

1. Product Identification

Product Name

- Single-Person Manned Aerial Vehicle System

Product Functions

- **Basic Functions**
 - Provide solutions for emergency rescue and payload delivery
 - Enable rapid deployment and efficient operation
- **Special Functions**
 - Operate in diverse and challenging environments, including complex terrain and severe weather
 - Support autonomy, low operational workload, and modular design

Key Performance Indicators

- Rapid deployment time
- Autonomous navigation accuracy
- High energy efficiency
- Flexible and precise operational capability

Operational Environment

- Operating conditions: varied terrain, complex weather
- Storage requirements: convenient for storage and transport
- Transportation conditions: rapid transport in emergency scenarios
- Foreseeable misuse: improper operation or use under extreme weather

User Requirements

- Target users: first responders, emergency rescue personnel, and humanitarian organizations
- Detailed needs:

1. Basic Functional Needs

- Survival functions and long-duration operational support

2. Performance Needs

- Rapid deployment and efficient operation, multi-environment operability, precise navigation and flexibility

3. Operational Needs

- Autonomy, low operator workload, user-friendly interface

4. Safety Needs

- Operational safety, emergency protocols, fail-safes, severe weather operability

5. Social Needs

- Team collaboration capability

6. Esteem Needs

- Professional recognition and brand trust

7. Self-Actualization Needs

- Innovation opportunities, personal growth

8. Emerging Needs

- Psychological support, sustainability and environmental impact, user adaptability training

9. Other Needs

- Modular design, energy efficiency, data collection and analysis, eco-friendliness

User Training Requirements

- Provide personalized training programs to support rapid user adaptation and mastery

2. Market Identification

Target Market Description

- Global emergency response and humanitarian aid market, projected to reach \$30 billion by 2025 with a CAGR of ~10%

Market Trend Analysis

- Emerging trends: integration of automation and sustainability, especially in drones for emergency and disaster response. Big data and AI are increasingly integrated to enhance operational efficiency.

- User preference shifts: increasing demand for efficient, safe, and intelligent products with reliability in complex environments.

Expected Market Demand

- Estimated annual sales: 5,000 units across emergency response, medical rescue, and disaster monitoring sectors

Competitive Products

- Comparative analysis: benchmarked against existing personal aerial vehicles and automated drones in autonomy, response speed, and adaptability
- Differentiation: enhanced multifunctionality and modular design for superior flexibility and deployment

Brand Strategy

- Trademark: safety, innovation
- Logo: integration of technology and human-centric design
- Brand name: reflects innovation and reliability

3. Engineering Characteristics

1. Prioritize propulsion system efficiency
2. Focus on endurance and material strength to ensure survival support and multi-environment operability
3. Emphasize maximum flight speed and navigation system accuracy
4. Optimize battery capacity and motor power
5. Enhance maximum payload while carefully balancing overall dimensions

4. Evaluation Criteria

Evaluation Criteria	Definition	Quantitative Metrics	Weight
Autonomy	Ability to operate independently with minimal input	Navigation accuracy, automation	15%
Multifunctionality	Capability to handle diverse tasks/environments	Adaptability, multitasking	15%

Stability and Safety	Reliable and safe operation in all conditions	System integrity, safe performance	20%
Deployability and Portability	Quick deployment and usability in the field	Deployment time, portable design	15%
Operational Efficiency	Ability to perform tasks efficiently	Response time, user interface	10%
Durability and Adaptability	Sustained performance and adaptation over time	Material durability, design	10%
Cost Effectiveness	Economic viability of the system	Cost-performance ratio	5%
Innovation	Degree of technical and design innovation	New tech, innovative features	5%
Energy Efficiency	Efficient energy use during operation	Consumption ratio, endurance	5%

5. Social, Political, and Legal Requirements

Regulatory Compliance

- Compliance with aerospace regulations such as ICAO and national civil aviation authorities
- Global legal alignment with anti-terrorism and emergency response laws

Patent Opportunities

- Patent applications for core technologies and novel designs, including autonomous navigation and environmental adaptation

Safety and Environmental Standards

- Adherence to drone operation standards by FAA and environmental protection regulations

Standards

- Compliance with international and local aerospace standards (e.g., IPC, ISO, ASTM)

Product Safety and Liability

- Consideration of all misuse and abnormal use cases, with detailed user manuals and safety protocols

- Clear labeling and instruction to ensure safe operation

Intellectual Property

- Patent protection of core technologies, licensing strategy for collaborative development

6. Financial Requirements

Economic Assumptions

- Economic viability based on global demand and technology leadership; high initial investment with substantial growth potential

Profitability Targets

- Target gross margin: over 40% to support sustained R&D and market expansion

Lifecycle Pricing Strategy

- Target manufacturing cost: <\$20,000 per unit
- Expected retail price: \$50,000 per unit
- Discount policy: 10% for bulk orders

Warranty Policy

- Two-year comprehensive warranty including replacement and repair of key components

Projected Financial Performance

- ROI: 20% within 3 years; break-even in 2 years

Cost-Benefit Analysis

- Long-term profitability based on multifunctionality and strong market demand

Capital Investment Required

- Initial R&D: \$5 million; additional \$2 million for production and marketing

7. Lifecycle Objectives

Time-based Performance Targets

- R&D: complete within 2 years
- Market launch: within 3 years

Recycling Policy

- 80% of components recyclable under company policy

Service Life and Warranty

- Operational life: 10 years
- Warranty: 2 years

Installation and Operation Costs

- Initial installation: \$3,000
- Ongoing costs: energy, battery maintenance, regular inspections

Maintenance Plan

- Basic maintenance by users; complex maintenance by certified service centers

Reliability

- MTBF: 5,000 hours; key components: 10,000 hours

End-of-Life Strategy

- Remanufacturing and refurbishment services
- Regular upgrades and replacements based on evolving user needs

Sustainability Targets

- Reduce carbon footprint via efficient energy and renewable materials
- Maximize renewable material use

8. Technical Roadmap

Final Technology Roadmap

Module 1: Emergency Rescue and Delivery

- Implementation: Adaptive delivery mechanism
- Description: Automatically adjusts delivery strategy via real-time environmental data to enhance efficiency and success

Module 2: Rapid Deployment and Operation

- Implementation: Modular portable design
- Description: Enables rapid assembly/disassembly for deployment under urgent scenarios

Module 3: Environmental Adaptation

- Implementation: Real-time environmental data analysis

- Description: Embedded sensors analyze surroundings to adapt task strategies with reduced manual input

Module 4: Autonomous Navigation and Processing

- Implementation: AI decision support system
- Description: Combines learning and real-time data to improve planning and task execution

Module 5: User Interaction

- Implementation: Wearable control devices
- Description: Gesture or voice-based interface enhances interaction and reduces manual operation

Module 6: Propulsion System

- Implementation: Efficient battery-motor combination
- Description: Improves power output and mission longevity through energy-efficient solutions

Module 7: Energy Management

- Implementation: Smart energy allocation system
- Description: Real-time monitoring ensures optimal energy usage and minimal waste

Module 8: Safety System

- Implementation: AI-based fault prediction system
- Description: Early detection of failures boosts system reliability and safety

Module 9: Materials and Structure

- Implementation: Carbon fiber composite materials
- Description: Lightweight yet strong material improves performance

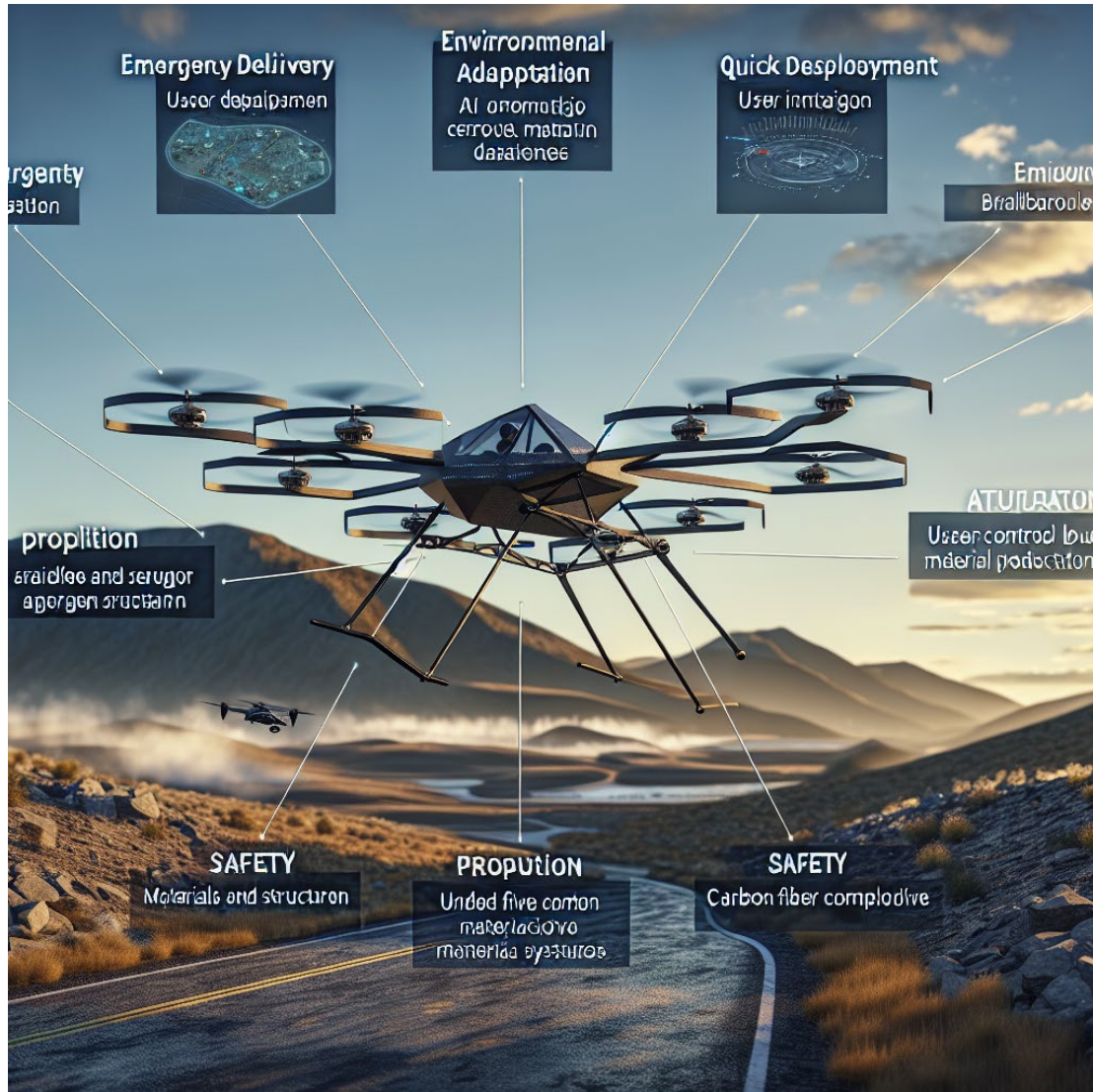
Module 10: Communication

- Implementation: 5G real-time data transmission
- Description: High-speed, stable communication enables multi-device coordination

Note:

- The system employs morphological matrix elements like adaptive delivery, modular design, and AI-enhanced safety. The resulting solution ensures efficiency, robustness, and operational agility in diverse emergency contexts.

Concept scheme



9. Manufacturing Specifications

In-House Production

- Key components: autonomous navigation, AI decision support, energy management

Manufacturing Requirements

- Precision processes, annual capacity of 5,000 units
- High automation with robotic and AI QA systems

- ISO 9001 quality control protocols

Suppliers

- Global suppliers with long-term contracts to stabilize supply
- ERP and IoT-based full-chain supply management

10. Risk Assessment

Identified Risks

- Technical: algorithm stability and reliability
- Market: new entrants and demand volatility
- Legal: changing international regulations

Mitigation Strategies

- Technical: continuous iteration and testing
- Market: proactive analysis, branding, user education
- Legal: policy monitoring and product compliance adaptation