Low-Altitude Airspace Use Regulation Based on Low-Altitude Development Rights: Current Situation, Theoretical Foundations, and Institutional Framework

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Abstract: This study first analyzes the typical challenges in the development and use of low-altitude airspace in China from three dimensions: legal-theoretical basis, spatial planning, and refined utilization, and then systematically reviews relevant international experience in low-altitude airspace development and management. It further examines the origins, connotations, and practices of space rights, airspace rights, and spatial development rights, and identifies conflicts between space rights and airspace rights in the low-altitude economy in terms of object scope, sources of rights, legal nature and content, and subjects. On this basis, it proposes the concept of low-altitude development rights as a means through which public planning authority can guide low-altitude development activities. Finally, drawing on regulatory characteristics such as air-ground coordination, spatial hierarchy, spatiotemporal dynamics, and hierarchical authorization, the paper puts forward the general logic and basic framework for constructing a low-altitude airspace use regulation system. Its main contribution is twofold. Theoretically, it proposes low-altitude development rights on the basis of spatial development rights, using them as a conceptual bridge between space rights and airspace rights and as a legal reference for incorporating low-altitude development into territorial spatial planning and use regulation. Practically, it preliminarily constructs a framework for China's low-altitude airspace use regulation system and provides operational guidance for advancing such regulation.

Keywords: low-altitude airspace; spatial development rights; low-altitude development rights; territorial spatial use regulation; air-ground collaborative regulation

With the deepening of low-altitude airspace reform, the low-altitude economy has become an important field of new quality productive forces [1]. By March 2025, 45 Chinese cities had initiated policy compilation or planning studies for the low-altitude economy [2]. As aircraft operate at increasingly lower altitudes, the overlap between low-altitude airspace resource use and ground-based socioeconomic activities has expanded, and conflicts have become more visible. These conflicts have moved beyond illegal low-altitude flights such as black flights that infringe privacy, intrude into civil airport obstacle-limitation surfaces, or endanger public safety, and have extended to deeper questions concerning the definition of low-altitude airspace resources and associated rights. The attempted transfer of special operating rights for the low-altitude economy in Pingyin County, Shandong Province in November 2024 attracted broad public attention precisely because rights relationships and compensated-use mechanisms were unclear.

Existing research has discussed low-altitude flight services and traffic management [1], the elements and solutions of the low-altitude economy [2-3], legal issues in low-altitude airspace management [4-6], planning compilation [7], and public low-altitude routes and infrastructure [8]. However, research has not yet fully integrated the legal logic of rights, the planning logic of air-ground coordination, and the institutional logic of use regulation. This paper therefore takes low-altitude airspace use regulation as its target, analyzes the rights basis for low-altitude airspace resource development and use, and preliminarily constructs an institutional framework for low-altitude airspace use regulation.

1 Current situation and main problems of low-altitude airspace development and use in China

1.1 Theoretical basis: unclear rights relationships in airspace

Low-altitude airspace has important natural, social, and economic attributes [8-10]. Like land and sea, it is an important component of national natural resources and has significant scarcity. Yet as an important resource, the connotation, legal structure, and ownership relationships of low-altitude airspace remain insufficiently studied, leaving weak foundations for realizing rights and designing administrative management tools. Basic concepts such as space and airspace, space rights and airspace rights, have not been systematically distinguished from the perspective of resource rights. Low-altitude legal relationships involve constitutional law, land law, aviation law, and related fields, but the connotation, nature, and content of low-altitude rights remain unclear. Basic provisions on airspace interests are still insufficient in the Civil Code, Land Administration Law, Civil Aviation Law, and related laws.

Airspace management involves governments at different levels, the military, civil aviation authorities, and market actors [11]. Unclear authority and responsibility have become a major constraint on the development of the low-altitude economy. In recent years, China has piloted the devolution of management authority over airspace below 600 m in some regions, and local governments have actively issued supportive policies. However, systems for airspace and route management, flight activity management, and aircraft management still need improvement. Under these conditions, attempts to transfer special operating rights for the low-altitude economy have naturally generated controversy.

1.2 Planning layout: insufficient air-ground collaborative planning

As airspace management extends from the ground into three-dimensional space, the road-air integration concept in transportation has evolved toward air-ground coordination, emphasizing coordinated development between low-altitude development and all elements of ground natural resources [12-13]. At present, however, effective coordination between low-altitude airspace planning and territorial spatial planning remains insufficient. Low-altitude new infrastructure is still in an early stage, and technical research on air-ground collaborative planning remains weak. The transmission and connection between low-altitude specialized plans and the territorial spatial planning system have not yet been established. Moreover, low-altitude airspace management and ground planning management remain separated, causing insufficient infrastructure, low utilization of airspace resources, and inadequate guidance for flight demand. For example, simple vertical take-off and landing sites can be built in general forestland or grassland without changing land-use attributes, but the absence of planning and use-regulation support often makes implementation difficult.

1.3 Integrated management: an undeveloped use regulation system

Low-altitude airspace resources are typical quasi-public goods. On the one hand, specific use activities require scientific management to improve resource efficiency and promote value preservation and appreciation, which corresponds to management of low-altitude use activities. On the other hand, development activities require use regulation to prevent harm to public interests and reduce externalities such as safety risks, congestion, privacy intrusion, and noise, which corresponds to low-altitude use regulation. At present, low-altitude use activity management in China is mainly undertaken by air traffic management departments and draws on relatively mature civil aviation airspace management experience, emphasizing safe and orderly aircraft navigation and belonging mainly to operational management [4,14]. A low-altitude airspace use regulation system has not yet been established. It is therefore necessary to promote layered, graded, and classified integrated management so that low-altitude airspace can fully realize its socioeconomic value.

2 International experience in low-altitude airspace management

2.1 Clarifying the bottom altitude of low-altitude airspace and the public-private rights boundary

With the popularization of air transport, scholars have proposed various theories of airspace ownership. Zone theory holds that landowners have rights only over airspace within a certain height, while the airspace above that height belongs to the public; this theory has been recognized in U.S. legislation and judicial practice [15]. Its main difficulty lies in uncertainty, because courts must define the effective possession area in each flight-intrusion case, namely the bottom altitude at which aircraft may fly over each parcel [16]. In the field of low-altitude use, recent studies have examined the use of low-altitude airspace above public roads, three-dimensional route planning, and the definition of new airspace property rights such as public airspace use rights from the perspectives of urban planning law and usufructuary rights, with the aim of integrating urban air mobility with urban planning and coordinating private rights with urban air-traffic demand [17].

2.2 Carrying out land-air integrated planning and management

In 2016, the European Union proposed the concept of U-space, suggesting a refined classification of low-altitude airspace use in relation to ground socioeconomic activities [18]. In 2024, the American Planning Association's guidance on advanced air mobility planning summarized key points for integrating vertiports with the built environment, including the conceptual master planning of vertiport conversion at London Waterloo [19]. The Florida Department of Transportation issued guidance on land-use compatibility and site approval for advanced air mobility in 2024, encouraging reasonable layout of low-altitude take-off and landing facilities in urban and rural areas and integration of advanced air mobility control requirements into zoning and form-based codes [19]. The International Civil Aviation Organization has continued to update the global common framework for unmanned aircraft systems traffic management, emphasizing that digital airspace management should strengthen air-ground coordination and account for differences in ground conditions and aircraft types [20].

2.3 Clarifying the division of labor and responsibilities among different actors

The Federal Aviation Administration's Urban Air Mobility Concept of Operations 2.0 identifies the functions of the FAA, unmanned aircraft system service suppliers, operators, and other actors [21]. As the regulator of civil aircraft operations in the national airspace system, the FAA is responsible for controlled airspace authorization and allocation of navigable airspace, and therefore undertakes the allocation of low-altitude airspace resources from the national to the local level. The EU's U-space program further proposes a multi-department and multi-actor unmanned aircraft traffic management platform [18], including core services, operating environments, airspace management, flight rules, and technical architecture, laying the basis for future deep integration of automated unmanned aircraft and manned aircraft. Planning and land departments also play important roles in air-ground collaborative regulation. The American Planning Association proposes a vertical oriented development model based on TOD, treating low-altitude transport hubs as integrated transport nodes and activity centers [19]. Japan's Ministry of Land, Infrastructure, Transport and Tourism has promoted a national roadmap for advanced air mobility and has studied the site selection and reservation of take-off and landing sites in metropolitan areas [22].

3 Theoretical basis: from spatial development rights to low-altitude development rights

3.1 Refinement of the land bundle of rights under socioeconomic change

Since the Industrial Revolution, the development and use of land and space have become increasingly complex and refined. Three-dimensional development of land resources has generated new layers, and land-right relationships have been continuously adjusted. Against this background, the land bundle of rights has been refined [23], profoundly affecting the object and content of rights and generating new forms of rights.

3.1.1 Space rights: safeguarding three-dimensional land development

Land ownership has evolved from absolute domination and unlimited vertical extension above and below the surface to relativized and socialized rights that can be stratified and separately disposed of. Since the late nineteenth century, space rights have entered legal research and practice and have been regarded as property-like rights over a certain range of air or underground space detached from the land surface [24]. Depending on legal tradition and management needs, two main paths have emerged. In common-law systems represented by the United Kingdom and the United States, space rights were first established through case law and then in some U.S. states through specific legislation. In civil-law systems represented by Germany, France, and Japan, related content is provided through superficies, sub-superficies, and other usufructuary rights [25]. The 1946 U.S. case United States v. Causby is a landmark case involving low-altitude property rights. It rejected the doctrine that land ownership extends indefinitely into the sky and confirmed constitutional protection for low-altitude property rights, while also leaving room for public airspace for modern aviation [26].

China's 2007 Property Law did not explicitly establish space rights, but it allowed construction land-use rights to be created in layers on, above, or below the surface. The Civil Code, implemented in January 2021, continued this design. In practice, underground space ownership, high-voltage line and oil-gas corridor crossings, and related issues have long been focal points in judicial practice [27]. Because the subjects, scope, use, and duration of surface and underground space rights remain unclear, stratified establishment of construction land-use rights still faces substantial difficulty in confirmation and registration [28]. Overall, the space-rights system, especially space use rights, is becoming more mature and has become an important legal basis for modern urban planning [24,29-31].

3.1.2 Airspace rights: the materialization of nature

The invention of aircraft made airspace an important national resource. As a theoretical foundation in aviation and aerospace law, airspace lies at the intersection of constitutional law, administrative law, aviation law, and international law. Although some scholars emphasize the social character of airspace as a quasi-public good and distinguish it from petroleum, minerals, and other tangible natural resources [32], most researchers agree that airspace is an important national natural resource. Existing studies point out that land and territory, understood respectively in terms of natural resources and national sovereignty, extend to airspace and territorial airspace, reflecting the coupling of an aviation carrier space as a natural resource with sovereignty as a social institution [33].

Airspace possesses the three elements of a thing in modern property-rights theory: it has economic value, exists outside the human body, and can be controlled by human beings. After the Second World War, aviation developed rapidly and airspace use increased. To avoid the tragedy of the commons in airspace resources, airspace rights entered theoretical and judicial practice. Physically, airspace can exist independently of land, but conceptually it is closely connected with space and differs significantly in use purpose, scope, and its relationship to the surface; the relationship between near-surface space and airspace is especially complex [34]. Zone theory has been widely recognized in Western countries with private land ownership [26]. In China, civil aviation authorities and scholars have promoted airspace property legislation in response to inefficient airspace use, insufficient market allocation of flight slots, and the need to improve aviation management, and have even regarded it as a key to solving airspace management problems [35-36].

3.1.3 Spatial development rights: the intervention of public power

Land development rights originated in the United Kingdom and refer to rights within land ownership that are constrained by public planning authority and used to change land use and implement land development [37-38]. They reflect the transformation of land-right systems since the first half of the twentieth century from a static focus toward the coexistence of static and dynamic allocation of land rights [39]. Although China's legal system

does not explicitly use the term land development rights, such rights exist in fact and have legal and regulatory bases [40], and show characteristics such as implicitness, two-level structure, and dual categories [41]. On this basis, scholars have further proposed spatial development rights, including rights differentiation at functional-zone and parcel scales [40], and coordinated protection of development and protection rights across land, sea, and air in the new era [9].

Many questions about land development rights still require further study [42-43]. Nevertheless, researchers generally agree that land development rights are not traditional property rights, but a hybrid form of private property rights and public planning power. Their essence is a tool through which government regulates land development by public-law means, with the purpose of adjusting land value increments and public interests. Even where some countries or regions show characteristics of public-law confirmation plus private-law transaction, tradability is largely a surface form, while the substance is the market allocation of publicly assigned quotas. Discussions on the legal structure of land development rights are therefore highly applicable to spatial development rights and provide a basis for further research.

3.2 Low-altitude development rights: the legal and value basis for low-altitude use regulation

The balance between space rights and airspace rights in the age of manned aviation, in which the former applied to a certain range above and below the surface and the latter to aviation airspace, has been disrupted in the low-altitude economy. New legal relationships are urgently needed to support regulation and adjustment.

3.2.1 Conflicts between space rights and airspace rights in low-altitude airspace

In the low-altitude economy, conflicts between space rights and airspace rights are mainly reflected in object scope, source of rights, legal nature and content, and subjects. First, both take space as their object, but overlap in low-altitude airspace. Space rights start from three-dimensional land development and emphasize a certain range above and below the surface, while airspace rights start from navigable scope and emphasize the carrier space of aviation activities above the surface. Therefore, defining the upward reach of space rights and the downward reach of airspace rights is fundamental. U.S. judicial practice after Causby has often used 400 or 500 feet, roughly 120 m or 150 m, as a reference [44-45]. In China, current airspace management policies often use true heights of 120 m, 300 m, and 1000 m as upper limits for different aircraft. For space rights, relevant laws require the planar boundary points and upper and lower elevation planes of parcels to be specified when managing state-owned construction land-use rights, but no unified national standard exists for determining these vertical limits.

Second, the source of space rights is stronger than that of airspace rights. China's Constitution, Civil Code, Land Administration Law, and Air Defense Law provide basic rules on ownership, use rights, and easements, while equivalent provisions for airspace rights are lacking. In practice, policy documents of competent departments mainly address aviation operation management. Internationally, key issues such as property rights and jurisdiction in airspace have not yet formed universally applicable legal measures. Third, the legal nature and content of the two rights differ. Space rights are real-estate property rights with both property and creditor-right attributes and belong mainly to private law, while airspace rights involve passage, take-off and landing, and air-traffic support. Fourth, the subjects are complex: space-right subjects can be further studied under China's land system, but the legal source and subject of airspace rights remain unclear.

3.2.2 Implementing low-altitude airspace use regulation through low-altitude development rights

The objects of space rights and airspace rights overlap in low-altitude airspace. Compared with airspace rights, space rights have clearer legal bases and legal relationships, while the property-rightization of airspace rights still lags behind in theory, legislation, and practice. Low-altitude development rights can therefore be proposed

as a planning-based public-law mechanism that connects space rights and airspace rights. They do not simply privatize airspace. Rather, they use public planning authority to define the development and use conditions of low-altitude space, coordinate public and private rights, guide infrastructure layout and route organization, and support classified access and compensated use.

Low-altitude development rights inherit the regulatory logic of spatial development rights. They allocate the possibility and intensity of low-altitude development through planning, and convert fragmented claims of land, airspace, safety, privacy, noise, and public interest into manageable spatial units, functions, time windows, and control elements. This provides the legal and value basis for incorporating low-altitude airspace into territorial spatial planning and use regulation.

4 Overall framework: a low-altitude use regulation system based on low-altitude development rights

4.1 Characteristics of low-altitude airspace use and use regulation

4.1.1 Air-ground collaborative regulation: low-altitude use and ground use influence each other

Low-altitude use is inseparable from ground space. Take-off and landing sites, charging and battery-swap facilities, communication, navigation, surveillance, meteorology, emergency support, and logistics facilities all occupy land or affect land-use functions. Conversely, existing ground uses, buildings, ecological protection areas, military facilities, cultural heritage sites, water sources, power facilities, and high obstacles influence the delineation and use intensity of low-altitude airspace. Use regulation must therefore coordinate low-altitude airspace and ground land use.

4.1.2 Spatial hierarchical regulation: spatial units and spatial functions should be decomposed by level

Low-altitude airspace has clear vertical hierarchy and horizontal spatial differentiation. The regulation system should distinguish different airspace classes, altitude layers, route corridors, take-off and landing control spaces, and ground support spaces. It should also decompose regulatory responsibilities and control requirements into spatial units, spatial functions, and control elements that can connect with territorial spatial master planning, specialized planning, and detailed planning.

4.1.3 Spatiotemporal dynamic regulation: high-density and high-frequency use requires dynamic control

Compared with traditional land use, low-altitude use has stronger temporal variability. Flight activities may be high density, high frequency, intermittent, and sensitive to weather, safety conditions, and operational demand. Time therefore becomes an important regulatory object. Through dynamic allocation of airspace, time-limited opening of training airspace, forced release of airspace, and similar measures, the time utilization rate of airspace can be improved [46].

4.1.4 Hierarchical authorization: low-altitude airspace management requires stepwise delegation

Low-altitude airspace use regulation should be implemented through hierarchical authorization. One level is reflected in national-to-local authorization for airspace use management, including low-altitude use regulation by natural resource departments and low-altitude activity management by air traffic departments. Another level is embedded in local management of specific low-altitude development activities by natural resource and air traffic authorities, which should be decomposed according to planning-defined spatial units, spatial functions, and control elements.

4.2 Framework of the low-altitude use regulation system

4.2.1 Regulatory subjects: strengthening departmental and central-local coordination

Low-altitude airspace use regulation involves the natural resource, air traffic management, civil aviation, public security, emergency management, transportation, and ecological-environment departments, as well as military-related management. It requires clear division of authority between central and local governments and among departments. Natural resource departments should focus on integrating low-altitude airspace into territorial spatial planning and use regulation, while air traffic management departments should focus on flight activity management and operational safety. Local governments should coordinate planning, land use, infrastructure layout, and market cultivation within their jurisdictions.

4.2.2 Regulatory objects: emphasizing integrated spatiotemporal use regulation of land and air

The regulatory object can be defined as a triad of spatial unit, spatial function, and time window at different spatial levels. On the one hand, the object should highlight air-ground coordination and hierarchical regulation. It should regulate both the use of low-altitude airspace and the land occupied by take-off and landing hubs, communication, navigation, surveillance, meteorology, and other infrastructure. It should both ensure normal operation and avoid or control negative impacts. Existing special land and buildings formed through ground spatial development rights, such as political, economic, and military land uses, may affect the delineation of upper airspace and may need to be protected as restricted or hazardous airspace, thereby influencing low-altitude development rights. Conversely, low-altitude development will affect surface use, because minimum flight height and corridor management influence the control of surface development intensity and urban form. On the other hand, time is also an important regulatory object. Dynamic allocation of airspace, time-limited opening of training airspace, and mandatory release of airspace can improve time utilization [46]. Stable long-term use of low-altitude airspace should mainly fall within the use-regulation function of natural resource departments, while short-term airspace release caused by ground activities or weather changes is closer to the authority of air traffic departments and should not be treated as ordinary use regulation. Different development stages of low-altitude transportation, from trial operation to medium-scale operation and mature transport, correspond to different richness and intensity of airspace use types [47]. In a low-altitude airspace planning case for a western prefecture-level city, 22 functional zones were designated after comprehensive evaluation, with multiple composite functions closely related to ground socioeconomic conditions. Within and across these zones, route corridors and take-off and landing control spaces were further defined. In another mountainous county in eastern China, ground passenger, freight, and postal routes were integrated with unmanned-aircraft logistics routes, with parcels transported by ground public transport to central villages and then delivered by drones to remote villages.

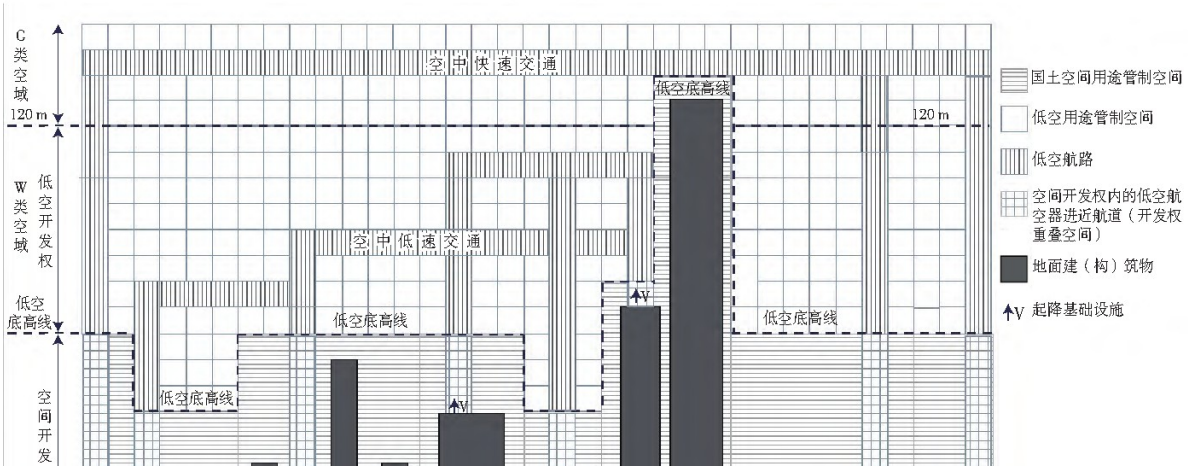

Fig. 2 Integration model of Class W low-altitude-airspace use regulation and territorial spatial use regulation (vertical section).

4.2.3 Regulatory basis: integrating into the territorial spatial planning system

Recognizing low-altitude airspace resources as important national natural resources, they should be gradually incorporated into territorial spatial development protection and unified use control under the two unifications. The connotation of national territorial spatial planning should be extended to low-altitude airspace, strengthening its foundational role. Low-altitude airspace planning and low-altitude new-infrastructure planning should be treated as spatial specialized plans within the territorial spatial planning system, incorporated into the hierarchy of master planning and detailed planning, and translated into operational contents such as control priorities and implementation requirements. Interfaces should be clarified between territorial spatial master plans, detailed plans, and low-altitude specialized plans. Take-off and landing infrastructure and supporting corridors are the main overlapping spaces between low-altitude use regulation and existing territorial spatial use regulation.

At the master planning stage, special studies or specialized plans can be carried out to determine lower boundary height, built-environment height and density, flight safety conditions, and social connection conditions according to local terrain and landform features. For Class W low-altitude airspace in cities, a bottom altitude boundary should be specified. In urban areas, aircraft noise and safety are important factors determining the lowest flight height. The bottom altitude of low-altitude development rights can be extended upward or downward according to parcel use, plot ratio, building form, and other conditions. For example, near green-space land it can be lower, whereas around commercial and business land above 120 m, surrounding plots should provide setback or enclosure. At the detailed planning stage, height limits, access corridors, take-off and landing facilities, charging and battery-swap facilities, and logistics facilities should be refined in units and parcels. In urban renewal implementation schemes, take-off and landing, energy supply, and logistics facilities can be incorporated. In rural areas, low-altitude facilities can be arranged with culture-tourism development and rural revitalization projects through point-based land supply.

4.2.4 Regulatory tools: implementing integrated time-space-land collaborative regulation

The tools for low-altitude airspace use regulation are similar to those for transport infrastructure-related use regulation, including plan management, spatial access, use conversion, and planning permits. Each tool has its own applicable setting and institutional context. Low-altitude airspace and route elements can be explored within natural resource plan management and rights registration systems. For spatial access, the relationship between low-altitude control and heritage protection areas, ecological protection areas, noise-sensitive areas,

military facilities, water sources, substations, and super-high obstacles should be studied, and positive and negative lists for low-altitude uses should be established. Classification and conversion rules for low-altitude airspace uses should be studied, and integrated air-ground use regulation should be explored. Through the planning-permit system, low-altitude use conditions and restrictions can be incorporated into planning conditions in land conveyance and other procedures, providing support for project approval, site selection, construction, and acceptance.

In practical projects, air-ground collaborative planning can be applied to the siting and design of low-altitude take-off and landing facilities. At the macro level, a suitability evaluation map for take-off and landing site selection can be formed for the study area using the one-map platform of territorial spatial planning, and areas can be classified by suitability. At the meso level, suitable land patches can be selected in the recommended areas and take-off and landing sites arranged according to land-use compatibility. At the micro level, for specific sites, simulations of take-off and landing protection areas can be carried out on digital bases such as Realistic 3D China in combination with surrounding terrain and building distribution, and concrete design requirements can be clarified.

4.2.5 Guarantee mechanisms: advancing through integrated pilot measures

A technical system for air-ground collaborative low-altitude airspace planning and use regulation should be established. First, on the basis of the national airspace classification system, rules for transforming suitable flight airspace and controlled airspace should be studied. Standards for classifying low-altitude airspace uses and rules for functional compatibility and conversion should be developed. For example, suitable flight airspace can be refined into uses such as scientific research and testing, freight transport, manned flight, emergency rescue, urban-rural governance, inspection operations, and aviation sports, with differentiated access conditions and regulatory requirements. Second, technical standards for low-altitude airspace planning and low-altitude infrastructure planning should be accelerated, and the connection between low-altitude specialized plans and the territorial spatial planning system should be strengthened.

Planning and land policies that support the construction and operation of new low-altitude infrastructure should be explored. Moderate advance provision of new infrastructure is the basis for low-altitude flight. In facility planning and site selection, market mechanisms should be used, and linkages should be formed with charging and battery-swap stations, communication facilities, and other infrastructure under construction. Low-altitude new infrastructure should be combined with urban renewal and redevelopment of inefficient land, promoting coordinated development of urban low-altitude airspace with above-ground and underground space.

A digital and dynamic low-altitude airspace management platform should be strategically deployed. Low-altitude airspace management requires a change in paradigm from static partition, fixed use, limited capacity, low efficiency, and high vulnerability. On the basis of the digital foundation of the territorial spatial planning implementation monitoring network, three-dimensional grid-based airspace should be further delineated, and a low-altitude three-dimensional traffic signal system with unified spatiotemporal standards should be constructed. AI-based urban theory and intelligent agents can support a high-density integrated flight service and control platform. The one-map planning system should reserve interfaces and establish a low-altitude ground infrastructure database.

Policy, regulatory, and pilot demonstration studies should be advanced steadily. Under the premise of ensuring the safe and healthy development of the low-altitude economy, pilots should be promoted in sequence for air-ground collaborative planning, land-use support policies for the low-altitude economy, and layered use regulation for Class G and Class W low-altitude airspace. Since low-altitude use regulation involves multiple departments and fields, relevant laws and regulations should be improved to support the property-rightization

of resources, clarification of rights and responsibilities, and rational use. Pilot projects may be combined with central air-traffic pilot cities.

5 Conclusion

The 2025 Government Work Report emphasized the safe and healthy development of emerging industries such as the low-altitude economy and called for commercial space, the low-altitude economy, and other sectors to be developed as new growth engines. The low-altitude economy has entered a period of rapid development, but the institutional framework for low-altitude airspace use regulation remains incomplete. This paper argues that low-altitude airspace should be understood as an important natural resource and that low-altitude development should be incorporated into territorial spatial planning and use regulation.

The concept of low-altitude development rights can serve as a bridge between space rights and airspace rights. It provides a legal-theoretical basis for guiding low-altitude development activities through public planning authority, coordinating public and private rights, and transforming complex conflicts into manageable regulatory objects. Based on air-ground coordination, spatial hierarchy, spatiotemporal dynamics, and hierarchical authorization, China should build a low-altitude airspace use regulation system that clarifies regulatory subjects, objects, bases, tools, and guarantee mechanisms. This system should support the safe, orderly, and efficient development and use of low-altitude airspace while protecting public interests and coordinating low-altitude development with territorial spatial governance.

Notes

① In physical terms, the land bundle of rights includes soil rights, water rights, air rights, mining rights, and related rights. In social terms, it includes rights of use, possession, income, transfer, and others. Because common-law and civil-law systems differ in their property-law structures, this bundle of rights also differs substantially; this paper does not expand on those differences.

② Space rights are also called air rights in some literature, with English expressions including air right and air space right.

③ It should be noted that superficies in the civil codes of Germany, France, and other countries are not entirely equivalent to space rights. Space rights are not a single right, but a general term for rights to control a certain range above and below the land surface, including space ownership, which is absorbed by land ownership, and space use rights, which may be property-like or contractual. Property-like space use rights mainly include space superficies, differentiated superficies, and space easements, while contractual space rights include space lease rights and space loan rights. In Germany and France, space superficies are treated as a special form of superficies and are regulated within the traditional usufructuary-rights system.

④ Airspace rights have two legal meanings: in international law, they refer to a state's sovereignty over its airspace; in domestic law, they refer to rights over airspace. This paper discusses the latter.

⑤ Taking the Earth's atmosphere as the boundary, the carrier space for aviation, aerospace, and spaceflight within the inner and outer layers is collectively called airspace. Considering length and research focus, this paper focuses on inner airspace.

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