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# BEYOND ORWELL: THE APPLICATION OF UNMANNED AIRCRAFT SYSTEMS IN DOMESTIC SURVEILLANCE OPERATIONS

PAUL MCBRIDE\*

“IN THE FAR distance a helicopter skimmed down between the roofs, hovered for an instant like a blue-bottle, and darted away again with a curving flight. It was the Police Patrol, snooping into people’s windows.”<sup>1</sup> Many Americans may believe that George Orwell’s depiction of totalitarianism is something that could never happen in the United States. Unfortunately, some aspects of *Nineteen Eighty-Four* have very nearly become accepted parts of modern American society. In fact, in 1989 the Supreme Court upheld police helicopter surveillance nearly identical to the surveillance described by Orwell.<sup>2</sup> In *Florida v. Riley*, the Supreme Court determined that a police officer’s naked-eye observation into the defendant’s greenhouse, through a partially open roof, from a helicopter circling 400 feet above the ground was not a “search” within the meaning of the Fourth Amendment.<sup>3</sup>

While Orwell was writing *Nineteen Eighty-Four* in the late 1940s, and even up to the Supreme Court’s decision in *Florida v. Riley*, helicopters appeared to be at the limit of aerial surveillance technology available to domestic law enforcement officials.<sup>4</sup>

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<sup>1</sup> GEORGE ORWELL, *NINETEEN EIGHTY-FOUR* 2 (Plume Printing 2003) (1949).

<sup>2</sup> *Florida v. Riley*, 488 U.S. 445, 450–52 (1989).

<sup>3</sup> See U.S. Const. amend. IV (“the right of the people to be secure in the persons, houses, papers, and effects, against unreasonable searches and seizures. . . .”); *Riley*, 488 U.S. at 450–52.

<sup>4</sup> Cf. *Riley*, 488 U.S. at 462–63 (Brennan, J., dissenting) (describing a helicopter capable of covert operations in a manner that suggests the technology either does not exist or is at least unavailable to domestic law enforcement agencies);

During the last two decades, however, the technology potentially available for aerial surveillance operations expanded dramatically.<sup>5</sup> As new technologies emerge, the courts are called upon to assess the technology's impact on constitutional protections, particularly those of the Fourth Amendment against unreasonable searches.<sup>6</sup> This comment addresses the potential applications of one particular technology, Unmanned Aircraft Systems (UAS), and its use in domestic surveillance operations. Part I discusses the development of UAS technology and some modern applications of UASs. Part II considers the evolution of precedent regarding warrantless surveillance, particularly with regard to aerial surveillance. Part III analyzes the use of UASs in domestic surveillance in light of existing Supreme Court jurisprudence and argues that the surveillance of the curtilage of the home using UAS platforms is a search under the Fourth Amendment. Finally, Part IV concludes by noting that future developments may significantly impact the resolution of the constitutionality of UAS surveillance.

## I. DEVELOPMENT AND APPLICATIONS OF UAS TECHNOLOGY

Although widely known as UAVs or Unmanned Aerial Vehicles, the modern preference is to redefine the technology as UAS.<sup>7</sup> According to one very basic definition, an unmanned aircraft is "[a] device used or intended to be used for flight in the air that has no onboard pilot."<sup>8</sup> Another definition demon-

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Arthur J. Sosa, *Unmanned Aerial Vehicles: Promises and Potential*, in AY 97 COMPENDIUM: ARMY AFTER NEXT PROJECT 53, 53–54 (Douglas V. Johnson II ed., 1998), available at <http://handle.dtic.mil/100.2/ADA346295> (explaining that the general public was unaware of unmanned aerial vehicle technology until Operation Desert Storm).

<sup>5</sup> See generally, e.g., Melissa Deal, Comment, *Can Big Brother Watch You? The Implications of the Department of Homeland Security's Proposed National Applications Office for Fourth Amendment Protections*, 73 J. AIR L. & COM. 407 (2008) (discussing dissemination of satellite imagery to domestic law enforcement agencies).

<sup>6</sup> See, e.g., *Kyllo v. United States*, 533 U.S. 27, 29 (2001) (considering thermal-imaging technology).

<sup>7</sup> U.S. GOV'T ACCOUNTABILITY OFFICE, PUB. NO. GAO-08-511, UNMANNED AIRCRAFT SYSTEMS: FEDERAL ACTIONS NEEDED TO ENSURE SAFETY AND EXPAND THEIR POTENTIAL USES WITHIN THE NATIONAL AIRSPACE SYSTEM 6 (2008) [hereinafter GAO REPORT: FEDERAL ACTIONS NEEDED]. While UAV is still a widely understood and used acronym, this comment uses the term UAS exclusively.

<sup>8</sup> AVIATION SAFETY UNMANNED AIRCRAFT PROGRAM OFFICE, FAA, INTERIM OPERATIONAL APPROVAL GUIDANCE 08-01, UNMANNED AIRCRAFT SYSTEMS: OPERATIONS IN THE U.S. NATIONAL AIRSPACE SYSTEM 4 (2008).

strates the diversity of the aircraft: “a powered aerial vehicle that does not carry a human operator, uses aerodynamic forces to provide vehicle lift, can fly autonomously or be piloted remotely, can be expendable or recoverable, and can carry a lethal or nonlethal payload.”<sup>9</sup> Because the aircraft itself does not need to support a pilot, it can take on a variety of configurations, each with unique and varied capabilities.<sup>10</sup> The change in nomenclature, from UAV to UAS, reflects the fact that in addition to the unmanned aircraft, a complete UAS includes multiple pieces of ancillary equipment, such vehicle control equipment, communications systems, and potentially even launch and recovery platforms.<sup>11</sup> The versatility of UAS configurations may in fact be one of the strongest motivating forces behind the development of the technology—the identification of new potential uses leads to the adaptation of the systems.<sup>12</sup>

**Table 1. Illustration of Variation In UAS Design and Capabilities**

	Northrop Grumman RQ-4 Global Hawk (Block 20) <sup>13</sup>	AeroVironment RQ-11B Raven <sup>14</sup>
Wingspan	130.9 feet	4.5 feet
Weight	32,250 pounds (fully fueled)	4.2 pounds
Endurance	35 hours (maximum)	60-110 minutes (depending on battery used)
Operating Altitude	65,000 feet (maximum)	100-500 feet (typical)
Range	12,300 nautical miles	10 kilometers
Velocity	320 knots (loiter)	14-44 knots

<sup>9</sup> U.S. GOV'T ACCOUNTABILITY OFFICE, PUB. NO. GAO-06-610T, UNMANNED AIRCRAFT SYSTEMS: IMPROVED PLANNING AND ACQUISITION STRATEGIES CAN HELP ADDRESS OPERATIONAL CHALLENGES, 5 (2006) [hereinafter GAO REPORT: IMPROVED PLANNING AND ACQUISITION].

<sup>10</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 7–8.

<sup>11</sup> *Id.* at 6.

<sup>12</sup> See U.S. GEN. ACCOUNTING OFFICE, FORCE STRUCTURE: IMPROVED STRATEGIC PLANNING CAN ENHANCE DOD'S UNMANNED AERIAL VEHICLES EFFORTS 4–5 (2004).

<sup>13</sup> Northrop Grumman Integrated Systems, RQ-4 Block 20 Global Hawk, <http://www.is.northropgrumman.com/systems/ghrq4b.html> (last visited Aug. 15, 2009).

<sup>14</sup> AeroVironment, Raven RQ-11B Technical Specifications, [http://www.avinc.com/downloads/AV\\_RAVEN-DOM\\_V10109.pdf](http://www.avinc.com/downloads/AV_RAVEN-DOM_V10109.pdf) (last visited Aug. 28, 2009).

## A. HISTORICAL DEVELOPMENT OF UAS TECHNOLOGY

While UASs have only recently captured the attention of the public,<sup>15</sup> the technology is far from new.<sup>16</sup> At least as early as World War I, military theorists recognized the value and potential of being able to remotely direct unmanned aircraft in combat settings.<sup>17</sup> Until recently, however, most development of UAS technology, particularly following World War II, was highly classified and largely unheard of outside the intelligence and military communities.<sup>18</sup> To a significant extent, modern public awareness of UAS technology was a product of the war reporting that occurred during Operation Desert Storm—for the first time, the military applications and sophisticated capabilities of UASs were displayed to the American public.<sup>19</sup>

The initial efforts to prove the feasibility of UAS technology occurred in the early 1960s following a series of international incidents involving manned aerial surveillance of America's Cold War enemies.<sup>20</sup> From the inception of the U-2 aerial reconnaissance aircraft program, government officials recognized that the ability to conduct manned overflights of Soviet territory safely would only extend for the few years that it would take the Soviet Union to develop technology capable of attacking the aircraft.<sup>21</sup> On May 1, 1960, this danger became a reality as the Soviet Union succeeded in shooting down a U-2 with a surface-to-air missile and capturing the pilot.<sup>22</sup> The international embarrassment associated with the incident resulted in the termination of U-2 flights over the Soviet Union and deprived the

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<sup>15</sup> Cf., e.g., *IRON MAN*, Ch. 7 (Marvel Studios 2008) (conducting a fictional analysis of UAS applications in aerial combat while showing a Global Hawk UAS); *TRANSFORMERS*, Ch. 8 (DreamWorks LLC and Paramount Pictures 2007) (showing what appears to be a Global Hawk UAS in operation but identifying it as a Predator UAS).

<sup>16</sup> Sosa, *supra* note 4 at 53–54.

<sup>17</sup> ERIK K. SNYDER, U.S. AIR FORCE, AIR COMMAND AND STAFF COLLEGE, COUNTER NARCOTICS MISSIONS FOR UNMANNED AERIAL VEHICLES 8 (2000), available at <https://research.au.af.mil/papers/ay2000/acsc/00-165.pdf>.

<sup>18</sup> Sosa, *supra* note 4 at 53–54.

<sup>19</sup> *Id.* at 53.

<sup>20</sup> *Id.* at 55.

<sup>21</sup> Letter from Edwin H. Land, Chairman, Project 3, Technological Capabilities Panel, Office of Defense Mobilization, Executive Office of the President, to Allen W. Dulles, Director of Central Intelligence, Central Intelligence Agency (Nov. 5, 1954), <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB54/st03.pdf>.

<sup>22</sup> THOMAS C. REED, *AT THE ABYSS: AN INSIDER'S HISTORY OF THE COLD WAR* 55–56 (2004).

United States of intelligence invaluable to the security of the nation.<sup>23</sup>

Although the government was actively pursuing replacements and alternatives to the U-2 program before May 1960,<sup>24</sup> the sudden termination of U-2 overflights left a gap in the country's aerial reconnaissance capabilities: the U-2's replacement (OXCART) was not projected to be operational until the summer of 1963<sup>25</sup> and satellite imagery (CORONA) was still an unproven and immature technology.<sup>26</sup> In July of 1960, perhaps as a way to address the loss of reconnaissance capabilities until the OXCART or CORONA programs yielded operational results, the government initiated a program, known as RED WAGON, to convert existing target drones into unmanned reconnaissance aircraft.<sup>27</sup> Although RED WAGON yielded limited short-term results, possibly because of strong presidential opposition to overflight missions of the Soviet Union<sup>28</sup> and competition for research and development funding,<sup>29</sup> the initial program set the stage for future UAS development.

Two years after the imitation RED WAGON, the Cuban Missile Crisis and the loss of a U-2 and its pilot to hostile fire over

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<sup>23</sup> CENTRAL INTELLIGENCE AGENCY, SITUATION ESTIMATE FOR PROJECT CHALICE: FISCAL YEARS 1961 AND 1962 3-4 (Mar. 14, 1960), <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB54/st09.pdf>; Sosa, *supra* note 4, at 55-56.

<sup>24</sup> GREGORY W. PEDLOW & DONALD E. WELZENBACH, THE CENTRAL INTELLIGENCE AGENCY AND OVERHEAD RECONNAISSANCE: THE U-2 AND OXCART PROGRAMS, 1954-1974 191 (1998), *available at* <http://www.foia.cia.gov/search.asp> (search "Search Declassified Docs:" for "Overhead Reconnaissance OXCART U-2"; then follow "THE CENTRAL INTELLIGENCE AGENCY AND OVERHEAD RECONNAISSANCE; THE U-2 AND OXCART" hyperlink).

<sup>25</sup> CENTRAL INTELLIGENCE AGENCY, XXX-3945-62/A, OFFICE OF DEPUTY DIRECTOR (RESEARCH), 2 (1962), <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB54/st18.pdf>. In actuality, the first operational mission of the A-12 did not occur until May 31, 1967. CLARENCE L. JOHNSON, Lockheed Aircraft Corp., Advanced Development Projects, History of the OXCART Program 20 (1968), <http://www.foia.cia.gov/a12oxcart.asp> (follow "document list" hyperlink; follow "HISTORY OF THE OXCART PROGRAM" hyperlink).

<sup>26</sup> CENTRAL INTELLIGENCE AGENCY PHOTOGRAPHIC INTELLIGENCE CENTER, JOINT MISSION COVERAGE INDEX, MISSION 9009, 18 AUGUST 1960 120 (Sept. 1960), <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB54/st11.pdf> ("Average ground resolution is in the order of 20 to 30 feet on a side"). The August 18, 1960 mission was the first successful execution of the CORONA satellite imagery program. REED, *supra* note 22, at 59. One-foot was considered high-resolution imagery in the early 1960s. Sosa, *supra* note 4, at 56.

<sup>27</sup> Sosa, *supra* note 4, at 55-56.

<sup>28</sup> PEDLOW & WELZENBACH, *supra* note 24, at 195-96.

<sup>29</sup> Sosa, *supra* note 4, at 56-57.

Cuba sparked a renewed interest in UAS development.<sup>30</sup> This interest continued through the Vietnam War, during which time the intelligence community used UASs extensively in a variety of roles.<sup>31</sup> According to one source, “[t]wenty-eight different configurations of UA[S]s flew from 1962 through 1975, involving over 3,435 operational sorties.”<sup>32</sup> While many of the UASs were dedicated to reconnaissance over heavily defended areas of North Vietnam (to avoid the loss of human pilots),<sup>33</sup> others were used to conduct electronic countermeasures missions, serve as decoys, and to drop propaganda leaflets.<sup>34</sup> Unfortunately, following the termination of the Vietnam War, realization of many of the proposed additional uses for UAS technology was delayed as a result of reduced support for unmanned aircraft<sup>35</sup> and reduction in force initiatives.<sup>36</sup>

From the late-1970s until the mid-1980s, advances in domestic UAS technology were limited. The successful implementation of UASs by Israel against Lebanon in the Bekaa Valley during the Israel–Lebanon war of 1982 however, instigated a significant drive within the Department of Defense to acquire UAS platforms.<sup>37</sup> This effort, started by Secretary of the Navy John Lehman, eventually led to the development and deployment of a

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<sup>30</sup> *Id.* at 57.

<sup>31</sup> *Id.*

<sup>32</sup> *Id.* These numbers are representative of the development of UAS technology during the Vietnam Era; however, they are likely “incorrect” considering that many UAS programs were, and potentially still are, highly classified. Compare CONGRESSIONAL BUDGET OFFICE, OPTIONS FOR ENHANCING THE DEPARTMENT OF DEFENSE UNMANNED AERIAL VEHICLE PROGRAMS 2 tbl. 1 (1998) (omitting the TAGBOARD drone, developed in conjunction with the OXCART program during the late 1960s and early 1970s, from the list of major UAS programs) with Memorandum from John Parangosky, Deputy Director of Special Activities on TAGBOARD Program for Deputy Director for Science & Technology (Aug. 17, 1967), <http://www.foia.cia.gov/search.asp> (search “Search Declassified Docs:” for “TAGBOARD”; follow “TAGBOARD PROGRAM” hyperlink) (providing information on the TABGOARD drone program).

<sup>33</sup> NATIONAL RECONNAISSANCE OFFICE, REPORT TO THE PRESIDENT’S FOREIGN INTELLIGENCE ADVISORY BOARD ON THE NATIONAL RECONNAISSANCE PROGRAM: JANUARY 1 TO JUNE 30, 1967, at 26 (1967), available at <http://www.gwu.edu/~nsarchiv/news/20030611/nsa-pfiab.pdf>.

<sup>34</sup> Sosa, *supra* note 4, at 57.

<sup>35</sup> *Id.* at 58 (“In the Air Force, advocacy for unmanned systems was seen as a vote against manned aircraft, tantamount to career suicide for senior aviators.”).

<sup>36</sup> SNYDER, *supra* note 17, at 8.

<sup>37</sup> *Id.* at 9.

variety of UASs, with varying degrees of success, across the discrete branches of the military.<sup>38</sup>

## B. PRESENT MILITARY APPLICATIONS OF UAS PLATFORMS

Unlike early military and intelligence community efforts to develop UASs, currently the development of UASs within the military is a joint service operation overseen by the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics.<sup>39</sup> Under a system of centralized development, the military is able to establish goals for development, such as increased interoperability, more effective Joint Services interoperability, and cost control, in order to ensure that future UAS platforms meet the needs of the various military components.<sup>40</sup> The consolidation of development activities allowed the Department of Defense to field a variety of highly developed UASs, such as the Predator and the Global Hawk, during the mid and late 1990s.<sup>41</sup> While the fielding of the Predator and Global Hawk were major developments, the most significant growth in UAS deployment within the military occurred because of the Global War on Terrorism and the associated ongoing military operations in Iraq and Afghanistan.<sup>42</sup>

According to a 2006 Government Accountability Office report, from 2000 to February 2006, the Department of Defense's inventory of unmanned aircraft grew from fewer than 50 to over 3,000.<sup>43</sup> Additionally, over eighty-eight percent of the unmanned aircraft are considered small UAS platforms—in 2000, the Department of Defense's inventory did not include any small unmanned aircraft.<sup>44</sup> Funding for UAS development has also increased because of the Global War on Terrorism.<sup>45</sup> Be-

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<sup>38</sup> *Id.*

<sup>39</sup> GAO REPORT: IMPROVED PLANNING AND ACQUISITION, *supra* note 9, at 2; U.S. GEN. ACCOUNTING OFFICE, UNMANNED AERIAL VEHICLES: MAJOR MANAGEMENT ISSUES FACING DOD'S DEVELOPMENT AND FIELDING EFFORTS 4–5, 8 (2004).

<sup>40</sup> *See* OFFICE OF THE SECRETARY OF DEFENSE, UNMANNED SYSTEMS ROADMAP: 2007–2032, i–ii (2007), *available at* [http://www.acq.osd.mil/uas/docs/2007\\_Unmanned\\_Systems\\_Roadmap.pdf](http://www.acq.osd.mil/uas/docs/2007_Unmanned_Systems_Roadmap.pdf).

<sup>41</sup> CONGRESSIONAL BUDGET OFFICE, *supra* note 32, at 2 tbl. 1.

<sup>42</sup> GAO REPORT: IMPROVED PLANNING AND ACQUISITION, *supra* note 9, at 5–7.

<sup>43</sup> *Id.* A 2008 GAO report placed the number of UASs in the Department of Defense inventory at over 5,000. GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 9 n.3.

<sup>44</sup> GAO REPORT: IMPROVED PLANNING AND ACQUISITION, *supra* note 9, at 5. The report defines a small UAS as weighing less than ten pounds and having an air-speed less than 100 knots. *Id.* at 6 tbl. 1.

<sup>45</sup> *Id.* at 20.



tween fiscal year 2001 and fiscal year 2011, funding for UASs is expected to grow from \$323 million per year to an estimated \$3.02 billion per year.<sup>46</sup>

The recent dramatic growth in UAS capabilities has effectively revolutionized the way that the military conducts its operations.<sup>47</sup> The addition of the Predator and Global Hawk UASs provides commanders with the ability to conduct extended medium to high altitude surveillance and reconnaissance over large geographical areas.<sup>48</sup> The expenses associated with procuring and operating the theater-level aircraft however, reduces their availability to the commanders of smaller units.<sup>49</sup> Additionally, the capabilities of the theater-level UAS platforms do not always match the requirements and priorities of smaller units.<sup>50</sup> To meet the needs of the smaller brigade-level maneuver units, the military is deploying additional systems, such as the Shadow 200 UAS.<sup>51</sup> Systems such as the Shadow give commanders on the ground access to real-time information about the activities occurring within their area of operations.<sup>52</sup> This information may be essential to the successful accomplishment of their mission.<sup>53</sup> With the planned continued investment in UAS programs and increased deployment of the systems within the military,<sup>54</sup> it is reasonable to expect that the capabilities of

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<sup>46</sup> *Id.* at 7.

<sup>47</sup> See *id.* at 8–9; cf. JOINT CHIEFS OF STAFF, JOINT VISION 2010, at 11–13 (1996); JOINT CHIEFS OF STAFF, JOINT VISION 2020, at 8–10 (2000); Jason Dangel, *Unmanned Aerial Vehicles Play Key Role in Iraq*, DEFENSELINK, Aug. 15, 2008, <http://www.defenselink.mil/news/newsarticle.aspx?id=50821> (quoting MAJ Jonathan Shaffner: “[i]t’s hard to imagine combat today without UAVs. The aircrafts’ capabilities are continuously improving, and they are beginning to do a lot of the same missions as our manned aircraft.”).

<sup>48</sup> U.S. Air Force, Factsheets: RQ-4 Global Hawk Unmanned Aircraft System (Oct. 2008), <http://www.af.mil/information/factsheets/factsheet.asp?id=13225>; U.S. Air Force, Factsheets: MQ-1 Predator Unmanned Aircraft System (Sept. 2008), <http://www.af.mil/information/factsheets/factsheet.asp?fsID=122>.

<sup>49</sup> Cf., e.g., U.S. Air Force, Factsheet: RQ-4 Global Hawk Unmanned Aircraft System, *supra* note 48 (identifying the unit cost of the RQ-4B as \$55–\$81 million).

<sup>50</sup> See OFFICE OF THE SECRETARY OF DEFENSE, *supra* note 40, at 21; Timothy Coffey & John A. Montgomery, *The Emergence of Mini UAVs for Military Applications*, DEFENSE HORIZONS, Dec. 2002, at 1, <http://www.ndu.edu/inss/DefHor/DH22/DH22.pdf>.

<sup>51</sup> See OFFICE OF THE SECRETARY OF DEFENSE, *supra* note 40, at 71.

<sup>52</sup> See Dangel, *supra* note 47.

<sup>53</sup> See, e.g., *id.*

<sup>54</sup> U.S. Army, 2008 Army Posture Statement—Information Papers—Shadow Unmanned Aircraft System, [http://www.army.mil/aps/08/information\\_papers/reset/Shadow\\_Unmanned\\_Aircraft\\_System.html](http://www.army.mil/aps/08/information_papers/reset/Shadow_Unmanned_Aircraft_System.html) (last visited Aug. 15, 2009).

UASs will increase and that the relative cost of the technology will decrease.<sup>55</sup>

### C. NON-MILITARY APPLICATIONS OF UAS TECHNOLOGY

As is true of many technologies developed by the military, the civilian community has gradually begun to employ UAS platforms for non-military applications.<sup>56</sup> Of the various UAS platforms available, the Predator appears to have received the most attention outside of the military. This attention is perhaps attributable to the Predator's capabilities, such as its operating altitude, endurance, and ability to carry a variety of sensing systems.<sup>57</sup>

Domestically, the most significant civilian use of the Predator UAS is in border protection operations conducted by U.S. Customs and Border Protection (CBP) officers.<sup>58</sup> During the first seven months of operations, a single Predator operating along the United States-Mexico border flew 886 hours and helped the agency capture 2,300 undocumented aliens and over 8,300 pounds of marijuana.<sup>59</sup> The CBP currently operates at least four second-generation Predator B systems<sup>60</sup> along the United States-Canada border and along the United States-Mexico border.<sup>61</sup>

The domestic uses of UASs are not limited to border security however—many other government and private organizations

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<sup>55</sup> See OFFICE OF THE SECRETARY OF DEFENSE, *supra* note 40, at 4–5.

<sup>56</sup> See generally, e.g., Mitch Waldrop, *DARPA and the Internet Revolution*, in DARPA: 50 YEARS OF BRIDGING THE GAP 78 (2008), available at [http://www.darpa.mil/Docs/Internet\\_Development\\_200807180909255.pdf](http://www.darpa.mil/Docs/Internet_Development_200807180909255.pdf) (describing the Defense Advanced Research Projects Agency's involvement in development of the technology that allowed the creation of the Internet).

<sup>57</sup> See SNYDER, *supra* note 17, at 16.

<sup>58</sup> See Press Release, U.S. Customs and Border Protection, Department Of Homeland Security Unmanned Aerial Vehicles Operating in Arizona to Support Border Security (June 25, 2004), available at [http://www.cbp.gov/xp/cgov/newsroom/news\\_releases/archives/2004\\_press\\_releases/062004/06252004.xml](http://www.cbp.gov/xp/cgov/newsroom/news_releases/archives/2004_press_releases/062004/06252004.xml); Press Release, U.S. Customs and Border Protection, U.S. Customs and Border Protection Selects the "Predator B" as Unmanned Aerial Vehicle Platform to Guard our Nations Borders (Aug. 30, 2005), available at [http://www.cbp.gov/xp/cgov/newsroom/news\\_releases/archives/2005\\_press\\_releases/082005/08302005.xml](http://www.cbp.gov/xp/cgov/newsroom/news_releases/archives/2005_press_releases/082005/08302005.xml).

<sup>59</sup> John M. Doyles, *CBP's New Predator B Drone Expected Later This Month*, WKLY. BUS. AVIATION, Sept. 18, 2006, at 132, 132.

<sup>60</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 13.

<sup>61</sup> Press Release, U.S. Customs and Border Protection, Unmanned Aircraft Arrives in North Dakota (Dec. 6, 2008), available at [http://cbp.gov/xp/cgov/newsroom/news\\_releases/archives/2008\\_news\\_releases/december\\_2008/12062008.xml](http://cbp.gov/xp/cgov/newsroom/news_releases/archives/2008_news_releases/december_2008/12062008.xml).

have used UAS platforms in the execution of their operations.<sup>62</sup> For example, in 2004, the U.S. Geological Survey and the U.S. Forest Service relied on UASs to study volcanic activity above Mount St. Helens.<sup>63</sup> Because the UAS was capable of withstanding the extreme temperatures and toxic gases emitted by the volcano, it could penetrate into areas where manned aircraft were unable to operate.<sup>64</sup> Other governmental agencies, such as NASA and the National Oceanographic and Atmospheric Association (NOAA), have also used UAS platforms to conduct scientific research.<sup>65</sup> Following Hurricane Katrina, local agencies along the U.S. Gulf Coast used various UASs, although with only limited success, to assist in conducting search and rescue operations.<sup>66</sup> Similarly, during the 2007 wildfires in Southern California, NASA deployed a Predator B UAS to assist with the firefighting efforts.<sup>67</sup>

As UAS technology expands within the military sector, the potential applications within the civilian sector also expand.<sup>68</sup> Much of modern UAS development focuses on meeting the demands of the market by ensuring that UASs are adaptable to a variety of roles and that new technology is compatible with existing systems.<sup>69</sup> In the future, organizations may acquire UASs for a variety of purposes. The projected future applications of UAS technology are wide-ranging and include such diverse applications as aerial photography of real estate, pipeline inspection, communications relays, firefighting,<sup>70</sup> and pesticide application.<sup>71</sup> According to the Government Accountability Office (GAO), however, while a market for UAS technology will eventually develop, the cost of UAS platforms in the near term may be prohibitively high for many of its potential commercial uses.<sup>72</sup>

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<sup>62</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 10–11.

<sup>63</sup> *Id.* at 11.

<sup>64</sup> *Id.*

<sup>65</sup> *Id.*

<sup>66</sup> Jonathan Karp & Andy Pasztor, *Drones in Domestic Skies?*, WALL ST. J., Aug. 7, 2006, at B1.

<sup>67</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 10–11.

<sup>68</sup> See Terry Costlow, *Pilotless Planes: Unmanned Aerial Vehicle Use Grows Rapidly, Versatility Improves*, DESIGN NEWS, Aug. 14, 2006, available at 2006 WLNR 13909207.

<sup>69</sup> *Id.*

<sup>70</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 14–15.

<sup>71</sup> Karp & Pasztor, *supra* note 66.

<sup>72</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 15.

## D. LAW ENFORCEMENT APPLICATIONS OF UAS TECHNOLOGY

While an expansive market for UASs may not be generally available for many years, domestic law enforcement agencies are aggressively pushing to integrate the technology into their current operations.<sup>73</sup> According to an industry projection of UAS growth from 2008 to 2017, during the latter portion of the forecast period, more local law enforcement agencies could be interested in operating UASs.<sup>74</sup> In the short term however, many local law enforcement groups have already attempted to integrate UAS capabilities into their programs.<sup>75</sup> In 2006, the police department of Pasadena, California initiated a field-testing program of the SkySeer UAS.<sup>76</sup> Similarly, the Miami-Dade Police Department is considering using a UAS developed by Honeywell.<sup>77</sup>

As illustrated by the Pasadena Police Department and the Miami-Dade Police Department examples, law enforcement interest in UAS technology is primarily directed toward the acquisition of small UAS platforms.<sup>78</sup> According to the stated intentions of these police departments, police officers would use the UASs to assist in their tactical operations, such as hostage situations or manhunts.<sup>79</sup> The attributes of the small UASs make them particularly well-suited to tactical situations. By being battery powered, rather than relying on an internal combustion engine, systems such as the SkySeer can engage in nearly silent operations.<sup>80</sup> Additionally, the ability to fly at slow speeds and low altitudes allow many small UAS platforms to loiter, if not hover, over a location for extended periods.<sup>81</sup> Finally, and

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<sup>73</sup> *Id.* at 14; Tom Brown, *Spy-in-the-Sky Drone Sets Signs on Miami*, REUTERS, Mar. 26, 2008, available at <http://alertnet.org/thenews/newsdesk/N19297979.htm>.

<sup>74</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 14.

<sup>75</sup> FAA, Order 1110.150, Small Unmanned Aircraft System Aviation Rulemaking Committee, 1 (Apr. 10, 2008).

<sup>76</sup> *Pilotless Aircraft for Police; Crime: SkySeer Created to give Law Enforcement a Birds-Eye View of Activity*, LONG BEACH PRESS-TELEGRAM, Feb. 4, 2006, at A4, available at 2006 WLNR 2215424.

<sup>77</sup> Press Release, Honeywell, Honeywell Wins First Production Contract for its T-Hawk Micro Air Vehicle (Nov. 4, 2008), <http://www51.honeywell.com/honeywell/news-events/press-releases-details/11.4.08T-Hawk.html>.

<sup>78</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 14.

<sup>79</sup> Brown, *supra* note 73; *Pilotless Aircraft*, *supra* note 76.

<sup>80</sup> *Pilotless Aircraft*, *supra* note 76; Octatron, SkySeer: Lightweight, Backpackable Reconnaissance UAV (advertising brochure) available at, <http://www.octatron.com/brochures/brochure-SkySeer.pdf> (last visited Aug. 15, 2009).

<sup>81</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 7; Brown, *supra* note 73; *Pilotless Aircraft*, *supra* note 76.

perhaps most importantly from the perspective of local law enforcement agencies, many of the small UAS platforms are designed to be portable, rapidly deployed, and easily operated.<sup>82</sup> As explained by a representative of CHANG Industry, the SkySeer's developer, "[d]uring a burglary or manhunt, officers can simply pop [the SkySeer] out of a tube, assemble it in minutes and launch it into the sky."<sup>83</sup>

While small UAS platforms will probably be an essential and vital component of future police responses to dangerous tactical situations, it is unlikely that the systems will remain confined to such a narrow range of law enforcement activities.<sup>84</sup> One additional potential use of UASs is their employment in targeted aerial surveillance operations. For example, in 2007, a town in the United Kingdom began using small UASs to "track criminals and record antisocial behaviour."<sup>85</sup> Ultimately, many of the same attributes that make UASs well-suited for tactical situations, such as quiet operation and the ability to loiter over a target, apply equally to the conduct of aerial surveillance.<sup>86</sup> As the technology associated with UASs improves, especially increases in endurance and decreases in operating costs relative to manned aircraft, their desirability as general aerial surveillance platforms will increase.<sup>87</sup>

This potential expansion, however, poses significant questions regarding the legality and desirability of UASs as domestic surveillance systems. While some people may welcome the introduction of additional technology that may catch or decrease criminal activity, others are significantly more apprehensive about the widespread use of such technology.<sup>88</sup> Regardless of personal opinions though, the courts will ultimately have the fi-

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<sup>82</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 7; Brown, *supra* note 73; *Pilotless Aircraft*, *supra* note 76.

<sup>83</sup> *Pilotless Aircraft*, *supra* note 76. The SkySeer vehicle is transported in a four inch by forty-eight inch tube and the control station is contained in Pelican case only slightly larger than a normal laptop computer bag. Octatron, *supra* note 80.

<sup>84</sup> See Brown, *supra* note 73.

<sup>85</sup> Philip Johnston, *Police Spy in the Sky Fuels 'Big Brother' Fears*, DAILY TELEGRAPH (London), May 22, 2007, at 11, available at 2007 WLNR 9569476.

<sup>86</sup> *Id.*

<sup>87</sup> See GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 7; Johnston, *supra* note 85.

<sup>88</sup> JAY STANLEY & BARRY STEINHARDT, AMERICAN CIVIL LIBERTIES UNION, BIGGER MONSTER, WEAKER CHAINS: THE GROWTH OF AN AMERICAN SURVEILLANCE SOCIETY 2-3 (2003), available at [http://www.aclu.org/FilesPDFs/aclu\\_report\\_bigger\\_monster\\_weaker\\_chains.pdf](http://www.aclu.org/FilesPDFs/aclu_report_bigger_monster_weaker_chains.pdf); Johnston, *supra* note 85.

nal say regarding the constitutionality of UAS platforms deployed to conduct aerial surveillance operations.

## II. EVOLUTION OF PRECEDENT CONCERNING WARRANTLESS SURVEILLANCE ACTIVITIES

### A. THE RELATIONSHIP BETWEEN PRIVACY AND THE FOURTH AMENDMENT

Throughout history, society's conceptions regarding "privacy" and the courts' application of the term to the Fourth Amendment have undergone a significant evolution.<sup>89</sup> As Martin Kuhn asserted, the Supreme Court's analysis of privacy under the Fourth Amendment has progressed through four distinct stages.<sup>90</sup> According to Richard Posner, the Supreme Court's development of multiple opinions on the issue can be explained by the difficulty associated with identifying precisely what types of privacy the Fourth Amendment was designed to protect.<sup>91</sup> When considering technological developments, the failure to distinguish between privacy as seclusion and privacy as secrecy has significant repercussions.

[W]hether wiretapping and police spying are subject to the Fourth Amendment depends on whether the Fourth Amendment protects only privacy in the sense of seclusion or physical privacy—in which event these methods of gathering material should not be subject to the Fourth Amendment because, unlike physical searches of a person or his premises, they are unobtrusive—or whether it also protects privacy in the sense of secrecy, in which event they are clearly within the scope of the Fourth Amendment.<sup>92</sup>

In 1967, the Supreme Court significantly changed the jurisprudence related to searches under the Fourth Amendment.<sup>93</sup> In *Katz v. United States*, the Supreme Court considered the con-

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<sup>89</sup> See generally Richard A. Posner, *The Uncertain Protection of Privacy by the Supreme Court*, 1979 SUP. CT. REV. 173 (1979) (discussing the role and interpretation of privacy within the Supreme Court's Fourth Amendment jurisprudence).

<sup>90</sup> MARTIN KUHN, *FEDERAL DATAVEILLANCE: IMPLICATIONS FOR CONSTITUTIONAL PRIVACY PROTECTIONS* 112–13 (2007) (identifying the four stages as "[(1)] Fourth and Fifth Amendment due process, [(2)] privacy as space, [(3)] privacy as secrecy, and [(4)] privacy as information control").

<sup>91</sup> See Posner, *supra* note 89, 188–89.

<sup>92</sup> *Id.* at 188.

<sup>93</sup> *Katz v. United States*, 389 U.S. 347, 352–53 (1967); cf. ALAN F. WESTIN, *PRIVACY AND FREEDOM* 384 (1967) (predicting that "the Supreme Court will soon issue a broad, path-breaking decision on the right to privacy from technological intrusion").

stitutionality of warrantless electronic eavesdropping of a telephone conversation conducted within a closed public phone booth.<sup>94</sup> The Court's opinions are significant for at least three reasons. First, the Court stated that the "Fourth Amendment protects people, not places" and that "[w]hat a person knowingly exposes to the public, even in his own home or office, is not a subject of Fourth Amendment protection."<sup>95</sup> Second, the Court explicitly rejected the previous formulation of Fourth Amendment protection, finding that the resolution of the issue "cannot turn upon the presence or absence of a physical intrusion into any given enclosure."<sup>96</sup> Finally, and perhaps most importantly, the concurring opinion written by Justice Harlan provided a two-pronged framework for evaluating when a violation of the Fourth Amendment occurs.<sup>97</sup> Under Justice Harlan's two-part test, to rely on the protections of the Fourth Amendment, a person must "have exhibited an actual (subjective) expectation of privacy" and the expectation must "be one that society is prepared to recognize as 'reasonable.'"<sup>98</sup>

Since 1967, courts have relied on Justice Harlan's test to determine when the government has violated an individual's Fourth Amendment rights. Generally, following the example of *Katz*, courts apply the test to determine if a "search" within the meaning of the Fourth Amendment has occurred.<sup>99</sup> If a court concludes that a search has occurred, it will find that it is "presumptively unreasonable" in the absence of a warrant.<sup>100</sup> The test however, is subject to significant criticism. Many scholars, including Justices Rehnquist and Scalia, have identified the circular and self-indulgent nature of the test.<sup>101</sup> As Justice Scalia stated in his concurrence to *Minnesota v. Carter*, "unsurprisingly, those 'actual (subjective) expectation[s] of privacy' 'that society is prepared to recognize as "reasonable,"' bear an uncanny resemblance to those expectations of privacy that this Court con-

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<sup>94</sup> *Katz*, 389 U.S. at 349–51.

<sup>95</sup> *Id.* at 351.

<sup>96</sup> *Id.* at 353.

<sup>97</sup> *Id.* at 361 (Harlan, J., concurring).

<sup>98</sup> *Id.*

<sup>99</sup> See, e.g., *Minnesota v. Olson*, 495 U.S. 91, 95–96 (1990).

<sup>100</sup> E.g., *Kyllo v. United States*, 533 U.S. 27, 40 (2001).

<sup>101</sup> *Id.* at 34; *Minnesota v. Carter*, 525 U.S. 83, 97 (1998) (Scalia, J., concurring); *Rakas v. Illinois*, 439 U.S. 128, 143 n.12 (1978); JEFFREY ROSEN, *THE UNWANTED GAZE* 60–61 (2000); Posner, *supra* note 89, at 188.

siders reasonable.”<sup>102</sup> Based on his indictment of the test, it should not be surprising that in *Kyllo v. United States*, Justice Scalia’s opinion moved away from Justice Harlan’s analysis.<sup>103</sup>

In *Kyllo*, the Supreme Court considered whether the use of a thermal imaging device to determine the presence of an indoor marijuana growing operation in a defendant’s home was a search within the meaning of the Fourth Amendment.<sup>104</sup> Justice Scalia, writing for the majority, determined 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.”<sup>105</sup>

The opinion in *Kyllo* represents a significant shift in the Court’s attitude toward technological advances.<sup>106</sup> *Katz* and its progeny relied on the reasonableness of the subjective intent of the party to determine if a violation of the expectation of privacy occurred. Under the *Katz* view, if a defendant made information available to third persons, the defendant lost their expectation of privacy.<sup>107</sup> Following this logic, a variety of highly intrusive government activities were held not to be a search within the meaning of the Fourth Amendment.<sup>108</sup> Additionally, as technology allowed for increasingly sophisticated methods of surveillance, a person’s subjective expectation of privacy decreased.<sup>109</sup> In his dissenting opinion in *Dow Chemical Co. v. United States*, Justice Powell acknowledged this concern: “[s]uch an inquiry will not protect Fourth Amendment rights, but rather

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<sup>102</sup> *Carter*, 525 U.S. at 97 (Scalia, J., concurring) (quoting *Katz*, 389 U.S. at 96 (Harlan, J., concurring)).

<sup>103</sup> *Kyllo*, 533 U.S. at 34.

<sup>104</sup> *Id.* at 29.

<sup>105</sup> *Id.* at 34 (citation omitted).

<sup>106</sup> *See id.*

<sup>107</sup> *Katz v. United States*, 389 U.S. 347, 351 (1967) (“What a person knowingly exposes to the public . . . is not a subject of Fourth Amendment protection.”).

<sup>108</sup> *E.g.*, *California v. Greenwood*, 486 U.S. 35, 39–40 (1988) (determining that the defendant did not have a reasonable expectation of privacy in garbage, contained in opaque bags, left for collection outside the curtilage of the his house); *Smith v. Maryland*, 442 U.S. 735, 742–43 (1979) (attaching a pen register to record all phone numbers dialed was not a search because defendant lacked an expectation of privacy in the numbers he dialed).

<sup>109</sup> *E.g.*, *United States v. Robinson*, 62 F.3d 1325, 1328–29 (11th Cir. 1995) (holding that the defendant did not have “a subjective expectation of privacy in the heat generated by his indoor marijuana cultivation” that was detected by a thermal imaging device).



will permit their gradual decay as technology advances."<sup>110</sup> At least as far as the home is concerned, *Kyllo* reversed the trend established by *Katz*, finding that there were limits "upon this power of technology to shrink the realm of guaranteed privacy."<sup>111</sup>

#### B. SUPREME COURT DECISIONS REGARDING AERIAL SURVEILLANCE ACTIVITIES

On three occasions during the 1980s, the Supreme Court applied the two-pronged test announced by Justice Harlan in *Katz* to determine whether aerial surveillance was a search within the meaning of the Fourth Amendment.<sup>112</sup> Each case presented the Court with a unique set of facts concerning the specifics of the surveillance; however, in each situation the Court determined that a subjective expectation of privacy that society was willing to recognize as reasonable did not exist.

In *California v. Ciraolo*, the respondent erected a set of fences around his property in order to conceal the marijuana growing in his backyard.<sup>113</sup> Police officers, acting on an anonymous tip and unable to observe the contents of the backyard from ground level, secured an airplane and flew over the respondent's house at an altitude of 1,000 feet.<sup>114</sup> While flying over, the officers identified and photographed, with a standard 35mm camera, marijuana plants growing in a fifteen by twenty-five foot plot in the respondent's backyard.<sup>115</sup> The California Court of Appeal, reversing the trial court ruling, determined that the placement of the fences "constituted 'objective criteria from which we may conclude [the respondent] manifested a reasonable expectation of privacy by any standard.'"<sup>116</sup> The California Supreme Court declined to hear the State's appeal.<sup>117</sup>

On certiorari, the Supreme Court reversed the holding of the California Court of Appeal.<sup>118</sup> The Court began its analysis by

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<sup>110</sup> *Dow Chemical Co. v. United States*, 476 U.S. 227, 240 (1986) (Powell, J., concurring in part and dissenting in part).

<sup>111</sup> *Kyllo v. United States*, 533 U.S. 27, 34 (2001).

<sup>112</sup> *Florida v. Riley*, 488 U.S. 445, 449-51 (1989); *California v. Ciraolo*, 476 U.S. 207, 209 (1986); *Dow Chemical*, 476 U.S. at 229, 234-35.

<sup>113</sup> *Ciraolo*, 476 U.S. at 209.

<sup>114</sup> *Id.*

<sup>115</sup> *Id.*

<sup>116</sup> *Id.* at 210 (quoting *California v. Ciraolo*, 208 Cal. Rptr. 93, 97 (Cal. Ct. App. 1984)).

<sup>117</sup> *Id.*

<sup>118</sup> *Id.*

noting that the respondent manifested “his own subjective intent and desire to maintain privacy as to his unlawful agricultural pursuits.”<sup>119</sup> The Court questioned, though, whether manifesting a subjective expectation of privacy from ground level observations necessarily meant that the respondent “manifested a subjective expectation of privacy from *all* observations.”<sup>120</sup> Because the issue was not raised by the State, however, the court declined to address the question.<sup>121</sup>

Taking up the second part of the test from *Katz*, the Court determined that the question was “whether naked-eye observation of the curtilage by police from an aircraft lawfully operating at an altitude of 1,000 feet violates an expectation of privacy that is reasonable.”<sup>122</sup> Answering this question in the negative, the Court concentrated on the fact that the officer’s observations “took place within public navigable airspace.”<sup>123</sup> Under the premise that Fourth Amendment protections do not apply to “[w]hat a person knowingly exposes to the public,” the Court explained that

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. Nor does the mere fact that an individual has taken measures to restrict some views of his activities preclude an officer’s observations from a public vantage point where he has a right to be and which renders the activities clearly visible.<sup>124</sup>

Because any member of the public could have flown over the respondent’s house, looked down, and seen what the officers saw, the Court determined that the claimed expectation of privacy was not one that “society [was] prepared to honor.”<sup>125</sup>

The Supreme Court issued its second opinion addressing aerial surveillance at the same time as it issued its opinion in *Ciraolo*; however, each case involved a significantly different set of facts.<sup>126</sup> The second case, *Dow Chemical Co. v. United States*, concerned the aerial surveillance and photography of an indus-

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<sup>119</sup> *Id.* at 211.

<sup>120</sup> *Id.* at 211–12.

<sup>121</sup> *Id.* at 211.

<sup>122</sup> *Id.* at 213.

<sup>123</sup> *Id.*

<sup>124</sup> *Id.*

<sup>125</sup> *Id.* at 213–14.

<sup>126</sup> *Dow Chemical Co. v. United States*, 476 U.S. 227, 234–35 (1986).

trial facility operated by Dow Chemical.<sup>127</sup> Dow Chemical, the petitioner, claimed that by hiring a commercial aerial photographer, who used a precision aerial mapping camera to photograph the facility at altitudes ranging from 1,200 feet to 12,000 feet, the Environmental Protection Agency conducted a search subject to the Fourth Amendment.<sup>128</sup> While the United States District Court for the Eastern District of Michigan found that Dow Chemical's expectation of privacy was reasonable, the Sixth Circuit reversed.<sup>129</sup> The circuit court concluded that because the common-law curtilage doctrine did not apply to an industrial facility, the case was more analogous to those evaluated under the "open fields" standard and therefore the expectation was not reasonable.<sup>130</sup>

The Supreme Court, affirming the holding of the Sixth Circuit, addressed a significant difference that distinguished the circumstances of *Ciraolo* from the circumstances of *Dow Chemical*.<sup>131</sup> In *Dow Chemical*, the Court concluded that the "open areas of an industrial plant complex . . . spread over an area of 2,000 acres are not analogous to the 'curtilage' of a dwelling for purposes of aerial surveillance."<sup>132</sup> In drawing this distinction, the Court stated that "[t]he curtilage area immediately surrounding a private house has long been given protection as a place where the occupants have a reasonable and legitimate expectation of privacy that society is prepared to accept."<sup>133</sup> Differentiating the curtilage doctrine from the open fields doctrine, the Court explained 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.'" <sup>134</sup>

Having established the differences between open fields and curtilage, and commercial facilities and private homes, the court concluded that photographing the exterior areas of an industrial complex with "a conventional, albeit precise, commercial camera commonly used in mapmaking" from public navigable

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<sup>127</sup> *Id.* at 229.

<sup>128</sup> *Id.* at 229-30.

<sup>129</sup> *Id.* at 230.

<sup>130</sup> *Id.* at 231.

<sup>131</sup> *Id.* at 235.

<sup>132</sup> *Id.* at 239.

<sup>133</sup> *Id.* at 235.

<sup>134</sup> *Id.* (quoting *Oliver v. United States*, 466 U.S. 170, 179 (1984)).

airspace was not a search within the meaning of the Fourth Amendment.<sup>135</sup>

The Supreme Court issued its most recent opinion assessing the constitutionality of aerial surveillance in 1989.<sup>136</sup> In *Florida v. Riley*, the Court considered “[w]hether surveillance of the interior of a partially covered greenhouse in a residential backyard from the vantage point of a helicopter located 400 feet above the greenhouse constitute[d] a ‘search’ for which a warrant is required under the Fourth Amendment.”<sup>137</sup> Similar to *Ciraolo*, the situation in *Riley* started with an anonymous tip to local law enforcement agencies that the respondent was growing marijuana on his property.<sup>138</sup> Additionally, in both cases, the respondent had taken measures to conceal the growth from observation at ground level.<sup>139</sup> Unlike *Ciraolo* however, the police officers in *Riley* conducted their aerial surveillance from the vantage point of a helicopter circling at 400 feet and the respondent had at least partially attempted to conceal the marijuana from aerial observation.<sup>140</sup> Although it noted that *Riley* was analogous to *Ciraolo*, the Florida Supreme Court distinguished the capabilities of a helicopter from those of a fixed-wing aircraft and determining that the observations made from the helicopter were a search under the Fourth Amendment.<sup>141</sup>

Only two years prior to hearing *Florida v. Riley*, the Supreme Court tacitly approved of the distinction between helicopters and fixed-wing aircraft.<sup>142</sup> In *California v. Sabo*, the Court denied a writ of certiorari in a case where the California Court of Appeal relied in part on the distinction between the two surveillance platforms and held that helicopter surveillance was a search under the Fourth Amendment.<sup>143</sup> In *Florida v. Riley*, the Court gave Justice White the opportunity to convert his dissent

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<sup>135</sup> *Id.* at 238–39 (noting that the cameras used produce photographs that may permit the identification of objects as small as 1/2 inch in diameter).

<sup>136</sup> *Florida v. Riley*, 488 U.S. 445, 447–48 (1989) (White, J., plurality opinion).

<sup>137</sup> *Id.*

<sup>138</sup> *Id.* at 448; *California v. Ciraolo*, 476 U.S. 207, 209 (1986).

<sup>139</sup> *Riley*, 488 U.S. at 448.

<sup>140</sup> *Id.*

<sup>141</sup> *Riley v. State*, 511 So. 2d. 282, 288–89 (Fla. 1987) (“[C]ourts have recognized that because of a helicopter’s virtually unlimited maneuverability and observational capabilities, helicopter surveillance poses a serious risk to privacy.”), *rev’d*, *Florida v. Riley*, 488 U.S. 445 (1989).

<sup>142</sup> See *California v. Sabo*, 481 U.S. 1058, 2201 (1987).

<sup>143</sup> *Id.* (White, J., dissenting) (questioning the California Court of Appeal’s analysis regarding the distinctions between helicopters and fixed-wing aircraft).

in the denial of certiorari into a plurality opinion of the Court.<sup>144</sup> Finding that *Ciraolo* controlled, Justice White noted that, because a fraction of the roof of the greenhouse was uncovered, Riley would not have a reasonable expectation of privacy from an officer seated in a fixed-wing aircraft flying at 1,000 feet.<sup>145</sup> Taking his conclusion one step further, Justice White determined that because “‘private and commercial flight [by helicopter] in the public airways is routine’”<sup>146</sup> and the helicopter was operating at an altitude not contrary to law or regulation, any member of the public could have made an equivalent flight over Riley’s backyard.<sup>147</sup> Based on this analysis, Justice White rejected the contention that the helicopter surveillance was a violation of the Fourth Amendment and reversed the Florida Supreme Court.<sup>148</sup>

### C. LIMITATIONS OF *CIRAOLLO*, *DOW CHEMICAL*, AND *RILEY*

While the Supreme Court’s decisions in *Ciraolo*, *Dow Chemical*, and *Riley* certainly established that at least some forms of aerial surveillance are independent of Fourth Amendment considerations,<sup>149</sup> the opinions also introduced a variety of limitations and questions that remain unanswered. Relying on the decisions of the Supreme Court, a multitude of state and lower federal courts have evaluated some of the considerations unanswered by the three Supreme Court opinions; however, the results are often inconsistent<sup>150</sup> and some have been implicitly rejected by the Supreme Court’s decision in *Kyllo*.<sup>151</sup>

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<sup>144</sup> *Riley*, 488 U.S. at 447. Justice O’Connor issued an opinion in which she concurred in the judgment but questioned Justice White’s reliance on the fact that the helicopter was where it had a right to be. *Id.* at 454 (O’Connor, J., concurring). See *supra* text accompanying notes 138–39.

<sup>145</sup> *Id.* at 400.

<sup>146</sup> *Id.* at 450 (quoting *Ciraolo* but adding “by helicopter” to the original text).

<sup>147</sup> *Riley*, 488 U.S. at 451.

<sup>148</sup> *Id.* at 451–52.

<sup>149</sup> See *supra* Part II.B.

<sup>150</sup> Compare, e.g., *People v. Pollock*, 796 P.2d 63, 65 (Colo. App. 1990) (finding that helicopter surveillance at an altitude of 200 feet violated a reasonable expectation of privacy) with *United States v. Boyster*, 436 F.3d 986, 992 (8th Cir. 2006) (finding that even if the helicopter surveillance was conducted at 100 feet, it was “not shown that flights at this altitude are so rare as to make aerial surveillance at that level unreasonable”).

<sup>151</sup> E.g., *United States v. Robinson*, 62 F.3d 1325, 1328–30 (11th Cir. 1995) (determining that the use of thermal imaging to measure heat emanating from a house conducted from a helicopter did not violate a reasonable expectation of

In each of the three cases considered, the Supreme Court focused on the routine nature of private and commercial flight in the public navigable airspace, thereby leaving open the question of how the Court would respond to types of flights that are not routine. As Justices Brennan and White stated in their opinions, “[i]n an age where private and commercial flight in the public airways is routine,” an expectation of privacy from aerial surveillance by helicopters or fixed-wing aircraft is unreasonable.<sup>152</sup> Justice White, however, suggested that the ability to show that a specific type of flight is not routine might produce a different result.<sup>153</sup> In *Riley*, Justice White stated that “there is nothing in the record or before us to suggest that helicopters flying at 400 feet are sufficiently rare in this country to lend substance to respondent’s claim that he reasonably anticipated that his greenhouse would not be subject to observation from that altitude.”<sup>154</sup> Justice O’Connor made a similar observation in her concurrence: “[i]f the public rarely, if ever, travels overhead at such altitudes, the observation cannot be said to be from a vantage point generally used by the public and *Riley* cannot be said to have ‘knowingly expose[d]’ his greenhouse to public view.”<sup>155</sup> Under Justice O’Connor’s view, if a defendant can establish that a method of observation was rarely used by the public, then the use of that method by the police “would violate reasonable expectations of privacy.”<sup>156</sup>

A second question left open by the Supreme Court is how courts should address the use of photography to capture images of the curtilage of the home. In *Dow Chemical*, the Court considered the use of sophisticated, but commonly available, aerial mapping cameras capable of producing images that could reveal more detail than could be observed through naked-eye observations.<sup>157</sup> However, the Court, in multiple situations, identified that the opinion in *Dow Chemical* considered industrial facilities evaluated under the open fields doctrine and not the curtilage adjacent to a private home.<sup>158</sup> The fact that in both *Ciraolo* and

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privacy). Such warrantless use of thermal imaging equipment was declared unconstitutional in *Kyllo v. United States*. *Supra* Part II.A.

<sup>152</sup> *California v. Ciraolo*, 476 U.S. 207, 215 (1986); *accord Riley*, 488 U.S. at 450.

<sup>153</sup> *Riley*, 488 U.S. at 451–52.

<sup>154</sup> *Id.*

<sup>155</sup> *Id.* at 455 (O’Connor, J., concurring).

<sup>156</sup> *Id.*; see *People v. Pollock*, 796 P.2d 63, 65 (Colo. App. 1990).

<sup>157</sup> *Dow Chemical Co. v. United States*, 476 U.S. 227, 238 (1986).

<sup>158</sup> *California v. Ciraolo*, 476 U.S. 207, 215 n.3 (1986) (distinguishing *Ciraolo* from *Dow Chemical*); *Dow Chemical*, 476 U.S. at 237 n.4 (“We find it important that

*Riley*, in addition to making naked-eye observations, the officers took photographs using commonly available cameras supports the distinction between photography of an industrial complex and photography of the curtilage of the home.<sup>159</sup> In *Ciraolo*, the Supreme Court even went so far as to expressly state that it declined to reach the question of the constitutionality of photographing the curtilage of the home.<sup>160</sup> Additionally, in *Ciraolo* and *Riley*, the Court was careful to phrase its holding in terms of “naked-eye” observations as opposed to observations generally.<sup>161</sup> While subsequent lower court cases have evaluated the use of aerial photography, the cases either involved the photography of land located outside the curtilage of the home,<sup>162</sup> erroneously interpreted *Ciraolo* as an endorsement of aerial photography,<sup>163</sup> ignored the use of photography in favor of the officer’s unaided observations,<sup>164</sup> or addressed issues other than searches under the Fourth Amendment.<sup>165</sup>

Going beyond the mere use of photography, the Supreme Court hinted that the use of sophisticated technology might constitute a Fourth Amendment search when used in aerial surveillance.<sup>166</sup> The foundation for this possibility rests with Justice Harlan’s concurrence in *Katz*, where he warned that “reasonable expectations of privacy may be defeated by electronic as well as

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this is *not* an area immediately adjacent to a private home, where privacy expectations are most heightened.”).

<sup>159</sup> *Ciraolo*, 476 U.S. at 209; *Riley v. State*, 511 So. 2d 282, 283 n.2 (1987), *rev’d on other grounds*, *Florida v. Riley*, 488 U.S. 445 (1989).

<sup>160</sup> *Ciraolo*, 476 U.S. at 213 n.1 (“Because the parties framed the issue in the California courts below and in this Court as concerning only the reasonableness of aerial observation generally without raising any distinct issue as to the photograph . . . our analysis is similarly circumscribed.” (citation omitted)).

<sup>161</sup> See *Florida v. Riley*, 488 U.S. 445, 448, 451 (1989) (White, J., plurality opinion) (noting that the officer’s observations were conducted “[w]ith his naked eye” and that “[t]he police officer did no more”); *Ciraolo*, 476 U.S. at 215 (“[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” (emphasis added)).

<sup>162</sup> *E.g.*, *United States v. Allerheiligen*, Nos. 99-3144, 99-3154, 2000 WL 1055487, at \*1, \*6 (10th Cir. Aug. 1, 2000).

<sup>163</sup> See, *e.g.*, *United States v. Pace*, 955 F.2d 270, 276 n.6 (5th Cir. 1992) (erroneously stating “[a]erial photography from an aircraft legitimately in the airspace over private property was held not to violate the Fourth Amendment in *California v. Ciraolo*); *supra* note 161.

<sup>164</sup> *E.g.*, *Riley v. State*, 511 So. 2d 282, 283 n.2 (1987), *rev’d on other grounds*, *Florida v. Riley*, 488 U.S. 445 (1989).

<sup>165</sup> *E.g.*, *United States v. Sherman*, 551 F.3d 45, 47 (1st Cir. 2008).

<sup>166</sup> *Katz v. United States*, 389 U.S. 347, 362 (1967) (Harlan, J., concurring).

physical invasion.”<sup>167</sup> The Supreme Court’s opinions in the *Ciraolo* and *Dow Chemical* cases built upon this foundation. In *Ciraolo*, the Court disputed that aircraft were “within the category of future ‘electronic’ developments that could stealthily intrude upon an individual’s privacy” but noted that “[a]erial observation of curtilage may become invasive, either due to physical intrusiveness or through modern technology which discloses to the senses those intimate associations, objects or activities otherwise imperceptible to police or fellow citizens.”<sup>168</sup> The opinion in *Dow Chemical* echoes this possibility with additional specificity: “[i]t may well be, as the Government concedes, 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.”<sup>169</sup>

In some respects, the Court’s opinion in *Kyllo* has assisted in the resolution of how courts should consider advances in technology. The Court, considering thermal imaging technology, specifically noted the importance of the fact that *Dow Chemical* did not address an “area immediately adjacent to a private home,”<sup>170</sup> but rather an “industrial complex, which does not share the Fourth Amendment sanctity of the home.”<sup>171</sup> The Court also clarified the statement in *Ciraolo* that modern technology could become invasive based on its ability to reveal intimate details, explaining that “the Court’s focus in this secondhand dictum was not upon intimacy but upon otherwise-imperceptibility.”<sup>172</sup> To illustrate this point, Justice Scalia discussed the lack of a connection between technological advancement and the intimacy of the details the technology reveals, and the problems intimacy poses if used as a basis for when a search occurs:

The Agema Thermovision 210 might disclose, for example, at what hour each night the lady of the house takes her daily sauna and bath—a detail that many would consider “intimate”; and a much more sophisticated system might detect nothing more intimate than the fact that someone left a closet light on. . . . [We]

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<sup>167</sup> *Id.*

<sup>168</sup> *California v. Ciraolo*, 476 U.S. 207, 215, 215 n.3 (1986) (internal quotation omitted).

<sup>169</sup> *Dow Chemical Co. v. United States*, 476 U.S. 227, 238–39 (1986).

<sup>170</sup> *Kyllo v. United States*, 533 U.S. 27, 33 (2001).

<sup>171</sup> *Id.* at 37.

<sup>172</sup> *Id.* at 38 n.5.



would have to develop a jurisprudence specifying which home activities are "intimate" and which are not. And even when (if ever) that jurisprudence were fully developed, no police officer would be able to know *in advance* whether his . . . surveillance picks up "intimate" details-and thus would be unable to know in advance whether it is constitutional.<sup>173</sup>

While the opinion appears to establish that the use of technology capable of allowing police officers to observe things otherwise imperceptible to others through routine means may constitute a search, the impact of *Kyllo* on the Supreme Court's existing aerial surveillance jurisprudence is unclear for two reasons. First, *Kyllo* addresses the interior of the home while the curtilage of the home is the primary focus of the existing aerial surveillance cases.<sup>174</sup> Second, because the Court has not considered any aerial surveillance cases since *Kyllo*, it is difficult to predict whether and how *Kyllo* will change the Court's analysis of aerial surveillance.<sup>175</sup>

Finally, the Court's opinions regarding aerial surveillance leave open the question of what constitutes surveillance so "intrusive" that it becomes a violation of a reasonable expectation of privacy.<sup>176</sup> Considering that the Court decided the three aerial surveillance cases during the 1980s, the Court's analysis of intrusiveness focused on those attributes commonly associated with aircraft known at the time.<sup>177</sup> In his two opinions on the subject, Justice White seemed to equate intrusiveness with surveillance that disrupted the use of the area under surveillance.<sup>178</sup> In his plurality opinion in *Riley*, Justice White observed that the helicopter surveillance did not disrupt the "respondent's normal use of the greenhouse or of other parts of the curtilage. As far as this record reveals, no intimate 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."<sup>179</sup> To illustrate the questionable foundation of Justice White's intrusive-equals-disruptive position though, Justice Brennan created a thought exercise that described a hypothetical he-

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<sup>173</sup> *Id.* at 38-39.

<sup>174</sup> See *supra* Part II.B.

<sup>175</sup> See *id.*

<sup>176</sup> *Supra* Part II.B.

<sup>177</sup> *Id.*

<sup>178</sup> *Florida v. Riley*, 488 U.S. 445, 451-52 (1989) (White, J., plurality opinion); *California v. Sabo* 481 U.S. 1058, 1058 (1987) (White, J., dissenting).

<sup>179</sup> *Riley*, 488 U.S. at 452 (1989) (White, J., plurality opinion).

licopter capable of stealthily conducting surveillance and asked whether the plurality would “continue to assert that ‘[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures’ was not infringed by such surveillance?”<sup>180</sup> The *Ciraolo* opinion also demonstrates the Court’s inability to fathom intrusive surveillance without disruption.<sup>181</sup> Referencing Justice Harlan’s concurrence in *Katz*, Chief Justice Burger asserted that “[o]ne can reasonably doubt that in 1967 Justice Harlan considered an aircraft within the category of future ‘electronic’ developments that could *stealthily intrude* upon an individual’s privacy.”<sup>182</sup> While Chief Justice Burger may have been correct in his general interpretation of Justice Harlan’s concurrence, it does not follow that Justice Harlan intended to exclude an aircraft that is capable of “stealthily intrud[ing] upon an individual’s privacy.”<sup>183</sup>

### III. UAS AERIAL SURVEILLANCE IS A “SEARCH” WITHIN THE MEANING OF THE FOURTH AMENDMENT

#### A. DISTINGUISHING BETWEEN CONVENTIONAL AND UAS AERIAL SURVEILLANCE

Under existing Supreme Court precedent, it is undoubtedly well established that at least some forms of aerial surveillance do not constitute a search within the meaning of the Fourth Amendment.<sup>184</sup> As Justice White stated in *Riley*, however, “[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.”<sup>185</sup> Considering that the Supreme Court’s current jurisprudence on the subject is intertwined with conventional manned fixed and rotary wing aircraft, any future argument for the unconstitutionality of warrantless surveillance conducted using UAS platforms should attempt to differentiate the features and capabilities of the methods in order to distinguish UAS surveillance from conventional aerial surveillance.

Perhaps the most obvious distinction between UAS and conventional aircraft is the fact that the UAS operates without an

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<sup>180</sup> *Id.* at 462–63 (Brennan, J., dissenting).

<sup>181</sup> See *California v. Ciraolo*, 476 U.S. 207, 215 (1986).

<sup>182</sup> *Id.* (emphasis added).

<sup>183</sup> *Id.*

<sup>184</sup> See *supra* Part II.

<sup>185</sup> *Riley*, 488 U.S. at 451.

onboard pilot or crew.<sup>186</sup> This fact has at least five significant implications for UAS surveillance operations: (1) location of the observer, (2) use of cameras to conduct surveillance, (3) ability to conduct continuous operations, (4) covert rather than disruptive surveillance, and (5) restrictions on access to the national airspace system.

First, surveillance conducted with conventional aircraft requires that the police officer be onboard making direct observations of the area under surveillance. With UAS platforms, however, while the aircraft is operating above the surveillance area, any police officer controlling the unmanned aircraft will be in a remote location.<sup>187</sup> The operator's ability to conduct surveillance remotely using a UAS is limited by the method of communication between the control station and the UAS aircraft.<sup>188</sup> Typically, provided that "line-of-sight" communications are possible, the operator of a small UAS can be located many miles from the area under surveillance.<sup>189</sup> As the sophistication of the communications system increases to permit beyond line-of-sight operation, the distance from which the operator can control the UAS aircraft increases.<sup>190</sup> By using satellite data links, operators are able to control some UAS platforms from thousands of miles away.<sup>191</sup>

The second implication of the absence of a pilot is the fact that while a police officer in a conventional aircraft can make "naked eye" observations of the area under surveillance, UAS surveillance requires the use of cameras mounted to the unmanned aircraft. Although it is possible to equip the unmanned aircraft with conventional cameras, at least a portion of the benefits derived from the application of unmanned aircraft systems are associated with the use of advanced electro-optical devices, such as thermal imaging cameras, and other sensors.<sup>192</sup>

Third, the absence of an onboard pilot allows for continuous operations for longer periods than is possible with manned air-

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<sup>186</sup> GAO REPORT: FEDERAL ACTION NEEDED, *supra* note 7, at 6.

<sup>187</sup> *Id.* at 7.

<sup>188</sup> See SNYDER, *supra* note 17, at 11-12.

<sup>189</sup> *E.g.*, AeroVironment, *supra* note 14 (noting that the "Raven provides aerial observation . . . at line-of-sight ranges up to [6.2 miles]").

<sup>190</sup> See SNYDER, *supra* note 17, at 11 (describing how different communications systems can be used to control the Predator UAS in line of sight or non-line of sight operations).

<sup>191</sup> Karp & Pasztor, *supra* note 66 (noting that some of the UAS platforms operated over Afghanistan are controlled by pilots located in Nevada).

<sup>192</sup> See Coffey & Montgomery, *supra* note 50, at 7.

craft.<sup>193</sup> While small UASs may not presently rival the endurance of manned systems and large UASs, endurance is one of the key areas of current research in UAS technology.<sup>194</sup> As the technology improves, small UASs could potentially meet or exceed the endurance of manned aircraft.<sup>195</sup> Even though many small UASs currently have a shorter endurance than manned aircraft, the ability to deploy the systems close to where they are needed may mitigate this limitation. While a conventional aircraft may spend a significant amount of its flight traveling to and from the surveillance area, a small UAS deployed close to the surveillance location can dedicate a greater percentage of its time to actually conducting surveillance.

The fourth distinction between conventional and unmanned aircraft comes from the availability of alternative fuels and the size of small UAS aircraft. Unlike conventional fixed and rotary wing aircraft, many small UAS aircraft rely on batteries to power electric motors during flight.<sup>196</sup> Because of the absence of a combustion engine, battery powered UASs are able to operate with significantly less noise than conventional aircraft.<sup>197</sup> Additionally, the minimal size of small UAS aircraft makes them less visible during flight.<sup>198</sup> Even small UAS aircraft that rely on combustion engines for power still have the advantage of being less visible because of their small size, and have smaller engines that produce significantly less noise than the engines of full-size aircraft.<sup>199</sup> The combination of small size and relatively silent flight enables the operator of a small UAS to conduct aerial surveillance covertly. While it would be difficult not to notice a manned helicopter conducting surveillance,<sup>200</sup> it is possible that a small UAS could observe a single location for over an hour without detection.<sup>201</sup>

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<sup>193</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 7.

<sup>194</sup> *See id.*

<sup>195</sup> *See id.*

<sup>196</sup> *E.g.*, AeroVironment, Dragon Eye Technical Specifications, [http://www.avinc.com/downloads/Dragon\\_Eye\\_AV\\_datasheet.pdf](http://www.avinc.com/downloads/Dragon_Eye_AV_datasheet.pdf) (last visited Aug. 15, 2009); AeroVironment; *supra* note 14; Octatron, *supra* note 80.

<sup>197</sup> *E.g.*, AeroVironment, Dragon Eye, *supra* note 196.

<sup>198</sup> *E.g., id.*

<sup>199</sup> *Cf.* OFFICE OF THE SECRETARY OF DEFENSE, *supra* note 40, at 73 (listing the characteristics of the Shadow 200 UAS including length, wingspan, and power).

<sup>200</sup> *See* People v. Pollock, 796 P.2d 63, 63 (Colo. Ct. App. 1990) (noting that a helicopter hovering at 200 feet generated “enough noise that numerous people ran out of their houses to see what was going on”).

<sup>201</sup> *See* AeroVironment, Dragon Eye, *supra* note 196.

Although not an inherent characteristic of a UAS, the absence of an onboard pilot in UASs has led to one additional significant distinction between manned surveillance aircraft and UAS platforms. In 2008, the Federal Aviation Administration (FAA) indicated its concern regarding the growing popularity and interest in UAS technology and the potential implications associated with the operations of unmanned systems within the national airspace.<sup>202</sup> According to the FAA, a variety of groups, including law enforcement agencies, proceeded with UAS deployment under the mistaken belief that their operations were allowed under the model aircraft operating standards contained in FAA Advisory Circular 91-57.<sup>203</sup> In its National Policy Order 1110.150, the FAA clarified its position on the issue and announced the creation of the Small Unmanned Aircraft System Aviation Rulemaking Committee.<sup>204</sup> According to a 2008 GAO report addressing the integration of UASs within the national airspace, the development of regulations allowing routine access to the national airspace system may take over a decade.<sup>205</sup> One of the main challenges associated with the integration is the development of systems that will permit UASs to meet the safety requirements of the national airspace system.<sup>206</sup> Presently, UASs are unable to comply with fundamental safety requirements, such as being able to see and avoid other aircraft.<sup>207</sup> Until the FAA develops regulations that permit routine access for UASs, agencies that wish to operate UASs within the national airspace system must comply with a myriad of special permitting requirements managed by the FAA.<sup>208</sup> This practice stands in sharp contrast with the well-established requirements applicable to conventional aircraft and pilots desiring to operate within the national airspace system.<sup>209</sup>

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<sup>202</sup> FAA, *supra* note 75.

<sup>203</sup> *Id.*

<sup>204</sup> *Id.*

<sup>205</sup> GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 4.

<sup>206</sup> *Id.* at 3.

<sup>207</sup> *Id.* at 17–18.

<sup>208</sup> See generally AVIATION SAFETY UNMANNED AIRCRAFT PROGRAM OFFICE (detailing the special permitting requirements associated with the operation of UASs in the national airspace system).

<sup>209</sup> See generally FEDERAL AVIATION ADMINISTRATION, PILOT'S HANDBOOK OF AERONAUTICAL KNOWLEDGE, ch.14 (2008) (describing the attributes and requirements associated with the national airspace system).

B. APPLYING SUPREME COURT JURISPRUDENCE  
TO UAS SURVEILLANCE

As the Supreme Court's most recent pronouncement regarding Fourth Amendment protections and home surveillance, courts should look to *Kyllo* to determine the constitutionality of warrantless surveillance performed using UAS technology. Following *Kyllo*, a court should hold that warrantless surveillance, at least of the curtilage of the home, using UAS technology is a search within the meaning of the Fourth Amendment and therefore "presumptively unconstitutional."<sup>210</sup> Holding that UAS surveillance is a search by analogizing to *Kyllo* would not be inconsistent with the existing Supreme Court opinions regarding aerial surveillance. Indeed, such a holding would be the logical outcome, as many of the issues addressed in *Kyllo* are directly related to UAS surveillance.

In *Kyllo*, the Supreme Court drew a bright-line at the door to the home, holding 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."<sup>211</sup> The Court recognized that "it may be difficult to refine [the two pronged test stated in] *Katz* when the search of areas such as telephone booths, automobiles, or even the curtilage and uncovered portions of residences is at issue."<sup>212</sup> When considering the interior of the home, though, the Court identified that a refinement already existed: "in the case of the search of the interior of homes . . . 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*."<sup>213</sup>

Despite focusing its holding on the interior of the home, the Court stressed the heightened constitutional protections afforded to the curtilage of the home.<sup>214</sup> While framing the question presented in *Kyllo*, Justice Scalia reiterated that *Dow Chemical*, which upheld the constitutionality of high-resolution aerial photography of an industrial complex, was "*not* an area

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<sup>210</sup> *Kyllo v. United States*, 533 U.S. 27, 32 (2001).

<sup>211</sup> *Id.* at 34 (citation omitted).

<sup>212</sup> *Id.* at 34.

<sup>213</sup> *Id.*

<sup>214</sup> *Id.* at 33.

immediately adjacent to a private home, where privacy expectations are most heightened.’”<sup>215</sup> This implies that although the curtilage does not benefit from the absolute protection afforded to the interior of the home, there is a close relationship between the two, and that technology directed at the home and its curtilage will be subjected to a more skeptical analysis than would be applied in a case involving open fields or industrial areas.<sup>216</sup> Therefore, while naked-eye observations of the curtilage of the home made from conventional aircraft may not violate an expectation of privacy that “society is prepared to recognize as ‘reasonable,’”<sup>217</sup> the same surveillance conducted using cameras mounted to a UAS airframe is likely to produce an opposite result. Applying the Court’s analysis in *Kyllo* to answer the questions unresolved by *Ciraolo*, *Dow Chemical*, and *Riley*, bolsters the conclusion that warrantless UAS surveillance of the curtilage of the home is unconstitutional.

In reaching its conclusion in *Kyllo*, the Court focused on the relative unavailability of thermal imaging technology to the public.<sup>218</sup> Under *Kyllo*, the public’s ability to use technology to reveal information previously considered private represents the outer limits of what is acceptable in government surveillance.<sup>219</sup> Referring to *Ciraolo* and *Dow Chemical*, Justice Scalia stated that “the technology enabling 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.”<sup>220</sup> These previous Supreme Court opinions presented the possibility that the unavailability of technology to the public was a factor for a court to consider in its analysis.<sup>221</sup> *Kyllo*, holding that a search occurs when “the technology in question is not in general public use,” establishes this factor as an affirmative limitation on constitutional surveillance.<sup>222</sup>

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<sup>215</sup> *Id.* at 33 (quoting *Dow Chemical Co. v. United States*, 467 U.S. 227 (1986)).

<sup>216</sup> *See Dow Chemical*, 467 U.S. at 235 (“The curtilage area immediately surrounding a private house has long been given protection as a place where the occupants have a reasonable and legitimate expectation of privacy that society is prepared to accept.”).

<sup>217</sup> *Katz v. United States* 389 U.S. 347, 361 (1967) (Harlan, J., concurring).

<sup>218</sup> *Kyllo*, 533 U.S. at 40.

<sup>219</sup> *See id.*

<sup>220</sup> *Id.* at 34.

<sup>221</sup> *Id.* at 39 n.6; *Dow Chemical*, 476 U.S. at 238 (“[S]urveillance . . . using highly sophisticated surveillance equipment not generally available to the public . . . might be constitutionally proscribed absent a warrant.”).

<sup>222</sup> *Kyllo*, 533 U.S. at 34.

Considering that the use of UAS platforms is generally limited to the federal government, particularly the military, and that a public market for UASs is unlikely to emerge in the near term, it is reasonable to conclude that for the foreseeable future, UASs will be a technology “not in general public use.”<sup>223</sup> Furthermore, the lack of regulations allowing routine access to the national airspace system weighs heavily against a finding that the public generally uses UASs. Because of the lack of public use, UAS surveillance of the curtilage of the home should be unconstitutional in the absence of a warrant. In addition to following from *Kyllo*, the determination that warrantless UAS surveillance is unconstitutional because of the lack of public use is consistent with the opinions in *Ciraolo*, *Dow Chemical*, and *Riley*. In these three opinions, the Court tied its conclusion that the expectation of privacy was unreasonable to the fact that “private and commercial flight in the public airways [was] routine.”<sup>224</sup> Considering the absence of “routine” flights by UASs, it is not offensive to the established Supreme Court jurisprudence regarding aerial surveillance for a court to hold that UAS surveillance is a search under the Fourth Amendment.

In determining that UAS surveillance is a search under the Fourth Amendment, the implication of “general public use” is not limited merely to the UAS airframe itself. Considering that UAS surveillance relies on cameras, the public availability of the camera technology is also a significant factor. While a UAS can be outfitted with conventional optics, many are also capable of supporting thermal-imaging systems, night-vision devices, and other advanced sensors.<sup>225</sup> Assuming that these sensor systems are not generally used by the public, the use of the sensors in UAS surveillance suggests that the surveillance is a search for Fourth Amendment purposes.

The necessity for cameras and, to a degree, the use of UAS platforms generally, presents an additional reason to find that UAS surveillance is a Fourth Amendment search. In *Ciraolo* and *Riley*, the Court considered naked-eye observations conducted during the aerial surveillance.<sup>226</sup> Although *Dow Chemical* addressed aerial photography, the Court expressly identified that

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<sup>223</sup> *Id.*; see GAO REPORT: FEDERAL ACTIONS NEEDED, *supra* note 7, at 13–15.

<sup>224</sup> *California v. Ciraolo*, 476 U.S. 207, 215 (1986); see *Florida v. Riley*, 488 U.S. 445, 454–55 (1989) (O’Connor, J., concurring); *Dow Chemical*, 476 U.S. at 239.

<sup>225</sup> Coffey & Montgomery, *supra* note 50, at 7.

<sup>226</sup> *Riley*, 488 U.S. at 448; *Ciraolo*, 476 U.S. at 213.



it was not considering the curtilage of the home.<sup>227</sup> In all three of the opinions though, the Court noted as significant the fact that the surveillance did not reveal "intimate details."<sup>228</sup> Justice Scalia however, directly addressing the Court's opinion in *Ciraolo*, stated that the focus of the Court was "not upon intimacy but upon otherwise-imperceptibility."<sup>229</sup> Under this metric, Justice Scalia concluded that, applied to the interior of the home, the use of technology to "explore details . . . that would previously have been unknowable without physical intrusion" was a search.<sup>230</sup> The recognition that naked-eye aerial observations of the curtilage of the home are permissible is consistent with the reduced expectation of privacy associated with the ability to observe areas in plain view.<sup>231</sup> However, the general principle of otherwise-imperceptibility should apply when surveillance of the curtilage of the home goes beyond what is merely in plain view—that is, subject to aerial observation with the naked eye. When police officials use cameras and other sensors affixed to a UAS airframe to see what they would be unable to detect without physical intrusion into the curtilage, a court should conclude that a search has occurred.<sup>232</sup>

While the proposition of imperceptibility certainly should apply to cameras and UASs that permit resolution greater than or different from what a police officer could obtain through naked-eye observations, it is tempting to assert that so long as UAS surveillance reveals no more than manned surveillance, despite the lack of public use, the surveillance should not be a search. Indeed, this would seem to follow from the Court's opinion in *United States v. Knotts*.<sup>233</sup> In *Knotts*, the use of an electronic tracking device was not a search because it did not reveal anything that the public could not observe through visual observation.<sup>234</sup> In *Kyllo*, however, the Court appears to reject the notion that technology is an acceptable substitute for naked eye obser-

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<sup>227</sup> *Dow Chemical*, 476 U.S. at 239.

<sup>228</sup> See *Kyllo v. United States*, 533 U.S. 27, 37–38 (2001); *Riley*, 488 U.S. at 452.

<sup>229</sup> *Kyllo*, 533 U.S. at 38 n.5.

<sup>230</sup> *Id.* at 40.

<sup>231</sup> *Katz v. United States*, 389 U.S. 347, 351 (1967) ("What a person knowingly exposes to the public . . . is not a subject of Fourth Amendment protection.").

<sup>232</sup> Cf. *United States v. Karo*, 468 U.S. 705, 715–16 (1984) (discussing how the use of an electronic beeper that permitted the law enforcement agents to "obtain information that [they] could not have obtained by observation from outside the curtilage of the house" was a search).

<sup>233</sup> *United States v. Knotts*, 460 U.S. 276, 282 (1983).

<sup>234</sup> *Id.*

vations.<sup>235</sup> Responding to the dissent, Justice Scalia stated that “[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.”<sup>236</sup> Under this view, the mere fact that the police could make the same observations from a manned aircraft does not legitimize the use of means of surveillance that would otherwise be unconstitutional.

Furthermore, it is highly questionable whether UAS surveillance can ever be the functional equivalent of manned surveillance. As previously identified, the inherent characteristics of small UAS platforms permit them to operate and conduct surveillance through relative stealth.<sup>237</sup> This feature has two significant implications germane to the determination that UAS surveillance constitutes a search under the Fourth Amendment.

First, the lack of stealth associated with conventional aircraft provides an individual with notice—as a low-flying helicopter approaches, a person may be able to take measures to keep private those activities that they do not wish to expose to public view. If conducted through stealth, however, the surveillance may reveal details that the person would otherwise keep private. This situation is closely analogous to the rejection of intimacy as a factor in assessing the constitutionality of surveillance in *Kyllo*.<sup>238</sup> Using imperceptibility as the basis for evaluating the constitutionality of technology, a police officer employing a UAS, regardless of the type of camera, will be unable to assess the constitutionality of the surveillance in advance. The officer will not know whether the stealth aerial surveillance will reveal activities that would be imperceptible using a manned aircraft until the activities are actually observed.

Second, while courts judge the invasiveness of a conventional aircraft based on the aircraft’s interference with the normal use of the curtilage through noise, wind, dust, and threat of injury,<sup>239</sup> the invasiveness of UAS surveillance is grounded in other considerations. While it may be true that the surveillance becomes more invasive as it becomes more disruptive, it does not necessarily follow that it also becomes less invasive as it becomes less disruptive. Justice Brennan, in his dissent to *Riley*, questioned this relationship: “[i]f indeed the purpose of the re-

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<sup>235</sup> See *Kyllo*, 533 U.S. at 35 n.2.

<sup>236</sup> *Id.*

<sup>237</sup> See *supra* Part I.D.

<sup>238</sup> See *Kyllo*, 533 U.S. at 38–39.

<sup>239</sup> *Florida v. Riley*, 488 U.S. 445, 452 (1989).

straints imposed by the Fourth Amendment is to ‘safeguard the privacy and security of individuals,’ then it is puzzling why it should be the helicopter’s noise, wind, and dust that provides the measure of whether this constitutional safeguard has been infringed.”<sup>240</sup> In actuality, one would expect that the opposite considerations would be more relevant in determining if surveillance violates the Fourth Amendment. Although describing the “Panopticon” structure for prison design,<sup>241</sup> Professor Solove’s observations could equally apply to UAS surveillance conducted in relative stealth:

Those in the tower can watch any inmate but they cannot be seen. By always being visible, by constantly living under the reality that one could be observed at any time, people assimilate the effects of surveillance into themselves. They obey not because they are monitored but because of their fear that they could be watched. This fear alone is sufficient to achieve control. The Panopticon is so efficient that nobody needs to be in the tower at all.<sup>242</sup>

The power of the Panopticon suggests that surveillance conducted with UAS technology may be far more intrusive than conventional aerial surveillance precisely because of the lack of noise, wind, and dust. Although not directly addressed in *Kyllo*, this tension is apparent in the Court’s discussion of thermal-imaging technology. Justice Scalia began his analysis in *Kyllo* by stating that

[i]t would be foolish to contend that the degree of privacy secured to citizens by the Fourth Amendment has been entirely unaffected by the advance of technology. . . . The question we confront today is what limits there are upon this power of technology to shrink the realm of guaranteed privacy.<sup>243</sup>

Were the courts to conclude that UAS surveillance was not a search for Fourth Amendment purposes, the “realm of guaranteed privacy” that applies to the curtilage of the home would not

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<sup>240</sup> *Id.* at 462 (Brennan, J., dissenting).

<sup>241</sup> The Panopticon is a prison design that places a guard tower at the center of a circular building of cells. Each cell is open to the central tower and backlit so that the guards concealed in the tower can easily observe the prisoners. A prisoner however, is unable to determine if he is actually being watched at any given time. DANIEL J. SOLOVE, *THE DIGITAL PERSON: TECHNOLOGY AND PRIVACY IN THE INFORMATION AGE* 30–31 (2004).

<sup>242</sup> *Id.*

<sup>243</sup> *Kyllo*, 533 U.S. at 33–34.

be shrunk—it would be eliminated.<sup>244</sup> Just as the Panopticon can create a culture of surveillance “so efficient that nobody needs to be in the tower at all,”<sup>245</sup> the possibility of UAS surveillance could lead to an environment where individuals believe that a UAS is watching them even when no UASs are in operation. This potential for indiscriminate stealth aerial surveillance would render any expectation of privacy in the curtilage of the home unreasonable, and thus remove it from the scope of Fourth Amendment protection. As the Court stated in *United States v. Karo*, the “[i]ndiscriminate monitoring of property that has been withdrawn from public view would present far too serious a threat to privacy interests in the home to escape entirely some sort of Fourth Amendment oversight.”<sup>246</sup>

#### IV. CONCLUSIONS—THE UNCERTAIN FUTURE OF UAS SURVEILLANCE

Under the existing Supreme Court jurisprudence related to aerial surveillance and the privacy implications of surveillance technology, courts should determine that the warrantless UAS surveillance of the curtilage of the home is an unconstitutional search within the meaning of the Fourth Amendment. This conclusion follows from a variety of factors, such as the rarity of UAS use within the public sector, the ability of the technology to perceive details that would otherwise be imperceptible without physically entering the curtilage of the home, and the invasive nature of UAS surveillance conducted through stealth. Unfortunately, however, attempting to conclude what courts, once presented with the question, will ultimately decide is speculative at best. The foregoing analysis of the unconstitutionality of warrantless UAS surveillance presents at least one potential paradox that courts will eventually need to resolve. So long as UAS flights remain rare, the technology poses only a limited threat to privacy within the curtilage of the home. However, if courts continue to use the routine nature of public flight to support finding that aerial surveillance is not a search, then as UAS flights become increasingly routine they will (1) present an ever greater threat to privacy and (2) be more likely not to be a search subject to Fourth Amendment constraints. While the Supreme Court hinted at this conceptual problem in *Kyllo*, it de-

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<sup>244</sup> *Id.*; see *Dow Chemical Co. v. United States*, 533 U.S. 227, 235 (1986).

<sup>245</sup> SOLOVE, *supra* note 241, at 31.

<sup>246</sup> *United States v. Karo*, 468 U.S. 705, 716 (1984).

clined to resolve the issue.<sup>247</sup> The ultimate resolution of this concern may significantly impact the constitutionality of the surveillance.

Analyzing public conceptions of privacy and reconciling them with Supreme Court decisions, Professor Rosen noted that “the real problem with the Supreme Court’s test of invasions of privacy is not empirical but conceptual.”<sup>248</sup> Professor Rosen and other scholars and jurists have noted the circular or “self indulgent” nature of Justice Harlan’s two-part analysis from *Katz*.<sup>249</sup> As Justice Scalia observed “unsurprisingly, those ‘actual (subjective) expectation[s] of privacy’ ‘that society is prepared to recognize as reasonable’ bear an uncanny resemblance to those expectations of privacy that this Court considers reasonable.”<sup>250</sup> Professor Rosen takes a less generous view of the Supreme Court’s conclusions, stating that

[i]t’s not surprising that Supreme Court justices, who are secluded in a marble palace and have spent most of their careers in the cosseted solitude of lower courts and universities, aren’t terribly good at predicting how much privacy ordinary Americans expect. . . . In many cases, people have an objectively valid expectation of privacy that the Court, by judicial fiat, has deemed unjustifiable.<sup>251</sup>

These assertions, coupled with the fact that opinions such as *Kyllo*, *Ciraolo*, and *Dow Chemical* were decided in a five-four split of the court and the opinion in *Riley* failed to secure the signatures of five justices, means that any shift in the Court’s composition could significantly alter future decisions. It is entirely possible that while a strong case for the unconstitutionality of warrantless UAS surveillance may exist today, a future composition of the Supreme Court may reach an opposite conclusion.

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<sup>247</sup> Compare *Kyllo*, 533 U.S. at 39 n.6 (attributing the issue to *Ciraolo*) with *Kyllo*, 533 U.S. at 47 (Stevens, J., dissenting) (noting the potential conflict).

<sup>248</sup> ROSEN, *supra* note 101, at 63.

<sup>249</sup> *Minnesota v. Carter*, 525 U.S. 83, 97 (1998) (Scalia, J., concurring); ROSEN, *supra* note 101, at 60–61.

<sup>250</sup> *Carter*, 525 U.S. at 97 (Scalia, J., concurring).

<sup>251</sup> ROSEN, *supra* note 101, at 62–63.