

THE USE OF ARMED DRONES BY LAW
ENFORCEMENT:
A NEED FOR ESSENTIAL ELEMENTS IN POLICY

By

GARY L. JONES

Bachelor of Science in Organizational Leadership
Southern Nazarene University
Bethany, Oklahoma
2007

Master of Science in Management
Southern Nazarene University
Bethany, Oklahoma
2008

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Dissertation Approved:

Dr. Jon Loffi

Dissertation Adviser

Dr. Timm Bliss

Dr. Samuel Vance

Dr. Jeffrey Sallee

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Name: GARY L. JONES

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Title of Study: THE USE OF ARMED DRONES BY LAW ENFORCEMENT: A NEED FOR ESSENTIAL ELEMENTS IN POLICY

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Abstract: In 1936, Lt. Cmdr. Fahrney, Officer in Charge of the Navy's Radio-Controlled Aircraft Project, introduced the term *drone* in his semi-annual report for aerial targets. Later, in 1946, the United States military used the word *drone* to describe an Unmanned Aerial Vehicle. It had a two-fold meaning. First, drone was an Old English term meaning "male bee" and secondly, a "monotonous, sustained sound." Drones have played a huge role in military operations around the world and are being used on the front lines in the United States' war on drugs. Currently, 910 state and local agencies, including law enforcement, utilize drones in their day-to-day operations. Due to regulatory ambiguity, many law enforcement agencies have not developed acceptable policies on the use of armed drones. The purpose of this qualitative study was to conduct in-depth interviews of subject matter experts with professional knowledge and experience from three separate disciplines within law enforcement: drone operations, policy development, and legal counsel. A purposeful sample of 15 subject matter experts from all three disciplines were selected to participate in the study. Participant interviews were driven by three research questions pertaining to the development of policy; what current laws and regulations apply to the use of drones by law enforcement agencies, what elements are needed to insure the use of armed drones by law enforcement do not violate the Fourth Amendment rights of the citizens, and what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy. Results of the interviews were analyzed to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones and as a base for further research. Law enforcement is reactive by nature. The goal of this study was to provide law enforcement agencies and the aviation community with a knowledge base of information to assist in the development of regulations and policy prior to the implementation of armed drones in the field. This type of research in the area of unmanned aircraft policy is essential, in order to maintain the high level of standards the aviation and aerospace industry is accustomed to and to ensure the safe integration of armed drones into the domestic airspace.

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CHAPTER I

INTRODUCTION

In 1936, Lt. Cmdr. Fahrney, Officer in Charge of the Navy's Radio-Controlled Aircraft Project, introduced the term *drone* in his semi-annual report for aerial targets (Keane & Carr, 2013). Later, in 1946, the United States military used the word *drone* to describe an Unmanned Aerial Vehicle. It had a two-fold meaning. First, drone was an Old English term meaning "male bee" and secondly, a "monotonous, sustained sound" (Merriam-Webster, 2018). Drone, Unmanned Aerial System (UAS), Small Unmanned Aerial System (sUAS), Micro Aerial Vehicle (MAV), Unmanned Aircraft (UA), Remotely Piloted Aircraft Systems (RPAS), Unmanned Aerial Vehicle (UAV), and Remotely Operated Aircraft (ROA), no matter what you call it, the drone is a technological wonder that is taking over the public and private service communities.

In recent years, drones have played a huge role in military operations during the war on terrorism in Iraq and Afghanistan (Callam, 2010; Marra & McNeil, 2012; McDougal, 2013; Preble, 2015; Spallanzani, 2017). Business leaders with vision have begun to view drones as part of the near future. Drones have been used in the public sector to survey roads, equipment and pipelines in the Prudhoe Bay area of Alaska (Nichols, 2014). Businesses are utilizing drones for delivery of products as an

improved means of transportation (Preble, 2015). Farmers are using drones to count and check cattle and to monitor fence conditions. Twenty years ago, many adults had a smart phone on their birthday or Christmas wish list. Now, not only adults, but also children have included a drone on their wish list for Christmas. It was predicted that, over one million Americans would receive a drone for Christmas (Porter, 2017).

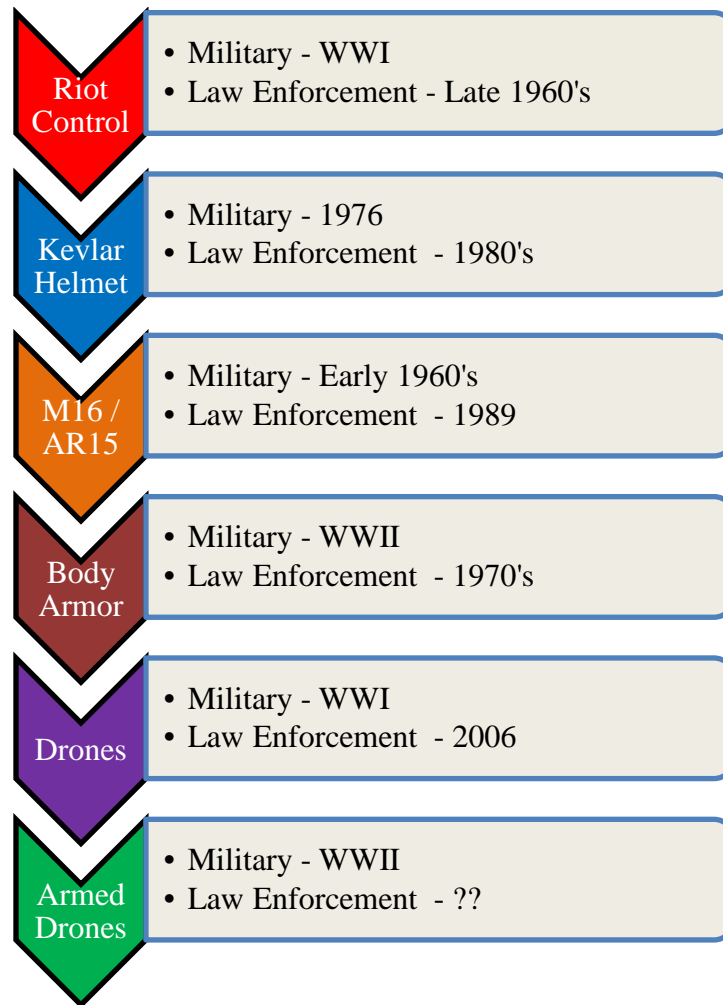
This obsession to acquire a drone includes the public safety sector. From 2006 to 2014, only a few public safety agencies were considering the utilization of drone technology. In 2017, 347 state and local public safety departments had purchased drones (Gettinger, 2017). Currently, over 910 public safety agencies have acquired drones and law enforcement purchases account for two-thirds (599) of these (Gettinger, 2018). Along with advancements in technology have come challenges to insuring the safe and responsible use of drones going forward. Specifically armed drones, which have the ability to improve tactical response to a situation, while providing the protection needed to ensure the safety of police officers and the public.

Background of the Problem

The military, especially during times of war, is the testing ground for law enforcement when it pertains to tools of the trade (McDougal, 2013). The tools of the trade include both tactics and equipment. History has revealed to us the crossover between the military and law enforcement (Figure 1.1). Riot control agents, Kevlar helmets, M16 Rifles, body armor, and now drones have made the transition from military application to tactical equipment in everyday use by law enforcement. (Bocetta, 2017; Callam, 2010; NIJ, 1998; Duffy, 2009; Fry, 2010; Gettinger, 2018; James 2016; Keane & Carr, 2013; Kindervater,

2016; McClellan, 2009; Nichols, 2014; NIJ, 2014; Rottman, 2011; Sidell, 1997; Szinicz, 2005; Trueman, 2015; Walsh, Scott, & Spagnuolo, 2005).

Figure 1.1 Crossover between Military and Law Enforcement



History indicates the current use of armed drones by the U.S. military forces will be followed by their use in law enforcement in the near future. They are efficient, effective, economical, and now battle tested (Kindervater, 2016; Nagy 2014). The use of drones in both the private and public sectors has increased dramatically over the last decade (Porter, 2017; Sharkey, 2011). In 2012, the Federal Aviation Administration (FAA) Modernization and

Reform Act was passed in order to safely integrate drones into the domestic airspace. This act tasked the FAA with developing regulations relevant to the use of Unmanned Aerial Systems (UAS) for public entities (Aquino-Segarra, 2016; Nagy, 2014). The FAA Modernization and Reform Act allows for the use of drones by law enforcement, but does not identify specific operational guidelines pertaining to Fourth Amendment considerations, use of force, or the arming of drones, lethal or less than lethal, concerns dealt with by law enforcement (Brumfield, 2014). Many states have passed legislation pertaining to the use of drones by law enforcement (Smith, 2014); however, there is a lack of consistency between states in the purpose of the legislation making it difficult to establish baseline requirements for use in policy development specific to law enforcement. This study was designed to address the need to establish the essential policy elements needed to safely and responsibly integrate armed drones to be used by law enforcement into our domestic airspace.

Statement of the Problem

Aviation in the form of fixed and rotary wing aircraft has been used by law enforcement for decades. However, the rapid advancement of drone technology has left lawmakers scrambling to enact legislation pertaining to both the public and private sectors. The demands placed on the aviation industry to regulate this growing and complex sector are extremely high.

Research indicates that due to regulatory uncertainty, many law enforcement agencies have not developed acceptable policies on the use of drones for operations within their agencies (Rapp, 2009; Vacek, 2009). This study was designed to add to the body of knowledge pertaining to sound practices in the development of policies and procedures for armed drones, therefore presenting a proactive approach to armed drone policy development

for law enforcement. Subject matter experts (SMEs) in the law enforcement community can aid in filling the void created by such a fast growing industry and significantly contribute to the body of knowledge pertaining to the development of aviation regulation.

Purpose of the Study

The purpose of this qualitative study is to conduct in-depth interviews with subject matter experts (SMEs). Professional knowledge and experienced perspective received from SMEs in three areas of drone policy making: drone operations, policy development, and legal counsel will be collected and analyzed. Results will then be used to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement and as a base for further research.

Research Questions

The following research questions will be answered by this study.

1. What current laws and regulations apply to the use of drones by law enforcement agencies?
2. According to subject matter experts, what elements are needed to insure the use of armed drones in law enforcement do not violate the Fourth Amendment rights of the citizens?
3. According to subject matter experts, what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy?

Assumptions

Due to the continuous evolution of technology surrounding drone development, the following assumptions must be included in this study. First, there is an assumption that essential elements of policy are needed by law enforcement. Second, is the assumption that

the participants of this study would respond to each question accurately and results analyzed in accordance with the purpose of the study. Lastly, it is assumed that through the design of this study, essential information will be obtained and effective policy elements established.

Limitations

A concern with any qualitative research is the relatively small number of participants. However, Patton (2015) assures us that utilization of purposeful sampling provides in-depth rich data, eliminating the need for large samples normally seen in quantitative studies. A second and primary limitation is the probable geographical location of participants, which will create the need to conduct several interviews via Skype or telephone. Due to the experience of the researcher in conducting interviews, any limitation would be minimal. Another limitation of this study is the bias of the participants. By utilizing a triangular method of data collection, participants selected from three separate disciplines, the researcher aims to reduce the opportunity for bias.

Definitions

Armed Drone – For the purpose of this study, armed drone refers to any drone, as described above, carrying a weaponized payload.

CFR – Code of Federal Regulation

COA – Certificate of Authorization issued by the Federal Aviation Administration

Curtilage – The land immediately surrounding a house or dwelling, to include any buildings or structures.

Drone – For the purpose of this study, any unmanned aircraft to include: Unmanned Aerial System (UAS), Small Unmanned Aerial System (sUAS), Micro Aerial Vehicle (MAV), Unmanned Aircraft (UA), Remotely Piloted Aircraft Systems (RPAS),

Unmanned Aerial Vehicle (UAV), and Remotely Operated Aircraft (ROA),
(Cavoukian, 2012; Marks, 2017; Spelman, 2015).

FAA – Federal Aviation Administration

Force Multiplier – Tools that help you amplify your effort to produce more output (Kaufman,
2012)

GPS – Global Positioning System

LEA – Law Enforcement Agency

MAV – Micro Air Vehicle

Mosaic Theory – A theory of law whereby searches can be viewed as a collective sequence
of steps rather than separate individual steps when placed in the context of the Fourth
Amendment definition of a search (Kerr, 2012).

Open Field – The area beyond curtilage, which does not fall under the Fourth Amendment
protection described as persons, houses, papers, or effects.

ROA – Remotely Operated Aircraft (Spelman, 2015)

RPAS – Remotely Piloted Aircraft Systems (Spelman, 2015)

Stash House – A house where weapons, supplies, or drugs are hidden.

sUAS – Small Unmanned Aerial System (Marks, 2017).

SWAT – Special Weapons and Tactics

UA – Unmanned Aircraft (Spelman, 2015)

UAS – Unmanned Aerial System, to include the entire system; aircraft, digital network, and
operator (Thompson, 2013).

UAV – Unmanned Aerial Vehicle (Spelman, 2015)

Scope of the Study

The aviation and aerospace industry is one of the most complex and diverse of any in the United States. The complexity of the industry consists of research, design, manufacturing, maintenance and repair. It's diversity includes military, general aviation, industrial and commercial sectors. The focus of this study is to research the area, which spans several of the industry sectors. Specifically, the segment of aviation concerned with regulating and policy development overarching multiple sectors both public and private.

With advancements in technology, the use of drones is becoming more and more popular. Many law enforcement agencies are limited when it comes to resources, specifically personnel and budget restraints. The purpose of this study is to provide information to law enforcement agencies in order for them to develop an effective policy prior to the implementation of armed drones in the field. Results of this study will contribute significantly to policy development for law enforcement and will provide a knowledge base of information to assist the aviation industry in the advancement of regulations needed for such a rapidly growing industry.

The benefits of this study will apply to law enforcement agencies with limited resources, providing them with an in-depth study of drone policies and the basic elements needed for an effective armed drone policy. In addition, the general public will benefit from this study in understanding how drone operations can work within guidelines outlined in current use of force policy and the Fourth Amendment.

The data derived from this research can provide a knowledge base for aviation administrators and aid in developing or enhancing regulations, defining terminology, properly wording legislation and policies for all aircraft. The need for establishment of

federal regulations addressing the progressive and cutting-edge applications of drone technology is evident. This type of research in the area of unmanned aircraft policy is essential in order to maintain the high level of standards the aviation and aerospace industry is accustomed to and to ensure the safe integration of drones into the domestic airspace.

CHAPTER II

REVIEW OF LITERATURE

Introduction

In 2015, fourteen states had enacted legislation, which governed the use of drones for law enforcement (Jenks, 2015). By 2017, the number of states increased to thirty eight (NCSL, 2017). These laws, running from extremely restrictive to extremely permissive, represent the confusion created by the federal regulations concerning the use of law enforcement drones in the national airspace.

On August 29, 2016, the Federal Aviation Administration (FAA) published its first regulation pertaining to the use of Unmanned Aerial Systems (UAS) in the United States (FAA, 2016). The regulation known as Part 107 of the Code of Federal Regulation (CFR) outlined operating limitations, line-of-sight rules, weight limits, altitude requirements, and certification requirements for users. CFR Part 107 does not outline regulations for drones pertaining to law enforcement or emergency management. This leaves regulating those agencies up to each individual state.

Research has shown that due to regulatory uncertainty at the federal and state levels, many law enforcement agencies have not developed acceptable policies on the use of drones for operations within their agencies (Rapp, 2009; Vacek, 2009). McDougal

(2013) commented that the use of new technology tended to occur prior to any policies or procedures being created for it. The purpose of this study was to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement.

This goal of this study was to address three research questions: (1) What current laws and regulations apply to the use of drones by law enforcement agencies? (2) According to subject matter experts, what elements are needed to insure the use of armed drones in law enforcement do not violate the Fourth Amendment rights of the citizens? (3) According to subject matter experts, what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy?

A review of previous research and literature was conducted, concentrating on the following seven areas in order to focus this study on the needs of law enforcement and the aviation industry as a whole: a) Current UAS Regulations, b) The History of Armed Drones, c) The Evolution of Drone Technology, d) Use of Force and Fourth Amendment Considerations, e) The Present Use of Drones in Law Enforcement, f) The Need for Basic Policy Considerations, and g) Developing a Framework for Drone Policy.

Current UAS Regulations

The Federal Aviation Administration (FAA) Modernization and Reform Act of 2012 was enacted by congress in order to safely integrate drones into the domestic airspace and tasked the FAA with developing regulations relevant to the use of Unmanned Aerial Systems (UAS) for public entities (Aquino-Segarra, 2016; Matiteyahu, 2015; Nagy, 2014; Spelman, 2015). FAA regulations separate UAV operations into three types; public, civil, and hobbyist or model. Law enforcement, as a public entity, is

required to request a Certificate of Waiver or Authorization from the FAA permitting the use of Unmanned Aerial Vehicles (UAV) “for a particular purpose, in a particular area” (Blitz, Grimsley, Henderson, & Thai, 2015, p. 61). The certificate of waiver allows agencies to operate drones, but does not regulate the specific use by law enforcement for the purpose of surveillance. Federal regulations do not cover the use of armed drones. Regulations pertaining to the use of armed drones by law enforcement must be legislated at the state level (Nagy, 2014).

According to Straub (2014), there is no shortage of suggested state laws and policies pertaining to the use of drones in the National airspace. The current situation is in a state of flux with bills being introduced which range from a total ban of the use of drones for law enforcement to allowing government agencies to regulate themselves in the matter (Straub, 2014).

Between 2013 and 2017, thirty-eight states had considered legislation regulating the government’s use of drones. Twenty-six states had passed drone legislation in an attempt to address the concerns surrounding the privacy of citizens, to include warrant requirements for drones used by law enforcement (NCSL, 2017; Smith, 2014). Currently, forty-five states have considered legislation pertaining to the use of drones, each focusing on the privacy rights of citizens and not policy considerations for operations (Porter, 2017).

In 2013, Florida enacted the Freedom from Unwarranted Surveillance Act, which prohibits law enforcement from using drones to gather information or evidence (Nichols, 2014). In 2016, Oklahoma legislators enacted the Unmanned Aircraft Act (2016), legislation that controls the operation of unmanned aircraft over private property or

critical infrastructure, with an exception for law enforcement and utility companies during times of emergency. One concern with this law is the lack of a clear definition of emergency. This leaves the definition open to interpretation by the operator or agency. In addition, the law does not address any Fourth Amendment concerns, such as reasonable expectation of privacy, unreasonable searches, or use of force.

The constitutionality of the use of drones for surveillance by law enforcement is determined on the basis of three elements: location (at an individual's residence, public access areas, or near a national border), the sophistication of the technology used, and the duration of the surveillance (Thompson, 2013). Section 287 of the Immigration and Nationality Act allows law enforcement to conduct warrantless searches of any vehicle within 25 miles of the U.S. border (Thompson, 2013).

Since the application of the Fourth Amendment in most cases determines that law enforcement must obtain a warrant to search an individual or their property with the exception of a few cases, it is reasonable to assume that any policy developed pertaining to drones will be tested in the courts at some point (Thompson, 2013).

By the end of 2017, eighteen states had enacted legislation which governed the use of drones for law enforcement. These laws, running from extremely restrictive to extremely permissive, represented the confusion created by the federal regulations concerning the use of drones in the national airspace (Jenks, 2015; NCSL, 2017). This confusion can only be addressed after an incident occurs and the results decided in a court of law.

Based on previous case decisions, it is safe to assume that any surveillance of an individual at their place of residence would constitute a violation of their Fourth

Amendment right to privacy, especially if sophisticated technology were used (Thompson, 2013). Legality is less clear when considering surveillance in a public area or open field. Based on previous cases involving aerial surveillance, a warrant is not required as long as law enforcement are in public airspace and not utilizing technology unavailable to the general public (Thompson, 2013).

To further complicate the legal definition of a search under the Fourth Amendment, courts have introduced what is known as the mosaic theory. Under the mosaic theory, searches can be viewed as a collective sequence of steps rather than separate individual steps when placed in the context of the Fourth Amendment definition of a search (Kerr, 2012). In review of *United States v. Jones*, in 2004, an FBI task force secretly placed a GPS device on the undercarriage of a vehicle driven by suspected drug lord Antoine Jones. The device tracked Jones' movements over the period of approximately one month, during which time he visited a stash house several times. The device created a digital pattern of Jones' movements during this period. The task force obtained warrants and seized large amounts of drugs and money. Jones was convicted of conspiracy to distribute and possession with intent to distribute. However, on appeal, the District of Columbia Circuit Court of Appeals overturned the conviction citing the mosaic theory. The court held that the prolonged tracking of Jones' movements constituted a search within the meaning of the Fourth Amendment (Ostrander, 2011).

The use of the mosaic theory could apply to aerial surveillance as well if such surveillance extended over a prolonged period of time. The theory contends that a person's movements over the course of a month would not be exposed to the public because it is unlikely that one individual would observe all of those movements.

Prolonged surveillance would be able to reveal specific information about a person's repetitive actions that would not be revealed on a single trip (Kerr, 2012).

As drone technology continues to advance, legal frameworks must change to keep up. Stocker, Bennett, Nex, Gerke, and Zevenbergen (2017) address the issue of developing soft laws as an alternative to address areas of concern facing policy until formal legislation can catch up with new developments. Soft laws or regulations address the gaps left in formal regulations through rulemaking by industry associations, stakeholders, and industry companies committed to developing standards through industry and organizational self-regulation. This process would allow for flexible or interim regulations in order to address concerns surrounding the rapidly advancing UAV technology, due to the slow approval process involved in federal and state regulation development. The willingness of the industry to assist in development of soft laws was visible in submitted requests to the FAA Drone Advisory Committee (Walden, Messina, Flint, Schober, McVenes, & Burke, 2019).

The use of technology by drones will also be a deciding factor by the courts in the future. The advancement of technology in today's society has definitely impacted the public's perspective of the term privacy. Are cameras and imaging equipment located on drones any more invasive than license plate readers mounted over highways? Cases tried in Federal Court have held that a person has no expectation of privacy when it comes to their license plate (Thompson, 2013). Lastly, the duration of surveillance could be a factor in future cases pertaining to law enforcement's use of drone technology. Drones now have the ability to hover and stay in the air for long periods of time. This advancement in technology may sway future court decisions as to whether long term

surveillance by drones constitutes a search based on the Fourth Amendment (Thompson, 2013).

Proponents of law enforcement's use of armed drones see it as a way to reduce budget, protect officers, and enhance protection for the citizens (Nagy, 2014). Those against the use of drones by law enforcement feel it is one more step toward the overuse of force by officers and a violation of an individual's right to privacy (Nagy, 2014; Porter, 2017).

Laws at the federal level and FAA regulations addressing the use and operation of drones, specifically pertaining to law enforcement are very unclear (Spelman, 2015; Straub, 2014). This magnifies the need for more specific policy at the local level to insure both law enforcement officials and individual citizens are protected during the operation of drones. As previously stated, any policies written by law enforcement addressing these concerns will almost certainly be challenged in the courts.

On August 31, 2016, the FAA established the Drone Advisory Committee. This committee was created to prioritize the integration of drones into the National Air Space and oversee the development of new policies and procedures. Committee members include representatives from municipal and academic leadership, businesses, drone association membership, and the aviation industry (FAA, 2016). It is in the best interest of this committee to establish criteria at the federal level to insure law enforcement's use of drone technology in preventing and prosecuting crime is conducted safely and efficiently while protecting the rights of citizens.

The History of Armed Drones

Armed drones were initially developed during WWII and have been in use since the 1950's (Callam, 2010; Keane & Carr, 2013; Takemura, 2014). In the 1980's, during the Cold War, the weaponized *Albatross* drone was developed, leading to increased funding of drone research by the U.S. military (Nichols, 2014). In 2001, the United States military began using the MQ-1 Predator and the MQ-9 Reaper drones for missions during the war on terrorism (Brumfield, 2014; Takemura, 2014). These drones allow for target identification and destruction with little or no risk to the operator or friendly forces.

The RQ-4 Global Hawk drone has been utilized for humanitarian missions since 2007. The Global Hawk has been deployed to monitor earthquake disasters around the globe. It was used to monitor wild fires in California and monitor radiation levels from the Fukushima Daiichi nuclear power plant after it was destroyed by a tsunami in 2011 (Takemura, 2014). The Navy's Phantom Ray and X-47b, supersonic capable UAVs designed for aerial dogfights, indicate the future direction of drone technology in the U.S. military (Sharkey, 2011).

In 2013, a social experiment labeled *Let's Check Google Autofill* revealed that people had mixed feelings about armed drones being used by law enforcement agencies, which leaned toward the negative. The researcher typed "drones are" into the google search and identified the most frequently occurring terms. Those conducting the experiment determined that many related the term drone with the military. Their thoughts were of weaponized drones being flown by members of the military located in the U.S. and firing upon people in other countries (Jenks, 2015).

A similar attitude toward drones was revealed in a Gallop poll in 2013. The poll showed 65 percent of the respondents were in favor of the U.S. using armed drones against suspected terrorists in other countries, but only 25 percent were in favor using the same technology against a suspected terrorist in the U.S. (Jenks, 2015).

Drone technology has evolved from its use in the military to many applications available to law enforcement and the public sector today (Brumfield, 2014). Several law enforcement agencies in the U.S. currently utilize drones in their daily operations for surveillance and tracking (Nagy, 2014).

The use of drones in both the private and public sectors has increased dramatically over the last decade (Porter, 2017; Sharkey, 2011). Drones are used by farmers and ranchers to check crops and cattle, by utility companies to check power lines and pipelines, by photographers, adults, and children (Porter, 2017). According to Jacobsen (2016), U.S. consumers spent over \$100 million on UAVs in 2015. Currently there are over 50 countries that deploy drones for various reasons, which include military and law enforcement purposes (Sharkey, 2011). The number of drone users will only increase in the future, to include their use by law enforcement.

Between 2007 and 2013, the FAA issued more than 1,400 permits to individuals in the U.S. for domestic drone operations (Jenks, 2015). In January 2019, U.S. Secretary of Transportation, Elaine Chao, announced nearly 1.3 million drones had now been registered with the FAA and as of December 2018, there were over 116,000 registered drone operators in the U.S. (Chao, 2019). To date, very little attention by state or federal lawmakers has been given to the use of armed drones by law enforcement (Straub, 2014).

Because of their low cost, revolutionary technology, and reliability, drones provide a low-risk alternative to manned aviation systems (Rapp, 2009). Both armed and conventional drones have proven themselves in combat situations in Afghanistan, Iraq, and Lebanon (Rapp, 2009). This same technology is now proving itself in the public and private sectors. The world is just beginning to see the potential application of drone technology for the future.

The Evolution of Drone Technology

According to Google Trends (2019), the interest in drones by the public has increased from 12 billion hits in 2012 to over 58 billion hits in December 2018, reaching over 90 billion hits three times during this period. Spelman (2015) noted an increase of approximately 150 percent from the end of 2011 to the end of 2014. According to a world UAV forecast study conducted by the Teal Group, the drone market is projected to increase from a \$6 billion industry in 2011 to over \$128 billion by 2020 (Cavoukian, 2012).

UAV platforms have become more reliable in terms of flight control due to ongoing improvements in both sensor and navigation technology (Cavoukian, 2012). Nearly all drones have the capability to carry cameras or other technology that can capture images and transmit those images to the operator. Many systems have audio, thermal imaging, or infrared capabilities as well (Jenks, 2015).

Many of these same capabilities are why law enforcement is leaning toward the use of drones in day to day operations. According to Cavoukian (2012), the use of drones by law enforcement has dramatically increased due to the UAVs distinct functional advantages over manned aircraft and the rapidly decreasing cost of drone technology.

Because of their unusual flight capabilities, drones have the ability to drastically improve law enforcement surveillance operations and the capacity to carry high-powered camera systems capable of monitoring and capturing individuals from an extreme distance without their knowledge (Matiteyahu, 2015; Spelman, 2015). This type of technology is critical for law enforcement to track suspects who are a threat to society or search for missing persons.

Advocates of drone technology consider it a cost effective platform that maximizes resources with minimal loss. The government has an obligation to insure consistent, impartial, and accurate data is collected. This is accomplished with the use of drone technology. Those in opposition see it as a distraction from the safety and danger surrounding its use. They consider the technology overreaching and unfair in that privacy is jeopardized. They feel the government would be abusing the power instilled upon them by the people (West & Bowman, 2016).

However, West and Bowman (2016) concluded that, tempered by ethical insights, drones are capable of benefiting both government agencies and individuals in the name of the greatest good, duty, and character. Law enforcement operation in a democratic government is about safeguarding individual freedoms as well as protecting and serving the public good (West & Bowman, 2016).

Drone technology is rapidly evolving and future drones will be increasingly autonomous (Jenks, 2015). In December 2017, scientists from the San Diego Zoo teamed with Northrop Grumman Corporations engineers to collect sea ice data in the Hudson Bay area of Canada. The team used a customized drone equipped with four integrated sensors operating simultaneously, to fly 11 mapping missions. The drone collected

detailed data on polar bear activity and sea ice habitats, without posing any risk to the team (Northrop Grumman, 2018). In today's environment, both armed and unarmed drones represent the cutting edge technological frontier of law enforcement (Takahashi, 2012).

Use of Force and Fourth Amendment Considerations

Use of Force

Very little doctrine exists when it comes to use of force and drone technology (Straub, 2014). It is very difficult to use the same procedures used when an officer is on the scene. With a drone, there is limited vision for the operator to make snap decisions. Additionally, there is the idea that use of force pertains to officers who might be at risk. Such is not the case if the officer is displaced to a safe location. The decision then would involve risk to other individuals or victims physically located at the scene. Many agencies have opted to avoid this controversial issue and not use armed drones until such time as they are more readily accepted by the courts and the general public (Straub, 2014).

A review of Supreme Court cases concluded there is no clear universal set of rules on the use of force by UAV officers and the law is ever changing in regards to the general use of UAVs for law enforcement operations (Porter, 2017). Current policy pertaining to use of force by officers is based on reasonableness and the amount of force needed to achieve a lawful objective (Straub, 2014). This reasonableness is determined by the officer on the ground. Each individual reacts based on his training and knowledge of the situation in front of him. Based on a review of agency policies, use of force can range from a physical presence and vocal statements to actual use of deadly force (Straub, 2014).

UAVs are fully capable of providing voice commands, and providing non-lethal use of force such as deploying pepper spray, onboard Taser, and limited laser inflicted pain. UAVs are also capable of deploying deadly force if necessary (Straub, 2014). Force continuum scales used by many officers to determine the amount of force needed in any situation vary from agency to agency. Levels of force vary between three to six ranges depending on the agency (Straub, 2014). Matrixes allow similar levels to be established in order to measure use of force standards for drone operations.

Opponents believe the use of armed drones by law enforcement make it easier for operators to use tactics such as, on board Tasers, tear gas, etc., leading to an increased use of force and violence by officers (Brumfield, 2014; Koerner, 2015).

In order to answer the question, when should armed UAVs be deployed, Straub (2014) presents a framework for decision making. A model was created to assess the decision making processes for UAVs manually and remotely controlled by officers, and autonomous UAVs utilizing onboard or remote software without the need for human intervention. Straub (2014) identified the key differences, which existed between the physical presence of an officer on the scene and a UAV. A matrix was used to determine the impact the UAV had on goal attainment and safety. The study stated that UAVs, while unable to determine subject behavior and having limited situational awareness capabilities, would still be useful in limited use of force situations (Straub, 2014).

Law enforcement agencies are currently fighting the same battles fought by previous administrations who dealt with policy issues surrounding the use of Tasers or body-worn-cameras. It was determined current technologies required for use of force by autonomously controlled UAVs were not reliable at this time considering the risk

involved. Although autonomously controlled UAVs were faster at logic and decision making, due to the high-risk environment, issues existed with object recognition and perception (Straub, 2014).

Fourth Amendment Considerations

The Fourth Amendment constitutionally protects the people of the United States from intrusion by the government into their private lives. It ensures the *right of the people to be secure* and free from *unreasonable searches* as it pertains to their *persons, houses, papers, and effects* (U.S. Const. amend. IV).

Since warrantless searches would be considered unreasonable, Spelman (2015) proposed three doctrines which might determine if a search by law enforcement needed a warrant or not: a) the reasonable expectation of privacy, b) common-law physical trespass, and c) technological trespass.

In *Katz v. U.S.*, the court held that the Fourth Amendment protects people, not places. The ruling of the court in 1967, decided that the FBI conducted a search when they used a listening device to monitor and record a conversation conducted in a public telephone booth. The court determined this act violated the individuals Fourth Amendment right of a reasonable expectation of privacy (Jenks, 2015; Spelman, 2015; Thompson, 2013). The decision of the court in *Katz* was based on the test of two components. First, “that a person have[sic] exhibited an actual expectation of privacy” and second, “that the expectation be one that society is prepared to recognize as reasonable” (Matiteyahu, 2015, p. 270).

In the case of *United States v. Causby*, it was determined that a property owner owns the airspace around his home up to the height of the roof. Any space above the roof

is treated similar to an open field and therefore, surveillance conducted above roof level passes the physical trespass test and does not violate an individual's Fourth Amendment rights (Spelman, 2015).

In 2001, *Kyllo v. United States*, tested the technological trespass law. Relatively new doctrine required a warrant be obtained by law enforcement when conducting surveillance of the interior of a home using technology to gather such information. This doctrine only required a warrant if the technology was considered not in general public use. In the case of *Kyllo*, the court decided the use of a thermal imaging device used to monitor the heat radiated by a person from the home constituted a *search* and required a warrant, since the technology was not widely used by the general public (Cavoukian, 2012; Jenks, 2015; Spelman, 2015).

Three court cases, *California v. Ciralo*, *United States v. Jones*, and *Florida v. Riley*, provide a legal starting point as to how drones used by law enforcement will stand up against the Fourth Amendment. In each of the cases, the courts ruled that a person's Fourth Amendment rights had not been violated and there was no reasonable expectation of privacy in regards to aerial surveillance by law enforcement since the same observations could have been made by the general public (Aquino-Segarra, 2016; Frazier, 2016; Jenks, 2015).

Applying the common-law physical trespass doctrine in *United States v. Jones*, 2012, the Supreme Court determined the government was in violation of an individual's Fourth Amendment rights when they physically attached a GPS tracking device to his car in order to monitor his movements over a long period of time. The court ruled this constituted a search based on his expectation of privacy and protection against trespass of

“persons, houses, papers, and effects” (U.S. Const. amend. IV). Based on the court’s decision in this case, it may become constitutionally necessary for law enforcement to obtain a warrant for any use of sophisticated surveillance technologies using drones in public spaces (Cavoukian, 2012; Jenks, 2015; Spelman, 2015).

Furthermore, when considering the case of *Jones*, it is reasonable to assume that based on the court’s ruling of the use of a GPS tracking device, the use of drone technology to track an individual over an extended period of time would also be considered a search under the mosaic theory as it applies to the Fourth Amendment (Jenks, 2015). These cases must be considered when directing policy at the local law enforcement level.

The cases of *Kyllo* and *Jones* could provide insight into future court decisions, which will affect how law enforcement agencies develop policy. In the case of *Kyllo*, the court’s ruling was based on the premise that thermal imaging was not considered to be used by the general public. As technology continues to evolve and become more cost effective, the general public may have more access to devices once considered rare (Jenks, 2015).

In the case of *Dow Chemical Co. v. United States*, the court’s decision was similar to the cases of *Riley* and *Ciralo*. The distinction here was that the surveillance was conducted over a 2,000 acre commercial rather than private property. The court concluded that the commercial complex was considered to fall between an “open field” and “curtilage” with characteristics of both. Curtilage is the land immediately surrounding a house or dwelling, to include any buildings or structures. Open field is defined as the area beyond curtilage, and does not fall under protection, which the Fourth

Amendment describes as persons, houses, papers, or effects. The final ruling by the court was similar to *Ciralo* and *Riley*, in that the same observations could have been made by the general public and there was no reasonable expectation of privacy (Jenks, 2015; Matiteyahu, 2015).

Two points stand out in these cases, which might affect future court rulings pertaining to unmanned aircraft. First, the public could have made a similar observation as law enforcement since this was considered public air space. Second, the justification by the Supreme Court that this was not a rare incident and was based on the fact that over 1,500 police helicopters were in operation in the U. S. at that time (Jenks, 2015). With the increase in popularity of drones in the U. S., it is highly probable that privately owned drones will far exceed the number of law enforcement drones in the future. This should strengthen the argument against any expectation of privacy and violation of an individual's Fourth Amendment rights.

Two cases, *United States v. Knotts* and *United States v. Karo*, similar in content, but with different outcomes, only serve to further confuse law enforcement trying to develop policy. In the case of *Knotts*, after a monitoring device was placed in an item by law enforcement and given to the subject, his movements were tracked along public roadways. The court held that the subject had no reasonable expectation of privacy on public roads and therefore no warrant was required (Thompson, 2013). In the case of *Karo*, law enforcement tracked an individual with a beeper device both on public roads and into a private residence. In this case, the court held that the search was unlawful due to an expectation of privacy at the residence (Thompson, 2013). It would be nearly impossible for law enforcement to determine prior to tracking an individual whether or

not they would enter private property. The same would hold true for tracking individuals with drone technology, making it very difficult for agencies to develop policies and procedures based on the past rulings of the multiple court decisions to date.

A point which must be considered is the actual use of drones by law enforcement today. Between 2011 and 2013, the Mesa County, Colorado, Sheriff's Office conducted over 40 drone missions consisting of search and rescue, crime scene images, and imagery in support of fire suppression. However, none of the missions flown were for surveillance purposes (Villasenor, 2013).

Professor Joh Villasenor, University of California, Los Angeles, contends the data collected by drones along with data compiled on smart phones and other mobile devices, will become part of a larger digital footprint of nearly everything we do (Cavoukian, 2012). According to Thompson (2013), unless there is established a distinction between traditional forms of surveillance by law enforcement and that using drone technology, existing jurisprudence suggests that courts would uphold drone surveillance in most cases. So far, the Supreme Court has not wished to delve into setting precedent where law enforcement's use of drones is concerned due to the underlying theme of protecting citizen's health and safety (Thompson, 2013).

The Present Use of Drones in Law Enforcement

In 2006, the Los Angeles County Sheriff's Department was one of the first law enforcement agencies to utilize drone technology (Gettinger, 2017). Since then, the use of drones by public safety departments has continued to rise. Due to shrinking budgets, law enforcement has turned to technology to fight crime (Rudisil, 2016). This technology includes the use of drones for tactical situations and as a platform for surveillance

(Rudisil, 2016). Given the rapid pace at which technology advances, the possible applications for drones in law enforcement is only limited to the imagination of developers and operators.

Serious consideration and development of armed drones for use in the military came about during the cold war when electronic and information warfare was emerging (Kindervater, 2016). According to Marra and McNeil (2012), by 2025 most U.S. armed forces, by reasoning and weighing cost vs. benefit on the battlefield, will be largely robotic. The military, specifically during combat situations, is the testing ground for law enforcement when it pertains to tools of the trade (McDougal, 2013). The tools of the trade include both tactics and equipment. History indicates the current use of armed drones by the U.S. military forces will be followed by their use in law enforcement in the near future. They are efficient, effective, economical, and now battle tested (Kindervater, 2016; Nagy 2014). Tools of the trade making a transition from military to law enforcement applications include, but are not limited to, riot control agents, Kevlar helmets, the M16 or AR15 rifle, body armor, and drones.

Modern use of riot control agents in combat were first introduced by the French, German, and British armies in WWI and primarily confined to military use through WWII (Duffy, 2009; Fry, 2010; Sidell, 1997; Szinicz, 2005; Trueman, 2015). These agents saw extensive use during the Vietnam war (Szinicz, 2005). Riot control agents began being used by law enforcement in Europe in 1968-69, and in the U.S. in the late 1960's (Sidell, 1997).

Kevlar Helmets evolved after the invention of Kevlar in 1965 and became commercially available in 1972. The U.S. Army replaced the M1 Helmet (steel pot) with

the Personal Armor System for Ground Troops (PASGT), otherwise known as the Kevlar Helmet in 1976 (Walsh, Scott, & Spagnuolo, 2005). Kevlar helmets were issued to 82nd Airborne soldiers in 1982 and first used in combat during operation Urgent Fury in Granada in 1983 (The Fritz Helmet, 2016; Stewart, 1983). The Kevlar helmet has since been adopted by law enforcement for use in riot control and tactical operations (Walsh, Scott, & Spagnuolo, 2005).

The AR-15 rifle was first introduced to the military in the early 1960's (Bocetta, 2017; Zimba, n.d.). Later renamed M-16, in 1962 it was issued to U.S. Army Special Forces and U.S. Air Force Security Police guarding nuclear weapons (Rottman, 2011; McClellan, 2009). The AR-15 made its way into the civilian market in 1989 and is the preferred long range weapon by many law enforcement officers today (Bocetta, 2017).

Ballistic vests, sometimes referred to as flack jackets, bulletproof vests, or body armor, were introduced to the military during WWII (NIJ, 1998). Body armor first became a practice in law enforcement in the 1970's (NIJ, 2014). In 1999, through a matching grant program for law enforcement, known as the Bullet-Proof Vest Partnership Grant Act of 1998, Congress provided funding for law enforcement to acquire armored vests (James, 2016). The program was so successful; the National Institute of Justice published a guide to assist LE in developing policies for the selection and use of body armor (NIJ, 2014). Currently local, state, federal and tribal law enforcement agencies are all utilizing body armor. In 2013, 71% of police departments required their officers to wear armored vests at all times (James, 2016).

The use of drones in the military first emerged during WWI when the U.S. Navy hired Ambrose Sperry to develop a fleet of unmanned torpedoes, which were improved

during WWII (Keane & Carr, 2013; McDougal, 2013; Nichols, 2014). In 1936, Lt. Cmdr. Fahrney, Officer in Charge of the Navy's Radio-Controlled Aircraft Project, introduced the term drone in his semi-annual report for aerial targets (Keane & Carr, 2013). During WWII, the Germans began utilizing remote controlled aircraft (Marra & McNeil, 2012).

Drone development by the U.S. Navy and U.S. Air Force continued to increase during the 1950's, followed by a renewed interest during the 1991 Gulf War (Callam, 2010; Keane & Carr, 2013; Kindervater, 2016; Nichols, 2014). The late 1950's and early 1960's brought about a new era of drone development with new technology and the U.S. involvement in Vietnam. During this time, the U.S. Air Force contracted with Ryan Aeronautical to develop a target drone called the Fire Bee (Cook, 2007).

Drones became more widely acceptable for wartime missions during the Vietnam war, mainly used for reconnaissance and surveillance of Chinese military facilities and troop movements (Cook, 2007; Keane & Carr, 2013). In 1995, Global Hawk and Predator drones were developed for reconnaissance and intelligence gathering missions over the Balkans (Cook, 2007; Kindervater, 2016; Marra & McNeil, 2012; Nichols, 2014). In 2006, the Los Angeles County Sheriff's office became one of the first law enforcement agencies to experiment with a fixed-wing Octatron SkySeer drone (Gettinger, 2017).

In 1942, the U.S. Navy conducted its first successful live attack with radio-controlled aircraft using a dummy torpedo. A special air task group was created in 1943 to operate target drones filled with explosives and used as primitive guided missiles. The Navy's first mission against an enemy using drones was in 1944, against a Japanese merchant craft with anti-aircraft batteries (Callam, 2010; Keane & Carr, 2013).

Drones were mainly used for surveillance over Afghanistan prior to 2001, at which time the CIA and Air Force armed Predator drones with Hellfire missiles. Compared to conventional aircraft, the predator drone was extremely inexpensive to operate (Brumfield, 2014; Gogarty & Robinson, 2011; Kindervater, 2016).

February 4, 2002, was the first targeted killing by the CIA through the use of drone technology. Since then, thousands of drones, mostly Predator and Reaper drones, have been fired in Iraq, Afghanistan, Yemen, Somalia, Pakistan, and Libya during the Global War on Terrorism, Operation Iraqi Freedom and Operation Enduring Freedom (Callam, 2010; Marra & McNeil, 2012; McDougal, 2013; Spallanzani, 2017). In 2007, the U.S. Congress urged the Department of Defense to pursue the acquisition of UAVs over conventional manned aircraft and by 2012, the Pentagon had acquired over 7,500 UAVs (Gogarty & Robinson, 2011; Kindervater, 2016). History indicates the current use of armed drones by the U.S. military forces will be followed by their use in law enforcement in the near future. They are efficient, effective, economical, and now battle tested (Kindervater, 2016; Nagy 2014).

Drones offer capabilities for law enforcement ranging from use of force to remote sensing. Use of force applications can keep officers out of harm's way and provide tactics not feasible by officers alone such as, dispersing of riot control agents, rapid response capabilities, and protecting officers during confrontation with armed suspects (Brumfield, 2014; Straub, 2014). Maragaritoff (2017) acknowledged that the use of drones would help officers do their job and was one more tool available to law enforcement to save people's lives.

Remote sensing technology can allow for the tracking of suspects based on facial recognition or heat signature, capturing evidence, and directing officers to appropriate locations during emergency situations. Most drones in use by law enforcement are equipped with, or can be equipped with, high-tech camera systems, forward-looking infrared systems, and facial recognition software (Cavoukian, 2012; Doherty, 2016; Straub, 2014). This advanced technology has the capability of decreasing the operational expenses of equipment and manpower, freeing up officers for other duties.

The views of society toward drones most often stem from misconceptions about how law enforcement will utilize them, personal biases, and emotions (Jenks, 2015). Early attempts at drone legislation to support law enforcement were met with unfavorable results. In 2013, the city of Charlottesville, Virginia banned the use of drones for law enforcement. The next day, the Virginia legislation passed a two-year moratorium on the use of UAS by law enforcement, despite the fact that the FAA had just selected the Virginia Polytechnic Institute as a UAS research and test site (Jenks, 2015; Rainer, 2014).

An article by Jenks (2015) concluded that most attempts by states at regulating drone operations has been reactionary to public outcry. Legislation fails to address key issues and questions surrounding privacy for both society and government agencies. Several states with legislation pertaining to law enforcement require registration and some form of reporting, which can be available to the public. In 2017, eleven states, Florida, Indiana, Kentucky, Montana, New Jersey, North Carolina, Oregon, South Dakota, Texas, Utah and Virginia had adopted legislation dealing with public service use of drones. New legislation focused on interfering with emergency operations, weaponizing drones, and classification of criminal offenses (NCSL, 2017).

In 2010, the Seattle Police Department purchased two drones to be used for search and rescue, hostage situations, and natural disasters. After negative outcry by citizens, the mayor of Seattle stopped the use of the drones and they were later sold to the Los Angeles Police Department (Jenks, 2015). In 2013, the Illinois legislation enacted *The Freedom from Drone Surveillance Act* in an attempt to mitigate negative publicity concerning the privacy rights of citizens. However, in support of law enforcement, an exception to this act allowed departments to utilize drones for the surveillance of suspects in addition to other specific circumstances (Jenks, 2015).

Through the application of FAA Certificates of Waiver, law enforcement agencies across the country are already using drones in their day-to-day operations (Spelman, 2015). Currently, 910 state and local agencies, associated with public safety, have purchased drones for their departments (Gettinger, 2018). This number rapidly grows each day. As of 2014, the FBI had spent over three million dollars on the use of drones for domestic surveillance since 2006 (Spelman, 2015). However, one issue on the part of the FBI is the lack of policy pertaining to the use of drones. The FBI has consistently determined drone limitations based on case-by-case information (Spelman, 2015).

The U.S. Customs and Border Protection (CBP) has for years utilized the Predator drone for surveillance along the border. The Predator is a large fixed wing drone which is used by the U.S. military in operations overseas. Other law enforcement agencies have utilized CBP predator drones for domestic operations as well (Spelman, 2015). The CBP has coordinated the use of drones to combat border-crossing violations, search for missing persons, and investigate drug related cases with law enforcement agencies in Texas, North Dakota and Minnesota (Spelman, 2015).

Gettinger (2017) comments that drones are no longer a novelty item when it comes to law enforcement. Currently, over 910 public safety departments have acquired and are currently using drones, with no signs of a slowdown in acquisitions. Of the 910 departments using drones, 66 percent (599) are made up of law enforcement agencies (Gettinger, 2018). Currently there are more than twice as many public safety agencies operating drones than manned aircraft (Gettinger, 2018). Margaritoff (2017) recorded a 518 percent growth in drone use from 2015 to 2017. This growth includes use by law enforcement for search and rescue, traffic collision reconstruction, crime scene analysis, surveillance, crowd monitoring, and the investigation of suspects and active shooters (Margaritoff, 2017).

In an article written in response to the October 1, 2017, Las Vegas shooting, Wallace and Loffi (2017) point out the possible benefits of deploying a drone in this case. A drone would have the capability of bypassing physical barriers, which hampered officers on the ground. The use of a drone in this or similar situations would provide actionable reconnaissance and real-time intelligence information to aid law enforcement (Gazzar, 2017). Most importantly, the use of a drone in any tactical situation decreases or eliminates officer exposure to dangerous tactical threats (Wallace & Loffi, 2017).

According to an article by Police One, five UAS technologies currently in use or being considered by law enforcement include the ELIMCO E300, L3 Communications Viking 400-S, Information Processing Systems' MCV, Sensefly's eBee, and the Kaman UAT. The ELIMCO E300 and the Kaman UAT are noted for their cargo capabilities. The eBee for its small size and portability. And the Viking 400-S and MCV for their payload technologies, which include communications systems, high-resolution cameras,

and night vision capabilities (5 UAS Technologies, 2017). Each of these systems could easily be redesigned to carry lethal or less than lethal weapons to assist law enforcement operations.

The Need for Basic Policy Considerations

Society generally relates armed drones with the military and does not see them being used by law enforcement within the United States (Doherty, 2016; Straub, 2014). However, the armed drone is another tool available to law enforcement to assist in the performance of their duties. Drones can be used to keep officers out of harm's way, to reach places not accessible by other means, to allow faster access than is available by officers, respond to natural disasters, or maintain order (Straub, 2014).

In a study conducted by the University of Nevada, Las Vegas, Center for Crime and Justice Policy, 93 percent of the general public was in favor of using drones for searching remote areas for missing persons, but were evenly divided on whether or not drones should be used to detect criminal activity or for surveillance (Spelman, 2015).

Those advocating that the use of drones by law enforcement infringes on the rights of citizens have mounted a convincing campaign which has succeeded in convincing 13 states to enact legislation regulating the use of drones by law enforcement. Eleven of the 13 states have gone as far as to require a warrant before the drones can be used (McNeal, 2014). In cases such as these, McNeal (2014) explains that in order for a department to utilize the technology of a drone to monitor crowds at a marathon, they would need a warrant. This warrant would not be required if the monitoring were accomplished by means of a helicopter or an officer on a rooftop.

The view of law enforcement by society today is reflected in the titles of drone legislation adopted by some of the states. State legislation includes short titles such as, the “Freedom from Unwarranted Surveillance Act” and the “Freedom from Drone Surveillance Act” (Matiteyahu, 2015). Given the climate surrounding the use of drones by government agencies, it is crucial that law enforcement protects itself through the development of the best policy imaginable.

In 2012, the Electronic Privacy Information Center (EPIC) called for government agencies to develop policies to control and regulate the use of drones for surveillance. In addition, EPIC recommended the FAA develop an evaluation program to ensure individual’s rights and civil liberties were protected in the design of those policies (Cavoukian, 2012).

In a similar move, the Washington Center for Democracy and Technology called for the FAA to establish processes to protect civil liberties through stricter approval and oversight of drone operations, specifically addressing the collection of information by government agencies (Cavoukian, 2012).

How legislation is drafted and adopted by individual states will impact future court decisions pertaining to drone utilization. For example, if state statute prohibits photographing a person without their consent, the courts could rule that any photography, or surveillance, by a drone is in violation of an individual’s rights and therefore, merit Fourth Amendment consideration (Matiteyahu, 2015). In addition to existing statutes, individual judges may have differing opinions on how much latitude should be given in the furtherance of public safety. Depending on a judge’s positive or negative adoption of

law, it could decide whether a person's expectation of privacy is recognized as reasonable or not (Matiteyahu, 2015).

In the *United States v. Causby*, the Supreme Court rejected the notion that the airspace above an individual's property belonged to that individual as far out as it reached. Now the courts generally agree that the airspace above an individual's property actually owned by him is only as much as they can reasonably utilize. Any space beyond reasonable use is considered public domain, similar to a public highway (Vacek, 2009).

Current federal regulations pertaining to law enforcement's use of drones is inadequate. Until the FAA publishes clear guidance, law enforcement will not be able to fully utilize the drone as a tool to prevent and respond to public safety incidents (Vacek, 2009). Vacek (2009) describes the situation surrounding the development of drone regulations for law enforcement agencies as an "aeronautical Wild West" (p.675). The rapid increase in the purchase of drones for law enforcement and public safety has outpaced the production of legislation and policy surrounding the issue. This leaves officers and agencies out in the cold if a situation were to occur involving legal ramifications.

From an ethical standpoint, West and Bowman (2016) discuss the dilemmas surrounding the use of drones. Many people consider technology to be neutral in ethical decision processes, however drones can be considered justifiable by providing a service to all, or an oppressive device catering to the needs of the few while infringing on the rights of the masses (Doherty, 2016; West & Bowman, 2016).

The American Civil Liberties Union (ACLU) argues that if law enforcement is authorized to use force with the aid of drones, it will be easier for them to use force and

therefore will use more force (Brumfield, 2014). Local municipalities are less likely to approve of the use of drones in the public safety sector unless they are assured of development and implementation of an effective drone operational safety policy (Rudisil, 2016). Municipalities are more concerned with the legal fallout that could potentially occur.

One of the major concerns surrounding the use of drones for law enforcement is the potential for lawsuits stemming from accidents or injury occurring during the use of a drone performing official operations (Rapp, 2009). Presently civil cases pertaining to manned aircraft are governed by existing aviation law (Rapp, 2009). In the case of remote controlled aircraft, civil matters rely mainly on existing case law (Rapp, 2009). It is essential that law enforcement agencies develop comprehensive policies and procedures to address these issues prior to implementing drone operations. According to the U.S. Department of Justice (2016), those policies should include a community advisory panel and the collection, use and retention of data.

Despite the lack of current policy, based on constitutional understanding, law enforcement agencies nationwide utilize drones while the courts, attorneys, and academia debate the issue (Spelman, 2015). Like any other tool available to law enforcement agencies, drones should be regulated and a framework developed to insure proper application and effectiveness is maintained (Straub, 2014).

Developing a Framework for Drone Policy

The ACLU has stated the use of drones by law enforcement is a more serious threat to privacy than manned aircraft due to the ability to see more than the naked eye. The ACLU proposes changes in regulations, which would include usage restrictions,

image retention restrictions, public notices of use, democratic control over policy decisions, and tracking and auditing operations (Cavoukian, 2012). The need for agencies to standardize policy elements is paramount to successfully counter those campaigning against the use of drones.

The first step in creating a drone policy is identifying the need within the agency (Borelli, 2017). Other considerations include, what type of drone best suits the agency's need, how will it be used, will there be interaction with other agencies, who will control the use, what training is needed, what are the current laws, regulations and local ordinances pertaining to drones, and most importantly how will the agency fund the program (Borelli, 2017). Each of these considerations must be weighed against the rights and privacy of the public being served.

In developing drone policy, it is essential that agencies account for the basic legal liability tenets within the framework of the policy. Those tenets should include the possibility of ground damage, air-to-air collision with other aircraft or structures, disruption or interference with existing communications systems, the constitutional rights and privacy of citizens, the rights of landowners concerning trespassing or nuisance, and environmental concerns (Rapp, 2009). Brumfield (2014) cautions law enforcement "Because the FAA authorizes LEAs to use drones in their daily operations, the LEA risks losing its ability to operate drones if it fails to comply with applicable federal laws, regulations, or state laws" (p. 570).

Cavoukian (2012) suggests a three-part privacy impact assessment to ensure the prevention of unlawful surveillance through policy design. Part I would consist of developing an information flow map within the organization to determine privacy

vulnerabilities, privacy risks, and developing solutions. Part II would analyze the performance of Part I to insure privacy principles are adhered to, technical compliance with current regulations and statutes, and policies and laws afford the privacy protection desired. Part III includes the development of mitigating options through analysis and risk assessment of issues identified by the system review (Cavoukian, 2012). This provides more of a proactive rather than reactive approach to drone policy design.

Cavoukian (2012) also proposes a privacy by design approach. The design includes the integration of privacy into the technical software of the drone rather than separately developing minimum standards, thereby insuring privacy is automatically protected (Cavoukian, 2012). Any software design would be integrated into the basic components of policy to insure compliance with current regulations.

In August of 2012, the International Association of Chiefs of Police (IACP) developed Recommended Guidelines for the use of Unmanned Aircraft. The guideline outlined recommendations for community engagement, system requirements, operational procedures, and image retention. The following contains highlights of the IACP recommendations (IACP, 2012):

- Community Engagement
 - How the technology would be used including cost and benefits.
 - Community engagement early in the process.
 - Compliance with current federal, state and local laws governing search and seizure.
 - Community review of policy and procedures.
 - News media involvement early in the process.

- System requirements
 - Ability to capture flight time.
 - Visibility paint requirements.
 - Discouraging the use of weaponized aircraft.
 - Discouraging the use of model aircraft.

- Operational procedures
 - Requirement of a Certificate of Operation.
 - Trained pilot and crew members.
 - Supervisor approval of all missions.
 - Flight documentation audits.
 - Strict accountability.
 - Alert notification systems for citizens living close by to operations.
 - Intrusion upon reasonable expectation of privacy.

- Image retention
 - Only as required as evidence of a crime, investigation, training, or by law.
 - Open for public inspection.

Retired Lieutenant Frank Borelli (2017), editor in chief for Officer.com and editorial director for Officer Media Group, addressed the components he felt were necessary in a comprehensive department drone policy.

- Personnel structure of the drone unit
- Primary and secondary missions of the unit
- Where the drone may be flown or any restricted areas
- Location of the drone, under what conditions or authorization

- How the drone will be requested, either directly or in a support role
- Where the drone will be stored and who is responsible for access, maintenance, and training

Brumfield (2014) outlines what he considers specific requirements, which need to be incorporated into an effective drone use of force policy. In *Graham v. Connor*, the court determined that all claims of excessive force must be analyzed under the Fourth Amendment objective reasonableness standard (Miller, n.d.). Reasonableness requires a consideration of the circumstances of each individual case, paying careful attention to the facts pertaining to the severity of the crime, any threat posed to the officer by the suspect, and whether the suspect is actively resisting arrest. Additionally, reasonable use of force must be judged from the perspective of a reasonable officer on the scene (Brumfield, 2014). Taking into account internal policies pertaining to the use of force and insuring the *Graham* standard is met, Brumfield determined basic policy requirements should include:

- A LEA will follow all applicable FAA regulations as well as state and federal laws regarding the operation of drones.
- When practical, an officer will notify the LEA supervisor that an armed drone has been deployed at a specific incident.
- Unless clearly contrary to an objective measure of reasonableness, the LEA supervisor shall approve every request by an officer at the scene to use the non-lethal or lethal drone weapons against a suspect or suspects.
- An officer who wishes to utilize a drone armed with non-lethal or lethal weapons as a use of force will make the decision under an objective reasonableness standard. Non-inclusive circumstances considered in the reasonableness standard

include: (1) “the severity of the crime at issue,” (2) “whether the subject poses an immediate threat to the safety of the officers or others,” and (3) “whether [the subject] is actively resisting arrest or attempting to evade arrest by flight.”

- At no time will an officer controlling a drone act alone and use the drone to apply force on an individual, unless the drone operator is at the scene of the incident or, if not at the scene, the drone operator has received clear communication from an officer at the scene directing the operator to use the drone to apply force.

The Kent, Washington, police department drone policy authorizes use for crime/collision scene applications, officer safety tactical applications, mutual aid, and community outreach. It prohibits the use of its drones for random surveillance, targeting individuals based on characteristics, intimidation, or personal business. Their policy states operators must be fully trained and maintain a flight log. Retention of data collect must be retained in accordance with state and local policy (Kent Police Department, 2018).

An article by Kenyon (2018) highlights the need to adopt a policy that addresses the needs of law enforcement and also the civilian population. Policies should include knowledge of state laws, a defined purpose, a specific plan for storage and dissemination of data collected, transparency with the community, and public support (Kenyon, 2018).

Lexipol (2017), a leader in state-specific policies for public safety organizations, recognized five key considerations for a law enforcement drone policy, in addition to the permitted and prohibited uses: 1) Random surveillance and crowd control, 2) weaponization, 3) targeting a person based on individual characteristics, 4) facial recognition, and 5) nighttime use.

As a list of considerations for legislators, McNeal (2014) suggests in order to address any type of aerial surveillance, policy development should include a clear definition of airspace, considerations for duration, data retention procedures, transparency and accountability measures. In addition, McNeal (2014) suggests recognizing the difference between surveillance by a drone and that of human surveillance.

A drone is no different from any other tool available to officers in the field and should be treated as such. Borelli (2017) advocates keeping an agency's drone program professional and efficient, not letting it become a hobby for the department. The emergence of drones into the domestic airspace has led to understandable privacy issues and many legal and ethical issues. The greatest challenge for law enforcement will be to convince an already skeptic public that incorporating an armed drone into the department is beneficial and cost effective in daily operations (Brumfield, 2014).

A review of the literature indicates that although drones are currently being used by law enforcement and many departments have policies in place, a need exists to establish the basic elements of policy needed to meet the minimum standards for an effective armed drone policy, which addresses use of force and does not violate the Fourth Amendment rights of the citizens. This study will add to the body of knowledge and provide valuable information for both law enforcement and the aviation industry in the area of legislation and policy development.

CHAPTER III

METHODOLOGY

The purpose of this qualitative study is to interview subject matter experts (SMEs) in order to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement. This study will examine a sample of professionals, knowledgeable in the fields of drone operations, policy development and legal counsel. It is the belief of the researcher that the perspective provided by the professionals is critical in gaining a better understanding of the components needed to establish an effective policy for armed drone operations.

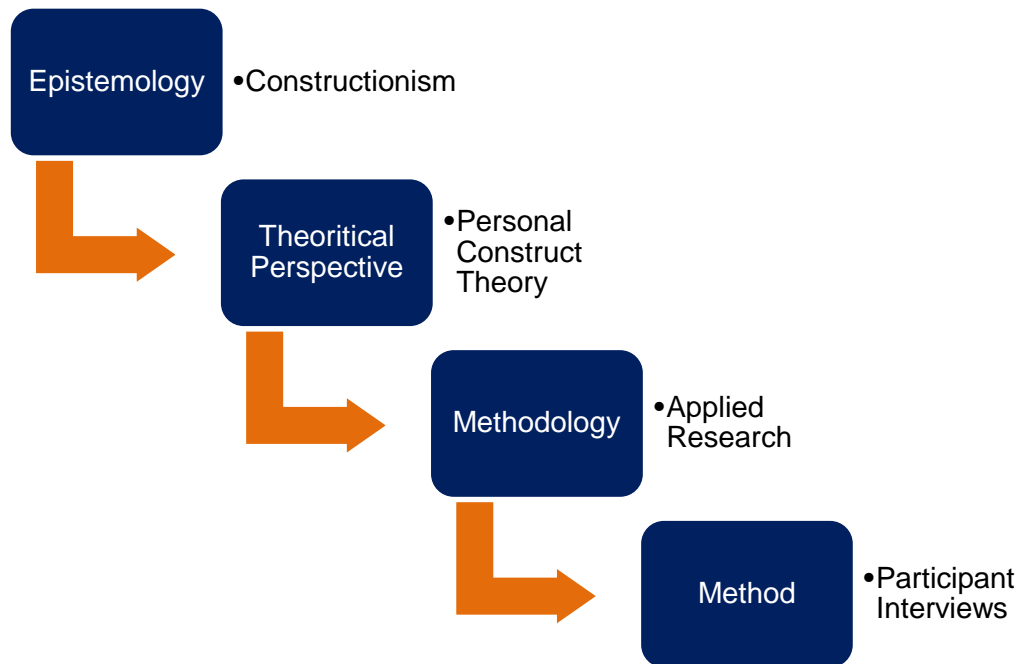
This goal of this study is to address three research questions: (1) What current laws and regulations apply to the use of drones by law enforcement agencies? (2) According to subject matter experts, what elements are needed to insure the use of armed drones in law enforcement do not violate the Fourth Amendment rights of the citizens? (3) According to subject matter experts, what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy?

For the purpose of organization, this chapter discusses the research design, sample selection validity and reliability, methodology, data collection, instrumentation, and data analysis.

Research Design

This study will utilize George Kelly's Personal Construct Theory, which suggests that people understand the world around them based on experiences and observations (Punch, 2016; Warren, 2012). They develop constructs, mental representations used to interpret events, and create theories to explain those events. Construct theory is a form of sensemaking, which is described by Crotty (1998) as the individual human subject making sense of an object through interaction or engagement. Patton (2015) further explains how constructionism seeks to point out that an individual's unique experiences and culture shapes how we view the world. See Figure 3.1.

Figure 3.1 Research Perspective



Personal Construct Theory evolves from the basis of cognitive psychology, but focuses on the basic building blocks of cognitive perspective (Warren, 2012). Similar to reflexivity, where the researcher applies thinking to making sense of patterns observed around them. It involves the interpretation of their experiences, while considering the cognitive, perceptual and cultural circumstances embedded in those interpretations (Patton, 2015).

Individuals interpret the world in different ways. Constructions are subjective representations of their experiences and knowledge rather than objective truths (Raskin, 2010). Warren (2012) describes it as mental representations, based on our experiences and observations that we use to interpret events. The natural sciences seek to find casual explanations of phenomenon. The social sciences, due to the complex world in which we live, should seek understanding rather than explanations. Through personal construct theory, the broader context is of understanding the meaning behind the words (Butt, 2004).

Through the interviews of multiple subject matter experts, this study will seek to capture the definition of each person's personal experiences and collectively understand their interpretation of the basic elements essential in an effective drone policy. As described by Patton (2015), an effective qualitative inquiry will seek to honor the idea of multiple realities. Each person creates a set of cognitive constructs about their environment. Each individual participating in this study provides an additional perspective and a different view on the topic (Patton, 2015).

Sample Selection

1. **Population:** The population for this study is persons considered subject matter experts (SMEs) based on their experience and professional knowledge in one or more of the following three law enforcement disciplines: drone operations, policy development, or legal counsel. This triangulated approach allows for a more detailed account of policy design through the different viewpoints of the SMEs.
2. **Sample:** The sample of 15 SMEs from the study population must meet the following criteria based on their law enforcement discipline area:
 - Drone operations SMEs will have a minimum of two years experience directly involved in law enforcement drone operations.
 - Policy development SMEs will have a minimum of two years experience in policy development. Priority will be given to those individuals who have been involved in the development of drone policy.
 - Legal counsel SMEs must currently serve as legal counsel or on legal staff with their agency. Priority will be given to individuals with Fourth Amendment litigation experience.
3. **Sampling Method:** This study will consist of a combination of *Purposive (or Judgement) Sampling* and *Snowball (or Chain) Sampling* (Mills & Gay, 2016). *Purposive* sampling allows for the selection of individuals the researcher feels are able to contribute key information and a rich understanding of the problem based on their professional expertise. Due to the possibility of a relatively low number of accessible subject matter experts, *Snowball* sampling will allow for additional samples for a more credible study.

4. **Sampling Procedure:** Identification of participants will be completed with the assistance of two separate organizations. Contact information for participants located in Oklahoma will be acquired utilizing email with the assistance of the Oklahoma Information Fusion Center (OIFC) through their law enforcement notification list. Contact information for participants located outside of Oklahoma will be acquired utilizing email with the assistance of the International Association of Crime Analysts (IACA) through their subscriber list. Those individuals identified as meeting the sample requirements will be grouped by discipline. Once grouped, five individuals from each discipline will be selected based on accessibility for an interview. All 15 individuals will be contacted via email to request participation in the study. Those not responding after two weeks will be contacted a second time via email. Individuals not responding to the second email after one week will be contacted by phone. If after efforts to contact individuals by phone, the sample size is $< N=10$, five additional individuals from the initial list will be selected based on discipline and contacted by phone. Any other individuals will be selected through snowball sampling efforts.
5. **Sample Size:** This study will consist of a small sample size, $N=15$. This study, through applied qualitative research, focuses on the contribution to literature and relevance and applicability of the findings to the law enforcement and aviation communities' body of knowledge (Patton, 2015). A strength of the study is the purposeful sampling method, which relies on the selection of information rich cases for in-depth analysis, thereby eliminating bias commonly found in statistical sampling (Patton, 2015).

6. **Sampling Bias:** By selecting individuals from three separate disciplines, drone operations, policy development, and legal counsel, the researcher aims to mitigate any sampling bias that may occur.

Validity and Reliability

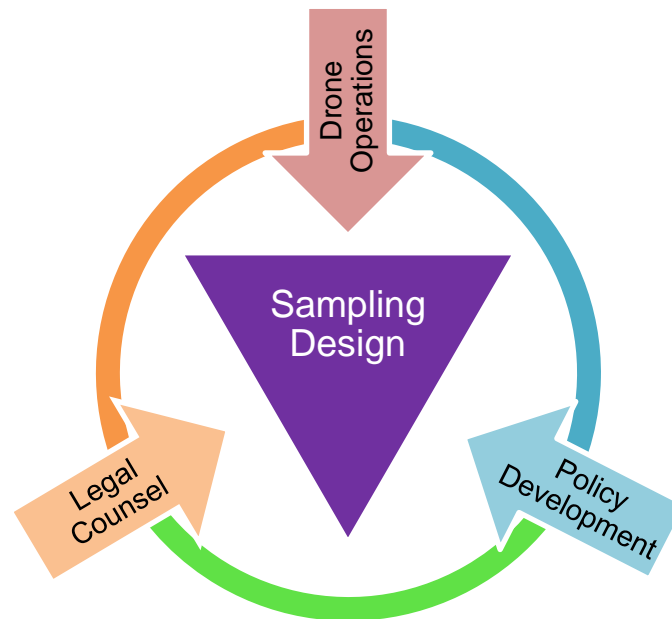
Trustworthiness and understanding are used to describe validity in qualitative research (Golafshani, 2003; Mills & Gay, 2016). In other words, is the data collected an accurate representation of the study. Credibility and dependability are in turn used to establish trustworthiness (Mills & Gay, 2016). Establishing credibility can be accomplished through different methods, such as control measures, which support data collection verification and data interpretation. Golafshani (2003) commented that reliability is a prerequisite for validity.

Reliability, trustworthiness, credibility, dependability, and transferability all go hand in hand in establishing a solid qualitative study that is valued by colleagues. This study seeks to establish validity by employing digital recordings along with field notes of all interviews and a peer debriefing to identify any data collection inconsistencies.

This study will employ a strategy of triangulation through sampling design. See Figure 3.2. Subject matter experts will be chosen from three separate law enforcement disciplines; drone operations, policy development, and legal counsel, in order to improve the reliability and thereby improving the validity of the research. The application of reflexivity through each step of the study will assist in avoiding any researcher bias.

This strategy, along with consistency in data collection, will assist the researcher in accurately presenting the study (Golafshani, 2003).

Figure 3.2 Reliability and Validity Triangulation Strategy



Reflexivity takes us to the point of understanding, based on a critical self-examination of our own thoughts, what we know and why we know it (Bloomberg & Volpe, 2012; Patton, 2015). It leads us to apply critical thinking methods throughout our project citation. In my case, this includes why am I conducting this study, who is my audience and why, who I have chosen to interview and why, what meaning have I interpreted from the interviews, and have I considered any assumptions or biases for each phase of this project. Patton (2015) comments that “reflexivity is meant to direct us to a particular kind of reflection grounded in the in-depth, experiential, and interpersonal nature of qualitative inquiry” p. 70.

I have chosen this study based on my background in law enforcement. I believe the need for standardized policy in today’s society is essential, especially when it deals with the Fourth Amendment rights of citizens. During this study, I will have to insure my biases toward law enforcement are not reflected in my research, especially in the

interpretation of information. One area I am concerned about is the self-identification of assumptions I might make while conducting interviews and when reporting the results of my study. In order to minimize these risks, I plan to conduct pilot studies of the proposed questions (Bloomberg & Volpe, 2012) and utilize NVivo, a computer software program, to assist in the analysis of data. NVivo uses data management, query and visualization tools to provide a sophisticated analysis of qualitative data from text, which will result in a deeper understanding of the research findings. Through peer reviews, debriefings, and audit trails, I aim to establish the trust needed for an effective and credible qualitative study (DeCuir-Gunby & Schutz, 2017).

Methodology

1. This study will consist of participant interviews utilizing a combination of structured and ad hoc interview questions designed to answer the following research questions:
 - What current laws and regulations apply to the use of drones by law enforcement agencies?
 - According to subject matter experts, what elements are needed to insure the use of armed drones in law enforcement do not violate the Fourth Amendment rights of the citizens?
 - According to subject matter experts, what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy?
2. Each participant will be interviewed individually through the use of open-ended questions. The questions, and possible follow-on questions, listed below will be used to achieve three key points:
 - a. Identify individual qualifications and professional skills of the interviewee.

- b. Identify issues surrounding Fourth Amendment rights and use of force for drone operations.
- c. Identify specific elements needed for an effective armed drone policy.

Data Collection

1. Participants will be interviewed through two separate means based on physical location.
 - a. Participants living within 100-miles of Oklahoma City, Oklahoma, will be interviewed via face-to-face meeting at their location or a location agreed upon for their convenience.
 - b. Participants located outside of the 100 mile radius of Oklahoma City, Oklahoma, will be interviewed via phone, Skype, Zoom, or other social media.
 - c. Participants will be contacted via email, with a follow up phone call, to schedule the interview time and place, suitable to their personal schedule.
 - d. The email will also include the IRB consent form to be signed and returned prior to conducting the interviews.
 - e. Interviews should take no more than one hour to complete, to include any ad hoc questions.
2. This researcher has two concerns pertaining to data collection.
 - a. Primary concern is failure of the digital recording device. Field notes can be used for analysis, but could lessen the dependability of the data.

- b. Secondary concern is the possibility of interview distractions due to the professional demands of the interviewees, which could jeopardize the reliability of the study.
- c. SME criteria based on a relatively new field of study, drones in law enforcement.

Instrumentation

An interview guide based on narrative inquiry, as suggested by Patton (2015), was established. Interviewees will be identified in accordance with the study's sampling procedures. A question guide, consent form, and participatory letter were developed in preparation for the conduct of interviews.

A total of three written instruments were used during this study. First, Appendix B contains a copy of the participation consent form, approved by the IRB board, and emailed to each participant. Second, Appendix C contains a participation letter sent to each interviewee outlining the research study and providing the interviewee with the researcher's contact information should they have any questions prior to or post interview. Lastly, Appendix D contains the interview guide consisting of ten interview questions and follow-up questions used during the interview process to allow for a more structured and detailed collection of information.

Armed Drone Scenarios

The following four scenarios were developed to highlight the capabilities and advantages of utilizing armed drones in law enforcement operations. And as a platform to launch the study's interview questions.

1. Active shooter neutralization

Similar to the 2017 Las Vegas shooting. An active shooter is terrorizing citizens attending an event from an elevated and protected vantage point. The suspect's location could be a high-rise building or elevated wooded area. A drone would be quickly deployed offering a bird's eye view to assess the situation. The drone would be able to identify the location of the shooter, surrounding area, possible escape routes, and provide valuable intelligence to officers on the ground. Armed with a 9mm weapon, a riot control agent (tear gas), or both would give officers the ability to neutralize the situation quickly without further loss of life. (Varah, 2015).

2. Riot control agents

During riot control situations, police are normally dressed in full riot control gear to prevent injury and increase force protection. Often police are viewed as an opposing force rather than a deterrent to the already escalated situation. A drone deployed over a crowd poses a less military looking presence and can de-escalate then monitor the situation without any harm to officers. When necessary, a drone or multiple drones, armed with riot control agents (i.e. tear gas or rubber bullets) would have the capability of neutralizing the riot while protecting police officers and lessening the risk of use of force issues.

3. Hostage monitoring and action

Imagine an armed terrorist holding a civilian hostage in a public area such as a parking lot or mall. Police would be able to deploy a drone armed with a camera and a 9mm weapon. The drone would be able to assess the situation and provide detailed information, which might not be available from a distance. Officers could monitor the suspect's behavior via the camera and as a last resort, if necessary; neutralize the suspect

with an onboard 9mm weapon or Taser (Ortiz, 2017). A suspect would likely acknowledge the camera mounted on the drone, but not suspect the drone was armed. Often, in situations like this, seconds count in the ability to save a life.

4. High speed chase

High speed police chases have the ability to turn deadly in a short period of time. When an officer engages a suspect in a chase, instead of risking the officer's safety, the safety of bystanders, and the cost of damage to a police vehicle, they could deploy a drone. The drone would be able to hover and monitor the vehicle without the suspect's knowledge. This increases the chance of the suspect slowing down if he does not think he is being followed. If the suspect refuses to stop or slow down, the armed drone could be maneuvered to deploy armament to deflate the tires rendering the vehicle inoperable.

Additional Information:

- Drones are small enough to be carried in the trunk of police vehicles and deployed from almost anywhere.
- Drones are less expensive to operate than helicopters, can hover at lower altitudes, and get into tighter areas such as under bridges and inside buildings.
- In addition to the ones listed above, a range of scenarios are possible for the use of armed drones in law enforcement such as, dismantling a bomb in a remote area, shooting down another armed drone, or using a Taser on a suspect.
- Possible arms would include, but not limited to riot control agents such as tear gas, 9mm weapons, shotguns, Tasers, or rubber bullets.

- Combat areas of operation are testing sites for armed drones. The drone technology and armament used by the military today is the future for law enforcement.

Data Analysis

Data analysis is a very important phase of the research study. Interview data will be collected through the use of a recorder, which will then be transcribed into written text for analysis. Analysis of the interview data will be performed through the use of NVivo 12, a computer software program designed specifically for qualitative data analysis. Interviews will be transcribed then uploaded into NVivo 12 to be coded and analyzed. A report will then be generated with the results of the data.

CHAPTER IV

FINDINGS

The purpose of this qualitative study was to conduct in-depth interviews with subject matter experts (SME) in order to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement and to develop a base for further research. SMEs in three areas of drone policy making: drone operations, policy development, and legal counsel were interviewed, and their results recorded.

The findings from this study were extracted from ninety-five pages of SME interviews, which were transcribed and analyzed to develop major themes pertaining to the three research questions. Each participant played a crucial role in determining the outcome of the research based on extensive knowledge in their particular area of expertise. The credibility and validity of the information is dependent upon the participant's ability to articulate the in-depth understanding they have of the research topic. According to Patton (2015), the quality of the data obtained during the interview process depends greatly on the interviewer. It is the interviewer's responsibility to guide the participant through the use of questions formulated to focus on the research problem.

This study was designed using a series of questions, which highlighted each participant's expert opinion in order to answer the three research questions from chapter one. In addition to participant's biographical information, interview questions one and two provide additional background on the participant's knowledge of the research subject.

1. How long have you worked in your current position?
2. Have you completed any specialized training pertaining to your position?

Interview questions three and four were designed to answer the research question; what current laws and regulations apply to the use of drones by law enforcement agencies?

3. Does your agency currently have a drone policy?
4. In your opinion, how can drone operations enhance police procedures?

Interview questions five through eight include acknowledgment that the FAA currently prohibits the arming of drones (FAA News, 2019), and aid in answering the research question; what elements are needed to insure the use of armed drones by law enforcement do not violate the Fourth Amendment rights of the citizens?

5. Currently, the FAA prohibits arming drones, other than for the military. If the FAA were to allow an exception for law enforcement to utilize armed drones, lethal and less than lethal, based on your expertise, what changes would be required in use of force standards for armed drone operations?
6. Currently, the FAA requires line-of-sight operations. If the FAA were to allow an exception for law enforcement to operate flying beyond visual line-of-sight, what concerns do you have about drone operators being detached from the scene verses an officer on site?

7. Based on your expertise, how can field supervisors best control drone operations without being on scene?

8. In your opinion, how should policy differ between drone operations and normal police operations as it pertains to surveillance and an individual's Fourth Amendment rights?

Lastly, interview questions nine and ten serve to answer the research question; what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy?

9. Again, if the FAA were to allow an exception for law enforcement to utilize armed drones, lethal and less than lethal, what would you consider the most important elements needed in an effective armed drone policy?

10. Is there any additional information you would like to add?

Participant Qualifications and Experience

In addition to selection of participants from three separate areas of drone policy development, participants were selected from various geographical areas of the U.S. in order to enhance the validity and credibility of the study. See Figure 4.1.

Figure 4.1 Geographical Area of Participants

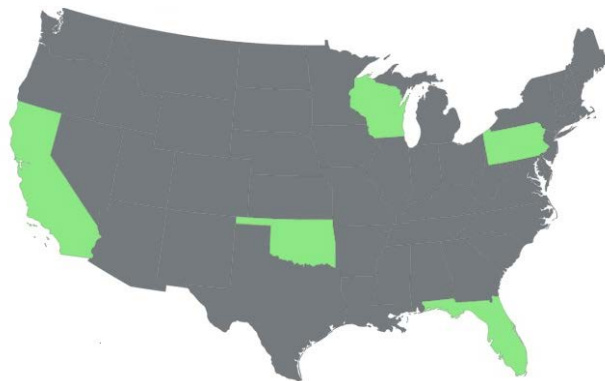


Table 4.1 is an overview of the participant’s qualifications and experience pertaining to their specific area expertise as it relates to the problem of the study.

Table 4.1 Participant Qualifications and Experience

Participant	Area of Expertise	Experience
1	Drone Operations and Policy Development	Fifteen years experience in law enforcement; two years as drone operations supervisor for a major metropolitan police department; four years as uniform support supervisor; nine years police tactical unit supervisor; and two years as a law enforcement instructor.
2	Policy Development and Legal Counsel	Thirty-seven years experience in law enforcement; 31 years law enforcement at a major university to include current position as Deputy Chief, Support Services Bureau; 24 years as a practicing attorney; serves on the university’s UAV committee and lead for policy development; 16 years in emergency management policy development; serves on the State’s Region One Homeland Security Planning Board; author of two police

publications on Constitutional Law and Liability Issues; and holds both a PhD and a Juris Doctorate.

- | | | |
|---|---|---|
| 3 | Policy Development and Drone Operations | Fourteen years experience in law enforcement for a large metropolitan police department; six years experience special investigations and intelligence; three years experience in UAS policy development and review; FAA Part 107 certified; and has completed over 100 hours of law enforcement drone use training. |
| 4 | Drone Operations | Nine years total experience in law enforcement; five years experience in law enforcement for a small metropolitan police department; four years experience as a crime scene investigator for a state law enforcement agency; two years experience as UAS program manager for a state law enforcement agency; two years as state level unmanned vehicle evaluation team member; holds an FAA Remote Pilot Certification (sUAS rating); Advanced Law Enforcement certification; |

FARO Laser Scanner & SCENE Operator certification; Law Enforcement Instructor certification; UAS & Part 107 test preparation course instructor; has developed UAS ground school curriculum; completion of UAS photography academy; 52 hours of sUAS specific training; and 100 hours of informal drone training.

5 Policy Development

Thirty-four years total experience in law enforcement; one year experience with a county sheriff's department; 18 years experience with a small police department; three years as division director for a state law enforcement agency; 10 months experience as assistant director; over 12 years experience in law enforcement policy development; a graduate of the Southern Police Institute; Backster School of Lie Detection; and the Police Executive Leadership Graduate Program, University of Louisville.

- 6 Legal Counsel Twenty-four years total experience in law enforcement legal counsel; two months experience as chief legal counsel for a state law enforcement agency; 23 years as a district attorney; six years as an attorney in private practice; served as President of the District Attorney's Council; Chair of the Justice Assistance Grant Board; Governor's Appointment to the Commission on Children and Youth; Supreme Court Appointment to the state Dispute Resolution Advisory Board; adjunct instructor at several universities; and has presented nationally at the Family Justice Alliance, American Correctional Association, and Department of Justice.
- 7 Drone Operations Thirty-eight years total experience in law enforcement for a major county sheriff's office; two and one half years with the agency's Special Enforcement Bureau (unmanned aircraft); current Bureau Commander; served as Lieutenant with the agency's Aero Bureau

(manned aircraft); and has completed specialized training in drone operations.

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| 8 | Legal Counsel | Twenty years total experience in legal counsel; six years Assistant Municipal Counsel for a major city; six years as Assistant State Attorney General; seven years as General Counsel for State Department of Public Safety; one year as Police Legal Advisor for a major metropolitan police department; provides research and instruction on police operations, liability, and constitutional law. |
| 9 | Legal Counsel | Twenty years experience in law enforcement legal counsel; three months as Assistant District Attorney; over 19 years as Chief Legal Counsel for a state law enforcement agency. |
| 10 | Policy Development and Drone Operations | Twenty-one years experience in law enforcement; current Assistant Division Commander of Operations for a large metropolitan police department; four years in drone operations to include development of the |

department's drone policy; speaker and presenter at several UAS conferences to include the DJI AirWorks conference.

- 11 Policy Development Fifteen years experience in law enforcement, industrial security, and emergency medical services; served as Assistant Director of the Western Pennsylvania Advance Technology Center; has launched five companies focused on the integration of technology into public safety operations; served as Director of Research for the Ielase Institute of Forensic Psychology; currently serves as CEO of a company, which integrates aerial robotic technologies into the workplace of public agencies; is active in two research projects on detection, interception, and forensic analysis of drones used for crime and terrorism, and the use of drone sensor technology for search & rescue and search & recovery operations; has authored several articles on drone technology and presented at conferences nationally, to include InterDrone, the Massachusetts

Association of Crime Analysts, and the National Association of Subrogation Professionals.

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|----|------------------|--|
| 12 | Drone Operations | Fourteen years experience with a major county sheriff's office; five years experience as Public Information Officer; currently in charge of the agency's drone unit and traffic unit; completed specialized training on drone operations, policy, procedures, and safety; attended drone operational training from Embry-Riddle Aeronautical. |
| 13 | Drone Operations | Eight years experience in law enforcement; five years experience as a Crime Scene Investigator for a state law enforcement agency, two and one half years as a drone operator; FAA certified Unmanned Aerial Pilot; certified in crime scene reconstruction, bloodstain pattern analysis, shooting incident reconstruction; a veteran combat medic; holds a B.A. in Criminal Justice and an M.A. in Criminal Justice Management; and over 1800 |

hours of law enforcement continuing education.

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| 14 | Legal Counsel and Policy Development | Twenty-five years experience in law enforcement; 17 years as Assistant District Attorney one year as State Assistant District Attorney; three years as General Counsel for a state law enforcement agency; five years private practice; 10 years U.S. Air Force KC/EC-135 Instructor Navigator; three years work with drone policy development for law enforcement; adjunct instructor for a major city police department and state level police academy. |
| 15 | Drone Operations and Policy Development | Seventeen years experience in law enforcement; 10 years with a large municipal police department holding positions as patrolman, narcotics detective, and SWAT operator; seven years with state level law enforcement in the Enforcement, Diversion, and Professional Standards Divisions; created, implemented and currently manages the |

agency's sUAS program; FAA Part 107 certification; firearms instructor and member of the agency's policy development committee; completed DGI Mavic and Thermal training; speaks nationally at UAS conferences and training venues.

The data from the participant interviews was transcribed into text format and imported into NVivo 12 for coding and analysis. The NVivo software assisted in the analysis of the qualitative data and provided a deeper understanding and insight into the raw information provided by the participants during the interviews.

Participant responses were organized by question in order to illuminate patterns and major themes pertaining to the study's research questions. The objective of the analysis of participant responses is not to develop quantitative results, but to keep qualitative information qualitative (Patton, 2015). It is a deeper understanding of the participant's lifetime of experience and knowledge that is foremost in being able to answer the research questions and apply the results to the overall research problem.

Evaluation and Analysis of Findings

Each interview question was analyzed and coded using NVivo 12 and verified manually by the researcher to identify themes established by the SMEs relevant to the associated research question. Results were collated through the use of crosstabs. Crosstabs were constructed containing the variables, theme and participant, for each interview question.

Interview Questions One and Two

Together with the personal biographies and resumes received from the participants, interview questions one and two highlighted the experience, and the expertise in their field, of the participants. The 15 participants had accumulated a total of 305 years' experience in law enforcement. Individual experience ranged from eight years to 38 years. The subject matter experts interviewed had a total of 23 hours experience in drone operations ranging from two to five years; 48 combined years' experience in policy development ranging from two to 16 years; and 113 combined years of legal counsel experience ranging from 20 to 25 years. See Table 4.2. Many of the organizations represented by the participants had recently developed drone programs; therefore, six participants had experience in multiple areas of expertise and were directly responsible for the initial development of the drone policy for their agency.

Table 4.2 Participant Years' of Experience

Years of Experience	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Law Enforcement	15	37	14	9	34	24	38	14	20	21	15	14	8	25	17	305
Drone Operations	2		3	2			2.5			4		5	2.5		2	23
Policy Development	2	16	3		12					4	6			3	2	48
Legal Council		24				24		20	20					25		113

In addition to the years of experience in their specific field, six of the participants had completed the FAA's Part 107 drone certification training. Other training identified

included; training from commercial pilots, military training, DGI drone training, training from local vendors, along with self-study and self-training. Participants collectively identified 152 hours of additional formal drone training.

Six of the participants (40%) had subject matter expertise in one of the other selected disciplines. Four were experienced in drone operations and policy development and two were experienced in legal counsel and policy development. This additional expertise allowed for a deeper understanding of the overall subject being researched. Interview question three focused on ascertaining the participant's knowledge of current drone policies and regulations. See Table 4.3.

Interview Question Three

The current drone policies of the agencies represented varied based on the operational use of the drones for each particular agency. Ten participants (67%) stated their drone policies focused on procedures, which included pre-flight procedures, maintenance of the drones, personnel requirements, when the drone could be deployed, how it was to be used operationally, other equipment requirements, and weather and altitude restrictions. Participant 4 stated their policy contained,

Procedures regarding everything from pre-flight, how those checks should be done, what type of information needs to be obtained by the remote pilot prior to flight, policies and procedures regarding flights, what to do in case of certain emergencies, what not to do, what legal authority we should operate under when using our UAS, post-flight procedures such as documentation, maintenance of aircraft, requirements for continued education of pilots, and also education and certification for pilots as well (Participant 4, Interview response, April 19, 2019).

Participant 12 responded their agency policy “deals with procedures, expectations, and when to use the drones, the types of callouts examples and when to use the drones, how a drone is to be used, minimum manpower for drone usage and weather related issues such as when we can and cannot fly, FAA rules related to when we can and cannot fly, and safety” (Participant 12, Interview response, June 25, 2019).

Seven of the participants (47%) stated that their policies addressed required documentation, such as pilot certification training, continued education requirements for pilots, and video surveillance retention. Participant 15 stated their policy outlined “safety protocols and training that our pilots require, as well as our operational procedures” (Participant 15, Interview response, July 8, 2019).

Seven participants (47%) stated their policies stressed FAA compliance. Participant 5 responded “Our policy addresses when it’s used, how it’s used, to make sure that it’s in compliance with FAA standards, upkeep on the drones itself” (Participant 5, Interview response, April 25, 2019). Participant 13 stated much of their policy was covered by “FAA Part 107 policy” and “certificates of authorization” (Participant 13, Interview response, June 28, 2019).

Seven participants (47%) stated their policies covered approval for deployment by agency supervisors. Participant 2 responded they have “a drone committee” which authorizes the use of their drones (Participant 2, Interview response, January 26, 2019).

Five participants (33%) mentioned other restrictions contained in their policies such as, interaction with manned aircraft, restricted air space, safety protocols, software and hardware changes, and line of sight requirements. Participant 10 stated their policy needed to be updated to include “the interaction between manned and unmanned aircraft”

and “it seems to happen more and more frequently” (Participant 10, Interview response, June 18, 2019). Four participants (27%) indicated their agencies were currently working on policies, which were either in draft form awaiting approval or not published yet.

Table 4.3 Participant Knowledge of Existing Policies and Regulations

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Procedures				X	X		X	X		X	X	X	X	X	X	10
Training / Documentation				X	X					X	X	X		X	X	7
FAA Compliance					X		X			X		X	X	X	X	7
Approval for Deployment		X					X			X		X	X	X	X	7
Restrictions							X			X			X	X	X	5
Software & Hardware														X	X	2
Safety Protocols										X				X	X	3
Policy in Progress	X		X			X			X							4

Interview Question Four

Question four addressed whether or not the participants felt drones did enhance police procedures for their agencies, thereby determining the value of drones for law enforcement operations in the future and the need for an armed drone policy for law enforcement. See Table 4.

Seven participants (47%) stated drones increased safety for their officers.

Participant one commented “its ability to go places where officers were at risk” (Participant 1, Interview response, January 25, 2019).

Participant 4 stated “ it has the ability to increase officer safety for tactical operations” (Participant 4, Interview response, April 19, 2019).

Fourteen participants (93%) agreed drones were a cost saving tool for their agencies. Participants 1, 3, 4, 5, 7, 10, 11, 12, 13, and 14, all compared the cost saving to that of conventional aircraft such as a helicopter. Participant 7 stated “it’s night and day difference in cost “ (Participant 7, Interview response, May 23, 2019). Participant 11 commented “You’d never be able to achieve that with additional man-power unless you hired birds that can fly around and do that” (Participant 11, Interview response, June 22, 2019).

Six participants (40%) felt drones increased the ability of their agency to reach places not available to personnel. Participant 12 called the drone their “eye in the sky” with “a global view of the scene” (Participant 12, Interview response, June 25, 2019). Seven participants (47%) commented that drones increased the intelligence gathering capabilities for their agencies. Participant 12 responded “drones can help law enforcement quickly analyze scenario situations” (Participant 12, Interview response, June 25, 2019).

Seven participants (47%) stated drones increased the efficiency of field operations. Participant 1 stated drones would “enhance the speed and efficiency in which we conduct any type of operation, whether its investigation or even tactically” (Participant 1, Interview response, January 25, 2019). Participant 15 added it had “the

ability to be more rapidly available and rapidly deployed” (Participant 15, Interview response, July 8, 2019).

All participants (100%) agreed that drones minimized the risk for their officers and civilians. Seven participants (47%) stated that drones added to their ability to communicate information through video capabilities by having *eyes* on the mission in real time. Participant 13 stated, “You get real-time information. It provides perspective that couldn’t be garnered by any other means even helicopter” and it will “provide you with the actual video” (Participant 13, Interview response, June 28, 2019).

Eight participants (53%) considered drones to be a force multiplier for their agency.

Participant 10 stated,

It’s one of those things that...almost like the computer. We have computers in our desks. We have computers in our cars. We have computers now in our pockets. Drones have almost done that to law enforcement. They’ve kind of effected just about everything we do. We use them to apprehend criminals. We use them to process crime scenes. We use them for social media now... it’s certainly a force multiplier. Drones can do, when it comes to searches, the work of multiple people (Participant 10, Interview response, June 18, 2019).

Eleven participants (73%) deemed the drone to be a tremendous tool available for law enforcement. Lastly, all participants (100%) agreed that drones were a time saving accessory for their agency. Participant 4 responded,

The time to perform pre-flight and be in the air is less than five minutes, which would also include checking your aviation weather sources, your airspace for

applicability of flight to a certain area, and once you're off the ground, you're ready to go to work (Participant 4, Interview response, April 19, 2019).

Table 4.4 Do Drones Enhance Police Procedures

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Safety	X					X				X	X	X	X		X	7
Cost Savings	X	X	X	X	X	X	X		X	X	X	X	X	X	X	14
Ability to go places	X				X	X			X				X		X	6
Intelligence Gathering		X				X	X			X	X	X	X			7
Speed/Efficiency	X		X	X	X							X		X	X	7
Minimize Risk	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15
Communication Video Capability			X		X		X	X	X			X	X			7
Force Multiplier		X	X		X			X	X		X		X		X	8
Another Tool in Toolbox		X	X		X		X	X	X	X		X	X	X	X	11
Time Savings	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	15

Interview Question Five

Questions five through eight addressed any Fourth Amendment issues to include use of force, line of sight restrictions and supervisory requirements. Question five specifically address the question of whether or not current policies used by police officers

needed to be changed if drones were to be armed with lethal or less than lethal munitions in the future. See Table 4.5.

Two participants (13%) stressed the need for major changes to the law.

Participant 9 stated “It would require a large-scale change or development in the entire body of law, with regards to use of force” (Participant 9, Interview response, May 31, 2019).

Participant 11 stated “You’re going to need to probably change the law that allows police departments to use force or to work with other departments, if necessary” (Participant 11, Interview response, June 22, 2019).

Twelve participants (80%) stated that little or no change was required in use of force standards. Those participants indicating minor changes were needed addressed revisions in platform type and deployment requirements (33%), technology requirements (40%), and training requirements (20%). Participant 1 responded “Our use of force standards are pretty stringent on this department. The standards, the main concern that you’re going to have with lethal or less lethal is the platform from which you are deploying it” (Participant 1, Interview response, January 25, 2019). Participant 2 stated “they’d have to meet all of the same components of use of force, whether it’s the officer engaging directly or the officer engaging indirectly” (Participant 2, Interview response, January 26, 2019).

Participant 4 stated “I don’t really see a need in changing use of force standards” (Participant 4, Interview response, April 19, 2019). Participant 6 responded,

The drone is just a next extension of the use of force. The use of force policy mentions certain things, but it doesn’t mention all things. I’m not sure the use of

force policy is indigenous to the person and the situation. I don't know if the policy itself needs as much change just on the use of force issue. Use of force applies to the situation you're in and what it would take to dispel the threat. I don't know if there's much difference between the use of a drone in that, use of a weapon in that, or the use of pepper spray in that. I think the policy remains the same, in my opinion (Participant 6, Interview response, April 30, 2019).

Participant 8 stated "The standard really wouldn't change. That's dictated by Supreme Court, Fourth Amendment, when deadly force or use-of-force is justified would still be in existence" (Participant 8, Interview response, May 24, 2019). Twenty percent of the participants stated the drone is just another tool available to their agency.

Table 4.5 Change in Use of Force Standards

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Change Needed									X		X					2
Very Little or No Change	X	X	X	X	X	X	X	X		X			X	X	X	12
Platform / Deployment Requirements	X		X		X			X							X	5
Technology		X	X		X			X		X				X		6
Training			X					X					X			3
Another Tool in Toolbox			X					X							X	3

Interview Question Six

Question six address line of sight concerns, which could affect surveillance and an individual's Fourth Amendment rights. See Table 4.6. Nine participants (60%) were concerned with relying on technology for information flow to those individuals making decisions to use weaponized drones. Participant 1 had concerns as to "how quickly can you get that information" (Participant 1, Interview response, January 25, 2019).

Participant 2 stated "just relying on the technology itself might be hazardous" (Participant 2, Interview response, January 26, 2019). Participant 13 responded,

I don't think you can compensate for it unless you have a more robust system.

With today's technology and the types of drones that I think most people are flying. I think the only way to do it would be to upgrade that system to be more reliable (Participant 13, Interview response, June 28, 2019).

Eight participants (53%) were not comfortable with the level of situational awareness when line of sight was lost due to the limited view provided by most drone cameras.

Participant 6 stated "you only see what the drone sees" therefore, "your ability to gather, and make accurate, dependable decisions is significantly impaired" (Participant 6, Interview response, April 30, 2019). Participant 8 stated,

If they have the ability to engage either with lethal or non-lethal weapons, that detachment could alter the decision-making a little bit, I think. Being there, in the situation, seeing, hearing, smelling, feeling whatever's going on, all factor into the justification for whatever actions you take, be it use-of-force or anything else. I would worry that the perception of somebody viewing a situation through a screen

and not directly observing it could have an effect on their perception and their decision-making (Participant 8, Interview response, May 24, 2019).

Participant 9 had concerns with the drone operator's ability to "hear all cues that may be going on" and the ability to "see and hear" what an officer on the scene might (Participant 9, Interview response, May 31, 2019).

Eight participants (53%) felt there should be some form of independent monitoring by a human in addition to the drone for any type of armed drone scenario. Participant 2 responded "I think that would definitely exasperate it [the problem] because you don't have an independent way to monitor what the instrument is doing except from the instrument itself" (Participant 2, Interview response, January 26, 2019).

Participant 12 commented "it would have to be with a visual observer that is trained what to look for and how to communicate with a good radio system" (Participant 12, Interview response, June 25, 2019).

Six participants (40%) were concerned about the safety of both citizens and officers on the scene if the drone were to malfunction without having continuous line of sight. Participant 4 responded "I think that the restriction for operating beyond line of visual sight is well justified, especially for the safety of manned aircrafts who are sharing the skies" (Participant 4, Interview response, April 19, 2019).

Participant 15 stated "The first issue you have to address is how you're going to safely and/or show the FAA that you're doing those things safely" and "safely show where that drone is, avoidance of manned aircraft or power lines, trees, buildings, structures" (Participant 15, Interview response, July 8, 2019).

Three participants (20%) believed line of sight operations should require FAA authorization or exception for law enforcement.

Table 4.6 Line of Sight Concerns

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Technology - Intel Flow	X	X		X	X	X				X			X	X	X	9
Sit Awareness - Camera Capabilities		X	X	X	X	X		X	X						X	8
Independent Monitoring		X	X		X	X		X	X			X			X	8
Safety			X	X							X		X	X	X	6
Authorization				X							X	X				3

Interview Question Seven

Question seven addresses concerns over supervisor location away from the scene when armed drones are deployed. See Table 4.7. Thirteen participants (87%) believed that it was not necessary for the supervisor to be present on the scene due to the technology available with drones today. The technology used on most law enforcement drones has the ability to live stream video in real time to any command post or computer for supervisors to monitor. Technology monitors flight tracking, deployment time, flight duration, weather, temperature, altitude, and direction of flight, in addition to video monitoring and recording. Participant 10 responded,

What I tell people who have drone programs is that if they're not taking advantage of a streaming technology and being able to remotely stream out what

the drone sees. They're not getting the full benefits of the drone program. We have the ability to stream, so anywhere you have LT connections, you're able to log on and see the incident for yourself. It allows for remote supervision (Participant 10, Interview response, June 18, 2019).

Seven participants (47%) felt that current agency policies and protocols were sufficient to cover supervisor requirements for armed drones. Participant 4 stated,

I think that for supervisors, the best control that they can have is just through sound policy and procedures. If sound policies and procedures have been established, I think that's going to be our best resolve. At least for law enforcement, policy and procedure dictates most of what we do. By necessity, law enforcement employs a culture of allowing each individual officer to operate autonomously, independently. Policies and procedures exist to mitigate the concerns associated with those largely independent law enforcement operations. Policy and procedures, although not the answer necessarily that the question was asking, I think policy and procedures are the best way that field supervisors can control drone operations without being on the scene" (Participant 4, Interview response, April 19, 2019).

Participant 8 responded "it's no different than putting a rookie in a car with a gun on his hip and sending him out to the city. You have to trust that they have been trained" (Participant 8, Interview response, May 24, 2019).

Six (40%) of the participants thought there should be increased training for supervisors dealing with armed drones. Participant 2 stated "You just go back to the old

basics, you write a good plan on how they're deployed and train people properly to the plan, and do a lot of practice" (Participant 2, Interview response, January 26, 2019).

Participant 8 responded "The best way is a good policy, and then of course, robust training" (Participant 8, Interview response, May 24, 2019).

Six (40%) participants stated there would have to be constant communication with the drone operator during any mission utilizing armed drones. Although Participant 6 agreed that supervisors needed a real time assessment of the situation through video, body-cams, or other information feeds, he added "I think it is a bit of a problem" and "It's more important to have them on-scene, otherwise it's impractical" (Participant 6, Interview response, April 30, 2019).

Table 4.7 Supervisor Location

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Technology - Software	X	X	X	X	X	X	X			X	X	X	X	X	X	13
Policy - Protocols		X		X	X		X	X			X				X	7
Training		X						X	X		X	X		X		6
Communications			X		X					X			X	X	X	6

Interview Question Eight

In addition to question six (line of sight concerns) question eight deals directly with the participants views on whether current policy dealing with an individual's Fourth Amendment rights should be changed for armed drones. See Table 4.8. Nine participants (60%) stated that no change or very minimal change in current policy was needed.

Participant 9 stated “The body of law surrounding the Fourth Amendment, and particularly surveillance, already factors in the use of technology in surveilling” (Participant 9, Interview response, May 31, 2019). Participant 9 considered a drone a tool law enforcement used, but they still had to comply with Fourth Amendment rights. Participant 10 responded “with the Bill of Rights, we have an amazing structure already in place that protects us. If we follow the spirit of the Constitution and the Bill of Rights, nothing much needs to change” (Participant 10, Interview response, June 18, 2019). Participant 13 stated “Unless there are extenuating circumstances no different than in any other law enforcement position” (Participant 13, Interview response, June 28, 2019).

Ten participants (67%) believed drone specific terminology would be needed if armed drones were allowed. Participant 11 commented,

There’s going to be some privacy laws that haven’t been kind of adapted to a drone situation yet. When that’s the case, then I think the departments just need to use common sense. There’s another dimension to this. We’re seeing it already around the country. It’s going to pick up a lot. Citizens are bringing in their drone video, and saying, look what I just saw, look what my drone captured. Sometimes that’s going to be a violation of privacy...The policies and procedures have to cover not only the department, but they have to extend to any instance which you’ve been given drone video or drone analytics that could compromise somebody’s privacy (Participant 11, Interview response, June 22, 2019).

Two participants (13%) thought it would be very challenging for agencies to protect privacy if armed drones were utilized. One individual, Participant 3, stated that drastic

changes in Fourth Amendment policy would be needed for armed drones, separate from normal police operational policy.

Table 4.8 Surveillance and Fourth Amendment Rights

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Minimal or No Change	X			X	X			X	X	X	X		X	X		9
Drone Specific Policy			X	X	X	X	X		X		X	X		X	X	10
Challenging to Protect Privacy		X	X													2
Change Needed			X													1

Interview Question Nine

Question nine deals directly with the overarching research question; what are the most important elements needed in a policy if law enforcement were to utilize armed drones as part of their normal operations. See Table 4.9. Six participants (40%) stated an armed drone policy would need to comply with current federal regulations and state statute. Participant 9 responded,

I think it would largely be the same elements that you need in your effective policies with regards to the police officers themselves. Because of this concept that I view, I view the drone as another tool rather than some type of independent actor (Participant 9, Interview response, May 31, 2019).

Participant 11 stated “at minimum, it has to account for existing laws” (Participant 11, Interview response, June 22, 2019).

Ten participants (67%) wanted a policy to cover deployment procedures, to include where armed drones could be deployed and restricted areas, when the drone could be deployed based on time of day or weather conditions, who could authorize deployment, type of drone, type of weapons system, and technology requirements.

Participant 1 stated “You’re going to have to have backdrop policies. You’re going to have to have misfire policies” (Participant 1, Interview response, January 25, 2019).

Participant 2 stated “I think you need to be very clear about where they can and cannot be operated, and when they can and cannot be deployed...time of day, any restrictive locations...who can authorize it” (Participant 2, Interview response, January 26, 2019).

Ten participants (67%) stated the policy would need to address under what situations an armed droned would be utilized and for what type of missions.

Participant 2 stated “Because it lands in the force continuum in a certain place, what does it take before you can actually deploy it” (Participant 2, Interview response, January 26, 2019). Participant 3 responded “I think that it would have to be something for lethal and less-lethal where we would only use it in a very serious consideration where someone’s life could be in danger” (Participant 3, Interview response, January 28, 2019).

Nine participants (60%) wanted the policy to include use of force requirements. Participant 8 stated “Authorization to employ the use of force, who makes that decision, and what is it based on” (Participant 8, Interview response, May 24, 2019). Participant 6 stated “use of it should be significantly more restricted than it would be for an officer on the ground’ (Participant 6, Interview response, April 30, 2019).

Only three participants (20%) thought Fourth Amendment rights needed to be included.

Participant 4 responded,

Whether it's for use of force or any other means, as it pertains to Fourth Amendment, we've just got to be careful. If we're entering a premises, we need to make sure we're obtaining legal authority to do so (Participant 4, Interview response, April 19, 2019).

Participant 9 responded,

The standards that are established with regards to Fourth Amendment, particularly surveillance, already factor in the notion and the thought of use of technology by officers and what technology they can and can't use. I think you take those into consideration and when you decide to use a drone. It's just another piece of technology. It's going to be subject to those same standards (Participant 9, Interview response, May 31, 2019).

Twelve participants (80%) wanted the policy to address line of sight requirements.

Participant 2 stated "you'd still have to put some parameters on what you mean by how far out of the line-of-sight" and "Outlining what it means to be in a safe location" (Participant 2, Interview response, January 26, 2019). Participant 6 stated "you've got to put them as close as you can to the situation" (Participant 6, Interview response, April 30, 2019). Participant 8 stated "Maybe define the operation to a certain radius" (Participant 8, Interview response, May 24, 2019).

Ten participants (67%) believed the policy should contain additional requirements for supervisors. Participant 2 addressed the need for "a supervisory training program" to

insure supervisors “understand the capabilities and limitations so they can make good decisions” (Participant 2, Interview response, January 26, 2019).

Participant 13 thought supervisors needed to be proficient in “risk assessment” and “cost-benefit analysis” and be able to “accept some level of liability” (Participant 13, Interview response, June 28, 2019).

Seven participants (47%) felt training requirements needed to be addressed.

Participant 15 stated “Training, because the further you get removed from mankind use of force or lethality, you need to have training. You need to be at a higher level of proficiency” (Participant 15, Interview response, July 8, 2019). Participant 8 responded,

If you’re going to use these for lethal or non-lethal use, I would imagine you’d probably create a section that does just that. It wouldn’t be only on the drone operator today. I think you would have people who would be assigned that role and they would just constantly be trained, put through scenarios and things like that. You would hope to have some continuity there. You wouldn’t want a lot of turnover. You’d want somebody who’s experienced in using them, employing them, someone who’s familiar with the law, who’s gone through these training experiences over and over. That troop would likely have its own supervisor who would probably be one of the persons who would authorize the final use of force (Participant 8, Interview response, May 24, 2019).

Participant 12 responded “training, training, training” (Participant 12, Interview response, June 25, 2019). Participant 14 stated “I think that the training requirements would just go through the roof” (Participant 14, Interview response, July 2, 2019).

Four participants (27%) wanted the policy to address safety concerns. Participant 10 stated, “It would have to have fail-safes, a way to override it” (Participant 10, Interview response, June 18, 2019). Participant 12 responded,

First and foremost it’s going to be safety, training, and redundancy. When I say redundancy, you should be able to have more than one way to communicate, backup communication, just like an aircraft has redundant electrical systems in it in case something happens, you have a backup and when you’re dealing with lethal then it escalates it even more (Participant 12, Interview response, June 25, 2019).

Three participants (20%) stated the policy needed to contain reporting requirements. Participant 5 stated “Obviously we’d want a report of every use...an after action report” (Participant 5, Interview response, April 25, 2019).

Additionally, two participants felt that target identification should be part of policy and two participants wanted the policy to address communications requirements. Participant 7 stated his agency would not allow armed drones for any reason and would not develop a policy that support armed drones.

Table 4.9 Most Important Elements Needed in an Effective Policy

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Current State & Fed Laws/Regs	X			X	X				X	X	X					6
Deployment Procedures	X	X	X		X			X	X	X	X		X		X	10
Situation / Mission	X	X	X	X	X	X		X	X		X				X	10
Use of Force Requirements	X	X		X	X				X	X		X	X	X		9
4th Amendment Stipulations	X												X	X		3
Line of Sight Requirements	X	X	X	X	X	X		X	X		X		X	X	X	12
Add'l Supervisor Requirements		X	X		X	X	X	X			X	X		X	X	10
Training	X	X								X	X	X	X		X	7
Safety					X					X		X		X		4
Reporting Requirements		X	X		X											3

Interview Question Ten

Question ten asked participants to provide any additional information they considered important for an armed drone policy that might not have been addressed in the previous questions. See Table 4.10. Five of the participants added the fact that law enforcement is far behind the technology when it comes to drone policy. Participant 1 stated “Everybody is so far behind this wave of technology that we’ve got a lot of

catching up to do” (Participant 4, Interview response, April 19, 2019). Participant 4 responded,

I think that the speed at which we’re progressing in this industry would certainly allow the potential for armed, unmanned aircraft systems to be a thing, and I think that in time it can be a safe thing...if you can think it, we can probably do it. It would not surprise me at all if I find myself in fifteen years operating an unmanned aircraft system in a law enforcement capacity that’s armed with some type of weaponry (Participant 4, Interview response, April 19, 2019).

Participant 10 responded “I think that less-than-lethal options will be here just around the corner” (Participant 10, Interview response, June 18, 2019).

Four of the participants added, public reaction and perception was very important when starting up a drone program. Participant 3 responded,

There are people out there that are worried about Fourth Amendment issues but are also worried about us using drones for things we shouldn’t. We’re really going to try to start with that in mind and be really transparent with our use (Participant 3, Interview response, January 28, 2019).

Participant 5 described it as being politically full of barricades. He felt that most people, especially in his home state, were concerned about their privacy, government overstepping, doing things that they don’t think the government should be doing. Drones were one of their biggest fears (Participant 5, Interview response, April 25, 2019). One participant stressed the importance of training in policy and one participant stressed the importance of safety.

Participants 3, 5, and 15 stressed the importance of including in any policy, how drones are used and for what purpose. Participants 6 and 11 were concerned with the legal aspects of arming drones. Participant 6 commented “as I sat there and tried to think through how I would defend this lawsuit, I think you can write the policy from that” (Participant 6, Interview response, April 30, 2019). Participants 7 and 9 reiterated that drones are a great tool for law enforcement with both benefits and drawbacks.

Table 4.10 Additional Information

Theme	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Behind the technology	X			X						X		X		X		5
Public Reaction		X	X		X								X			4
Drone Use			X		X										X	3
Lawsuits						X					X					2
Drones as a Tool							X		X							2
Training and Safety													X		X	2

Discussion of Findings

Themes established during the coding and analysis of interview questions, which had been conveyed by seven or more participants (47%), were additionally coded as major themes and analyzed for their importance and relevance to each corresponding research question.

Research Question One

Interview questions three and four were designed to answer the research question; what current laws and regulations apply to the use of drones by law enforcement agencies? Ten participants (67%) responded, they were familiar with their agency policies, which addressed procedures for drone operations. Three additional major themes identified by participants included, training and documentation, FAA compliance, and approval for deployment. See Table 4.11. Participants interviewed were familiar with FAA regulations governing the use of drones for law enforcement and with FAA certificates of waiver for law enforcement.

A review of literature revealed between 2015 and 2017, the number of states which governed the use of drones for law enforcement had increased from 14 to 38 (Jenks, 2015; NCSL, 2017). However, many law enforcement agencies had not developed drone policies due to the uncertainty or instability of regulations at the state and federal levels (Rapp, 2009; Vacek, 2009).

Table 4.11 Analysis of Findings (Research Question 1)

Analysis of Findings	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Procedures				X	X		X	X		X	X	X	X	X	X	10
Training / Documentation				X	X					X	X	X		X	X	7
FAA Compliance					X		X			X		X	X	X	X	7
Approval for Deployment		X					X			X		X	X	X	X	7

Research Question Two

Interview questions five through eight aided in answering the research question; what elements are needed to insure the use of armed drones by law enforcement do not violate the Fourth Amendment rights of the citizens? Thirteen participants (87%) determined advanced technology or software was necessary when supervisors were not co-located with the drone operator. Twelve participants (80%) responded little or no change was needed, but use of force standards would need to be included in an armed drone policy. Nine participants (60%) stated minimal or no change was needed in policy as it pertained to the Fourth Amendment, however, ten participants (67%) would like to see drone specific language included in an armed drone policy. Nine participants (60%) agreed technology to maintain information flow from the operator to a supervisor would need to be addressed as it pertained to line of sight restrictions. Eight participants (53%) stated line of sight operations identifying camera capabilities and supervisor awareness would need to be specified in an armed drone policy. Eight participants (53%) would like for policy to have requirements for independent monitoring of drone operations. Lastly, seven participants (47%) believed protocols for supervisor location should be addressed in an armed drone policy. See Table 4.12.

A review of literature supported the use of technology in drone operations. Cavoukian (2012) had the concept of integrating privacy standards into the software to automatically insure regulatory compliance. Jenks (2015) noted that most drones now carry cameras and many have the ability to add thermal imaging or infrared technology to the platform. However, many agencies have opted to avoid discussions pertaining to the arming of drones until issues surrounding Fourth Amendment rights, due to the ambiguous nature of rules surrounding use of force, until they have been tested in the

courts and have become more palatable to the public (Straub, 2014; Porter, 2017). Many of the same issues previously encountered by law enforcement concerning use of force surrounding the use of Tasers, now apply to armed drones as well (Straub, 2014).

Table 4.12 Analysis of Findings (Research Question 2)

Analysis of Findings	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
SL Technology - Software	X	X	X	X	X	X	X			X	X	X	X	X	X	13
Very Little or No Change in Use of Force	X	X	X	X	X	X	X	X		X			X	X	X	12
Drone Specific Policy for 4th Amendment			X	X	X	X	X		X		X	X		X	X	10
Very Little or No Change in 4th Amendment	X			X	X			X	X	X	X		X	X		9
LOS Technology - Intel Flow	X	X		X	X	X				X			X	X	X	9
LOS Sit Awareness - Camera Capabilities		X	X	X	X	X		X	X						X	8
LOS Independent Monitoring		X	X		X	X		X	X			X			X	8
SL Policy - Protocols		X		X	X		X	X			X				X	7

Research Question Three

Lastly, interview questions nine and ten serve to answer the research question; what basic elements of policy are needed to meet the minimum standards for an effective armed drone policy? Eighty percent of the participants responded that line of sight requirements would be needed in an armed drone policy primarily due to the device being armed verses unarmed. Sixty-seven percent of the participants agreed that deployment procedures, to include where armed drones could be deployed, restricted areas, when the drone could be deployed based on time of day or weather conditions, who could authorize deployment, type of drone, type of weapons system, and technology requirements, needed to be addressed in an armed drone policy.

Sixty-seven percent of the participants felt the situation and type of mission for deployment of an armed drone would have to be covered in policy. Sixty-seven percent of the participants recognized the need for additional supervisor requirements outlined in policy. Sixty percent of the participants highlighted the need for use of force requirements to be defined in policy. Lastly, forty-seven percent of the participants wanted to see training requirements included in an armed drone policy. See Table 4.13.

Table 4.13 Analysis of Findings (Research Question 3)

Analysis of Findings	Participant															Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Line of Sight Requirements	X	X	X	X	X	X		X	X		X		X	X	X	12
Deployment Procedures	X	X	X		X			X	X	X	X		X		X	10
Situation / Mission	X	X	X	X	X	X		X	X		X				X	10
Add'l Supervisor Requirements		X	X		X	X	X	X			X	X		X	X	10
Use of Force Requirements	X	X		X	X				X	X		X	X	X		9
Training	X	X								X	X	X	X		X	7

In 2012, the International Association of Chiefs of Police developed recommended guidelines for the use of unmanned aircraft, which can be adapted for use in an armed drone policy. The guidelines included community engagement, system requirements, operational procedures, and image retention (IACP, 2012). A review of literature supported many of the opinions of the participants and included elements for a drone policy which identified under what conditions a drone could be deployed to include location, responsibilities, training, and maintenance (Borelli, 2017). Brumfield (2014) determined a basic drone policy should include applicable state and federal laws and regulations in addition to whether or not the subject poses an immediate threat to officers or citizens prior to authorization for use of force. McNeal (2014) suggested policy should contain elements outlining clarity in airspace, data retention, transparency, and accountability.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

The purpose of this this qualitative study was to conduct in-depth interviews with subject matter experts (SME) in order to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement and to develop a base for further research. SMEs in three areas of drone policy making: drone operations, policy development, and legal counsel were interviewed, and their results recorded.

Validity and reliability were established for this study as outlined in chapter three. Utilizing a strategy of triangulation through sampling design, geographical consideration of participants, consistency in data collection, and employing digital recordings and field notes, this researcher was able to accurately represent the introspection of the participants in the results of the study and answer the research questions in an organized manner. To insure dependability within the study, conclusions were based on a consensus of seven or more (47%) of the participants on each major theme. Interpretation in qualitative data analysis involves drawing conclusions and offering explanations based on both the evidence and the researchers own perspective gained during the interview process

(Patton, 2015). The following conclusions illustrate the thoughts and recommendations of the subject matter experts based on the questions employed in this study.

Conclusions Based on Research Question One

The study concluded there were no federal laws or regulations specifically addressing policy or procedure for armed drones for law enforcement. Forty-five states had considered legislation pertaining to drones for law enforcement. Of those, only two states, North Dakota and Connecticut, had adopted legislation pertaining to the use of armed drones for law enforcement.

Additionally, the study concluded the majority of participants (67%) were familiar with agency drone policy and had knowledge of federal regulations pertaining to the use of drones by law enforcement. Participants expressed how important policy was in their line of work. They believed it was the backbone of their operations. Policy is critical not only in the decision making process, but also in defending any actions taken during a mission.

Twenty-seven percent commented their agencies were currently working on a drone policy in draft form or awaiting approval by leadership. Only one participant was unsure of the status of his agency's drone policy. Additionally, 47% of participants had knowledge in three areas pertaining to policy or regulation of drone usage. First, was training and documentation requirements outlined by their agencies.

Second, participants were familiar with FAA compliance standards as they applied to the use of drones by law enforcement. Third, participants were familiar with their agencies policy on the approval process for deployment of a drone for official use.

Many of the participants expressed concern over the prospect of arming drones. Most believed the use of less than lethal armament was just around the corner for law enforcement, but did not believe lethal munitions would be considered in the near future. They did however agree that developing a clear-cut policy prior to the acquisition of armed drones would be very beneficial and they supported the concept presented in this study.

Conclusions Based on Research Question Two

The study considered those elements in policy, identified by the SMEs, needed to insure law enforcement complied with the Fourth Amendment rights of citizens to include, surveillance, search and seizure, and use of force. Eighty percent of the participants agreed little or no change was needed in current use of force policy and sixty percent concurred minimal or no change was needed in policy as it pertained to the Fourth Amendment. However, 67% felt there needed to be drone specific language in policy addressing Fourth Amendment issues.

Surprisingly, 87% of the participants identified the need for technology and software requirements in order for supervisors, not co-located with the drone operator, to maintain situational awareness. This requirement could include the use of live streaming video, geographic location, and real-time access to the drone's telemetric readings. Forty-seven percent indicated protocols should be established for supervisors not co-located with the drone operator.

Advanced technology to insure consistent and accurate information flow for drones flying beyond line of sight was considered important to 60% of the participants. For drones flying beyond line of sight, participants felt camera capabilities and situational

awareness were necessary to insure an individual's Fourth Amendment rights were taken into consideration during the decision making process. Fifty-three percent of the participants determined it to be necessary to have an independent monitor for any drone, which flew beyond line of sight of the operator. The independent monitor could be an individual visually observing the mission or another device such as a backup drone or robot with live streaming video capabilities.

Opponents of the use of drones by police cite privacy as their number one concern. Jenks (2015) noted that many misconceptions the public have about law enforcement's use of drones is based on emotion and personal bias. Drones are relatively new as they pertain to policing citizens. Participants stressed the importance of public *buy-in* prior to the deployment of new technology. Having citizens, those both for and against the use of drones by law enforcement, participating in the policy development phase of the agency's drone project was crucial in establishing a successful drone unit for many agencies.

Conclusions based on Research Question Three

When trying to determine which elements needed to be included to meet the minimum standards for an effective armed drone policy, 87% of the participants concluded that line of sight requirements were extremely important due to the fact the drone would be armed. Sixty-seven percent wanted deployment procedures included in an armed drone policy. Those procedures would include when and where armed drones could be deployed, who would have authorization for deployment, identification of restricted areas, time restrictions, weather restrictions, the specific type of drone and specific weapons system authorized, and technology requirements.

It was agreed by 67% of the participants that additional requirements would need to be addressed for supervisors of armed drone operations. Additional requirements noted were primarily based on rigorous and continuous training. Participants believed supervisors should be knowledgeable about the capabilities and limitations of the drone in order to make critical decisions during extremely stressful situations. Another 67% of the participants concluded policy should include mission or situation requirements necessary for deployment of an armed drone. Sixty percent of the participants felt use of force requirements needed to be addressed in policy and 47% wanted training requirements included in an armed drone policy.

Training for drone units should consist of quarterly or annual requirements, similar to current weapons qualification standards. Training for law enforcement is conducted in a repetitive manner to insure when an officer is in a stressful situation and adrenalin is high, the body reacts to what it has been trained to do. Just as SWAT teams train on tactics and procedures, it would be important for drone units to do the same. In addition to training, unit cohesiveness was considered very important. A high personnel turnover rate would decrease the overall effectiveness of a drone unit, as it would any specialized unit in law enforcement.

The Need for Policy Development

Drones, including weaponized drones, have played a huge role in our military. As previously noted, history has shown us that equipment and tactics used by the military will be followed by their use in the law enforcement community. Armed drones have been utilized successfully by our military in Iraq, Afghanistan, Yemen, Somalia, Pakistan, and Libya during the Global War on Terrorism, Operation Iraqi Freedom and

Operation Enduring Freedom (Callam, 2010; Marra & McNeil, 2012; McDougal, 2013; Spallanzani, 2017). This study has shown the use of armed drones by law enforcement, specifically less than lethal is imminent. Once less than lethal use has been proven and accepted, the use of lethal weaponized drones will follow.

Interview question four was not directly associated with one of the three research questions, but was included in the study to determine the influence drones had in law enforcement operations and the importance of establishing policy for the use of armed drones. All participants (100%) agreed to the ability of a drone to save the agency time and most importantly, to minimize risk for both officers and the public. Ninety-three percent of the participants stated cost savings was very much a factor in their agency purchasing and utilizing drones. Other factors noted by participants was they considered the drone to be a force multiplier (53%) for operations and another valuable tool (73%) added to their tool box. Maragaritoff (2017) also concluded drones were one more tool to help officers do their job in protecting citizens and saving lives.

Due to limited capital available to law enforcement agencies, the maximizing of resources is critical in their ability to complete their mission. The use of drones over conventional aircraft has provided law enforcement agencies the ability to acquire aerial assets previously not affordable to them, thereby providing them with a tactical resource which saves, time, money, manpower, and lowers risk. Also mentioned by participants was the increase in safety when using a drone, expansion of intelligence gathering capabilities, communication and video capabilities, and the speed and efficiency in which a drone operates.

In addition to participants views on the potential use of armed drones by law enforcement in the near future, states are becoming more involved in legislation surrounding the issue of drones. Two states have already adopted legislation directly related to the use of armed drones by law enforcement.

North Dakota was the first state to allow law enforcement to equip drones with non-lethal weapons in August of 2015 (Spallanzani, 2017). North Dakota passed House Bill 1157, which stated, “A law enforcement agency may not authorize the use of, including granting a permit to use, an unmanned aerial vehicle armed with any lethal weapons.” This new law prohibits the arming drones with lethal weapons, but does not prohibit less than lethal. Law enforcement agencies in North Dakota with SWAT capabilities determined there needed to be in law the ability to deliver less than lethal munitions in certain circumstances (ND HB 1167, 2017).

In April 2017, the state of Connecticut passed House Bill 7260, which reads, “The bill limits the circumstances in which law enforcement officers may operate drones, including weaponized drones, and retain the information collected by such operation” (CT HB 7260, 2017).

In January 2019, the state of Connecticut passed Raised Bill 870, which states,

Not later than January 1, 2020, the Police Officer Standards and Training Council shall develop and promulgate a model policy that provides guidelines on the operation of an unmanned aerial vehicle by a law enforcement officer, including a weaponized unmanned aerial vehicle, and the destruction, modification and retention of information collected by such operation (CT RB 870).

Lack of specific guidance by the FAA has caused states to scramble to develop legislation concerning drones, especially as they pertain to law enforcement and the use of weaponized drones. It is essential that the public, law enforcement, and aviation communities work together to develop acceptable and constructive policies concerning the use of armed drones.

Recommendations

The findings of this study not only highlighted the importance of developing policy for the use of armed drones by law enforcement, but its urgency based on the momentum at which the industry is advancing. In December 2017, only 347 state and local public safety departments had purchased drones. By December 2018, one year later, that number had risen to 910 (Gettinger, 2018).

The law enforcement community is reactive by nature. They are trained to react to situations as they arise. This study revealed the need for a proactive approach when developing policy to address the use of armed drones. In order for new technology added to current tactical procedures to be successful, policy must address current laws and regulations in addition to the needs of operators, the agency, and the public.

Surprisingly, participants considered line of sight requirements as the number one priority for essential elements needed in an armed drone policy. Following line of sight requirements were elements pertaining to deployment procedures, situation and mission requirements, and additional supervisor requirements. Subsequent elements needed in an armed drone policy were use of force requirements and training. Following are the researcher's recommendations for the essential elements needed in an armed drone policy

for law enforcement based on this study's results, a review of previous literature, and information gleaned from participant interviews. See Figure 5.1.

Figure 5.1 Essential Elements Needed for Armed Drone Operations

- Line of Sight Requirements
 - Established distance thresholds: All armed drone missions will be conducted within visual line-of-sight, not to exceed 100 meters. Any missions conducted outside of line-of-sight requires independent monitoring (outlined below) of either an officer on the scene or another drone with line-of-sight to the target and live video streaming for situational awareness.
 - Technology and software requirements will be based on mission requirements and all updates installed.
 - Communication requirements (redundancy): 100% on-board system communications will be maintained at all times. Backup communications will be radio (primary) or cell phone (secondary).
 - Camera capabilities will be based on mission requirements and all system updates installed.
 - Independent monitoring requirements (backup): Observers must be trained on responsibilities of operating near other aircraft, in-flight visibility, right-of-way rules and conflicting traffic (14 CFR § 91), in order to communicate with the drone operator and maintain communications at all times. If communications with the operator is lost, the drone will land immediately.

- Deployment Procedures
 - How the drone will be requested: All flights will be approved by the drone unit supervisor or supervisor on the scene if the drone unit supervisor is not available.
 - Who has authorization to deploy an armed drone: All drone operators must be trained in the specific type of drone, technology, and weapons system prior to deployment. Additionally, all operators must have logged flight time within 90 days prior to deployment.
 - Operator requirements: Operators must have completed two qualifying flights, to include take-off and landing, within 90 days prior to deployment of any armed drone.
 - Location
 - Where the drone can be deployed (restricted areas): At no time will a drone be deployed over Federal or State restricted areas without prior written approval. At no time will a drone be deployed outside of the jurisdictional boundaries of the agency without the consent (written or verbal) of the adjoining jurisdiction.
 - When the drone can be deployed
 - Time of day: All armed drone flights will be conducted during daylight hours. Daylight hours are defined as the time beginning 10 minutes after daylight to 10 minutes before sunset.

- Nighttime armed drone flights must be approved by the agency command and must include artificial illumination and independent monitoring (outlined above).
 - Weather conditions: Drone unit supervisors are responsible for obtaining current weather conditions prior to launch. Drones will not be deployed if winds exceed 30 knots. Drones will not be deployed if temperatures exist below 0 degrees Fahrenheit or greater than 110 degrees Fahrenheit.
 - Technology requirements based on mission/situation.
 - Type of weapons system based on mission/situation.
 - Authorized lethal munitions
 - Authorized non-lethal munitions
- Operational Requirements
 - Type of mission requirement (primary and secondary)
 - Emergency situation threshold levels will include agency use of force continuum.
 - Data retention (Image and flight) – All information gathered by the drone will be destroyed after 90 days except where there is reasonable suspicion that the data contains information relevant to an ongoing investigation or is evidence which is criminal in nature.
 - Reporting procedures will be completed monthly and after each mission, to include:
 - Accountability of weapons and equipment
 - Flight log
 - Drone unit structure (personnel and equipment): Drone units will consist of a minimum of one supervisor, three operators, and one system technician in order to maintain 24 hour mission capabilities.
 - Drone storage and maintenance responsibilities: Drones will be maintained and stored in accordance with manufacturer’s specifications, to include on-board technology.
- Additional Supervisor Requirements
 - Knowledge of system capabilities and limitations.
 - Critical thinking and decision-making training.
 - Continuing training for all supervisors will include, but not limited to, FAA Part 107 certification, quarterly training on tactics and operations, and annual certification of supervisor proficiency.
 - Community engagement program
 - Notification to residents in close proximity to the mission will be achieved through “reverse 911” system or similar local alert system.
 - Supervisors will notify the Public Notice to Airmen, to include all FAA required notifications (14 CFR § 107.9) prior to deployment of an armed drone.
 - News media involvement: All notifications and responses to news medial will be routed through the Public Information Officer.

- Review of policy: The agency drone policy will be reviewed annually by the following individuals: One drone operator, drone unit supervisor, drone system technician, agency policy development coordinator, and agency legal council.
 - Location of supervisor
 - Supervisor protocols for supervisors not co-located with the operator will include the following:
 - Situational Awareness capabilities (information flow) will include primary and secondary communications with the drone operator.
 - Live streaming video requirements for situational awareness.
 - Real time system telemetric readings:
 - Geographic location
 - Altitude
 - Direction of travel
 - Speed
 - Other system data available
- Use of Force Requirements
 - Prior authorization requirements are based on current agency use of force continuum, and include the following:
 - Does the subject pose an immediate threat to officers or the public
 - Compliance with applicable state and federal regulations and statutes
 - Compliance with current agency use of force policy
- Training
 - Continuous training program (qualification): Training for all operators will include, but not limited to, FAA Part 107 certification, quarterly training on tactics and operations, and annual certification of operator proficiency.
 - Type of drones (capabilities and limitations): Operators must have logged flight time for the specific drone used within 90 days prior to deployment.
 - Use of technology: Operators must have logged flight time for the specific on-board technology used within 90 days prior to deployment.
 - Weapons systems: Operators must have logged flight time for the specific on-board weapons system used within 90 days prior to deployment.
 - System maintenance: All drone systems will be maintained in accordance with the manufacturers specifications.
 - Knowledge of state and federal regulations and statutes: All supervisors and operators will be familiar with current Federal, State, and Department policies concerning drone operations for law enforcement and use of force.

Recommendations for Further Research

This study illuminated the need for further research. Participants raised several issues surrounding the development of an armed drone policy for law enforcement.

Specifically, how the drone was viewed. The drone was considered by many participants as just another tool in an agency's arsenal of equipment available to them.

Further research into current policies aimed at identifying those elements pertaining specifically to deployment of K-9, would be beneficial in developing an armed drone policy. K-9 operations are similar in type and complexity to that of a drone. Identifying and understanding components such as operator training, line of sight requirements, safety of citizens, and authorization to deploy K-9, would greatly assist in developing drone policy. A K-9 policy would include many of the same elements needed for drones such as, when and where a K-9 could be deployed, and under what circumstances, and any restrictions pertaining to use of force.

Further research focused on current armed drone policy in use by military units would be highly useful for law enforcement when developing future policies. Although military drones, weaponized for combat use, are considerably larger and likely cost prohibitive to law enforcement, elements in policy for their use would be beneficial to law enforcement. Those elements could include target identification procedures, supervisor requirements, independent monitoring, fail-safe procedures, redundancy, and training requirements.

Summary

The purpose of this qualitative study was to interview subject matter experts (SMEs) in order to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement. This research, through the experience and knowledge

imparted by the participants during the interview process, along with previous research, was able to identify those elements needed.

This study succeeded in providing law enforcement agencies with the basic elements needed for an effective armed drone policy. This study also provides a knowledge base to aid aviation administrators as they move forward in developing or enhancing state and federal regulations pertaining to the use of drones for law enforcement and to ensure the safe integration of armed drones into the domestic airspace. Additionally, the public will benefit from this study, through increased knowledge in drone operations and the cutting-edge applications of drone technology.

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APPENDIX A
IRB APPROVAL FORM



Oklahoma State University Institutional Review Board

Date: 07/25/2018
Application Number: ED-18-91
Proposal Title: The Use of Armed Drones by Law Enforcement: A Need for Essential Elements in Policy

Principal Investigator: Gary Jones
Co-Investigator(s):
Faculty Adviser: Jon Loff
Project Coordinator:
Research Assistant(s):

Processed as: Expedited

Status Recommended by Reviewer(s): Approved
Approval Date: 07/25/2018
Expiration Date: 07/24/2019

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

The final versions of any recruitment, consent and assent documents bearing the IRB approval stamp are available for download from IRBManager. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms.
2. Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3. Report any unanticipated and/or adverse events to the IRB Office promptly.
4. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 223 Scott Hall (phone: 405-744-3377, irb@okstate.edu).

Sincerely,

A handwritten signature in black ink, appearing to read 'Hugh Crethar'.

Hugh Crethar, Chair Institutional Review Board

APPENDIX B
PARTICIPATION CONSENT FORM

CONSENT FORM

Project Title:

THE USE OF ARMED DRONES BY LAW ENFORCEMENT: A NEED FOR ESSENTIAL ELEMENTS IN POLICY

Investigator:

The investigator is pursuing the degree of Doctor of Education, Applied Educational Studies, Aviation and Space Specialization at Oklahoma State University. The investigator is also a faculty member at the University of Central Oklahoma where he teaches undergraduate and graduate courses in criminal justice. He is currently Coordinator for the Center for Innovative Solutions at the University of Central Oklahoma.

Gary L. Jones
9501 S. Cimarron Road
Mustang, Oklahoma 73064

Cell Phone: (405) 401-4073
Work Phone: (405) 974-5830
Email: gary.jones11@okstate.edu

Faculty Advisor:

Dr. Jon M. Loffi
Aviation and Space Education
Oklahoma State University
316 Willard Hall
Stillwater, Oklahoma 74078

Work Phone: (405) 744-9892
Email: jon.loffi@okstate.edu

Purpose:

You are invited to voluntarily participate in a study to identify the essential elements needed for an effective armed drone policy for law enforcement.

Procedures:

You have been selected to participate in this research study due to your status as a subject matter expert in drone policy development. Interviews will be conducted between June 1, 2018 and September 30, 2018. The interviewer will be interviewing several subject matter experts from both the government and private sector, and will be contacting you to

arrange a convenient interview time. The interview should last no more than one hour. However, in the event the interview is interrupted or discontinued for any reason, it may be necessary to reschedule and conclude the interview at a later date.

The interview will include questions pertaining to your personal background, educational history, and your opinions on drone policy development. With your permission, an audio recording will be made of the interview to aid the investigator in accurate data capture and analysis. Audio recordings, interview notes, and transcription of the interviews will be assigned a number for identification. Once a number is assigned, no other identifiers will be associated with the audio recordings, interview notes, or transcriptions.

When not being transcribed, analyzed and used for purposes of this study, and until their destruction, the audio recordings and the investigator's interview notes will be maintained and locked in a safe owned by the investigator.

The audio recordings will be transcribed by the investigator. The Oklahoma State University Institutional Review Board has the authority to inspect consent records and data files to assure compliance with approved procedures. Additionally, the investigator's faculty advisor and the investigator will have access to those audio recordings, interview notes, and transcribed interviews.

Once audio recordings are transcribed and the data analyzed, all audio recordings and interview notes will be destroyed by shredding to protect confidentiality. A record of that destruction will be made by the investigator and countersigned by the investigator's faculty advisor. The record of destruction shall be maintained and secured in a safe owned by the investigator.

Risk of Participation:

There are no known risks associated with this study that are greater than those ordinarily encountered in daily life.

Compensation:

There is no compensation for participation in this study.

Benefits:

There are no direct benefits to the subjects of the interview. However, since each subject has a role in drone operations or policy development, the research will provide a benefit to them by their contribution to the overall increase in the body of knowledge to academia, drone operators, and the aviation industry.

Confidentiality:

In order to protect your identity and for your responses to remain anonymous, personally identifiable information will be replaced by a participant number before coding and collating of data. The above described measures have been implemented by the investigator to ensure the confidentiality of each subject, interview notes, and transcriptions. A copy of the final report of the study will be presented to you if you so wish prior to submission to the graduate college.

Contacts:

For information regarding this study you may contact Gary L. Jones, at 9501 S. Cimarron Road, Mustang, Oklahoma 73064, email: gary.jones11@okstate.edu, telephone number (405) 974-5830, or faculty advisor Jon M. Loffi, Oklahoma State University, 316 Willard Hall, Stillwater, Oklahoma 74078, email: jon.loffi@okstate.edu, or telephone number (405) 744-9892. For information on subjects' rights, you may contact the IRB Manager, University Research Compliance, at (404) 744-3377 or irb@okstate.edu. All reports or correspondence will be kept confidential.

Participant Rights:

I understand that my participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my participation in this study at any time, without penalty.

Signatures:

I affirm that I am 18 years of age or older and have read and fully understand the consent form. I sign freely and voluntarily. A copy of this form has been given to me. I hereby give my permission for my participation in this study.

Signature of the Participant

Date

I certify that I have personally explained this document before requesting that the participant sign it.

Gary L. Jones, Investigator

Date

APPENDIX C
PARTICIPATION LETTER

PARTICIPATION LETTER

Dear Mr./Ms. _____

I am currently working on my doctoral dissertation in the College of Education, Applied Studies, Aviation and Space at Oklahoma State University, where I am conducting research that will use subject matter expert opinions to develop recommendations for the basic essential elements needed to establish an effective armed drone policy for law enforcement. You have been selected to participate in the study by virtue of your status in the field of drone operations or policy development. I will be interviewing a number of professionals in the government and private sector to obtain their unique perspectives on this important issue. I would greatly appreciate the opportunity to interview you in person (or by Skype/phone) sometime during the month of _____.

The purpose of this study is to conduct personal interviews with subject matter experts (SMEs) in the areas of drone operations, policy development, and legal counsel in order to identify the essential elements of policy needed to provide law enforcement agencies with an effective baseline policy pertaining to the operation of armed drones in law enforcement and a base for further research. Your assistance as a trusted member of the _____ sector will aid in the development of policy that will benefit the aviation industry as a whole.

Attached are sample questions that will be used during the interview lasting approximately one hour. With your permission, an audiotape will be made of the interview to aid in the capture and analysis of the data. Transcriptions of the recordings and notes will be identified by number only. The Oklahoma State University Institutional Review Board has the authority to inspect consent records and data files to assure compliance with approved procedures. Once the tapes are transcribed and the data analyzed, all recordings will be destroyed to protect confidentiality of the person being interviewed. A copy of the final report will be provided to you if you so wish prior to submission to the graduate college. There are no known risks associated with this study that are greater than those ordinarily encountered in daily life.

I will contact you by telephone on _____ to answer any questions you may have and obtain permission to interview. Please feel free to contact me if you have any questions regarding this research study. I may be contacted at (405) 401-4073.

Thank you in advance for your assistance and cooperation in this research study.

Sincerely,

Gary L. Jones

APPENDIX D
INTERVIEW GUIDE

INTERVIEW GUIDE

Hello Mr./Ms. (Participant Name),

My name is Gary L. Jones and I am conducting this research study as a requirement for my doctoral dissertation in the College of Education, Applied Studies, Aviation and Space at Oklahoma State University. I would like to thank you for your voluntary participation in this study.

The purpose of this study is to identify the essential elements needed for an effective armed drone policy for law enforcement through qualitative research with subject matter experts.

This interview will be recorded and last approximately one hour as stated in the consent document, which you signed earlier.

Please respond to all questions with candid and honest opinions during the interview. If you feel uncomfortable answering a questions, please state so and the question will be skipped. Feel free to take a break at any time during the interview. You may terminate the interview at any time without penalty. (Begin recording interview).

- Do you have any questions before we begin? If not, we will begin.
- Do I have your permission to record this interview? (If yes, proceed. If no, terminate the interview).
- Begin the interview.
- Stated by the researcher:
 - a. This is a Doctoral Research Study in Aviation and Space, College of Education, Oklahoma State University.
 - b. Primary researcher, Gary L. Jones
 - c. Today's date is (state date)
 - d. Title of the research study is *The Use of Armed Drones by Law Enforcement: A Need for Essential Elements in Policy*
 - e. Research participant number (state participant number)

Interview Questions

11. How long have you worked in your current position?
12. Have you completed any specialized training pertaining to your position?
13. Does your agency currently have an armed drone policy?
 - a. If yes, can you tell me about it?
 - b. If no, have there been any discussions about developing one?

14. In your opinion, how can drone operations enhance police procedures?
 - a. Do you believe it improves officer safety and why?
 - b. Do you believe it is more cost effective and why?
 - c. Do you believe it saves time and why?
 - d. Do you believe it improves the safety of the citizens and why?
15. Based on your expertise, what changes are required in use of force standards for armed drone operations?
 - a. Are changes needed based on employing a Taser, and why?
 - b. Are changes needed based on lethal weaponry, and why?
 - c. Are changes needed based on deploying chemical weapons, and why?
16. What concerns do you have about drone operators being detached from the scene verses an officer on site?
 - a. How would you compensate for those concerns?
17. Based on your expertise, how can supervisors best control drone operations without being on scene?
 - a. Is location important and why?
 - b. What technology is needed to insure supervisors have current and accurate information?
18. In your opinion, how should policy differ between drone operations and normal police operations as it pertains to surveillance and an individual's Fourth Amendment rights?
19. What would you consider the most important elements needed in an effective drone policy?

- a. What about supervisor requirements?
- b. What about use of force considerations?
- c. What about Fourth Amendment considerations?
- d. What about operator location?

20. Is there any additional information you would like to add?

VITA

Gary Lynn Jones

Candidate for the Degree of

Doctor of Education

Thesis: THE USE OF ARMED DRONES BY LAW ENFORCEMENT: A NEED FOR
ESSENTIAL ELEMENTS IN POLICY

Major Field: Applied Educational Studies

Biographical:

Personal Data: Born Sacramento, CA, the son of Mr. & Mrs. Walter J. Jones

Education:

Completed the requirements for the Doctor of Education in Applied Educational
Studies, Aviation and Space at Oklahoma State University, Stillwater,
Oklahoma in December, 2019.

Completed the requirements for the Master of Science in Management at
Southern Nazarene University, Bethany, OK/USA in 2008.

Completed the requirements for the Bachelor of Science in Organizational
Leadership at Southern Nazarene University, Bethany, OK/USA in 2007.

Experience: Coordinator, Center for Innovative Solutions, University of Central
Oklahoma, 2015 to present; Criminal Intelligence Analyst, Oklahoma
State Bureau of Investigation, 2007-2015, Special Investigator,
Oklahoma State Bureau of Investigation, 2005-2007; Battalion
Operations Non-Commissioned Officer, U.S. Army, 1983-2005.

Professional Memberships: Disabled American Veterans; International
Association of Crime Analysts; Chisholm Heights Baptist Church;
Oklahoma State Bureau of Investigation Employee Council (Past Chair);
160th Enlisted Association (Past President); International Security
Awareness Council (Past Board Member).