Territorializing Airspace: Reframing Rights–Restrictions–Responsibilities for Low-Altitude Governance

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SUMMARY

Conventional land management rests on a two-dimensional logic of 'parcel–tenure–use control' and, over recent decades, has been extended vertically, both upwards and downwards. Yet even these vertical extensions remain anchored in the unity of land-and-building title: spatial units can be traced to specific parcels or structures, enabling the allocation of rights, the specification of uses, and the assignment of responsibilities. This paper argues that the emerging low-altitude operating system (Urban Air Mobility, eVTOL, drones, etc.) is disrupting that paradigm. Low-altitude airspace is being reframed not merely as a technical domain for aviation regulators, but as a planable, licensable, operable, and accountable vertical urban space. In other words, low altitude is being territorialized: it is delineated into corridors, equipped with vertiport nodes, governed by time windows, integrated with real-time traffic management, and bound directly to local public safety, economic development, and externality governance—thus entering municipal planning and accountability structures.

Building on this observation, we pose two research questions: (1) Is the territorialization of low-altitude conceptually valid, i.e., can low altitude airspace be treated as a governable, allocable, and auditable urban spatial unit rather than a mere aggregation of flight technologies? (2) If so, can the classical Rights–Restrictions–Responsibilities model and responsibility-oriented land management paradigms (e.g., 8R) be ported to low-altitude, furnishing an institutional, replicable governance vocabulary?

Methodologically, we adopt a combination of conceptual construction, normative analysis, and paradigmatic induction. First, we abstract low-altitude space as a networked infrastructure of 'corridors–nodes–windows–traffic' management. Second, mapped to RRR, we propose a low-altitude governance framework in which rights denote access and operating rights to corridors

and nodes; restrictions comprise no-fly/sensitive segments, temporal constraints, and mission priorities; and responsibilities cover accidents, noise, privacy, safety, and maintenance. Unlike traditional land governance, the operative spatial unit here is a networked volumetric space spanning multiple parcels, not a vertical extension of a single parcel.

Finally, we embed ‘8R’ model to characterize low altitude as a responsibilized space that must jointly satisfy economic feasibility, social acceptance, public safety, and environmental tolerability. Our contributions are twofold: (i) we advance the concept of low-altitude territorialization, explaining how near-ground airspace is reconstituted from a nationally managed aviation domain into a municipally plannable, investable, operable, and accountable public-infrastructure space; and (ii) we explore the paradigm shift toward low-altitude governance, showing how land management models migrate from two-dimensional parcels to three-dimensional corridor networks.