

LOOK, UP IN THE SKY!: REGULATING DRONE USE TO PROTECT OUR SAFETY AND PRIVACY*

I. INTRODUCTION

Though not a new invention, Unmanned Aerial Vehicles (UAVs), more commonly known as “drones,” have only recently begun to enter the average American’s awareness.¹ Once the exclusive province of the military, various technological and social factors have led to drones entering the public sphere for use by private individuals and corporations.² As this usage increases rapidly, unforeseen implications begin to arise, including safety and privacy concerns for citizens.³ In response, the Federal Aviation Administration (FAA) has attempted to promulgate rules governing drone use, which have been met with resistance and legal challenges by private and commercial operators.⁴ Meanwhile, Congress and state legislatures have begun addressing similar concerns, with different states adopting more or less restrictive statutes governing drone use.⁵

In drafting these rules and statutes, the FAA and state legislatures may also consider the potential industrial security concerns raised by drone usage.⁶ Advancing technology has created many modern threats to corporate security, including computer viruses capable of stealing private user data, and highly sophisticated means for carrying out proprietary information theft.⁷ Recent

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1. See John Villasenor, *What Is a Drone, Anyway?*, SCI. AM. (Apr. 12, 2012), <http://blogs.scientificamerican.com/guest-blog/2012/04/12/what-is-a-drone-anyway/> (defining the term “drone” and briefly outlining their history and growing awareness among the general public).

2. See Chris Anderson, *How I Accidentally Kickstarted the Domestic Drone Boom*, WIRED, June 22, 2012 (June 22, 2012, 6:32 AM), http://www.wired.com/2012/06/ff_drones/all/ (outlining factors that have contributed to increasing private and commercial drone use).

3. See Ann Zaniewski, *Drones: They Might Have Their Eyes on You*, DET. FREE PRESS, Mar. 7, 2013, at A1 (noting that the FAA expects roughly 7,500 commercial drones to be active by about 2018).

4. See Ed Pilkington, *What’s Keeping America’s Private Drone Industry Grounded?*, GUARDIAN (Sept. 30, 2014, 11:18 AM), <http://www.theguardian.com/world/2014/sep/29/drone-testers-faa-aviation-frustration-grows> (observing that nearly all commercial drone use is prohibited by the FAA, and registering complaints from would-be users about the FAA’s slow pace in promulgating rules to govern private use).

5. See *infra* Part II.C.2 for a discussion of varying state statutes regulating the use of drones, as well as proposed Congressional bills.

6. See *infra* Parts II.B.2–3 for a discussion of modern threats to corporate security and existing industrial breaches by drones.

7. See *infra* notes 75–83 and accompanying text for a discussion of multiple recent industrial

instances of amateur drone operators shooting unauthorized video, and in some cases posting it online, provide examples of how less scrupulous parties might use drones to steal industry secrets.⁸

This Comment argues that specific, clearly worded legislation is needed to regulate drone use in order to protect privacy without infringing on fundamental rights. Section II examines current and pending uses for drones, the problems these uses may create, and possible solutions. Part II.A provides an overview of what drones are and how they developed from exclusively military to civilian and commercial use. Part II.B outlines numerous safety and privacy concerns raised by widespread drone use. It also addresses how advancing technology has impacted corporate security, including industrial breaches by drone operators. Finally, Part II.C discusses regulations and a court decision governing drone use, then compares and contrasts legislation enacted by different states pertaining to drones.

Section III contends that formal rules and legislation are needed to regulate drone use and suggests particular elements that should be incorporated. Part III.A asserts the need for specific legislation, given the aforementioned privacy and safety concerns. Part III.B argues that established regulations governing full-scale aircraft should be used to draw parallels for creating drone regulations. It concludes by assessing existing state statutes and proposed federal bills regulating drones, suggesting aspects that other states and Congress should adopt in drafting legislation.

II. OVERVIEW

This Section provides an overview of the benefits and risks posed by drones, as well as how the legal system has regulated them up to this point. Part II.A defines the term “drone” and discusses how these machines developed from exclusively military use to personal and commercial use. Part II.B outlines potential detrimental aspects of rapidly increasing drone use, including personal safety and privacy concerns and corporate security breaches. Finally, Part II.C examines existing legislation from various states and the primary court decision currently governing drone usage.

A. *The History of Drones and Their Expanding Use*

Unmanned flying devices, commonly called “drones,” arose from military leaders’ desires to spy on or attack enemies from a distance without risking human lives.⁹ While they continue to be used extensively by militaries, civilian

threats, such as a software bug allowing hackers to access personal information, as well as potential efforts to steal proprietary information related to electric cars.

8. See *infra* notes 93–101 and accompanying text for a discussion of unauthorized video shot by drones of Apple’s new headquarters, an advanced look at the site of a recent Apple product unveiling, and a World Cup soccer team’s practice.

9. See *Drones: A History of Flying Robots*, NESTA, <http://www.nesta.org.uk/node/753> (last visited Mar. 6, 2015) (describing the origins and definitions of unmanned aerial vehicles).

hobbyists have begun using similar devices recreationally.¹⁰ Advancing technology now allows such devices to record video and audio and to fly autonomously, drawing attention from parties who see great commercial and utilitarian applications for drones.¹¹ In response to this interest, administrative agencies, Congress, and state legislatures are faced with promulgating rules and drafting statutes to address concerns raised by drone usage.¹² Part II.A.1 provides some historical context on the development of drones, which were initially intended for military use. Part II.A.2 details the ways in which private citizens and companies currently use drones and explains how other commercial entities hope to use them in the near future.

1. Origins of Nonmilitary Drone Use

The United States military began experimenting with unmanned aircraft capable of delivering explosives as far back as World War I.¹³ In 1935, remote-controlled aircraft were first analogized to worker bees and nicknamed “drones.”¹⁴ The definition of the term “drone” has varied over time; in modern language it is generally used interchangeably with “Unmanned Aerial Vehicle” (UAV) or “Unmanned Aerial System” (UAS) to describe any unmanned aircraft with the capacity for autonomous flight.¹⁵ This autonomy is typically achieved through the use of GPS or other sensors, and distinguishes drones in the modern definition from devices requiring line-of-sight manual piloting, such as radio-controlled model planes.¹⁶ Most drones also contain a payload,¹⁷ usually

10. See Villasenor, *supra* note 1 (citing different military and civilian devices that have led to our modern conception of drones and outlining competing definitions).

11. See Anderson, *supra* note 2 (explaining recent advances in drone technology that have led to the current movement and myriad activities for which drones are being used).

12. See, e.g., G.S. Hans, *Drone Privacy Bills Attempt to Protect Americans from Governmental, Commercial Surveillance*, CTR. FOR DEMOCRACY & TECH. (Apr. 8, 2013), <https://cdt.org/blog/drone-privacy-bills-attempt-to-protect-americans-from-governmental-commercial-surveillance/> (summarizing bills introduced in Congress in an effort to regulate the use of drones).

13. John Sifton, *A Brief History of Drones*, NATION (Feb. 27, 2012), <http://www.thenation.com/article/166124/brief-history-drones>.

14. Ben Zimmer, *The Flight of ‘Drone’ From Bees to Planes*, WALL ST. J., July 27, 2013, at C4. In 2012, lawmakers defined model aircraft as being an unmanned aircraft capable of sustained atmospheric flight, within visual line of sight of the person flying it, and for recreational purposes. FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 336(c), 126 Stat. 11, 77–78 (2012).

15. Anderson, *supra* note 2. “Autonomous” flight refers to flight without a human being in control for at least part of the duration, through the use of devices such as GPS-guided autopilot. *Id.*; see also Villasenor, *supra* note 1 (discussing different terms describing drones and similar devices).

16. Anderson, *supra* note 2. “Line-of-sight manual piloting” refers to a human directly controlling the flight path of an aircraft within the distance he or she can maintain visual contact and make out its orientation without the use of enhancements such as binoculars. *Unmanned Aircraft Operation Utilizing First Person View Systems* 1, 3, ACAD. OF MODEL AERONAUTICS (revised Jan. 12, 2014), <https://www.modelaircraft.org/files/550.pdf>. But see *Unmanned Aircraft Systems*, FAA, <http://www.faa.gov/uas/> (last visited Mar. 11, 2016) (including model aircraft among different types of UAS operations, showing that the distinction is not always clear-cut and is still being defined).

17. “[T]he load carried by a vehicle exclusive of what is necessary for its operation.” *Payload*, MERRIAM-WEBSTER, <http://www.merriam-webster.com/dictionary/payload> (last visited Mar. 11, 2016).

including a camera or other sensors and a means to wirelessly transmit data back to the point of origin.¹⁸ The U.S. military has carried out successful missions using drones since the Vietnam War, and continues to do so today.¹⁹ However, it is only in recent years that civilians have begun to use drones.²⁰

Technically minded private citizens have enjoyed radio-controlled aircraft for decades.²¹ Meanwhile, the instrumentation necessary for autopilot functions has been used in planes since the 1930s.²² By the early 1990s, this instrumentation was capable of completely automating entire flights.²³ And the advent of smartphones led to single-chip microprocessors—like those used in airplane autopilots—becoming more efficient in size and power use.²⁴ One result of this ongoing reduction in the size and cost of microprocessors is the feasibility of incorporating them into small aircraft.²⁵ In 2007, the online community DIY Drones was established to enable autonomous aircraft enthusiasts to share code and designs.²⁶ And as technology continues to advance, a number of private companies have arisen that are devoted to manufacturing UAVs and the hardware required to fly them.²⁷

2. Rapidly Advancing Civilian Use and Impending Commercial Use

As the technology necessary for fully or partially automated flight becomes smaller and easier to mass-produce, light drones have become more affordable.²⁸ The most basic models are available for about \$300 and can be controlled

18. Anderson, *supra* note 2.

19. See Jim Garamone, *From U.S. Civil War to Afghanistan: A Short History of UAVs*, ARMY Communicator, Summer 2002, at 63–64 (summarizing failed attempts to use drones during WWII, followed by more successful use of “Firebee” drones for reconnaissance missions in North Vietnam, up through then-current use of Predator drones in the Balkans).

20. See Olga Kharif, *With Drones, the Sky’s the Limit*, WASH. POST, Nov. 3, 2013, at G3 (noting that investments in drone-related start-ups more than doubled from 2012 to 2013, with one reason for increased nonmilitary use being a steep drop in the cost of sensors thanks to the mass production of smartphones).

21. Pete Carpenter, *Model Flying—An Overview*, R/C AIRPLANE WORLD, <http://www.rc-airplane-world.com/model-flying.html> (last visited Mar. 11, 2016) (charting the history of recreational radio-controlled airplane flying, beginning in the mid-1950s).

22. Anderson, *supra* note 2.

23. *Id.*

24. *Id.* See also Dean Evans, *Moore’s Law: How Long Will it Last?*, TECHRADAR (Feb. 22, 2014), <http://www.techradar.com/us/news/computing/moore-s-law-how-long-will-it-last—1226772> (examining the continued accuracy of a 1965 prediction by Gordon E. Moore, future Intel cofounder, that every twenty-four months, the number of transistors incorporated in a chip will roughly double).

25. See Anderson, *supra* note 2 (noting that “the Moore’s law of drone technology is currently accelerating, thanks to the smartphone industry”).

26. See *id.* Originally a venue for independent drone enthusiasts to show their own codes, in time the site developed into a community with collaborative teams working on amateur projects that were previously limited to professional aerospace electronics departments. See *id.*

27. See, e.g., *id.* (noting that the creator of DIY Drones eventually cofounded a company which creates and sells autopilots and other drone hardware).

28. See Michael S. Rosenwald, *A Drone of Your Very Own*, WASH. POST, Aug. 18, 2013, at A1 (describing the ease and relatively low cost with which personal drones may be purchased).

through one's smartphone.²⁹ While some hobbyists use the technology purely for recreational purposes, many have begun exploring practical applications for drones.³⁰ Some individuals use the drones for tracking wildlife, mapping crops, and surveying terrain for 3-D modeling or even search and rescue purposes.³¹

In 2011, a formal organization dedicated to drone journalism, the Professional Society of Drone Journalists, was established.³² The society focuses on developing small drones and exploring best practices for their use in investigative, weather, sports, and other types of reporting.³³ In addition, multiple universities have implemented drone journalism programs to teach students how to build and use drones for reporting purposes and how to research the legal and ethical issues involved.³⁴

However, until the FAA issues regulations, journalists are not permitted to use drones for commercial enterprises.³⁵ When an explosion collapsed two buildings in Harlem in March 2014, an amateur drone journalist captured exclusive pictures of the disaster.³⁶ In doing so, he violated the FAA's current restrictions, which keep professional reporters from shooting and airing any footage themselves.³⁷ As a result of these restrictions, reporters are barred from using drones for any commercial purpose, including taking pictures for newspapers or shooting footage of traffic, civic events, natural disasters, or

29. *Id.* See Christina Bonnington, *An App-Controlled Drone That Delivers Beautiful 1080p Footage*, WIRED (May 12, 2014, 10:00 AM), <http://www.wired.com/2014/05/parrot-bebop-drone/>, for a drone that can be controlled by the Freeflight app for Android or Apple devices.

30. See Rosenwald, *supra* note 28, for a contrast of leisure uses for drones, such as delivering wedding rings to the altar, with more practical uses like mapping crops and monitoring wildlife.

31. *The Past and Future of Drones in the U.S.*, CRIM. JUST. DEGREE HUB, <http://www.criminaljusticedegreehub.com/drones-future/> (last visited Mar. 11, 2016). See Tracy Staedter, *Drone Finds Missing Elderly Man in 20 Minutes*, DISCOVERY NEWS (July 24, 2014, 12:12 PM), <http://news.discovery.com/tech/robotics/drone-finds-missing-elderly-man-in-20-minutes-140724.htm> (outlining how an amateur operator used his drone to locate an eighty-two-year-old man with dementia who had been missing for three days).

32. PROF. SOC'Y OF DRONE JOURNALISTS, <http://www.dronejournalism.org/> (last visited Mar. 11, 2016).

33. *Id.*

34. See, e.g., *About the Lab*, DRONE JOURNALISM LAB, <http://www.dronejournalismlab.org/about> (last visited April 2, 2016) (explaining that the Drone Journalism Lab at the University of Nebraska-Lincoln's College of Journalism and Mass Communications teaches students to "build drone platforms, use them in the field and research the ethical, legal and regulatory issues involved in using pilotless aircraft to do journalism").

35. Elise Hu, *Drone Journalism Can't Fully Take Flight Until Regulators Act*, NPR: ALL TECH CONSIDERED (May 5, 2014, 4:02 PM), <http://www.npr.org/blogs/alltechconsidered/2014/05/05/309742245/drone-journalism-cant-fully-take-flight-until-regulators-act>.

36. See Miles Klee, *Watch a Phantom Drone in Action at the Harlem Explosion Site*, THE DAILY DOT (Mar. 12, 2014, 12:36 PM), <http://www.dailydot.com/technology/harlem-explosion-drone-photographer/> (discussing an amateur drone operator who captured footage of the disaster site, potentially for sale to news organizations).

37. See Hu, *supra* note 35 (discussing how journalism, like all other commercial drone use, is currently prohibited by the FAA).

anything else.³⁸ Journalists currently wait to learn how the FAA will regulate their ability to use drones in reporting.³⁹

Meanwhile, accidental strides have already been taken in the use of drones for journalistic purposes. In 2011, an anonymous hobbyist reviewing photos taken with his drone noticed red areas in the Trinity River.⁴⁰ Wondering if it could be blood, he reported his findings to the Coast Guard, who in turn alerted the Environmental Protection Agency.⁴¹ The Environmental Protection Agency confirmed that the areas contained blood and launched an investigation into a local meatpacking plant for improper waste disposal.⁴² Felony charges were subsequently filed against the plant, and while the cases were ultimately dismissed due to a technical error, the incident illustrates how drones might be used by journalists and investigators.⁴³

Moreover, as individuals experiment with private drones, corporations are considering ways to use the rapidly advancing technology to improve their own functions. In 2013, Amazon.com CEO Jeff Bezos revealed that the company plans to use autonomous drones guided by GPS to deliver packages.⁴⁴ Real estate agents have also found industry-related uses for drones.⁴⁵ Agents plan on showing prospective homebuyers aerial views of neighborhoods and videoing the routes that the homebuyers' children could walk to school or parks.⁴⁶ Google also recently began experimenting with using drones to provide wireless Internet service in remote parts of the world.⁴⁷

38. See *infra* Part II.C.1 for a discussion of the restrictions on commercial and journalistic use of drones, and challenges to these restrictions.

39. See Hu, *supra* note 35 (outlining examples of drones being used to shoot aerial footage of the damage wrought by a tornado and of historical sites like an ancient shipyard).

40. Kashmir Hill, *Potential Drone Use: Finding Rivers of Blood*, FORBES (Jan. 25, 2012, 11:50 AM), <http://www.forbes.com/sites/kashmirhill/2012/01/25/potential-drone-use-finding-rivers-of-blood/>.

41. See Gary Mortimer, *Dallas Meat Packing Plant Investigated after Drone Images Reveal Pollution*, sUAS NEWS (Jan. 23, 2012), <http://www.suasnews.com/2012/01/11389/dallas-meat-packing-plant-investigated-after-drone-images-reveal-pollution/>. In an anonymous interview, the drone operator stated that after looking at an image of a blood red creek, the question became "who do I report this to that can find out what it is and where it is coming from." *Id.*

42. Hill, *supra* note 37.

43. See Jennifer Emily, *Felony Cases Dropped Against Oak Cliff Slaughterhouse on Pig Blood*, DALLAS MORNING NEWS (May 6, 2014, 11:00 PM), <http://www.dallasnews.com/news/community-news/best-southwest/headlines/20140506-felony-cases-dropped-against-oak-cliff-slaughterhouse-on-pig-blood.ece> (describing how aerial photographs led to the investigation being launched).

44. See *60 Minutes: Amazon* (CBS television broadcast Dec. 1, 2013), <http://www.cbsnews.com/news/amazons-jeff-bezos-looks-to-the-future/> (noting that drones might make it possible to deliver packages as quickly as half an hour after an order is placed, but cautioning that the technology was still four or five years away and pending FAA approval).

45. Joel Aschbrenner, *Flying Against the Wind*, DES MOINES REG., July 6, 2014, at A1.

46. See *id.* (noting that some agents are already doing so, in violation of FAA regulations banning commercial use, which could carry a \$10,000 fine).

47. Jon Brodtkin, *Google Testing Drones That Could Provide Internet Access to Remote Lands*, ARS TECHNICA (Sept. 15, 2014, 4:28 PM), <http://arstechnica.com/information-technology/2014/09/google-testing-drones-that-could-provide-internet-access-to-remote-lands/> (explaining how Google purchased Titan Aerospace, manufacturers of drones specialized for high-

While the FAA had previously instituted a complete ban on all commercial use of drones, very recently it has permitted a limited number of exceptions.⁴⁸ In June of 2014, oil company BP received the first ever UAV permit issued by the FAA to fly over U.S. soil.⁴⁹ Also, the FAA granted waivers to six film companies to record drone footage in the United States in September of 2014.⁵⁰ This is significant because while Hollywood has used drones to record aerial footage in several recent movies, this filming always had to be done abroad.⁵¹ Now that the FAA appears to be loosening its stance, many other commercial companies have applied for waivers as well.⁵²

B. *Negative Implications of Drone Use*

One consequence of the rapid pace of technological advancement in the last few decades has been the increased risk of these technologies being used for illegal or invasive purposes.⁵³ Corporations have often been the target of such illicit practices, particularly at the hands of companies vying for the same market share.⁵⁴ And there have already been examples of security breaches by drone users.⁵⁵ Part II.B.1 outlines some of the hazards that drones pose to public safety

altitude, long-endurance flights, and plans to test using them to transmit frequencies to provide Internet access to areas that lack fast, affordable Internet service, such as New Zealand).

48. See Stephen Shankland, *FAA Eases Barrier to Commercial Drone Use*, CNET (Feb. 4, 2015, 5:27 AM), <http://www.cnet.com/news/faa-eases-barrier-to-commercial-drone-use/> (noting the FAA's recent shift to allow two dozen exemptions for commercial use of drones, while pointing out that some companies, like Amazon.com, continue to be denied requested exemptions).

49. See Bill Chappell, *Drones Approved: FAA Gives OK to First Commercial Use Over Land*, NPR: THE TWO-WAY (June 10, 2014, 10:12 AM), <http://www.npr.org/blogs/thetwo-way/2014/06/10/320630017/drones-approved-faa-gives-ok-to-first-commercial-use-over-land> (reporting that the permit allows BP to use drones equipped with optical and infrared sensors to conduct oilfield surveys in Alaska).

50. Alan Levin, *Hollywood Drone Approval May Blaze Trail for Farmers: DOT*, BLOOMBERG (Sept. 25, 2014, 3:15 PM), <http://www.bloomberg.com/news/2014-09-24/movie-makers-said-to-win-u-s-approval-for-using-drones.html>.

51. Brooks Barnes, *Drone Exemptions for Hollywood Pave the Way for Widespread Use*, N.Y. TIMES, Sept. 26, 2014, at B1.

52. Levin, *supra* note 50.

53. See, e.g., Press Release, The White House, Office of the Press Sec'y, Remarks by the President on Securing Our Nation's Cyber Infrastructure (May 29, 2009) (discussion by President Obama of the risks posed by cyber criminals, including that in 2008, they are estimated to have stolen intellectual property in excess of one trillion dollars from businesses around the world); Alan McHughen, *Technological Advances Increase the Risk of Genetic Identity Theft*, GEN (Aug. 1, 2009), <http://www.genengnews.com/gen-articles/technological-advances-increase-the-risk-of-genetic-identity-theft/2979/> (comparing current identity theft with the future potential for *genetic* identity theft through genome mapping).

54. See Lauren Kirchner, *The High-Tech—and Very Low-Tech—Tactics of Corporate Espionage*, PAC. STANDARD (May 27, 2014, 10:00 AM), <http://www.psmag.com/navigation/business-economics/corporate-espionage-trade-secrets-82166/> (citing illegal methods companies use to spy on other organizations, including a CEO who pled guilty to hacking into two competitors' computer systems to gain a business advantage).

55. See, e.g., Seth Weintraub, *Apple Campus 2 December 2014 Update + Drone Flyover Video*, 9TO5MAC (Dec. 6, 2014), <http://9to5mac.com/2014/12/06/apple-campus-2-december-2014-update->

and privacy. Part II.B.2 discusses how advancing technology has historically affected corporate security, and then provides examples of security invasions perpetrated by drone operators.

1. Safety and Privacy Concerns

In the last year, at least three drone operators have been arrested by New York police for reckless endangerment.⁵⁶ Moreover, people in locations where an expectation of privacy might exist, such as behind fences or in high-rise apartments, have seen drones unexpectedly flying nearby, possibly taking pictures or recording video.⁵⁷ State legislatures have taken steps to ensure the safety and privacy of their citizens from drones, and the FAA's actions so far suggest that they will do the same when issuing formal rules.⁵⁸

Inexperienced or reckless drone use poses a threat to public safety. For instance, in October 2013 an inexperienced operator lost control of his drone, causing it to fall thirty stories and nearly hit a passerby on the street.⁵⁹ To understand the damage this might cause, consider the "octocopters" used to demonstrate how Amazon.com hopes to use drones for package delivery.⁶⁰ Their exact weight will vary depending on certain components like type of battery, but estimates range from about ten to twelve pounds.⁶¹ Further, the plan is for the drones to be able to carry packages weighing up to about five pounds.⁶²

drone-flyover-video/ (displaying video footage of Apple's under-construction new facility that was captured by a journalist's drone). Thus far, all known industrial security invasions have been carried out by amateur operators rather than competitors.

56. Michael Berry & Nabih Syed, *Drones and Laws of General Applicability*, WASH. POST: VOLOKH CONSPIRACY (Sept. 25, 2014), <http://www.washingtonpost.com/news/volokh-conspiracy/wp/2014/09/25/drones-and-laws-of-general-applicability/> (citing incidents in which one operator flew his drone too near a police helicopter, another flew one over the U.S. Open, and a third lost control, causing his drone to plummet from the air and crash at the feet of a pedestrian).

57. See Lindsey Bever, *Seattle Woman Spots Drone Outside Her 26th-Floor Apartment Window, Feels 'Violated'*, WASH. POST (June 25, 2014), <http://www.washingtonpost.com/news/morning-mix/wp/2014/06/25/seattle-woman-spots-drone-outside-her-26th-floor-apartment-window-feels-violated/> (describing a woman who called police after spotting a drone outside her window while walking around unclothed; the drone operator was taking pictures of the skyline for commercial purposes and apologized for the privacy invasion).

58. See *Spotlight on Surveillance – October 2014, DRONES: Eyes in the Sky*, EPIC (Oct. 2014), <https://epic.org/privacy/surveillance/spotlight/1014/drones.html> (comparing various state legislation governing drone use and predicting what regulations the federal government might adopt).

59. See Jim Hoffer, *Exclusive: Brooklyn Man Arrested for Flying Drone over Manhattan*, EYEWITNESS NEWS ABC 7 (Oct. 18, 2013, 2:54 PM), <http://7online.com/archive/9292217/> (noting that police charged the man with reckless endangerment).

60. See *60 Minutes: Amazon*, *supra* note 44.

61. Compare Rhett Allain, *Physics of the Amazon Octocopter Drone*, WIRED (Dec. 3, 2013, 8:15 AM), <http://www.wired.com/2013/12/physics-of-the-amazon-prime-air-drone/> (giving a low estimate of the octocopter's weight at about ten pounds), with Daniel Price, *5 Facts About Amazon's Delivery Drones*, CLOUDTWEAKS (Feb. 27, 2014), <http://cloudtweaks.com/2014/02/5-facts-amazons-delivery-drones/> (stating the weight of the octocopter to be twelve pounds).

62. See *60 Minutes: Amazon*, *supra* note 44, (noting that the company's planned delivery drones will be able to carry payloads of five pounds or less, which accounts for eighty-six percent of Amazon.com's current deliveries).

This means that between the drone and its payload, fully or partially automated devices weighing up to seventeen pounds could be flying above heavily populated city streets.⁶³

Along with potential danger to pedestrians, amateur-operated drones also pose a risk to full-scale aircraft.⁶⁴ In November 2014, a medical helicopter took evasive actions to avoid a drone collision after dropping off a patient for medical treatment.⁶⁵ Further, a number of remote-controlled helicopter hobbyists have been injured and sometimes killed by malfunctioning devices and user error.⁶⁶ These machines share many characteristics with drones, and while often thought of as toys, their metal blades and high-powered engines make them dangerous when proper safety precautions are not observed.⁶⁷

Meanwhile, privacy-conscious individuals have taken a concerted interest in drone use and regulation, given the increasing sophistication of surveillance technology.⁶⁸ One of the latest systems used in drones is ARGUS-IS, currently the world's highest-resolution camera.⁶⁹ The system is capable of capturing twelve frames of video a second over a range of ten to twenty square miles, and can record up to a million terabytes of data a day.⁷⁰ An operator can play back

63. See *supra* notes 59–62 and accompanying text for varying estimates of drone weight and the potential danger drones pose to pedestrians.

64. See Cheryl K. Chumley, *New York Police Helicopter, Drone Nearly Crash over City Streets*, WASH. TIMES (Sept. 18, 2014), <http://www.washingtontimes.com/news/2014/sep/18/new-york-police-search-chopper-drone-nearly-crash/> (noting how an NYPD helicopter searching for a missing teenager nearly collided with an amateur drone being operated after midnight); Alan Feuer, *2 Arrested After Drone Flies Close to a New York Police Helicopter*, N.Y. TIMES, July 9, 2014, at A22 (describing how two men were arrested and charged with reckless endangerment for flying a small drone within 800 feet of a police helicopter); Maya Srikrishnan, *Drone Flies Too Close to NYPD Chopper, Police Say; Operators Arrested*, L.A. TIMES (July 8, 2014, 3:18 PM), <http://www.latimes.com/nation/nationnow/la-na-nn-nyc-drone-nypd-helicopter-20140708-story.html> (citing a police complaint alleging that a drone hitting a helicopter blade might damage the helicopter's flight mechanism). *But see* Gregory S. McNeal, *In Drone Near Miss with NYPD Helicopter, Defendants Say NYPD to Blame*, FORBES (July 8, 2014, 10:11 AM), <http://www.forbes.com/sites/gregorymneal/2014/07/08/two-drones-nearly-collide-with-nypd-helicopter-operators-arrested/> (noting defendants' claim to have video evidence showing they were not operating their drone recklessly, but that the police helicopter instead followed their drone and was not endangered in any way).

65. See Patrick deHahn, *Medical Aviation Group Airs Drone Worries*, ASS'NS NOW (Dec. 5, 2014), <http://associationsnow.com/2014/12/medical-aviation-group-expresses-drone-worries/> (describing the incident and noting that the FAA has released a report detailing 25 near-collisions between drones and full-size aircraft since June 2014).

66. See J. David Goodman, *Remote-Controlled Model Helicopter Fatally Strikes Its Operator at a Brooklyn Park*, N.Y. TIMES, Sept. 6, 2013, at A19 (citing numerous deaths and injuries caused by remote-controlled helicopters).

67. *Id.*

68. See *Spotlight on Surveillance – October 2014, DRONES: Eyes in the Sky*, *supra* note 58 for a description of advanced new surveillance systems available for use in drones.

69. *Id.*

70. *Id.* By comparison, the Hubble Telescope produces about ten terabytes of new data per year. See *About the Hubble Space Telescope*, NASA, http://www.nasa.gov/mission_pages/hubble/story/index.html#.VF-G-fnF-So (last visited Mar. 11, 2016).

video recorded from a specific location within its observation range from days ago, pinpointed to the specific minute.⁷¹ In addition, facial recognition software continues to improve, and researchers have made preliminary efforts to incorporate it into drone recording systems.⁷² As well, the length of time drones can remain in flight continues to increase, with solar-powered models in development capable of staying aloft up to five years.⁷³ And audio software is being developed capable of reconstructing human speech based on minute vibrations detectable by high-resolution cameras.⁷⁴

2. The Impact of Advancing Technology on Industrial Security

As technology has progressed rapidly in the twentieth and twenty-first centuries, companies have become increasingly reliant on it, and vulnerable to its misuse.⁷⁵ The recent “Heartbleed” software bug was a massive Internet security breach estimated to affect as many as two-thirds of all websites online.⁷⁶ Heartbleed was a mistake written into security encryption that allowed hackers to access passwords, user names, and sensitive information from individuals and companies.⁷⁷ As a consequence of this vulnerability, many large organizations had to update their servers and suggest that users change their passwords in order to maintain security.⁷⁸

In another secure data incident in September 2014, French police arrested and questioned engineers employed by BMW in connection with an alleged espionage plot.⁷⁹ The engineers had been using computer equipment to conduct tests on recharging stations created by Bolloré, a small company that develops

71. *Spotlight on Surveillance – October 2014, DRONES: Eyes in the Sky*, *supra* note 58.

72. See Andrew Conte, *Drones with Facial Recognition Technology Will End Anonymity, Everywhere*, BUS. INSIDER (May 27, 2013, 8:58 AM), <http://www.businessinsider.com/facial-recognition-technology-and-drones-2013-5> (describing experiments at Carnegie Mellon involving a drone sending images to a computer that used facial recognition software to identify researchers).

73. Nidhi Goyal, *New Solar Powered Drones Will Remain Airborne for Years*, INDUSTRY TAP (Sept. 6, 2013), <http://www.industrytap.com/new-solar-powered-drones-will-remain-airborne-for-years/12492>.

74. See *infra* notes 86–89 and accompanying text for details regarding this software’s capabilities and related privacy and security implications.

75. Cf. *Cybersecurity: Threats to the Financial Sector: Hearing Before the Subcomm. on Fin. Insts. and Consumer Credit of the H. Fin. Servs. Comm.*, 112th Cong. 8–10 (2011) (statement of Gordon M. Snow, Assistant Director, Cyber Div., FBI) (testifying on the ability of cyber criminals to infiltrate online market and financial systems, which results in the loss of millions of dollars).

76. Gary Davis, *The Heartbleed Vulnerability: What It Is and How It Affects You*, MCAFEE BLOG CENT. (Apr. 10, 2014), <http://blogs.mcafee.com/consumer/what-is-heartbleed>.

77. *Id.*

78. *Id.* See also Danny Yadron, *Bug Puts Masses of Data at Risk*, WALL ST. J., Apr. 9, 2014, at B8 (noting that as many as two-thirds of active websites might have been affected, while observing that major online companies like Amazon.com and eBay appeared to be safe).

79. Henry Samuel, *BMW Accused of Spying on Low Cost Electric Car Autolib’*, TELEGRAPH (Sept. 10, 2013, 4:57 PM), <http://www.telegraph.co.uk/motoring/news/10299447/BMW-accused-of-spying-on-low-cost-electric-car-Autolib.html>.

small electrical cars that are popular in Paris.⁸⁰ Bolloré filed a complaint with the Paris prosecutor, noting that the charging stations contain valuable and highly advanced battery and geolocation technology.⁸¹ Without directly accusing BMW of attempting to steal proprietary information, Bolloré noted that BMW is about to launch its own electric car.⁸² For its part, BMW acknowledged it had asked technicians to run “routine tests” on charging stations but denied it had engaged in espionage.⁸³

Lawmakers have not been blind to the misuse of technology. A recent report from the Center for Corporate Policy outlines many examples of large corporations spying on various entities, including activist groups and nonprofit organizations.⁸⁴ Congress has tried discouraging trade secret theft through statutes imposing harsh penalties for industrial espionage, which include fines potentially tied to the value of the secrets stolen.⁸⁵ Even so, the advancing pace of technology continues to create new potential security threats. For instance, MIT researchers recently unveiled what they call the visual microphone.⁸⁶ The process involves recording and analyzing the tiny vibrations that sound waves create on objects in a room, then using a computer algorithm to reconstruct those sound waves.⁸⁷ When these vibrations are caused by human speech, the algorithm can recreate the specific words spoken.⁸⁸ And since this is accomplished through video rather than audio means, it can be done even through soundproof glass.⁸⁹

3. Existing Industrial Security Breaches Through Drone Usage

Unregulated drone usage raises potential concerns for corporate security

80. *Id.*

81. *Id.*

82. *Id.*

83. *Id.*

84. See GARY RUSKIN, SPOOKY BUSINESS: CORPORATE ESPIONAGE AGAINST NONPROFIT ORGANIZATIONS 1, 9–34 (2013), <http://www.corporatepolicy.org/spookybusiness.pdf> (discussing various examples of corporate espionage, such as utility company Électricité de France hacking into the computers of Greenpeace France and Walmart sending a long-haired employee to surveil the activist group Up Against the Wal). The report notes that it is common practice for companies to hire former military, intelligence, and law enforcement personnel for investigative purposes. *Id.* at 3.

85. See CHARLES DOYLE, CONG. RESEARCH SERV., R42681, STEALING TRADE SECRETS AND ECONOMIC ESPIONAGE: AN OVERVIEW OF 18 U.S.C. 1831 AND 1832 Summary (2014), <http://fas.org/sgp/crs/secrecy/R42681.pdf> (noting that trade secret theft is a federal crime when the information pertains to a product in foreign or interstate commerce, or when being acquired for a foreign power, and outlining the available punishments).

86. Rachel Feltman, *MIT Researchers Can Listen to Your Conversation by Watching Your Potato Chip Bag*, WASH. POST, Aug. 4, 2014, at A3.

87. *Id.* (describing results in which high-speed video of the miniscule vibrations on a bag of potato chips caused by human speech is used to accurately reconstruct a person’s words through sound-proof glass).

88. *Id.*

89. See *id.* (noting, however, that the technology is still extremely new and not ready for widespread use).

and the potential theft of proprietary information.⁹⁰ One can imagine an unscrupulous executive producing video of a rival company's CEO visiting a strip club or abortion clinic, prompting conservative clients to switch providers.⁹¹ Likewise, recordings of executives meeting can provide information on possible mergers or corporate alliances, giving unfair advantages to investors or stock traders.⁹²

Recent videos shot by amateur UAV operators have drawn attention to the corporate security implications of drone use. In August 2014, a private user flew his drone over the construction site of Apple's planned Campus 2 headquarters, then uploaded the footage to YouTube.⁹³ The clip showed the construction project from various angles and was detailed enough to reveal the facility's size and overall shape.⁹⁴ Not long after, another site posted drone-shot video of a large structure erected at the site of Apple's iPhone 6 unveiling, planned for September 9th.⁹⁵ The video was posted days before the official reveal of the highly anticipated device.⁹⁶ While the footage does not reveal any secrets, there was a possibility that it could confirm speculation that Apple would reveal a wearable product.⁹⁷ Knowing definitively in advance what products were being launched could be of significant strategic advantage to competitors.⁹⁸ For its part, Apple did not seem bothered by the footage, perhaps because the company had already revealed similar information about the Campus 2 site itself.⁹⁹

90. See The LexBlog Network, *Another Use for Drones: Stealing Trade Secrets*, YOUTUBE (June 25, 2014), https://www.youtube.com/watch?v=7TtOxKJ4Kps&feature=player_embedded (interview with attorney Daniel Josh Salinas regarding various ways drones might be used to spy on business competitors to gain advantage).

91. See Mark Oppenheimer, *At Christian Companies, Religious Principles Complement Business Practices*, N.Y. TIMES, Aug. 3, 2013, at A14 (citing several prominent corporations that self-identify as Christian businesses).

92. See, e.g., James F. Peltz, *Lawyer Settles Insider-Trading Charges over Defense Merger: Securities: Lockheed Martin Employee Admits No Guilt but Will Pay \$86,590, SEC Says*, L.A. TIMES, Apr. 27, 1995, http://articles.latimes.com/1995-04-27/business/fi-59662_1_lockheed-martin-employee (citing how advance knowledge of a merger between Lockheed Martin and Martin Marietta Corporation led to allegations of profiting from illegal insider trading).

93. jmcminn, *Apple Campus 2 Construction Video—August 2014—Shot with GoPro*, YOUTUBE (Aug. 24, 2014), <https://www.youtube.com/watch?v=pfZvimPkKio> (amateur drone video uploaded to YouTube, the video-sharing website that allows any user to post and view videos for free).

94. See Gregory S. McNeal, *A Drone Flew over Apple's New Campus, and What It Saw Was Amazing*, FORBES (Sept. 1, 2014, 6:16 AM), <http://www.forbes.com/sites/gregorymneal/2014/09/01/a-drone-flew-over-apples-new-campus-and-what-it-saw-was-amazing/> (discussing what can be discerned from the footage).

95. AppleInsider Staff, *Exclusive Aerial Footage of Apple's Mysterious White Box Next to iPhone 6 Event Site*, APPLEINSIDER (Sept. 4, 2014, 10:04 AM), <http://appleinsider.com/articles/14/09/04/exclusive-aerial-footage-of-apples-mysterious-white-box-next-to-iphone-6-event-site>.

96. *Id.*

97. *Id.*

98. See *id.* For instance, had drone footage shown Apple smart watches being brought into the facility, this might be highly valuable information to competitors wondering if they need to rush to market to avoid losing market share to Apple early on.

99. See Brian Caulfield, *Three Reasons Why Apple's New Campus Is Ready for Anything*,

Further, in June 2014, France's World Cup soccer team reported a drone flying over its practice facilities only days before its opening match against Honduras.¹⁰⁰ Initial speculation that the drone might belong to Honduran reporters or representatives proved false after local police located the operator, a private citizen who simply wanted to watch the team practice.¹⁰¹ Nonetheless, professional sports are a massive moneymaking endeavor in the United States and worldwide.¹⁰² Many teams jealously guard their training regimens, player's injuries, and statistical metrics from the public eye.¹⁰³ Team officials, players, gamblers, and others who stand to profit from sports might try to gain an advantage by using drones to observe team practices to learn strategies, record signals, and discover unreported injuries.¹⁰⁴

C. *Legislation and Case Law Governing Drones*

Until recently, the FAA's policy had been to prohibit all commercial drone use, while relying on recreational users to comply with voluntary guidelines.¹⁰⁵ Part II.C.1 outlines the regulations that the FAA has established regarding how private citizens and commercial entities may use drones. Part II.C.1 also explores how these regulations have been challenged, notably in a recent court ruling against the FAA. Finally, Part II.C.2 examines legislation that various states have passed governing drone use within their borders, as well as proposed federal legislation.

FORBES (June 10, 2012, 1:49 PM), <http://www.forbes.com/sites/briancaulfield/2012/06/10/three-reasons-why-apples-new-campus-is-ready-for-anything/> (discussing publicly available information regarding Apple's new campus).

100. See Stuart James, *FIFA Investigating France's Claims That a Drone Spied on Training*, GUARDIAN (June 14, 2014, 4:01 PM), <http://www.theguardian.com/football/2014/jun/14/france-drone-fifa-spying-investigation-world-cup> (reporting that France's coach resents the intrusion into the team's privacy, and believes governing body FIFA is carrying out an inquiry into the drone's purpose and origin).

101. Sean Gallagher, *France Cries Foul at World Cup "Spy Drone,"* ARS TECHNICA (June 16, 2014, 11:30 AM), <http://arstechnica.com/information-technology/2014/06/france-cries-foul-at-world-cup-spy-drone/>.

102. See Mike Ozanian, *The Most Valuable NFL Teams*, FORBES (Aug. 14, 2013, 9:36 AM), <http://www.forbes.com/sites/mikeozanian/2013/08/14/the-most-valuable-nfl-teams/> (noting that the average NFL team is worth \$1.17 billion and the world's top twenty soccer teams are worth on average \$968 million apiece).

103. See, e.g., Steve Mirsky, *Numbers Game*, SCI. AM., Apr. 2014, at 88, 88 (explaining that many professional baseball teams employ proprietary statistics quantifying various aspects of player performance, purchased from the people who developed them).

104. See, e.g., Greg Bishop & Pete Thamel, *Goodell May Have to Explain Actions in Spying Case to Congress*, N.Y. TIMES, Feb. 1, 2008, at D1 (describing how the New England Patriots faced heavy fines and league sanctions for filming the defensive hand signals of a competing team in order to predict plays).

105. See *infra* notes 106–21 and accompanying text for a discussion of the FAA's current approach, pending feedback on its proposed rules.

1. Regulations and Court Decision Regarding Drone Use

In spite of developing plans, the biggest impediment to commercial use of drones centers on the legality of doing so. In 1958, in the wake of a horrific midair collision between airplanes, Congress passed the Federal Aviation Act, establishing the FAA.¹⁰⁶ Aircraft regulations promulgated by the FAA are found in Title 14 of the Code of Federal Regulations.¹⁰⁷ These regulations establish that aircraft must be inspected annually and issued an airworthiness certificate,¹⁰⁸ that nearly all aircraft are required to be registered with the government,¹⁰⁹ and that aircraft pilots must have valid piloting certification.¹¹⁰

Rather than promulgating rules for model aircraft safety as they did with full-size aviation vehicles, the FAA issued an Advisory Circular for hobbyists in 1981, filled with suggestions pertaining to the use of model aircraft.¹¹¹ Notably, these were voluntary requests rather than formal rules.¹¹² For years, these voluntary guidelines remained the FAA's only stance governing the use of small unmanned aircraft, until the early stages of private drone use in 2005.¹¹³ Since 2005, the FAA has issued memoranda and policy statements further restricting the use of drones, as well as fines to perceived violators, but has not promulgated official regulations.¹¹⁴

In 2007, the FAA published its policies for UAV use in the Federal Register, which among other regulations, prohibits all drone use for commercial purposes.¹¹⁵ The policies define "commercial purposes" as use by private civilians for nonhobby purposes.¹¹⁶ Subsequently, as part of the FAA Modernization and Reform Act of 2012 (FMRA), Congress directed the FAA to develop a plan for integrating drones into U.S. airspace.¹¹⁷ Until such time as this

106. Michael Berry & Nabih Syed, *The FAA's Slow Move to Regulate Domestic Drones*, WASH. POST: VOLOKH CONSPIRACY (Sept. 24, 2014), <http://www.washingtonpost.com/news/volokh-conspiracy/wp/2014/09/24/the-faas-slow-move-to-regulate-domestic-drones/>.

107. FAA, AVIATION TECHNICIAN HANDBOOK—GENERAL 12-1 (2008), https://www.faa.gov/regulations_policies/handbooks_manuals/aircraft/amt_handbook/media/FAA-8083-30_Ch12.pdf (last visited Mar. 11, 2016).

108. 14 C.F.R. § 91.409 (2015).

109. *Id.* § 47.3.

110. *Id.* § 61.3.

111. *See* Berry & Syed, *supra* note 106 (citing suggestions including not flying model aircraft higher than 400 feet, within three miles of an airport, or near full-scale aircraft or noise-sensitive areas like schools, churches, or hospitals).

112. *See id.* (outlining specifics of Advisory Circular 91-57).

113. *Id.*]

114. *Id.* *See infra* notes 127–48 and accompanying text for a discussion of the FAA's efforts to enforce its drone policies and challenges to its authority to do so.

115. *See* Robert M. Howard & Hillary H. Steenberge, *FAA Lacks Authority to Ground Small UAVs Used for Commercial Purposes*, LATHAM & WATKINS CLIENT ALERT COMMENT., Mar. 11, 2014, at 1, 3, <http://www.lw.com/thoughtLeadership/LW-NTSB-decision-FAA-UAVs> (describing how the FAA has maintained that it has authority to regulate all civilian use of drones and has banned and taken aggressive steps to curtail any nonrecreational or for-profit use).

116. *Id.*

117. *See* FAA Modernization and Reform Act of 2012, Pub. L. No. 112-95, § 332(a)(3), 126

plan has received comment and been formalized, the FAA has taken a firmly restrictive approach to drone use.¹¹⁸ As part of its efforts, the FAA has posted a list of common myths and facts about private and commercial drone use on their website.¹¹⁹ It clearly states that all commercial drone use without specific FAA approval is prohibited.¹²⁰ Further, it indicates that the FAA has sufficient resources to regulate existing commercial drone operations.¹²¹

Private citizens and corporations alike are eager to begin using drones for their own purposes, which could create temptation to ignore the FAA's policies.¹²² However, the FAA has not been reticent about enforcing its regulations, issuing cease and desist letters to college drone journalism programs pending approval of certificates of authorization.¹²³ The University of Michigan planned to celebrate the 100th anniversary of its aerospace engineering program by having a drone deliver the game ball at a recent football game.¹²⁴ However, school officials were asked by the FAA to cancel these plans.¹²⁵ Prior to June 2014, commercial enterprises that applied to the FAA for exemptions were uniformly turned down, and many such requests continue to be denied.¹²⁶

Stat. 11, 73 (2012) ("The plan required . . . shall provide for the safe integration of civil unmanned aircraft systems into the national airspace system as soon as practicable, but not later than September 30, 2015.").

118. See Pilkington, *supra* note 4 (discussing how nearly all commercial use of drones is strictly prohibited).

119. See *Busting Myths About the FAA and Unmanned Aircraft*, FAA, <http://www.faa.gov/news/updates/?newsId=76240> (last modified Mar. 7, 2014, 4:44 PM) (addressing what the FAA believes to be popular misconceptions about drone use).

120. *Id.*

121. See *id.* (claiming as "myths" that there are too many commercial drone operations for the FAA to stop and that any commercial drone operations are a "gray area," rather than a clear violation of FAA regulations). See *supra* notes 48–52 and accompanying text for examples of the commercial operations that the FAA has thus far approved, which include surveying oilfields in Alaska and shooting footage for Hollywood movies.

122. See *supra* Part II.A.2 for a discussion of planned drone use by companies and private operators.

123. See Megan O'Neil, *2 Drone-Journalism Programs Seek Federal Approval to Resume Flying*, CHRON. OF HIGHER EDUC. (Aug. 27, 2013), <http://chronicle.com/blogs/wiredcampus/2-drone-journalism-programs-seek-federal-approval-to-resume-flying/45653> (explaining how current restrictions require them to alert the FAA regarding what drones they will be flying and when and where the flights will occur, and how difficult this is to do when attempting to cover breaking news).

124. Alan Levin, *Pigskin Delivery Drone at Michigan Thrown for Loss by FAA*, BLOOMBERG BUS. (Sept. 20, 2014, 12:00 AM), <http://www.bloomberg.com/news/articles/2014-09-20/pigskin-delivery-drone-at-michigan-thrown-for-loss-by-faa>.

125. See *id.* (noting that the FAA explained its drone regulations and pointed out it had already approved a temporary flight restriction for other aircraft to participate in the anniversary celebration, which convinced the school to voluntarily comply).

126. See Julianne Chiaet, *Drone Pilot Challenges FAA on Commercial Flying Ban*, SCI. AM. (Nov. 1, 2013), <http://www.scientificamerican.com/article/drone-pilot-challenges-faa-commercial-flying-ban/> (explaining that the FAA continues sending cease and desist letters to commercial drone users, citing as authority its mandate to enforce safety regulations applying to all aircraft). See *supra* notes 48–52 and accompanying text for a details of the limited number of waivers the FAA has granted to date for commercial drone use, as well as companies that have requested waivers and been denied, such as Amazon.com.

In response, certain smaller organizations, such as real estate agencies, have shown a willingness to use drones for commercial purposes without FAA authorization.¹²⁷ As justification, business owners point to the FAA's 2005 memorandum and 2007 policy statement.¹²⁸ Both documents state that the FAA has authority to regulate drone usage and to ban commercial use of drones.¹²⁹ However, these individuals argue that the FAA documents are simply statements or pronouncements, since they were not issued as formal rules as required by the Administrative Procedure Act.¹³⁰ If a judge agrees that the FAA did not go through the required rulemaking process, he or she could find the commercial ban not legally enforceable.¹³¹ Despite the lack of official regulatory standards, the FAA continues to issue cease and desist letters.¹³² Operators who ignore these orders maintain that the FAA lacks the authority to issue fines based on policy alone, rather than official regulations or laws.¹³³

The FAA's authority was tested recently with the case of Raphael Pirker, an aerial filmmaker.¹³⁴ In 2011, Pirker accepted payment to use his UAV to shoot aerial footage of the University of Virginia campus for promotional materials.¹³⁵ In 2013, the FAA issued Pirker a \$10,000 fine for this action.¹³⁶ Pirker responded by filing a motion to dismiss with an administrative law judge at the National Transportation Safety Board.¹³⁷ Pirker claimed that because the FAA has not issued formal rules regulating drones, their pronouncements are informal and unenforceable.¹³⁸

In a decision dated March 6, 2014, Administrative Law Judge Patrick Geraghty affirmed Pirker's motion to dismiss.¹³⁹ Judge Geraghty pointed out that policy statements from an agency are not binding on the general public and cannot be used to establish valid rules.¹⁴⁰ He conceded that the FAA's Notice 07-

127. See Aschbrenner, *supra* note 45 (explaining that they consider drones too good of a tool not to use, and have adopted a "request forgiveness later" philosophy).

128. Michael Berry & Nabih Syed, *Litigation Pushes Back Against FAA Enforcement*, WASH. POST: VOLOKH CONSPIRACY (Sept. 24, 2014), <http://www.washingtonpost.com/news/volokh-conspiracy/wp/2014/09/24/litigation-pushes-back-against-faa-enforcement/>.

129. *Id.*

130. *Id.*

131. Chiaet, *supra* note 126.

132. *Id.*

133. See, e.g., *id.* (reporting on an aerial filmmaker who has lost business in the past due to the commercial drone use restrictions and now ignores the FAA's direct order to cease operations due to his belief that they cannot legally fine him).

134. *Id.*

135. *Id.*

136. Berry & Syed, *supra* note 128. The FAA's rationale for assessing a civil penalty against Pirker included that he had violated the commercial ban and endangered people and property by flying his drone at extremely low altitudes, near people and railway tracks, and through tunnels with moving cars underneath. *Id.*

137. *Id.*

138. *Id.*

139. Huerta v. Pirker, No. CP-217, 2014 WL 3388631, at *7 (N.T.S.B. Mar. 6, 2014).

140. *Id.* at *3.

01 regarding current policy for UAS operations was published in the Federal Register, and thus could conceivably be considered legislative rulemaking.¹⁴¹ However, Judge Geraghty went on to determine that Notice 07-01 was not issued as a Notice for Proposed Rulemaking.¹⁴² Under the Administrative Procedure Act, in order to promulgate a rule, an agency must publish it in the Federal Register and allow for notice and comment.¹⁴³ Also, because Notice 07-01 was issued on February 6, 2007 and published as a Notice of Policy on February 13, 2007,¹⁴⁴ it did not meet the time requirement necessary to be considered a substantive rule.¹⁴⁵ In Judge Geraghty's view, Congress ordered the FAA to promulgate official rules governing drone use because there are currently none in place; thus the FAA cannot enforce its policies until these rules have been formalized.¹⁴⁶ The FAA immediately appealed this ruling.¹⁴⁷ Until further proceedings occur, the FAA believes that its appeal stayed Judge Geraghty's ruling, meaning it can still fine unauthorized drone users.¹⁴⁸

Until recently, the best guidance available to those looking to predict future rules was the FAA's "roadmap" to their intentions regarding drone regulation.¹⁴⁹ However, in February of 2015, the FAA released a draft of its proposed rules governing commercial use of drones.¹⁵⁰ Primary rules include limiting nonrecreational users to daylight flights within line of sight and requiring

141. *Id.* at *4.

142. *Id.*

143. Administrative Procedure Act, 5 U.S.C. § 553 (2014); *see also The Administrative Procedure Act (APA)*, EPIC, https://epic.org/open_gov/Administrative-Procedure-Act.html (last visited Mar. 11, 2016) (observing that in certain cases, notice and comment rulemaking is not required, such as matters involving the military or related to agency management; however, none of the exceptions would apply in this instance).

144. *Huerta*, 2014 WL 3388631, at *4.

145. *See id.* (noting that § 553(d) requires notice to be published no fewer than thirty days before the effective date to establish a substantive rule).

146. Berry & Syed, *supra* note 128; *see also Huerta*, 2014 WL 3388631, at *4 (finding it to be a reasonable inference that legislators, in asking the FAA to prepare a plan for regulating nonmilitary drone use rather than attempting to modify or amend any existing rules, believed that currently there are no formal regulations governing the operation of model aircraft and related devices).

147. *See* Nidhi Subbaraman, *FAA Fine Against Drone Photographer Dismissed*, NBC NEWS (Mar. 7, 2014, 4:50 PM), <http://www.nbcnews.com/tech/innovation/faa-fine-against-drone-photographer-dismissed-n46506> (noting that the FAA is "concerned that this decision could impact the safe operation of the national airspace system and the safety of people and property on the ground").

148. *See* Berry & Syed, *supra* note 128 *see also* Joshua S. Turner & Katy M. Ross, *Ruling on Drone Regulation Is Only Minor Setback for FAA*, WILEY REIN LLP (Mar. 11, 2014), <http://www.wileyrein.com/publications.cfm?sp=articles&id=9496> (predicting that the FAA will continue to issue cease and desist letters while its appeal proceeds).

149. *See* FED. AVIATION ADMIN., INTEGRATION OF CIVIL UNMANNED AIRCRAFT SYSTEMS (UAS) IN THE NATIONAL AIRSPACE SYSTEM (NAS) ROADMAP 5 (2013), http://www.faa.gov/uas/media/uas_roadmap_2013.pdf (expressing the FAA's intent to use its existing certification process for aircraft to evaluate items unique to drones).

150. Operation and Certification of Small Unmanned Aircraft Systems, 80 Fed. Reg. 9543 (proposed Feb. 15, 2015) (to be codified at 14 C.F.R. pt. 21, 43, 45, 47, 61, 91, 101, 107, 183).

operators to pass a certification test once every two years.¹⁵¹ If adopted, these rules will allow many commercial users to use drones in ways that until now have been prohibited.¹⁵² However, critics note that some of the restrictions, like the daylight and line-of-sight requirements, would severely hamper some commercial uses.¹⁵³ Until any such rules are finalized, commercial users are still required to obtain a waiver from the FAA.¹⁵⁴ The proposed rules do not impact recreational users, who may fly drones without restriction if they refrain from interfering with air traffic.¹⁵⁵

2. State and Federal Legislation

Many states did not wait for the FAA to finish preparing its recommendations to present to Congress.¹⁵⁶ In all, forty-one states have drafted legislation indicating how law enforcement personnel and private citizens may use drones.¹⁵⁷ Of these, fifteen have enacted laws placing restrictions on drone use.¹⁵⁸

151. See Press Release, FAA, DOT and FAA Propose New Rules for Small Unmanned Aircraft Systems (Feb. 15, 2015), http://www.faa.gov/news/press_releases/news_story.cfm?newsId=18295 (stating that other requirements include that operators be at least seventeen years old); see also Sam Sanders, *FAA Proposal on Drones Highlights Safety over Privacy Concerns*, NPR (Feb. 15, 2015, 5:00 PM), <http://www.npr.org/2015/02/15/386544387/faa-proposal-on-drones-highlights-safety-over-privacy-concerns> (outlining various elements of the proposed rules, including that the rules would allow for most journalistic and real estate use, and observing that these rules do not cover privacy issues, but that the FAA plans to revisit those concerns later).

152. See Matt McFarland, *Here's What Drone Advocates Love and Hate About the FAA's Proposed Rules*, WASH. POST (Feb. 15, 2015), <http://www.washingtonpost.com/blogs/innovations/wp/2015/02/15/heres-what-drone-advocates-love-and-hate-about-the-faas-proposed-rules/> (noting that, while required to pass a certification test, operators will neither need to obtain a private pilot license nor have their drones certified for "airworthiness" by the FAA).

153. See Scott Shane, *F.A.A. Acts to Regulate Drones Used for Business*, N.Y. TIMES, Feb. 16, 2015, at A8 (observing that these requirements would rule out the automated delivery services contemplated by Amazon.com and other companies, but noting that Amazon officials believe the rules might be relaxed in the future); see also Craig Whitlock, *FAA Rules Might Allow Thousands of Business Drones*, WASH. POST (Feb. 15, 2015), http://www.washingtonpost.com/world/national-security/faa-releases-proposed-rules-for-domestic-drone-use/2015/02/15/6787bdce-b51b-11e4-a200-c008a01a6692_story.html (citing further restrictions, such as being required to fly less than 100 mph and under 500 feet).

154. See Aaron Cooper, *FAA Proposes to Allow Commercial Drone Use*, CNN (Feb. 15, 2015, 3:00 PM), <http://www.cnn.com/2015/02/15/politics/drones-faa-rules-commercial-flights/> (noting that the proposed rules will go through public comment and other feedback and could take years to be finalized).

155. See Whitlock, *supra* note 153 (noting that the FAA is prohibited from regulating recreational drone use as long as users do not interfere with air traffic).

156. See Allie Bohm, *Status of 2014 Domestic Drone Legislation in the States*, AM. CIV. LIBERTIES UNION, <https://www.aclu.org/blog/technology-and-liberty/status-2014-domestic-drone-legislation-states> (June 30, 2014) (providing an overview of which states have introduced legislation regarding drones and the status of that legislation).

157. *Id.*

158. Christina Sterbenz, *Should We Freak Out About Drones Looking in Our Windows?*, BUS.

Of existing legislation governing the operation of drones, Idaho's statutes are among the most comprehensive and restrictive.¹⁵⁹ Section 21-213 of the Idaho Code firmly regulates the use of unmanned aircraft systems (including drones) to prevent surveillance or information gathering.¹⁶⁰ Law enforcement personnel are barred from using drones, except with a search warrant or "for emergency response for safety, search and rescue or controlled substance investigations."¹⁶¹ In addition, section 21-213 prohibits all people and state agencies from publishing, or otherwise publicly disseminating, pictures or recordings taken by a drone without the written consent of the subjects of the picture or recording.¹⁶² The American Civil Liberties Union observed that this would probably bar news stations from showing footage shot with a drone without obtaining written permission from every person in the frame¹⁶³ and theorized that this might violate First Amendment rights.¹⁶⁴

In contrast, other states have enacted more flexible statutes to regulate private and commercial use of drones. Oregon's restrictions allow an individual to bring a civil action only if a drone operator continues flying a drone over that individual's property after being asked to stop.¹⁶⁵ Meanwhile, Texas has enacted comparatively moderate restrictions through the Texas Privacy Act, which gives law enforcement personnel broad discretion to use drones.¹⁶⁶ The statute

INSIDER (Sept. 24, 2014, 2:22 PM), <http://www.businessinsider.com/privacy-issues-with-commercial-drones-2014-9>. For instance, Texas and Idaho have banned publishing photos shot by drones without the consent of every person in the photograph and the landlord of every building shown. Aaron Sankin, *The Dizzying State of America's Drone Laws*, THE DAILY DOT (Apr. 24, 2014, 10:28 AM), <http://www.dailydot.com/politics/us-state-drone-laws-mess/>.

159. See Allie Bohm, *The First State Laws on Drones*, AM. CIV. LIBERTIES UNION (Apr. 15, 2013, 3:13 PM), <https://www.aclu.org/blog/technology-and-liberty-national-security/first-state-laws-drones> (explaining how Idaho's law "significantly restricts the private use of drones").

160. See IDAHO CODE ANN. § 21-213 (West 2015) (barring any person or state agency from intentionally conducting surveillance of, gathering information about, or recording another person or private property).

161. *Id.*

162. *Id.*

163. Bohm, *supra* note 159.

164. Allie Bohm, *The Year of the Drone: An Analysis of State Legislation Passed This Year*, AM. CIV. LIBERTIES UNION (Nov. 7, 2013, 8:50 AM), <https://www.aclu.org/blog/technology-and-liberty/year-drone-roundup-legislation-passed-year>; see also Timothy B. Lee, *States Look to Rein in Drones*, WASH. POST, June 19, 2013, at A13 (noting that courts have ruled that private citizens have a right to shoot video of the actions of public officials under the First Amendment, and theorizing that the same reasoning would apply to aerial drone recordings of police activities).

165. OR. REV. STAT. ANN. § 837.380 (West 2013); see also Michael Berry & Nabih Syed, *State Legislation Governing Private Drone Use*, WASH. POST: VOLOKH CONSPIRACY (Sept. 25, 2014), <http://www.washingtonpost.com/news/volokh-conspiracy/wp/2014/09/25/state-legislation-governing-private-drone-use/> (noting that presently, a property owner may sue a private drone operator only if the drone has been flown less than 400 feet over the property at least once, the property owner has told the drone operator that he does not give consent, and the operator again flies the drone less than 400 feet over the property).

166. See TEX. GOV'T CODE ANN. § 423.002 (West 2015) (permitting law enforcement officers to use drones when they have reasonable suspicion or probable cause that an offense has been committed, to investigate scenes of fatalities or auto accidents, to search for missing persons, and in

prohibits civilian drone operators from capturing images of people or property without permission, and makes them liable for civil damages.¹⁶⁷ However, it also includes a number of exemptions that allow certain users to fly drones freely.¹⁶⁸

In September 2014, California's governor approved AB 2306, a bill—created partially in response to drones—that bolsters California's privacy laws.¹⁶⁹ It expands potential liability for constructive invasion of privacy, removing a prior provision stating that to be liable, the party must have used a visual or auditory enhancement device.¹⁷⁰ Under certain definitions, a drone might not qualify as an enhancement device, potentially letting drone users escape liability for constructive invasion of privacy.¹⁷¹ Thus, California law now prohibits using *any* device to capture a “visual image, sound recording, or other physical impression . . . of another person engaging in a personal or familial activity under circumstances in which the other person had a reasonable expectation of privacy.”¹⁷² By allowing the aggrieved party to sue for actual, treble, and punitive damages, California has issued a strong statement against invasion of privacy by drone use.¹⁷³

Congress has followed the example of state legislatures in assessing several drone-related bills.¹⁷⁴ The Drone Aircraft Privacy and Transparency Act of 2013 would have required private drone operators to be licensed and to provide the FAA with a data collection statement prior to receiving a license.¹⁷⁵ These statements would have had to include the identity of the person operating the drone, where she or he plans to operate it, what data is to be collected, how it will be used and stored, and whether it will be sold to third parties.¹⁷⁶ The bill

numerous other circumstances).

167. *Id.* § 423.003.

168. *Id.* § 423.002; see also Will Weissert, *Texas Drones Law Gets Tough on Public, Private Use*, HUFFINGTON POST (Sept. 14, 2013, 12:44 PM), http://www.huffingtonpost.com/2013/09/14/texas-drones-law_n_3926849.html (providing examples of parties who are allowed to fly drones without restrictions, including teachers and students doing research and licensed real estate brokers in connection with selling real property).

169. Associated Press, *5 Notable Bills Passed During California's Legislative Session*, Aug. 30, 2014, <http://www.news10.net/story/news/local/california/2014/08/30/legislature-ends-with-water-ethics-guns-bills/14876807/>.

170. See Editorial, *Privacy and the Paparazzi*, L.A. TIMES, Aug. 20, 2014, at A10 (noting that the removal of this provision makes it possible to prosecute those who record others without use of, for instance, a telephoto lens or long-range microphone, thereby increasing the bill's power to protect privacy).

171. *Id.*

172. Assemb. B. 2306, 2013–14 Leg., Reg. Sess. (Cal. 2014).

173. See Donald Wagner, *Update on Developments in California Drone Law*, BUCHALTER NEMER AVIATION AND AEROSPACE BLOG (Oct. 13, 2014), <http://www.buchalter.com/practice-area-blog/update-on-developments-in-california-drone-law/> (summarizing AB 2306 and outlining some of its consequences).

174. See Berry & Syed, *supra* note 106 for brief summations of two such pending bills.

175. Drone Aircraft Privacy and Transparency Act of 2013, H.R. 2868, 113th Cong. § 339 (2013).

176. See Hans, *supra* note 12 for a summation of the most significant elements of the Drone Aircraft Privacy and Transparency Act of 2013.

would also have required the FAA to maintain a database of licensed drone operators, keeping track of the times and locations of their flights, what data they are collecting, and any security breaches they may have suffered.¹⁷⁷ However, the Drone Aircraft Privacy and Transparency Act of 2013 was not enacted and is currently listed as dead.¹⁷⁸

The Preserving American Privacy Act of 2013 devoted more attention to governmental use of drones, but also contained provisions regulating private drone operators.¹⁷⁹ It would have banned private operators from intentionally using drones to capture data on anyone engaging in personal activities, “in a manner that is highly offensive to a reasonable person.”¹⁸⁰ This language seems designed to protect drone operators who accidentally capture images that might conceivably violate someone’s privacy.¹⁸¹ The Preserving American Privacy Act of 2013 likewise was not enacted and is now considered dead.¹⁸²

Finally, in February 2015, President Obama issued a memorandum regarding drone use.¹⁸³ This memorandum does not impact private or industrial users, but instead sets rules on how federal agencies may use drones.¹⁸⁴ As for nongovernmental drone operators, the memorandum calls for a stakeholder group to create guidelines governing commercial and private use.¹⁸⁵

As technology advances and becomes more affordable, private citizens and companies will continue exploring the use of drones for recreational, commercial, and humanitarian purposes.¹⁸⁶ However, with these benefits arise numerous concerns surrounding personal safety and privacy, as well as corporate security.¹⁸⁷ The FAA’s current drone regulations (pending adoption of their proposed rules) are highly restrictive and potentially unenforceable.¹⁸⁸ In

177. *Id.*

178. See *H.R. 2868: Drone Aircraft and Privacy Act of 2013*, GOVTRACK, <https://www.govtrack.us/congress/bills/113/hr2868> (last visited Mar. 5, 2016) (noting the bill’s status as “Died in a previous Congress”).

179. Preserving American Privacy Act of 2013, H.R. 637, 113th Cong. (2013).

180. *Id.* § 3119f.

181. See *id.* (proposing to make unlawful an *intentional* use of an unmanned aircraft system to capture private data).

182. See *H.R. 637 (113th): Preserving American Privacy Act of 2013*, GOVTRACK, <https://www.govtrack.us/congress/bills/113/hr637> (last visited Mar. 5, 2016) (showing the bill’s status as “Died in a previous Congress”).

183. Jack Nicas & Andy Pasztor, *FAA Proposes Rules to Allow Commercial Drone Flights in U.S.*, WALL ST. J. (Feb. 15, 2015, 1:43 PM), <http://www.wsj.com/articles/obama-issues-privacy-rules-for-government-drones-in-u-s-1424015402>.

184. See *id.* (noting that the rules are intended to safeguard the civil liberties and privacy of citizens, including in many cases setting a 180-day time limit during which drone-gathered data may be retained by agencies).

185. See *id.* (reporting that the memorandum orders the Department of Commerce to assemble this group within ninety days, and for the group to examine “privacy, accountability and transparency issues” related to drone use).

186. See *supra* Part II.A.2 for a discussion of the growing civilian and commercial use of drones.

187. See *supra* Part II.B.1–3 for a discussion of the negative implications of drone use.

188. See *supra* Part II.C.1 for a discussion of regulations governing drones.

amending the proposed rules following public comment and feedback, the FAA should consider incorporating parts of various states' statutes and proposed federal bills into its regulations.¹⁸⁹

III. DISCUSSION

This Section contends that regulation of drones is necessary, and that to effectively protect safety and privacy, these regulations must be stronger than the rules recently proposed by the FAA. The rapidly increasing availability of drones offers excitement for the myriad ways they may improve our enjoyment and quality of life.¹⁹⁰ Many companies foresee means of using drones to increase their profitability.¹⁹¹ However, unrestricted drone use is unfeasible due to potential industrial espionage, safety concerns, and the possibility of violating substantive privacy rights.¹⁹² Formal rules, state and federal legislation, or a combination of both are necessary to promote proper use and discourage misuse of this new technology.¹⁹³ As the FAA receives comments on its proposed rules and Congress considers drone regulation bills, both bodies should look to existing state statutes.¹⁹⁴ In doing so, they should assess which elements might be overly restrictive, and which may not regulate enough.¹⁹⁵ Specifically, the FAA and Congress should find Idaho's statutes overly prohibitive in their efforts to safeguard privacy, and Oregon's laws too broad to effectually protect privacy.¹⁹⁶ Instead, both bodies should look to California's and Texas's drone laws as partial templates, albeit requiring more specificity to avoid potential Constitutional privacy issues.¹⁹⁷

Part III.A of this Section argues that legislation governing drone activity will be critical as use continues to increase. Part III.A.1 contends that unrestricted drone use would be highly problematic due to various safety

189. See *supra* Part II.C.2 for a discussion of state and federal legislation regarding drones.

190. See *supra* Part II.A.1–2 for a discussion of why drones are expanding from exclusively military application to private use and the current and potential benefits.

191. See *supra* Part II.A.2 for a discussion of the current and possible future benefits of commercial drone use.

192. See *supra* Part II.B.1–3 for a discussion of the potential risks of unregulated drone use and why it ultimately is not feasible.

193. See *supra* Part II.C.1–2 for a discussion of current FAA rules regulating drones, why they may be unenforceable, and current state and proposed federal legislation.

194. See *supra* notes 156–73 and accompanying text for a discussion of state statutes regulating drone use.

195. See *supra* notes 156–73 and accompanying text for a discussion of state statutes regulating drone use.

196. See *supra* notes 159–65 and accompanying text for a comparison of Oregon's and Idaho's current drone legislation. See *infra* Part III.B.2 for a discussion of which elements of each state's current regulations are likely to be effective long term and which could cause problems and require amendment.

197. See *supra* notes 166–73 and accompanying text for a discussion of Texas's and California's respective drone regulation laws. See *infra* Part III.B.2 for examples of additions and revisions that might make these or similar statutes more effective without removing their ability to protect safety and privacy.

concerns. Part III.A.2 delineates privacy issues that likewise would arise from a lack of drone regulations, thus revealing why legislation governing drone operation is necessary. Part III.B of this Section discusses past, current, and future legislation regulating aircraft and drones. Part III.B.1 examines how the FAA regulates full-scale aircraft and recommends that some of these rules should also apply to drones. Part III.B.2 assesses proposed federal bills and current state statutes regulating drones, arguing for certain elements to be carried over by other states and Congress in drafting legislation.

A. *Necessity of Legislation*

A study of both the history of similar technologies and of recent events suggests that drone regulation is necessary to safeguard reasonable expectations of privacy and safety. At the same time, care must be taken not to violate the civil liberties of citizens or to overly restrict the immense potential that drones possess. Part III.A.1 discusses the safety issues posed by drones and argues that the FAA needs to institute regulations to protect against injuries. Part III.A.2 cites privacy concerns that remain unaddressed in the FAA's proposed rules, contending that these rules must be amended to more effectively safeguard privacy before being formalized.

1. Safety Concerns

One of the greater potential safety hazards posed by drones is unintentional interference with the operations of larger aircraft.¹⁹⁸ In addition to police investigations or missing person searches, a drone collision could force medical aircraft into emergency landings, delaying necessary treatment.¹⁹⁹ A drone striking a helicopter's rotor might cause the helicopter to sustain damage or even to crash.²⁰⁰ The FAA recorded twenty-five near collisions between drones and full-scale aircraft just between June and November of 2014.²⁰¹ Given the relatively small number of recreational drone users thus far and the current ban on commercial drones, this raises obvious concerns.²⁰² Notably, critics point to the fact that helicopters routinely fly at low altitudes overlapping with the highest level at which commercial drones are allowed to fly.²⁰³ With the expected increase in the use of drones among both private operators and businesses, near-collisions may turn into actual collisions without proper safety measures.²⁰⁴

198. See *supra* notes 64–65 and accompanying text, describing multiple instances of near collisions between drones and larger aircraft.

199. See deHahn, *supra* note 65 (highlighting risks to medical services flights).

200. *Id.*

201. *Id.*

202. See Zaniewski, *supra* note 3, observing that in contrast to today's numbers, by 2018 approximately 7,500 commercial drones are expected to be in operation.

203. See Nicas & Pasztor, *supra* note 183 (noting that the FAA's proposed rules allow commercial operators to fly drones up to 500 feet in the air and that helicopters routinely operate between 400 and 700 feet).

204. See *supra* notes 64–65 and accompanying text for instances of drones flying too close to

Of course, aside from endangering aircraft, a drone falling from the sky could easily injure bystanders.²⁰⁵ Drones do not even need to be in flight to pose safety hazards, due to the spinning propeller blades found on many models.²⁰⁶ Other than being fully or partially automated, drones utilize much of the same technology as model helicopters and planes, and thus carry the same risks.

The FAA's proposed rules for regulating drones are primarily focused on protecting safety.²⁰⁷ Requiring commercial operators to be certified, and to renew this certification every two years, is a step in the right direction.²⁰⁸ However, it is concerning that certification requires only a written test, unlike the examination by an inspector that one must pass to obtain a pilot's or driver's licence.²⁰⁹ Equally worrisome is that the FAA's proposed rules apply only to commercial users, leaving recreational users functionally unrestricted.²¹⁰ As discussed previously, the FAA has traditionally relied on voluntary compliance by model airplane hobbyists.²¹¹ But the FAA needs to officially regulate private drone users, whether by revising the current proposed rules or crafting additional rules to be issued later.²¹²

2. Privacy Concerns

There are a number of ways that companies could use drone monitoring and facial recognition software to gain competitive advantage, some of which may violate legal and ethical boundaries. For instance, a drone equipped with the "visual microphone" referenced earlier and a high-speed, telescopic camera could record video of conversations without participants being aware.²¹³ Then, the algorithm could recreate these conversations from the soundless video footage, carrying unsettling implications for personal privacy and industrial

full-scale aircraft and the safety hazards posed. *See also* Nicas & Pasztor, *supra* note 183 (commenting that the FAA expects to handle approximately 10,000 applications for commercial drone use in the first three years, with some industry and government officials anticipating a much higher number).

205. *See* Hoffer, *supra* note 59 for an example of a drone dropping from an apartment balcony and nearly hitting a pedestrian.

206. *See* Goodman, *supra* note 66, at A19.

207. Nicas & Pasztor, *supra* note 183.

208. *See id.* (discussing the proposed rules requiring certification of commercial drone operators as a means to protect public safety).

209. *See id.* (noting that obtaining certification from the FAA to operate a commercial drone will require only passing a written test and complying with safety requirements).

210. *See* Whitlock, *supra* note 153 (noting that the proposed rules do not apply to recreational users and that a 2012 law passed by Congress prevents the FAA from regulating small hobby drones as long as they do not interfere with air traffic).

211. *See supra* notes 110–14 and accompanying text for an explanation of the development of the FAA's voluntary rules pertaining to model airplane hobbyists.

212. *See infra* Part III.B.2 for a discussion of current state laws and proposed federal laws regarding drones and how they could be improved.

213. *See* Feltman, *supra* note 86 (observing that theoretically, any private or sensitive conversation occurring outdoors or in view of a window could be recorded by a device flying far away, with this video later used to reconstruct the contents of the conversation).

security.²¹⁴

In addition, unrestricted drone use creates the possibility of both intentional and accidental corporate security breaches. As discussed in Part II.B.3, amateur drone operators shot footage of Apple's new headquarters under construction and an Apple product-unveiling site.²¹⁵ While Apple did not seem bothered by these leaks, other companies might feel differently. For instance, corporations looking to guard the existence or specifics of a new project, such as materials being used or personnel on site, might balk at a drone obtaining footage.²¹⁶ Companies whose decision makers worry about security breaches are likely to become more conservative and to innovate less. Further, these concerns might foster company cultures of mistrust and paranoia. Certainly it would be preferable to avoid allowing such security concerns to take hold, both for the general wellbeing of citizens and the country's long-term economic health.

It is notable that the FAA's proposed rules for commercial drone use focus exclusively on guarding safety, not privacy.²¹⁷ The agency has stated that it intends to address privacy regulations later.²¹⁸ However, given limited agency resources, lengthy delays in drafting the current proposed rules, and the expected explosion of commercial drone use, there is no telling how long this might take.²¹⁹ President Obama's memorandum addresses privacy issues but only applies to governmental drone use.²²⁰ In the immediate future, individual state legislation seems the most likely source to safeguard personal privacy from drone use.²²¹ Over the long term, the FAA and Congress should look to certain elements of state statutes in crafting rules and legislation protecting privacy.²²²

B. Past and Current Precedent of Rules and Legislation

Following the comment period, the FAA should look to its existing regulations of other forms of aircraft in revising their proposed drone rules. In regulating model aircraft use, the FAA has only provided hobbyists with voluntary guidelines rather than formal rules.²²³ While the FAA may take these guidelines into consideration, it should also consider regulations it has

214. *See id.*

215. AppleInsider Staff, *supra* note 95; McNeal, *supra* note 94.

216. *See supra* Part II.B.3 for a discussion of recent industrial security breaches and the potential for drone involvement in future breaches.

217. *See Sanders, supra* note 151 ("[T]he current FAA proposal doesn't address privacy concerns for commercial drones, [but] the agency said it will revisit that issue later.").

218. *Id.*

219. *See id.* (noting that the current proposed rules will likely take "a year or two" to be approved); *see also* Nicas & Pasztor, *supra* note 183 (observing that the proposed rules are approximately four years behind schedule).

220. Sanders, *supra* note 151.

221. *See supra* notes 156-73 and accompanying text for a comparison of existing state statutes regulating drones.

222. *See infra* notes 243-52 and accompanying text for a discussion of elements of extant state legislation that should be considered for adoption by other states, the FAA, and Congress.

223. Berry & Syed, *supra* note 106.

promulgated for full-scale aircraft.²²⁴ In turn, when more states begin drafting drone legislation, the FAA should look at both the strengths and limitations of existing statutes from states like California, Oregon, and Texas.²²⁵ Similarly, the FAA would benefit from examining existing congressional bills that have died, but may yet provide insight regarding language to use and what behaviors should be regulated.²²⁶ Part III.B.1 outlines certain rules the FAA uses to regulate full-scale aircraft, and argues that they should be modified to govern drone use. Part III.B.2 concludes by discussing existing and proposed state and federal legislation governing drones, and recommending aspects that should be adopted by other states and the FAA in the future.

1. Full-Scale Aircraft

The FAA's rules for larger aircraft might provide insight into effective means of regulating drones. Drones create hazards akin to those posed by full-scale aircraft, albeit on a smaller scale, and going forward they will occupy adjacent airspace.²²⁷ In light of these similarities, the FAA should consider adopting rules for drone use modeled after those used to regulate larger aircraft.²²⁸

One issue is that of airworthiness. In its 2013 roadmap for integrating drones into U.S. airspace, the FAA mentioned working with the drone industry to determine an acceptable policy to certify drones as airworthy.²²⁹ One specific bullet point mentioned is "Increasing Levels of Certification Oversight."²³⁰ However, in contrast to full-size aircraft, the recent proposed rules do not require drone manufacturers or users to certify in advance that drones are safe to fly.²³¹ It is true that these rules would only apply to drones weighing fifty-five pounds or less.²³² However, a device weighing fifty pounds plummeting from hundreds of feet in the air, or striking someone at speeds of nearly 100 miles an hour, could still be extremely harmful, even lethal. While it is understandable that the FAA may choose not to certify "micro-drones" of only a few pounds, safety issues suggest any drones larger than this should require mandatory

224. See FEDERAL AVIATION ADMINISTRATION, *supra* note 149, at 5 (noting that "[t]he FAA has a proven certification process in place for aircraft" and that "[t]his process will be used to evaluate items unique to [drones]").

225. See *Spotlight on Surveillance – October 2014, DRONES: Eyes in the Sky*, *supra* note 58 (offering brief summaries of existing state legislation governing drone use).

226. See *supra* notes 174–82 and accompanying text for examples of drone-related congressional bills that were drafted but have since died.

227. See Nicas & Pasztor, *supra* note 183 for a discussion of the risks of drones colliding with larger aircraft and how their airspace is adjacent and sometimes overlaps.

228. See FEDERAL AVIATION ADMINISTRATION, *supra* note 149, at 5 (stating that the FAA expects to evaluate existing aircraft certification processes in assessing items unique to drones).

229. *Id.* at 25–26.

230. *Id.* at 26.

231. See Whitlock, *supra* note 153 (clarifying that these rules only apply to drones weighing fifty-five pounds or less and the FAA has not yet completed proposed rules for larger drones).

232. *Id.*

airworthiness certification.²³³

Another consideration is that of operator licensing. As mentioned before, the model aircraft hobbyist community is not subject to any licensing requirements by the FAA.²³⁴ While many undoubtedly enjoy this freedom, user error is thought to be a contributing factor to the injuries and deaths caused by radio-controlled helicopters and similar devices.²³⁵ The FAA alluded to this in its roadmap, expressing the intent that “UAS training standards will mirror manned aircraft training standards to the maximum extent possible.”²³⁶ This intention seems prudent, due to the projected drastic increase in the number of commercial and private drones soon to be in the air.²³⁷

However, despite the FAA’s comments in the roadmap, the recent proposed rules do not govern private drone operators at all.²³⁸ This may not be entirely of the FAA’s own choosing, as a 2012 Congressional law largely prevents it from regulating small hobby drones.²³⁹ Nonetheless, in light of recent near collisions, some test of knowledge and ability should be mandatory for both commercial and recreational users, whether through FAA rulemaking or federal legislation.²⁴⁰ The FAA’s proposed rules would only require commercial operators to pass a written test, without requiring any demonstration of their ability to safely operate a drone.²⁴¹ Given the potential safety hazards posed by a drone’s weight and rotors, and the limited airspace available in skyscraper-filled major cities, this requirement does not seem stringent enough. At least for operators using drones in cities or high population density areas, airworthiness certification and flight safety courses that require demonstrating flying prowess should be mandatory, not optional.²⁴²

2. Current State Statutes and Proposed Federal Legislation

Though relatively new, in some cases state legislation protecting privacy from drones may serve as a model for other states in drafting legislation and the FAA in promulgating rules. As discussed previously, Oregon’s current law

233. See *id.* (defining “micro-drones” as those weighing less than 4.4 pounds and noting that the FAA is considering a separate set of rules for them).

234. Berry & Syed, *supra* note 106.

235. See Goodman, *supra* note 66, at A19 (citing several deaths caused by remote-controlled helicopters and stressing that untrained operators can easily hurt themselves or others).

236. FEDERAL AVIATION ADMINISTRATION, *supra* note 149, at 28.

237. See *Busting Myths about the FAA and Unmanned Aircraft*, *supra* note 119 (estimating the number of small commercial drones flying in 2018 to be as many as 7,500).

238. See Whitlock, *supra* note 153 (observing that the FAA cannot regulate small hobby drone use as long as users do not interfere with air traffic).

239. *Id.*

240. See *supra* notes 64–65 and accompanying text for examples of amateur drone operators nearly colliding their devices with larger aircraft.

241. See Whitlock, *supra* note 153 (noting that commercial users would not have to demonstrate flying skills or obtain a pilot’s license).

242. See *supra* notes 56–67 and accompanying text for a discussion of safety hazards posed by careless drone use, particularly in cities.

regulating private use of drones is far from stringent.²⁴³ A property owner must tell a drone operator that he or she does not consent to a drone flying over her property.²⁴⁴ As a result, no civil action may be brought against a drone operator for the first flyover. Additionally, if the property owner cannot locate the operator (if he or she is concealed or controlling the drone from afar), no such prohibition can be given. This leaves the operator free to continue flying drones over that property. And while the law applies to drones flying 400 feet or less over property, modern technology allows for detailed photos or video from far greater distances than 400 feet. Under these minimal requirements, an unscrupulous drone operator trying to glean information about a competitor's new facility, or paparazzi seeking to hound a celebrity, could easily engage in drone usage that does not violate Oregon's law.

On the other hand, California's recent law protecting privacy from drones may be overly restrictive.²⁴⁵ Prior to its passage, using a drone to record someone might not make one liable for constructive invasion of privacy, depending on the definition of "visual or auditory enhancement device."²⁴⁶ Now, using *any* device to record someone engaged in "personal or familial activity" when they had a reasonable expectation of privacy may create liability.²⁴⁷ In theory this sounds like an effective means of safeguarding privacy. However, the sticking point is what qualifies as a "personal or familial activity" and a "reasonable expectation of privacy."²⁴⁸ In California, a state that is home to countless celebrities, one can easily imagine a glut of drone privacy lawsuits clogging up courts. Some would be justified, but the law runs a significant risk of fettering genuine journalism. What if a drone is launched to record an unrelated story, but happens to capture video of a celebrity engaged in a personal activity—must that footage be erased for fear of litigation?

While not a perfect solution, perhaps other states should look to Texas's statutes governing private drone use.²⁴⁹ The Texas Privacy Act in broad terms makes it illegal to use drones to take a visual image of an individual or private property.²⁵⁰ However, it also outlines numerous exceptions for teachers and students, real estate agents, and those engaged in searches for missing persons,

243. See *supra* note 165 and accompanying text for the limitations of the Oregon law's ability to protect privacy from drone use.

244. See *supra* note 165 and accompanying text for the limitations of the Oregon law's ability to protect privacy from drone use.

245. See *supra* notes 169–73 and accompanying text for details on California's AB 2306 and how it expands liability for constructive invasion of privacy in ways that may hinder drone operations.

246. See Assemb. B. 2306, 2013–14 Leg., Reg. Sess. (Cal. 2014). See also *supra* notes 169–73 and accompanying text for details on California's AB 2306 and how it expands liability for constructive invasion of privacy in ways that may hinder drone operations.

247. Wagner, *supra* note 173.

248. See Assemb. B. 2306.

249. See *supra* notes 166–68 and accompanying text for some of the specifics of Texas drone regulation laws.

250. TEX. GOV'T CODE ANN. § 423.003 (West 2013).

among others.²⁵¹ As the act currently stands, there are likely not enough exceptions; for instance, other states looking to emulate Texas's drone legislation might do well to make provisions for the use of drones by professional journalists.²⁵² Even so, the language of the act echoes California's similar effort to defend privacy, while allowing for greater flexibility with specific exceptions that receive an automatic pass. [It also seems significantly less vulnerable to abuse than Oregon's drone laws. When other states draft legislation, and for the FAA in revising its rules to encompass privacy as well as safety, Texas's statutes may serve as a useful template. In practice, they are likely to be neither as rigid as California's efforts to curb drone invasion of privacy nor as porous as those of Oregon.

Finally, while both the proposed Drone Aircraft Privacy and Transparency Act and Preserving American Privacy Act bills died, their language and provisions may be useful in drafting future bills and administrative rules. The Preserving American Privacy Act contained specific provisions banning private operators from intentionally using drones to capture data of a person in a way that is "highly offensive to a reasonable person."²⁵³ While that goal is laudable, the specific language could open up a number of loopholes. For example, an operator could easily claim he had no intention of recording someone engaged in familial activity, but simply can't control what his automated drone records. Moreover, the word "highly" stands out as one that could lead lawyers to argue endlessly over whether the violation of a party's privacy was *highly* offensive or merely offensive. Of potentially greater concern, the language may not be precise enough to appropriately regulate the private collection of data in public spaces.²⁵⁴ This, in turn, could be found to unconstitutionally violate the "right to record" protected by the First Amendment.²⁵⁵

Meanwhile, the Drone Aircraft Privacy and Transparency Act called for significantly greater oversight by the FAA of private drone operators than the FAA itself requires in its proposed rules. This would have included requiring operators to be licensed by the FAA and to submit a data collection statement of how they intended to use their drones.²⁵⁶ Some of the information to be included in these statements (what data would be collected, how it would be used, and whether it would be sold to third parties) would seem highly relevant to privacy

251. *Id.* § 423.002.

252. See *supra* notes 163–64 and accompanying text, which note that under statutes like those of Idaho (and by extension Texas, since the Texas Privacy Act does not grant exceptions to reporters), journalists would have difficulty showing news footage captured by a drone without obtaining permission from every person in the shot.

253. H.R. 637, 113th Cong. § 3119f (2013).

254. See Hans, *supra* note 12 (discussing potential problems with the language of § 3119f of the Preserving American Privacy Act).

255. *Id.*; see also Bohm, *supra* note 164 (theorizing that Idaho's drone laws may violate the First Amendment by banning recording by drones if someone will profit from said recording).

256. See *supra* notes 175–78 and accompanying text for details of the specific provisions of the Drone Aircraft Privacy and Transparency Act.

protection.²⁵⁷ At the same time, provisions would likely need to be included for operators who mean to use their drones one way, only to capture unexpected data that may be used differently from the original intent.²⁵⁸

While these bills will not become law, some federal legislation is likely to pass in the near future, be it before or after the FAA has formalized its proposed rules. Hopefully the drafters will look to these and other proposed bills and make appropriate adjustments, such as making its regulations on private recording less broad in scope than those of the Preserving American Privacy Act.²⁵⁹ Similarly, the group assigned by President Obama to examine drone issues should consider the idea of requiring data statements to be submitted to the FAA before any commercial drone use.²⁶⁰

IV. CONCLUSION

The availability and widespread use of drones by private citizens is increasing rapidly and will continue to do so in the near future. Corporations will soon be using drones for a variety of tasks, as waivers are granted and the FAA moves closer to formally implementing rules. However, drone technology also poses real hazards to individual privacy, safety, and corporate security. Thus, lawmakers and administrative agencies must foresee potential problems that drone use and misuse may cause, and be prepared with rules and legislation to address these issues.

Notably, future regulations and statutes should include language prohibiting all recording of persons, except with their explicit permission, in places wherein they have a reasonable expectation of privacy, like residences. Specific exceptions should be written into the rules or statutory language allowing greater freedom and eliminating liability for certain individuals, like teachers, students, and rescue workers. Additionally, operators should be required to complete basic piloting courses designed by the FAA before being allowed to operate a drone, contingent on the size and complexity of the particular UAV. By adhering to past precedent and restrictions like those outlined above, lawmakers and administrators can effectively regulate drones without infringing on their usefulness and entertainment value.

257. See Hans, *supra* note 12 (outlining the information that would have been included in data collection statements).

258. See *supra* notes 40–43 and accompanying text for details of the drone hobbyist who accidentally recorded footage of illegal waste dumping in a river.

259. See Hans, *supra* note 12 (noting that any bill seeking to regulate the collection of private data will need careful wording to avoid potentially violating the First Amendment and free expression values).

260. See *supra* notes 183–85 and accompanying text for details of President Obama's memorandum directing the Department of Commerce to assemble a stakeholder group to investigate drone issues related to privacy and accountability.