OBSERVATIONS FROM ABOVE: UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

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INTRODUCTION

Military aviation experts and model airplane hobbyists have known for decades that an airplane can be flown without a human in the cockpit. Until very recently, however, for most people the very concept of an aircraft was inextricably tied to that of the pilot it was presumed to carry. In the long run, that may turn out to be a historical aberration.

"Drones"—more accurately, unmanned aircraft—will dominate the future of aviation as thoroughly as manned aircraft have dominated its past. In the military the transition is well under way. In 2012, the United States military had close to 6,300 unmanned aircraft systems (UAS)[1] and is training hundreds of

1. UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS, DEPARTMENT OF DEFENSE REPORT TO CONGRESS ON FUTURE UNMANNED AIRCRAFT SYSTEMS TRAINING, OPERATIONS, AND SUSTAINABILITY 2 (2012), *available at* http://www.fas.org/irp/program/collect/uas-future.pdf. The

new pilots each year to fly them.[2] Civilian UAS use in the United States is also set to grow rapidly in the wake of a law enacted in February 2012 providing for the integration of unmanned aircraft into the national airspace over the next several years.[3]

UAS can be employed in an endless variety of civilian applications, the overwhelming majority of them beneficial. They can be used, for example, to help rescuers identify people in need of assistance following a natural disaster, or to provide vital overhead imagery to police officers attempting to defuse a hostage standoff. In the commercial world, UAS will be increasingly employed for tasks as diverse as surveying, crop spraying, and traffic congestion monitoring. Scientific applications include air quality assessment, wildlife tracking, and measuring the internal dynamics of violent storms. UAS will also generate a number of economic benefits, both by creating jobs that involve the design and production of UAS and by spurring advances in robotics that will apply well beyond aviation, in fields ranging from manufacturing to surgery.

However, like any technology, UAS can be misused. The most common concern regarding domestic UAS relates to their potential impact on privacy. This is a legitimate concern. Existing laws and jurisprudence provide an important foundation, but they also leave many questions unanswered. And although in some respects UAS simply represent one more manifestation of the always complex intersection between technology and privacy, they are also unique in making it possible, for the first time ever, to easily and inexpensively obtain observations from above.

As Justice Samuel Alito wrote in a concurrence in *United States v. Jones*, the January 2012 Supreme Court ruling that addressed the constitutionality of affixing a GPS tracking device

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term unmanned aircraft system (UAS) refers to an unmanned aircraft as well as the associated communication and control components used in its operation. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). "UAS" is also sometimes expanded as "unmanned aerial system." The term unmanned aerial vehicle (UAV) refers to the aircraft itself. *See, e.g.*, Bart Elias, Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System 1 n. 1 (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42718.pdf.

2. Elisabeth Bumiller, *A Day Job Waiting for a Kill Shot a World Away*, N.Y. TIMES, July 29, 2012, http://www.nytimes.com/2012/07/30/us/drone-pilots-waiting-for-a-kill-shot-7000-miles-away.html.

3. *See* FMRA §§ 331–336, 126 Stat. at 72–78.

to a vehicle without a valid warrant, "[i]n the pre-computer age, the greatest protections of privacy were neither constitutional nor statutory, but practical."[4] Although Justice Alito's statement was directed toward GPS tracking, it has direct relevance to UAS. In comparison with manned aircraft, UAS can be very inexpensive to procure and operate. As the practical barriers to obtaining aerial imagery fall away, the resulting privacy issues take on heightened importance.

This Article considers the constitutional, statutory, and common law frameworks that will inform privacy rights with respect to observations from unmanned aircraft.[5] The potential privacy challenges raised by unmanned aircraft are direct consequences of their capabilities and of the rules governing the manner in which they can be flown. Accordingly, Part I provides the historical context for UAS technology and describes the range of platforms available today. Part II addresses the current regulatory environment in the United States, with particular attention to those provisions of the FAA Modernization and Reform Act of 2012 (FMRA) that relate to UAS.

Part III discusses government operation of unmanned aircraft in light of the Supreme Court's Fourth Amendment jurisprudence. Although the Supreme Court has never specifically ruled on the question of UAS privacy, it has examined the Fourth Amendment implications of aerial surveillance on several occasions. Part III examines those cases in some detail, as well as *Jones*[6] and *Kyllo v. United States*,[7] and the interpretations they suggest with respect to the constitutionality of UAS observations.

Part IV addresses UAS operated by private entities, who are unconstrained by the Fourth Amendment restrictions that apply to the government. Private UAS users will enjoy strong First Amendment protections for gathering information in public spaces. But the rights conferred by the First Amendment are not unbounded, and it does not take much imagination to conclude

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4. United States v. Jones, 132 S. Ct. 945, 963 (2012) (Alito, J., concurring in the judgment).

5. For another treatment of some of the issues discussed here, see generally ALISSA M. DOLAN & RICHARD M. THOMPSON, II, INTEGRATION OF DRONES INTO DOMESTIC AIRSPACE: SELECTED LEGAL ISSUES (2013), *available at* http://www.fas.org/sgp/crs/natsec/R42940.pdf. Dolan and Thompson's report was released while this Article was in the process of revision for publication.

6. *Id.* at 945.

7. 533 U.S. 27 (2001).

that paparazzi, stalkers, and others could employ UAS in manners that pose clear violations of privacy. Part IV then explores some of the laws that can be used to address such behavior. Part V considers potential new voluntary and statutory privacy solutions and discusses some of the preemption issues that may arise when non-federal entities attempt to regulate UAS use.

Several overarching conclusions result from the analysis presented in this Article. First, a careful examination of Supreme Court privacy jurisprudence suggests that the Constitution will provide a much stronger measure of protection against government UAS privacy abuses than is widely appreciated. The Fourth Amendment has served us well since its ratification in 1791, and there is no reason to suspect it will be unable to do so in a world where unmanned aircraft are widely used. In addition, there are substantial statutory and common law protections that will limit the ability of non-government entities to violate privacy using unmanned aircraft.

This does not mean that there is no need for additional statutory UAS privacy protections. However, when drafting new laws it is critical to adopt a balanced approach that recognizes the inherent difficulty of predicting the future of any rapidly changing technology. In the early days of the Internet and mobile phones, it would have been nearly impossible to accurately foresee all of the uses—both positive and otherwise—to which these technologies have been applied. It is similarly difficult today to predict exactly how UAS will be used—or even what they will look like—in the coming decades. Although unmanned aircraft pose real and increasingly well recognized privacy concerns, they also offer real and much less widely appreciated benefits. A dialogue conducted with full awareness of this balance will be much more likely to lead to positive policy outcomes.

I. UNMANNED AIRCRAFT SYSTEMS TECHNOLOGY

In addressing UAS privacy, it is important to start with an understanding of the technology, including both the historical context and the range of platforms that exist today. Privacy approaches designed to address only the concerns raised by the larger unmanned aircraft that have dominated much of the current press coverage may be inadequate or inappropriate for unmanned aircraft weighing only a few pounds. And, as is clear from the history of unmanned aircraft, although near-

term predictions regarding emerging aviation technology are feasible, it can be exceedingly difficult to look more than a few years into the future.

A. Historical Context: The Nineteenth and Twentieth Centuries

Unmanned flight has a long history. In fact, early research in unmanned aviation laid some of the critical groundwork that was later used by pioneers in manned aviation,[8] including the Wright Brothers, who achieved sustained manned airplane flight in 1903.[9] As early as the 1830s, William Samuel Henson was exploring the fundamentals of airframe design,[10] and in 1848 John Stringfellow successfully carried out an indoor flight of a steam-powered unmanned airplane with a wingspan of ten feet.[11] In the 1870s Alphonse Penaud demonstrated the use of twisted rubber strands as an energy source for "model"-sized airplanes and helicopters.[12] In 1896, Samuel Pierpont Langley, then Secretary of the Smithsonian Institution, flew an unmanned twin-propeller, steam-engine-powered aircraft with a wingspan of slightly under fourteen feet.[13] The aircraft, called Aerodrome Number 5, was catapult launched from a houseboat on the Potomac River and made two test flights, in each case travelling several thousand feet before landing in the river.[14]

The Sperry Aerial Torpedo, developed during World War I and demonstrated in 1918, was a bomb-equipped biplane that used an on-board timer to shut off the engine and, in theory (it was never actually used in combat), send it diving onto a tar-

8. Bill Hannan, *History in Models, Models in History*, MODEL AVIATION, Dec. 1986, at 78, 79–81.

9. *Milestones of Flight: 1903 Wright Flyer*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/exhibitions/gal100/wright1903.html (last visited Jan. 28, 2013).

10. LOUIS H. HERTZ, THE COMPLETE BOOK OF MODEL AIRCRAFT SPACECRAFT AND ROCKETS 178 (1967).

11. *Id*. at 185. A two-pound steam-powered helicopter was flown even earlier, by W.D. Phillips in 1842. *Id*. at 178.

12. Hannan, *supra* note 8, at 79–81.

13. *Langley Aerodrome Number 5*, SMITHSONIAN NAT'L AIR AND SPACE MUSEUM, http://airandspace.si.edu/collections/artifact.cfm?id=A19050001000 (last visited Jan. 28, 2013).

14. *Id.*

get.[15] This was a very early example of "autonomous" flight, in which a UAS is controlled from within the aircraft, without intervention from a human on the ground.

The first unmanned airplane to be successfully flown by radio remote control was a modified N9 Navy seaplane that remained aloft for about twelve minutes during a September 1924 test, sometimes at a distance of several miles from the transmitter held by the pilot on the ground.[16] By the late 1930s, radio-controlled unmanned aircraft had started to gain significant attention in the hobbyist community[17] and in the military. During the ten-year period starting in 1934, the British military purchased hundreds of radio-controlled unmanned "Queen Bee" biplanes to use for target practice;[18] in fact, the term "drone" may have originally arisen to describe the unmanned aircraft used for this purpose.[19]

In the United States, the Radioplane Company was founded in the late 1930s[20] and during World War II built over 15,000 "drones" for the U.S. military to use in training antiaircraft gunners.[21] Radioplane was acquired by Northrop in 1952,[22] and continued to supply the U.S. military with unmanned aerial vehicles including, in the 1950s, models equipped with an on-board film-based camera.[23] Other countries with unmanned aircraft programs in the years during or shortly following World War II included Russia, France, Italy, Germany, and Japan.[24]

In the 1960s, military reconnaissance use of unmanned aircraft became increasingly common. Ryan Aeronautical Company,

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15. *Curtiss / Sperry Aerial Torpedo*, CRADLE OF AVIATION MUSEUM, http://www.cradleofaviation.org/exhibits/ww1/sperry_torpedo/index.html (last visited Jan. 28, 2013).

16. Walt Good, *History of RC Flying*, MODEL AVIATION, Mar. 1986, at 56, 126.

17. Walt Good, *History of RC Flying, Part 2*, MODEL AVIATION Apr. 1986, at 58, 148; Walt Good, *History of RC Flying, Part 3*, MODEL AVIATION, May 1986, at 76, 76–81.

18. STEVEN J. ZALOGAUNMANNED AERIAL VEHICLES: ROBOTIC AIR WARFARE 1917–2007, at 7 (2008).

19. LAURENCE R. "NOISE" NEWCOME, UNMANNED AVIATION: A BRIEF HISTORY OF UNMANNED AERIAL VEHICLES 4 (2004).

20. *Id.* at 57.

21. ZALOGA, *supra* note 18, at 7.

22. *Id.*

23. *Id.* at 10.

24. NEWCOME, *supra* note 19, at 49–56.

which won a contract with the U.S. Air Force in 1948,[25] was a major provider of U.S. military UAS for much of the 1950s and 1960s. Versions of the Ryan Firebee flew thousands of reconnaissance and electronic warfare missions over Vietnam.[26]

The 1970s and 1980s saw continued development of military UAS technology, with the United States, Russia, Canada, Israel, and Europe all possessing active programs.[27] In the conflict with Lebanon in 1982, Israel used a relatively small UAS called the Mastiff to provide reconnaissance imagery,[28] and during the 1991 Gulf War, the U.S. military flew over 500 missions using the Pioneer UAS.[29] The Gnat-750, a precursor to the Predator, was first flown in 1989 and was employed in the mid-1990s to acquire imagery during the conflict in the former Yugoslavia.[30]

B. Unmanned Aircraft Systems Today

Since 2000, worldwide UAS use for both military and civilian applications has increased dramatically. One key factor contributing to this growth is the continuing advance of computing, imaging, and communications technologies. Computational power and storage that would have filled multiple rooms in the 1960s can now easily fit within a single chip. In the context of UAS, this has made it possible to equip even very small platforms with sophisticated on-board computational systems for tasks such as navigation and image processing. The advent of high-resolution, low-cost digital imaging systems, when combined with high-bandwidth communications links, enables high-resolution images and video acquired by an unmanned aircraft to be transmitted in real time to an observer fifty feet—or 5000 miles—away. Thanks to continuing innovations in airframe design and flight control algorithms, the cameras that can be mounted on UAS are becoming smaller and more agile.

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25. ANTHONY FINN & STEVE SCHEDING, DEVELOPMENTS AND CHALLENGES FOR AUTONOMOUS UNMANNED VEHICLES: A COMPENDIUM 15 (2010).

26. JASJIT SINGH, AIR POWER IN MODERN WARFARE 198 (1988).

27. ZALOGA, *supra* note 18, at 16–24.

28. BENJAMIN S. LAMBETH, MOSCOW'S LESSONS FROM THE 1982 LEBANON AIR WAR 7 (1982), *available at* http://www.rand.org/pubs/reports/2007/R3000.pdf.

29. ZALOGA, *supra* note 18, at 26–28.

30. *Id.* at 29–33.

The American global positioning system (GPS),[31] which began development in 1973 and was completed in 1995,[32] has also helped to spur UAS growth. GPS makes it possible for UAS to determine their precise location using on-board systems, and therefore to perform missions involving much more complex navigational tasks than could be attempted in the pre-GPS era.[33]

Today, unmanned aircraft come in an incredible variety of shapes and sizes. Some, such as the Global Hawk used by the U.S. military, are as large and nearly as fast as business jets.[34] Others are small enough to fit in a backpack or even the palm of a hand. The video-capable Nano Hummingbird, developed by California-based AeroVironment, weighs only two-thirds of an ounce.[35] The solar-powered QinetiQ Zephyr, which weighs only slightly over 110 pounds despite having a wingspan of about 74 feet, stayed aloft for over two continuous weeks in Arizona during the summer of 2010.[36]

UAS can be controlled during flight in a variety of ways. A pilot on the ground who maintains visual contact with a UAS can fly it using a handheld or computer-based radio remote control interface. Alternatively, or in addition, in a "first-person-view" (FPV) system, a UAS-mounted camera transmits a real-time "cockpit" view to a pilot on the ground who flies

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31. The United States developed the GPS system and, in 1983, made it available for civilian applications. MICHAEL RUSSELL RIP & JAMES M. HASIK, THE PRECISE REVOLUTION: GPS AND THE FUTURE OF AERIAL WARFARE 9–10 (2002). Russia, the European Union, China, and India have also developed or are developing comparable satellite-based positioning systems. *See* UNITED NATIONS OFFICE FOR OUTER SPACE AFFAIRS, CURRENT AND PLANNED GLOBAL AND REGIONAL NAVIGATION SATELLITE SYSTEMS AND SATELLITE-BASED AUGMENTATIONS SYSTEMS, at v (2010), *available at* http://www.oosa.unvienna.org/pdf/publications/icg_ebook.pdf.

32. Randy James, *GPS*, TIME, May 26, 2009, http://www.time.com/time/magazine/article/0,9171,1901500,00.html.

33. *See, e.g.*, Rip & Hasik, *supra* note 31, at 191–275 (discussing the role of GPS in modern warfare).

34. *RQ-4 Global Hawk Factsheet*, THE OFFICIAL WEB SITE OF THE U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

35. Press Release, AeroVironment Inc., AeroVironment Develops World's First Fully Operational Life-Size Hummingbird-Like Unmanned Aircraft for DARPA, Feb. 17, 2011, *available at* http://www.avinc.com/resources/press_release/aerovironment_develops_worlds_first_fully_operational_life-size_hummingbird.

36. Andrew Chuter, *Solar UAV Lands After Record 2 Weeks Aloft*, DEFENSENEWS, July 23, 2010, http://www.defensenews.com/article/20100723/DEFSECT01/7230304/Solar-UAV-Lands-After-Record-2-Weeks-Aloft. The weight and length are reported in this article at 50 kilograms and 22.5 meters, respectively. *Id.*

the aircraft as if he or she were physically on-board. If the radio link between the UAS and the pilot is sufficiently strong, the UAS can be flown beyond the visual line of sight.

Autonomous flight using information from an on-board GPS receiver to perform navigation without any human intervention can also be used. Many UAS have the capability to operate in multiple modes—for example, navigating semi-autonomously to a destination based on a set of GPS waypoints input by a pilot, who then takes over active control using an FPV system. Of course, what is possible technologically and what is permitted by regulations are two very different things. At present, with very limited exceptions,[37] the Federal Aviation Administration (FAA) does not permit UAS flights in which the operator on the ground is unable to maintain continuous visual contact with the aircraft.

The UAS industry today is large, global, and rapidly growing. According to the Association for Unmanned Vehicle Systems International (AUVSI), the largest international association for unmanned systems, there are now over 400 active manufacturers of UAS globally, including 150 in the United States.[38] Other countries with significant UAS development include Australia, Brazil, Canada, China, France, Germany, India, Iran, Israel, Japan, Pakistan, Turkey, Russia, and the United Kingdom.[39] The Teal Group, an aerospace and defense consultancy based in Virginia, predicts that global annual UAS spending will rise from an estimated $6.6 billion in 2012 to over $11 billion over the next decade, corresponding to a total ten-year expenditure of nearly $90 billion.[40]

Even as overall spending is increasing, per-unit costs for the smaller platforms are dropping. Large military surveillance

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37. The FAA Modernization and Reform Act of 2012, discussed later in this Article, includes a provision (Section 332(d)) that will allow beyond-line-of-sight operation in the Arctic (northern Alaska). *See id.* at 11–15.

38. E-Mail from Melanie Hinton, Senior Commc'ns Manager, AUVSI, to author (Aug. 15, 2012, 12:44 PDT) (on file with author).

39. U.S. Gov't Accountability Office, GAO-12-536, Nonproliferation: Agencies Could Improve Information Sharing and End-Use Monitoring on Unmanned Aerial Vehicle Exports 10–16 (2012).

40. Press Release, Teal Group Corp., Teal Group Predicts Worldwide UAV Market Will Total $89 Billion in Its 2012 UAV Market Profile and Forecast (Apr. 11, 2012), *available at* http://www.prnewswire.com/news-releases/teal-group-predicts-worldwide-uav-market-will-total-89-billion-in-its-2012-uav-market-profile-and-forecast-147008115.html.

platforms such as the Global Hawk can cost many tens of millions of dollars or more to purchase[41] and require large teams of highly trained people using specialized equipment to fly.[42] However, there are increasing numbers of highly capable commercially available small UAS that can be purchased for under $1000. It is only a matter of time—and probably not much time—before GPS and video-equipped UAS drop below $100, and then below $10.

UAS can be used in law enforcement, search and rescue, surveying, scientific research, and many other civilian applications. Although many people equate the prospect of law enforcement use of UAS with surveillance, in practice this may be the exception rather than the rule. In this respect, the experience of the Mesa County, Colorado, Sheriff's Office is instructive. Mesa County has one of the only current FAA Certificates of Authorization for operational (as opposed to training) use of UAS.[43] The Mesa County Sheriff's Office has (as of February 2013) flown approximately 40 missions since 2011, and has never used them to perform surveillance.[44] Instead, typical operations have been for obtaining after-the-fact crime scene images, search and rescue, and providing imagery for structure fire suppression and arson investigations. Ben Miller, the Unmanned Aircraft Program Manager in Mesa County, puts the per-hour operating cost of Mesa County's UAS at $25;[45] a manned helicopter, by contrast, costs hundreds of dollars per hour to operate. The dramatically lower operating cost for unmanned aircraft provides a powerful economic incentive for their adoption. In addition, they can be used in circumstances where a manned helicopter would have been too dangerous or disruptive.

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41. A U.S Government Accountability Office report put the "unit cost" of a Global Hawk at $176 million as of July 2010. MICHAEL J. SULLIVAN, U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-233SP, DEFENSE ACQUISITIONS: ASSESSMENTS OF SELECTED WEAPON PROGRAMS 69 (2011), *available at* http://www.gao.gov/assets/320/317081.pdf.

42. *See, e.g.*, *RQ-4 Global Hawk*, U.S. AIR FORCE, http://www.af.mil/information/factsheets/factsheet.asp?id=13225 (last visited Jan. 28, 2013).

43. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug. 13, 2012, 10:45 PDT) (on file with author).

44. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Feb. 7, 2013, 7:02 PST) (on file with author).

45. E-Mail from Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Cnty. Sheriffs Office, to author (Aug 15, 2012, 13:19 PDT) (on file with author).

In Australia, where certain commercial operations using small unmanned aircraft have been permitted for over ten years,[46] applications have included mining surveys and transportation of equipment to drilling rigs.[47] In Japan, agricultural spraying is often performed using small unmanned helicopters.[48] In the United States, NASA researchers have used UAS for studying Hawaiian volcanoes.[49] UAS are also ideal platforms for identifying wildfire hotspots without putting a human pilot at risk.[50]

II. REGULATORY FRAMEWORK

A. The Federal Aviation Administration

When considering the regulatory framework applicable to UAS in the United States, it is helpful to start by briefly addressing how aircraft operations in general are regulated. The FAA, which was established in 1958 and has been part of the

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46. *See* Duncan Jefferies, *Drone journalism set for takeoff – once they're permitted to use our airspace*, THE GUARDIAN MEDIA NETWORK BLOG (Oct. 29, 2012, 7:09 AM), http://www.guardian.co.uk/media-network/media-network-blog/2012/oct/29/drone-journalism-take-off (noting that commercial drones have been licensed in Australia since 2002); *see also* Australia Civil Aviation Safety Authority Advisory Circular 101-1(0), *Unmanned Aircraft and Rockets: Unmanned Aerial Vehicle (UAV) Operations, Design Specification, Maintenance and Training of Human Resources* (July 2002), *available at* http://www.casa.gov.au/wcmswr/_assets/main/rules/1998casr/101/101c01.pdf. The Advisory Circular states "Provided that a small UAV is operated not above 400ft AGL [above ground level] and remains clear of designated airspace, aerodromes and populous areas, there are no restrictions imposed upon the operation of a small UAV." *Id*. § 7.1.1. The Australia Civil Aviation Safety Authority defines "small" UAS as those weighing under 150 kilograms. *See* Gary Carr, *Unmanned Aircraft CASA Regulations* 2, Australian Gov't Civil Aviation Safety Auth., *available at* http://www.uatar.com/CASA%20Presentation%20-%20Unmanned%20Aircraft%20CASA%20Regulations.pdf.

47. Ry Crozier, *Australian miners send drones to work*, ITNEWS, May 28, 2012, http://www.itnews.com.au/News/302240,australian-miners-send-drones-to-work.aspx.

48. REG AUSTIN, UNMANNED AIRCRAFT SYSTEMS: UAVS DESIGN, DEVELOPMENT AND DEPLOYMENT 273–74 (2010).

49. Mark Brown, *Nasa sends UAV back to explore explosive Hawaiian volcano*, WIRED.CO.UK, Apr. 5, 2011, http://www.wired.co.uk/news/archive/2011-04/5/nasa-sends-out-volcano-spying-drone.

50. Brian Bennett, *Drones tested as tools for police and firefighters*, L.A. TIMES, Aug. 5, 2012, http://articles.latimes.com/2012/aug/05/nation/la-na-drones-testing-20120805.

Department of Transportation since the 1960s,[51] oversees nearly all[52] aircraft operations in the United States.[53] This is a complex task in a national airspace that has an "average of more than 100,000 aviation operations per day, including air carrier, air taxi, general aviation, and military aircraft."[54]

Like other administrative agencies of the United States government, the FAA makes and enforces rules to implement and interpret laws passed by Congress.[55] New rules,[56] such as those to be developed by the FAA to enable the integration of UAS into the airspace, are formulated through a rulemaking process that includes an internal drafting and review stage, publication of a draft rule in the Federal Register, a period of public comment, revisions based on the comments, and publication of a final rule.[57]

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51. *A Brief History of the FAA*, FED. AVIATION ADMIN., http://www.faa.gov/about/history/brief%5Fhistory/http://www.faa.gov/about/history/brief_history/ (last visited Nov. 10, 2012) [hereinafter *Brief History*].

52. There are a few exceptions. For example, the FAA does not have any responsibility to ensure the separation of military aircraft operating within "MARSA" airspace. MARSA is an acronym for "Military Assumes Responsibility for Separation of Aircraft." FED. AVIATION ADMIN., AIR TRAFFIC ORG. POLICY ¶ 2-1-11 (2012), *available at* http://www.faa.gov/air_traffic/publications/atpubs/atc/atc0201.html. In addition, the FAA does not oversee model aircraft operated in accordance with FAA Advisory Circular 91-57 or with Section 336 of the FAA Modernization and Reform Act of 2012, which creates a special rule for model aircraft. *See* FED. AVIATION ADMIN., ADVISORY CIRCULAR 91-57, MODEL AIRCRAFT OPERATING STANDARDS (1981) [hereinafter ADVISORY CIRCULAR 91-57], *available at* http://www.faa.gov/documentLibrary/media/Advisory_Circular/91-57.pdf; FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 336, 126 Stat. 11, 77 (2012).

53. Brief History, supra note 51.

54. *Fact Sheet: Unmanned Aircraft Systems (UAS)*, FED. AVIATION ADMIN., http://www.faa.gov/about/initiatives/uas/media/uas_fact_sheet.pdf (last visited Jan. 28, 2013) [hereinafter *Fact Sheet*].

55. Formally, a "rule" is "the whole or a part of an agency statement of general or particular applicability and future effect designed to implement, interpret, or prescribe law or policy. . . ." Administrative Procedure Act § 1, 5 U.S.C. § 551(4) (2012).

56. FAA "rules" are also called "regulations." *See, e.g.*, 49 U.S.C. § 40103 (directing that the Administrator of the FAA promulgate "regulations" governing the flight of aircraft).

57. There are actually various forms of rulemaking in accordance with the Administrative Procedure Act, which was enacted in 1946. The steps described in the text (and provided in 5 U.S.C. § 553) occur in association with what is referred to as informal rulemaking, which is by far the most common form. There is also a formal rulemaking process under 5 U.S.C. §§ 556–557 that includes a hearing and

FAA regulations[58] classify aircraft, without regard to whether they are manned, as either "public"[59] or "civil."[60] Public aircraft are those operated by local, state, and federal public entities, including law enforcement agencies.[61] Civil aircraft, typically, are operated by private companies, individuals, and other non-government entities. The public-civil distinction is extremely important both generally and with respect to UAS.

B. The FAA and Unmanned Aircraft Systems

On February 14, 2012, President Obama signed the FAA Modernization and Reform Act of 2012 (FMRA)[62] into law. FMRA provides, among other things, a set of overlapping deadlines for the integration of UAS into the national airspace over the next three years.[63] Although UAS integration has been on the proverbial radar screen of the FAA for a number of years, FMRA represents the first significant congressional legislation addressing the domestic use of UAS.

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a number of other steps. RAYMOND C. SPECIALE, FUNDAMENTALS OF AVIATION LAW 124–25 (2006).

58. FAA regulations are provided in the Code of Federal Regulations (CFR), Title 14 ("Aeronautics and Space"), Volumes 1–3, which comprise parts 1–199 (not all of the numbers in this range are currently used). "General Operating and Flight Rules" for aircraft are found in Volume 2, Subchapter F ("Air Traffic and General Operating Rules"), Part 91, denoted 14 C.F.R. § 91 and sometimes referred to as FAR Part 91. FAR is an acronym for "Federal Aviation Regulations." "General Definitions" are in 14 C.F.R. § 1.1. An unofficial version of the CFR is provided through the Electronic Code of Federal Regulations (e-CFR) by the government at http://ecfr.gov.

59. Section 331(4) of the FAA Modernization and Reform Act provides that "[t]he term 'public unmanned aircraft system' means an unmanned aircraft system that meets the qualifications and conditions required for operation of a public aircraft . . . ." FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 331, 126 Stat. 11, 72 (2012). The term "public aircraft" is defined in 49 U.S.C.A. § 40102(a)(41) (2012), as well as in 14 C.F.R. § 1.1 (2012).

60. *See* 49 U.S.C. § 40102(a)(16).

61. *See* § 40102(a)(41). Whether an aircraft has "public aircraft status" depends, in part, on how it is being used. An aircraft that is owned by a government entity but engaged in an operation that replicates a service that could be obtained from a commercial air carrier does not have public aircraft status during that operation. As used in this Article, "public aircraft" and "government aircraft" refer to aircraft that satisfy the statutory qualifications for public aircraft status under § 40125.

62. Pub. L. No. 112-95, 126 Stat. 11 (2012).

63. *Id*. §§ 331–336, 126 Stat. at 72–78.

Recognizing that UAS raise unique issues that "may differ substantially from manned aircraft operations and systems,"[64] the FAA created a new Unmanned Aircraft Program Office in early 2006.[65] In accordance with policies established well before the enactment of FMRA, operators of UAS engaged in public aircraft operations are required to obtain a Certificate of Authorization (COA).[66] Civil (i.e. private) UAS operators need a "special airworthiness certificate."[67] Use of UAS for commercial purposes is currently prohibited,[68] though that is expected to change by 2014.

According to data released in early 2012 in response to a Freedom of Information Act lawsuit filed by the Electronic Frontier Foundation, the FAA had issued "about 700–750 authorizations since the program began in 2006," of which approximately 300 remained active as of April 2012.[69] Public entities that have been issued COAs include the U.S. Air Force,

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64. James Sizemore & Richard Posey, Fed. Aviation Admin., Unmanned Aircraft Systems (UAS) Certification Status 2 (2006), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/uas_policyupdate.pdf.

65. *Id.* at 1.

66. *See* DEP'T. OF TRANSP., UNMANNED AIRCRAFT OPERATIONS IN THE NATIONAL AIRSPACE SYSTEM, DOCKET NO. FAA-2006-25714 (2007), *available at* http://www.faa.gov/about/initiatives/uas/reg/media/frnotice_uas.pdf. In addition to "Certificate of Authorization," COA is sometimes written in expanded form as "Certificate of Waiver or Authorization" or "Certificate of Authorization or Waiver." *See id.* An exception to the COA requirement is MARSA airspace. *See supra* note 52.

67. *See* 14 C.F.R. § 21.175 (2012). Although model aircraft are obviously unmanned, provided that they are flown for hobby or recreational use, they are not treated as "civil UAS" by the FAA. *See* ADVISORY CIRCULAR 91-57, *supra* note 52; FMRA § 336, 126 Stat. at 77.

68. Even though this prohibition is not explicit with respect to UAS, it is implicit in the list, provided in 14 C.F.R. § 21.191, of purposes for which experimental certificates can be issued. To date, special airworthiness certificates have been issued only in the experimental category. *Fact Sheet*, *supra* note 54, at 146 ("An SAC-EC is the only certification means available to civil operators for UAS and optionally-piloted aircraft (OPA)."). "SAC" is an acronym for special airworthiness certificate. The list in § 21.191 includes purposes such as "[r]esearch and development," "[a]ir racing," and "[c]rew training," but not commercial use. In addition, 14 C.F.R. § 91.319, which describes operating limitations for aircraft having experimental certificates, provides, among other things, that "[n]o person may operate an aircraft that has an experimental certificate—(1) For other than the purpose for which the certificate was issued; or (2) Carrying persons or property for compensation or hire."

69. Jennifer Lynch, *FAA Releases Lists of Drone Certificates—Many Questions Left Unanswered*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/deeplinks/2012/04/faa-releases-its-list-drone-certificates-leaves-many-questions-unanswered.

U.S. Army, the Defense Advanced Research Projects Agency (DARPA), FBI, NASA, some county and municipal law enforcement agencies, and various public universities.[70] The list of companies that have been issued special airworthiness certificates includes Raytheon, Honeywell, General Atomics, and other defense companies.[71]

COAs specify where and under what circumstances a UAS can be used. For example, a COA might require that the UAS only be flown during daylight hours, and only within the visual line of sight of the operator.[72] In the case of a UAS operated by a law enforcement agency, the COA might specify that flights must be performed only for training, as opposed to operational, purposes. In early 2008, the FAA began the process of developing recommendations for regulating "small" UAS (those weighing under fifty-five pounds).[73] Thus, by the time FMRA was signed into law in February 2012, the FAA had already been actively planning for UAS integration for several years.

FMRA sets a goal of integrating UAS into the national airspace system by late 2015.[74] Under the new law, public UAS operators have had access to expedited COAs since May 14, 2012.[75] UAS under these authorizations must weigh no more than twenty-five pounds[76] and be operated within the line of sight of the op-

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70. *FAA List of Certificates of Authorizations (COAs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-certificates-authorizations-coas (last visited Jan. 28, 2013).

71. *FAA List of Special Airworthiness Certificates – Experimental Category (SACs)*, ELECTRONIC FRONTIER FOUNDATION, https://www.eff.org/document/faa-list-special-airworthiness-certificates-experimental-categorysacs (last visited Jan. 28, 2013).

72. *Fact Sheet*, *supra* note 54, at 2.

73. In April 2008, the FAA created the Small Unmanned Aircraft System Aviation Rulemaking Committee. *See* FED. AVIATION ADMIN., ORDER 1110.150, SMALL UNMANNED AIRCRAFT SYSTEM AVIATION RULEMAKING COMMITTEE (2008), http://www.faa.gov/documentLibrary/media/Order/1110.150.pdf. This committee is often referred to using the acronym sUAS ARC, and has members from both government and industry. The sUAS ARC issued a set of recommendations for sUAS regulatory development in April 2009. *See* FED. AVIATION ADMIN., SMALL UNMANNED AIRCRAFT SYST. AVIATION RULEMAKING COMM., COMPREHENSIVE SET OF RECOMMENDATIONS FOR SUAS REGULATORY DEVELOPMENT (2009), *available* at http://www.modelaircraft.org/faa/recommendations.pdf.

74. FMRA, Pub. L. No. 112–95, § 332(a)(3), 126 Stat. 11, 73 (2012).

75. *See id*. § 334(c), 126 Stat. at 76.

76. *FAA Makes Progress with UAS Integration*, FED. AVIATION ADMIN., http://www.faa.gov/news/updates/?newsId=68004 (last visited Jan. 28, 2012). Interestingly, with respect to weight, the FAA went further than was required by

erator, less than 400 feet above the ground, and during daylight conditions.[77] By December 31, 2015, the FAA is required to "develop and implement operational and certification requirements for the operation of public unmanned aircraft systems in the national airspace system by September 30, 2015."[78]

For civil UAS, FMRA mandates the development of a "comprehensive plan" that will "provide for the safe integration of civil unmanned aircraft systems into the national airspace."[79] Additionally, regulations for the operation of small civil UAS (including allowing their use for commercial purposes) are due by August 2014.[80]

The FAA is in somewhat of a unique position with respect to deadlines laid out in legislation such as FMRA. FMRA requires that the FAA "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."[81] This language contains no explicit provision for what happens if, in the FAA's view, "as soon as practicable" is later than that date. However, Congress is unlikely to hold the FAA to a deadline that might risk jeopardizing airspace safety.

C. The Impact of Safety Regulations on Privacy

Though privacy and airspace safety are distinct UAS issues, they are in some respects closely intertwined. By placing limitations on where and how unmanned aircraft can be operated, airspace safety regulations can impact privacy.

For example, under the FAA regulations that prescribe "flight rules governing the operation of [both manned and un-

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FMRA, which provided that the authorizations must "allow a government public safety agency to operate unmanned aircraft weighing 4.4 pounds or less." FMRA § 334(c)(2)(C), 126 Stat. at 77.

77. These requirements are among those provided in FMRA § 334(c)(2)(C). Additional requirements in this Section restrict operation to Class G (uncontrolled) airspace more than five miles from airports and other locations with aviation activities. *See id*.

78. *Id.* § 334(b), 126 Stat. at 76.

79. *Id.* § 332(a)(1).

80. *Id.* § 332(b)(1).

81. *Id.* § 332(a)(3).

manned] aircraft within the United States,"[82] it is illegal to operate an aircraft "in a careless or reckless manner so as to endanger the life or property of another."[83] Aircraft must also be operated at a sufficiently high altitude to allow "an emergency landing without undue hazard to persons or property on the surface" in the event of an engine failure.[84] Compliance with these rules, which apply to both manned and unmanned aircraft,[85] could be called into question, for example, in the monitoring of a peaceful protest if a UAS is flown (either by law enforcement or by a protester) at very low altitudes directly above a crowd of people.[86]

The tie between safety and privacy is tightest with respect to rules requiring the operator of a UAS to be able to see the aircraft at all times. Public UAS operated in association with the expedited authorizations in Section 334(c)(2)(C) of FMRA have a "line of sight" requirement.[87] The rules for civil small UAS due for implementation in August 2014 likely will also have this constraint. From the FAA's standpoint, any such requirement would be solely motivated by safety concerns related to the need to "sense and avoid" other aircraft and to problems that might arise if a UAS beyond the line of sight loses communication with its operator.[88] But there are privacy consequences as well.

It is easy for an operator standing on the street in front of a house to fly a UAS high enough to obtain overhead images of a fenced-in backyard while maintaining visual contact with the

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82. Subpart B of part 91 applies to "the operation of aircraft within the United States and within 12 nautical miles from the coast of the United States." 14 C.F.R. § 91.101 (2012).

83. 14 C.F.R. § 91.13(a).

84. 14 C.F.R. § 91.119(a).

85. *See* 14 C.F.R. § 91.1(a) (stating that part 91 "govern[s] the operation of aircraft . . . within the United States.").

86. *See* 14 C.F.R. § 91.13(a).

87. FMRA § 334(c)(2)(c).

88. *See Fact Sheet*, *supra* note 54, at 2. Not everyone in the unmanned aviation community is in agreement regarding the safety value of a line of sight requirement. Opponents of such a requirement could argue, among other things, that a UAS beyond the visual line of sight that loses communication with an operator can be programmed to land itself safely. Opponents could also argue that even if a UAS is within visual line of sight, if the ability of the operator to communicate with it is lost, being able to see it does little to mitigate any resulting risks. Nonetheless, this is an area in which regulators are likely to act very conservatively.

aircraft. It is far harder, by contrast, to maintain visual line of sight while lowering the UAS into the yard to obtain eye-level images through the back windows of the house. Thus, the questions of if, when, and under what circumstances non-visual line of sight operation will be permitted will have an impact on privacy.[89]

Even assuming that FAA regulations adopted in the next several years continue to require visual line of sight operation, in the longer term this requirement is likely to be relaxed for some specific classes of UAS operations. Some of the most promising applications of UAS, by their very nature, require non-visual line of sight operation. For example, UAS have enormous potential for search and rescue in large part because they can enable an operator to quickly and safely examine many square miles of potentially inhospitable terrain. Surveying of pipelines, long-distance electric transmission lines, and other extended structures can also entail large separations between an operator and a UAS. As "sense and avoid" technologies become more mature, these sorts of non-line of sight operations may eventually be permitted. This will expand ways in which a UAS flown in compliance with FAA regulations might be used to violate privacy.

III. GOVERNMENT UNMANNED AIRCRAFT AND THE FOURTH AMENDMENT

The Fourth Amendment is central to the privacy issues with respect to government UAS operation. Although the Supreme Court has never explicitly considered the question of UAS privacy, there is a long list of relevant precedents.[90] Among them

89. The term "line of sight" is more complex than it first appears. Some people in the UAS community use "line of sight" to refer to operation in which a radio signal can be transmitted directly from an operator to a UAS, without being relayed through a satellite, other aircraft, or ground-based communications network (sometimes also called "electronic line of sight"). This does not ensure that the operator can necessarily see the UAS, as radio signals can easily pass through trees and other objects, sometimes traveling for miles. The term "*visual* line of sight," by contrast, is unambiguous: The operator must be able to see, with his or her eyes, the UAS.

90. In addition to the cases discussed at greater length in Part III of this Article, see, e.g., City of Indianapolis v. Edmond, 531 U.S. 32 (2000), Minnesota v. Carter, 525 U.S. 83 (1998), United States v Karo, 468 U.S. 705 (1984), Oliver v. United States, 466 U.S. 170 (1984), United States v. Knotts, 460 U.S. 276 (1983), Steagald v.

are several cases from the 1980s that specifically considered aerial observations and the Fourth Amendment. The 2001 *Kyllo v. United States*[91] and 2012 *United States v. Jones*[92] decisions are also pertinent.

A. Dow Chemical Co. v. United States

In 1978, the Environmental Protection Agency, without Dow Chemical's consent, contracted with a commercial aerial photographer to provide images of a 2000-acre Dow Chemical manufacturing facility from altitudes of 1200, 3000, and 12,000 feet.[93] When Dow Chemical became aware of this, it filed suit in Federal District Court, which granted summary judgment, finding the aerial photography to be a search in violation of the Fourth Amendment.[94] The Sixth Circuit reversed the decision, ruling that even though the company had taken precautions, including installing a perimeter fence and alarm system[95] that provided a subjective expectation of privacy from ground-level intrusions, it did not have such an expectation with respect to aerial surveillance.[96] Thus, the Sixth Circuit concluded, the acquisition of aerial images without a warrant was not a Fourth Amendment search.[97]

In reviewing this ruling on certiorari, the Supreme Court affirmed the Sixth Circuit's decision, concluding in a 1986 ruling that the open areas in the 2000-acre industrial facility were more akin to an "open field"[98] than to the curtilage of a home,

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United States, 451 U.S. 204 (1981), Smith v. Maryland, 442 U.S. 735 (1979), Rakas v. Illinois, 439 U.S. 128 (1978), City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624 (1973), Katz v. United States, 389 U.S. 347 (1967), Camara v. Mun. Court, 387 U.S. 523 (1967), Griggs v. Allegheny Cnty., 369 U.S. 84 (1962), Silverman et al. v. United States, 365 U.S. 505 (1961), Johnson v. United States, 333 U. S. 10 (1948), United States v. Causby, 328 U.S. 256 (1946), Hester v. United States, 265 U.S. 57 (1924), and Boyd v. United States, 116 U.S. 616 (1886).

91. 533 U.S. 27 (2001).

92. 132 S. Ct. 945 (2012).

93. Dow Chem. Co. v. United States, 476 U.S. 227, 229 (1986).

94. *Id.* at 230.

95. *Id.* at 240–41 (Powell, J., concurring in part and dissenting in part).

96. *Id.* at 230.

97. *Id.* at 229.

98. The Court wrote that "open fields do not provide the setting for those intimate activities that the [Fourth] Amendment is intended to shelter from governmental interference or surveillance" and that "an individual may not legitimately demand privacy for activities out of doors in fields, except in the area immedi-

and, as a result, were "open to the view and observation of persons in aircraft lawfully in the public airspace immediately above or sufficiently near the area for the reach of cameras."[99] The Court also noted the role of technology diffusion as a factor, writing that "surveillance of private property by using highly sophisticated surveillance equipment not generally available to the public, such as satellite technology, might be constitutionally proscribed absent a warrant."[100] However, the Court observed, "[a]ny person with an airplane and an aerial camera could readily duplicate"[101] the photographs at issue. "[T]he taking of aerial photographs of an industrial plant complex from navigable airspace is not a search prohibited by the Fourth Amendment."[102]

B. California v. Ciraolo

Ciraolo[103] was decided in 1986, on the same day as *Dow Chemical*. On September 2, 1982, police in Santa Clara, California, received a tip regarding backyard marijuana cultivation.[104] After finding the yard surrounded by high fencing obscuring the view from the street, they obtained a small airplane and flew over the residence at 1000 feet.[105] The officers on the airplane observed and photographed what they concluded to be marijuana plants growing in the backyard.[106] This evidence was used to obtain a search warrant to seize the plants.[107]

The Supreme Court granted certiorari after the California Court of Appeal ruled that the warrantless aerial observations violated the Fourth Amendment.[108] In May 1986, the Supreme Court issued a five-to-four decision reversing the lower court.[109] Writing for the majority, Chief Justice Burger framed

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ately surrounding the home." *Id.* at 235–36 (alteration in original) (quoting Oliver v. United States, 466 U.S. 170, 178–79 (1984)) (internal quotation marks omitted).

99. *Id.* at 239.

100. *Id.* at 238.

101. *Id.* at 231.

102. *Id.* at 239.

103. California v. Ciraolo, 476 U.S. 207 (1986).

104. *Id.* at 209.

105. *Id.*

106. *Id.*

107. *Id.*

108. People v. Ciraolo, 161 Cal. App. 3d 1081, 1090 (Ct. App. 1984).

109. *Ciraolo*, 476 U.S. at 215.

the analysis in terms of the "reasonable expectation of privacy"[110] articulated in Justice Harlan's concurrence in *Katz*.[111] For an expectation of privacy to be "reasonable" under *Katz*, two separate criteria must be satisfied. First, the person must "have exhibited an actual (subjective) expectation of privacy."[112] Second, the expectation must "be one that society is prepared to recognize as 'reasonable.'"[113]

With respect to the first criterion, the *Ciraolo* Court wrote that although the presence of fences clearly conveyed a "desire to maintain privacy," and indeed successfully did so with respect to "normal sidewalk traffic," the marijuana plants might well have been visible from a truck or two-level bus.[114] Thus, it was unclear that the respondent had "a subjective expectation of privacy from all observations of his backyard."[115]

With respect to the second criterion, the Court did not dispute that the backyard was in the curtilage of the home,[116] but noted that police observations of curtilage are not necessarily unconstitutional. "The Fourth Amendment protection of the home has never been extended to require law enforcement officers to shield their eyes when passing by a home on public thoroughfares."[117] Moreover, "the mere fact that an individual has taken measures to restrict some views of his activities [does not] preclude an officer's observations from a public vantage

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110. *Id.* at 211.

111. Katz v. United States, 389 U.S. 347, 360 (1967) (Harlan, J., concurring).

112. *Id.* at 361.

113. *Id.* Much turns on the interpretation of "reasonable." For example, in *Illinois v. Caballes*, the Supreme Court explained that "the expectation 'that certain facts will not come to the attention of the authorities' is not the same as an interest in 'privacy that society is prepared to consider reasonable.'" 543 U.S. 405, 408–09 (2005) (quoting United States v. Jacobsen, 466 U.S. 109, 122 (1984)). In *Caballes*, the Court also distinguished between legitimate privacy expectations with respect to lawful, as opposed to unlawful, activity: "The legitimate expectation that information about perfectly lawful activity will remain private is categorically distinguishable from respondent's hopes or expectations concerning the nondetection of contraband in the trunk of his car." *Id.* at 410.

114. *Ciraolo*, 476 U.S. at 211.

115. *Id.* at 211–12.

116. *See, e.g.*, Oliver v. United States, 466 U.S. 170, 180 (1984) ("Thus, courts have extended Fourth Amendment protection to the curtilage; and they have defined the curtilage, as did the common law, by reference to the factors that determine whether an individual reasonably may expect that an area immediately adjacent to the home will remain private.").

117. *Ciraolo*, 476 U.S. at 213.

point where he has a right to be and which renders the activities clearly visible."[118] Because the observations were made from "public navigable airspace . . . in a physically nonintrusive manner," the respondent's expectation of privacy from such aerial observations was not one "that society is prepared to honor."[119] The Court concluded that "[i]n an age where private and commercial flight in the public airways is routine, it is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet."[120]

The dissent, delivered by Justice Powell, criticized the Court's reliance on the absence of a "physical invasion of the curtilage" in finding no constitutional violation: "Since *Katz*, we have consistently held that the presence or absence of physical trespass by police is constitutionally irrelevant to the question whether society is prepared to recognize an asserted privacy interest as reasonable."[121] The dissent also disagreed with the Court's view that conducting an overflight with the specific goal of enabling trained officers to observe a suspect's backyard raised no more constitutional questions than overflights by members of the flying public: "[T]he actual risk to privacy from commercial or pleasure aircraft is virtually nonexistent. Travelers on commercial flights, as well as private planes used for business or personal reasons, normally obtain at most a fleeting, anonymous, and nondiscriminating glimpse of the landscape and buildings over which they pass."[122] And, in an observation that would foreshadow the *Kyllo* decision fifteen years later, Justice Powell warned that "[r]apidly advancing technology now permits police to conduct surveillance in the home itself, an area where privacy interests are most cherished in our society, without any physical trespass."[123]

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118. *Id.*

119. *Id.* at 213–14.

120. *Id.* at 215.

121. *Id.* at 223 (Powell, J., dissenting).

122. *Id.* In a footnote to this text, Justice Powell called the Court's "analogy to commercial and private overflights" "wholly without merit." *Id.* at 223 n.8.

123. *Id.* at 226.

C. Florida v. Riley

Just under three years after *Ciraolo*, the Supreme Court once again ruled on the constitutionality of aerial observations of a home's curtilage by law enforcement. Like *Ciraolo*, *Florida v. Riley*[124] arose from a tip involving marijuana cultivation behind a house, where the plants could not be seen from the street. In *Riley*, the observations were made from a helicopter at 400 feet, enabling officers to see the plants through openings in the roof and sides of a greenhouse located behind a mobile home.[125] A majority of the justices in *Riley* found these observations constitutional.

Writing for the plurality,[126] Justice White wrote that "our decision in *California v. Ciraolo* controls this case."[127] While Riley took steps that "protected against ground-level observation," "the sides and roof of his greenhouse were left partially open" and "what was growing in the greenhouse was subject to viewing from the air."[128] "Any member of the public could legally have been flying over Riley's property in a helicopter at the altitude of 400 feet and could have observed Riley's greenhouse. The police officer did no more."[129]

Despite Justice White's statement that "[w]e would have a different case if flying at that altitude had been contrary to law or regulation,"[130] his opinion also provided an important qualifier: "This is not to say that an inspection of the curtilage of a house from an aircraft will always pass muster under the Fourth Amendment simply because the plane is within the navigable airspace specified by law."[131] Specifically, in ruling that there was no violation of the Fourth Amendment in the present case, Justice White found it of note that "no intimate

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124. 488 U.S. 445 (1989).

125. *Id.* at 448.

126. The *Riley* decision comprised an opinion delivered by Justice White and joined by Chief Justice Rehnquist and Justices Scalia and Kennedy; an opinion from Justice O'Connor concurring in the judgment; a dissent from Justice Brennan joined by Justices Marshall and Stevens; and a separate dissent filed by Justice Blackmun. Thus, even though there was no majority opinion, a majority of the Justices found the observations constitutional.

127. *Id.* at 449 (plurality opinion) (internal citation omitted).

128. *Id.* at 450.

129. *Id.* at 451.

130. *Id.*

131. *Id.*

details connected with the use of the home or curtilage were observed, and there was no undue noise, and no wind, dust, or threat of injury."[132]

In her opinion concurring in the judgment, Justice O'Connor raised concerns about relying on "compliance with FAA regulations alone" as a litmus test for privacy from overhead surveillance.[133] Rather, she wrote, "consistent with *Katz*, we must ask whether the helicopter was in the public airways at an altitude at which members of the public travel with sufficient regularity that Riley's expectation of privacy from aerial observation was not 'one that society is prepared to recognize as reasonable.'"[134] She then concluded that because there is "considerable public use of airspace at altitudes of 400 feet and above," Riley did not have a reasonable expectation of privacy from naked-eye observations from that altitude.[135] However, she wrote, "public use of altitudes lower than that—particularly public observations from helicopters circling over the curtilage of a home—may be sufficiently rare that police surveillance from such altitudes would violate reasonable expectations of privacy, despite compliance with FAA air safety regulations."[136]

Justice Brennan's dissent also took issue with the tie between FAA safety regulations and privacy: "It is a curious notion that the reach of the Fourth Amendment can be so largely defined by administrative regulations issued for purposes of flight safety."[137] He observed that the police officer's "ability to see over Riley's fence depended on his use of a very expensive and sophisticated piece of machinery to which few ordinary citizens have access."[138] The question, in Justice Brennan's view, was not whether the flights were in compliance with the FAA regulations, "but whether public observation of Riley's curtilage was so commonplace that Riley's expectation of privacy in his backyard could not be considered reasonable."[139] And while privately owned helicopters occasionally fly over populated areas

132. *Id.* at 452.
133. *Id.* at 453 (O'Connor, J., concurring in the judgment).
134. *Id.* at 454 (quoting Katz v. United States, 389 U.S. 347,361 (1967)).
135. *Id.* at 455.
136. *Id.*
137. *Id.* at 458 (Brennan, J., dissenting).
138. *Id.* at 460.
139. *Id.*

at 400 feet, "such flights are a rarity."[140] Justice Blackmun's dissent also cited the rarity of helicopter overflights at 400 feet and stated that for any observations below 1000 feet (the altitude of the fixed-wing aircraft in *Ciraolo*), the prosecution should have the burden of proving that a suspect whose curtilage was observed lacked a reasonable expectation of privacy.[141]

D. Kyllo v. United States

Although *Kyllo*[142] involved ground-based observations of a home, the case is nonetheless highly relevant to privacy from aerial observations; in fact, *Ciraolo* was invoked multiple times in the Court's 2001 *Kyllo* opinion. In January 1992, a government agent in a car used a thermal imaging device to measure the external temperature of the roof and outside wall of the home of Danny Lee Kyllo, who was suspected of growing marijuana.[143] The roof and wall were found to be abnormally warm, and a search warrant was issued based in part on this information.[144] Upon execution of the search warrant, marijuana plants were found and Kyllo was arrested.[145] A district court and the Ninth Circuit upheld the use of the thermal imager, in part on the grounds that it "merely indicated amorphous 'hot spots' on the roof and exterior wall and not the detailed images of private activity."[146]

The Supreme Court reversed the Ninth Circuit in a five-to-four opinion delivered by Justice Scalia.[147] The Court framed its analysis by noting that "well into the 20th century, our Fourth Amendment jurisprudence was tied to common-law trespass."[148] More recent rulings have "decoupled violation of a person's Fourth Amendment rights from trespassory violation of his property, but the lawfulness of warrantless visual surveillance of a home has still been preserved."[149] However, with

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140. *Id.* at 465.
141. *Id.* at 468 (Blackmun, J., dissenting).
142. Kyllo v. United States, 533 U.S. 27 (2001).
143. *Id.* at 29–30.
144. *Id.* at 30.
145. *See id.*
146. United States v. Kyllo, 190 F.3d 1041, 1047 (9th Cir. 1999).
147. *Id.* at 29.
148. *Id.* at 31.
149. *Id.* at 32 (citation omitted).

respect to searches of the interior of a home, "there is a ready criterion, with roots deep in the common law, of the minimal expectation of privacy that *exists*, and that is acknowledged to be *reasonable*."[150]

The Court expressed concern that allowing the government to freely collect any information "emanating from a house" would put people "at the mercy of advancing technology—including imaging technology that could discern all human activity in the home."[151] The Court also noted that "[w]hile the technology used in the present case was relatively crude, the rule we adopt must take account of more sophisticated systems that are already in use or in development."[152] The Court then concluded that when "the Government uses a device that is not in general public use, to explore details of the home that would previously have been unknowable without physical intrusion, the surveillance is a 'search' and is presumptively unreasonable without a warrant."[153]

In dissent, Justice Stevens criticized the Court for, in his view, failing to follow established principles providing that searches inside a home are presumptively unreasonable, while searches of property "in plain view" are not.[154] Justice Stevens also wrote that "any member of the public might notice that one part of a house is warmer than another part or a nearby building if, for example, rainwater evaporates or snow melts at different rates across its surfaces," and that "[h]eat waves, like aromas that are generated in a kitchen, or in a laboratory or opium den, enter the public domain if and when they leave a building."[155] Justice Stevens also criticized the Court's use of a standard that would diminish privacy protection as "intrusive equipment becomes more readily available."[156] Indeed, in the decade following *Kyllo*, thermal imagers have become less ex-

150. *Id.* at 34.

151. *Id.* at 35–36.

152. *Id.* at 36.

153. *Id.* at 40.

154. *Id.* at 42 (Stevens, J., dissenting) (quoting Payton v. New York, 445 U.S. 573, 586–87 (1980)).

155. *Id.* at 43–44.

156. *Id.* at 47. Justice Stevens also disputed the Court's "assumption that the thermal imager used in this case" was not in general public use, and noted in a footnote that similar imagers were available for rental through a toll-free telephone number. *Id.* at 47 & n.5.

pensive and more widely available. Writing in 2010, Orin Kerr observed that "remote infrared temperature-sensing has become quite common in a wide range of applications" and "it seems to me that there's at least a plausible case that the police can now use thermal imaging devices—or at least the simple single-point infrared devices—without a warrant."[157]

E. United States v. Jones

The most recent major Supreme Court privacy ruling is *United States v. Jones*,[158] decided in January 2012. In September 2005, agents on a joint FBI and Metropolitan (Washington D.C.) Police Department task force installed, without a valid warrant,[159] a GPS tracking device on a vehicle used by a suspect in a narcotics investigation.[160] The GPS tracker collected location data for approximately one month, and was used to place the suspect, Antoine Jones, at a house at a date and time where drug sales allegedly occurred.[161] After two trials in the United States District Court for the District of Columbia (the first ended in a mistrial), Jones and another defendant were convicted on a drug conspiracy charge.[162]

On appeal, Jones' conviction was overturned.[163] While noting that a person's reasonable expectation of privacy is highest in his or her home, the District of Columbia Circuit Court of Appeal recognized that "[a] person does not leave his privacy behind when he walks out his front door . . . . On the contrary, in *Katz* the Court clearly stated 'what [one] seeks to preserve as private, even in an area accessible to the public, may be constitutionally

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157. Orin Kerr, Can the Police Now Use Thermal Imaging Devices Without a Warrant? A Reexamination of Kyllo in Light of the Widespread Use of Infrared Temperature Sensors, THE VOLOKH CONSPIRACY, (Jan. 4, 2010, 12:33 PM), http://www.
volokh.com/2010/01/04/can-the-police-now-use-thermal-imaging-devices-without-a-warrant-a-reexamination-of-kyllo-in-light-of-the-widespread-use-of-infrared-temperature-sensors/.

158. 132 S. Ct. 945 (2012).

159. The agents had obtained a warrant, but it was for the District of Columbia and was valid for a ten-day period. The agents installed the tracking device in Maryland on the eleventh day. *See id.* at 948.

160. *Id.*

161. *Id.* at 948–49.

162. *Id*.

163. *Id.* at 949.

protected.'"[164] In using the warrantless GPS tracker to discover "the totality and pattern of his movements," the court concluded that the government violated the Fourth Amendment.[165]

The Supreme Court granted the government's petition of certiorari.[166] The Court's January 2012 decision was unanimous in finding the government's actions unconstitutional, but the Justices widely diverged in the bases for that finding. The majority opinion, delivered by Justice Scalia, found a Fourth Amendment violation in the physical trespass that occurred during the placement of the GPS device on the vehicle.[167] That intrusion, wrote Justice Scalia, "would have been considered a 'search' within the meaning of the Fourth Amendment when it was adopted."[168] The Court acknowledged that extended electronic surveillance "without an accompanying trespass" may be unconstitutional, but noted that the "present case does not require us to answer that question."[169]

In his opinion concurring in the judgment, Justice Alito criticized "the Court's reliance on the law of trespass" to decide the case.[170] Instead, he wrote, the question is whether the "respondent's reasonable expectations of privacy were violated by the long-term monitoring" of his vehicle.[171] Because "law enforcement agents tracked every movement that respondent made in the vehicle he was driving" for four weeks—a level of monitoring that Justice Alito felt impinged on reasonable expectations of privacy—Justice Alito concluded that the monitoring constituted a search.[172] Justice Sotomayor, in addition to joining the majority, provided a separate concurring opinion arguing that "the trespassory test . . . reflects an irreducible constitutional minimum."[173] Justice Sotomayor also expressed concern that the unchecked abil-

164. United States v. Maynard, 615 F.3d 544, 563 (D.C. Cir. 2010) (second alteration in original) (citation omitted).

165. *Id.* at 558, 568.

166. *Jones*, 132 S. Ct. at 949.

167. *See id.*

168. *Id.*

169. *Id.* at 953–54.

170. *Id.* at 962 (Alito, J., concurring in the judgment).

171. *Id.* at 958.

172. *Id.* at 964. Justice Alito left open the possibility that some periods of GPS surveillance might not constitute a search, but noted that in this case "the line was surely crossed before the 4-week mark." *Id.*

173. *Id.* at 955 (Sotomayor, J., concurring).

ity of the government to conduct long-term monitoring of "the sum of one's public movements" could enable it to obtain private information regarding political and religious beliefs.[174]

F. Privacy and Unmanned Aircraft Systems in Light of Supreme Court Jurisprudence

In *Ciraolo*, *Riley*, and *Kyllo*, the Supreme Court expressed a view that the extent to which an expectation of privacy is "reasonable" is tied, at least in part, to the level of technology diffusion. In addition, with respect to the specific question of the constitutionality of aerial observations, in *Ciraolo*, *Riley*, and *Dow Chemical*, the Court considered the use of public navigable airspace to be important, though not necessarily determinative. In those three rulings the Court also explicitly or implicitly distinguished overhead observations made using the naked eye or widely available camera technology from those made using less common imaging systems. For UAS privacy, these three tests—whether a technology is in general public use, whether the observations are made from public navigable airspace, and the nature of the imaging (or other information-gathering) system—will play fundamental roles.

Jones is most relevant to UAS in relation to extended surveillance. Today, tethered blimps called "aerostats" are being stationed in the sky in some places along the U.S.-Mexico border.[175] In addition, in the future, it will become practical to utilize fixed-wing unmanned aircraft for long-term surveillance. Thus, the types of constitutional questions considered (though not resolved) in *Jones* have direct implications for some categories of UAS.

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174. *Id.* at 956.

175. Kathleen Hickey, *Former wartime blimp refitted for border surveillance*, GOV'T COMPUTER NEWS, Aug. 16, 2012, http://gcn.com/Articles/2012/08/16/CBP-aerostats-unmanned-blimps-border-surveillance.aspx.The government has increased search powers near the border. For example, within twenty-five miles of "any external boundary of the United States," 8 U.S.C. § 1357(a)(3) allows the government, without a warrant, "to have access to private lands, but not dwellings, for the purpose of patrolling the border to prevent the illegal entry of aliens into the United States."

1. Technology in "General Public Use"

In *Dow Chemical*, the Supreme Court wrote that warrantless "surveillance of private property by using highly sophisticated surveillance equipment *not generally available to the public*" may be unconstitutional.[176] But the Court also noted that the "photographs at issue in this case are essentially like those commonly used in mapmaking. Any person with an airplane and an aerial camera could readily duplicate them."[177]

In the *Ciraolo* ruling issued on the same day, the Court concluded that in an era when private and commercial flight is "routine," there is no reasonable expectation of privacy from naked-eye observations made from public navigable airspace.[178] The *Ciraolo* Court stopped short of stating whether or not similar overhead observations made using non-routine aircraft or imaging technology would pass constitutional muster.

Fifteen years later in *Kyllo,* the Court again viewed the extent to which a technology was publicly available as highly relevant to defining a Fourth Amendment "search." The *Kyllo* Court was clearly concerned about future developments that might enable the Government to "see" into the interior of the home from the outside.[179] This concern was reflected in the Court's expressed desire to protect people from "advancing technology" that might "discern all human activity in the home" and the resulting need to "adopt" a "rule" taking account "of more sophisticated systems that are already in use or in development."[180] Yet, in the end, the rule adopted was more narrowly crafted.

The *Kyllo* holding that a search occurs when "the Government uses a device that is not in general public use, to explore details

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176. Dow Chem. Co. v. United States, 476 U.S. 227, 238 (1986) (emphasis added).

177. *Id.* at 231.

178. California v. Ciraolo, 476 U.S. 207, 215 (1986).

179. *See* Kyllo v. United States, 533 U.S. 27, 34 (2001). Recently, there have been significant advances in "terahertz" imaging, which refers to the formation of images using electromagnetic waves with a frequency on the order of one trillion times per second. As described in a conference paper published in early 2012, researchers at University of Texas at Dallas "have designed an imager chip that could turn mobile phones into devices that can see through walls, wood, pastics, paper and other objects." *New Research Could Mean Cellphones That Can See Through Walls*, UNIV. OF TEXAS AT DALLAS NEWS CENTER, Apr. 18, 2012, http://www.utdallas.edu/news/2012/4/18-17231_New-Research-Could-Mean-Cellphones-That-Can-See-Th_article-wide.html.

180. *Kyllo*, 533 U.S. at 35–36.

of the home that would previously have been unknowable without physical intrusion"[181] clearly bars the use of uncommon technology for this purpose. However, sophisticated and uncommon are two different things. Indeed, the *Kyllo* Court called the thermal imager in question "crude"[182] while also recognizing that it was nonetheless not in general public use. Furthermore, the district court in *Dow Chemical* had found a Fourth Amendment violation, in part, because the images were taken with "the finest precision aerial camera available," permitting capture of "a great deal more than the human eye could ever see."[183] In upholding the Sixth Circuit's reversal of this decision, the Supreme Court considered the wide public availability of the camera to be more relevant than its sophistication.[184]

So how does *Kyllo* bear on the issue of "routine" technology? As the dissent in *Kyllo* noted, the Court's language raises at least the possibility that the protection offered "dissipates as soon as the relevant technology is in general public use."[185] However, to conclude from *Kyllo* that use of a widely available technology to examine a home will necessarily be constitutional is not an entirely fair reading of Justice Scalia's opinion. As Justice Scalia stated in a footnote, in response to the dissent on this specific point, thermal imaging is not routine (or at least was not in 1992, the year in which law enforcement officers used the thermal imager at issue in *Kyllo*).[186] Based on existing Supreme Court precedent, that was sufficient to find its use unconstitutional. To the extent that there is a loophole through which overhead surveillance using "routine" (and possibly but not necessarily sophisticated) technologies might slip, it was created by *Ciraolo* and *Dow Chemical*, and the Court in *Kyllo* declined to revisit it.[187]

And what about technology *not* in general public use, which at least for the moment describes the state of UAS in the United

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181. *Id.* at 40.

182. *Id.* at 38.

183. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)).

184. *See id.* at 238–39.

185. *Kyllo*, 533 U.S. at 47 (Stevens, J., dissenting) (internal quotation marks omitted).

186. *Id.* at 39–40 n.6 (majority opinion).

187. *See id.* ("Given that we can quite confidently say that thermal imaging is not 'routine,' we decline in this case to reexamine that factor.").

States? Under a fair reading of *Kyllo*, that fact alone would not automatically bar its use for surveillance of a home. *Kyllo* did not prevent government use of uncommon technology generally, but instead was focused on the use of such technology to "explore details of the home that would previously have been unknowable without physical intrusion."[188] Thus, although warrantless use of a UAS equipped with a sophisticated thermal imaging camera to "see" through the walls of a home would certainly run afoul of *Kyllo*, acquisition of visible-light images of a home's exterior or curtilage using a UAS-mounted consumer-grade, low-resolution imaging system in public navigable airspace would likely not. After all, the information those images would reveal could be acquired easily from manned aircraft, something that the Court has found multiple times to be constitutional. Perhaps most importantly, to the extent that a "not in general public use" test furnishes a measure of privacy protection with respect to UAS platforms, that protection inevitably will soon disappear as their use becomes more widespread.

2. "Public Navigable Airspace"

As is clear from *Ciraolo*, *Riley*, and *Dow Chemical*, the use of "public navigable airspace" is a threshold test for determining whether warrantless aerial observations are constitutional.[189] This does not imply that all such observations will be constitutional, but those that are made from outside public navigable airspace are almost certainly unconstitutional. The question of what constitutes "public navigable airspace" for UAS operated by the government is thus central to the privacy inquiry.

This is not as easy to answer as it might first appear. FAA regulations provide that, except as necessary for takeoff or landing, fixed-wing manned aircraft must generally operate above 1000 feet when over congested areas, and above 500 feet over most non-congested areas.[190] UAS operated above these

188. *Id.* at 40.

189. *See* Florida v. Riley, 488 U.S. 445, 450 (1989); California v. Ciraolo, 476 U.S. 207, 213–14 (1986); *Dow Chem. Co.*, 476 U.S. at 239.

190. 14 C.F.R. § 91.119(b)–(c) (2012). The full set of minimum altitude rules is more complex. For example, for congested areas, the minimum is 1000 feet above the highest obstacle within a horizontal radius of 2000 feet of the aircraft. § 91.119(b). For noncongested areas other than over open water or sparsely popu-

minimums therefore are certainly in public navigable airspace.[191] In addition, the altitude must always be sufficiently high to allow "an emergency landing without undue hazard to persons or property on the surface."[192]

But this is not the whole story. The FAA regulations specifically exempt helicopters[193] from the minimums if "the operation is conducted without hazard to persons or property on the surface."[194] FAA regulations nonetheless provide a *de facto* impediment to very low altitude operation of manned helicopters over residential areas: In the event of an engine failure, it would be difficult to claim that the pilot of a manned helicopter hovering fifty feet over a home could perform an emergency landing without endangering persons or property on the ground. For an unmanned helicopter (or fixed wing aircraft) weighing only a few pounds, however, the risks posed to persons on the ground by an emergency landing, though not nonexistent, are certainly modest compared to those posed by manned aircraft. Thus, the combination of the helicopter rules and the "emergency landing" provision in current FAA minimum safe altitude regulations have little or no protective power with respect to UAS privacy concerns.

An additional complicating factor is that for at least some categories of unmanned aircraft, the traditional paradigm is inverted and the FAA imposes altitude *maximums* instead of minimums. Public unmanned aircraft operated in accordance with Section 334(c)(2)(C) of FMRA must be operated at a height lower than 400 feet.[195] Unless FMRA paradoxically is read to mandate navigation outside of "navigable airspace," with respect to this class of aircraft, altitudes of 350 feet, 300 feet, and 250 feet would almost always be within public navigable airspace. However, just as

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lated areas, the minimum is 500 feet. § 91.119(c). Over open water and sparsely populated areas, "the aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure." *Id*.

191. Provided, of course, that there are no other restrictions associated with the airspace.

192. § 91.119(a).

193. § 91.119(d). A helicopter is "a rotorcraft that, for its horizontal motion, depends principally on its engine-driven rotors"; a rotorcraft, in turn, is "a heavier-than-air aircraft that depends principally for its support in flight on the lift generated by one or more rotors." *Id.* § 1.1 (2012).

194. § 91.119(d).

195. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 122-95, § 334(c)(2)(C), 126 Stat. 11, 77.

clearly, the air five feet above the ground in the backyard of a home is not within any reasonable definition of public navigable airspace. As the Supreme Court wrote in 1946 in *United States v. Causby*,[196] "[w]e have said that the airspace is a public highway. Yet it is obvious that if the landowner is to have full enjoyment of the land, he must have exclusive control of the immediate reaches of the enveloping atmosphere."[197]

Attempts to identify a precise boundary where the "immediate reaches" under the "exclusive control" of a landowner end and the area available to the public begins can lead to complex questions.[198] For example, it could be argued that a warrantless government-operated UAS that dips into a backyard at eye level to obtain photographs into the house through a back window would be operating outside of public navigable airspace, and that the images it acquired would be unconstitutional for that reason (among others).[199]

Interestingly, airspace that may not be "publicly navigable" can still be subject to governmental control. In places such as the Washington, D.C. Metropolitan Area Flight Restricted Zone, the FAA prohibits *all* outdoor flight operations (including UAS), at any altitude, unless authorized by the FAA/Transportation Security Administration.[200] Thus, the FAA can and does promulgate regulations that control the air all the way down to the ground, even over private property. However, that the government has a right to *prohibit* certain flight operations in the air a few feet above private land does not mean that the government (or a private party) has an affirma-

196. 328 U.S. 256 (1946).

197. *Id.* at 264.

198. The definition of "navigable airspace" in 49 U.S.C. § 40102 does little to resolve this question. "Navigable airspace" is defined as the "airspace above the minimum altitudes of flight prescribed by regulations under this subpart and subpart III of this part, including airspace needed to ensure safety in the takeoff and landing of aircraft." § 40102(a)(32).

199. The Supreme Court considered the more general question of whether looking into a home through a window constitutes a Fourth Amendment search in *Minnesota v. Carter*, 525 U.S. 83 (1998). In that case, police had observed of a drug transaction through a gap in the closed blinds of a window. Because the respondents "were essentially present for a business transaction and were only in the home a matter of hours," the relevant expectation of privacy was that tied to commercial premises, not residential property. As a result, the Court found that the police observations were not a Fourth Amendment violation. *Id.* at 90.

200. *See* 14 C.F.R. § 93.341 (2012).

tive right to *conduct* flight operations in that same airspace without the property owner's consent.

In the dense urban cores of cities such as New York, Chicago, and Boston, public navigable airspace can unquestionably extend *below* the level of many residences. In New York, for example, manned helicopters routinely fly over the Hudson River at altitudes significantly lower than the taller buildings in Manhattan. The air 550 feet over the Hudson River is in public navigable airspace.[201] But there is a good argument that the air six inches outside the window of a fiftieth-floor apartment in midtown Manhattan is not. As noted above, in *Causby* the Court recognized the importance of providing a landowner with "exclusive control of the immediate reaches of the enveloping atmosphere."[202] A high-rise apartment dweller should have at least as much control over the enveloping atmosphere of his or her home.[203] That control, however, will only extend a modest distance. Thus, a UAS operated at several hundred feet above the ground and at a reasonable horizontal standoff from any nearby buildings would almost always be in public navigable airspace.[204]

Will warrantless UAS surveillance from public navigable airspace always be constitutional? Certainly not. The holding in *Ciraolo* addressed naked eye observations from "public airways."[205] *Ciraolo* would provide little support for use of an imaging system capturing much more detail than could the human eye.[206] The opinions in the (slightly) more recent *Riley* decision also imply the existence of some limits. Both of the *Riley* opinions that found in favor of the government expressed concern about using operation in public navigable airspace as

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201. Although the airspace 550 feet above the Hudson near Manhattan is publicly navigable, there are special flight rules that apply within the "Hudson River Exclusion." *See* 14 C.F.R. § 93.352 (2012). Altitudes below 1000 feet within the Hudson River Exclusion are available to aircraft conducting a "local operation" as defined in § 93.350(a).

202. *Causby*, 328 U.S. at 264.

203. An additional complication with respect to control over the air surrounding buildings in cities like New York relates to the "air rights" that are commonly transacted in association with real estate development. *See Zoning Glossary*, NEW YORK CITY DEPARTMENT OF CITY PLANNING, http://www.nyc.gov/html/dcp/html/zone/glossary.shtml#development_rights (last visited Jan. 29, 2013).

204. An exception would occur in locations subject to temporary or permanent flight restrictions.

205. California v. Ciraolo, 476 U.S. 207, 215 (1986).

206. *See id.* at 214–15.

the only threshold for constitutionality. Writing for the plurality, Justice White noted that "simply because the plane is within the navigable airspace specified by law," it does not follow that the observations it makes will always "pass muster under the Fourth Amendment."[207] Justice O'Connor also warned against relying on "compliance with FAA regulations alone,"[208] and Justice Brennan's dissent raised the same issue.[209]

Justice White's opinion in *Riley* also identifies some specific tests beyond simply being in public navigable airspace that might be applied. For example, the opinion implies that observations from legally operated aircraft that generated undue noise, wind, dust, or threat of injury could be unconstitutional.[210] Although a UAS weighing a few pounds or less would generate very little noise, wind, or dust, if it loses power it could certainly cause injuries. This could occur both directly, if it lands on a person, or indirectly, if it lands in traffic or becomes caught in power lines and initiates an injury causing event. Interestingly, the language of the opinion ties privacy expectations in part to the freedom from being subjected to a *threat* of injury, as distinct from an actual injury itself.

3. The Role of Imaging Technology

In *Ciraolo* and *Riley*, the aerial observations of the curtilage of a home were performed with the naked eye, a fact specifically noted by the *Ciraolo* Court[211] and by both of the *Riley* opinions that found against the government.[212] But in *Dow Chemical*, the use of a camera permitting capture of "a great deal more than the human eye could ever see" did not render the observations

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207. Florida v. Riley, 488 U.S. 445, 451 (1989).

208. *Id.* at 453 (O'Connor, J., concurring in the judgment).

209. *Id.* at 464 (Brennan, J., dissenting).

210. *See id.* at 452 (plurality opinion).

211. "[I]t is unreasonable for respondent to expect that his marijuana plants were constitutionally protected from being observed with the naked eye from an altitude of 1,000 feet." *Ciraolo*, 476 U.S. at 215.

212. Justice White's opinion stated that the investigating officer in *Riley* "circled twice over respondent's property in a helicopter at the height of 400 feet. With his naked eye, he was able to see through the openings in the roof and one or more of the open sides of the greenhouse and to identify what he thought was marijuana growing in the structure." *Riley*, 488 U.S. at 448. Justice O'Connor wrote that "I conclude that Riley's expectation that his curtilage was protected from naked-eye aerial observation from that altitude was not a reasonable one." *Id.* at 455 (O'Connor, J., concurring in the judgment).

unconstitutional; it was the public availability of the camera that mattered.[213]

What is the constitutionality of warrantless use of an extremely high-resolution (but widely available) camera on a UAS to observe the curtilage of a suspect's home? The Court has never grappled with this specific question, and existing case law is unclear on this point. A suspect could find support in *Ciraolo* and *Riley* when arguing that a Fourth Amendment violation occurred; the government could also find support in *Ciraolo* as well as in *Dow Chemical* and *Kyllo* in arguing that it did not.[214] That *Kyllo* is more recent is not dispositive in light of, among other things, the discussion of *Ciraolo* it contains.

Imaging technology is also relevant given Justice White's opinion in *Riley* that found no Fourth Amendment violation in part because "no intimate details connected with the use of the home or curtilage were observed."[215] Even though he was not speaking for a majority, Justice White's language is nonetheless intriguing, as it indicates that there may be some level of detail beyond which warrantless UAS observations, even if conducted from public navigable airspace, may cross the line into a Fourth Amendment search.

With present-day imaging capabilities, it would be an easy matter to use a UAS (or a manned aircraft) within navigable airspace to acquire imagery that includes "intimate details." For example, a government UAS at an altitude of several hundred feet could identify the topic of an electronic or paper news article being read by a person sitting in his or her fenced-in backyard. A strong case could be made that these observations, even when made from public navigable airspace, would be unconstitutional in the absence of a warrant.

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213. Dow Chem. Co. v. United States, 476 U.S. 227, 230 (1986) (quoting Dow Chem. Co. v. United States, 536 F. Supp. 1355, 1367 (E.D. Mich. 1982)) (internal quotation marks omitted). Another key factor in *Dow Chemical* was the Court's conclusion that the observed areas were more akin to "open fields" than to the curtilage of a home. *See id.* at 239.

214. Aspects of *Ciraolo* could be cited to support both positions. A suspect could cite the reference in *Ciraolo* to "naked eye" observations. The government could in response point to the *Ciraolo* language regarding the "routine" nature of the technology of flight, which was also referenced in *Kyllo*. *See Ciraolo*, 476 U.S. at 215; Kyllo v. United States, 533 U.S. 27, 39–40 n.6.

215. *Riley*, 488 U.S. at 452.

4. Extended Surveillance Using Unmanned Aircraft in Light of Jones

For financial, regulatory, and logistical reasons, law enforcement agencies will usually use small UAS. Today, these platforms generally have flight durations measured in hours, rendering their continuous use for days or weeks to perform surveillance impractical. But future developments will make long-term surveillance with UAS possible. In addition, at least along the U.S.-Mexico border, aerostats already are in use today.[216]

Some of the most vexing constitutional questions will arise in association with the use of high-altitude long-endurance (HALE) UAVs. These solar-powered UAVs can stay aloft for extraordinarily long periods of time. As noted above, the QinetiQ Zephyr stayed aloft for over two weeks in a 2010 demonstration.[217] Boeing is under contract with DARPA to develop the SolarEagle, which will be able to stay aloft in the stratosphere for five continuous years.[218] Because they fly at such high altitudes, HALE UAS could potentially track every car trip in a city, or the times when lights in residences were turned on and off.[219] It will likely be much later in the decade before HALE technology becomes sufficiently advanced and cost-effective to make it practical to install a permanent HALE presence above an American city. Currently, there is no indication that any government agency plans to do so.

No Supreme Court case is directly on point with respect to the type of extended surveillance that could be performed using a HALE platform, though some of the issues involved arose in *Jones*. The *Jones* opinions contain extensive discussion of the Court's 1983 holding in *United States v. Knotts* that a "person

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216. Hickey, *supra* note 175.

217. Chuter, *supra* note 36.

218. Press Release, Boeing Co., Boeing Wins DARPA Vulture II Program (Sept. 15, 2010), *available at* http://boeing.mediaroom.com/index.php?s=43&item=1425.

219. Satellites are not well-suited to perform extended, continuous high-resolution surveillance. The only satellites that can remain in place over one spot are in geostationary orbits, which are over 22,000 miles above the Earth—much too far to gather images revealing details of a home or curtilage. Satellites in lower orbits can acquire very detailed images, but not on a continuous basis. *See Phoenix, Tactical Technology Office*, DARPA, http://www.darpa.mil/our_work/tto/programs/phoenix.aspx (last visited Feb. 8, 2013).

traveling in an automobile on public thoroughfares has no reasonable expectation of privacy in his movements."[220]

Justice Scalia's majority opinion in *Jones* states that performing extended surveillance "through electronic means, without an accompanying trespass" *may* be unconstitutional, "but the present case does not require us to answer that question."[221] In his concurrence in the judgment, Justice Alito expressed a view that extended electronic surveillance of public movements *is* unconstitutional, writing, "the use of longer term GPS monitoring in investigations of most offenses impinges on expectations of privacy."[222] Justice Sotomayor's concurrence also expressed doubts about the constitutionality of extended electronic surveillance: "I do not regard as dispositive the fact that the Government might obtain the fruits of GPS monitoring through lawful conventional surveillance techniques."[223] In the end, however, it was the physical trespass involved in installing the GPS tracker, not the tracking itself, that formed the basis for the *Jones* decision.[224]

While HALE UAS surveillance is like GPS tracking in that it gathers information using technology that would have required a "large team of agents"[225] in the past, in one respect it is very different: A GPS tracker only identifies the movement of the single vehicle or other object to which it is attached, whereas HALE platforms equipped with banks of cameras could easily capture images of all the vehicle movements in an entire city. The prospect that the government might be able to capture—and then use at will—this level of information about the travels of private individuals is sobering. But if that is unconstitutional, where does that leave the networks of ground-level cameras and license plate readers that are increasingly being deployed along public streets and intersections? Those ground-level systems collect information that, when aggregated, can

220. 460 U.S. 276, 276 (1983).

221. United States v. Jones, 132 S. Ct. 945, 954 (2012).

222. *Id.* at 964 (Alito, J., concurring in the judgment).

223. *Id.* at 956 (Sotomayor, J., concurring).

224. *See id.* at 949 (majority opinion).

225. In his concurrence in the judgment in *Jones*, Justice Alito wrote that "constant monitoring of the location of a vehicle for four weeks" using traditional surveillance methods from the pre-computer age "would have required a large team of agents, multiple vehicles, and perhaps aerial assistance." *Id.* at 963 (Alito, J., concurring in the judgment).

track automobile trips just as thoroughly as a solar-powered HALE UAS making slow circles in the stratosphere.[226] An argument against the constitutionality of HALE systems would need to be reconciled with the information available through aggregated street-level traffic surveillance data. If government tracking of effectively all traffic in a city is unconstitutional, that holding should apply regardless of whether the technology used is on the ground or in the air.[227]

In future years it may also be necessary to revisit the assumption that widely available small, low-altitude UAS can only stay aloft for several hours. UAV Factory, a company based in Latvia, announced in the summer of 2012 that its "Penguin B" small UAS had stayed aloft for over fifty-four hours.[228] Future technological advances presumably will lead to flights of even longer durations. From a purely technological standpoint, platforms such as these conceivably could be used to survey a target for several days. Whether this is likely to happen in practice is another matter. At least under current regulations, this UAS class can only be operated by a government agency within line of sight of an operator.[229] A law enforcement agency could thus use rotating shifts of operators to fly this class of small UAS for several continuous days.

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226. Depending on where the cameras on the aerostats along the U.S.-Mexico border are aimed, similar questions regarding long-term surveillance are raised. An important difference between aerostats and HALE UAS is the altitude. HALE platforms fly many times higher, and can survey a much larger area than can aerostats.

227. Jurisprudence related to traffic checkpoints is relevant to this issue. In *City of Indianapolis v. Edmond*, the Court noted that it "is well established that a vehicle stop at a highway checkpoint effectuates a seizure within the meaning of the Fourth Amendment." 531 U.S. 32, 40 (2000). Recording a license plate of a passing car—or tracking the car using a HALE UAS—is certainly not a seizure. However, the *Edmond* ruling also noted that "stops can only be justified by some quantum of individualized suspicion," a test that would not be met by systems that perform pervasive tracking of all vehicles in a city. *Id.* at 47.

228. *UAV Factory Touts Endurance Flight Record*, UNMANNED SYSTEMS MAGAZINE, Aug. 2012, at 13; Press Release, UAV Factor, New Endurance Record for Small Unmanned Aircraft (July 7, 2012), *available at* http://www.uvs-interntional.org/index.php?option=com_docman&task=doc_view&gid=1969&Itemid=25.

229. FAA Modernization and Reform Act of 2012 (FMRA), Pub. L. No. 112-95, § 334(c)(2)(C), 126 Stat. 11, 77.

5. Residual Privacy Rights When a Warrant Is Obtained?

When law enforcement officers wiretap a phone pursuant to a warrant, a great deal of privacy is lost, but ultimately some minimal privacy is still maintained. For example, a tapped phone does not provide images of the interior of a home.

But with UAS, the implication that a search warrant should have some limits is not unreasonable. Imagery acquired by UAS pursuant to a warrant could lead to profound violations of privacy for both a suspect and the other residents of a house. It is one thing for a wiretap to capture the private conversations of a suspect's spouse. It is quite another for a UAS, hovering in a backyard and taking pictures through a window (or in the future, hiding unseen inside the house), to acquire images that might show an occupant of the house in a state of undress. To assert that the government, even when armed with a warrant, has an unfettered right to acquire, store, and view such images raises significant concerns. Thus, questions of UAS privacy do not end with the issuance of a warrant.

IV. NON-GOVERNMENT UNMANNED AIRCRAFT AND THE FIRST AMENDMENT

Although much of the attention regarding UAS privacy has focused on government use and the Fourth Amendment, it is non-government use that is likely to raise some of the most significant privacy challenges in the coming years. For private entities, which are not bound by Fourth Amendment restrictions that apply to the government, the key constitutional question is the extent of their First Amendment privilege to gather information.

As the Supreme Court recognized in its 1972 *Branzburg v. Hayes* decision, "[w]ithout some protection for seeking out the news, freedom of the press could be eviscerated."[230] Furthermore, the freedom to gather information is not limited to the press. In a 2011 ruling upholding the right of a citizen to record the actions of police in a public space, the First Circuit wrote that "[i]t is firmly established that the First Amendment's aegis extends further than the text's proscription on laws 'abridging the freedom of speech,

230. 408 U.S. 665, 681 (1972).

or of the press,' and encompasses a range of conduct related to the gathering and dissemination of information."[231]

However, the freedoms conferred by the First Amendment are not unlimited. In *Branzburg*, for example, the Supreme Court recognized the existence of some bounds: "It is clear that the First Amendment does not invalidate every incidental burdening of the press that may result from the enforcement of civil and criminal statutes of general applicability."[232]

Even though almost all companies and individuals will endeavor to operate UAS responsibly, there undoubtedly exist some classes of potential UAS users who will perceive observe less restraint. If paparazzi are willing to engage in high-speed freeway chases to capture images of a celebrity,[233] it would be optimistic to the point of naïveté to expect them to always operate UAS in a manner respectful of privacy considerations and in compliance with FAA safety regulations. When, as will inevitably occur, a paparazzo or stalker flies a UAS into a backyard and takes pictures through a back window, what laws will come into play?

A. Trespassing

Common sense would suggest that a homeowner[234] has the right to prevent a UAS from being flown around his or her backyard at eye level. And indeed, in some states, trespassing statutes are worded in a manner that would encompass trespassory use of a UAS. In Arizona, for example, "entry" in association with criminal trespass is defined as "the intrusion of any part of any instrument or any part of a person's body inside the external boundaries of a structure or unit of real property."[235] Unless an argument could be made that a UAS is not an "instrument," this statute would cover intrusion by a UAS

231. Glik v. Cunniffe, 655 F.3d 78, 82 (2011).

232. 408 U.S. at 682.

233. For an example of one alleged such incident, see Kate Mather, *Photographer who allegedly chased Justin Bieber charged*, L.A. TIMES, July 26, 2012, http://articles.latimes.com/2012/jul/26/local/la-me-bieber-paparazzi-20120726.

234. Or other person legally occupying the property, such as a lessee.

235. ARIZ. REV. STAT. § 13-1501 (West 2012).

at extremely low altitudes (for example, at eye level) that are under the control of a property owner.[236]

In Oregon, by contrast, "enter" as defined in association with criminal trespass is, among other things, "[t]o enter or remain in or upon premises . . . when the entrant is not otherwise licensed or privileged to do so."[237] While this somewhat circular definition is clearly intended to criminalize unauthorized entry by a person, it leaves open the question of whether entry by a very low-flying UAS would be covered. California's trespassing laws prohibit driving a vehicle on another person's property without consent,[238] but define vehicle in a manner that excludes UAS.[239]

The general lack of attention to the potential trespassory use of UAS in current state criminal statutes is not at all surprising. In the future, it almost certainly will be necessary to add specific language to criminal trespassing statutes addressing UAS.

B. Invasion of Privacy

Use of a UAS to invade an individual's privacy could result in civil or criminal liability. With respect to civil liability, courts in most jurisdictions recognize the two forms of common law invasion of privacy most likely to arise in connection with UAS: intrusion upon seclusion and public disclosure of private

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236. As discussed above, the question of the altitude at which a landowner's control over the air above the ground in his or her backyard ends, and the public's access begins, was at issue in *United States v. Causby*. Under any reasonable reading of *Causby* (and other relevant case law), the space in a backyard at eye level is certainly within the "immediate reaches of the enveloping atmosphere" that are under the "exclusive control" of the landowner. *See Causby*, 328 U.S. 256, 256 (1946). This interpretation is also supported by the manner in which overhanging tree branches from a neighbor's property are often handled. In many states, a homeowner has the right (subject to some exceptions) to trim tree branches in the air above his or her land. *See, e.g.*, Macero v. Busconi Corp., 12 Mass. L. Rep. 521 (Super. Ct. 2000) ("Massachusetts law recognizes a right of self-help by which a property owner can cut the limbs or branches of a tree that invade his property as long as such cutting is done at the property line.").

237. OR. REV. STAT. § 164.205(3)(a) (West 2012).

238. CAL. PENAL CODE § 602(n) (West 2012).

239. California Vehicle Code § 670, referenced in the criminal trespassing statute, defines a vehicle as "a device by which any person or property may be propelled, moved, or drawn upon a highway, excepting a device moved exclusively by human power or used exclusively upon stationary rails or tracks." CAL. VEH. CODE § 670 (West 2012).

facts.[240] In addition, some states also have civil or criminal statutes, or both, related to invasion of privacy.[241]

1. Intrusion Upon Seclusion

The potential of a UAS to intrude upon seclusion in the home is obvious. A person who is unwillingly photographed in his or her own home by a UAS hovering just outside an otherwise inaccessible window would have strong grounds for a valid cause of action. Even public figures, whose privacy rights are presumptively lower than those of private individuals,[242] can nonetheless reasonably expect views into the interior of their residences from their own backyards to be private.

Although privacy expectations are greatly reduced outside the home, the non-governmental use of a UAS to capture images and other information taken while the individual is in a public setting could nonetheless constitute an invasion of privacy. *Shulman v. Group W Productions, Inc.*,[243] a 1998 California Supreme Court ruling regarding filming that occurred following a car accident, is instructive in this regard. In *Shulman*, the victims of an accident were captured on video and audio recording, without their consent, for a television program called *On Scene: Emergency Response*.[244] The recording occurred both at the scene of the accident as well as in a rescue helicopter during transport to a hospital.[245]

The California Supreme Court affirmed the court of appeals' decision to reverse the trial court's summary judgment finding that the television program producers' activities were protected

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240. Prosser articulated four forms of the common law invasion of privacy tort in 1960: (1) "[i]ntrusion upon the plaintiff's seclusion or solitude, or into his private affairs;" (2) "[p]ublic disclosure of embarrassing private facts about the plaintiff;" 3) "[p]ublicity which places the plaintiff in a false light in the public eye;" and 4) "[a]ppropriation, for the defendant's advantage, of the plaintiff's name or likeness." William L. Prosser, *Privacy*, 48 CALIF. L. REV. 383, 389 (1960); *see also* RESTATEMENT (SECOND) OF TORTS §§ 652A–652E (1997).

241. *See, e.g.*, CAL. CIV. CODE § 1708.8 (West 2011); N.J STAT. ANN. §§ 2C:14-9, 2A:58D-1 (2004).

242. *See generally* Hustler Magazine, Inc. v. Falwell, 485 U.S. 46 (1988); Gertz v. Robert Welch, Inc., 418 U.S. 323 (1974); New York Times Co. v. Sullivan, 376 U.S. 254 (1964).

243. 955 P.2d 469 (Cal. 1998).

244. *Id.* at 475.

245. *Id.* at 474–75.

under the First Amendment.[246] The court held that a woman injured in the accident "was entitled to a degree of privacy in her conversations with [the nurse] and other medical rescuers at the accident scene."[247] It was improper, the ruling stated, to conclude that the "plaintiffs had no reasonable expectation of privacy at the accident scene itself because the scene was within the sight and hearing of members of the public."[248] At the time of the rescue, the vehicle was located "in a ditch many yards from and below" a highway, rendering it "unlikely . . . that any passersby on the road could have heard" the conversation of the victim with the nurse and other rescuers.[249]

The *Shulman* decision provides important guidance regarding newsgathering and UAS with respect to intrusion upon seclusion by drawing a distinction between the information about a newsworthy event available to passersby and the potentially greater amount of information available only to those intimately involved in the event itself. Under some circumstances, there will be no difference: If a crowd of people has gathered around an assault victim who is being treated by paramedics, the conversation between the victim and the paramedics may well be audible to all, and the victim's reasonable expectation of privacy correspondingly lower. But there will be many cases in which, as in *Shulman*, passersby have far from complete information about an unfolding event. Using a UAS to fill in the gaps would carry a risk of crossing the line into intrusion.

Just as the First Amendment does not provide an impenetrable shield for all uses of video, audio, and other electronic monitoring in public areas, intrusion upon seclusion is not automatically implicated for all observations of activities occurring in a home. A passerby on the street at night who happens to glance up and notice that the light in a nearby home has just been turned off is certainly not violating privacy rights. Likewise, courts will be very unlikely to consider a fleeting, acci-

246. *See id.* at 497–98.

247. *Id.* at 491.

248. *Id.*

249. *Id.* In addition to considering whether the audio and video recorded at the scene of the accident intruded on the victim's expectation of privacy, the California Supreme Court also considered the recording that took place within the helicopter, ruling that the "Court of Appeal correctly found [that] triable issues exist as to whether defendants invaded plaintiffs' privacy by accompanying plaintiffs in the helicopter." *Id.* at 477.

dental capture of imagery of a home's curtilage or (through a window) interior acquired by a passing UAS to be an invasion of privacy. Although the specifics vary from state to state, to prevail in a common law or statutory intrusion upon seclusion claim, a plaintiff generally must establish, at a minimum, that the intrusion was intentional and that it would be "highly offensive to a reasonable person."[250]

Some highly offensive intrusions upon seclusion have nonetheless been protected under the First Amendment. Most notably, in *Snyder v. Phelps*[251] the Supreme Court ruled in favor of members of the Westboro Baptist Church who had picketed the funeral of a serviceman killed in Iraq. A jury in Maryland had found members of Westboro Baptist Church liable for damages based on claims including intrusion upon seclusion.[252] However, in affirming the Fourth Circuit's reversal, the Supreme Court ruled that "the First Amendment bars Snyder from recovery for intentional infliction of emotional distress or intrusion upon seclusion" against Westboro Baptist Church members and that "we must likewise hold that Snyder cannot recover for civil conspiracy based on those torts."[253]

2. Publication of Private Facts

Precedents from state court rulings unrelated to aviation indicate that UAS could also figure into invasion of privacy through the publication of private facts. This could be particularly important with respect to UAS images of private individuals who become involuntarily caught up in newsworthy events.

In September 1999, *Sports Illustrated* published a story entitled "Every Parent's Nightmare" that included a photograph of a Little League team.[254] There were eighteen people in the photograph, including a team manager who had been convicted of molestation

250. Restatement (Second) of Torts § 625B (1977).

251. 131 S. Ct. 1207 (2011).

252. *Id.* at 1214. The District Court reduced the damages award but left the verdict intact. *Id.*

253. *Id.* at 1220.

254. William Nack & Don Yaeger, *Every Parent's Nightmare*, SPORTS ILLUSTRATED, Sept. 13, 1999, at 40, 42–43, *available at* http://sportsillustrated.cnn.com/vault/edb/reader.html?magID=SI&issueDate=19990913&mode=reader_vault.

charges in 1971 and who pled guilty in April 1998 to charges of molesting five of the children he coached in Little League.[255]

Ten of the people in the photograph filed suit against Time Warner, Inc., the then-owner of *Sports Illustrated*, for invasion of privacy and infliction of emotional distress.[256] In 2001, the California Court of Appeal upheld a lower court decision to deny Time Warner's motion to strike the complaint, writing that the "plaintiffs have demonstrated a prima facie case for invasion of privacy," particularly in relation to public disclosure of a private fact.[257] The court recognized that while the identity of the molester was publicly known and certainly newsworthy, the identities of the other coaches and the players on the team were not.[258]

Publication of private facts via imagery was also at issue in a Florida case involving a woman who suffered from a poorly performed plastic surgery.[259] The woman consented to be interviewed for a television program under the condition that the video would be edited to alter her voice and obscure her face.[260] When the broadcast took place without these two things occurring as promised, thereby revealing her identity, she filed suit.[261] In reversing a summary judgment in favor of the defendant, the Florida Court of Appeals held that "while the topic of the broadcast was of legitimate public concern, the plaintiff's identity was not."[262]

Images acquired by UAS could easily convey facts not previously known to the public, and, upon publication, could be an actionable invasion of privacy in many states. While news organizations are well aware of the tension between the privacy rights of their subjects and the organizations' First Amendment right to gather news, they will almost certainly need to reexamine existing policies in light of the unique imaging and other information gathering capabilities (such as monitoring of wire-

255. *Id.* at 43.

256. M.G. v. Time Warner, Inc., 89 Cal. App. 4th 623, 626 (2001).The same photograph had also been broadcast on the HBO program *Real Sports*. HBO was also owned by Time Warner.

257. *Id.*

258. *Id.* at 632.

259. Doe v. Univision Television Grp., Inc., 717 So. 2d 63, 64 (Fla. Dist. Ct. App. 1998).

260. *Id.*

261. *Id.*

262. *Id.* at 65.

less signals) of UAS. In addition, given the ease with which anyone—not only news organizations—can now publish content, all users of UAS who contemplate publishing aerial images or other information from UAS would be well advised to give careful consideration to the common law and statutory invasion of privacy frameworks that apply in their jurisdictions.

C. Stalking and Harassment

In January 2009, the U.S. Department of Justice released a report based on data collected from over three million stalking victims and two million harassment victims.[263] About 245,000 of the stalking victims and 70,000 of the harassment victims stated that they had been subjected to electronic monitoring using one or more of the following devices: video or digital cameras, computer spyware, listening devices, and GPS tracking.[264] Stalkers will have no qualms about adding UAS to this list.

It was not until 1990 that California became the first state to criminalize stalking.[265] Today, statutes addressing stalking (and typically harassment) are now on the books in all fifty states and in Washington, D.C. Fortunately, many of these statutes are worded broadly enough that use of a UAS to persistently follow a person or peer into his or her car or home would be considered, at the very least, harassment. Stalking often carries the additional connotation of causing the victim to fear for his or her safety.[266] Under some circumstances, UAS use alone could constitute stalking (for example, if it is used to chase or corner a person).[267] More often, a stalker using a UAS would also be engaged in a larger constellation of behaviors consistent with stalking. To the extent that anti-harassment and anti-stalking statutes specifi-

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263. Katrina Baum et al., U.S. Dep't. of Justice, Bureau of Justice Statistics Special Report, Stalking Victimization in the United States (2009), http://bjs.ojp.usdoj.gov/content/pub/pdf/svus.pdf.

264. *Id.* at 5.

265. *See* Christine B. Gregson, Comment, *California's Antistalking Statute: The Pivotal Role of Intent*, 28 GOLDEN GATE U. L. REV. 221, 221 (1998).

266. *See, e.g.*, CAL. PENAL CODE § 646.9 (West 2008): "Any person who willfully, maliciously, and repeatedly follows or willfully and maliciously harasses another person and who makes a credible threat with the intent to place that person in reasonable fear for his or her safety, or the safety of his or her immediate family is guilty of the crime of stalking . . . ."

267. Obviously, the other requirements of the legal definition of stalking must be met. As such, a child who momentarily chases his or her sibling using a 9-ounce toy remote control helicopter is clearly not engaging in stalking.

cally enumerate the technologies that might be exploited, UAS should be added to the list. If a stalker employing a UAS crosses state lines (or operates a UAS, with the assistance of someone local to the victim, from a different state), then federal anti-stalking statutes could also be implicated.[268]

D. Unmanned Aircraft and Business Privacy

In 2011, a Texas man flew an unmanned aircraft over land near a Dallas-area meat packing plant and acquired images appearing to show environmental violations.[269] He contacted the Coast Guard, and in early 2012 the Texas Environmental Crimes Task Force served a search warrant on the company.[270] Once on the property, investigators found a pipe that "originate[d] in the back of the slaughterhouse" that appeared to be channeling pigs' blood into a nearby river and "[was] not linked to a waste water system."[271]

Though few would rush to defend a slaughterhouse that may be in violation of environmental codes, the ability of private citizens or groups to easily inspect for such violations via overflights raises complex issues. To the extent that such overflights are lawfully conducted and reveal activities that may be endangering public health, they are obviously valuable. But what happens if a well-meaning but overzealous environmental group conducts daily flights over a large, fenced-in manufacturing facility and repeatedly reports "violations" to the government that turn out, after costly and time-consuming on-the-ground inspections, not to be violations after all? Does the company that owns the facility have grounds to ask a court to enjoin the environmental group from further overflights? What if the group posts pictures from its daily aerial surveillance missions on the Internet, and in doing so exposes information that the company regards as a trade secret? Could the group use a UAS to examine the interior of buildings at the facility using an advanced thermal imager that, if in government

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268. *See, e.g.*, 18 U.S.C. §§ 2261, 2261A, 2262, 2265 (2006).

269. Meghan Keneally, *Drone plane spots a river of blood flowing from the back of a Dallas meat packing plant*, MAILONLINE, Jan. 24, 2012, http://www.dailymail.co.uk/news/article-2091159/A-drone-plane-spots-river-blood-flowing-Dallas-meat-packing-plant.html.

270. *Id.*

271. *Id.*

hands and used to inspect a home, would be unconstitutional under *Kyllo*? More generally, to what extent does a corporation have common law or constitutional privacy rights that parallel those accorded to individuals?

This last question was raised but not fully resolved in a recent Supreme Court case, *FCC v. AT&T, Inc.*[272] While noting that "this case does not call upon us to pass on the scope of a corporation's 'privacy' interests as a matter of constitutional or common law,"[273] the Court ruled that the "protection in [the Freedom of Information Act] against disclosure of law enforcement information on the ground that it would constitute an unwarranted invasion of personal privacy does not extend to corporations."[274] The Court also expressed skepticism regarding arguments that corporations have a common law right to personal privacy, writing that "[o]n the contrary, treatises in print around the time that Congress drafted the exemptions at hand reflect the understanding that the specific concept of 'personal privacy,' at least as a matter of common law, did not apply to corporations."[275] Corporate privacy rights are related in part to the much broader question regarding the extent to which constitutional protections extend to corporations.[276] UAS represent one of the many ways in which those rights may be tested in the coming years.

The fact that UAS might be used to perform corporate espionage is another important issue. Observations of a competing company's facilities and activities—whether made from the ground or the air—are not necessarily illegal. For example, consider a person who drives by a competing company on public roads as part of his or her regular commute to work. If this person notices that there are suddenly far fewer cars in the company's parking lot than in previous months, he or she might infer that there have been significant layoffs. Under this scenario, visual observations have yielded potentially valuable information about a competitor without breaking any laws. Analogous scenarios involving incidentally acquired UAS imagery can also be envisioned.

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272. 131 S. Ct. 1177 (2011).
273. *Id.* at 1184.
274. *Id.* at 1185.
275. *Id.* at 1183–84.
276. *See, e.g.*, Citizens United v. FEC, 558 U.S. 310 (2010).

By contrast, circling a UAS over the roof of a competing company to intercept wireless signals emanating from the building would represent something similar to an "illegal wiretap" and violate the Stored Communications Act.[277] Photographs taken from a UAS without authorization that both (1) convey a trade secret, and (2) are obtained for the purpose of benefiting a "foreign government, foreign instrumentality, or foreign agent" would violate economic espionage statutes.[278]

V. NEW FRAMEWORKS FOR UNMANNED AIRCRAFT SYSTEMS AND PRIVACY

Many of the most important UAS privacy questions relate directly to the scope and interpretation of the First and Fourth Amendments. Those questions will be addressed in the inevitable court tests that will arise with increased UAS use. But there are also proactive steps that can be taken, including the adoption of voluntary policies by law enforcement agencies as well as new federal, state, and local legislation.

A. Voluntary Approaches

Several voluntary approaches for addressing UAS privacy have been proposed. These include the Association for Unmanned Vehicle Systems International (AUVSI) Code of Conduct, which calls for a commitment to "respect the privacy of individuals,"[279] as well as a set of model guidelines released by the International Association of Chiefs of Police (IACP).[280]

Although the IACP guidelines are not binding, many American law enforcement agencies likely will adopt the guidelines or use them as a starting point to develop more extensive guidelines. The IACP guidelines recommend that "[w]here there are specific and articulable grounds to believe that the UA [unmanned aircraft] will collect evidence of criminal

277. *See* 18 U.S.C. § 2511(1)(a) (2006).

278. *See, e.g.*, 18 U.S.C. § 1831(a)(2) (2006).

279. *Unmanned Aircraft System Operations Industry "Code of Conduct"*, ASS'N FOR UNMANNED VEHICLE SYS. INT'L, www.auvsi.org/conduct/ (last visited Feb. 1, 2013).

280. *Recommended Guidelines for the use of Unmanned Aircraft*, INT'L ASS'N OF CHIEFS OF POLICE: AVIATION COMM. http://www.theiacp.org/portals/0/pdfs/IACP_UAGuidelines.pdf (last visited Feb. 1, 2013).

wrongdoing and if the UA will intrude upon reasonable expectations of privacy, the agency will secure a search warrant prior to conducting the flight."[281] The guidelines also address data minimization, community involvement and feedback regarding policies for UAS use, and documentation of UAS flights.[282] Some of these recommendations are consistent with recommendations provided by the American Civil Liberties Union in a December 2011 report on "Protecting Privacy From Aerial Surveillance."[283] Voluntary frameworks will play a vital role in addressing UAS privacy concerns both directly, in terms of encouraging law enforcement agencies to use UAS responsibly, and indirectly, by spurring an important dialog between law enforcement agencies and their communities.

B. Federal Legislation

There were multiple bills related to UAS privacy introduced in the 112th Congress, though none were enacted.[284] In June 2012, Senator Rand Paul introduced the "Preserving Freedom from Unwarranted Surveillance Act of 2012,"[285] a bill that, subject to a small number of exceptions (such as preventing "imminent danger to life"), would have required a warrant for gov-

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281. *Id.* at 3.

282. *Id.* at 2–3. In the context of privacy, "data minimization" refers to the practice of collecting only relevant information, and destroying data that has ceased to become relevant. *See, e.g.*, ANDREAS PFITZMANN, MARIT HANSEN, & HANNES TSCHOFENIG, INTERNET ENGINEERING TASK FORCE, TERMINOLOGY FOR TALKING ABOUT PRIVACY BY DATA MINIMIZATION: ANONYMITY, UNLINKABILITY, UNDETECTABILITY, UNOBSERVABILITY, PSEUDONYMITY, AND IDENTITY MANAGEMENT (2010), http://tools.ietf.org/id/draft-hansen-privacy-terminology-00.html.

283. *See* Jay Stanley & Catherine Crump, Protecting Privacy From Aerial Surveillance: Recommendations for Government Use of Drone Aircraft, Am. Civil Liberties Union 15–16 (2011), http://www.aclu.org/files/assets/protectingprivacyfromaerialsurveillance.pdf.

284. Some of these UAS privacy legislative initiatives, as well as more general Fourth Amendment UAS issues are discussed in Richard M. Thompson II, Cong. Research Serv., R42701, Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses (2012), *available at* http://www.fas.org/sgp/crs/natsec/R42701.pdf.

285. Preserving Freedom from Unwarranted Surveillance Act of 2012, S. 3287, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/s3287. Essentially the same bill was introduced in the House by Representative Austin Scott. *See* Preserving Freedom from Unwarranted Surveillance Act of 2012, H.R. 5925, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5925.

ernment use of UAS to "gather evidence or other information pertaining to criminal conduct or conduct in violation of a statute or regulation."[286] A week later, Representative Shelley Capito introduced H.R. 5961, which would have limited "aerial surveillance of agricultural land."[287] The next month, Representative Ted Poe introduced the "Preserving American Privacy Act of 2012,"[288] which would have prohibited the use of UAS "for law enforcement purposes or for surveillance of a United States national or real property owned by that national . . . except pursuant to warrant and in the investigation of a felony."[289]

In December 2012, Representative Edward J. Markey introduced the "Drone Aircraft Privacy and Transparency Act of 2012.'' The bill would have required all entities seeking a "grant of authority to operate an unmanned aircraft system in the national airspace system" to provide a "data collection statement" specifying, among other things, "whether the unmanned aircraft system will collect information or data about individuals or groups of individuals," and if so, how it will be used.[290] Applications from law enforcement agencies would also have had to provide a "data minimization statement" describing the agencies' policies for minimizing data collection unrelated to a crime investigation and "requir[ing] the destruction of such information and data, as well as of information and data collected by the unmanned aircraft system that is no longer relevant to the investigation of a crime under a warrant."[291] With some exceptions for exigent circumstances, the bill would also have required law enforcement agencies to obtain a warrant for "generalized surveillance."[292]

There will undoubtedly be a new set of UAS privacy bills and privacy related amendments introduced (or reintroduced) in the 113th Congress and beyond. It is relatively easy to draft

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286. *Id.*

287. Farmer's Privacy Act of 2012, H.R. 5961, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr5961.

288. Preserving American Privacy Act of 2012, H.R. 6199, 112th Cong. (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6199.

289. *Id.* § 2.

290. Drone Aircraft Privacy and Transparency Act of 2012, H.R. 6676, 112th Cong. § 339 (2012), *available at* http://www.govtrack.us/congress/bills/112/hr6676/text.

291. *Id.* § 339(c).

292. *Id.* § 341.

legislative language that will increase privacy from UAS observations. It is far harder to do so without negatively impacting the use of UAS in applications that raise few or no privacy concerns. For example, as part of an arson investigation, police might want to employ a UAS to acquire overhead images of a formerly vacant industrial building that has been damaged by a suspicious fire. Requiring police to first obtain a warrant would delay the investigation and increase the burden on the courts with no benefit to privacy.

When drafting legislation, it is also important to consider the role that could be played by unintentionally captured images. Suppose that a brutal assault that takes place on a sidewalk is captured on video by a government-operated UAS that happens to be monitoring traffic on the adjacent street. Suppose further that the video from the UAS turns out to be the only available evidence that can identify the perpetrator. It would defy common sense if the police or prosecutors were barred by new UAS privacy rules from making use of this information.

Legislation that would include a blanket prohibition on government use of private UAS data in criminal investigations would also be ill advised, as well as inconsistent with what routinely occurs in nonaviation settings. Investigators often use images collected from privately owned surveillance cameras to help solve crimes, including, in many cases, cameras that were not owned or operated by the victim of the crime. In June 2012, a man suspected of killing three people in New York was arrested thanks in large part to images captured by a surveillance camera down the street from the scene of the crime.[293] What mattered most was that the camera captured the images vital to identifying the suspect, not whether it was publicly or privately owned. If, in the example in the previous paragraph, the images of the assault on the street had been captured by a UAS operated by a television station instead of by the government, it would make no sense to place them beyond the legal reach of investigators.

Any new legislation should also recognize that images of public spaces from government (or private) UAS will sometimes also include images of nearby homes. Residences next to a freeway are often within the frame of view of video from

293. *Police arrest suspect accused of executing three men outside Columbia University*, MAILONLINE, June 23, 2012, http://www.dailymail.co.uk/news/article-2163776/Police-arrest-suspect-accused-executing-men-outside-Columbia-University.html.

manned traffic helicopters reporting on a freeway problem. Video from UAS used to monitor traffic will be no different. Thus, a law stating that no UAS images of any nonpublic spaces can ever be acquired by the government without a warrant would, at least on its face, effectively ban government UAS use in almost any suburban or urban setting.

UAS privacy legislation, either at the federal or state level, should also avoid creating collateral damage for the operation of model aircraft. The Academy of Model Aeronautics, which, with over 150,000 members,[294] constitutes the world's largest model aviation organization, has an exemplary seventy-five-year safety record and a safety code that requires pilots of radio-controlled model airplanes to "avoid flying directly over unprotected people, vessels, vehicles or structures."[295] Aircraft operated in this manner are ill-suited for surveillance. Impeding their operation in the name of privacy would benefit no one.

"Drone" hobbyists should similarly be protected from legislation that leaves them as collateral damage. If, five years from now, a parent and child acting in compliance with applicable FAA regulations wish to fly a very small UAS in a backyard or public park, new privacy laws should not force the parent to file paperwork with the government documenting the date, time, duration, location, and image collection status of every flight.

As is clear from the above, there is no shortage of unsuitable legislative approaches. The best solutions are those that increase privacy protections without impeding reasonable, non-privacy-violating uses. Laws addressing data retention by government UAS users are one possible example. It is also reasonable to require law enforcement agencies to keep thorough records identifying the details of flight operations, including the date and time, location, who was operating the aircraft, and what sort of data was collected.[296]

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294. *What is AMA?*, ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/102.pdf (last visited Feb. 1, 2013).

295. *Academy of Model Aeronautics National Model Aircraft Safety Code* para. B(1), ACAD. MODEL AERONAUTICS, http://www.modelaircraft.org/files/105.pdf (last visited Feb. 1, 2013).

296. Laws specifically addressing UAS image data retention would raise the issue of consistency with respect to retention of data from ground-level, government-operated surveillance cameras.

C. State and Local Legislation and the Scope of Federal Preemption

The prospect of state and local UAS privacy regulation raises the issue of federal preemption.[297] Higher courts have repeatedly ruled that aircraft safety regulation has been preempted by the federal government. In 2007, the Ninth Circuit held that "[t]he [Federal Aviation Act] and regulations promulgated pursuant to it establish complete and thorough safety standards for air travel, which are not subject to supplementation by, or variation among, state laws."[298] Similarly, a 1999 Third Circuit ruling stated "[b]ecause the legislative history of the FAA and its judicial interpretation indicate that Congress's intent was to federally regulate aviation safety, we find that *any* state or territorial standards of care relating to aviation safety are federally preempted."[299]

Aircraft noise is another aviation-related field that has been federally preempted. In a 1973 decision involving Burbank's right to establish an airport curfew to address noise concerns, the Supreme Court ruled that the federal government "has full control over aircraft noise, preempting state and local control."[300] And in 1978, the Airline Deregulation Act included an express preemption prohibiting states from enacting laws "related to a price, route, or service of an air carrier that may provide air transportation."[301]

Yet this does not prevent states from passing any laws relating to how aircraft are flown. Reckless operation of aircraft is

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297. As the Supreme Court explained in a 1987 ruling, "when acting within constitutional limits, Congress is empowered to pre-empt state law by so stating in express terms." Cal. Fed. Sav. & Loan Ass'n v. Guerra, 479 U.S. 272, 280 (1987). In addition, "congressional intent to pre-empt state law in a particular area may be inferred where the scheme of federal regulation is sufficiently comprehensive to make reasonable the inference that Congress 'left no room' for supplementary state regulation. . . . As a third alternative, in those areas where Congress has not completely displaced state regulation, federal law may nonetheless pre-empt state law to the extent it actually conflicts with federal law." *Id.* at 280–81 (citation omitted).

298. Montalvo v. Spirit Airlines, 508 F.3d 464, 468 (9th Cir. 2007).

299. Abdullah v. Am. Airlines, 181 F.3d 363, 371 (3d Cir. 1999).

300. City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624, 633 (1973).

301. 49 U.S.C. § 41713(b)(1) (2006); *see also* John Maggio & Allison M. Surcouf, *Federal Preemption in The Field of Aviation*, 78 J. TRANSP. L., LOGISTICS & POL'Y 243, 249–50 (2011).

prohibited by both FAA regulations[302] and criminal statutes in many states. In ruling that a Maryland law making it a crime to "operate an aircraft . . . in a careless or reckless manner so as to endanger the life or property of another"[303] was not preempted by federal law, the Maryland Court of Appeals wrote that it "would be incongruous indeed, in light of the federal purposes and objectives, if Maryland were to be constitutionally precluded from the criminal prosecution of a person for such conduct because a federal regulation authorized civil penalties."[304] More generally, the court observed, "[w]e have no difficulty whatever in deciding that Congress has not occupied the entire field of aeronautics by the Federal Aviation Act of 1958."[305] Thus, federal preemption is complex both generally[306] and with respect to aviation.[307]

A state does not have the authority to enact UAS privacy laws that would decrease the safety of flight operations. A state law aiming to prevent UAS from hovering for too long over a home by requiring a certain minimum speed would raise concerns with respect to airspace safety, and would be unlikely to withstand a legal challenge. On the other hand, although it would be unadvisable, a state or municipality could enact legislation forbidding the use of any public funds to purchase or operate unmanned aircraft. There is also a gray area between these two extremes. State laws attempting to limit where and how government UAS can be operated, the resolution of the cameras they carry, or the retention of the data they collect would almost certainly be subject to preemption challenges.

From a preemption standpoint, the safest legislative role for states with respect to UAS privacy lies in minimizing privacy abuses by non-government UAS operators. State power to address trespass, invasion of privacy, harassment, and stalking is well established. Current civil and criminal statutes in those areas were drafted in an era, which is now ending, when UAS

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302. 14 C.F.R. § 91.13 (2006).

303. Ward v. State, 374 A.2d 1118, 1118 (Md. 1977) (quoting MD. ANN. CODE. art. 38, § 1 (1971), *repealed by* Acts 2004, Ch. 26, § 1 (2004)).

304. *Id.* at 1125.

305. *Id.* at 1123–24.

306. See Geoffrey C. Hazard, Jr., Quasi-Preemption: Nervous Breakdown in Our Constitutional System, 84 TUL. L. REV. 1143, 1145 (2010).

307. *See* Maggio & Surcouf, *supra* note 301, at 243.

were not widely accessible to private citizens. As a result, in many cases these laws fail to anticipate some of the unique ways in which UAS in the hands of irresponsible operators could be used to threaten privacy. These statutes should be reexamined to identify and close any loopholes that might be exploited.

State UAS privacy regulations also run the risk of being undermined by the physics and geometry of flight. Consider a UAS operated over Maryland, at the Virginia border, and at a high enough altitude to obtain very precise imagery of activities in Virginia five miles south of the Potomac River.[308] While the operators of the UAS would certainly need to comply with federal and Maryland laws, they could very credibly argue that their data collection practices should not be subject to Virginia law.[309] The scenarios that could play out in relation to municipal-level regulations are even more varied. If Berkeley, California, were to prohibit its police department from purchasing or using UAS, a UAS owned and operated by the City of Oakland, which is adjacent to Berkeley, could easily remain over Oakland while acquiring video of portions of Berkeley. The Oakland UAS could also freely cross into the airspace over Berkeley.

The early months of 2013 have seen a significant increase in UAS-related legislative activity at the state and local levels. To cite some of the many examples, in February 2013 the Virginia General Assembly passed a bill that, if signed into law by the Governor, would place broad restrictions on state and local law enforcement UAS use until July 2015.[310] An Oregon Senate bill, if enacted, would prohibit certain UAS uses within what it defines as the "Airspace of Oregon"; that is, "the space above the ground that is not part of airspace governed by federal law." [311]

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308. In this hypothetical scenario, it is assumed that the flight would occur outside the restricted zone in the Washington, D.C., area. *See Notice to Airmen 0/8326*, FED. AVIATION ADMIN., http://tfr.faa.gov/save_pages/detail_0_8326.html (last visited Feb. 1, 2013).

309. The ability of state law to reach high into the sky is questionable even in its "own" airspace. It is doubtful, for example, that a state could enact a valid law prohibiting passengers in commercial airliners flying over the state at 36,000 feet from taking pictures through the aircraft windows of the scenery below.

310. Jason Koebler, *Virginia Becomes First State to Pass Drone Regulations,* US NEWS, Feb. 5, 2013, http://www.usnews.com/news/articles/2013/02/05/virginia-becomes-first-state-to-pass-drone-regulations-.

311. S.B. 71, 77th Legis. Assemb., Reg. Sess. (Or. 2013), *available at* http://www.leg.state.or.us/13reg/measures/sb0001.dir/sb0071.intro.html.

Other states in which UAS-related measures have been introduced include California, [312] Florida, [313] and Texas. [314]

CONCLUSION

The only certain aspect of the debate about unmanned aircraft and privacy is that it will be contentious. Some people believe that there is no need to create new laws,[315] whereas others believe that UAS "could be just the visceral jolt society needs to drag privacy law into the twenty-first century."[316]

In the quarter of a century since *Ciraolo*, the cost of sophisticated imaging technology has plummeted. UAS will make it easy to put that technology in the air. Thus, the constitutionality of government UAS observations of a home or its curtilage using imaging technology that is both sophisticated and in general public use is certain to be tested.

None of the key Supreme Court precedents definitively resolve this issue. *Ciraolo* and *Riley* involved naked eye observations. *Dow Chemical* involved a camera that was both widely available and sophisticated for its time, but did not concern a home or curtilage. In *Kyllo*, the Court considered the thermal imager to be non-routine. And *Jones* concerned GPS, not imaging.

In combination, however, these rulings indicate that the Fourth Amendment is likely to provide significantly more protection from government UAS observations than is commonly assumed. At the very least, the Court will not grant the government the unconstrained power to perform warrantless UAS surveillance. Instead, the Court is more likely to adopt a test tied to the amount of detail revealed as opposed to the level of technology diffusion. Under that standard, even unsophisticated imag-

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312. S. B. 15, 2013–2014 Legis., Reg. Sess. (Cal. 2013), *available at* http://www.leginfo.ca.gov/pub/13-14/bill/sen/sb_0001-0050/sb_15_bill_20121203_introduced.html.

313. S.B. 92, 2013–2014 Legis., Reg. Sess. (Fla. 2013), *available at* http://www.flsenate.gov/Session/Bill/2013/0092/BillText/Filed/PDF.

314. *See* Robert Stanton, *Bill wants to make sure drone owners aren't neighborhood spies*, HOUSTON CHRONICLE, Feb. 6, 2013, http://www.chron.com/news/houston-texas/houston/article/Bill-wants-to-make-sure-drone-owners-aren-t-4256365.php.

315. *E.g.*, Jim Harper, *Old Laws Can Cover New Technologies*, N.Y. TIMES, Feb. 22, 2012, http://www.nytimes.com/roomfordebate/2012/02/20/civilian-drones-in-the-united-states/old-laws-can-cover-new-technologies.

316. M. Ryan Calo, *The Drone as Privacy Catalyst*, 64 STAN. L. REV. ONLINE 29, 29 (2011), http://www.stanfordlawreview.org/online/drone-privacy-catalyst.

ing technology might lead to a Fourth Amendment violation if it is misused in a low-flying government UAS, while images from a sophisticated camera flown at a high altitude might reveal very few details and raise no constitutional concerns.

When considering potential new statutory UAS privacy protections, it is helpful to keep in mind what has occurred with the Internet and mobile telephones, two technologies that are associated with privacy threats that are in some respects much more significant than those that will arise from unmanned aircraft. Both the Internet and mobile phones grew as fast as their underlying technologies enabled. As a result, the public and legislative dialogue regarding how best to address the privacy issues they raise has been conducted with a strong appreciation of their benefits. By contrast, while the privacy concerns associated with domestic UAS are real and deserving of attention, they are getting significant focus long before the potential benefits of the technology are widely recognized.

This early consideration creates both opportunities and risks. The opportunities lie in the ability to proactively address the privacy issues associated with a new technology before it becomes common. The risks lie in letting this information imbalance—in which the privacy downsides are well-known but the benefits are not—lead to correspondingly imbalanced legislative approaches.

If, in 1995, comprehensive legislation to protect Internet privacy had been enacted, it would have utterly failed to anticipate the complexities that arose after the turn of the century with the growth of social networking and location-based wireless services. The Internet has proven useful and valuable in ways that were difficult to imagine over a decade and a half ago, and it has created privacy challenges that were equally difficult to imagine. Legislative initiatives in the mid-1990s to heavily regulate the Internet in the name of privacy would likely have impeded its growth while also failing to address the more complex privacy issues that arose years later.

Thus, while it is important to proactively consider how to protect against the privacy abuses UAS could make possible, in doing so it is important to recognize the near impossibility of predicting all of the ways that a rapidly developing technology can be used—for good or for ill—in future years. Maintaining that perspective will be vital in achieving good UAS policy outcomes.