Low-Altitude Economy Development: Risk Control and Legal Protection Mechanism

Jiang Mengzi
School of Law, South China Normal University, Guangzhou, Guangdong, China

Abstract: Low altitude economy, as an emerging comprehensive economic form that relies on low altitude airspace resources and is driven by civilian manned and unmanned aerial vehicle low altitude flight activities, is gradually becoming a representative of national new quality productivity and an important force in promoting regional high-quality development. 2024 is known as the "first year of China's low altitude economy" and plays an important role in China's national economic strategic layout. Various provinces and cities have also introduced favorable policies to seize the golden period of low altitude economy development. However, in the pursuit of high-speed development of the low altitude economy, security and legal protection have become crucial links that cannot be ignored. Security is the cornerstone of development, and the rule of law is an important means of ensuring security and regulating development. This article aims to deeply analyze the security risks and legal challenges that high-quality development of low altitude economy may face, and propose targeted legal paths, in order to provide theoretical support and practical guidance for the stable and sustainable development of low altitude economy.

Keywords: Low Altitude Economy; Security Guarantee; Legal Protection; High Quality Development

1. Security Risks Faced by High-Quality Development of Low Altitude Economy

1.1 Defense Security Risks

Small aircraft such as drones pose many potential threats to national defense security due to their low altitude flight characteristics and strong concealment. For example, in 2024, there were multiple incidents of unidentified drones approaching military controlled areas in a border region of a certain country. These drones take advantage of their difficulty in being effectively detected by conventional radar systems and frequently hover over military facilities, suspected of conducting illegal reconnaissance activities. Although multiple forces jointly responded and ultimately drove away or captured the relevant drones, this incident fully exposed the severe challenge posed by low altitude aircraft to the safety protection of military facilities. The development of China's low altitude economy may also face similar risks. Criminals may use civil aircraft to illegally spy on military facilities, military enterprises, or classified places, obtain national military confidential information, and transmit it abroad, seriously damaging national sovereignty and security interests. In addition, terrorist organizations or extremist forces may also use low altitude aircraft to launch terrorist attacks, such as carrying explosives or biological weapons to destroy key targets such as military command centers and ports, causing social panic and national security crises.

1.2 Flight Safety Risks

Some low altitude aircraft pose a serious threat to flight safety due to technical malfunctions or illegal operations. Taking the 2021 Chongqing drone incident as an example, during this low altitude light show performance, a large number of drones lost control due to sudden malfunctions in their flight control systems and deviated from their scheduled routes, heading straight towards the audience area. This incident has aroused high public attention to the safety of low altitude flight. In daily low altitude flight activities, consumers' safety awareness and flying skills vary greatly. Many untrained individuals operate aircraft for recreational flights, which can easily lead to aircraft crashes or collisions with other objects due to operational errors. At the same time,

some unauthorized aircraft taking off may disrupt normal air traffic order and cause flight conflicts with police, military, or commercial flights, potentially leading to serious air accidents. If an incident occurred this year where a drone illegally entered the airport clearance area, causing multiple flights to be delayed or forced to change routes, resulting in huge economic losses. Furthermore, adverse weather conditions have a significant impact on low altitude flight safety. In coastal areas, typhoon, rainstorm and severe convection weather are frequent, and low altitude aircraft flying under these extreme meteorological conditions are vulnerable to flight accidents due to strong wind, lightning, low visibility and other factors.

1.3 Public Safety Risks

The flight activities of low altitude aircraft also pose many risks and hidden dangers in the field of public safety. In terms of data security, as the amount of data collected during low altitude flight activities continues to increase, identity information, flight trajectories, and other data face the risk of leakage during transmission and storage. For example, a low altitude flight data service company was hacked due to network security vulnerabilities, resulting in a large amount of user flight data being stolen, including some sensitive personal information, which has raised public concerns about personal privacy and security. In terms of personal and property safety, incidents of ground personnel injury or property damage caused by technical failures or operator errors of low altitude aircraft occur from time to time. In 2022, there was an incident in Taizhou City where a drone lost control during a test flight and hit a roadside vehicle, causing serious damage to the vehicle. In addition, low altitude flight may also violate citizens' personal privacy. Criminals have used drones to illegally film residential areas, observing others' private lives, and even spreading the captured videos online, seriously infringing on citizens' privacy rights and causing public outrage.

2. Legal Challenges Faced by High-Quality Development of Low Altitude Economy

2.1 The Legal Regulatory System is Incomplete

There are still many deficiencies in the legal norms in the field of low altitude economy. On the one hand, existing laws are difficult to fully cover the diversity and complexity of the low altitude economy. For example, there is a lack of clear and detailed legal provisions regarding the airworthiness standards, route planning, and takeoff and landing sites for new unmanned aerial vehicles. Taking a new type of ultra light unmanned aerial vehicle as an example, its flight speed and range far exceed traditional unmanned aerial vehicles. However, the current laws have vague regulations on its flight altitude restrictions and whether special flight permits are required, which has led to many legal difficulties for the market promotion and actual operation of this unmanned aerial vehicle. On the other hand, the definition of legal responsibility is not clear. In low altitude flight safety accidents, there is a lack of clear definition of the legal responsibilities that aircraft manufacturers, operators, flight controllers and other parties should bear, which leads to difficulties in resolving disputes after the accident occurs. In the 2012 Xiamen drone and car collision case, due to the lack of clear legal provisions on the responsible parties and division standards for drones flying in specific airspace, the responsibility was shifted between the car driver and the drone owner.

2.2 The Regulatory Mechanism is not Sound

The unclear division of responsibilities and insufficient coordination in low altitude economic regulation are another legal challenge currently faced. Firstly, in different application scenarios, there are overlapping and gaps in the responsibilities of various departments. For example, in low altitude flight sightseeing projects in tourist attractions, the tourism department, civil aviation department, and market supervision department all have certain management responsibilities. However, the specific boundaries of responsibilities for tourism project approval, flight safety supervision, and operational norms supervision are unclear, which can easily lead to a situation of multiple management or no one being responsible. Secondly, there is a lack of information sharing mechanism. The lack of an effective information communication platform among regulatory departments has resulted in the inability to share regulatory information in a

timely manner. When the public security department is investigating illegal drone flight activities, it is difficult to accurately crack down on illegal and irregular behaviors due to the inability to timely obtain the flight plan and registration information of the drone from the civil aviation department. Finally, regulatory standards are not uniform. There are differences in regulatory standards for low altitude aircraft among different departments. For example, market regulatory departments have different emphasis on product quality standards for unmanned aerial vehicle manufacturers, while civil aviation departments have different emphasis on aircraft airworthiness standards. This can easily leave companies at a loss, increase compliance costs, and affect regulatory efficiency and effectiveness.

2.3 The Effectiveness of Law Enforcement Needs to be Improved

The lag in law enforcement will also constrain the development of low altitude economy. One reason is that the basis and standards for law enforcement are not clear. Due to the lack of top-level design, law enforcement agencies often lack clear legal provisions and unified punishment standards when dealing with illegal and irregular activities in the low altitude economy. For example, for the unauthorized conduct of commercial low altitude flight performances, the relevant laws do not clearly stipulate the specific amount of fines, revocation of licenses, and other punishment measures, resulting in a high degree of arbitrariness in law enforcement. Secondly, the cost and difficulty of law enforcement are high. The large number of low altitude aircraft and scattered flight activities, especially the small size and strong maneuverability of drones, pose great difficulties for law enforcement and supervision. In urban areas, law enforcement agencies find it difficult to monitor and effectively intercept a large number of unmanned aerial vehicles that violate regulations, resulting in high enforcement costs and poor enforcement effectiveness. Thirdly, the professional competence of law enforcement teams varies greatly. Some law enforcement personnel have insufficient knowledge of laws, regulations, and technical standards related to low altitude economy, and there are non-standard law enforcement behaviors in the law enforcement process, such as incorrect identification of illegal facts and illegal punishment procedures, which affect the fairness and authority of law enforcement and weaken the deterrent effect of the law on illegal and irregular behavior in low altitude economy.

3. The Rule of Law Path for High Quality Development of Low Altitude Economy

3.1 Improve the Legal Regulatory System

Accelerate the construction of a comprehensive legal regulatory system for low altitude economy. Firstly, formulate a specialized low altitude economic security guarantee law. Clarify the definition and scope of low altitude economy, establish the basic principles of safety supervision, such as safety first and prevention oriented principles; Determine the regulatory body, such as clarifying the functional division of labor among civil aviation departments, public security departments, market supervision departments, etc. in low altitude economic supervision; Refine the rights and obligations of all parties involved, including the product quality assurance obligations of aircraft manufacturers, the safety operation responsibilities of operators, the qualification requirements and flight standards of flight operators, etc; Establish an efficient mechanism for rights relief and provide convenient judicial remedies for those whose rights have been damaged. Secondly, improve relevant supporting normative documents. Develop strict data encryption, storage, transmission, and usage standards for data security, and clarify legal responsibilities for data breaches; In terms of privacy protection, the collection and use boundaries of personal privacy information during low altitude flight activities are stipulated, and illegal collection and abuse of personal privacy data are prohibited; For flight safety, detailed industry standards such as aircraft airworthiness standards and flight operation specifications should be developed to reduce illegal flight behavior from the source and ensure the safety and standardization of low altitude flight activities.

3.2 Establish a Sound Regulatory Mechanism

Guided by low altitude economic application scenarios, establish a comprehensive

collaborative supervision mechanism. Firstly, clarify the regulatory responsibilities of each department. In the low altitude flight operation scenario of agricultural crop protection, the agricultural and rural departments are responsible for reviewing operation requirements and supervising operation effects, the civil aviation department is responsible for approving flight airspace and supervising flight safety, and the market supervision department is responsible for supervising the product quality of crop protection drones, forming a clear division of labor and coordinated supervision pattern. Secondly, establish a provincial-level low altitude flight comprehensive management service platform. Integrate information resources from multiple departments such as civil aviation, public security, and market supervision to achieve real-time sharing and interconnectivity of regulatory information. Through this platform, low altitude flight activities can be dynamically monitored throughout the entire process, and potential safety risks can be detected and warned in a timely manner, such as predicting drone flight trajectory conflicts, monitoring the impact of adverse weather on low altitude flight, and issuing warning information in a timely manner to guide aircraft in avoiding risks. At the same time, with the help of the platform, we will strengthen the risk assessment of low altitude economic activities, regularly conduct safety performance evaluations and credit ratings of various low altitude flight operation enterprises and aircraft, implement classified supervision based on the evaluation results, increase supervision of high-risk entities, provide policy support and convenience to compliant business entities, and improve regulatory efficiency and accuracy.

3.3 Enhance Law Enforcement Efficiency

To ensure the effective implementation of legal norms for low altitude economy, it is necessary to comprehensively enhance law enforcement efficiency. One is to establish a rapid response law enforcement mechanism. Establish a dedicated low altitude economic law enforcement emergency command center, equipped with advanced monitoring and emergency response equipment, such as low altitude radar monitoring systems, unmanned aerial vehicle jamming guns, etc. When an emergency or sudden event occurs, the command center can quickly activate the emergency plan, dispatch law enforcement personnel to quickly rush to the scene, promptly stop illegal and irregular behavior, and reduce accident losses and social impact. The second is to strengthen cross departmental joint law enforcement. Strengthen law enforcement cooperation among civil aviation, public security, market supervision and other departments, establish a normalized joint law enforcement mechanism, form a strong law enforcement force, and improve the intensity and precision of cracking down on illegal and irregular activities in the low altitude economy. The third is to strengthen the construction of law enforcement teams. Regularly organize law enforcement personnel to participate in training on low altitude economic laws, regulations, technical standards, and law enforcement skills, invite industry experts and legal scholars to give lectures and conduct case analysis, and improve the legal literacy and professional abilities of law enforcement personnel. At the same time, establish and improve the assessment and evaluation mechanism for law enforcement personnel, including indicators such as the quantity, quality, and compliance of law enforcement cases, to enhance the overall quality and law enforcement level of the law enforcement team. The fourth is to promote social co governance. Strengthen the publicity and education of laws, regulations, and safety knowledge related to low altitude economy, and enhance public awareness and legal consciousness of low altitude economic activities. By establishing a reward system for reporting, we encourage the public to actively report illegal and irregular activities in the low altitude economy. In addition, we guide industry associations, social organizations, and others to actively participate in the regulation of the low altitude economy, formulate industry self-discipline norms, strengthen internal supervision and dispute mediation in the industry, and form a low altitude economy social governance pattern of government regulation, social coordination, and public participation.

4. Conclusion

In summary, in the process of high-quality development of the low altitude economy, it is necessary to attach great importance to security and legal protection. By accurately identifying

and effectively responding to various security risks, focusing on addressing the shortcomings and challenges in the construction of the rule of law, building a sound legal regulatory system, a sound regulatory mechanism, and an efficient law enforcement system, we can create a favorable legal environment for the vigorous development of the low altitude economy, cultivate it into a new economic growth pole, and ensure that national security, social public safety, and individual citizen rights are fully protected.

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