

Drones, Airspace Design, and Aerial Law in States and Cities

Brent Skorup

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DRONES, AIRSPACE DESIGN, AND AERIAL LAW IN STATES AND CITIES

*Brent Skorup**

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I. INTRODUCTION

In the summer of 2015, a polarizing scenario involving guns, property rights, and technology unfolded at William Meredith's Kentucky residence. Meredith's young daughter alerted him to a small drone flying over the neighborhood as he, his friends, and his family were grilling in

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his backyard.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 the police arrested Meredith and charged him under a 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 Meredith 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, Meredith 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 Meredith 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 *United States v. Causby*, the 1946 Supreme Court aviation case concerning landowner property rights.⁵

The core dispute in the *Meredith* case is one that many Americans have pondered as drones go mainstream: Where does my property line end and drone airspace begin, and *who* will decide the location of the line? 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 and have growing relevance for specialized infrastructure.⁶ As one scholar recently asked: “What policies are best suited to allocate airspace among its increasingly complex array of competing uses?”⁷

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

1. Nancy Grace, *Previous Tensing Traffic Stop Video Emerges; Man Shoots Down Drone*, CNN TRANSCRIPTS, (aired Aug. 3, 2015, 8:00PM), <http://transcripts.cnn.com/TRANSCRIPTS/1508/03/ng.01.html> [https://perma.cc/UUC9-2RXD].

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, 9:10 AM), <https://www.dailymail.co.uk/news/article-3294792/Victory-Kentucky-Drone-Slayer-took-aircraft-home-SHOTGUN.html> [https://perma.cc/KP2G-CL6R].

4. Grace, *supra* note 1.

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*, 328 U.S. 256 (1946).

6. See Troy A. Rule, *Airspace in a Green Economy*, 59 UCLA L. REV. 270 (2011).

7. *Id.* at 274.

purchase avigation easements from neighboring property owners. However, as Meredith'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 protecting landowners from intrusions by low-flying drones.⁸ Many states have created drone "no-fly" zones, and Texas is currently defending its power to prohibit drones in surface airspace surrounding state land and sensitive locations.⁹

Courts will increasingly need to apply property, nuisance, and takings principles to low-altitude airspace as the commercial drone industry grows. In pilot projects in the United States and around the world, drone services companies and industry leaders—like Walmart, Google, and UPS¹⁰—have made hundreds of thousands of deliveries, showing great potential for rapid delivery for medical supplies, home parcel delivery, and infrastructure inspections.¹¹ In 2016, Congress instructed the Federal Aviation Administration to integrate small drones into the nation's airspace, and in January 2021 the agency announced rules to make commercial drone services more routine, with an eye towards

8. See, e.g., Matt Reynolds, *ABA House of Delegates Passes Resolution on Drones; Delegate Calls It "a Hot Topic,"* ABA J. (Feb. 17, 2020, 6:45 PM), <https://www.abajournal.com/news/article/resolution-111> [<https://perma.cc/65G5-Q7EC>] (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"). 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 Construction*, 10 NAT'L L. REV. 147 (May 26, 2020), <https://www.natlawreview.com/article/balancing-new-technology-and-privacy-when-using-drones-land-use-and-construction> [<https://perma.cc/S3RK-VUWG>].

9. Plaintiffs' Complaint for Declaratory and Injunctive Relief at 30, Nat'l Press Photographers Ass'n v. McCraw, 504 F. Supp. 3d 568 (W.D. Tex. 2020) (No. 1:19-CV-946-RP).

10. See, e.g., Annette Beard & Serenah McKay, *Planners Approve Walmart Drone Launch Pad Request in Pea Ridge*, NW ARK. DEMOCRAT GAZETTE (Jan. 6, 2021, 7:27 AM), <https://www.nwaonline.com/news/2021/jan/06/planners-approve-walmart-drone-launch-pad-request> [<https://perma.cc/Q6N2-ZLXZ>] (Walmart drone deliveries in Arkansas); Matt O'Brien, *Girl Scout Cookies Now Home-Delivered by Drone in Virginia as Google Affiliate Adds Service*, CHI. SUNTIMES (April 28, 2021, 11:16 AM), <https://chicago.suntimes.com/business/2021/4/28/22407843/girl-scout-cookies-drones-deliveries-thin-mints-wing-alphabet-google-virginia-christiansburg> [<https://perma.cc/YM9R-KPRP>] (Google's subsidiary drone company making deliveries in Virginia); 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/> [<https://perma.cc/YGM4-2B9N>] (UPS drone deliveries in Virginia).

11. See, e.g., the Zipline drone company, which keeps a real-time update of its completed commercial deliveries on its company website. As of this writing the company has completed nearly 209,000 commercial deliveries, mostly in Rwanda and Ghana. ZIPLINE, <https://flyzipline.com/> [<https://perma.cc/JG6B-G8LT>] (last visited Oct. 20, 2021).

permitting long-distance services like parcel delivery.¹² Commercial drones are much heavier and noisier than many people's small, hobbyist drones. To have an extensive commercial-drone delivery industry there will need to be drone highways—aerial corridors—crisscrossing towns, suburbs, and cities. Constitutional law questions and property rights precedents, however, will pose daunting legal impediments to broad claims of federal authority over low-altitude airspace and to drone operations above private land.¹³

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

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 to:

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

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.

12. See Operation of Small Unmanned Aircraft Systems Over People (Final Rule), 86 Fed. Reg. 4314 (Jan. 15, 2021) (codified at 14 C.F.R. §§ 11, 21, 43, and 107) (requiring drones to have identifying wireless devices so that long-distance services can be permitted).

13. See, e.g., Nat'l Press Photographers Ass'n, 504 F. Supp. at 588–91 (W.D. Tex. 2020) (dismissing with prejudice the arguments from drone operators that state-created drone no-fly zones are subject to conflict and field preemption).

II. 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.¹⁴ 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.”¹⁵ 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.¹⁶

Congress has granted the Federal Aviation Administration (FAA) authority over the management of *navigable airspace*,¹⁷ but that leaves major questions unanswered: Who controls *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 is formulating its legal perspective on drone federalism. In fall 2020, a Government Accountability Office (GAO) report to Congress explained that the U.S. Department of Transportation (USDOT) views all outdoor airspace as navigable airspace for drones,¹⁸ a

14. 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> [https://perma.cc/S2P8-SBFA].

15. ALISSA M. DOLAN & RICHARD M. THOMPSON II, CONG. RSCH. SERV., R42940, INTEGRATION OF DRONES INTO DOMESTIC AIRSPACE: SELECTED LEGAL ISSUES 2 (2013), <https://fas.org/sgp/crs/natsec/R42940.pdf> [https://perma.cc/2TB6-YPWT].

16. See Trunkes, *supra* note 8 (“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) (UNIF. L. COMM’N, Proposed Draft for Discussion, 2018).

17. 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)).

18. U.S. GOV’T ACCOUNTABILITY OFF., B-330570, UNMANNED AIRCRAFT SYSTEMS: CURRENT JURISDICTIONAL, PROPERTY, AND PRIVACY LEGAL ISSUES REGARDING THE COMMERCIAL AND RECREATIONAL USE OF DRONES 6 (2020), <https://www.gao.gov/assets/710/709370.pdf> (“Although FAA has issued no regulation prescribing minimum safe flight altitudes for [unmanned

view that, if codified, represents a massive expansion of USDOT jurisdiction. At the time of this writing, the USDOT and U.S. Department of Justice are drafting their legal position.¹⁹

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 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.”²⁰ “[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.”²¹

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.²² Some cities, likewise, are prohibiting drone flights at low altitudes.²³ The FAA

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.’”).

19. *Id.* at 3 (“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.”).

20. *Huerta v. Haughwout*, No. 3:16-cv-358, 2016 WL 3919799, at *3 (D. Conn. July 18, 2016).

21. *Id.* at *3.

22. DEL. CODE ANN. tit. 11, § 1334 (West 2020) (no operations over events with more than 1,500 people, over incidents with first responders, or over critical infrastructures); FLA. STAT. § 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 (West 2020) (restrictions over state Capitol Complex); TEX. GOV’T CODE ANN. § 423.0046 (West 2020) (restrictions over sports venues); WIS. STAT. § 114.045 (2020) (no operations over a correctional institution); *see also* Stephen J. Migala, *UAS: Understanding the Airspace of the States*, 82 J. AIR L. & COM. 3, 62–63 (2017).

23. In October 2019, Silverthorne, Colorado, passed an ordinance that generally prohibits drones at heights less than 40 feet above rooftops. Council Agenda Memorandum from John Minor, Chief of Police to Town of Silverthorne, Colorado Town Council Re: Ordinance 2019-19: An

has avoided litigating the issue, but some entities in the drone industry assert that only federal regulators have the authority to define and prohibit where drones operate.²⁴ In particular, they argue that drone no-fly zones “may only be established . . . by the federal government.”²⁵ In October 2020, some drone advocates petitioned the FAA to preempt these state no-fly zones.²⁶ As explained later in this paper, it is unclear what altitude extinguishes state and property owners’ powers.

Drone litigation is growing, including lawsuits against states and cities for creating no-fly zones and against drone operators for aerial trespass.²⁷ One illustrative case is pending in federal court in Texas.²⁸ 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.”²⁹ Photographers sued in 2019 on several grounds, including that federal drone regulation preempts state regulation of drone operations.³⁰ Even the plaintiffs seem unclear about whether states have authority to prohibit

Ordinance to Provide for the Regulation of Unmanned Aircraft (Nov. 13, 2019), <https://silverhome.civicweb.net/document/23430> [<https://perma.cc/9S7J-WG4E>].

24. See, e.g., Brief of Amicus Curiae Ass’n for Unmanned Vehicle Systems International and the Consumer Technology Ass’n at 7, *Nat’l Press Photographers Ass’n v. McCraw*, 504 F. Supp. 3d 568 (W.D. Tex. 2020) (No. 1:19-CV-946-RP) (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).

25. 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).

26. Letter from All. for Drone Innovation et al. to FAA Adm’r Steve Dickson Re: Implementation of Section 2209 2, (Oct. 22, 2020) (on file with the author).

27. See Donohue, *supra* note 17, 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/> [<https://perma.cc/K4F8-JVPX>]. 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?)* at 10:00, YOUTUBE (July 2, 2020), <https://www.youtube.com/watch?v=ufWqRiYRmcA&feature> [<https://perma.cc/69TK-GLCU>].

28. See Silas Allen, *Photojournalists Group Challenges Texas’ Drone Law*, DALL. OBSERVER (Sept. 27, 2019, 4:00AM), <https://www.dallasobserver.com/news/news-photographers-group-sues-to-have-texas-drone-law-overturned-11766014> [<https://perma.cc/M6NS-56ST>].

29. TEX. GOV’T CODE ANN. §§ 423.0045–.0046 (West).

30. Plaintiffs’ Complaint for Declaratory and Injunctive Relief at 30, *Nat’l Press Photographers Ass’n v. McCraw*, 504 F. Supp. 3d 568 (W.D. Tex. 2020), <https://www.courthousenews.com/wp-content/uploads/2019/09/news-drones.pdf> [<https://perma.cc/2EC5-G6FR>] (“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.”).

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.”³¹

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 management (UTM) system.³² Ohio’s drone task force director says they hope to have a statewide UTM system in the next few years.³³ 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.³⁴ Landowners, particularly commercial landowners,³⁵ 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.

III. LEGAL HISTORY OF AIRSPACE REGULATION

A. *Airspace as Property*

Low-altitude airspace “is a complex and oft-forgotten natural resource”³⁶ and a monetizable asset bearing the hallmarks of property.³⁷

31. *Id.* at 29.

32. 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> [https://perma.cc/88TE-EDRP].

33. 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/> [https://perma.cc/B2AR-X4B6].

34. 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*, 404 N.Y.S.2d 225, 231 (N.Y. Ct. Cl. 1978).

35. 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).

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

37. 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).

In Harold Demsetz's influential property rights work in the 1960s, he identified an economic phenomenon: technology shocks create demand for novel assets, and property rights emerge to coordinate increased use of the asset.³⁸ This Demsetz phenomenon has been documented for many previously lightly used resources that became *propertized*, including the Great Plains circa 1870,³⁹ Native American lands in colonial Canada,⁴⁰ and the pre-1927 radio spectrum.⁴¹ One can trace a similar story 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.⁴² Instead, courts cited the maxim *ad coelum*—“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.⁴³ As a court in Minnesota said in a 1923 aerial trespass case, “when, 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.”⁴⁴

38. 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).

39. Anderson & Hill, *supra* note 38, at 170–72.

40. Around 1700, Native Americans near Quebec divided their hunting land because of increased demand for animal fur. Demsetz, *supra* note 38, at 351–53.

41. 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).”).

42. 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”).

43. 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).

44. *Johnson v. Curtiss Nw. Airplane Co.*, 1928 U.S. Av. R. 42, 43–44 (Arnold W. Knauth, Henry G. Hotchkiss & Emory H. Niles, eds., 1928).

However, courts have long treated surface airspace as real property.⁴⁵ Anglo-American legal treatises from the 1840s onward note that one could partition property horizontally⁴⁶ and that airspace—the “upper chamber” of a parcel of real estate—could be owned separately from the surface property.⁴⁷ 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.’”⁴⁸ Perhaps the first Anglo-American statute recognizing landowners’ exclusive rights to surface airspace was The Telegraph Act of 1863 in England, which codified landowners’ right to object to the construction of a telegraph line hanging above their property.⁴⁹ American law mirrored this principle in a 1906 trespass case, *Butler v. Frontier Telephone Co.*, dealing with a telephone 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

45. A New York court in 1906, for instance, allowed for the ejection of a telephone line above property but warned that “this [*ad coelum*] may not be taken too literally.” *Butler v. Frontier Tel. Co.*, 186 N.Y. 486, 491, (1906); *see also* *Johnson v. Curtiss Nw. Airplane Co.*, 1928 U.S. Av. R. 42, 44 (Arnold W. Knauth, Henry G. Hotchkiss, & Emory H. Niles, eds., 1928) (“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. . . .”).

46. 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 . . .”).

47. *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).

48. 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)).

49. Telegraph Act 1863, 64 Vict. c. 112, § 22 (Eng.) (“[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. 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 1863, ch. 112).

occupation accordingly.”⁵⁰ 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.”⁵¹

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—which accelerated the propertization of airspace in cities.⁵² Airspace sales and transfers began in earnest in the 1920s,⁵³ especially after the development of the Merchandise Mart in Chicago recorded the first “air lot.”⁵⁴ This air lot lease above the Chicago railroad terminal derived from common law principles of land partition.⁵⁵ In 1930, the growing airspace marketplace led a former American Bar Association president to say: “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.”⁵⁶

By the 1960s, condominium laws simplified the process of demarcating fee simple interests in land in a vertical column.⁵⁷ The creation and sale of airspace tracts separate from the land was routine.⁵⁸

50. *Butler*, 186 N.Y. at 491.

51. JOHN G. HAWLEY & MALCOLM MCGREGOR, A TREATISE ON THE LAW OF REAL PROPERTY 5 (Collector Pub. Co. 1900).

52. See THEODORE STEINBERG, SLIDE MOUNTAIN: OR, THE FOLLY OF OWNING NATURE 146 (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).

53. *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.”).

54. Schmidt, *supra* note 48, at 68.

55. *Id.* at 68, 70–71. A 1929 conveyance of air rights in Boston was done using common law principles.

56. *Id.* at 54 (quoting a former American Bar Association president).

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

58. 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); OKLA. STAT. tit. 60, § 802.

In the decades since, treatment of airspace and airspace lots vary under state law, though states treat them as a form of real property.⁵⁹

B. *Early Aviation and State Sovereignty Over Airspace*

Early aviation law grafted onto a 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. Many believe the world's first aviation legislation was the municipal ordinance passed by the Kissimmee, Florida, town council in 1908.⁶⁰ The law claimed jurisdiction over the airspace above town up to 20 miles in the sky.⁶¹ Massachusetts was regulating flight and prohibiting flight over crowded areas in 1913.⁶² The law viewed low-altitude airspace as part of the underlying land, over which state governments had sovereignty. Harold Hazeltine, in his 1911 air law treatise, noted the following:⁶³

[A]ir above a land has such a close relationship to the land 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 drafting the Uniform State Law for Aeronautics, states began codifying their sovereignty claims over surface

59. See, e.g., VA. CODE ANN. § 55.1-1900 (2020) (defining “land” as “a three-dimensional concept”); *Macht v. Dep’t of Assessments*, 296 A.2d 162, 167–68 (Md. 1972) (holding that for assessment purposes, airspace is treated like a negative easement for a term of years); 68 PA. CONS. 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 Bigman*, 533 A.2d 778, 781 (Pa. Commw. Ct. 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 Cent. Transp. Co. v. City of New York, 438 U.S. 104 (1978) (holding that air rights do not constitute real property in the context of regulatory takings).

60. See HAZELTINE, *supra* note 47, 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, and asserting that it proposes to establish an aerial police!”).

61. 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 Robert 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, app. 1 (Mar. 1978) (Ph.D dissertation, McGill University) (including section 1 of Kissimmee’s Aircraft Ordinance, adopted 1908).

62. See *Smith v. New England Aircraft Co.*, 170 N.E. 385, 388 (Mass. 1930).

63. HAZELTINE, *supra* note 47, at 15, 46–47 (distinguishing air from the sea). Though 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.

airspace against the federal government.⁶⁴ At least 19 states have these laws today.⁶⁵ Until the 1950s, airport and airspace regulation had a local character that federal law tolerated and even encouraged.⁶⁶

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.⁶⁷ In the debates over the drafting of 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.⁶⁸ The Uniform State Law for Aeronautics allowed flights if they did not interfere with the “then existing use” of a property.⁶⁹ In tort law, flight over property at low altitude was a privilege subject to landowners’ right of exclusion.⁷⁰

News stories frequently cover the sale and lease of private airspace in dense cities; however, the public airspace market receives less

64. 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.” UNIF. STATE L. FOR AERONAUTICS § 2 (NAT’L CONF. OF COMM’R ON UNIF. STATE L. 1922).

65. ARIZ. REV. STAT. ANN. § 28-8206 (West 2020); CAL. PUB. UTIL. CODE § 21401 (Deering 2020); COLO. REV. STAT. § 41-1-106 (2020); DEL. CODE ANN. tit. 2, § 302 (2020); HAW. REV. STAT. § 263-2 (2020); IDAHO CODE § 21-202 (2020); IND. CODE § 8-21-4-2 (2020); ME. REV. STAT. tit.1, § 6 (West 2020); MD. CODE ANN., TRANSP. § 5-104 (West 2020); MINN. STAT. § 360.012 (2020); MONT. CODE ANN. § 67-1-202 (2019); NEV. REV. STAT. § 493.030 (2019); N.C. GEN. STAT. § 63-11 (2019); N.D. CENT. CODE § 2-03-02 (2019); N.J. STAT. ANN. § 6:2-4 (2020); TENN. CODE ANN. § 42-1-102 (2020); UTAH CODE ANN. § 72-10-123 (West 2020); WIS. STAT. § 114.02 (2020); WYO. STAT. ANN. § 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).

66. 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 at 15 (2001). The California Supreme Court 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.*, 52 P.2d 226, 230 (Cal. 1935).

67. *See, e.g.*, STUART BANNER, WHO OWNS THE SKY?: THE STRUGGLE TO CONTROL AIRSPACE FROM THE WRIGHT BROTHERS ON 185–97 (2008).

68. *Id.*

69. UNIF. STATE. L. FOR AERONAUTICS § 4 (NAT’L CONF. OF COMM’R ON UNIF. STATE L. 1922).

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

attention.⁷¹ 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.⁷² The legal mechanisms for state DOT leasing of airspace are discussed later in this paper because it is a potentially groundbreaking way to greenlight and safely manage widespread commercial drone services. One must keep these earlier sovereignty and property understandings in mind to approach and interpret contemporary federal aviation legislation.

C. *Federal Sovereignty Over Airspace Is Not Nationalization of Airspace*

Congress passed the 1926 Air Commerce Act 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.”⁷³ Read in isolation, this provision, to the uninitiated, could be misinterpreted as the nationalization of airspace against state and local powers.

One can readily dismiss that interpretation. The law’s drafters,⁷⁴ the Senate legislative counsel,⁷⁵ and the Supreme Court nearly 20 years later⁷⁶

71. 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> [<https://perma.cc/YE9E-3KG9>].

72. STEPHEN S. ROOP & SONDIP MATHUR, TEXAS DEP’T OF TRANSP., RESEARCH REPORT 1329-1F, LEASING OF TXDOT’S RIGHTS OF WAY (1993).

73. 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 17, at 35–36.

74. 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.”).

75. 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).

76. 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

repudiated the idea that it was a declaration against the states. 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.”⁷⁷ According to contemporaneous congressional records, “The [sovereignty] section in no wise affects the apportionment of sovereignty as between the several States, but only as between the United States and the rest of the world.”⁷⁸

The 1926 act went so far as to permit, in section 4, “airspace reservations” by the states.⁷⁹ 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.”⁸⁰ 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.⁸¹ Section 4 of the 1926 Act, which recognized the power of states to make airspace reservations, was

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. Neb. St. Bd. of Equalization & Assessment, 347 U.S. 590, 595–96 (1954).

77. Migala, *supra* note 22, at 15.

78. 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. 68-1262, 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).

79. 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. 9355 (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.* 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 (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).

80. Amine C. Ernst, Note, *Possible Impact of the Tidelands Decisions on Airspace Sovereignty*, 7 SW. L.J. 280, 284 (1953) (emphasis added).

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

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.⁸²

Nevertheless, one cannot interpret this omission of section 4 as the 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, adding a “savings clause” to the Federal Aviation Act of 1958 that preserved the effect of state laws, including “the remedies now existing at common law or by statute,” did not extinguish state powers over surface airspace.⁸³ Now this paper turns to the legal treatment of surface airspace and the remedies at common law and state law.

D. 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.⁸⁴ For reasons lost to history, the U.S. 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 Army flights

82. 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. *Supra* note 22, at 59.

83. 49 U.S.C.A. § 1506 (West 1988), amended by 49 U.S.C. § 40120(c) (1994). 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., Vreeland v. Ferrer*, 71 So. 3d 70, 77 n.3 (Fla. 2011) (citing 1994 U.S.C.C.A.N. 818) (emphasis in original) (“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.*”); *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 Advert. v. City of Boulder*, 868 P.2d 1077, 1084 (Colo. 1994).

84. 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).

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.⁸⁵ The constant airplane noise, which killed nearly 150 of the Causbys' chickens, had destroyed their livelihood.⁸⁶ 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, particularly 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 the control of landowners and U.S. state powers.

In *Causby*, the federal government argued (a) that flights at low altitude, if within “navigable airspace,” cannot amount to a taking⁸⁷ and (b) that landowners do not own surface airspace—the “superadjacent airspace”—except that occupied by buildings.⁸⁸ 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 more conventional entry upon it.”⁸⁹ When flights invade the airspace that the landowner can “use in connection with the land,” the Court said a taking could occur.⁹⁰

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.”⁹¹ Finally, the Court acknowledged and cited favorably North Carolina's claim to sovereignty to surface airspace in its takings

85. BANNER, *supra* note 67, at 229.

86. *Id.* at 229.

87. *United States v. Causby*, 328 U.S. 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.”). BANNER, *supra* note 67, 250 (“None of [the Justices] cared that federal law had defined as navigable airspace the area in which the planes flew over the Causbys' land.”).

88. *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.”).

89. *Id.* at 264.

90. *Id.* at 264.

91. *Id.* at 264 (emphasis added).

analysis.⁹² 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.’”⁹³

E. 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 instance⁹⁴) to divide airspace into two zones:

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.”⁹⁵

The *Causby* case brought predictability to potential litigants in airport cases.⁹⁶ 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

92. *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.”).

93. *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 Env’t Prot.*, 550 U.S. 702, 732 (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.*, 550 U.S. at 707 (internal citation omitted; emphasis added); *Bd. of Regents of State Colls. v. Roth*, 408 U.S. 564, 577 (1972).

94. 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 75, at 108.

95. 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.”).

96. BANNER, *supra* note 67, at 260.

glide paths, but the Supreme Court held in *Griggs v. Allegheny Cty.* that even planes in navigable airspace are invading property at low altitudes.⁹⁷ As the Supreme Court said in *Griggs*, *Causby* stands for the proposition that government must compensate for takings of air easements, navigable airspace or not.⁹⁸ The Court in *Griggs* noted that “the use of land presupposes the use of some of the airspace above it.”⁹⁹ 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.¹⁰⁰ Today, airports prefer to acquire all the land (including the airspace) needed for landing and departing aircraft, but, as FAA guidance notes, land acquisition is not always possible.¹⁰¹ In those cases, the FAA requires airports receiving federal support to purchase an avigation easement from neighboring property owners.¹⁰² As discussed later in this paper, courts presume that the two zones of airspace are separated at 500 feet above ground level, though property interests can extend higher.

IV. 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.¹⁰³ An extensive commercial drone industry will need drone highways—airial 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

97. *Griggs v. Allegheny Cty.*, 369 U.S. 84, 88–89 (1962).

98. *Id.* at 88.

99. *Id.* at 89.

100. 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_appendix_noiseandavigationeasements.pdf?sfvrsn=2 (several examples of the legal templates for easements negotiated between airports and nearby property owners) [<https://perma.cc/WB2H-84XQ>].

101. FED. AVIATION ADMIN., U.S. DEP'T OF TRANSP., ADVISORY CIRCULAR NO. 150/5100-17, LAND ACQUISITION AND RELOCATION ASSISTANCE FOR AIRPORT IMPROVEMENT PROGRAM (AIP) ASSISTED PROJECTS at 1–7 (2005), https://www.faa.gov/documentLibrary/media/advisory_circular/150-5100-17/150_5100_17_chg6.pdf [<https://perma.cc/EA8P-PRGP>].

102. *Id.* at 1–7. (“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.”)

103. 49 U.S.C. § 44802 (2020).

landowners but also from state governments, who have a plausible claim of sovereignty and police powers over surface airspace.¹⁰⁴

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

- a. Landowners own surface airspace—the immediate reaches above the land—including the airspace unoccupied by buildings.
- b. Low-altitude flights in surface airspace, *even if within navigable airspace*, can amount to a taking.
- c. The Court will look to state claims of sovereignty to airspace and 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 U.S. airspace while avoiding controversy and litigation between the federal and state governments.¹⁰⁵ This idea for cooperative federalism for drone regulation has been described elsewhere,¹⁰⁶ 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).¹⁰⁷ 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

104. 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.”).

105. 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).

106. Jonathan M. Zalewski, *Sharing the Sky: Regulating Unmanned Aircraft in American Airspace Via Cooperative Federalism*, 42 U. DAYTON L. REV. 333 (2017).

107. *Id.* at 351.

interstate communications. However, the FCC does not choose where to install telecommunications facilities. Instead, state and local police powers govern the construction of cell sites and conduit, 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.”¹⁰⁸ 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 nuisance and trespass from regular drone flights, but also the potential loss of their air rights.¹⁰⁹ Likewise, local droneport system operators, whether public or private, face the prospect of expensive litigation and landowner remedies if they fly into surface airspace above private property.¹¹⁰ Private droneport and UTM system

108. 47 U.S.C. § 253(a).

109. 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.*, 270 Cal. Rptr. 337, (Ct. App. 1990); *Insitoris v. City of Los Angeles*, 258 Cal. Rptr. 418, (Ct. App. 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 aviation 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. *3775 Genesee St., Inc. v. State*, 415 N.Y.S.2d 575, 585 (1979) (“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.”).

110. 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 attend his operation of a public airport.” *Air Transp. Ass’n 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

operators are particularly vulnerable, much like private airports face more costly lawsuits than public airports.¹¹¹

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 Meredith case and more than a dozen drone shootings reveal, many Americans have great skepticism about drone flights.¹¹²

V. 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.¹¹³ The jurisdictional problem arises because airspace *is land*—subject to state police powers—and *navigable airspace*—subject to federal regulation. As mentioned earlier, many states have claimed sovereignty over low-altitude airspace, and more than 20 states expressly allow state and municipal officials to lease airspace above public land or public easements.¹¹⁴

A. 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 to establish drone highways. USDOT and state DOTs

overhead flights, state courts interpret state constitutions' conception of inverse condemnation to include aircraft noise over adjacent properties. Bennett, *supra* at 490; *see also, e.g.*, Greater Westchester Homeowners Ass'n v. City of Los Angeles, 603 P.2d 1329 (Cal. 1979). 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.

111. 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.*

112. Brent Skorup & Connor Haaland, *Encounters of the Drone Kind: Drone Shootings and No-Fly Zones*, TECH. LIBERATION FRONT (June 26, 2020) (documenting cases of drone shootings in the United States), <https://techliberation.com/2020/06/26/encounters-of-the-drone-kind-dron-e-shootings-and-no-fly-zones/> [<https://perma.cc/J5VR-5V3G>].

113. Operation and Certification of Small Unmanned Aircraft Systems, 81 Fed. Reg. 42,063, 42,194 (June 28, 2016) (codified at 14 C.F.R. pts. 21, 43, 61, 91, 101, 107, et al.).

114. *See* BRENT SKORUP & CONNOR HAALAND, WHICH STATES ARE PREPARED FOR THE DRONE INDUSTRY? A 50-STATE REPORT CARD (2020), <https://www.mercatus.org/publications/technology-and-innovation/which-states-are-prepared-drone-industry> [<https://perma.cc/RK84-MWUV>].

would share responsibility for demarcating aerial corridors 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 U.S. 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.¹¹⁵ More relevantly for small drones, a 1961 amendment to federal highway laws formalized the practice of airspace leasing, 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.”¹¹⁶ In the 1970s and 1980s, state DOTs began leasing airspace in earnest as many states’ financial status degraded.¹¹⁷

Beginning in 1986, the Federal Highway Administration of the U.S. Department of Transportation created a policy that state departments of transportation must dedicate revenue from roadway airspace leasing to highway programs, not general revenue funds.¹¹⁸ Having put this policy into place, the Federal Highway Administration began encouraging airspace leasing and offered technical assistance to state DOTs to routinize the practice.¹¹⁹ To date, no states have employed drone highways under this authority.

B. 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.¹²⁰ In fall

115. See Brent Skorup, *Who Should Govern the Skies?*, in *EYES TO THE SKY* (Matthew Feeny ed., 2021); Gareth R. Jones & Michael W. Pustay, *Interorganizational Coordination in the Airline Industry, 1925–1938: A Transaction Cost Approach*, 14 *J. MGMT.* 529, 537 (1988).

116. Federal-Aid Highway Program of 1961, Pub. L. No. 87-61, § 104, 75 Stat. 122 (1961) (codified as amended at 23 U.S.C. § 111(a)).

117. Roop & Mathur, *supra* note 72, at 2.

118. *See id.*

119. *Id.*

120. 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*, AJOT: AIR CARGO NEWS (July 16, 2018), <https://www.ajot.com/news/tepcogroup-zenrin-and-rakuten-examining-drone-highways-for-drone-logistics> [https://perma.cc/KNC6-795B]; *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-

2017, the FAA's Drone Advisory Committee invited me to brief a working group about drone airspace leasing. The Drone Advisory Committee discussed the idea in their 2018 report to the FAA; and the GAO discussed the idea again in 2019 and 2020 reports.¹²¹ The earliest publication of the idea, to my knowledge, is a June 2017 *Salt Lake Tribune* story, noting that a Utah lawmaker proposed airspace leasing above public roads.¹²² The idea may have developed from railroad or utility use of drones. BNSF Railway, for instance, flew 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,¹²³ and the market in airspace use above railroad rights-of-way has been active for over a century.¹²⁴

There are several benefits to federal and state authorities demarcating safe drone routes above roadways. First, using public right-of-way

chichibu-city-jointly-conducted-beyond-visual-line-of-sight-drone-flight-test/[https://perma.cc/BWN3-LKR4]. 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.

121. Drone Advisory Comm., Fed. Aviation Admin., *Drone Integration Funding* 21 22 (Radio Tech. Comm'n for Aeronautics, RTCA Paper No.047-18/DAC 011, Mar. 2018), https://www.faa.gov/uas/programs_partnerships/drone_advisory_committee/rta_dac/media/dac_tg_3_funding_report_long_term_final.pdf [https://perma.cc/Q3HH-64RL] (discussing the "Auction or Lease of Airspace"); U.S. GOV'T ACCOUNTABILITY OFF., GAO-20-136, AIRCRAFT SYSTEMS: FAA SHOULD IMPROVE DRONE-RELATED COST INFORMATION AND CONSIDER OPTIONS TO RECOVER COSTS (2019), <https://www.gao.gov/assets/710/703320.pdf> [https://perma.cc/8RCA-HP6V]; U.S. GOV'T ACCOUNTABILITY OFF., B-330570 UNMANNED AIRCRAFT SYSTEMS: CURRENT JURISDICTIONAL, PROPERTY, AND PRIVACY LEGAL ISSUES REGARDING THE COMMERCIAL AND RECREATIONAL USE OF DRONES, APPENDICES I-VI 35 (2020), <https://www.gao.gov/assets/710/709371.pdf> [https://perma.cc/WGX9-AYZ5] ("[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).

122. 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> [https://perma.cc/PW78-WWAS] (citing Sophia DiCaro); see also Brent Skorup & Melody Calkins, *Why Not Auction Off Low-Altitude Airspace for Exclusive Use?*, TECH. LIBERATION FRONT (June 27, 2017), <https://techliberation.com/2017/06/27/why-not-auction-off-low-altitude-airspace-for-exclusive-use/> [https://perma.cc/AXV9-226Q].

123. "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 UAS into the Airspace: Before the U.S. S. Comm. on Com., Sci. and Transp.'s Aviation Operations, Safety and Sec. Subcomm.*, 115th Cong. 2 (2018) (statement of Todd Graetz, Director of Technology Services: BNSF Railway Company), <https://www.commerce.senate.gov/services/files/6B09FEF7-53C8-4AFD-9066-0FA19C430BA1>.

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

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 they could deploy services once they have airspace access:¹²⁵

‘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,”¹²⁶ 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 between 3,000–6,000 square miles,” which is about the size of Connecticut.¹²⁷ Since there are “more than 8 million lane miles of public roadways under state DOT supervision,”¹²⁸ there is an extensive nationwide air corridor network for drone operators to use.

Third, roadway airspace leasing ensures that the market allocates this natural resource, not via regulatory rationing or first-come-first-serve mechanisms.¹²⁹ Markets dispose of public assets such as offshore oil leases and public timberlands,¹³⁰ 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

125. Miriam McNabb, *UPS Drone Delivery: DroneUp Flies to Prove the Case for Coronavirus Response*, DRONELIFE (Apr. 21, 2020), <https://dronelife.com/2020/04/21/ups-drone-delivery-droneup-partners-fly-to-prove-the-case-for-coronavirus-response/> [<https://perma.cc/8KWX-BT47>].

126. 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> [<https://perma.cc/9D2H-HS2D>].

127. U.S. DEP’T. OF TRANSP., *FUTURE USES OF HIGHWAY RIGHTS OF WAY* (2012), <https://www.fhwa.dot.gov/policy/otps/rowstudyproj.cfm> [<https://perma.cc/762K-HMPR>].

128. Carson Poe & Gina Filosa, *Alternative Uses of Highway Rights-of-Way: Accommodating Renewable Energy Technologies*, 2270 TRANSP. RSCH. REC. 23 (2012).

129. See Skorup, *supra* note 115.

130. *Id.*

130. *Id.*

purchased with assistance from the federal Highway Trust Fund.¹³¹ 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. A “layer cake” approach to leasing will promote competition in drone services (perhaps three drone highways above each roadway at three separate altitudes) and encourage 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.¹³² Thus, one needs federal approval 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.¹³³

Airspace leasing above the public rights-of-way isn't straightforward in every state. In some jurisdictions, there is extensive practice with airspace leasing, while 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.¹³⁴ Illinois law is quite restrictive, for example, and municipalities can lease airspace to only the owners of the fee.¹³⁵ Virginia

131. 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.” Letter from Anthony H. Gamboa, General Counsel, to Sen. John McCain, Committee on Commerce, Science and Transportation (Sept. 13, 2002) (on file with the U.S. Gov't. Acct. Off.) <https://www.gao.gov/assets/370/366636.pdf> [<https://perma.cc/ZW4B-QCWR>].

132. Gamboa, *supra* note 131, at 6 (“[I]n 1987, Congress asserted an interest in the federal share of the proceeds resulting from the disposition of air rights.”).

133. U.S. DEP'T. OF TRANSP., AIRSPACE GUIDELINES TO 23 CFR 710.405–710.407 (2010), https://www.fhwa.dot.gov/real_estate/right-of-way/corridor_management/airspace_guidelines.cfm [<https://perma.cc/3C4L-TQRV>] (“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 (2016).

134. See, e.g., *Kiely v. Graves*, 271 P.3d 226, 230 (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.”).

135. 65 ILL. COMP. STAT. § 5/11-75-1.

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.¹³⁶ However, Oregon has perhaps the broadest airspace leasing law, allowing leasing of airspace whether the state or municipality possesses fee title or an easement.¹³⁷ Some states, like California, have well-established airspace leasing offices,¹³⁸ 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 ensures safety with drone certifications and inspections of operations, which will mitigate much of the risk. Nevertheless, the flight over roadways injects some risk to pedestrians and roadway users. As with any new service or product, some combination of government certification, professionalization of operators, and new insurance products will mitigate risk. Some insurers are already creating new or expanding traditional aviation products to cover drones and drone debris.¹³⁹ 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.

VI. 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.¹⁴⁰ Traditional aviation law and judicial

136. VA. CODE ANN. § 15.2-2030 (2011).

137. 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.

138. *Airspace and Telecommunications Licensing*, CAL. DEPT. OF TRANSP., <https://dot.ca.gov/programs/right-of-way/airspace-and-telecommunications-licensing> [https://perma.cc/2FJX-4U4H].

139. See, e.g., *Handing Over Control to Autonomous Vehicles*, INS. CAN. (Apr. 25, 2014), <https://www.insurance-canada.ca/2014/04/25/handing-over-control-to-autonomous-vehicles/> [https://perma.cc/2YES-XN55] (“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”).

140. 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*

precedents provide a possible model. As Migala points out, courts apply a limit of 500 feet almost mechanically, finding a compensable taking for even transitory flights below 500 feet.¹⁴¹ This 500-foot rule is treated much like a presumption by courts:¹⁴² the *floor* for a taking, not the *ceiling*. As one federal court stated in an aerial takings case: “[T]he most appropriate rule is that when overflights occur in navigable airspace [that is, above 500 feet altitude], a presumption of non-taking exists[,] which can be overcome by proof of destruction of, or substantial impairment to the property.”¹⁴³ This judge-made rule likely derived from FAA regulations, which, with some exceptions for glide paths and helicopters,¹⁴⁴ deem airspace below 500 feet as non-navigable airspace.¹⁴⁵

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.”¹⁴⁶ 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.¹⁴⁷ Some scholars would draw the line at 200 feet,¹⁴⁸ some at 350 feet,¹⁴⁹ and some at 500 feet (resembling traditional aviation’s legal standards).¹⁵⁰ There is a bill in the U.S. House and another in the U.S.

the Line Separating the National Airspace and Private Property, 86 GEO. WASH. L. REV. 1152, 1173 (2018).

141. See, e.g., *Griggs v. Allegheny Cnty.*, 369 U.S. 84, 90 (1962); *Palisades Citizens Ass’n., 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. 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. City of Clark*, 173 P.3d 724, 731–32 (Nev. 2007); *Thompson v. City of Denver*, 958 P.2d 525, 527 (Colo. App. 1998); *Brown v. United States*, 73 F.3d 1100, 1101 (Fed. Cir. 1996).

142. See, e.g., *Branning v. United States*, 654 F.2d 88, 102–03 (Ct. Cl. 1981).

143. *Stephens v. United States*, 11 Cl. Ct. 352, 362 (1986).

144. See 14 CFR § 91.119(d) (2010) (permitting helicopter and powered parachute operations below the usual minimum safe altitude requirements).

145. See 14 CFR § 91.119 (2010).

146. *United States v. Causby*, 328 U.S. 256, 264 (1946).

147. Gustafson, *supra* note 140, at 264–66.

148. Page, *supra* note 140, at 1173.

149. Gregory McNeal, *Drones and Aerial Surveillance: Considerations for Legislatures*, BROOKINGS (Nov. 2014), <https://www.brookings.edu/research/drones-and-aerial-surveillance-considerations-for-legislatures/> [<https://perma.cc/7Q5U-4CJL>].

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

Senate that would draw that line, largely delegating airspace management below 200 feet to the states and private property owners.¹⁵¹

However, in the absence of congressional or FAA action on this issue, courts should 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.”¹⁵² 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 standard into takings jurisprudence:¹⁵³ 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.”¹⁵⁴

Courts should presume flights below 200 feet 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.¹⁵⁵

Further, below 200 feet, the safety concerns of manned aircraft and the FAA attenuate. Most airspace below 500 feet is non-navigable airspace, so very few manned aircraft fly in surface airspace. The FAA’s light-handed approach to aerial obstructions below 200 feet indicates that the federal interest attenuates. In particular, current regulations require developers and construction companies to notify the FAA of new

151. Drone Innovation Act of 2017, H.R. 2930, 115th Cong. (2017).

152. *United States v. Causby*, 328 U.S. 256, 265 (1946).

153. 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.comell.edu/wex/nuisance> [<https://perma.cc/5K4B-54AG>]. This blending of nuisance and trespass in aerial invasion cases has old precedents. See e.g., *Clifton v. Bury* [1887] 4 TLR 8 (U.K.) (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).

154. *Causby*, 328 U.S. at 266 (1946).

155. 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 (Sept. 28, 2019), <https://www.wsls.com/2019/09/28/christiansburg-meets-wing-the-self-flying-delivery-drones-soon-to-be-in-its-sky/> [<https://perma.cc/NUZ8-8PS7>]; 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 [<https://perma.cc/33YR-XLRE>] (“The mayors of the towns where Google Wing flights are operating have not heard major resident complaints about drone noise.”).

construction or towers within approximately 3.5 miles of an airport.¹⁵⁶ This notice is not required, however, for towers and obstructions that are less than 200 feet tall,¹⁵⁷ presumably because such obstructions pose a negligible risk to air traffic.¹⁵⁸ 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 more salient above 200 feet.

VII. CONCLUSION

Drone technology has rapidly matured in recent years. Today, firms and state governments are prepared to deploy statewide UTM systems and extensive long-distance drone services. Until federal and state aviation officials define their respective regulatory responsibilities, however, litigation and fear of stranded investment will delay the industry. Under current understandings of property and takings law, historical federal dominance in aviation 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 almost immediately begin widespread, long-distance drone services.

156. 14 C.F.R. § 77.17(a) (2011); 14 CFR § 77.9 (2011).

157. *Id.*

158. 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. *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/> [<https://perma.cc/2DFL-BHRC>].