VILNIUS UNIVERSITY

SIAULIAI ACADEMY

BACHELOR PROGRAMME SOFTWARE ENGINEERING

Software Project Management Plan for ScatterSky Application Development

Management of Software Projects

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Project Charter Development

Project Objectives

1. Technological Development

Design and Manufacturing: Develop advanced drones with customizable features tailored to national requirements;

Innovation: Incorporate cutting-edge technologies like AI, machine learning, and autonomous navigation to improve performance and efficiency;

Reliability: Ensure the drones are robust, durable, and capable of operating in diverse environmental conditions.

2. National Security and Defence

Operational Support: Provide tactical support to defence and law enforcement agencies;

Threat Detection: Integrate advanced sensors for real-time threat identification and counteraction.

3. Research and Development

Knowledge Advancement: Foster collaboration with academic institutions and research organizations to drive innovation;

Adaptability: Continuously refine and upgrade drone technologies to meet evolving needs.

4. Strategic Autonomy

National Sovereignty: Reduce reliance on foreign technology by establishing an independent supply chain for drone components.

Scope Statement

1. Features of the Drones

High-Resolution Imaging: Cameras and sensors for detailed surveillance and data collection;

Durability: Weather-resistant and long-endurance designs for operations in harsh environments;

Safety Mechanisms: Features such as emergency landing systems, geofencing, and collision prevention.

    2. Application

Ground Control Stations: Development of systems for remote control and monitoring;

Drone Monitoring and Management: battery percentage, remaining flight time, and low-power alerts;

Flight Status Updates: Provide real-time updates on altitude, speed, and operational mode (manual, autonomous, etc.);

Route Planning: Enable pre-defined and dynamic route planning based on the mission requirements;

System Health Check: Perform diagnostics to assess the health of critical components such as motors, sensors, and communication systems;

Maintenance Alerts: Notify operators of routine maintenance schedules or required repairs;

Task Scheduling: Set specific tasks for the drone, such as surveillance areas or delivery points;

Weather Integration: Display weather conditions and suggest operational adjustments;

Emergency Contact: Direct link to customer support or emergency services for immediate assistance;

Feedback and Reporting: Allow users to report operational issues or provide feedback.

Flight Logs: Record and store data from previous flights, including routes, images, and sensor readings;

Data Analytics: Analyze collected data for performance improvement or operational insights;

Secure Cloud Sync: Enable cloud-based storage for mission data and logs.

    3. Support Systems

Training Programs: Comprehensive training for operators and maintenance personnel;

Maintenance and Repairs: Establishment of maintenance hubs to ensure operational efficiency.

Stakeholders

Categorization of Internal and External Stakeholders:

Internal stakeholders are directly involved in or part of the project and its operations.

External stakeholders are not directly part of the project but influence or are impacted by it.

Roles of the Stakeholders:

Key Stakeholders - These stakeholders have the highest influence and interest in the project's success.

Project Team Members - These stakeholders are directly involved in the development, operation, and delivery of the drones.

External Stakeholders - These stakeholders indirectly influence the project or are involved in related operations.

Community and Public - These stakeholders are part of the broader community impacted by the use or presence of drones.

Categorization of Stakeholders: Primary vs. Secondary:

Primary stakeholders are directly involved in the core activities of the project and have the most significant interest and influence over its outcomes.

Secondary stakeholders are indirectly involved, either impacted by or influencing the project in a supporting role or peripheral capacity.
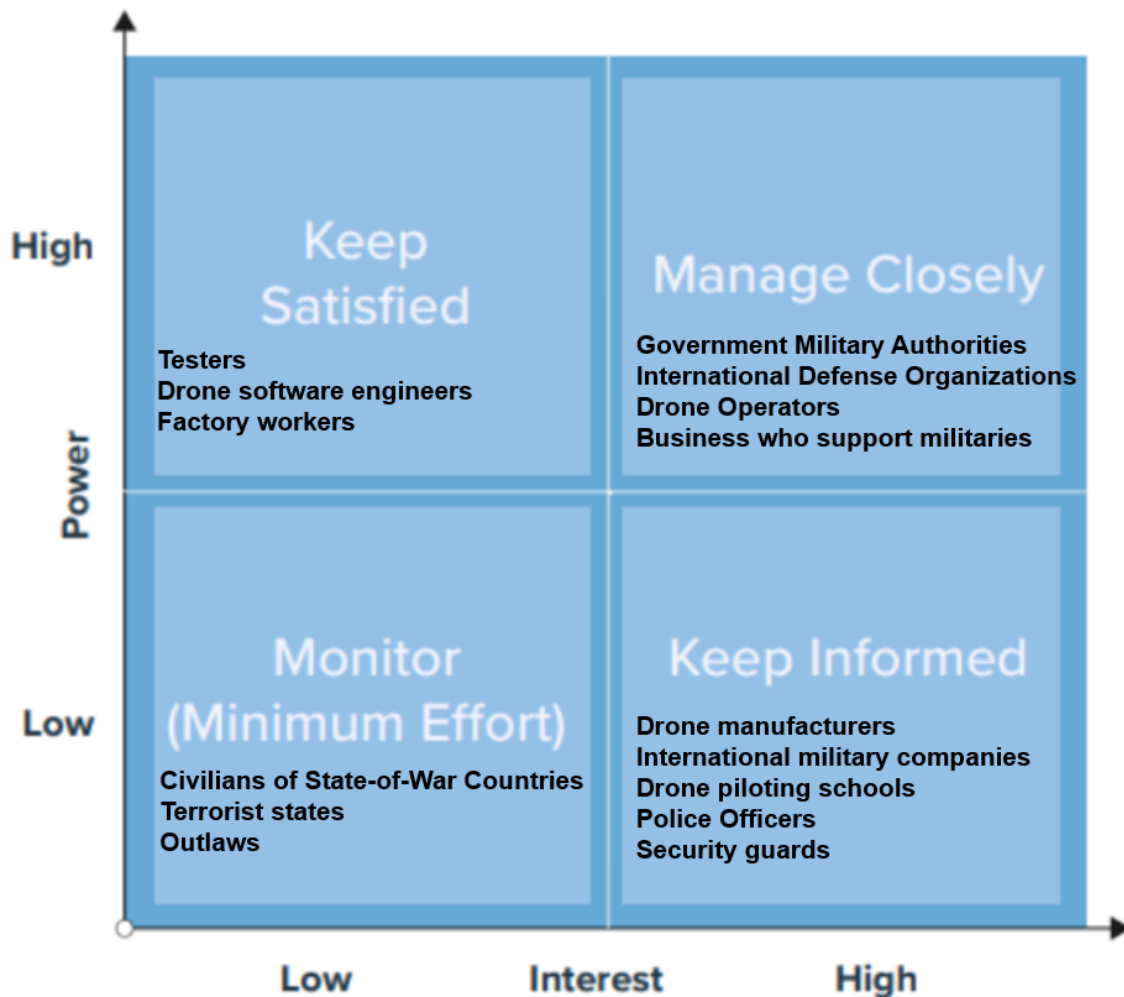
Influence/Interest Grid for Stakeholder Prioritization:

High Influence, High Interest - These stakeholders have both significant influence over the project and a high level of interest in its outcomes.

High Influence, Low Interest - These stakeholders have high influence but lower interest in the day-to-day activities of the project.

Low Influence, High Interest - These stakeholders have high interest but lower influence over the project's progress and decisions.

Low Influence, Low Interest - These stakeholders have low levels of both influence and interest in the project.

Key Deliverables

1. **Project Initiation:**

- Project Charter
- Stakeholder Requirements Document
- Market Research Report

- Risk Management Plan

2. **Documentation:**

- UML diagrams

- Software Requirements Specification (SRS)

- Hardware Requirements Specification

- Regulatory and Compliance Documentation

3. **Design Phase**

- Drone Design Documents

- Blueprints

- Prototype Validation

- Software Design Documents

- User Interface (UI/UX) Design

4. **Development Phase**

- Modules for specific functionalities such as:
  - Autonomous navigation
  - Real-time data transmission
  - Flight control systems
  - Obstacle detection and avoidance

- Integrated System Prototype

- Hardware Engineering

5. **Testing Phase**

- Unit Testing Reports

- System Integration Testing Reports

- Field Testing and Performance Analysis

- Security and Penetration Testing Reports

6. **Manufacturing**

- Resource Managment

- Component Fabrication

- System Assembly

- Mass Production Setup

- Prototype Creation

7. Deployment Phase

- Deployment Plan

- Advertisement Campaign Plan

- Advertisement Campaign Content

- Customers Feedback Garnering tools

- User Training Manuals

- Final System Deployment

8. Post-Deployment and Support

- Maintenance and Support Plan

- Bug Statistics Logs

- Performance optimization Reports

- Final Project Report

- Operational Feedback Analysis

Assumptions and Constraints

Assumptions

1. Resource Availability:

Availability of skilled personnel, including drone software engineers, hardware developers, and testers, throughout the project lifecycle.

Required hardware components (e.g., sensors, processors, batteries) are readily available in the market without significant supply chain disruptions.

2. Technological Feasibility

The technology required for drone software, hardware, and autonomous navigation is achievable within the current state of innovation.

Existing cloud and communication infrastructure (e.g., GPS, 4G/5G networks) will support the project requirements

3. Stakeholder Commitment

Key stakeholders (e.g., government authorities, International Defense Organizations) will remain supportive and provide timely inputs during the project.

End-users (e.g., soldiers, drone operators) will be available for testing and feedback.

4. Regulatory Compliance

All regulatory requirements and certifications can be obtained within the project timeline.

Cooperation will only occur with the countries recognized by the UN and deemed politically stable.

5. Budget and Funding

Allocated project funding will remain consistent and sufficient to cover the development, testing, and deployment phases.

6. Market Stability

There will be no significant political, economic, or environmental disruptions that could delay the project.

Constraints

1. Budget Limitations

The project will operate withing the budget up to 500,000 euros

2. Deadlines

The project must be completed within the timeline of up to 24 months.

Strict deadlines are set for each project phase due to external commitments (e.g., delivery to military authorities, government timelines).

3. Compliance with Regulations

The project must comply with national and international laws on drone usage, privacy, and safety.

4. **Limited Testing Environments**

Field testing may be restricted to specific controlled environments due to safety and legal considerations.

5. **Scope of Functionality**

The scope of drone features (e.g., autonomous navigation, obstacle avoidance) must be finalized early, with limited flexibility for major additions during the development phase.

6. **Dependencies on External Parties**

Dependencies on third-party vendors for hardware components, software integrations, or certifications could cause delays if not managed effectively.

7. **Security Concerns**

High-security standards must be maintained, increasing the complexity of software and hardware development.

8. **Geopolitical Risks**

Geopolitical tensions, especially with regions of interest, may impose trade restrictions or supply chain disruptions.

9. **Scalability Requirements**

The design must allow for future scalability and upgrades, potentially limiting rapid development options for the initial deployment.

10. **User Restrictions**

Purchase of drones and subsequent use of the application is available only to citizens with a drone pilot license.

Project Plan Creation

Work Breakdown Structure (WBS)

Work Breakdown Structure consist of 8 phases for project implementation with feasible sub-tasks.

1.1 Project Initiation:

Setting the foundation for the project by clearly defining its objectives, scope, budget, and timeline. It ensures alignment between stakeholders and provides a roadmap for execution.

1.2 Requirements and Planning:

Ensures that the project team fully understands the needs of all stakeholders. Identifiy what the drone system must accomplish (functional requirements) and the limitations under which it will operate (non-functional requirements).

1.3 Software Development:

Create system architecture, hardware designs, software specifications, and user interface layouts. Ensure that all technical and functional components are well-defined and integrated.

1.4 Hardware Development:

Designee and assemble the physical components of the drones, such as frames, motors, sensors, and batteries. Ensure that the hardware can meet the operational demands and integrate seamlessly with the software

1.5 Testing:

Ensure that both the hardware and software components function as intended, both independently and when integrated. Test covers performance, reliability, security, and safety under real-world conditions. Identify and address defects, this phase ensures the final system meets all standards and requirements.

1.6 Manufacturing:

Create drones at scale while ensuring quality and consistency. Production workflows are optimized, materials are sourced, and the final products are assembled, tested, and packaged for deployment.

1.7 Deployment

Setting up infrastructure, performing final installations, and transferring the systems to the client or end-users. Deployment ensures the system is fully operational and ready for use.

1.8 Post-deployment:

Provide ongoing support to the users after deployment. It includes regular maintenance, system updates, and addressing any operational issues that arise. Feedback collected during this phase is used for continuous improvement and planning future enhancements.

Project Schedule

Gantt Chart project planner

Gantt chart representing the project timeline with all tasks and milestones. Each bar corresponds to a task or milestone, showing its start and end dates. The chart provides a visual overview of the project's timeline and dependencies.

Responsibility and Resources Allocation

Project Team Members and Assigned Roles

Role	Responsibility
Project Manager	Manage the overall project, coordinate between teams, ensure timeline adherence, and handle stakeholder communication
Stakeholder Manager	Stakeholder manager organize, monitor and improve relationships stakeholders
Financial Analyst	A financial analyst is responsible for gathering data, organizing information, analyzing historical results, making forecasts and projections, plan budget

Business Analyst	Gather requirements, document specifications, and ensure alignment between stakeholders and the development team
Requirements Analyst	Analyze project needs to ensure clear and actionable specifications. Work closely with the Business Analyst to bridge the gap between technical teams and stakeholders
System Architect	Design the overall architecture for hardware-software integration and ensure technical feasibility.
Hardware Engineers	Develop drone hardware components (frames, sensors, motors) and create prototypes
UI/UX Designer	Design operator-friendly dashboards and improve the user interface for accessibility and usability
Software Developer	Develop drone software modules, including navigation, communication systems, and interface components
AI Engineer	Implement algorithms for automation, obstacle detection, and learning systems within the drone software
Systems Developer	Program microcontrollers, integrate hardware with software, and troubleshoot hardware-software interactions
Cybersecurity Specialist	Develop and implement cybersecurity measures to protect drone data and systems from threats
Sensor Specialist	Design and integrate sensors for navigation, obstacle detection, and environmental data collection
Prototyping Technician	Troubleshoot hardware designs and recommend modifications for improved performance. Support engineers in creating physical models using tools such as 3D printers or CNC machines
Test Engineer	Identify and document bugs, inconsistencies, or performance bottlenecks. Develop automated testing scripts for repetitive tasks
Flight Test Engineer	Plan and conduct drone flight tests to evaluate performance under real-world conditions

Manufacturing Engineer	Implement efficient workflows and troubleshoot production bottlenecks. Work with the supply chain and factory supervisors to optimize resource utilization
Factory Supervisor	Supervise assembly line workers and provide training as needed. Monitor compliance with safety and quality standards during production
Supply Chain Manager	Plan and manage procurement of raw materials, components, and equipment. Coordinate with vendors to ensure timely delivery of supplies
Quality Assurance Specialist	Develop and implement quality assurance processes for both hardware and software. Perform inspections and tests to verify adherence to design and functional specifications
Deployment Engineer	Install and configure drone systems for end users, including software and hardware. Troubleshoot deployment issues and ensure smooth system handover
IT Support Specialist	Provide technical assistance to resolve software or system-related issues. Document and address user-reported problems promptly
Logistics Coordinator	Optimize shipping routes and methods to meet project schedules cost-effectively
Maintenance Engineer	Maintain detailed records of maintenance activities and schedules
Support Technician	Act as the first point of contact for post-deployment issues. Schedule plan for regular maintenance

Resource Allocation by Project Phases

1.1 Project Initiation

Role: Project Manager, Stakeholder Manager, Bussines Analyst, Financial Analyst

Software Tools: Microsoft Project, Jira, Trello, Slack, Microsoft Teams

1.2 Requirements and Planning

Role: Requirements Analyst, System Architect, Hardware Engineer, UI/UX Designer

Software Tools: Microsoft Visio, Lucidchart

1.3 Software Development

Role: AI Engineer, System Development, Cybersecurity Specialist, Software Developer,

Software Tools: Visual Studio Code / IntelliJ IDEA, ROS (Robot Operating System), Git / GitHub / GitLab, Docker / Kubernetes

1.4 Hardware Development

Role: Hardware Engineer, Sensor Specialist, Prototyping Technician

Software Tools: SolidWorks / Fusion 360, LabVIEW

1.5 Testing

Role: Flight Test Engineer, Test Engineer

Software Tools: JUnit / Selenium, MATLAB, Wireshark

1.6 Manufacturing

Role: Manufacturing Engineer, Factory Supervisor, Supply Chain Manager, Quality Assurance Specialist

Software Tools: SAP / Oracle ERP, CATIA, CNC Programming Tools

1.7 Deployment

Role: Deployment Engineer, IT Support Specialist, Logistics Coordinator

Software Tools: Jenkins / CircleCI, AWS / Azure, Red Hat Ansible

1.8 Post-deployment

Role: Maintenance Engineer, Support Technician, Customer Success Manager

Software Tools: ServiceNow, Splunk, Jira Service Management

Milestones

Table with milestones

M 1.1 Project Kickoff

Description: Formal start of the project with stakeholder alignment on goals, budget, and timeline

Completion requirements:

- Project Manager Assigned
- Stakeholders Identified
- Completion of the Milestone 1.2
- Planed budget and schedule
- Completed risk management plan

M 1.2 Project Charter Approved

Description: Approval of the project charter, confirming scope, objectives, and resource allocation

Completion requirements:

- Project charter document completed, including scope, objectives, stakeholders, and risks

M 2.1 Requirements Document Approved

Description: Formal approval of the software and hardware requirements specification

Completion requirements:

- Finalized and reviewed requirements specification document
- Approval obtained from stakeholders and system architects

M 2.2 Blueprint and design approved

Description: Formal approval of the blueprint and design

Completion requirements:

- Approval of the blueprint from Hardware Engineer

M 2.3 System Architecture Finalized

Description: Completion of the high-level system design, including hardware-software integration plans

Completion requirements:

- High-level system architecture diagrams completed, including hardware-software integration
- Approval from system architects and engineering leads

M 3.1 Software Development Complete

Description: Completion of software module coding, including navigation, obstacle detection, and control systems

Completion requirements:

- All software modules (navigation, communication, obstacle detection) implemented
- Code reviewed and validated by senior developers
- Integration of modules into a cohesive system completed

M 3.2 Quality assurance of the software

Description: Completion of the code reviews and debugging, versions control and documentation

Completion requirements:

- Code reviewed and debugged by the senior developers
- Completion of the version control and other documentations

M 4.1 Hardware Prototype Ready

Description: A functional prototype of the drone, including integrated hardware components, ready for testing

Completion requirements:

- Physical prototype of the drone assembled, including frame, sensors, and motors

M 4.2 Functionality Evaluated

Description: Battery life and power consumption evaluated, Sensors, Cameras and Actuators are integrated and ready for assembly

Completion requirements:

- Battery life and power consumption evaluated
- Sensors, Cameras and Actuators are integrated and ready for assembly
- The evaluation reviewed by senior hardware engineer

M 4.3 Performance Optimized

Description: Design and functions optimized and ready for testing

Completion requirements:

- The optimization reviewed and approved by senior hardware engineer
- The optimization reviewed and approved by senior sensor specialist

M 5.1 Unit Testing Complete

Description: Verification of individual software modules and hardware components

Completion requirements:

- Individual software modules and hardware components tested
- Defects identified and resolved

M 5.2 Integration Testing Complete

Description: Validation of integrated hardware and software systems

Completion requirements:

- Software and hardware integrated and tested as a cohesive system
- Communication and functional workflows validated

M 5.3 Performance Testing Complete

Description: Successful flight tests, including range, obstacle detection, and payload management testing

Completion requirements:

- Flight tests conducted under varying conditions (range, payload, environment)
- Performance benchmarks met or exceeded

M 5.4 Security Testing Complete

Description: Validation of security software

Completion requirements:

- Successful network tests for communication protocol
- Pass of the application after white hacking

M 5.5 Testing Complete

Description: Full system verification, ensuring readiness for deployment and manufacture

Completion requirements:

- Comprehensive test report created, including results for all test phases
- Final testing sign-off obtained from quality assurance and project stakeholders

M 6.1 Manufacturing Workflow Established

Description: Finalization of manufacturing workflows, including resource and logistics planning

Completion requirements:

- Workflow documentation completed, including assembly line setup and processes
- Approval from manufacturing and supply chain teams

M 6.2 Completion of education

Description: First butch of workers educated and ready to work

Completion requirements:

- Educational materials distributed and training sessions completed
- Completion of the test work to confirm workers knowledge

M 6.3 Manufacture Complete

Description: Completion of full-scale production of drones as per project requirements

Completion requirements:

- Entire production batch completed and inspected
- Delivery readiness verified by logistics team

M 7.1 Deployment Plan Finalized

Description: Confirmation of deployment strategy, resources, and timelines

Completion requirements:

- Deployment strategy documented, including timelines, resources, and logistics
- Approval from deployment and support teams

M 7.2 Manuals and guides prepared

Description: Completion of the manuals and guides for drone and app usage

Completion requirements:

- Documentation and videos for end-users created and uploaded

M 7.3 System Deployed to End Users

Description: Successful deployment of drones and related systems to intended users

Completion requirements:

- Successful installation and configuration of systems at user locations
- Initial operational tests passed

M 8.1 Continuous Improvement Plan Established

Description: Completion of the schedule for maintenance

Completion requirements:

- Framework for feedback collection and iterative improvements created

M 8.2 Final Project Report Delivered

Description: Completion of the bug fixes and summarization of the first launch of the product

Completion requirements:

- Compliance checks completed and all necessary certifications obtained
- Maintain detailed records of maintenance activities and schedules
- Document with analyzation of the result

Risk Management Plan

Risk Identification

- Technical Risks:
1. **Technology Challenges**: Integration issues between hardware and software components
2. **Cybersecurity Threats**: Potential vulnerabilities in drone systems that could lead to data breaches or hijacking
3. **Performance Issues**: Failure to meet speed, stability, or payload capacity expectations during testing
   - Resource Risks:
4. **Resource Shortages**: Unavailability of skilled personnel, raw materials, or critical components
5. **Key Personnel Dependency**: Loss of critical team members impacting project continuity
   - Schedule Risks
6. **Delays**: Missed deadlines due to unforeseen challenges in design, manufacturing, or testing
7. **Testing Overruns**: Extended testing cycles caused by recurring system failures
   - Financial Risks

8. **Budget Overruns**: Increased costs due to scope changes or unforeseen technical challenges

9. **Vendor Cost Fluctuations**: Unexpected price increases for components or services

   - External Risks

10. **Geopolitical Factors**: International trade tensions or conflicts affecting supply chain reliability

11. **Competition**: Emergence of more advanced or cost-effective solutions from competitors

    - Operational Risks

12. **Manufacturing Defects**: Errors during production impacting quality or functionality

Risk Assessment and Mitigation Strategies

Table of Risk Assessment Matrix

Risk Monitoring

1. **Risk Reviews**: Schedule weekly risk review meetings to evaluate the status of existing risks and identify new ones.

2. **Risk Owner Assignment**: Assign ownership of each risk to specific team members for accountability.

3. **Risk Log**: Maintain a live risk log documenting occurrences, resolutions, and effectiveness of mitigation efforts.

Communication Management Plan

Matrix of communication management plan

Stakeholder Engagement

Gathering Feedback

1. **Feedback Channels**:

Surveys: Use digital surveys to gather structured feedback from end-users and operators.

Workshops: Conduct interactive sessions to capture real-time input.

Pilot Testing: Gather insights during test runs, focusing on usability and functionality.

2. **Feedback Review**:

Consolidate all feedback in a centralized repository.

Conduct weekly review sessions with the project team to evaluate feedback.

Prioritize actionable items based on criticality and feasibility.

3. **Feedback Loop**:

Acknowledge receipt of feedback to stakeholders.

Inform contributors about the actions taken and their outcomes.

Addressing Concerns

1. **Proactive Identification**:

Regularly monitor stakeholder sentiment through check-ins, surveys, and discussions.

Maintain a stakeholder issue log to document concerns systematically.

2. **Escalation Process**:

Assign a dedicated point of contact for each stakeholder group.

Develop a clear process for escalating unresolved issues to the project manager or leadership.

3. **Resolution Tactics**:

Open Dialogue: Arrange meetings or calls to clarify misunderstandings or disputes.

Action Plans: Commit to resolving concerns with a timeline and accountability structure.

Reassurance: Offer updates on progress and measures taken to address critical issues.

Communication Guidelines

1. **Transparent Communication**: Share timely updates, especially about changes, risks, or delays that may affect stakeholders.
2. **Individual Messaging**: Customize communication to suit the technical or operational background of the audience.

3. **Two-Way Engagement**: Actively listen to stakeholders' concerns and integrate feedback where appropriate.
4. **Cultural Sensitivity**: Adapt communication style and engagement methods to cultural and contextual nuances for international stakeholders.

Quality Management Plan

Quality Objectives

- **Defect Rate**: Achieve a defect rate of less than 2% in the final software.
- **Performance Benchmarks**: Ensure that the drone's software responds to commands within 0.5 seconds and maintains 99.9% uptime.
- **Security**: Ensure the software passes all security tests, meeting military-grade encryption and data protection standards.
- **User Experience**: Ensure ease of use for operators, with an intuitive user interface (UI) and minimal training time required

Quality Assurance (QA)

Code Reviews:

Conduct regular code reviews throughout the development process. Each piece of code should be reviewed by at least two team members to ensure accuracy, security, and adherence to best practices.

Testing Methodologies:

Unit Testing: Each module of the software will be tested separately to ensure individual components work correctly.

Integration Testing: After unit tests, the modules will be tested together to ensure they function as expected when combined.

System Testing: The entire software system will be tested to ensure all components work together seamlessly.

Compliance with Industry Standards:

Follow industry standards for security (e.g., ISO/IEC 27001 for information security), software development (e.g., Agile or DevOps methodologies), and military defense regulations (e.g., compliance with NATO standards).

Use best practices for coding, security, and software architecture.

Quality Control (QC)

Regular Testing Cycles:

Conduct continuous testing at every stage of development. This includes automated tests for new code and manual testing for more complex features.

Regular testing cycles bi-weekly to catch defects early in the development process

User Acceptance Testing (UAT):

Perform UAT with a group of military personnel or other key stakeholders to validate the software's functionality in real-world scenarios.

Gather feedback to ensure the software meets the needs of the users and is suitable for military and defense purposes.

Defect Tracking:

Implement a defect tracking system (such as Jira or Trello) to log, prioritize, and monitor defects from identification to resolution.

Use the system to ensure that all defects are addressed and resolved within a set timeframe (e.g., critical bugs resolved within 48 hours).

Metrics

Criterion Name	Frequency	Tolerance	Explanation
Artefacts Review (per project phase)	Once per phase	No tolerance	Review key project artifacts at the end of each phase to ensure they meet standards.
Monthly Timesheets Reviewed and Approved	Monthly	No tolerance	Track team progress and labor input to ensure effective use of resources.
Status Reports Distributed	Monthly	One month (i.e., every two months)	Provide regular updates on project status to stakeholders.
Project Review Meetings Performed	Weekly	One week (exceptions for holidays)	Regular meetings to review progress, identify issues, and adjust plans.
Milestone Reviews Executed	Per milestone	No tolerance	Ensure all deliverables meet quality standards before moving to next phase.

Phase-Exit Reviews Executed	Per phase exit	No tolerance	Conduct reviews at the end of each phase to ensure progress and quality.
Project and Process Audits Performed	Yearly or once during project	No tolerance	Audits to ensure compliance with standards and process improvement.
Audits of Contractors' Project Quality Activities	Yearly or once during project	No tolerance	Ensure contractors' quality activities align with project goals and standards.

Budget and Cost Management

Table with budget breakdown

Cost Control

1. Methods for Tracking Expenses

Effective expense tracking ensures that project spending aligns with the budget. Here are some methods:

a. Budget Allocation and Categorization

- Break down the budget into categories (e.g., design, software development, hardware development, testing, etc.).
- Assign a specific portion of the budget to each category based on initial cost estimates.

b. Expense Tracking Tools

- Use project management software (e.g., Microsoft Project, Monday.com, or specialized ERP tools) integrated with financial tracking systems to monitor real-time expenses.
- Implement a cost ledger for detailed tracking of all expenses.

c. Milestone-Based Financial Reviews

- Define milestones (e.g., completion of design, software MVP development, prototype testing) and allocate funds to each.
- Conduct financial reviews at each milestone to ensure adherence to the allocated budget.

d. Regular Reporting

- Set up weekly or bi-weekly financial reports to track spending trends.
- Compare actual expenses against planned budgets regularly.

2. Methods for Managing Cost Overruns

Cost overruns can derail a project if not managed proactively. Here's how to address them:

a. Contingency Reserves

- Allocate a contingency fund within the €550,000 budget (typically 5–15% of the total budget).
- Use this reserve exclusively for unforeseen expenses.

b. Change Control Process

- Implement a formal change control process to evaluate and approve any budget changes due to scope modifications.
- Assess the impact of changes on the overall budget and schedule before implementation.

c. Cost Optimization

- Identify areas for cost reduction without compromising quality, such as optimizing design processes or sourcing alternative hardware components.
- Negotiate contracts with vendors and suppliers for cost savings.

3. Methods for Conducting Variance Analysis

Variance analysis helps identify deviations from the planned budget and provides insights for corrective actions.

a. Baseline Comparison

- Establish a cost baseline during project planning.

- Regularly compare actual costs against the baseline to calculate variances.

b. Root Cause Analysis

- For significant variances, conduct a root cause analysis to identify underlying issues.

- Categorize variances by type (e.g., material, labor, software) to pinpoint areas of concern.

c. Reporting and Communication

- Include variance analysis in project status reports for stakeholders.

- Communicate findings and corrective actions clearly to ensure transparency.