The Enlightenment and Reference of Shenzhen Low-Altitude Economy Development Model

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Abstract: Against the backdrop of economic globalization and rapid technological advancement, the low-altitude economy has emerged as a significant driver of regional economic growth. This sector encompasses diverse fields including aviation services, manufacturing, and logistics. Accelerating its development can optimize industrial structures and enhance regional competitiveness. Shenzhen, a pivotal innovation hub in China's reform and opening-up, has developed a distinctive "Shenzhen model" for low-altitude economy development. This model offers valuable insights for other regions, enabling effective replication of such economic development strategies. By promoting rapid growth in the low-altitude economy, Shenzhen's approach can elevate China's overall economic development standards.

1. Introduction

Shenzhen's low-altitude economy sector exhibits distinctive characteristics, featuring a robust market mechanism, strong innovation capacity, and a vibrant innovation ecosystem. By establishing collaborative partnerships with research institutions during corporate development, enterprises can accelerate technological innovation and achieve industrial upgrading. Shenzhen's industrial advantages include a solid foundation, a relatively complete industrial chain, high market demand, and a highly favorable policy environment-all of which provide a solid foundation for the growth of the low-altitude economy. During its development, the sector can draw lessons from this model, gain valuable insights, and effectively promote healthy industry growth.

2. Analysis of the Development Model of Shenzhen Low-altitude Economy

2.1 Basic Conditions

Shenzhen boasts a solid foundation for developing its low-altitude economy, with distinct geographical and transportation advantages. Located in the Pearl River Delta, the city enjoys a prime location and an extensive transportation network, providing ideal conditions for industrial growth. Moreover, Shenzhen has a robust industrial base, featuring strong R&D capabilities and a well-established industrial system, which has attracted numerous research centers and high-tech

enterprises. Additionally, the city has a wealth of talent reserves, including professionals in fields such as electronics, machinery, and aviation [1].

2.2 Background of Formation

As one of China's special economic zones, Shenzhen boasts an exceptionally open policy environment, strategic geographical advantages, and a distinctly innovative industrial ecosystem. These factors have created ideal conditions for the development of the low-altitude economy, leading to the formation of a distinctive Shenzhen model in this sector. Local governments provide strong support for this emerging industry, while the city's prime location further optimizes the external environment for industrial growth. Moreover, Shenzhen's relatively complete low-altitude economic industrial system and robust manufacturing foundation have become crucial drivers for the sector's advancement [2].

2.3 Operational Mechanisms

First, the market-driven mechanism: Shenzhen has effectively leveraged its market advantages by conducting comprehensive market research, accurately identifying industrial development needs, and optimizing resource allocation, thereby effectively promoting the development of the low-altitude economy. Second, the policy-guided mechanism: The local government has implemented effective policy measures, providing solid support for industrial development at the policy level. The introduction of relevant policies has played a crucial role in fostering industrial growth.

3. Inspiration from the Development Model of Shenzhen's Low-altitude Economy

First, in the development of the low-altitude economy, it is crucial to prioritize innovation-driven growth and continuously advance high-tech sectors to enhance industrial competitiveness. Second, the Shenzhen municipal government has significantly strengthened its support for industrial development through effective policies, funding, and talent cultivation, leading to a comprehensive optimization of the industrial ecosystem. Third, the Shenzhen model demonstrates a clear international perspective by effectively adopting advanced global technologies and incorporating international management practices, encouraging enterprises to actively participate in global competition [3]. Taking SF Express's Fengyi drones as an example, their flight operations have surpassed one million missions, marking the entry into the "Low-Altitude Logistics 2.0" era. Currently, with the fully loaded Fengzhou 90 drone flying over Lingdingyang from Zhuhai and landing safely at Shenzhen's Chiwan Airport, the Fengyi drones have completed their millionth flight. During this milestone journey, the drones transported over 5.2 million parcels weighing more than 2,700 tons, covering nearly 5.3 million kilometers-enough to circle the Earth 132 times-truly providing an additional option for delivering happiness to people's lives.

4. Reference to the Development Model of Shenzhen's Low-altitude Economy

4.1 Promotion Measures

First, it is essential to strengthen policy guidance by introducing supportive measures for the development of the low-altitude economy, thus optimizing the policy environment. Market - driven mechanisms should be utilized to allocate resources rationally and enhance the innovation vitality of enterprises. Second, coordinated development across the industrial chain must be effectively

realized through comprehensive resource integration. This requires rational optimization of industrial chain layouts, enhanced corporate collaboration, and full integration of resources such as talent, capital, and technology. Third, innovative centers should be established to facilitate the development of the low - altitude economy, integrating diverse innovation entities such as enterprises, research institutions, and universities. A strong collaborative innovation network should be constructed to effectively transform technological innovations into practical industrial applications. Additionally, during the development of the low - altitude economy, international cooperation and exchanges should be deepened, a comprehensive standard system should be established, professional talent should be cultivated, the business environment should be continuously optimized, and public opinion should be effectively guided [4].
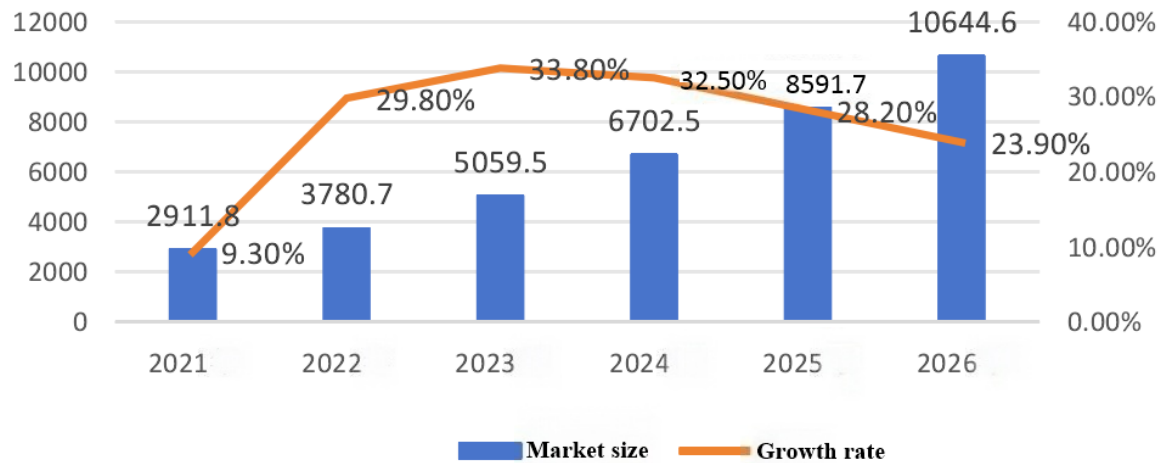

Figure 1: Expected Market Size and Growth Rate of China's Low-altitude Economy from 2021 to 2026

4.2 Successful Cases

Figure 2: Schematic diagram of the UAV

Taking the drone industry as an example, after strengthening policy guidance, conducting in-depth market analysis, and achieving effective technological innovation, drones have been widely applied in logistics, surveying, and agriculture, as shown in Figure 1 and 2. By the end of 2023, Shenzhen had over 1,700 drone enterprises with an annual output value of 96 billion yuan. The city has established 126 low-altitude flight routes and 89 drone landing sites, with over 600,000 drone cargo and general flight operations in 2023. According to projections, by 2025, Shenzhen will deploy more than 600 low-altitude aircraft landing platforms in a grid pattern, launch over 220 urban drone routes, exceed 1,700 chain enterprises, and surpass the 100 billion yuan output

threshold. By the first half of 2024, Shenzhen's low-altitude cargo drone flight volume, newly added freight routes, manned flight operations, and passenger transport capacity ranked among the nation's top. Taking a low-altitude tourism company as an example, its recent operating conditions are shown in the table 1. It can be observed that the company's total profit and net profit have continued to grow, demonstrating strong operational performance and significant improvement in overall economic efficiency [5].

Table 1: Business performance (in billions of yuan)

project	2021	2022	2023	2024
operating receipt	79.97	80.00	91.77	76.30
total profit	4.24	4.29	5.47	7.04
net margin	3.72	4.06	5.21	6.33
Total assets	101.12	86.32	98.36	97.12

4.3 Effectiveness Assessment

First, the low-altitude economy sector has achieved significant economic benefits, with notable growth in industrial output and sustained improvement in profitability, effectively boosting regional economic development. Second, the vigorous promotion of the Shenzhen model has effectively stimulated market vitality in this industry, significantly optimized the business environment, lowered market entry barriers, and diversified market participants [6]. Taking China Oceanic Helicopter (COH) as an example, headquartered in Shenzhen, Guangdong Province, the company operates helicopter airports in Shenzhen, Tianjin, Zhanjiang, and Hainan Oriental, while maintaining operational bases in Beijing, Shanghai, Zhejiang, and Fujian. Its business spans China's three major maritime regions and major cities, making it the domestic general aviation enterprise with the most extensive geographical coverage and strongest operational capabilities. Meanwhile, CITIC Helicopter owns Asia's largest civilian helicopter fleet, comprising approximately 80 aircraft of 15 of the world's most advanced models, including Airbus Helicopters' EC225, AS332L/L1, EC155 B/B1, Sikorsky's S92, and Leonardo's AW139.

5. Development Strategy of Low-altitude Economy Industry Based on Shenzhen Model

5.1 Strengthening innovation-driven development

For enterprises in the low-altitude economy sector, it is essential to encourage increased investment in technology R&D to ensure continuous innovation. During this period, these enterprises should strengthen collaboration with research institutions and universities, effectively establishing a technological innovation system that grants the low-altitude economy sector significant technical advantages. Shenzhen should proactively build an open and collaborative industrial innovation ecosystem, fostering synergy among upstream and downstream enterprises in the industrial chain. Support should be provided for leading enterprises to form innovation consortia and tackle key core technologies. Currently, Shenzhen's low-altitude economy has taken the lead in areas like flight control and batteries, but it still needs to overcome "bottleneck" technologies and establish an independently controllable industrial chain system. To achieve this, Shenzhen's low-altitude economy development should focus on core technologies by establishing "specialized R&D programs." Priorities should include high-end fields such as eVTOL manned flights and high-capacity logistics drones, with increased investment in technologies like "high energy density batteries (targeting 450Wh/kg by 2026), low-power main control chips, and complex environmental sensing sensors." Leveraging platforms like the Guangdong Vertical Takeoff and Landing Aircraft

Manufacturing Innovation Center and the Harbin Institute of Technology (Shenzhen) Low-altitude Science and Technology Research Institute, Shenzhen should form "enterprise-university-research institute" innovation consortia. The goal is to achieve 100% self-sufficiency in core components of the industrial chain by 2026, eliminating external dependence [7].

5.2 Optimizing the industrial ecosystem

For the low-altitude economy sector, optimizing industrial ecosystems and achieving multi-party collaboration are crucial to establishing a comprehensive industrial development framework. This process requires strengthened policy guidance and enhanced cooperation between upstream and downstream enterprises to fully leverage cluster effects. Simultaneously, cross-sector collaboration should be prioritized by integrating emerging technologies like big data and the internet, driving innovation in application scenarios and expanding the business scope of the low-altitude economy. Shenzhen should serve as the "core engine" by coordinating with cities in the Guangdong-Hong Kong-Macao Greater Bay Area to create a "complementary advantages and resource-sharing" low-altitude economy ecosystem. For Shenzhen, leveraging the nation's first city-level low-altitude economy standardization technical committee, it should transform local experiences such as "electronic fence control," "airworthiness certification procedures," and "infrastructure construction standards" into "Bay Area standards" for adoption by cities like Guangzhou, Dongguan, and Zhuhai. Additionally, establishing a "Low-Altitude Economy Collaborative Development Alliance" with Bay Area cities to unify policies on airspace allocation, flight approvals, and emergency rescue operations will eliminate regional barriers. Shenzhen should also promote joint development of "inter-city low-altitude routes" (e.g., Shenzhen Longhua-Dongguan Songshan Lake, Shenzhen Qianhai-Huizhou Xunliao Bay) with Dongguan and Huizhou, aiming to launch over 50 inter-city routes by 2026. Sharing resources like test fields and R&D platforms (e.g., opening Shenzhen test fields to Bay Area enterprises to reduce R&D costs) will form an industrial chain division pattern where "R&D is in Shenzhen, manufacturing in Dongguan, and applications in Huizhou" [8].

5.3 Improving the legal framework

Against the backdrop of rapid development in the low-altitude economy sector, it is imperative to strengthen regulatory frameworks by clarifying airspace management authorities and rationally allocating operational permissions to streamline flight approval processes. Additionally, enhancing industrial management efficiency is crucial to balance development with flight safety. Simultaneously, accelerated establishment of comprehensive regulatory systems covering drone design, manufacturing, airworthiness certification, operational monitoring, and accident investigation is essential. Innovative regulatory models like "sentinel" systems should be actively adopted, utilizing surveillance and communication technologies to build digital low-altitude traffic management systems that enable real-time monitoring and refined flight control. Furthermore, as the low-altitude economy scales up, a full-chain safety system encompassing "prevention, monitoring, and response" must be established. First, the "categorized and tiered supervision" mechanism should be refined, implementing differentiated standards based on aircraft weight, flight altitude, and application scenarios: small consumer drones should be subject to "automatic flight bans" through electronic fencing; large logistics drones and eVTOL aircraft require "real-time positioning + emergency parachute" equipment; manned flights should adopt a "rigorous pilot qualification review + quarterly aircraft maintenance" system, with the goal of achieving "zero major safety incidents" by 2026. Secondly, an "emergency response rapid response system" should be established by adding an "emergency command module" to the SILAS system. In the event of aircraft loss of contact or collisions, the system will automatically dispatch nearby drones and

helicopters for rescue operations. Meanwhile, "low-altitude security patrol teams" equipped with drone countermeasures should be deployed in key areas (such as airport peripheries and densely populated zones) to prevent risks like unauthorized flights and air traffic interference.

5.4 Deepening market development

Shenzhen's low-altitude applications have expanded into logistics, cultural tourism, and emergency response sectors, but there's a need to explore high-value-added scenarios to establish a "sustainable commercialization model". First, Shenzhen should leverage the Shenzhen-Hong Kong regulatory sandbox to expand cross-border drone flight pilots: launch "Shenzhen-Hong Kong cross-border logistics routes" at Shekou Cruise Terminal and the Hetao area, prioritizing time-sensitive goods like fresh produce, pharmaceuticals, and high-end electronic components. The goal is to achieve "30-minute cross-border delivery" by 2026, while promoting "mutual recognition of airworthiness standards" and "simplified customs procedures" between Shenzhen and Hong Kong to reduce operational costs. Additionally, collaborating with companies like SF Express and Meituan to develop "inter-city low-altitude logistics" (e.g., Shenzhen-Dongguan, Shenzhen-Huizhou) will establish a "1-hour low-altitude express network in the Guangdong-Hong Kong-Macao Greater Bay Area". Second, drone technology should be deeply integrated into urban governance across all scenarios: deploy "drone + infrared monitoring" systems for forest fire prevention to improve early warning efficiency by over 80%; utilize drones for river and reservoir inspections to achieve "full coverage within a 3-kilometer radius"; and employ eVTOL aircraft for rapid casualty transfer in traffic accidents, reducing emergency response time to under 10 minutes. As shown in the table 2, China's low-altitude economy has witnessed significant expansion in both industry scale and enterprise numbers, with their proportion in the total market growing substantially. This demonstrates the accelerating development and deepening market penetration of China's low-altitude economy sector [9].

Table 2: Scale and Number of Low-altitude Economy Enterprises from 2018 to 2022

project	2018	2019	2020	2021	2022
Enterprise size (in billions of yuan)	41782.45	53074.24	69843.90	82450.02	75966.10
Number of businesses (count)	195	211	240	265	287
Enterprise share (%)	5.35	5.59	5.90	5.76	5.84

5.5 Strengthening talent development

In the development of the low-altitude economy industry, it is essential to conduct in-depth analysis of talent demands and implement effective talent recruitment and cultivation strategies. By aligning with the industry's unique characteristics, specialized training programs should be established through enhanced collaboration with universities to develop versatile professionals who are proficient in market operations, management expertise, and advanced technological applications. Concurrently, talent policies must be optimized to attract outstanding individuals, enabling them to contribute to the industry's growth and provide robust talent support for the low-altitude economy sector [10].

6. Conclusion

In conclusion, Shenzhen's development model for the low-altitude economy sector serves as a vital reference for China's regional growth. By adopting its proven strategies, we can accelerate industrial advancement through strategic policy guidance, technological innovation, talent

cultivation, and market expansion. This approach ensures optimal resource integration, propelling regional economic development with tangible progress.

References

[1] Wang Youzhi. Global Competition and Urban Strategy: International Comparison of Low-altitude Economy Development Models and the Shanghai Path. International Metropolis Development Research (Chinese-English), 2025, 2(3): 21-41.

[2] Yao Xing, Wang Yongjun, Sun Shanlin, et al. Exploring and Practicing Talent Cultivation Models for UAV Applications in the Low-Altitude Economy [J]. Journal of Guilin University of Aerospace Technology, 2025, 30(2): 186-194.

[3] Wang Jue. Intelligent Governance: An Innovation in Low-altitude Economy Management Mode Based on "Artificial Intelligence+" [J]. Journal of Southwest Petroleum University (Social Sciences Edition), 2025,27(5):44-54.

[4] Liu Jiawen, Wang Liuying, Shen Tong, et al. Development of Low-altitude Economy at Home and Abroad and Its Application Scenarios in the Railway Sector [J]. Railway Transport and Economy, 2025,47(10):30-43.

[5] Shi Dongjian, Li Shanshan, Cao Jiangdong, et al. Research on the Development Path of Nantong's Low-altitude Economy under the Background of New Quality Productivity [J]. Modern Industrial Economy and Informatization, 2025, 15(8):13-18.

[6] Huang Yuhuan, Yang Liying, Chen Qingyu, et al. Market innovation under policy empowerment: Research on the opening of low-altitude airspace and the transformation of exhibition service supply models [J]. China Scientific and Technological Achievements, 2025,26(12):40-43.

[7] Li Munan, Xie Tianqi. China's low-altitude economic development: Relying on self-reliance and self-improvement in science and technology to facilitate the formation of new quality productivity [J]. Science and Technology Management Research, 2024,44(17):1-9.

[8] Tianbao Li, An Wang, Jiahua Liao, et al. Organic sulfurization interface enabled the long-lifespan lithium metal anode for Ah-class pouch cells[J]. Rare Metals,2025,44(8):5301-5309.

[9] Qinghong Zhang, Rumeng Li, Juanzhen Sun, et al. A Review of Research on the Record-Breaking Precipitation Event in Henan Province, China, July 2021[J]. Advances in Atmospheric Sciences,2023,40(8):1485-1500.

[10] Yali Zhu, Fangwu Song, Dong Guo. Decadal changes in the western Siberian summer mean and extreme rainfall during 1982-2021[J]. Atmospheric and Oceanic Sciences Letters (English Edition), 2024,17(3):37-41.