From the Battlefield to Domestic Airspace: An Analysis of the Evolving Roles and Expectations of Drone Technology

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Abstract: *Perhaps one of the most notable developments, with respect to overall impact, to emerge from the War on Terror is the Unmanned Aerial System (UAS), or drone. This technology has revolutionized the U.S. Military, and following a long history of military technology shifting to domestic law enforcement operations, will likely impact law enforcement in a significant manner. This transition from the battlefield to domestic airspace is not without hazards or consequences. If drone technology is to be used effectively and efficiently by domestic law enforcement agencies to enhance public safety, prudence must prevail. The U.S. Department*

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of Homeland Security's (DHS) Customs and Border Protection (CBP) is leading the way for the implementation of this technology into domestic operations. CBP's short history with drone technology, as well as its future endeavors, will be examined in this paper and provide a framework for improving the transition of drone technology from the battlefield to domestic airspace.

Introduction

The United States military has logged over three million hours of flying time using drones, or unmanned aerial systems (UAS), since President George W. Bush declared the War on Terror in 2001. [2] With the U.S. Military presence in Iraq drawing down and the war in Afghanistan likely drawing down in the near future, the military's vast cache of drones will be increasingly directed toward other military and non-military missions. The extension of drones into non-military service is well under way: "Over 60 agencies have already applied to use a drone, including the FBI, the Department of Homeland Security (DHS), the Defense Advanced Research Projects Agency (DARPA), the U.S. Air Force, Army, Navy, Marine Corps, local sheriffs' offices, and around 20 different universities." [3] In any attempt to discern the implications of introducing military technology into domestic law enforcement agencies, history offers a resolute lesson. A long history of technology studies has documented the dynamics of how new socio-technical systems emerge (Nobel, 1984;[4] Winner, 1986;[5] Zuboff, 1988;[6] Tenner, 1996;[7] Pool, 1997[8]). These new operating environments--especially in the law enforcement sector--tend to blossom ahead of the policies and procedures governing their use, ultimately necessitating judicial interpretation, as well as new and revised policies and operating procedures.[9]

Drone technology first emerged during World War I when the U.S. Navy hired Elmer Ambrose Sperry to develop a fleet of unmanned air torpedoes that could be launched by catapult and guided to a precise target.[10] Remote controlled unmanned aerial devices were improved during WWII to target German bunkers behind enemy lines, but experienced a decline in investment and improvement after the war. [11] The development of rocket technology in the aftermath of WWII and in the midst of the Cold War stalled further development of drone technology until the CIA began covert surveillance missions over Afghanistan in the spring of

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[2] Turse, Nick, "*Investigation Finds U.S. Military Drones Have Flown Close to 3 Million Hours."* U.S. AlterNET Data Center, February 2011.

[3] Sibilla, Nick, "*Attack of the Drones: FAA Loosens Regulations for Domestic Drones."* Bill of Rights Defense Committee, May 23rd, 2012.

[4] Nobel, S. (1984), "*Cities, Space, and the New World of Urban Law Enforcement Technologies,"* Journal of Urban Affairs, Vol. 23, p. 259-278.

[5] Winner, L. (1986), "*The Whale and the Reactor: A search for Limits in an Age of High Technology."* University of Chicago Press, Chicago IL, p. 42-49.

[6] Zuboff, S. (1988), *"In the Age of the Smart Machine: The Future of Work and Power."* Basic Books, New York, New York, p. 12-31.

[7] Tenner, E. (1996), *Why Things Bite Back: Technology and the Revenge of Unintended Consequences."* Knopf Publishers, New York, New York.

[8] Pool, R. (1997), "*Beyond Engineering: How Society Shapes Technology."* Oxford University Press, New York, New York, pg. 56-83.

[9] Nunn, Samuel. "*Seeking Tools for the War on Terror: A critical Assessment of Emerging Technologies in Law Enforcement."* Policing, Vol. 26, Issue 3, p. 454-472, (2003).

[10] Sifton, John. "*The History of Drone Technology."* The Nation, February 27th, 2012.

[11] Sifton, John. "*The History of Drone Technology."* The Nation, February 27th, 2012.

2000. [12] Unarmed drones patrolled the skies over Afghanistan, but that was short lived. The terrorist attacks of September 11th, 2001 prompted the CIA and Air Force to arm its fleet of Predator drones with hellfire missiles, and on February 4th, 2002, the first CIA-targeted killing using drone technology took place: Osama bin Laden was believed to have been the target.[13] In the past decade, thousands of hellfire missiles have been released from drones over Afghanistan, Iraq, Pakistan, Yemen, Somalia, and Libya, prompting an International inquiry into the controversial use of these weapons.[14] The shadow of controversy surrounding drones will seemingly remain with the technology in its transition from the battlefield to domestic airspace.

Customs and Border Protection (CBP), a component of DHS, currently has the largest fleet of drones in operation over U.S. airspace. "CBP currently deploys nine Predator-B unmanned aerial systems (UAS) to patrol US borders and provide surveillance for border security and disaster response. Two of these Predators are equipped with sensors for patrolling ports and waterways, thus putting them in a maritime surveillance configuration known as the Guardian. CBP anticipates receiving a 10th Predator UAS in September; it will be the third configured as a Guardian."[15] "According to CPB, unmanned drones now cover the southwest border all the way from California to Texas, providing critical intelligence to agents on the ground. The drone program contributed to the seizure of more than 7,600 pounds of narcotics and the apprehension of 467 individuals involved in illicit activities" in 2010 alone.[16]

This paper will evaluate the Department of Homeland Security's (DHS) use of drones, as DHS is currently the only domestic law enforcement agency with large scale drone operations. Given the seemingly fluctuating nature of DHS's current drone program, this paper will also address the anticipated future uses of drone technology in domestic law enforcement operations and the perceived challenges associated with expanded use. Finally, a list of recommendations will be made to address the perceived challenges and directions of drone technology use in order to help the Department of Homeland Security, and other domestic law enforcement agencies at the federal, state, local, tribal, and territorial level, efficiently and effectively use drones "to ensure that the homeland is safe, secure, and resilient against terrorism and other hazards."[17]

Findings

Finding 1: The Department of Homeland Security's drone program is inefficient and lacks credible evidence in support of the mission of border surveillance--the utility of the program is that the mere possible presence of drones alters/disrupts traditional criminal movements/activities.

The value of the 7,600 pounds of narcotics seized by the Customs and Border Protection (CBP) drone operation, estimated at approximately $19.3 million, [18] grossly fails to support the cost of operating CBP's entire drone fleet; a $250 million price tag over the past six years, with each drone costing approximately $3,000 an hour to fly, and requiring one hour of maintenance

[12] Sifton, John. "*The History of Drone Technology."* The Nation, February 27th, 2012.
[13] Sifton, John. "*The History of Drone Technology."* The Nation, February 27th, 2012.
[14] Sifton, John. "*The History of Drone Technology."* The Nation, February 27th, 2012.
[15] McCarter, Mickey. "*CBP Lacks Equipment, Plans to Support Predator UAV Flights, IG Warns."* Insight and Analysis for Government Decision Makers, June 6th, 2012.
[16] Thomas, Pierre, Jack Cloherty, and Jason Ryan. "*Fewer Illegal Immigrants Crossing Southwest Border."* ABC World News, December 2011.
[17] The Department of Homeland Security Mission Statement, http://www.dhs.gov/xabout/responsibilities.shtm.
[18] Sibilla, Nick. "*Attack of the Drones: FAA Loosens Regulations for Domestic Drones."* Bill of Rights Defense Committee, May 23rd, 2012.

for every one hour flown.[19] In addition to this lack of return on investment, in a 2011 audit, the DHS Inspector General noted that "CBP did not plan to have enough money to support UAS equipment as well as operations and maintenance; the agency lacks a formal process for managing and prioritizing mission requests for its UAS; and it does not properly seek reimbursement of any expenses incurred while its UAS fulfill mission requests from other agencies."[20]

The U.S.-Canadian border and, as of December 2011, the Gulf of Mexico also have CBP drone surveillance operations. Although not as established and expansive as the Southwest border drone operation, both of these missions, like the Southwest border, involve surveying thousands of miles which are virtually un-patrollable by foot and road vehicle. According to Officer Charles D. Perriguey of the Los Angeles Police Department (LAPD), "airborne law enforcement operations change the way criminals operate."[21] Officer Perriguey cites an example involving professional car thieves, who, mindful of the potential for an overhead law enforcement presence, have significantly modified the way they steal and deliver vehicles from the location of the theft to the chop shop or immediate transportation site.[22] The presence of drones on the borders and in the Gulf of Mexico have had a similar effect in these areas according to the DHS Inspector General in a 2011 audit, although an acknowledgement was made in the audit that "deterrence by presence" is not the primary goal of the program.[23] In testimony before a U.S. Senate Panel in April of 2012, Homeland Security Secretary Janet Napolitano and CBP spokeswoman Gina Gray highlighted the primary value of the drone program as being that drones "can stay in the air for up to 20 hours at a time, something no other aircraft in the federal inventory can do. In this manner it is a force multiplier, providing aerial surveillance support for border agents by investigating sensor activity in remote areas to distinguish between real or perceived threats, allowing the boots on the ground forces to best allocate their resources and efforts."[24]

A recent drone mission in Corpus Christi, Texas, according to CBP Supervisory Air Interdictory Agent Scott Peterson, highlights some of the limitations and subsequent shortcomings with the current drone program.[25] During this mission, a drone was dispatched to the skies above a likely illegal drug running mission from Mexico into the United States. Peterson, aware of the silence and tracking capabilities of the drone, wanted to pilot the UAS to follow the drug runner to a stash house which would have likely contained more senior level cartel members. Rather than baiting the drug runner with the drone to give up the "bigger guys," CBP agents rushed in to grab the smuggler, dismissing the drone technology's tracking capabilities.

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[19] Olive, David. "*IG Questions Effectiveness of Predators by CBP."* Security Debrief, The George Washington University Homeland Security Policy Institute, April 30th, 2012.

[20] McCarter, Mickey. "*CBP Lacks Equipment, Plans to Support Predator UAV Flights, IG Warns."* Insight and Analysis for Government Decision Makers, June 6th, 2012.

[21] Perriguey, Charles D., and Michael R. Hillman, "*Law Enforcement Aviation—21st Century Tactics for 21st Century Challenges."* Journal of California Law Enforcement, Vol. 36, Issue 3, p. 8-12, (2002).

[22] Perriguey, Charles D., and Michael R. Hillman, "*Law Enforcement Aviation—21st Century Tactics for 21st Century Challenges."* Journal of California Law Enforcement, Vol. 36, Issue 3, p. 8-12, (2002).

[23] Office of the Inspector General, Department of Homeland Security, June 2012.

[24] Department of Homeland Security Senate oversight committee hearing on expansion of drone use on the Canadian border, April 2012.

[25] Bennett, Brian. "*Predator Drones have yet to Prove their Worth on the Border."* The Los Angeles Times, Washington Bureau, April 2012.

Finding 2: DHS lacks long-term planning and definitive roles describing current drone use.

The legality of using drone technology to track and record individuals is extremely controversial and un-established, resulting in even less reliance by authorities on the technology.[26] Regardless of the inability to track and record criminal activity at this point in time, DHS drones have assisted local law enforcement agencies in other ways. Although some uses of drones are not common occurrences, DHS's uses in such a manner raise questions about intent.

Rodney Brossart of North Dakota was involved in a dispute over cows on his property in April 2011. Upon police involvement, Brossart armed himself to defend what he believed was rightfully his. A standoff with police ended without injury when DHS sent in a drone to track Brossart's movements throughout his property. This case marks the first time drone evidence has been submitted during a criminal arrest, and the pending challenge by Brossart over the constitutionality of using such technology will have a large impact with respect to future use of drones for similar use and missions.[27]

In the wake of the FAA relaxing domestic drone regulations, DHS and other government agencies have identified potential mission areas for the technology, including terrorist attack and natural disaster mapping, non-stop surveillance for security-critical land and infrastructure, un-interrupted coast surveillance, emergency logistics, and many others.[28] Despite the current shortcomings with DHS's drone program, senior advisors to DHS maintain that "it is not about the things we are doing today. It is about the things we might be able to do." [29]

Finding 3: Drone technology is growing more sophisticated and is increasingly more responsive to the needs of domestic law enforcement agencies rather than the military.

Drone technology is becoming increasingly sophisticated, and at a pace in which immediate implementation of the technology is not plausible. Companies such as Northrop Grumman, Lockheed Martin, and Aero Vironment have partnered with private airlines, law enforcement technology development firms, and software companies to produce the next generation of drones.[30] Capabilities such as vertical-takeoff, in-flight refueling, hand-launched takeoff, stealth, and non-lethal weaponry have been some of the many areas of investment in these military-domestic drone development partnerships.[31] In pitches to police departments, Vanguard Defense Industries in Texas has been touting the ability of its drones to carry shotguns and grenade launchers, as well as non-lethal weapons delivery capabilities for crowd control. [32] Drones the sizes of insects have been produced and are being developed with alternative fuels such as hydrogen to silently stay aloft for days at time, significantly adding to surveillance

[26] Bennett, Brian. "*Predator Drones have yet to Prove their Worth on the Border."* The Los Angeles Times, Washington Bureau, April 2012.
[27] Nelson County Sheriff's Office, Lakota, North Dakota, April 2012
[28] Bennett, Brian. "*Predator Drones have yet to Prove their Worth on the Border."* The Los Angeles Times, Washington Bureau, April 2012.
[29]Bennett, Brian. "*Predator Drones have yet to Prove their Worth on the Border."* The Los Angeles Times, Washington Bureau, April 2012.
[30] Grahm, Warwick. "*Unmanned Technology Advances."* Aviation Week and Space Technology, Vol. 173, Issue 4, January 2011, p. 90.
[31]Grahm, Warwick. "*Unmanned Technology Advances."* Aviation Week and Space Technology, Vol. 173, Issue 4, January 2011, p. 93-95.
[32] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 46-59.

capabilities once completed. [33] Peter W. Singer, a fellow at the Brookings Institution, observed the quick technological advances associated with drones and concluded that "the nature of technology is that it is introduced for one role and then it slippery-slopes into unintended roles."[34]

The development of drone technology is often spurred by tactical scenarios envisioned by law enforcement officials. For example, an Aero Vironment presentation to a group of law enforcement executives in 2011 presented a scenario where sensor microphones in a Philadelphia neighborhood might be able to triangulate the exact location of a gunshot, and within moments a swarm of small drones could arrive on the scene to map it out for law enforcement officials.[35]In another presentation, Aero Vironment advertised its "work-in-progress" technology, known as The Pelican, which can enter a building and create a detailed map of its current environment, providing an invaluable tool to law enforcement in hostage situations and school shooting scenarios. [36]

Consistent with a measure adopted by the U.S. House of Representatives on June 7, 2012 barring armed drones in domestic airspace, DHS has indicated that it has no intention of arming, even with non-lethal rounds, its drones in the CBP border patrol mission.[37] The attendance of presentations and financial backing of some of the previously listed unarmed drone technologies by DHS has spurred lobbyists of liberal drone rules to push the FAA for even looser regulations.[38] DHS recently ordered several high-tech launch systems that are currently being tested in Florida and Kansas. These launch systems, once approved by the FAA, will allow a limited number of drones to be launched in domestic, public airspace, a step many consider the pre-cursor to moving drones beyond the border patrol mission and into the skies over U.S. cities.[39]

Findings 4: DHS's current drone operations and its potential future uses of the technology in domestic airspace cause public fear and skepticism regarding Fourth Amendment rights.

As noted in the CBP mission in which the drone operator wanted to trace and record a drug smugglers movement to catch the "bigger fish," there is no formal, authoritative protocol to allow such a thing.[40] A major public concern regarding domestic law enforcement agencies increasing their use of drone technology is that people's every move, criminal and non-criminal, will be watched and subjected to investigation. The American Civil Liberties Union has challenged DHS in court over its use of drones, citing an abusive and unconstitutional interpretation of Section 215 of the Patriot Act.[41] Section 215 authorizes the government to

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[33] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 62-63.
[34] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 48.
[35] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 52-53.
[36] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 52-53.
[37] Fulghum, David A. *"What's Next: Drone Technology."* Aviation Week and Space Technology, Vol. 172, Issue 32, p.66 (2010).
[38] Fulghum, David A. *"What's Next: Drone Technology."* Aviation Week and Space Technology, Vol. 172, Issue 32, p.66 (2010).
[39] Fulghum, David A. *"What's Next: Drone Technology."* Aviation Week and Space Technology, Vol. 172, Issue 32, p. 67-71, (2010).
[40] Bennett, Brian. "*Predator Drones have yet to Prove their Worth on the Border."* The Los Angeles Times, Washington Bureau, April 2012.
[41] American Civil Liberties Union, June 29th, 2012, http://www.aclu.org/national-security/section-215-patriot-act-foia.

obtain any tangible thing relevant to a terrorism investigation, even if there is no showing that the thing pertains to suspected terrorists or terrorist activities.[42] In other words, the justification for using military technology in domestic airspace, even under the Patriot Act, still violates the Fourth Amendment of the U.S. Constitution.[43] The Fourth Amendment states that "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized."[44]

An historical review of law enforcement surveillance capabilities over the past two hundred years shows a definitive connection between military technology and its subsequent adoption by domestic law enforcement agencies. Such technological examples "encompass a wide gamut of [items], from… wiretapping and eavesdropping tools to sophisticated facial recognition systems."[45] Even going all the way back to the Revolutionary War where military intelligence officers began monitoring the U.S. postal system, to the thousands of cameras operated by the NYPD on the streets of New York City today,[46] surveillance methods have followed military developments.[47] Drone technology follows a pattern that has developed over time where policing strategies have changed from reactive response to proactive community policing.[48] The nature of DHS's mission is proactive and therefore requires proactive technology.[49] However, proactive surveillance techniques have often been challenged under the Fourth Amendment, and a look at relevant case law can guide future implementation of military technology into domestic law enforcement operations.[50]

Privacy concerns dominate the case law surrounding drones and other surveillance techniques that use video recording. The storage and access of the video images are central to the Fourth Amendment concerns raised in court.[51] The case law dictating the legal boundaries of surveillance video use comes from *McCoy v. the State of Florida* (2010). In this case a concealed camera captured the video that was presented as evidence in court. The District Court of Appeals for the State of Florida, first district, held that the videotape was a "silent witness" to the murder. Using the "silent witness" theory, video is considered more credible than an eyewitness. As

[42] USA Patriot Act, Section 215.
[43] American Civil Liberties Union, June 29th, 2012, http://www.aclu.org/national-security/section-215-patriot-act-foia.
[44] United States Constitution, Fourth Amendment.
[45] Nunn, Samuel. "*Seeking Tools for the War on Terror: A critical Assessment of Emerging Technologies in Law Enforcement."* Policing, Vol. 26, Issue 3, p. 454-472, (2003).
[46] Chan, Serena, "*Towards Coherent Regulation of Law Enforcement Surveillance in the Network Society."* Laboratory for Information and Decision Systems, Massachusetts Institute of Technology, (2007).
[47] Nunn, Samuel. "*Seeking Tools for the War on Terror: A critical Assessment of Emerging Technologies in Law Enforcement."* Policing, Vol. 26, Issue 3, p. 454-472, (2003).
[48] Nunn, Samuel. "*Seeking Tools for the War on Terror: A critical Assessment of Emerging Technologies in Law Enforcement."* Policing, Vol. 26, Issue 3, p. 454-472, (2003).
[49] Department of Homeland Security (2005). "*Testimony by Secretary Michael Chertoff Before the House Homeland Security Committee."* April 13th, Washington, DC: Office of the Press Secretary.
[50] Reed, Ben Jr. "*Future Technology in Law Enforcement."* ProQuest Criminal Justice, FBI Law Enforcement Bulleting, May 2009, p. 15-77.
[51] Gordon, Arthur and Ross Wolf. "*License Plate Recognition Technology: Innovation in Law Enforcement Use."* ProQuest Criminal Justice, FBI Law Enforcement Bulletin, March 2007.

direct evidence, the video speaks for itself and corroboration is not required, as it would be with a human eyewitness.[52]

Finding 5: DHS's drone program is plagued by public misperception of the agency's intended use for the technology.

The Fourth Amendment does not allow law enforcement to use cameras to survey individuals without due process and probable cause. Consistent with case law, opponents of expanding drone technology have equated the technology with putting a "silent witness" in place to monitor everything. Warrants, they argue, must be granted for drones to capture any video data.[53] Those in favor of drone technology argue that "the public proposition, at this point, anyway, is not that drones will subjugate or assassinate unwitting citizens but that they will conduct search-and-rescue operations, fight fires, catch bad guys, inspect pipelines, spray crops, count nesting cranes and migrating caribou, and measure weather data and algae growth." In an interview with Criminal Justice Professor and respected criminologist Dr. Jeffrey Ian Ross, it was apparent that this dichotomy of perception is the first thing that must be addressed; simultaneously with FAA air safety regulations and Fourth Amendment concerns given how long it takes to revise these processes.[54]

Dr. Ross believes that because both the public and scholars know little about the DHS's current drone operations program, and couple with a widespread and historical public distrust of federal government agencies, that a negative perception of domestic drone usage has emerged. He points to the most common source of information regarding drones: the news media. "When people hear the word drone, the most common image that comes to mind, according to my research, is a Predator-B swooping down from the clouds and dropping ordinance on a group of terrorists; many times killing innocent civilians in the process."[55] Dr. Ross singles out news reports of drone strikes in Afghanistan, Pakistan, and Yemen, as well as a handful of drone crashes in the U.S. as providing "less than a pretty picture" of drones.[56] Other experts, such as Ryan Calo of the University of Washington School Of Law, have provided a similar analysis to Dr. Ross: "If you get the tech out there and use it to find a lost kid, people will accept it better. If you sell it as tech that you use to kill or to spy on people, people will resist it. The first time a drone tazes the wrong dude at a Phish concert, you're going to have problems."[57]

As previously mentioned, the overarching historical trend with implementing military technology into domestic law enforcement operations is that "new socio-technical systems evolve that change the relationships between the police and the civilian populations they are sworn to protect. These new operating environments tend to blossom and grow ahead of the policies and procedures governing their use, ultimately necessitating juridical interpretation, as well as new and revised policies and operating procedures."[58] Law enforcement agencies, such as DHS, depend on public cooperation to fulfill the mission, so new policing strategies must be

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[52] Lewis, Don L. "*Surveillance Video in Law Enforcement."* Journal of Forensic Identification, ProQuest Criminal Justice (2004).

[53] American Civil Liberties Union, May 18th, Court Press Release.

[54] Live interview with Dr. Jeffrey Ian Ross, conducted by Cameron McDougal, July 12th, 2012.

[55] Live interview with Dr. Jeffrey Ian Ross, conducted by Cameron McDougal, July 12th, 2012.

[56] Live interview with Dr. Jeffrey Ian Ross, conducted by Cameron McDougal, July 12th, 2012.

[57] Paumgartner, Nick. "*Here's Looking at You." "*The New Yorker, Vol. 88, Issue 13, p. 48.

[58] Nunn, Samuel. "*Seeking Tools for the War on Terror: A critical Assessment of Emerging Technologies in Law Enforcement."* Policing, Vol. 26, Issue 3, p. 454-472, (2003).

cautiously devised so as not to turn the public against the agency. [59] DHS and others in favor of drone technology point to the capabilities that drone technology will present in the future and not necessarily what the technology is providing today.[60] "As with any future issue it is difficult to present hard data and fact-based research because the future has yet to occur," yet this is exactly what those in favor of domestic law enforcement drone operations must do.[61]

Finding 6: Drone technology malfunctions regularly and is not adequately secured from hacking incidents.

Adding to the public perception problem with drones are the seemingly frequent malfunctions of the technology. In December 2010, a drone operated by the Mexican Federal Police crashed into a Texas back yard; fortunately nobody was injured or killed.[62] A DHS drone flying surveillance on the Canadian border in March 2010 malfunctioned in flight and operators temporarily lost control of the aircraft. Additionally in October of 2010, a U.S. Navy drone flew itself to within 40 miles of Washington, DC before operators were able to regain control.[63] Most recently, students led by Professor Todd Humphreys at the University of Texas at Austin hijacked a drone right in front of DHS personnel. Dr. Humphreys used about a thousand dollars worth of technology to take control of the drone's GPS system, highlighting the fact that the anticipated expansion to thousands of drones in U.S. skies could amount to missiles flying around waiting to be hacked and used against us.[64]

With both military and law enforcement technology, one must be reminded that there is an opponent seeking to counter any technological system aimed at disrupting criminal activity. Prior to widespread use of new law enforcement technologies, there must be procedures to re-counter any counter measure taken by criminals to use law enforcement technology against law enforcement officials.[65]

Recommendations

Recommendation 1: The DHS Inspector General's concerns regarding CBP's drone program should be addressed. A "freeze" should be implemented prohibiting CBP from purchasing any new drones and equipment until CBP can demonstrate that the current fleet has the staffing and infrastructure to fly the drones at the same capacity required of airlines by the FAA.

The less-than-expected narcotics and criminal movement disruption numbers are partly attributable to the fact that frequent maintenance needs are supported by insufficient maintenance personnel and tools. As noted in a 2011 audit by the DHS Inspector General, CBP's plans to

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[59] Beckly, "*Law Enforcement Products from 1953-2003."* Law and Order Jorunal, ProQuest Criminal Justice, (2006), p. 26-32.

[60] Sibilla, Nick. "*Attack of the Drones: FAA Loosens Regulations for Domestic Drones."* Bill of Rights Defense Committee, May 23rd, 2012.

[61] Reed, Ben Jr. "*Future Technology in Law Enforcement."* ProQuest Criminal Justice, FBI Law Enforcement Bulleting, May 2009, p. 15-77.

[62] Bracamontes, Ramon. "*US, Mexico Trust Defused Issue Crashed Drone, Official Says."* El Paso Times, January, 2011.

[63] "*When Drones Go Crazy! More Use in U.S. Leads to More Potential "Software" Problems in Flight."* Security Journal, October 2010.

[64] Humphreys, Todd. "*Texas College Hacks Drone in Front of DHS."* RetroTech USA, June 27th, 2012.

[65] Perriguey, Charles D., and Michael R. Hillman, "*Law Enforcement Aviation—21st Century Tactics for 21st Century Challenges."* Journal of California Law Enforcement, Vol. 36, Issue 3, p. 8-12, (2002).

purchase 24 drones over the next decade will only make the program grow less efficient and effective under the status quo conditions.[66]

Recommendation 2: Devise procedures and policies that allow CBP drones to track and record criminal activity beyond the border under a court-ordered warrant.

Numerous unsuccessful CBP drug trafficking operations using drones have stained the reputation of the technology as limited and insignificant in the border patrol mission. Shortcomings like the Corpus Christi operation, in which the potential for the discovery of major cartel members was rejected because of tracking concerns, are avoidable, and success in tracking drug traffickers will help the public's perception of drones.

Similar to license plate recognition technology (LPR) data collection procedures, warrant-legitimized tracking missions should feed data to a single agency-supplied mobile data terminal (MDT), such as a laptop. Rather than data searches being conducted on a continual, live inquiry into a government database, daily downloads of drone tracking data should be used to keep the amount of stored information at a minimum. This procedure keeps the amount of people with access to the data on a limited, need-to-know, case-by-case basis and provides for un-used data to be erased daily. By doing this, only the criminal activity that is being recorded and tracked under a warrant is investigated by law enforcement personnel.[67] The same type of retrieval and data storage procedure should be implemented for all drone-related missions including amber alert searches, search and rescue operations, natural disaster mapping, and wildlife documentation. The purpose of the drone's flight should be explicitly stated in a warrant and used for the stated reason only. This will alleviate Fourth Amendment concerns regarding the right to privacy.

Recommendation 3: DHS should initiate a massive public messaging campaign through various media outlets. The public messaging campaign should address recommendation #2's measures to avoid Fourth Amendment violations, explain that drones in domestic airspace will not be used as they are in the military, explain FAA air safety regulations, and provide numerous success stories and potential benefits of employing drones in various public safety services.

DHS has not shown any intention of using drones like the military, so this misperception needs to be addressed. If people see drones as spying, flying video cameras that will subject their every move to government investigation, the positive benefits to public safety could be outweighed. The cost savings of drones compared to manned aircraft, usually a $1/10^{th}$ cost ratio,[68] the increased surveillance times per flight, and the removal of humans from dangerous surveillance situations are all benefits that can be overshadowed by the current public misperception that DHS is going to spy on everyone and assassinate criminals with drones. Every positive story involving drones should be visible on TV, radio, newspapers, social media, and print magazines.

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[66] McCarter, Mickey. "*CBP Lacks Equipment, Plans to Support Predator UAV Flights, IG Warns."* Insight and Analysis for Government Decision Makers, June 6th, 2012.

[67] Gordon, Arthur and Ross Wolf. "*License Plate Recognition Technology: Innovation in Law Enforcement Use."* ProQuest Criminal Justice, FBI Law Enforcement Bulletin, March 2007.

[68] Graham, Warwick. "*Unmanned Technology Advances."* Aviation Week and Space Technology, Vol. 173, Issue 4, January 2011, p. 93-95.

Recommendation 4: DHS, in leading the way in introducing drone technology to domestic law enforcement agencies, should use federal authority under the Posse Comitatus Act of 1878[69], and request congressional acts if necessary, to be the sole entity governing drone use in all federal, state, local, tribal, and territorial law enforcement agencies.

If DHS's critical mission is to be increasingly supported by drone technology, the policies and procedures that it puts in place to reassure the public of their safety and constitutional rights cannot be overshadowed by other law enforcement agencies: a bad public perception of any agency's drone operations could lead to a bad public perception of all agencies' drone operations. Similar to DHS's oversight in counterterrorism operations within domestic law enforcement agencies, drone use and requests by all law enforcement officials should be vetted through DHS's established procedures.

Recommendation 5: DHS should halt mass-implementation of drone operations until manufacturers can guarantee that control of the devices meet standard military and FAA regulations for aircraft with respect to hacking vulnerabilities.

The recurring loss of control by operators on the ground and the demonstration by the University of Texas at Austin students' hijacking of a drone in mid-air are examples of the dangerous unknowns of the technology; a public perception problem arises here again. Rather than fund the development of more types of drones, DHS should demand/fund drones that meet FAA system-security requirements, ensuring that drones will remain under operator control at the same capacity required of other aircraft.

Conclusion

Thomas Jefferson once wrote, "I like the dreams of the future better than the history of the past." The Department of Homeland Security is leading the way in the use of drone technology in domestic missions, and despite the expected shortcomings with such an innovative and complex development, should continue its already substantial progress. The increased utilization of drone technology by the Department of Homeland Security could have substantial positive impacts on our ability to keep our borders safe and respond to man-made and natural disasters with resilience. The challenges that lie ahead in fixing the current shortcomings of DHS's drone operations, controlling future developments of drone technology, ensuring citizens that their Fourth Amendment right to privacy will not be violated, addressing negative public perception, and ensuring reliability of control regarding drones will determine the future role of the drone in domestic law enforcement operations. The examples of technology implementation of the past should not be overlooked as the drone moves from the military to domestic law enforcement agencies. DHS's mission must be reflected in its drone operation: keeping the homeland safe is a transparent, coordinated effort that requires public acceptance and cooperation. Much is to be done on the part of DHS as the drone moves from the battlefield to domestic airspace.

[69] Posse Comitatus Act of 1878.