ON THE RADAR: GOVERNMENT UNMANNED AERIAL VEHICLES AND THEIR EFFECT ON PUBLIC PRIVACY INTERESTS FROM FOURTH AMENDMENT JURISPRUDENCE AND LEGISLATIVE POLICY PERSPECTIVES

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ABSTRACT: The utility of Unmanned Aerial Vehicles (UAVs) in military operations and border security is well documented. As the technology becomes more affordable and available, domestic law enforcement agencies, other state and federal governmental agencies, and private enterprises envisage UAV technology in their future operations. As UAVs are generally introduced into domestic airspace, they will test the Fourth Amendment's protection of citizens against unreasonable searches and seizures. Existing Supreme Court cases relevant to the issue of aerial warrantless searches are not ultimately determinative of UAVs' constitutionality in this regard. The Supreme Court was split in each of these previous cases, which dealt with manned flight, not unmanned flight. It is possible, however, to roughly evaluate the impact of UAV aerial surveillance on citizen privacy in a contemporary timeframe by extrapolating the Court's logic into the future. Currently, the Federal Aviation Administration (FAA) does not allow generalized UAV flight in national airspace, so the issue is not immediately at hand. The FAA, however, is formulating regulations to admit them, so this is a propitious time to consider how to maintain citizens' rights to privacy free from government infringement through this new technology. The Fourth Amendment most likely will provide only minimal protections. Thus a responsible legislative and administrative solution is required, incorporating accountability and restrictions on visual and sensory enhancing technology without a warrant while providing necessary but clearly drawn statutory exceptions to the warrant requirement. Otherwise, UAV technology may diminish citizens' reasonable expectations of privacy.

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Unmanned Aerial Vehicles (UAVs) have proven their military worth in well-documented battlefield operations, specifically in Kosovo, Afghanistan, and Iraq. The extensive electronic suite aboard military UAVs provides for real-time surveillance and reconnaissance of the battlefield, over-the-horizon communication links, and even the ability to track and destroy ground targets. In short, UAVs are well suited for "dull, dirty, or dangerous" missions that are instrumental in military operations.[1]

The roles of military UAV technology are shifting and adapting to domestic airspace, otherwise known as the national airspace system (NAS). Domestic, nonmilitary organizations are planning to use UAVs for a broad range of missions, from private real estate developers utilizing visual or radar topographic imaging for developing land to the Environmental Protection Agency enforcing pollution or water usage using onboard environmental sensors. Most significantly, state and federal law enforcement agencies may use UAVs domestically for surveillance. Unfettered use of UAVs by law enforcement agencies could erode the Fourth Amendment rights of U.S. citizens. The issue is not imminent because the FAA is undergoing an extensive review of how to best integrate UAVs into the NAS with a focus on "safety of flight," such as allowing unmanned aircraft to fly alongside manned commercial jetliners. Until the regulations emerge, the FAA will allow only extremely limited use of UAVs in the NAS. Discussion of the privacy issues is warranted now, however, so law in this vital area can keep pace with rapidly developing technology and structure its use from the advent of that technology.[2]

This comment describes UAV technology, discusses its integration into the NAS, and evaluates its future use by law enforcement and the important Fourth Amendment issues it raises. We can extrapolate from an analogous line of Supreme Court cases to create a predicative framework in which to evaluate how the many considerations will interact. In the face of this minimal and unsatisfactory judicial guidance, Congress should work with state and federal regulatory agencies to consider privacy legislation with regard to domestic overflights of UAVs to positively ensure a proper balance of privacy with law enforcement interests.

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1. U.S. DEP'T OF DEF., UNMANNED SYSTEMS ROADMAP (2007–2032) 19 (2007) [hereinafter UNMANNED SYSTEMS ROADMAP].

2. The rapid pace of development is evidenced by the U.S. Customs and Border Protection's (CBP) recent expansion of UAV surveillance to the United States-Canadian border. *See* Monica Davey, *Drone to Patrol Part of Border with Canada*, N.Y. TIMES, Dec. 8, 2008, at A22 (reporting that the CBP is adding a Predator B UAV to patrol the northern border in conjunction with established UAV surveillance of the United States-Mexico border).

I. UAVS: TECHNOLOGY OF THE FUTURE

UAVs are known by many names, such as drones, robot planes, pilotless aircraft, and remotely piloted vehicles.[3] These terms represent a range of UAVs, from autonomous robotic aircraft to vehicles attached by a wire to a hand held controller. Within this comment, all unmanned aircraft will be termed UAVs, understood as "an unmanned aircraft . . . that is operated without the possibility of direct human intervention from within or on the aircraft."[4]

Currently, UAVs may enter the NAS only via complex regulatory rules and special FAA authorization.[5] The FAA has effectively outlawed UAV general operations in the NAS because technological impediments do not allow unmanned aircraft to fly safely with manned aircraft under a "see and avoid doctrine," which is the primary method pilots use to maintain a safe distance in the visual flight spectrum.[6] In time, however, as technology improves and regulatory agencies adapt, we will observe UAVs flying a variety of missions in tandem with manned aircraft. For now, UAVs are currently constrained to restricted areas, border regions, and various limited airspace deemed safe for small UAVs.[7] Until technology and the applicable regulatory framework provides a viable safety environment, the FAA is "'interested in accommodating the needs of unmanned aircraft, but [is] not going to compromise safety in order to do that.'"[8]

To better understand current and potential benefits of UAVs, and fully appreciate the looming privacy issues that may arise as they take to the skies, it is helpful to understand how UAVs operate and what their capabilities are.

A. UAV Airframe Characteristics

Nearly all citizens are familiar with helicopters, private fixed wing aircraft, and large commercial jetliners. Some are even familiar with various military aircraft. Citizens, however, generally are not familiar with UAVs.[9] That will soon change. UAVs will be roaming the airspace because "[t]he age

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3. ELIZABETH BONE & CHRISTOPHER BOLKCOM, CONG. RESEARCH SERV., UNMANNED AERIAL VEHICLES: BACKGROUND AND ISSUES FOR CONGRESS 1 (2003).

4. The GAO uses this FAA definition. Although "UAV" is currently the general term, the international community, including the United States, is beginning to use the term "Unmanned Aerial Systems" to reinforce the overall system, such as the operators, manning stations, communication links, etc. U.S. GOV'T ACCOUNTABILITY OFFICE (GAO), UNMANNED AIRCRAFT SYSTEMS: FEDERAL ACTIONS NEEDED TO ENSURE SAFETY AND EXPAND THEIR POTENTIAL USES WITHIN THE NATIONAL AIRSPACE SYSTEM 6 (2008) [hereinafter GAO].

5. *See generally* Mark Edward Peterson*, The UAV and the Current and Future Regulatory Construct for Integration into the National Airspace System*, 71 J. AIR L. & COM. 521 (2006) (discussing the current regulatory rules and exploring possible future regulatory models).

6. *See id.* at 561–62.

7. *See* GAO, *supra* note 4, at 3–5.

8. Jeff Wise, *Civilian UAVs: No Pilot, No Problem*, POPULAR MECHANICS.COM, Apr. 2007, at 65, 67 (quoting Nick Sabatini, FAA associate administrator for aviation safety).

9. *See id.* at 66–68.

of robot planes has begun. Soon it will be hard to imagine how we ever lived without them."[10] Because of the combination of faster computers, fly-by-wire controls, satellite navigation, miniaturization of sensors, improved software, and fast data transmission, UAVs have burst on the scene in militaries across the globe and are moving into civil use.[11] UAVs are less noisy, cumbersome, and conspicuous than conventional manned aircraft.[12] Furthermore, experts expect UAVs' costs to diminish as technology advances.[13] There already is a wide range of UAVs available to future customers.[14] In time, as citizens become as familiar with UAVs as they are with current conventional aircraft, this familiarity may factor into whether it is reasonable for citizens to expect Fourth Amendment protections in the future.

UAVs can come in all sizes, shapes, and capabilities, ranging from the size of a softball[15] to the size of a "full size" aircraft. The following Figures exemplify the most common UAVs currently on the market and outline their basic aeronautical performance capabilities:[16]

Figure 1. RQ-4A "Global Hawk"
Wingspan: 116 ft.
Weight: 26,750 lbs.
Maximum speed: 350 knots
Mission duration: 32 hours
Maximum altitude: 65,000 ft.
Launch mechanism: Runway

10. *Id.* at 69.

11. *See* Peterson, *supra* note 5, at 546–48.

12. *See* P.W. Singer, *Robots at War: The New Battlefield*, WILSON QUARTERLY, Winter 2009, at 30, 34–35; Daniel B.Wood, *It's a Kite. It's a Model Airplane. It's . . . the Sheriff!*, THE CHRISTIAN SCI.MONITOR, July 11, 2006, at 1, 1–2.

13. *See Unmanned and Dangerous*, ECONOMIST TECH. Q., Dec. 8, 2007, at 22, 24.

14. GAO, *supra* note 4, at 10.

15. *See* UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 35; BONE & BOLKCOM, *supra* note 3, at 47 (discussing the micro air vehicle (MAV)); *see also* Singer, *supra* note 12, at 34 (describing a UAV which can carry a camera the size of a peanut).

16. GAO, *supra* note 4, at 8 (discussing varying models of the examples shown and thus varying specifications depending on the model. The models, however, are presented here to give the reader a general idea of the platform size and aeronautical performance); *see* UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 65–102 (providing an all inclusive listing of UAVs).

Figure 2. MQ-9 "Predator B" (nonmilitary version)
Wingspan: 66 feet
Weight: 10,000 lbs
Maximum speed: 220 knots
Mission duration: 30 hours
Maximum altitude: 50,000 feet
Launch mechanism: Runway

Figure 3. MQ-8 "Fire Scout"
Wingspan: 27.5 feet (rotor diameter)
Weight: 3150 lbs
Maximum speed: 125 knots
Mission duration: 8 hours
Maximum altitude: 20,000 feet
Launch mechanism: Vertical (helicopter takeoff)

Figure 4. Aerosonde
Wingspan: 9.5 feet
Weight: 33.5 lbs
Maximum speed: 60 knots
Mission duration: 30 hours
Maximum altitude: 15,000 feet
Launch mechanism: Catapult or from roof of a fast moving ground vehicle

Figure 5. SkySeer
Wingspan: 6.5 feet
Weight: 4 lbs
Maximum speed: 24 knots
Mission duration: 50 minutes
Maximum altitude: 11,000 feet
Launch mechanism: Hand launched[17]

17. Photograph reproduced with permission of the Los Angeles County Sheriff's Department. Unauthorized use not permitted.

The Department of Defense (DoD) continues to aggressively cultivate the unmanned aerial platform. The Defense Advanced Research Projects Agency (DARPA), the central research and development organization for the DoD, contributes greatly to governmental UAV defense technology. Currently, it focuses on two areas with respect to UAVs: (1) improving individual platforms to provide new capabilities, "such as unprecedented endurance or survivability" and (2) "expanding the level of autonomy and robustness of robotic systems."[18] To achieve these goals, DARPA encourages, incorporates, and coordinates outside entities to assist them in furthering the technology.[19]

As the DoD continues to cultivate UAV capabilities, the actual manufacturers are exploring their adaptation into the civilian and commercial sectors. It follows that as the airframe technology develops, so does the core value of the UAVs—the sensors on board.

B. UAV Sensory Capabilities and Their Applications

UAVs are a transformational military technology whose sensory capability is changing "how wars are fought and won."[20] Originally limited to reconnaissance and surveillance, UAVs have grown to encompass broad military missions:

- electronic surveillance;
- visual surveillance;
- target identification and designation;
- chemical, biological, radiological, nuclear, and explosive reconnaissance;
- resupply;
- communication relay;
- various special operations missions; and
- search and destroy.[21]

The aerospace industry, stimulated by increased defense budgets and the fiscal priority assigned to UAVs, has now set its sights on the nonmilitary market.[22] Federal and local government agencies, as well as private entities, appreciate the nearly infinite range of UAVs' technological utility. For the future, "'[t]echnology is not the limitation . . . [i]t's the ability of people to conceive of ways to use the technology.'"[23]

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18. UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 34.

19. For, example, in 2005, the DoD held the DARPA Grand Challenge. Although designed for unmanned *ground* vehicles, this challenge required autonomous navigation using only onboard navigation equipment and sensors to find and follow a 132-mile route through rugged desert roads. *Id.* at 36. This technology will be applied to airborn UAVs in the future.

20. BONE & BOLKCOM, *supra* note 3, at 3.

21. *Id.* at 14–18; *see generally* UNMANNED SYSTEMS ROADMAP, *supra* note 1 (mapping out many current and future functions); *Unmanned and Dangerous*, *supra* note 13, at 22.

22. *See* Peterson, *supra* note 5, at 547–50.

23. Wise, *supra* note 8, at 66 (quoting Rich O'Lear, vice president for Unmanned Aerial Systems at Lockheed Martin).

For example, in 2005, the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA) partnered to fly an Altair UAV for scientific purposes.[24] Their onboard sensors and their applications included:

- a "[d]igital camera system to facilitate shoreline mapping, habitat mapping, and ecosystem monitoring";
- an "[e]lectro-optical/infrared . . . sensor to provide . . . maritime surveillance for fishery and maritime sanctuary enforcement";
- an "[o]cean color sensor to facilitate fisheries management through better assessment of ecosystem health";
- an "[o]zone sensor to help determine ultraviolet vulnerability";
- a "[g]as chronograph to help scientists estimate greenhouse gases"; and
- a "[p]assive microwave vertical sounder to help determine when flash flood warnings must be issued."[25]

Other general current or future nonmilitary uses include:

- Customs and Border Protection (CBP): using infrared and video cameras to monitor the border;
- NOAA: monitoring hurricanes and tropical storms;
- private real estate developers and similar services: surveying and mapping
- oil and gas industries: pipeline management;
- National Park Service and firefighters: forest fire detection or surveillance
- agricultural interests: spotting ripe fields in large acreage;
- various agencies: search and rescue assistance; and
- local law enforcement agencies: criminal surveillance, situational awareness, hot pursuit, accident or crime scene forensics, and hazardous material reconnaissance.[26]

These examples illustrate the tremendous potential for UAV technology.

The Department of Defense and other federal agencies are taking highly classified technology that allows observers to *see through* walls and are adapting that technology to UAVs.[27] The most mature sensor technology, however, continues to be thermal imaging (Forward Looking Infrared, or "FLIR"), digital imaging, synthetic aperture radar, and video surveillance

24. UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 40–41; GAO, *supra* note 4, at 11.

25. UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 41.

26. *See* GAO, *supra* note 4, at 13–16; Wise, *supra* note 8, at 66–67; Peter Bowes, *High Hopes for Drone in LA Skies*, BBC NEWS, June 6, 2006, http://news.bbc.co.uk/2/hi/americas/5051142.stm.

27. William Saletan, *Nowhere to Hide*: *Killer Drones that Can See Through Walls*, SLATE, Sept. 17, 2008, http://www.slate.com/id/2200292/; Greg Miller & Julian E. Barnes, *Higher-Tech Predators Targeting Pakistan*, LOS ANGELES TIMES, Sept. 12, 2008, http://articles.latimes.com/2008/sep/12/world/fg-pakistan12.

systems.[28] Though these sensors are vital tools for U.S. armed forces on the battlefield, they are also the most troublesome mature sensors with regard to a citizen's right to privacy. They are highly effective surveillance technologies used to observe anything or anyone in nearly any environment.[29] Indeed, UAV sensory technology can discern "intimate details" of a citizen's private home, such as sleep and sexual patterns, by gathering information simply from infrared readings through walls or from enhanced visual technology.[30] Therefore, what would keep a UAV operator from observing the most intimate details of an individual's life on, or in, one's property? It is important to explore this question in light of the Fourth Amendment to better incorporate the UAV into modern society.

C. So, What Is the Big Deal?

Whether local or federal, a major crime-fighting tool is observing people and places. UAVs give a tremendous technological boost to law enforcement agencies' ability to locate, track, and observe targets for hours or even days.[31] For example, the Customs and Border Protection (CBP) currently uses Predator B UAVs (as pictured in Figure 2) to patrol a stretch of the United States border south of Fort Huachuca in Arizona.[32] This program has been so successful in assisting the detection of illegal immigrants and drug smugglers along the Arizona-Mexico border that the CBP will be purchasing and integrating more UAVs to augment its ground personnel.[33] Questions arise, however, as to what the operators look at while those Predators transit to the border area from their operational base miles away.

In local law enforcement, for example, the Los Angeles Sherriff's Department has explored the use of the SkySeer to hover in virtual silence over an accident or crime scene, without any risk to a pilot, providing officers both a tactical and economic advantage.[34] "'The potential savings . . . are astronomical compared to the high cost of owning, storing, and using the helicopters that [they] now use.'"[35] Though UAVs have been tested only in experimental trials, once various agencies overcome the regulatory hurdles and the technology improves, an individual officer in the field will have the ability to assemble a UAV in a matter of minutes and utilize it for a myriad of missions.

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28. See e.g., FLIR, http://www.flir.com/US/ (last visited Aug. 3, 2009); Sandia National Laboratories, What Is Synthetic Aperture Radar?, http://www.sandia.gov/radar/whatis.html (last visited Aug. 3, 2009).

29. Singer, *supra* note 12, at 34–35 (discussing detailed imagery technology used on the battlefield).

30. *See* Kyllo v. United States, 533 U.S. 27, 37–39 (2001).

31. Wood, *supra* note 12, at 1–2; *see also* Singer, *supra* note 12, at 34–35 (discussing military search and tracking capabilities).

32. Wise, *supra* note 8, at 65.

33. *See* UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 38–39; Wise, *supra* note 8, at 69.

34. Bowes, *supra* note 26.

35. Wood, *supra* note 12, at 1–2 (quoting Commander Heal, Los Angeles County Sheriff's Department (LASD)).

Privacy advocates, therefore, are concerned about the government using UAVs to intrude on a citizen's right to privacy. "'What concerns us is that privacy is fundamentally a right to be let alone and go about your business and daily life without having the government looking over your shoulders,' says Kurt Opsahl, staff attorney for the Electronic Frontier Foundation, a nonprofit organization that aims to protect people's digital rights."[36] "'It is as disturbing if they are looking over your shoulder with a drone flying overhead as much as over your shoulder literally.'"[37] Even the FAA concedes "'[i]t smacks of Big Brother if every time you look up there's a [UAV] looking at you.'"[38]

As Fourth Amendment concerns emerge with the new technology, citizen apprehension may be best exemplified by a statement from an actual law enforcement officer addressing UAVs and the invasion of privacy: "'There's no place in an urban environment that you can go right now that you're not being looked at with a video camera and you have nothing to fear from your own government—you are being watched by your fellow citizens.'"[39] Such a statement makes it abundantly clear that as traffic control and security cameras become more prevalent in public places, the issue of omnipresent eyes in the sky must be addressed.

II. PERTINENT FOURTH AMENDMENT CASE LAW

Although state constitutions and various regulatory mechanisms can provide individual citizens generous privacy protection, the Fourth Amendment sets a minimum standard for privacy:

> The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.[40]

The Supreme Court's interpretation of the Fourth Amendment has evolved over time, ranging from exploring it as a threshold question in 1886[41] to the 2001 case, *Kyllo v. United States*.[42] Some posit that the modern Court's interpretation of case law may lead to the diminishment of Fourth Amendment rights.[43] The inevitable governmental use of UAVs in law enforcement, as well

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36. *Id.* at 2.

37. *Id.* (quoting Kurt Opsahl).

38. *The Fly's a Spy*, ECONOMIST, Nov. 1, 2007, at 91, 92 (quoting Nicholas Sabatini, FAA Associate Administrator for aviation safety).

39. Bowes, *supra* note 26 (quoting Commander Heal, LASD).

40. U.S. CONST. amend. IV.

41. Boyd v. United States, 116 U.S. 616, 622–23 (1886); Susan Moore, Note, *Does Heat Emanate Beyond the Threshold?: Home Infrared Emissions, Remote Sensing, and the Fourth Amendment Threshold*, 70 CHI.-KENT L. REV. 803, 805 (1994).

42. Kyllo v. United States, 533 U.S. 27 (2001).

43. *See* Moore, *supra* note 41, at 832–33.

as use by the public generally, is a compelling reason to revisit the pertinent case law to explore the extent of future constitutional societal privacy protections.

A. *Katz*: The Modern Standard?

The Court introduced the current judicial standard in its landmark 1967 decision, *Katz v. United States.*[44] *Katz*, in effect, reevaluated the 'physical trespass' doctrine from *Olmstead v. United States*,[45] which previously had allowed the warrantless wiretapping of phone lines outside of a person's property.[46] The *Olmstead* Court determined that the government did not violate a suspect's privacy "unless there has been an official search and seizure of his person or such a seizure of his papers or his tangible material effects or an actual physical invasion of his house or curtilage for the purpose of making a seizure."[47] Justice Brandeis exposed the shortsightedness of this decision, arguing in his *Olmstead* dissent that the "right to be let alone [is] the most comprehensive of rights and the right most valued by civilized men."[48] He prophetically warned that "[t]he progress of science in furnishing the government with means of espionage is not likely to stop with wire tapping."[49]

Almost forty years later, *Katz* involved a gambling suspect who used a public phone booth to place bets. Law enforcement, without a warrant, placed listening devices on the outside of the booth. The plurality stated that the Fourth Amendment "protects people, not places. What a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection. But what he seeks to preserve as private, even in an area accessible to the public, may be constitutionally protected."[50]

Justice Harlan's concurrence became the *Katz* standard. He articulated a two prong test to determine when Fourth Amendment protection is appropriate: "[1] a person [must] have exhibited an actual (subjective) expectation of privacy and, . . . [2] the expectation [must] be one that society is prepared to recognize as 'reasonable.'"[51] Like Justice Brandeis before him, Justice Harlan foresaw that technology would further improve on methods of surveillance. He warned against "reasonable expectations of privacy [that] may be defeated by *electronic* as well as physical invasion."[52] In essence, *Katz* seemed to focus more on the *results* of the search in light of the individual's privacy interest and less on the *method* of invasion.[53] *Katz* effectively made it possible to de-

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44. Katz v. United States, 389 U.S. 347 (1967).
45. Olmstead v. United States, 277 U.S. 438 (1928).
46. *Id.* at 466.
47. *Id.* (quotation omitted).
48. *Id.* at 478 (Brandeis, J., dissenting).
49. *Id.* at 474.
50. Katz v. United States, 389 U.S. 347, 351 (1967) (citations omitted).
51. *Id.* at 361 (Harlan, J., concurring) (quotations omitted).
52. *Id.* at 362. (emphasis added).
53. *See* Ric Simmons, *From* Katz *to* Kyllo: *A Blueprint for Adapting the Fourth Amendment to Twenty-First Century Technologies*, 53 HASTINGS L.J. 1303, 1321–22 (2002).

fend against a nonphysically intrusive search; in determining a privacy right infringement, courts now consider the location of the individual or information observed.[54] Subsequent Fourth Amendment jurisprudence has adapted the *Katz* standard to emerging technologies.[55]

In criminal cases, however, the Court has effectively discounted the first prong, an individual's subjective expectation of privacy.[56] For example, in *Smith v. Maryland*, the majority ruled the defendant assumed the risk that the government would discover who he called, when he placed a call from his home through a local *electronic* switchboard.[57] The Court held the defendant should have known, assumed, or expected that he had exposed the called phone number to the phone company, and therefore, he was releasing that information to the world.[58]

Justice Marshall's dissent in *Smith* emphasized two important points. First, "[i]t is idle to speak of 'assuming' risks in contexts where, as a practical matter, individuals have no realistic alternative."[59] Second, if notice is a criterion for defeating subjective privacy expectations, then the government can eradicate a person's subjective expectation of privacy simply by providing notice, because nothing could be subjectively private if the government proclaimed it public.[60]

Using the *Smith* logic, is a person's expectation to privacy in his or her personal back yard or curtilage illegitimate because, if a private third party could nontortiously observe these areas, one must be "assuming" the risk of intrusive law enforcement observations? As aviation has advanced and has become more accessible to the public, the logical answer according to *Smith* is "yes." Also, could citizens lose their subjective expectation of privacy because the state gives them notice of no expectation of privacy in their backyard? Published post-*Smith* cases dealing with the collision between manned aviation, improved technology, and the Fourth Amendment unfortunately also answer "yes."[61] The question now is how future courts will apply Fourth Amendment jurisprudence to UAVs.

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54. Patrick Korody, *Satellite Surveillance Within U.S. Borders*, 65 OHIO ST. L.J. 1627, 1642–43 (2004).

55. *E.g.*, Kyllo v. United States, 533 U.S. 27, 31–35 (2001).

56. Ric Simmons, *Technology-Enhanced Surveillance by Law Enforcement Officials*, 60 N.Y.U. ANN. SURV. AM. L. 711, 714 (2005).

57. Smith v. Maryland, 442 U.S. 735, 744–46 (1979).

58. *See id.*

59. *Id.* at 750 (Marshall, J., dissenting) (stating that, at the time, telephones were the predominant form of real-time distance communications).

60. *Id.*

61. Three important cases that define the future of Fourth Amendment searches of curtilage from the air are *California v. Ciraolo,* 476 U.S. 207 (1986), *Dow Chem. Co. v. United States,* 476 U.S. 227 (1986), and *Florida v. Riley*, 488 U.S. 445 (1989) (plurality opinion).

B. *Ciraolo* and *Riley*: Aerial Searches by UAVs

After *Katz* and *Smith*, the Court further expanded law enforcement's broad search powers in *Oliver v. United States*.[62] Here, the court reaffirmed the "open field doctrine"[63] by determining that police, although trespassing on a person's fields marked with "No Trespassing" signs, were not violating the Fourth Amendment's requirement of a search warrant. They ruled, "[A]n individual may not legitimately demand privacy for activities conducted out of doors in fields, except in the area immediately surrounding the home."[64] Then in *United States v. Dunn*,[65] the Court created four factors to determine whether future courts should give Fourth Amendment protection to claimed "curtilage:"

> [1] the proximity of the area claimed to be curtilage to the home, [2] whether the area is included within an enclosure surrounding the home, [3]the nature of the uses to which the area is put, and [4] the steps taken by the resident to protect the area from observation by people passing by.[66]

The Court's focus then shifted from *Katz's* "subjective expectation" prong to the matter of whether new technology has infringed on the individual's expectation of privacy in view of societal reasonableness, *Katz's* second prong.[67] How then do reasonable societal expectations of Fourth Amendment privacy relate to the *overhead, unmanned* searches UAVs will be conducting in the future?

California v. Ciraolo[68] and *Florida v. Riley*[69] are the primary manned overflight cases with which to begin a measured analysis. The two cases permitted police to observe residences' curtilage via *manned* aviation because the courts considered the NAS a public thoroughfare. The courts permitted the observations, despite the fact that police purposefully targeted the residences without a warrant. *Unmanned* police aerial observations obviously have not yet been addressed. But if Justice O'Connor's concurrence in *Riley* becomes the standard for unmanned law enforcement aerial observations, as Justice Harlan's concurrence in *Katz* became the privacy standard for emerging technologies, most likely UAVs will not be permitted to observe untargeted private residences so long as the technology allows safety of flight through a congested NAS without visual ground observations along the way.[70] On the other hand, if the state of technology requires a UAV operator to reference the

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62. Oliver v. United States, 466 U.S. 170, 178 (1984).
63. *See* Hester v. United States, 265 U.S. 57, 59 (1924).
64. *Oliver*, 466 U.S. at 178.
65. United States v. Dunn, 480 U.S. 294 (1987).
66. *Id.* at 301.
67. *See* Simmons, *supra* note 53, at 714.
68. California v. Ciraolo, 476 U.S. 207 (1986).
69. Florida v. Riley, 488 U.S. 445 (1989) (plurality opinion).
70. For example, visual ground observations may not be needed if technology like a global positioning system (GPS) is utilized for navigation. UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 115.

ground for safety of flight, similar to a pilot in a manned helicopter or aircraft, then observation of residences along the way to a specific target may be allowed because the courts consider the NAS a public thoroughfare.

1. California v. Ciraolo: *Fixed Wing Surveillance*

California v. Ciraolo made it possible for police, when targeting a certain residence, to search that residence from the air,[71] comparing overflight to "passing by a home on public thoroughfares."[72] In *Ciraolo*, a police officer, based on an anonymous tip, was permitted to fly a fixed wing aircraft at 1000 feet and observe marijuana in a suspect's backyard without a warrant. The court held that "[i]n an age where private and commercial flight in the public airways is routine, it is unreasonable for [the defendant] to expect that his marijuana plants were constitutionally protected from being observed . . . ."[73] The officer observed the plants from overhead and, based upon that observation, was able to procure a warrant to later physically search the premises.[74]

The defendant made deliberate attempts to conceal his yard from outside ground observation, and the California Supreme Court found that the police's focused observation was "a direct and unauthorized intrusion into the sanctity of the home" that violated defendant's expectation of privacy.[75] Nonetheless, the United States Supreme Court found that he did not have any *reasonable expectation of privacy*.[76] The subjective first prong of *Katz* was irrelevant for the Court because the defendant's expectations did not meet the objective second prong, namely privacy that *society* deemed reasonable.[77] The *Ciraolo* Court determined that so long as an officer is in legal, navigable airspace, he is "where he has a right to be."[78] Even though the plants were within curtilage, the Court ruled that a police officer does not have "to shield [his] eyes" when passing by and could traverse the airways like a typical aviator.[79] In the end, the Court decided *for society* that police surveillance from navigable airspace in this case was reasonable and was what society was "prepared to honor."[80]

Four Justices dissented, stating the opinion strayed significantly from the standard developed in *Katz* and ignored the warning proscribed by Justice Harlan in his *Katz* concurrence.[81] They distinguished targeted police surveil-

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71. *Ciraolo*, 476 U.S. at 215.
72. *Id.* at 213.
73. *Id.* at 215.
74. *Id.* at 209–10.
75. *Id.* at 210 (quoting People v. Ciraolo, 161 Cal. App. 3d 1081, 1089–90 (Cal. Dist. Ct. App. 1984)).
76. *Id.* at 214.
77. *Id.* at 212–14.
78. *Id.* at 213.
79. *Id.*
80. *See id.* at 212–14 (establishing the unreasonable privacy expectations of the defendant and his backyard garden).
81. *Id.* at 215–16 (Powell, J., dissenting).

lance from normal air traffic activities on which the majority relied.[82] Further, they criticized how the curtilage doctrine as espoused in *Oliver* and reaffirmed in *Dow Chemical Co. v. United States*,[83] decided the same day as *Ciraolo*, was not fully analyzed in this case and brought to bear on intimate details that may have been discovered in the curtilage.[84]

2. Florida v. Riley: *Rotary Wing Surveillance*

Three years later, the Supreme Court had another chance to decide a similar overflight case, this time regarding a helicopter. In *Florida v. Riley,* the plurality ruled that a police officer in a helicopter circling a home twice at 400 feet, in navigable airspace, did not constitute a search under the protection of the Fourth Amendment.[85] Again, as in *Ciraolo*, the United States Supreme Court overruled the state supreme court.[86] Also, as in *Ciraolo*, the police were tipped off to the defendant growing marijuana in the curtilage of his home.[87] In this case, however, when the police overflew the defendant's residence, the officer was able to see marijuana *in a greenhouse* because two roof panes were missing.[88]

The defendant had posted a "DO NOT ENTER" sign and had a wire fence enclosing the property.[89] The plurality found that even though he had a subjective expectation of privacy, that expectation did not pass the second prong of the *Katz's* analysis.[90] The plurality held that "such an expectation was not reasonable and not one 'that society is prepared to honor.'"[91] The police were traveling the public airways as any citizen could be. The plurality did not take into account the actual *regularity* of helicopter overflight in defendant's county, citing only general helicopter use across the United States *as a whole*.[92]

The plurality, however, noted that the outcome would have been different had the aircraft been flying at an altitude deemed illegal by the FAA.[93] Moreover, they stated "[t]his is not to say that an inspection of the curtilage of a house from an aircraft will always pass muster under the Fourth Amendment

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82. "[T]he Court fails to acknowledge the qualitative difference between police surveillance and other uses made of the airspace. Members of the public use the airspace for travel, business, or pleasure, not for the purpose of observing activities taking place within residential yards. Here, police conducted an overflight at low altitude solely for the purpose of discovering evidence of crime within a private enclave into which they were constitutionally forbidden to intrude at ground level without a warrant. It is not easy to believe that our society is prepared to force individuals to bear the risk of this type of warrantless police intrusion into their residential areas." *Id.* at 224–25.

83. Dow Chemical Co. v. United States, 476 U.S. 227, 235–39 (1986).

84. *Ciraolo*, 476 U.S. at 219.

85. Florida v. Riley, 488 U.S. 445, 452 (1989).

86. *Id.*

87. *Id.* at 448.

88. *Id.*

89. *Id.* at 448.

90. *Id.* at 449–52.

91. *Id.* at 449 (quoting California v. Ciraolo, 476 U.S. 207, 214 (1986)).

92. *Id.* at 450–52.

93. *Id.* at 451.

simply because the plane is within the navigable airspace specified by law."[94] Still, the opinion placed great emphasis on the fact that the helicopter was flying legally.[95] Also, the Justices added new criteria to judge the legality of warrantless aerial searches, noting the following: (1) "there was no undue noise, and no wind, dust, or threat of injury," and (2) "the helicopter [did not] interfere[] with the respondent's normal usage of the greenhouse or of other parts of the curtilage . . . [and] no intimate details . . . of the home or curtilage were observed . . . ."[96]

Justice Sandra Day O'Connor's concurrence weakened the plurality's emphasis on the legality of the overflight and focused more on the true intention of *Ciraolo*.[97] She pointed out that the FAA did not design safety of flight regulations to determine aviation legality in respect to Fourth Amendment rights.[98] Justice O'Connor tried to find a middle ground between unfettered police overflights and Fourth Amendment protected "'personal privacy in . . . area[s] intimately linked to the home, both physically and psychologically, where privacy expectations are most heightened.'"[99] Further countering the plurality's emphasis on the regulatory legality of the overflight, Justice O'Connor noted that just because helicopters may fly safely at any particular altitude, society may not be ready to recognize some overflight police searches as reasonable. "The fact that a helicopter could conceivably observe the curtilage at virtually any altitude or angle, without violating FAA regulations, does not in itself mean that an individual has no reasonable expectation of privacy from such observation."[100] She added, "individuals who have taken effective precautions to ensure against ground-level observations cannot block off all conceivable aerial views of their outdoor patios and yards without entirely giving up their enjoyment of those areas."[101]

The four-Justice dissent echoed Justice O'Connor's concurrence, disagreeing with the plurality's reliance on the helicopter's adherence to FAA safety regulations, but went further.[102] The dissenting Justices attacked the "puzzling" criteria, such as helicopter noise, wind, and dust, as a measure used by the plurality in analyzing an invasion of privacy.[103] They foresaw technology as improving to a point where such characteristics are not present at all in the future, even at lower levels of altitude.[104] They also addressed the startling passage in the plurality opinion regarding the "intimate details" not observed in the curtilage. The dissenters asked, "[i]f the police had observed Riley embracing his wife in the backyard greenhouse, would we then say that his rea-

94. *Id.*
95. *Id.* at 451–52.
96. *Id.* at 452.
97. *Id.* at 452–53 (O'Connor, J., concurring).
98. *Id.* at 452.
99. *Id.* (quoting California v. Ciraolo, 476 U.S. 207, 212–13 (1986)).
100. *Id.* at 454.
101. *Id.*
102. *Id.* at 464–65 (Brennan, J., dissenting).
103. *Id.* at 462.
104. *Id.* at 463.

sonable expectation of privacy had been infringed?"[105] Finally, the dissent focused on a citizen's reasonable expectation of privacy because "[i]f the Constitution does not protect Riley's marijuana garden against such surveillance, it is hard to see how it will prohibit the government from aerial spying on the activities of a law-abiding citizen on her fully enclosed outdoor patio."[106] The only real difference between the dissent and Justice O'Connor's concurrence was the empirical matter about the regularity of helicopter traffic and Riley's burden of producing such evidence.[107]

3. *How Will These Manned Aviation Cases Determine UAV Infringement of Privacy?*

Ciraolo and *Riley* permit manned overflight of private residences whether the residence is the destination of the overflight or is simply viewed en route to a destination. As in public thoroughfares, a law enforcement officer flying overhead simply cannot avert his eyes from his surroundings in a place he has a right to be—the NAS—that is within FAA safety standards. Because UAVs will be a part of this county's future, they will be transiting the NAS. As *Ciraolo* and *Riley* dealt solely with manned flight, one question for the future is whether unmanned UAVs *must* avert their "eyes" while in the NAS. Importantly, will UAV technology allow operators to fly the aircraft safely without sensory visual cues from the ground? If the answer is yes, a UAV will have the ability to "power down" its visual surveillance sensors until it reaches its target area, whether it is to execute an aerial search on a private residence or evaluate a forest fire. Will untargeted curtilage then be protected from intrusive UAV overflight because jurisprudence will force UAV operators to avert their eyes until they reach their destination?

Justice O'Connor's concurrence in *Riley* seems the most likely guidance for general UAV overflight privacy questions. She states that just because a manned helicopter can safely fly without violating FAA regulations at virtually any altitude or angle, this does not mean that individuals do not have a reasonable expectation of privacy in their curtilage.[108] This logic, in line with the dissent in *Riley*, seems to offer some Fourth Amendment protection from surveillance by UAVs that are able to transit the NAS *safely* without visual ground navigation (surveillance) via such technology as a global positioning system (GPS). After all, "[t]o require individuals to completely cover and enclose their curtilage is to demand more than the 'precautions customarily taken by those seeking privacy.'"[109] This will remove the "intimate detail" analysis in the two manned aviation cases because UAVs will not *have* to look in the direction of "possibly embracing couples" in their backyard in order to fly. If visual cues are required for transiting UAVs, however, observing resi-

105. *Id.*
106. *Id.* at 464.
107. *See id.* at 464–68.
108. *Id.* at 454 (O'Connor, J., concurring).
109. *Id.* at 454 (quoting Rakas v. Illinois, 439 U.S. 128, 152 (1978)).

dences and their curtilage will be allowed within the bounds of current Fourth Amendment jurisprudence.

Again in line with the dissent, Justice O'Connor's concurrence addressed another key issue, namely the regularity of helicopter overflight. She argued that simply because *any* helicopter *may* have the ability to fly over a residence does not necessarily mean that a person should not reasonably expect privacy from a law enforcement helicopter.[110] Translated to UAVs, residents may lose some expectation of privacy if they are, for example, close to the southern United States border. The regularity of UAV transit flights may decrease their reasonable expectation to privacy.

Last, the *Riley* plurality introduced a new factor, such as the lack of noise, wind, or dust created by the helicopter.[111] How this relates to privacy is truly puzzling. Regardless, this factor should be discounted, or at least given negligible weight, because there already are UAVs that do not make detectable noise or wind even at nearly five feet.[112]

C. *Dow,* the *Torres* Line, and *Kyllo*: The Answer to Enhanced Technology and UAV Video Surveillance Questions?

One main attribute of UAVs in law enforcement is their enhanced video surveillance and photographic capabilities, but they also have sensory capabilities well beyond the visual spectrum. Three cases partially demonstrate how photographic surveillance, video surveillance, and future nonvisual sensory technology may apply to UAVs. *Dow Chemical Co. v. United States* recognized the important distinction between manned, aerial photographic observation of commercial property and private residence curtilage.[113] Privacy is heightened in the latter case, and therefore photographic technology that is not in general use will face close judicial scrutiny. *United States v. Torres*, a Seventh Circuit case followed by most other circuits, disallowed video surveillance without a warrant.[114] Last, *Kyllo v. United States* prohibited law enforcement from using infrared imaging (emerging technology not in general use) to discern intimate details in a residence. [115] In all, the courts most likely will not allow UAVs to target and view private residences via intrusive observation technology or to utilize nongeneral public use technology regardless of the safety of flight issues.

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110. *Id.* at 454–55.

111. *Id.* at 452.

112. *See* UNMANNED SYSTEMS ROADMAP, *supra* note 1, at 35; BONE & BOLKCOM, *supra* note 3, at 47; Singer, *supra* note 12, at 34.

113. Dow Chem. Co. v. United States, 476 U.S. 227, 237 n.4 (1986).

114. United States v. Torres, 751 F.2d 875, 885–86 (7th Cir. 1984).

115. Kyllo v. United States, 533 U.S. 27, 40 (2001).

1. Dow: *Photographic Technology*

The Supreme Court, again closely split, addressed the issue of aerial photography by government agencies in *Dow Chemical Co. v. United States*.[116] The property at issue was a 3,000 acre chemical plant facility, not a private home. As in *Ciraolo* and *Riley*, the Court first applied the open field doctrine and generally allowed the search because the facilities 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."[117] Additionally, the Court did not consider the facility, nor the areas that would have been considered curtilage if it was a private residence, as protected by the Fourth Amendment. The Court stressed that it was "important that this is *not* an area immediately adjacent to a private home, where privacy expectations are most heightened."[118] Further, there were no "intimate details as to raise constitutional concerns."[119]

In a separate opinion, Justice Powell stated that "[t]he Fourth Amendment protects private citizens from arbitrary surveillance by their Government."[120] He emphasized that the *Katz* standard protected privacy rights as technology developed over the years.[121] In Justice Powell's view, the Court "ignore[d] the heart of the *Katz* standard" because the Court based its decision on a physical entry analysis, which was the doctrine *Katz* seemed to refute.[122] His dissent reminded the Court that *Katz* meant to ensure a person's privacy from *emerging technologies*, with a man's conversations in a *public* telephone booth the privacy to be protected in that case and an action society recognized deserved a reasonable expectation of privacy.[123] Justice Powell's dissent in *Dow* further asserted that the new standard resulted in a "method" based analysis instead of the "results" based analysis in *Katz*.[124]

Regarding the photographic issue in *Dow,* the Court permitted the cameras used by law enforcement because they were standard still cameras in general public use. With regard to high technology surveillance cameras, however, "[i]t may well be . . . 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."[125] The Court did not address the 35mm camera used to photograph the *private residence* in *Ciraolo* because the officer there was able to see the suspect's marijuana plants with his own eyes.[126]

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116. Dow Chem. Co., 476 U.S. at 227. .
117. *Id.* at 239.
118. *Id.* at 237 n.4.
119. *Id.* at 238.
120. *Id.* at 240 (Powell, J., concurring in part and dissenting in part).
121. *Id.*
122. *Id.* at 247.
123. *Id.* at 251.
124. *Id.*
125. *Id.* at 238 (majority opinion) (emphasis added).
126. California v. Ciraolo, 476 U.S. 207, 215 (1986).

The *Dow* majority also stated, "[t]he mere fact that human vision is enhanced somewhat, at least to the degree here, does not give rise to constitutional problems."[127] The opinion continues, "[n]o objects as small as ½-inch in diameter such as a class ring, for example, are recognizable, nor are there any identifiable human faces . . . captured in such a fashion as to implicate more serious privacy concerns."[128] The clear implication is that the Court would closely examine the enhanced photographic capabilities of an unmanned UAV peering into curtilage of a private residence where the expectation of privacy is highest.

2. Torres *and Its Progeny: Video Surveillance*

Some technology enhanced searches, termed "hyper-intrusive searches," warrant greater scrutiny because: "[1] they are overbroad . . . ; [2] they occur without notice; [3] they are ongoing; and [4] they pose an unusual threat to human dignity."[129] Legislatures have taken notice, creating various statutes to control such searches.[130] The pertinent federal act in this case is Title III of the Omnibus Crime Control and Safe Streets Act of 1968.[131] Because hyper-intrusive searches are *presumably* repugnant to the Fourth Amendment, the statute clarified that these searches must be held to higher scrutiny and law enforcement agents must comply with strict measures to acquire a warrant.[132]

Although Title III targeted all oral and wire communications, many courts have come to consider video surveillance techniques a hyper-intrusive search under Title III analysis. In *United States v. Torres*, a case where the defense successfully suppressed nonaudio video, Judge Posner of the 7th Circuit ruled that "[t]elevision surveillance is identical *in its indiscriminate character* to wiretapping and bugging."[133] Judge Posner then included video surveillance under the regulations imposed by Title III and applied Fourth Amendment jurisprudence.[134] In a sweeping declaration, the ruling stated, "Since the Fourth Amendment has long been held fully applicable to the states through the Fourteenth Amendment, state and local officers who might want to use television surveillance in criminal investigations will be under the same restraints as we impose on federal officers today."[135]

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127. *Dow Chem. Co.*, 476 U.S. at 238.

128. *Id.* at 238 n.5.

129. Simmons, *supra* note 53, at 722–23.

130. *Id.* at 723 (noting as an example the Federal Communications Act of 1934, 47 U.S.C. § 605 (2006) which prohibited wiretapping of telephones even after the practice was ruled constitutional in *Olmstead*)**.**

131. 18 U.S.C. §§ 2510–20 (2006).

132. *See id.* § 2518.

133. United States v. Torres, 751 F.2d 875, 885 (7th Cir. 1984).

134. *See id.* at 882–86.

135. *Id.* at 886.

Since *Torres*, six other courts have accepted this interpretation of the Fourth Amendment, with the "effect the Title III [requirements] have become 'constitutionalized,' at least for video surveillance."[136] Will video cameras aboard UAVs fall under constitutional surveillance analysis, or will safety of flight needs that rely on the cameras prevail? Again, it likely depends on future UAV navigation technology.

3. Kyllo: *Sensory Enhancing Equipment and Intimate Details*

As the latest in a long line of major Fourth Amendment cases, *Kyllo v. United States* also was a split decision.[137] Somewhat surprisingly, however, the Court decided that warrantless police use of a thermal imaging device, or sensory enhancing device, was unconstitutional because it disclosed the intimate details revealed by the emissions of heat from a private residence.[138] It was "more than naked-eye surveillance of a home"[139] as in *Riley* and *Ciraolo*. The Court reemphasized *Dow's* statement that the expectation of privacy is most heightened in an area adjacent to a private residence,[140] as was the case here.

While reminding us that the simple premise of the physical trespass doctrine is still in effect for the actual home, the Court conceded the difficulty of determining privacy expectations in "telephone booths, automobiles, or even the *curtilage and uncovered portions of residences* . . . ."[141] It also acknowledged that technology does affect the degree of citizens' privacy expectations because in *Ciraolo*, the "technology [of] human flight has exposed to public view (and hence, we have said, to official observation) uncovered portions of the house and its curtilage that once were private."[142] The Court, however, then tried to delineate a clear, bright line rule about what surveillance is permitted in regard to the actual home structure. "Where, as here, 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."[143]

A vital aspect of this rule was left open to interpretation, which subsequently has been the subject of much criticism and debate.[144] Justice Scalia's carefully worded majority opinion, at first glance, may allow law enforcement

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136. Simmons, *supra* note 53, at 726; *see* United States v. Biasucci, 786 F.2d 504, 510 (2d Cir. 1986); United States v. Cuevas-Sanchez, 821 F.2d 248, 252 (5th Cir. 1987); United States v. Mesa-Rincon, 911 F.2d 1433, 1437 (10th Cir. 1990); United States v. Koyomejian, 970 F.2d 536, 542 (9th Cir. 1992); United States v. Falls, 34 F.3d 674, 680 (8th Cir. 1994); United States v. Williams, 124 F.3d 411, 416–17 (3d Cir. 1997).

137. Kyllo v. United States, 533 U.S. 27, 29 (2001).

138. *Id.* at 40–41.

139. *Id.* at 33.

140. *Id.*

141. *Id.* at 34 (emphasis added).

142. *Id.*

143. *Id.* at 40 (emphasis added).

144. *See* Korody, *supra* note 54, at 1652–57.

to use sensory enhancing technology that is in "general public use"[145] without a warrant. His opinion may be read, however, to narrowly confine the judgment only to the facts in *that specific case*, which involved technology that was not in general public use. Therefore, later courts will have to determine whether technology used by law enforcement, even if that technology is in "general public use," nonetheless constitutes a "search" for Fourth Amendment purposes.

To date, the Supreme Court has not directly addressed the issue of general public use technology after *Kyllo*. Justice Scalia, however, hinted that the *Kyllo* decision "assures preservation of that degree of privacy against the government that existed when the Fourth Amendment was adopted."[146] Also, "[t]he fact that equivalent information could sometimes be obtained by other means does not make lawful the use of means that violate the Fourth Amendment."[147] Therefore, we may infer that future cases will not allow law enforcement to use any sensory enhancing technology, whether in general use or not, at least in regard to the actual private home, so long as it interferes with the trespass doctrine protecting the interior of the home as when the Founding Fathers adopted the Fourth Amendment.[148] "To withdraw protection of this minimum expectation would be to permit police technology to erode the privacy guaranteed by the Fourth Amendment."[149]

On the other hand, Justice Stevens' dissent leaned toward allowing the police to use the search technology without a warrant, drawing a distinction between "through-the-wall" technology and information *inferred* from "off-the-wall" surveillance.[150] Here, the dissent considered the FLIR technology as simple plain view surveillance of the exterior of the home because no "intimate details of the home were observed."[151] The dissent drew its own bright line rule in terms of interpretation of the Founders' intent. Inferences drawn from external observances of the home are permitted so long as they do not infringe on the actual activities inside the home.[152] Justice Stevens then sum-

145. "We think that obtaining by sense-enhancing technology any information regarding the interior of the home that could not otherwise have been obtained without physical 'intrusion into a constitutionally protected area,' constitutes a search—at least where (as here) the technology in question is not in general public use." Kyllo, 533 U.S. at 34 (quoting Silverman v. United States, 365 U.S. 505, 512 (1961)).

146. *Id.* at 34.

147. *Id.* at 35 n.2.

148. Justice Scalia noted that "[t]he Fourth Amendment's protection of the home has never been tied to measurement of the quality or quantity of information obtained . . . . In the home, our cases show, *all* details are intimate details, because the entire area is held safe from prying government eyes." *Id.* at 37.

149. *Id.* at 34. This quotation seems to reinforce the position that Justice Scalia tried to draw a line at the intimate details in a home, as compared to his previous decisions in *Ciraolo* and *Riley*, which were based on the open field and plain view doctrines outside the home.

150. *Id.* at 41 (Stevens, J., dissenting). "Through-the-wall" surveillance technology allows outside observers to discern express details inside the home, while "off-the-wall" technology allows observers to use information garnered outside the walls of the home—heat emanating from a chimney for example. *See id.* at 42–43.

151. *Id.* at 41 n.1.

152. *Id.* at 44.

marized the majority's "newly minted rule" as encompassing "[the] obtaining [1] by sense enhancing technology [2] any information regarding the interior of the home [3] that could not otherwise have been obtained without physical intrusion into a constitutionally protected area . . . [4] at least where (as here) the technology in question is not in general public use."[153] If this last condition becomes a "general public use" doctrine, it could well mean that if the general public has access to the technology, then the police may use it as well without a warrant.[154]

Indeed, as the dissent suggested, the majority's view of Fourth Amendment protections can be seen as "*apparently* dissipat[ing] as soon as the relevant technology is 'in general public use.'"[155] The dissent complained about the lack of clarity on this very point, stating "*it seems likely*" the privacy expectation will decay as new technologies emerge and are available for public use.[156] The dissent preferred to defer conflicts between Fourth Amendment rights and future technology because "[i]t would be far wiser to give legislators an unimpeded opportunity to grapple with these emerging issues rather than to shackle them with prematurely devised constitutional constraints."[157]

Moreover, the dissent was concerned with technology in general use that law enforcement may utilize, and rightly so in light of the majority's narrow opinion. The majority opinion, however, gives guidance to future court decisions even in regard to technology in general public use because of its strong advocation of the Fourth Amendment's original meaning. The opinion contained a focused defense against *any* intimate details that law enforcement may observe in a private residence.[158] So long as those details are *in* a private residence, they are assuredly safe from *any* law enforcement technology, including UAVs, in the absence of a warrant.

4. Dow, Torres *and* Kyllo *Applied to UAVs*

Dow allowed law enforcement to use sensory enhancing technology in general public use without a warrant in the overflight of commercial property.[159] *Kyllo* forbade law enforcement to use nongeneral public use surveillance enhancing technology without a warrant on private residences.[160] Neither of these cases, however, addressed law enforcement using sensory enhancing equipment in general public use for observing the *curtilage* of private residences.

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153. *Id.* at 46.
154. *Id.* at 47–48.
155. *Id.* at 47.
156. *Id.* (emphasis added). This flies directly in the face of Scalia's bright line determination and dogged protection of intimate details in the home in light of Fourth Amendment rights.
157. *Id.* at 51.
158. *Id.* at 34 (majority opinion).
159. Dow Chem. Co. v. United States, 476 U.S. 227, 237–39 (1986).
160. *Kyllo*, 533 U.S. at 40.

In *Ciraolo,* the Court sidestepped the issue of the camera photography because the officer was able to see the marijuana plants with his own eyes.[161] In *Dow,* the Court addressed the visually enhanced camera technology by applying the open fields and plain view doctrines to commercial property, but it expressed concern over highly advanced visual enhancing technology, especially with regard to private residences.[162] Therefore, from *Dow,* it is difficult to determine if the Court will permit the use of advanced photography equipment in warrantless aerial observations of private residences and their curtilage.

Kyllo, however, shut the door on private residence searches by *sensory enhanced* methods not in general use, and arguably even methods in general use, because they constitute "more than naked eye surveillance of a home" and can invade "intimate details."[163] *Kyllo* advocated heightened scrutiny with regard to private residences as compared to *Dow's* lessened scrutiny for commercial areas. Extrapolating the three cases here to UAVs, so long as UAVs are considered nongeneral use technology, we can deduce the Court will not allow law enforcement to use sensory enhancing equipment onboard UAVs to search a private residence without a warrant. Further, the court most likely will disallow the intrusion of curtilage by highly advanced photographic technology.[164]

Citizens concerned with privacy rights can also take solace that, if the Court follows *Torres* and other circuit court opinions, the Court will not allow video surveillance, or "eyes in the sky," without strict warrant requirements. In particular, if ground video is not required for safety of flight, then most likely UAVs will have to keep their hyper-intrusive cameras off or powered down until reaching the target of the warrant. If required for navigation, the cameras most likely will be limited to a certain degree of visual enhancement and directional line of sight to ensure safety of flight while at the same time respecting citizens' privacy.

But what about the relatively distant future, when UAVs are in such widespread use that courts consider them generally used technology? In *Katz*, we may find a clue. Remember, *Katz* was a "results"-based opinion in that it protected the privacy interests and expectations of an individual regardless of the technological surveillance method employed at the time. Through the years, however, the Court, using *Katz* as a guide, has diluted the results expectation by focusing on the methods used.[165] *Kyllo,* however, was "a definitive return to

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

162. Dow Chem. Co., 476 U.S. at 237–38.

163. This of course depends on what visual sensors are onboard UAVs and future rulings. For example, as in *Dow Chemical Co.*, certain visual acuities may be allowed, even if somewhat sharper than the naked human eye. Dow Chem. Co., 476 U.S. at 238–39.

164. A comparison between UAVs and satellite photographic surveillance requires separate analysis because of their obvious differences and is beyond the scope of this comment. For example, "general use," regularity of overflight, overall availability, and observations during transit delineate the two surveillance platforms.

165. *See generally* Smith v. Maryland, 442 U.S. 735 (1979); *Ciraolo*, 476 U.S. at 213; Dow Chem. Co. v. United States, 476 U.S. 227 (1986); Florida v. Riley, 488 U.S. 445 (1989). These

the results-based *Katz* analysis . . . ."[166] In *Katz*, the Court "conclude[d] that the underpinnings of *Olmstead* . . . have been so eroded by our subsequent decisions that the 'trespass' doctrine there enunciated can no longer be regarded as controlling."[167] Thus, we can predict the Court will interpret as reasonable the citizens' expectation of privacy to preclude UAVs searching their private residences and curtilage without a warrant. Future jurisprudence, however, may return to a method-based analysis and determine that law enforcement may use sensory enhancing products available to the common public in situations similar to that in Kyllo. Then it will be up to legislatures or regulatory agencies to protect the expectations of privacy in residences or curtilage.

D. State and Canadian Interpretations

Interestingly, state courts have differed markedly from the Supreme Court, even as they use the Supreme Court decisions as a guide, by applying their own reasoning to their respective equivalents of the federal Fourth Amendment. Not surprisingly, state courts are mixed about the results. For example, in *State v. Bryant*,[168] the Vermont Supreme Court relied heavily on Justice O'Connor's concurrence in *Riley* and ruled that a law enforcement helicopter hovering at 100 feet for up to 30 minutes conducted an unconstitutional search because it was outside of the reasonableness prong.[169] Conversely, in *Henderson v. People*, the Colorado Supreme Court upheld surveillance by helicopter that passed over a residence five times at 500 feet without making any excessive noise, dust, or wind.[170]

Interestingly, the Canadian Supreme Court explored the *Kyllo* standard and subsequently rejected it. The Canadian Supreme Court permitted "off-the-wall" thermal imaging technology based on two points:

1. FLIR information alone is insufficient grounds to obtain a search warrant; and
2. if, as the Court expected, FLIR technology gets better, the constitutional issue will have to be reconsidered.[171]

This result is important because the Canadian Supreme Court, although obviously not having adopted the United States Constitution, used the *Kyllo* dissent's emanating heat argument, believing law enforcement could not thereby observe intimate details. Further, the Canadian Supreme Court did address the *Kyllo* Court's concern that courts will have to examine *future* technologies as they emerge.[172] The Canadian Supreme Court did not try to create a bright line

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cases focus on the technological method of the search to determine whether the target of the surveillance had a reasonable expectation of privacy in light of the availability of the technology used.

166. Korody, *supra* note 54, at 1654.
167. Katz v. United States, 389 U.S. 347, 353 (1967).
168. State v. Bryant, 950 A.2d 467 (Vt. 2008).
169. *See id.* at 479, 481.
170. Henderson v. People, 879 P.2d 383, 389–90 (Colo. 1994).
171. R. v. Tessling, [2004] 3 S.C.R. 432, 2004 SCC 67 (Can.).
172. *Id.*

rule as *Kyllo* did, but determined to decide issues on a case by case basis. These variances in a variety of legal domains reemphasize the sharp splits in every U.S. Supreme Court Fourth Amendment decision.

III. PROPOSED APPROACH

There may be some predictable certainty about how the U.S. Supreme Court would rule on law enforcement surveillance utilizing UAVs. First, the manned flight aerial observation cases, culminating in Justice O'Connor's *Riley* concurrence, suggest that courts will protect the privacy of curtilage and residences from unmanned aerial observation. This protection will apply to targeted surveillance or observations made via transiting unmanned UAVs. When *Riley* is combined with the sensory technology cases of *Dow*, where nongeneral-use photographic technology used to observe curtilage apparently would face close judicial scrutiny, and *Kyllo*, where nongeneral-use thermal imaging of the actual residence was forbidden, the Court likely will not permit enhanced, nongeneral-use UAV technology to observe curtilage or private residences without a warrant. If UAVs and their sensory enhancing technology become general use in the future, however, the only judicial protections afforded citizens will be in their residences, as implied from Justice Scalia's strong originalist defense of the private residence.

Last, *Torres* categorizes video surveillance as hyper-intrusive. Thus, video cameras onboard UAVs transiting the NAS may be restricted by the Supreme Court if not required for safety of flight, even though the NAS is considered a public thoroughfare. The intrusive nature of such observations clashes with the subjective and objective expectation of privacy in one's residence or curtilage. This comment suggests privacy expectations ultimately will survive such a confrontation before the Court.

Historically, however, nothing is certain in sharply split constitutional jurisprudence, such as the relevant Fourth Amendment cases discussed in this comment. In today's heightened security climate, security may trump privacy in the mind of an undecided Justice. "Courts will address the issue in the time honored common law 'case-by-case' manner, but the national security imperative will be a powerful weight on the scales of justice. If history is to be a predictor, without congressional guidance, the courts alone may not prove to be enough" to fully protect citizens' privacy.[173] Therefore, federal and state regulation is the key.

To what extent will Congress or state legislatures be willing to constrain law enforcement or security agencies? These legislative bodies must be vigilant, keeping in mind that law enforcement is a vital component in a civil society. The Founding Fathers created the Bill of Rights shortly after defeating an oppressive governmental tyranny. In the Fourth Amendment, they created an expectation of citizens to be secure in their person, houses, papers, and effects

173. Harvey Rishikof, *Long Wars of Political Order—Sovereignty and Choice: The Fourth Amendment and the Modern Trilemma*, 15 CORNELL J.L. & PUB. POL'Y 587, 602 (2006).

against unreasonable searches. If a helicopter can look into someone's greenhouse through missing panes, according to the plurality in *Riley*, then there may be nothing to stop an unmanned flight from looking into a transparent skylight above a bathroom. To have UAVs, even at altitudes as high as 60,000 feet,[174] peering into our homes with their enhanced imaging ability is a most unsettling prospect.[175] Whether UAVs are on their way to observe a suspected criminal's residence or are transiting over homes to garner weather information, operators may get bored and attempt to observe intimate details.[176] There is always the danger that law enforcement may use any available opportunity to broaden hyper-intrusive searches on unsuspecting private citizens.

Despite these privacy concerns, we must incorporate UAVs into the airspace as soon as technology and the FAA will allow because they have tremendous positive potential for the progression of society, the environment, and commerce. For example, UAVs have been extremely successful in protecting the southern U.S. border. Any criminal with a semblance of aviation experience, however, can research the location of certain domestic NAS restricted areas and determine where UAVs are most likely operating. A myriad of examples, from observing wildlife migration patterns to assisting real estate development, demonstrate how limiting utilization of UAVs is also restraining the improvement of commerce, science, and other areas of importance. Opening the skies to UAVs will generally alleviate this problem.

As the FAA and technology entrepreneurs work out the safety issues, legislatures must work with them to begin formulating privacy regulations or policy in regard to UAVs. Some common-sense recommendations include:

1. Write plain language statutes requiring warrants for UAV searches.
2. Focus efforts on nonvisual navigation and safety of flight technology.
3. Require any UAVs to power down sensory enhancing technology when transiting to the target of the warrant or other mission.
4. Require logs of sensory enhancing technology use on all UAVs.
5. Create exceptions for immediate warrantless observation requirements, such as criminal chases, fires, and chemical exposures.
6. Establish an objective regulatory body to enforce the rules on operators.

In addition to these general recommendations, a comprehensive plan is required to properly incorporate UAVs into the NAS with respect to flight safety, effective law enforcement, and privacy.

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174. Singer, *supra* note 12, at 34–35.

175. From this altitude, there will be no noise, wind, or dust as was a factor in *Riley*. Florida v. Riley, 488 U.S. 445, 452 (1989).

176. This author has looked in private areas and curtilage using FLIR cameras at night while on domestic helicopter training flights.

Regulation is the key to future UAV use that respects citizens' privacy. Legislatures must lead the way, championing a comprehensive integration of UAV technology consistent with privacy concerns. In every important relevant decision, the Supreme Court has been divided. In addition, the courts generally have allowed technology to slowly erode a citizen's right to privacy by permitting emerging technology to rule subjective expectations and societal values. This arguably is somewhat unavoidable. A vigorous Fourth Amendment, however, must be maintained or

> ironically, as the people become less able to personally secure their own privacy interests from violations, they concurrently lose constitutional protection to secure them against such violations. If the progress of science and the Court's analysis are taken to their ultimate, logical conclusion, the Fourth Amendment could be virtually reduced to a quaint remnant of early American society and political theory.[177]

For appropriate regulation, a results-oriented *Katz* standard should be the primary privacy determinative, and the dicta in *Kyllo* should form a minimum protective standard regardless of the availability of any technology. With such an approach, UAV technology utilized by law enforcement in the NAS can progress in hand with citizens' reasonable expectations of Fourth Amendment privacy.

177. Moore, *supra* note 41, at 833.