Exploring the Model of Low-Altitude Economy and Regional Integration: A Case Study of Promoting Regional Integration in the Yangtze River Delta through Low-Altitude Economy

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Abstract. This paper explores the integration of the low-altitude economy with the coordinated development of the Yangtze River Delta (YRD) region, drawing on the theories of growth poles, industrial clusters, and sustainable development. By analyzing the region's industrial foundation, policy environment, and technological advantages, the study reveals how low-altitude economic activities—driven by technological innovation and industrial integration—empower sectors such as manufacturing, logistics, modern agriculture, and services. The YRD has preliminarily established an industrial pattern of "Shanghai for R&D – Suzhou for Manufacturing – Hangzhou for Applications," and has made notable progress in airspace reform and infrastructure. However, challenges such as fragmented airspace management and inconsistent technical standards persist. This study proposes a four-dimensional coordination path—"policy guidance, industrial synergy, technological innovation, and ecological co-construction"—to demonstrate how the low-altitude economy can reconfigure spatial resource allocation and cultivate new regional growth poles. This model offers a practical paradigm for promoting regionally coordinated development driven by new quality productive forces, with its core focused on establishing cross-regional governance mechanisms and mutual recognition systems for technical standards, thereby enabling the market-oriented allocation of airspace resources and innovative breakthroughs in ecological sharing.

Keywords: Low-altitude economy, regional integration, airspace management, industrial coordination, technology-driven development.

1. Introduction

The low-altitude economy, as a new frontier of global technological and industrial transformation, has become a key arena of strategic competition among nations. China has classified it as a strategic emerging industry, aiming to unlock the potential of low-altitude airspace and foster new quality productive forces. In 2024, the joint release of the Implementation Plan for Innovation and Application of General Aviation Equipment (2024–2030) by four national ministries signaled the beginning of the low-altitude economy's rapid development phase.

The Yangtze River Delta, with its solid manufacturing base and strengths in scientific and technological innovation, has been at the forefront of exploring the integration of the low-altitude economy into regional development. Demonstrative projects have already emerged in areas such as logistics in Shanghai's Lingang Area, drone industry clusters in Hangzhou, and low-altitude tourism in Nanjing. However, strict airspace regulations and outdated legal frameworks still pose significant challenges.

The low-altitude economy refers to an integrated industrial system centered on general aviation and reliant on low-altitude airspace resources. It encompasses flight services, aviation logistics, scientific research, and education. According to the 2023 Civil Aviation Industry Development Statistical Bulletin, China's low-altitude economy reached a scale of 505.95 billion yuan in 2023, with a growth rate of 33.8%. The market is projected to surpass one trillion yuan by 2030.

This study, grounded in regional development theory and current trends in industrial transformation, reveals how the "drone+" model enables innovation in logistics, inspection, and agriculture. From a Marxist spatial perspective, the vertical and multi-dimensional characteristics of this economy are reshaping the economic geography and promoting regional synergy. For the YRD

to become a national model, it must overcome three major bottlenecks: optimizing institutional frameworks, advancing technology applications, and addressing ethical concerns. By building a replicable “low-altitude aircraft +” ecosystem, the region can serve as a pioneering example for institutional innovation and industrial upgrading nationwide.

This paper integrates academic research from home and abroad, using case studies, policy analysis, and data synthesis to investigate two core questions:

How does the low-altitude economy empower industries such as logistics, manufacturing, and cultural tourism?

How can it promote regional coordination and industrial upgrading in the Yangtze River Delta?

The goal is to provide a reference path that combines theoretical depth with practical value for the high-quality development of regional economies.

2. Theoretical Foundations of the Low-Altitude Economy and Regional Development

2.1. Definition and Components of the Low-Altitude Economy

Qin Rui (2023) defines the low-altitude economy as an economic domain composed of a series of activities that rely on aviation transport and operational equipment technologies as primary tools, low-altitude airspace as the main area of activity, and low-altitude flight operations as the ultimate form of output [12]. Based on this definition, the core tools include low-altitude aircraft and innovative technologies. Low-altitude aircraft types include drones, eVTOLs (electric vertical takeoff and landing vehicles), helicopters, and traditional fixed-wing planes. Innovative technologies span both the production end—such as new energy sources, new materials, and advanced technologies—and the operational support end, which includes big data, cloud computing, BeiDou Navigation, artificial intelligence, and the entire industrial chain .

The core of low-altitude airspace lies in the diversified use of vertical space below 1,000 meters. The low-altitude economy can be divided into two major dimensions:

Industrial domain: The industrial structure of the low-altitude economy can be summarized as "144" , referring to:

One key resource: low-altitude airspace

Four core industries: low-altitude manufacturing, low-altitude flight operations, low-altitude support services, and comprehensive service industries.

Four auxiliary groups: public sector/government forces, education/scientific/cultural organizations, investment and financing groups, and intermediary service providers .

Application scenarios: These include traditional general aviation operations such as agricultural and forestry protection, and power grid inspections, as well as emerging industries such as aerial tourism and air sports.

According to Liu Xianjiang et al. (2024), the low-altitude economy is characterized by four core traits: extensiveness, integration, three-dimensionality, and regional specificity.

Extensiveness is reflected in its wide range of industries and applications.

It features unique integrations across civil-military domains and air-ground operations.

The core of its "low-altitude economy+" development model lies in the integration of aircraft with various industrial forms .

Three-dimensionality is demonstrated by the comprehensive use of vertical airspace below 1,000 meters. Taking the most prominent drone industry as an example, its applications can be divided into four types:

Low-altitude economy + logistics: Drones equipped with intelligent navigation and control systems perform precise deliveries.

Low-altitude economy + agriculture: Drones guided by flight control or ground-based remote sensing enhance production efficiency.

Low-altitude economy + transportation: eVTOLs and helicopters contribute to the development of urban air mobility (UAM) systems, easing ground traffic congestion.

Low-altitude economy + urban management: Drones are deployed in emergency response, power inspections, and other services to enhance responsiveness and daily operational efficiency.

This model forms a three-dimensional mechanism where “aerial operations empower ground-based systems.”

Although currently constrained by regional specificity and the lack of large-scale collaboration, the low-altitude economy—empowered by 5G and the Internet of Things—possesses great potential for industrial integration and spatial expansion, emerging as a new engine to overcome geographic limitations and drive high-quality development.

2.2. Theories of Regional Economic Development

From the perspectives of growth pole theory, industrial cluster theory, and sustainable development theory, the low-altitude economy is closely aligned with the theoretical logic of regional economic development, providing new-quality momentum for the integration of the Yangtze River Delta (YRD).

With its strong capacity for technological innovation and industrial transformation, the low-altitude economy aligns with the innovation intensity and growth potential emphasized by growth pole theory. It promotes regional economic development by facilitating technology diffusion and industrial chain integration, effectively radiating economic benefits to surrounding areas and becoming a new driver of regional growth.

Moreover, the low-altitude economy encompasses multiple segments of the industrial chain, which supports both vertical integration and horizontal collaboration. For example, the drone industry in Zhejiang Province adopts a "R&D–manufacturing–application" integrated model. Through shared technologies and market interactions among enterprises, production costs are reduced, and the YRD’s collaborative efficiency and overall competitiveness are enhanced.

Additionally, the low-altitude economy embraces sustainable development principles by balancing economic, ecological, and social benefits. For instance, drone-based delivery reduces carbon emissions, and agricultural drones lower energy and pesticide usage, reflecting the industry’s green and low-carbon transformation. The planning and implementation of general aviation industrial parks in Jiangsu Province exemplify how the low-altitude economy contributes to new pathways for sustainable regional development.

3. The Development Status and Policy Practices of the Low-Altitude Economy in the Yangtze River Delta

3.1. Overview of Low-Altitude Economy Development in the Yangtze River Delta

Leveraging its advantages in early policy implementation, industrial clusters, and geographical location, the Yangtze River Delta (YRD) region is accelerating the construction of a highland for the low-altitude economy. A full industrial chain has gradually taken shape in the region: the upstream segment focuses on R&D and raw material supply; the midstream includes manufacturing and infrastructure development, such as final assembly, airworthiness testing, and facility construction; and the downstream is centered on application and services, including commercial use, operations, and policy support. This has formed a coordinated pattern of “Shanghai for R&D – Suzhou for manufacturing – Hangzhou for applications.”

According to the 2024 Urban Low-Altitude Economy “Connectivity Power” Index Report and the MIIT-affiliated CCID Consulting Report, Shanghai is home to 70% of the national aviation manufacturing supply chain and 50% of eVTOL innovation enterprises. The Jinshan District drone base has gathered 40 industry-chain enterprises, and JD.com and SF Express handle over 20,000 drone deliveries per day. Zhejiang, driven by the digital economy, has established a drone R&D

cluster in Hangzhou, while airside economic zones in cities like Wenzhou have expanded the industry scale to over 12 billion yuan. Jiangsu is focusing on 5G-connected drones and general aviation, with Nanjing setting up the country's first 5G drone test flight base. In Anhui, the opening of W-class airspace in Hefei and the development of the Luogang experimental zone have enabled full-scenario coverage for piloted eVTOL operations.

Together, the three provinces and one municipality have built 98 general airports, 326 take-off and landing sites, and 12 low-altitude air routes. Zhejiang's 5G-A network enables centimeter-level positioning, and Shanghai's "One River, One Creek" air corridor supports an intelligent logistics system. Although challenges remain, institutional innovations such as specialized planning and billion-level industrial funds have initially formed an industrial ecosystem, steering the region toward becoming an international demonstration zone for the low-altitude economy.

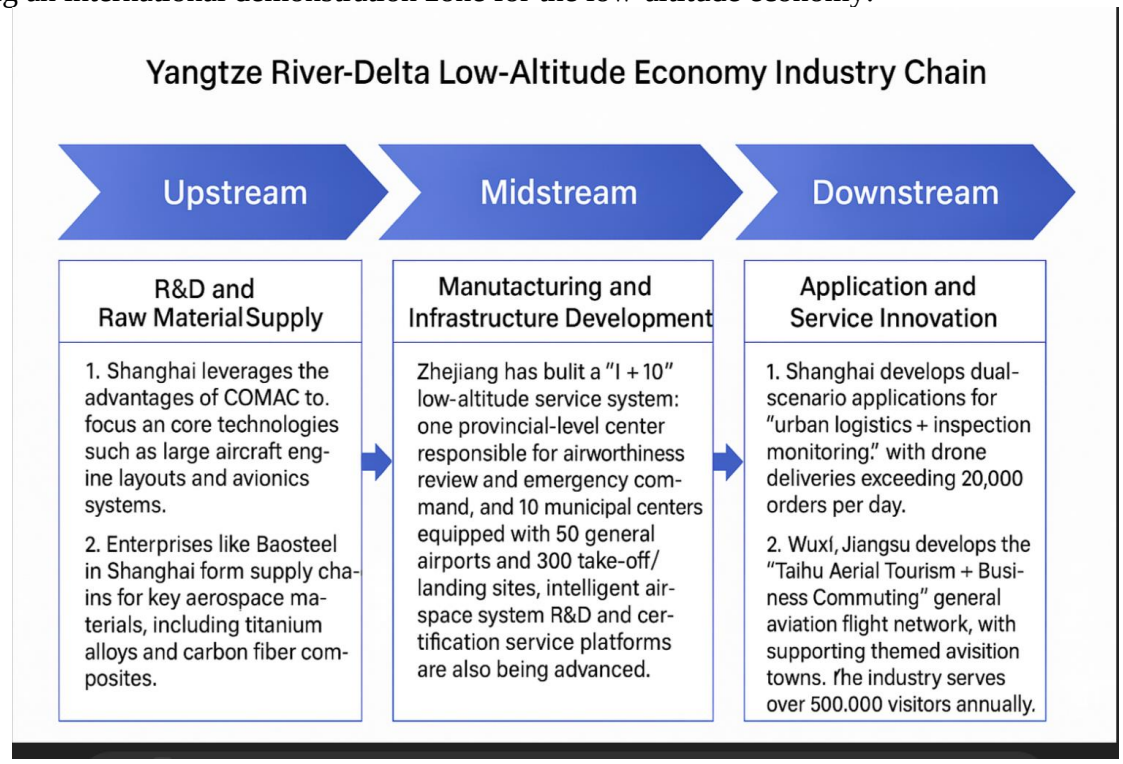

Figure 1. Yangtze River Delta Low-Altitude Economy Industry Chain

3.2. Government Policies and Support

The development of the low-altitude economy in the YRD is driven by both national and local policies. Understanding the direction of these policies is essential to grasping the current and future trajectory of the industry.

At the national level, airspace reform began with the Opinions on Deepening the Reform of Low-Altitude Airspace Management in 2010. In 2021, the concept of the low-altitude economy was first included in the National Comprehensive Three-Dimensional Transportation Network Planning Outline. The Civil Aviation Administration of China (CAAC) proposed expanding drone applications and developing a new low-altitude economy driven by intelligent unmanned aircraft in its 14th Five-Year Plan for General Aviation Development (2022). In December 2023, the Central Economic Work Conference listed the low-altitude economy as a strategic emerging industry. The Implementation Plan for Innovation and Application of General Aviation Equipment (2024–2030) released in 2024 clearly targets the formation of a trillion-yuan market by 2030. These national-level reforms, along with airspace classification and streamlined approval processes, are unleashing institutional dividends.

At the local level, a "three-year action plan + targeted subsidies" policy package has been widely adopted:

① Action Plans: Typically set for three-year periods, these plans are frequently released at the provincial and municipal levels, focusing on specific development areas and outlining blueprints for low-altitude economic growth.

② Supporting Measures: These include detailed subsidy policies providing tangible financial support for enterprises, while guiding the industry's direction by funding key projects.

For example, Shanghai's Action Plan for the High-Quality Development of the Urban Low-Altitude Economy Industry (2024–2027) sets a 50 billion yuan target and aims to establish a comprehensive logistics network. Nanjing and Wuxi in Jiangsu have issued similar government documents—such as Implementation Plan for Promoting the High-Quality Development of the Low-Altitude Economy in Nanjing (2024–2026) and Three-Year Action Plan for the High-Quality Development of the Low-Altitude Economy in Wuxi—to support infrastructure and application scenarios. Zhejiang has invested 2 billion yuan in funds to strengthen drone technology, and its 14th Five-Year Plan for the Aerospace Industry proposes a province-wide "1 (provincial center) + 10 (municipal centers)" aviation service support system. Anhui's Implementation Plan for Accelerating the Cultivation and Development of the Low-Altitude Economy (2024–2027) leverages YRD regional cooperation, focusing on dual-core development in Hefei and Wuhu, aiming to achieve a 60 billion yuan industry scale. These differentiated policy systems and coordinated resource allocations are injecting momentum into the region's low-altitude economic development.

3.3. Development Challenges

Despite its promising trajectory, the YRD low-altitude economy is still in its early stages and faces three core bottlenecks:

Weak regional coordination mechanisms: The lack of unified policies and standards leads to inconsistent implementation, intensifying homogeneous competition among cities. Fragmented infrastructure and technical standards increase coordination costs, while collaboration across government, industry, academia, and end-users remains insufficient.

Airspace management conflicts: Military control over airspace significantly restricts civil development, and complex cross-provincial flight approval procedures (e.g., a drone logistics project in Jiangsu was stalled for six months due to approval delays) undermine operational efficiency.

Insufficient local legislative support: Current policies focus mainly on incentives, but foundational legal frameworks—such as the allocation of airspace rights and liability for accidents—are underdeveloped.

Overcoming these coordination barriers and airspace constraints is key to advancing the integrated development of the low-altitude economy in the Yangtze River Delta.

4. The Impact of the Low-Altitude Economy on Industrial Development in the Yangtze River Delta

4.1. Empowering the Upgrade of Traditional Industries in the Yangtze River Delta

Amid growing constraints on urban land resources, the three-dimensional development enabled by the low-altitude economy offers new momentum and spatial potential for economic and social growth. In recent years, the Yangtze River Delta (YRD) has advocated for transforming traditional industries through new quality productive forces to promote high-quality regional integration. The empowering effect of the low-altitude economy on traditional industries in the YRD is particularly significant. Through systematic pathways such as technological innovation, process restructuring, management upgrading, and ecological reconfiguration, the low-altitude economy provides multidimensional support for industrial transformation in the region.

In the manufacturing sector, it promotes intelligent transformation through both direct and indirect pathways:

① Direct effects: Drone technologies directly enhance production processes. For example, Shanghai Electric uses drone swarm technology to inspect wind turbine blades, expanding coverage radius to 20 kilometers and increasing efficiency eightfold. Baosteel Group employs autonomous drones for equipment maintenance, reducing high-risk operations by 32,000 hours annually and lowering costs by 40%.

② Indirect effects: The development of the low-altitude economy drives demand for new materials, thereby pushing improvements in precision manufacturing. Zhongfu Shenying's T1100-grade carbon fiber composite has improved tensile strength by 40%, tripling the output of Changzhou's carbon fiber industry within three years. Suzhou Green Harmonic developed a high-precision 17-arc-second reducer, boosting the Yangtze River Delta's market share in robotic joint modules to 58%.

In logistics and transportation, a three-tiered aerial network is being built:

At the macro level, traditional aviation hubs like Shanghai and Hangzhou airports form a "trunk-branch-terminal" system, creating an "aerial highway" to ease ground traffic and restructure logistics. SF Express's drone logistics hub in Jiaxing reduces pharmaceutical delivery times to 30 minutes and is projected to cut total logistics costs in the region by 12 billion yuan by 2025.

At the micro level, vertical takeoff and landing (VTOL) drones create a "15-minute response circle" in industrial parks. For example, drone routes between Tesla's Shanghai factory and Suzhou suppliers reduced mold transportation time from 4 hours to 18 minutes, increasing inventory turnover by 50%.

In warehouse management, vertical inventory systems using drones and RFID technology enable dynamic inventory tracking. Cainiao's smart warehouse in Wuxi uses drones for inventory checks on 30-meter-high shelves, increasing efficiency fivefold and achieving 99.9% real-time data accuracy.

In modern agriculture, the low-altitude economy enables dynamic environmental monitoring and predictive health management models. XAG's agricultural base in Anhui uses multispectral drones to achieve 97% crop monitoring accuracy, reducing pesticide use by 30%. DJI Agriculture's drone services in Yancheng, Jiangsu, are 60 times more efficient than manual operations, increasing farmers' income by 200 yuan per mu.

In the services sector, innovations are increasingly diverse. Projects like aerial tourism over Taihu Lake and low-altitude flights in Hangzhou Bay integrate AR/VR technologies to provide immersive experiences. Drone mapping data also enhances smart city management and insurance evaluation processes.

By systematically empowering traditional industries, the low-altitude economy facilitates a transformation from two-dimensional to three-dimensional development, from process-driven to data-driven operations, and from product manufacturing to value creation. By 2025, the low-altitude economy is expected to increase labor productivity in YRD manufacturing by 18%, reduce energy consumption per 10,000 yuan of output by 12%, and raise the service industry's share of total revenue above 40%, accelerating the region's climb up the global value chain.

4.2. Economic Contributions of the Low-Altitude Economy to the Yangtze River Delta

According to forecasts by the Civil Aviation Administration of China, the market size of the low-altitude economy will reach 3.5 trillion yuan by 2035, with a compound annual growth rate of 8.8% from 2026 to 2035. As a core development region, the Yangtze River Delta is projected to contribute over 30% of the national total by 2026. In 2023, China's low-altitude economy reached 505.95 billion yuan (a year-on-year increase of 33.8%). Wuhu in Anhui Province alone recorded an industrial output of 40 billion yuan, and Shanghai aims to exceed 50 billion yuan in core industry output by 2027.

This industry has given rise to new professions such as drone operators, with a nationwide shortage of over one million qualified personnel. Furthermore, the low-altitude economy is reshaping the regional economic geography and improving urban space utilization by 15% to 20%. For instance, Shanghai has implemented layered airspace management, and Zhejiang has constructed 150 drone take-off and landing sites.

The sector also promotes an integrated “policy-technology-capital-application” incubation model. By 2030, the YRD is expected to host 2,000 high-tech enterprises and cultivate 3 to 5 global industry leaders. The low-altitude economy is thus becoming a new engine for high-quality regional development—driving the upgrading of traditional industries, nurturing new business models, and propelling the industrial system toward three-dimensional advancement.

5. Technological Drivers of Low-Altitude Economy Development

5.1. Current Technological Landscape of the Low-Altitude Economy

According to Ouyang Taohua and Zheng Shuwen (2024), from the perspective of industrial co-evolution, the development of the low-altitude economy requires the coordinated advancement of three key elements: application scenarios, technology, and airspace. Among them, technology serves as the core driver, meaning that breakthroughs in key and core technologies facilitate the expansion of use cases and the development of airspace applications, enabling alignment with advanced technological systems .

Technological innovation in the low-altitude economy focuses primarily on three core areas: flight control systems and management, communication technologies, and propulsion and energy systems.

Flight control technologies and management systems: These utilize RRT (Rapidly-exploring Random Tree) algorithms for path optimization, deep learning AI for obstacle recognition and prediction, and Kalman filtering for state estimation and enhanced positioning accuracy—together constructing an intelligent flight control system. GIS-based geofencing algorithms (electronic fences) and blockchain-based data authentication platforms enable dynamic airspace allocation and transparent regulation. For example, Nanjing’s "Eagle Eye" obstacle avoidance system achieves a rapid response time of 0.1 seconds using multispectral sensors. The East China Air Traffic Management Bureau’s UTM 1.0 system managed coordinated operations of over 100 drones in a pilot project in Nantong. However, challenges remain in scaling the system, such as jurisdictional division of airspace rights and cross-regional scheduling.

Communication technologies are structured in a hierarchical architecture:

① Metropolitan-level (5G/6G): Technologies such as orthogonal frequency-division multiplexing and millimeter-wave enable millisecond latency and gigabit-level speeds, supporting real-time data transmission and remote control.

② Satellite backup: Satellite communication links serve as redundancy in complex terrain to ensure flight safety.

③ Localized emergency (private networks): Emergency communication networks provide real-time control under adverse conditions.

Zhejiang has already established a province-wide 5G private network for low-altitude flight, while Shanghai has installed 2,000 BeiDou augmentation stations, enabling centimeter-level positioning and significantly enhancing flight safety in densely populated urban areas.

Power and energy systems: These are exploring high-energy-density batteries, hydrogen fuel cells, and technologies for wireless charging and fast battery swapping. Biomimetic perching systems are also under development to reduce energy consumption. Nonetheless, endurance and ease of operation remain major bottlenecks.

Practice in the Yangtze River Delta has shown that technological breakthroughs must be accompanied by innovations in airspace governance to ensure the sustainable development of the low-altitude economy.

5.2. Logic Behind Low-Altitude Infrastructure Development

Infrastructure construction serves as the “hard support” for the low-altitude economy. It includes physical infrastructure such as general aviation airports and various takeoff/landing points, as well as information infrastructure for communication, navigation, surveillance, and weather monitoring.

Additionally, digital management and service platforms for low-altitude flight operations are also essential.

As an emerging economic model with limited historical precedent, overall design and planning have become top priorities. Design institutes engaged in smart city and intelligent transportation projects—as well as large engineering companies—have begun participating in infrastructure planning. For instance:

The Civil Aviation Planning and Design Institute contributed to the Medium and Long-Term Development Plan for the General Aviation Industry in Anhui Province (2023–2035).

Suzhou-based SUEP has undertaken multiple low-altitude economy projects in Jiangsu and Zhejiang, and has allied with 28 research institutions and enterprises to form a Low-Altitude Economy Innovation Development Alliance, demonstrating the region's strong commitment to infrastructure development.

Zhejiang's 14th Five-Year Plan for the Aerospace Industry outlines a province-wide low-altitude flight support system structured as "1 (provincial center) + 10 (municipal centers)," focusing on infrastructure development.

Examples include:

A 200-kilometer drone logistics corridor between Shanghai and Ningbo has entered trial operation, with 12 radar monitoring stations and 5 emergency landing zones along the route.

Suzhou's planned low-altitude tourism network includes 8 sightseeing air routes, along with supporting charging stations and maintenance centers capable of handling up to 100 drone operations per day.

These infrastructure developments lay a solid foundation for both commercial applications and the integration of the low-altitude economy across the Yangtze River Delta.

6. Challenges and Ethical Considerations in the Development of the Low-Altitude Economy

6.1. Practical Challenges in Implementing the Low-Altitude Economy

China's low-altitude economy is still in its early stages and faces four key challenges: technological, managerial, institutional, and safety-related.

Technological challenges include limitations in environmental sensing, path planning, and obstacle avoidance. Insufficient endurance severely restricts operational efficiency. According to industry reports, commercial-grade drones typically last 30–60 minutes per charge, while industrial-grade drones last around 6 hours. High-energy batteries and dynamic perching technologies—where drones hover or use external objects like branches to reduce energy consumption—are urgently needed. Additionally, issues such as air pollution, noise pollution, and solid waste generated by drone use must be addressed through eco-friendly and noise-reduction solutions.

Managerially, Ouyang Taohua (2024) emphasized that airspace governance is a core driver of the low-altitude economy. However, current airspace regulation is hindered by fragmented zoning and strict military control, with poor alignment to dynamic civilian demand. A smart airspace management system is needed to streamline approval processes and enable dynamic zoning.

Legal and institutional challenges are particularly evident in the lack of clear airworthiness certification standards for eVTOLs, fragmented local policies, and unclear regulatory responsibilities. Top-level design is urgently needed to unify standards.

Safety risks include incidents such as drone collisions. In October 2023, drone interference at Shenzhen Bao'an International Airport caused widespread flight delays and raised privacy concerns. This highlights the need for stronger data encryption and flight monitoring.

To fully realize the low-altitude economy, a coordinated transformation across technology, institutions, and society is essential. Government, industry, and civil society must collaborate to overcome short-term challenges and reshape long-term urban ecosystems in transportation, logistics, and beyond.

6.2. Ethical Pain Points in the Low-Altitude Economy

While the low-altitude economy is undergoing rapid development, it also faces several ethical dilemmas. Zhang Shichang and Xu Fangfei (2025) note that current ethical challenges stem from the gap between consumer expectations and market reality, a sharp conflict between safety concerns and development goals, and issues such as environmental degradation, fairness, and regulatory challenges that pose new governance risks .

Social adaptation: The spread of drones raises privacy and noise concerns. A survey in Shanghai found that 68% of respondents opposed drone deliveries in residential areas. eVTOL services face low public acceptance due to high costs (e.g., Suzhou to Shanghai eVTOL fares exceed high-speed rail) and a lack of infrastructure (e.g., only 249 takeoff/landing sites in Shenzhen).

Environmental sustainability: Flight noise disturbs ecosystems and wildlife, rare earth metal mining for batteries increases resource strain, and battery disposal poses pollution risks. A balance between efficiency and environmental responsibility is urgently needed.

Technology access and equity: Market dominance by major firms (e.g., 80% of the drone market in Zhejiang is controlled by leading companies) and disparities in urban-rural infrastructure intensify regional imbalances. Issues of technology sharing and fair distribution must be addressed.

Research suggests that the low-altitude economy requires a collaborative governance framework focusing on safety risk control, environmental cost constraints, and equitable sharing of outcomes to prevent technological benefits from exacerbating social inequality and environmental degradation.

7. Conclusion and Development Recommendations

7.1. Key Issues Analysis

The core contradictions in the low-altitude economy lie in insufficient policy integration, structural imbalance in the industrial chain, and a lack of technological ecosystem collaboration. A shift from “single-point breakthroughs” to “systematic integration” is needed, which requires:

① Policy level:

The industry faces fragmented airspace management, complex approval procedures, and a lack of systematic legislation. Cross-regional coordination remains weak, and fiscal subsidies dominate current policy tools. Legal synergy and regional integration must be strengthened.

② Industrial level:

Although full-chain layouts are forming based on traditional industries, imbalances persist—particularly with fierce midstream manufacturing competition and underdeveloped downstream services and data applications. SMEs face financing difficulties and low technology transfer efficiency, necessitating improved market competition mechanisms.

③ Technological level:

While 5G, AI, and BeiDou technologies have empowered low-altitude applications, low integration and weak ecosystem collaboration persist—shown in incompatible protocols, disconnected supply chains, and a lack of synergy between hardware and software services. Talent imbalances are also evident, with an oversupply of R&D personnel and a 40% shortfall in cross-functional operational talent.

7.2. Recommendations for High-Quality Integrated Development

To transform the low-altitude economy in the Yangtze River Delta from a “policy dividend” into an innovation-driven engine, a five-pronged development path is proposed: policy guidance, industrial synergy, technological innovation, ecological co-construction, and ethical assurance.

7.2.1 Government Level: Legislative Coordination and Mechanism Optimization

① Legislation first: As Kong Dejian and others suggest, coordination between national and local policies is essential for orderly development of China’s low-altitude economy [2]. A unified national

regulatory framework should be promoted, including clarified airspace boundaries, flight standards, and liability definitions, along with streamlined “one-stop” approval procedures and coordinated central-local governance.

② Classified regulation: Airspace management should balance control and innovation by establishing dedicated regulatory agencies and improving airworthiness certification and industry standards.

③ Regional coordination: Tailored local policies and action plans should define development targets, promote cross-provincial data platform construction in the YRD, and eliminate policy implementation barriers.

7.2.2 Industrial Level: Ecosystem Building and Scenario Integration

A Yangtze River Delta Low-Altitude Economy Industry Alliance should be formed, integrating manufacturers (e.g., EHang), operators (e.g., SF Express), and research institutes to build a “manufacturing-operations-data” integrated platform. Application-driven development can be fostered by implementing a "chain leader" mechanism to coordinate resources, pilot "low-altitude aircraft +" models in areas like emergency logistics and medical delivery, and build a “15-minute emergency logistics circle.” Financial innovation such as “data asset-based loans” can lower entry barriers for SMEs and accelerate the commercialization of technical achievements.

7.2.3 Technological Level: Indigenous Innovation and System Integration

Key technologies should be integrated into comprehensive “hardware + software + service” solutions. A smart network and a regional low-altitude big data center should be developed to optimize flight routes and decision-making using AI. Joint training programs with universities are needed to cultivate cross-disciplinary talent, addressing the 40% talent gap between R&D and operations.

7.2.4 Ethical Level: Green Technology Evaluation Framework

Establish an eco-rating system covering energy consumption, noise, and carbon emissions of low-altitude aircraft, and promote deep integration of new energy technologies. Full lifecycle environmental impact assessments should be implemented to align technological development with ecological conservation. Corporate ethical responsibility must also be reinforced to ensure inclusive access to technology, prevent monopolies and data misuse, and protect public privacy and airspace safety.

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