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God's Eye News: The Use of Drones in Journalism, a documentary film

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GOD'S EYE NEWS: THE USE OF DRONES IN JOURNALISM, A DOCUMENTARY FILM

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This thesis uses the format of documentary film to investigate the aesthetic, legal, and ethical issues surrounding the use of Unmanned Aircraft Systems, commonly known as drones, in journalism. Particularly important are the topics of public perception, safety, freedom of speech, and privacy. Do journalists' First Amendment protections extend to the right to gather images using drones? How will the privacy of citizens be protected against aerial cameras that can go virtually unnoticed? Can drones be safely integrated into the National Airspace System? The goal of the documentary is not necessarily to answer these questions, but to gather opinions from journalists, video professionals, legal experts, flight instructors and historians, to provide the facts so that viewers can reach their own informed conclusions.

GOD'S EYE NEWS: THE USE OF DRONES IN JOURNALISM,

A DOCUMENTARY FILM

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CONTENTS

GLOSSARY OF TERMS AND ACRONYMS

Altitude Ceiling: The maximum height at which a drone may be legally flown. This height is different, depending on the intended use of the aircraft (Civil, Public or Hobby.)

Airman Certificate: A group of certifications commonly known as a pilot's license.

Airship: A lighter-than-air craft with a powered navigation system.

Balloon: A lighter-than-air craft with no navigation abilities.

Bird Strike: When a bird flies into an oncoming aircraft. Many consumer model drones are similar in size and weight to a bird, so it is speculated that the result of a collision between a drone and manned aircraft would result in similar damage.

Civil Unmanned Aircraft: Unmanned Aircraft operated commercially for profit by private citizens.

COA: Certificate of Waiver or Authorization – a one-time permit to fly a drone for commercial purposes. In the past, COA authorization seldom occurred sooner than 60 days after the application. In the first quarter of 2015, the FAA streamlined the COA process considerably.

Drone: The common name for an unmanned aircraft, technically known as a UAV.

EF4: The second highest rating on the 5-point Enhanced Fujita scale. Tornadoes with a rating of EF4 are capable of leveling even the most robust structures and homes.

FAA: Federal Aviation Administration – the governing body of all aircraft within the National Airspace System. FAA Modernization and Reform Act of 2012: Congress' 2012 mandate to the FAA, which includes instructions for the FAA to create regulations to introduce drones into the commercial airspace by 2015. One big point of contention of this act is that it stops the FAA from putting further regulation or restriction on non-commercial model aircraft. This Act also defines Civil, Public and Model Aircraft.

Fixed Wing: Aircraft that uses wings for lift (airplanes), vs. rotors (helicopters.)

FPV: First Person View – a video system that allows a drone operator to see from the aircraft's point of view. Similar to a first person shooter video game.

GoPro: A brand of small video camera, designed to operate in tight spaces.

GPS: Global Positioning System – a network of satellite systems that map the globe and allow electronic devices to sense global position. In drones, this system is used to stabilize the craft with minimal operator control. Without GPS, the wind would blow a hovering craft to another location.

Human Supervised: a drone system capable of either computer controlled flight, or human operator flight.

Human Out-of-the-loop: a drone system intended to be flown entirely under the control of a computer, but with an emergency manual override option.

Jib: A boom device that allows a camera to be moved smoothly both horizontally and vertically.

Manned Aircraft: Aircraft with an on-board pilot.

Micro-Drone: A drone weighing less that 4.4 pounds.

Model Aircraft: Unmanned Aircraft operated by private citizens without the intention of making a profit.

Multi-Rotor: An aircraft that uses multiple propeller systems for lift. Common configurations are quad-rotor (4 propellers), hex-rotor (6 propellers) and octo-rotors (8 propellers.)

Nano-Drone: A very small drone – perhaps weighing only several ounces.

NAS: National Airspace System – the United States airspace and aircraft that fly within that space, and the systems in place to operate those aircraft (e.g. air traffic control.)

Neolithic: The historical period beginning about 10,200 BC and ending around 2,000 BC.

Operator: The person who controls a camera or a remote aircraft. Many professional unmanned systems allow for separate camera and aircraft operators.

POV: Point of View—a video shot designed to allow the viewer to experience the view of the subject.

Projectile: an airborne object that lacks control. These are not classified as drones.

Public Unmanned Aircraft: Unmanned Aircraft owned and operated by government agencies.

ROA: Remotely Operated Aircraft – another name for drone.

RPV: Remotely Piloted Vehicle – another name for drone.

Section 333 Exemption: An exemption from Section 333 of the FAA Modernization and Reform Act of 2012. This exempts the unmanned aircraft from meeting specific standards that manned aircraft are required to meet. Early 333 exemption applications

could take from 6 months to a year to process, but the FAA has lowered the turnaround time to weeks, rather than months.

Sensor: A device that can collect data from external phenomena (e.g. camera, thermal imaging device, thermometer or microphone.) Many drones are capable of carrying multiple sensors.

TUAV: Tactical unmanned aerial vehicles – military drones.

UA: Unmanned aircraft – another name for drone.

UAS: Unmanned aerial system – includes the aircraft, as well as the controller.

UAV: Unmanned aerial vehicle – includes only the aircraft.

Unmanned Aircraft: Aircraft with no on-board pilot. May be controlled remotely by an operator, or computer controlled.

UVS: Unmanned vehicle system – includes land and water vehicles, in addition to aerial.

VLOS: Visual line of sight – the drone operator must maintain visual contact with the craft.

VUAV: Vertical unmanned aerial vehicle – can lift off vertically.

CHAPTER I

PROJECT SUMMARY

Statement of the Topic

Drones are currently a high profile topic in the media. On the surface, it seems logical that the media would give the topic increased coverage—most media would stand to gain by using drones to capture video and other data. But much of the media coverage surrounding the use of drones is negative. The use of drones, officially recognized by the FAA as Unmanned Aircraft Systems (UASs), to capture video has become popular among hobbyists—but FAA regulations currently prohibit the commercial use of drones, with few exceptions. Congress mandated a 2015 deadline for the FAA to announce regulations, which would integrate commercial drones into the National Airspace System (NAS.) The FAA released a proposal in January of 2015, and solicited public suggestions for changes. The deadline for comment was April 24, 2015. Now, the FAA has begun a review process, to determine a final set of regulations. This review process could take several years.

Regulation of drones by the FAA may seem like a very simple task. But in reality, the issues are quite complex. Even the classification of drones (now, and in the future) is a massive undertaking. Drones can range from sizes as large as a commercial passenger jet to smaller than an insect. Some drones are controlled by a human operator, within visual

line of sight. Others are controlled from a great distance, using cameras and digital guidance systems. Alternately, the human element can be removed completely, allowing artificial intelligence to control the aircraft. Some drones run on small batteries, and can operate for only minutes.

The great variance in form and capability of different drones creates a wide range of potential threats to the public. Larger drones can clearly be a safety problem. If a large drone was to collide with a manned aircraft (or another large drone) the results could be catastrophic. The smallest drones might not present more than a nuisance to another aircraft, but they could represent serious concerns for privacy, security and Fourth Amendment search and seizure violations. An insect-sized drone, equipped with a miniature camera could enter virtually any private space and record the actions of private citizens—even potentially taking DNA samples.

Research Questions

Q1: How might drones be used in journalism?

Q2: Is it a violation of the First Amendment for the FAA to deny journalists the use of drones, but to allow hobbyists to use them?

Q3: Can drones be safely integrated into the National Airspace System?

Q4: How will drones affect public privacy?

This documentary film attempts to provide perspective and insight to these questions by presenting differing points of view from journalists, hobbyists, cognitive scientists, and legal experts. It is not intended to specifically answer the questions, but to allow the viewer to make informed decisions, based on the opinions voiced in the documentary.

CHAPTER II

SIGNIFICANCE

On the afternoon of November 17, 2013, a tornado touched down in Washington, Illinois. Peoria television news crews scrambled to get to the scene and let the public know what had happened. In addition to traditional newsgathering tools, these crews were using mobile technology and social media to get the information out as quickly and effectively as possible. But even with these tools, some journalists were frustrated by the inability to adequately capture the scope of the destruction. (A. Barra, personal communication, November 20, 2013; C. Martindale, personal communication, November 20, 2013, C. Martindale, personal communication, January 17, 2015). These journalists believed their coverage could have been much more effective with the use of aerial video. Unfortunately, the cost of operating a helicopter makes it prohibitive for all but the most expensive television stations. Even if they could have afforded one, the weather would have made manned helicopter flight too dangerous until much later. These journalists have suggested that a small, lightweight, inexpensive, unmanned-aircraft—commonly known as drones—would have been a viable tool on that day. But they say they are frustrated, because current FAA regulations prohibit the commercial use of drones. Nearly all news organizations are commercial operations, meaning that journalists cannot

legally use what many consider one of the best and safest methods of informing the public of large-scale disasters.

Some journalists, like Brian Emfinger have used drones while off the clock. Emfinger captured some powerful aerial video, when "an EF4 tornado tore through two small Arkansas towns last April, killing 16 people. (Atherton, 2014, p. 47). The Federal Aviation Administration (FAA) has since made it clear that journalists are not allowed to use drones to capture video that will be used at work, even if they aren't being paid. In contrast, drone hobbyist, Josh Lillie was able to shoot aerial video of the Washington, Illinois tornado completely within the FAA regulations.

The FAA is in the process of creating regulations that would allow for the commercial use of drones, but it is a slow process—and events like the Washington tornado won't wait until the legalities are sorted out. This has left many journalists feeling frustrated. That feeling is intensified by the fact that a hobbyist is legally allowed to shoot video with a drone and post it to the Internet—simply because he or she is not making money.

Some journalists have argued that preventing the use of drones for newsgathering is a violation of First Amendment Rights, but there are many factors that complicate the issue. Opponents of legalization have argued that drones "also pose serious concerns about safety, privacy, conflict of interest, perspective, and credibility" (Culver, 2014, p. 52).

CHAPTER III

REVIEW OF RELATED LITERATURE

A Brief History of Aerial Imagery

Aerial images substantially pre-date the advent of human flight. Cosgrove and Fox (2009) pointed out that imagined aerial images were created in stone carvings and paintings around the world as early as the Neolithic period. Thousands of years later, powered flight and photography were pioneered and popularized—nearly simultaneously in the first half of the nineteenth century. "The two histories are thus inextricable, and cannot be separated from questions of spatial cognition and representation that reach back much further than the inventive nineteenth century" (p. 8). By mid-nineteenth century, photographers were employing balloons and kites to obtain aerial photographs. One early use of aerial photography was military surveillance. It is believed that the Union army used aerial photography in the Civil War to identify Confederate troop positions, but the South quickly discovered that "they could simply shoot down the balloons, and no photographs have ever surfaced to confirm actual deployment of a camera" (p. 27).

In 1906, George Lawrence used kites to shoot a series of aerial shots of the San Francisco earthquake. According to Cosgrove and Fox (2009), he assembled the photos into a panorama of the destruction, and sold them for $15,000, which was "almost

certainly a record for a single photograph at that time, and inaugurated the use of aerial photography as a medium for covering such large-scale news events" (p. 29). In 1957, the Los Angeles police department began using helicopters. "Within a year this stimulated local television stations to send up their first news choppers over the vast urban region so they could keep up with the action" (Cosgrove & Fox, 2009, p. 69).

Aerial videography is now a daily expectation for viewers in large cities, but television stations in medium and small markets can seldom afford the expense of a helicopter—including maintenance, storage, fuel, insurance and the cost of a pilot. According to Black (2013), "manned aircraft are typically larger, require several people, and can cost hundreds of dollars per hour to operate" (p. 1841).

A drone capable of capturing broadcast quality video can be purchased for less than the cost of most professional news cameras, and the yearly operational cost is comparable to operating the break-room refrigerator. The most common models are small enough that they could hit a person square in the torso and not leave much more than a scratch or slight bruise (I have witnessed this on more than one occasion.) But confusion and fear have made it difficult for the FAA to pass regulation. "Though UAVs are not a new technology, they exhibit many characteristics of a newly emerging technology market: the technology is not altogether mature, operational concepts are being formed, and emotional and political influences on the market remain strong" (DeGarmo, 2004, p. 19).

Popularity of Drones

Despite the fact that they can currently be flown only by hobbyists, drones are rapidly increasing in popularity (Atherton, Biba, Boyle, Dillow, Gertz, Hambling, Hsu, Mone & Sofge, 2014; Berry, 2014; Black, 2013; Chapa, 2013; Clarke, 2014b; Culver,

2015; Elias, 2012; Ganey, 2013; Gynnild, 2014; Kellington & Berger, 2014; McAdams, 2015; Marron, 2013; Molko, 2013; O'Neil, 2013; Ravich, 2009; Rapp, 2009; Reid, 2014; Roug, 2014; Rutkin, 2014; Schroyer, 2013; Spayd, 2014; Takahashi, 2012a, 2012b; Trymayne & Clark, 2014; Villasenor, 2013; Waite, 2014; Winslow, 2012; Wolfgang, 2013.) Chapa (2013) suggests that, "imagining a time when more than 30,000 of these unmanned vehicles will fill U.S. skies sounds like a scene from a science fiction novel but will soon be reality" (p. 9). But only two years later, McAdams (2015) reported the Consumer Electronics Association's prediction that the U.S. skies will be filled with as many as one million drones per day by the year 2025. Clarke (2014b) has attributed the surge in drone use to recent technological advances, which have made them much more functional and affordable. This appears to be a self-perpetuating cycle, as "the increase in market-size has attracted further investment, and a leap in the functionality-to-cost ratio has occurred" (p. 230).

Despite these predictions that the skies will be virtually filled with drones, Elias (2012) suggests that, "the extent to which civilian sales will contribute to this market is highly dependent on how the regulation of civilian drones proceeds" (p. 2). If regulation does go well, civilian industries that might benefit from drone use include agriculture, insurance, delivery services, real estate, tourism, and film. The scope of potential drone uses seems impressive, but according to Bellows (2013), "few seem ready to completely transform an industry the way 'drone journalism' may" (p. 596).

The Appeal of the Aerial Image

There are many potential practical uses for drones in journalism, but practicality is only part of the appeal. At its root, journalism is storytelling. Part of good storytelling is

capturing the viewers' attention—and keeping it. If people lose interest, they might change the channel and miss the story. Interesting visual images can help keep viewers engaged, and there appears to be something inherently fascinating about aerial images. According to Cosgrove and Fox (2009), people are naturally more drawn to aerial photography, or as they call it—the 'God's-Eye view', than land-based photography. They have suggested that people who would spend seconds looking at a land-based work of art would likely spend minutes in front of an aerial work "puzzling out details and seeking to recognize what it is they are seeing, particularly if they think they can locate sites familiar to them" (p.p. 9-10) They argued that humans, even at an early age, have an innate ability, which they term 'geographical imagination'. That allows a person to create a high-angle mental image from almost any location.

Cosgrove and Fox (2009) suggested that this "may have less to do with aesthetics and more to do with neurophysiology" (p. 10). They argued that humans are hard-wired with this 'geographical imagination' as a survival tool, and because primitive humans didn't have maps to navigate the landscape, the ability to imagine the view from above was essential to stay alive.

But over the years, our interest in aerial images has evolved. "While the biological study of vision as pattern recognition suggests that it may be related to survival needs, within the history of art the interest has been in how these patterns work compositionally in picture making" (Cosgrove & Fox, 2009, p. 99). In other words, we now enjoy the aesthetics of an aerial image—even if it isn't necessary to our survival.

Cosgrove and Fox (2009) also suggested another potential factor in the popularity of the aerial image. They have reasoned that there may be spiritual or power associations

tied to the 'God's-Eye view'. We commonly refer to the space above our heads as 'the heavens'. Religions throughout history have considered the sky the domain of the gods. To have a view from the sky essentially gives a human a brief glimpse of what it might be like to have at least a small fraction of the power of a god.

Journalism Uses

According to Bellows (2013), drones "stand poised to revolutionize the media in much the same way the Internet has changed the print media" (p. 596). This is partially because many drones are inexpensive and fairly easy to operate. Small drones can maneuver into spaces where manned aircraft could not. They might also minimize danger in hazardous situations where a pilot's life might be at risk. But there are some potential downsides of drone use in journalism. As Tremayne and Clark (2014) pointed out, "The implications for the field of journalism and mass communication are numerous, with practical, theoretical and ethical dimensions" (p. 232).

Roug (2014) has asserted that some drone video has had "a vivid, eyewitness feel that far surpassed the quality of shots from cameramen behind yellow police tape" (p. 29). She equates the potential transformative effect of drones in journalism with other technology, claiming that it is "on par with the advent of cellphone cameras and Twitter" (p. 30). Schoyer (2013) added that drones could allow journalists to gather information and images currently available only from the government. He pointed out that many stations used aerial shots of the aftermath following tropical storm Sandy—which is great, except that "all those pictures came from the government" (paragraph 15). If journalists rely on the government for video, it puts all of the power into the hands of the institution journalists should be striving to keep in check.

Drones have many potential uses in journalism, ranging from disaster coverage to protests, traffic reports, and even sporting events. In fact, they have already been used internationally for all of these purposes (Berry, 2014; Culver, 2014; Tremayne & Clark, 2014; Waite, 2014; Winslow, 2012). Tremayne and Clark (2014) have suggested that putting aerial surveillance technology in the hands of the people, especially journalists, "'reverses the panoptic gaze' then the watched become the watchers" (p. 233). This gives power to the citizens to 'police' the police—bringing to light issues such as racial profiling or abuse of power. This is an extension of the power already gained through the use of mobile devices and social media. Ubayasiri (2009) has suggested that the use of satellite and drone video in Sri Lanka made it possible for the world to open a dialog about the alleged abuses, which might have been otherwise censored by the government. Without that video, "the much needed debate on the human suffering and the civilian death toll may have been non-existent" (p. 1). Similar 'watchdog' drone videos have shown protests around the world (Bellows, 2013; Tremayne & Clark, 2014; Waite, 2014).

Video is only one of many potential uses for drones in journalism. Drones might be used to carry a multitude of data-gathering devices, including geographic information systems to map the extent of wildfires, or sensors to measure radiation levels, wind speeds, or thermal images (Bellows, 2013; Culver, 2014; Schroyer, 2013). The ability to gather this type of data opens up the possibility of an entirely "new form of reporting, offering to the UAS operator a completely new way to discover, investigate, and track a story" (Bellows, 2013, p. 612).

One feature, more than any other, makes drones attractive to news directors—cost. Drones are substantially cheaper to operate than manned aircraft. "The most sophisticated

drones are a small fraction of the price of news helicopters and commissioned manned flights (Culver, 2014, p. 52). But Clarke (2014b) has pointed out that we should keep in mind the media's agenda when considering their coverage of drones. Because many newsrooms would like to be able to use drones, "a great deal of the media coverage of drones comprises lightly dressed-up versions of corporate sales brochures and media releases, with limited critical thought applied by the nominal author" (p. 230).

The potential usefulness of drones in journalism has created a desire to incorporate them into educational programs. Ganey (2013) has suggested that, "in addition to learning about Associated Press style and the use of the inverted pyramid, future journalists may have to master the radio controls of remotely operated drones" (p. 27). Marron (2013) added that journalism students "will need to leverage digital tools not just to find a job but to invent or reinvent one, and not just to learn but to relearn for a lifetime" (p. 95). Bellows (2013) took this a step further by suggesting that students who can fly a drone "can expect to find not only work but also job security and high pay" (P. 597). But with current FAA regulations, teaching students to pilot drones is as challenging as flying one commercially.

The University of Nebraska at Lincoln and The University of Missouri were early adopters, starting drone journalism programs in 2011 and 2012, respectively (Fahn, 2013; O'Neil, 2013). However, both schools were issued cease and desist orders from the FAA in July of 2013. To resume flying, the schools were required to obtain Certificates of Waiver or Authorization (COA), which require "applicants to state what type of drone will be flown, when it will be flown, and where it will be flown" (O'Neil, 2013).

Universities are not the only ones receiving cease and desist orders. According to Berry (2014), "An online news entity called 'The Daily' received a cease-and-desist letter after it published gripping footage of the damage caused by tornadoes in Alabama." (p. 52). Fahn (2013) has argued that the application process for a Certificate of Waiver or Authorization, which can take months, is hardly conducive to the application of journalism. The fact that the FAA lets hobbyists fly drones with few restrictions, but prohibits their use by professional journalists "sets up yet another potential battle between First Amendment protections and privacy rights" (Fahn, 2013 p. 19).

First Amendment

Bellows (2013) has suggested that the FAA Modernization and Reform Act of 2012 might be an unconstitutional overregulation of drones, which is potentially "slowing or stopping the use of UASs for citizen 'drone journalism'" (p. 589). The First Amendment ensures that the government won't make laws that encroach upon "the freedom of speech, or of the press" (U.S. Constitution. Amendment. I). Spayd (2014) has objected to the fact that First Amendment issues might be decided by "an agency whose expertise lies in aeronautics and cockpit procedures" (p. 4).

According to Dolan and Thompson (2013), "the Court has intimated in a series of cases beginning in the 1960s that the public and the press may be entitled to a right to gather news under the First Amendment" (p. 18). At first glance, FAA regulations that prevent journalists from flying drones to gather video and data might appear to violate this right to gather news. Any news photographer or videographer has the right to stand on public property and record what can be seen. Roug (2014) argued that, "photography is photography, a protected right that shouldn't be revoked because a new technology

came along" (p. 31). Chapa (2013) argued that, "if the FAA denied a reporter's request to fly a drone because of the subject being covered, it could be unconstitutional" (p. 11).

But Dolan & Thompson (2013) were quick to point out that the courts have not interpreted the First Amendment as carte blanche for journalists to break the law. According to Constitution of the United States of America: Analysis and Interpretation (2014), laws that apply to the general population do not violate First Amendment rights, simply because they happen to incidentally impede the press' ability to gather news. In other words, it wouldn't be a First Amendment violation for an officer to pull a reporter over, and ticket her for speeding, simply because it would make her late to the story. The same reporter also could not trespass, steal or commit murder in order to gather information for a story. This seems fairly intuitive, and most journalists would not argue against these legal limitations to their ability to gather news.

However, there is some precedent to indicate that the press should have some protections that exceed those of the general public. Because the press is so vital in informing the public, "its role constitutionally entitles it to governmental 'sensitivity,' to use Justice Stewart's word" (112th Congress, 2nd Session, 2014, p. 1084). With this in mind, the FAA regulation of drones would appear to reverse this situation, because it allows the general public, as hobbyists, to fly drones, while prohibiting the commercial press from doing the same. Since the regulations do not apply equally to everyone, it would seem logical that journalists should enjoy at least the same amount of freedom as hobbyists.

However, constitutional law is rarely a simple case of clear-cut logic. As pointed out by Dolan and Thompson (2013), "challenges arise in attempting to find an appropriate balance between this interest in newsgathering and the competing privacy interests at

stake" (p. 17). Culver (2014) has suggested that it would be unwise to jump into drone journalism before we think through all potential consequences, because "robotic technology poses serious legal and ethical issues that must be addressed as UAVs are developed, not in the wake of their deployment in journalism" (p. 53).

Fourth Amendment

Even when drone technology is used for the good of the people, it must not violate Constitutional protections against search and seizure. The Fourth Amendment states that, "The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated" (U.S. Constitution, p. 1281). Many feel that drone use poses a threat to search and seizure protections (Black, 2013; Dolan & Thompson, 2013; Elias, 2012; Fahn, 2013; Molko 2013; Oyegunle, 2013; Rapp, 2009; Reid, 2014; Schlag, 2013; Takahashi, 2012a; Talai, 2014).

The many different sensors that drones can carry are of great potential benefit to society, but Fahn (2013) pointed out that they also have the potential for more nefarious use. "The power of individuals and organizations to monitor ever more intimate details of our private lives raises ethical, safety, legal, and even constitutional questions that societies—and legislatures—are only beginning to grapple with" (p. 18). Black (2013) argued that drones "could allow the police to fly circles around Fourth Amendment law" (p. 1837). Molko (2013) went as far as to claim that drone use "threatens to destroy whatever vestiges of privacy remain in modern society, even in areas like a secluded, fenced-in backyard or private estate" (p. 1281). "Without a regulatory framework to ensure that authorities do not abuse their power, we tread on the verge of becoming a

surveillance society in which people's movements are routinely tracked, recorded, and analyzed by authorities" (Farber, 2014, p. 45).

The ability to carry sensors into hard to reach spaces (while attracting minimal attention) makes drones an attractive tool for government surveillance. Farber (2014) predicted that, "drone surveillance will eventually enable law enforcement to gather unprecedented amounts of information about individuals, making it virtually impossible to shield oneself from government watch" (Farber, 2014, p. 5).

As Black (2013) pointed out, government officials are already allowed to use public spaces to observe private property during surveillance. He has pointed out that, "even in the residential setting, gaps in legal protection exist, especially as new technology emerges" (p. 1833). The courts have determined search and seizure rulings on the criteria of "whether a reasonable man should have expected that his activities were exposed to public viewing from the air" (p. 1834). Molko (2013) has elaborated that, in addition to the individual's expectation of privacy, the law requires the public's recognition of that expectation as reasonable.

In the case of aerial photography, it has been determined that complete privacy is not a reasonable expectation, even on private property, if the property is visible by commercial flights in the National Airspace System (NAS.) "Authorities have been monitoring public spaces from overhead cameras, helicopters, and planes for decades." (Bowden, 2013, p. 64). This is possible because private and commercial flight within the NAS is commonplace. Just like anything that can be seen from a public sidewalk, anything visible from a manned aircraft in the public airspace can be recorded with a video recorder, and be used by law enforcement.

At this point in time, drone use is not commonplace. Therefore, the reasonable man or woman would have an expectation that drones are not recording or broadcasting his or her actions in otherwise private spaces. But that expectation of privacy depends heavily on "assumptions of resource scarcity that will cease to be true in the face of widespread police use of drones" (Black, 2013, p. 1834). If 30,000 drones are in use by 2020, as Farber (2014) has suggested, "it will be difficult under existing case law to find a reasonable expectation of privacy from unmanned aerial surveillance in navigable airspace" (Farber, 2014, p. 22). Takahashi (2012a) pointed out that the public's expectation of privacy has decreased as technology has increased, because technology such as GPS, mobile technology and social media "are causing seismic shifts in the amount of formerly private information that citizens voluntarily reveal" (p. 110). According to Oyegunle (2013), the use of drone surveillance is at least as much of a fourth amendment concern as government GPS tracking.

There are currently no legal precedents regarding the use of drones in searches, because "courts are slow to respond when it comes to evaluating the constitutional implications of new technology" (Farber, 2014, p. 4). At this point, few (if any) law enforcement agencies are using drones for surveillance, and in order for a case to go to trial on Fourth Amendment grounds, "the technology must be used by the government in the course of investigating a criminal offense; the use of the technology must yield evidence of a crime; it must lead to an arrest; and then it must lead to a constitutional challenge requiring judicial resolution" (Farber, 2014, p. 4). When this finally does happen, Takahashi (2012a) has expressed optimism that the Supreme Court might

"address the constitutional implications of all forms of technologically enhanced surveillance in a single holding" (p. 108).

Until then, the only thing standing between law enforcement agencies and Fourth Amendment rights is the FAA. But, as Oyegunle (2013) has pointed out, the FAA Modernization Act of 2012 does not include privacy measures. Schlag (2013) contended that the FAA "is drastically ill equipped to prevent invasions of privacy of the magnitude posed by domestic drone use" (p. 2). Chapa (2013) added that this is because "the agency has stated that it does not have the authority to make or enforce privacy-related rules" (p. 11). This is not surprising, as the FAA (2015f) is primarily concerned with the safety of aircraft within the NAS. Privacy laws would be up to federal or state legislators, but the FAA is still under pressure from groups who feel strongly about privacy. Until laws are in place, those groups would prefer that drones are not allowed, and currently, "proposed methods for dealing with drones only scratch the surface of necessary controls required to ensure individual privacy rights are protected" (Schlag, 2013, p. 20).

Not everyone is fearful that drones will bring about a 'Big Brother' scenario. Black (2013) has suggested that, "Though the specter of continuous drone surveillance may threaten societal notions of what the Fourth Amendment protects, a destruction of privacy is not inevitable" (p. 1833). The current restrictions on aerial surveillance would apply equally to drones. The drone would still need the legal right to fly in the airspace, and a reasonable person would still need to have the expectation that his or her activities were exposed to the public. Drones cannot, and likely will not in the foreseeable future, be allowed to fly above private property (FAA, 2015f). Therefore, it would appear that the biggest Fourth Amendment concerns with drone use will likely be confined to the space

between the tops of privacy fences and the legal height at which manned aircraft can legally fly—and bounded by the line that divides private property and private easements. Most reasonable people do currently have an expectation of privacy of private property blocked by a fence, and do not reasonably expect anything in public space to be raised (or flying so low) that it could see over that fence. The danger of undetected surveillance from this space will only increase as technology allows cameras and drones to become smaller and quieter. Few of us would ever notice a drone the size of a large insect hovering near the border of our property.

Privacy

Search and seizure are not the only privacy issues concerning the use of drones. Fourth Amendment rules apply only to government agencies. If government surveillance is a serious concern, voyeuristic stalkers and unscrupulous paparazzi armed with tiny flying cameras are nearly as troubling. But, since these scenarios do not involve government agencies, there would be no violation of the Fourth Amendment. "Instead, those who are watched have to rely on a complex state-by-state patchwork of privacy statutes and the ethical reasoning of those doing the watching" (Culver, 2014, p. 59).

It is not surprising that many have acknowledged non-government privacy concerns (Bellows, 2013, Chapa, 2013; Clarke, 2014a; Culver, 2014; 2013; Farber, 2014, Jarvis, 2013; Ravich, 2009; Schlag, 2013; Tremayne & Clark, 2014; Wolfgang, 2013). "Domestic drone use could be the nail in the coffin of privacy rights, and those concerned are voicing their objections and disseminating information on the dangers of drone surveillance to as many people as will listen" (Farber, 2014, p. 38).

Tremayne and Clark (2014) have suggested that drones "can record events that take place in areas that may have previously been hard for a journalist to get to for geographic reasons—places where an expectation of privacy may exist" (p. 235). This ability makes it "easier to keep tabs on celebrities and public figures" (Wolfgang, 2013, p. 20). In fact, one of the first cases of drone journalism was the 2010 footage of Paris Hilton vacationing in the French Riviera (Tremayne & Clark, 2014; Waite, 2014). Clarke (2014a) has suggested that drone surveillance might "create the risk of stimulating avoidance manoeuvres that may be frantic and ill-judged" (p. 289), potentially leading to tragic circumstances.

One problem with the issue of privacy is the lack of clear definition of private property as it extends into airspace. Ravich (2009) pointed out that the U.S. long ago backed away from the concept that property rights "extended upward to the periphery of the universe" (p. 604). Public flights now have the right to travel above private property within the navigable airspace—but the precise definition of navigable airspace is difficult to understand, and has changed often. Dolan & Thompson (2013) ask some important questions,

> "Where is the dividing line between the 'immediate reaches' of the surface and public domain airspace? Can navigable airspace intersect with the 'immediate reaches' belonging to the private property? Can aircraft flying wholly within navigable airspace, as defined by federal law, ever lead to a successful takings claim? How does one assess claims based on lawfully operated aircraft, such as helicopters, flying below navigable airspace?" (p. 8).

These questions illustrate some of the problems with defining navigable airspace. The limits of navigable airspace cannot be a single, fixed number. The space needed for takeoff and landing an aircraft is necessarily a part of the navigable airspace—and in some cases, this may intersect with private property. In addition, the safe operation height is not the same for different types of aircraft. A helicopter can fly at lower altitudes than a fixed wing craft. Lightweight drones can safely fly much lower than helicopters or fixed wing craft—in fact, the upper limits proposed for commercial drone flight is lower than the lower limit for fixed wing craft (Federal Aviation Authority, 2015f).

Schlag (2013) has suggested that Congress needs to enact baseline consumer protection laws that would "address drone surveillance, data collection, and the various drone technological capabilities" (p. 21). But Berry (2014) argued that drone privacy laws are unnecessary because "stalking, harassment and 'Peeping Tom' laws already make it illegal for people to use drones in potentially nefarious ways" (p. 53).

Our expectations of privacy have already been lowered by the existence of satellite imaging, traffic cameras, mobile phones and social media. Tremayne and Clark (2014) have suggested that this would further erode as video-equipped drones were to become commonplace. Meyrowitz (2009) explained that we have learned how to be watched by watching television—and that we worry less about maximizing privacy, and have learned to "accept the exposure and to shape our behaviors to reduce *major* inconsistencies from one setting to another, while also raising our tolerance for (and even pleasure in) public exposure of behavioral idiosyncrasies and variations in behavior over time and from place to place" (p. 39). Waite (2014) illustrated this point by analogizing early drone use with the advent of the Kodak Brownie. When the Brownie was first released in 1888, it

was the first publicly accessible 'point and shoot' camera. Before the introduction of the Brownie, cameras were very expensive, and took skill and patience to operate. The introduction of the Brownie raised public concerns that parallel those raised about drones, today.

> Signs were posted barring Kodak Brownies from beaches because people were afraid to be photographed in their bathing suits. Scholars and lawyers wrote long essays about how public life was forever destroyed because strangers with small cameras could record everyone's private moments (p. 30).

If we tend look back today at those early reactions with some amount of bemusement and slight disbelief, we should also wonder how our current concerns will be viewed a century from now. The notion of privacy is a socially constructed reality—constantly changing with public opinion. We may be too close to the forest to clearly see the extent to which our perceptions of privacy have changed in just the last decade, but consider the fact that nearly everyone carries, via mobile phone, a concealed, portable, high-definition video camera with them every time they enter a public restroom. Most of us would have been shocked at the idea, just a few years ago. This technology enables us to potentially record some very private moments. Most of us would never use the technology that way, but some would—and have. Despite their extreme potential to invade our privacy, we have not banned cell video capable mobile devices. This is partly because of existing privacy laws, and partly because we have faith that our fellow citizens will behave ethically.

Ethics

Chapa (2013) has questioned the ethics of citizen journalists, who are typically not bound to follow (or even have an awareness of) professional journalism codes of ethics. They are "only constrained by a personal sense of what is right or wrong" (p. 240). Tremayne and Clark (2014) acknowledged that professional journalism organizations, like The Radio Television Digital News Association, explicitly cover the use of hidden cameras in their ethics codes, and have argued that, "for covert surveillance purposes, the use of drones may be seen as being similar to the use of hidden cameras." (p. 241). Chapa (2013) has pointed out that a new organization, The Professional Society of Drone Journalists, has specifically "established an ethics code emphasizing the importance of 'newsworthiness, safety and sanctity' of public spaces in drone reporting" (p. 9). This brings me back to that nagging question—why are hobbyists (and, by extension, unpaid citizen journalists) allowed to fly drones, while professional journalists are not? This may be partially because hobbyists are being 'grandfathered' in. Hobbyists have been flying model aircraft for decades with few serious safety or privacy issues. It would be difficult for the government to justify stripping them of the ability to enjoy a hobby into which they have invested, in some cases, large amounts of money and time. If there have been few safety or privacy issues, it must be asked why the FAA is even regulating drones at all? One probable reason would be the vast array of aircraft that can be classified as a drone.

A Drone By Any Other Name

In order to understand the regulation of drones, one must first understand what actually constitutes a drone. This is no easy task. The term 'drone' is in popular usage for

useful pilotless aircraft (Clarke, 2014b, p. 231), but drones are called by many other names—actually, a veritable alphabet soup of acronyms. Along with his recommendations for integrating drones into the civil airspace, Degarmo (2004) included a glossary of 85 acronyms describing drones and the agencies associated with them. At various times, drones have been called Remotely Piloted Vehicles (RPVs), Remotely Operated Aircraft (ROAs), Remotely Piloted Aircraft (RPAs), Tactical Unmanned Aerial Vehicles (TUAVs), Unmanned Aircraft (UAs), Unmanned Vehicle Systems (UVSs), Vertical Unmanned Aerial Vehicles (VUAVs) Unmanned Aerial Vehicle Systems (UAVSs) and Unmanned Aerial Vehicles (UAVs). To complicate things, the FAA currently refers to them as Unmanned Aircraft Systems (UASs) to acknowledge that there is more involved than the vehicle.

There are various reasons drones have been called by these different designations—many of which have to do with negative connotations associated with the name drone (many people think of drones as flying death machines.) It is understandable that organizations might not want to bring up those connotations, but because the common public name is drone, and because the purpose of this thesis is to inform the public, I will refer to them as drones except in direct quotations.

Fear of Drones

One of the biggest obstacles facing would-be drone operators today is public fear. The public doesn't know much about drones right now, and much of what they do know is, frankly, pretty scary. "As with many new technologies that are unchecked and untried, our society can have a reflexive compulsion to reach for a straitjacket before letting them loose" (Spayd, 2014, p. 4). Media coverage of military drones has painted a picture of

machines, which have the capabilities to "inspire fear and induce an oppressive psychological effect without actually or continuously being present" (Talai, 2014, p. 742).

"Those ominous, free-floating, sometimes unseen killers that have walked our nation out onto some perilously thin ice, geopolitically and ethically? Even the word itself is loaded" (Atherton, 2014, p. 1). In the minds of most people, the word drone "carries military connotations" (Roug, 2014, p. 31), and "conjures autonomous flying robots" (Bowden, 2013, p. 62), "aircraft dropping bombs overseas (Chapa, 2013, p. 9), or missions to "kill people in far-off lands" (Berry, 2014, p. 51). At best, the name drone might bring to mind "tiny machines flitting through buildings, spying on the occupants inside" (Chapa, 2013, p. 9).

In fact, early military drones were given names specifically designed to invoke "images of dread and prowess: Predator, Reaper, Shadow, Global Hawk, Sentinel (also called the 'Beast of Kandahar'), and Fire Scout" (Oyegunle, 2013, p. 371-372), and are virtually inseparable from the public's conception of "military surveillance and targeted airstrikes" (Anand, 2013, p. 1).

The negative association of the name drone might be the motivation for the menagerie of alternate names created by drone operators and their organizations, but Bowden (2013) argued that the "linguistic battle has already been lost" (p. 62). The word is already in the dictionary—and more than that, it is a part of the collective conscious of the world. According to Schoyer (2013), the media is responsible for the public image of drones as scary weapons of war. Therefore, he has suggested that the media should work to show the public that drones might also be used as positive tools. "Let them touch. Let

them fly. Most important, show them that this innovation doesn't have to be a threat" (paragraph 31).

Defining Drones

In addition to inconsistencies in naming, there have been discrepancies in defining and categorizing drones (Anand, 2013; Clarke, 2014a, 2014b; DeGarmo, 2004; Dolan & Thompson, 2014; Kellington & Berger, 2014; Reid, 2014). Drones come in all shapes and sizes (Anand, 2013; Black, 2013; Clarke, 2014b). "The versatility of UAS, which is precisely what makes them attractive, poses enormous regulatory challenges for a system designed for manned aircraft" (Anand, 2013, p. 2). According to DeGarmo (2004), "the lack of a common definition is part of the current debate and presents an impediment to UAV regulatory and standards development" (p.p. 1-2).

It is tempting to define a drone as any aircraft capable of being flown without a human on board, but that definition would include kites, balloons, fireworks, airships (also known as dirigibles or blimps) and missiles. Definitions of drones differ in many ways, but most exclude the previous examples. Another consistent point of definition is that the drone is not tethered to the operator. This is an interesting point, because it appears to be a potential loophole in FAA regulation, which some manufacturers are attempting to leverage to their advantage. The addition of simple kite string could seemingly convert a drone into a tethered vehicle. However, this has currently not been tested in the courts.

Another general exemption from the drone category refers to artifacts that lack controls. This would include "artillery projectiles (cannonballs, mortars, shells), and accidental projectiles (e.g. whose pilot is unconscious or dead)" (Clarke, 2014b, p. 235). It would also appear to include paper airplanes and unguided model planes.

In the past, it has been less clear as to whether other 'model aircraft' could be classified as drones. Interestingly, the current defining factor seems not to lie entirely within the vehicle itself, but also in the use. A vehicle used for hobby or sport would be considered a 'model aircraft', and would be exempt from FAA drone regulations (although there are guidelines for the operation of model aircraft.), however the exact same vehicle would be classified a drone if used for commercial purposes—and would be prohibited, except under certain exemptions. This has resulted in some confusion among users, as well as difficulty in enforcement.

Dolan and Thompson (2013) have suggested that the FAA focus less on the use, and more on the size and capability of the aircraft. "Larger drones that physically resemble fixed-wing aircraft could be subject to similar safe minimum operating altitude requirements whereas smaller drones could be regulated similar to helicopters" (p. 3). Clarke (2014b) has echoed that sentiment, adding that size will correlate to other features, like "payload, the sophistication of navigation and communications facilities, and the level of quality assurance involved in manufacture, maintenance and operation" (p. 236). However, he has suggested a wider variety of size classifications.

Size

Clarke (2014b, p. 236) has suggested the following four categories for drones: large drones —100kg or larger (approximately the size of piloted aircraft); mini-drones—20kg to 149kg; micro-drones—2kg to 19kg; and nano-drones—anything smaller than 2kg. This nano-drone category could include 'smart particles' or 'smart dust'. Note that Clarke's (2014b) classifications were somewhat flexible on the exact sizes—varying by

as much as several kg for upper and lower ranges. He also pointed out that some sources have suggested an additional category between micro-drones and nano-drones (p. 235).

Drones in the large category are in the range of manned aircraft, and pose obvious safety hazards, but the smaller categories may present hazards of a different kind. The very smallest drones, "below perhaps 0.1 kg, may readily escape detection because of some combination of their size and their appearance" (Clarke, 2014b, p. 235). If these nano-drones were capable of carrying a payload of sensors, privacy and security could become a major concern. Reid (2014) has suggested that one day, nano-drones the size of mosquitos may actually be able to carry cameras and microphones—or even possibly "take a DNA sample or leave an RFID tracking device under the skin" (p. 3).

Control

Clark (2014b) suggested control as another potentially useful tool in classification. He divided the control of drones into three separate categories—visual line of sight (VLOS), first person view (FPV), instrument control, and autonomous.

With VLOS control, the pilot must maintain direct line of sight of the aircraft. "This has long been the primary mode of operation of model aircraft" (p. 233). Of the four control models, VLOS is the least likely to experience a loss of control due to technical problems—because the pilot relies on his or her own eyes, rather than technology. This method does come with limitations. The pilot must be near the aircraft, and also must not have buildings or other objects obstructing the line of sight. Flying at night, or in inclement weather becomes significantly more difficult. It is also difficult and dangerous for a single operator to control multiple systems at once. These limitations make VLOS a less attractive option for commercial uses, such as package delivery. A drone delivery

would be no more efficient than a ground delivery, if the pilot were required to follow within line of sight.

FPV control is a newer, and more expensive means of control. In systems using this method, a camera is mounted on the drone and the video signal is transmitted wirelessly to the pilot. A pilot using visual control from the ground must make mental adjustments to compensate for the difference in spatial orientation. FPV offers the ability to see from the vantage point of the drone. It also allows the drone to be further from the pilot than a VLOS system. Disadvantages of FPV include signal latency and potential loss of signal, which make the FPV control system more dangerous than VLOS.

With an instrument control system, the pilot is aided by data feeds, as well as associated instruments. Like manned aircraft, instrument control of drones would require significantly more pilot training than VLOS or FPV. It also requires more expensive technology in the aircraft, as well as the control station. Instrument control would require sophisticated and reliable collision-avoidance sensors. The dependence on technology, coupled with the limitations of radio bandwidth in populated areas pose strong challenges for instrument control. But the ability to navigate at night, and under adverse weather conditions makes instrument control more appealing for many situations. Another advantage would be that a single pilot could control multiple aircraft at one time.

According to Clarke (2014b), nearly all drone systems (including VLOS, FPV and instrument control) are autonomous to some extent, because "such functions as stabilisation of attitude and altitude are readily delegated to electronic components" (p. 232). Even relatively inexpensive VLOS systems, like the DJI Phantom series are able to enter a semi-autonomous mode when communication is disrupted. In that situation, the

drone levels to a set altitude, and uses GPS to navigate to the spot from which it launched.

Instrument control systems take more control out the human hands than VLOS or FPV, but there are still two levels of autonomy beyond instrument control. Clarke (2014b) refered to these as “human-supervised” (p. 232) and “human-out-of-the-loop” (p. 233).

Human-supervised systems would seem like the best fit for large-scale corporate operations, like those proposed by Amazon. These systems would be pre-programmed, but fly completely without operator assistance, but the pilot would still have the ability to fly manually. This manual mode would be necessary for situations that require human decisions, such as where to drop a delivered package.

Human-out-of-the-loop systems would be more suited to long-term high-altitude survey missions, where control would only be overridden under emergency situations. Both of these autonomous drone systems would require even more advanced technology than instrument control systems. For instance, they would need the ability to detect and repair problems with the aircraft. They would also need to be able to react to unforeseen circumstances, like changing weather conditions and bird attacks. We are still in the very early stages of drone autonomy, but the technology is advancing quickly, and the prices are falling at an equally quick pace. It would not be surprising to see human-supervised drones replace traffic or weather cameras in the near future, if the FAA allows their use.

Intended Missions

Clarke (2014a, 2014b) also suggested potential categorization strategies based on how drones might be used. He lists several possible applications, including delivery,

entertainment, professional journalism, informal (citizen) journalism, voyeurnalism (celebrity stalking paparazzi), law enforcement, community policing, voyeurism, 'killer' drones, and passenger transport. These potential uses range from highly beneficial to extremely threatening. Voyeurism and 'killer' drones are especially troubling. Clarke's (2014b) idea of 'killer' drones is exactly what the name implies. Weaponized drones are already used by the military. It isn't hard to imagine law enforcement agencies arming drones in the near future. It probably wouldn't be long before criminals begin to use drones for fly-by shootings. Clarke (2014b) claimed that the video-game-like experience of operating a weaponized drone is likely to de-sensitize even the most well-intentioned operator, creating "the risk of acts that breach the rules of engagement, that constitute extra-judicial murder, and that place low value on collateral damage to civilians" (p. 242). The biggest problem with an attempt to classify drones by intended use is that the users with bad intentions are very unlikely to reveal those intentions.

Safety

The Federal Aviation Administration (2015f) has asserted that the main purpose of drone regulation is safety. According to Rapp (2009), drones are much more likely to crash than manned aircraft. This is in part, because there is no pilot to observe conditions of the vehicle while in the air. Takahashi (2012b) has suggested that drone technology is immature, and wondered whether it would be "wise to permit the broad use of this sort of flying machine on the home front during peacetime" (p. 8). Similar safety concerns have prompted Bellows (2013) to suggest that, "new rules issued by the FAA under the FAA Modernization and Reform Act of 2012 must address a wide range of uses beyond those commonly contemplated" (p. 588). Moore (2014) questioned who would be responsible

"when people die or suffer serious injury, physical or financial, as a result of a drone or drones being at a supposed news scene" (p. 6).

One of the leading safety concerns is communication security (Bellows, 2013; Clarke, 2014b; Phillippens, 2013; Rapp, 2009; Takahashi, 2012b). "Without secured GPS navigational abilities, UASs are susceptible to spoofing and being turned into projectile weapons" (Bellows, 2013, p. 615). Phillippens (2013) has expressed concern over "increased uncertainty about the measure of control a commander will have on its assets" (p. 3). This lack of control could be a result of simple radio interference, but it could also potentially be more nefarious. There is always the possibility that a drone could be hijacked by hacking the frequency. According to Clarke (2014b), "the range of circumstances in which communications links may be broken is considerable, and that they occur sufficiently often" (p. 234).

Another safety concern is weather. According to Clarke (2014b), a strong storm can do a great deal of damage, so drones must be manufactured with "sufficient physical robustness to withstand threatening events such as wind-shear and turbulence" (p. 232).

These assessments of the safety of drones may seem alarming, but as Waite (2014) observed, "most people don't realize most of the talk about drones is about small devices with limited range and flight time" (p. 31). These small drones may be much more likely to crash than a manned aircraft, but when they do, the damage is likely to be negligible. First, there is no pilot or camera operator aboard the craft. The pilot is safely on the ground, and in many cases, the camera is simply a fixed-mount GoPro with no operator. Second, many of the popular video gathering models (like the DJI Phantom series) are so

light that they could hit a person at full speed without causing more than a mild bruise or some skin abrasions.

The danger of manned aircraft is a real concern for journalists. According to Gynnild (2014), the process of eyewitness reporting "often implies considerable risk taking for reporters" (p. 2). In 2007, television stations KNXV and KTVK in Phoenix, Arizona made national headlines when helicopters from each station crashed mid-air, killing all four on board (Giblin, 2007). Other news helicopters have crashed recently in Miami, Florida (Parra Herrera, Yanez & Jeffers, 2000), Brooklyn, New York (Tavernise, Newman, Brick, Lueck, & Wisloski, 2004) and Seattle, Washington (Cornwell & Rosenthal, 2014). Tremayne and Clark (2014) echoed these reports, noting that "Dozens of men and women working for broadcast outlets and other news organizations have lost their lives in work-related plane and helicopter accidents" (p. 239).

It would seem like drones might be a logical alternative to the dangers of manned flight. Gynnild (2014) argued that "the emergent methodological approach and genre of drone journalism exemplify a 'disruptive innovation'" (p. 3), reducing risk and increasing innovation among professional journalists. She has suggested that drones might soon "come to reduce the news media industry's need for human risk taking considerably, especially when covering catastrophic and conflicting events" (p. 8). Anand (2013) has suggested that drones "can be used in conditions where it is too dangerous to fly manned aircraft" (p. 1).

Lightweight drones might cause little damage to people or property on the ground, however it is less clear what would happen if a drone collided mid-air with a manned craft. If a drone hit a manned aircraft in precisely the wrong way, the result could be

catastrophic. Whitlock (2014) listed twenty-five near miss incidents between drones and manned aircraft between June and December of that year. Those close calls were "among more than 175 incidents in which pilots and air-traffic controllers have reported seeing drones near airports or in restricted airspace since June" (paragraph 9). Because of the danger, drones have always been prohibited from flying within five miles of an airport. Exceptions can be granted, but the drone pilot "must give proper, prior notice to the appropriate air control personnel-including the control tower, where applicable" (Bellows, 2013, p. 605). Some have suggested that additional measures need to be taken. Clarke (2014b) has suggested that drones come equipped with special sensors, because "where the airspace may become congested, or where attacks can be expected, collision-avoidance appears likely to quickly become a critical capability" (Clarke, 2014b, p. 234).

In spite of the recent claims of near-misses, model aircraft have been flown for decades without a single collision. As a whole, model aircraft users have acted "with considerable care and responsibility, typically as members of a club that sets constraints, arranges insurance cover, and uses dedicated and somewhat isolated airfields" (Clarke, 2014b, p. 239). This might partially be attributed to the fact that, in the past, the price of model aircraft technology has been high enough to promote a degree of responsibility. However, as prices continue to drop, the "combination of increasing popularity, ease of use, and affordability that is driving recreational UASs into the mainstream is also creating headaches for regulation under the new FAA Modernization and Reform Act of 2012" (Bellows, 2013, p. 598). This is especially concerning as "the less expensive models have now come within the price range of adolescents' Christmas presents" (Clarke, 2014b, p. 239).

We are currently faced with a very likely scenario in which a pre-teen hobbyist might legally fly a drone, while a responsible adult, working for a corporation with full liability insurance, is legally prohibited. Spayd (2014) argued, "if a drone is up there to make a buck it's somehow more dangerous to the skies than a drone with no such mission" (p. 4). Clarke (2014b) took the notion a step further, declaring that, "drones used by neighbourhood and voyeuristic paparazzi are model aircraft, provided that no-one pays a fee for a service performed by the drone" (p. 235). To add to the confusion, he argued that, "a competition for, say, delivering a load, finding a missing object or person (e.g. UAVOC, 2014), or tracking a vehicle, is reasonably interpreted as 'sport', even if money does change hands" (Clarke, 2014b, p. 235). This logic has led many would-be-drone-journalists to offer their drone video to the companies they worked for, 'free of charge'.

The FAA (2014a) was quick to issue a seventeen-page interpretation of Congress' (2012) special rules for Model Aircraft. One important clarification in that document related specifically to this type of situation. The FAA (2014a) stated that, "flights that are in furtherance of a business, or incidental to a person's business, would not be a hobby or recreation flight" (p. 10).

According to Bellows (2013), much of this confusion has come about because "section 336 of the FAA Modernization Act quarantines an entire sector of UAS use and excludes it from FAA regulation" (p. 613). He added that this unregulated recreational use of drones "is currently inviting trouble for some recreational users" (p. 613). I would disagree slightly with that assessment, as model aircraft were not regulated prior to the FAA Modernization Act. As such, the FAA Modernization Act hasn't given anyone the

freedom to use drones—it simply restricts a sector of potential drone users whom had never been restricted.

Regulation

In his recommendation for integrating drones into the NAS, Ravich (2009) stated that drone "operations have out-paced the law in that they are not sufficiently supported by a dedicated and enforceable regime of rules, regulations, and standards respecting their integration into the national airspace" (p.p. 597-598). Three years later, Congress passed the FAA Modernization Act, which "made clear its intention to rapidly expand domestic drone activity" (Black, 2013, p. 1844). The Act gave the FAA a deadline of 270 days to "develop a comprehensive plan to safely accelerate the integration of civil unmanned aircraft systems into the national airspace system*"* (United States Congress, 2012, p. 64).

In addition, the Act mandates that the FAA develop and implement a 'Standards for Operation and Certification' program for the public use of drones within the NAS by December 31, 2015. Culver (2014) has asserted that, "Most read the Act as a reflection of Congress' concern about slow FAA progress on the question of drones" (p. 54). But Clarke (2014b) has questioned whether even the mandates set forth by the FAA Modernization Act will be able to keep pace with the rapidly growing drone industry. Drone growth during the twentieth century was relatively slow, but in this century, "changes in both drone technologies and drone economics have been much more rapid. Particularly in the case of small, inexpensive devices, the question arises as to whether existing regulatory frameworks can cope" (Clarke, 2014b, p. 230). But not everyone believes that drone regulations should be rushed. Takahashi (2012b) called the FAA Modernization Act reckless, because it "is written in a manner that encourages the

inadvertent construction and operation of unnecessarily dangerous flying machines" (p. 7).

The FAA Modernization Act defines three operational categories of drone use—Civil, Public and Model Aircraft (Congress, 2012, p.p. 63-68). These categories form the foundation of all current Federal drone regulation.

Civil Unmanned Aircraft Operations

Civil operations are essentially non-governmental agencies or individuals operating for commercial gain. This is the category within which the majority of news agencies would fall. Until September of 2014, the only way for a civil operation to access the NAS with a drone was to obtain a Special Airworthiness Certificate, Experimental Category. To obtain this certification, applicants must describe in great detail "how their system is designed, constructed and manufactured" (FAA, 2015f, paragraph 3). This certification also requires applicants to specify exactly when and where they will operate the drone. Clearly, this process was not conducive for drone use in covering a breaking news event. Fortunately, there are now other avenues for civil operators to obtain authorization to fly drones. These will be explained in the next section.

Public Unmanned Aircraft Operations

Public operations are government-funded. Public agencies include, but are not limited to law enforcement, emergency response, military, homeland security, and publicly funded universities.

Model Aircraft Operations

United States Congress (2012) defined Model Aircraft as any unmanned aircraft that is "(1) capable of sustained flight in the atmosphere; (2) flown within visual line of sight

of the person operating the aircraft; and (3) flown for hobby or recreational purposes (p.p. 67-68). United States Congress (2012) blocked the FAA from creating new regulations for Model Aircraft as long as the aircraft is flown only for hobby or recreation, and sticks to a few safety guidelines. The aircraft cannot weigh more than 55 pounds. It cannot be flown in a way that interferes with manned aircraft. And the operator must notify Air Traffic Control, if the flight path will be within 5 miles of the airport.

Bellows (2013) argued that the FAA has issued little guidance to recreational drone users—referring them to the 1981 Advisory Circular, which only "set *voluntary* operating procedures for flying model aircraft" (p. 601). This is not entirely accurate. The rules established by Congress (2012) in the FAA Modernization Act were similar to the Federal Aviation Administration (1981) circular, but there were two important differences. First, the regulations in the FAA Modernization Act are mandatory. Second, they expanded the airport perimeter from 2 miles to 5 miles. Curiously, the 400-foot altitude suggestion from the FAA (1981) circular was not carried over to the FAA Modernization Act's mandate for model aircraft—but it does appear in the section regulating public unmanned aircraft.

Airworthiness Exemptions

According to the FAA (2015e), current law mandates that any aircraft operation within the NAS "requires a certificated and registered aircraft, a licensed pilot, and operational approval" (paragraph 1). Section 333 of Congress' (2012) FAA Modernization and Reform Act provides a mechanism to petition for an exemption of the airworthiness certification for a UAW. This process is designed to discourage illegal operation of drones, and give a competitive advantage to "operators who wish to pursue

safe and legal entry into the NAS" (paragraph 3). The application process is involved, and until early in 2015, FAA response times could be as long as five months. It is important to note that a Section 333 exemption does not grant permission to operate the drone. It simply exempts the drone from the rigorous standards required for certification and registration of manned aircraft.

Certificate of Waiver or Authorization

After receiving a Section 333 exemption, a drone operator must obtain a Certificate of Waiver or Authorization (COA). As early as 2003, the FAA began to issue COAs to a select few public operations, "recognizing that certain UAS might be operated safely in the NAS despite these human standards and also acknowledging the legitimate needs of public agencies" (Anand, 2013, p. 2). The process of applying for a COA is long and complicated, and initially took months to be approved, but Bellows (2013) pointed out that "Congress instructed the DOT to cut down on the length of time for COA issuance, requiring a decision within sixty business days of application" (p. 603). As noted later in this paper, the application review process is being refined, and current turnaround times for COAs is considerably less than it was in 2013.

Proposed Regulations

The state of drone regulation is in constant flux. On January 15, 2015 the Federal Aviation Administration (2015c) released a proposal, Operation and Certification of Small Unmanned Aircraft Systems. If passed, this 195-page proposal would create the first step in widespread introduction of commercial drones into the NAS. The approach with this proposal is not to try to create an over-arching regulatory framework for all drones. Instead, it would begin the process by introducing the least risky class of drones,

under some very strict operating constraints. The FAA (2015c) has suggested that this least risky class of drone would be limited to a total weight of fifty-five pounds—including the aircraft and its payload. The FAA is considering the possibility of creating a separate, micro category for aircraft with a maximum weight of 4.4 pounds. If created, this category would require less aeronautical knowledge—but would have tighter restrictions on other constraints, such as operator certification, maximum altitude, and minimum distance from the nearest airport. But for now, all aircraft under fifty-five pounds would be considered equal.

Visual Line of Sight

The proposed FAA (2015c) regulations would require an operator or visual observer to maintain "line of sight of the small unmanned aircraft with vision that is not enhanced by any device other than corrective lenses" (p. 49). The purpose of this rule is to prevent mid-air collisions, and according to the FAA (2015c), other visual aids might obstruct peripheral vision. This visual line of sight rule would require that small commercial drones only be flown during daylight hours, and in weather that provides three miles of visibility.

According to FAA (2015c), a visual observer is not necessary for drone operation, as long as the operator maintains a visual line of site. However, a visual observer could be used to expand flexibility. For instance, the operator could wear first person view goggles, while the visual observer watched the drone. It is important to note that the operator must still remain in a position to see the drone, if needed. The proposal would allow radio communication between the operator and the visual observer. The proposal would not allow drone operation from a moving aircraft or motor vehicle, but it would

allow operation from a moving boat. “This is because there are far less people and property located over water than on land” (p. 76).

Testing and Certification

Another regulation proposed by the FAA (2015c) is operator certification. Drone operators would not be classified as pilots, and would not require a pilot’s license. Instead, operators would be required to obtain a “new type of airman certificate that would be created by this proposed rule” (p. 61). The visual observer would not be considered an airman, and would not be required to obtain any certification. To qualify for certification, an operator would need to be at least seventeen years old. Another requirement for certification would be the ability to read and write the English language. Certification would not require a flight proficiency demonstration or aeronautical experience, but it would require a test of aeronautical knowledge every twenty-four months.

According to FAA (2015c), proposed testing would cover the applicant’s knowledge of drone regulations; airspace classification; flight restrictions and prohibited areas; basic collision-avoidance maneuvers; weather hazards; load balancing and weight distribution; emergency response; aeronautical decision-making; airport operations and terminology; and the physiological effects of drugs and alcohol (including prescription drugs.) The FAA would administer the certification tests at existing testing centers, and “applicants who take the test will be issued an airman knowledge test report showing the results of the knowledge test” (p. 108). Certificates “will not have an expiration date, and once issued, it will remain valid until surrendered, suspended, or revoked” (p. 114). The small drone knowledge testing is expected to cost $150. (p. 142).

Limitations

To avoid collisions between drones and manned aircraft, the FAA (2015c) proposal would set a maximum altitude of 500 feet above ground level. This 500-foot ceiling would limit drones to the space below which a manned aircraft would be allowed to fly, in most circumstances. The proposal would also require drone operators to yield the right-of-way to manned aircraft in all situations. Drone operators would be prohibited from flying near enough to present the manned aircraft pilot "with a see-and-avoid decision or the impression that it must maneuver" (p. 73). Drone operators would need permission from Air Traffic Control to fly within a five-mile radius of an airport. Manned aircraft currently require "two-way radio communication for departures, through flights, arrivals, and operations inside the airspace" (p. 86). Since most drones would not be capable of two-way radio communication, it would be up to the discretion of the Air Traffic Controller to decide whether the drone flight would be safe. Drones would also be prohibited from flying in areas that are off limits to manned aircraft—including areas that are temporarily off limits due to sporting events, emergency situations, or presidential movements.

The proposed regulations would require pre-flight testing to be sure that all controls were functioning properly. Drone speed would also be capped at 100 miles per hour. The FAA (2015c) reasoned that, "an aircraft traveling at a high speed poses a higher risk to persons, property, and other aircraft than an aircraft traveling at a lower speed" (p. 80). To further minimize risk, the FAA (2015c) proposal would prohibit the use of drones over people who are not directly participating in the drone's operation. Anyone participating in the drone's operation would need to be briefed on "operating conditions,

emergency procedures, contingency procedures, roles and responsibilities, and potential hazards" (p. 81).

The proposed regulations would mirror manned aircraft regulations, which prohibit reckless operation and operator drug use before or during operation. Drones would also be subject to existing regulations prohibiting the transportation of drugs and other illegal substances. The proposal would not require medical certification, but would prohibit operation or visual observation if a person is aware of a condition that would prevent safe operation of the drone.

Registration and Inspection

Under the proposed FAA (2015c) regulations, drones would need to be registered, just like manned aircraft. The process would be relatively simple—the owner would send in contact information, information about the aircraft, evidence of ownership, and a five-dollar fee. Once the information was processed, the owner would receive the proper registration numbers. Manned aircraft must display the registration numbers in characters that are at least twelve inches high. This is obviously too large for most drones weighing less than fifty-five pounds. The FCC (2015c) would "address this issue by allowing the too-small aircraft to simply display its registration number in as large a manner as practicable" (p. 130).

According to FAA (2015c), drone accidents would only need to be reported when they resulted in injury or damage to property other than the aircraft. Incidents with injury or property damage would need to be reported within ten days. The reporting process would not be difficult, requiring only "one page of paperwork associated with reporting an accident" (p. 159).

The FAA (2015c) did not propose that drones undergo the yearly safety inspections and maintenance required by manned aircraft. It was decided that, "due to their light weight, small unmanned aircraft generally pose a significantly lower risk to people and property on the ground than manned aircraft" (p. 90). Because of this, the operator would only be required to perform an inspection to ensure that the drone is in safe travel condition, prior to each flight. This inspection would look for problems "such as dents, corrosion, mis-alignment, loose wires, binding controls, loose fasteners, and excessive wear " (p. 137).

Cost-Benefit Analysis

FAA (2015c) has suggested that the benefits of these regulations would outweigh the costs—estimating the total startup cost of certifying a small drone and operator at $214, which "is relatively inexpensive to be licensed for operation of a commercial vehicle" (p. 152). Potential benefits of regulation could include creation of new industries, as well as improved safety. Because the commercial drone industry doesn't currently exist (legally), it would be difficult to estimate the actual impact of regulation, but the FAA (2015c) does predict that "most, if not all, of these new commercial activities would be conducted by operators of small UAS who are small business entities" (p. 152).

Each section of the FAA (2015c) proposal includes a call for public feedback and suggestions to improve or change the regulations. The period for public comment will end April 24, 2015. At that point, the FAA will begin a review process before making a final draft of the regulations. The FAA (2015c) has asserted that they will also "consider comments filed after the comment period has closed if it is possible to do so without incurring expense or delay" (p. 163). This process could take up to a year.

Interim Policies

Blanket COAs

On March 24, 2015, the FAA (2015a) established "an interim policy to speed up airspace authorizations for certain commercial unmanned aircraft (UAS) operators who obtain Section 333 exemptions" (paragraph 1). This policy grants a 'blanket' COA to any drone operator, who has already obtained "a Section 333 exemption for aircraft that weigh less than 55 pounds, operate during daytime Visual Flight Rules (VFR) conditions, operate within visual line of sight (VLOS) of the pilots, and stay certain distances away from airports or heliports" (paragraph 2).

This new 'blanket' COA policy carries great significance for journalistic use of drones, because it cuts out the need for a drone operator to apply for a separate COA for each use, which could have taken up to 60 days. Operators wishing to fly higher than 200 feet would still need to obtain a separate COA for each flight, but 200 feet is high enough for many potential uses.

Summary Grants

On April 9, 2015, the FAA (2015b) further streamlined the process by implementing a summary grant review of Section 333 exemption requests. Petitions are now compared to past requests, and the FAA "can issue a summary grant when it finds it has already granted a previous exemption similar to the new request" (paragraph 3). According to the FAA (2015b), Section 333 exemption petitions "generally fall into two categories: film/television production and aerial data collection" (paragraph 4). Most petitions that fall into these categories will now be handled as summary grants, greatly speeding up the process. From September 25, 2014 through April 3, 2015, the FAA only granted ninety-

eight Section 333 exemptions. In the first week of the summary grant program, they issued thirty new exemptions—with twenty-eight of them granted on April 8, alone.

With changes happening this quickly, I cannot even make a prediction about what will change by the time I finish the documentary portion of this Thesis—but it will be exciting to find out what happens next.

CHAPTER IV

TREATMENT

Introduction

The documentary begins with an anecdote of local news coverage of a recent tornado. On the afternoon of November 17, 2013, a tornado touched down in Washington, IL. Peoria television news crews scrambled to get to the scene and let the public know what had happened. In addition to traditional newsgathering tools, these crews were using mobile technology and social media to get the information out as quickly and effectively as possible. But even with these tools, some journalists were frustrated by the inability to adequately capture the scope of the destruction.

Local journalist, Andrew Barra, shared his personal experience with this event, and explained why he believes the coverage could have been better with the use of drones. Barra discussed his frustration at not being able to use aerial video, because current FAA regulations prohibit the commercial use of UASs. Hobbyist, Josh Lillie was able to use a drone at the scene, because he does not intend to make money with his drones. Lillie described the emotional response of seeing his aerial tornado footage for the first time.

A Brief History of Aerial Imagery

In this short segment, I interviewed David Smith, an aviation and photography historian, about the parallel developments and history of flight and photography Smith gave a basic overview of the timelines of the two technologies, and how they have been used together

to create aerial images.

Aerial Image Appeal

In this segment, the film explores the foundations that explain why drone photography might be an important addition to traditional newsgathering tools. In addition to Barra, Smith and Lillie, I talked to Dr. Ssrikant Dandatkaar, a cognitive scientist, who provided some insight on why people seem to be drawn to aerial images. I also talked to Phil Vandiver and Colin Hinkle. Vandiver is a professional video producer, who can only use his drone for recreational purposes. Hinkle is a freelance news videographer and video producer who was granted an exemption by the FAA to fly his drones for profit. Hinkle has traveled around the world to capture exotic aerial video, as well as video of tornado cleanup in his hometown of Washington, IL. Professional remote camera operator, Ben Lynn, shared his experience with aerial videography from the viewpoint of someone who has gotten aerial shots at some of the biggest televised events in the world, such as the Olympics and the Super Bowl.

Fear: Safety, Privacy, and Ethics

These are some of the most convincing arguments against the public use of drones. The name drone itself carries negative connotations of heartless military strikes. Add in surveillance technology and fear of Big Brother (or worse), and it is no wonder that some people are apprehensive about allowing drones to fill our airspace. This segment attempts to walk the viewer through these concerns, one-by-one—explaining, de-mystifying, and sorting out the truth from the fiction. I talked to flight instructor, Brandon Tobias, about safety issues. Dr. Robert Bradley addressed the delicate balance between privacy rights

and First Amendment freedoms. I also talked to Dr. Dandatkaar about the science behind the fear of drones.

First Amendment

This segment is an examination of free speech protections vs. government regulation of the National Airspace System (NAS). The FAA has authority to regulate the NAS for public safety. Journalists have First Amendment protection to gather information, but precedent indicates that journalists are not entitled to special privileges, simply because a law might impede their ability to gather information. However, the FAA drone regulations do not apply equally to everyone. Hobbyists are exempt from the law, simply on the qualification that they are not paid. This would seem to be an exceptional situation, which should be considered closely. Dr. Bradley weighed in on the Constitutionality of these issues, while Hinkle, Lillie, Barra and journalist, Aaron Eades shared their personal feelings regarding freedom of speech and the use of drones. Lynn pointed out that the system is backwards, but it isn't likely to change.

Definition and Categorization

This segment illustrates the complexity of defining and categorizing drones. At this time, nearly every organization that deals with drones uses different names, definitions and classification systems. This has made it extremely difficult for the FAA to create a set of regulations that would introduce commercial drones into the NAS. With the FAA Modernization and Reform Act of 2012, Congress mandated that the situation would change. They tasked the FAA with drafting a set of regulations by 2015. The first step in regulation of drones is classification. The FAA has divided drone use into three separate categories—Civil, Public, and Model Aircraft. Civil operations are any non-government

drone use for commercial purposes. Public operations are government-controlled or funded drone operations. Model Aircraft are any non-government drones that are less than 55 pounds and are not used for commercial purposes. These three categories are to be regulated in substantially different ways.

Regulation

In this segment, I talked to Hinkle, Lynn, Barra, Eades, and Vandiver to see how much they understand about current and proposed drone regulation. The regulations and policies are complex, and change often. With the exception of Hinkle, they generally understand very little, or have misconceptions about regulations, and the exemption process. Hinkle pointed out that even with his knowledge of the matter, it was still necessary to retain an attorney to file for a section 333 exemption. Lynn was able to summarize the proposed regulations. Dr. Bradley weighed in on the role of the FAA. One important fact is that the FAA does not consider itself responsible for privacy, therefore all FAA regulation is based on safety issues. In another surprising revelation, Bradley also pointed out that the FAA has actually never made any laws about model aircraft. Instead, they have made recommendations—which do not hold up in a court of law.

Model aircraft are, and will continue to be, the least regulated. Hobbyists are basically exempt from rules that would require them to register model aircraft with the FAA, and operators do not require certification. All flights must remain below 500 feet, and must be flown at a distance of at least five miles from the nearest airport.

Public drone use is regulated more heavily, partially because of concern about potential Fourth Amendment violations. In addition to FAA regulations, many states have

begun to create statutes restricting the use of drones for surveillance by government bodies.

Regulation of civil aircraft has been in a constant state of flux since the FAA Modernization and Reform act of 2012. The FAA proposed new legislation in early 2015, which would allow civil aircraft under 55 pounds to fly commercially. Most of the flight and distance regulations would be similar to the Model Aircraft rules, but operators would need to become certified, and the aircraft would need to be registered and clearly marked. These regulations will probably not go into effect for at least a year. In the interim, the FAA has instituted policies to expedite exceptions and waivers for commercial operators who can show that they have a need, and intend to act responsibly.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Observation of Results

When covering a controversial topic, such as the use of drones, it is expected that experts in the field might have differing opinions. One of the most interesting things I have observed over the course of this documentary is that the experts often disagree, not only with others, but also with themselves.

Answers to Research Questions

No definitive answers should be assigned to the questions posed by this documentary film. The purpose is to allow viewers to form their own opinions. But I will summarize some of the opinions presented by the subjects of the film, in answer to the research questions.

Q1: How might drones be used in journalism?

Drones might be useful in many aspects of journalism. They could be used to cover situations where it is too dangerous to send in a reporter, or even fly a helicopter (e.g., a tornado or a riot.) They might also be used to give viewers a greater perspective on a major event—to show the scope or magnitude of the situation.

Q2: Is it a violation of the First Amendment for the FAA to deny journalists the use of drones, but to allow hobbyists to use them?

There is no clear answer to this question. Many journalists feel that it might be a First Amendment violation, but are afraid to become the precedent-setting test case. Legal battles can be prohibitively expensive and time-consuming. The courts have been slow to rule on issues involving technology—and in many cases, the technology has changed significantly by the time the courts have made decisions. Drone technology is changing so rapidly that it is really hard to predict what might happen, even in the next few years.

Many of the subjects interviewed shared a similar sense of bewildered acceptance of the fact that the FAA allows drone use by hobbyists, but not journalists. The system in place seems to be analogous to an absurd, fictional scenario, in which the U.S. Department of Transportation would suddenly declare that national highways could not be used for commercial purposes. It is difficult to imagine that safety is the driving concern behind the FAA's distinction between hobby and commerce, since hobbyists could be young children, while most businesses uses would involve adults with much more at stake.

Q3: Can drones be safely integrated into the National Airspace System?

Most of the interview subjects agreed that the answer to this question would be a qualified 'yes'. The qualification hinges on drone categorization. The complexity of categorization lends some insight on why the FAA might be so slow to implement regulations on unmanned aerial vehicles. Drones can come in such vastly different shapes and sizes—and with such completely different capabilities—that it is nearly impossible to consider them as a single, cohesive classification. Currently, the smallest drones are only the size of insects. It is hard to imagine any scenario where these would pose a threat to physical safety. They could hit a person, or be sucked into a jet engine with almost no

effect at all. But the most popular drones used for capturing video are closer to the size of a large bird. These could do more serious damage—particularly if they were to get sucked into a jet engine. To safely integrate these drones into the National Airspace System, it will be important to ensure that they are not allowed to fly in areas where they might come into contact with manned aircraft. The largest drones are the size of large manned aircraft, and would probably need to be regulated very much like manned aircraft.

Q4: How will drones affect public privacy?

Answers to this question seem to be nearly inversely proportional to Q3 answers. Smaller drones will have the potential to be much more invasive in our private lives than larger ones. Those who regularly fly small drones (e.g, the DJI Phantom series) are quick to point out that even these small drones are not quiet enough to be very surreptitious. It was also pointed out that existing privacy and trespass laws would apply to drones, just as they would apply to the use of any other camera. The main area of concern seems to be the use in areas where public space meets private property. It is uncertain whether a drone should be allowed to fly from a public space adjacent to private property, but at a height that could gain a vantage point over a privacy fence, or otherwise inaccessible rooftop.

It has been suggested that the expectation to privacy is a constantly changing notion. Technology is believed to be one of the major factors in this change. In the early 1900s, cameras were rare, and people were hesitant to allow them in public spaces. Today, mobile technology has made it virtually impossible to venture out into public without ending up in the background of someone's selfie. The interesting thing is that our society seems to accept this fact with very little question. If predictions are correct, and we see a

million drones in the U.S. skies each day, we will probably become as indifferent to aerial video as we are to mobile.

The Future of Drones

The interview subjects had high hopes for the future of drones in journalism (pun intended.) Most agreed that these devices will eventually become yet another tool in the tech toolbox of the future journalist. Drones will probably not replace land-based camera configurations, because of the importance of seeing a subject's eyes—but as they become smaller and easier to use, it will become common to see aerial shots—even in the smallest television markets. Possibly the most interesting prediction was that it will be children who show us the best ways to use this technology. Children are not afraid to fail, and they have very perceptions of the 'right' way to use technology. This allows them to try things with new technology that most adults would never consider.

Limitations of the Study

This documentary was limited by factors of time and money. The interviews were all from a very narrow convenience sample—mostly consisting of people with whom I had a professional relationship. Other subjects just happened to be at the right place at the right time. Because of this, there is a noticeable lack of gender diversity. I did attempt to recruit several female interview subjects, but they were either unavailable, or referred me to a better-qualified male subject. With more time, I believe that I could have found an equal number of female subjects who were knowledgeable on the topic.

Another big limitation of this project was copyright. There were dozens of YouTube videos that would have brilliantly illustrated many of the points in this documentary. One example that stands out is a video, in which a drone operator flies his drone right into the

faces of a posing bride and groom. Unfortunately, I was unable to secure the proper consent to use many of these videos within the time constraints of this project.

Finally, I was disappointed that some very interesting potential subjects were either unwilling or unable to go on camera for this documentary. One news director was afraid of retaliation from the FAA if he spoke (or allowed his employees to speak) on camera. The FAA also declined to go on camera, saying that they were unable to comment while recommendations were under consideration. I also tried, unsuccessfully to get an opinion from a member of Congress. I did have some initial interest from Aaron Schock's office, but that became a non-issue as events unfolded, and he eventually resigned from office.

Further Research Suggestions

There are many facets of this topic that could be further explored. I think it would be fascinating to follow a drone-related case through the legal system. It would also be interesting to follow the FAA through the regulatory decision making process—or to explore the enforcement process. There is no real way to distinguish between a hobbyist and a commercial operator, until the final product is finished. So, how does the FAA track down violators?

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APPENDIX A

MEDIA REVIEW AND MARKET ANALYSIS

Drone video has captured the attention of the public recently in a way that few things can. More than 100 drone hobbyist videos on Youtube have reached at least a million views each. Four of those have more than 10 million views—with the top video amassing more than 17 million views. These numbers rival the viewing numbers for prime time television shows. Bibel (2015) lists 'Survivor' as the top view-getter for May 13, 2015—with only 9.6 million viewers (para 3).

Drones are also popular in the news. A search for the word drone on Google News returns 12,200,000 stories. Narrowing down the search to stories only about 'drone journalism' returns 71,500 hits. Some of this media attention might be attributed to controversy and confusion over the FAA's regulation (or lack thereof) of drones in the U.S. Many of the news articles that I have read contain false, or highly over-simplified information about a topic that is far to complex to cover in the space allowed by news media.

Drones have also been popular in the movies. A keyword search for the word drone on the Internet Movie Database (IMDB) returns 114 titles. Many of these are in the science fiction genre, and many simply have drones as relatively insignificant plot points. However, some, like 'Ender's Game' have prominently featured futuristic versions of

drones—and have tackled many of the moral and ethical issues surrounding the military use of remotely controlled weapons.

Surprisingly, only been a handful of documentary films about drones have been released, and they focus primarily on military uses. There do not appear to be any documentary films released, which explore the legal, ethical and aesthetic issues surrounding the use of drones by journalists. Because of this, I believe climate would be advantageous for a release of this documentary through some public distribution channel. Possibilities would include PBS, direct to Netflix, or the iTunes store. I also believe that documentary film festivals might be a good venue to get the film out to the public.

APPENDIX B

CONTENT SOURCES

Interview subjects included Andrew Barra, Aaron Eades, Phil Vandiver, Ben Lynn, Brandon Tobias, David Smith, Ssrikant Dandatkaar, Robert Bradley, Josh Lillie, and Colin Hinkle. All were firmly committed to the project, and were quite flexible in order to help me meet my deadlines.

Phil Vandiver, Colin Hinkle, and Josh Lillie all provided samples of aerial video. Some of this video had been previously recorded, but some was recorded during our interview sessions. Ben Lynn supplied some video and still photos he had shot while attending a drone conference. WMBD-TV provided Washington IL tornado video free of charge.

Archival video and photos were obtained from the US National Archive via the Internet. This video was created by the US government, and as such, is in the public domain.

I composed and recorded the musical score, using Apple's GarageBand and an inexpensive USB Keyboard.

Jim Browne volunteered to voice the narration free of charge.

APPENDIX C

BUDGET AND SCHEDULE

Budget

Total costs for this documentary were minimal—less than $200. Expenses consisted mainly of three short road trips. I drove from Normal, Illinois to Chicago, Illinois and to Charleston, Illinois to record interviews and b-roll. I also made a quick drive to Peoria, Illinois to retrieve some tornado video from WMBD-TV. All other shoots were in the Bloomington/Normal area.

As a member of the registered student organization, Student Television Workshop, I was able to use that group's camera, microphones and lighting equipment for shoots. Post-production work was completed on my office computer, using Final Cut Pro X, Motion and GarageBand. I used my own USB keyboard as a surface control for GarageBand when scoring the music.

All interview subjects and narration talent participated on a voluntary basis. WMBD-TV supplied video from the Washington tornado free of charge. I had originally planned to use student volunteers to help on shoots, but found that it was too hard to schedule shoots on short notice.

Schedule

The proposal defense was held on April 22. Chair and committee members signed the approval form. Interviews began on April 25, with Aaron Eades and Andrew Barra at the Illinois News Broadcasters' Association convention in Normal. The process of logging bites began the following day. Using Final Cut Pro X keyword collections, sound bites were categorized by the name of the subject, and by the segment of the documentary—as well as sub-categories (e.g. the fear category was subdivided into fear of the name, fear of privacy invasion and fear of safety.)

Other interviews were recorded as follows: Phil Vandiver— April 28; Ben Lynn—May 4; Colin Hinkle and Brandon Tobias—May 13; David Smith—May 14; Ssrikant Dandatkaar—May 18; Josh Lillie—May 19. Logging continued as interview material became available. The Washington tornado video was retrieved from WMBD-TV on May 20.

Rough Cut assembly began on May 18, and was completed on May 25. Revisions and scoring were completed May 27.