

12-1-2023

From Blue Skies to Gray Areas: Examining Privacy and Property Law in the Age of Drone Technology

Cheng-chi (Kirin) Chang
Tsinghua University

Follow this and additional works at: <https://scholarship.richmond.edu/jolt>

Recommended Citation

Cheng-chi (Kirin) Chang, *From Blue Skies to Gray Areas: Examining Privacy and Property Law in the Age of Drone Technology*, 30 Rich. J.L. & Tech 1 (2024).

Available at: <https://scholarship.richmond.edu/jolt/vol30/iss1/1>

This Article is brought to you for free and open access by the Law School Journals at UR Scholarship Repository. It has been accepted for inclusion in Richmond Journal of Law & Technology by an authorized editor of UR Scholarship Repository. For more information, please contact scholarshiprepository@richmond.edu.

**FROM BLUE SKIES TO GRAY AREAS: EXAMINING PRIVACY
AND PROPERTY LAW IN THE AGE OF DRONE TECHNOLOGY**

Cheng-chi (Kirin) Chang*

Cite as: Cheng-chi Chang, *From Blue Skies to Gray Areas: Examining Privacy and Property Law in the Age of Drone Technology*, 30 RICH. J.L. & TECH. 1 (2023).

* Law Research Assistant, Institute for Studies on AI and Law, Tsinghua University; J.D. Candidate, University of Florida Levin College of Law; LL.M., University of Arizona James E. Rogers College of Law; LL.B., National Chung Hsing University School of Law in Taiwan. I would like to express my sincere gratitude to Professor Jiaying Jiang and Professor Lisa Edgar for their invaluable guidance and support in the preparation of this article. I am also thankful for the insightful feedback provided by Rachel Cohen, Youyang Zhong, Kevin White, Anthony Evans, Li-Yin Hsiao, Jack Goodman, and Renee Wan, which enriched the content of this paper. Special thanks to RiRi Wan for her thorough research support. Additionally, I would like to extend my appreciation to the editors of the Richmond Journal of Law and Technology for their assistance in bringing this article to publication. Any errors or omissions are my sole responsibility.

ABSTRACT

This article presents a comprehensive analysis of the legal frameworks governing the use of drones in both the United States and the European Union, and the privacy and property rights issues that arise from their use. The article emphasizes the importance of balancing the benefits of drone technology with the protection of individual rights. The regulatory frameworks governing drones are compared between the two jurisdictions, highlighting key similarities and differences. Furthermore, the article delves into the legal challenges surrounding drone usage and property rights, offering several solutions to address privacy concerns.

In conclusion, the article highlights the need for a proper balance between the rights of landowners and drone operators and greater clarity in the United States law regarding airspace rights over low-altitude airspace above an individual's land. The article recommends that state legislatures clarify landowners' rights to exclude drones from their property or that governments exercise eminent domain to condemn public drone pathways or corridors. It also suggests that transparency in the operation of drones over private property is necessary to promote accountability for potential privacy violations.

I. INTRODUCTION

[1] Drones, or unmanned aerial vehicles (UAVs), have rapidly become an essential part of various industries and military operations worldwide due to their efficiency and versatility.¹ However, the increasing use of drones has raised significant concerns about privacy and property rights, particularly regarding the airspace above landowners' property. The current legal frameworks in the US and the EU have not adequately addressed these concerns,² making it necessary to focus on the legal issues related to privacy and property rights in the context of drone use.

[2] This article aims to provide a comparative overview of the regulatory frameworks governing drones in the US and the EU. While the first half of the article will compare the legal framework of both regions, the second half will focus on the privacy and property laws in the US. The goal of this article is to identify similarities and differences in the design of the regulations across jurisdictions and demonstrate how the current legal frameworks in the US and the EU have addressed the challenges, particularly concerning privacy and property rights posed by the use of drones.

[3] To achieve this goal, this article will first examine the various components of drones, including their basic structure and functions. Then, it will provide a comparative overview of the regulatory frameworks governing drones in the US and the EU. Finally, the article will analyze how privacy and property law have been impacted by the use of drones in the US. By examining the current legal frameworks and analyzing the impact of drones on privacy and property rights, this paper will demonstrate the

¹ Syed Agha Hassnain Mohsan, et al., *Unmanned Aerial Vehicles (UAVs): Practical Aspects, Applications, Open Challenges, Security Issues, and Future Trends*, 16 INTELLIGENT SERV. ROBOTICS 109, 109 (2023).

² Ben Lutkevich & Alan R. Earls, *What is a drone?*, TECHTARGET, <https://www.techtarget.com/iotagenda/definition/drone> [<https://perma.cc/T74H-BPM3>] (last updated Dec. 2021).

significance of drones as a new technology and the importance of continued analysis and development of legal frameworks to address their use, and contribute to the ongoing debate on how to address regulatory challenges posed by drones.

II. INTRODUCTION TO DRONES

[4] Drones are now essential in various industries and military operations worldwide.³ Their tasks include rescuing avalanche victims and delivering everyday items.⁴ Nevertheless, their increasing use poses privacy issues on land and in the air.⁵ To address this, both the US and EU have established regulatory frameworks for commercial and recreational drones.⁶ Drones are a new, controversial technology with untapped potential uses.

[5] Drones, or unmanned aerial vehicles (UAVs), can be controlled remotely or operated autonomously using software-controlled flight plans.⁷ Drones have both military and civilian applications, including search and rescue, surveillance, monitoring, firefighting, videography, photography, and delivery services.⁸ They are selected for their enhanced safety and efficiency and can range from remotely piloted to highly autonomous.⁹ Despite their differences, all drones share common components, such as

³ *Id.*

⁴ Sam Daley, *Drone Technology: What Is a Drone?*, BUILT IN, <https://builtin.com/drones> [<https://perma.cc/VR9D-SXBV>] (last updated Mar. 23, 2023).

⁵ Lutkevich & Earls, *supra* note 2.

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

electronic speed controllers, GPS modules, flight controllers, batteries, antennas, receivers, cameras, and sensors.¹⁰

[6] Drones have cameras that can capture images and videos.¹¹ They are used for surveying and monitoring properties, agricultural land, power lines, and equipment.¹² Drones are useful for aerial photography, and some are designed specifically for this purpose.¹³ Firefighters can use drones with cameras to survey an affected area and determine the extent of the damage.¹⁴ Television networks use drones to capture footage of sporting events.¹⁵ Drones with cameras are small and light, with limited distance, speed, and height.¹⁶ Consumer drones with video and camera capabilities typically weigh 10 pounds or less and have various designs and technologies.¹⁷ Popular models of these drones have various features, such as sensors and stabilization technology.¹⁸

[7] Drones are widely used in agriculture to increase efficiency and reduce manual labor.¹⁹ They perform tasks that save farmers' time, such as

¹⁰ Lutkevich & Earls, *supra* note 2.

¹¹ Daley, *supra* note 4.

¹² Lutkevich & Earls, *supra* note 2.

¹³ Daley, *supra* note 4.

¹⁴ Lutkevich & Earls, *supra* note 2.

¹⁵ *Id.*

¹⁶ Daley, *supra* note 4.

¹⁷ *See* Lutkevich & Earls, *supra* note 2.

¹⁸ *Id.*

¹⁹ Daley, *supra* note 4.

field surveys, seeding, livestock tracking, and crop yield estimation.²⁰ Lidar remote sensing technology allows drones to measure crop height.²¹ Drones encourage sustainable farming practices and increase production.²² Another use for drones is in delivery services.²³ Delivery drones, also known as “last mile” delivery drones, are unmanned aircrafts used to transport goods from nearby stores or warehouses to customers.²⁴ Retailers such as Amazon, Walmart, Google, FedEx, and UPS use these autonomous drones to enhance their delivery services and minimize reliance on delivery drivers.²⁵ These drones can carry up to 55 pounds of goods.²⁶ Drones have various applications, including using biological sensors to measure air or water quality, surveying damage from forest fires, and aiding in emergency rescue situations.²⁷ The K-MAX drone, capable of carrying 6000 pounds of cargo, has been utilized in firefighting efforts in China and Australia.²⁸ Additionally, NASA and the U.S. Air Force have been testing drones for spacecraft technology and experiments, with the X-37B UAV circling the Earth for over two years.²⁹

²⁰ *Id.*

²¹ Lutkevich & Earls, *supra* note 2.

²² *Id.*

²³ *Id.*

²⁴ Daley, *supra* note 4.

²⁵ *See id.*

²⁶ *Id.*

²⁷ Lutkevich & Earls, *supra* note 2.

²⁸ Daley, *supra* note 4.

²⁹ *Id.*

[8] In wildlife conservation, drones are used to track and measure the health of animal populations and fight against poaching.³⁰ Drones are also used in reforestation efforts, dropping containers of seeds, fertilizers, and nutrients in areas affected by forest fires.³¹ In archaeology, drones create 3D renderings of historical sites.³² In medicine, drones transport medical supplies to remote areas and even organs for transplants.³³ A specially-made drone once transported a kidney between two hospitals in Maryland in under five minutes, improving the efficiency and safety of organ transportation.³⁴

[9] Overall, drones offer a wide variety of benefits in a wide variety of areas and are a technological advancement that has benefited humanity greatly. The future for drone technology is extremely optimistic, with companies such as Grandview Research predicting that revenue from the commercial drone market will reach \$501.4 billion in 2028, and MarketsAndMarkets stating that the drone services market will grow up to \$40.7 billion by 2026.³⁵ In addition, the Association for Unmanned Vehicle Systems International has predicted that the drone industry will create over

³⁰ *Id.*

³¹ *Id.*

³² William Harms, *Drones bring new dimension to archeology*, UCHI NEWS (Aug. 24, 2015), <https://news.uchicago.edu/story/drones-bring-new-dimension-archaeology> [<https://perma.cc/AH2N-BMBS>]; Daley, *supra* note 4.

³³ Franziska Stephan et al., *Human Drone Interaction in Delivery of Medical Supplies: A Scoping Review of Experimental Studies*, 17 PLOS ONE 2–3, 13 (Apr. 28, 2022), <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0267664> [<https://perma.cc/A7UC-L4EC>]; Robert Lee Hotz, *In Rwanda, Drones Deliver Medical Supplies to Remote Areas*, WALL ST. J., (Dec. 1, 2017, 5:48 AM), <https://www.wsj.com/articles/in-rwanda-drones-deliver-medical-supplies-to-remote-areas-1512124200> [<https://perma.cc/F5QS-9CCS>]; Daley, *supra* note 4.

³⁴ Daley, *supra* note 4.

³⁵ Lutkevich & Earls, *supra* note 2.

100,000 jobs in the United States by 2025.³⁶ The market for drones is increasingly growing and will become a more prominent industry every year.³⁷ Therefore, the regulation of drones by policymakers is becoming ever more relevant.

[10] Drones are regulated globally due to safety and privacy concerns.³⁸ Regulations limit drone usage, including prohibiting flights over certain areas for national security and safety.³⁹ Drones can be used for harmful purposes, such as carrying explosives or smuggling contraband.⁴⁰ Improper use or technical issues can also cause accidents.⁴¹ This article will examine drone regulations in the United States and European Union.

III. REGULATION OF DRONES IN THE US AND THE EU: A COMPARATIVE OVERVIEW

A. U.S. Regulation of Drones

[11] Under United States law, drones are regulated by the U.S. Federal Aviation Authority (FAA), which governs air travel and other aspects of

³⁶ *Id.*

³⁷ *See id.*

³⁸ *See id.*

³⁹ Ammar Mandourah & Hartwig Hochmair, *Analyzing the Violation of Drone Regulations in Three VGI Drone Portals Across the US, the UK, and France*, GEO-SPATIAL INFO. SCI. 1 (Nov. 1, 2022), <https://doi.org/10.1080/10095020.2022.2072240> [<https://perma.cc/3DGG-KCUR>].

⁴⁰ *Id.* at 2.

⁴¹ *Id.*

flying.⁴² Flying commercial drones was only legalized in 2006, and non-commercial flights were only permitted below 400 feet if operators followed an advisory regulation issued in 1981.⁴³ In 2012, the FAA Modernization and Reform Act of 2012 was passed, giving the U.S. Secretary of Transportation the authority to approve the use of commercial drones on a case-by-case basis.⁴⁴ In 2015, the FAA mandated the registration of drones, including those for recreational use, due to the increase in the number of drones, the threat of potential incidents, and the lack of any collision insurance on many drones.⁴⁵

[12] Until 2016, commercial businesses that used drone technology had to possess a pilot's license regardless of what industry they operated in.⁴⁶ In 2016, the FAA further relaxed its previous restrictions on drones, issuing the Small Unmanned Aircraft Systems Regulation, Part 107, which placed limits on autonomous or semi-autonomous drone operation.⁴⁷ These restrictions included restricting unmanned aircraft from flying outside the visual line of sight of the remote pilot, flying too far away from the pilot, operating above anyone not directly participating in their operation, under a covered structure, or inside a covered stationary vehicle, and flying during nighttime, as well as forcing drones to yield the right of way to other aircraft.⁴⁸

⁴² *Drone Laws in the United States of America*, UAV COACH (Dec. 10, 2022), <https://uavcoach.com/drone-laws-in-united-states-of-america> [<https://perma.cc/CBW9-YYBD>] [hereinafter *U.S.A Drone Laws*].

⁴³ Lutkevich & Earls, *supra* note 2.

⁴⁴ *Id.*

⁴⁵ Mandourah & Hochmair *supra* note 39.

⁴⁶ Daley, *supra* note 4.

⁴⁷ Lutkevich & Earls, *supra* note 2.

⁴⁸ *Id.*

[13] In 2018, the FAA Reauthorization Act of 2018 was passed, setting new conditions for recreational drone use and setting out different rules for commercial and personal drone use.⁴⁹ For example, a Remote Pilot Certificate is required to fly drones for commercial use, commercial UAVs must be registered with the FAA and flown under 100 mph, and both recreational and commercial pilots are limited to a maximum height of 400 feet.⁵⁰ In 2021, the FAA updated Part 107 to permit regular operations above individuals and during the nighttime, under certain circumstances.⁵¹

[14] To ensure compliance with FAA regulations, recreational drone usage necessitates passing the Recreational UAS Safety Test (TRUST) and registering the UAV with the FAA.⁵² Community-based safety guidelines must also be adhered to, and drones must be operated within the visual line of sight.⁵³ Furthermore, recreational drones cannot weigh more than 55 pounds unless they are certified by a FAA-recognized Community-Based Organization.⁵⁴ Additionally, they must not be flown in proximity to other aircraft or emergency response efforts.⁵⁵ The FAA has designated different categories of airspace, including Class G, B, C, D, and E, with Class G airspace being the only airspace where recreational drones can be flown.

⁴⁹ *Id.*

⁵⁰ *Id.*

⁵¹ *Id.*

⁵² See *Recreational Flyers & Community-Based Organizations*, FAA, https://www.faa.gov/uas/recreational_flyers [<https://perma.cc/E4XY-9M62>] (last updated Aug. 7, 2023).

⁵³ *Id.*

⁵⁴ *Id.*; *FAA-Recognized Community Based Organizations*, FAA, <https://www.faa.gov/uas/recreationalfliers/faa-recognized-community-based-organizations> [<https://perma.cc/ZDJ6-YLZ8>] (last updated Apr. 13, 2023).

⁵⁵ *U.S.A. Drone Laws*, *supra* note 42.

Prior authorization is required for flying in Class B, C, D, or E controlled airspace.⁵⁶

[15] On the other hand, commercial drones are subject to even more FAA restrictions than recreational drones.⁵⁷ Individuals who wish to use drones for commercial purposes must register with the FAA and obtain a Remote Pilot Certificate.⁵⁸ The Aeronautical Knowledge Test and English proficiency are mandatory for obtaining the Remote Pilot Certificate.⁵⁹ Additionally, commercial drone pilots must pass the TRUST test, be over 16 years old, and undergo TSA security screening.⁶⁰ The drone, including any payload, must weigh less than 55 pounds at takeoff and must be flown within the visual line of sight of the pilot.⁶¹ Commercial drones must fly at or below 400 feet and at or below 100 mph, and the pilot must yield the right of way to manned aircraft.⁶²

[16] Laws regarding drone operation vary from state to state, each having its own unique regulations.⁶³ In Arizona, municipalities with more than two public parks must allow drones in at least one of them.⁶⁴ Meanwhile, in

⁵⁶ *Id.*

⁵⁷ *See id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

⁶⁰ *U.S.A. Drone Laws, supra* note 42.

⁶¹ 14 C.F.R. § 107 (2021).

⁶² *Id.*

⁶³ *See New Drone Laws in the USA*, DRONE U (Mar. 28, 2023), <https://www.thedroneu.com/blog/usa-drone-laws-regulations-by-state> [<https://perma.cc/LB27-RPVL>].

⁶⁴ ARIZ. REV. STAT. § 13-3729 (LexisNexis 2016).

Minnesota, commercial drone operators must hold a commercial operations license and have their drones insured.⁶⁵ In addition, numerous states restrict the flying of drones over hazardous facilities such as prisons, gas, water, and electrical facilities, and petroleum and chemical plants.⁶⁶ It is clear that the United States has a vigorous framework for the regulation of commercial and recreational drones, although various local governments have imposed their own regulations.

B. European Union's Regulation of Drones

[17] The European Union regulates the commercial and recreational use of drones through regulations issued by the European Union Aviation Safety Agency (EASA).⁶⁷ As of 2021, the EASA has standardized drone regulations throughout its member states, and these regulations have been adopted by non-member states such as Iceland, Switzerland, Lichtenstein, and Norway.⁶⁸ The EASA regulations classify drones into three operational categories based on their weight and intended use: Open, Specific, and Certified.⁶⁹ The Specific category applies to drones with a higher operational risk and requires the remote pilot to conduct a predefined risk assessment (PDRA) and receive approval from the National Aviation Authority (NAA) prior to the operation.⁷⁰ The Certified category applies to

⁶⁵ MINN. STAT. § 360.59 (2021).

⁶⁶ Mandourah & Hochmair, *supra* note 39.

⁶⁷ *Civil drones (unmanned aircraft)*, EASA PRO, <https://www.easa.europa.eu/en/domains/civil-drones> [<https://perma.cc/H8LX-X62V>] (last updated Sept. 6, 2023).

⁶⁸ *Drone Laws in the European Union*, UAV COACH (Dec. 13, 2022), <https://uavcoach.com/drone-laws-in-the-european-union> [<https://perma.cc/AS3X-Z8CX>] [hereinafter *E.U. Drone Laws*].

⁶⁹ *Id.*

⁷⁰ *Id.*

drones with high-risk operations, such as those involving large drones and transporting humans or dangerous goods.⁷¹

[18] To operate a drone in an EASA member state, operators must complete an online training course, and remote pilots must be familiar with the drone manufacturer's manual and operation instructions.⁷² Training for the specific and certified categories may require additional certification for the operator, depending on the intended operation.⁷³ As with the United States, the regulatory framework governing drone technology is complex.

C. Comparing US and EU Drone Regulations: Key Differences

[19] The usage of drones is regulated in both the United States and the European Union, with some notable similarities and differences in their respective regulatory frameworks. In the United States, drones are classified as either commercial or recreational, depending on their usage. On the other hand, the European Union employs a three-tiered system based on the level of risk associated with drone operations.⁷⁴

[20] In addition to this fundamental difference, the EU also regulates drones in the Open category further by dividing them into three additional subcategories based on their class identification label and weight.⁷⁵ It is essential to note that the European Union began regulating the use of drones

⁷¹ *Id.*

⁷² *Id.*

⁷³ *E.U. Drone Laws*, supra note 68.

⁷⁴ Dan Wawrzyn, *Commercial Drone Laws and Regulations in the US, Australia, and Europe: What You Need to Know*, PROPELLER, <https://www.propelleraero.com/blog/commercial-drone-regulations-in-australia-the-u-s-and-europe-the-basics-you-need-to-know> [<https://perma.cc/2MU3-T6AF>] (last visited Sept. 28, 2023).

⁷⁵ *Id.*

around the same time the United States did, proposing the regulations in 2015 and implementing a comprehensive plan for citizen participation and feedback.⁷⁶ Furthermore, in December 2016, the EASA published the Terms of Reference for the final ruling, outlining the regulatory framework for drone usage.⁷⁷ These regulatory differences have practical implications for drone operators in their respective jurisdictions. Therefore, it is crucial to understand the differences in drone regulations to ensure compliance with the appropriate standards and avoid potential legal consequences.

[21] The current value options of European and American drone norms are extremely similar because both the FAA and the EASA restrict drones from being flown near crowds of people, as discussed in Section 107 in the United States, and the Specific Operational Risk Assessment (SORA) in the European Union.⁷⁸ These measures demonstrate the commitment of regulatory authorities in both regions to minimize the risk of harm to individuals and property resulting from drone operations. Although the United States and the European Union employ different metrics, the use of drones is regulated according to their usage with the welfare of the common citizens in mind.⁷⁹ In addition, drone operators must pass assessments for licensing and special assessments for potentially dangerous purposes.⁸⁰ Safety precautions are taken in both jurisdictions to ensure safe drone operations.

⁷⁶ Juan Plaza, *How Does Drone Regulation in the United States Compare with Laws in Europe?*, COM. UAV NEWS (Mar. 8, 2017), <https://www.commercialuavnews.com/infrastructure/drone-regulation-united-states-compare-laws-europe> [<https://perma.cc/5Q5J-CZ6P>].

⁷⁷ *Id.*

⁷⁸ Wawrzyn, *supra* note 74.

⁷⁹ *Id.*

⁸⁰ *Id.*

D. US and EU Regulations for Commercial Drones: Differences and Similarities

[22] There are also key differences and similarities regarding the regulations imposed on commercial drones by both the United States and the European Union. Both jurisdictions have a fragmented regulatory environment, with the United States having drone regulations passed in all 50 individual states, as well as over 3,000 counties and 19,000 cities, all of which have the capacity to pass laws and ordinances regulating the use of drones without the interference of the federal government.⁸¹ For example, at the end of 2015, a few months before Part 107 was passed by the FAA, over 20 states, in addition to major cities such as Chicago, Miami, and Los Angeles had approved stringent regulations restricting the use of drones over populated areas.⁸² The FAA had to reach out to individuals in these local governments and inform them that the FAA had sole jurisdiction over the airspace of the United States.⁸³

[23] The regulatory framework of the European Union is even more fragmented since the European Union consists of 28 independent countries, all of which have their own individual legal and political regimes.⁸⁴ In 2021, the EASA took the step of replacing each individual European Union member's existing laws on the commercial operation of drones and on drone operation in general with a set of standards applicable to all drone operators.⁸⁵ Non-EU member states Iceland, Switzerland, Liechtenstein, and Norway have also adopted these new regulations, which set out the

⁸¹ Plaza, *supra* note 76.

⁸² *Id.*

⁸³ *Id.*

⁸⁴ *Id.*

⁸⁵ Wawrzyn, *supra* note 74.

Open, Specific, and Certified categories for drone operation.⁸⁶ Individual countries also have their own laws related to drones, with Austria requiring drone operators to have insurance for about \$1 million U.S. dollars, France requiring operator ID labels and proof of drone insurance, and several nations prohibiting flights beyond the visual line of sight.⁸⁷ The United Kingdom, since the Brexit referendum, is no longer part of the European Union but maintains its drone regulations under its Civil Aviation Authority (CAA) consistent with those of the EASA.⁸⁸ Drone regulations in the European Union vary, but all have the same or substantially similar features.

[24] Drones are regulated in both the United States and the European Union, with restrictions placed on who can operate one and where they can be operated.⁸⁹ In addition, both jurisdictions regulate drones according to their use, and the European Union places complex regulations on drones based on their weight, the operator's skill level, and the level of potential danger of their use.⁹⁰ Both jurisdictions, along with nearly every other country in the world, have regulations distinguishing between recreational and commercial flights, with recreational flights having slightly fewer restrictions.⁹¹ Also, both jurisdictions set a maximum height level between 300 and 400 feet, commonly accepted as the safest height a drone can fly without interfering with airplanes or other aircraft, and both restrict flying

⁸⁶ *Id.*

⁸⁷ Jason Reagan, *Your Guide to International Drone Rules & Regulations*, DRONEGENUITY (Jan. 2020), <https://www.dronegenuity.com/international-drone-laws-requirements> [<https://perma.cc/QYM6-6QFT>].

⁸⁸ *Id.*

⁸⁹ *Id.*

⁹⁰ *Id.*

⁹¹ *Id.*

over people or crowds due to the risk to bystanders.⁹² There are also restrictions on flying drones under the influence of drugs or alcohol, not allowing the drone to get out of eyesight, and restrictions on nighttime drone operation.⁹³ It is clear that policymakers have considered the potential for accidents or other dangerous conditions from drone operations in drafting regulations, as the use of drones for both commercial and recreational purposes is one that is heavily regulated by the relevant governmental entities.⁹⁴

[25] The worldwide drone market is expected to triple in market sales to \$14.3 billion over the next ten years, a projection that underscores the urgent need for clarity in laws and regulations related to drones.⁹⁵ Based on the above analysis, to effectively address the challenges posed by the rapid growth of the worldwide drone market, it is crucial to establish clear laws and regulations related to drone use. While policymakers in the U.S. and EU have drafted regulations with safety in mind, there are still unresolved issues surrounding privacy and property rights. Specifically, the use of drones raises significant concerns about the airspace above landowners' property, which current legal frameworks have not adequately addressed.⁹⁶ To ensure the protection of individual rights and freedoms, it is necessary to focus on the legal issues related to privacy and property rights in the context of drone use. This article aims to contribute to the ongoing debate on how to address regulatory challenges posed by drones. It is important to note that there are research limitations, given the vastly different legal

⁹² See Reagan, *supra* note 87; see also *Small Unmanned Aircraft Systems (UAS) Regulations*, FAA (Oct. 6, 2020), <https://www.faa.gov/newsroom/small-unmanned-aircraft-systems-uas-regulations-part-107> [<https://perma.cc/YG3V-RKT2>].

⁹³ Reagan, *supra* note 87.

⁹⁴ See *id.*

⁹⁵ *Id.*

⁹⁶ See Daley, *supra* note 4.

systems in the European Union and elsewhere. As such, this article focuses primarily on the application of these issues to U.S. jurisdiction.

[26] Focusing on privacy and property rights issues related to drones is necessary to identify gaps in the legal landscape and develop effective legal frameworks that balance the benefits of drone technology with the protection of individual rights. In particular, these issues have important ramifications for police surveillance and the Fourth Amendment's prohibition on unreasonable searches and seizures, as well as the issue of eminent domain of private property and the need for adequate compensation. These are significant issues with serious potential consequences that require attention and viable reform measures, as discussed below.

IV. DRONE PRIVACY, AIRSPACE, AND PROPERTY LAW ISSUES

A. Overview

[27] The use of drones raises significant concerns surrounding privacy rights and airspace regulation.⁹⁷ Due to the cameras equipped on drones, operators can easily capture photographs and videos, potentially violating the privacy of individuals on the ground.⁹⁸ Although there have been laws enacted to prevent drones from intruding on the privacy of others, many operators continue to disregard these regulations, subjecting themselves to criminal or civil liability.⁹⁹

[28] Moreover, drones can reach altitudes comparable to those of jet planes, which creates the possibility of causing disasters or other emergency

⁹⁷ *Id.*

⁹⁸ Matthew Feeney, *Surveillance Takes Wing: Privacy in the Age of Police Drones*, CATO INST. (Dec. 13, 2016), <https://www.cato.org/policy-analysis/surveillance-takes-wing-privacy-age-police-drones> [<https://perma.cc/ZR7F-K8TT>].

⁹⁹ Daley, *supra* note 4.

situations.¹⁰⁰ Due to the difficulties in tracking drones using traditional air traffic radars, pilots of planes and helicopters may not be aware of the presence of these drones in the airspace, which could result in collisions.¹⁰¹ Additionally, drones may hinder emergency aircraft from providing assistance to those affected by natural disasters, such as wildfires, in certain areas like the American Southwest.¹⁰² To address these concerns, policymakers have introduced a variety of laws and regulations.

B. *Boggs v. Merideth*

[29] The ruling of a Kentucky federal court in the case of *Boggs v. Merideth* is illustrative of the kind of privacy issues that have arisen from drone usage.¹⁰³ In that case, Boggs filed a lawsuit against his neighbor, Merideth, who shot down Boggs' drone due to his belief that it was on his property.¹⁰⁴ Merideth alleged that the drone flew over his property multiple times as low as 10 feet and below the try line, but Boggs provided evidence that the drone did not fly over Merideth's property or at low altitude.¹⁰⁵ Merideth was arrested and charged with criminal mischief, and the case

¹⁰⁰ *Id.*

¹⁰¹ See, e.g., Fed. AVIATION ADMIN., AERONAUTICAL INFO. MANUAL, ENR 5.7 POTENTIAL FLIGHT HAZARDS (2023), https://www.faa.gov/air_traffic/publications/atpubs/aip_html/part2_enr_section_5.7.html [<https://perma.cc/KSS9-NNUD>].

¹⁰² Daley, *supra* note 4.

¹⁰³ See *Boggs v. Merideth*, No. 3:16-CV-00006-TBR, 2017 U.S. Dist. LEXIS 40302, at *1–2 (W.D. Ky. Mar. 21, 2017).

¹⁰⁴ Brady Getlan, *Boggs v. Merideth and the Present and Future Laws and Regulations of Drone Usage*, 7 U. BALT. J. LAND & DEV. 1,4 (2017).

¹⁰⁵ Elton F. Dean III, *Are UAVs Fair Game Over Private Land*, 13 NAT'L L. REV. (June 4, 2017), <https://www.natlawreview.com/article/are-uavs-fair-game-over-private-land> [<https://perma.cc/K4E3-4AFG>].

gained international attention as the “drone slayer” case, with Merideth’s supporters selling merchandise with the phrase to fund his legal defense.¹⁰⁶

[30] Boggs sought a judgment that said when a drone is in the air, it is considered an aircraft operating in federal navigable airspace, and thus was not violating Merideth’s privacy, so Merideth had no legal right to shoot the drone down.¹⁰⁷ The court dismissed the claim, stating that the claim should be litigated in state court as there was no question of federal law presented and only a claim based on Kentucky state law.¹⁰⁸ This ruling had the consequence that drone users would not be able to bring claims of trespass to chattels in federal court, and thus the individual states had great leeway to regulate the use of drones.¹⁰⁹

[31] The *Boggs* case also illustrates that privacy is a vital concern in the operation of drones because those being photographed or videotaped by a drone may feel privileged to destroy the drone, causing damage to the property of the owner as well as financial injury from the cost of the drone. Disputes like *Boggs* illustrate the fact that the rights of a landowner to the low-altitude airspace over their property is a controversial subject in the law, with many theories proposed for determining whether a landowner is privileged to control the low-altitude airspace over their property.¹¹⁰

¹⁰⁶ *Id.*

¹⁰⁷ Getlan, *supra* note 104, at 4–5.

¹⁰⁸ *Id.* at 5.

¹⁰⁹ *Id.* at 6.

¹¹⁰ Colin Cahoon, *Low Altitude Airspace: A Property Rights No-Man’s Land*, 56 J. AIR L. & COM. 157, 160 (1990).

C. Theories of Land Ownership and Airspace Boundaries

[32] Six theories have been formulated regarding land ownership and airspace rights: absolute ownership, public easement, privilege of flight tort, ownership to a fixed height, possible effective possession, and no ownership.¹¹¹ The theory of absolute ownership asserts that the owner of the land owns all the airspace above it without any limit.¹¹² However, this theory is inapplicable to cases involving commercial or recreational aviation, and no court has ever adopted it in an aviation case.¹¹³ The theory was first proposed by legal theorists like Sir Edward Coke during the pre-aviation era.¹¹⁴ The public easement theory holds that the owner of the land owns the airspace above their property, subject to a public easement to aviation traffic.¹¹⁵ Thus, a legal dispute may arise when the easement is misused.¹¹⁶ The privilege of flight tort theory posits that the landowner owns all the airspace above their property, but an aircraft is a privileged trespasser, and the property owner will only prevail if they can prove that the aircraft operator abused the privilege.¹¹⁷

[33] According to the ownership to a fixed height theory, the extent of a landowner's rights to airspace is defined by a horizontal boundary.¹¹⁸ The airspace above the boundary, which is a fixed particular altitude, is public

¹¹¹ *Id.* at 163.

¹¹² *Id.*

¹¹³ *Id.*

¹¹⁴ *Id.* at 164.

¹¹⁵ Cahoon, *supra* note 110.

¹¹⁶ *Id.*

¹¹⁷ *Id.*

¹¹⁸ *Id.* at 165.

property, while the airspace below it is the property of the landowner.¹¹⁹ This theory is the basis on which Congress designated altitudes as "navigable airspace" in regulating airspace for commercial aviation in the Air Commerce Act of 1926 and the Civil Aeronautics Act of 1938.¹²⁰ This legislation defined navigable airspace as 500 feet above the ground.¹²¹ The possible effective possession theory holds that a landowner's rights to airspace are limited to a fixed height of effective possession, which is determined by the nature of the land and its possible uses.¹²² This concept forces courts to determine the exact location of the property rights boundary in each case, and then the application of this theory is similar to the ownership to a fixed height theory in that all airspace above the effective possession of the landowner is public property.¹²³ The final theory is the no ownership theory, which holds that the landowner only has ownership rights to airspace that is actually occupied. An overflight is thus only compensable when there is actual physical damage to the underlying property.¹²⁴

[34] Except for the pure ownership theory, which would have required avigation easements from thousands of landowners throughout the United States for a single cross-country flight,¹²⁵ all of these approaches were adopted in various degrees by different jurisdictions in relation to the question of airspace ownership, with no consistent judicial standard set

¹¹⁹ *Id.*

¹²⁰ Stephen Migala, *UAS: Understanding the Airspace of States*, 82 J. AIR L. & COM. 3, 4, 81 (2017).

¹²¹ Troy A. Rule, *Airspace In An Age of Drones*, 95 B.U. L. REV. 155, 166 (2015); Migala, *supra* note 120, at 3.

¹²² Cahoon, *supra* note 110, at 165–66.

¹²³ *Id.* at 166.

¹²⁴ *Id.*

¹²⁵ Rule, *supra* note 121.

across the United States, an issue that was eventually resolved by the United States Supreme Court in *United States v. Causby*.¹²⁶

[35] The *Causby* case originated from a 1942 lawsuit filed by a North Carolina chicken farmer against the United States government.¹²⁷ The farmer alleged that the frequent, low overflight of military aircraft to a nearby airport, which had been leased to the federal government, was causing harm to his chickens and damaging his livelihood.¹²⁸ As the United States entered World War II, the airport became a hub for large military aircraft, including four-motored bombers that flew at tree-top level over the neighboring farm.¹²⁹ Some planes passed at a height of less than 83 feet above ground level and 67 feet above the roof of the plaintiff's home.¹³⁰ The noise and light from the planes caused the chickens to fly into the walls of their coop and die, devastating the farmer's business.¹³¹ Furthermore, the airplanes' night operations resulted in the family losing sleep due to the glare and noise of the aircraft.¹³² The local Court of Claims determined that these circumstances constituted a taking of the plaintiff's property that required just compensation from the United States government.¹³³

¹²⁶ See *United States v. Causby*, 328 U.S. 256, 264–65 (1946); Cahoon, *supra* note 110, at 166–67.

¹²⁷ *Drone Privacy: Is Anyone in Charge?*, CONSUMER REPORTS (Feb. 10, 2016), <https://www.consumerreports.org/electronics/drone-privacy-is-anyone-in-charge-a1127325389/> [<https://perma.cc/9YZN-PPCT>].

¹²⁸ *Id.*

¹²⁹ Cahoon, *supra* note 110, at 167.

¹³⁰ Rule, *supra* note 121, at 167.

¹³¹ *Id.*

¹³² *United States v. Causby*, 328 U.S. 256, 259 (1946).

¹³³ Cahoon, *supra* note 110, at 167–68.

[36] The Supreme Court took up the case, and it ruled that both the no ownership and absolute ownership theory were inapplicable because the plaintiffs had a legitimate property interest in the airspace over their land.¹³⁴ The Court’s opinion, delivered by Justice Douglas, stated that a property owner owned the “superadjacent” airspace above his or her property, and that a taking of property occurred when overflights were “so low and so frequent as to be a direct and immediate interference with the enjoyment and use of the land.”¹³⁵ The Court determined that there had been a taking of the plaintiff’s property and remanded the case back to the Court of Claims to determine the extent of the easement over the property.¹³⁶

[37] In response to the Court’s ruling, the United States government set an arbitrary limit to property rights over airspace at 83 feet if the landowner owned a house.¹³⁷ The *Causby* decision remains the only clear statement from the federal government about how far above the land a person’s property ends, which has important implications concerning privacy rights and the use of drones.¹³⁸ The *Causby* decision established the precedent that a landowner possesses airspace property rights over the “non-navigable” low-altitude airspace,¹³⁹ but those rights have definite limits.¹⁴⁰ This is an effective endorsement of the possible effective possession theory in that it fixed the landowner’s property rights at a horizontal boundary, dividing airspace into property “zones” and that this fixed boundary depends on the use of the land, because residential or commercial use of the land has the

¹³⁴ *Id.* at 168–69.

¹³⁵ *Id.*

¹³⁶ *Id.* at 170.

¹³⁷ *Drone Privacy: Is Anyone in Charge?*, *supra* note 127.

¹³⁸ *Id.*

¹³⁹ Cahoon, *supra* note 110, at 169, 171.

¹⁴⁰ *Id.* at 175.

potential for the violation of the boundary by aircraft to cause a significant nuisance.¹⁴¹ The Court in the *Causby* case in effect found that the possible effective possession theory of airspace property rights was the absolute minimum protection to which a landowner is entitled.¹⁴²

[38] In regard to the use of drones, there is a significant potential for the property rights of landowners to be negatively impacted, with reports of civilian drones crashing into buildings, having dangerously close encounters with helicopters, peeping into residential windows, and being shot down like in the *Boggs* case.¹⁴³ There remains an ambiguity in United States law regarding property airspace rights and drones.¹⁴⁴ There is not much clarity regarding the extent to which a landowner is entitled to exclude drones from flying in the airspace directly over his or her property because the *Causby* court did not specify the extent that the surface owners possessed the space below the 500-foot navigable airspace line.¹⁴⁵ This has proven to be problematic with the rise in drone technology which has given unprecedented access to low-altitude airspace to businesses and individuals, and the laws regarding airspace property rights were drafted to apply to large airplanes and helicopters.¹⁴⁶

[39] One aspect of the problem of airspace property rights and drones is related to the notion of aerial trespass, as the current laws do not provide definite boundaries for the columns of airspace controlled by landowners,

¹⁴¹ *Id.* at 165–66.

¹⁴² *Id.* at 170.

¹⁴³ *See* Rule, *supra* note 121, at 157; *see also* Getlan, *supra* note 104, at 4.

¹⁴⁴ *See* Rule, *supra* note 121, at 165.

¹⁴⁵ *See id.* at 168–69.

¹⁴⁶ *Id.* at 169–70.

leading to uncertainty as to where drones may fly on private property.¹⁴⁷ Therefore, in aerial trespass cases, courts must inquire as to where the “immediate reaches” of the plaintiff’s airspace are and whether the intrusion substantially interfered with the plaintiff’s use of his or her land, and a court could find that a drone was more similar to a projectile than an aircraft, leading to a different rule being issued.¹⁴⁸ There is, thus, great uncertainty as to how a court might rule in a drone trespass case, with the low-altitude airspace where most drones fly being dubbed a “property rights ‘no-man’s land’” where the rights of the landowner and the drone operator are unclear.¹⁴⁹

[40] In addition, this uncertainty could complicate takings claims involving drones as well, because a taking occurs “when government action results in aircraft flying over a landowner’s property low enough and with sufficient frequency to have a direct and immediate effect on the use and enjoyment of the property.”¹⁵⁰ The question for the courts is what constitutes “low enough” or “sufficient frequency” to trigger a taking requiring compensation, a question that gains more relevance with the increasing use of drone technologies by private individuals, businesses, and governments.¹⁵¹

[41] Low-altitude airspace has long been a difficult area to regulate under the law because it is unclear whether the property approaches for the land underneath it or the navigable airspace above it should be used in this space, where drones typically are flown.¹⁵² The private property system for surface

¹⁴⁷ *See id.* at 170.

¹⁴⁸ *Id.*

¹⁴⁹ Rule, *supra* note 121, at 171.

¹⁵⁰ *Id.* at 171–72.

¹⁵¹ *See id.* at 172.

¹⁵² *See id.* at 174.

land is governed by a rigid private property system, in which division lines are delineated strictly, and thus, intentional invasions across these lines give rise to actionable trespass claims.¹⁵³ Navigable airspace, on the other hand, is classified by the FAA as a “public highway” for air travel, and thus landowners cannot exclude ordinary aircraft from flying directly above their land at altitudes of over 500 feet.¹⁵⁴ High-altitude airspace is therefore considered an open-access “commons” resource available to all.¹⁵⁵

[42] Property theories dealing with low-altitude airspace are inconsistent due to the fact that landowners use this space in a variety of non-obvious ways; the existing set of laws regulating this airspace varies between exclusion and governance in order to balance the competing interests of property owners and airspace users such as drone operators.¹⁵⁶

[43] In property law, low-altitude airspace is typically treated like surface land. This involves exclusion-based rules aimed at safeguarding the landowner's interests in the airspace. For instance, when a tree, building, or any other fixed structure encroaches into the airspace directly above a neighboring property, the law usually upholds the neighbor's right to exclude the encroachment.¹⁵⁷ Strong private property protection is given to low-altitude airspace rights through an exclusion regime.¹⁵⁸ In situations where governments need access to low-altitude airspace near airports for

¹⁵³ *Id.* at 174–75.

¹⁵⁴ Lindsey P. Gustafson, *Arkansas Airspace Ownership and the Challenge of Drones*, 39 U. ARK. LITTLE ROCK L. REV. 245, 271 (2017); Rule, *supra* note 121, at 166.

¹⁵⁵ Rule, *supra* note 121, at 180.

¹⁵⁶ *Id.* at 182.

¹⁵⁷ *Id.* at 182.

¹⁵⁸ *Id.* at 183.

regular takeoffs and landings, they pay landowners just compensation to acquire avigation easements.¹⁵⁹

[44] However, governance rules are also utilized in some cases involving low-altitude airspace conflicts.¹⁶⁰ These rules do not depend on clear exclusion rights, but instead rely on courts and lawmakers to identify socially valuable airspace uses in a particular context.¹⁶¹ The majority of drone-related low-altitude airspace laws are applied through a governance lens, and the process is case-specific.¹⁶² This approach can greatly burden courts and discourage drone operators and landowners from investing in their low-altitude airspace interests.¹⁶³

[45] One solution to this issue is greater precision in airspace rights. State legislatures could establish new laws to clarify landowners' rights to exclude drones from entering the low-altitude airspace above their property, allowing them to bring actionable trespass claims against drone operators.¹⁶⁴ This approach would also make it easier for courts to adjudicate matters concerning drone usage by law enforcement agencies, as it would be clearer whether or not the police had a "right to be" in a particular airspace area.¹⁶⁵ Another potential solution is for governments to exercise eminent domain authority to condemn public drone pathways or corridors through private airspace upon payment of compensation to the

¹⁵⁹ *Id.*

¹⁶⁰ Rule, *supra* note 121, at 184.

¹⁶¹ *Id.* at 177.

¹⁶² *Id.*

¹⁶³ *Id.* at 185.

¹⁶⁴ *Id.* at 187.

¹⁶⁵ Rule, *supra* note 121, at 188.

landowners.¹⁶⁶ Local governments could also create zoning ordinances regarding the use of drones in order to precisely designate what areas of airspace drones may or may not fly in.¹⁶⁷

[46] As an example of state legislatures giving landowners drone exclusion rights, Oregon passed a law in 2013 creating a new civil claim for drone trespass.¹⁶⁸ The Oregon law allowed property owners to bring a lawsuit against anyone who flies a drone over their land a second time at a height of fewer than 400 feet after being explicitly asked not to, and it allowed for plaintiffs to recover treble damages for any injuries.¹⁶⁹ Currently, drone regulations have been relaxed to allow drone operators greater freedom in operation, with the FAA modifying Part 107 in April 2021 to allow routine operations over people and at night, amending the 2016 rule.¹⁷⁰ In addition, the FAA approved in 2022 the use of Beyond the Visual Line of Sight (BVLOS) drones, which can operate while the operator is far away, a decision that raises the question of what privacy rights are available for landowners.¹⁷¹ It is clear that the use of drones brings up many thorny issues regarding the rights of landowners and drone operators alike, and the law in the United States must address a proper balance between the two so that neither is disadvantaged.

¹⁶⁶ *Id.* at 196.

¹⁶⁷ *Id.* at 204.

¹⁶⁸ *Id.* at 188.

¹⁶⁹ *Id.*

¹⁷⁰ Lutkevich & Earls, *supra* note 2.

¹⁷¹ Andrés Arrieta, *Over-the-Horizon Drones Line Up But Privacy Is Not In Sight*, ELEC. FRONTIER FOUND. (Aug. 29, 2022), <https://www.eff.org/deeplinks/2022/08/over-horizon-drones-lineup-privacy-not-sight> [<https://perma.cc/4TN7-KYLE>].

D. Drones and Privacy

[47] In addition, the use of drone technology raises significant privacy concerns.¹⁷² Drones pose a serious threat to individual privacy, and appropriate safeguards are necessary to prevent potential misuse.¹⁷³ The development of BVLOS drones has particular implications for privacy rights, as they can fly over homes and property at low altitudes, enabling them to capture details of the private lives of property owners.¹⁷⁴ This could provide industries with a better understanding of people's daily activities, potentially facilitating the recording of car license plates and facial recognition of individuals.¹⁷⁵ Unfortunately, many industries often share such information with third parties, including the government.¹⁷⁶ For instance, Ring has collected visual and audio information from residents and passersby, and without consent or warrants, given law enforcement

¹⁷² Ana Campoy, *The Law's New Eye in the Sky: Police Departments' Use of Drones Is Raising Concerns Over Privacy and Safety*, WALL ST. J. (Dec. 13, 2011), <https://www.wsj.com/articles/SB10001424052970204319004577088891361782010> [<https://perma.cc/WBG3-9XWB>].

¹⁷³ Jeanne M. Hill, *Drones: The Latest Threat to the Right to Privacy*, NAT'L JUD. COLL. (July 16, 2015), <https://www.judges.org/news-and-info/drones-latest-threat-right-privacy/> [<https://perma.cc/D9BD-6FLM>]; Yassine Mekdad et al., *A Survey on Security and Privacy Issues of UAVs*, 224 COMPUT. NETWORKS 1, 1, 18 (Feb. 7, 2023).

¹⁷⁴ Arrieta, *supra* note 171.

¹⁷⁵ *Id.*

¹⁷⁶ *Your Data Is Shared and Sold... What's Being Done About It?*, KNOWLEDGE AT WHARTON (Oct. 28, 2019), <https://knowledge.wharton.upenn.edu/article/data-shared-sold-whats-done/> [<https://perma.cc/SEC6-CMR4>]; Arrieta, *supra* note 171.

access to this information.¹⁷⁷ This development is a significant concern for those worried about civil liberties, as it appears that the government is using drones to bypass constitutional privacy protections for individual citizens.¹⁷⁸

[48] As a result of this potential for abuse, groups such as the Electronic Privacy Information Center (EPIC) filed a lawsuit in the D.C. Circuit Court of Appeals in 2016 to force the FAA to set out rules protecting citizens from privacy intrusions by drones.¹⁷⁹ In addition, the public has expressed privacy concerns regarding drones, evidenced by incidents such as a Seattle woman calling the police when she suspected a drone was peering into her apartment in 2014, and repeated nighttime overflights by a drone in Albuquerque in 2015 that resulted in complaints to the police about trespassing by the drone operators.¹⁸⁰ Such incidents demonstrate that citizens in the United States are apprehensive about the potential misuse of drone technology.¹⁸¹

¹⁷⁷ Scott Simon, *Amazon says it's given information from Ring cameras to police without owners' consent*, NPR (July 23, 2022, 8:03 AM), <https://www.npr.org/2022/07/23/1113166744/amazon-says-its-given-information-from-ring-cameras-to-police-without-owners-con> [<https://perma.cc/96AA-XJBW>]; Jason Kelley & Matthew Guariglia, *Ring Reveals They Give Videos to Police Without User Consent or a Warrant*, ELEC. FRONTIER FOUND. (July 15, 2022), <https://www.eff.org/deeplinks/2022/07/ring-reveals-they-give-videos-police-without-user-consent-or-warrant> [<https://perma.cc/C2Z3-7DEU>].

¹⁷⁸ Arrieta, *supra* note 171.

¹⁷⁹ *EPIC v. FAA: Challenging the FAA's Failure to Establish Drone Privacy Rules*, EPIC.ORG, <https://epic.org/documents/epic-v-faa/> [<https://perma.cc/SDA9-8GHQ>] (last visited Apr. 10, 2023).

¹⁸⁰ *Drone Privacy: Is Anyone in Charge?*, *supra* note 127.

¹⁸¹ *See id.*

[49] To address privacy issues, governments have taken action. In California, for example, a law has been passed making drone operators responsible for invading privacy when they knowingly enter onto another person's land or airspace without permission to capture images or sound recordings of the landowner.¹⁸² Similarly, Wisconsin has passed a law prohibiting photographing nude or partially nude individuals with drones.¹⁸³ Numerous other states have passed or considered passing laws regulating the use of drones, focusing on capturing images. However, state governments lack authority over drone flight paths, which rests solely with the FAA.¹⁸⁴

[50] The Drone Aircraft Privacy and Transparency Act, currently proposed in the United States Senate, aims to establish basic privacy and transparency standards applicable to both private drone operators and law enforcement, which would be enforced by the FAA.¹⁸⁵ However, there is significant debate regarding excessive surveillance by law enforcement drones, with groups such as the American Civil Liberties Union (ACLU) warning that lack of oversight could lead to abuse, and other legal analysts arguing that poorly written regulations may protect governmental and commercial drone operators at the expense of the general public.¹⁸⁶

[51] There are several court precedents in the United States dealing with the issue of drone privacy. In the case of *California v. Ciraolo*, the United

¹⁸² CAL. CIV. CODE § 1708.8(a) (West 2016).

¹⁸³ See generally WIS. STAT. ANN. § 942.09 (West 2017) (prohibiting the capture of nude photographs without consent via anything that stores a visual image despite not explicitly including drone photography).

¹⁸⁴ *Drone Privacy: Is Anyone in Charge?*, supra note 127.

¹⁸⁵ *Id.*

¹⁸⁶ Richard T. Farias, *Drone America: The End of Privacy?* 7, 13–14, 24, 65 (Dec. 1, 2020) (unpublished M.A. thesis, Naval Postgraduate School) (on file with Defense Technical Information Center); *Drone Privacy: Is Anyone in Charge?*, supra note 127.

States Supreme Court ruled that police surveillance conducted from an airplane flying 1,000 feet above the ground did not constitute a violation of a landowner's reasonable expectation of privacy or the landowner's Fourth Amendment rights, because the flights took place over airspace designated as open access by the FAA where law enforcement or the public "has a right to be."¹⁸⁷ The *Ciraolo* case attracted considerable criticism from civil liberties groups, who contended that the aerial surveillance was a mere attempt by law enforcement to evade the Fourth Amendment protections and that the aerial surveillance violated the defendant's personal security and liberty.¹⁸⁸

[52] Similarly, the Court found in the case of *Florida v. Riley* that warrantless surveillance from a helicopter flying only 400 feet above the ground was permissible under the Fourth Amendment, because helicopters are not required to stay above the 500-foot navigable airspace floor applicable to other aircraft and "[a]ny member of the public could legally have been flying over Riley's property in a helicopter at the altitude of 400 feet and could have observed Riley's greenhouse."¹⁸⁹ In addition, in the case of *Dow Chemical Co. v. United States*, the Supreme Court ruled that the Environmental Protection Agency's (EPA) surveillance of a Michigan manufacturing facility was not a search within the meaning of the Fourth Amendment, because there was no reasonable expectation of privacy in the air.¹⁹⁰ The Court found that "[t]he intimate activities associated with family privacy and the home and its curtilage simply do not reach the outdoor areas or spaces between structures and buildings of a manufacturing plant."¹⁹¹

¹⁸⁷ *California v. Ciraolo*, 476 U.S. 207, 213 (1986).

¹⁸⁸ Rosemarie Falcone, *California v. Ciraolo: The Demise of Private Property*, 47 LA. L. REV. 1365, 1379–80 (1986).

¹⁸⁹ *Florida v. Riley*, 488 U.S. 445, 445, 455 (1989).

¹⁹⁰ Diane Rosenwasser Skalak, *Dow Chemical Co. v. United States: Aerial Surveillance and the Fourth Amendment*, 3 PACE ENVTL. L. REV. 277, 277, 285 (1986).

¹⁹¹ *Dow Chem. Co. v. United States*, 476 U.S. 227, 236 (1986).

The Supreme Court has thus given sanction to the notion that aircraft can legally survey a landowner's land under the U.S. constitution if the public could legally be in the airspace in question.¹⁹²

[53] In the legal community, there have been divergent opinions regarding this matter.¹⁹³ Justice Powell, in his dissenting opinion in the *Ciraolo* case, argued that curtilage is entitled to privacy protection under the Fourth Amendment.¹⁹⁴ He further contended that advancements in technology have expanded the scope of curtilage to include airspace over the defendant's property, thereby providing protection against police surveillance.¹⁹⁵ In the view of Justice Powell's dissent, evolving police practices required the tailoring of new protections to match them, and a privacy interest against aerial surveillance should be articulated.¹⁹⁶ In addition, in the *Riley* case, Justice Brennan dissented, noting a hypothetical situation involving a drone to emphasize the importance of a defendant's Fourth Amendment privacy rights against government surveillance:

Imagine a helicopter capable of hovering just above an enclosed courtyard or patio without generating any noise, wind, or dust at all—and, for good measure, without posing any threat of injury. Suppose the police employed this miraculous tool to discover not only what crops people were growing in their greenhouses, but also what books they were reading and who their dinner guests were. Suppose, finally, that the FAA regulations remained unchanged, so that the

¹⁹² See *Dow Chem. Co.*, 476 U.S. at 239; *Riley*, 488 U.S. at 450; *Ciraolo*, 476 U.S. at 215.

¹⁹³ See *Ciraolo*, 476 U.S. at 215–25 (Powell, J., dissenting).

¹⁹⁴ *Ciraolo*, 476 U.S. at 216 (Powell, J., dissenting).

¹⁹⁵ Catherine Hancock, *Justice Powell's Garden: The Ciraolo Dissent and Fourth Amendment Protection for Curtilage-Home Privacy*, 44 SAN DIEGO L. REV. 551, 555–56 (2007).

¹⁹⁶ *Id.*

police were undeniably “where they had a right to be.” Would today’s plurality continue to assert that “[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures” was not infringed by such surveillance? Yet that is the logical consequence of the plurality’s rule. . . .¹⁹⁷

[54] The legal concept of "space" regarding privacy has a rich history, dating back to the case of *Katz v. United States*.¹⁹⁸ In this case, the court established a two-part test to determine whether a Fourth Amendment violation occurred: (1) whether an individual held an actual, subjective expectation of privacy and (2) whether society was willing to recognize that expectation as reasonable.¹⁹⁹ Thus, an individual would have a reasonable expectation of privacy in a private space, such as his or her property, if he or she did not intentionally expose what is on the land to the public.²⁰⁰ The Court stated in the *Katz* case that "[w]hat a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection . . . [b]ut what he seeks to preserve as private, *even in an area accessible to the public*, may be constitutionally protected," and that "once it is recognized that the Fourth Amendment protects people . . . against unreasonable searches . . . it becomes clear that *the reach of that Amendment cannot turn upon the presence or absence of a physical intrusion*."²⁰¹ Generally, an individual is considered to have a reasonable expectation of privacy within his or her curtilage, or land associated with his or her dwelling.²⁰² In this way, the use of drones over private property

¹⁹⁷ *Riley*, 488 U.S. at 462–63 (Brennan, J., dissenting).

¹⁹⁸ Skalak, *supra* note 190, at 289.

¹⁹⁹ *Id.* at 282–83.

²⁰⁰ *Id.* at 283.

²⁰¹ Falcone, *supra* note 188, at 1370.

²⁰² Hancock, *supra* note 195, at 552–53.

has the potential to violate the Fourth Amendment privacy rights of individuals, although this right has been controversial in the United States court system.

[55] The case of *Boggs* raises an important privacy issue, namely, when does an individual have a reasonable expectation of privacy on their property and what measures are appropriate to defend it? According to Kentucky state law, an individual's privacy may be invaded by "(a) unreasonable intrusion upon the seclusion of another. . .; or (b) appropriation of the other's name or likeness. . .; or (c) unreasonable publicity given to the other's private life. . .; or (d) publicity that unreasonably places the other in a false light before the public. . ." ²⁰³ In addition, it is arguable that an individual's property can be either invaded or trespassed on by a drone, as trespass is defined under Kentucky law as "an intended or negligent encroachment onto another's property that is not privileged."²⁰⁴ Thus, drone usage according to the precedent set in the *Boggs* case has the potential to either negligently or intentionally invade the privacy rights of individual property owners.²⁰⁵ However, it is unclear that any violation of this privacy right gives an individual the right to destroy the property of another, as this is potentially dangerous.²⁰⁶

D. Airspace Delineation and Drone Control Means

[56] One suggestion for resolving the dispute regarding the rights of drone owners and the rights of property owners from unnecessary intrusion is a clearer delineation between the airspace that is accessible to the public and that which is part of a landowner's private property. In this way, there

²⁰³ *Boggs v. Merideth*, No. 3:16-CV-00006-TBR, 2017 U.S. Dist. LEXIS 40302, at *22 (W.D. Ky. Mar. 21, 2017); Getlan, *supra* note 104, at 5.

²⁰⁴ *Boggs*, 2017 U.S. Dist. LEXIS 40302, at *22; Getlan, *supra* note 104, at 6.

²⁰⁵ See generally *Boggs*, 2017 U.S. Dist. LEXIS 40302, at *22.

²⁰⁶ Getlan, *supra* note 104, at 7.

can be no doubt about where a drone can and cannot fly. Applying governance rules to low-altitude airspace has become an anachronism, as the rules regarding low-altitude airspace date from a time before the development of drones and can deter both drone operators and landowners from making proper decisions about their respective interests in low-altitude space.²⁰⁷ As a solution, state legislatures can draft laws defining a property owner's airspace rights up to the navigable airspace line, 500 feet, which would exclude drones from this area.²⁰⁸

[57] In addition, there is the issue of control of the drone itself. Drones can be controlled from a mere smartphone,²⁰⁹ and many can be controlled from a large distance away from the operator.²¹⁰ These developments have underscored the need for transparency in the operation of drones over private property, in order to promote accountability for any potential privacy violations.²¹¹ To enhance transparency, a proposed regulation requires BVLOS drone operators to disclose relevant information about their drone's operation.²¹² This includes the type of sensors used, their purpose, the drone's technical capabilities, the data being collected, its intended use, the parties it will be shared with, and the community impact.²¹³ In this way, the privacy rights of individual landowners will be positively impacted by full disclosure and accountability, and conflicts between property owners and drone operators can potentially be avoided.

²⁰⁷ Rule, *supra* note 121, at 156.

²⁰⁸ *Id.* at 159.

²⁰⁹ *Id.* at 157.

²¹⁰ Arrieta, *supra* note 171.

²¹¹ *Id.*

²¹² *Id.*

²¹³ *Id.*

[58] Overall, the operation of drones has a potential for causing concerning privacy violations for individual property owners in that drones fly over private property and can potentially capture intimate details of everyday life with their camera and video functions. In addition, there is the potential for damage to the drone operator's property should an individual decide to destroy the drone, as in the *Boggs* case in Kentucky.²¹⁴ Also applicable is the unclear extent to which a landowner has rights to the airspace above his or her land under United States law.²¹⁵ There is a need for greater clarity in United States law regarding the airspace rights over low-altitude airspace above an individual's land, as having control over this airspace means the right to potentially exclude drones. Ultimately, the law must address the balance between the rights of drone operators and landowners.

[59] Moreover, it should be emphasized that the court system has not sufficiently tackled the matter of drone usage. Many of the controlling precedents regarding property rights and airspace, such as the *Causby* decision, only applied to aircraft, and others such as the *Riley* and *Ciraolo* decisions held that law enforcement surveillance within low-altitude airspace above a person's property did not violate the Fourth Amendment prohibition on unreasonable searches and seizures.²¹⁶ These decisions were issued before drones were a viable technology, so they are obsolete when it comes to the privacy and property issues represented by drone technology. There is a need within the United States legal system to address whether the usage of drones by law enforcement over a person's property would constitute a Fourth Amendment violation since the landowner would have a reasonable expectation of privacy, or whether it would be permissible since the airspace is considered a public access area. Courts must address

²¹⁴ *Boggs*, 2017 WL 1088093, at *1.

²¹⁵ *Id.*

²¹⁶ See *United States v. Causby*, 328 U.S. 256, 256 (1946); see also *Florida v. Riley*, 488 U.S. 445, 445 (1989); *California v. Ciraolo*, 476 U.S. 207, 207 (1986).

where and when airspace is considered public or private property in order for the laws regarding drones to be clearer.

V. RECOMMENDATIONS AND CONCLUSIONS

A. Future Direction and Recommendations

[60] One of the most important issues related to drones is privacy rights. As previously mentioned, there must be a new regulation issued extending the airspace of a landowner to the navigable airspace line, excluding drones from this area. While this could potentially impact drone operations, it would have the effect of protecting the privacy rights of landowners who would be negatively impacted by drone operations. In addition, there should be a new court ruling regarding when a landowner has a reasonable expectation of privacy over the airspace above their property related to drones, as many of the precedents, such as *Ciraolo* and *Riley*, only deal with technologies including helicopters and aircraft and do not consider low-flying technologies such as drones.²¹⁷ The question of whether an individual has a reasonable expectation of privacy against intrusion by a drone is one that should be answered. In addition to a law or regulation resolving the question of where a drone can operate over an individual's private property, an interest group such as the Electronic Frontier Foundation (EFF), which has fought for transparency in the operation of BVLOS drones,²¹⁸ can file a lawsuit in a district court regarding the Fourth Amendment privacy issue, forcing the courts to file a ruling laying out what privacy rights a landowner has against the use of drones.

[61] In addition, the FAA has the authority to issue new regulations that specify the permitted locations and times for drone operation.²¹⁹ Currently,

²¹⁷ See generally *Riley*, 488 U.S. at 449; *Ciraolo*, 476 U.S. at 213.

²¹⁸ Arrieta, *supra* note 171.

²¹⁹ *Id.*

the FAA is convening an Aviation Rulemaking Committee (ARC) to draft rules governing the use of drones that operate beyond visual line of sight (BVLOS).²²⁰ As such, the FAA is already undertaking efforts to revise the drone usage regulations.²²¹ The FAA has been continuously revising its guidelines for the use of a drone, with the most recent revision being the modification of Part 107 in 2021,²²² so the rules and guidelines are constantly changing. It is important that the FAA consider the privacy concerns of individual landowners when drafting new regulations for the use of drones, because drones have the potential to cause massive violations of privacy for individual citizens.

[62] States can also pass laws regarding the type of images that can be captured by drones to minimize the potential for intrusions into privacy. For example, “paparazzi” laws that outlaw the use of drones to capture nude images, such as the one passed in Wisconsin,²²³ or the use of drones to capture images of a plaintiff on their property without their consent, such as the one in California,²²⁴ can have the effect of outlawing abusive behavior by drone operators and protecting a vital privacy interest of the individual property owner. States can pass new laws regarding privacy and drone usage in order to protect the privacy of their citizens from unwarranted intrusion, as well as strengthen existing laws regarding nuisance and invasion of privacy.²²⁵ These laws can be easily tailored to allow for exceptions such as emergency response drones, as is the case for other low-

²²⁰ *Id.*

²²¹ *Id.*

²²² Lutkevich & Earls, *supra* note 2.

²²³ *Drone Privacy*, *supra* note 127.

²²⁴ *U.S.A. Drone Laws*, *supra* note 42.

²²⁵ *Drone Privacy*, *supra* note 127.

flying aircraft like helicopters.²²⁶ To regulate the use of drones, states may expand the misdemeanor of trespassing to include flying over private airspace, in addition to the property itself.²²⁷ Defining public and private airspace would clarify legal disputes involving drones hovering over private property.²²⁸ Another approach is to establish drone-zoning ordinances, which designate areas where drones are allowed or prohibited, as governments do with commercial or residential zones.²²⁹ These “NAMBY” or “Not Above My Backyard” measures would generally prohibit drones from flying over residential areas, subject to limited exceptions for specific purposes and times.²³⁰ By doing so, drone operators could plan accordingly while protecting the privacy rights of property owners.²³¹ Another option is to enhance individual property rights over airspace, to avoid uncertainty about drone flyovers.²³² State and local governments can exclude drones from low-altitude airspace by redefining private airspace up to 500 feet above ground level and asserting that landowners' exclusive rights extend to that height.²³³

[63] Courts can also do this by modifying the principle set forward by the Supreme Court in the *Causby* decision, which stated that invasions of low-altitude airspace “are in the same category as invasions of the

²²⁶ Rule, *supra* note 121, at 202.

²²⁷ *Id.* at 202–03.

²²⁸ *Id.* at 186.

²²⁹ *Id.* at 203–04.

²³⁰ *Id.* at 206–07.

²³¹ Rule, *supra* note 121, at 207.

²³² *Id.* at 189.

²³³ *Id.* at 187.

surface.”²³⁴ This would entail applying surface trespass and takings laws to situations involving drones, thus preserving the level of privacy and safety that landowners enjoyed prior to the invention and rise of drone technology.²³⁵ The FAA could also be prohibited from adjusting the navigable airspace line to decrease the height of any landowner’s private space without the payment of just compensation.²³⁶

[64] In addition to concerns about privacy and airspace rights, laws clarifying landowners’ interests in low-altitude airspace would have the effect of making it easier for courts to adjudicate cases related to the use of drones by law enforcement agencies.²³⁷ In this way, law enforcement agencies would have greater clarity about whether or not a drone had a “right to be” in a particular area of airspace while capturing a photo, and there would be fewer difficulties in applying the protections of the Fourth Amendment to adjudicate the admissibility of photo or video evidence taken by a drone.²³⁸ When applying to operate a drone, law enforcement agencies should disclose the purpose, technical capabilities, and data collected in the interest of transparency, so that abuses are prevented, as has been suggested by groups such as EFF.²³⁹ When dealing with the issue of security, there is a need for transparency in the operation of drones so that law enforcement does not abuse their power and infringe upon the constitutional rights of the citizens.

²³⁴ *United States v. Causby*, 328 U.S. 256, 265 (1946); *see also* Rule, *supra* note 121, at 168–69.

²³⁵ Rule, *supra* note 121, at 208.

²³⁶ *Id.* at 188.

²³⁷ *Id.* at 172.

²³⁸ *Id.* at 173–74

²³⁹ Arrieta, *supra* note 171.

B. Conclusion

[65] In recent years, drones have become increasingly popular and accessible, offering a broad range of benefits.²⁴⁰ However, the potential for privacy and property rights violations through drone usage is a significant concern. Consequently, it is essential for laws and regulations to evolve and better safeguard the interests of landowners who do not consent to drone flights over their property.

[66] Laws banning drones, except for those involved in emergency rescue services, from airspace below 500 feet would help to solve the problem of abusive drone behavior. Furthermore, clarifying the property rights of landowners in the airspace above their property would help resolve disputes between drone operators and better apply the Fourth Amendment in cases involving aerial surveillance conducted by drones.

[67] Additionally, abusive conduct such as taking nude photos of people using drones, or other illegal or intrusive behavior, can be banned and specifically penalized. Zoning ordinances for drones can be implemented, clarifying where drones may and may not operate, and violators could be subject to fines and other penalties. Measures increasing transparency in the use of drones are also important, particularly those used by law enforcement agencies.

[68] Overall, it is essential to protect the privacy and property rights of United States citizens as drones become more commonplace and advanced. Policymakers must study this issue and address it in a just and equitable way to prevent disputes, foster transparency and accountability, and preserve the rights of all parties involved. Drones have the potential for both good and bad to result from their increased usage, and therefore, it is incumbent upon policymakers to draft laws, rules, and regulations that

²⁴⁰ *Drone market outlook in 2023: industry growth trends, market stats and forecast*, INSIDER INTELLIGENCE (Jan. 07, 2023), <https://www.insiderintelligence.com/insights/drone-industry-analysis-market-trends-growth-forecasts> [<https://perma.cc/U9FG-CGZ3>].

prevent harm from the use of drones while still allowing for their beneficial uses.