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Protecting Privacy From Aerial Surveillance:

Recommendations for Government Use of Drone Aircraft

Report by Jay Stanley and Catherine Crump

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American Civil Liberties Union
125 Broad Street, 18th Floor
New York, NY 10004
www.aclu.org

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Introduction

Unmanned aircraft carrying cameras raise the prospect of a significant new avenue for the surveillance of American life. Many Americans have heard of these aircraft, commonly called drones, because of their use overseas in places like Afghanistan and Yemen.[1] But drones are coming to America. Their deployment has so far been held up by the Federal Aviation Administration (FAA) over safety concerns, but that agency is under strong industry and Congressional pressure to pave the way for domestic deployment. Meanwhile, the technology is quickly becoming cheaper and more powerful, interest in deploying drones among police departments is increasing, and our privacy laws are not strong enough to ensure that the new technology will be used responsibly and consistently with democratic values.

In short, all the pieces appear to be lining up for the eventual introduction of routine aerial surveillance in American life—a development that would profoundly change the character of public life in the United States.

We need a system of rules to ensure that we can enjoy the benefits of this technology without bringing us a large step closer to a "surveillance society" in which our every move is monitored, tracked, recorded, and scrutinized by the authorities. In this paper, we outline a set of protections that we believe would protect Americans' privacy in the coming world of drones.

Aerial surveillance from manned aircraft has been with us for decades. One of the first aircraft the Wright brothers built was a surveillance aircraft, and it was sold to the U.S. Army. Many common uses of drone aircraft—search and rescue, fighting wildfires, dangerous tactical police operations—are beneficial. In the 1980s the Supreme Court ruled that the Fourth Amendment does not categorically prohibit the government from carrying out warrantless aerial surveillance of private property.

Manned aircraft are expensive to purchase, operate and maintain, and this expense has always imposed a natural limit on the government's aerial surveillance capability. This natural limit is eroding.

But manned aircraft are expensive to purchase, operate and maintain, and this expense has always imposed a natural limit on the government's aerial surveillance capability. Now that surveillance can be carried out by unmanned aircraft, this natural limit is eroding. The prospect of cheap, small, portable flying video surveillance machines threatens to eradicate existing practical limits on aerial monitoring and allow for pervasive surveillance, police fishing expeditions, and abusive use of these tools in a way that could eventually eliminate the privacy Americans have traditionally enjoyed in their movements and activities.

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1 The ACLU has filed a Freedom of Information Act (FOIA) lawsuit against the U.S. Department of Defense and the Central Intelligence Agency asking for information on when, where and against whom drone strikes can be authorized, the number and rate of civilian casualties and other basic information essential for assessing the wisdom and legality of using armed drones to conduct targeted killings. See ACLU, "Predator Drone FOIA" web page, at http://www.aclu.org/national-security/predator-drone-foia. The focus of this report is on a different subject: their domestic use for surveillance.

Just as the FAA regulates drones to ensure that they are safe, so, too, should drones be regulated so they are not used in ways that infringe on privacy. The FAA's primary purpose is protecting the physical safety of the national airspace, but its mandate also extends to "protecting individuals . . . on the ground," and the courts have suggested that this mandate is a broad one.[2] Therefore, the FAA's obligation to protect individuals on the ground should include protecting the privacy that Americans have traditionally enjoyed and rightly expect. If the agency refuses to do so, or is found by the courts to have limited powers in that area, then Congress should step in to directly enact any additional protections that are needed to preserve that privacy.

The technology

There are hundreds of different types of Unmanned Aerial Vehicles (UAVs), as drones are formally known.[3] They can be as large as commercial aircraft or as small as hummingbirds, and include human remotely guided aircraft as well as autonomous, self-guided vehicles. They include:

- **Large fixed-wing aircraft.** The largest UAVs currently in use, such as the Israeli-made Eitan, are about the size of a Boeing 737 jetliner. The Eitan's wingspan is 86 feet, and it can stay aloft for 20 hours and reach an altitude of 40,000 feet.[4] The Predator B drone, which has been used extensively on overseas battlefields as well as on the U.S.-Mexico border, has a wingspan of 66 feet, and it can stay aloft for over 30 hours and reach an altitude of 50,000 feet.[5] In Pakistan and Afghanistan, the U.S. military and CIA deploy Predators and Reapers armed with surveillance capability as well as missiles capable of destroying a moving vehicle from thousands of feet in the air.[6]
- **Small fixed-wing aircraft.** Smaller fixed-wing aircraft are the current favorite for domestic deployment. The Houston police department, for example, recently tested the ScanEagle, made by Boeing subsidiary Insitu.[7] The ScanEagle is 4 ½ feet long with a wingspan of 10 feet, and it can climb to 19,500 feet and stay aloft for more than 24 hours.[8]

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2 49 U.S.C. § 40103(b)(2)(B) (2006); City of Burbank v. Lockheed Air Terminal, Inc., 411 U.S. 624, 626-27 (1973) ("[T]he Administrator of the Federal Aviation Administration (FAA) has been given broad authority to regulate the use of the navigable airspace, 'in order to insure the safety of aircraft and the efficient utilization of such airspace . . .' and 'for the protection of persons and property on the ground.'").

3 See Wikipedia, "List of unmanned aerial vehicles," at http://en.wikipedia.org/wiki/List_of_unmanned_aerial_vehicles.

4 "Israel unveils world's largest UAV," *Homeland Security Newswire*, Feb. 23, 2010, online at http://homelandsecuritynewswire.com/israel-unveils-worlds-largest-uav.

5 See General Atomics web page on Predator B at http://www.ga-asi.com/products/aircraft/predator_b.php; R.P.G. Collinson, *Introduction to Avionic Systems* (2011), p. 495.

6 Yochi J. Dreazen, "From Pakistan, With Love: The technology used to monitor the skies over Waziristan is coming to your hometown," *National Journal*, March 13, 2011, online at http://www.nationaljournal.com/magazine/drones-may-be-coming-to-your-hometown-20110313.

7 Stephen Dean, "Police line up to use drones on patrol after Houston secret test," *Houston Examiner*, Jan. 11, 2010, online at http://www.examiner.com/page-one-in-houston/police-line-up-to-use-drones-on-patrol-after-houston-secret-test.

8 Insitu, ScanEagle brochure, online at http://www.insitu.com/documents/Insitu%20Website/Marketing%20Collateral/ScanEagle%20Folder%20Insert.pdf

- **Backpack craft.** Another class of craft is designed to be carried and operated by a single person. The hand-launched AeroVironment Raven, for example, weighs 4 pounds, has a wingspan of 4.5 feet and a length of 3 feet, can fly up to 14,000 feet and stay aloft for up to 110 minutes. Similar-sized products include a three-foot helicopter called the Draganflyer X6, a one-foot-long, one-pound fixed-wing craft called the AeroVironment Wasp, and a fan-propelled craft called the Honeywell T-Hawk that can "hover and stare." Individual hobbyists have also built a number of drones in this size range.[9]

- **Hummingbirds.** A tiny drone called the Nano Hummingbird was developed for the Pentagon's Defense Advanced Research Projects Agency (DARPA) by AeroVironment. Intended for stealth surveillance, it can fly up to 11 miles per hour and can hover, fly sideways, backwards and forwards, for about 8 minutes. It has a wingspan of 6.5 inches and weighs only 19 grams—less than a single AA battery.[10]

- **Blimps.** By mid-2012, the Air Force aims to fly a massive, 370-foot long blimp over Afghanistan.[11] Some blimps are envisioned as high-altitude craft, up to 300 feet in diameter, that would compete with satellites, while others would be low-altitude craft that would allow the police to monitor the streets. Supporters say they are more cost-effective than other craft due to their ability to stay aloft for extended periods.[12]

- **Satellites.** While not precisely drones, space satellites raise many of the same issues. In 2007 the Department of Homeland Security approved a plan to allow U.S. law enforcement to turn the nation's powerful spy satellites inward for use domestically.[13] The program, which was run by the blandly named "National Applications Office," provoked continuing objections from members of Congress as well as privacy and civil liberties groups,[14] which raised numerous questions about the program's unclear legal basis, its inadequate privacy controls and the worrisome implications of using military assets for domestic law enforce-

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9 AeroVironment brochure, online at http://www.avinc.com/downloads/Raven_Domestic_1210.pdf; AeroVironment web page on the Wasp at http://www.avinc.com/uas/small_uas/wasp/; Carrie Kahn, "It's A Bird! It's A Plane! It's A Drone!" National Public Radio, March 14, 2011, online at http://www.npr.org/2011/03/14/134533552/its-a-bird-its-a-plane-its-a-drone; "Drones on the home front," *Washington Post*, Jan. 23, 2011, online at http://www.washingtonpost.com/wp-srv/special/nation/drone-gallery/.

10 W.J. Hennigan, "It's a bird! It's a spy! It's both," *Los Angeles Times*, Feb. 17, 2011, online at http://articles.latimes.com/2011/feb/17/business/la-fi-hummingbird-drone-20110217.

11 Noah Shachtman, "Look: Giant Spy Blimp Dwarfs 18-Wheeler," *Wired.com*, Oct. 7, 2011, online at http://www.wired.com/dangerroom/2011/10/giant-blimp-dwarfs-truck.

12 On high-altitude blimps see Elliott Minor, "Interest Growing in 'Security' Blimps," Associated Press, April 27, 2004, available online at http://www.rustysforum.com/cgi-bin/domains/com/rustysforum/frc_bb/ultimatebb.cgi?ubb=next_topic&f=1&t=000807&go=older; on low-altitude blimps see e.g. James Nelson, "Utah city may use blimp as anti-crime spy in the sky," Reuters, Jan. 16, 2011, online at http://www.reuters.com/article/2011/01/16/us-crime-blimp-utah-idUSTRE70F1DJ20110116.

13 See Joby Warrick, "Domestic Use of Spy Satellites To Widen," *Washington Post*, Aug. 16, 2007, online at http://www.washingtonpost.com/wp-dyn/content/article/2007/08/15/AR2007081502430.html; Siobhan Gorman, "Satellite-Surveillance Program to Begin Despite Privacy Concerns," *Wall Street Journal*, Oct. 1, 2008, online at http://online.wsj.com/article/SB122282336428992785.html.

14 Congressional testimony on this issue by the ACLU, which helped prod Congress on the issue, is available online at http://www.aclu.org/privacy/gen/31835prs20070906.html

ment. Amid continuing debate, DHS decided in 2009 to end the program.[15] It is unclear what the precise capabilities and limits of the nation's spy satellite system are in terms of the resolution of the images they take, their ability to target specific geographic areas, and the degree to which they utilize thermal and other forms of imaging that reveal details not visible to the naked eye. It is known that their telescopes can peer at the surface of the earth in great detail.

Drone capabilities—today and in the future

The aircraft themselves are steadily improving and, as with so many technologies, that is likely to continue. They are becoming smaller. The military and law enforcement are keenly interested in developing small drones, which have the advantages of being versatile, cheap to buy and maintain, and in some cases so small and quiet that they will escape notice.[16] They are also becoming cheaper. The amazing continual decreases in the prices of electronics that have become normal in our time all but guarantee that the surveillance technologies attached to UAVs will become less expensive and yet more powerful—and with mass production, the aircraft that carry those electronics will become inexpensive enough for a police department to fill the skies over a town with them.

Drones are also becoming smarter. Artificial intelligence advances will likely help drones carry out spying missions. Korean researchers, for example, are working to teach robots how to hide from and sneak up upon a subject.[17] They also will have better staying power, with a greater ability to stay aloft for longer periods of time. Mechanisms for increasing time aloft could include solar power, or the use of blimps or gliders.[18]

Although the primary uses of drones so far have been military, even on overseas battlefields their main use is surveillance. The larger drones can be fitted with weapons or other heavy payloads, but all of them can carry cameras and other imaging technologies that have developed amazing capabilities in recent years and are likely to become even more capable in the near future.

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15 Spencer S. Hsu, "DHS to Cut Police Access to Spy-Satellite Data," *Washington Post*, June 24, 2009, online at http://www.washingtonpost.com/wp-dyn/content/article/2009/06/23/AR2009062302060.htm; DHS, "Secretary Napolitano Announces Decision to End National Applications Office Program," DHS press release, June 23, 2009, online at http://www.dhs.gov/ynews/releases/pr_1245785980174.shtm.

16 W.J. Hennigan, "It's a bird! It's a spy! It's both," *Los Angeles Times*, Feb. 17, 2011, online at http://articles.latimes.com/2011/feb/17/business/la-fi-hummingbird-drone-20110217.

17 M. Ryan Calo, "Robots and Privacy," April 2010, online at http://ssrn.com/abstract=1599189.

18 "Gliders Emerge As Surveillance UAVs," *Aviation Week*, June 8, 2010, online at http://www.aviationweek.com/aw/generic/story_generic.jsp?topicName=ila_2010&id=news/awx/2010/06/08/awx_06_08_2010_p0-232627.xml; James Nelson, "Utah city may use blimp as anti-crime spy in the sky," Reuters, Jan. 16, 2011, online at http://www.reuters.com/article/2011/01/16/us-crime-blimp-utah-idUSTRE70F1DJ20110116; Ned Smith, "Solar-powered UAV can stay aloft 5 years," *TechNewsDaily*, Sept. 22, 2010, online at http://www.msnbc.msn.com/id/39313306/ns/technology_and_science-tech_and_gadgets/t/solar-powered-uav-can-stay-aloft-years.

Except for possibly the very lightest craft, drones can carry the full range of advanced surveillance technologies that have been developed—and are likely to be developed—including:

The military is developing radar technologies that can see through ceilings and walls and allow the tracking of human targets even when they are inside buildings.

- **High-power zoom lenses.** UAVs can carry increasingly powerful lenses that allow significant zooming, increasing the chance that individuals will come under scrutiny from faraway aircraft without knowing it. And the density of photo sensors is growing at an exponential pace (in line with Moore's law), allowing for higher and higher resolution photos to be taken for the same price camera.[19]

- **Night vision.** Infrared and ultraviolet imaging enable night vision by capturing light outside the spectrum visible to the human eye. Infrared imaging (also known as thermal imaging) shows heat emitted by an object, and so is especially suited for identifying humans and animals in the dark.[20] Ultraviolet (UV) imaging can detect some materials not visible in natural or infrared light, and can also be used to enhance detail; for instance, it can be used to image surface textures not apparent in visible light.[21] Moving forward, thermal imaging is likely to improve—for example becoming more sensitive and available at higher resolutions.

- **See-through imaging.** The military is developing radar technologies that can see through ceilings and walls and allow the tracking of human targets even when they are inside buildings.[22] A technology called Synthetic Aperture Radar, for example, can see through cloudy and dusty conditions and through foliage, and has the potential to penetrate the earth and walls.[23]

- **Video analytics.** This field seeks to apply artificial intelligence techniques not just to collect but also to "watch" video. The technology has been improving rapidly, and can recognize and respond to specific people, events, and objects.[24] One of the most significant uses would be to continually track individuals or vehicles as they move about, using face recognition or other

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19 Nathan Myhrvold, "Moore's Law Corollary: Pixel Power," *New York Times*, June 7, 2006, online at http://www.nytimes.com/2006/06/07/technology/circuits/07essay.html. Moore's law is the observation that the number of transistors that can be placed on an integrated circuit—and therefore broadly speaking the power of computers—doubles approximately every two years. It has held true for over 50 years.

20 NASA Science Mission Directorate, "Infrared Energy," Mission: Science, 2010, online at http://missionscience.nasa.gov/ems/07_infraredwaves.html.

21 Austin Richards, "Digital Reflected-Ultraviolet Imaging," *Advanced Imaging*, Apr. 2006, online at http://www.uvcorder.com/pdf/ADI0406%20Component%2018-20.pdf.

22 See e.g., William Saletan, "Nowhere To Hide," *Slate.com*, Sept. 17, 2008, online at http://www.slate.com/articles/health_and_science/human_nature/2008/09/nowhere_to_hide.html; Greg Miller and Julian E. Barnes, "Special drones pursue militias," *Los Angeles Times*, Sept. 12, 2008, online at http://articles.latimes.com/2008/sep/12/world/fg-pakistan12.

23 "Ground Moving Target Indicator (GMTI) Radar Discrimination of Combatants versus Animals in Severe Clutter," DARPA, undated document (topic number SB082-019), online at http://www.dodsbir.net/sitis/archives_display_topic.asp?Bookmark=32303. Sandia National Laboratories, "Synthetic Aperture Radar Applications," undated, online at http://www.sandia.gov/radar/sarapps.html; Alicia Tejada, "MIT Develops New Radar Technology: Military Could See Through Walls," ABC News, Oct. 20, 2011, online at http://abcnews.go.com/Technology/radar-technology-mit-walls/story?id=14773871.

24 Vigilant Video, online at http://www.vigilantvideo.com (last visited Aug. 12, 2011).

bodily characteristics.[25] It might also be used to identify particular movement patterns as "suspicious," or to identify and flag changes in routines, buildings or grounds.[26] Computers performing these tasks have a distinct advantage over human observers, because as one observer summed it up, "machines do not blink or forget. They are tireless assistants."[27]

- **Distributed video.** A large number of cheap, autonomous UAVs working in concert like a swarm of insects could provide surveillance capabilities impossible with just a few vehicles.[28] The Air Force is testing a system called "Gorgon Stare," which uses multiple video cameras that "will be looking at a whole city, so there will be no way for the adversary to know what we're looking at, and we can see everything," as an Air Force officer enthused to the *Washington Post*. The Air Force is seeking to put the system on a craft that can stay airborne for up to two weeks—and the Department of Homeland Security is exploring the technology for possible domestic applications.[29]

> "Gorgon Stare will be looking at a whole city, so there will be no way for the adversary to know what we're looking at, and we can see everything."
>
> —AIR FORCE MAJ. GEN. JAMES O. POSS

Current status of domestic deployment

So far the federal government has restricted law enforcement's use of drones out of concern for the safety of the airspace. But those restrictions may soon be loosened, and law enforcement has a strong interest in deploying drones as a cheap way to conduct surveillance that is now prohibitively expensive.[30] Already, limited deployments of UAVs have been made, including:

- Along the border. Since 2005, the Customs and Border Protection agency (CBP) has operated UAVs along the border. It currently operates seven Predator B drones, which are controlled remotely by pilots sitting in Arizona, North Dakota, and Florida, and hopes to expand that number to 24 by 2016, with 11 of those assigned to the southwest border and the rest

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25 Noah Shachtman, "Army Tracking Plan: Drones That Never Forget a Face," *Wired.com*, Sept. 28, 2011, online at http://www.wired.com/dangerroom/2011/09/drones-never-forget-a-face/.

26 On change detection, see Sandia National Laboratories, "Synthetic Aperture Radar Applications," undated, online at http://www.sandia.gov/radar/sarapps.html.

27 Steve Lohr, "Computers That See You and Keep Watch Over You," *New York Times*, Jan. 1, 2011, online at http://www.nytimes.com/2011/01/02/science/02see.html.

28 Darren Quick, "Boeing demonstrates swarm technology," *Gizmag.com*, Aug. 22, 2011, online at http://www.gizmag.com/uav-swarm-technology/19581/.

29 Ellen Nakashima and Craig Whitlock, "With Air Force's Gorgon Drone 'we can see everything'," *Washington Post*, Jan. 2, 2011, online at http://www.washingtonpost.com/wp-dyn/content/article/2011/01/01/AR2011010102690.html.

30 Yochi J. Dreazen, "From Pakistan, With Love: The technology used to monitor the skies over Waziristan is coming to your hometown," *National Journal*, March 10, 2011, online at http://www.nationaljournal.com/magazine/drones-may-be-coming-to-your-hometown-20110313.

elsewhere.[31] As of September 1, 2010, CBP drones patrol the entire length of the southern border.[32] Starting in February, the Department of Defense moved beyond the border, sending drones deep into Mexico in an effort to gather information about major drug traffickers as part of the Mexican drug war.[33]

- The Los Angeles Times reported in December 2011 that CBP has been making its Predator drones available for domestic law enforcement operations by local police departments, and federal agencies such as the FBI and the Drug Enforcement Administration have used Predators inside the United States as well. This expanded use of the Predators was carried out with no public knowledge or debate.[34]

- The police department in rural Mesa County, Colorado won FAA permission in early 2011 to operate its Draganflyer drones anywhere in the county, the first time a police department had won permission to operate in such a broad area.[35]

- The Miami police have also won permission to test drones, which they have been doing for more than 18 months with two 18-pound Honeywell aircraft, one of which they obtained with a grant from the federal government and the other of which Honeywell is loaning them. But they may only fly them over the everglades and no higher than 400 feet.[36]

- Police in Houston, Texas attempted to carry out secret tests of a drone in 2007, which were discovered and filmed by local television reporters. After a police spokesperson allowed that drones might ultimately be used to issue traffic tickets, support for the program reportedly collapsed.[37]

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31 "UAS Overview," U.S. Customs and Border Protection, Aug. 31, 2010, online at http://www.cbp.gov/xp/cgov/border_security/air_marine/uas_program/uasoverview.xml; Leslie Berestein, "Drones' Aim: Smugglers," *San Diego Union-Tribune*, Dec. 4, 2009, online at http://www.signonsandiego.com/news/2009/dec/04/drones-aim-smugglers/; General Accountability Office, "Observations on the Costs and Benefits of an Increased Department of Defense Role in Helping to Secure the Southwest Land Border," GAO-11-856R, Sept. 12, 2011, online at http://www.gao.gov/products/GAO-11-856R.

32 "U.S. Drones to Watch Entire Mexico Border from September 1," Reuters, Aug. 30, 2010, online at http://www.reuters.com/article/2010/08/30/us-usa-immigration-security-idUSTRE67T5DK20100830.

33 Ginger Thompson and Mark Mazzetti, "U.S. Drones Fight Mexican Drug Trade," *New York Times*, Mar. 15, 2011, online at http://www.nytimes.com/2011/03/16/world/americas/16drug.html.

34 Brian Bennett, "Police employ Predator drone spy planes on home front," *Los Angeles Times*, Dec. 10, 2011, online at http://www.latimes.com/news/nationworld/nation/la-na-drone-arrest-20111211,0,72624.full.story.

35 The FAA requires the operator to keep the craft within line of sight, and below 400 feet, however. John Dzenitis, "Cop Drone Stirs Big Brother Debate," KREX News Channel 5, Feb. 10, 2011, online at http://www.krextv.com/news/around-the-region/Cop-Drone-Stirs-Big-Brother-Debate-115796764.html; Shawn Zeller, "Unmanned Planes Take Off," *Congressional Quarterly Weekly—Vantage Point*, April 11, 2011, p. 785.

36 Yochi J. Dreazen, "From Pakistan, With Love: The technology used to monitor the skies over Waziristan is coming to your hometown," *National Journal*, March 10, 2011, online at http://www.nationaljournal.com/magazine/drones-may-be-coming-to-your-hometown-20110313.

37 Stephen Dean, "Local 2 Investigates Police Secrecy Behind Unmanned Aircraft Test," KPRC Local 2 News Houston, Nov. 21, 2007, online at http://www.click2houston.com/investigates/14659066/detail.html; Peter Finn, "Domestic use of aerial drones by law enforcement likely to prompt privacy debate," *Washington Post*, Jan. 23, 2011, online at http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html.

- Police in Arlington, Texas received a drone to help with security during the Super Bowl in February 2011 and FAA permission to deploy it for "training and evaluation" purposes in unpopulated areas.[38]
- The Texas Department of Public Safety has also been using unmanned surveillance aircraft for specific police operations. In one operation, they used a bird-sized "Wasp" aircraft for aerial surveillance as part of an operation in which a search warrant was executed on private property and a suspect arrested.[39]
- In 2011 the city of Ogden, Utah sought FAA permission to deploy an autonomous unmanned blimp for surveillance and crime prevention.[40]
- Hawaii has taken steps toward federal approval to fly drones for surveillance over its harbors, a plan that was reportedly "under review" by the state governor.[41]
- National Guard units around the country also operate drones to train for their use overseas. Brigades in 30 states have or are receiving AAI Shadow UAVs, which have a 14-foot wingspan and can fly 15,000 feet high.[42] The New York Air National Guard, meanwhile, deploys the much larger (66-foot wingspan) Reaper drone. The military is barred by law from engaging in domestic law enforcement, but Guard soldiers do practice their aerial tracking skills by following random civilian vehicles driving near the Adirondacks.[43]

Pressure on the FAA to loosen the rules

Despite strong interest in deploying drones from law enforcement, so far the domestic use of drones has been held back by the Federal Aviation Administration (FAA), which is responsible for the safety of the nation's airspace and has been proceeding very cautiously.[44] Any entity wishing to

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38 "Arlington, Texas hopes to keep aerial drone," *Homeland Security Newswire*, May 17, 2011, online at http://www.homelandsecuritynewswire.com/arlington-texas-hopes-keep-aerial-drone.

39 Peter Finn, "Domestic use of aerial drones by law enforcement likely to prompt privacy debate," *Washington Post*, Jan. 23, 2011, online at http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html.

40 James Nelson, "Utah city may use blimp as anti-crime spy in the sky," Reuters, Jan. 16, 2011, online at http://www.reuters.com/article/2011/01/16/us-crime-blimp-utah-idUSTRE70F1DJ20110116; Tim Gurrister, "Ogden blimp may be patrolling by Christmas," *Standard-Examiner* [Ogden, Utah], August 31, 2011, online at http://www.standard.net/stories/2011/08/29/ogden-blimp-may-be-patrolling-christmas.

41 Jim Dooley, "State Surveillance Drones 'Under Review,'" *Hawaii Reporter*, Feb. 1, 2011, online at http://www.hawaiireporter.com/state-surveillance-drones-under-review/123.

42 William Cole, "Hawaii Guard gets flock of Shadow UAVs," *Honolulu Star Advertiser*, May 25, 2011, online at http://www.staradvertiser.com/news/hawaiinews/20110525_hawaii_guard_gets_flock_of_shadow_UAVs.html.

43 Dave Tobin, "Unmanned drones, controlled by Air National Guard from Hancock Airfield, will fly over the Adirondacks," *Post-Standard* [Syracuse, NY], Feb. 6, 2011, online at http://www.syracuse.com/news/index.ssf/2011/02/unmanned_drones_controlled_by.html.

44 The FAA's rules for "Unmanned Aircraft Operations in the National Airspace System," effective March 28, 2011, are online at http://www.faa.gov/documentLibrary/media/Notice/N7210.766.pdf.

operate a UAV must obtain permission from the agency,[45] and the FAA has only permitted a small number of domestic law enforcement agencies to do so—and attaches strict conditions to their flights.[46]

Aerospace companies are looking beyond Iraq, Pakistan and Afghanistan and see a potentially lucrative domestic market for their technology.

However, the FAA is coming under increasing pressure from industry and its allies in Congress, as well as law enforcement agencies, to open the skies to UAVs. Aerospace companies are looking beyond Iraq, Pakistan and Afghanistan and see a potentially lucrative domestic market for their technology, and supporters argue that the United States must loosen restrictions on the technology so that the nation can be a leader in the industry.[47] Manufacturers have formed a trade association, the Association for Unmanned Vehicle Systems International.[48] Pressure is also coming from states; for example Oklahoma, hoping to help retain and attract aerospace businesses, is pushing to create an 80-mile corridor where drones could fly without specific FAA permission.[49]

Proposed legislation would require the FAA to grant permits more quickly and allow broader use of the technology by 2015.[50] Meanwhile, amid the mounting pressure, the FAA is planning to create a more permissive approval system for commercial UAV operations, which have been severely restricted until now.[51]

The FAA's caution is understandable—the prospect of unmanned flying robots being introduced into the national air space obviously raises very serious safety issues. Groups representing pilots and aircraft operators have expressed concern about UAVs, and have argued that they should not

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45 In 2006 the Los Angeles County Sheriff was slapped down by the FAA after they tested a surveillance drone without agency permission. Lynn Doan and Ashraf Khalil, "FAA Grounds L.A. Sheriff's Drone Air Force," *Los Angeles Times*, June 22, 2006, online at http://articles.latimes.com/2006/jun/22/local/me-drone22. The agency also told police in Gaston County, N.C. that a 15-pound drone they were testing could not be flown without permission. Yochi J. Dreazen, "From Pakistan, With Love: The technology used to monitor the skies over Waziristan is coming to your hometown," *National Journal*, March 10, 2011, online at http://www.nationaljournal.com/magazine/drones-may-be-coming-to-your-hometown-20110313.

46 Peter Finn, "Domestic use of aerial drones by law enforcement likely to prompt privacy debate," *Washington Post*, Jan. 23, 2011, online at http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html. The FAA sometimes also grants the military swaths of restricted airspace where UAVs can be freely flown. For the private sector, getting permission to fly a UAV is much harder; they are only granted for research and development, demonstrations, and crew training. Although rules permit their operation by hobbyists, commercial uses of UAVs are not permitted. Government entities wishing to fly drones (from law enforcement at all levels to state universities to the Department of Defense) must obtain a certificate from the FAA (a "Certificate of Waiver or Authorization," or COA). The permit available to non-government parties is called the "Special Airworthiness Certificate—Experimental Category." The FAA's regulations, "Unmanned Aircraft Operations in the National Airspace System," effective March 28, 2011, are online at http://www.faa.gov/documentLibrary/media/Notice/N7210.766.pdf.

47 Yochi J. Dreazen, "From Pakistan, With Love: The technology used to monitor the skies over Waziristan is coming to your hometown," *National Journal*, March 10, 2011, online at http://www.nationaljournal.com/magazine/drones-may-be-coming-to-your-hometown-20110313.

48 *See* Association for Unmanned Vehicle Systems International website, http://www.auvsi.org/Home.

49 Neal Ungerleider, "Oklahoma Wants To Reserve Airspace For Drones," Talking Points Memo Idea Lab, July 26, 2011, online at http://idealab.talkingpointsmemo.com/2011/07/oklahoma-blocks-off-airspace-for-drones.php.

50 Shawn Zeller, "Unmanned Planes Take Off," *Congressional Quarterly Weekly—Vantage Point*, April 11, 2011, p. 785.

51 U.S. Dep't of Transp., Report on DOT Significant Rulemakings: FAA, Aug. 2011, online at http://regs.dot.gov/rulemakings/201108/FAA.htm#11.

be permitted to operate in the National Air Space unless they have the same ability as all other aircraft to fly under visual flight rules, and can be certified to the same level as manned aircraft.[52] A number of domestic UAV accidents have been reported; in 2006, for example, a Predator B drone operated by Customs and Border Protection (CBP) crashed along the U.S.-Mexico border.[53] In 2009 North Little Rock's unmanned helicopter crashed due to a "software failure."[54] In 2010, a Mexican drone crashed into the back yard of an El Paso home.[55] And that same year, a military drone experiencing what the Navy called a "software problem" flew off course and entered restricted Washington, DC airspace.[56] According to government data, UAVs experience an accident rate over 7 times higher than general aviation, and 353 times higher than in commercial aviation.[57]

According to government data, UAVs experience an accident rate over 7 times higher than general aviation, and 353 times higher than in commercial aviation.

Just as the FAA is carefully evaluating the safety implications of drones, so too should we be evaluating the privacy implications of this new technology. We need clear privacy rules so that we can enjoy the benefits drones have to offer in many contexts, without having to worry that they are being used to trample our privacy.

UAVs and privacy

With the federal government likely to permit more widespread use of drones, and the technology likely to become ever more powerful, the question becomes: what role will drones play in American life? Based on current trends—technology development, law enforcement interest, political and

52 Statement of Andrew V. Cebula, Aircraft Owners and Pilots Association, before the House Committee on Transportation and Infrastructure, Aviation Subcommittee, on Unmanned Aerial Vehicles in the National Airspace System, March 29, 2006, online at http://www.aopa.org/whatsnew/newsitems/2006/060329uav-testimony.html.

53 Geoff Carrigan, Dave Long, M.L. Cummings, John Duffner, "Human Factors Analysis of Predator B Crash," MIT Humans and Automation Lab (2008), online at http://web.mit.edu/aeroastro/labs/halab/papers/Carrigan_AUVSI.pdf.

54 "North Little Rock Police Department UAV Crashes During Training," Aero News Network, June 24, 2009, online at http://www.aero-news.net/index.cfm?do=main.textpost&id=d356535f-4aab-4037-aa50-ccf9cf2c65de. Documents obtained by the ACLU of Arkansas connected with North Little Rock's acquisition of UAVs include discussion of various failure modes for the craft, including "Lost link," "Lost communications," "computer hardware or software failure," "GPS failure," "engine failure," and "fly away." Letter on "Public aircraft," North Little Rock [Arkansas] Police Department, Jan. 30, 2008, online at https://www.aclu.org/technology-and-liberty/letter-drone-failure-modes.

55 Diana Washington Valdez and Daniel Borunda, "Mexican drone crashes in backyard of El Paso home," *El Paso Times*, Dec. 17, 2010, online at http://www.elpasotimes.com/ci_16875462.

56 Peter Finn, "Domestic use of aerial drones by law enforcement likely to prompt privacy debate," *Washington Post*, Jan. 23, 2011, online at http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html.

57 Statement of Nancy Kalinowski, Vice President for System Operations Services, FAA, before the House of Representatives Committee on Homeland Security, Subcommittee on Border, Maritime, and Global Counterterrorism on the Role of Unmanned Aerial Systems on Border Security, July 15, 2010, online at http://www.faa.gov/news/testimony/news_story.cfm?newsId=11599. Statement of Henry Krakowski, Chief Operating Officer, Air Traffic Organization, FAA, before the Senate Committee on Commerce, Science, & Transportation, Subcommittee on Aviation Operations, Safety, & Security, Sept. 13, 2010, online at http://www.faa.gov/news/testimony/news_story.cfm?newsId=11841.

industry pressure, and the lack of legal safeguards—it is clear that drones pose a looming threat to Americans' privacy. The reasons for concern reach across a number of different dimensions:

Based on current trends—technology development, law enforcement interest, political and industry pressure, and the lack of legal safeguards—it is clear that drones pose a looming threat to Americans' privacy.

- **Mission creep.** Even where UAVs are being envisioned for search and rescue, fighting wildfires, and in dangerous tactical police operations, they are likely to be quickly embraced by law enforcement around the nation for other, more controversial purposes. The police in Ogden, Utah think that floating a surveillance blimp above their city "will be a deterrent to crime when it is out and about."[58] In Houston, police suggested that drones could possibly be used for writing traffic tickets.[59] The potential result is that they become commonplace in American life.[60]
- **Tracking.** The Justice Department currently claims the authority to monitor Americans' comings and goings using GPS tracking devices—without a warrant. Fleets of UAVs, interconnected and augmented with analytics software, could enable the mass tracking of vehicles and pedestrians around a wide area.
- **New uses.** The use of drones could also be expanded from surveillance to actual intervention in law enforcement situations on the ground. Airborne technologies could be developed that could, for example, be used to control or dispel protesters (perhaps by deploying tear gas or other technologies), stop a fleeing vehicle, or even deploy weapons.[61]

In addition, drones raise many of the same issues that pervasive video surveillance brings in any context. For example:

- **Chilling effects.** What would be the effect on our public spaces, and our society as a whole, if everyone felt the keen eye of the government on their backs whenever they ventured outdoors? Psychologists have repeatedly found that people who are being observed tend to behave differently, and make different decisions, than when they are not being watched. This effect is so great that a recent study found that "merely hanging up posters of staring human eyes is enough to significantly change people's behavior."[62]

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58 James Nelson, "Utah city may use blimp as anti-crime spy in the sky," Reuters, Jan. 16, 2011, online at http://www.reuters.com/article/2011/01/16/us-crime-blimp-utah-idUSTRE70F1DJ20110116.

59 Stephen Dean, "Police line up to use drones on patrol after Houston secret test," Houston Examiner, Jan. 11, 2010, online at http://www.examiner.com/page-one-in-houston/police-line-up-to-use-drones-on-patrol-after-houston-secret-test.

60 Joseph Nevins, "Robocop: Drones at Home," Boston Review, January/February 2011, online at http://www.bostonreview.net/BR36.1/nevins.php.

61 Stephen Dean, "New Police Drone Near Houston Could Carry Weapons," KPRC Houston, Nov. 10, 2011, online at http://www.click2houston.com/news/New-Police-Drone-Near-Houston-Could-Carry-Weapons/-/1735978/4717922/-/59xnnez/-/index.html.

62 Sander van der Linden, "How the Illusion of Being Observed Can Make You a Better Person," Scientific American, May 3, 2011, online at http://www.scientificamerican.com/article.cfm?id=how-the-illusion-of-being-observed-can-make-you-better-person; M. Ryan Calo, "People Can Be So Fake: A New Dimension to Privacy and Technology Scholarship," 114 Penn St. L. Rev. 809, online at http://www.pennstatelawreview.org/articles/114/114%20Penn%20St.%20L.%20Rev.%20809.pdf.

- **Voyeurism.** Video surveillance is susceptible to individual abuse, including voyeurism. In 2004, a couple making love on a dark nighttime rooftop balcony, where they had every reason to expect they enjoyed privacy, were filmed for nearly four minutes by a New York police helicopter using night vision. This is the kind of abuse that could become commonplace if drone technology enters widespread use. (Rather than apologize, NYPD officials flatly denied that this filming constituted an abuse, telling a television reporter, "this is what police in helicopters are supposed to do, check out people to make sure no one is ... doing anything illegal").[63]

- **Discriminatory targeting.** The individuals operating surveillance systems bring to the job all their existing prejudices and biases. In Great Britain, camera operators have been found to focus disproportionately on people of color. According to a sociological study of how the systems were operated, "Black people were between one-and-a-half and two-and-a-half times more likely to be surveilled than one would expect from their presence in the population."[64]

- **Institutional abuse.** In addition to abuse by the inevitable "bad apples" within law enforcement, there is also the danger of institutional abuse. Sometimes, bad policies are set at the top, and an entire law enforcement agency is turned toward abusive ends. That is especially prone to happen in periods of social turmoil and intense political conflict. During the labor, civil rights, and anti-Vietnam war movements of the 20th century, the FBI and other security agencies engaged in systematic illegal behavior against those challenging the status quo. And once again today we are seeing an upsurge in spying against peaceful political protesters across America.[65]

- **Automated enforcement.** Drones are part of a trend toward automated law enforcement, in which cameras and other technologies are used to mete out justice with little or no human intervention. This trend raises a variety of concerns, such as the fact that computers lack the judgment to fairly evaluate the circumstances surrounding a supposed violation, and may be susceptible to bugs and other software errors, or simply are not programmed to fairly and properly encapsulate the state of the law as passed by legislatures.[66]

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One point that is often made with regards to new surveillance technologies is that, while they may increase government surveillance of individuals, they can also increase individuals' ability to

63 "Did NYPD Cameras Invade A Couple's Privacy?" WCBS-TV report, Feb. 24, 2005, video no longer available online; Jim Dwyer, "Police Video Caught a Couple's Intimate Moment on a Manhattan Rooftop," *New York Times*, Dec. 22, 2005, online at http://www.nytimes.com/2005/12/22/nyregion/22rooftop.html.

64 Clive Norris and Gary Armstrong, "The Unforgiving Eye: CCTV Surveillance in Public Spaces," Centre for Criminology and Criminal Justice at Hull University, 1997.

65 See ACLU "Spyfiles" web site at www.aclu.org/spyfiles.

66 Danielle Keats Citron, "Technological Due Process," 85 Washington University Law Review 1249 (2008), online at http://lawreview.wustl.edu/inprint/85/6/Citron.pdf.

record the activities of officials, which can serve as a check on their power.[67] Too often, however, the authorities seek to increase their surveillance over individuals (for example, by installing surveillance cameras throughout public spaces) while restricting individuals' ability to use that same technology as a check against their power (for example, by attempting to prevent individuals from videotaping police[68]). Already, security experts have started expressing concern that unmanned aircraft could be used for terrorism[69]—which naturally raises the question: will individuals be able to make use of the new technology for their own purposes, or will government seek a monopoly over the new technology by citing fears of its use for terrorism?

The Fourth Amendment restricts the use of drones

With drone technology holding so much potential to increase routine surveillance in American life, one key question is the extent to which our laws will protect us. The courts should impose limits on the use of drones for surveillance, prohibiting them from becoming pervasive.

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The Supreme Court has never taken a position on whether the Fourth Amendment places limits on government use of UAV surveillance. However, it allowed some warrantless aerial surveillance from *manned* aircraft.

- In the 1986 decision **California v. Ciraolo**, the Supreme Court focused on whether an individual has a privacy interest in being free from aerial surveillance of his backyard. The police had received a tip that Dante Ciraolo was growing marijuana in his backyard, but high fences prevented them from viewing his backyard from the street. The police borrowed a plane, flew it over the backyard and easily spotted marijuana plants growing there. Ciraolo argued that his Fourth Amendment rights were violated because the government did not get a warrant. The Court rejected this argument, explaining that there was no intrusion into his privacy because "[a]ny member of the public flying in this airspace who glanced down could have seen everything that these officers observed."[70]
- In **Dow Chemical Co. v. United States**, also decided in 1986, the Supreme Court addressed whether the Environmental Protection Agency violated Dow's Fourth Amendment rights when it employed a commercial aerial photographer to use a precision aerial mapping camera to take photographs of a chemical plant. The Court found no violation, in part because

67 See David Brin, *The Transparent Society* (New York: Basic Books, 1998).

68 See Jay Stanley, "You Have Every Right to Photograph That Cop," ACLU, online at http://www.aclu.org/free-speech/you-have-every-right-photograph-cop.

69 Agence France Press, "Flying Robot Attacks 'Unstoppable' Say Experts," Agence France Press, May 11, 2006, available online at http://www.rense.com/general71/sspm.htm.

70 476 U.S. 207 (1986).

surveillance and held that the government's warrantless tracking violated the Fourth Amendment.[75] That case is now up on review before the Supreme Court. Because drones allow for surveillance at least as pervasive and continuous as GPS tracking, the courts should recognize that the Fourth Amendment places restrictions on their use.

With drones as in so many areas, the technology is moving far more rapidly than our jurisprudence, and it is important that the courts keep the Constitution relevant in the world of high technology in which we are increasingly going to be living.

Recommendations

UAVs are potentially extremely powerful surveillance tools, and that power, like all government power, needs to be subject to checks and balances. Like any tool, UAVs have the potential to be used for good or ill. If we can set some good privacy ground rules, our society can enjoy the benefits of this technology without having to worry about its darker potentials. We impose regulations on what law enforcement can do all the time, for example allowing law enforcement to take a thermal image of someone's home only when they get a warrant. We need to impose rules, limits and regulations on UAVs as well in order to preserve the privacy Americans have always expected and enjoyed.

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The ACLU recommends at a minimum the following core measures be enacted to ensure that this happens:

- **Usage restrictions.** UAVs should be subject to strict regulation to ensure that their use does not eviscerate the privacy that Americans have traditionally enjoyed and rightly expect. Innocent Americans should not have to worry that their activities will be scrutinized by drones. To this end, the use of drones should be prohibited for indiscriminate mass surveillance, for example, or for spying based on First Amendment-protected activities. In general, drones should not be deployed except:
    - where there are specific and articulable grounds to believe that the drone will collect evidence relating to a specific instance of criminal wrongdoing or, if the drone will intrude upon reasonable expectations of privacy, where the government has obtained a warrant based on probable cause; or
    - where there is a geographically confined, time-limited emergency situation in which particular individuals' lives are at risk, such as a fire, hostage crisis, or person lost in the wilderness; or

75 *United States v. Maynard*, 615 F.3d 544, 556 (2010).

- for reasonable non-law enforcement purposes by non-law enforcement agencies, where privacy will not be substantially affected, such as geological inspections or environmental surveys, and where the surveillance will not be used for secondary law enforcement purposes.

- **Image retention restrictions.** Images of identifiable individuals captured by aerial surveillance technologies should not be retained or shared unless there is reasonable suspicion that the images contain evidence of criminal activity or are relevant to an ongoing investigation or pending criminal trial.

- **Public notice.** The policies and procedures for the use of aerial surveillance technologies should be explicit and written, and should made public. While it is legitimate for the police to keep the details of particular investigations confidential, policy decisions regarding overall deployment policies—including the privacy tradeoffs they may entail—are a public matter that should be openly discussed.

- **Democratic control.** Deployment and policy decisions surrounding UAVs should be democratically decided based on open information—not made on the fly by police departments simply by virtue of federal grants or other autonomous purchasing decisions or departmental policy fiats.

- **Auditing and effectiveness tracking.** Investments in UAVs should not be made without a clear, systematic examination of the costs and benefits involved. And if aerial surveillance technology is deployed, independent audits should be put in place to track the use of UAVs by government, so that citizens and other watchdogs can tell generally how and how often they are being used, whether the original rationale for their deployment is holding up, whether they represent a worthwhile public expenditure, and whether they are being used for improper or expanded purposes.