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Public Safety Agencies and UAV Technology: A Review of Uses

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Abstract

This study utilizes a systematic review of some of the scholarly literature available on drone usage within Southern California, specifically in Los Angeles and Chula Vista. I ask: how do public safety agencies use drone technology? The review will cover cases from existing scholarly literature, as well as policy reports and books from the Google Scholar database. A systematic review was the best methodology to begin fully investigating my research question, since the scope could have been so large that individual data points would have been difficult to find and instead requires a macro-level review. This data will provide a foundation to function as a pre-study for scholars to use in future research and case studies. I chose this method since most academia has tended to examine the usage of UAV technology abroad or at the border, but the expansion of domestic drone usage by public safety agencies hundreds of miles from any border necessitates an understanding of their role in domestic policing. Using the approach described above, I will develop original data using the process of thematic coding to respond to the identified question to understand the real usage of drones and UAV systems in California.

Keywords

drones, public safety, UAVs

Disciplines

Public Policy | Social Control, Law, Crime, and Deviance | Technology and Innovation

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Public Safety Agencies and UAV Technology:

A Review of Uses

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Introduction

With a total population of over three million to protect and serve, public safety agencies in Los Angeles have tried new methods for surveilling and policing the sprawling communities that compose the city. One such evolution in methodology has been the acquisition of four DJI Mavic drones by the LAPD.[1] These drones came from Seattle, Washington, following public outcry against the perceived militarization of Seattle's local police force.[2] In an effort to mitigate this potential outcome, the Southern Californian LAPD Council created a strict set of guidelines that govern their ability to utilize their UAV systems. These guidelines outline specific instances in which the agency can deploy the tech; the department is only allowed to use the drones in instances such as active shooters and hostage situations. Following these guidelines in 2021, the LAPD only deployed the drones 5 times.[3] However, 150 miles to the south, the border city of Chula Vista has taken a completely different approach to their UAV systems. Their public safety agencies have implemented a 'drones as first responders' program, sending out their 10 drones with law enforcement officers, or as sole responders. In 2021, their program deployed drones approximately 4,400 times to respond to emergency calls.[4] Rather than outlining which instances drones can be used like the LAPD, the police department of Chula Vista has specific contexts in which UAVs *cannot* be used. Chula Vista's guidelines permit a far greater scope for potential deployments by their agencies and highlight a massive gap in the uses of UAV technology even within a state.

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[1] Cindy Chang, "Drones Are Now a Permanent Part of the LAPD's Arsenal," Los Angeles Times (Los Angeles Times, September 11, 2019).

[2] Manaugh, Geoff. "Drone Cops Take Flight in Los Angeles." The Atlantic. Atlantic Media Company, June 8, 2018. https://www.theatlantic.com/technology/archive/2018/06/drone-cops-take-flight-in-los-angeles/562214/.

[3] Frank Stoltze, "The LAPD Used Drones Just 5 Times in a Year," LAist, August 16, 2021.

[4] "City of Chula Vista," Drone Program | City of Chula Vista, n.d.

California ranks first in the United States for two things: population size and number of public safety drones. As of 2020, California had 120 agencies with UAV technology, consisting of 8.9% of the total number of public safety agencies with drones.[5] These two cities illustrate the grey area that UAVs occupy in domestic policing. Many law enforcement agencies across the country have been increasing their supply of UAV systems, arguing that they reduce risk to officers in settings with low spatial awareness. In an effort to promote transparency, many agencies have published guidelines that 'limit' the extent to which they can deploy such systems, oftentimes requiring that there be a hostage situation, hazardous materials, or an active shooter to justify a UAV presence.[6] But the guidelines also contain clauses (such as a person who *might be armed and resisting arrest*) that allows for massive disparities in their usage, leading to an obvious gap in their purported and actual uses.[7] This research is an attempt to understand how drones are actually being used, and the extent to which citizens should be concerned for their inherent right to privacy.

Background Literature

Gaps in Information on Domestic Drone Use

There are many gaps in the literature available on when and how drones are used by public safety agencies within the United States. Much of the information available is self-contradictory and avoids exploring the grey areas that UAV technology thrives in. It is important however to start my background research there and attempt to set forth a clear record on the extent of domestic UAV usage. It should be noted that there are competing timelines on the deployment of

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[5] Gettinger, Dan. "Public Safety Drones 3rd Edition," March 2020. 3.
[6] Frank Stoltze, "The LAPD Used Drones Just 5 Times in a Year," LAist, August 16, 2021.
[7] Chief of Police. Letter to The Honorable Board of Police Commissioners. "Intradepartmental Correspondence." Los Angeles, California , August 28, 2019.

drones along the US-Mexico border, with most historians suggesting that US Department of

Homeland Security's Bureau of Customs and Border Protection (CBP) intiated a drone program

using the Predator B drones as early as 2002 while others suggest 2005. This three-year range is

not the only potential timeline; Koslowski & Schulzke (2018) assert that "the use of drones for

border surveillance began with the counter drug-smuggling Operation Alliance, when US

Marines piloted UAVs along the US-Mexico border in Texas for three weeks in February

1990."[8] The possibility that there is a realistic fifteen year window for the first deployments of

UAV technology is astonishing. For a country such as the US—which so insistently calls itself

the beacon of freedom and democracy for the world—to muddle the history of its tactical tools in

domestic airspace is pure hypocrisy. While much of the secrecy surrounding the existence of

drone systems within the US has led to a growing number of scholarly thought on the topic, there

is somehow only one semi-comprehensive open access database collecting information on drone

programs by public safety agencies. The lone database was created by Center for the Study of the

Drone, and reports that as of March 2020, "at least 1,578 state and local public safety agencies in

the U.S. have acquired drones."[9] Additionally, "70 percent of disclosed public safety agencies

with drones work in law enforcement," leading to serious implications for conceptions of

policing and justice.[10] This number will only continue to grow as the technology becomes

cheaper and more easily accessible.

Another missing piece of the UAV puzzle concerns the categorization and composition of

UAVs. As the increasing number of public safety agencies, both locally and federally, acquire

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[8] Koslowski, Rey, and Marcus Schulzke. "Drones along Borders: Border Security Uavs in the United States and the European Union." *International Studies Perspectives* 19, no. 4 (2018): 309.
[9] Gettinger, Dan. "Public Safety Drones 3rd Edition," March 2020. 1
[10] Ibid., 1.

drone technology, it would make sense for there to be a single framework for classifying and sorting drones. Yet "there is no universally accepted criteria for drone classification. Instead, each defense or civil organization creates its own criteria."[11] This has resulted in a patchwork of categorization systems, dependent upon whether the authorizing body cares more about size, weight, or capabilities of the technology. Furthermore, agencies contracting to purchase drones have the ability to tailor their UAVs; the composition of each drone depends on the desired mission outcome and the budget of the actor acquiring them. This means that two drones can come from the same manufacturer yet be vastly different. Agencies can cherry-pick their UAV systems within several parameters on the creation of each piece of technology. In less technical terms, the parameters constrain the design of the drone and allows the actor to find "an optimum solution… one that combines the highest operational capabilities with the lowest acquisition and operational cost."[12] Proponents of drones use this as one of their greatest selling points: UAV technology can be made for any purpose with any budget size.

Most proponents for the use of drones argue that they can replace unfavorable jobs normally done by people; jobs which "usually [are] characterized as the '3 Ds': dull, dirty and dangerous."[13] Their attraction comes from their ability to "reduce the 'man hours' required for tasks, reduce collateral damage and decrease risk for individuals, and gain access to places people might not be able to access."[14] In order to fulfill these goals, UAVs can be equipped with

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[11] Karampelas, Panagiotis, Thirimachos Bourlai, Anastasios Kokkalis, and Theodore L Lekas. "Drones Surveillance Challenges and Techniques ." Essay. In *Surveillance in Action: Technologies for Civilian, Military and Cyber Surveillance*, 185–94. Cham: Springer International Publishing, 2018. 186

[12] Ibid., 189.

[13] Friedewald, Michael, and Luisa Marin. "The Deployment of Drone Technology in Border Surveillance ." Essay. In *Surveillance, Privacy and Security: Citizens' Perspectives*. London: Routlede/ Taylor & Francis Group, 2017. 109.

[14] Bracken-Roche, Ciara. "Domestic Drones: The Politics of Verticality and the Surveillance IndustrialComplex." *Geographica Helvetica* 71, no. 3 (2016): 168.

a seemingly endless combination of surveillance equipment (basic live-feed, freeze-frame, target

acquisition (RSTA), infrared cameras/sensors, facial recognition and tracking), audio

components (voice communications, recorded message traffic), lethal or nonlethal options (air to

air missiles, Taser, rubber bullets, teargas, sonic weaponry), and digital capabilities (Wi-Fi

crackers, signal jammers).[15] This is by no means a comprehensive list of options and the

imagination can realistically be used to fill in the gaps. A lot of public safety agencies and local

councils however have banned the addition of the more extreme technological capabilities, such

as the LAPD in California which has constrained their drones to prohibit the addition of facial

recognition software.[16] However the manufacturers of drones still offer much of this technology

as possible additions to their design—so long as it fits into the budget of the agency.[17]

The ability to tailor the tech for any mission reveals an important lack of federal

oversight—there are currently no comprehensive procedures or protocols to regulate the

deployment of drones domestically. The government has yet to meaningfully curtail the

expansive use of drones and their surveillance capacities. The US Supreme Court has not

overturned their ruling in *Florida v. Riley* (488 US 445 (1989)), when they "held that warrants

are not required for aerial observation in public airspace."[18] This ruling (*loophole*) allows law

enforcement agencies to bypass conventional legal protections for citizens through UAV

technology. And if we have learned anything from the recent protests for police accountability, it

should not be up to the approximately 1,500 public safety agencies to govern and restrain

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[15] Coyne, Christopher J., and Abigail Hall. *Tyranny Comes Home: The Domestic Fate of U.S. Militarism*. Stanford University Press, 2018.

[16] Chief of Police. Letter to The Honorable Board of Police Commissioners. "Intradepartmental Correspondence." Los Angeles, California , August 28, 2019.

[17] "Buy Camera Drones - DJI Store," Buy Camera Drones - DJI Store, n.d.

[18] Crampton, Jeremy W. "Assemblage of the Vertical: Commercial Drones and Algorithmic Life." *Geographica Helvetica* 71, no. 2 (2016): 143.

themselves. Legislation so far is the only means to curtail what may be added to the composition

of a drone, as localized agencies pass bans on the extreme additions to UAV technology. Most

debate on the usage of drones concerns their deployment in international conflict zones, but it is

becoming increasingly clear that drones are a popular tool for public safety agencies. If

policymakers ignore the increasing number of UAV systems domestically, the general public

may soon find the theater of war within their own cities as the nexus between police-power and

war-power grows larger.

Philosophical Considerations: Police-Power/War-Power Nexus

The police-power/war-power nexus was originally thought of by Kaplan & Miller (2019)

and concerns the interdependent relationship between the military and police's monopoly of

violence. These authors suggest that the integration of drones from the traditional battlefield to

domestic use is part of the larger 'ecology of power' that has existed as long as the state has had

a monopoly on force and violence. Rather than a 'trickle-down' from the military to the

domestic, the authors assert that "the modern military has always included policing functions,

and modern police forces have always drawn on military surplus equipment and military

practices, procedures, and personnel."[19] The growing adaptation of UAV systems highlights this

power-sharing effect, as police implement military strategies to deal with unprecedented

domestic national events. Already in 2014 "the American Civil Liberties Union (ACLU) charged

that police in the United States have become dangerously militarized with almost no oversight or

official restraint."[20] Many proponents for drones like to assure the public there is a difference in

the drones used in the international theater of war and domestically by public safety agencies;

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[19] Kaplan, Caren, and Andrea Miller. "Drones as 'Atmospheric Policing.'" *Public Culture* 31, no. 3 (2019): 420.
[20] Ibid. 421.

that there is no dual use and overlap. They point to variations in manufacturers, size, weight, and capabilities to insist that the state has not brought its terrorist fighting tools home to its citizenry. Yet it is important to note that there is "absolutely no difference in the use of a drone for the tracking of a fast boat involved in an illegal trafficking action and the tracking of a fast boat carrying enemy Special Forces personnel."[21] The systems and the software are the same; the only difference is the agency of the pilot.

Scholars have pointed out the fact that such dual use effects lead to drones both capable of deployment in "military scenarios for battlefield reconnaissance" and emergency response teams domestically.[22] The supposed separation between international and domestic uses of drones is only an aporetic distinction in which military technology is used; "this perceived gap between the military and the police, then, creates and maintain notions of interiority and exteriority for the nation-state. It evacuates manifestations of power and renders banal the persistent violence of policing, in favor of the spectacularization of war at a distance."[23] Militarized local public safety agencies "[strive] to maintain a division between state violence that is directed 'overseas' against purportedly deserving targets and the control and interdiction of criminalized populations 'at home'."[24] The supposed distance between the two conceptions of UAVs is further exaggerated by the news media, as many researchers insist the media is "able to concentrate on only one term of the binary at a time."[25] When public outrage is directed at the heightened presence of UAVs

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[21] Karampelas, Panagiotis, Thirimachos Bourlai, Anastasios Kokkalis, and Theodore L Lekas. "Drones Surveillance -Challenges and Techniques ." Essay. In *Surveillance in Action: Technologies for Civilian, Military and Cyber Surveillance*, 185–94. Cham: Springer International Publishing, 2018. 189.

[22] Bracken-Roche, Ciara. "Domestic Drones: The Politics of Verticality and the Surveillance IndustrialComplex." *Geographica Helvetica* 71, no. 3 (2016): 170.

[23] Kaplan, Caren, and Andrea Miller. "Drones as 'Atmospheric Policing.'" *Public Culture* 31, no. 3 (2019): 435.

[24] Wall, Tyler, and Torin Monahan. "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes." *Theoretical Criminology* 15, no. 3 (2011): 437.

[25] Kaplan, Caren, and Andrea Miller. "Drones as 'Atmospheric Policing.'" *Public Culture* 31, no. 3 (2019): 435.

abroad, domestic agencies are able to increase their own supply of drones, as the spotlight is shining elsewhere. This contributes to many gaps in extant literature on how drones are used, and why policymakers only choose to focus on one aspect of UAV deployment. Public safety agencies rely on societal apathy to get away with exponentially increasing their surveillance capabilities.

Philosophical Considerations: Atmospheric Policing

The proliferation of drones has extended the nexus power to the skies, with some researchers asserting that the notion of 'atmospheric policing' should be considered "an assault on the [citizen's] acute environmental living conditions, starting with a poison attack on the human organism's most immediate environmental resource: the air he breathes."[26] The growing number of law enforcement agencies possessing drones and deploying them regularly is arguably turning spaces of discourse and democracy (inner cities) into militarized zones. Wall & Monahan (2019) support this notion when they write that "the use of drones in non-combat settings may symbolically transform those sites to arenas of agonistic engagement and further militarize domestic police departments and government agencies to the detriment of individual liberties and the public good."[27] While this seems extreme, other scholars warn that "without directly addressing civil liberties, privacy, and surveillance concerns, the use of civil and commercial drones has the potential to fall into typical applications in the military/surveillance industrial complex and be used for crime control, national security, and public safety."[28] There is some

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[26] Sloterdijk, Peter, Amy Patton, and Steve Corcoran. *Terror from the Air*. Los Angeles: Semiotext(e), 2009. 29.
[27] Wall, Tyler, and Torin Monahan. "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes." *Theoretical Criminology* 15, no. 3 (2011): 245.
[28] Bracken-Roche, Ciara. "Domestic Drones: The Politics of Verticality and the Surveillance IndustrialComplex." *Geographica Helvetica* 71, no. 3 (2016): 168.

indication that this transition has already begun, as an increasing number of public safety agencies have begun using drones regularly, such as Chula Vista's 'drones as first responders' programs.

Theoretical Considerations: Predictive Policing and the Homogenization Effect

Predictive policing refers to the collection of bulk data of citizens that is then fed into an algorithm, in order predict trends in criminal behavior and assist law enforcement agencies. The output is used to modulate policing of certain areas or individuals to prevent crime. Some scholars warn that "as long as a risk-management paradigm prevails, prejudicial social-sorting— or mortality triage, as the case may be—will continue, as will unjustifiable interventions based on profiles and probabilities."[29] While a fairly futuristic and dystopian notion, the LAPD currently uses a "predictive policing system develop by PredPol Inc. to 'develop hotspots in neighborhoods' and to create a list of targeted individuals."[30] This system identifies individuals "through predictive features and data collected from patrol and parole officer" and places them "into a chronic offender bulletin (COB) and ranked via a point system. Individuals with the most points become 'primary targets' for policing."[31] Using these programs however reinforce poor policing methods, since it leads to further targeting of neighborhoods that already have an extensive police presence. When public safety agencies input data which already matches their biases and prejudicial habits, it comes as no surprise that profiles are created to support it. The

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[29] Wall, Tyler, and Torin Monahan. "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes." *Theoretical Criminology* 15, no. 3 (2011): 251.
[30] Ibid., 434.
[31] Kaplan, Caren, and Andrea Miller. "Drones as 'Atmospheric Policing.'" *Public Culture* 31, no. 3 (2019): 435.

prejudicial systems function as a confirmation bias for poor policing methods, and these practices are supported rather than modified.

This additional presence of drones alongside law enforcement officers exponentially increases citizens' threat perceptions; UAV technology is unsettling by itself, without the watchful eye of the state. When drones become the main mechanism for public safety agencies to interact with citizens, the relationship between these two entities radically changes. Bracken-Roche (2016) illustrates this effect when they write "that a reciprocal gaze is so intrinsic to social relations that when a gaze is only one way, or when it is between human and technology, it is not only asymmetrical but also potentially dehumanizing" for both the observed and the beholder.[32] This gaze also leads to the homogenization effect for drone pilots—citizen behavior inevitably can only fall into one of two categories: 'good' and 'criminal'.[33] There is no grey area for people to exist through the lens of a UAV system because of the homogenization effect; the data must be analyzed and categorized into those two options. This effect is most clearly stated by journalist Noah Shachtman's observations within a piloting center: "Everyone looks like germs, like ants, from the Hunter's 15,000 foot point of view."[34] This leads to the flat-lining of data points, with no ability to discern between legal citizens and illegal immigrants, criminals and people in crisis. This notion refutes the common justification of UAV technology at the border, that drone intelligence can be used "to protect migrants by preventing them from being misidentified as smugglers and mistakenly attacked."[35] All the pilots see are people on the

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[32] Bracken-Roche, Ciara. "Domestic Drones: The Politics of Verticality and the Surveillance IndustrialComplex." *Geographica Helvetica* 71, no. 3 (2016): 170.
[33] Chamayou Grégoire, *A Theory of the Drone*, trans. Janet Lloyd (New York: The New Press, 2015).
[34] Wall, Tyler, and Torin Monahan. "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes." *Theoretical Criminology* 15, no. 3 (2011): 246.
[35] Ibid., 314.

ground moving away from their enforcement officers. Who knows what their intention and legal status is? Certainly not the pilots, until border patrol officers are deployed on the ground.

Reality of the Drone: Faulty Assumptions

There are many faulty assumptions associated with the use of drones and UAV technology, stemming from the disparities in extant literature on their usage. I have explored four of these assumptions below, to ground my research in the actual capabilities of drones to potentially prevent misinterpretation of my data. While there are many theoretical issues to consider, the public should be aware of where the technology currently is.

Assumption 1: Drones increase spatial awareness in situations of high-risk for officers. While most drone deployments are justified by law enforcement agencies through whatever mechanisms their guidelines offer, the ACLU found that "the majority of deployments of paramilitary weapons were used to execute search warrants in 'low-level drug investigations'".[36] The Federal Aviation Agency has also not fully assessed the integration of drone technology into national airspace either, due to a lack of information and technology on collision-avoidance, communication, and weather avoidance.[37] This severely limits how UAV technology can be used, if agencies are not able to acquire permits that allow them to bypass certain restrictions and regulations.

Assumption 2: Drones are more efficient and cost effective than their manned alternatives, and the capability of flying for at least 20 straight hours modifies the surveillance landscape. A 2014

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[36] Wall, Tyler, and Torin Monahan. "Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes." *Theoretical Criminology* 15, no. 3 (2011): 432
[37] Congressional Research Services, and Christopher C. Bolkcom, Homeland security: Unmanned Aerial Vehicles and border surveillance § (2004).

Inspector General's report criticizes their usage for this exact reason, stating that "poor planning and mismanagement…limited actual flight time…at an estimated cost of $12,255 per hour in fiscal year 2013."[38] Moreover it was reported that "the costs of operating a UAV are more than double the costs of operating a manned aircraft. This is because UAVs require a significant amount of logistical support and specialized operator and maintenance training. Operating one UAV requires a crew of up to 20 support personnel."[39] A Report for Congress (2010) found that "UAVs are less expensive to procure than manned aircraft but may cost more to operate. Thus, the life cycle cost of UAVs could actually be greater than the life cycle cost of manned aircraft."[40] Currently drones are not the most efficient method of policing, especially since they officers still need to be deployed once surveillance data has been received and interpreted.

Assumption 3: The surveilling capabilities and computational powers are infallible. Adding extra technology significantly increases the price tag, with many officials and official reports criticizing and cancelling projects due to their absurd costs. The sensing capabilities fail tremendously when surveilling areas with dense foliage, rough terrain, and bad weather conditions. Moreover, the massive collection of data is useless if there are not enough human resources to analyze and respond in a timely manner; there is no point to continuous surveillance if there are not humans to actually interpret said data.[41] The general public and public safety agencies should also be aware that technology to detect and destroy drones has become an emerging industry.[42] Geofencing protections are easily hackable, especially with drones using

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[38] Koslowski, Rey, and Marcus Schulzke. "Drones along Borders: Border Security Uavs in the United States and the European Union." *International Studies Perspectives* 19, no. 4 (2018): 310.

[39] Congressional Research Service, Chad C. Haddal, and Jeremiah Gertler, Homeland security: Unmanned Aerial Vehicles and border surveillance § (2010). 5.

[40] Ibid. 5.

[41] Congressional Research Service, Chad C. Haddal, and Jeremiah Gertler, Homeland security: Unmanned Aerial Vehicles and border surveillance § (2010).

[42] Ibid.

unencrypted frequencies; "in 2015, at DEFCON 25, the annual hacker convention, two Chinese researchers demonstrated an inexpensive build your own GPS spoofer to trick a popular model of consumer drone to override its geofencing so that it would operate in a no-fly zone."[43]

Assumption 4: The distance between the pilot and the UAV leads to greater outcomes. According to the Report for Congress (2004), "UAV accident rate is 100 times higher than that of manned aircraft."[44] When something in the system fails, the removal of the pilot severely limits the decisions they can make in the moment to save the mission and technology. Furthermore, the frequencies used by multiple drones within close proximity often leads to "interference and loss of control between the UAV and the remote pilot. In many cases interference led to accidents."[45] Pilots on the ground and away from the tech have few ways of anticipating these errors, oftentimes remaining unaware until it is too late.

Methodology

This study utilizes a systematic review of some of the scholarly literature available on drone usage within Southern California, specifically in Los Angeles and Chula Vista. I ask: *how do public safety agencies use drone technology?* The review will cover cases from existing scholarly literature, as well as policy reports and books from the Google Scholar database. A systematic review was the best methodology to begin fully investigating my research question, since the scope could have been so large that individual data points would have been difficult to find and instead requires a macro-level review. This data will provide a foundation to function as

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[43] Crampton, Jeremy W. "Assemblage of the Vertical: Commercial Drones and Algorithmic Life." *Geographica Helvetica* 71, no. 2 (2016): 143.

[44] Congressional Research Services, and Christopher C. Bolkcom, Homeland security: Unmanned Aerial Vehicles and border surveillance § (2004). 4.

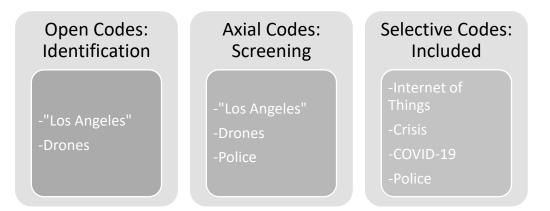[45] Ibid. 5.

a pre-study for scholars to use in future research and case studies. I chose this method since most academia has tended to examine the usage of UAV technology abroad or at the border, but the expansion of domestic drone usage by public safety agencies hundreds of miles from any border necessitates an understanding of their role in domestic policing. Using the approach described above, I will develop original data using the process of thematic coding to respond to the identified question to understand the real usage of drones and UAV systems in California.[46]

On April 5, 2022, I searched in Google Scholar my open codes, "Los Angeles" and drones, for any time, yielding 30,600 results. Next, I limited my search from 2021 to the present; that search yielded 3,130 results. I further narrowed the results only to 2022 to yield 483 results. I sorted those hits by relevance, then I cursorily reviewed the top 100 most relevant articles. I read for relevance and retained all articles that appeared to have information relevant to my research question. Continuing the coding process of systematic reviews, I chose three axial codes in order to retain or reject the top 100 articles: drones, Los Angeles, and police. Of these top 100 I initially identified and processed with selective coding, I retained 13. The remaining 87 articles were rejected because many of them did not cover drone usage by public safety agencies, Los Angeles, and domestic usages, or simply were in another language. Additionally, many of the articles that concerned drones and Los Angeles concerned the commercial use of UAV systems for last-mile transportation and deliveries. I then read the remaining 13 articles thoroughly to identify common themes and found three major categories that I used as my selective codes: drones supplementing the Internet of Things, UAVs assisting in crisis management, drones used to mitigate COVID-19 spread, and UAVs are a method of policing and state violence. I ended up

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[46] Williams, Michael, and Tami Moser. "The Art of Coding and Thematic Exploration in Qualitative Research." *International Management Review* 15, no. 1 (2019).

rejecting one last article to include a total of 12, since it did not cover any of these selective

codes.

Open Codes: Identification	Axial Codes: Screening	Selective Codes: Included
-"Los Angeles" -Drones	-"Los Angeles" -Drones -Police	-Internet of Things -Crisis -COVID-19 -Police

These selective codes compose my main findings, with each code as its own thematic

category. I explored the actual usage on UAV technology within these four mechanisms, and

further considered the theoretical implications of their application.

Results and Theoretical Discussions

Internet of Things

The Internet of Things (IoT) refers to the system of interconnected intelligence devices

that sense and surveil large urban areas. Cities with these systems are known as 'smart cities'

since the devices deployed are capable of providing real-time information to public safety

agencies and aid in their mission of security. According to Kubina & Sulyova (2022), in "2050,

the global trend of urbanization is to increase the size of the population in cities 90%."[47] This

rapid growth of urban populations contributes to fears over citizens' safety and security, as

resources are stretched thin to prevent and monitor criminal activity. Furthermore, without real-

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[47] Milan Kubina and Dominika Sulyova, "World Best Practice for the Development and Use of UAV Equipment in Cities," *Research Gate*, March 2022.

time accurate data, public safety agencies will struggle to respond appropriately to crisis

situations. UAV technology has the capacity to mitigate these potential issues, as drones can

supplement much of the information needed to sustain smart networks. The proliferation of

drones into the IoT are leading to a conversion from human monitoring of on-site situations to

"more automatic and intelligent ways of data collection."[48] The use of UAV technology in the

IoT promotes a digitalization of public safety, wherein data from digital technologies provides

information to advise public safety responses.

There are tremendous benefits to using drones for such a purpose, with the literature on

this category finding that drones in the IoT are most suited for: fire detection and monitoring,

traffic control and accident detection, criminal behavior monitoring and efficient deployment of

officers, crowd monitoring and management, geo-mapping during crises and crisis prediction,

monitoring of environmental conditions, and other related data collection.[49] Moreover, "drones

can be of significant help in monitoring areas where human intervention is risky, expensive, or

hardly possible."[50] All these uses are compounded by the rapid data relationship between the IoT

and UAV technology. Kubina & Sulyova illustrated this point by emphasizing that "the

interdependence between the IoT and drones is particularly evident in data sharing. Smart drones

are characterized by simple use, dynamic adaptation, the ability to obtain data from difficult-to-

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[48] Ning Chen and Yu Chen, "Anomalous Vehicle Recognition in Smart Urban Traffic Monitoring as an Edge Service," *Future Internet* 14, no. 2 (February 10, 2022). 54.

[49] Milan Kubina and Dominika Sulyova, "World Best Practice for the Development and Use of UAV Equipment in Cities," *Research Gate*, March 2022.; Navid Ahmadian et al., "Smart Border Patrol Using Drones and Wireless Charging System under Budget Limitation," *Computers Industrial Engineering* 164 (2022).; Ning Chen and Yu Chen, "Anomalous Vehicle Recognition in Smart Urban Traffic Monitoring as an Edge Service," *Future Internet* 14, no. 2 (February 10, 2022).; Mehran Eskandari Torbaghan et al., "Understanding the Potential of Emerging Digital Technologies for Improving Road Safety," *Accident Analysis and Prevention* 166 (2022).

[50] Navid Ahmadian et al., "Smart Border Patrol Using Drones and Wireless Charging System under Budget Limitation," *Computers Industrial Engineering* 164 (2022). 1.

access terrains in real time at low costs."[51] This digitalization of public safety and security has "the potential to create 'smarter administration', in which data can be shared across traditional policy silos to create a more holistic understanding …in which issues can be pre-empted and considered to create preventative rather than reactionary policy."[52]This method of "real-time information collection and decision-making are essential for a good understanding of dynamic city elements" and provide a mechanism for "timely reactions to emergencies". [53] This usage is seen most aptly in Chula Vista, where public safety agencies rely heavily on drones to assess a situation prior to sending a law enforcement officer to respond to emergency calls.[54] Public safety agencies in massive urban areas will struggle to respond appropriately to crisis situations and monitor city conditions if populations continue to grow without an adequate system to surveil.

However, some theoretical implications arise when drones become a significant contributor to public safety agencies' data collection in urbanized areas. Are citizens tacitly agreeing to this scale of potential surveillance when they decide to move into cities that have an IoT system? There were no mentions of informing citizens that they live in areas with an IoT, or that public safety agencies are monitoring so many aspects of their existence within the city. Moreover, the absence of guidelines on what to do with the bulk collection of data creates incentives for law enforcement agencies to store the information indefinitely, leading to a

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[51] Milan Kubina and Dominika Sulyova, "World Best Practice for the Development and Use of UAV Equipment in Cities," *Research Gate*, March 2022. 1.
[52] Mehran Eskandari Torbaghan et al., "Understanding the Potential of Emerging Digital Technologies for Improving Road Safety," *Accident Analysis and Prevention* 166 (2022). 3.
[53] Ning Chen and Yu Chen, "Anomalous Vehicle Recognition in Smart Urban Traffic Monitoring as an Edge Service," *Future Internet* 14, no. 2 (February 10, 2022). 54.
[54] "City of Chula Vista," Drone Program | City of Chula Vista, n.d.

potential mismanagement of individual's private information. Is trading social security for privacy a fair bargain?

Crisis Management

The next major category of UAV usage concerns their deployment in crisis situations. Worsening climate change effects are leading to more frequent and worsening natural disasters across the country, with a greater number of destructive fires and floods happening in California alone. When these events occur, public safety agencies only have a limited window to respond and aid the people most affected—however there is only so much a person can do and decisions must be made quickly and efficiently. Because of this, an increasing number of public safety agencies are using drones after hurricanes, floods, and fires to aid rescue missions and monitor the conditions of potentially worsening areas. Drones provide public safety agencies with "rapid responses [and] delivery of supplies to unreachable areas" while also increasing their capacity to "gain information of the impacted areas and capture images for surveillance and communication."[55] Much of the uses rely on the drones original intent: real-time monitoring.

UAV technology also helps public safety agencies "gain instant situational awareness with mapping technology and imagery, to help firefighters identify hotspots, to capture imagery for communications, to cover news, to search for any survivors, to identify post-disaster infrastructure damage, and to create before-and-after maps of the impacted areas."[56] Moreover, "drones are great at monitoring, identifying the hot spots that face high levels of risk, locating survivors to exit and rescue team troops to enter, the extent of structural damage done, and

[55] Kashish Chordia et al., "To Study the Scope of Drone Usage for Disaster Management in India with Respect to the USA with a Comparison of Economic Factors Including the GDP, the Level of Unemployment and Inflation, and the Government Regulations.," *Research Square*, March 25, 2022. 3.
[56] Ibid., 5.

delivering necessary resources during recovery."[57] In California, "the incident of the Creek and Skirball fires tearing through Los Angeles was controlled by firefighters using drones for the first time. The drones were used majorly to locate property damages caused by the fire."[58] Drones "can also be used to predict disasters such as landslides, floods, storms, etc., before they occur, allowing the government and other responsible authorities to take precautionary steps and ensure the safety of everyone in potential areas of impact."[59] Oftentimes, UAVs are able to work much faster than regular response teams; their contributions of real-time information streamlines the process of collecting data and reduces response times. What may take a whole day for a rescue team can be more efficiently done by drones in less than half an hour.[60]

Wilk-Jakubowski & Harabin (2022) assert that "the effectiveness of [UAV] activities in disaster management demonstrates their future significance for civil protection."[61] The same article however questions "the lack of research on the legal and ethical consequences of the use of [drones] in crises management", potentially refuting a proliferation of widespread drone usages.[62] This leads to potential implications of possible spill-over effects by justifying drone deployments for all emergency situations, not necessarily only for crises. Without comprehensive federal guidelines for how drones are deployed and when, local public safety agencies can operate without much oversight to deploy drones at will. Any perceived public crisis could justify the deployment of UAV technology, leading to serious implications for

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57 Kashish Chordia et al., "To Study the Scope of Drone Usage for Disaster Management in India with Respect to the USA with a Comparison of Economic Factors Including the GDP, the Level of Unemployment and Inflation, and the Government Regulations.," *Research Square*, March 25, 2022. 15-16.
58 Ibid.,4.
59 Ibid., 16.
60 Ibid., 4.
61 Grzegorz Wilk-Jakubowski, Radoslaw Harabin, and Stanislav Ivanov, "Robotics in Crisis Management: A Review," *Technology in Society* 68 (2022). 10.
62 Ibid., 9.

citizen's privacy. The threat perception of drones should also be considered: imagine enduring an incredibly terrifying natural disaster and as you wait for help, a small, unmanned machine flies in to film you. Would that be reassuring? Or would you be comfortable hedging your survival bets on the hope that its flown by pilots relaying the information in real-time to rescue teams?

Police and State Violence

Universal to every state and country, the "police are the human embodiment of the state's monopoly of violence" and any method of policing is inherently an action by "agents of the state."[63] The adoption of predictive policing systems and the bulk collection of data is leading to an evolution in the practices of policing, and potentially redefining the concepts of state violence and justice. It is well known amongst the literature on this topic that the LAPD has implemented and used predictive policing systems to monitor and target specific areas based on the likelihood that they experience higher rates of criminal activity.[64] Tucker (2022) discussed this methodology, writing that "there is nothing inherently problematic about algorithmic processing, and there is nothing problematic about creating machines that can do the work of algorithmic processing for human beings." The contribution of drones into such a network facilitates the collection of data necessary for these programs and streamlines the transition from traditional to digital forms of policing.

The theoretical issue here concerns the adaptation of drones into a structural weapon for state violence, especially against minorites. Butler (2022) writes that "violence is not always an

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[63] Brandon Rudolph Davis, "The Ethics of Policing: New Perspectives on Law Enforcement," ed. Ben Jones and Eduardo Mendieta, *Perspectives on Politics* 20, no. 1 (2022) 331.; Paul Butler, "The Problem of State Violence," *Daedalus* 151, no. 1 (January 2022). 27.

[64] Emily Tucker, "Deliberate Disorder: How Policing Algorithms Make Thinking about Policing Harder," *NYU Review of Law and Social Change* 46, no. 1 (2022). 13.

'event', but rather a process or ongoing social condition embedded in our everyday lives."[65] The

constant monitoring of citizens is one example of this, in which the homogenizing effect

inevitably leads to behaviors only existing in two categories: 'good' and 'criminal'. While

machines may be capable of algorithmic processing, one author suggests that computers are not

able "to do the *non-algorithmic* work of human judgment—thinking work that *does* require

insight and that…cannot be automated."[66] Technology of this kind—drone surveillance and

predictive algorithms—"literally turns the police officer's field of vision into a mechanism for

sorting members of the public into crime categories."[67] Davis (2022) found that "predictive

policing freezes individuals in a mathematical time and place and robs them of autonomy and the

presumption of innocence, inadvertently creating suspicious identities."[68] These findings

illustrates how the adaptation of UAV technology into public safety agencies significantly

modifies the relationship between law enforcement officers and their communities. Moreover,

Davis (2022) found that the threat perception of state violence onto citizen populations is heavily

increased by the widespread use of drones; they suggested that the asymmetrical nature of drones

largely increases the production of violence against marginalized communities. What may be

considered normal behavior with a positive relationship between agencies and communities can

instead be perceived as suspicious or dangerous when observed and interpreted by an unmanned

machine.

Additionally, the adoption of UAV technology highlights the militarization of domestic

public safety agencies. Davis (2022) "argues that the boundaries between zones of war and peace

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[65] Paul Butler, "The Problem of State Violence," *Daedalus* 151, no. 1 (January 2022). 24.
[66] Ibid., 13.
[67] Ibid.,16.
[68] Brandon Rudolph Davis, "The Ethics of Policing: New Perspectives on Law Enforcement," ed. Ben Jones and Eduardo Mendieta, *Perspectives on Politics* 20, no. 1 (2022). 331.

are eroding" as military equipment becomes a common tool for civilian law enforcement officers.[69] The evolution of state violence causes one particularly important value-based question to arise: who gets to decide what policing and justice should look like? Tucker (2022) asserts that while policing algorithms and widespread drone surveillance "are the ultimate depersonalization of political authority", these mechanisms "are part of a much larger set of economic and administrative systems that have encouraged us, often silently and invisibly, to be subject rather than sovereign."[70] If the United States is meant to be the 'land of the free' and California is meant to be a great liberal utopia, are we as a society agreeable to such a creep of state power and violence?

COVID-19 Mitigation

As the COVID-19 pandemic spread rapidly around the world, local public safety agencies struggled to find effective means to reduce the positivity rates and enforce public mandates. This led to many agencies to turning to their arsenal of drones and adapting the technology to mitigate the deadly virus. Literature on this category has found that UAV technology has the capacity to efficiently fight against COVID-19 spread by adapting the original intended usage: surveilling an area to monitor social distancing; detecting people with a fever and report to local authorities; monitoring and enforcing lockdown and masking mandates through the installation of loudspeakers to communicate to citizens; spraying areas with disinfectants; and providing logistical capabilities through the transportation of tests and

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[69] Brandon Rudolph Davis, "The Ethics of Policing: New Perspectives on Law Enforcement," ed. Ben Jones and Eduardo Mendieta, *Perspectives on Politics* 20, no. 1 (2022). 330.
[70] Emily Tucker, "Deliberate Disorder: How Policing Algorithms Make Thinking about Policing Harder," *NYU Review of Law and Social Change* 46, no. 1 (2022). 27.

samples, medicines, and other essential supplies.[71] Oftentimes, drones are able to be deployed to reduce the person-to-person contact in many of these instances while still allowing the real-time presence of public safety agencies. Following the trendline for UAV systems, there are currently no protocols for using drones in epidemic situations.[72]

Restás (2022) conducted a similar systematic review to establish the best practices of drones for combatting COVID-19. They explored six key areas where applications of UAV technology could efficiently fight against the pandemic: "surveillance of an area with a visual camera, detection of fever-infected people with a thermal camera, communication with an on-board installed loudspeaker or QR code flag, and three different logistic tasks such as transportation of essentials, health products and disinfectants."[73] They found that drones were most efficiently used for their original intent: monitoring a particular area. The collection of data on social distancing and public movement allows public safety agencies to monitor and enforce lockdown measures.

While this type of UAV usage was not observed directly in Los Angeles, public safety agencies in Chula Vista deployed their drones in an effort to combat the spread amongst homeless populations who most likely were unaware of the extent of the problem.[74] The law enforcement officers were able to use the additions of loudspeakers to inform houseless individuals to maintain distance between them and seek medical attention if they developed any symptoms related to possible coronavirus infections. Additionally in other areas of Southern

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[71] Rohit Goyal and Adam Cohen, "Advanced Air Mobility: Opportunities and Challenges Deploying Evtols for Air Ambulance Service," *Applied Sciences* 12, no. 3 (2022; Ágoston Restás, "Drone Applications Fighting Covid-19 Pandemic—towards Good Practices," *Drones* 6, no. 1 (August 2022).

[72] Ágoston Restás, "Drone Applications Fighting Covid-19 Pandemic—towards Good Practices," *Drones* 6, no. 1 (August 2022). 2.

[73] Ibid., 6.

[74] Kucher, Karen. "Chula Vista Police Eyeing Using Drones in the Fight against COVID-19." Tribune. San Diego Union-Tribune, March 24, 2020.

California, drone manufacturers "developed software that can help public agencies use drones to monitor social distancing and face mask compliance."[75] In this instance, pilots are able to approach individuals who are not following local mandates and use speakers to ensure that the message is delivered and understood.

Interestingly enough, there is an established framework within the literature on the method of approaching individuals with drones to ensure compliance and cooperation. Restás (2022) found that "it is advisable to choose a lower vision than the 45-degree angle" of the approaching target person rather "a greater angle of view" since it "expresses dominance, which is not necessary as long as the target person or persons visibly accept the given instructions and demonstrate cooperation."[76] Additionally, pilots need to take safety procedures into consideration and maintain a certain distance from people to limit potential accidents. When loudspeakers are used to deliver messages to individuals or groups, the drone has to be close enough to ensure that the targets can hear and understand, while also far away enough that the message is not overwhelming.

Limitations and Future Research

There were two main limitations to my study which fortunately can be overcome with future research on this topic. These limitations concern the number of databases used and the limited number of open code searches that were done. The narrow scope of this paper restricted much of the nuance of scholarly debate, and potentially missed some other actual uses of drones in other regions. By only using Google Scholar, I was not able to include local news agencies'

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[75] Rohit Goyal and Adam Cohen, "Advanced Air Mobility: Opportunities and Challenges Deploying Evtols for Air Ambulance Service," *Applied Sciences* 12, no. 3 (2022). 2.

[76] Ágoston Restás, "Drone Applications Fighting Covid-19 Pandemic—towards Good Practices," *Drones* 6, no. 1 (August 2022). 15.

reports on their police department usages, as well as editorials criticizing certain applications of local UAV technology. Additionally, other databases could contain the specific laws and policies that shape drone use in other localities, which could inform future policy recommendations to restrict controversial deployments nation-wide. Future research should take these possibilities into consideration when exploring the extent to which public safety agencies use drones, since much of UAV usage is shaped by public reactions. The fact that Los Angeles got its drones from Seattle when Washingtonians protested their adoption reveals just how influential public opinion is; public safety agencies may have released press briefings explicating this effect on their guidelines.[77] The inclusion of other databases would allow me to investigate all the literature and relevant publications more thoroughly on this topic.

Moreover, there is a large body of literature on this topic and all the various subtopics on the relationship between drones and other aspects of the state. Using additional codes could explore these relationships and their implications for citizens, with codes such as: "drones and policing," "data collection and UAV," and "domestic drones." Some uses may have gone unrecorded since my original search only used two sets of codes without controlling for domestic; this led to the rejection of many hits since they concerned international deployments of drones. These future open codes also narrow the scope of drone uses, since my research specifically intended to investigate the use of drones by public safety agencies, rather than all drone uses; this led to the rejection of many hits since they concerned commercial and hobby uses of drones. Using additional codes could also help to determine the relationship between minorities in overly policed areas and UAV perceptions. Focusing on public safety drones will

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[77] Manaugh, Geoff. "Drone Cops Take Flight in Los Angeles." The Atlantic. Atlantic Media Company, June 8, 2018. https://www.theatlantic.com/technology/archive/2018/06/drone-cops-take-flight-in-los-angeles/562214/.

allow me to investigate their uses more deeply without widening the scope of the research. This expanded search will also provide a mechanism for exploring the many philosophical considerations that arise when public safety agencies use drones.

As an increasing number of public safety agencies are deploying drones, either alongside or instead of law enforcement officers, many philosophical questions come up that challenge our understanding of privacy and policing. My findings on the Internet of Things (IoT), for example, asks more questions on drone usages than it answers: what does privacy mean for citizens living in large cities that have an IoT system? How is the notion of policing modified if continuous surveillance is one of their main methods? Is society prepared to lose its freedom from state bulk data collection if it leads to a reduction in harm? These real applications open up other important theoretical questions, and future research should examine each set given the advent of the digitalization of policing. Moreover, the homogenization and militarization of the police changes the relationship between citizens and public safety agencies and has the potential to reshape public perceptions of justice. Is society ready to allow the proliferation of predictive policing programs based on the bulk collection of data from drone surveillance? While law enforcement officer safety is a priority, should drones become the first method of contact between citizens during emergencies? Questions such as these deserve to be more thoroughly investigated in future research and supported by an expanded search methodology.

Conclusions and Recommendations

The absence of scholarly consensus on how drones are most often used leaves an enormous area for future research and investigations to explore. My cursory examination of the extent to which drones are used by public safety agencies reveal four main categories of uses: supplementing data within the Internet of Things, aiding in crisis situations and management, as

an extension of state violence, and a means to mitigate and fight the spread of the COVID-19 virus. These four uses are all seen within Southern Californian public safety agencies, with certain uses being favored over others. These varying uses illustrate the need for the creation of federal guidelines, to comprehensively establish proper protocols and procedures for the deployment of drones in domestic airspaces. As shown above, while there are many benefits to the widespread use of UAV technology, there are also many theoretical considerations for the public to aware of. The strength and power of these systems rely on the tacit agreement of the general public; there can be no massive surveillance mechanism without the willing participation of citizens to be surveilled. Public safety agencies operating without oversight may not be able to resist the temptation to misuse this technology, and may allow certain homogenizing effects to creep in. Public safety agencies rely on the public's apathy as their main strategy to increase their state power, and more emphasis should be placed on informing society of their surveillance practices.

This emphasis on accessible information also contributes to the need for federal requirements to disclose the flight logs and justifications of their deployment by public safety agencies. Currently, the only incentivizing factor for agencies to release such information is public opinion. In Los Angeles, for example, public protests against UAVs led to the creation of strict guidelines and a yearly date to release information associated with flights. The federal government should create legislation to compel public safety agencies to release their data on when drones were deployed, why, their flight paths, and the duration of the flight. This information will allow citizens to decide whether or not the justifications are valid, and if they would like their local governments to further restrict their uses.

The continuing occurrence of unprecedented national events have led to new uses of UAV technology, where public safety agencies are trying creative new methods to manage situations as they arise. The literature covered in my systematic review should be considered a starting point rather than holistic understanding, given how limited my scope was for investigation. These four foundational uses will only increase in the future as the world becomes more reliant on digitalization and data, leaving us with one question: do we, as a society, believe the benefits of drones and algorithmic policing to outweigh the theoretical costs?

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