LOOK! IT'S A BIRD! IT'S A PLANE! NO, IT'S A TRESPASSING DRONE

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Abstract

Drones have become increasingly popular as new uses are continuously discovered. However, landowners who watch drones fly over their yards and peer into their windows may not be as excited as the drone enthusiasts. Landowners are asking, "How can I keep that drone away from my property?" Do existing property laws addressing trespass and nuisance sufficiently protect landowners from unwanted drones? What rights and remedies are available to landowners to curtail intrusive drone use? How can business owners secure their property to prevent drones from obtaining confidential information during a drone flight? And how do state and federal regulators manage the challenges of navigation, hardware reliability, and airspace management?

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INTRODUCTION

Remotely piloted aircraft known as "drones" are becoming increasingly popular with both individuals and businesses, and new uses are discovered daily. In fact, the Federal Aviation Administration (FAA) anticipates that by 2021, the number of recreational drones in use could reach as high as 2.94 million and that commercial drones could reach over 600,000.[1] Hobbyists fly drones for fun on a Sunday afternoon, businesses use them to deliver goods, and law enforcement officers use them to conduct searches with less personal risk to officers.[2] They are even being tested as a taxi service, with the hope of transporting people.[3] However, landowners who are watching drones fly over their yards and peer into their windows may not be as excited as the drone users. Sixty-three percent of respondents to a recent Pew Research Center survey felt "it would be a change for the worse if *personal and commercial drones are*

1. FED. AVIATION ADMIN., FAA AEROSPACE FORECAST: FISCAL YEARS 2018–2038 41, 43 (2018), https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2018-38_FAA_Aerospace_Forecast.pdf.

2. The use of drones for warrantless searches is subject to well-established search and seizure precedents under the Fourth Amendment. *See* United States v. Jones, 565 U.S. 400, 404 (2012) (holding that the attachment of a GPS tracking device to a vehicle and use of that device to monitor a vehicle's movement on public streets constitutes a trespass and therefore a search under the Fourth Amendment); Kyllo v. United States, 533 U.S. 27, 40 (2001) (holding that the use of sense-enhancing technology, or thermal imaging, to gather information regarding the interior of a home that could not otherwise have been obtained without physical intrusion into a constitutionally protected area constitutes a search requiring a warrant); Florida v. Riley, 488 U.S. 445, 455 (1989) (holding that a warrantless aerial observation of the interior of a partially covered greenhouse in a residential backyard from a helicopter flying at 400 feet was not unreasonable under the Fourth Amendment); California v. Ciraolo, 476 U.S. 207, 215 (1986) (holding that a warrantless aerial observation of fenced-in backyard from an aircraft flying at 1,000 feet was not unreasonable under the Fourth Amendment).

3. In Dubai, a 2-seat unmanned vehicle designed by German firm Volocopter, took off for a five-minute flight, watched by Crown Prince Sheikh Hamdan bin Mohammed. Volocopter hopes to have unmanned taxis ready for commercial use within five years, and Dubai, wanting to be the "smartest city in the world" looks forward to using such vehicles. "The skies over Dubai could become uncomfortably crowded very quickly. The ground level of the city could become a dark place of intrigue and mystery like Blade Runner," said Noel Sharkey, computer scientist and robotics expert at Sheffield University. Jane Wakefield, *Dubai Tests Drone Taxi Service*, BBC NEWS (Sept. 26, 2017), https://www.bbc.com/news/technology-41399406.

given permission to fly through most U.S. airspace."[4] Clearly in agreement with that sentiment, William H. Merideth was arrested after shooting at a drone, flown by his neighbor John David Boggs, that was hovering over his backyard and spying on his 16-year-old daughter while she was sunbathing by the pool.[5] Merideth has adopted the moniker the "Drone Slayer" and asserted that Boggs invaded his and his family's privacy when the drone took a video of his daughter.[6] Boggs admitted that he was recording video but released the flight data recorder, which shows the drone's path at 193 feet above the ground.[7] He asserted that "for sure [it] didn't descend down to no 10 feet, or look under someone's canopy, or at somebody's daughter."[8] Ironically, the incident occurred in Bullitt County, Kentucky, where Merideth was cleared of first-degree endangerment and criminal mischief charges, with the judge opining that Merideth "had the right to shoot this drone."[9]

Merideth and other landowners want to know how to keep drones away from their property or what civil redress is available to them for unwelcome drones. Do existing property laws addressing trespass and nuisance sufficiently protect landowners from unwanted drones?[10] What rights and remedies are available to landowners to curtail intrusive drone use? How can business owners prevent physical injury to their property[11]

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4. AARON SMITH, PEW RES. CTR., U.S. VIEWS OF TECHNOLOGY AND THE FUTURE 3 (2014), http://www.pewresearch.org/wp-content/uploads/sites/9/2014/04/US-Views-of-Technology-and-the-Future.pdf.

5. WAVE, an NBC affiliate, reported that Bullitt County Judge Rebecca Ward asserted that the drone invaded the Merideths' privacy and that "they had the right to shoot this drone." Elisha Fieldstadt, *Case Dismissed Against William H. Merideth, Kentucky Man Arrested for Shooting Down Drone*, NBC NEWS (Oct. 27, 2015, 1:28 PM), https://www.nbcnews.com/news/us-news/case-dismissed-against-william-h-merideth-kentucky-man-arrested-shooting-n452281 ("Merideth was cleared of first-degree endangerment and criminal mischief charges . . . .").

6. Miriam McNabb, *The Kentucky "Drone Slayer" Case Dismissed*, DRONELIFE (Mar. 22, 2017), https://dronelife.com/2017/03/22/kentucky-drone-slayer-case-dismissed/.

7. Gil Corsey, *Update: Drone Owner Disputes Shooter's Story; Produces Video He Claims Shows Flight Path*, WDRB (July 30, 2015, 11:57 AM), http://www.wdrb.com/story/29670583/update-drone-owner-disputes-shooters-story-produces-video-he-claims-shows-flight-path.

8. *Id.*

9. McNabb, *supra* note 6.

10. The creators of the trespass tort could not possibly have conceived of the invention of drones because "[t]respass is one of the oldest torts known to Anglo-American jurisprudence, dating as far back as twelfth-century England." Int'l Union of Painters & Allied Trades Dist. Council 15 Local 159 v. Great Wash Park, LLC, No. 67453, 2016 WL 4499940, at *6 (Nev. Ct. App. Aug. 18, 2016) (Tao, J., concurring).

11. *See, e.g.*, Leslie Kaufman & Ravi Somaiya, *Drones Offer Journalists a Wider View*, N.Y. TIMES, Nov. 25, 2013, at B1 (describing drones crashing into Manhattan skyscrapers and falling to the sidewalk).

and secure their property to block drones from potentially obtaining confidential information from a drone flyover? And how do state and federal regulators manage the challenges of navigation, hardware reliability, and airspace management?[12]

These examples demonstrate that while the legal implications of the increasing prevalence of drones overhead embrace a broad array of torts and crimes ranging from invasion of privacy to industrial espionage, the focus here will be limited primarily to the tort of trespass to land. Part I of this Article will discuss what drones are and how they are used. Part II will provide the history of airspace rights, current regulation, and the challenges of integrating drones into the airspace. Parts III, IV, and V, will explore the state and local regulation of drones, including the viability of trespass and other state law torts that arise from the use of drones. Finally, Part VI will examine the future of drone use, including a possible implication of cryptocurrency tokens.

I. WHAT ARE DRONES AND HOW ARE THEY USED?

A. *What Are Drones?*

A drone is an unpiloted aircraft also known as an "unmanned aerial vehicle" (UAV).[13] When expanded to include its remote controls, the ensemble is an "unmanned aircraft system" (UAS).[14] There are two main classifications when it comes to drones in the United States: recreational drones, also known as "small hobbyist" drones, and commercial drones.[15]

UAVs can use engines powered by either a gasoline and oil mixture similar to those in lawn mowers, or gas engines like those used in cars. However, electric motors, which use energy from batteries, solar cells, or

12. The FAA found that drone sightings by United States air traffic facilities increased to 1,274 between February and September 2016 compared to 874 drone sightings for the same period in 2015. In addition to the incident between an Army UHB-60 Black Hawk helicopter carrying security officials to the United Nations and a Phantom 4 drone in New York City, there was a near-miss incident between a Lufthansa passenger jet at LAX and a drone flying in the approach corridor. Trevor Mogg, *A Phantom 4 Drone Hit a Helicopter over New York and the Drone Came Out Worse*, DIGITAL TRENDS (Oct. 5, 2017, 11:55 PM), https://www.digitaltrends.com/cool-tech/drone-helicopter-new-york-collision/.

13. Elizabeth Howell, *What Is a Drone?*, SPACE (Oct. 3, 2018, 2:32 PM), https://www.space.com/29544-what-is-a-drone.html ("Drones have been around for almost as long as airplanes have been used in warfare (1911), and that's not even including bomb-filled balloons that were first used by Austria in the mid-1800s.").

14. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 331(8) 126 Stat. 11, 72 (2012); 14 C.F.R. § 107.3.

15. Andrew Meola, *The FAA Rules and Regulations You Need to Know to Keep Your Drone Use Legal*, BUS. INSIDER (July 25, 2017, 1:12 PM), http://www.businessinsider.com/drones-law-faa-regulations-2017-7.

fuel cells, are increasingly popular.[16] Hobbyists may pay up to $500 for a UAS that includes the UAV, batteries, chargers, and the remote control.[17] Sometimes, the control is by a smartphone app rather than a separate device.[18] Generally, the basic drones can fly for "up to 10 minutes on a battery charge at up to 22 mph, with a range of about 150–200 feet."[19] As the hobby interest increases, prices could move toward $2,000 for more elaborate drones, which may include a camera.[20] These better UAVs may be able to remain airborne for twenty-five minutes with a range of half a mile.[21] "Commercial users may pay $10,000 or more" for UAVs that will stay airborne longer with an extended range and payload-carrying capability.[22] They also are often quieter than the low-end UAVs.[23]

B. *How Are Drones Used?*

Drones can change the way businesses operate and the way hobbyists enjoy technology, enabling them to see the world from a bird's-eye view. Hobbyists and commercial operators often use drones for aerial photography purposes.[24] Photography can range from families taking overhead pictures of a backyard barbeque, to real estate agents taking pictures for a home listing, to professional videographers filming a documentary, and to anything in between. Skyris Imaging, an aerial photography, video, and GIS company, does not take residential real estate companies as clients to avoid flying drones over private property.[25] According to its owner, Joe Vaughn, his company's focus is on commercial clients, which reduces the potential privacy issues.[26]

It will not be long until businesses are using drones in the shipment

16. BILL CANIS, CONG. RES. SERV., UNMANNED AIRCRAFT SYSTEMS (UAS): COMMERCIAL OUTLOOK FOR A NEW INDUSTRY 4 (2015), https://fas.org/sgp/crs/misc/R44192.pdf.

17. *Id.* at 5.

18. *Id.* at 4.

19. *Id.*

20. *Id.*

21. *Id.*

22. *Id.*

23. *Id.* at 7 ("The drone, weighing less than an ounce, can hover silently for more than eight minutes . . . .").

24. *See* David Schloss, *Drones for Photography*, OUTDOOR PHOTOGRAPHER (Aug. 8, 2017), https://www.outdoorphotographer.com/photography-gear/cameras/drones-for-photography/#.

25. *See* Christina Sterbenz, *Should We Freak Out About Drones Looking in Our Windows?*, BUS. INSIDER (Sept. 24, 2014, 2:22 PM), http://www.businessinsider.com/privacy-issues-with-commercial-drones-2014-9.

26. *Id.* ("If I were to point [a drone] at somebody's window, I'd have to be within feet to see anything . . . .").

and delivery of their products.[27] Companies like Amazon have bold plans to send drones from distribution centers directly to customer's homes to deliver products, which would require flight patterns through residential areas.[28] In fact, on December 7, 2016, Amazon made its first commercial drone delivery.[29] Google, UPS, FedEx, and various startups are also considering the possibilities of drone usage.[30] Of course, that could raise some problems with the neighbors. While the recipient may agree to a drone delivery, just like implied consent for a ground delivery from FedEx or UPS, the neighbors may not want to have the delivery drone flying over their backyard to reach the recipient's property.

Meteorologists have been using drones to help predict severe weather because drones equipped with special meteorological sensing equipment expedite the forecasting process.[31] The ability of drones to monitor areas that are out of reach for ground-based instruments and altitudes below where satellites are effective make them extremely attractive in the weather industry as well as in weather-related rescue efforts. Additionally, drones are increasingly being used by organizations to assist disaster management operations. The American Red Cross has begun using drones to assist relief efforts after hurricanes, tornadoes, and other natural disasters.[32] Drones can help locate missing individuals and assess which areas need the most aid. Drones also help evaluate monetary

27. *See* Jack Nicas, *Corporate News: Amazon Asks FAA for Permission to Test Drones*, WALL ST. J. (July 11, 2014, 7:28 PM), https://www.wsj.com/articles/amazon-asks-faa-for-permission-to-fly-drones-1405088198; *see also* Lois Weiss, *Amazon Eyes Midtown Lair on Avenue of the Americas*, N.Y. POST (July 16, 2014, 6:42 AM), https://nypost.com/2014/07/16/amazon-eyes-midtown-lair-on-avenue-of-the-americas/. (suggesting that the 285,000 square foot facility Amazon was purportedly targeting would allow Bezos to test out drone deliveries).

28. *Amazon Prime Air*, AMAZON, https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011 (last visited Oct. 24, 2018).

29. Jamie Condliffe, *An Amazon Drone Has Delivered Its First Products to a Paying Customer*, MIT TECH. REV. (Dec. 14, 2016), https://www.technologyreview.com/s/603141/an-amazon-drone-has-delivered-its-first-products-to-a-paying-customer/ (reporting that Amazon delivered an Amazon Fire TV stick and a bag of popcorn—a lightweight payload—and that the test was conducted in Cambridge, U.K. because of challenges presented by FAA regulations requiring that drones fly within the line of sight).

30. Will Knight, *Sorry, Shoppers: Delivery Drones Might Not Fly for a While*, MIT TECH. REV. (Mar. 30, 2016), https://www.technologyreview.com/s/601117/sorry-shoppers-delivery-drones-might-not-fly-for-a-while/ (noting that since the FAA still prohibits commercial drone flights, these companies must all seek exemptions to proceed with their testing).

31. Jamie Leventhal, *Storm Drones Could Revolutionize Weather Forecasting*, QUARTZ (July 6, 2017), https://qz.com/1022076/storm-drones-could-revolutionize-weather-forecasting/.

32. Chris Morris, *Here's How the Red Cross Is Using Drones for Disaster Relief*, FORTUNE (Sept. 8, 2017), http://fortune.com/2017/09/08/red-cross-drones-houston-harvey/.

damages for insurance purposes, which is a key component of a city's aid package.[33]

The private sector is using drones for such rescue efforts as well. Zipline, a company formed by Silicon Valley entrepreneurs, operates the "world's only drone delivery system at national scale to send urgent medicines, such as blood and animal vaccines, to those in need—no matter where they live."[34] Zipline currently operates within the African nation of Rwanda, making fifty to 150 deliveries per day using fifteen UAVs.[35] According to Margaret Chan, director general of the World Health Organization, "[t]his visionary project in Rwanda has the potential to revolutionize public health, and its life-saving potential is vast."[36] Interestingly, one of the poorest countries in the world[37] gets to take advantage of burgeoning technology because it is not burdened by the strict regulations and safety concerns that often delay progress in more well-developed countries.[38] The United States worries about reliability, safety, and air traffic control issues, among other concerns. Nicholas Roy, an MIT professor, notes that "[y]ou have to assume [drones will] fall out of the sky. So how do you make sure these vehicles are reliable enough—both the hardware and the software?"[39]

Rescue efforts with drones are also made by journalists. "What drones give you is anywhere, anytime access to the sky. . . . That perspective is something a journalist just wouldn't have unless he waited for officials, or hired a plane," according to Chris Anderson, who now runs a drone

33. *See id.*; *see also* Alexandria Tomanelli, *A Drone's Eye View: Why and How the Federal Aviation Administration Should Regulate Hobbyist Drone Use*, 34 TOURO L. REV. 867, 875–76 (2018) (discussing the FAA's use of drones to conduct damage assessments of infrastructure, homes, and rail lines in Texas after Hurricane Harvey passed through).

34. Zipline, *Lifesaving Deliveries by Zipline Drone in Rwanda*, MIAMI HERALD (Feb. 8, 2018, 6:49 PM), https://www.miamiherald.com/news/business/article198436619.html.

35. Will Knight, *Why Rwanda Is Going to Get the World's First Network of Delivery Drones*, MIT TECH. REV. (Apr. 4, 2016), https://www.technologyreview.com/s/601190/why-rwanda-is-going-to-get-the-worlds-first-network-of-delivery-drones/.

36. *Id.*

37. John Markoff, *Drones Marshaled To Drop Lifesaving Supplies over Rwandan Terrain*, N.Y. TIMES (Apr. 4, 2016), https://www.nytimes.com/2016/04/05/technology/drones-marshaled-to-drop-lifesaving-supplies-over-rwandan-terrain.html (noting that in 2014, the International Monetary Fund ranked Rwanda 170th for gross domestic product).

38. *Id.* (reporting that Michael Fairbanks, a member of the Rwandan president Paul Kagame's presidential advisory council, applauded the ability of Rwanda to make a quick decision); *see also* Linda Chiem, *Drone Test Sites Give States Expanded Regulatory Role*, LAW360 (May 23, 2018, 7:29 PM), https://www.law360.com/articles/1046392/drone-test-sites-give-states-expanded-regulatory-role ("Put bluntly, federal regulators are not operating with the urgency necessary to keep abreast of industry development . . . .").

39. Knight, *supra* note 30.

company after being an editor of *Wired* magazine.[40] But it is not just about getting the story. For example, British photographer Lewis Whyld launched a drone to film the destruction following Typhoon Haiyan in the Philippines, and in the process, discovered two bodies that were later recovered.[41] Whyld's footage was broadcast on CNN, but the Associated Press, News Corporation, and the BBC have used drones to show the scale of large disasters as well.[42]

After all, UAVs can fly in tighter spaces than helicopters, are far less expensive, and can hover closer to the targeted area—making them incredibly useful in search and rescue operations.[43] One example occurred in January 2018 when two young men were caught in turbulent waves outside Sydney, Australia. Australian lifeguards noticed the men during a practice session with the drone and dropped an inflatable "rescue pod" that helped save the young men.[44] The use of drones for similar operations will likely explode in the future.

Drones also give paparazzi a new way to follow and photograph celebrities.[45] There are so many opportunities for drones in journalism that universities have started drone journalism courses.[46]

Geographic Information Systems have utilized drones to deliver "high-resolution images in near real time."[47] The ability of drones to fly at altitudes much lower than manned aircraft enable researchers to survey

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40. Kaufman & Somaiya, *supra* note 11.

41. *Id.*

42. *Id.*

43. Carl Franzen, *Canadian Mounties Claim First Person's Life Saved by a Police Drone*, VERGE (May 10, 2013, 12:23 PM), https://www.theverge.com/2013/5/10/4318770/canada-draganflyer-drone-claims-first-life-saved-search-rescue (reporting that in 2013, an injured driver stranded in a snowy area of Saskatchewan, Canada, was located by Canadian police using a Dragonflyer X4-ES drone with an infrared camera after a helicopter search failed); Keith Nelson Jr., *Drones Can Help When Disaster Strikes, but Only When They're Allowed to*, DIGITAL TRENDS (Sept. 28, 2017, 3:00 AM), https://www.digitaltrends.com/cool-tech/rescue-drones-hurricane-flood-disaster-relief/ (reporting that a recent study concluded drones helped save one life per week and noting that in 2015, the Auburn, Maine Fire Department used a DJI Phantom 3 to drop down life vests to an 18-year-old man stranded in the middle of the river).

44. Isabella Kwai, *A Drone Saves Two Swimmers in Australia*, N.Y. TIMES (Jan. 18, 2018), https://www.nytimes.com/2018/01/18/world/australia/drone-rescue-swimmers.html.

45. Kaufman & Somaiya, *supra* note 11 (reporting that a drone flew over singer Tina Turner's private wedding in Switzerland in August 2013 and that on another occasion, a picture of singer Beyoncé was captured by a drone on a roller coaster at Coney Island).

46. *Id.* (listing the University of Missouri, University of Nebraska, and the Tow Center for Digital Journalism at Columbia University as institutions with such programs but noting that such programs must seek permission from the FAA for their educational flights); *see also infra* note 226.

47. *How Are Surveying Drones Taking GIS Mapping to The Next Level?*, IDENTIFIED TECHS. (Oct. 21, 2017, 2:46 PM), https://www.identifiedtech.com/blog/construction-uav/how-are-surveying-drones-taking-gis-mapping-to-the-next-level/.

land with much greater accuracy than ever before.[48] Further, drones provide cheaper production costs in addition to superior survey photography capabilities.[49] Drones also have significantly reduced the time and cost of performing building inspections because they can perform facade inspections, roof inspections, and moisture inspections by attaching thermal imaging cameras.[50]

The benefit of drones has become apparent in recent years within the farming industry. Farmers have used drones in several ways, from ranging and surveying property to crop dusting and spraying crops.[51] Forecasters predict drones sold for agricultural use will dramatically increase in the future. The American Farm Bureau estimated that farmers using drone services to monitor their crops could see a return on their investment of $12 per acre for corn, $2.60 per acre for soybeans, and $2.30 per acre for wheat.[52] Eventually, farmers might use UAVs for targeted application of herbicides and pesticides.[53]

The Teal Group, a United States aerospace consulting firm, sees a strong potential for growth.[54] It believes UAVs are "the most dynamic growth sector of the world aerospace industry," and "[n]ew unmanned combat aerial vehicle programs, commercial, and consumer spending all promise to drive more than a tripling of the market over the next decade."[55] For example, Boeing has unveiled a cargo delivery drone prototype that could transform the logistics industry.[56] Boeing's new drone weighs nearly 750 pounds and could transport a load around 500 pounds.[57] Cargo transport drones could help deliver time-sensitive and high-value goods for individuals or organizations.

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48. *Id.*

49. *Id.*

50. Adam Frumkin, *Drones: The Future of Building Inspections*, KIPCON (Feb. 26, 2017), http://kipconengineering.com/drone-building-inspections/.

51. Andrew Meola, *Exploring Agricultural Drones: The Future of Farming Is Precision Agriculture, Mapping, and Spraying*, BUS. INSIDER (Aug. 1, 2017, 2:33 PM), http://www.businessinsider.com/farming-drones-precision-agriculture-mapping-spraying-2017-8.

52. Matt Hopkins, *American Farm Bureau Federation, Measure Launch Drone ROI Calculator*, PRECISIONAG (July 21, 2015), https://www.precisionag.com/systems-management/data/american-farm-bureau-federation-launches-drone-roi-calculator/.

53. Marco Margaritoff, *North Dakota State University's Herbicide-Spraying Drone Covers 33 Acres in an Hour*, DRIVE (July 23, 2018), https://www.thedrive.com/tech/22348/north-dakota-state-universitys-herbicide-spraying-drone-covers-33-acres-in-an-hour.

54. *UAV Production Will Total $93 Billion*, TEAL GROUP CORP. (Aug. 17, 2015), http://www.tealgroup.com/index.php/pages/press-releases/34-uav-production-will-total-93-billion.

55. *Id.*

56. Lewis King, *Boeing's Cargo UAV a Shot in the Arm for Drone Delivery Market*, AIR CARGO WORLD (Jan. 11, 2018), https://aircargoworld.com/allposts/boeings-cargo-uav-a-shot-in-the-arm-for-drone-delivery-market-video/.

57. *Id.*

II. AIRSPACE RIGHTS

A. *Trespass*

So, what's the problem? Landowners may not want drone traffic over their private property and may seek remedies, civil and criminal, to keep drones away from their property. The question then is whether a drone flying over a landowner's property constitutes a trespass. Courts have long held that a trespass occurs when a person or object interferes with the owner's exclusive possession and control of the land.[58] But in the case of drones, we are not talking about trespass of the physical land, but rather trespass of the airspace above the land. This requires the trespasser to enter into the immediate reaches of the airspace and interfere substantially with the landowner's use and enjoyment of the land.[59]

B. *History of Airspace Rights*

While one generally thinks of trees, water, and animals as the planet's natural resources, airspace is one of the most abundant natural resources. Just as location is important in evaluating the value of land, whether that airspace is a beach view or is navigable airspace used by commercial jets, the location of that airspace is a large determinant of its value. And while it is abundant, it is finite and must be respected and shared.

The property rights of landowners in the airspace above their real property largely began to be addressed in the fourteenth century with the doctrine of "cujus est solum, ejus usque ad coelum."[60] The doctrine translates to "whoever owns the ground, owns it all the way from heaven to hell."[61] This belief was fused into English and American common law

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58. *See* RESTATEMENT (SECOND) OF TORTS § 158 (AM. LAW. INST. 1965) ("One is subject to liability to another for trespass, irrespective of whether he thereby causes harm to any legally protected interest of the other, if he intentionally (a) enters land in the possession of the other, or causes a thing or a third person to do so, or (b) remains on the land, or (c) fails to remove from the land a thing which he is under a duty to remove."); s*ee also* CAL. CIV. CODE § 1708.8(a) (West 2016) ("A person is liable for physical invasion of privacy when the person knowingly enters onto the land or into the airspace above the land of another person without permission or otherwise commits a trespass in order to capture any type of visual image, sound recording, or other physical impression of the plaintiff engaging in private, personal, or familial activity and the invasion occurs in a manner that is offensive to a reasonable person.").

59. *See* RESTATEMENT (SECOND) OF TORTS § 159(2) (AM. LAW. INST. 1965) ("Flight by aircraft in the air space above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the air space next to the land, and (b) it interferes substantially with the other's use and enjoyment of his land.").

60. *See generally* Yehuda Abramovitch, *The Maxim "Cujus Est Solum Ejus Usque Ad Coelum" as Applied in Aviation*, 8 MCGILL L.J. 247, 247–65 (1962).

61. Luna Vanderispaillie, *Does Your Property Reach Heaven's Gates? An International Legal Perspective*, UNIFLY (Aug. 7, 2017), https://www.unifly.aero/news/does-your-property-reach-heavens-gates.

in the seventeenth and eighteenth centuries due in large part to Edward Coke and William Blackstone's instrumental commentaries.[62]

Airspace rights needed legal clarification once airplanes and air travel became common in everyday life. Can you imagine if every airline had to request permission[63] from every property owner along a route in order to fly through their airspace? The Air Commerce Act of 1926,[64] as amended in the Civil Aeronautics Act of 1938,[65] established the federal air highway. Currently, although 49 U.S.C. § 40103(a)(1) states that "[t]he United States Government has exclusive sovereignty of airspace of the United States," subsection 2 recognizes public use of airspace only above "navigable airspace," thereby retaining private ownership below "navigable airspace."[66] The ownership and use of airspace rights is significant in today's society in the context of view easements, solar access easements, flight path easements, and development rights in the non-navigable airspace above an owner's land. Property rights and their associated air rights have evolved at a blistering pace in modern times due to many technological innovations. With the birth of high-rise buildings and other architectural advancements, airspace has become increasingly valuable.[67] Airspace over land in the middle of wide open spaces in Alaska may be of little value, but a small amount of airspace in the heart of Manhattan is likely worth a fortune.[68] In recent years, the innovation and popularity of drones has blurred the lines of navigable airspace and property rights to an even greater degree.[69]

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62. Troy A. Rule, *Airspace in a Green Economy*, 59 UCLA L. REV. 270, 278–79 (2011).

63. Such a permission would be an avigation easement, which would "allow aircraft to fly through a given airspace." City of Westchester v. Town of Greenwich, 793 F. Supp. 1195, 1204 (S.D.N.Y. 1992), *rev'd sub nom.* City of Westchester v. Comm'r of Transp., 9 F.3d 242 (2d Cir. 1993).

64. Air Commerce Act of 1926, Pub. L. No. 69-254, 44 Stat. 568.

65. Civil Aeronautics Act of 1938, Pub. L. No. 75-706, 52 Stat. 973.

66. 49 U.S.C. § 40103(a)(1)–(2) (2018).

67. Martin A. Schwartz, *It's Up in the Air: Air Rights in Modern Development*, FLA. B.J., Apr. 2015, at 42, https://www.floridabar.org/the-florida-bar-journal/its-up-in-the-air-air-rights-in-modern-development/.

68. Twenty years ago, $45 a square foot was considered a reasonable fee for air rights in New York, but in recent years, that figure has risen to $450 per square foot in prime neighborhoods. Robin Finn, *The Great Air Race*, N.Y. TIMES (Feb. 22, 2013), https://www.nytimes.com/2013/02/24/realestate/the-great-race-for-manhattan-air-rights.html. The value of sunlight for solar panels is an increasing concern, New Mexico and Wyoming even prohibit interference with solar panels. *See* N.M. STAT. ANN. § 47-3-4(B)(1) (2019); WYO. STAT. ANN. § 34-22-103(b)(i) (2019).

69. Andrea Peterson & Matt McFarland, *You May Be Powerless to Stop a Drone from Hovering over Your Own Yard*, WASH. POST (Jan. 13, 2016), https://www.washingtonpost.com/news/the-switch/wp/2016/01/13/you-may-be-powerless-to-stop-a-drone-from-hovering-over-your-own-yard/?utm_term=.cc6909ac86e8.

In 1946, the Supreme Court of the United States provided guidance on where navigable airspace begins and private property ends in the landmark case *United States v. Causby*.[70] The Causbys were farmers living adjacent to a military airport that had aircraft flying as low as eighty-three feet above their land.[71] The deafening noise of aircraft caused their chickens great harm and resulted in them killing themselves by flying into the walls.[72] The Supreme Court's decision brought forth two key principles regarding airspace while maintaining the public air highway in its holding.[73] First, landowners have "exclusive control of the immediate reaches of the enveloping atmosphere."[74] Second, "the landowner owns at least as much of the space above the ground as he can occupy or use."[75]

C. *FAA Regulation of Airspace*

Pursuant to the Federal Aviation Act of 1958, the FAA has the right to regulate airspace.[76] The FAA has clearly defined six major classifications of regulated airspace, including both controlled airspace (Class A through Class E) and uncontrolled airspace (Class G).[77]

> Regulated, controlled airspace includes the following classes:

70. United States v. Causby, 328 U.S. 256, 258 (1946).

71. *Id.*

72. *Id.* at 259.

73. *Id.* at 260–61 ("It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe . . . . But that doctrine has no place in the modern world. The air is a public highway . . . . Were that not true, every transcontinental flight would subject the operator to countless trespass suits.").

74. *Id.* at 264.

75. *Id.* In addition, the Federal Aviation Act of 1958 expanded the statutory definition of "navigable airspace" from 500 feet above ground level to include all "airspace needed to insure safety in take-off and landing of aircraft." Federal Aviation Act of 1958, Pub. L. No. 85-726, § 101(24), 72 Stat. 731, 739; *see also* 14 C.F.R. § 77.23 (2019). "Navigable airspace" is defined as "airspace above the minimum altitudes of flight prescribed by regulations [but also] including airspace needed to ensure safety in the takeoff and landing of aircraft." 49 U.S.C. § 40102(a)(32) (2019). In other words, "The FAA is responsible for the safety of U.S. airspace from the ground up." *Busting Myths About the FAA and Unmanned Aircraft*, FED. AVIATION ADMIN., https://www.faa.gov/news/updates/?newsId=76240 (last updated Mar. 7, 2014).

76. Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731.

77. FED. AVIATION ADMIN., PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE 15-2–3 (2016), https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/pilot_handbook.pdf.

> Class A airspace is classified as any airspace over 18,000 feet above mean sea level ("MSL"), and aircraft operating in this airspace need to operate via instrumental flight rules.[78]
>
> Class B airspace is classified as airspace from surface level up to 10,000 feet above MSL. This airspace surrounds the nation's busiest airports and requires air traffic control ("ATC") clearance to enter.[79]
>
> Class C airspace is similar to Class B airspace and includes airspace from surface level up to 4,000 feet above the airport elevation charted in MSL. Aircraft operators must maintain two-way ATC communication before entering.[80] Class C airspace does not surround the nation's busiest airports, but it surrounds those airports that operate with control towers, radar approach control, and instrumental flight rules.
>
> Class D airspace covers the airspace around the smallest airports from surface level up to 2,500 feet above the airport elevation charted in MSL. Like Class C airspace, Class D airspace requires any aircraft operator to establish two-way ATC communication before entering.[81]
>
> Class E airspace is all controlled airspace not included in Class A through Class D airspaces. Most areas of Class E airspace begin at 1,200 feet above ground level up to the beginning of Class A airspace at 18,000 feet above MSL.[82] Many other locations of Class E airspace begin at 700 feet above ground level.
>
> Regulated, but uncontrolled airspace:
>
> Class G uncontrolled airspace extends from the surface up to the beginning of the overlying Class E airspace, which many times is either 1,200 feet or 700 feet above MSL. Pursuant to the FAA Modernization and Reform Act of 2012, UAV operators are required to fly their aircraft in Class G airspace.[83]

UAV operators must be conscious of approaching Class B airspace near airports, even at heights of only a few hundred feet above MSL. Much of New York City has Class B controlled airspace since there are

78. *Id.* at 15-2.
79. *Id.*
80. *Id.*
81. *Id.*
82. *Id.* at 15-2–3.
83. *Id.* at 15-3.

three nearby airports (LaGuardia, JFK, and Newark).[84] In addition, there are Special Flight Rules, which most drones cannot comply with, limiting flights above the Hudson and East Rivers, and there is a temporary flight restriction over President Trump's family residence.[85] This makes flight by UAVs in Manhattan very difficult.

While Los Angeles has a major international airport, there are also many smaller airports surrounded by controlled airspace, much of which is Class D—the airspace with the most waivers.[86] This is helpful for the dozens of film, television, and news companies that want to use that airspace. Many open areas in the broad Los Angeles area are available to drone flights, including downtown Los Angeles.[87] Drones are an efficient means to obtain aerial shots, whether for news or entertainment, and Hollywood producers are eager to explore uses for the new technology. Unlike news agencies trying to capture an unfolding event, film and television productions work on a schedule and can apply for authorizations and waivers as needed.

D. *Integration of UAVs into the United States Airspace*

The FAA Modernization and Reform Act of 2012 required that the FAA safely integrate UAVs into the United States airspace by September 30, 2015.[88] Recognizing that recreational drones are by far the most common and numerous, the FAA decided that each recreational drone over 0.55 pounds must be registered with the FAA.[89] The FAA estimates that there were around 1.1 million recreational drones in 2016, with estimates for that amount to increase to as high as 2.94 million by 2021.[90] However, since many recreational drones are less than 0.55 pounds and thus do not meet the registration requirement,[91] the FAA's estimate is very limited. The Consumer Technology Association (CTA) reported that there were 2.4 million recreational drones sold in 2016, more than double

84. Eric Ringer, *Drone Airspace in America's Largest Media Markets*, SKYWARD (Aug. 16, 2017), https://skyward.io/drone-airspace-in-americas-largest-media-markets/.

85. *Id.*

86. *Id.*; *see also* Tariq Rashid, *How to Apply for a Part 107 Waiver*, SKYWARD (Mar. 1, 2017), https://skyward.io/how-to-apply-for-a-part-107-waiver-from-the-faa-the-right-way/ (noting types and procedure for waivers).

87. Ringer, *supra* note 84.

88. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 332(a)(3) 126 Stat. 11, 73 (2012).

89. *See FAADroneZone*, FED. AVIATION ADMIN., https://faadronezone.faa.gov/#/ (last visited Sept. 3, 2019).

90. FED. AVIATION ADMIN., *supra* note 1, at 40–41.

91. *See* Andrew Meola, *Drone Market Shows Positive Outlook with Strong Industry Growth and Trends*, BUS. INSIDER (July 13, 2017, 10:42 AM), http://www.businessinsider.com/drone-industry-analysis-market-trends-growth-forecasts-2017-7.

the FAA's estimate.[92] This figure takes into account all recreational drones, no matter the size. The CTA also estimates that recreational drone sales could increase to 29 million by 2021.[93]

To use a small UAS, one must register it with the FAA, pay a $5 fee, and have a remote pilot certification with a small UAS rating.[94] However, obtaining the certification is not enough to understand the law related to operating a UAS; it is incumbent upon the pilot to take extra care to understand this law. In fact, "the FAA strongly encourages all UAS pilots to check local and state laws before gathering information through remote sensing technology or photography" because privacy issues are beyond the FAA's scope.[95] However, the FAA does "provide all drone users with recommended privacy guidelines as part of the UAS registration process and through the FAA's B4UFly mobile app."[96]

In June 2016, the FAA issued the final rule for drone operation, known as Part 107, which set the parameters for commercial use of drones weighing up to 55 pounds.[97] The regulations state that commercial drones:

- Can only be operated during daytime or civil twilight while with appropriate anti-collision lighting;
- Can only be operated up to a maximum of 400 feet above the ground level. If operated from a structure, it must be within 400 feet of the structure;
- Cannot be operated from a moving aircraft;
- Cannot be operated from a moving vehicle unless it's being operated over sparsely populated areas;
- Can only be operated when weather visibility is at least three miles from the control station;
- With an ATC permission, can be operated in Class B, C, D, and E airspaces;

92. *Id.*

93. *Id.*

94. *See* 14 C.F.R. § 107.12–.13 (2017); *Register Your Drone*, FED. AVIATION ADMIN., https://www.faa.gov/uas/getting_started/register_drone/ (last updated July 11, 2019, 8:56 AM); *see also* Juan Plaza, *FAA Remote Pilot Certification Reaches an Important Milestone*, COMM. UAV NEWS (Aug. 7, 2018), https://www.expouav.com/news/latest/faa-remote-pilot-certificates-milestone/ ("On July 26th the Federal Aviation Administration (FAA) announced that more than 100,000 people have obtained a Remote Pilot Certificate to fly a drone for commercial and recreational uses (not qualifying as 'model aircraft').").

95. *Fact Sheet—Small Unmanned Aircraft Regulations (Part 107)*, FED. AVIATION ADMIN. (June 21, 2016), https://www.faa.gov/news/fact_sheets/news_story.cfm?newsID=20516.

96. *Id.*

97. 14 C.F.R. § 107.3 (2019).

- Can be operated in a Class G airspace even without ATC permission;
- While in operation, must remain in the Visual-Line-Of-Sight.[98]

Commercial drone operators can request a waiver from these restrictions.[99] However, that can be time-consuming, often taking months, since the FAA receives more than 3,000 waiver requests per week "with a backlog in the tens of thousands."[100]

Commercial drones operate to satisfy a wide variety of business activities. Pilots for commercial drones must satisfy each of the following requirements: have a Remote Pilot Airman Certification, be at least sixteen years old, and pass vetting by the Transportation Security Administration.[101] Like recreational drones over 0.55 pounds, every commercial drone must be registered with the FAA and have a unique registration number for each aircraft.[102] The FAA estimated that roughly 42,000 commercial drones were in use in 2016 and that by 2021, 442,000 to 1.6 million commercial drones would be operating.[103] The FAA also estimated that there were 73,000 commercial drone pilots by the end of 2017 and that the number of pilots would increase to almost 400,000 pilots by 2022.[104] For comparison, BI Intelligence estimated commercial drone shipments in 2016 at 102,600, nearly double the FAA's estimate.[105] BI Intelligence also estimates that by 2021, the number of commercial drone shipments will increase by 51% to 805,000.[106] The challenge then

98. 14 C.F.R. §§ 107.11, .25, .29, .31, .41, .51 (2019).

99. Waiver requests cover several scenarios. *Part 107 Waivers*, FED. AVIATION ADMIN., https://www.faa.gov/uas/commercial_operators/part_107_waivers/ (last updated Aug. 1, 2019); Rashid, *supra* note 86.

100. Rebecca Wilson, *Q&A: How Skyward Is Working with the FAA on LAANC*, SKYWARD (Aug. 7, 2017), https://skyward.io/qa-how-skyward-is-working-with-the-faa-on-laanc/.

101. *Summary of Small Unmanned Aircraft Rule (Part 107)*, FED. AVIATION ADMIN. (June 21, 2016), https://www.faa.gov/uas/media/Part_107_Summary.pdf; *Drone Certification: A Step-by-Step Guide to FAA Part 107 for U.S. Commercial Drone Pilots*, UAV COACH, https://uavcoach.com/drone-certification/#1 (last visited Apr. 4, 2019).

102. *Register Your Drone*, FED. AVIATION ADMIN., https://www.faa.gov/uas/getting_started/register_drone/ (last updated July 11, 2019, 8:56 AM).

103. David Shepardson, *U.S. Commercial Drone Use to Expand Tenfold by 2021: Government Agency*, REUTERS (Mar. 21, 2017, 4:22 PM), https://www.reuters.com/article/us-usa-drones/u-s-commercial-drone-use-to-expand-tenfold-by-2021-government-agency-idUSKBN16S2NM (reporting statements by the FAA regarding the growing use of commercial drones as the regulatory framework surrounding them evolves).

104. FED. AVIATION ADMIN., *supra* note 1, at 44–45.

105. Meola, *supra* note 91.

106. *Id.*

is regulating airspace in a manner that will permit the use of drones without interfering with landowners' property rights.[107]

E. *Penalties for Unregistered Drones*

According to Michael Braasch, an electrical engineering professor and drone expert at Ohio University, one challenge with novice drone operators is that they are often "blissfully unaware" of aviation safety practices.[108] The FAA has partnered with the drone industry on a public awareness campaign, *Know Before You Fly*, which disseminates safety rules to hobbyist flyers. In addition, the B4UFly application serves the same purpose.[109] The industry is also encouraging manufacturers to put warning labels on the UAS itself, reminding operators to research and follow safety regulations.[110]

Drone owners need only spend $5 and a short amount of time on the FAA's website[111] to register their drones, which is well worth it: individuals who fail to register their drones can face stiff penalties, including a $27,500 civil penalty, a $250,000 criminal penalty, three years of jail time, or a combination of these.[112] These penalties were previously overturned by the United States Court of Appeals for the District of Columbia in the beginning of 2017, which cited the FAA Modernization and Reform Act of 2012 as allowing hobbyists to fly their drones with little oversight.[113] More than 820,000 operators had

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107. *See* Troy A. Rule, *Airspace in an Age of Drones*, 95 B.U. L. REV. 155, 163 (2015) ("Unfortunately, the United States will be unable to take full advantage of modern domestic drone technologies until federal, state, and local governments develop a more robust legal and regulatory structure to govern these high-tech devices.").

108. Craig Whitlock, *Rogue Drones a Growing Nuisance Across the U.S.*, WASH. POST (Aug. 10, 2015), https://www.washingtonpost.com/world/national-security/how-rogue-drones-are-rapidly-becoming-a-national-nuisance/2015/08/10/9c05d63c-3f61-11e5-8d45-d815146f81fa_story.html.

109. *See Unmanned Aircraft Systems (UAS)/Drones*, PIEDMONT TRIAD INT'L AIRPORT, https://flyfrompti.com/unmanned-aircraft-systems-uas-drones/ (last visited Apr. 7, 2018) ("The B4UFLY app provides model aircraft users with situational awareness and considers the user's current or planned location in relation to operational restrictions to derive a specific status indicator. The color- and shape-coded status indicators inform the user if model aircraft operation is prohibited, requires the user to take certain actions, or if there are no FAA operating restrictions other than flying safely.").

110. Whitlock, *supra* note 108.

111. *FAADroneZone*, *supra* note 89.

112. Jacob Pramuk, *Unregistered Drone Users May Face Jail Time*, CNBC (Feb. 23, 2016, 2:17 PM), https://www.cnbc.com/2016/02/23/unregistered-drone-users-may-face-jail-time.html; Keith Wagstaff, *Fail to Register Your Drone? You Could Be Hit With $27K Fine*, NBC NEWS (Dec. 15, 2015, 9:02 AM), https://www.nbcnews.com/tech/innovation/fail-register-your-drone-you-could-be-hit-27k-fine-n481856.

113. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 336(a), 126 Stat. 11, 77 (2012); *e.g.*, Taylor v. Huerta, 856 F.3d 1089, 1091 (D.C. Cir. 2017).

registered their drones since December 2015—prior to when the federal court halted the required registration.[114] John Taylor, a model aircraft enthusiast, filed suit against the FAA in January 2016, arguing that the FAA was prohibited from passing any rules regulating model aircraft operators. He further argued that model aircraft carriers would include non-commercial hobbyist drone operators.[115] However, President Trump signed the 2018 National Defense Authorization Act into law in December 2017, which reinstated the registration requirement and the previously stated penalties for unregistered drones.[116]

F. *Line of Sight Restrictions*

Drones must be operated within a user's visual line of sight (VLOS), according to the FAA.[117] VLOS means that drone operators must be able to visually see the drone without the aid of any optical device, such as binoculars, zoom lenses, or telescopes.[118] In addition, VLOS prohibits the use of drones in dense fog, clouds, or at night when users are unable to maintain eye contact with the UAV.[119]

With the technology currently available, many UAVs are capable of flying well beyond a user's visual line of sight (BVLOS). However, without a waiver of the FAA regulation, it is prohibited in the United States to operate a drone BVLOS.[120] There are many potential commercial and government applications for drone use if owners were allowed to operate drones BVLOS, and a future increase in waiver applications is anticipated. Pilots using the first person view (FPV),

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114. April Glaser, *Americans No Longer Have to Register Non-Commercial Drones with the FAA*, VOX (May 19, 2017, 1:54 PM), https://www.recode.net/2017/5/19/15663436/us-drone-registration-rules-faa.

115. Huerta, 856 F.3d at 1090. Judge Kavanaugh wrote that "[t]he Act codified the FAA's longstanding hands-off approach to the regulation of model aircraft. Specifically, Section 336 of the Act, called the 'Special Rule for Model Aircraft,' provides that the FAA 'may not promulgate any rule or regulation regarding a model aircraft.'" *Id.* at 1091 (quoting FAA Modernization and Reform Act, Pub. L. No. 112-95, § 336(a), 126 Stat. 11, 77 (2012)). The court determined that requiring hobbyist drone operators to register was a "rule or regulation" and that "statutory interpretation does not get much simpler. The Registration Rule is unlawful as applied to model aircraft." *Id.* at 1092.

116. National Defense Authorization Act for Fiscal Year 2018, Pub. L. No. 115-91, § 1092(d), 131 Stat. 1283, 1611 (2017).

117. FAA Modernization and Reform Act, Pub. L. No. 112-95, § 336(c), 126 Stat. 11, 77–78 (2012); *see also* 14 C.F.R. § 107.31 (2019).

118. 14 C.F.R. § 107.31; *Summary of Small Unmanned Aircraft Rule (Part 107)*, *supra* note 101.

119. 14 C.F.R. §§ 107.29, .51; *Summary of Small Unmanned Aircraft Rule (Part 107)*, *supra* note 101.

120. *See Part 107 Waivers*, FED. AVIATION ADMIN., https://www.faa.gov/uas/commercial_operators/part_107_waivers/ (last modified Aug. 1, 2019, 2:14 PM).

which provides the UAV pilot a cockpit view via an onboard video camera to assist in navigation, are still operating a drone BVLOS and require the same FAA § 107.31 waiver.[121]

Extended visual line of sight (EVLOS) refers to a remote pilot in command (PIC) relying on remote observers of the UAV to keep the UAV in sight at all times once it is BVLOS of the PIC.[122] Remote observers relay important flight information via radio or other communication to the PIC. Those wishing to operate a drone EVLOS must also obtain a waiver.[123]

For the commercial use of drones to be successful, there must be a BVLOS system in place. Toward that end, Alphabet's Project Wing is working with the FAA and NASA to develop systems that could manage the air traffic control challenge of keeping drones from crashing into each other or other property.[124] The "unmanned aircraft systems Air Traffic Management" software (UTM) was successfully tested by six drones operating at the same time, simulating the pick-up and drop-off of packages.[125] The software makes adjustments to the flight path as the drones fly without the pilot needing to act.[126] No-fly zones, such as airports, could be added so that the UTM would know what areas the drones should avoid. While it was a successful test, a sample size of six drones is very small. An extensive amount of development is still needed, and the FAA expects that it will be at least 2019 before it can finalize collision-avoidance standards.[127]

Ground-based and airborne "sense and avoid" technologies, which can enable drones to sense objects in their path and change course in order to avoid collisions, are safety features under development that could help with BVLOS flights.[128] Other programs that are designed to automatically send drones back to the ground safely if they are disconnected from the remote operators' signals, such as "lost-link" or

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121. *Summary of Small Unmanned Aircraft Rule (Part 107)*, *supra* note 101.

122. ALLISON FERGUSON, ENABLING BEYOND LINE OF SIGHT WITH THE FAA PATHFINDER PROGRAM: EXTENDED VISUAL LINE OF SIGHT 1 (2017), https://www.astm.org/COMMIT/XPO17 Paper_Ferguson.pdf.

123. *See Part 107 Waivers*, *supra* note 120.

124. Jamie Condliffe, *Alphabet's New Air Traffic Control System Steers Drones Away from Peril*, MIT TECH. REV. (June 7, 2017), https://www.technologyreview.com/s/608050/ alphabets-new-air-traffic-control-system-steers-drones-away-from-peril/.

125. *Id.*

126. *Id.*

127. *Id.*

128. *See* Thomas Black, *Amazon's Drone Dream Sets Off Race to Build Better Sensor*, BLOOMBERG (June 7, 2014, 12:01 AM), https://www.bloomberg.com/news/articles/2014-06-06/amazon-s-drone-dream-sets-off-race-to-build-better-sensor [http://perma.cc/3K36-YLSS] ("Sense and avoid is one of the biggest opportunities in the industry . . . .").

"return-to-base," would be valuable standard features for small drones.[129] Another safety concern is that one could hack into a drone's signals during flight to send rogue signals and take control of the drone, intentionally directing it to cause harm. An anti-hacking system to prevent such signal interception would be a recommended requirement.[130]

One challenge for landowners trying to report drone activity is being able to sufficiently identify the drone for authorities to be able to track down the owner. Perhaps the FAA could require GPS software to be installed in the drones so that they could be tracked. However, each of these proposed systems would cost time and money to develop while also increasing the cost of drones. Some might argue that increased cost is a good thing because it could potentially reduce the number of drones in the air. However, if drones are going to be useful to businesses, then cost control is important.

The FAA is developing the Low Altitude Authorization and Notification Capability system (LAANC) to give commercial operators pre-approved flight zones and maximum altitudes for operating UAVs near airports rather than requiring a waiver.[131] As of 2018, the system is still in beta form, but the list of participating facilities is growing.[132] The goals of LAANC would be to automate the waiver application process, reduce the wait time for approvals, and give recreational drone pilots a way to notify airport air traffic control when they will fly near an airport.[133] While LAANC will provide more access to airspace, it is not an unmanned traffic management system and is not intended to be.[134]

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129. *See* WENDIE KELLINGTON, LAND USE INST., UNMANNED AIR SYSTEMS AND REGULATING NAVIGABLE AIRSPACE 11 (2013), https://perma.cc/G8FD-RLEY ("UAVs often include programmed maneuvers to be automatically deployed if a command and control link is disrupted . . . .").

130. *See, e.g.*, Joshua Turner & Sara Baxenberg, *NASCAR Drone Countermeasures May Be Illegal*, LAW360 (Apr. 18, 2018, 4:55 PM), https://www.law360.com/articles/1034908/nascar-drone-countermeasures-may-be-illegal.

131. Wilson, *supra* note 100.

132. *FAA Facilities Participating in LAANC*, FED. AVIATION ADMIN., https://www.faa.gov/uas/programs_partnerships/uas_data_exchange/airports_participating_in_laanc/ (last updated Aug. 26, 2019).

133. Wilson, *supra* note 100.

134. *See id.*

III. AIRSPACE TRESPASS

A. *Airspace Trespass by Something Other than Drones*

As the use of drones increases, trespass litigation by landowners is likely to increase. However, to date, there have been few drone cases to serve as precedent.[135] In order for the courts to decide these new cases, they will need to look at parallel trespass cases for guidance on the extent to which intrusion into the airspace of another constitutes trespass.[136] For example, in an analogous case in 1993, the Wagners cut down tree limbs that originated from trees on the Joneses' property.[137] The limbs were hanging over a fence that separated property boundaries and onto the Wagners' property.[138] In other words, the limbs were encroaching on the Wagners' airspace. The Joneses sought damages, claiming that the Wagners had no right to trim the tree limbs and that the limbs did not trespass because they did not cause any harm.[139] The Pennsylvania Superior Court found that the issue of whether one could utilize self-help by cutting down overhanging limbs had been determined several times before[140] and was not limited solely to an interest in land:

> But the interest in exclusive possession is not limited to the surfaces; it extends above and below. There is a property right in the air space above the land, which may be invaded by overhanging structures, or telephone wires, by thrusting an arm above the boundary line, or by shooting across the land, even though the bullets do not fall upon it.[141]

The court emphasized that a landowner can enforce his right to freely enjoy exclusive use of his property without any physical harm or damage present.[142] In this context, landowners have a right to enjoy the land they

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135. Zack Kurzhals, *Drones, Damages, and Property Rights*, U. CIN. L. REV. BLOG (Nov. 1, 2017), https://uclawreview.org/2017/11/01/drones-damages-and-property-rights/.

136. *See* RESTATEMENT (SECOND) OF TORTS § 159(2) (AM. LAW INST. 1965) ("Flight by aircraft in the air space above the land of another is a trespass if, but only if, (a) it enters into the immediate reaches of the air space next to the land, and (b) it interferes substantially with the other's use and enjoyment of his land.").

137. Jones v. Wagner, 624 A.2d 166, 167 (Pa. Super. Ct. 1993).

138. *Id.*

139. *Id.* ("[The Joneses] claim that [the Wagners] are liable to them at law since [the Wagners], having suffered no appreciable damage by the overhanging branches, are not entitled to exercise a self-help remedy by trimming the trees.").

140. *Id.*

141. *Id.* at 169 (citations omitted).

142. *Id.*; *see also* JACQUELINE P. HAND & JAMES CHARLES SMITH, NEIGHBORING PROPERTY OWNERS § 5:3, at 114 (1988) ("If a building is constructed so that part of it projects across the boundary line at a point above the surface, trespass is available. An example would be eaves of a

rightfully possess, free from any sort of airspace intrusion, even if the tree limbs do not cause any property damage or bodily injury.[143] The court also noted that "continued presence of a structure, chattel, or other thing which the actor has tortiously placed there, whether or not the actor has the ability to remove it"[144] is a continuing trespass, which would permit the Wagners to even cut the branches again when they regrow. "An actor places branches 'tortiously' on another's property when he is subject to liability in tort, that is, when he is trespassing onto another's property."[145]

In another analogous case, a landowner successfully argued that his neighbor trespassed in breaking down a fence surrounding the landowner's property and building a barn with eaves that extended over the owner's property.[146] Another example of a parallel case involved defendants who ran clothes reels with laundry onto plaintiffs' property and actually interfered with plaintiff's use of the premises.[147] While initially there was permission for the reels, the plaintiff subsequently revoked it.[148] Thereafter, "each extension of the reels over the plaintiffs' land, contrary to their wishes, was an unlawful invasion of the legal rights of the plaintiffs and constituted a separate trespass."[149] One can also look to *Wandsworth Board of Works v. United Telephone Co.*, an old English case that is often cited when plaintiffs claim that their airspace rights have been infringed.[150] In *Wandsworth*, an unauthorized telephone wire the defendant had installed hung over the property lines and into the plaintiff's airspace.[151] The court found the presence of the telephone wire

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roof that overhang a neighbor's land. Similarly, utility wires cannot be strung across land without the consent of its owner, even though none of the poles or standards are located on the owner's surface.").

143. Jones v. Wagner, 624 A.2d 166, 169 (Pa. Super. Ct. 1993) ("Thus, there is no question that a branch overhanging a landowner's property line is a technical trespass which he may alleviate by exercising self-help, as did appellees here. They were entitled to trim the encroaching branches without regard to the degree of physical harm done to their property. The redressable harm caused by the trees is that of the trespass onto appellees' property, not physical damage done to their land."). Contrast that, though, with nuisance. While the court said that "[i]t may be understood that any erection upon one man's land, that projects over the land of another, as well as any tree whose branches thus project, doing actual damage, or anything that interferes with the rights of an adjoining landowner, is an actionable nuisance," it acknowledged that some courts had found that "appreciable damage must be shown in order to give overhanging branches the character of nuisance." *Id.* at 168–69.

144. *Id.* at 170 (citing RESTATEMENT (SECOND) OF TORTS § 161(1) (AM. LAW INST. 1965)).

145. *Id.* (citing RESTATEMENT (SECOND) OF TORTS § 161 cmt. a (AM. LAW INST. 1965)).

146. Smith v. Smith, 110 Mass. 302, 303–04 (Mass. 1872).

147. Scioscia v. Iovieno, 63 N.E.2d 898, 898–99 (Conn. Super. Ct. 1945).

148. *Id.* at 899.

149. *Id.*

150. *See generally* Wandsworth Bd. of Works v. United Tel. Co. [1884], 13 QBD 904 (Eng.).

151. *Id.* at 905.

to be a trespass and ruled in favor of the plaintiff.[152] It was not material to the case whether or not the plaintiff would or could use the airspace.[153] Likewise, UAV operators could find themselves liable for trespassing on private property without the landowners having to prove whether they would actually use the property or suffer harm.

Similar to *Wandsworth*, the court in *Didow v. Alberta Power Ltd.* ruled in favor of the plaintiff, who sued the defendant for trespass, because the defendant's power lines hung above the plaintiff's property.[154] What is unclear—and again presents a challenge for drone operators—is determining at what specific height an airspace intrusion constitutes a trespass. In *Didow*, the contested power lines were fifty feet above the surface and protruded six feet onto Didow's land.[155] The court found that it could not literally apply the maxim that whoever owned the land owned the sky up to the heavens.[156] However, the court did find that interfering with an owner's airspace by encroaching upon the potential or actual use of the airspace constitutes trespass.[157] In both *Didow* and *United States v. Causby*, the courts' ambiguous language leaves UAV operators in a tricky situation when flying over private property.[158] Neither case specified a specific limit to private airspace, but rather that trespass includes anything that interferes with the enjoyment or use of private land.[159]

The use of cranes has helped allow areas all over the United States, namely urban communities, to explode in size. A crane's jib, the long extended arm, needs to swing freely in the wind when not in use to help it stabilize, so many developers seek consent of adjoining owners to allow the jib to enter private airspace to avoid a trespass claim.[160] In *Whitney National Bank of New Orleans v. Poydras Center Associates*, no such consent was obtained.[161] Whitney obtained a temporary restraining order (TRO) enjoining defendants "from trespassing on either the surface, subsurface or air rights" of Whitney's property by the "use of cranes, dust or any other instrumentality or substance intruding on, under or over" Whitney's property, arguing that using a crane over neighbor's property

152. *Id.* at 907–08.

153. *See id.* at 908.

154. Didow v. Alberta Power Ltd. (1988), 88 A.R. 250 (Can.).

155. *Id.*

156. *Id.*

157. *Id.*

158. *See id.*; U.S. v. Causby, 328 U.S. 256, 264–65 (1946).

159. *Didow*, 88 A.R. 250 (Can.); *Causby*, 328 U.S. at 265–66.

160. Jesse S. Ishikawa, *Tower Cranes, Trespass, and Temporary Airspace Use Agreements*, PROB. & PROP., Jan.–Feb. 2006, at 63, 65.

161. Whitney Nat'l Bank of New Orleans v. Poydras Ctr. Assocs., 468 So. 2d 1246, 1247 (La. Ct. App. 1985).

would be trespassing.[162] Poydras sought to dissolve the TRO and multiple hearings followed.[163] By the time the court was ready to rule, construction had been completed, so the court refused to issue an injunction to prevent activity that had already been completed.[164] Many developers in recent years have sought temporary easements or license agreements with neighboring property owners while completing construction to keep from inadvertently trespassing.[165] Could this be the route UAV owners will be required to take in the future to prevent trespasses?

The use of firearms and the paths of their bullets give another good example for courts and drone operators to reference when dealing with this complex issue. In the 1925 Montana Supreme Court case *Herrin v. Sutherland*, the plaintiff sued the defendant for trespass after the defendant fired a shotgun and the shotgun shells traveled over the plaintiff's private property.[166] The plaintiff argued that the shots "interfered with 'the quiet, undisturbed, peaceful enjoyment' of the plaintiff" at his dwelling-house, ranch, and property.[167] The court sided with the plaintiff and affirmed that the bullets constituted a trespass that disturbed the quiet and peaceful use of the land.[168] In addition, the court said that there was a clear danger with a shotgun being fired over the plaintiff's property even without actual damages.[169]

The court's decision could cause trouble for drone operators because there is no need for actual damages from the aerial trespass, only the possibility of danger. Drones are mechanical objects that sometimes fail. Even if a capable drone operator were allowed to fly over private property, a drone can still possibly run out of battery or cease to operate for any number of reasons, which could cause it to fall out of the sky and injure an unsuspecting individual. Therefore, the language of the court's opinion issued in *Herrin v. Sutherland* does not give reassurance to drone operators but only complicates the issue.

An old case about horses in England from the late 1800s provides another example of the challenges that courts face. In *Ellis v. Loftus Iron Co.*, the court found the defendant liable for trespass onto the land of his neighbor when the defendant's horse stuck his head through a wire fence and bit the plaintiff's horse.[170] The court's decision was important

162. *Id.*
163. *Id.*
164. *Id.* at 1249.
165. Ishikawa, *supra* note 160, at 65.
166. Herrin v. Sutherland, 241 P.2d 328, 329 (Mont. 1925).
167. *Id.* at 331–32.
168. *Id.*
169. *Id.* at 332.
170. Ellis v. Loftus Iron Co. [1874], 10 LRCP 10 (Eng.).

because it determined that the horse engaged in a trespass although it never physically touched the ground of neighboring land.[171] In addition, although the horse caused physical damage to the plaintiff's property in this specific case, the court found that merely an intrusion that affects the enjoyment of private property also constitutes a trespass.[172] The presiding judge in the case, Lord Coleridge, had this to say in his decision:

> It is clear that, in determining the question of trespass or no trespass, the court cannot measure the amount of the alleged trespass; if the defendant places a part of his foot on the plaintiff's land unlawfully, it is in law as much a trespass as if he had walked half a mile on it.[173]

As evidenced by this statement, Lord Coleridge believed that a trespass was the same in the court's eye no matter if by a few inches or a few thousand feet. This idea presents a major issue for drone operators because, under this view, if a drone crosses over into private property by only a foot, the operators could be held liable for trespass. The courts would find it extremely difficult to determine the precise location of a drone in relation to the boundaries of private property to determine whether a trespass occurred. Such difficulty may lead the court to favor the landowner, erring on the side of trespass.

B. *Airspace Trespass by Drones*

The recent federal court case *Boggs v. Merideth* best highlights the legal difficulties faced by UAV operators.[174] The plaintiff was operating his drone in uncontrolled and navigable Class G airspace above the defendant's property when the defendant shot down the drone with a shotgun.[175] The plaintiff argued that he was operating the drone in the "navigable airspace" and high enough not to constitute a trespass, but the defendant claimed that the drone was being operated on her property.[176] The judge dismissed the lawsuit, and while the decision appears to be a win for landowners, the issue is far from resolved.[177]

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171. *Id.* at 12.

172. *Id.* at 13.

173. *Id.* at 12.

174. Boggs v. Merideth, No. 3:16-cv-00006-TBR, 2017 U.S. Dist. LEXIS 40302 (W.D. Ky. Mar. 21, 2017); *see also* Fieldstadt, *supra* note 5.

175. *Boggs*, 2017 U.S. Dist. LEXIS 40302, at *1–2.

176. *Id.*

177. *Id.* at *24.

The plaintiff then brought his case to federal court because he claimed that the drone in question was subject to the FAA's federal regulation.[178] However, Judge Russell concluded the following:

> But even if Boggs is correct that his unmanned aircraft *is* subject to federal regulation, as the Court noted above, the fact remains that the FAA has not sought to enforce any such regulations in this case. Moreover, FAA regulations, at most, would constitute ancillary issues in this case, in which the heart of Boggs' claim is one for damage to his unmanned aircraft under Kentucky state law.[179]

Thus, the court does not completely clear the defendant of any wrongdoing, but states that the issue should be taken up in a state court as opposed to a federal court.[180] Both drone operators and landowners need to take this decision with caution, as concrete aerial property boundaries are still far from being clarified.

IV. STATE AND LOCAL REGULATION OF DRONES

A. *State Regulation of Drones*

If state tort law is going to apply to trespass by drones, then states will want to exercise some power over drone regulation within their boundaries. This is not a question of federal preemption, but rather additional state regulation over its uncontrolled airspace. The United States Department of Transportation (DOT) recently granted ten special licenses to UAS projects backed by state and local governments.[181] The DOT's Unmanned Aircraft Systems Integration Pilot Program's goal is to "foster a meaningful dialogue on the balance between local and national interests related to UAS integration, and provide actionable information to the USDOT on expanded and universal integration of UAS into the national airspace system."[182] However, there is some concern

178. *See id.* at *12.

179. *Id.* at *14.

180. *Id.* at *24.

181. Chiem, *supra* note 38 (reporting that Alaska, California, Florida, Kansas, Nevada, North Carolina, North Dakota, Oklahoma, Tennessee, and Virginia will participate in the DOT's Unmanned Aircraft Systems Integration Pilot Program to test commercial drone operations that would typically require waivers, including package delivery and nighttime flights). Specifically, a 1,500-pound UAV will monitor mosquitoes in Florida, and Flirtey, a medical equipment startup, will fly drones with emergency medical equipment to heart-attack victims in Nevada. David Shepardson & Jeffrey Dastin, *U.S. Drone Program Taps Apple, Passes Over Amazon, China's DJI*, REUTERS (May 9, 2018, 1:27 PM), https://www.reuters.com/article/us-usa-drones-companies/us-drone-program-taps-alphabet-passes-over-amazon-chinas-dji-idUSKBN1IA2WC.

182. Chiem, *supra* note 38.

about state regulations attempting to dilute federal regulations, particularly Part 107.[183]

Congress gave the FAA the authority to regulate aviation safety, the scope of which includes drone operations, but states are implementing rules to regulate drone-related concerns such as property rights, liability, and privacy.[184] Regulation of airspace below navigable airspace should belong to states because state tort law will be implicated. States regulate drivers' licenses, so why not regulate drone licenses?[185] While the FAA may regulate airspace,[186] state and local governments have some power to regulate the use of airspace, and therefore, the use of that airspace by drones. Amanda Essex, a policy associate for the National Conference of State Legislatures, commented: "I wouldn't necessarily say there is one state doing it better than the others. They're all kind of taking their own approaches as to what they think is going to work for their state and what is best in their situation."[187]

In the 2017 legislative session, thirty-eight states considered UAS legislation, resulting in eighteen of those states passing twenty-four pieces of legislation.[188] Three states adopted resolutions to address UAS legislation in 2018.[189] Alaska has a Task Force on UAS, North Dakota supports the development of the UAS industry, and Utah supports the building of a NASA drone testing facility and Command Control Center in Tooele County, Utah.[190] Utah also passed legislation extending criminal trespass to drones and prohibiting the disturbance of livestock

183. *See* Singer v. City of Newton, No. CV 17-10071, 2017 WL 4176477 (D. Mass. Sept. 21, 2017); *see generally* Nicholas Cody, Note, *Flight and Federalism: Federal Preemption of State and Local Drone Laws*, 93 WASH. L. REV. 1495 (2018).

184. *See* Eyragon Eidam, *Report: Drone Legislation a Priority for States Across the U.S.*, GOV'T TECH. (July 11, 2016), http://www.govtech.com/policy/Report-Drone-Legislation-a-Priority-for-States-Across-the-US.html.

185. Rule, *supra* note 107, at 203 ("Through drone operator license tests, periodic safety inspections, liability insurance criteria, and related means, such licensing systems could do a great deal to promote drone safety and to ensure that drone users are familiar with laws relating to the devices.").

186. *See* Federal Aviation Act of 1958, Pub. L. No. 85-726, 72 Stat. 731.

187. Eidam, *supra* note 184.

188. *Current Unmanned Aircraft State Law Landscape*, NAT'L CONF. OF STATE LEGISLATURES (Sept. 10, 2018), http://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx.

189. *Id.*

190. *Id.*

with drones.[191] Virginia made it a misdemeanor for a UAS to trespass for the purpose of spying.[192]

Austin Haughwout, a nineteen-year-old, posted YouTube videos of a drone using a flamethrower to roast a turkey[193] and another of a drone holding and shooting a gun.[194] The FAA has been investigating, but Haughwout and his father argue that the FAA is exceeding its authority because drones are models, not aircraft, and because his videos are of a backyard hobby, not commercial use.[195] Mario Cerame, Haughwout's attorney, argued that "[c]onstruing small civilian drones as aircraft is not consonant with the history and policy purpose of the FAA. It was about airplanes, helicopters, and blimps, and the accoutrements that accompany them."[196] Those incidents led to a proposed Connecticut law prohibiting the remote control of a deadly weapon.[197]

In California, a property owner's rights in the airspace over his land include rights to the "free or occupied space [above the property] for an indefinite distance upwards . . . subject to limitations upon the use of airspace imposed . . . by law."[198] In September 2015—following several incidents between firefighters and drones—California state legislators

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191. UTAH CODE ANN. § 76-9-308 (LexisNexis 2019) ("[A] person is guilty of harassment of livestock if the person intentionally, knowingly, or recklessly chases, with the intent of causing distress, or harms livestock through the use of . . . an unmanned aircraft system."); *see also* § 76-6-206(2)(a) ("A person is guilty of criminal trespass if . . . the person . . . causes an unmanned aircraft to enter and remain unlawfully over property . . . .").

192. VA. CODE ANN. § 18.2-130.1 (2017) ("It is unlawful for any person to knowingly and intentionally cause an electronic device to enter the property of another to secretly or furtively peep or spy . . . into . . . a dwelling . . . is a Class 1 misdemeanor.").

193. Hogwit, *Roasting the Holiday Turkey*, YOUTUBE (Dec. 7, 2015), https://www.youtube.com/watch?v=lmD3rXUR1Tw (listing over 700,000 views as of May 14, 2019).

194. Hogwit, *Flying Gun*, YOUTUBE (July 10, 2015), https://www.youtube.com/watch?v=xqHrTtvFFIs (listing over four million views as of May 14, 2019).

195. Edmund H. Mahony, *Drone-Flying Teen and His Dad Go to Court to Fight FAA Investigation*, HARTFORD COURANT (July 6, 2016, 9:15 PM), http://www.courant.com/news/connecticut/hc-drone-boy-0707-20160706-story.html.

196. *Id.*

197. H.R. 7260, 2017 Leg., Gen. Assemb., Jan. Sess. (Conn. 2017), https://www.cga.ct.gov/2017/TOB/h/2017HB-07260-R00-HB.htm ("Except as otherwise provided by law, no person . . . shall operate or use any computer software or other technology, including, but not limited to, an unmanned aerial vehicle, that allows such person, when not physically present, to release tear gas or any like or similar deleterious agent or to remotely control a deadly weapon, as defined in section 53a-3 of the general statutes, or an explosive or incendiary device, as defined in section 53-206b of the general statutes."); Miriam McNabb, *Connecticut Decides Against "Weaponized" Drones for Law Enforcement*, DRONELIFE (May 2, 2017), https://dronelife.com/2017/05/02/connecticut-decides-weaponized-drones-law-enforcement/ (reporting that Connecticut's House of Representatives did not take action on Connecticut House Bill 7260).

198. CAL. CIV. CODE § 659 (West 2019).

passed a bill[199] granting immunity to emergency responders who damage a drone that gets in their way.[200] In one case, a drone interfered with helicopters fighting a major fire in Northern California, causing a delay of ten minutes.[201] The pilot of the drone was given a citation, but he commented that he did not know that flying his drone near the airport was illegal.[202] However, in California, such interference is a misdemeanor.[203]

In 2013, Oregon was one of the early states to enact a statute creating a civil claim for drone trespass.[204] The statute, as enacted, allowed real property owners to bring claims against anyone who flew a drone over their property below 400 feet, but not for the first such flight.[205] The property owner must have first asked the pilot not to fly over the property, and then if the pilot flies the drone a second time, the property owner can bring a trespass claim.[206] In such a case, prevailing plaintiffs can recover treble damages for any injuries to persons or property caused by the unwanted drone and, in some cases, attorney fees.[207]

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199. *Id.* § 43.101(a) (West 2019) ("An emergency responder shall not be liable for any damage to an unmanned aircraft or unmanned aircraft system, if that damage was caused while the emergency responder was providing, and the unmanned aircraft or unmanned aircraft system was interfering with, the operation, support, or enabling of the emergency services listed in Section 853 of the Government Code.").

200. Whitlock, *supra* note 108 (reporting that in California, drones interfered with firefighters' efforts to battle wildfires and that in New York, firefighters used their water hoses to knock down a drone that had been filming them as they battled a house blaze).

201. Press Release, Petaluma Police Dep't, 24 Year Old Petaluma Resident Cited for Flying a Drone over the Petaluma Airport Halting Cal. Fire Helicopters (Oct. 15, 2017, 10:10 PM), http://www.nixle.us/9MZ35 (stating that 24-year-old Nestor Rodriguez received a citation for Impeding Emergency Personnel for flying a drone over the airport being used by the firefighting helicopters).

202. *Id.*

203. CAL. PEN. CODE § 402 (West 2019) ("It is unlawful to knowingly, intentionally, or recklessly operate an unmanned aircraft or unmanned aircraft system in a manner that prevents or delays the extinguishment of a fire, or in any way interferes with the efforts of firefighters to control, contain, or extinguish a fire, including, but not limited to, efforts to control, contain, or extinguish the fire from the air. A violation of this section is punishable by imprisonment in a county jail not to exceed six months, by a fine not to exceed five thousand dollars ($5,000), or by both that imprisonment and fine.").

204. OR. REV. STAT. § 837.380 (2013) (amended 2016).

205. *Id.* § 837.308(1)(a).

206. *Id.* § 837.308(1)(b).

207. *Id.* § 837.380(3)–(4).

B. *Local Regulation*

1. Community Regulation

In addition to state-wide regulations, states often delegate regulation of local community activities.[208] Municipalities regulate many activities that impact landowners and neighbors, ranging from the lighting of fireworks[209] to the raising of backyard chickens.[210] "In early 2013, Charlottesville, Virginia became the first city to pass an anti-drone resolution. And [Texas] House Bill 912, also known as the Texas Privacy Act, makes using drones for surveillance a crime."[211]

In Honolulu, Hawaii, Skysign International, Inc. had an FAA waiver certificate permitting its helicopters to carry lighted advertising signs beneath their fuselages.[212] That federal certificate specifically provided: "The operator, by exercising the privilege of this waiver, understands all local laws and ordinances relating to aerial signs, and accepts responsibility for all actions and consequences associated with such operations."[213] Both the city and county of Honolulu bar the use of aircraft to display "any sign or advertising device."[214] According to the Ninth Circuit Court of Appeals, the Honolulu aerial signage ordinance specifically targeted navigable airspace as "an area where there has been a history of significant federal presence."[215] Skysign tried to argue that the federal regulation of airspace preempted the state regulations, but

208. *See, e.g.*, Richard Briffault, *Home Rule for the Twenty-First Century*, 36 URB. LAW. 253, 258–59 (2004) ("If all political decisions were centralized at the state level, it would be difficult to vary these policies to take into account varying local needs, circumstances, and preferences . . . . Home rule permits cities and suburbs, liberal communities and conservative communities, ethnically diverse and ethnically homogeneous settings, to adopt policies that reflect their differing values and conditions. It thus increases the likelihood that people will be happy with their government.").

209. *See* 7A EUGENE MCQUILLIN, THE LAW OF MUNICIPAL CORPORATIONS § 24:471 (3d ed. 2014) ("Fireworks ordinances enacted by municipalities are ordinarily sustained as a valid exercise of their police power." (citation omitted)).

210. *See* Jaime Bouvier, *Illegal Fowl: A Survey of Municipal Laws Relating to Backyard Poultry and a Model Ordinance for Regulating City Chickens*, 42 ENVTL. L. REP. 10888, 10903–17 (2012) (surveying residential chicken-raising ordinances in the 100 most populous United States cities and determining that backyard chicken raising is permitted under certain conditions in residential areas within most of the nation's largest cities).

211. Sterbenz, *supra* note 25.

212. Skysign Int'l, Inc. v. City and Cty. of Honolulu, 276 F.3d 1109, 1113 (9th Cir. 2002).

213. *Id.*

214. HONOLULU, HAW., REV. ORDINANCES § 40-6.1 (1990 & Supp. 1996).

215. *Skysign Int'l*, 276 F.3d at 1116 (quoting United States v. Locke, 529 U.S. 89, 108 (2000)).

since the certificates specifically referenced state and local law, that argument ultimately failed.[216]

Some states focus on the purpose of the drone flight rather than the flight itself. In Tennessee, it is a crime to use "a drone with the intent to conduct video surveillance of private citizens who are lawfully hunting or fishing without obtaining the written consent of the persons being surveilled prior to conducting the surveillance."[217] Similarly, in Barstow, California, a UAS cannot be operated "in a manner that harasses, startles, or annoys pedestrians or vehicles."[218]

2. Prevention of Drones

In addition to possible civil liability for unwelcome drone usage, some landowners are taking matters into their own hands. For example, NASCAR did not want drones flying over the Texas World Speedway during a race in Fort Worth, Texas, so it contracted with DroneShield to track and interdict unauthorized drones.[219] DroneShield claims that it coordinated with state and local Texas authorities to implement its solution to use a high-powered directional radio jammer called a "DroneGun" to protect the race.[220] However, the FCC warned that "it is illegal to use a cell phone jammer or any other type of device that blocks, jams or interferes with authorized communications. This prohibition extends to every entity that does not hold a federal authorization, including state and local law enforcement agencies."[221] In addition to prohibiting signal jamming, there are additional legal issues associated with attempts to intercept and disable aircraft, including unmanned aircraft. Section 32(a)(1) of Title 18 provides that, "[w]hoever willfully . . . sets fire to, damages, destroys, disables, or wrecks any aircraft" is guilty of a federal felony.[222] That provision has not yet been used in the context of drones, but it could be applied in the future. Typically, drone countermeasures, including signal jammers, are only permitted to be used by the United States Department of Defense to protect military installations.[223]

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216. *Id.* at 1114.

217. TENN. CODE ANN. § 70-4-302(a)(6) (2014).

218. BARSTOW, CAL. CODE OF ORDINANCES § 9.66.020(b) (2017).

219. Turner & Baxenberg, *supra* note 130.

220. *Id.*

221. 47 U.S.C. § 333 (2018) ("No person shall willfully or maliciously interfere with or cause interference to any radio communications of any station licensed or authorized by or under this chapter or operated by the United States Government.").

222. 18 U.S.C. § 32(a)(1) (2018).

224. *See* Turner & Baxenberg, *supra* note 130.

Another form of drone defense is the drone catcher, invented by Mo Rastgaar, an associate professor of mechanical engineering at Michigan Technological University.[224] His theory was that even if there were a legitimate security interest to disable a drone, like threatening a military installation or the White House, shooting it down could create additional problems, so he devised a way to catch the drone with a net and take it safely to the ground.[225]

3. University Regulation

Some universities are prohibiting the use of drones on campus. For example, the University of Notre Dame's Standards of Conduct state that "the University prohibits any student from using Unmanned Aerial Systems (UAS), or Drones, on campus."[226] Similarly, Janielle Tchakerian, Assistant Vice President for Student Affairs for Saint Mary's College said, "Since Saint Mary's College is in the flight path to the South Bend airport, we wanted to inform our students that for the safety of the manned aircrafts flying above our campus that drones are prohibited."[227]

V. ADDITIONAL TORTS

A. *Nuisance*

One might argue that interference by a drone is closer to a nuisance than a trespass. A nuisance claim requires a person or object to interfere with the landowner's ability to use and enjoy his or her land.[228] However,

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224. Marcia Goodrich, *Drone Catcher: "Robotic Falcon" Can Capture, Retrieve Renegade Drones*, MICH. TECH (Jan. 7, 2016, 10:17 AM), http://www.mtu.edu/news/stories/2016/january/drone-catcher-robotic-falcon-can-capture-retrieve-renegade-drones.html.

225. *Id.* ("What makes this unique is that the net is attached to our catcher, so you can retrieve the rogue drone or drop it in a designated, secure area. It's like robotic falconry.").

226. *Prohibition on Drones and Unmanned Aerial Systems*, U. NOTRE DAME, http://dulac.nd.edu/community-standards/standards/drones/ (last visited Oct. 25, 2018); *Game Day Policies*, U. NOTRE DAME (Oct. 29, 2016), https://gameday.nd.edu/news/stadium-bag-policy/ ("The Federal Aviation Administration (FAA) prohibits the operation of any UAS within a 5 mile radius of an airport. Given the University's proximity to the South Bend International Airport (SBN), any use of UAS on campus is strictly prohibited."). However, the University of Notre Dame Wireless Institute is working with the city of South Bend to test advanced wireless research using a drone. Erin Blasko, *South Bend and Notre Dame Demonstrate Next-Gen Wireless*, SOUTH BEND TRIB. (Mar. 21, 2017), https://www.southbendtribune.com/news/local/south-bend-and-notre-dame-demonstrate-next-gen-wireless/article_cf50c778-c15c-5d41-91aa-c60b696d2872.html.

227. Nicole Caratas, *Saint Mary's Bans 'Hoverboards' and Drones*, OBSERVER (Jan. 15, 2016), http://ndsmcobserver.com/2016/01/hoverboards-and-drones-banned-at-smc/.

228. Martin v. Reynolds Metals Co., 342 P.2d 790, 795 (Or. 1959); *see also* Int'l Union of Painters & Allied Trades Dist. Council 15 Local 159 v. Great Wash Park, LLC, No. 67453, 2016 WL 4165919, at *8 (Nev. Ct. App. July 29, 2016) (Tao, J., concurring) (pointing out that nuisance requires an inquiry "into whether the intensity, duration, or other qualities" of the objectionable

a nuisance claim can succeed even if the interference flew over the neighbor's adjoining land, but not directly into plaintiff's airspace, as long as the flight constitutes a substantial and unreasonable interference with the use and enjoyment of the land.[229] UAVs present a threat as both a trespass and a nuisance with their ability to physically invade private property as well as interfering with the enjoyment of one's private property.[230] As noted in *Hinman*, however, the rights to the use of one's land may not be fixed.[231]

According to Robert L. Ellis,[232] "[a] century ago, a court expressed what might be called the 'noises of progress' principle when dismissing a property owner's nuisance claim against a railroad: 'A material amount of noise is produced . . . . by modern civilization.'"[233] He went on to point out that "[i]n another early case, the court refused to enjoin a business from staying open late and attracting traffic, pointing out that the recent appearance of automobiles on the roads, including at night, had become normal 'but would some years ago have been considered a nuisance.'"[234] It is unclear whether courts will apply the "noises of progress" principle to drone nuisance lawsuits or if they will allow drone nuisance claimants

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interference were unreasonable or excessive, whereas there is no such analysis in a trespass claim—either there was an interference or there was not). *See generally* RESTATEMENT (SECOND) OF TORTS § 821D (AM. LAW INST. 1979) (distinguishing trespass as an interference with a property owner's right to exclusive possession of a property from a nuisance, which is an interference with the owner's use or enjoyment of the property).

229. ALISSA M. DOLAN & RICHARD M. THOMPSON II, CONG. RES. SERV., INTEGRATION OF DRONES INTO DOMESTIC AIRSPACE: SELECTED LEGAL ISSUES 11 (Apr. 4, 2013), https://fas.org/sgp/crs/natsec/R42940.pdf.

230. A drone might also be considered a projectile, which has also been held to be actionable trespass. *See* RESTATEMENT (SECOND) OF TORTS § 158 cmt. i ("[I]n the absence of the possessor's consent or other privilege to do so, it is an actionable trespass to throw rubbish on another's land . . . or to fire projectiles . . . through the air above it, even though no harm is done to the land or to the possessor's enjoyment of it."); *see also* Eugene Volokh, *Is Projecting a Message onto the Wall of a Building a Trespass? A Nuisance?*, WASH. POST (Aug. 17, 2016), https://www.washingtonpost.com/news/volokh-conspiracy/wp/2016/08/17/is-projecting-a-message-onto-the-wall-of-a-building-a-trespass-a-nuisance/?utm_term=.92044cd016d5.

231. Hinman v. Pac. Air Transp., 84 F.2d 755, 758 (9th Cir. 1936) ("We own so much of the space above the ground as we can occupy or make use of, in connection with the enjoyment of our land. This right is not fixed. It varies with our varying needs and is coextensive with them. The owner of land owns as much of the space above him as he uses, but only so long as he uses it."); *see also* Geller v. Brownstone Condo. Ass'n, 402 N.E.2d 807, 809 (Ill. App. Ct. 1980) ("And to constitute an actionable trespass, an intrusion has to be such as to subtract from the owner's use of the property.").

232. Robert L. Ellis, *Mastering Small Unmanned Aircraft Systems Regulations*, ROSSDALE CLE 6 (Sept. 14, 2017).

233. *Id.* (citing Dean v. S. Ry. Co. in Mississippi, 73 So. 55, 56 (Miss. 1916)).

234. *Id.* (citing Thoenebe v. Mosby, 101 A. 98 (Pa. 1917)).

to succeed where they can prove their injury to be "real, material, and substantial."[235]

B. *Invasion of Privacy*

While privacy issues are beyond the scope of this Article, they are worth a mention. United States Senate Bill 631, the "Drone Aircraft Privacy and Transparency Act of 2017," provides that "[t]he Secretary of Transportation shall establish procedures to ensure that the integration of unmanned aircraft systems into the national airspace system is done in compliance with the privacy principles."[236] While speaking at Oklahoma City University School of Law in September 2014, Supreme Court Justice Sonia Sotomayor called the changes in surveillance "frightening":

> There are drones flying over the air randomly that are recording everything that's happening on what we consider our private property. That type of technology has to stimulate us to think about what is it that we cherish in privacy and how far we want to protect it and from whom.[237]

It may be true that a spying drone is a little creepy, but we are incidentally seen by people every day. We often end up in the background of someone's cell phone video, and certainly internet browsers are recording our every move.[238] "Drones' size, price, and noisiness also make them faulty surveillance devices. If people want to spy, they'd achieve better results installing a hidden camera in a tree or on a windowsill."[239]

VI. FUTURE FOR DRONE OPERATORS

The recent emergence of blockchain technology provides a potential solution to the increasing use of drones at low altitudes over private property. No matter the reason for drone operation, landowners could be able to financially capitalize this use of their low-altitude, private airspace. AERO Token is an Ethereum-based blockchain technology that

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235. *See id.* (citing Elmer v. S.H. Bell Co., 127 F. Supp. 3d 812, 825 (N.D. Ohio 2015)).

236. Drone Aircraft Privacy and Transparency Act of 2017, S. 631, 115th Cong. § 337 (applying privacy principles to commercial and public use, but not to news gathering or hobbyists), https://www.congress.gov/bill/115th-congress/senate-bill/631/text.

237. Sterbenz, *supra* note 25.

238. *Your ISP Is Tracking Every Website You Visit: Here's What We Know*, PRIVACYPOLICIES.COM, https://www.privacypolicies.com/blog/isp-tracking-you/ (last updated Aug. 6, 2019).

239. *Id.*

offers a glimpse of how blockchain can transform the aerial highway in the future.[240] The company behind the AERO technology provides a way for landowners, known as "hosts," to grant avigation easements for authorized drone service providers over private property.[241] Participants would make their airspace available on the blockchain and then generate additional income via digital currency each time they grant access for drones to pass through their airspace.[242]

The AERO Foundation proposes the use of uniform Revocable Avigation Easements, which would allow for landowners to grant access to commercial drone service providers within the AERO Network.[243] The AERO Network is the platform through which the hosts and drone service providers operate.[244] The AERO Network validates the hosts' requests to allow use of private airspace and then notifies all drone service providers of low-altitude airspace availability.[245] Drone service providers may also request permission to enter specific navigable airspace if a host has not initially authorized use on the network.[246] The additional income generated by this network benefits the government in addition to hosts and operators. Income from temporary easements is treated as rental income under IRS tax laws in the United States, which is generally taxed as regular income.[247] Although it is not widely used and accepted at the moment, the AERO Token Network provides a framework that could benefit all parties involved. Landowners can be compensated for allowing use of their private airspace, drone operators would be given a clear flight pattern that would reduce the possibility of trespass, and the government could collect extra income taxes from easement income.

Missy Cummings, professor of mechanical engineering and director of the Humans and Autonomy Lab at Duke University suggests that "perhaps Starbucks could be your intermediary point. You're not really going to deliver to everyone's home. Do you want drones to land in a backyard with a dog?"[248] Just as Amazon has Amazon lockers for its standard automobile deliveries,[249] maybe those centers will need to be

240. HAYLEY HALPIN ET AL., AERO TOKEN, CREATING A DRONE SUPERHIGHWAY USING THE BLOCKCHAIN (2017), https://icosbull.com/whitepapers/3110/AERO_Token_whitepaper.pdf.

241. *Id.*

242. *Id.* at 12.

243. *Id.* at 21.

244. *Id.* at 30.

245. *Id.* at 32.

246. *Id.* at 30.

247. *See* I.R.S. Priv. Ltr. Rul. 201250008 (Dec. 14, 2012).

248. Knight, *supra* note 30.

249. John-Michael Bond, *Amazon Locker Ensures You Never Have Another Package Stolen*, DAILY DOT (Feb. 23, 2018, 5:45 AM), https://www.dailydot.com/debug/what-is-amazon-locker/.

attended by someone who could meet a drone, take the package, and send it back on its way.

CONCLUSION

When drones burst onto the scene, they blurred the lines in an already grey area of the law—the intersection of uncontrolled navigable airspace and property rights. The historical belief was that the property held by an owner on the ground extended all the way to the heavens, but that is no longer the case.[250] Technology has developed at a blistering pace, first through architectural feats, then air travel, and now through drone usage. With each new technological development, the courts face difficult challenges in determining the precise rights of landowners.

Drones have made matters even more difficult because operators use them for such a wide variety of reasons. Many governmental bodies, such as police, fire departments, and search and rescue units, use them for public-safety concerns.[251] Many private companies are rapidly increasing their use of drones for operations, ranging from building or site inspections, land surveying, or package delivery.[252] Drones have also taken hobbyists by storm, who operate them to take pictures or simply for fun.[253] One thing is for certain: Drones are here to stay.

The FAA has tried to provide some clarity for drone operators through their airspace classifications of controlled airspaces: Classes A through E, and the uncontrolled Class G airspace in which UAVs operate.[254] In addition, current FAA legislation states that unless a waiver is obtained to operate BVLOS, UAV operators must keep their drones within VLOS.[255] However, it is easy for drone operators to violate these restrictions with the advanced technology that drones possess.

The huge number of drones operating in the United States also presents a great challenge for the courts because there is so little legislation and minimal precedent regarding their use. Many analogous cases addressing aerial trespass that drone operators could use in courts of law were decided over fifty years ago—way before drones were even a thought.[256] Moving forward, the number of cases dealing with aerial drone trespasses will likely greatly increase because of the explosion of UAV popularity and the lack of concrete enforcement measures.

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250. *E.g.*, Pyramid Coal Corp. v. Pratt, 99 N.E.2d 427 (Ind. 1951).

251. *See* Franzen, *supra* note 43; *see also* Nelson, *supra* note 43.

252. *See* IDENTIFIED TECHS., *supra* note 47; Frumkin, *supra* note 50; Knight, *supra* note 30.

253. *See* Schloss, *supra* note 24.

254. FED. AVIATION ADMIN., *supra* note 77.

255. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 336, 126 Stat. 11, 77 (2012).

256. *See supra* Section III.A.

AERO Network provides a potential model that could create a consensus among private landowners and drone operators, as both sides would benefit. Although currently promoted through blockchain technology that many citizens do not yet understand, the AERO Network could benefit every party that has a stake in UAV use. Through this network, private landowners gain AERO Tokens, a digital currency, for allowing use of their low-altitude, navigable airspace.[257] Drone operators can have peace of mind operating their UAVs through airspace with the consent of landowners. Finally, the government will benefit by receiving extra income tax dollars through income earned from the temporary avigation easements.[258] After all, real estate developers have been trading in airspace rights for years and have annexed airspace above and around development properties for fees that can be many millions of dollars.[259]

The possibilities that drones provide are exciting for the future. However, courts are just beginning to feel the ramifications of this new technology. They have little concrete guidance in their decisions regarding what constitutes privately owned airspace. Furthermore, enforcement is and will be extremely difficult if they follow previous analogous court rulings, which hold that a mere intrusion by as little as one foot is a trespass.[260] Drones are not going away, so courts, state legislatures, and the federal government must come together to provide clarity to drone operators and private landowners concerning their rights.

257. HALPIN ET AL., *supra* note 240, at 28.

258. *See id.* at 12.

259. Finn, *supra* note 68 ("Air rights are, in actuality, not fluffy chunks of available or orphaned air. They are unused or excess development rights gauged, like building density or lot size, by the square foot and transferable, when zoning permits it, from one buildable lot to another.").

260. Ellis v. Loftus Iron Co. [1874], 10 LRCP 10 (Eng.).