Assignment 1 - System Categroization
System Description
CSE 4380

Group Thorin

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1 System Description

1.1 AeroTech Industries and the X9 Drone System

In 2005, Dr. Emily Carter and Dr. Michael Patel founded AeroTech Industries to provide aerospace and defense solutions through the design, development, and manufacturing of unmanned aerial vehicles (UAVs). The company began with the mission to revolutionize aerial solutions by providing cutting-edge UAV technology that enhances efficiency, safety, and decision-making across industries. The earliest drones produced by AeroTech were used for agricultural monitoring, and the company's focus remained primarily on the commercial market until 2020.

AeroTech's progression in drone technology is evident in its product timeline. In 2015, they released the AeroTech X5, which became an industry benchmark for reliability and performance in the commercial sector. The potential for border security, surveillance missions, and emergency services in later models attracted the interest of government agencies as well.

The AeroTech X9, introduced in 2023, is the company's most advanced drone system to date. The X9 emphasizes modularity and adaptability, allowing it to meet diverse mission requirements for government, commercial, and emergency services stakeholders on a global scale. It offers integrated advanced artificial intelligence for autonomous navigation and decision-making. The lightweight and durable materials developed through AeroTech's materials science research protect the aircraft, while state-of-the-art cybersecurity protocols safeguard operations and data integrity.

AeroTech Industries has a global presence with offices and facilities in North America, Europe, Asia-Pacific, and the Middle East, supporting the X9's worldwide operational capabilities. The company continues to invest heavily in research and development, focusing on artificial intelligence, materials science, energy solutions, and cybersecurity to maintain its position at the forefront of UAV technology.

1.2 Purpose and Capabilities

In rural areas, Aerotech drones have provided assistance to many users in the commercial sector since 2008, and the X9 will only improve upon the services previous versions provided. Farming with the X9 becomes a considerably more precise operation. The X9 can be fitted with multi-spectral and thermal sensors to monitor crop health, optimize resource use by identifying areas needing irrigation or fertilization improving yields and reducing cost. Automated drones flights can survey large fields of crops identifying pests and plant disease much earlier than traditional methods minimizing crop damage. In more urban areas, the Aerotech X9 will be used for building, bridge, powerlines, and other critical infrastructure inspections, and the remote monitoring of difficult to reach places like the tops of electrical towers to minimize expensive manual inspections. The X9 will be used for forest health and wildlife monitoring, pollution detection, rapid and efficient delivery in cities, and remote deliveries to locations within rough terrain areas. The capabilities of the X9 in commercial indistries is limited only by the imagination of the user.
(Not Finished)

1.3 System Components

Hardware Components:
Airframe:
Lightweight, durable materials (developed through AeroTech's materials science research)
Modular design for adaptability and customization
Propulsion System:
Electric Motors (Brushless DC)
Propellers
Electronic Speed Controllers (ESCs)
Navigation & Control Hardware:

GPS Module
Inertial Measurement Unit (IMU)
Flight Controller Board
Transmitter/Receiver (for remote control)
Power System:
High-Capacity Battery (LiPo or similar)
Power Distribution Board (PDB)
Voltage Regulators
Payload Interfaces:
Standardized mounting points
Power and data connections for various sensors/payloads
Communication System:
Telemetry Module (for real-time data transmission)
Antennas

1.3.1 Software Components

Software Components:
Flight Control Software:
Stabilization algorithms
Navigation algorithms (GPS-based, autonomous)
Mission planning and execution software
Real-time control algorithms
AI and Autonomy Software:
Machine learning algorithms for decision-making
Object recognition and tracking
Path planning and obstacle avoidance
Cybersecurity Software:
Encryption protocols
Intrusion detection systems
Authentication and authorization mechanisms
Sensor Data Processing Software:
Image processing algorithms
Data fusion algorithms (combining data from multiple sensors)
Communication Software:
Telemetry data encoding/decoding
Command and control protocols
User Interface Software:
Ground control station software
Mobile app for remote control and monitoring

1.3.2 Third-Party Components/Services

1.4 Stakeholders

1.5 Operational Environment