
SOFTWARE REQUIREMENTS SPECIFICATION

for

Drone's Flight Recommendation System

Version 1.0

Prepared by : Soumik Das

Organization : School of Mobile Computing &
Communication, JU

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1 Introduction

1.1 Purpose

This document specifies the software requirements for the drone's flight recommendation System. It includes navigation, vehicle state positioning, delivery, obstacle avoidance, risk assessment, and link reliability as primary features. The purpose is to ensure robust, efficient, and secure drone operations across multiple domains such as logistics, surveillance, and mapping.

1.2 Document Conventions

- Requirements are uniquely numbered as REQ-XX.
- Priority levels are indicated as High, Medium, or Low.

1.3 Intended Audience and Reading Suggestions

This document is intended for:

- Developers: To design and implement the system
- Testers: To verify functionality and performance
- Project Managers: To ensure alignment with business goals
- Users: To understand the capabilities and limitations of the software

1.4 Project Scope

The software will enable drones to perform autonomous and semi-autonomous navigation, accurate positioning, and reliable delivery of payloads. It will provide enhanced safety through obstacle avoidance and risk assessment mechanisms while maintaining robust communication links.

1.5 References

- PX4: <https://docs.px4.io/main/en/>
- Ardupilot: <https://ardupilot.org/>

- DroneKit: <https://dronekit.io/>
- DroneUp: <https://www.droneup.com/>
- Skydio Autonomy: <https://www.skydio.com/skydio-autonomy>
- DJI Terra: <https://enterprise.dji.com/dji-terra>
- PIX4D: <https://www.pix4d.com/>

2 Overall Description

2.1 Product Perspective

The system is an integrated solution designed for autonomous and semi-autonomous drones. It includes modules for navigation, positioning, delivery, and advanced safety features. The system can be adapted to various drone hardware configurations.

2.2 Product Features

- Autonomous Navigation
- Real-time Vehicle Positioning
- Payload Delivery Management
- Obstacle Avoidance System
- Risk Assessment Module
- Communication Link Reliability Monitoring

2.3 User Classes and Characteristics

- Operators: Require basic training for system monitoring
- Technicians: Perform system updates and maintenance
- End-users: Utilize drones for delivery or data collection

2.4 Operating Environment

- **Hardware:** Drones equipped with GPS, sensors, and communication modules
- **Software:** Compatible with embedded systems and mobile platforms
- **Environment:** Outdoor and indoor scenarios, including adverse weather

2.5 Design and Implementation Constraints

- Compliance with aviation regulations
- Limited hardware processing capabilities

2.6 User Documentation

- User manuals and quick-start guides
- Online help and tutorials

2.7 Assumptions and Dependencies

- Assumes availability of GPS and communication networks
- Relies on third-party APIs for mapping and positioning

3 System Features

3.1 Navigation

3.1.1 Description and Priority

Provides autonomous route planning and execution. **Priority: High.**

3.1.2 Functional Requirements

- REQ-1: The system must calculate optimal paths in real-time.
- REQ-2: It should reroute in case of obstacles or restricted zones.

3.2 Vehicle State or Positioning

3.2.1 Description and Priority

Tracks and updates the drone's position. **Priority: High.**

3.2.2 Functional Requirements

- REQ-3: Provide real-time positioning updates with 95% accuracy.
- REQ-4: Integrate with external APIs for enhanced localization.

3.3 Delivery

3.3.1 Description and Priority

Manages payload and delivery tasks. **Priority: Medium.**

3.3.2 Functional Requirements

- REQ-5: Support payloads up to 5 kg.
- REQ-6: Notify users of successful deliveries.

3.4 Obstacle Avoidance

3.4.1 Description and Priority

Detects and avoids obstacles. **Priority: High.**

3.4.2 Functional Requirements

- REQ-7: Use sensors to detect obstacles within a 5-meter radius.
- REQ-8: Implement avoidance maneuvers in under 2 seconds.

3.5 Risk Assessment

3.5.1 Description and Priority

Analyzes and mitigates operational risks. **Priority: Medium.**

3.5.2 Functional Requirements

- REQ-9: Evaluate flight risks based on weather and terrain.
- REQ-10: Alert operators for high-risk scenarios.

3.6 Link Reliability

3.6.1 Description and Priority

Monitors communication links for stability. **Priority: High.**

3.6.2 Functional Requirements

- REQ-11: Ensure link uptime of at least 98%.
- REQ-12: Implement fallback mechanisms for link loss.

4 External Interface Requirements

4.1 User Interfaces

- Intuitive dashboards for operators.
- Mobile app for monitoring.

4.2 Hardware Interfaces

- Interfaces with GPS, LIDAR, and cameras.

4.3 Software Interfaces

- Integration with mapping APIs and cloud storage.

4.4 Communications Interfaces

- Support for Wi-Fi, 4G/5G, and satellite links.

5 Other Nonfunctional Requirements

5.1 Performance Requirements

- Process navigation updates within 500 ms.

5.2 Safety Requirements

- Comply with aviation safety standards.

5.3 Security Requirements

- Encrypt communication links with AES-256.

5.4 Software Quality Attributes

- Maintainability, reliability, and scalability.

6 Other Requirements

- Support for multilingual user interfaces.