned response < 0.3 s • Smooth maneuvering • Sensor sync ±3 ms, processing delay < 50 ms
Path Optimization & Autonomy	Efficient mission planning and execution	• 55% path reduction (380.9 m → 169.7 m) • MAVSDK + PX4 for autonomy • Reduced scan overlap & energy usage

Conclusion

• The LD-UAS project developed a fully autonomous UAV for landmine detection, meeting key specifications including 20-minute endurance, 3 kg payload, and 95% accuracy. Through iterative testing, it integrated custom hardware, sensor fusion, real-time processing, and optimization. The system offers a safe, efficient alternative to manual demining, with strong potential for real-world use and future scalability.