



NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

**DOMESTIC AERIAL SURVEILLANCE AND HOMELAND
SECURITY: SHOULD AMERICANS FEAR THE EYE IN
THE SKY?**

by

Barclely W. Stamey

March 2014

Thesis Advisor:
Second Reader:

Erik Dahl
Clay Moltz

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE			<i>Form Approved OMB No. 0704-0188</i>	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.				
1. AGENCY USE ONLY (Leave blank)		2. REPORT DATE March 2014	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE DOMESTIC AERIAL SURVEILLANCE AND HOMELAND SECURITY: SHOULD AMERICANS FEAR THE EYE IN THE SKY?			5. FUNDING NUMBERS	
6. AUTHOR(S) Barclay W. Stamey				
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A			10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number ____N/A____.				
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited			12b. DISTRIBUTION CODE	
13. ABSTRACT (maximum 200 words) <p>Unmanned aircraft systems (UAS, also known as drones) are being increasingly more utilized in domestic law enforcement operations, enabling officers to maximize situational awareness from overhead while minimizing their exposure to danger. As the domestic airspace is scheduled to be fully drone integrated by 2015, growing concerns over national security and privacy issues have highlighted the capabilities and potential implications of using UAS on a national scale. This thesis examines the potential effectiveness of utilizing domestic aerial surveillance to increase homeland security while addressing how, and to what level, these programs should be federally overseen and regulated without infringing on Americans' civil liberties.</p> <p>This thesis argues that large-scale UAS operations by federal agencies are cost-inefficient and lack tangible results, while state and local agency operations, which employ smaller systems in more specific situations, are less expensive and more effective.</p> <p>Current U.S. law allows for aerial surveillance by law enforcement, but updating privacy legislation to account for modern technology should be considered. The Department of Homeland Security (DHS) needs to accelerate its working relationship with the Federal Aviation Administration (FAA) and its UAS approval process to establish and maintain privacy safeguards to ensure the highest level of national security while minimizing civil liberty infringement.</p>				
14. SUBJECT TERMS unmanned aircraft systems, drones, surveillance, effectiveness, privacy, security, domestic			15. NUMBER OF PAGES 75	
			16. PRICE CODE	
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU	

THIS PAGE INTENTIONALLY LEFT BLANK

Approved for public release; distribution is unlimited

**DOMESTIC AERIAL SURVEILLANCE AND HOMELAND SECURITY:
SHOULD AMERICANS FEAR THE EYE IN THE SKY?**

Barclely W. Stamey
Lieutenant Commander, United States Navy
B.S., United States Naval Academy, 2002

Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
March 2014**

Author: Barclely W. Stamey

Approved by: Erik Dahl
Thesis Advisor

Clay Moltz
Second Reader

Mohammed Hafez
Chair, Department of National Security Affairs

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

Unmanned aircraft systems (UAS, also known as drones) are being increasingly more utilized in domestic law enforcement operations, enabling officers to maximize situational awareness from overhead while minimizing their exposure to danger. As the domestic airspace is scheduled to be fully drone integrated by 2015, growing concerns over national security and privacy issues have highlighted the capabilities and potential implications of using UAS on a national scale. This thesis examines the potential effectiveness of utilizing domestic aerial surveillance to increase homeland security while addressing how, and to what level, these programs should be federally overseen and regulated without infringing on Americans' civil liberties.

This thesis argues that large-scale UAS operations by federal agencies are cost-inefficient and lack tangible results, while state and local agency operations, which employ smaller systems in more specific situations, are less expensive and more effective.

Current U.S. law allows for aerial surveillance by law enforcement, but updating privacy legislation to account for modern technology should be considered. The Department of Homeland Security (DHS) needs to accelerate its working relationship with the Federal Aviation Administration (FAA) and its UAS approval process to establish and maintain privacy safeguards to ensure the highest level of national security while minimizing civil liberty infringement.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	MAJOR RESEARCH QUESTION.....	1
B.	IMPORTANCE.....	2
C.	PROBLEMS AND HYPOTHESES	3
D.	LITERATURE REVIEW	4
1.	Analyzing Current Domestic Drone Operations.....	4
2.	Other Law Enforcement Use	7
3.	Fourth Amendment and Privacy Concerns.....	8
4.	Current Regulation and Oversight.....	10
5.	Preliminary Conclusions and Needs for Additional Research	11
E.	METHODS AND SOURCES	12
F.	THESIS OVERVIEW	12
II.	UNMANNED AIRCRAFT SYSTEMS BACKGROUND AND CAPABILITIES.....	15
A.	UAS DEFINITION AND CLASS STRUCTURE	15
B.	CAPABILITIES.....	18
C.	FUTURE CAPABILITIES	22
III.	CURRENT EMPLOYMENT AND EFFECTIVENESS.....	25
A.	NATIONAL LEVEL USE.....	25
B.	STATE AND LOCAL AGENCY USE	31
1.	Mesa County, Colorado, Sheriff's Office.....	33
2.	Montgomery County, Texas, Sheriff's Office.....	34
3.	Additional Examples of Time-Sensitive Use.....	36
C.	CONCLUSION	37
IV.	PRIVACY ISSUES AND FEDERAL OVERSIGHT	39
A.	THE PRIVACY DEBATE	40
1.	U.S. Supreme Court Cases	40
2.	Public Opinion and Privacy Advocates.....	42
B.	REGULATION AND OVERSIGHT	44
1.	Current COA Regulation	44
2.	Federal Oversight.....	45
3.	The Way Forward.....	46
C.	CONCLUSION	47
V.	CONCLUSION	49
A.	REVIEW	49
B.	RECOMMENDATIONS.....	51
VI.	LIST OF REFERENCES	55
	INITIAL DISTRIBUTION LIST	59

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF FIGURES

Figure 1.	Groupings of DoD UAS.....	16
-----------	---------------------------	----

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF ACRONYMS AND ABBREVIATIONS

ACLU	American Civil Liberties Union
ALEA	Airborne Law Enforcement Association
ATC	Air Traffic Control
CBP	Customs and Border Protection
COA	Certificate of Authorization or Waiver
CRCL	Office for Civil Rights and Civil Liberties
DHS	Department of Homeland Security
DoD	Department of Defense
DOJ	Department of Justice
EO	Electro-Optical
EPIC	Electronic Privacy Information Center
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FLIR	Forward Looking Infrared Radar
FY	Fiscal Year
IDENT	Next Generation Identification Database
I&A	Office of Intelligence and Analysis
JPDO	Joint Planning and Development Office
LOS	Line Of Sight
MTS-A	Multi-Spectral Targeting System
NSA	National Security Agency
OAM	Office of Air and Marine
ODNI	Office of the Director of National Intelligence
RPV	Remotely Piloted Vehicle
U.S.	United States
UAS	Unmanned Aircraft Systems
UAV	Unmanned Aerial Vehicle
VFR	Visual Flight Rules

WAAS Wide Area Airborne Surveillance

ACKNOWLEDGMENTS

I would like to take the opportunity to thank my thesis team, professors Erik Dahl and Clay Moltz, for their patience, expertise, and mentorship during this thesis process. Their tireless contribution to my research and writing enabled me to produce a thesis that I can be confident in and proud to share. I would also like to thank my wife, Natalie, for her patience during my long working days and her continued encouragement whenever I needed to lock myself in the office in order to be productive. I could not have completed my master's thesis in a timely manner without the assistance of the three, aforementioned individuals. Thank you.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

In the aftermath of the Boston Marathon bombings of 2013, the United States government realized the need for increased domestic intelligence. Islamic radicals had once again attacked Americans from within our borders, sparking a debate over domestic surveillance that was later made even more vigorous after revelations and leaks about the National Security Agency's telephone and Internet-monitoring programs. How intelligence is collected remains the focal point of the ongoing surveillance debate. With rapidly increasing advances in technology, some of the most formidable tools at the government's disposal are Unmanned Aircraft Systems (UAS). Having an overhead vantage point of any situation provides greater detail, improves response time, and minimizes confusion among law enforcement agencies.

But with the advancement of new technology, comes an increased concern about Americans' civil liberties and their right to privacy. The balance between liberty and security must be carefully monitored in order to ensure that the inherent freedoms this country's citizens expect are not jeopardized. A thorough investigation of current and future UAS capabilities coupled with a detailed understanding of their implications for civil liberties can help us understand the proper role of UAS in homeland security and prevent similar acts of terror on U.S. soil.

A. MAJOR RESEARCH QUESTION

The domestic use of UAS is relatively new. Due to the youthfulness of UAS programs, the United States does not yet have proven ways of measuring their effectiveness or established methods of providing oversight typically believed necessary for intelligence programs. This thesis examines the questions, what is the potential effectiveness of utilizing domestic aerial surveillance to increase homeland security? How, and to what level, should these programs be overseen and regulated in order to ensure they do not infringe on American's civil liberties?

B. IMPORTANCE

Since September 11, 2001, Americans have become aware of the threat of domestic terrorism. Our nation's foreign policy and actions in the Middle East continue to influence radicals to commit jihadist acts against the United States. UAS, or drones as the general public refers to them, have been used by federal, state, and local law enforcement agencies for several years in combating domestic threats. The United States Customs and Border Protection (CBP), part of the Department of Homeland Security (DHS), uses military grade MQ-9 Predator Bs to assist in drug and alien interdiction missions along the border between the United States and Mexico, while other law enforcement agencies use smaller versions to aid in standoffs, traffic pursuits, and persons-of-interest tracking. However, the use of such drones places Americans under the watchful eye of federal, state, and local agencies, and has the potential to violate Americans' civil liberties.

Unfortunately, as the April 2013 attacks at the Boston Marathon demonstrated, our nation cannot stop all domestic terrorist attacks. Aerial surveillance has the potential to be widely used at large concentrations of people such as sporting events, concerts, and political events, or in the event of immediate national security threats. Being able to provide a God's-eye view of rural and urban areas brings a level of detail to intelligence efforts that this country has yet to capitalize on. Tracking the movements and activities of potential domestic threats provides insight into the daily lives of such individuals. Patterns can be detected; abnormalities can be documented; authorities can be quickly dispatched if the need arises.¹ Several domestic organizations already utilize these systems in their own operations with varying levels of success, and proponents of UAS believe that the government should analyze the potential effectiveness of using similar

¹ Bart Elias, *Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System*, CRS Report R42718 (Washington, DC: Library of Congress, Congressional Research Service, September 10, 2012), 2.

systems to improve homeland security. UAS can potentially offer homeland security efforts higher fidelity and greater surveillance detail through advanced technology.²

However, various differing opinions exist in society about domestic surveillance. The Fourth Amendment allows for people to be secure in their persons, places, and effects. But at what point do national security interests overrule an individual's right to privacy? Experts have yet to agree on this issue, even at the country's highest court. Several past Supreme Court cases tend to favor limited aerial surveillance, but recent technological developments bring into consideration the modernity of these previous rulings.³ Both sides of the privacy argument need to recognize what current laws permit in order to substantiate future oversight.

C. PROBLEMS AND HYPOTHESES

Several issues arise when exploring the option of domestically using UAS to gather intelligence. The privacy versus security debate is at the forefront of most Americans' interest, and allowing government surveillance breeds concerns about too much societal transparency. Americans already experience aerial surveillance in various forms, and UAS may have the potential to increase national security through more detailed and precise methods.

Measuring the effectiveness of aerial surveillance, and determining who should provide oversight, can be difficult. Should the federal government be responsible for all oversight, or can lower-level organizations monitor UAS operations on a situational basis under national guidance? Unchecked government surveillance can be extremely detrimental to the liberty of society, and determining what constitutes success can be equally challenging, while a system of checks and balances may provide a smooth transition to large-scale UAS operations. Agencies currently using UAS for border protection and law-enforcement purposes are only bound by the terms of their Federal Aviation Administration (FAA) issued Certificate of Waiver or Authorization (COA) and

² Peter Finn, "Domestic Use of Aerial Drones by Law Enforcement Likely to Prompt Privacy Debate," *Washington Post*, January 23, 2011, <http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html>.

³ *California v. Ciraolo*, 476 U.S. 207 (1989); *Florida v. Riley*, 488 U.S. 445 (1989).

simply govern themselves.⁴ One expected conclusion of this thesis is that a properly implemented and regulated national oversight program, manned by agencies such as the Department of Homeland Security or National Security Agency (NSA), overseen by the Office of the Director of National Intelligence (ODNI), has the potential to improve domestic intelligence efforts and reduce terrorism while minimizing civil liberties infringement. Preliminary research also suggests that state and local level oversight is possible without federal attention, although the current COA process for operating UAS is already at the federal level.

It is worth noting that although satellites play a large role in domestic intelligence, a study of their operating procedures and effectiveness is beyond the scope of this thesis. Likewise, employing UAS over America's skies with any type of weapon systems, whether lethal or non-lethal, is also beyond the scope of this thesis.

D. LITERATURE REVIEW

Two issues require thorough consideration when discussing the potential effectiveness of utilizing drones to combat domestic terrorism and their impact on civil liberties. The first of these issues concerns effectiveness and the value of UAS programs for homeland security. In what capacity are organizations currently using drones, and what success are they experiencing? The second issue concerns oversight. What are the current regulatory frameworks on drone operations, and how do they respect Fourth Amendment provisions and ensure minimal infringement on Americans' civil liberties?

1. Analyzing Current Domestic Drone Operations

The first step in tackling the issue of domestic drone surveillance is to examine how current organizations utilize UAS, how effective they have been, and what value they provide for homeland security. On the national level, UAS supporters and operators praise their effectiveness, but some critics and internal experts highlight drones' lack of results while emphasizing how expensive they are to operate and maintain. On the state

⁴ Elias, *Pilotless Drones*, 6.

and local levels, data show that not only are UAS extremely useful, but also cost-effective, and very few people dispute supporters' impression of UAS value.

The largest and most recognized organization employing UAS is the U.S. Customs and Border Protection.⁵ According to CBP's mission statement, their UAS program focuses on "anti-terrorism by helping to identify and intercept potential terrorists."⁶ Although CBP desires to have a fleet of 24 Guardians and MQ-9 Predator Bs by 2016, some experts feel that this course of action is not in the best interest of the agency. DHS's own Office of Inspector General has started to build a picture of "utter inefficiency, absolute lack of ... planning, a pattern of technical failures, and CBP resistance to undertaking ... evaluations and comparative studies."⁷

CBP officials praise the use of Predators due to their long loiter times, enhanced sensor technology, and precise real-time feed to ground operators.⁸ These capabilities contribute to significant operational advantages over manned aircraft. Thermal imaging sensors also give CBP the ability to track violators and potential terrorists through dense foliage or mountainous terrain, where ground assets may be significantly hindered.⁹ Without actual numbers to back up her statement, former DHS Secretary Janet Napolitano praised the use of drones along the border by stating, "Violent crime is down along the U.S. side of the border, and seizures of illegal weapons, drugs, and cash have risen."¹⁰

Despite the well-publicized advantages of using UAS along the border, actual results point to serious concerns over the effectiveness of CBP's drone program.

⁵ Tom Barry, "Drones over the Homeland: How Politics, Money and Lack of Oversight Have Sparked Drone Proliferation, and What We Can Do," *International Policy Report* (Washington, DC: Center for International Policy, April 2013), 4, 6.

⁶ *Ibid.*, 4.

⁷ *Ibid.*, 23.

⁸ Chad Haddal and Jeremiah Gertler, *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, CRS Report RS21698 (Washington, DC: Library of Congress, Congressional Research Service, July 8, 2010), 3.

⁹ *Ibid.*, 3.

¹⁰ Ceci Connolly, "Obama Administration Announces New Border Security Measures," *Washington Post*, June 24, 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/06/23/AR2010062305358.html>.

According to retired Air Force Major General Michael Kostelnik, who heads CBP's Office of Air and Marine (OAM), drones are extremely maintenance intensive, cost more to operate than traditional means, and are often unavailable to assist border agents because DHS has farmed them out to other entities such as the FBI.¹¹ Since the beginning of CBP's UAS program in 2005, drones have logged more than 12,000 flight hours in support of border security operations similar to what experts envision using drones for on a national, counter-terrorism scale. Over that time, approximately 46,600 pounds of illicit drugs and 7,500 individuals have been seized or detained during UAS supported operations.¹² Although these numbers might seem high, they are comparatively insignificant when taking into account CBP's total interception. On average, CBP seizes 3,500 pounds of marijuana every day in Arizona alone. In 2012, the Border Patrol seized 2.3 million pounds of pot. From 2005–2011, CBP alone detained 4.1 million immigrants; therefore, the 7,500 individuals apprehended with UAS assistance equates to less than .01 percent—further diminishing the effectiveness of drone use. The single-most destructive statistic that opponents to drones tout is that in the previously mentioned years, not a single terrorist, member of the middle or top echelon of Transnational Criminal Organizations, or drug cartels has been arrested with the help of UAS.¹³

Adding to critics' opposition to drone use is cost-effectiveness. DHS invested \$332 million in the program since 2005, not including flight hour cost. Predators cost roughly \$3,500 per flight hour including maintenance, operator training, and research and development. Assuming that UAS was solely responsible for the drug and personnel seizures mentioned earlier, that would equate to \$44,800 per alien apprehension and \$7,214 per pound of marijuana.¹⁴ These costs are staggering when considering that arrests and seizures involve teams of Border Patrol agents, vehicles, horses, planes, and helicopters. Although making cost comparisons between UAS and manned aircraft is

¹¹ Brian Bennett, "On Mexican Border, Drones Have Not Proved Their Worth," *Washington Post*, May 6, 2012, A6.

¹² Barry, "Drones Over the Homeland," 21.

¹³ *Ibid.*, 24.

¹⁴ *Ibid.*, 27.

difficult, drone command and control systems are being developed that can control multiple drones simultaneously. These new capabilities may shift the cost-effectiveness in the drones' favor once implemented.¹⁵ Until then, rival schools of thought continue to clash in the debate over CBP's UAS program.

2. Other Law Enforcement Use

Federal agencies are not the only organizations interested in utilizing UAS for surveillance and law enforcement. State and local agencies recognize the utility and potential cost-effectiveness of employing drones in their respective areas of responsibility and may be the biggest supporters of UAS. At lower levels, drones can be used for investigative and tactical surveillance, intelligence gathering, and large crowd-control disturbances such as the Boston Marathon bombing.¹⁶ The ability to decipher a dangerous situation quickly can be made easier with the help of overhead surveillance, as was the case after the Boston bombing. After locating one suspect hiding in a boat in a backyard, authorities deployed a manned helicopter, armed with thermal imaging technology, to orbit over the scene. The thermal imaging camera was able to determine the location and activities of the suspect inside the boat. One huge advantage of UAS is that they could use similar technology to acquire the same intelligence at a much lower cost and at a significantly lesser risk to officers.¹⁷

A recent example of successful employment of a UAS by law enforcement occurred in 2012. In this case, an individual in North Dakota barricaded himself inside his property after officials ordered him to return six cows that wandered onto his land. An armed standoff with police commenced and at some point, DHS offered up through the local police department, the temporary use of one of its Predators for surveillance. Police were able to successfully apprehend the individual after confirming via the drone

¹⁵ Haddal and Gertler, *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, 5.

¹⁶ Anna Mulrine, "Drones over America: Public Safety Benefit or 'Creepy' Privacy Threat?" *Christian Science Monitor*, March 13, 2013, <http://www.csmonitor.com/USA/Society/2013/0313/Drones-over-America-public-safety-benefit-or-creepy-privacy-threat>.

¹⁷ *Eyes in the Sky: The Domestic Use of Unmanned Aerial Systems: Hearing before the House Committee on the Judiciary*, (May 17, 2013) (statement of Bob Goodlatte, Judiciary Committee Chairman, Subcommittee on Crime, Terrorism, Homeland Security, and Investigations), <http://judiciary.house.gov/cache/files/69365986-a0b1-4a21-ad9d-fc4e47762735/113-40-80977.pdf>.

that he and his family members were all unarmed. This intelligence was only possible because of the overhead thermal imagery provided by the UAS. A district judge ruled that “there was no improper use of an unmanned aerial vehicle,” which resulted in the first ever conviction of an American citizen through the use of a drone.¹⁸

Yet another agency advocating for the domestic use of drones is the Mesa County Sheriff’s Office in Mesa, Colorado. During a hearing before the U.S. Senate Committee on the Judiciary, Benjamin Miller, the unmanned aircraft program manager for the Sheriff’s office, outlined how his department has successfully used UAS in more than 40 missions since 2009.¹⁹ The Texas Department of Public Safety uses a similar style drone to provide live video to ground agents. Both agencies emphasized how relatively inexpensive technology can provide vast amounts of situational awareness with little risk to their officers. According to Miller, UAS can “provide an aerial view for a fraction of the cost of manned aviation.”²⁰ Initial data show that investment and operating costs of UAS are the most significant factors when evaluating this technology’s effectiveness. Being able to provide aerial surveillance of crime operations and national security issues along international borders is paramount in the fight against terrorism, but if the cost is simply too high, the systems may not proliferate as intended. The market for law enforcement drones might lean towards smaller, more agile, yet cheaper models as opposed to massive, military-grade systems.

3. Fourth Amendment and Privacy Concerns

Domestic drone use raises concern for oversight needs due to privacy considerations. UAS bring new capabilities to the playing field that are capable of penetrating natural privacy protection measures such as dwelling fences and walls. Many critics argue that UAS unduly infringe on Americans’ expectation of privacy due to

¹⁸ Jason Koebler, “Court Upholds Domestic Drone Use in Arrest of American Citizen,” *U.S. News & World Report*, August 2, 2012, <http://www.usnews.com/news/articles/2012/08/02/court-upholds-domestic-drone-use-in-arrest-of-american-citizen>.

¹⁹ *Future of Drones in America: Law Enforcement and Privacy Consideration: Hearing before the Senate Committee on the Judiciary*, 113th Cong. 1 (March 20, 2013) (statement of Benjamin Miller, Unmanned Aircraft Program Manager, Mesa Country Sheriff’s Office), <https://www.hsdl.org/?view&did=737816>.

²⁰ Ibid.

advancements in aerial video resolution. But others, including some legal scholars, suggest that UAS operations can be effectively used by law enforcement without jeopardizing civil liberties. Although an in-depth legal analysis is beyond the scope of this thesis, it is important to understand what current privacy laws allow.

Two cases, *California v. Ciraolo* and *Florida v. Riley*, involve the issue of aerial surveillance and appear to be privacy precedents with regard to UAS use. The Fourth Amendment provides, in part: “The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated.”²¹ As technology advances, what is reasonable under the Fourth Amendment may “adjust as people’s expectations of privacy evolve.”²² In both cases, one involving a manned helicopter and the other a small drone, the court found that aerial surveillance used to confirm illegal activity did not violate the defendants’ expectation of privacy. Law enforcement officials believe the court’s rulings are still valid and apply to modern surveillance methods, and they use current laws as justification for continued drone operations in accordance with FAA COA procedures. Opponents believe the court’s rulings are outdated and that surveillance legislation has not kept up with technology advancements.

Privacy advocacy groups believe that current safeguards are inadequate. Leaders of the Electronic Privacy Information Center (EPIC) are pushing for drone legislation that includes use and data retention limitations along with requirements for transparency and public accountability.²³ Likewise, the American Civil Liberties Union (ACLU) believes that broad, unchecked surveillance is unconstitutional and that the United States is wrongfully using “offensive” surveillance in a “defensive” nature.²⁴ Finally, Daniel

²¹ U.S. Const. amend. IV.

²² Richard Thompson, *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, CRS Report R42701 (Washington, DC: Library of Congress, Congressional Research Service, April 3, 2013), 1.

²³ *Future of Drones in America: Law Enforcement and Privacy Considerations: Hearing before the Senate Committee on the Judiciary*, 113th Cong. 1 (March 20, 2013) (statement of Amie Stepanovich, Director of the Domestic Surveillance Project, Electronic Privacy Information Center), <https://www.hsdl.org/?view&did=737816>.

²⁴ Donald F. Kettl, *System under Stress: Homeland Security and American Politics* (Washington, DC: CQ, 2007), 113-115.

Solove emphasizes that video surveillance limits our freedom, ties us to our past through trails of information, and is a “sweeping” form of investigatory power that should be transparent.²⁵

4. Current Regulation and Oversight

Most parties feel that some form of UAS oversight is required, but an evaluation of current regulations is required before determining the level of oversight needed. The FAA addresses requests to operate UAS on a case-by-case basis. COAs must be obtained through a web-based system by all federal (including military), state, and local agencies prior to operation, and their flights must adhere to the stipulations of their individual COA.²⁶ Although it is a relatively simple process, no blanket COA approval exists. The FAA denied an emergency COA for the Montgomery County, Texas, Sheriff’s Office, citing there had to exist a “loss of life or potential loss of life.”²⁷ It is most likely that FAA regulation and oversight will adopt an evolving risk-based approach toward seamless UAS integration.

Public opinion also plays a crucial role in gauging society’s willingness to give up certain amounts of liberty. According to a recent Monmouth University poll, most Americans support the use of unarmed domestic drones, but they prefer requiring some sort of court authorization prior to their use.²⁸ Thirty-three percent of Americans have very little confidence that federal or local law officials will use drones appropriately, further emphasizing the desire for oversight.²⁹ More than 80 percent of Americans support drones during search and rescue missions while 60 percent also support their use

²⁵ Daniel J. Solove, *Nothing to Hide: The False Tradeoff between Privacy and Security* (New Haven, CT: Yale University, 2011), 178–179.

²⁶ Elias, *Pilotless Drones*, 5–7.

²⁷ *Using Unmanned Aerial Systems Within the Homeland: Security Game Changer?: Hearing before the House of Representatives Subcommittee on Oversight, Investigations, and Management of the Committee on Homeland Security*, 112th Cong. 2 (July 19, 2012) (statement of William McDaniel, Chief Deputy of the Montgomery County Sheriff’s Office, Conroe, Texas), <http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg80848/pdf/CHRG-112hhrg80848.pdf>.

²⁸ Patrick Murray, “National: U.S. Supports Unarmed Domestic Drones,” *Monmouth University Poll*, August 15, 2013, 1.

²⁹ *Ibid.*, 2, 5.

in combating immigration and terrorism issues along the border, but more than 75 percent believe that agencies should be required to obtain a warrant prior to using UAS. Public opinion appears to accept court-issued warrants as oversight, but determining whether one is necessary for every drone mission is an ongoing challenge.

5. Preliminary Conclusions and Needs for Additional Research

At this point, the evidence is mixed on the effectiveness of current drone operations within the United States. While large government agencies such as CBP tout their UAS effectiveness, the actual numbers suggest that perhaps national-level systems are not only ineffective, but also extremely costly. Drone frameworks at the federal level appear to be too robust, maintenance intensive, and overpriced. Meanwhile, state and local authorities have ample data to support the need for UAS operations on a smaller scale with more focused attention on individual events and not broad surveillance. Depending on agencies' short and long-term goals, UAS may not be the most effective tool in achieving desired results, but this thesis further examines the issue.

One area needing attention is that of oversight. The FAA has procedures in place for organizations to acquire COAs in order to operate UAS, but is this method suitable for the rapidly increasing desire by law enforcement to operate drones? The research shows that many critics believe DHS should take an active role in partnering with the FAA to regulate drone operations, providing the desired federal level oversight to promote the appropriate use of drones.³⁰ This thesis examines the feasibility and appropriateness of such involvement.

The research also outlines the current framework in place regarding individuals' right to privacy under the Fourth Amendment. Most Americans support drone operations as long as there exists some form of oversight. Court-issued warrants appear to be well accepted forms of oversight when conducting drone operations, but law enforcement

³⁰ *Using Unmanned Aerial Systems Within the Homeland: Security Game Changer? Hearing before the House of Representatives Subcommittee on Oversight, Investigations, and Management of the Committee on Homeland Security*, 112th Cong. 2 (July 19, 2012) (statement of Gerald L. Dillingham, Director of the Government Accountability Office for Civil Aviation Issues), <http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg80848/pdf/CHRG-112hhrg80848.pdf>.

agencies do not always have the time or means to properly acquire one. When considering what constitutes a search under the Amendment, flying systems that operate in navigable airspace, whether manned or unmanned, are free to gather visual intelligence without the need for a warrant. The two previously mentioned cases set a precedent of 400 feet as a minimum benchmark altitude for which UAS operations can be permitted. The research supports an initial perception that properly overseeing nationwide use of UAS has the potential to increase homeland security without infringing on the civil liberties our nation fights to protect.

E. METHODS AND SOURCES

This thesis focuses on individual examples of both successes and failures of current domestic drone use. Primary sources of research include scholarly books, governmental websites, Congressional hearing testimony, respected journalism sources, and Supreme Court rulings. First, this thesis examines current federal, state, and local use of UAS in order to determine the usefulness of such systems during modern mission sets and how effective they are in combating terrorism. Many of the examples pertain specifically to law enforcement operations, but this thesis argues that many of these same employment methods can be used against terrorism.

Second, analyzing current FAA COA procedures lays the foundation for further development of federal oversight either through DHS or another national agency. Also, having an understanding of relevant Supreme Court rulings on aerial surveillance establishes precedence for future Fourth Amendment concerns while analyzing opponents' opinion of how the Court's rulings are outdated and prevent proper oversight. This thesis provides recommendations for how UAS, coupled with proper regulation and oversight, can be utilized to increase homeland security within the United States.

F. THESIS OVERVIEW

This thesis is organized into five chapters. Chapter I provides the introduction. Chapter II includes a background of UAS, their current capabilities, and what types of future capabilities are in development. Chapter III scrutinizes how federal, state, and local law enforcement agencies currently employ UAS and what their effectiveness has

been. Chapter IV analyzes the legal aspects of using drones for domestic surveillance by examining several related Supreme Court cases while investigating what current regulations and oversight measures are in place. It also examines what domestic drone critics have to say about the issue. Chapter V concludes this thesis and provides recommendations for federal oversight and UAS proliferation in support of national security.

THIS PAGE INTENTIONALLY LEFT BLANK

II. UNMANNED AIRCRAFT SYSTEMS BACKGROUND AND CAPABILITIES

During recent history, unmanned aircraft have become an integral part of America's arsenal in the fight against terrorism. Growing resistance to U.S. casualties coupled with exponential advancements in drone technology have led to an increased utilization of UAS, but the U.S. military is not the only organization looking to capitalize on further UAS development. Large federal agencies along with smaller, regionally centered organizations have started using drones with varying levels of success. However, not every organization uses the same systems, or needs the level of sophistication inherent to military-grade drones. To address the effectiveness of domestic drone use in combating terrorism, it is important to understand current and future capabilities. Therefore, this chapter will briefly explore the classes and capabilities of current systems, while providing a snapshot of future uses.

A. UAS DEFINITION AND CLASS STRUCTURE

Unmanned aircraft nomenclature continues to evolve depending on the context of its use and who describes it. According to the DoD, the most common names associated with unmanned aircraft include: drone, unmanned aerial vehicle (UAV), balloons, and remotely piloted vehicle (RPV).³¹ According to a recent Congressional Research Service report, there are two types of UAVs: drones and remotely piloted vehicles. Both systems are pilotless, but drones are programmed for autonomous flights; ground control operators actively fly RPVs via remote means.³² No matter what verbiage is used, each term recognizes that an unmanned aircraft is "an aircraft operated without the possibility or direct human intervention from within or on the aircraft."³³ In order to promote

³¹ Department of Defense, *DoD Dictionary of Military and Associated Terms*, Joint Publication 1-02, September 15, 2013, http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.

³² Haddal and Gertler, *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, 1.

³³ Department of Transportation, Federal Aviation Administration, *Unmanned Aircraft Operations in the National Airspace System*, NJO 7210.766, March 28, 2011.

commonality, most bodies recognize the term unmanned aerial system (UAS) to include all variants of the above-mentioned terms, and UAS will be used throughout this thesis.

Over time, drones' class structure has evolved due to many manufacturers' desire to produce the next top-of-the-line system. According to the Department of Defense, UAS are organized into five groups based on size, cost, capability and mission set, and what command level is present.³⁴ These groups of UAS are further illustrated in Figure 1.





DoD Unmanned Aircraft Systems (As of 1 JULY 2011)					
General Groupings	Depiction	Name	(Vehicles/GCS)	Capability/Mission	Command Level
Group 5 • > 1320 lbs • > FL180		•USAF/USN RQ-4A Global Hawk/BAMS-D Block 10 •USAF RQ-4B Global Hawk Block 20/30 •USAF RQ-4B Global Hawk Block 40	•9/3 •20/6 •5/2	•ISR/MDA (USN) •ISR •ISR/BMC	•JFACC/AOC-Theater •JFACC/AOC-Theater •JFACC/AOC-Theater
		•USAF MQ-9 Reaper	•73/85* *MQ-1/MQ-9 same GCS	•ISR/RSTA/EW/STRIKE/FP	•JFACC/AOC- Support Corps, Div, Brig, SOF
Group 4 • > 1320 lbs • < FL180		•USAF MQ-1B Predator	•165/85*	•ISR/RSTA/STRIKE/FP	•JFACC/AOC-Support Corps, Div, Brig
		•USA MQ-1 Warrior/MQ-1C Gray Eagle •USN UCAS- CVN Demo •USN MQ-8B Fire Scout VTUAV	•31/11 •2/0 •14/8	•(MQ-1C Only-C3/LG) •Demonstration Only •ISR/RSTA/ASW/ASUW/MIW/OMCM/EOD/FP	•NA •NA •Fleet/Ship
Group 3 • < 1320 lbs • < FL180 • < 250 knots		•SOCOM/DARPA/USA/USMC A160T Hummingbird	•8/3	•Demonstration Only	•NA
		•USA MQ-5 Hunter •USA/USMC/SOCOM RQ-7 Shadow •USN/USMC STUAS	•45/21 •368/265 •0/0	•ISR/RSTA/BDA •ISR/RSTA/BDA •Demonstration	•Corps, Div, Brig •Brigade Combat Team •Small Unit
Group 2 • 21-55 lbs • < 3500 AGL • < 250 knots		•USN/SOCOM/USMC RQ-21A ScanEagle	•122/13	•ISR/RSTA/FORCE PROT	•Small Unit/Ship
Group 1 • 0-20 lbs • < 1200 AGL • < 100 knots		•USA / USN / USMC / SOCOM RQ-11 Raven	•5628/3752	•ISR/RSTA	•Small Unit
		•USMC/ SOCOM Wasp	•540/270	•ISR/RSTA	•Small Unit
		•SOCOM SUAS AECV Puma	•372/124	•ISR/RSTA	•Small Unit
		•USA gMAV / USN T-Hawk	•270/135	•ISR/RSTA/EOD	•Small Unit

Figure 1. Groupings of DoD UAS³⁵

After reviewing Figure 1, it is apparent that the Group classification also takes into account vehicle weight, speed, and operating altitude. We see that only Group 5

³⁴ U.S. Department of Defense, *Unmanned Systems Integrated Roadmap FY2011-2036* (Washington, DC: GPO, 2011), 21.

³⁵ Ibid., 21.

UAS operate above 18,000 feet, which is considered the transition altitude in U.S. airspace. Transition altitude is significant because it is the point at which all aircraft must be under Air Traffic Control (ATC) supervision. No Visual Flight Rules (VFR) operations are allowed in this type of airspace due to aircraft speed and capability. Also, a certain skillset is required when operating in ATC controlled airspace. Some level of flight training or certification is required to understand the structure, communication, and regulations that enable ATC to maintain safety buffers. This directly affects who can operate these types of systems, which not only limits qualified operators, but also drives up command and control costs. Single individuals with a small amount of training can operate Lower Group systems, but larger systems such as the Predator require multiple certified operators.³⁶

The last column of the DoD UAS table is also important because it provides insight into the level of command required. For example, Groups 1–3 deal with small units such as squads and platoons that contain no more than 30 individuals. Even at the Group 4 level, there are still manageable sizes of troops on the order of 5,000 individuals. Units larger than these warrant more capable systems because they encompass much larger geographical areas. Theaters can spread vast distances and span multiple international borders; only Group 5 UAS are capable of providing the necessary support to multiple units from multiple services.

Other than the U.S. Customs and Border Protection (CBP), all other non-military, domestic organizations are currently only using drones from either Group 1 or Group 2. These systems are more lightweight, affordable, and satisfy the needs of the respective law enforcement departments or state agencies. CBP currently uses MQ-9B Predators from Group 4, which will be discussed further. Although there exists a wide range of capabilities and mission sets, most non-federal agencies prefer smaller systems due to their inherent flexibility, portability, and lower investment cost. Of note, repair and maintenance costs of more advanced systems increase exponentially due to supply and

³⁶ “Unmanned Aircraft System MQ-9 Predator B Fact Sheet,” U.S. Department of Homeland Security, Customs and Border Protection May 1, 2013, http://www.cbp.gov/linkhandler/cgov/border_security/am/documents/oam_fact_sheets/predator_b.ctt/predator_b.pdf.

specialization of parts. Smaller UAS parts are relatively easy to manufacture on large scales, while larger systems require much more detail-oriented parts.

B. CAPABILITIES

UAS capabilities vary greatly depending on what group they belong to. Different agencies have different requirements, needs, and mission sets, which determine what type of drone to purchase and employ. This thesis focuses primarily on the U.S. CBP, FBI, and several state sheriff departments since the current proliferation of domestic UAS is quite limited; therefore, this section describes the capabilities of the MQ-9B Predator, ShadowHawk, Wasp, and Draganflyer X6, which are the three most common systems used by these agencies.

First, the largest and most recognized organization employing UAS is the U.S. Customs and Border Protection agency, which operates under the Department of Homeland Security (DHS) through the Office of Air and Marine (OAM), which was created in 2005.³⁷ CBP currently operates ten Predator B drones and of these, three are modified specifically for maritime operations.³⁸ Operators control Predators remotely via data link either through satellite uplinks or over-the-horizon communication networks. The MQ-9 is a Group 4, 10,500-pound drone capable of achieving altitudes of 50,000 feet, speeds of 240 knots, and can remain on station for up to 30 hours.³⁹ Aerial reconnaissance is the primary Predator mission, and it is well equipped for such tasks; it carries the Multi-Spectral Targeting System (MTS-A), which integrates an infrared sensor, color/monochromatic daylight TV camera, image-intensified TV camera, laser designator, and laser illuminator into a single sensor package.⁴⁰ Each full-motion video feed can either be viewed individually, or meshed together to give the operator a multi-dimensional view of real-time missions. Laser capabilities are not used for weapons

³⁷ Barry, "Drones over the Homeland," 4, 6.

³⁸ According to news reports, one CBP Predator recently crashed, which would reduce their active inventory to nine. Alex Dobuzinskis, "U.S. Customs Grounds Fleet of Drones after Crash at Sea," *Reuters*, January 28, 2014, <http://www.reuters.com/article/2014/01/28/us-usa-drone-crash-idUSBREA0R1JT20140128>.

³⁹ "Unmanned Aircraft System MQ-9 Predator B Fact Sheet," Department of Homeland Security.

⁴⁰ Jeffrey T. Richelson, *The U.S. Intelligence Community* 6th ed. (Boulder: Westview, 2012), 185.

targeting; rather, they can be utilized to illuminate location information to ground units equipped with IR goggles. Also, Electro-Optical (EO) sensors can identify an object the size of a lunchbox from an altitude of 60,000 feet.⁴¹ This capability, coupled with the ability to remain aloft for more than 30 hours, contributes to significant operational advantages over manned aircraft. Thermal imaging sensors also give CBP the ability to track violators and potential terrorists through dense foliage or mountainous terrain, where ground assets may be significantly hindered.⁴² Predators are also equipped with surface search radars and ground moving target indicators, which allow operators to view terrain features while autonomously tracking movements of individuals of interest.⁴³ With all-weather capabilities and either fixed or mobile ground control stations, the MQ-9 is clearly the “Cadillac” of UAS, but with a lofty price tag of \$16.9 million, only elite government agencies with substantial funding can acquire such a system.

Next, the ShadowHawk UAS made by Vanguard Defense Industries is a Group 2 drone used by state agencies such as the Montgomery County, Texas, Sheriff’s Department. Although it is not as robust as the Predator, the ShadowHawk is an extremely capable platform for specialized use in both urban and rural terrains. This drone is a 49-pound, piston or turbine driven vehicle capable of altitudes up to 1,000 feet with loiter times ranging from 45 minutes to three hours depending on which engine is used. Its sensor suite includes electro-optical cameras with Forward-Looking Infrared Radar (FLIR) capabilities. ShadowHawks are used for aerial surveillance of houses, vehicles, people, and situations needing aerial coverage without noise intrusions and cost only 11 percent of a manned helicopter. Vanguard boasts of their extreme versatility in day/night operations and adverse weather conditions. Paired with an initial investment cost of \$300,000, the ShadowHawk is an advanced Group 2 UAS with a wide range of law enforcement capabilities that is currently being used throughout the United States.⁴⁴

⁴¹ Haddal and Gertler, *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, 3.

⁴² Ibid.

⁴³ “Unmanned Aircraft System MQ-9 Predator B Fact Sheet,” Department of Homeland Security.

⁴⁴ Vanguard Defense Industries, “Features of the ShadowHawk Unmanned Aerial System,” accessed October 30, 2013, <http://vanguarddefense.com/productsservices/uavs/>.

Finally, Innovative UAV Aircraft & Aerial Video Systems' Draganflyer X6 and Aerovironment's Wasp III are very small, lightweight, and affordable UAS currently being used by the Texas Department of Public Safety and Mesa County, Colorado, Sheriff's Department. Both systems are Group 1 assets that come in several variants with differing capabilities, but are battery operated systems limited by wind conditions and with significantly lower loiter times. Draganflyer is capable of 15–20 minutes before requiring a new battery, while the Wasp is considered a micro-UAV that can stay aloft for 45 minutes. Mission sets for these UAS are the same as previously mentioned drones, but with less advanced optical suites. The Wasp is capable of carrying forward- and side-look cameras, or high-resolution EO cameras with electronic pan, tilt, and zoom features, making it ideal for squad-level reconnaissance and surveillance.⁴⁵ These capabilities, combined with its lightweight portability, allow it to hover several hundred feet in the air and provide live video to agents on the ground.⁴⁶ Likewise, Draganflyer operators enjoy high-resolution, gyro-stabilized, real-time video feeds via a four channel video transmitter. Unlike the Wasp, the Draganflyer allows for GPS positioning hold, which gives users the ability to maintain a desired location in order to concentrate on camera operation.⁴⁷

Technical parameters and capabilities do not, however, answer the larger question of how do these capabilities enable these agencies to accomplish their goals and engage in counter-terrorism. Aside from the obvious advantage of possessing an aerial vantage point, UAS equip officials with tools that are not possible from ground-based positions. UAS allow law enforcement to see into otherwise denied areas such as a backyard, as was the case in the Boston Marathon suspect apprehension. This can be true of any fenced enclosure situation where timely information is necessary. Another advantage is being able to track suspects much easier through urban terrain. Everyone remembers the video footage from a helicopter following O.J. Simpson in his white Bronco through the

⁴⁵ Aerovironment, "Wasp III Data Sheet," accessed February 11, 2014, http://www.avinc.com/downloads/WASP-III_datasheet.pdf.

⁴⁶ Finn, "Domestic Use of Aerial Drones by Law Enforcement Likely to Prompt Privacy Debate".

⁴⁷ "X6 Technical Overview," Innovative UAV Aircraft & Aerial Video Systems, accessed October 30, 2013, <http://www.draganfly.com/uav-helicopter/draganflyer-x6a/specifications/>.

streets of Los Angeles; current technology allows for the same type of surveillance at a fraction of the cost of a manned helicopter, and it can be immediately deployed without scheduling constraints. UAS equipped with IR cameras also allow police to track suspects through residential areas under the cover of darkness, providing for quick and safe apprehension. Smaller systems like the Draganflyer also allow for covert observation, giving law enforcement an advantage over potential terrorist activity. Clearly, utilizing UAS for surveillance purposes provides officials with tools not previously known to conventional, ground-based personnel.

Government agencies and other law enforcement entities have a wide-range of UAS at their disposal with varying levels of efficiency, capabilities, and cost-effectiveness. Although private companies desire drone use, commercial use is currently all but banned. The FAA has only given a limited go-ahead to the government and police sectors.⁴⁸ Nevertheless, there are an estimated 20,000 to 30,000 amateur users in the United States, and large corporations are looking to utilize drone technology. Amazon recently unveiled its vision for same-day delivery by using UAS in a program known as Amazon Prime Air.⁴⁹ Once approved and implemented, the retailer claims to have the ability to deliver orders within 30 minutes from select locations. Lawmakers are continuing to develop civilian implementation procedures to comply with the FAA Modernization and Reform Act of 2012, which requires the FAA to fully integrate drones into the national airspace system by the end of Fiscal Year (FY) 2015.⁵⁰ Senior leaders are evaluating mission sets and desired end-states in order to choose which method of aerial surveillance works best for their organization. Domestic drone use is rapidly increasing throughout the country, and with new advancements in drone technology arriving almost daily, most law enforcement agencies are not asking themselves if they should purchase drones, but when.

⁴⁸ Anne Eisenberg, "Preflight Turbulence for Commercial Drones," *New York Times*, September 8, 2013, 3.

⁴⁹ Dominic Basulto, "Forget the Doubters, Commercial Drones Are Here to Stay," *Washington Post*, December 3, 2013, <http://www.washingtonpost.com/blogs/innovations/wp/2013/12/03/forget-the-doubters-commercial-drones-are-here-to-stay/>.

⁵⁰ Elias, *Pilotless Drones*, 1.

C. FUTURE CAPABILITIES

Manufactures begin to explore methods of system improvements as soon as products become available, and the same holds true for UAS development. Engineers are constantly designing new methods and technologies for improving aerial surveillance. Americans can expect these types of improvements to be used domestically in the near future, as well as continued use by the U.S. military overseas. For instance, the RAND Corporation already highlighted a promising methodology that uses computer software to “detect anomalies in the movement of large groups of people.”⁵¹ This technology can be extremely useful in urban environments with large concentrations of people where it is far easier to detect a person moving the wrong way in a crowd from overhead, rather than from ground personnel. These systems are capable of autonomous anomaly detection, which greatly empowers security or law enforcement officials.

An important aspect of future UAS development is communication between assets and operators. Optical communications are one avenue being explored by engineers to improve drone communications. The major challenge with optical communication is atmospheric signal absorption, but future systems will offer far greater bandwidth, which is the amount of information that can be relayed. While current Line of Sight (LOS) capabilities exist out to 50 km, future development strives to extend slant range air-to-ground links outwards of 100km. This type of improvement would allow drone operators to use a more localized communication hub as opposed to uplink or over-the-horizon relay methods.⁵²

Improvements in communication and sensor technologies are expected to cause a shift away from reliance on simple video operators to provide a “God’s eye” perspective. Satellites are an even less desired option because they are not capable of providing video. Satellites provide extremely high-resolution photographs, but the situation can change immediately after the image is captured. UAS producers plan to incorporate both manned and unmanned systems into their technology suites, which will allow operators to view a situation from multiple perspectives simultaneously. Wide-area sensors are

⁵¹ Arthur S. Hulnick, “Indications and Warnings for Homeland Security: Seeking a New Paradigm,” *International Journal of Intelligence and Counterintelligence* 18, no.4 (2005): 600.

⁵² Department of Defense, *Unmanned Systems Integrated Roadmap FY2011-2036*, 70.

changing the surveillance paradigm and allowing for a migration away from current closed-loop systems between sensor and operator. Allowing each video/sensor feed to be assigned a node on a larger surveillance network has the potential to dramatically improve homeland security practices. Tactical data link control of UAS, coupled with aircraft autonomy will provide operators with scalable transparent control, advancing the missions of CBP and other state and local agencies.⁵³

One new development specifically designed for use on the MQ-9 is the concept of Wide Area Airborne Surveillance (WAAS). Current CBP Predators are limited to single target monitoring. Operators do not currently have the ability to see in multiple locations at the same time. WAAS, through a plug-and-play system known as Gorgon Stare, allows for the simultaneous monitoring of 12 independent search areas. By overlapping the 12 feeds, operators can either have a single picture of a 4x4 km coverage area, or monitor each target feed individually.⁵⁴ This allows CBP to focus their efforts on multiple locations simultaneously and allows leadership to determine where is the best use of their ground assets for interdiction or counter-terrorism purposes. This technology is currently unavailable for smaller, regionally allocated systems, but CBP can essentially expand their coverage area by installing this system on all Predators and networking their airborne assets into a single situational awareness display.

This review of current and future drone capabilities has shown that technology is rapidly evolving into a formidable tool for domestic law enforcement and counter-terrorism. UAS provide varying levels of mission capabilities with significantly lower risk to personnel while maximizing agencies' budgets. Current FY2015 legislation requirements are opening the door for commercialized drone use as well, which will only increase their use across the national spectrum. The next chapter will build on this analysis by examining the employment and effectiveness of current UAS operations in law enforcement and counter-terrorism efforts. It will also analyze the cost effectiveness of these new systems.

⁵³ Department of Defense, *Unmanned Systems Integrated Roadmap FY2011-2036*, 86-87.

⁵⁴ Blair Hansen, "Unmanned Aircraft Systems Present & Future Capabilities," *Defense Intelligence Operations Coordination Center*, October 23, 2009, 13. <http://cryptome.org/dodi/uav-future.pdf>.

THIS PAGE INTENTIONALLY LEFT BLANK

III. CURRENT EMPLOYMENT AND EFFECTIVENESS

With the background provided in the previous chapter of the types and capabilities of current unmanned surveillance systems, this thesis will now analyze how drones are being employed by different agencies, to what level of effectiveness they are being used, and how their employment can be improved to better ensure homeland security. No one true definition exists for drone effectiveness, and UAS effectiveness might be different for CBP than for a local police department. The following section defines effectiveness and how it is measured by CBP. This chapter analyzes how two national organizations and several state and local agencies are currently using UAS domestically. It scrutinizes both the operational effectiveness of multiple systems and the systems' cost effectiveness, while providing a comprehensive impression of usefulness by the agency experts themselves.

This chapter suggests that to date, large-scale UAS operation by the CBP is too costly given the actual results that have been achieved by missions incorporating the Predator. The number of illegal immigrants apprehended, drug amounts interdicted, and national security threats prevented by CBP through drone use is minimal when compared to the results achieved by CBP more generally. Conversely, state and local agencies have achieved impressive results through the use of smaller UAS despite their much smaller budgets. CBP and the Federal Bureau of Investigation (FBI) use MQ-9 Predator Bs from Group Four, while state sheriff departments and local police use systems from Groups One and Two.

The first section of this chapter reviews the use of UAS by the two national-level agencies that currently use drones domestically, the CBP and the FBI. The second section examines use by several state and local agencies.

A. NATIONAL LEVEL USE

The leading national agency currently using drones to combat a wide range of domestic threats is U.S. Customs and Border Protection. With its fleet of seven MQ-1 Predators and three MQ-1 Guardians—Predators modified for marine surveillance—CBP

is at the forefront of large-scale drone operations. With an annual budget exceeding \$11 billion, CBP is well equipped for protecting our national security while combating potential terrorist threats.⁵⁵ But how efficiently are those funds being used, and what is meant by effectiveness? According to Merriam-Webster, effectiveness is “producing a decided, decisive, or desired effect or result.”⁵⁶ Ultimately, that desired result is safe international borders. Accomplishing this result involves the apprehension of illegal immigrants, interdiction of illicit drugs, and prevention of terrorist infiltration, which CBP does quite well, but with respect to UAS, effectiveness must be viewed on a much broader scale. This section takes into account the size of CBP, its operational budget, and couples it with published results.

According to CBP, the primary mission of drone use is “anti-terrorism by helping to identify and intercept potential terrorists and illegal cross-border activity.”⁵⁷ CBP uses its Predators and Reapers to accomplish this goal through human detection and tracking, surface asset coordination, and threat detection through IR sensors in multiple scenarios. Previously mentioned sensor suites allow the Predator to detect movement along the border, identify actual personnel numbers, and track the location of threats all while being unobserved to the individuals on the ground. With their long loiter times, Predators allow officials to monitor gaps along the border while maximizing the efforts of ground personnel in actual interdiction missions. After witnessing the functionality of actual Predator operations in Afghanistan, this author realizes the value in having high definition video sensors overhead during dangerous operations. This type of technology certainly has a place in homeland security missions, and future capabilities will provide a clear advantage to U.S. personnel in combating border security. This force multiplier mindset is one CBP has adopted and publicizes regularly to justify the success of its drone program. Long loiter times, remote area access, and flexibility during National Special Security Events are common claims.

⁵⁵ U.S. Department of Homeland Security, Customs and Border Protection, “Securing America’s Borders,” accessed December 2, 2013, http://www.cbp.gov/xp/cgov/about/organization/assist_comm_off/.

⁵⁶ Merriam-Webster Online Dictionary, s.v. “effectiveness,” accessed December 2, 2013, <http://www.merriam-webster.com/dictionary/effectiveness?show=0&t=1386009264>.

⁵⁷ Barry, “Drones Over the Homeland,” 4.

For several reasons, however, CBP UAS operations are less cost effective than they are often portrayed. First, even though these systems are unmanned, it is not widely recognized how manpower intensive they are to operate. In 2011, the chief of CBP's Office of Air and Marine (OAM), Major General Kostelnik, testified during congressional hearings that it takes anywhere from 20 to 50 individuals to execute a single UAS surveillance flight. These individuals handle everything from launch and recovery teams to sensor flight control operators. Overseas drone operations require even more people due to special qualifications needed for ordnance planning, loading/unloading, and arming/de-arming. Even after dangerous people and goods have been identified, it is still manned ground teams that must interdict and apprehend said individuals, and the costs associated with these assets is not included in CBP's UAS cost calculations.

Second, the CBP UAS program lacks performance standards or a methodology to measure plausible increases in border security; therefore, CBP has resulted to a traditional practice of what border scholar Peter Andreas calls "the numbers game."⁵⁸ Highly inflated results are the norm when justifying the millions of dollars being allocated for UAS operations by CBP. However, a close look at reported CBP results during UAS operations provides a less glorified picture of their actual utility. In reality, CBP drone operations require more people—operators and ground personnel—than the public might think, and CBP has a tendency to inflate its successes.

It is important to reiterate current production numbers in order to achieve the previously mentioned broad scale conclusion about effectiveness. From 2005–2011, CBP reported that its drones flew in excess of 12,000 flight hours in support of border operations. The efforts of these mission hours led to the seizure of 46,600 pounds of illicit drugs and the apprehension of 7,500 individuals engaged in illegal activity along the Southwest border.⁵⁹ These numbers are impressive if taken out of context. But during this time period, the total number of individuals apprehended by Border Patrol agents alone was 4.1 million— meaning UAS contributed to less than .01 percent of the

⁵⁸ Ibid., 20, 21.

⁵⁹ Ibid., 21.

total. The same picture is evident when discussing drug seizures; 46,600 pounds of marijuana over a seven-year period is virtually insignificant when compared with the 2.3 million pounds seized in 2012 alone.⁶⁰ Further degrading CBP's drone success claim is the statistic of roughly 3,500 pounds of marijuana seized every day just in Arizona, which means that it would only require two weeks' worth of effort in Arizona to achieve the five-year total of UAS. More current numbers are even more dismal. In a 2013 budget summary, DHS attributed UAS operations to the seizure of only 7,600 pounds of drugs and the apprehension of 467 individuals—the product of 4,400 drone flight hours.⁶¹ Of all this data, the most glaring statistic that warrants concern is that since the inception of CBP's drone program, not a single terrorist or top echelon Transnational Criminal Organization or drug cartel member has been apprehended, and no weapons of mass destruction or effects have been seized as a result of these operations.⁶² It is clear that CBP's primary mission of “anti-terrorism by helping to identify and intercept potential terrorists” is not being adequately addressed.

In addition to requiring more manpower and producing fewer results than commonly recognized, CBP UAS operations are not cost effective. CBP's Predators, for example, are much more expensive to acquire, operate, and maintain than CBP officials claim. This chapter continues to use the 2005–2011 timeframe in order to maintain continuity across the data spectrum. A conservative figure of \$332 million for initial procurement and operational costs combined with \$4.2 million for 12,000 flight hours—\$3,500 per UAV flight hour— totals \$336.2 million.⁶³ This does not take into account additional costs of housing the Predators at U.S. military bases. Assuming that UAS were solely responsible for the above-mentioned interdictions, the cost was \$44,800 per apprehension and \$7,214 per pound of marijuana seized. It must be noted that other assets including teams of Border Patrol agents, vehicles, chase planes, horses, and

⁶⁰ Ibid., 22.

⁶¹ Ibid., 21, 22.

⁶² Ibid., 24.

⁶³ Ibid., 27.

helicopters all play a role in actual interdictions; therefore, these added costs increase the total dollar amounts.⁶⁴

UAS also tend to be more complex than traditional aviation platforms. According to a January 2012 Congressional Research Service report, “UAVs operate as part of a system, which generally consists of a ground control station, a ground crew, including remote pilots and sensor operators, communication links and often multiple air vehicles.”⁶⁵ Unlike manned systems, each of these facets of the larger system are required supporting elements needed for flight, and they each have associated costs. Ultimately, the operational infrastructure that helps make up the entire UAS system is extremely complex, further driving up the cost of CBP’s drone operations.

Decision makers are faced with tough choices regarding CBP’s Predator program. Although most people believe it is a valuable asset and critical to America’s national defense along its borders, how much is it actually contributing to homeland defense and security? Are the insignificant interdiction numbers worth the high costs? Realistically, the answer to the second question is no. Americans’ taxes can be better utilized by CBP with a scaled back version of current operations. Although national security is of utmost importance and their technology can be valuable, Predators along our borders are not having a significant enough impact to justify their constant use, at least at the current cost.

Patrolling the northern and southern borders is not the only national-level use for Predators; they have been used on occasion by other agencies during unique situations. One situation occurred in August of 2013; officials used a Predator operated by the National Guard to combat the California Rim Fire. The National Guard offered its asset to firefighters in order to monitor fire perimeters while providing early warning to crews on any new flare-ups. The Predator utilized both its EO sensor suite along with its IR capabilities during night operations. The drone remained on station for up to 22 hours and was operated by the 163rd Wing of the California National Guard at March Air

⁶⁴ Ibid.

⁶⁵ Jeremiah Gertler, *U.S. Unmanned Aerial Systems*, CRS Report R42136 (Washington, DC: Library of Congress, Congressional Research Service, January 3, 2012) 13.

Reserve Base in Riverside, California. California fire spokesman Daniel Berlant praised the addition of the Predator by outlining how it provided “data directly back to the incident commander, allowing him to make quick decisions about which resources to deploy and where.” In this situation, drone technology was rapidly deployed to counter a dangerous situation, much like they could be deployed during the initial phase of terrorist situations or threat to national security.⁶⁶ This example highlights the extreme utility of Predators as situation-based assets. The prolonged use in combating the wildfire ensured the protection of hundreds of personnel while preventing the destruction of further homes.

The National Guard is not the only agency to utilize CBP’s Predators. Recently released data show that from 2010 through 2012, CBP flew nearly 700 surveillance missions on behalf of other agencies.⁶⁷ Although CBP did not disclose the names of the government agencies borrowing its assets, mission sets included disaster relief, search and rescue, and missing persons scenarios. The former chief of CBP, David V. Aguilar, outlined how requests were granted if there was a pressing law enforcement purpose or public safety emergency and that “there was a sensitivity attached to this.”⁶⁸ The records indicate these missions were effective due to their focused, situation-based use and not broad, large-scale utilization.

Rounding out the national use of UAS is limited employment by the FBI. In July of 2013, the assistant director of the Office of Congressional Affairs for the FBI, Stephen Kelly, sent a letter to the Honorable Rand Paul, United States Senate, outlining how the FBI uses drones for domestic surveillance. In his letter, Kelly describes how the FBI uses UAS in very limited circumstances to conduct surveillance when there is a specific, operational need. Since 2006, Kelly wrote, UAS have only been used in eight criminal

⁶⁶ Brian Skoloff and Tracie Cone, “Predator Drone Now Part of California Wildfire Battle,” *Current News: Early Bird*, August 29, 2013.

⁶⁷ Craig Whitlock and Craig Timberg, “Border-Patrol Drones Being Borrowed by Other Agencies More Often Than Previously Known,” *Washington Post*, January 14, 2014, http://www.washingtonpost.com/world/national-security/border-patrol-drones-being-borrowed-by-other-agencies-more-often-than-previously-known/2014/01/14/5f987af0-7d49-11e3-9556-4a4bf7bcb84_story.html?hpid=z1.

⁶⁸ Ibid.

cases and two national security cases; of which, they were utilized for mission sets such as kidnappings, search and rescue, drug interdiction, and fugitive investigations. In all instances, the FBI applied for and was granted a Certificate of Authorization (COA) by the FAA. The FBI's internal legal counsel, in order to ensure its use did not violate Fourth Amendment rights or infringe on privacy concerns, also reviewed each request. The privacy debate concerning drone use will be addressed in the next chapter, but the FBI adamantly states that it will not use UAS to acquire information without an approved warrant when suspects have a reasonable expectation of privacy. Although Kelly acknowledged the need for transparency in drone operations, he did not disclose further details of the FBI's operations; rather, he enclosed a classified addendum containing details that are beyond the scope of this thesis.⁶⁹ Without exploring the classified addendum included by Kelly, too little is known about the FBI's use of UAS to make an accurate assessment its cost effectiveness. What can be derived is that in the eight instances mentioned in the letter, all of them were on a situation-based need. Continuous surveillance was not employed or condoned by the FBI; rather, it followed the current operational process in order to utilize the available technology in dangerous situations.

Predator operations can be valuable and effective if their use is tailored to individual situations and circumstances, but they are presently not cost effective enough to remain airborne around the clock. The proper balance between security and cost effectiveness may not lie with military-grade Predators patrolling the skies, but with smaller, situation-based UAS that do not deplete taxpayer-funded budgets. Next, this thesis examines how lower level agencies are effectively employing smaller UAS and also how a more focused, situation-based use of UAS can be far more useful and effective in promoting homeland security.

B. STATE AND LOCAL AGENCY USE

Although surveillance is still the primary mission during state and local agency drone use, it is more focused and does not incorporate the broad surveillance techniques

⁶⁹ Stephen Kelly, "Drone Inquiry Response Letter to Senator Rand Paul," July 19, 2013, <http://www.paul.senate.gov/files/documents/071913FBIresponse.pdf>.

used by CBP. CBP employs Predators almost around the clock to monitor the vast distances along our borders, and when a situation develops that needs constant surveillance, they orbit overhead to provide continuous situational awareness through video and other sensor feeds. State agencies do not request “hover-and-stare” authorization during their COA processes with the FAA because it is not within the scope of their operations. “Hover-and-stare” can be potentially dangerous to civil liberties because it is constant surveillance directed without any clear goals. State law enforcement organizations and local sheriffs effectively utilize UAS on an efficient, case-by-case basis while maximizing the cost effectiveness of their budgets. As of August 2012, 10 law enforcement agencies possessed both an operational UAS and an FAA approved COA for its use. Of those agencies, only two have discontinued their drone use; one UAS crashed during testing and its corresponding COA expired, the other was purchased for demonstration purposes only. All ten systems, which belong to the Group One or Two families mentioned in the last chapter, were purchased with grants from either DHS or the Department of Justice (DOJ).⁷⁰

UAS operations by state and local agencies are typically time-sensitive scenarios in which an overhead vantage point is crucial in obtaining valuable situational awareness, providing an overhead view for coordination efforts, and ensuring the safety of officers to the maximum extent possible in dangerous situations. A prominent example of such a scenario occurred in the days following the Boston Marathon bombing; agents located, identified, and apprehended one of the suspects after using overhead, IR imaging to determine his state and threat to law enforcement. Authorities accomplished this with the use of a manned helicopter, but a distinct parallel can be drawn to the usefulness of a drone in the same situation at significantly lower cost to the agency.⁷¹ Rapidly deployed

⁷⁰ Frost & Sullivan Industries, “Non-military Use of Unmanned Aerial Systems in the United States: Current and Future Opportunities in a Market Poised for Significant Growth,” August 2012, <http://www.frost.com/sublib/display-report.do?searchQuery=non-military+use+of+unmanned+aerial+systems&ctxixpLink=FcmCtx1&ctxixpLabel=FcmCtx2&id=9831-00-16-00-00&bdata=aHR0cDovL3d3dy5mcm9zdC5jb20vc3JjaC9jYXRhbG9nLXNlYXJjaC5kbz9xdWVyeVRleHQ9bm9uLW1pbGl0YXJ5K3VzZStvZit1bm1hbm5lZCthZXJpYWwrc3lzdGVtc0B%2BQFNlYXJjaCBSZXN1bHRzQH5AMTM4NjE5NDUzMTM1Ng%3D%3D>.

⁷¹ Goodlatte, *Eyes in the Sky*, statement before the House Committee on the Judiciary.

drones in a similar situation following a terrorist threat or attack can provide officials with time critical information necessary for rapid identification and apprehension.

1. Mesa County, Colorado, Sheriff's Office

In his testimony before the 2013 Committee on the Judiciary for the U.S. Senate, Benjamin Miller, Unmanned Aircraft Program Manager for Mesa County Sheriff's Office and a member of the Airborne Law Enforcement Association (ALEA), gave a detailed account of how his office has used drones successfully in its law enforcement mission. It is important to understand the scope of operations for Mesa County, Colorado. The Sheriff's office is a middle-size agency that employs roughly 200 people with a patrol team of just over 65 deputies. They are responsible for 175,000 citizens who live inside a 3,300 square mile county. The type of criminal activity in this region varies widely from petty offenses to major drug trafficking and homicide.⁷²

The primary use of Mesa County's Draganflyer X6 is for search and rescue and crime scene reconstruction. The office also uses a Falcon UAV, and both the Falcon and Draganflyer are equipped with daytime cameras capable of live video feeds and still image capture. Since the genesis of Mesa County's UAS programs, it has used its drones in just over 40 missions totaling 185 flight hours. Although Miller initially had thoughts of grandeur like chasing criminals across the landscape and solving all his community's problems with state of the art technology only seen on TV in Iraq and Afghanistan, he admits that his office only uses its drones for time sensitive surveillance missions. The most notable success was locating a woman who had been reported missing. Deputies were able to fly all day, clearing large areas in a short amount of time. The woman's body was discovered far more quickly than if traditional search resources had been used. The UAS allowed the sheriff's office to more directly apply its resources. This type of area search is precisely the type of utility UAS potentially have for ensuring homeland security. Should authorities be alerted to potential terrorist movements in rural areas – much like the style of combat in Afghanistan—they can launch a similar system to locate

⁷² Miller, *Future of Drones in America*, statement before the Senate Committee on the Judiciary.

the suspected individuals in much shorter periods of time. Timely apprehension prevents further attacks on public safety, as illustrated in the Boston Marathon example.⁷³

Adding to the effectiveness of the Mesa County example is the cost savings. The cost of unmanned flight for the office is \$25 an hour rather than \$250 to thousands of dollars for manned helicopters and aircraft. Although not related to law enforcement, Miller offered a glimpse of how much more efficient unmanned surveillance is to manned air assets when describing how his office used its Draganflyer X6 to survey the county's landfill to determine waste increases. This mission was accomplished for only \$200, whereas previous methods cost more than \$10,000. Miller, with the support and endorsement of the ALEA, believes UAS can complete 30 percent of the missions of manned aviation for 2 percent of the cost. Mesa County Sheriff's Department is a clear example of UAS effectiveness and provides a realistic perspective of the many benefits drones can provide to public safety.⁷⁴

2. Montgomery County, Texas, Sheriff's Office

Furthering the argument for increased domestic drone use in the homeland defense and security mission is the Montgomery County, Texas, Sheriff's Office. Heading this organization is Chief Deputy William R. McDaniel who gave testimony before the U.S. House of Representatives' Committee on Homeland Security in support of increased UAS operations. McDaniel believes that UAS currently available to law enforcement are "exactly the type of technology" that will make them more successful. The data McDaniel provided suggest that when used at the state and local levels, drone systems are extremely viable, effective, and economical means to enhance public safety and further America's homeland security.

Similar to Mesa County, Colorado, Montgomery County, Texas law enforcement is responsible for a population of 471,000 individuals residing in just over 1,000 acres. Dense urban populations combined with vast rural areas make Montgomery County a challenging venue for law enforcement along the Texas-Mexico international border. In

⁷³ Ibid.

⁷⁴ Ibid.

2011, the Sheriff's office purchased a Group Two ShadowHawk UAS with a Homeland Security grant and immediately began to see enhancements in its operational effectiveness in a variety of mission sets. Its ShadowHawk serves mission sets such as SWAT operations, high-risk warrant, lost persons identification, and manhunts, all of which are considered "critical incidents" and share a distinct parallelism between counter terrorism and protecting national security.⁷⁵ Montgomery County's ShadowHawk assisted in 23 SWAT missions during the first year of its employment, providing an overhead vantage point from which to send real time information to mission commanders on the ground using high definition video feeds and at times, FLIR images during night operations. According to agency officials, those types of incidents were ideal for the ShadowHawk and continue to be of utmost importance in their law enforcement effectiveness.⁷⁶

Cost effectiveness also played a role in the office's decision to apply for a DHS grant. After considering multiple platforms to aid in operational effectiveness through airborne, multi-purpose utility, the organization decided a UAS was the best choice given its budget. The Sheriff's office purchased its ShadowHawk in December 2011 for an initial cost of \$220,000. This investment included a one-year maintenance plan and air crew training for two people. The office purchased an upgraded guidance package and LED lighting system upgrade the following year. Chief McDaniel explained that this was the most cost effective option given that the minimum price for any manned aircraft capable of the same mission started at \$400,000.⁷⁷ Montgomery County does not use its UAS for routine surveillance, and Chief McDaniel believes that is not the intended purpose for such systems. However, the use of drones by public safety organizations is, ultimately, about "protecting and making safe the citizens we serve."

⁷⁵ McDaniel, *Using Unmanned Aerial Systems Within the Homeland*, statement before the House of Representatives Subcommittee on Oversight.

⁷⁶ Ibid.

⁷⁷ Ibid.

3. Additional Examples of Time-Sensitive Use

One of the first examples of successful UAS employed occurred in Texas in early 2011. Agents with the Texas Department of Public Safety were serving an arrest warrant for a man believed to be hoarding a large cache of illicit drugs and high-caliber weapons. As SWAT members arrived, they needed an aerial advantage point for coordination efforts and also to identify potentially where in the structure the man resided and what weapons he possessed. Fearing for the safety of a manned helicopter, the department launched a Group One Wasp armed with thermal imaging and video cameras. The Wasp provided instant feedback to mission commanders and successfully identified the location and condition of the individual of interest. After further confirmation, SWAT members raided the house and arrested the suspect without incident. Bill Nabors Jr., Chief Pilot with the Texas DPS, praised the use of the drone, highlighting its covertness and versatility in critical situations.⁷⁸ Texas DPS has been the most active user of drones for high-risk operations within the state of Texas and routinely uses them for operations along the southern border. Agents routinely utilize UAS for surveillance of drug interdiction and human trafficking surveillance.

A more recent example of drone effectiveness occurred in North Dakota during August 2012. In this case, an individual barricaded himself inside his residence with his family and proceeded to engage in an armed standoff with the Grand Forks Police Department. Lacking the capabilities for aerial surveillance, DHS offered up the temporary use of one of its Predators, which happened to be on a surveillance mission on the Canadian border. Through the video and thermal imaging feeds provided by the Predator, Grand Forks SWAT was able to determine that the suspect and his family were concentrated in a single area of the property and were unarmed. Police were able to successfully apprehend the individual, and SWAT team Chief Bill Macki praised the surveillance efforts of DHS in ensuring his team successfully completed their mission without incident. This incident was the first time a domestic drone was used in the arrest

⁷⁸ Finn, "Domestic Use of Aerial Drones by Law Enforcement Likely to Prompt Privacy Debate."

of an American citizen, but it adds to the evidence of UAS effectiveness within America's borders.⁷⁹

C. CONCLUSION

This chapter has explored how various levels of law enforcement are currently using UAS domestically. The evidence shows that although highly capable, military grade Predators operated by CBP contribute far less to national security and at a much higher cost to the American taxpayer than expected. Much of this is due to Predators being airborne far longer than needed while practicing broad surveillance techniques. Focused efforts are only utilized when required, and UAS enabled results are insignificant when compared to overall mission analysis.

On the other hand, state and local agencies have found a balance between cost effectiveness and mission capable platforms in the smaller versions of drone technology. Situation and time-sensitive based missions are ideal operations for law enforcement agencies to employ UAS and ensure homeland security. If a cost effective UAS is capable of enhancing the public safety that Chief McDaniel describes, then every effort should be made to acquire and utilize this type of technology. It would behoove other state agencies to recognize and follow the example of the two previously mentioned Sheriff's departments. The evidence clearly shows that small, lightweight UAS are making a difference at the state and local level with regard to homeland security.

The next chapter will build on this concept of domestic effectiveness and examine privacy concerns relating to drone operations while taking an in-depth look at oversight and regulation issues. Privacy, oversight, and regulation are key areas of concern for lawmakers and civil liberties advocates, especially with the FAA's rapidly approaching 2015 full drone implantation requirement.

⁷⁹ Koebler, "Court Upholds Domestic Drone Use in Arrest of American Citizen."

THIS PAGE INTENTIONALLY LEFT BLANK

IV. PRIVACY ISSUES AND FEDERAL OVERSIGHT

As mentioned in previous chapters, Congress has directed the FAA to research, develop, and implement regulations that allow for full drone use throughout the United States by 2015. This requirement primarily addresses commercial and private UAS use since the current system enables DoD and Federal agencies to use drones as long as they follow the FAA's COA process. But with increasing advances in technology, and private industry realizations of the potential usefulness of drones, many civil liberty groups question not only whether Americans' personal privacy could be jeopardized, but who will act as an oversight authority and to what extent. Although an in-depth analysis of the legal ramifications of full drone authorizations is beyond the scope of this thesis, this chapter examines the current stance of the U.S. Supreme Court with regard to individuals' expectations of privacy and what current oversight policies are in place. It analyzes the potential need for more regulation at the federal level to coincide with the FAA's impending responsibility to integrate UAS operations into the national airspace.

This chapter reviews Supreme Court rulings that find individuals cannot invoke a reasonable expectation of privacy argument outside their homes if they are in plain view—an unobstructed view from any given location—to the airspace above them. In addition, the Supreme Court has found in favor of law enforcement agencies with respect to the use of manned and unmanned aircraft for overhead surveillance. This chapter suggests that integrating the Department of Homeland Security's Privacy Office, as an oversight authority, into the FAA's COA approval process may be a positive route for adding another level of protection for Americans' privacy while increasing security, and it will ensure that the entire spectrum of drone operators—from federal agencies to individual users—does not abuse the rapidly increasing capabilities of airborne video surveillance.

The first section reviews three significant Supreme Court cases that dealt with expectations of privacy when law enforcement agencies were confronted with warrant requirements prior to conducting airborne surveillance. It also highlights advocacy

groups' concerns about domestic UAS operations. The second section analyzes the FAA COA process, oversight, and the need for DHS integration.

A. THE PRIVACY DEBATE

At the heart of the domestic drone debate is the issue of privacy. Tensions between security and privacy interests are not new, but have been heightened by the explosion of surveillance technology in recent decades. Both privacy and UAS advocates look to the Fourth Amendment to substantiate their views on domestic surveillance. The Fourth Amendment provides, in relevant part: “The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated.”⁸⁰ Since “privacy” does not exist in the legislation, some conservatives argue that there is no constitutional right to privacy, but others argue that privacy is exactly what is meant by “being secure in their persons ... against unreasonable searches.” The Fourth Amendment does not apply to all government acts, but only to those that constitute a search. How does this translate to aerial surveillance, and what does the United States’ highest court have to say on the issue? Two cases, *California v. Ciraolo* and *Florida v. Riley*, involve the issue of aerial surveillance and provide the interpretational framework for domestic UAS operations.

1. U.S. Supreme Court Cases

In *California v. Ciraolo*, police officers received a tip that an individual was growing marijuana in his backyard. Because fencing obstructed the backyard from view, police launched a small UAS at an altitude of 1,000 feet over the property to conduct aerial surveillance. Officers visually identified marijuana plants and the suspect was arrested and subsequently convicted. The defendant claimed he had a reasonable expectation of privacy in his backyard in accordance with the Fourth Amendment. The Supreme Court disagreed; they stated that, “what a person knowingly exposes to the public ... is not a subject of Fourth Amendment protection.”⁸¹ In other words, what was

⁸⁰ U.S. Const. amend. IV.

⁸¹ *California v. Ciraolo*, 476 U.S. 207; Thompson, *Drones in Domestic Surveillance Operations*, 8.

in plain view to the public was not subject to protection. Any civilian flying overhead could have seen the same plants, so using a UAS was no different. A key aspect of this ruling is that the drone was operating at all times in navigable federal airspace.⁸² Even though a fence encircled the defendant's yard, "plain view" also applies to overhead surveillance. This ruling highlights the rights of law enforcement agencies to simply observe areas of interest from an overhead vantage point without the need for a warrant.

Florida v. Riley is similar in nature, except this time the marijuana was in a greenhouse 10–20 feet from the individual's home. Police flew a manned helicopter over the greenhouse at an altitude of 400 feet and visually identified the marijuana plants through the roof of the greenhouse.⁸³ Like in *Ciraolo*, the defendant believed he had a reasonable expectation of privacy, and the over flight of a helicopter sans warrant was indicative of a search; however, the Supreme Court concluded that like the UAS, the helicopter was in navigable airspace, did not constitute a search, and a warrant was unnecessary.⁸⁴ In order to actually seize the drugs and apprehend the suspect, a warrant was required to enter the greenhouse since it was a structure on the defendant's property, but one was not required to observe the interior of the greenhouse from above.

In order to emphasize the significance of the previous rulings, it is important to briefly address another case in which the defendant was protected under the Fourth Amendment. In addition to physical entry and search of a home, police are likewise prohibited from using certain technology to pierce this zone of privacy.⁸⁵ In *Kyllo v. United States*, police used a thermal imaging device to detect abnormal levels of heat radiating from the home of Danny Kyllo. Officials entered his home without a warrant and after discovering marijuana growing in a back room, arrested Kyllo.⁸⁶ The Supreme Court highlighted that the use of thermal imaging devices constitute a search because

⁸² *California v. Ciraolo*, 476 U.S. at 213.

⁸³ *Florida v. Riley*, 488 U.S. 445.

⁸⁴ Thompson, *Drones in Domestic Surveillance Operations*, 8; *Florida v. Riley*, 488 U.S. at 448.

⁸⁵ *Ibid.*, 6.

⁸⁶ *Kyllo v. United States*, 533 U.S. 27.

they are not in “general public use.”⁸⁷ This case has the potential to be revisited due to the rapidly increasing use of UAS technology in the public sector, but for now, using technology that is not readily available to the public to penetrate the exterior of a home requires a warrant.

These three cases provide the initial framework for domestic surveillance and privacy considerations by emphasizing two main points: individuals do not enjoy an expectation of privacy if law enforcement officials can observe their property or activities from an aerial vantage point, and the use of technology not in public use constitutes a search. Both points are extremely important when considering privacy implications of UAS use since drones both operate in public airspace and use technology that currently is not available to the public. Future sections of this chapter will address the second point since drone technology is rapidly becoming more available to the public, highlighting the need for clarification with respect to what constitutes a “search.”

2. Public Opinion and Privacy Advocates

It is important to recognize the views of American citizens in the domestic drone debate because they are the very individuals who are subjected to domestic surveillance. What liberties and potential invasions of privacy are Americans willing to risk in order for the government to further our homeland security? The answer to this question may depend upon the context in which such surveillance takes place. The general public tends to support drone usage in certain circumstances, but people are less enthusiastic about using them as part of routine law enforcement activity.⁸⁸ However, focused, situation-based surveillance seems to be widely tolerated and embraced. A recent poll by Monmouth University suggests that Americans are comfortable with the use of unarmed domestic drones as long as some type of court grants prior authorization.⁸⁹ Although more than half of the people polled—60 percent—support the use of UAS in issues of national security along our nation’s borders, more than 75 percent believe that the

⁸⁷ Thompson, *Drones in Domestic Surveillance Operations*, 6; *Kyllo v. United States*, 533 U.S. 27.

⁸⁸ Thompson, *Drones in Domestic Surveillance Operations*, 1.

⁸⁹ Murray, “National: U.S. Supports Unarmed Domestic Drones,” 1.

operating agency should be required to obtain some type of warrant prior to their use. The challenge with obtaining a warrant prior to every use is timely determination of whether one is necessary for every mission. Still, with a growing transparency and exposure to UAS operations, society tends to accept domestic surveillance as long as some form of oversight exists. When asked about confidence in federal, state, and local law enforcement agencies to use drones appropriately, less than 50 percent expressed confidence, with 33 percent having very little confidence.⁹⁰ Clearly, public opinion is in flux, and civil liberties organizations are even more skeptical.

Large privacy advocate groups such as the American Civil Liberties Union (ACLU) and the Electronic Privacy Information Center (EPIC) have been very outspoken about the domestic use of UAS. Leaders of the ACLU suggest that “unmanned aircraft ... raise the prospect of a significant new avenue for the surveillance of American life,” and that multiple attributes of surveillance UAS make them “uniquely threatening to privacy.”⁹¹ Both organizations believe that widespread, unregulated surveillance is unconstitutional and that the United States is incorrectly labeling “offensive” surveillance as “defensive in nature” in order to justify continued use.⁹² Drones are certainly game changers in the world of surveillance, which is why EPIC and the ACLU are urging strict limits on their use. Jay Stanley, a senior policy analyst at the ACLU, warns that UAS can “profoundly change the character of public life.”⁹³ He also said that the ACLU wants to prevent government agencies from conducting “pervasive, mass surveillance.”⁹⁴

These are valid concerns as technology evolves to produce platforms that can quietly record every aspect of our daily lives. But just as our nation develops technology to help ensure our national security, it would be wise to assume that radical groups looking to harm the United States are also developing new ways of attacking Americans at home. The U.S. government and law enforcement agencies may require a certain

⁹⁰ Ibid., 4.

⁹¹ Glenn Greenwald, “Domestic Drones and their Unique Dangers,” *The Guardian*, March 29, 2013, <http://www.theguardian.com/commentisfree/2013/mar/29/domestic-drones-unique-dangers>.

⁹² Kettl, *System under Stress*, 113-115.

⁹³ Eisenberg, “Preflight Turbulence for Commercial Drones.”

⁹⁴ Ibid.

amount of leniency regarding new technologies in order to ensure our future homeland security. As a later section in this chapter will show, DHS is well aware of society's privacy concerns and is developing ways to address them while maximizing the usefulness of technological developments associated with UAS.

B. REGULATION AND OVERSIGHT

Domestic drone use is accelerating as new technology develops and private companies and organizations learn of its potential benefit. In order to increase security while maintaining Fourth Amendment protection, lawmakers are addressing the topic of oversight. What regulations are currently in place regarding drones and who holds the authority to grant use authorizations? Does the federal government have oversight measures in place and to what effect? This section takes a close look at current regulatory implementations and future oversight to account for the rise in domestic surveillance efforts.

1. Current COA Regulation

At the present time, FAA authority is required for all drone operations within the United States under the FAA's Joint Planning and Development Office (JPDO). DHS is one of several partner agencies of this office working to safely integrate UAS into the National airspace in accordance with the FAA Modernization and Reform Act of 2012 (P.L. 112-95), which contains extensive provisions designed to promote and facilitate the use of civilian unmanned aircraft to include UAS.⁹⁵ The FAA addresses requests to operate unmanned aircraft on a case-base basis through its online Certificate of Waiver or Authorization (COA) process. Currently, all military or other federal, state, or local agencies must obtain a COA prior to using UAS. These COAs outline the specifics of usage such as when, where, for what purpose, and for how long. Every COA granted also contains an expiration date on the usage window, meaning that these agencies must renew their authorizations once they expire.⁹⁶ Although the web-based application

⁹⁵ Dillingham, *Using Unmanned Aerial Systems Within the Homeland*, statement before the House of Representatives Subcommittee on Oversight.

⁹⁶ Elias, *Pilotless Drones*, 6.

process is relatively simple to use, there is not a blanket approval for all applicants. The FAA denied the Montgomery County, Texas, Sheriff's Office an emergency COA for a time-sensitive situation because the situation did not present "loss of life or potential loss of life."⁹⁷

The FAA continues to streamline its approval process, but has not taken any formal steps in considering privacy implications of COA approvals. Texas Representative Ted Poe suggests one possible solution in his Preserving American Privacy Act of 2013 (H.R. 637). In addition to applying for a COA through the FAA, H.R. 637 would require any entity applying for a COA to also file a data collection statement with the U.S. Attorney General's office.⁹⁸ This new legislative proposal, aimed at addressing privacy concerns with drone operations, is indicative of an increasing awareness to privacy implications relating to widespread UAS operations. Although this bill, and several similar ones, have not yet passed, congressional leaders appear to be hearing the voice of the public and taking steps to ensure Americans are not only safe to go about their daily lives, but also protected from unnecessary surveillance practices.

2. Federal Oversight

Recent congressional reports express that some Members of Congress and the public fear there are insufficient safeguards in place to ensure that drones are not used to spy on American citizens and unduly infringe upon their fundamental privacy. This concern is further emphasized by various testimonies by UAS-experienced officials. Gerald Dillingham of the Government Accountability Office believes that "Congress should consider creating an overarching body within the FAA to address obstacles for privacy access."⁹⁹ Others, such as Chief McDaniel from Texas, believe DHS should be the primary oversight agency due to its ability to manage the operational environment of UAS. According to McDaniel, the FAA has aeronautical field expertise, but not the

⁹⁷ McDaniel, *Using Unmanned Aerial Systems Within the Homeland*, statement before the House of Representatives Subcommittee on Oversight.

⁹⁸ Thompson, *Drones in Domestic Surveillance Operations*, 19.

⁹⁹ Dillingham, *Using Unmanned Aerial Systems Within the Homeland*, statement before the House of Representatives Subcommittee on Oversight.

public safety experience needed to oversee daily operations. He believes that DHS “would manage the operational aspect by setting and enforcing operational guidelines and procedures, establish a database relating to UAVs ... and act as a resource and information tool for current public safety agencies.”¹⁰⁰

The privacy advocate group EPIC has narrowed its opinion down even further; senior leaders of this organization believe that the responsibility falls on DHS’s Privacy Office. Amie Stepanovich, one of EPIC’s litigation counsel members, stated before Congress that DHS’s Privacy Office is responsible for “conducting [Privacy Impact Assessments] on technologies ... and activities ... to ensure that privacy considerations and protections are incorporated into the Department.”¹⁰¹ Domestic drone operations certainly fall within the two mentioned categories of “technologies” and “activities.” Even though Stepanovich recognizes the potential benefits of drone use, she believes DHS needs to be more proactive and evolve to conform to increased privacy needs.

3. The Way Forward

With the rapidly approaching 2015 deadline for full UAS implementation into the domestic airspace, DHS has taken the primary role of oversight and assigned its Privacy Office the responsibility for evaluating the privacy implications of using sensor-equipped aircraft—including UAS—to accomplish DHS and other domestic law enforcement missions. DHS’s Privacy Office recently released its annual report to Congress, and in this report it outlined what actions it is taking in the realm of UAS operations and oversight.

In 2013, the Privacy Office’s leadership established the Privacy, Civil Rights, and Civil Liberties Working Group on UAS with the Office for Civil Rights and Civil Liberties (CRCL), which the Privacy Office co-chairs with CBP and CRCL.¹⁰² The

¹⁰⁰ McDaniel, *Using Unmanned Aerial Systems Within the Homeland*, statement before the House of Representatives Subcommittee on Oversight.

¹⁰¹ Stepanovich, *Future of Drones in America*, statement before the Senate Committee on the Judiciary.

¹⁰² U.S. Department of Homeland Security, *Privacy Office: 2013 Report to Congress*, November 2013, 17, <http://www.dhs.gov/sites/default/files/publications/2013-dhs-privacy-office-annual-report-final-11062013.pdf>.

Working Group provides a forum for all components whose work relates in some way to UAS activities to discuss items of common interest and to coordinate guidance on privacy, civil rights, and civil liberties issues. The group is currently completing a best practices document that highlights lessons learned by DHS's UAS operations, and it could be used to provide guidance to state and local agencies regarding privacy issues to consider when establishing UAS programs.¹⁰³ Even after releasing this document, the Working Group will continue to meet regularly to address rising UAS issues and to determine if further guidance is needed for domestic UAS use.

A key player in the Working Group is the Office of Intelligence and Analysis (I&A). I&A is significant because it is a Component Privacy Office within DHS that provides intelligence support across the Department and also disseminates guidance to state, local, tribal, and territorial governments, and the private sector. This office participated in the Working Group to examine the privacy implications of expanded domestic UAS use, and their products will directly affect agencies aspiring to acquire and implement drones.¹⁰⁴

C. CONCLUSION

Senior leaders in Congress, DHS, and the FAA are well aware of the privacy implications associated with domestic UAS operations. Critics continue to voice their concerns, and advocates continue to ensure that drones are operated with the public's best interest in mind. Based on the aerial surveillance cases previously mentioned, it is reasonable to assume a warrant is not necessary to conduct UAS surveillance of most public places for a relatively short period of time. Surveillance by UAS on all levels can be considered passive and therefore may be even less likely to run afoul of Fourth Amendment requirements. UAS surveillance does not require any physical manipulation of property or persons and does not require the seizure of a person for any period of time (though drone surveillance may lead to law enforcement physically apprehending a person who is seen engaging in suspected illegal or terrorist activity). The use of drones

¹⁰³ Ibid., 18.

¹⁰⁴ Ibid., 53.

to view people and objects in plain view while in their home does not trigger Fourth Amendment protection, according to recent court cases.

While the FAA's approach to address the mandates set forth in P.L. 112-95 is yet to be defined, it is most likely that FAA regulation and oversight of UAS will adopt an evolving, risk-based approach toward the end goal of seamless integration. This approach could be interconnected with DHS's Privacy Office and its Working Group in order to promote the proper balance between security and privacy. The FAA's COA process is working, but the FAA lacks the manpower to handle the increased volume of COA requests once the domestic airspace is opened to the private sector. DHS is moving in the right direction by taking ownership of the oversight issue, but further partnering of its Privacy Office and the FAA is needed to build a cohesive team that is capable of streamlining the process that will increase homeland security while simultaneously protecting Americans' civil liberties.

The analysis of this chapter suggests that additional oversight is needed due to the rapidly diminishing gap between UAS technology and public availability, and the most appropriate solution might be to further the young partnership between DHS's Privacy Office and the FAA. This recommendation is discussed next, in the concluding chapter of this thesis.

V. CONCLUSION

A. REVIEW

This thesis examined the potential effectiveness of utilizing domestic aerial surveillance to increase homeland security. It also analyzed what level of regulation and oversight is needed in order to ensure Americans' security without unduly infringing on their civil liberties. The literature introduced outlined how several federal and a handful of state and local agencies use UAS domestically to varying levels of success. Advocates of domestic UAS use flaunt the advanced capabilities of drone technology and the cost effectiveness of unmanned versus manned platforms. Critics claim that larger drones operated by CBP and the FBI are too expensive and do not produce consistent and effective results. Privacy advocates press the issue of civil liberty infringement by calling for greater federal oversight and privacy considerations by both DHS and the FAA. Although a full domestic UAS implementation process is underway, determining the proper balance among effectiveness, privacy, and oversight is an ongoing challenge.

Drone technology is rapidly maturing into a formidable asset for law enforcement and counter-terrorism efforts. Long loiter times, operator simplicity, and high-precision electro-optical suites continue to advance with the increasing demand and availability of unmanned platforms. Capabilities such as the Wide Area Airborne Surveillance (WAAS) and advanced networking programs like Gorgon Stare enable CBP to monitor vast areas of our nation's borders without jeopardizing personnel. Future developments include Predators equipped with facial recognition technology that will remotely identify individuals in various public places and then link these images to the FBI's Next Generation Identification database known as IDENT.¹⁰⁵ Future drone capabilities are limitless, but the technology needed to increase homeland security is already here and being utilized across the country.

¹⁰⁵ "Next Generation Identification: Fingerprints & Other Biometrics," Federal Bureau of Investigation, accessed February 11, 2014, http://www.fbi.gov/about-us/cjis/fingerprints_biometrics/ngi.

Two categories of agencies currently use UAS for national security and law enforcement purposes. First, CBP employs large, military-grade Predators along the nation's borders to combat a variety of threats to national security. Although Predators are the most capable UAS flying over American skies, their utility is greatly overestimated by CBP and other advocates. Actual effectiveness numbers paint a much less efficient picture of their ability to increase homeland security. The cost of operating these large drones is also far greater than advertised, putting into question the overall effectiveness of using such a complex system on the domestic front. The addition of previously mentioned improvements like facial recognition software coupled with IDENT has the potential to increase utility and cost effectiveness, but this idea has yet to be tested in an operational environment. Second, state and local law enforcement agencies use much smaller UAS in a more focused mission set. These organizations appear to have found a balance between cost effectiveness and mission capable platforms. Situation-based mission sets are ideal for smaller drones and provide a great deal of utility to the officers employing them. Small, lightweight UAS are making a difference with regard to homeland security at the state and local level.

While the first three chapters of this thesis provided insight into the current capabilities and usefulness of UAS on the domestic scale, Chapter IV addressed the debate between privacy and security while analyzing the question of federal oversight. Privacy advocate groups continue to question the legitimacy of domestic drone operations without further federal oversight. Supreme Court rulings relating to expectations of privacy are outdated and do not reflect the paradigm shift towards unmanned technology with respect to domestic surveillance; however, current rulings enable federal and state agencies to conduct aerial surveillance sans warrant in areas not obstructed to the airspace above, and they also allow the use of UAS to view people and their effects in plain view without triggering Fourth Amendment protection.

Regulation and oversight are already conducted at the federal level, but only through the FAA's COA application process, which must be adhered to prior to using UAS. As the national airspace becomes available to privatized drone use, COA applications will saturate the already overtasked division of the FAA responsible for UAS

use approval. DHS has recognized the need for privacy considerations imbedded in the COA process and established a working group within DHS's Privacy Office to analyze and address the issue of privacy versus security. Although the partnership between DHS's Privacy Office and the FAA is still in its infancy, the Privacy Office possesses the proper foundation to act as the needed federal oversight authority throughout the full domestic UAS implementation process.

B. RECOMMENDATIONS

The research for this thesis supports arguments of those who believe that UAS are a critical asset in promoting homeland security. Rapidly advancing progress in drone capabilities, efficiency, and cost can be tailored to meet the needs of law enforcement officials from the federal level down to local police departments. Through the use of UAS, response times are accelerated, risk to human life is minimized, and mission flexibility increases. The salient concern is to what level can homeland security increase with the addition of drones to the national arsenal and at what cost to citizens' civil liberties. With the acknowledgement of a need for federal oversight by government officials, privacy advocates, and law enforcement agencies, national leaders must determine who will adopt the responsibility of oversight in order to promote our national security without unduly infringing on privacy.

Technology continues to accelerate as time progresses. It is generally understood that as soon as an individual purchases a computer, that computer is out of date. The same could be assumed about drones, and the public has first-hand experience with advances in UAS technology as drones are becoming more commercially available. CBP and a few state agencies realized the potential effectiveness of adding drones to their repertoire early in the unmanned era and have adopted UAS as part of their inventory.

Group 4 Predators operated by CBP are too expensive and do not produce results expected by such large-scale drone operations. The data provided in this thesis shows an over-inflation of drone operation results that is coupled with a cost estimation not indicative of effective asset management. Due to the complexity of these systems, their use should be tailored to more regionally centered national missions such as drug

interdiction and disaster relief rather than broad surveillance. Predators are equipped with the most advanced optical suites, network capabilities, and identification software currently on the market, which is exactly why they should remain in CBP's inventory. Our national borders are a gateway for illicit drugs, illegal immigrants, and potential terrorist organization, and they should be guarded with the most advanced UAS; however, CBP cannot continue to operate these unmanned assets under the current doctrine of remaining airborne around the clock. The cost-benefit analysis simply does not favor this course of action. CBP's Predators can be more effective if they are employed in a more focused, time-sensitive role similar to the two sheriff's departments mentioned in this thesis.

Likewise, Mesa County, Colorado, and Monroe County, Texas, Sheriff's departments have mastered the delicate balance of integrating drones into their daily operations. These two agencies are maximizing the effectiveness of their drones by deploying them when needed and under the right circumstances. Airborne vantage points provide the necessary detail and intelligence required for law enforcement officials to make accurate, timely decisions in situations such as hostage rescues, search and rescue, high-speed chases, and suspect apprehensions. Smaller UAS such as the Draganflyer X6 and ShadowHawk provide crucial real-time video feeds as needed without endangering actual officers. This should be the model for all agencies looking to acquire UAS within the coming years, and federal agencies such as CBP and the FBI can increase their effectiveness by adopting this type of employment.

Although UAS developers continue to innovate and design new systems capable of addressing our national security concerns, officials continue to struggle with addressing the oversight and privacy considerations associated with domestic drone implementation. Once the market is open to commercialization, the FAA will be flooded with COA requests and will have to address each one individually. As of February 15, 2013, there were 327 active drone certifications, but once a regulatory framework is in

place, the FAA estimates 7,500 commercial drones will be viable within five years.¹⁰⁶ The FAA's online COA application process is adequate, but the FAA should plan to increase the number of personnel reviewing requests in order to handle the influx of applications once the commercial market fully opens. Without additional manpower, the system will become oversaturated and law enforcement agencies needing quick approvals for time-sensitive missions will be left flexing to less desirable courses of action.

In addressing privacy concerns, ideally, Congress would take the opportunity to finally drag privacy law into the twenty-first century by reexamining our outmoded doctrines, but this is a slow process. Proposed legislation addressing domestic drones illustrates that officials are making strides, but having a suitable framework in place before the 2015 deadline is highly unlikely. University of Washington School of Law Professor Ryan Calo is on the right track by suggesting that the FAA take an active role as a privacy safeguard. His belief is for Congress to instruct the FAA to take privacy into account as part of its mandate to integrate drones into domestic airspace.¹⁰⁷ Congress should embrace this suggestion and require all applicants to provide the FAA with a plan to minimize their impact on privacy as part of the application.

The responsibility of promoting homeland security ultimately falls on DHS, and it has taken the required first steps to ensuring the proper balance between privacy and security. The previously mentioned working group within DHS's Privacy Office has the potential to be an adequate safeguard; however, it should be transformed into a separate entity within the Privacy Office and actively partnered with COA personnel in the FAA. Only convening when issues arise fosters an environment where regulation and guidance will always be addressed after the need has passed. DHS should develop this entity as a concept of operations for working alongside personnel within the FAA. Having two mutually invested, yet separate offices monitoring privacy implications of UAS use gives

¹⁰⁶ Matt Haldane, "U.S. Slowly Opening up Commercial Drone Industry," *Chicago Tribune*, August 8, 2013, http://articles.chicagotribune.com/2013-08-08/business/sns-rt-us-usa-drones-commercial-20130808_1_drone-industry-ben-gielow-faa.

¹⁰⁷ *Future of Drones in America: Law Enforcement and Privacy Considerations*, Hearing before the Senate Committee on the Judiciary, 113th Cong. 1 (March 20, 2013) (statement of Ryan Calo, Assistant Professor, University of Washington School of Law), <https://www.hsdl.org/?view&did=737816>.

the drone market the best chance of succeeding without infringing on Americans' civil liberties.

In conclusion, our government's greatest responsibility is to protect the American people and ensure they are secure within our borders. UAS have the capability to increase homeland security while minimizing effects on civil liberties. Whether it is CBP and its military-grade Predators, or state agencies operating much smaller versions, drone technology is here and will continue to evolve in the future. UAS are an operational and cost-effective platform to promote homeland security if they are properly adapted to the needs of the agency employing them. The potential vulnerabilities of drones lie with public perception, which forces legislators to address privacy concerns and consider further oversight measures. Having a well-defined, established oversight process in place will ensure that UAS can continue to be employed in national security and law enforcement situations without the need for Americans to fear the eye in the sky.

VI. LIST OF REFERENCES

- Aerovironment. "Wasp III Data Sheet." Accessed February 11, 2014.
http://www.avinc.com/downloads/WASP-III_datasheet.pdf.
- Barry, Tom. "Drones over the Homeland: How Politics, Money and Lack of Oversight Have Sparked Drone Proliferation, and What We Can Do." *International Policy Report*. Washington, DC: Center for International Policy, April 2013.
- Basulto, Dominic. "Forget the Doubters, Commercial Drones are Here to Stay." *Washington Post*, December 3, 2013.
<http://www.washingtonpost.com/blogs/innovations/wp/2013/12/03/forget-the-doubters-commercial-drones-are-here-to-stay/>.
- Connolly, Ceci. "Obama Administration Announces New Border Security Measures." *Washington Post*, June 24, 2010, <http://www.washingtonpost.com/wp-dyn/content/article/2010/06/23/AR2010062305358.html>.
- Department of Defense. *Unmanned Systems Integrated Roadmap FY2011-2036*. Washington, DC: GPO, 2011.
- _____. *DoD Dictionary of Military and Associated Terms*. Joint Publication 1-02, June 13, 2007. http://www.dtic.mil/doctrine/new_pubs/jp1_02.pdf.
- Department of Homeland Security, U.S. Customs and Border Protection. "Unmanned Aircraft Systems MQ-9 Predator B Fact Sheet." May 1, 2013.
http://www.cbp.gov/linkhandler/cgov/border_security/am/documents/oam_fact_sheets/predator_b.ctt/predator_b.pdf.
- _____. "Securing America's Borders." Accessed December 2, 2013.
http://www.cbp.gov/xp/cgov/about/organization/assist_comm_off/.
- _____. *Privacy Office 2013 Report to Congress*. November 2013.
<http://www.dhs.gov/sites/default/files/publications/2013-dhs-privacy-office-annual-report-final-11062013.pdf>.
- Department of Transportation. Federal Aviation Administration. "Unmanned Aircraft Operations in the National Airspace System." NJO 7210.766. March 28, 2010.
- Dobuzinskis, Alex. "U.S. Customs Grounds Fleet of Drones after Crash at Sea." *Reuters*, January 28, 2014. <http://www.reuters.com/article/2014/01/28/us-usa-drone-crash-idUSBREA0R1JT20140128>.
- Eisenberg, Anne. "Preflight Turbulence for Commercial Drones." *New York Times*, September 8, 2013.

Elias, Bart. *Pilotless Drones: Background and Considerations for Congress Regarding Unmanned Aircraft Operations in the National Airspace System*, CRS Report R42718. Washington, DC: Library of Congress, Congressional Research Service, September 10, 2012.

Federal Bureau of Investigation. "Fingerprints & Other Biometrics. Next Generation Identification." Accessed February 11, 2014. http://www.fbi.gov/about-us/cjis/fingerprints_biometrics/ngi.

Finn, Peter. "Domestic Use of Aerial Drones by Law Enforcement Likely to Prompt Privacy Debate." *Washington Post*, January 23, 2011. <http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html>.

Frost and Sullivan Industries. "Non-military Use of Unmanned Aerial Systems in the United States: Current and Future Opportunities in a Market Poised for Significant Growth." August 24, 2012. <http://www.frost.com/sublib/display-report.do?searchQuery=non-military+use+of+unmanned+aerial+systems&ctxixpLink=FcmCtx1&ctxixpLabel=FcmCtx2&id=9831-00-16-00-00&bdata=aHR0cDovL3d3dy5mcm9zdC5jb20vc3JjaC9jYXRhbG9nLXNIYXJjaC5kbz9xdWVyeVRleHQ9bm9uLW1pbGl0YXJ5K3VzZStvZit1bm1hbm5lZCthZXJpYWwrc3lzdGVtc0B%2BQFNiYXJjaCBSZXN1bHRzQH5AMTM4NjE5NDUzMTM1Ng%3D%3D>.

Gertler, Jeremiah. *U.S. Unmanned Aerial Systems*, CRS Report R42136. Washington, DC: Library of Congress, Congressional Research Service, January 3, 2012.

Greenwald, Glenn. "Domestic Drones and Their Unique Danger." *The Guardian*, March 29, 2013. <http://www.theguardian.com/commentisfree/2013/mar/29/domestic-drones-unique-dangers>.

Haddal, Chad and Jeremiah Gertler. *Homeland Security: Unmanned Aerial Vehicles and Border Surveillance*, CRS Report RS21698. Washington, DC: Library of Congress, Congressional Research Service, July 8, 2010.

Haldane, Matt. "U.S. Slowly Opening up Commercial Drone Industry." *Chicago Tribune*. August 8, 2013. http://articles.chicagotribune.com/2013-08-08/business/sns-rt-us-usa-drones-commercial-20130808_1_drone-industry-ben-gielow-faa.

Hansen, Blair. "Unmanned Aircraft Systems Present & Future Capabilities." *Defense Intelligence Operations Coordination Center*, October 23, 2009. <http://cryptome.org/dodi/uav-future.pdf>.

Hulnick, Arthur S. "Indications and Warnings for Homeland Security: Seeking a New Paradigm." *International Journal of Intelligence and Counterintelligence* 18, no. 4 (2005): 580–613.

- Innovative UAV Aircraft & Aerial Video Systems. "X6 Technical Overview." Accessed October 30, 2013. <http://www.draganfly.com/uav-helicopter/draganflyer-x6a/specifications/>.
- Kelly, Stephen. "Drone Inquiry Response Letter to Senator Rand Paul." July 19, 2013. <http://www.paul.senate.gov/files/documents/071913FBResponse.pdf>.
- Kettl, Donald F. *System under Stress: Homeland Security and American Politics*. Washington, DC: CQ, 2007.
- Koebler, Jason. "Court Upholds Domestic Drone Use in Arrest of American Citizen." *U.S. News & World Report*, August 2, 2012. <http://www.usnews.com/news/articles/2012/08/02/court-upholds-domestic-drone-use-in-arrest-of-american-citizen>.
- Mulrine, Anna. "Drones over America: Public Safety Benefit or 'Creepy' Privacy Threat?" *Christian Science Monitor*, March 13, 2013. <http://www.csmonitor.com/USA/Society/2013/0313/Drones-over-America-public-safety-benefit-or-creepy-privacy-threat>.
- Murray, Patrick. "National: U.S. Supports Unarmed Domestic Drones." *Monmouth University Poll*, August 15, 2013. <https://www.monmouth.edu/assets/0/32212254770/32212254991/32212254992/32212254994/32212254995/30064771087/409aecfb-3897-4360-8a05-03838ba69e46.pdf>.
- Richelson, Jeffrey T. *The U.S. Intelligence Community*. 6th ed. Boulder: Westview, 2012.
- Skoloff, Brian and Tracie Cone. "Predator Drone Now Part of California Wildfire Battle." *Current News: Early Bird*, August 29, 2013.
- Solove, Daniel J. *Nothing to Hide: the False Tradeoff between Privacy and Security*. New Haven, CT: Yale University, 2011.
- Thompson, Richard. *Drones in Domestic Surveillance Operations: Fourth Amendment Implications and Legislative Responses*, CRS Report R42701. Washington, DC: Library of Congress, Congressional Research Service, April 3, 2013.
- Vanguard Defense Industries. "Features of the ShadowHawk Unmanned Aerial System." Accessed October 30, 2013. <http://vanguarddefense.com/productservices/uavs/>.
- Whitlock, Craig and Timberg, Craig. "Border-Patrol Drones Being Borrowed by Other Agencies More Often Than Previously Known." *Washington Post*, January 14, 2014. http://www.washingtonpost.com/world/national-security/border-patrol-drones-being-borrowed-by-other-agencies-more-often-than-previously-known/2014/01/14/5f987af0-7d49-11e3-9556-4a4bf7bcbd84_story.html?hpid=z1.

THIS PAGE INTENTIONALLY LEFT BLANK

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center
Ft. Belvoir, Virginia
2. Dudley Knox Library
Naval Postgraduate School
Monterey, California