Drone Technology, Airspace Design, and Aerial Law in States and Cities

Brent Skorup

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Abstract

Federal and state governments have embraced drone technology in recent years to stimulate a domestic industry for new jobs and long-distance delivery services. However, the federal-state breakdown about who manages drone airspace has not been resolved, which, as the Government Accountability Office recently reported to Congress, threatens the progress of the US drone industry. What is clear is that landowners, whether public or private, own low-altitude airspace and air rights. This article traces the legal treatment of surface airspace as real property back to Anglo-American legal treatises and court decisions in the mid-19th century. Therefore, absent a revolution in property and government takings law, state and city authorities will play a major role in demarcating drone highways, as well as creating time, place, and manner restrictions such as time-of-day rules, noise maximums, and privacy protections. This paper proposes a cooperative federalism system of airspace leasing above public roads to avoid most nuisance, trespass, and takings lawsuits from residents. Finally, this paper proposes a legal presumption establishing an altitude where private air rights end and federally managed airspace begins.

JEL codes: H44, H77, K11, K23, L93, L98, R4

Keywords: aviation, drones, property rights, property law, federalism, regulation, leasing, airspace, innovation, technology, legal history

Author Affiliation and Contact Information

Brent Skorup
Senior Research Fellow
Mercatus Center at George Mason University
bskorup@mercatus.gmu.edu

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Introduction

In the summer of 2015, a polarizing scenario involving guns, property rights, and technology unfolded at William Merideth's Kentucky residence. As he, his friends, and his family were grilling in his backyard, Merideth's young daughter alerted him to a small drone flying over the neighborhood.[1] Annoyed, he retrieved his shotgun from his home, and when the drone crossed his property line, he shot it out of the sky.[2] The drone's owner, a neighbor, called the police upon discovering his destroyed drone, and Merideth was arrested and charged under local law for firing a gun in a populated area. At the highly publicized trial in state court, the judge dismissed the charges with a brief statement that Merideth was justified in shooting the drone because of the invasion of privacy.[3]

When asked on a national television news program why he shot the drone, Merideth said that he had called the police when a drone had flown overhead before and the police told him they could do nothing about it.[4] Merideth said he had done some legal research and concluded (somewhat dubiously, it turns out) that he was within his rights to shoot the drone because of the

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[1] Nancy Grace, Man Shoots Down Drone, CNN Transcript, aired Aug. 3, 2015, http://transcripts.cnn.com/TRANSCRIPTS/1508/03/ng.01.html.

[2] Id.

[3] Kieran Corcoran, Victory for Kentucky 'Drone Slayer' Who Took Out Aircraft Flying Over His Home with a Shotgun as Case Against Him Thrown Out of Court, DAILY MAIL, Oct. 25, 2015, https://www.dailymail.co.uk/news/article-3294792/Victory-Kentucky-Drone-Slayer-took-aircraft-home-SHOTGUN.html.

[4] Grace, *supra* note 1.

1946 Supreme Court aviation case concerning landowner property rights, *United States v. Causby.*[5]

The core dispute in *Boggs v. Merideth*[6] is one that many Americans have pondered as drones go mainstream: Where does my property line end and drone airspace begin? And *who* gets to decide where that line is located? As drone technology advances and regular flight paths sprout up, local authorities and residents will demand more input over drone operations. Air rights are bought and sold in traditional real estate but also have growing relevance for specialized infrastructure,[7] including drone routes. As one scholar recently asked: "What policies are best suited to allocate airspace among its increasingly complex array of competing uses?"[8] The Causby case, discussed later in this paper, recognized the traditional principle that landowners own surface—but not high-altitude—airspace above their land. The 1946 decision and its antecedents made aviation litigation more predictable—airports were compelled to purchase avigation easements from neighboring property owners. However, as Merideth's case illustrates, drones create new controversies about property rights, nuisance, and government takings. State legislatures and state real estate bars are beginning to draft legislation that protects landowners from intrusions by low-flying drones.[9] Many states have created drone no-fly zones

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[5] Grace, *supra* note 1 ("[After the police] tell me there's nothing they can do because there's no laws against it, I did some research. In 1946, Causby v. U.S. Government [*sic*], Mr. Causby sued the U.S. government for flying mail planes over his property and won."). *See* United States v. Causby, 28 U.S. 256 (1946).

[6] John David Boggs v. William H. Merideth, No. 3:16-CV-00006-TBR (W. D. Ky), Memorandum Opinion, https://law.justia.com/cases/federal/district-courts/kentucky/kywdce/3:2016cv00006/96944/20/.

[7] *See* Troy A. Rule, *Airspace in A Green Economy*, 59 UCLA L. REV. 270 (2011).

[8] *Id.* at 274.

[9] *See, e.g.,* Matt Reynolds, *ABA House of Delegates Passes Resolution on Drones; Delegate Calls It "a Hot Topic*," ABA JOURNAL, Feb. 17, 2020 (noting that the American Bar Association will begin "lobbying for regulations that would help prevent operators of the unmanned aircraft from trespassing on private property"), https://www.abajournal.com/news/article/resolution-111. In 2019, the American Law Institute's drafters of the *Restatement of the Law Fourth, Property* applied principles of trespass law in a new section proposed for drone flights. *See* Virginia K. Trunkes, *Balancing New Technology and Privacy When Using Drones in Land Use and*

and Texas is currently defending its power to prohibit drones in surface airspace surrounding state land and sensitive locations.[10]

There is a way forward: to open up millions of miles of new drone highways while still protecting landowner property rights, public officials should lease corridors of airspace above the public rights-of-way. There is legal precedent, and there are federal and state statutes allowing rights-of-way airspace leasing. That framework requires *cooperative federalism* between federal and state aviation officials; some responsibilities for airspace design and management should be devolved to states and cities, much like some regulation of telecommunications infrastructure and roadways is devolved locally.

This paper first outlines the history of federal and state regulation of low-altitude airspace and aviation. Second, this article explains the litigation risks of federal and state officials allowing widespread low-altitude commercial drone flights above private land. This article proposes airspace leasing above public rights-of-way not only to avoid landowner lawsuits but also to do the following:

1) Open up potentially millions of miles of drone routes.
2) Allow market allocation of a scarce natural resource (surface airspace).
3) Allow government entities to monetize public right-of-way use and gain passive income.

Construction, NAT'L L. REV., May 26, 2020, https://www.natlawreview.com/article/balancing-new-technology-and-privacy-when-using-drones-land-use-and-construction.

[10] Nat'l Press Photographers Assoc. v. McCraw, No. 1:19-cv-00946-RP (W. D. Tex.), Plaintiffs' Complaint for Declaratory and Injunctive Relief 30 (Sept. 26, 2019), https://www.courthousenews.com/wp-content/uploads/2019/09/news-drones.pdf.

Finally, this paper proposes that, in the absence of clarity from Congress, federal and state courts should establish a presumption that the regular flying of drones below a certain altitude amounts to a trespass. This paper suggests an altitude of 200 feet above ground level.

Background of Federal and State Airspace Rules

For years, the debate about the federal and state roles in drone airspace regulation has gone in circles.[11] Aviation, particularly airport management and low-altitude flights, involves a mix of federal and state prerogatives, which are sometimes at odds. For drone flights, the Congressional Research Service noted in a 2013 report to Congress that "[t]his right to travel in navigable airspace came into conflict with the common law idea that each landowner owned the airspace above the surface in perpetuity."[12] Nearly a decade later, Congress has not brought clarity to the federal-state divide over drone airspace issues, even as states increasingly assert their powers over drones and the use of surface airspace and as influential law drafters such as the Uniform Law Commission, American Bar Association, and the American Law Institute draft airspace trespass provisions.[13]

Congress has granted the Federal Aviation Administration (FAA) authority over management of *navigable airspace*,[14] but that leaves major questions unanswered: Who controls

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[11] The issue of defining aerial trespass for drones at the Uniform Law Commission is entering its fourth year after several controversies and debates over the issue. *See Tort Law Relating to Drones Committee*, UNIFORM LAW COMMISSION, https://www.uniformlaws.org/committees/community-home/librarydocuments?communitykey=2cb85e0d-0a32-4182-adee-ee15c7e1eb20&tab=librarydocuments&LibraryFolderKey=&DefaultView=&page=6.

[12] Alissa M. Dolan & Richard M. Thompson II, Cong. Research Serv., R42940, Integration of Drones into Domestic Airspace: Selected Legal Issues 2 (2013), https://fas.org/sgp/crs/natsec/R42940.pdf.

[13] See Trunkes, *supra* note 9 ("In 2019, the American Law Institute's (ALI) drafters of the Fourth Restatement of Property applied principles of trespass law in proposing § 1.2A—'Trespass by Overflight.'"); Tort Law Relating to Drones Act § 301(a) (UNIFORM LAW COMMISSION, Proposed Draft for Discussion, 2018).

[14] See Laura K. Donohue, *A Tale of Two Sovereigns: Federal and State Use and Regulation of Unmanned Aircraft Systems in* HANDBOOK OF UNMANNED AERIAL VEHICLES (Kimon P. Valavanis & George J. Vachtsevanos eds., Springer International Publishing AG 2d ed. forthcoming).

non-navigable airspace and surface airspace that landowners own? What are the powers of states and cities over surface airspace used by drone operators?

The federal government's legal perspective on drone federalism is being formulated. In fall 2020, a Government Accountability Office (GAO) report to Congress explained that the US Department of Transportation (USDOT) views all outdoor airspace as navigable airspace for drones,[15] a view that, if codified, represents a massive expansion of USDOT jurisdiction. At the time of this writing, the USDOT and US Department of Justice are drafting their legal position.[16]

The FAA cannot simply nationalize low-altitude airspace and start authorizing drone flights across backyards, farm fields, and private woodlands around the country. Landowners, states, and cities would object and defend their property rights and constitutional rights. As one federal judge said, in *dicta*, in a 2016 drone case: "the FAA believes it has regulatory sovereignty over every cubic inch of outdoor air in the United States."[17] "[I]t is far from clear that Congress intends—or could constitutionally intend—to regulate all that is airborne on one's own property and that poses no plausible threat to or substantial effect on air transport or interstate commerce in general."[18]

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[15] US Gov't Accountability Office, B-330570, Unmanned Aircraft Systems: Current Jurisdictional, Property, and Privacy Legal Issues Regarding the Commercial and Recreational Use of Drones B-330570, 6 (2020), https://www.gao.gov/assets/710/709370.pdf ("Although FAA has issued no regulation prescribing minimum safe flight altitudes for [unmanned aircraft systems (UAS)], DOT officials told us 'it is the Department's stance that, for purposes of the definition of the term navigable airspace, zero feet ('the blades of grass') is the minimum altitude of flight for UAS.'").

[16] US Gov't Accountability Office, B-330570, Unmanned Aircraft Systems: Current Jurisdictional, Property, and Privacy Legal Issues Regarding the Commercial and Recreational Use of Drones B-330570, 3 (2020), https://www.gao.gov/assets/710/709370.pdf ("Importantly, a task force of attorneys in the DOT Office of the Secretary and FAA . . . is conducting an in-depth review of the Department's legal position regarding federal preemption of state and local laws and other UAS jurisdiction-related issues. . . . DOT officials told us they expect the results of the Working Group to be provided to DOT senior leadership in the coming months.").

[17] Huerta v. Haughwout, No. 3:16-cv-358 (JAM), 2016 WL 3919799, *3 (D. Conn. 2016).

[18] *Id.* at *3.

Many states have expressly asserted sovereignty to surface airspace for decades and are beginning to regulate that airspace. As Stephen Migala points out in a recent law journal article about drones and federalism, several states have created no-fly zones for drones over sensitive areas such as critical infrastructure, schools, sports venues, and prisons.[19] Some cities, likewise, are prohibiting drone flights at low altitudes.[20] The FAA has avoided litigating the issue, but some entities in the drone industry assert that only federal regulators have authority to define where drones operate and where they are prohibited.[21] In particular, they argue that drone no-fly zones "may only be established . . . by the federal government."[22] In October of 2020, some drone advocates petitioned the FAA to preempt these state no-fly zones.[23] As explained later in

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[19] DEL. CODE tit. 11, § 1334 (2020) (no operations over events with more than 1,500 people, over incidents with first responders, or over critical infrastructures); FLA. STAT. ANN. § 330.41 (2020) (no operations over critical infrastructures); LA. STAT. ANN. § 14:63 (2020) (defining criminal trespass to include operating a UAS over property of another); LA. STAT. ANN. § 14:108 (2020) (no operations over a police cordon); LA. STAT. ANN. § 14:337 (2020) (no operations over certain facilities, including schools); NEV. REV. STAT. § 493.103 (2020) (no operations under 250 feet over property when owner notifies UAS operator); NEV. REV. STAT. § 493.109 (2020) (no operations over critical facilities); OKLA. STAT. tit. 3, § 322 (2020) (no operations over critical infrastructure facilities); OR. REV. STAT. § 837.380 (2020) (restrictions over property when owner notifies UAS operator); S.D. CODIFIED LAWS § 50-15-3 (2020) (no operations over prisons or military facilities); TENN. CODE ANN. § 39-14-405 (2020) (criminal trespass via UAS over private property in non-navigable airspace); TEX. GOV'T CODE ANN. §§ 411.062, 411.065 (2020) (restrictions over state Capitol Complex); TEX. GOV'T CODE ANN. § 423.0046 (2020) (restrictions over sports venues); WIS. STAT. § 114.045 (2020) (no operations over a correctional institution). *See* Stephen J. Migala, *UAS: Understanding the Airspace of the States*, 82 J. AIR L. & COM. 3, 62–63 (2017).

[20] In October 2019, Silverthorne, Colorado, passed an ordinance that generally prohibits drones at heights less than 40 feet above rooftops. John Minor, *Council Agenda Memorandum: Ordinance 2019-19—An Act to Provide for the Regulation of Unmanned Aircraft*, Silverthorne, Colo., Nov. 13, 2019, https://silverthorne.civicweb.net/document/23430/Ordinance%202019-19%20An%20Ordinance%20to%20Provide%20for%20t.pdf?handle=5FE77E7F0FDB49F6B9AB40D7B25FD153.

[21] *See, e.g.,* Nat'l Press Photographers v. McCraw, No. 1:19-cv-00946-RP, Brief of Amicus Curiae Assoc. for Unmanned Vehicle Systems International and the Consumer Technology Assoc. 7 (Jan. 10, 2020) (asserting that state laws that "directly limit the operations of UAS in the national airspace" by creating no-fly zones above sensitive locations are preempted by federal regulation).

[22] Betsy Lillian, *Drone Industry Responds to Draft Tort Law on "Aerial Trespass,"* UNMANNED AERIAL, July 25, 2018, https://unmanned-aerial.com/drone-industry-responds-to-draft-tort-law-on-aerial-trespass (quote attributed to representatives in the drone industry).

[23] Letter from Alliance for Drone Innovation et al. to FAA Administrator Steve Dickson Re: Implementation of Section 2209 2, (Oct. 22, 2020) (on file with the author).

this paper, states and landowners likely have the power to create no-fly zones at low altitudes, but it is unclear at what altitude state and property owners' powers are extinguished.

Drone litigation is growing, including lawsuits against states and cities for creating no-fly zones and against drone operators for aerial trespass.[24] One illustrative case is pending in federal court in Texas.[25] Beginning in 2013, the Texas legislature prohibited drone operations that are below 400 feet above the ground and above certain types of property in the state, including any jail, prison, or "critical infrastructure facility."[26] Photographers sued in 2019 on several grounds, including that state regulation of drone operations is preempted by federal drone regulations.[27] Even the plaintiffs seem unclear about whether states have authority to prohibit low-altitude drone flights and concede in their brief that the state "may promulgate drone regulations consistent with its traditional police powers, such as to protect privacy or prevent trespass or voyeurism."[28]

States are also beginning to fund and test drone management systems in low-altitude airspace. North Dakota authorized $28 million in 2019 for a statewide unmanned traffic

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[24] *See* Donohue, *supra* note 14, at 20–22. A Louisiana court in early 2020 convicted a man of criminal trespass (a misdemeanor) under state law for flying a drone with a camera above neighbor's property. The man appears to have violated La. Stat. Ann. § 14:63 (defining criminal trespass to include operating a UAS over property of another). Josh Spires, *Drone Pilot Vows Fight After Arrest for Flying over His Neighbor's Home*, DRONEDJ, July 6, 2020, https://dronedj.com/2020/07/06/drone-pilot-arrested-and-banned-for-flying-his-drone/. Louisiana law prohibits operating a drone over another's property without permission. In the words of the defendant, "You're not getting help from the FAA. . . . You're on your own." Ken Heron, *Jailed and Banned from Owning a Drone (Can They Do That?!)*, YOUTUBE (July 2, 2020), https://www.youtube.com/watch?v=ufWqRiYRmcA&feature=emb_title (at 10:00).

[25] *See* Silas Allen, *Photojournalists Group Challenges Texas' Drone Law*, DALLAS OBSERVER, Sept. 27, 2019, https://www.dallasobserver.com/news/news-photographers-group-sues-to-have-texas-drone-law-overturned-11766014.

[26] TEX. GOV'T CODE §§ 423.0045–.0046.

[27] Nat'l Press Photographers Assoc. v. McCraw, No. 1:19-cv-00946-RP (W. D. Tex.), Plaintiffs' Complaint for Declaratory and Injunctive Relief 30 (Sept. 26, 2019), https://www.courthousenews.com/wp-content/uploads/2019/09/news-drones.pdf ("By banning drone use within the airspace around critical infrastructure and other facilities, Texas is attempting to regulate aviation safety through its No-Fly Provisions.").

[28] *Id*. at 29.

management (UTM) system.[29] Ohio's drone task force director says they hope to have a statewide UTM system in the next few years.[30] The federal policy for traditional aviation, which will likely extend to drone aviation, is that local airport operators, whether public or private, assume any liability related to trespass, nuisance, and takings lawsuits from affected landowners.[31] Landowners, particularly commercial landowners,[32] are likely to resist and sue over frequent drone flights over their land. This legal uncertainty about whether drones can fly at low altitudes over private property raises the prospect that drone operators will face costly lawsuits and statewide injunctions.

Legal History of Airspace Regulation

Airspace as Property

Low-altitude airspace "is a complex and oft-forgotten natural resource"[33] and a monetizable asset bearing the hallmarks of property.[34] In his influential property rights work in the 1960s, Harold Demsetz identified an economic phenomenon: technology shocks create demand for novel assets,

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[29] Patrick Groves, *North Dakota Plans Statewide Drone Air Traffic Control*, GOVERNMENT TECHNOLOGY, June 10, 2019, https://www.govtech.com/products/North-Dakota-Plans-Statewide-Drone-Air-Traffic-Control.html.

[30] Brian Garrett-Glaser, *At Ohio Air Taxi Symposium, Policy Seen as Far Behind Technology*, AVIATION TODAY, Mar. 3, 2020, https://www.aviationtoday.com/2020/03/03/ohios-grand-plans-urban-air-mobility/.

[31] The airport operator bears the cost of acquiring the necessary clearance zones to comply with the FAA standards. The federal policy, as a New York state court summarized it, is "not to have the Federal Government assume any liability relative to takeoff and landing rights." Kupster Realty Corp. v. State, 93 Misc. 2d 843, 849 (Ct. Claims N.Y. 1978).

[32] As one property scholar notes:

Air rights are frequently the most valuable rights connected with the ownership of commercial land since the value of such property consists principally of the owner's right to erect buildings in the airspace.

Mark H. Allen, The Federal Income Tax Consequences of Commercial Conveyances of Rights in Airspace, 47 J. AIR L. & COM. 91, 91 (1981).

[33] Troy A. Rule, *Airspace and the Takings Clause*, 90 WASH. U. L. REV. 421, 425 (2012).

[34] Demsetz presaged the competition for low-altitude airspace in a 1966 article:

In the case of lower airspace, we are dealing with the problem of whether or not the right to use or own lower airspace should be involuntarily *reassigned*. The existence of serious competing claims to the use of lower airspace should create doubt about our ability to judge which use is most valuable and, hence, should lead us to rely to a larger extent on voluntary negotiations between competing claimants and landowners.

Harold Demsetz, *Some Aspects of Property Rights,* 9 J.L. & ECON. 61, 67 (1966) (emphasis in original).

and property rights emerge to coordinate increased use of the asset.[35] This Demsetz phenomenon has been documented for many previously lightly used resources that became *propertized*, including the Great Plains circa 1870,[36] Native American lands in colonial Canada,[37] and pre-1927 radio spectrum.[38] A similar story can be traced in surface airspace.

Airspace as property, including airspace sales and leasing, has a long pedigree in American law. In the 19th and early 20th centuries, most Anglo-American courts and property theorists rejected the view that "land" projected infinitely upward.[39] Courts cited the *ad coelum* maxim—"Land hath also, in its legal signification, an indefinite extent, upwards as well as downwards"—frequently in trespass cases but often denied that there could be a trespass or a property interest in airspace that was not practically usable by the landowner.[40] As a court in Minnesota said in a 1923 aerial trespass case, "[W]hen, as here, the air is to be considered at an altitude of two thousand feet or more, to contend that it is part of the realty . . . is only a legal fiction, devoid of substantial merit."[41]

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[35] Harold Demsetz, *Toward a Theory of Property Rights*, 57 AM. ECON. REV. 347, 350 (1967). *See also* Terry L. Anderson & P. J. Hill, *The Evolution of Property Rights: A Study of the American West*, 18 J.L. & ECON. 163, 170–72 (1975) (showing that it became economical for cattlemen, for instance, to fence off the Great Plains as land value increased and the cost of defining property rights decreased from 1860 to 1900).

[36] Anderson & Hill, *supra* note 35, at 170–72.

[37] Around 1700, Native Americans near Quebec divided their hunting land because of increased demand for animal fur. Demsetz, *supra* note 35, at 351–53.

[38] *See, e.g.*, Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast Spectrum*, 33 J.L. & ECON. 133, 143–44 (1990) ("There existed a very lively market in broadcast properties, sold with frequency rights attached, early in the development of the industry (that is, pre-1927).").

[39] The famous *ad coelum* maxim is that "[l]and hath also, in its legal signification, an indefinite extent, upwards as well as downwards." 2 WILLIAM BLACKSTONE, COMMENTARIES ON THE LAWS OF ENGLAND: IN FOUR BOOKS 18 (1818). The Supreme Court in *United States v. Causby* somewhat exaggerated "*indefinite* extent" in this maxim to mean something like "*infinite* extent." United States v. Causby, 328 U.S. 256, 260 (1946) (characterizing *ad coelum* as the "ancient doctrine that at common law ownership of the land extended to the periphery of the universe").

[40] One legal scholar noted in 1910:

[I]t is curious to note that even as late as the early part of the last [that is, 19th] century, there was considerable doubt as to whether trespass would lie, where there was no tangible interference with the land, but only with the airspace."Arthur K. Kuhn, *The Beginnings of an Aërial Law*, 4 AM. J. INT'L L. 109, 123 (1910).

[41] Johnson v. Curtiss N. W. Airplane Co., 1928 U. S. Av. R. 42, 43–44 (Dist. Ct., Ramsey Co., Minn. 1923).

The surface airspace, however, have long been treated by courts as real property.[42] Anglo-American legal treatises from the 1840s onward note that property could be partitioned horizontally[43] and that airspace—the "upper chamber" of a parcel of real estate—could be owned separately from the surface property.[44] In the mid-1800s, the Illinois Supreme Court "took it for granted that there could be a horizontal severance of ownership in a building, with the ground floor owned by one person, and the upper portion of the building by another 'in fee.'"[45] Perhaps the first Anglo-American statute recognizing landowners' exclusive rights to surface airspace is The Telegraph Act of 1863 in England, which codified landowners' right to object to the construction of a telegraph line hanging above their property.[46] This principle was mirrored in American law in a 1906 trespass case, *Butler v. Frontier Telephone Co.*, dealing with a telephone

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[42] A New York court in 1906, for instance, allowed for the ejectment of a telephone line above property but warned that "this [*ad coelum* maxim] may not be taken too literally." Butler v. Frontier Telephone Co., 186 N.Y. 486, 491, 79 N.E. 716 (1906). See also Johnson v. Curtiss N. W. Airplane Co., 1928 U.S. Av. R. 42, (Dist. Ct., Ramsey Co., Minn. 1923) ("The air, so far as it has any direct relation to the comfort and enjoyment of the land, is appurtenant to the land, and no less the subject of protection than the land itself . . . .").

[43] JOHN B. PHEAR, A TREATISE ON RIGHTS OF WATER 2 (V. & R. Stevens and G. S. Norton 1859) ("[T]he partition [of land] may be carried on in a vertical, as well as in a horizontal direction . . . .").

[44] See SILAS JONES, AN INTRODUCTION TO LEGAL SCIENCE 179 (J. S. Voorhies 1842) (noting exceptions to *ad coelum*) ("[F]or instance, a man may have an inheritable corporeal property in an upper chamber, though the lower stories and soil may belong to another. This, it is true, is as much as saying a man may have land by owning an upper chamber, or in other words, that an upper chamber is land!"); JOSEPH A. SHEARWOOD, A CONCISE ABRIDGMENT OF THE LAW OF REAL PROPERTY AND AN INTRODUCTION TO CONVEYANCING 2 (Stevens & Sons 1878) ("One man therefore may have a house in fee and another the ground in fee; or if the house is subdivided in chambers there may be different owners in fee to each set."). As one treatise noted:
The English law is different [from the absolute ownership principles in Roman law], permitting one man to own the surface, another to own a mining substratum, while still a third owns a horizontal flat in the structure erected upon the land. Accordingly, I say, the adoption of a zone theory would be quite in harmony with the general spirit of the English land law as regards these horizontal hereditaments.

Harold D. Hazeltine, The Law of the Air 75 (Univ. of London Press 1911).

[45] Theodore Schmidt, *Public Utility Air Rights*, 1 J. AIR L. & COM. 52, 63 (1930) (citing McConnel v. Kibbe, 29 Ill. 483 (1852); McConnel v. Kibbe, 33 Ill. 175 (1864)).

[46] Telegraph Act 1863, ch. 112, § 22 ("[T]he [telegraph] Company shall not place a Telegraph above Ground . . . or place a Telegraph above Ground across an Avenue or Approach to a Dwelling House" unless "in each Case [the company] obtain the Consent of the" occupier, lessee, or owner.). *See also* JOHN F. CLERK & W. H. B. LINDSELL, LAW OF TORTS 291 (2d ed., Sweet & Maxwell 1896) ("The provisions of the Telegraph Act, 1863 . . . are based upon the assumption that there is a right of property in the air space . . . .) (citing Telegraph Act of 1863, ch. 112).

line 30 feet above private land: "The law regards the empty space as if it were a solid, inseparable from the soil, and protects it from hostile occupation accordingly."[47] As one contemporaneous treatise noted: "It follows from this [*ad coelum* principle] that land may be divided horizontally as well as vertically, and the owner of land may divide and sell the space above the surface . . . as well as he can divide the surface into city lots."[48]

Building construction innovations at the turn of the century increased the value of low-altitude airspace—the economic phenomenon Demsetz identified—because high-rises and skyscrapers could now occupy airspace above urban land. New York's 1916 zoning law, imitated around the country, was the first to limit building size by volume—height and setback rules—and this accelerated the propertization of airspace in cities.[49] Airspace sales and transfers began in earnest in the 1920s,[50] especially after development of the Merchandise Mart in Chicago recorded the first "air lot."[51] This air lot lease above the Chicago railroad terminal derived from common law principles of land partition.[52] The growing airspace marketplace led a former president of the American Bar Association to remark in 1930: "This practice of the owner retaining the use of the surface of his land and leasing or selling air space above is becoming increasingly common and obtains in many of our large cities."[53]

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[47] Butler v. Frontier Telephone Co., 79 N.E. at 718.

[48] John G. Hawley & Malcolm McGregor, A Treatise on the Law of Real Property 5 (Collector Pub. Co. 1900).

[49] See THEODORE STEIN, SLIDE MOUNTAIN: OR, THE FOLLY OF OWNING NATURE 146 (U. Cal. Press 1995) (noting change after passage of the 1916 law) ("[A]irspace, a three-dimensional abstraction, became a *thing* that could be owned and sold." (Emphasis in original.)).

[50] *Id.* at 148 ("Transferring air was nothing new in New York. The city had permitted the shifting of air rights from lot to lot to build higher towers at various times since the 1920s.").

[51] Schmidt, *supra* note 45, at 68.

[52] *Id*. at 68 (1930). A 1929 conveyance of air rights in Boston was done using common law principles. *Id*. at 70–71.

[53] *Id.* at 54 (1930) (quoting a former American Bar Association president).

By the 1960s, condominium laws simplified the process of demarcating fee simple interests in land in a vertical column.[54] The creation and sale of airspace tracts separate from the land was routine.[55] In the decades since, treatment of airspace and airspace lots vary under state law, though they are treated as a form of real property.[56]

Early Aviation and State Sovereignty Over Airspace

Early aviation law, therefore, was grafted onto this tradition of treating surface airspace as real property. State and local governments asserted their authority over airspace soon after the Wright brothers unveiled their invention. The world's first aviation legislation is believed to be the municipal ordinance passed by the Kissimmee, Florida, town council in 1908.[57] The law claimed jurisdiction over airspace above town up to 20 miles in the sky.[58] Massachusetts was regulating

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[54] See Douglas C. Harris, *Condominium and the City: The Rise of Property in Vancouver*, 36 L. & SOC. INQUIRY 694, 695 (2011).

[55] Note, *Conveyance and Taxation of Air Rights*, 65 COLUM. L. REV. 338, 339 (1964) ("[I]t seems reasonably clear that an owner may effectively convey 'tracts' of space that are physically unattached to the land."). The ABA published the Model Airspace Act in 1972, which formalized airspace propertization, but only Oklahoma appears to have adopted significant portions of the act. *See* Subcommittee on Airspace Utilization and Multiple Use, Committee on New Developments in Real Estate Practice, *Final Draft of Model Airspace Act*, 7 REAL PROP., PROB. & TR. J. 353 (1972); 60 OKLA. STAT. tit. 60, § 60-802 et seq.

[56] *See, e.g.,* VA. CODE ANN. § 55.1-1900 (2020) (defining "land" as "a three-dimensional concept"); Macht v. Dep't of Assessments, 266 Md. 602, 611–12, 296 A.2d 162 (1972) (holding that for assessment purposes, airspace is treated like a negative easement for a term of years); 68 PA. STAT. § 802 (2020) ("[R]ights and interests in air space . . . shall be dealt with for all purposes and in all respects as estates, rights and interests in real property"); In re Appeal of Bigman, 110 Pa. Commw. 539, 547 (1987) ("Although air space does not fit squarely within either of these definitions, we conclude that it is more closely aligned with 'buildings' than with 'land.'). *But see* Penn Central Transportation Co. v. New York City, 438 U.S. 104 (1978) (holding that air rights do not constitute real property in the context of regulatory takings).

[57] *See* HAZELTINE, *supra* note 44, at 47–48 ("A little town in Florida has already passed an ordinance relative to traffic in the air, claiming jurisdiction as high as twenty kilometres [*sic*], and asserting that it proposes to establish an aerial police!").

[58] Among other things, the ordinance required aircraft to travel at slow speed at low altitudes, prohibited occupants from throwing debris from an aircraft in flight, and required an annual license fee. John R. Tamm, The Status of States' Rights in the Airspace of the United States: The Sovereign Powers of and the Powers Exercised by the Several States at Airports and in the Airspace Superjacent to Their Territory 251, Appendix 1 (Mar. 1978) (unpublished dissertation, McGill University) (including section 1 of Kissimmee's Aircraft Ordinance, adopted 1908).

flight and prohibiting flight over crowded areas in 1913.[59] Low-altitude airspace was viewed as part of the underlying land, over which state governments had sovereignty. Harold Hazeltine, in his 1911 air law treatise, noted the following:[60]

> [A]ir above a land has such a close relationship to the lanyd that it may be looked upon as an appurtenance of the territorial state or even as a part of the territorial state. . . . It is quite clear, I think, that states exercise a right of sovereignty in the lowest stratum of the air-space, that stratum, namely, occupied by buildings and other structures with the encircling atmosphere.

Beginning in the 1920s, after the drafting of the Uniform State Law for Aeronautics, states began codifying their claims of sovereignty over surface airspace against the federal government.[61] At least 19 states have these laws today.[62] Until the 1950s, airport andyairspace regulation had a local character that was tolerated and even encouraged by federal law.[63]

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[59] *See* Smith v. New England Aircraft Co., 270 Mass. 511, 519 (1930).

[60] HAZELTINE, *supra* note 44, at 15, 46–47 (distinguishing air from the sea). Although Hazeltine is speaking of nations when referring to "states," in the United States land and territory are generally held and regulated by subnational states upon joining the union.

[61] Section 2 of the 1922 Uniform State Law for Aeronautics provided:

Sovereignty in the space above the lands and waters of this State is declared to rest in the State, except where granted to and assumed by the United States pursuant to a constitutional grant from the people of this State.

National Conference of Commissioners on Uniform State Laws, Uniform State Law for Aeronautics, Conference, San Francisco, CA, August 2–8, 1922.

[62] ARIZ. REV. STAT. § 28-8206 (2020); CAL. PUB. UTIL. CODE § 21401 (2020); COLO. REV. STAT. § 41-1-106 (2020; DEL. CODE tit. 2, § 302 (2020); HAW. REV. STAT. ANN. § 263-2 (2020)**;** IDAHO CODE § 21-202 (2020); IND. CODE ANN. § 8-21-4-2 (2020); ME. REV. STAT. tit.1, § 6 (2020); MD. CODE ANN., TRANSP. § 5-104 (2020); MINN. STAT. § 360.012 (2020); MONT. CODE ANN. § 67-1-202 (2019); NEV. REV. STAT. ANN. § 493.030 (2019); N.C. GEN. STAT. § 63-11 (2019); N.D. CENT. CODE § 2-03-02 (2019); N.J. STAT. § 6:2-4 (2020); TENN. CODE ANN. § 42-1-102 (2020); UTAH CODE ANN. § 72-10-123 (2020); WIS. STAT. § 114.02 (2020); WYO. STAT. § 10-4-301 (2020). South Carolina, South Dakota, and Vermont repealed their airspace sovereignty statutes in 2012, 2014, and 1997, respectively. *See* S.C. CODE ANN. § 55-3-30 (repealed 2012); S.D. CODIFIED LAWS § 50-13-2 (repealed 2014); VT. STAT. ANN. tit. 5, § 401 (repealed 1997).

[63] Janet R. Daley Bednarek, in her history of early American airports, notes that by 1926, "it had been fairly firmly, but not exclusively established, that local governments (primarily cities, but sometimes counties or city-county combinations), with or without federal aid, would take the lead in building the nation's airports." JANET R. DALEY BEDNAREK, AMERICA'S AIRPORTS: AIRFIELD DEVELOPMENT, 1918–1947 15 (Tex. A. & M. Univ. Press 2001). The California Supreme Court rule in *Parker v. James Granger, Inc.* in 1935 refused to consider applying federal aviation laws in the case because "under the federal Constitution and the California Aircraft Act enacted in 1929 the state of California was vested with exclusive power to prescribe air traffic rules to govern the operation of aircraft flying in purely intrastate flights." Parker v. James Granger, Inc., 4 Cal.2d 668, 677 (1935).

There was notable resistance from aviators to airspace ownership and state sovereignty. Stuart Banner notes in his history of airspace regulation that the aviation industry sought to eliminate the concept of owning airspace in the early 20th century.[64] In the debates over the drafting of the influential Uniform State Law for Aeronautics in 1922 and the Restatement of Torts in 1934, aviators lost both battles to real estate and property advocates.[65] The Uniform State Law for Aeronautics allowed flights if they did not interfere with the "then existing use" of the property.[66] In tort law, flight over property at low altitude was a privilege subject to landowners' right of exclusion.[67]

The sale and lease of private airspace in dense cities is frequently covered in news stories;[68] less attention is paid to the market for public airspace. With this sovereignty and property in hand, state departments of transportation (DOTs) began leasing public airspace—typically above the right-of-way—in earnest in the 1970s and 1980s as a revenue source.[69] The legal mechanisms for state DOT leasing of airspace is discussed later in this paper because it is a potentially groundbreaking way to greenlight and safely manage widespread commercial drone services. The contemporary federal aviation legislation must be approached and interpreted with these earlier sovereignty and property understandings in mind.

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[64] *See, e.g.,* Stuart Banner, Who Owns the Sky?: The Struggle to Control Airspace from the Wright Brothers On 185–97 (Harvard Univ. Press 2008).

[65] *See, e.g., id*. at 185–97.

[66] Uniform State Law for Aeronautics, *supra* note 61, at § 4.

[67] BANNER, *supra* note 64, at 197 ("According to the *Restatement of Torts*, landowners owned their airspace, subject only to a privilege of reasonable flights at reasonable heights.").

[68] *See, e.g.,* Charles V. Bagli, *With $240 Million Deal, Floodgates Open for Air Rights in Midtown East*, N.Y. TIMES, Mar. 2, 2018, https://www.nytimes.com/2018/03/02/nyregion/jp-morgan-chase-midtown-east-air-rights.html.

[69] Stephen S. Roop & Sondip Mathur, *Leasing of TxDOT's Rights-of-Way* 2 (Texas Transportation Institute, Texas A. & M. University, Research Report 1329-1F, 1993), https://static.tti.tamu.edu/tti.tamu.edu/documents/1329-1F.pdf.

Federal Sovereignty Over Airspace Is Not Nationalization of Airspace

The 1926 Air Commerce Act was passed by Congress to bring some order to the regulation of interstate and foreign air services. Included in that Act was a declaration of "complete sovereignty of the airspace over the lands and waters of the United States."[70] Read in isolation, this provision, to the uninitiated, could be misinterpreted as a nationalization of airspace against state and local powers.

One can readily dismiss that interpretation. The idea that this was a declaration against the states was repudiated by the law's drafters,[71] the Senate legislative counsel,[72] and, nearly 20 years later, by the Supreme Court.[73] Migala notes in his examination of the major federal aviation laws in 1926, 1938, and 1958 that it is "exceedingly clear that Congress used this section to declare sovereignty only internationally; it did not intend to trample on the sovereignty of states' airspace rights."[74] According to contemporaneous congressional records, "The

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[70] Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568, § 6 (1926). In 1938, this declaration was amended somewhat, though it was still interpreted to mean sovereignty against foreign nations. *See* Donohue, *supra* note 14, at 35–36.

[71] Senator Hiram Bingham, one of the drafters of the law, confirmed that the act made "no interference with municipal or State regulation." 67 Cong. Rec. 9355 (1926) (statement of Sen. Bingham) ("None whatever.").

[72] In his influential legal brief to the U.S. Senate about the 1926 Air Commerce Act, Senate legislative counsel Frederic P. Lee noted that the sovereignty provisions left surface air rights unaffected: "It is true that the principle of exclusive Federal sovereignty in the air domain *above the surface air space*, rests the validity of such diverse State regulations (so far as they apply to the upper strata of air space) only upon the consent of the Federal Government rather than upon a State power which may be exercised irrespective of the action of the Federal Government." Frederic P. Lee, The Air Domain of the United States, Legislative Counsel, U.S. Senate (1926) (emphasis added), reprinted by General Printing Office, Civil Aeronautics, Legislative History of the Air Commerce Act of 1926, 104 (1928).

[73] The Court in *Braniff Airways* rejected the claim that the sovereignty provision nationalized airspace against the states: "The provision pertinent to sovereignty over the navigable air space in the Air Commerce Act of 1926 was an assertion of exclusive national sovereignty. The convention between the United States and other nations respecting international civil aviation . . . accords. The Act, however, did not expressly exclude the sovereign powers of the states. . . . These Federal Acts regulating air commerce are bottomed on the commerce power of Congress, not on national ownership of the navigable air space, as distinguished from sovereignty." Braniff Airways v. Nebraska St. Board of Equalization & Assessment, 347 U.S. 590, 595–96 (1954).

[74] Migala, *supra* note 19, at 15.

[sovereignty] section in nowise affects the apportionment of sovereignty as between the several States and the United States, but only as between the United States and the rest of the world."[75]

The 1926 act went so far as to permit, in section 4, "airspace reservations" by the states.[76] The crucial implication of this statute, one legal observer noted, is that "sovereignty [over surface airspace] *was acquired by a State before it was admitted into the Union* and was retained afterward, or sovereignty was acquired subsequent to statehood."[77] In 1958, Congress updated the aviation statutes with the Federal Aviation Act. Airspace was becoming scarcer, and collisions more likely, as civil and military operators competed for use.[78] Section 4 of the 1926 Act, which recognized the power of states to make airspace reservations, was dropped. As Migala notes, throughout the hearings and reports preceding the 1958 Federal Aviation Act, there was no discussion of state power to make airspace reservations.[79]

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[75] STAFF OF H. COMM. ON INTERSTATE AND FOREIGN COMMERCE, 69TH CONG., CIVIL AIR NAVIGATION 8 (Comm. Print 1926) (to accompany S. 41, 69th Cong.). For similar statement, see H.R. REP. NO. 1262, 68th Cong., at 19 (1925). Colonel W. Jefferson Davis, for instance, represented the War Department at the Congress on International Aviation Legislature, and he writes in his 1930 casebook, *Aeronautical Law:* "The question of sovereignty as between the Federal government and the states is not solved by the [1926] Federal Air Commerce Act. The declaration of sovereignty [in the 1926 Act] is only with regard to international relations." W. JEFFERSON DAVIS, AERONAUTICAL LAW 128 (1930).

[76] The original House bill for what became the 1926 Air Commerce Act included a provision authorizing the Secretary of Commerce to regulate aircraft and pilots in intrastate commerce. 67 Cong. Rec. 9354 (1926) (statement of Sen. Bingham). In the compromise bill that passed, that authority over intrastate aircraft and pilots was stripped out and replaced by a section that expressly protected state powers over low-altitude airspace. *Id.* (statement of Sen. Bingham). The law that eventually passed permitted states, in section 4, to make "airspace reservations," in order that they may preclude low-altitude flights over cities and sports venues. Air Commerce Act of 1926, 44 Stat. 570, of the (repealed in 1958); see 67 Cong. Rec. 9355 (1926) (statement of Sen. Bingham). In debating the airspace reservations issue, Sen. Bingham conceded that hypothetically, states had the power under the bill to exclude interstate commerce from the airspace reservations. 67 Cong. Rec. 9355 (1926) (statement of Sen. Bingham).

[77] Armine C. Ernst, Possible Impact of the Tidelands Decisions on Airspace Sovereignty, 7 Sw. L.J. 280, 284 (1953) (emphasis added).

[78] Federal Aviation Agency Act: Hearings Before the Subcomm. on Aviation of the S. Comm. on Interstate & Foreign Commerce, 85th Cong. 151 (1958) (statement of E. R. Quesada, Chairman, Airways Modernization Board).

[79] Migala notes the following: "Throughout the hearings for the 1958 Act, and in all of the accompanying reports and testimony that make up the comprehensive legislative history, at no time was there any discussion about states' rights to enact airspace reservations under § 4." Migala, *supra* note 19, at 59.

Nevertheless, this omission of section 4 cannot be interpreted as a nationalization of all airspace against state powers. First, in 1958, Congress was surely familiar with the express holding of the 1946 *Causby* case that federally approved air routes must yield to property rights at low altitudes. Further, state powers over surface airspace were not extinguished because the Federal Aviation Act of 1958 added a "savings clause" that preserved the effect of state laws, including "the remedies now existing at common law or by statute."[80] Now this paper turns to the legal treatment of surface airspace and the remedies at common law and state law.

Causby and Landowners' Airspace as Property

During World War II, the government condemned and acquired a wedge of airspace from a few property owners adjacent to a military airport in Louisiana so that airplanes were guaranteed an unobstructed glide path to the runway.[81] For reasons lost to history, the US government made no such compensation to the Causbys, farmers in North Carolina, before converting a small local airport bordering the Causbys' chicken farm into a military airport. The Causbys challenged

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[80] 49 U.S.C.A. § 1506 (1988) (codified as amended at 49 U.S.C. § 40120(c)). In 1994, Congress engaged in a recodification of the Federal Aviation Act, and the savings clause now reads: a "remedy under this part is in addition to any other remedies provided by law." Courts, scholars, and contemporaneous congressional records hold that this recodification was not intended to effect a substantive change from the predecessor statutes. *See, e.g.,* the Florida Supreme Court's comment on the issue:

> Congress expressly stated that a recodification of the federal aviation statutes that occurred in 1994, which included renumbering section 1506 as section 40120(c), was *not intended to substantively change those statutes.*

Vreeland v. Ferrer, 71 So. 3d 70, 77 n.3 (Fla. 2011) (citing 1994 U.S.C.C.A.N. 818) (emphasis in original). See also Massachusetts v. United States, 435 U.S. 444, 473 (1978) (Rehnquist, J., dissenting) ("The United States does not 'own' the airspace above its territorial boundaries, although it undoubtedly has considerable authority to regulate the use of that airspace."). As the Colorado Supreme Court recognized in a 1994 case about airspace management, the Federal Aviation Act contains no explicit preemption of local regulation of air traffic and airspace management. This was a banner ad case. The court did find, however, that the local regulations were preempted because towing objects was within the exclusive domain of the federal government. The court also found that the ordinance was preempted because it "stands as an obstacle" to the purposes and objectives of Congress. Banner Advertising, Inc. v. People of the City of Boulder, 868 P.2d 1077, 1084 (Colo. 1994).

[81] The easement to the airspace began at 25 feet above the ground and continued for 15 years, or until the war concluded. United States v. 357.25 Acres of Land in Calcasieu Parish, 55 F. Supp. 461, 461 (W.D. La. 1944).

Army flights over their property as an unconstitutional taking, a famous property rights case decided by the Supreme Court in 1946.

The low-altitude flights of bomber planes terrified the Causbys—one errant Army aircraft missed a landing and killed their neighbors, a mother and three children.[82] The constant airplane noise, which killed nearly 150 of the Causbys' chickens, had destroyed their livelihood.[83] The Supreme Court agreed with the Causbys that low-altitude flights could amount to a taking under the Fifth Amendment. The *Causby* case also formalized longstanding trends in the law discussed earlier and, in particular, the idea that there are two layers of airspace: a high-altitude layer that the federal government largely controls and a low-altitude layer largely under control of landowners and US state powers.

In *Causby*, the federal government argued (a) that flights at low altitude, if within "navigable airspace," cannot amount to a taking[84] and (b) that landowners do not own surface airspace—the "superadjacent airspace"—except that occupied by buildings.[85] The Supreme Court rejected both arguments.

In rejecting the government's first argument, the Court held that "the flight of airplanes, which skim the surface but do not touch it, is as much an appropriation of the use of the land as a

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[82] BANNER, *supra* note 64, at 229.

[83] *Id*. at 229.

[84] United States v. Causby, 328 US 256, 260 (1946) ("It is, therefore, argued [by the federal government] that since these flights were within the minimum safe altitudes of flight which had been prescribed, they were an exercise of the declared right of travel through the airspace. The United States concludes that when flights are made within the navigable airspace without any physical invasion of the property of the landowners, there has been no taking of property."). "None of [the Justices] cared that federal law had defined as navigable airspace the area in which the planes flew over the Causbys' land." BANNER, *supra* note 64, 250.

[85] Causby, 328 U.S. at 260 ("[The United States] also argues that the landowner does not own superadjacent airspace which he has not subjected to possession by the erection of structures or other occupancy.").

more conventional entry upon it."[86] When flights invade the airspace that the landowner can "use in connection with the land," the Court said, a taking can occur.[87]

In rejecting the second argument, the Court held that landowners do own surface airspace above their land: "The landowner owns at least as much of the space above the ground as he *can occupy or use* in connection with the land."[88] Finally, the Court acknowledged and cited favorably North Carolina's claim to sovereignty to surface airspace in its takings analysis.[89] The Supreme Court reiterated in *Causby* that "while the meaning of 'property' as used in the Fifth Amendment was a federal question, 'it will normally obtain its content by reference to local law.'"[90]

Post-Causby Effects and the Two Zones of Airspace

In the wake of the *Causby* decision, a commentator noted that the Court had formalized the traditional view (described by Frederic Lee in drafting the 1926 Act, for instance[91]) that airspace

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[86] *Id*. at 264.

[87] *Id*. at 264.

[88] *Id.* at 264 (emphasis added).

[89] *Id.* at 266 ("Sovereignty in the airspace rests in the State 'except where granted to and assumed by the United States.' Gen.Stats.1943, § 63-11.").

[90] *Id*. at 266 (quoting United States ex rel. TVA v. Powelson, 319 U.S. 266, 279 (1943)). *See also* Stop the Beach Renourishment, Inc. v. Florida. Dep't. of Envtl. Prot., 130 S. Ct. 2592, 2612 (2010) ("The Takings Clause only protects property rights as they are established under state law, not as they might have been established or ought to have been established."). Further: "*Generally speaking, state law defines property interests*, including property rights in navigable waters and the lands underneath them." Stop the Beach Renourishment, Inc., 130 S. Ct. at 2597 (internal citation omitted; emphasis added); Board of Regents of State Colleges v. Roth, 408 U.S. 564, 577 (1972).

[91] Lee noted:

> Two types of air domain are required to be distinguished, the higher strata of air space and the surface air space. . . . Such surface air space has always been regarded as appurtenant to the contiguous lands and waters and a part of the domain of the nation holding such lands and waters. Such surface air space is acquired as a part of the domain of a nation by the same method and at the same time as the subjacent land and waters are acquired. The acquisition, as a part of a nation's domain, of the higher strata of air space is dependent however, on other considerations [namely, international law].

Lee, *supra* note 72, at 108.

can be divided into two zones:[92]

> In the lower zone next to the earth's surface, private property in the airspace is permitted and we must assume that in that zone normal relationships exist between State and Federal sovereignty as elsewhere in State territory. But in the upper zone . . . the rights of the Federal Government seem to have been considered so paramount that Congress was able to place the navigable airspace, as stated in the Court's opinion, "within the public domain."

The *Causby* case brought predictability to potential litigants in airport cases.[93] After *Causby*, Congress amended "navigable airspace" to mean takeoff and landing glide paths. Aviation officials believed this amendment negated takings lawsuits for planes staying in their authorized glide paths, but the Supreme Court held in *Griggs v. Allegheny County* that even planes in navigable airspace are invading property at low altitudes.[94] As the Supreme Court said in *Griggs*, *Causby* stands for the proposition that government takings of air easements must be compensated, navigable airspace or not.[95] The Court in *Griggs* noted that "the use of land presupposes the use of some of the airspace above it."[96] In short, *Causby* and *Griggs* hold that navigable airspace designations must yield to property rights at low altitudes.

Therefore, the common practice evolved for airports to negotiate and compensate landowners for nuisance and avigation easements.[97] Today, airports prefer to acquire all the land

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[92] John C. Cooper, *State Sovereignty vs. Federal Sovereignty of Navigable Airspace*, 15 J. AIR L. & COM. 27, 27 (1948). *See also* Madeline C. Dinu, *State Sovereignty in the Navigable Airspace*, 17 J. AIR L. & COM. 43, 51 (1950) ("So far as the private property owner is concerned, the superadjacent non-navigable airspace below safe altitudes of flight . . . has the quality of property, and as an incident to his ownership of the land, the landowner has a claim to such non-navigable airspace. Invasions of it are like trespass on the surface, and the rights of the private property–owner are paramount in such non-navigable airspace.").

[93] BANNER, *supra* note 64, at 260.

[94] Griggs v. Allegheny Cty., 369 U.S. 84, 88–89 (1962).

[95] *Id.* at 88.

[96] *Id.* at 89.

[97] *See, e.g.,* Phoenix Sky Harbor International Airport, *Appendix F: Noise and Avigation Easements* (F.A.R. Report, Noise Compatibility Study Update,1999), https://www.skyharbor.com/docs/default-source/pdfs/Part-150/appendices/1999_part150_appendixf_noiseandavigationeasements.pdf?sfvrsn=2 (several examples of the legal templates for easements negotiated between airports and nearby property owners).

(including the airspace) needed for landing and departing aircraft, but, as FAA guidance notes, acquisition of the needed land is not always possible.[98] In those cases, the FAA requires airports receiving federal support to purchase an avigation easement from neighboring property owners.[99] As discussed later in this paper, there is a presumption by courts that the two zones of airspace are separated at 500 feet above ground level, though property interests can extend higher.

Application to Drone Airspace Regulation and Liability

As part of the 2018 FAA Reauthorization Act, Congress and the president required the FAA to integrate small drones into the national airspace system.[100] An extensive commercial drone industry will need drone highways—aerial corridors—crisscrossing towns, suburbs, and cities. Currently, some small drone corridor pilot programs exist around the country. However, if the FAA were to extend those drone corridors unilaterally, the corridors would face opposition not only from landowners but also from state governments, who have a plausible claim of sovereignty and police powers over surface airspace.[101]

The Court in *Causby* and *Griggs* made three legal principles clear that are relevant for drone operations:

a) Landowners own surface airspace—the immediate reaches above the land—including the airspace unoccupied by buildings.

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[98] Federal Aviation Administration, *Land Acquisition and Relocation Assistance for Airport Improvement Program (AIP) Assisted Projects* 4 (U.S. Department of Transportation, Advisory Circular No. 150/5100-17, Nov. 7, 2005, https://www.faa.gov/documentLibrary/media/advisory_circular/150-5100-17/150_5100_17_chg6.pdf.

[99] An FAA advisory circular notes: "Normally the [airport] sponsor will acquire fee title to all land within the airport boundaries and for the runway protection zone (RPZ). If fee acquisition for the RPZ is not practical then an avigation easement is required." *Id.* at 4.

[100] 49 U.S.C. § 44802 (2020).

[101] THE FEDERALIST NO. 45 (James Madison) ("The powers reserved to the several States will extend to all the objects, which, in the ordinary course of affairs, concern the lives, liberties, and properties of the people, and the internal order, improvement, and prosperity of the state.").

b) Low-altitude flights, even if within navigable airspace, can amount to a taking.

c) The Causby Court acknowledged and cited favorably state claims of sovereignty to airspace and looked to state law for the definition of airspace property.

Federal and state policymakers should consider formalizing a framework of cooperative federalism to quickly integrate drones into US airspace while avoiding controversy and litigation between the federal and state governments.[102] This idea for cooperative federalism for drone regulation has been described elsewhere,[103] given the legal and practical realities of drone operations (for example, only three FAA employees enforce drone regulations in Ohio, a state of nearly 12 million residents).[104] In this framework, the FAA would largely be responsible for certifying drone aircraft and UTM systems (for example, separation minimums between drones and emergency landing procedures) and "whitelisting" surface airspace where drone operations could commence. States and cities would then have responsibility for demarcating drone highways, leasing airspace if needed, and creating other traditional time, place, and manner restrictions.

Perhaps the closest cooperative federalism model and analog is telecommunications—another technology with widespread enterprise and consumer use. The construction and operation of droneports and drone highways, like telecommunications, will require local zoning permits and private property. In telecommunications, the Federal Communications Commission (FCC) has sole authority over communications devices and interstate communications. However, the FCC does not pick and choose where telecommunications facilities are installed. The

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[102] Michael S. Greve, *Bloc Party Federalism*, 42 HARV. J. L. & PUB. POL'Y 279, 287 (2019) (noting that cooperative federalism "works where and when states are tolerably homogenous" and "breaks down when a substantial number of states, *acting as a bloc*, refuse cooperation") (emphasis in original).

[103] Jonathan M. Zalewski, Sharing the Sky: Regulating Unmanned Aircraft in American Airspace Via Cooperative Federalism, 42 U. DAYTONA L. REV. 333 (2017).

[104] *Id.* at 351.

construction of cell sites and conduit is governed by state and local police powers, though Congress authorizes the FCC to preempt state or local rules that "may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service."[105] Another similarity drones have with telecommunications is the possible use of public rights-of-way, a proposal discussed later in this paper. That proposal for airspace leasing of the public rights-of-way to drone operators contemplates revenue sharing between federal and state governments, another element where federal and state interests coincide.

Above all, by demarcating low-altitude drone corridors above public rights-of-way, federal and state aviation officials and drone operators can avoid takings and other lawsuits from residents and property owners. Landowners suffer not only from nuisance and trespass from regular drone flights, but also from potential loss of their air rights.[106] Local droneport and UTM system operators, whether public or private, face the prospect of expensive litigation and landowner remedies if they fly into surface airspace above private property.[107] Private droneport

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[105] 47 U.S.C. § 253 (a).

[106] With drone overflights, landowners face not only nuisance and trespass but also, over years, drone operators' possible acquisition of a prescriptive easement to landowners' airspace, which would entitle drone operators to enter property to cut trees or prevent new construction on the land. Several states that have considered aviation lawsuits have recognized prescriptive easements—essentially adverse possession of airspace. Courts in California, Connecticut, Oregon, and Washington recognize prescriptive easements of airspace. Baker v. Burbank-Glendale-Pasadena Airport Auth., 220 Cal. App. 3d 1602, 1609 (1990); Insitoris v. City of Los Angeles, 210 Cal. App. 3d 10, 14 (1989); Ventres v. Godspeed Airport LLC, 881 A.2d 937, 949 (Conn. 2005) (holding that airports can acquire prescriptive easement, including the right to enter neighboring land and cut trees); Christie v. Miller, 719 P.2d 68, 70 (Or. Ct. App. 1986); Petersen v. Port of Seattle, 618 P.2d 67, 70 (Wash. 1980) (acknowledging that avigation easements for public use can be prescriptively acquired and are not compensable). Although not expressly acknowledging a prescriptive easement, a New York court similarly prevented development in an aviation case:

> Although the operations of the airport have expanded considerably since 1962, the claimant purchased the property with knowledge of the presence of an airport, and therefore assumed the risk of fluctuations in market value that might be caused by the existence of a nearby airport. In this case, it cannot be said that the claimant ever had a reasonable expectation that the building could be vertically expanded. As the operations of the airport increased, the possibility of expansion diminished. This was not a result of the taking but of the risk the property owner assumed upon purchase of the property.

3775 Genesee St., Inc. v. State, 415 N.Y.S.2d 575, 585 (1979).

[107] It is established law that noise and takings issues fall on the airport—the FAA has generally been absolved of responsibility. "It is now firmly established that the airport proprietor is responsible for the consequences which

and UTM system operators are particularly vulnerable, much like private airports face more costly lawsuits than public airports.[108]

Unlike airport operators, droneport operators face potential lawsuits from virtually any resident subject to overflights because most drones are near the surface during the entire flight, not simply on takeoff and landing. As the Merideth case and more than a dozen drone shootings reveal, many Americans have great skepticism about drone flights.[109]

Proposal for Airspace Leasing Above Federal and State Roadways

The FAA has acknowledged local authorities' "police power" in five areas: land use, zoning, privacy, trespass, and law enforcement operations.[110] The jurisdictional problem arises because airspace *is land*—subject to state police powers—and *is navigable airspace*—subject to federal regulation. As mentioned earlier, many states have claimed sovereignty to low-altitude airspace and more than 20 states expressly allow state and municipal officials to lease airspace above public land or public easements.[111]

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attend his operation of a public airport." Air Transport Ass'n of America v. Crotti, 389 F. Supp 58, 63 (N.D. Cal. 1975) (citing City of Burbank v. Lockheed Air Terminal, 411 U.S. 624, 635 n.14 (1973)). *See* Ricarda L. Bennett, *Airport Noise Litigation: Case Law Review*, 47 J. AIR L. & COM. 449, 489 (1982). Much more than federal courts, which tend to limit inverse condemnation to overhead flights, state courts interpret state constitutions' conception of inverse condemnation to include aircraft noise over adjacent properties. Bennett, *supra* at 490. *See, e.g.,* Greater Westchester Homeowners Ass'n v. City of Los Angeles, 26 Cal. 3d 86 (1979), cert. denied, 449 U.S. 820 (1980). In some states, if a landowner wins an inverse condemnation lawsuit against the state, the state is responsible for reasonable fees, including attorney's fees. *See, e.g*., CAL. CIV. PROC. CODE § 1036; VA. CODE ANN. § 25.1-420.

[108] No court, for instance, has enjoined a publicly operated airport (though damages for nuisance have been awarded). In contrast, privately owned airports face court injunctions. J. Scott Hamilton, *Allocation of Airspace as a Scarce Natural Resource*, 22 TRANSP. L.J. 251, 262 (1994). Court penalties also seem to be stiffer, including daily damages for continuing operations. *Id.*

[109] Brent Skorup & Connor Haaland, *Encounters of the Drone Kind: Drone Shootings and No-Fly Zones*, TECHNOLOGY LIBERATION FRONT, June 26, 2020, https://techliberation.com/2020/06/26/encounters-of-the-drone-kind-drone-shootings-and-no-fly-zones/ (documenting cases of drone shootings in the United States).

[110] Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,064, 42,194 (June 28, 2016) (codified at 14 C.F.R. pts. 21, 43, 61, 91, 101, 107, et al.).

[111] *See* Brent Skorup & Connor Haaland, "Which States Are Prepared for the Drone Industry? A 50-State Report Card" (Mercatus Research, Mercatus Center at George Mason University, Arlington, VA, March 2020), https://www.mercatus.org/publications/technology-and-innovation/which-states-are-prepared-drone-industry.

Cooperative Federalism for Airspace Leasing

To avoid lawsuits from private property owners for takings and trespass and to avoid federal preemption litigation, the USDOT and state DOTs should expand their existing airspace leasing collaboration and revenue sharing for establishment of drone highways. Responsibility for demarcating aerial corridors would be shared by USDOT and state DOTs given the mix of aviation safety, state police powers, and property rights issues. States would generally receive leasing revenues from airspace use over state highways and local roads, and the US Department of Transportation would receive leasing revenues from airspace use over interstate highways.

Airspace leasing is not new. There was, for instance, a short period of market disposition—open bidding—on air routes in the 1920s, until Congress and federal regulators stepped in suddenly to assign airspace, routes, and terminals via administrative processes.[112] More relevantly for small drones, the practice of roadway airspace leasing was formalized in a 1961 amendment to federal highway laws allowing states and cities "to use or permit the use of the airspace above and below . . . the highway pavement for such purposes as will not impair the full use and safety of the highway."[113] In the 1970s and 1980s, state DOTs began leasing airspace in earnest as many states' financial status degraded.[114] Beginning in 1986, the Federal Highway Administration of the US Department of Transportation created a policy that revenue from roadway airspace leasing must be dedicated to highway programs, not general revenue funds.[115] Having put this policy into place, the Federal Highway Administration began encouraging

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[112] See Brent Skorup, Who Should Govern the Skies?, in EYES TO THE SKY (Matthew Feeney ed., forthcoming); Gareth R. Jones & Michael W. Pustay, Interorganizational Coordination in the Airline Industry, 1925–1938: A Transaction Cost Approach, 14 J. MGMT. 529, 537 (1988).

[113] Federal-Aid Highway Program of 1961 § 104, 23 U.S.C. § 111 (2020).

[114] Roop & Mathur, *supra* note 69, at 2.

[115] *See id.* at 2.

airspace leasing and offered technical assistance to state DOTs to routinize the practice.[116] To date, this authority has not been employed for drone highway use.

Drone Highways Above Roadways

The idea for leasing airspace above highways or utility and railroad rights-of-way to drone operators has circulated for a few years.[117] In fall 2017, I was invited to brief a working group of the FAA's Drone Advisory Committee about drone airspace leasing. The idea was discussed in the Drone Advisory Committee's 2018 report, a 2019 report from the GAO, and a 2020 report from the GAO.[118] The earliest mention in the media to my knowledge is a June 2017 *Salt Lake Tribune* story, noting that a Utah lawmaker proposed airspace leasing above public roads.[119] The idea may have developed from railroad or utility use of drones. BNSF Railway, for instance, flew

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[116] *Id.* at 2.

[117] In Japan, for instance, the regulator envisions drone highways that use the airspace owned by public utilities. *See TEPCO Group, Zenrin and Rakuten Examining "Drone Highways" for Drone Logistics*, AIR CARGO NEWS, July 16, 2018, https://www.ajot.com/news/tepco-group-zenrin-and-rakuten-examining-drone-highways-for-drone-logistics; *Tepco Ventures, Success in Package Delivery Experiment Using Drone Highway through Mountains*, TEPCO VENTURES, INC., Jan. 28, 2019, https://www.tepcoventures.co.jp/en_news/success-in-package-delivery-experiment-using-drone-highway-through-mountains-tepco-ventures-rakuten-zenrin-and-chichibu-city-jointly-conducted-beyond-visual-line-of-sight-drone-flight-test/. In the interest of brevity, this paper does not analyze the issue of leasing utility or railroad rights-of-way airspace. Such leases would likely resemble the private sale and leasing of airspace.

[118] Drone Advisory Committee, Federal Aviation Administration, *Drone Integration Funding* 21–22 (Radio Technical Commission for Aeronautics, RTCA Paper No. 047-18/DAC-011, Mar. 2018), https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/rtca_dac/media/dac_tg3_funding_report_long_term_final.pdf (discussing the "Auction or Lease of Airspace"); US Government Accountability Office, *Unmanned Aircraft Systems: FAA Should Improve Drone-Related Cost Information and Consider Options to Recover Costs* 38 (Report GAO-20-136, December 2019), https://www.gao.gov/assets/710/703320.pdf; U.S. Government Accountability Office, *Unmanned Aircraft Systems: Current Jurisdictional, Property, and Privacy Legal Issues Regarding the Commercial and Recreational Use of Drones, Appendices I–VI* 35 (Report B-330570, September 2020), https://www.gao.gov/assets/710/709371.pdf)("[T]wo legal commentators have recently proposed that states could create 'drone highways' above public rights-of-way that UAS operators could use for parcel delivery and other services"). *See also* Brent Skorup, *Auctioning Airspace*, 21 N.C. J.L. & TECH. 79 (2019) (proposing the demarcation and auction of aerial corridors for passenger drones).

[119] Lee Davidson, *Request for Transportation and Transit Reform Ideas Bring Flood of Proposals—Including State Takeover of UTA*, SALT LAKE TRIBUNE, June 14, 2017, https://archive.sltrib.com/article.php?id=5403664&itype=CMSID (citing Sophia DiCaro). *See also* Brent Skorup & Melody Calkins, *Why Not Auction Off Low-Altitude Airspace for Exclusive Use?*, TECHNOLOGY LIBERATION FRONT, June 27, 2017, https://techliberation.com/2017/06/27/why-not-auction-off-low-altitude-airspace-for-exclusive-use/.

hundreds of hours of long-distance drone flights from 2014 to 2018 under the FAA's Pathfinder Program using the railroad's airspace within the railroad right-of-way,[120] and the market in airspace use above railroad rights-of-way has been active for over a century.[121]

There are several benefits to federal and state authorities demarcating safe drone routes above roadways. First, using public right-of-way airspace negates most trespass, takings, and nuisance lawsuits from landowners because the airspace is already acquired and dedicated for (somewhat noisy) transportation uses. Second, demarcating airspace for drone highways opens up vast potential for new competitors and services. Drone operators can deploy services quickly once they obtain access to airspace. In April 2020, the United Parcel Service and drone operator DroneUp revealed how quickly services can be deployed once they have airspace access:[122]

> 'DroneUp and UPS did the most extensive delivery of packages that has ever been done,' says Tom Walker, DroneUp CEO. 'Hundreds, if not thousands of flights—it was an exhaustive exercise. We took a [vacant] 55-acre college campus, we made it a town, and by the end of day two we were doing deliveries every 3 minutes.'

Roadways and their accompanying airspace represent a huge amount of unused, non-revenue-generating public real estate. "Most major cities' road systems take up 25%–35% of the city's land area,"[123] and, according to estimates using Federal Highway Administration data, "the amount of existing [right-of-way] that is a part of the National Highway System (NHS) is

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[120] "BNSF's work with the FAA demonstrated our ability to control the land and airspace utilized by our UAS flights across managed flight corridors over BNSF's property." *Keeping Pace with Innovation—Update on the Safe Integration of Unmanned Aircraft Systems into the Airspace: Hearing Before the Subcomm. on Aviation Operations, Safety, and Security of the Committee on Commerce, Science and Transportation*, 115th Cong. 18, 20 (May 8, 2018) (prepared statement of Todd Graetz, BNSF Railway), https://fas.org/irp/congress/2018_hr/uas-integration.pdf.

[121] Committee on New Developments in Real Estate Practice, *Recent Developments in Airspace Utilization*, 5 REAL PROP. PROB. & TR. J. 347, 350–52 (1970).

[122] Miriam McNabb, *UPS Drone Delivery: DroneUp Flies to Prove the Case for Coronavirus Response*, DRONELIFE, April 21, 2020, https://dronelife.com/2020/04/21/ups-drone-delivery-droneup-partners-fly-to-prove-the-case-for-coronavirus-response/.

[123] In suburban areas "the percentage is smaller, around 15%–20%." Leo Thompson, *Is Your City Infrastructurally Obese?,* STRONG TOWNS, Oct. 29, 2019, https://www.strongtowns.org/journal/2019/10/29/is-your-city-infrastructurally-obese?rq=leo.

between 3,000–6,000 square miles," which is about the size of Connecticut.[124] Because there are "more than 8 million lane miles of public roadways under state DOT supervision,"[125] an extensive nationwide air corridor network exists for drone operators to use.

Third, roadway airspace leasing ensures that this natural resource is allocated by the market, not via regulatory rationing or first-come-first-serve mechanisms.[126] Markets are used for the disposition of public assets such as offshore oil leases and public timber lands,[127] and there is legal precedent for airspace leasing. Under federal law, state DOTs must charge fair market value for airspace leases—no giveaways—of aerial real estate above roadways purchased with assistance from the federal Highway Trust Fund.[128] It's difficult to define ex ante the best terms of a lease that encourages long-term investments into drone infrastructure while not creating local or regional monopolies. However, a good analog is spectrum licenses—10-year licenses with the presumption of renewal—which encourage billions of dollars of annual infrastructure investment. Competition in drone services can be accomplished by a "layer cake" approach to

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[124] US Department of Transportation, Federal Highway Administration, Office of Transportation Policy Studies, *Future Uses of Highway Rights of Way*, Report Summary (April 2012), https://www.fhwa.dot.gov/policy/otps/rowstudyproj.cfm.

[125] Carson Poe & Gina Filosa, *Alternative Uses of Highway Rights-of-Way: Accommodating Renewable Energy Technologies* 23, Transportation Research Record: Journal of the Transportation Research Board, No. 2270, 23, 2012.

[126] *See* Skorup, *supra* note 118.

[127] *Id*.

[128] Under federal law, "a State shall charge, at a minimum, fair market value for the sale, use, lease, or lease renewal . . . of real property acquired with Federal assistance made available from the Highway Trust Fund." 23 U.S.C. § 156(a). This applies to right-of-way airspace: "The predecessor to § 156 of title 23, U.S.C., applied only to the sale, use, lease or lease renewals of 'right-of-way airspace'. . . . [The Federal Highway Administration] correctly interprets the TEA-21 amendment as expanding the scope of § 156 to allow reapplication of the proceeds from all real property dispositions." US Government Accounting Office, *Subject: Use of Proceeds from the Sale of Real Property Purchased with Federal Highway Funds* 2 (B-290744, Letter from Anthony H. Gamboa, General Counsel, to Sen. John McCain, Committee on Commerce, Science and Transportation, September 13, 2002), https://www.gao.gov/assets/370/366636.pdf.

leasing (perhaps three drone highways above each roadway at three separate altitudes) and the encouragement of secondary markets in airspace leases.

A final, related benefit is that the government receives newfound revenue for the disposition of drone corridors. Under current law, the federal government retains a pro rata share of airspace leasing revenues for road projects receiving federal funding.[129] Federal approval is needed for airspace leasing above those roads, but states have and should have a relatively free hand in leasing airspace above state and local roads to drone operators.[130]

Airspace leasing above the public rights-of-way isn't straightforward in every state. In some jurisdictions, there is extensive practice with airspace leasing, whereas in others it is difficult under current state law. The nature of the title or right the state or municipality (or utility or railroad) holds to surface airspace above a road or tracks depends on the jurisdiction.[131] Illinois law is quite restrictive, for example, and municipalities can lease airspace to only the owners of the fee.[132] Virginia law is more liberal and allows municipalities to lease or sell airspace above roads and rights-of-way that the municipality owns in fee simple.[133] However, Oregon has perhaps the broadest airspace leasing law, allowing leasing of airspace whether the state or

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[129] US Government Accounting Office, *supra* note 128, at 6 ("[I]n 1987, Congress asserted an interest in the federal share of the proceeds resulting from the disposition of air rights.").

[130] US Department of Transportation, *Airspace Guidelines to 23 CFR 710.405–710.407*, FEDERAL HIGHWAY ADMINISTRATION, revised Aug. 10, 2010, https://www.fhwa.dot.gov/real_estate/right-of-way/corridor_management/airspace_guidelines.cfm ("FHWA approval [for air rights leases above roads] is normally required only for airspace leases on the Interstate system."). Right-of-way use agreements for airspace above interstate roads must meet federal requirements. *See* 23 C.F.R. § 710.405.

[131] *See, e.g.,* Kiely v. Graves, 271 P.3d 226 (Wash. 2012) (internal citations omitted): "The title or right acquired by the public in a statutory dedication depends upon the language of a jurisdiction's dedication statute. In many jurisdictions, a statutory dedication conveys a fee interest to the public. However, in other jurisdictions a statutory dedication may confer no further right than a mere easement." *Id.* at 230.

[132] 65 ILL. COMP. STAT. § 5/11-75-1.

[133] VA. CODE § 15.2-2030.

municipality possesses fee title or an easement.[134] Some states, like California, have well-established airspace leasing offices,[135] whereas others have little experience in airspace leasing.

One objection—safety of pedestrians and road users—is imminent and worth responding to briefly. Drones flying overhead will crowd urban skies somewhat, and collisions with other drones or foreign objects (such as birds, wires, and construction cranes) are possible. To date, the FAA is ensuring safety with drone certifications and inspections of operations, which will mitigate much of the risk. Nevertheless, the flight over roadways does inject some risk to pedestrians and roadways users. As with any new service or product, risk will be mitigated by some combination of government certification, professionalization of operators, and new insurance products. Some insurers are already creating new or expanding traditional aviation products to cover drones and drone debris.[136] The risk of over-roadway drone operations is not negligible, but a professionally operated drone abiding by FAA policies likely poses less risk to life and property than other routine roadway uses.

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[134] The law provides: Any political subdivision holding the easement or fee title to a street or highway may lease the space above or below that street or highway for private purposes . . . ." OR. REV. STAT. § 271.430.

[135] Caltrans, *Airspace and Telecommunications Licensing*, https://dot.ca.gov/programs/right-of-way/airspace-and-telecommunications-licensing.

[136] *See, e.g.,* Insurance Canada, *Handing Over Control to Autonomous Vehicles*, April 25, 2014, https://www.insurance-canada.ca/2014/04/25/handing-over-control-to-autonomous-vehicles/ ("Lloyd's underwriters, including Kiln, are already insuring UAS, and are lending their expertise to regulatory discussions in the European Union aimed at gradually accommodating the new technology . . . .").

Proposal for a Presumption of Trespass for Drone Flights Below 200 Feet

The final issue is determining the height at which drone operators can fly with some certitude that they will not face liability from private landowners. As other legal commentators have noted, the ambiguity surrounding drone trespass invites complex litigation between drone operators and landowners.[137] Traditional aviation law and the judicial precedents provide a possible model. As Migala points out, courts apply a limit of 500 feet in an almost mechanical fashion, finding a compensable taking for even transitory flights below 500 feet.[138] This 500-foot rule is treated much like a presumption by courts:[139] the *floor* for a taking, not the *ceiling*. As one federal court stated in an aerial takings case:[140]

> [T]he most appropriate rule is that when overflights occur in navigable airspace, a presumption of non-taking exists[,] which can be overcome by proof of destruction of, or substantial impairment to the property.

This judge-made rule is likely derived from FAA regulations, which, with some exceptions for glide paths and helicopters,[141] deem airspace below 500 feet as non-navigable airspace.[142]

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[137] See, e.g., Lindsey P. Gustafson, Arkansas Airspace Ownership and the Challenge of Drones, 39 U. ARK. LITTLE ROCK L. REV. 245, 255 (2017); Lane Page, Note, Drone Trespass and the Line Separating the National Airspace and Private Property, 86 GEO. WASH. L. REV. 1152, 1173 (2018).

[138] *See, e.g.,* Griggs v. Allegheny Cty., 369 U.S. 84, 90 (1962); Palisades Citizens Ass'n, Inc. v. C. A. B., 420 F.2d 188, 192 (D.C. Cir. 1969); United States v. 15,909 Acres, 176 F. Supp. 447, 448 (S.D. Cal. 1958); Speir v. United States, 485 F.2d 643, 646–47 (Ct. Cl. 1973); Aaron v. United States, 311 F.2d 798, 801 (Ct. Cl. 1963); A. J. Hodges Indus., Inc. v. United States, 355 F.2d 592, 597 (Ct. Cl. 1966); Jensen v. United States, 305 F.2d 444, 446 (Ct. Cl. 1962); Dick v. United States, 169 F. Supp. 491, 494 (Ct. Cl. 1959); Highland Park, Inc. v. United States, 161 F. Supp. 597, 598 (Ct. Cl. 1958); Persyn v. United States, 34 Fed. Cl. 187, 195–96 (1995), aff'd, 106 F.3d 424 (Fed. Cir. 1996); Hsu v. Cty. of Clark, 173 P.3d 724, 731–32 (Nev. 2007); Thompson v. City & Cty. of Denver, 958 P.2d 525, 527 (Colo. App. 1998); Brown v. United States, 73 F.3d 1100, 1101 (Fed. Cir. 1996).

[139] *See, e.g.,* Branning v. United States, 654 F.2d 88, 102–03 (Fed. Cir. 1981).

[140] Stephens v. United States, 11 Cl. Ct. 352, 362 (1986).

[141] *See* 14 CFR § 91.119(d) (permitting helicopter and powered parachute operations below the usual minimum safe altitude requirements).

[142] *See* 14 CFR 91.119.

This rule derives from the Supreme Court's holdings in *Causby* and *Griggs* that landowners "must have exclusive control of the immediate reaches of the enveloping atmosphere."[143] That 500-foot rule provides useful certainty in traditional aviation about liability and property rights. and some proposals recommend drawing an invisible, fixed line in the sky to separate private property from navigable airspace and drone routes.[144] Some scholars would draw the line at 200 feet,[145] some at 350 feet,[146] and some at 500 feet (resembling traditional aviation's legal standards).[147] There is a bill in the U.S. House and one in the U.S. Senate that would draw that line, largely delegating airspace management below 200 feet to the states and private property owners.[148]

In the absence of congressional or FAA action on this issue, courts should step in to establish a presumption of trespass for drone flights below a certain altitude. The 200-foot line used in those proposed bills is a useful benchmark for courts.

The starting point is *Causby*, which holds that "invasions of [superadjacent airspace] are in the same category as invasions of the surface."[149] Clearly, the FAA cannot simply start designating drone corridors below the rooflines and treetops in backyards and private lands, absent compensation to the landowner. However, *Causby* and subsequent cases inject a nuisance

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[143] United States v. Causby, 328 US 256, 264 (1946).

[144] Gustafson, *supra* note 137, at 264–66.

[145] Page, *supra* note 137, at 1173.

[146] Gregory McNeal, *Drones and Aerial Surveillance: Considerations for Legislatures*, Center for Technology Innovation at Brookings Institution, November 2014, https://www.brookings.edu/research/drones-and-aerial-surveillance-considerations-for-legislatures/.

[147] *See* Troy A. Rule, *Airspace in an Age of Drones*, 95 B.U. L. REV. 155 (2015).

[148] Drone Innovation Act of 2017, H.R. 2930, 115th Cong. (2017), https://www.congress.gov/bill/115th-congress/house-bill/2930/text.

[149] United States v. Causby, 328 US 256, 265 (1946).

standard into takings jurisprudence:[150] an aerial invasion is a taking, the *Causby* Court says, when it creates "a direct and immediate interference with the enjoyment and use of the land."[151]

Courts should consider flights below 200 feet presumptively as a trespass and a nuisance. Above that height, most small drones are fairly quiet. More evidence is needed, but pilot programs in the United States suggest that drones flying above 200 feet altitude would not substantially interfere with the use and enjoyment of the underlying land.[152]

Further, safety concerns of manned aircraft and the FAA are attenuated below 200 feet altitude. Most airspace below 500 feet is non-navigable airspace, so very few manned aircraft fly in surface airspace. The attenuation of the federal interest is indicated by relative indifference to aerial obstructions below 200 feet. Current regulations require developers and construction companies to provide notice to the FAA of new construction or towers within approximately 3.5 miles of an airport.[153] This notice is not required, however, for towers and obstructions that are less than 200 feet tall,[154] presumably because such obstructions pose a negligible risk to air

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[150] Compare with a legal definition of a private nuisance: "when the plaintiff's use and enjoyment of her land is interfered with substantially and unreasonably through a thing or activity." Legal Information Institute, Wex Law Dictionary, https://www.law.cornell.edu/wex/nuisance. This blending of nuisance and trespass in aerial invasion cases has old precedents. *See e.g.,* Clifton v. Bury [1887] 4 TLR 8 (UK) (finding that shots fired across land at a trajectory of 75 feet did not constitute a technical trespass but was nevertheless actionable when dangerous to the use and enjoyment of the land).

[151] United States v. Causby, 328 US 256, 266 (1946).

[152] Google Wing flights in Virginia cruise between 100 feet and 200 feet above the ground. *See* Shayne Dwyer, *Christiansburg Meets Wing, the Self-Flying Delivery Drones Soon To Be in Its Sky*, 10 NEWS, September 28, 2019, https://www.wsls.com/2019/09/28/christiansburg-meets-wing-the-self-flying-delivery-drones-soon-to-be-in-its-sky/; Jacob Demmitt, *Droning On: Some Warn of Rift to Come When Aerial Delivery Arrives in Blacksburg and Christiansburg*, Roanoke News, May 25, 2019, https://roanoke.com/news/droning-on-some-warn-of-rift-to-come-when-aerial-delivery-arrives-in-blacksburg-and/article_63c29dec-5c70-551c-bdc2-a549e4b3f8c9.html ("The mayors of the towns where Google Wing flights are operating have not heard major resident complaints about drone noise.").

[153] 14 C.F.R. §§ 77.9, 77.17(a).

[154] Id.

traffic.[155] A presumption of trespass at 200 feet would recognize two realities: property rights and police powers are stronger at the surface, and federal interests and aviation safety are more salient above 200 feet.

Conclusion

Drone technology has rapidly matured in recent years. Firms and state governments are prepared today to deploy statewide UTM systems and extensive long-distance drone services. Until federal and state aviation officials define their respective regulatory responsibilities, however, the industry will be delayed by litigation and fear of stranded investment. The federal dominance in traditional aviation, under current understandings of property and takings law, is not feasible in a world of drones flying in low-altitude surface airspace. Federal and state policymakers should anticipate the gridlock and legal controversies and recognize state, city, and landowner interests in airspace. Further, through demarcation and leasing of airspace above roadways, the industry and public authorities can begin, almost immediately, widespread long-distance drone services.

[155] That said, section 2110 of the FAA Extension, Safety and Security Act of 2016, Pub. L. No. 114-190, 199, 130 Stat. 615, 623–25 (2016), requires improved physical markings or lighting for some rural towers that are 50–200 feet tall. *See New FAA Rules Will Require Some 50-to-200-Foot Towers To Be Marked*, WIRELESS ESTIMATOR, July 25, 2016, http://wirelessestimator.com/articles/2016/new-faa-rules-will-require-some-50-to-200-foot-towers-to-be-marked/.