

**PROPOSED RULES TO DETERMINE THE LEGAL USE OF
AUTONOMOUS AND SEMI-AUTONOMOUS PLATFORMS IN
DOMESTIC U.S. LAW ENFORCEMENT**

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We need some rules. “Or there will be . . . trouble.”¹

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¹ ROBOCOP (Orion Pictures 1987).

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I. INTRODUCTION

On July 7, 2016, the Dallas Police Department affixed a pound of C4 plastic explosive to a remotely-controlled bomb disposal robot and rolled it into a parking garage that held a barricaded gunman, Micah X. Johnson.² A little over two hours earlier, Johnson engaged the Dallas police in a 45-minute gun battle in which he killed five

² See Manny Fernandez, Richard Pérez-Peña & Jonah Engel Bromwich, *Five Dallas Officers Were Killed as Payback, Police Chief Says*, N.Y. TIMES (July 8, 2016), <https://www.nytimes.com/2016/07/09/us/dallas-police-shooting.html> (describing the events of the shootings).

officers and wounded nine others, including two civilians.³ Shortly after the robot entered the garage, the Dallas Police detonated the C4, killing Johnson. In doing so, the Dallas police ushered in a new age in police use of lethal force in American law enforcement.⁴

Over the last decade, the United States has increasingly used drones in its “war on terror.”⁵ Media, legal and academic scholars, and novelists have extensively analyzed the use of these devices in this context, which has made the drone the quintessential symbol of 21st century warfare.⁶

However, less has been written about American domestic law enforcement’s use of similar technology.⁷ Yet a brief survey of

³ *Id.*

⁴ See generally Melissa Hamilton, *Excessive Lethal Force*, 111 NW. U. L. REV. 155 (2017) [hereinafter Hamilton, *Excessive Lethal Force*] (providing legal analysis on the use of police force in the Dallas shooting).

⁵ See generally WILLIAM M. ARKIN, UNMANNED: DRONES, DATA, AND THE ILLUSION OF PERFECT WARFARE 147–75 (Little, Brown and Co., 1st ed. 2015) (providing an overview of U.S. drone use in the “war” against terror); AVERY PLAW, MATTHEW S. FRICKER & CARLOS R. COLON, THE DRONE DEBATE: A PRIMER ON THE U.S. USE OF UNMANNED AIRCRAFT OUTSIDE CONVENTIONAL BATTLEFIELDS 13-63 (2016); P.W. SINGER, WIRED FOR WAR: THE ROBOTICS REVOLUTION AND CONFLICT IN THE 21ST CENTURY, 19–41 (1st ed. 2009); Laurie R. Blank, *After “Top Gun”: How Drone Strikes Impact the Law of War*, 33 U. PA. J. INT’L L. 675 (2012); Henry H. Perritt, Jr. & Eliot O. Sprague, *Drones*, 17 VAND. J. ENT. & TECH. L. 673 (2015).

⁶ See *supra* note 5.

⁷ That is not to say that it has not been written about. See generally Alexandra A. Breshears, *Use of Armed Drones by Domestic Law Enforcement: Presence and the Fourth Reasonableness Factor*, 33 T.M. COOLEY L. REV. 183 (2016); Eric Brumfield, *Armed Drones for Law Enforcement: Why It Might Be Time to Re-Examine the Current Use of Force Standard*, 46 MCGEORGE L. REV. 543 (2014); Hamilton, *Excessive Lethal Force*, *supra* note 4; Melissa Hamilton, *Police Robots and the Law*, 31 NO. 1 WESTLAW JOURNAL WHITE-COLLAR CRIME 1, 4 (2016) [hereinafter Hamilton, *Police Robots and the Law*]; Chris Jenks, *State Labs of Federalism and Law Enforcement “Drone” Use*, 72 WASH. & LEE L. REV. 1389 (2015); Elizabeth E. Joh, *Policing Police Robots*, 64 UCLA L. REV. DISCOURSE 516 (2016); Gregory S. McNeal, *Drones and the Future of Aerial Surveillance*, 84 GEO. WASH. L. REV. 354 (2016) [hereinafter McNeal, *Drones and the Future of Aerial Surveillance*]; Melanie Reid, *Rethinking the Fourth Amendment in the Age of Supercomputers, Artificial Intelligence, and Robots*, 119 W. VA. L. REV. 863 (2017).

media reports and internet searches using the term “[insert municipality police department] drone use” reveals that many U.S. law enforcement agencies incorporate or are considering incorporating semi-autonomous “drones” or “robots” into their daily operations.⁸ As of April 2017, the Center for the Study of the Drone at Bard College in New York noted that “at least 347 state and local

⁸ See Jonathan Bullington, *New Orleans Police Considering Drones, Transit Hub Changes, in Wake of Weekend Violence*, NOLA.COM (Dec. 1, 2015, 6:34 PM), http://www.nola.com/crime/index.ssf/2015/12/new_orleans_police_drones_buse.html (describing that the New Orleans Police Department is “testing the use of drones to aid in crime-scene investigations”); Benny Evangelista, *Fire, Police Drones Caught Between Saving Lives, Guarding Rights*, S.F. CHRON. (May 11, 2017, 6:00 AM), <http://www.sfchronicle.com/business/article/Fire-police-drones-caught-between-saving-lives-11137289.php> (reporting on public safety including police use of drones in the San Francisco Bay area); Jerry Iannelli, *Miami Beach Police Department Buys Two Drones for \$17,000*, MIAMI NEW TIMES (Mar. 27, 2017, 8:00 AM), <http://www.miaminewtimes.com/news/miami-beach-police-department-buys-two-drones-for-17000-9228675> (reporting on the Miami Beach Police Department’s recent purchase of two drones, in addition to the “military-grade” one it already had purchased in 2010); Kate Mather, *LAPD Becomes Nation’s Largest Police Department to Test Drones after Oversight Panel Signs off on Controversial Program*, L.A. TIMES (Oct. 17, 2017, 9:05 PM), <http://beta.latimes.com/local/lanow/la-me-ln-lapd-drones-20171017-story.html> (reporting on the LAPD’s decision to field a police drone no later than December 2017); Tina Moore, *NYPD Considering Using Drones and Gunshot Detectors to Fight Crime*, N.Y. DAILY NEWS (May 20, 2014, 11:54 PM), <http://www.nydailynews.com/new-york/nyc-crime/nypd-drones-fight-crime-article-1.1799980> (reporting on the NYPD’s consideration of employing drones); Jan Ransom, *Privacy Advocates Take Issue with Police Drone Use*, BOSTON GLOBE (Sep. 25, 2017), <https://www.bostonglobe.com/metro/2017/09/25/boston-police-purchasing-drones/SAiDIIMIJT4DHaDkBMjHML/story.html> (reporting on the Boston Police Department’s recent purchase of drones); Leif Reigstad, *It’s Official: HPD is Looking Into Using Drones*, HOUSTONPRESS.COM (Mar. 11, 2016, 6:00 AM), <https://www.houstonpress.com/news/its-official-hpd-is-looking-into-using-drones-8232801> (reporting on the Houston Police Department’s research into using drones for law enforcement); Lisa Roose-Church, *Michigan State Police Shows How It Will Use Drone*, DET. FREE PRESS (Mar. 12, 2015, 2:22 PM), <http://www.freep.com/story/news/local/michigan/2015/03/12/michigan-state-police-drone/70214866/> (reporting on the Michigan State Police’s press demonstration on how it intends to use an Unmanned Aircraft System, an Aeryon SkyRanger, for police work in Michigan).

police, sheriff, fire, and emergency units [in the United States] have acquired drones”⁹

The use of drone technology in the domestic law enforcement context brings with it legal issues and challenges equally as complex as the military’s use of drones.¹⁰ I argue that the domestic use of drones in the law enforcement context brings significantly more complex legal issues than the use of expeditionary defense drones because of the enhanced Constitutional protections people in the United States enjoy.¹¹

The trend towards American police militarization,¹² alongside the increasing autonomy¹³ of unmanned systems complicate this issue. Yet it is foreseeable that American domestic law enforcement

⁹ Dan Gettinger, *Public Safety Drones*, CTR. FOR THE STUDY OF THE DRONE (Apr. 2017), <http://dronecenter.bard.edu/public-safety-drones/>.

¹⁰ See RICHARD M. THOMPSON II, CONG. RESEARCH SERV., R42701, DRONES IN DOMESTIC SURVEILLANCE OPERATIONS: FOURTH AMENDMENT IMPLICATIONS AND LEGISLATIVE RESPONSES (2013), <https://fas.org/sgp/crs/natsec/R42701.pdf>; Brumfield, *supra* note 7, at 556–65 (analyzing the Fourth Amendment (seizure) and its application in law enforcement’s use of drones); Jenks, *supra* note 7, at 1403–24 (analyzing the application of the Fourth Amendment to law enforcement drone use); Gregory McNeal, *Drones and Aerial Surveillance: Considerations for Legislatures*, BROOKINGS (Nov. 2014), <https://www.brookings.edu/research/drones-and-aerial-surveillance-considerations-for-legislatures/> [hereinafter McNeal, *Drones and Aerial Surveillance: Considerations for Legislatures*] (discussing the Fourth Amendment (search) legal implications of law enforcement drone use); Reid, *supra* note 7, at 872–74, 887 (discussing the Fourth Amendment’s application to robotic policing).

¹¹ See *supra* note 10.

¹² See RADLEY BALKO, RISE OF THE WARRIOR COP: THE MILITARIZATION OF AMERICA’S POLICE FORCES (2013); Dan Gettinger & Arthur Holland Michel, *Law Enforcement Robots Data Sheet*, CTR. FOR THE STUDY OF THE DRONE (2016) <http://dronecenter.bard.edu/law-enforcement-robots-datasheet/> (noting “[t]he rate of transfers [of drones] to law enforcement agencies has increased from less than 10 transfers each year prior to 2010 to over 200 transfers so far in 2016”); Mark Nevitt, *Why Are We Giving U.S. Police Departments Bayonets?*, JUST SECURITY (Aug. 31, 2017), <https://www.justsecurity.org/44588/giving-u-s-police-departments-bayonets/>.

¹³ See Capt. Brent D. Sadler, USN, *AI Goes to War!*, 142 U.S. NAVAL INST. PROC., Dec. 2016, at 43–47.

will continue to increase its use of semi- and inevitably¹⁴ fully autonomous devices to execute its mission of public safety and security. This increased use generally—and with specific regard to more autonomous systems driven by advancements in artificial intelligence (“AI”)¹⁵—brings with it significant risks without the development of widely accepted best practices or guidelines that would optimally help illuminate where, when, and how civilian law enforcement agencies can best employ these tools while addressing the risks to individual rights under the law.

Legal scholars have concluded that existing Fourth Amendment case law likely provides sufficient protections with regard to American domestic law enforcement’s use of unmanned aerial systems (UAS) for what could fairly be characterized as “search” activities, with but minor adjustments to account for (1) true exigencies and (2) eventually fully autonomous UAS’ potential greater on-scene time, as compared to manned aviation systems.¹⁶ I concur with that analysis and will not travel too far down that relatively well-trod ground in this paper.

With regard to the use of force by police robots, I believe that a scheme which generally creates an inverse relationship between autonomy and lethality, with a special focus on rapidly developing non-lethal-use-of-force technology,¹⁷ could provide a strong

¹⁴ See, e.g., SINGER, *supra* note 5, at 123–24 (describing the increasing capabilities of autonomous robots).

¹⁵ Scott Rosenberg, *Why AI is Still Waiting for Its Ethics Transplant*, WIRED (Nov. 1, 2017, 6:45 AM), <https://www.wired.com/story/why-ai-is-still-waiting-for-its-ethics-transplant/> (interviewing Kate Crawford, co-founder of the AI Now Institute and discussing Ms. Crawford’s perception that current standards of AI ethics are wanting).

¹⁶ See Jenks, *supra* note 7; see also McNeal, *Drones and Aerial Surveillance: Considerations for Legislatures*, *supra* note 10, at 4.

¹⁷ See SINGER, *supra* note 5, at 83 (“Many believe that if a robot is going to have a weapon, it should be a nonlethal one.”). *But see* RONALD C. ARKIN, GOVERNING LETHAL BEHAVIOR IN AUTONOMOUS ROBOTS 71 (Chapman & Hall 2009) [hereinafter ARKIN, GOVERNING LETHAL BEHAVIOR] (“The application of nonlethal weaponry—for example, Tasers, sting-nets, foaming agents . . . can also potentially lead to unintentional lethality. They are sometimes referred to as less-lethal weapons, rather than nonlethal, for that reason.”). See generally NON-LETHAL WEAPONS PROGRAM, DEP’T OF DEF., <http://jnlwp.defense.gov> (last

foundation for an analytical paradigm which would successfully balance the capabilities that semi- and fully autonomous devices provide law enforcement with the importance of protecting important fundamental individual rights. Further, I believe that applying a strict civil liability standard for lethal use of force errors committed by autonomous law enforcement devices may help mitigate public concerns regarding appropriate accountability for their use.¹⁸

This article focuses on the seizure or arrest aspect of domestic law enforcement. Most of the analysis center on how domestic law enforcement agencies can optimally leverage the many benefits of semi-autonomous and fully autonomous devices to better execute their mission of public safety and security while managing the risks when these devices inevitably employ force up to and including deadly force.

Part I provides a general overview of the U.S. military's history in employing unmanned systems in the "war on terror." Part II frames the terms "robot" and "autonomy," and sketches out the pros and cons of law enforcement's use of robots later in the paper. It starts by focusing on issues involving law enforcement patrols, continues by defining and distinguishing between joint and independent patrols, characterizes three different modes of employing robots—remotely, semi-autonomously, and fully autonomously—and concludes by establishing the difference between tactical police patrols and operational-level patrols. Part III surveys the existing legal and policy landscape currently applicable when analyzing U.S. law enforcement's use of remotely-operated, semi-autonomous, and more fully autonomous devices. It starts with

visited Nov. 24, 2017) (providing a homepage for the Department of Defense's joint non-lethal weapons program).

¹⁸ See GABRIEL HALLEVY, *WHEN ROBOTS KILL: ARTIFICIAL INTELLIGENCE UNDER CRIMINAL LAW* 104–19 (Northeastern Univ. Press 2013); ALEX CAMPOLO, MADELYN SANFILIPPO, MEREDITH WHITTAKER & KATE CRAWFORD, *AI NOW 2017 REPORT* (2017), https://assets.contentful.com/8wprhhvnpfc0/1A9c3ZTCZa2KEYM64Wsc2a/8636557c5fb14f2b74b2be64c3ce0c78/_AI_Now_Institute_2017_Report_.pdf (calling for strong oversight and accountability mechanisms in fielding AI for a wide range of civil purposes).

a discussion of constitutional standards of search and seizure, and, with specific regard to the use of force, discusses how and to what extent U.S. law marries up to international human rights law on the subject, while also providing an overview of available domestic policy guidance on law enforcement use of “drones.” Part IV analyzes the pros and cons of law enforcement use of remotely-operated, semi-autonomous and more fully autonomous devices. Part V includes my recommendations using the framework in Part II and law and policy in Part III to address the issues identified and described in Part IV.

II. THE U.S. MILITARY’S USE OF REMOTELY-OPERATED WEAPONS IN THE “WAR ON TERROR.”

Al Qaeda’s terror attacks against America on September 11, 2001,¹⁹ ushered in an era of deployed U.S. military forces that continues on through today and will likely proceed into the foreseeable future with American armed forces conducting operations and fighting in Afghanistan, Iraq, Syria, Somalia, Libya, Yemen,²⁰ and throughout the African continent.²¹ There have been many military developments during this extended fight, but none are as emblematic as America’s use of what may be labeled as

¹⁹ See THE 9/11 COMMISSION REP., NAT’L COMMISSION ON TERRORIST ATTACKS UPON THE U.S. (2004) [hereinafter 9/11 Comm’n], <https://govinfo.library.unt.edu/911/report/911Report.pdf>.

²⁰ See THE WHITE HOUSE, REPORT ON THE LEGAL AND POLICY FRAMEWORKS GUIDING THE UNITED STATES’ USE OF MILITARY FORCE AND RELATED NATIONAL SECURITY OPERATIONS 6–10 (2016) (providing the domestic and international legal support for continued U.S. military operations in certain locations overseas).

²¹ See Dionne Searcey & Eric Schmitt, *In Niger, Where U.S. Troops Died, a Lawless and Shifting Landscape*, N.Y. TIMES (Oct. 29, 2017), <https://www.nytimes.com/2017/10/29/world/africa/niger-ambush-isis.html> (reporting on a battle involving U.S. special forces that resulted in the deaths of four U.S. Army members and noting that there were 800 U.S. service members in Niger and approximately 6,000 spread throughout the African continent).

automated warfighting systems (AWS) and specifically armed UAS, more commonly referred to as “drones.”²²

There are many reasons why America became “wired” in its war against terror, and, looking back, it is relatively easy to see how this occurred.²³ AWS—and especially UAS—are the rare force multiplier in that they help battlefield commanders stake out and maintain the literal high ground.²⁴ Specifically, they increase capacity and capabilities in areas critical to warfighting such as battlefield awareness, surveillance, and reconnaissance.²⁵

Non-human war machines are superior to humans in many respects. They are inexpensive compared to both their manned counterparts and individual human soldiers in that they do not need to be trained, fed, housed, or paid.²⁶ Further, they are not limited by physical, psychological, or other constraints²⁷ in that “[t]hey don’t

²² See ARKIN, UNMANNED, *supra* note 5; PLAW ET AL., *supra* note 5, at 13; SINGER, *supra* note 5, at 19–41; Blank, *supra* note 5, at 675; Perritt Jr. & Sprague, *supra* note 5.

²³ See PLAW ET AL., *supra* note 5, at 18; SINGER, *supra* note 5, at 215–24; Luke Dormehl, *How Did We Get Here? 9 Major Milestones in the History of Killer Robots*, DIGITAL TRENDS (Nov. 21, 2017, 3:00 AM), <https://www.digitaltrends.com/cool-tech/history-of-killer-robots/>.

²⁴ See *Drones: What Are They and How Do They Work?*, BBC NEWS (Jan. 31, 2012), <http://www.bbc.com/news/world-south-asia-10713898> (“[Drones] provide troops with a 24-hour ‘eye in the sky’, seven days a week. Each aircraft can stay aloft for up to 17 hours at a time, loitering over an area and sending back real-time imagery of activities on the ground.”).

²⁵ See PLAW ET AL., *supra* note 5, at 14–20.

²⁶ See Amitai Etzioni & Oren Etzioni, *Pros and Cons of Autonomous Weapons Systems*, MILITARY REVIEW, <http://www.armyupress.army.mil/Journals/Military-Review/English-Edition-Archives/May-June-2017/Pros-and-Cons-of-Autonomous-Weapons-Systems/> (last visited Nov. 12, 2017); Luis Martinez, *Pentagon: Fewer Soldiers, More Drones Will Save Money*, ABC NEWS (Jan. 26, 2012), <http://abcnews.go.com/Blotter/pentagon-fewer-soldiers-drones-save-money/story?id=15448631>; Wayne McLean, *Drones are Cheap, Soldiers are Not: A Cost-Benefit Analysis of War*, THE CONVERSATION (June 25, 2014, 11:26 PM), <https://theconversation.com/drones-are-cheap-soldiers-are-not-a-cost-benefit-analysis-of-war-27924>.

²⁷ See SINGER, *supra* note 5, at 63–64. *But see* Luke Dormehl, *Watch NASA’s A.I. Race a Pro Drone Pilot—You’ll Never Guess Who Wins*, DIGITAL TRENDS (Nov. 22, 2017, 2:04 PM), <https://www.digitaltrends.com/cool-tech/nasa-drone->

get hungry They're not afraid. They don't forget their orders. They don't care if the guy next to them has just been shot[,]”²⁸ and the commander of an AWS need not write a letter home to a loved one if it is damaged or falls on the field.²⁹ And as we have learned, one can mount weapons on them³⁰ in the hopes that they or their operators can employ those weapons with machine-like precision.³¹

The U.S. military has fielded a wide variety of stationary, mobile, and flight-capable, remotely-operated, semi-autonomous, and fully autonomous armed and unarmed devices.³² Remotely-piloted or autonomous devices of varying degree patrol the battlefield with human partners, clear explosives, conduct high-risk entries into opposed locations, provide military leaders and “boots

racing/ (reporting that a human drone piloted defeated an A.I. driven drone in a series of races, where “humanity came out of the competition as messier but more creative, whereas the A.I.-powered bot exhibited machine-like precision and consistency”).

²⁸ SINGER, *supra* note 5, at 63.

²⁹ Peter Singer, *Military Robots and the Future of War*, TED, https://www.ted.com/talks/pw_singer_on_robots_of_war/details (last visited Nov. 22, 2017) [hereinafter Singer, TED Talk].

³⁰ See ARKIN, GOVERNING LETHAL BEHAVIOR, *supra* note 17, at 78–79 (describing the rush to determine the practical and legal feasibility of arming Predator drones, in the specific context of the hunt for Osama bin Laden); PLAW ET AL., *supra* note 5, at 20, 23–25 (describing the arming the Predator and “[t]he Coming of the Reaper”); SINGER, *supra* note 5, at 34, 211 (describing that “[t]he idea then arose to arm the drone by mounting laser-guided Hellfire missiles on the wings” and noting that “[w]ith Predator, it was almost, ‘Hey we got this thing, let’s arm it’”).

³¹ See PLAW ET AL., *supra* note 5, at 47–48 (providing a table that captures data from multiple sources describing the ratio of militants to civilian drone strike casualties and noting a clearly diminishing trend of civilian casualties as U.S. drone use continued); SINGER, *supra* note 5, at 31 (noting that when describing the arming configuration of a land-based robot, “[t]he weapon . . . isn’t cradled in the soldier’s arms, moving slightly with each breath or heartbeat. Instead it is locked into a stable platform . . . [thereby] eliminating the majority of shooting errors” one can expect with a human shooter) (internal quotation omitted); Blank, *supra* note 5, at 687, 693.

³² E.g., ARKIN, GOVERNING LETHAL BEHAVIOR, *supra* note 17, at 10–25 (providing an order of robotic battle).

on the ground” increased situational awareness, and, in some cases, identify and neutralize threats.³³

It is reasonable to presume that the manufacturers of these devices would no doubt attest that all of these missions translate neatly into the context of domestic law enforcement.³⁴ As I previously noted, much has been written about the United States military’s use of AWS, specifically drones, in fighting the war on terror.³⁵ Further analysis of this issue exceeds the scope of this paper. However, it has become increasingly apparent that the use of these devices has changed warfare forever.³⁶

III. SCOPING LAW ENFORCEMENT ISSUES INVOLVING “ROBOTS” AND “AUTONOMY.”

This is not a technical paper, and instead makes several assumptions to avoid getting bogged down in programming jargon

³³ *Id.*

³⁴ See Kristin Bergtora Sandvik, *The Political and Moral Economies of Dual Technology Transfers: Arming Police Drones*, in *DRONES AND UNMANNED AERIAL SYSTEMS* 46, 56–58 (Ales Zavrsnik ed., Springer Int’l Pub. 2016).

³⁵ See ARKIN, *UNMANNED*, *supra* note 5, at 147–75; *DRONES AND UNMANNED AERIAL SYSTEMS* (Ales Zavrsnik ed., Springer Int’l Pub. 2016); PLAW ET AL., *supra* note 5, at 13–63; SINGER, *supra* note 5, at 19–41; Blank, *supra* note 5; Peritt Jr. & Sprague, *supra* note 5; Michael N. Schmitt, *Extraterritorial Lethal Targeting: Deconstructing the Logic of International Law*, 52 *COLUM. J. TRANSNAT’L L.* 77 (2013).

³⁶ *E.g.*, PLAW ET AL., *supra* note 5, at 287–98 (“Virtually all analysts believe that the global spread of both unarmed and armed UAVs will only expand exponentially in the years to come.”) (quoting D. M. Gormley, a senior lecturer in military affairs at the University of Pittsburgh’s Graduate School of Public and International Affairs); SINGER, *supra* note 5, at 37 (“[B]y 2008, there were 5331 drones in the U.S. military’s inventory, almost double the amount of manned planes . . . [and that] given the growth trends, it is not unreasonable to postulate future conflicts involving tens of thousands.”); Anthony Dworkin, *Drones and Targeted Killing: Defining A European Position*, 84 *EUR. COUNCIL ON FOREIGN REL.* 2–10 (2013) (“Armed drones or unmanned aerial vehicles (UAVs) are now the United States’ weapons platform of choice in its military campaign against the dispersed terrorist networks of al-Qaeda . . . [because] [t]hey offer an unprecedented ability to track and kill individuals with great precision, without any risk to the lives of the forces that use them, and a much lower cost than traditional manned aircraft.”).

such as “representational choices” and the advantages or disadvantages of “if/then” programming as compared to “while” statements.³⁷ Instead, this paper presumes a near-future state where sensor, computing, and mobility technology have reached a level of sophistication where a robot’s ability to “sense-think-act” is near equal to that of its human counterparts.³⁸ Given this assumption, there are several foreseeable means in which law enforcement could employ robots of varying complexity and capability.

U.S. law enforcement already uses specialized robots for activities like bomb disposal³⁹ and high-risk entry.⁴⁰ But I believe the future of robotic policing in the United States lies in what I will loosely label as “patrol.”⁴¹ Patrol largely entails police presence

³⁷ See generally ARKIN, GOVERNING LETHAL BEHAVIOR, *supra* note 17 (outlining the issues, challenges, and opportunities for programming lethal autonomy in battlefield robots).

³⁸ SINGER, *supra* note 5, at 67; see also Alan L. Schuller, *At the Crossroads of Control: The Intersection of Artificial Intelligence in Autonomous Weapon Systems with International Humanitarian Law*, 8 HARV. NAT’L SEC. J. 379, 392–97 (2017) [hereinafter Schuller, *Crossroads*] (describing this ability as “Observe, Orient, Decide, Act” and detailing each phase).

³⁹ See Michael Wilson, *How the Bomb Squad Disabled a Second Explosive in the Chelsea Bombing*, N.Y. TIMES (Oct. 5, 2017), <https://www.nytimes.com/2017/10/05/nyregion/chelsea-bombing-trial.html>.

⁴⁰ E.g., E.B. Boyd, *Is Police Use of Force About to Get Worse—With Robots?*, POLITICO MAG. (Sept. 22, 2016), <http://www.politico.com/magazine/story/2016/09/police-robots-ethics-debate-214273> (“Early Monday morning, FBI agents and New Jersey police officers used a bomb-squad robot to try to defuse the makeshift bombs found near a train station in Elizabeth. (The explosives ended up detonating after police used the machine to try to cut a wire.) Earlier this month, sheriff’s deputies from Los Angeles used a robot to disarm a violent suspect who had barricaded himself inside a berm in a Southern California desert. And last Friday, another robot was used to force doors open as police searched for a gunman hiding out in an Amtrak train.”).

⁴¹ See JOHN P. CRANK, UNDERSTANDING POLICE CULTURE 45 (2d ed., Routledge 2015) (noting “[t]he contemporary practice of police patrol, called random preventive patrol, is based on a philosophy of geographic crime deterrence” and stating that these patrols, “whose effectiveness is unquestioned in most police organizations” are anything but random and allow police officers “many opportunities for proactive police work”); DICTIONARY OF POLICING 188 (Tim Newburn & Peter Neyroud eds. 2008) (defining patrol and noting that “[t]hrough patrol duties the police perform a number of broad functions, including

within a specified area to both deter crime and shorten response time in the event crime occurs.⁴² Furthermore, when discussing patrol robots in the context of domestic law enforcement, it will be useful to further separate their use into several separate interrelated categories.

A. Independent v. joint patrols.

The first category distinguishes between an independent patrol as opposed to a joint patrol. In this paper, an independent patrol will refer to a patrol profile where a robot, remotely-operated or autonomous, operates alone. Conversely, a joint patrol will refer to a patrol profile where a robot may operate with a human “partner” or partners.⁴³ Further, independent patrols may become joint patrols and vice versa depending upon many factors such as the standard procedures of the agency in question, the technology available, and the facts on the ground of the real-time situation involved.⁴⁴ Additionally, there is a distinction between an independent patrol and a police unit responding to a specific incident.

the prevention and detection of criminal behavior (sic), the management of public order problems and traffic occurrences, and the provision of assistance to the public”).

⁴² See CRANK, *supra* note 41, at 43–50.

⁴³ See SINGER, *supra* note 5, at 132–34 (describing that the likely future first phase of integrating robots into military and police operations will involve partnering between humans and robots: “One example . . . is the through-the-door procedure often used by police and soldiers to enter an urban dwelling . . . [where] one kicks in the door then pulls back so another can enter low and move left, followed by an another who enters high and moves right, etc. . . . [T]he team will consist of robot platforms working with one or more human teammates as a cohesive unit.”).

⁴⁴ See *id.* at 134 (noting that one expert, David Bruemmer at the Idaho National Lab, believes that “[o]ver time . . . robots will have ‘dynamic autonomy’ built in, where the amount of ‘leash’ the robots are given is determined less by any ideal of keeping humans ‘in the loop’ and more by their human teammate’s experience and trust level . . . Trust [in this context refers to] having a proper sense of what the other is capable of, as well as being correct in your expectations of what the other will do.”).

B. *Levels of autonomy.*

Here, I break down robots into three categories: (1) remotely-operated; (2) semi-autonomous; and (3) fully autonomous. The first two categories have a human being well-established “in the loop.”⁴⁵ It is important to separate these levels because as this technology begins to take hold and proliferate within domestic U.S. law enforcement, there should be a generally inverse relationship between autonomy and lethality.

A remotely-operated robot has a human operator that controls the device. Its sensors feed information to the operator, and the operator takes the information from the sensors, maneuvers the device, and uses whatever tools with which the device is equipped, to interact with the operating environment. To large extent, a remotely-operated robot has a human not just “in the loop,” but that human is deciding how fast to draw the loop, how big the loop is, if the loop should have a color and what that color should be.

A semi-autonomous robot has a human controller, but the responsibilities for operating the device are shared between the human and the robot’s onboard computer.⁴⁶ For the purposes of this paper, the real decision point between who should act, the robot or the human, turns at the point where armed force would be employed.⁴⁷ For example, consider a human patrol officer arriving on the scene of a domestic violence call and deploying a small, unmanned aviation system from the trunk of her vehicle. Upon launch, the UAS establishes a real-time video link with an officer

⁴⁵ See *id.* at 123–24 (describing the go-to phrase to capture the idea that humans maintain control over certain robotic operations, but most specifically, the employment of force and referring to the “observe, orient, decide, act (OODA)” loop that is used as model to analyze action).

⁴⁶ See CAPTAIN ANDREW NORRIS, LEGAL ISSUES RELATING TO UNMANNED MARITIME SYSTEMS MONOGRAPH, U.S. NAVAL WAR C. R. 13, 14 (2013); Michael N. Schmitt & Jeffrey S. Thurnher, “*Out of the Loop*”: *Autonomous Weapon Systems and the Law of Armed Conflict*, 4 HARV. NAT’L SEC. J. 231, 236 (2013); Kenneth Anderson & Matthew Waxman, *Debating Autonomous Weapon Systems, Their Ethics, and Their Regulation Under International Law*, in OXFORD HANDBOOK ON LAW, REGULATION, AND TECHNOLOGY 1100-1103 (Oxford Univ. Press 2017).

⁴⁷ See Schmitt & Thurnher, *supra* note 46, at 234–36.

back at the station house, who can monitor the scene and has the ability to deploy any additional tools aboard the UAS. But the UAS is “smart” enough to always fly at the optimal distance from its human partner without any input from the remotely sited human operator.⁴⁸ Additionally, this category includes a drone operated by its human partner on scene.

As for the third category, there are varying degrees of “fully autonomous” which essentially turn on whether the computer processor can “learn” from interacting with its environment⁴⁹ or merely just react to sensor stimulus.⁵⁰ This is overlaid by the extent a human being could prevent the robot from taking some sort of action after its deployment and again by programming decisions.⁵¹ Thus, there are gradients of “full autonomy” within the spectrum of categories described above.⁵² When I use the term autonomous, I assume that the devices will be truly fully autonomous in that they will not only be able to react to sensor stimuli, but will be able to adjust their initial and potential future reactions based on that changing stimuli and without human input, take action in a timeframe in which it is meaningful for the device to do so.⁵³

⁴⁸ See Michael Horowitz, *The Ethics and Morality of Robotic Warfare*, 145 DAEDALUS 25, n.18 (2016) (noting that the U.S. Navy’s prototype X-47B can take off and land on its own).

⁴⁹ See Zoe Bernard, *So, What Is Machine Learning Anyways? Here’s a Quick Breakdown*, BUS. INSIDER (Nov. 23, 2017, 12:00 PM), <http://www.businessinsider.com/what-is-machine-learning-quick-explainer-2017-11>; Cade Metz, *Building A.I. That Can Build A.I.*, N.Y. TIMES (Nov. 5, 2017), <https://www.nytimes.com/2017/11/05/technology/machine-learning-artificial-intelligence-ai.html> (“Neural networks are rapidly accelerating the development of A.I. Rather than building an image-recognition service or a language translation app by hand, one line of code at a time, engineers can much more quickly build an algorithm that learns tasks on its own.”); Cade Metz, *Finally, Neural Networks That Actually Work*, WIRED (Apr. 21, 2015, 5:45 AM), <https://www.wired.com/2015/04/jeff-dean/>.

⁵⁰ See Sadler, *supra* note 13, at 45; Schuller, *supra* note 38, at 390–409.

⁵¹ See Schmitt & Thurnher, *supra* note 46, at 234–36; Schuller, *supra* note 38, at 417–20.

⁵² See Anderson & Waxman, *supra* note 46, at 1100–03.

⁵³ *Id.*

C. *Operational*⁵⁴ v. *tactical*⁵⁵ patrol.

Robots do not have the same physical or psychological biological limitations as humans.⁵⁶ They do not get tired or lose focus and are generally limited in their length of operation only by their onboard fuel or power.⁵⁷ This distinction helps bring the difference between operational and tactical policing into contrast.

Military planners have long separated and labeled different levels of warfare.⁵⁸ While police work is not warfare, the labels the military uses to describe a layered approach to analyzing objectives can easily apply in the scope of modern policing and provides a helpful framing tool.

“The operational level . . . links the tactical employment of forces to [meet a] . . . strategic objective.”⁵⁹ Here, that strategic objective is public safety and security. In the law enforcement context, operational level leadership and capabilities should or do inform decision making in “determin[ing] how, when, where, and for what purpose . . . [tactical-level] forces will be employed, to influence [a criminal’s] disposition before [police interaction], to deter . . . [criminal activities], and to assure [the public,] to achieve [public safety and security].”⁶⁰ For example, a domestic law enforcement agency could employ several medium-sized UAS to provide persistent, real-time surveillance of a wide area of responsibility so that police leadership better understand the

⁵⁴ See JOINT PUBLICATION 3-0, JOINT OPERATIONS, JOINT CHIEFS OF STAFF (Jan. 17, 2017), http://www.jcs.mil/Portals/36/Documents/Doctrine/pubs/jp3_0_20170117.pdf; Robert Bateman, *Understanding Military Strategy and the Four Levels of War*, ESQUIRE (Nov. 25, 2015), <http://www.esquire.com/news-politics/politics/news/a39985/four-levels-of-war/>.

⁵⁵ See JOINT PUBLICATION 3-0, *supra* note 54.

⁵⁶ See *supra* notes 26–27.

⁵⁷ SINGER, *supra* note 5, at 88–89 (describing the various novel ways currently being developed to power “robots”).

⁵⁸ See *supra* note 54.

⁵⁹ JOINT PUBLICATION 3-0, *supra* note 54.

⁶⁰ *Id.*; see also Trevor Mogg, *Drones are Helping French Traffic Cops Catch Hundreds of Dangerous Drivers*, DIGITAL TRENDS (Nov. 14, 2017, 11:35 PM), <https://www.digitaltrends.com/cool-tech/drones-help-french-traffic-cops/>.

environment and can more effectively deploy individual patrol forces.⁶¹ Open and transparent operational-level police work theoretically also has a deterrent effect on criminal activity by establishing a sort of wide ranging visible “omnipresence” beyond the scale provided by individual, tactical-level patrols.⁶²

That leads into the idea that operational-level activities differ from tactical activities in terms of scope.⁶³ In short, “[t]actics is the employment, ordered arrangement, and directed action of forces in relation to each other.”⁶⁴ In police work, it is the street cop or the vehicle patrol. Ideally, tactical actions are informed by operational planning, and in turn tactical patrols feed information to the operational level so that they can continuously improve in a never-ending feedback loop.⁶⁵

Operational-level use of robot technology, which at its most basic would cover more ground, brings with it different issues than those in the previous example of the tactical-level patrol officer fielding the UAS from the trunk of her patrol cruiser for back up or support in responding to the domestic violence call.

⁶¹ Peter Finn, *Domestic Use of Aerial Drones by Law Enforcement Likely to Prompt Privacy Debate*, WASH. POST (Jan. 23, 2011, 12:56 AM), <http://www.washingtonpost.com/wp-dyn/content/article/2011/01/22/AR2011012204111.html?sid=ST2011012204147> (noting that “[d]rones raise the prospect of much more pervasive surveillance”) (internal quotations removed); Monte Reel, *Secret Cameras Record Baltimore’s Every Move from Above*, BLOOMBERG (Aug. 23, 2016) <https://www.bloomberg.com/features/2016-baltimore-secret-surveillance/> (describing Baltimore’s practice of employing a small manned aircraft with “wide-angle cameras [capable of capturing] an area roughly 30 square miles and continuously transmitting real-time images to analysts on the ground”).

⁶² John Surico, *Omnipresence Is the Newest NYPD Tactic You’ve Never Heard Of*, VICE (Oct. 20, 2014), https://www.vice.com/en_us/article/vdpq7m/omnipresence-is-the-newest-nypd-tactic-youve-never-heard-of-1020 (noting that omnipresence is the “perfect word” to describe NYPD’s patrol strategy of seemingly being everywhere).

⁶³ See JOINT PUBLICATION 3-0, *supra* note 54.

⁶⁴ *Id.*

⁶⁵ *Id.*

IV. LAW AND POLICY OVERVIEW

This section provides an overview of U.S. constitutional search and seizure law with a brief discussion on how the international standards for the use of force compare to the U.S. standards. It concludes with a discussion of U.S. federal law, regulation, and policy on law enforcement use of drones, along with a survey of U.S. state law on the subject.

A. *Constitutional search requirements.*

I will not dwell on the use of remotely piloted, semi-autonomous, or fully autonomous drones in the context of “operational” level police surveillance. Professor Christopher Jenks of Southern Methodist University’s Dedman School of Law fully analyzed the existing state of the law in his excellent piece *State Labs of Federalism and Law Enforcement “Drone” Use*, published in the Washington and Lee Law Review in the Summer of 2015.⁶⁶ Further, Professor Gregory McNeal of Pepperdine University has also written extensively on the subject.⁶⁷ However, the following is a brief summary of the current state of the law.

A “search” is a quest for evidence of criminal wrongdoing by agents of the government into an area or object in which a person has a reasonable expectation of privacy.⁶⁸ The Fourth Amendment of the Constitution governs searches.⁶⁹ It reads:

[t]he right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath

⁶⁶ Jenks, *supra* note 7, at 1389; *see also* McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 406–08; THOMPSON II, *supra* note 10, at 4–17.

⁶⁷ *See* McNeal, *Drones and Aerial Surveillance, Considerations for Legislatures*, *supra* note 10 (disfavoring strongly the continued use of the warrant requirement for police unmanned aerial surveillance); McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7.

⁶⁸ *E.g.*, Katz v. United States, 389 U.S. 347, 361 (1960) (Harlan, J., concurring) (noting that a Fourth Amendment analysis into search activity requires both a subjective belief that the subject had an expectation of privacy and an objective requirement that the expectation be reasonable).

⁶⁹ *See* U.S. CONST. amend. IV.

or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.⁷⁰

Courts have long held that where people have a reasonable expectation of privacy, searches are only constitutional if they were supported by an appropriately-issued warrant, based on probable cause that evidence of a particular crime is in a particular place, at a particular time.⁷¹ Courts, however, have read in exceptions to the “warrant” requirement to account for “exigencies” or emergencies where there is a threat to life⁷² or the destruction of evidence⁷³ and “plain view” discoveries, where a police officer discovers evidence of a crime where they are in a place they are otherwise lawfully entitled to be.⁷⁴

As American law enforcement agencies became more and more technologically advanced, largely in response to the so-called *warrant-on-drugs*, the Supreme Court expanded this plain view exception by creating an “open view” doctrine that it applied where law enforcement used aircraft and helicopters to look for evidence of illegal drug production.⁷⁵ The Supreme Court found, in a series of cases, that it was not unconstitutional for police to use information regarding illegal activity that they discovered without first obtaining a warrant, while on patrol in an aircraft or helicopter operating within the navigable airspace above a location because the evidence of criminal wrongdoing was in open view of the police in the aircraft or helicopter and that it was not reasonable to have an expectation

⁷⁰ *Id.*

⁷¹ *See Katz*, 389 U.S. at 361.

⁷² *See Brigham City v. Stuart*, 547 U.S. 398, 406–07 (2006); *Payton v. New York*, 445 U.S. 573, 583, 587–88 (1980).

⁷³ *See Kentucky v. King*, 563 U.S. 452, 460 (2011); *Ker v. California*, 374 U.S. 23, 40 (1963).

⁷⁴ *See Coolidge v. New Hampshire*, 403 U.S. 443, 465 (1971) (“It is well established that under certain circumstances the police may seize evidence in plain view without a warrant.”).

⁷⁵ *See BALKO*, *supra* note 12, at 173–74; THOMPSON II, *supra* note 10, at 7–8; McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 373–79 (describing the history of the Supreme Court considering manned aerial surveillance in the law enforcement context by tracing the path from *California v. Ciraolo*, 476 U.S. 207, 213 (1986) to *Dow Chemical Co. v. United States*, 476 U.S. 227, 239 (1986) to *Florida v. Riley*, 488 U.S. 445, 448 (1989)).

of privacy from observation despite the greater vantage point of the police provided by that aircraft.⁷⁶ The Supreme Court reasoned that the enhanced vantage merely provided a vehicle for the police to use their normal means of observing criminal activity from an area they were otherwise authorized to be, but the Court was later unwilling to extend its acceptance of warrantless searches where the police used thermal imagery⁷⁷ or GPS monitoring with a device attached to a vehicle⁷⁸ to acquire evidence of criminality, in part because these methods exceeded human detection capabilities and have the potential to intrude upon places in which people can reasonably expect privacy.

B. Constitutional seizure requirements.

Like police searches in the United States, police use of force, including deadly force, is governed by the Fourth Amendment to the Constitution, because police use of force is a “seizure.”⁷⁹ Deadly force is that force which, based on the circumstances, creates a “substantial risk of death or serious bodily injury.”⁸⁰ “Generally, police officers have the authority to use deadly force, to cause the death of another human being, when their life or the life of another person is jeopardized.”⁸¹ This includes circumstances where police “have probable cause to believe a [fleeing felon] poses a risk to the safety of police officers or the community,”⁸² but that a resort to force must be reasonable under the totality of the circumstances.⁸³

⁷⁶ See *supra* note 75.

⁷⁷ *Kyllo v. United States*, 533 U.S. 27, 40 (2001).

⁷⁸ *United States v. Jones*, 565 U.S. 400, 404–06 (2012).

⁷⁹ See *Tennessee v. Garner*, 471 U.S. 1, 7 (1985); *U.S. v. Mendenhall*, 446 U.S. 544, 553 (1980), *reh’g denied*, 448 U.S. 908 (1980).

⁸⁰ Tim Longo, *Defining Instrumentalities of Deadly Force*, 27 *TOURO L. REV.* 261, 271 (2011).

⁸¹ Michael J. Palmiotto, *Use of Deadly Force*, in *POLICE USE OF FORCE: IMPORTANT ISSUES FACING THE POLICE AND THE COMMUNITIES THEY SERVE* 35 (Michael J. Palmiotto ed., 2016).

⁸² See *id.* at 39.

⁸³ See *Garner*, 471 U.S. at 7–9.

When police use force, that force must be reasonable and this requirement extends to all levels of police use of force.⁸⁴ Further, Courts assess reasonableness through the lens of what a reasonable officer on the scene would do, as opposed to applying a post-hoc standard of reasonableness, and their analysis does not account for the officer's underlying intent or motivation, but is instead focused on the totality of circumstances to which the officer is responding.⁸⁵ In examining the totality of the circumstances, Courts “must embody an allowance for the fact that police officers are often forced to make split-second judgments—in circumstances that are tense, uncertain, and rapidly evolving—about the amount of force that is necessary in a particular situation.”⁸⁶

C. *International legal standards on the use of force.*

The application of international law to domestic U.S. law enforcement activities is a subject with little practical effect outside the realm of academia.⁸⁷ There are many reasons for this. Some are: that as a general proposition, international legal paradigms often lack enforcement mechanisms;⁸⁸ the United States' trend away from strict adherence to international law and treaties and its habit of attaching Reservations, Understandings, and Declarations (RUD) to account for the nuances of the American governmental system;⁸⁹ the tendency of its courts to read international legal obligations

⁸⁴ See *Scott v. Harris*, 550 U.S. 372, 381–84 (2007).

⁸⁵ See *Graham v. Connor*, 490 U.S. 386, 396–97 (1989).

⁸⁶ *Id.*

⁸⁷ See generally Hamilton, *Police Robots and the Law*, *supra* note 7, at 4.

⁸⁸ But see Frederic L. Kirgis, *Enforcing International Law*, AM. SOC'Y INT'L L. (Jan. 22, 1996), <https://www.asil.org/insights/volume/1/issue/1/enforcing-international-law>.

⁸⁹ See Willem van Genugten, *The United States' Reservations to the ICCPR; International Law versus God's Own Constitution*, in *THE ROLE OF THE NATION-STATE IN THE 21ST CENTURY* 35–46 (M. Castermans-Holleman, F. van Hoof & J. Smith eds., 1998) (describing the history of the United States' Reservations to the International Convention on Civil and Political Rights (ICCPR)); M.S., *Why the Sheriff Should Follow the Law*, *ECONOMIST* (May 23, 2014), <https://www.economist.com/blogs/democracyinamerica/2014/05/america-and-international-law>.

narrowly;⁹⁰ its reluctance to be subject to international institutions;⁹¹ Federalism concerns;⁹² and a persistent belief in American exceptionalism in matters that pertain to the application of Constitutional law in domestic affairs.⁹³ Regardless, a quick look at international legal standards for the use of force in domestic law enforcement will provide some helpful context with the analysis of law enforcement use of drones and robots later in the paper.

“The use of force in law enforcement operations is mainly governed by international human rights law . . . [and] [t]he most relevant rights as regards the use of force in law enforcement is the right to life.”⁹⁴ To start, the Supreme Court’s reasonableness standard is objectively a bit more permissive than the applicable international legal standard, which authorizes police use of force

⁹⁰ *E.g.*, *Sale v. Haitian Centers Council Inc.*, 509 U.S. 155, 182 (1993) (interpreting U.S. international obligations regarding the protection of refugees by prohibiting their return to a location where there is danger only being triggered upon their actual arrival into the United States).

⁹¹ See Ben Cardin, *The South China Sea is the Reason the United States Must Ratify UNCLOS*, FOREIGN POL’Y (Jul. 13, 2016, 2:30 PM), <http://foreignpolicy.com/2016/07/13/the-south-china-sea-is-the-reason-the-united-states-must-ratify-unclos/>; Harold Hongju Koh, Dena Adler, Joanna Dafoe, Peter Posada, Conor Dwyer Reynolds & Eugene Rusyn, *Trump’s So-Called Withdrawal from Paris: Far From Over*, JUST SECURITY (June 2, 2017, 8:44 AM), <https://www.justsecurity.org/41612/trumps-so-called-withdrawal-paris/> (describing President Bush’s act of “unsigned” the Rome Statute establishing the International Criminal Court in the context of President Trump’s attempt to withdraw from the Paris climate accords).

⁹² See *Medellin v. Texas*, 552 U.S. 491, 504–07 (2008) (holding that while externally, the United States has international legal obligations to abide by treaties in which it is a party, only self-executing treaties are enforceable as the law of the land within the United States).

⁹³ See generally Garrett Epps, *Constitutional Myth #10: International Law is a Threat to the Constitution*, ATLANTIC (Jul. 28, 2011), <https://www.theatlantic.com/national/archive/2011/07/constitutional-myth-10-international-law-is-a-threat-to-the-constitution/242683/>; van Genugten, *supra* note 89.

⁹⁴ *The Use of Force in Law Enforcement Operations*, INT’L COMMITTEE OF THE RED CROSS (Sep. 23, 2015), <https://www.icrc.org/en/document/use-force-law-enforcement-operations>.

only as a last resort.⁹⁵ Furthermore, international standards, as articulated in the United Nations Code of Conduct for Law Enforcement and the UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials (BPUFF), provide that police may use deadly force in “[s]elf-defence [sic] or defence [sic] of others against the imminent threat of death or serious injury; [to prevent] the perpetration of a particularly serious crime involving grave threat to life; [to arrest] a person presenting a danger of perpetrating such a crime and resisting authority, or prevention of his or her escape.”⁹⁶ While many U.S. law enforcement agencies have use-of-force policies that are substantially similar to the international standards, especially as it pertains to the use of force in self-defense, including the defense of others, there are slight differences that may play out factually between the international standards and what a U.S. court may find as a “reasonable” application of police force.⁹⁷

D. Federal law and policy pertaining to law enforcement “drone” use.

UAS in America are governed federally by the Federal Aviation Administration (“FAA”), but there is no functionally equivalent regulatory agency that governs terrestrial remotely-operated or autonomous devices.⁹⁸ The FAA Modernization and Reform Act of 2012 (“FAA Act”)⁹⁹ included “specific requirements that government agencies must follow in order to operate a drone” in the United States, but was silent on armed drones.¹⁰⁰ After the FAA Act, “[t]he FAA and the Department of Justice [(“DOJ”)] created a Memorandum of Understanding (MOU) to implement a streamlined training and authorization process to enable [state] law enforcement agencies to operate [drones] within the United States safely,

⁹⁵ *Id.*

⁹⁶ *Id.*

⁹⁷ See Brumfield, *supra* note 7, at 567–69.

⁹⁸ See *id.* at 550.

⁹⁹ FAA Modernization and Reform Act of 2012, H.R. 658, 112th Cong. (2012) (enacted).

¹⁰⁰ Brumfield, *supra* note 7, at 550–51.

effectively, and lawfully.”¹⁰¹ “The MOU establishes . . . requirements for a [law enforcement agency] to gain [FAA] authorization to operate a drone”¹⁰² and limits current law enforcement operations to remotely piloted “drones” within sight of their operator, in a “defined incident perimeter (‘DIP’)” at an altitude no higher than 400 feet, during daylight hours only, with no ability to pursue or fly over groups of people or major roadways.¹⁰³ Further, DOJ also recently released guidance to DOJ components including the Federal Bureau of Investigation (FBI) on using “drones” for law enforcement purposes.¹⁰⁴ The DOJ guidance is largely non-substantive and primarily reiterates broad themes including the importance of protecting Constitutional rights, the value of restraint in planning and executing operations involving drones and UAS, and the importance of both accountability and transparency in conducting drone operations.¹⁰⁵ Additionally, in 2015, President Obama issued a Memorandum outlining his views on the Federal Government’s use of drones, specifically as they relate to potential privacy and civil liberties concerns.¹⁰⁶

¹⁰¹ *Id.* at 552.

¹⁰² *Id.* at 553.

¹⁰³ *See id.* at n.69–70 (quoting Memorandum of Understanding between FAA, UAS Integration Office & The U.S. DOJ, Office of Justice Programs, Nat’l Inst. Of Justice Concerning Operation of UAS by Law Enforcement Agencies 5, 7 (2013), <https://alea.org/images/UAS/DOJ%20FAA%20MOU.pdf>).

¹⁰⁴ *See Department of Justice Policy Guidance Domestic Use of Unmanned Aircraft Systems*, U.S. DEP’T. OF JUST. (May 22, 2015), <https://www.justice.gov/file/441266>.

¹⁰⁵ *Id.*

¹⁰⁶ *See* Memorandum on Promoting Economic Competitiveness While Safeguarding Privacy, Civil Rights, and Civil Liberties in Domestic Use of Unmanned Aircraft Systems, 80 Fed. Reg. 9355, 9355–58 (Feb. 15, 2015), <https://www.federalregister.gov/documents/2015/02/20/2015-03727/promoting-economic-competitiveness-while-safeguarding-privacy-civil-rights-and-civil-liberties-in->; *see also* Gregory S. McNeal, *What You Need to Know About the Government’s Drone Privacy Rules*, FORBES (Feb. 15, 2015, 1:40 PM), <https://www.forbes.com/sites/gregorymcneal/2015/02/15/the-drones-are-coming-heres-what-president-obama-thinks-about-privacy/#2eb84a8f3a98>.

E. Survey of specific state laws that address law enforcement use of drones and robots.

Regulating drone use is an exceedingly hot topic in state legislatures, and “[a]t least 38 states were considering legislation related to UAS [as of] 2017.”¹⁰⁷ In 2016:

18 states—Alaska, Florida, Idaho, Illinois, Indiana, Iowa, Maine, Montana, Nevada, North Carolina, North Dakota, Oregon, Tennessee, Texas, Utah, Vermont, Virginia and Wisconsin . . . passed legislation requiring law enforcement agencies to obtain a search warrant to use UAS for surveillance or to conduct a search. One state enacted such requirements in 2016.¹⁰⁸

Vermont went further and prohibited law enforcement’s use of drones to “investigate, detect, or prosecute crime, or to gather or retain data on citizens peacefully exercise[ing] their rights of free speech and assembly.”¹⁰⁹

Since UAS and drone use became the issue du jour, “[s]ome states, including Oregon, Virginia and Wisconsin, have outright banned law enforcement agencies from arming drones.”¹¹⁰ Additionally, “[o]nly North Dakota, so far, has explicitly permitted police to put weapons on drones, though only with less-than-lethal munitions, such as tear gas, bean bags and Tasers.”¹¹¹

¹⁰⁷ *Current Unmanned Aircraft State Law Landscape*, NAT’L CONF. OF STATE LEGIS. (Sept. 10, 2018), <http://www.ncsl.org/research/transportation/current-unmanned-aircraft-state-law-landscape.aspx> (providing overview of the current state of State UAS law).

¹⁰⁸ *2016 Unmanned Aircraft Systems (UAS) State Legislation Update*, NAT’L CONF. OF STATE LEGIS. (Mar. 20, 2017), <http://www.ncsl.org/research/transportation/2016-unmanned-aircraft-systems-uas-state-legislation-update.aspx>.

¹⁰⁹ *Id.*

¹¹⁰ Boyd, *supra* note 40; *see* *2016 Unmanned Aircraft Systems (UAS) State Legislation Update*, *supra* note 108.

¹¹¹ Boyd, *supra* note 40; *see also* Sidney Fussell, *Cops Just Got One Step Closer to Killing Americans by Drone*, GIZMODO (Mar. 31, 2017, 2:52 PM), <https://gizmodo.com/cops-just-got-one-step-closer-to-killing-americans-by-d-1793893015> (describing the Connecticut law, “An Act Concerning the Use and Regulation of Drones,” which “effectively bans weaponized drones for everyone in the state except police officers, permitting them to use drones equipped with tear gas, incendiary and explosive devices[,] and remote deadly weapons”)

The state legislative efforts appear focused on UAS and while UAS definitely are the proverbial “poster children”¹¹² for the debate on automated policing, as discussed above, the U.S. military has made great use of land-based robots and remotely-operated vehicles¹¹³ and indeed, many law enforcement agencies already employ land-based devices in a wide variety of configurations, for a wide variety of purposes.¹¹⁴ More are no doubt coming.¹¹⁵ Further, regardless of whether we are discussing law enforcement use of land-based or air-based devices, as long as a human is at the controls and making the decisions, the legal concerns are minimized.¹¹⁶ That

(emphasis omitted) (quotations omitted); Andrew Hazzard, *ND House: Nonlethal Drone Weapons Stay Legal for Law Enforcement*, DICKINSON PRESS (Feb. 21, 2017, 7:25 PM), <http://www.thedickinsonpress.com/news/4222456-nd-house-nonlethal-drone-weapons-stay-legal-law-enforcement>; Laura Wagner, *North Dakota Legalizes Armed Police Drones*, NAT’L PUB. RADIO (Aug. 27, 2015, 7:16 PM), <http://www.npr.org/sections/thetwo-way/2015/08/27/435301160/north-dakota-legalizes-armed-police-drones>; 2016 *Unmanned Aircraft Systems (UAS) State Legislation Update*, *supra* note 108.

¹¹² PLAW ET AL., *supra* note 5, at 333 (discussing “drones” as the poster children for targeted killing).

¹¹³ See ARKIN, *GOVERNING LETHAL BEHAVIOR*, *supra* note 17, at 10–20 (providing a run-down of land-based robots and autonomous vehicles employed by the DoD).

¹¹⁴ See Boyd, *supra* note 40 (“In one case, a SWAT team used a robot to reach through a window and pull a blanket off of a suicidal person to check whether he had a weapon. (He didn’t.) In other cases, robots have swept homes for booby traps, and they’re often used to toss tear gas or pepper spray into rooms, to disable suspects before officers enter. In the California desert earlier this month, sheriff’s deputies used a robot to creep up behind the suspect and take away his rifle while he was distracted by helicopters and police officers yelling at him through loudspeakers.”).

¹¹⁵ See Mike Murphy, *Boston Dynamics is Still Making Creepy Robots Under SoftBank*, QUARTZ (Nov. 13, 2017), <https://qz.com/1128469/softbanks-boston-dynamics-has-a-new-creepy-dog-like-robot-called-spotmini/>.

¹¹⁶ See David A. Graham, *The Dallas Shooting and the Advent of Killer Police Robots*, ATLANTIC (July 8, 2016), <https://www.theatlantic.com/news/archive/2016/07/dallas-police-robot/490478/> (quoting Seth Stoughton, an assistant professor of law at the University of South Carolina) (“The circumstances that justify lethal force justify lethal force in essentially every form If someone is shooting at the police, the police are, generally speaking, going to be authorized to eliminate that threat by shooting

is not to say there are none, but I believe the true issues occur when the role of the human “in the loop” is greatly diminished or eliminated altogether.¹¹⁷

Though this is not a current issue, I suspect it will be one that we will need to address on the near horizon. And I am assuming a sort of “lead-follow” relationship between the military and the police when it comes to employing remotely-operated and autonomous devices of varying degrees.¹¹⁸ The military sets the standard and the technology, and, to the extent it exists, the doctrine flows from the military to the police.¹¹⁹ Granted, the military and the police have significantly different core functions,¹²⁰ but there is some mission overlap,¹²¹ and there is also a long history of coordination on tactics and equipment transfers between the two.¹²² Though for now, while some would argue that the technology currently exists to empower robots to make deadly force decisions, the military has yet to publicly acknowledge that it has taken, or that it even intends to take, the human out of the loop when it comes to employing deadly force.¹²³ Thus, and leaving aside for the moment the key mission

them, or by stabbing them with a knife, or by running them over with a vehicle. Once lethal force is justified and appropriate, the method of delivery . . . [is likely not] legally relevant.”).

¹¹⁷ *Id.* (noting that once you “[m]ove away from the realm of remote-controlled devices into the world of autonomous or partially autonomous robots that could deliver lethal or even non-lethal, force . . . the concerns mount”).

¹¹⁸ See CRANK, *supra* note 41, at 119. See generally KRISTIAN WILLIAMS, *OUR ENEMIES IN BLUE* (3d ed. 2015).

¹¹⁹ *Supra* note 118.

¹²⁰ See CRANK, *supra* note 41, at 118 (“The police, of course, are not a military unit fighting a war—their principal clients are citizens, and their work is dominated by petty peace-keeping problems involving rowdy teenagers, angry spouses and neighbors, and other persistent social problems.”).

¹²¹ See, e.g., Gary Cordner & Kathryn Scarborough, *Information Sharing: Exploring the Intersection of Policing with National and Military Intelligence*, 6 *HOMELAND SECURITY AFF.* 1, 5–11, 14–15 (Jan. 2010),.

¹²² See BALKO, *supra* note 12, at 114–15; WILLIAMS, *supra* note 118, at 323–24.

¹²³ E.g., U.S. Dep’t of Def. Directive 3000.09, *Autonomy in Weapon Systems* (DoD 2012), <http://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/300009p.pdf> (noting that it is DoD policy that “[a]utonomous and semi-autonomous weapon

distinctions between the law enforcement and military activities, it is reasonable to conclude that domestic police will not consider taking the human out of the loop in deadly force scenarios until the military has done so first.

V. THE TENSIONS INVOLVED WITH POLICE USE OF REMOTELY-OPERATED, SEMI-AUTONOMOUS, AND FULLY AUTONOMOUS TECHNOLOGY IN DOMESTIC LAW ENFORCEMENT.

As is the case with most things, police use of remotely-operated, semi-autonomous, and fully autonomous technology to execute their mission has both benefits and risks.

A. *What are the benefits?*

The primary benefits of police use of remotely-operated, semi-autonomous, and fully autonomous technology to execute their mission are increased capacity and improvements to their capabilities.

1. *Increased capacity.*

The first benefit of the trend toward more automated police work is that it will likely increase law enforcement agencies' *capacity* by allowing them to better stretch their operational budgets.¹²⁴ This is an "efficiency" benefit. When assessing operational costs of robotic or drone police devices, factors such as size, capabilities, and complexity will likely be relevant. One can also imagine a sliding scale of cost with remotely-operated devices at the lower end, semi-autonomous devices in the middle, and fully autonomous devices at the high end.¹²⁵

systems shall be designed to allow commanders and operators to exercise appropriate levels of human judgment over the use of force").

¹²⁴ See Etzioni & Etzioni, *supra* note 26, at 72-73 (noting that in the military context, there are long-term savings that could be achieved through fielding an army of military robots); John Seewer, *Drones Become Crime Fighting Tool, But Perfection is Elusive*, WASH. TIMES (Nov. 3, 2017), <https://www.washingtontimes.com/news/2017/nov/3/drones-become-crime-fighting-tool-but-perfection-i/>.

¹²⁵ See Gabriel Nica, *Level 5 Autonomous Technology Not Possible Yet, Claims BMW*, BMW BLOG (Oct. 5, 2017), <http://www.bmwblog.com/2017/10/05/level->

Further, “operational level” devices will likely cost more than “tactical” devices. For example, a large flying device that can engage in “operational” patrolling for long periods of time will likely cost more than a small flying device intended for tactical patrolling with or in support of a human officer because of the size and complexity of the operational device as compared to the tactical device.¹²⁶ This is, of course, not a rule, in that one can also imagine a more complex tactical device that would need more advanced programming because it would be more likely to interact with the public,¹²⁷ especially if that tactical device were capable of employing force, deadly or otherwise.

Currently, while it is clear that police agencies around the country are increasing both the quantity and quality of the robots and drones in their inventories, these devices still remain relatively costly.¹²⁸ As is the case with most technologies, though, these costs will likely diminish over time,¹²⁹ especially if America begins winding down its expeditionary military activities, which will inevitably result in a stockpile of gear available for transfer to law enforcement agencies under the so-called federal 1033 program, which I discuss in more detail below.¹³⁰ Thus, in the near future, purchasing a robot or drone will generally be cheaper or provide

5-autonomous-technology-not-possible-yet-claims-bmw/ (describing a variable pricing scheme based on autonomy level in the context of autonomous vehicles).

¹²⁶ Compare PLAW ET AL., *supra* note 5, at 24 (calculating that a Predator drone costs approximately \$5 million per unit), with David Hernandez, *San Diego County Sheriff's Department Expands Drone Program*, GOV'T TECH. (Oct. 30, 2017), <http://www.govtech.com/public-safety/San-Diego-County-Sheriffs-Department-Expands-Drone-Program.html> (reporting that it costs the San Diego police department \$125,000-\$165,000 per year to operate their drone program using “the same kind [of drones] found on the shelves at any electronics store”).

¹²⁷ See IBM Watson, *IBM Watson: How it Works*, YOUTUBE (Oct. 7, 2014), https://www.youtube.com/watch?v=_Xcmh1LQB9I.

¹²⁸ See Gettinger, *supra* note 9.

¹²⁹ See SINGER, *supra* note 5, at 130.

¹³⁰ See *generally Mission*, DEF. LOGISTICS AGENCY, <http://www.dla.mil/DispositionServices/About/Mission.aspx> (last visited Aug. 12, 2018) (noting that as “[p]art of the Defense Logistics Agency, DLA Disposition Services disposes of excess property received from the military services”).

better value than training and paying a human patrol officer.¹³¹ That will either free up scarce fiscal resources through more efficient operations or drive increases in police effectiveness by increasing the amount of law enforcement resources available for deployment within the municipality.¹³²

The increase in the value of capacity logically relates to the level of autonomy. At the tactical level, a remotely piloted robot doesn't save a "body," it merely transfers the body from the patrol forces walking a beat to the division in the police department operating the drone.¹³³ This is especially true under the FAA's existing guidelines, which require that a remotely-piloted drone remain within sight of its operator.¹³⁴ The same would hold true for a semi-autonomous unit that can maneuver itself, but would depend on a human for more complex interactions like employing force. Thus, assuming efficiencies through a human support staff that can manage multiple tactical autonomous robots beyond a 1:1 ratio, only full autonomy optimizes increased capacity at the tactical level.¹³⁵ A fully autonomous robot engaged in tactical-level police work saves resources by replacing the human officer, while a fully autonomous

¹³¹ Sabrina Cupit, *Police in Metro Atlanta Buzzing About Drones*, WSB RADIO (May 31, 2017, 8:31 PM), <http://www.wsbradio.com/news/local/police-metro-atlanta-buzzing-about-drones/17qHTrzRMkyP59FSwLmQxM/> (reporting that police in the Atlanta metro area are claiming that drones are being used "very effectively," so much so, that "they could replace staff people in areas that are monitoring crowd controls").

¹³² See Etzioni & Etzioni, *supra* note 26.

¹³³ See Jack R. Greene & Ralph B. Taylor, *Community-Based Policing and Foot Patrol: Issues of Theory and Evaluation*, in *COMMUNITY POLICING: RHETORIC OR REALITY* 195–223 (Jack R. Greene & Stephen D. Mastrofski eds., 1988).

¹³⁴ See Brumfield, *supra* note 7, at 553 n.69–70.

¹³⁵ See Anderson & Waxman, *supra* note 46, at 1101 ("In some cases, a human operator might control only a single or very few sets of sensor and weapon units. In others, he or she might control or oversee an integrated network of many sensor and weapon units, which might operate largely autonomously, though with the supervisor able to intervene with respect to any of the weapon units."); see also SINGER, *supra* note 5, at 75 ("The more autonomy a robot has, the less human operators have to support it. As one Pentagon report put it, 'Having a dedicated operator for each robot will not pass the common sense test.' If robots don't get higher on the autonomy scale, they don't yield any cost or manpower savings.").

robot that is sophisticated enough to operate independently may result in a savings of two officers, in jurisdictions that still deploy officers in pairs.¹³⁶ There are also savings in that it is safe to assume that robotic officers will be able to work beyond the normal eight-hour shifts most human police officers work.¹³⁷ Again, they do not get tired, bored, or hungry, and so the fully autonomous robotic officer works more efficiently than its human counterpart.¹³⁸

At the operational level, there may be greater capacity increases depending upon the capabilities of the operational drone or robot. Take, for example, a comparison to a large metropolitan police department's aviation unit.¹³⁹ A fixed wing UAS will likely have greater operational range and longevity than a manned rotary wing helicopter.¹⁴⁰ Also, assume that the UAS support staff is equal to or

¹³⁶ See Tom Jackman & Peter Hermann, *Police Nationwide Order Officers to Ride in Pairs After Dallas Police Ambush*, WASH. POST (Jul. 8, 2016), https://www.washingtonpost.com/local/public-safety/dc-police-boost-patrols-after-snipers-in-dallas-kill-five-officers-wound-others/2016/07/08/9595063a-4508-11e6-88d0-6adee48be8bc_story.html?utm_term=.e62ebd98626b; Christina Sterbenz, *Police Around the Country are Making a Complicated Call to Increase Officer Safety in the Wake of Dallas and Baton Rouge*, BUS. INSIDER (Jul. 19, 2016, 7:24 PM), <http://www.businessinsider.com/problems-of-police-working-in-pairs-2016-7>.

¹³⁷ See generally SINGER, *supra* note 5, at 62–65.

¹³⁸ *Id.*

¹³⁹ See *LAPD Air Support Unit*, POLICE HELICOPTER PILOT, <http://www.policehelicopterpilot.com/lapd-air-support/> (last visited Nov. 22, 2017); *New York Police Department Aviation Division*, POLICE HELICOPTER PILOT, <http://www.policehelicopterpilot.com/nypd-aviation-unit/> (last visited Nov. 22, 2017).

¹⁴⁰ Compare Praveen Duddu, *The 10 Longest Range Unmanned Aerial Vehicles (UAVs)*, AIR FORCE TECH. (Nov. 19, 2013), <http://www.airforce-technology.com/features/featurethe-top-10-longest-range-unmanned-aerial-vehicles-uavs/> (describing UAS range, in some cases measured by days), with *Bell 429*, BELL HELICOPTER, <http://www.bellhelicopter.com/commercial/bell-429> (last visited Nov. 21, 2017) (claiming a 411 nautical mile range and 4.5 hours of endurance), and *R44 Raven II Police Helicopter*, ROBINSON HELICOPTER, <https://robinsonheli.com/r44-police-helicopter-specifications/> (claiming a 300 nautical mile range), and *R66 Turbine Police Helicopter*, ROBINSON HELICOPTER, <https://robinsonheli.com/r66-police-helicopter-specifications/> (claiming a 325 nautical mile range).

less than what is required to maintain manned helicopter capability. For argument's sake, then, let us say that a medium-sized UAS has a twelve-hour effective flight time¹⁴¹ and is equipped with cameras and sensors powerful enough to allow it to cover the entire municipality five times on patrol mode during that 12-hour flight.¹⁴² The law enforcement agency has three UAS, and it rotates them through so it keeps one on, leaves one in stand-by, and has one off for maintenance.¹⁴³ In one day, the UAS would orbit the municipality ten times and gather information that would take multiple 3-4 hour helicopter sorties and hundreds of vehicle or foot patrols to acquire. If it is remotely piloted, it does so at the cost of its one pilot and shared support staff. If it is semi-autonomous and doesn't have a mission profile which requires a human operator, or if fully autonomous, it only requires its support staff.

2. *Improved capabilities.*

The second benefit is the increased *capabilities* autonomous police devices provide. This is essentially an “effectiveness” benefit. In many cases, even on the battlefield, robots—remotely-operated or autonomous devices—merely provide a vehicle for enhanced sensors or weapons delivery for their human masters.¹⁴⁴ Often, these

¹⁴¹ See Duddu, *supra* note 140.

¹⁴² See *supra* note 61.

¹⁴³ See PLAW ET AL., *supra* note 5, at 24 tbl.1 (noting that for \$20 million, a typical Predator system comes with four aircraft).

¹⁴⁴ See generally GARY SOLIS, THE LAW OF ARMED CONFLICT 551 (2d ed., Cambridge Univ. Press 2016) (quoting Heeyong Daniel Jang, *The Lawfulness of and Case for Combat Drones in the Fight Against Terrorism*, 2 NAT'L SEC. L.J. 1, 12 (2013) and describing the sensor set up on modern military drones: “[T]he Multi-Spectral Targeting System (‘MTS-B’) . . . integrates an infrared sensors, a color/monochrome video camera, an image-intensified video camera, a laser designator, and a laser illuminator”); Anthony M. DeStefano, *Sensors, Scanners Shed Light on Terror Attack Suspect’s Movements*, NEWSDAY (Nov. 1, 2017, 9:26 PM), <https://www.newsday.com/news/new-york/nyc-terror-suspect-timeline-1.14716803> (reporting how a vast sensor net in Manhattan helped local police investigate a terror attack and noting that “the ubiquitous array of sensors and photographic scanners posted throughout the city . . . [gave] cops near-instant access to the movements of any vehicle”).

sensors exceed human levels.¹⁴⁵ Thermal imagers can detect heat,¹⁴⁶ sometimes even through solid objects.¹⁴⁷ Zoom lenses can provide fine details at distance.¹⁴⁸ Digital, near-infrared imaging allows machine vision to see beyond the human visual spectrum.¹⁴⁹ “Sniffers” of various types can detect chemical traces of explosives or narcotics.¹⁵⁰ Auditory microphones can pick up high octave and low octave sounds or extend the auditory detection range beyond what a normal human can hear.¹⁵¹

¹⁴⁵ See SINGER, *supra* note 5, at 63 (writing that UAS and manned aircraft are different because the UAS “has EO/IR/SARS [electro-optical, infrared, and synthetic-aperture radar sensors] to rely on. The pilot has the Mark I Eyeball”).

¹⁴⁶ See Nicholas Filipas, *Stockton Police Get Set to Have Eyes in the Sky*, RECORDNET.COM (Nov. 15, 2017, 7:31 PM), <http://www.recordnet.com/news/20171115/stockton-police-get-set-to-have-eyes-in-sky> (reporting that a local police department in Stockton, CA will be fielding a remotely piloted drone equipped with heat sensors).

¹⁴⁷ See Trevor Pott, *Peekaboo Drones and Edge Computing*, VIRTUALIZATION & CLOUD REV. (Nov. 1, 2017), <https://virtualizationreview.com/articles/2017/11/01/peekaboo-drones-and-edge-computing.aspx> (reporting on a prototype drone equipped with technology that allows it to use WiFi signals to see moving humans behind walls).

¹⁴⁸ See Zachariah Hughes, *Police Hope to Launch Drones Over Anchorage—With Limits*, KTOO PUB. MEDIA (Nov. 17, 2017), <https://www.ktoo.org/2017/11/17/police-hope-launch-drones-anchorage-limits/> (reporting that a proposed law enforcement drone’s “[o]verhead cameras can reduce search times for missing [people and for] [d]ocumenting a crime scene” but also that there may be “tactical applications when . . . responding with a SWAT team”).

¹⁴⁹ See Lindsay Grant, *Near-Infrared Imaging Enables Machine-Vision Advances*, SENSORS ONLINE (Oct. 27, 2017, 12:00 AM), <https://www.sensormag.com/components/near-infrared-imaging-enables-machine-vision-advances>.

¹⁵⁰ Compare Stacy Liberatore, *The Drug and Bomb Sniffing Drone that can Detect Dangerous Chemicals from 1.8 Miles Away*, DAILY MAIL (Nov. 15, 2016, 7:06 PM), <http://www.dailymail.co.uk/sciencetech/article-3940206/The-drug-bomb-sniffing-drone-detect-dangerous-chemicals-1-8-MILES-away.html> (describing a laser-based “sniffing” system), with Sarah Goncalves, *Drone of the Week: ‘Bomb-Sniffing’ UAVs Can Detect Nuclear Weapons*, ECN (May 10, 2016, 3:35 PM), <https://www.ecnmag.com/blog/2016/05/drone-week-bomb-sniffing-uavs-can-detect-nuclear-weapons> (describing a system that relies on neutron-based nitrogen activation).

¹⁵¹ See Ashley Forest & Christy Wilcox, *LVMPD Deploys Acoustic Technology to Assist with Crime Fighting*, KSNV (Nov. 16, 2017),

Further, robots tend to be more resistant and resilient to kinetic damage than human beings.¹⁵² In short, they take a beating better,¹⁵³ and, therefore, their use can decrease the risk to actual humans.¹⁵⁴ Again, robots will likely provide increased on-scene time because they do not share the human need to eat, rest, and remove waste, nor do they get bored, lose focus, or get scared.¹⁵⁵

These increased capabilities manifest in the law enforcement context in several key ways. First, regardless of whether we are discussing a remotely-operated or autonomous device, having the potential for fielding increased full-spectrum sensory capabilities allows law enforcement to be more effective at working crime scenes, gathering and preserving evidence,¹⁵⁶ and establishing a better awareness of the environment at both the tactical and operational levels. Second, tactically, police units already make great use of robots in high-risk situations involving explosives and

<http://news3lv.com/news/local/lvmpd-clark-county-deploys-acoustic-technology-to-assist-with-crime-fighting> (“ShotsSpotter is an acoustic technology that consists of audio sensors that detect, locate, and alert local law enforcement of gunfire incidents in real time. In no more than 45 seconds from the actual gun discharge, the alert and the precise location of the event is delivered to the police.”).

¹⁵² See Charles Q. Choi, *Damaged Robot Can ‘Heal’ Itself in Less Than 2 Minutes*, LIVE SCIENCE (May 27, 2015, 1:37 PM), <https://www.livescience.com/50988-damaged-robot-heals-itself.html>; Duncan Graham-Rowe, *Robot Spy can Survive Battlefield Damage*, NEWS SCIENTIST (Aug. 20, 2003), <https://www.newscientist.com/article/dn4075-robot-spy-can-survive-battlefield-damage/>.

¹⁵³ See Daniel H. Wilson, *Robots are Tougher Than You, Part 1: The Deep Sea*, POPULAR MECHANICS (Sept. 30, 2009), <http://www.popularmechanics.com/technology/gadgets/a4488/4212397/>.

¹⁵⁴ See Jason Koebler, *The Legal and Ethical Ramifications of Letting Police Kill Suspects With Robots*, VICE (July 9, 2016, 9:30 AM), https://motherboard.vice.com/en_us/article/8q8m93/dallas-shooting-bomb-robot-legal-analysis (asking “[i]f the technology exists to allow police officers to do their jobs more safely, why wouldn’t [we] employ the use of robots?”).

¹⁵⁵ See SINGER, *supra* note 5.

¹⁵⁶ See Sandra Parrish, *Police Drone Aids Accident Investigations*, WSB RADIO (Aug. 18, 2016, 8:29 PM), <http://www.wsbradio.com/news/police-drone-aids-accident-investigations/ejhL7IpBPJnj4D0Z4PDeRP/>.

opposed or barricaded entries,¹⁵⁷ and--save for the Dallas incident described above--have managed to do so without having to resort to deadly force. In the event of a terror attack, mass shooting like the Dallas event, or the October 1, 2017 tragedy in Las Vegas,¹⁵⁸ employing remotely-operated or autonomous devices will minimize the risk to police officers and, perhaps, the public because of the absence of physiological or psychological impacts of the responding “officer,” improved ability to survey the scene to develop better situational awareness, and the likely increased precision in the employment of force.¹⁵⁹

¹⁵⁷ See Iannelli, *supra* note 8 (noting that the Miami Beach PD drone use policy “authorize[s] vaguer usage for ‘tactical deployment’ in ‘emergency situations’ where there’s ‘imminent danger’”); see also *Miami-Dade Police Department Draft Drone Standard Operating Procedures*, ELECTRONIC FRONTIER FOUND., <https://www.eff.org/document/miami-dade-pd-draft-drone-standard-operating-procedures> (last visited Nov. 3, 2017) (posting what purports to be the “Miami Dade Police Department Special Patrol Bureau/Aviation Unit Micro Air Vehicle (MAV) Standard Operating Procedures”).

¹⁵⁸ See Mark Berman, *Las Vegas Gunman Shot Security Guard Minutes Before Massacre, Police Say*, WASH. POST (Oct. 10, 2017), https://www.washingtonpost.com/news/post-nation/wp/2017/10/09/las-vegas-gunman-shot-security-guard-minutes-before-massacre-police-say/?utm_term=.222cfa2d2eee (reporting on the Oct. 1, 2017 mass shooting that left 58 dead and hundreds wounded in Las Vegas, NV).

¹⁵⁹ Compare Conor Friedersdorf, *How Two Police Drones Saved a Woman’s Life*, ATLANTIC (Feb. 16, 2018), <https://www.theatlantic.com/politics/archive/2018/02/police-drones/553406/> (reporting on an event in Virginia where the use of two police drones facilitated the non-lethal apprehension of an armed subject, who would likely have been shot by police during her apprehension but for the use of the drones), with Vivian Wang, *Video Shows Daniel Shaver Pleading for His Life Before Being Shot by Officer*, N.Y. TIMES (Dec. 9, 2017), <https://www.nytimes.com/2017/12/09/us/police-shooting-video-arizona.html> (reporting on a police camera video of officers in Maricopa County that were obviously under a great deal of stress when encountering a subject they believed as potentially hostile, but ultimately unarmed, then shooting and killing the suspect for his failure to strictly abide by police commands to keep his hands visible).

Finally, the police shootings in Ferguson, Missouri,¹⁶⁰ and St. Louis, Missouri,¹⁶¹ and questionable police use of force in Baltimore, Maryland,¹⁶² and Staten Island, New York,¹⁶³ have brought to light concerns regarding the impact of bias, either unconscious or intentional, on the part of American police when specifically dealing with African-American subjects. This is a complex issue that rates its own scholarly writing,¹⁶⁴ but it is important to note, again, that autonomous police are not human and could (and should) be programmed with objective patrol and operational criteria that would likely greatly minimize the potential for pretext and bias, conscious or otherwise, in police work.¹⁶⁵

¹⁶⁰ See generally Michael Brown's Shooting and Its Immediate Aftermath in Ferguson, N.Y. TIMES (Aug. 25, 2014), <https://www.nytimes.com/interactive/2014/08/12/us/13police-shooting-of-black-teenager-michael-brown.html>.

¹⁶¹ See generally Tim O'neil & Mitch Smith, *Former St. Louis Officer, Jason Stockley, Acquitted in Shooting of Black Driver*, N.Y. TIMES (Sept. 15, 2017), <https://www.nytimes.com/2017/09/15/us/jason-stockley-anthony-lamar-smith-st-louis-officer.html>.

¹⁶² See generally Rebecca R. Ruiz, *Baltimore Officers Will Face No Federal Charges in Death of Freddie Gray*, N.Y. TIMES (Sept. 12, 2017), <https://www.nytimes.com/2017/09/12/us/freddie-gray-baltimore-police-federal-charges.html>.

¹⁶³ See generally Al Baker & Benjamin Mueller, *Records Leak in Eric Garner Case Renews Debate on Police Discipline*, N.Y. TIMES (Mar. 22, 2017), <https://www.nytimes.com/2017/03/22/nyregion/nypd-eric-garner-daniel-pantaleo-disciplinary-records.html>.

¹⁶⁴ See generally Decio Coviello & Nicola Persico, *An Economic Analysis of Black-White Disparities in the New York Police Department's Stop-And-Frisk Program*, 44 J. LEGAL STUD. 315 (2015); Vida B. Johnson, *Bias in Blue: Instructing Jurors to Consider the Testimony of Police Officer Witnesses with Caution*, 44 PEPP. L. REV. 245 (2017); Kimberly Barsamian Kahn, Joel S. Steele, Jean M. McMahon & Greg Stewart, *How Suspect Race Affects Police Use of Force in an Interaction Over Time*, 41 L. & HUM. BEHAV. 117 (2017); Clayton Mosher & J. Mitchell Pickerill, *Methodological Issues in Biased Policing Research with Applications to the Washington State Patrol*, 35 SEATTLE U. L. REV. 769 (2012).

¹⁶⁵ See ARKIN, GOVERNING LETHAL BEHAVIOR, *supra* note 17, at 29–36 (describing lack of emotion as one advantage that machines have over humans in lethal decision making). *But see* CAMPOLO ET AL., *supra* note 18, at 13–20 (describing how bias can work its way into computer programs, especially where programmers are not diverse); Rosenberg, *supra* note 15.

Furthermore, when operating in a joint patrol tactically—or even independently at the operational level—semi-autonomous and fully-autonomous police robots could provide valuable and ostensibly neutral and objective evidence where human police allegedly exceed their mandate to protect and serve by violating individual rights or inappropriately using force, in much the same way police body cameras are intended.¹⁶⁶

B. What is the downside or risk?

While there are certainly advantages to law enforcement fielding drones and robots of varying levels of sophistication and autonomy, these advantages may be offset by several inherent shortfalls or risks.

1. Robots, even those operated by people, are not human.

There is a qualitative aspect to effective police work beyond merely responding to crime.¹⁶⁷ Most, if not all, police departments recognize the value of “community policing” and practice at least some form of it, which is heavily centered on police officers placing a priority on teaming up and coordinating with the communities they serve.¹⁶⁸ While generally resource-intensive and recently disfavored in New York City’s now-widespread computer generated crime statistic-centric strategy,¹⁶⁹ community policing is making a comeback in the post-9/11 era of “intelligence-driven” police work.¹⁷⁰ Essentially, police departments have rediscovered the value

¹⁶⁶ See Mary D. Fan, *Justice Visualized: Courts and the Body Camera Revolution*, 50 U.C. DAVIS L. REV. 897, 947–50 (2017); Mindy Lawrence, *Lights, Camera, Action: The Age of Body Cameras in Law Enforcement and the Effects of Implementing Body Camera Programs in Rural Communities*, 91 N.D. L. REV. 611, 616–18 (2016) (describing the benefits of police use of body cameras).

¹⁶⁷ See Greene & Taylor, *supra* note 133.

¹⁶⁸ See JOHN M. RAY, *RETHINKING COMMUNITY POLICING* 109 (LFB Scholarly Pub. 2014) (“By the mid-1990s, nearly every major police department in the U.S. claimed to be practicing some sort of community policing.”); WILLIAMS, *supra* note 118, at 204 (“Philosophically, community policing is characterized by the solicitation of citizen input, the broadening of the police function, and the attempt to find solutions based on the value of the local community.”).

¹⁶⁹ See RAY, *supra* note 168, at 139–45.

¹⁷⁰ *Id.* at 143–45.

of the beat cop working closely within a particular community to both leverage that community's leaders and members in preventing crime and helping gain information through these "networks of community partnerships."¹⁷¹ As a result, "[t]he activity of patrol remains a central component of modern policing systems and (particularly in respect of calls for a more wholehearted return to walking beats) is an enduring theme in popular discourses about the preferred future direction of policing."¹⁷²

Thus, there was always and remains value in human interaction and community policing. It is fair to identify that robots, remotely-operated, or otherwise, will almost certainly be less capable than humans in this regard.¹⁷³ Furthermore, the temptation to employ technology, such as broad sweeping sensors to offset this shortcoming, could serve to decrease police effectiveness because doing so could reduce the trust between the police and their communities critical to the successful implementation of community policing.¹⁷⁴

¹⁷¹ *Id.*

¹⁷² DICTIONARY OF POLICING, *supra* note 41, at 189.

¹⁷³ *See* Reid, *supra* note 7, at 879–81 (noting that robotic police will almost certainly have "less people skills and common sense than human officers, and it is unclear how they will handle tense situations"). *See generally* Greene & Taylor, *supra* note 133 (analyzing the value of the police foot patrol in effective police work and noting that police officers in vehicles "cannot carry out the order maintenance function as effectively as officers who have greater community attachments, either through foot patrol or other community contacts. . . . This enhanced community sensitivity [of foot patrol officers] makes a successful resolution of incidents more likely[,] . . . lowers fear because there is more community exposure to police officers[,] . . . [and makes] people feel safer."). Thus, it stands to reason that if human police in cars are less effective at establishing community relations than human police walking a beat, a robot officer would be that much more ineffective.

¹⁷⁴ *See* Timothy N. Oettmeier & Lee P. Brown, *Developing a Neighborhood-Oriented Policing Style*, in COMMUNITY POLICING: RHETORIC OR REALITY 127–28 (Jack R. Greene & Stephen D. Mastrofski eds., 1988); Kate Mather & Cindy Chang, *LAPD Gets an Earful from the Public on UAS Use*, POLICEONE.COM (Aug. 24, 2017), <https://www.policeone.com/police-products/Police-Drones/articles/413735006-LAPD-gets-an-earful-from-the-public-on-UAV-use/>.

2. Increased technological capabilities often outstrip existing legal checks, especially when used by law enforcement.

Rapidly-increasing technology always seems to exceed legal protections.¹⁷⁵ This has been at least as true in the context of domestic law enforcement as it has been in nearly every other context.¹⁷⁶ Over the years, advancements in surveillance technologies,¹⁷⁷ transportation,¹⁷⁸ weapons, and even the accumulation and accessibility of data¹⁷⁹ have changed how domestic law enforcement conducts business. Invariably, law enforcement seems to serve as “early adopters” to leverage burgeoning technology to gain an edge of the criminals they pursue.¹⁸⁰ Yet our Courts have sometimes found that the police go

¹⁷⁵ E.g., Steven Groves, *A Manual Adapting the Law of Armed Conflict to Lethal Autonomous Weapons Systems*, HERITAGE FOUND. (Apr. 7, 2016), <http://www.heritage.org/defense/report/manual-adapting-the-law-armed-conflict-lethal-autonomous-weapons-systems> (“It is axiomatic that technological advances often outpace the law.”).

¹⁷⁶ See *Olmstead v. United States*, 277 U.S. 438, 466 (1928) (holding that warrantless wiretapping violated the Fourth Amendment). *But see Smith v. Maryland*, 434 U.S. 159, 168–69 (1977) (holding that installing and using a pen register to record telephone numbers dialed from a phone did not require a warrant).

¹⁷⁷ See generally *Kyllo v. United States*, 533 U.S. 27 (2001).

¹⁷⁸ See THOMPSON II, *supra* note 10, at 7–8; McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 374–78 (describing the history of the Supreme Court considering manned aerial surveillance in the law enforcement context by tracing the path from *California v. Ciraolo*, 476 U.S. 207, 213 (1986) to *Dow Chemical Co. v. United States*, 476 U.S. 227, 239 (1986) to *Florida v. Riley*, 488 U.S. 445, 448 (1989)).

¹⁷⁹ See Benjamin Mueller, *Police Add Civilians in Bid to Better Analyze*, N.Y. TIMES (Aug. 15, 2017), <https://www.nytimes.com/2017/08/15/nyregion/new-york-police-civilians-analyze-crime-data.html> (reporting that the NYPD is hiring employees, optimally with “a combination of law enforcement and math and statistics backgrounds, [who] will be expected to find crime patterns before they grow too large and to make the department’s vast amounts of crime data easier to decipher”).

¹⁸⁰ Benjamin Mueller & Al Baker, *Brooklyn Judge’s Ruling Raises Bar for Cover Cellphone Tracking*, N.Y. TIMES (Nov. 15, 2017), https://www.nytimes.com/2017/11/15/nyregion/brooklyn-judge-stingray-cellphone-tracking.html?_r=0 (reporting that a New York judge ruled that that the

too far when they apply technology without first fully considering constitutional protections or to circumvent those protections.

For example, in *United States v. Kyllo*, the Supreme Court examined the issue of whether a federal law enforcement agent could use a crude thermal imager, from the street, to determine whether a suspect was growing marijuana inside his home, without first obtaining a warrant.¹⁸¹ The Court held that the use of such a device, even one that merely measured and visually displayed temperature differences, to pierce the privacy one is entitled to when within the home was not reasonable without first getting a warrant, and, as such, was unconstitutional.¹⁸²

In *United States v. Jones*,¹⁸³ the Supreme Court examined police use of a GPS to monitor the movements of a drug suspect, again without a warrant. The Court held in favor of Jones using a trespass-based analysis, but concurring opinions by Justices Alito and Sotomayor touched on the non-trespass issue of whether persistent surveillance that tracked the movements of a person around the clock violates a fundamental right of privacy, and would be as such, unreasonable without first pursuing a warrant.¹⁸⁴

The Court did not squarely address the issue of the reasonableness of persistent surveillance squarely in *Jones* but did hold that the Government needed a warrant to pursue more than six days' worth of a subject's cellular telephone cite records in *Carpenter v. United States*.¹⁸⁵

NYPD's warrantless use of a cell tower simulator to track the movements of a murder suspect via his cell phone was unreasonable).

¹⁸¹ See *Kyllo*, 533 U.S. at 27.

¹⁸² Mueller & Baker, *supra* note 180.

¹⁸³ See *United States v. Jones*, 565 U.S. 400, 402, 404–06 (2012).

¹⁸⁴ See *id.* at 412-13.

¹⁸⁵ U.S. v. Carpenter, 585 U.S. 19 (2018); see Will Baude, *Carpenter v. United States and the Positive Law Model*, WASH. POST (Nov. 21, 2017), https://www.washingtonpost.com/news/voikh-conspiracy/wp/2017/11/21/carpenter-v-united-states-and-the-positive-law-model/?utm_term=.1c0291292649; David Kravets, *Supreme Court's New Term: Surveillance, Hacking, Sports Betting—And Cake, Too*, ARS TECHNICA (Oct. 2, 2017, 6:00 AM), <https://arstechnica.com/tech-policy/2017/10/supreme-courts-new-term-surveillance-hacking-sports-betting-and-cake-too>.

Finally, a court in New York recently excluded some evidence that the NYPD gathered against a murder suspect that they obtained by using a cellular tower simulator to track the subject without a warrant.¹⁸⁶ The device “essentially tricks nearby cellphones by acting like a cellphone tower and intercepting a phone’s signal . . . [and can] capture texts, calls, emails and other data.”¹⁸⁷ “[T]he ACLU has found that at least 72 [law enforcement] agencies in 24 states and Washington D.C [along with Federal agencies like] the FBI, ICE, [and the] IRS . . . use [such simulators].”¹⁸⁸ Indeed, “the NYPD has said that it used them 1,016 times between 2008 and May 2015.”¹⁸⁹

Robotic policing poses similar risks as those described above. Courts have yet to provide any directly on-point guidance describing the constitutional limits of the use of artificial patrol police, despite law enforcement agencies around the country using or preparing to use such technology.¹⁹⁰ Further, the concerns identified by the Court in *Kyllo* and *Jones* are particularly poignant here, given the clear application of enhanced imagery technology and persistent surveillance to robotic policing.¹⁹¹

Use of force by robotic police brings the same concerns, given the reasonableness standard courts employ in analyzing police use of force and the context driven, factually specific foundations behind that standard.¹⁹² Indeed, what is a reasonable application of

¹⁸⁶ See *People v. Gordon*, 58 Misc. 3d 544, 545–49, 68 N.Y.S.3d 306, 307–09 (N.Y. Sup. Ct. 2017); Mueller & Baker, *supra* note 180.

¹⁸⁷ *Id.*

¹⁸⁸ Mallory Locklear, *Judge Rules NYPD Needed a Warrant Before Using Cell-Site Simulator*, ENGADGET (Nov. 16, 2017), <https://www.engadget.com/2017/11/16/judge-rules-nypd-needs-warrant-cell-site-simulator/>.

¹⁸⁹ *Id.*

¹⁹⁰ See Jenks, *supra* note 7, at 1421–24; Michaëlle Bond, *Drones Give Law Enforcement a New Edge, But Raise Concerns*, PHILA. INQUIRER (Aug. 10, 2015, 1:07 AM), http://www.philly.com/philly/news/local/20150810_Drones_give_law_enforcement_a_new_edge_but_raise_concerns.html.

¹⁹¹ See generally *United States v. Jones*, 565 U.S. 400, 413–18 (2012) (Sotomayor J., concurring); *Kyllo v. United States*, 533 U.S. 27, 31–35 (2001).

¹⁹² See generally *Scott v. Harris*, 550 U.S. 372, 378–82 (2007); *Graham v. Connor*, 490 U.S. 386, 396–97 (1989); *Tennessee v. Garner*, 471 U.S. 1, 7 (1985).

robotic police use of force, where a remotely-operated device will present its operator with less sensory input¹⁹³ and a more autonomous device will both perceive its environment differently than a human and then decide to act using exclusively quantitative analysis?¹⁹⁴

3. *Inherent existential personal¹⁹⁵ and species risk¹⁹⁶ posed by autonomous machines/AI and the value of relative certainty of action.*¹⁹⁷

The threat of a killer robot revolution has been a hallmark of popular fiction for many years.¹⁹⁸ Indeed, recently the noted

¹⁹³ See Breshears, *supra* note 7, at 205–07.

¹⁹⁴ See Reid, *supra* note 7, at 880 (“All the machines have done is to self learn for problems where the goals are clear and quantifiable.”).

¹⁹⁵ See, e.g., *BLADE RUNNER* (Warner Bros. 1982) (asking whether androids dream of electric sheep and can a robot be more human than human); *RUNAWAY* (TriStar Pictures 1984) (chasing killer robot spiders controlled by Gene Simmons’ villain); *THE INCREDIBLES* (Pixar Animation Studios/Walt Disney Pictures 2004) (plotting to attack the city with killer robots that ultimately revolt); *2001: A SPACE ODYSSEY* (Metro-Goldwyn-Mayer 1968) (pleading “open the pod bay doors, HAL!”).

¹⁹⁶ See, e.g., *DANIEL H. WILSON, ROBOPOCALYPSE* (Double Day Pub. 2011) (fictionalizing a robot apocalypse); *AVENGERS: AGE OF ULTRON* (Marvel Studios/Walt Disney Pictures 2015) (threatening the Avengers, super powered defenders of humanity that “[t]here is only one path to peace . . . your extinction”); *THE MATRIX* (Warner Bros. 1999) (introducing the world to “Neo,” the chosen one, who will free humanity from the chains of bondage of their robot overlords); *THE TERMINATOR* (Orion Pictures 1984) (warning “[t]hat the Terminator[, a killer robot,] is out there. It can’t be bargained with. It can’t be reasoned with. It doesn’t feel pity, or remorse, or fear. And it absolutely will not stop, ever, until you are dead!”); *WARGAMES* (United Artists 1983) (asking ominously “would you like to play a game?”).

¹⁹⁷ But see Max Tegmark, *How to Make AI the Best Thing to Happen to Us*, NAT’L PUB. RADIO (Oct. 8, 2017, 2:51 PM), <http://www.npr.org/sections/13.7/2017/10/08/555044340/how-to-make-ai-the-best-thing-to-happen-to-us>.

¹⁹⁸ In Reid, *supra* note 7, at 883–85, the author provides a history of robots and AI in fiction, but neglects the excellent *Battlestar Galactica* reboot, which covered all manner of legal issues in through the lens of a robot revolution. “The cylons were created by man. They evolved. They rebelled. There are many copies. And they have a plan.” *Battlestar Galactica: Scattered* (Syfy television broadcast July 15, 2005).

technologist Elon Musk brought the issue to the forefront by posting to Twitter that he believed advancements in AI posed an existential threat to humanity in response¹⁹⁹ to a speech by Russian prime minister Vladimir Putin, who himself intimated that the first nation to master AI marked the next great opportunity to become the ruler of the world.²⁰⁰ Soon after, Musk also collaborated with over 100 technology experts in urging the United Nations to address autonomous weapons, noting that “[o]nce developed, they will permit armed conflict to be fought at a scale greater than ever, and at time[s] scales faster than humans can comprehend.”²⁰¹ Notably, the renowned physicist Stephen Hawking²⁰² and the neuroscientist and philosopher Sam Harris also share Musk’s concerns.²⁰³ Yet many others believe that “we are a long way from having the computing power or developing the algorithms needed to achieve

¹⁹⁹ See *supra* notes 194–95; Sean Illing, *The Rise of AI is Sparking an International Arms Race*, VOX (Sept. 13, 2017, 8:20 AM), <https://www.vox.com/world/2017/9/13/16287892/elon-musk-putin-artificial-intelligence-war>; James Titcomb, *Artificial Intelligence is Bigger Threat to Civilization than North Korea, Elon Musk Claims*, TELEGRAPH (Sept. 4, 2017, 2:07 PM), <http://www.telegraph.co.uk/technology/2017/09/04/artificial-intelligence-bigger-threat-civilisation-north-korea/>.

²⁰⁰ See James Vincent, *Putin Says the Nation that Leads in AI ‘Will be the Ruler of the World,’* VERGE (Sept., 2017, 4:52 AM), <https://www.theverge.com/2017/9/4/16251226/russia-ai-putin-rule-the-world>.

²⁰¹ Peter Holley, *Elon Musk calls for Ban on Killer Robots Before ‘Weapons of Terror’ are Unleashed*, WASH. POST (Aug. 21, 2017), https://www.washingtonpost.com/news/innovations/wp/2017/08/21/elon-musk-calls-for-ban-on-killer-robots-before-weapons-of-terror-are-unleashed/?utm_term=.291b5408d081.

²⁰² See Rory Cellan-Jones, *Stephen Hawking Warns Artificial Intelligence Could End Mankind*, BBC NEWS (Dec. 2, 2014), <https://www.bbc.com/news/technology-30290540>.

²⁰³ Sam Harris, *What Happens When Humans Develop Super Intelligent AI*, NAT’L PUB. RADIO (Sept. 15, 2017, 9:52 AM), <http://www.npr.org/2017/09/15/547886482/sam-harris-what-happens-when-humans-develop-super-intelligent-ai> (“The concern is really that we will build machines that are so much more competent than we are, that the slightest divergence between their goals and ours, could destroy us.”).

full artificial intelligence”²⁰⁴ and would prefer analysis less focused on “sci-fi scenarios or doomsday proclamations” and more driven by the need to “set up the structures, the understandings, the norms . . . [and] even the rules and laws, that will help us navigate” the dawn of AI and devices with high levels of, if not true, autonomy.²⁰⁵

The real crux of the issue is that no one is certain that humans will be able to program robots to act in the manner at least as good as a human would, given a complex, dynamic, fast moving situation such as whether or not to employ perhaps lethal force as a law enforcement patrol officer in accordance with the existing constitutional legal standards. However, it is worth noting here that human-like decision making is a double-edged sword, and some writers have staked out the position that robot-like decision making could in fact be superior to human decision making because it would presumably be free of emotion and bias.²⁰⁶

Scholars, scientists, and ethicists who focus on robotic war-fighting have the same concerns with the ability of AI-powered autonomous weapons applying the International Humanitarian Law(IHL) or Law of Armed Conflict (LOAC) specifically with regard to the core principles of distinction and proportionality.²⁰⁷ Layered throughout this concern is the idea that once robots figure out that it is sometimes acceptable to kill humans, there may be no accounting for how or when a “learning” AI might choose to do so

²⁰⁴ Cellan-Jones, *supra* note 202; *see also* Hamilton, *Excessive Lethal Force*, *supra* note 4, at 78 (“We are not close to having AI on a human level.”).

²⁰⁵ Illing, *supra* note 199 (providing Peter Singer’s thoughts on the subject via interview).

²⁰⁶ *See* ARKIN, GOVERNING LETHAL BEHAVIOR, *supra* note 17, at 29–36 (describing the advantages of machines over humans in lethal decision making in that the former lacks emotion). *But see* CAMPOLO ET AL., *supra* note 18, at 13–20 (describing how bias can work its way into computer programs, especially where programmers are not diverse); Rosenberg, *supra* note 15.

²⁰⁷ *See* SOLIS, *supra* note 144, at 539–41; Anderson & Waxman, *supra* note 46, at 1103–07; Schmitt & Thurnher, *supra* note 45, at 251-58; Frank Sauer, *Stopping ‘Killer Robots’: Why Now Is the Time to Ban Autonomous Weapons Systems*, ARMS CONTROL ASSOC. (Oct. 2016), https://www.armscontrol.org/ACT/2016_10/Features/Stopping-Killer-Robots-Why-Now-Is-the-Time-to-Ban-Autonomous-Weapons-Systems.

or whether or when it will choose to stop doing so.²⁰⁸ This is troubling, given some of the inherent advantages that a robot would have over a human in that they tend to be both more robust and more relentless in pursuit of whatever they believe their goal to be.²⁰⁹

As a starting point, Alan Schuller recommends that we focus on building *predictability* into artificial intelligence that governs war-fighting weapons systems.²¹⁰ He explains that “AI [can and should] account[t] for uncertainty by weighing the probability of certain outcomes against the desirability of such outcomes.”²¹¹ Further, for an autonomous weapon to act correctly, it must act rationally, which “depends on both the relative importance of various goals and the likelihood that and degree to which they will be achieved.”²¹² Ultimately, “[a]n AI is considered to make rational decisions if and only if it chooses the action that yields the highest expected utility, averaged over all the possible outcomes of the action.”²¹³ Thus, “[w]e must [strive to] program the computer to achieve the ‘best possible outcome under the circumstances’” and that once we’ve achieved that, predictability of action is the threshold for which we should assess the legality of autonomous war fighting machines.²¹⁴

While Schuller focuses on autonomous weapons systems in the context of warfighting, his focus on eliminating uncertainty of action directly translates to the application of the AI that would

²⁰⁸ See Ryan Browne, *US General Warns of Out-of-Control Killer Robots*, CNN (Jul. 18, 2017, 9:18 PM), <http://www.cnn.com/2017/07/18/politics/paul-selva-gary-peters-autonomous-weapons-killer-robots/index.html>; Rick Noack, *Stop the Rise of the ‘Killer Robots,’ Warn Human Rights Advocates*, WASH. POST (Nov. 16, 2017), https://www.washingtonpost.com/news/worldviews/wp/2017/11/16/stop-the-rise-of-the-killer-robots-warn-human-rights-advocates/?utm_term=.0f4654867210.

²⁰⁹ See *supra* note 208.

²¹⁰ See Schuller, *supra* note 38, at 408–12; Alan L. Schuller, *Focusing the Debate on Autonomous Weapon Systems: A New Approach to Linking Technology and IHL*, in AUTONOMOUS WEAPONS SYSTEM 27 (Int’l Comm. of the Red Cross 2016), <https://www.icrc.org/en/publication/4283-autonomous-weapons-systems>.

²¹¹ Schuller, *supra* note 38, at 409.

²¹² *Id.* at 411.

²¹³ *Id.* (internal quotations omitted).

²¹⁴ *Id.*

operate a device in U.S. domestic policing, particularly at the tactical patrol level. Additionally, I believe that the importance of checking uncertainty of action applies more directly when discussing robotic police use of force as compared to law enforcement surveillance because the consequences are more significant.

If an AI-driven police robot makes a mistake in data collection or surveillance no one is likely to die. The same is not true with police use of force decisions, which can be as challenging as, if not more so than, LOAC decisions because the rules for domestic law enforcement use of force, which are based on “reasonableness,” are very much dependent on context and are made even more challenging because police-use-of-force-decisions are often extraordinarily time compressed.²¹⁵ Furthermore, though the LOAC allows for the deployment of lethal force based on a status determination,²¹⁶ reasonable police use of force is nearly always a conduct-based decision.²¹⁷

The intersection of context-driven decision making and the complexity necessary to account for a highly dynamic law enforcement operating environment seemingly exacerbates the issues. “The dark irony is that the more advanced robots get, the more complex they become, and the more potential they have for failure . . . [for if there is] even one icon wrong in billions of lines of code . . . the whole system can either shut down or act unexpectedly.”²¹⁸ After all “[w]e’ve all had problems with our PCs freezing up . . . That’s inconvenient. But it’s much more worrisome if it’s a laptop computer [with a firearm].”²¹⁹

²¹⁵ *Tennessee v. Garner*, 471 U.S. 1, 7 (1985).

²¹⁶ *E.g.*, SOLIS, *supra* note 144, at 201–02 (describing “combatant status” and noting that “combatants may be attacked at any time until they surrender or are otherwise hors de combat, and only when actually threatening the enemy”).

²¹⁷ *See* Palmiotto, *supra* note 81, at 39–40.

²¹⁸ SINGER, *supra* note 5, at 195.

²¹⁹ *Id.* at 197 (quoting technology journalist Noah Shachtman).

4. *Employing robots in law enforcement invariably increases the trend of the militarization of police.*

Public concern over the militarization of police dates as far back to civilization's first use of an organized central police force in ancient Rome.²²⁰ In the United States, the 3rd Amendment to the Constitution represents one of the first efforts by Americans to keep soldiers from enforcing domestic law.²²¹ After slipping the yoke of Britain, the young United States stepped away from this idea for a bit in response to Shays' Rebellion and passed legislation authorizing the President to call forth state militias to respond to insurrections.²²² This legislation, which has evolved into today's Insurrection Act,²²³ was rarely used in the first 50 years of the United States save for a few post-Shays occasions.²²⁴

The real tension regarding the U.S. government employing troops to enforce law arose from the ashes of the Civil War, when Federal troops deployed to the Reconstruction-era South to enforce the Fourteenth Amendment, which extended Constitutional protections to the newly freed, former slaves.²²⁵ American Reconstruction efforts were politically charged for many reasons, not the least of which were the South's reluctance to fully enfranchise African Americans with the same rights of their fellow citizens.²²⁶ In part as a result of this tension, the U.S. Congress

²²⁰ See BALKO, *supra* note 12, at 3 (noting that it was Caesar crossing the Rubicon and bringing a standing Roman Army into Rome to serve as an internal security force that directly contributed to Rome's fall).

²²¹ See U.S. CONST. amend. III; BALKO, *supra* note 12, at 14 ("It was the deployment of British soldiers to colonial cities strictly for the purpose of enforcing law that set long-smoldering hostilities [that started the American Revolution] aflame.").

²²² BALKO, *supra* note 12, at 18.

²²³ See 10 U.S.C. §§ 251–55 (2017).

²²⁴ See BALKO, *supra* note 12, at 18.

²²⁵ See U.S. CONST. amend. XIV; BALKO, *supra* note 12, at 23–25 ("Reconstruction was a necessary policy, and it was probably necessary to use troops to enforce it. But it was a once-in-American-history sort of crisis After federal troops were pulled out of the South, the domestic deployment of US [sic] troops mostly reverted back to limited situations like large-scale riots and violent insurrections.").

²²⁶ See BALKO, *supra* note 12, at 23–25.

passed the *posse comitatus* act, which to this day establishes as a matter of law that the Army (and Air Force) cannot be used to enforce domestic law without the express authority of the President.²²⁷ The Insurrection Act²²⁸ scopes this authority, and the Department of Defense, as a matter of policy, extends *posse comitatus* to U.S. Navy and Marine Corps forces.²²⁹

Yet, it does not take actual soldiers or sailors enforcing law to cause concerns with trying to maintain the idea that police and not soldiers should enforce domestic law. “Militarization . . . can be defined in its broadest terms as the social process in which society organizes itself for the production of violence or the threat thereof.”²³⁰

In the century and a half following the Civil War, America’s adherence to the primary policy purpose behind the *posse comitatus* act (that is, the distinction between soldiers and police) has largely diminished as the years have passed.²³¹ The late 1960s brought significant social unrest as America continued its struggle with race relations,²³² and in the late 1970s and early 1980s the American “war

²²⁷ See 18 U.S.C. § 1385 (2017); Douglas Daniels, *How to Allocate Responsibilities between the Navy and Coast Guard in Maritime Counterterrorism Operations*, 61 U. MIAMI L. REV. 467, 480–86 (2007) (describing the *posse comitatus* statute, how the DoD extended the statute, and how the Navy works with the Coast Guard to enforce counter-narcotics law at sea in order to comply the purpose behind *posse comitatus*).

²²⁸ See 10 U.S.C. §§ 251–55 (2017).

²²⁹ See U.S. Dept. of Defense Directive 5525.5, *DoD Cooperation with Civilian Law Enforcement Officials* (DoD 1989), <https://www.hsdl.org/?abstract&did=421>; *The Posse Comitatus Act*, U.S. NORTHERN COMMAND (May 16, 2013), <http://www.northcom.mil/Newsroom/Fact-Sheets/Article-View/Article/563993/the-posse-comitatus-act/> (noting that of all of the armed forces, only the U.S. Coast Guard is at all times both an armed force and law enforcement agency). Compare 14 U.S.C. § 1 (2017), with 14 U.S.C. §§ 2, 89 (2017).

²³⁰ Peter B. Kraska, *Crime Control as Warfare: Language Matters*, in *MILITARIZING THE AMERICAN CRIMINAL JUSTICE SYSTEM* 16 (Peter B. Kraska ed., 2001) (emphasis omitted).

²³¹ See generally Laurence Armand French, *Use of Deadly Force*, in *POLICE USE OF FORCE* 39-40 (Michael Palmiotto ed., 2017).

²³² See WILLIAMS, *supra* note 118, at 323.

on drugs” got underway.²³³ Both brought a significant militarization of police, as police departments in general—but specifically the ones in large metropolitan cities—partnered with the military to develop tactics, create specialized weapons and tactics (SWAT) units, and fielded increasingly deadly weapons to counter the perceived public safety threat posed by the illegal narcotics trade.²³⁴ As the 1980s progressed, this effort redoubled in response to the crack epidemic.²³⁵ And after the tragic terror attacks of September 11, 2001, they seemingly redoubled again.²³⁶ In 2018, it’s not uncommon to see American police on patrol in major American cities armed with assault rifles, Kevlar helmets, and full flak protection, much like a U.S. soldier on patrol in Afghanistan.²³⁷ While these efforts do not run afoul of *posse comitatus*, they have marked a fundamental shift in police tactics, procedures, and even appearance that many argue undermines the legitimacy of the police as an institution.²³⁸

²³³ *Id.* at 327; BALKO, *supra* note 12, at 141–45, 147–50, 157–58.

²³⁴ *See* BALKO, *supra* note 12, at 132–33; WILLIAMS, *supra* note 118, at 324–27.

²³⁵ *See* BALKO, *supra* note 12, at 155–57 (describing the LAPD’s experiments with an armored battering ram used to breach “crack houses.”). For a demonstration of the LAPD battering ram in action, see DRAGNET (Universal Pictures 1987).

²³⁶ *See* BALKO, *supra* note 12, at 242–43 (“Terrorism would also provide new excuses for police agencies across the country to build up their arsenals and for yet smaller towns to start up yet more SWAT teams. The second half of the decade also saw more mission creep for SWAT teams and more pronounced militarization even outside of drug policing.”).

²³⁷ *See* Nevitt, *supra* note 12.

²³⁸ *See* Carl B. Klockars, *The Rhetoric of Community Policing*, in COMMUNITY POLICING: RHETORIC OR REALITY 244 (Jack R. Greene & Stephen D. Mastrofski eds., 1988) (“While extricating police from the shabby sides of urban politics and establishing discipline within the ranks were no small achievements in the history of U.S. police, the military metaphor that made those achievements possible brought with it some mighty long-term costs. Administratively, it left U.S. police with a quasi-military administrative structure that is wholly inappropriate as a device for managing the highly discretionary activity of police work.”); Radley Balko, *Militarized Policing Doesn’t Reduce Crime and Disproportionately Hits Black Communities*, WASH. POST (Aug. 22, 2018), <https://www.washingtonpost.com/news/opinions/wp/2018/08/22/militarized->

The so called “1033 program” is a direct contributor to the symbolic impact of police militarization in the United States:

Faced with a bloated military and what it perceived as a worsening drug crisis, the 101st Congress in 1990 enacted [a] National Defense Authorization Act. Section 1208 of the NDAA allowed the Secretary of Defense to “transfer to Federal and State agencies personal property of the Department of Defense, including small arms and ammunition, that the Secretary determines is— (A) suitable for use by such agencies in counter-drug activities; and (B) excess to the needs of the Department of Defense.” It was called the 1208 Program. In 1996, Congress replaced Section 1208 with Section 1033.²³⁹

In the intervening years since the implementation of the 1033 program, police forces of all sizes around the country took huge advantage of the 1033 program and purchased military assault and sniper rifles and optics, grenade launchers, mine resistant trucks, image intensifiers, night vision goggles, and riot gear.²⁴⁰ During the life of the program, the Department of Defense transferred a staggering \$5.4 billion worth of gear to police departments around the nation.²⁴¹

Recognizing that “militarized gear sometimes gives people a feeling like [police] are an occupying force as opposed to part of the

policing-doesnt-reduce-crime-and-disproportionately-hits-black-communities/?noredirect=on&utm_term=.3a8a3ed13d14 (citing to a study published in the Proceedings of the National Academy of Science that concluded that “there’s little upside to militarized policing”); Jonathan Mummolo, *What I Learned by Studying Militarized Policing*, ATLANTIC (Aug. 23, 2018), <https://www.theatlantic.com/politics/archive/2018/08/where-is-the-data-on-police-behavior/568258/> (asserting that “militarized policing does not, on average, make either the public or police any safer, [and] it may tarnish the reputation of police). See generally BALKO, *supra* note 12; WILLIAMS, *supra* note 118.

²³⁹ Taylor Wofford, *How America’s Police Became an Army: The 1033 Program*, NEWSWEEK (Aug. 13, 2014, 10:47 PM), <http://www.newsweek.com/how-americas-police-became-army-1033-program-264537>.

²⁴⁰ *Id.*; see also Tom Jackman, *Trump to Restore Program Sending Surplus Military Weapons, Equipment to Police*, WASH. POST (Aug. 27, 2017), https://www.washingtonpost.com/news/true-crime/wp/2017/08/27/trump-restores-program-sending-surplus-military-weapons-equipment-to-police/?utm_term=.004259579ae4.

²⁴¹ See Jackman, *supra* note 240.

community there to protect them,” President Obama placed limits on the program.²⁴² Shortly after arriving in office, President Trump repealed those limits.²⁴³

The idea that police are not soldiers (and vice versa) is a fundamental lynchpin to a free and democratic society well-grounded in the Constitution and Federal law.²⁴⁴ While the recent trend has strayed away from this idea, the public—and even some police departments and government officials—once again recognize the threat to our society that over-militarized police pose, if for no other reason than the axiomatic dynamic that once government has a tool, they’re going to want to use it.²⁴⁵ Thus, the same dynamic will hold true with robotic policing given the far above human capabilities they bring to law enforcement. The issue is how to best strike a balance between the increased capacity and enhanced capabilities robotic policing provides, without crossing the proverbial Rubicon as Caesar did when he marched his legions into Rome to “protect” the people.²⁴⁶

5. *The accountability gap.*

Finally, one of the key concerns with unmanned devices is that their use may make accountability for their misuse difficult.²⁴⁷ This

²⁴² *Id.*

²⁴³ *Id.*

²⁴⁴ See generally BALKO, *supra* note 12, at xiv, 322–32 (recommending that in order to stop the trend of police militarization, we should “[h]alt the [m]ission [c]reep[.]” increase “[t]ransparency[.]” focus on “[c]ommunity [p]olicing[.]” change “[p]olice [c]ulture[.]” and demand greater “[a]ccountability”).

²⁴⁵ See *id.* at 133 (quoting philosopher Abraham Kaplan, who describes the “Law of the Instrument: when you’re carrying a hammer, everything looks like a nail”).

²⁴⁶ *Id.* at 3.

²⁴⁷ See ARKIN, UNMANNED, *supra* note 5, at 200 (“[T]he use of autonomous drones would not always allow someone to be held accountable for actions.”); Michael Bourbonniere, *Law, Technology and the Conduct of Hostilities in Space*, in INTERNATIONAL HUMANITARIAN LAW AND NEW WEAPONS TECHNOLOGIES 164 (Wolff Heintschel von Heinegg ed., 2011); Anderson & Waxman, *supra* note 46, at 1110 (“Therefore, the difficulty is, as many have pointed out, that somehow human responsibility and accountability for the actions taken by the machine evaporate and disappear. The soldier in the field cannot be expected to understand

is not so much so where a human being is operating the device or is responsible for the use of force,²⁴⁸ but it is more applicable the more autonomous a device tends to be.²⁴⁹ Thus:

[presumably] a computer programmer program[s] these robots so that they function correctly and supposedly in accordance with the law Should one of these fully autonomous robots go “stupid” as sometimes happens with smart weapons, there has to be a liability regime which holds the owners of these things responsible The fundamental issue is necessarily that of accountability and competing human interests. Those who decide to use fully autonomous robots . . . should . . . remain accountable should there be innocent victims from the use of these machines, irrespective of the quality of the programming An effective liability regime will go a long way in assuring the correct use of these machines and increase the need for their constant human supervision.²⁵⁰

VI. RECOMMENDATIONS.

Given these tensions, I propose the following rules to help govern what I believe will be the inevitable widespread use of robotic police. All of these rules are generally premised on the underlying idea that there should be an inverse relationship between autonomy and lethality when discussing robotic use of force in the context of American law enforcement.

Rule 1: Comply with current trends in the state of the law when conducting surveillance and “search” activities.

I am choosing to start with a brief analysis on robotic police surveillance because surveillance is inextricably intertwined with

in any serious way the programming of the machine; the designers and programmers operate on a completely different legal standard; the operational planners could not know exactly how the machine would perform in the fog of war[.]”). *See generally* BONNIE DOCHERTY, MIND THE GAP, HUMAN RIGHTS WATCH (Apr. 9, 2015), <https://www.hrw.org/report/2015/04/09/mind-gap/lack-accountability-killer-robots>.

²⁴⁸ *See* Alison Brown, *Understanding the Law of Police Use of Force*, in POLICE USE OF FORCE 113-42 (Michael Palmiotto ed., 2017) (outlining the available State and Federal criminal and civil liability regimes for illegal police use of force).

²⁴⁹ *See, e.g.,* DOCHERTY, *supra* note 247 (describing the accountability issues with autonomous warfighting weapons).

²⁵⁰ *See* Bourbonniere, *supra* note 247, at 164.

the potential for police to use force, in that it provides increased opportunities for law enforcement to respond to allegations and reports of crime. In a string of aviation-surveillance cases, The Supreme Court articulated that “the Fourth Amendment simply does not require the police traveling in the public airways at [an altitude of 400-1000 feet] to obtain a warrant in order to observe what is visible to the naked eye.”²⁵¹ Yet, Justice O’Connor considered the relative infrequency of police helicopter patrols as part of her concurring opinion in *Riley*, “suggesting that more frequent low-altitude flights might impact whether it is reasonable for one to expect privacy from aerial observations.”²⁵²

Thus, one can extrapolate what reasonable, warrantless autonomous or remotely-piloted police drone surveillance could look like by layering in the *Kyllo* holding, which seems to stand for the idea that police may not use technological means not widely available to the public to breach the inherent privacy of the home without first obtaining a warrant,²⁵³ and *Jones*, specifically the concurrence led by Justice Alito, which represents the idea that warrantless police surveillance is limited to human standards of persistence.²⁵⁴

Under the first aspect of this extrapolation, airborne police surveillance is likely limited to surveillance conducted by the naked eye, and even if there is room to expand on that standard, such an expansion would not be so great as to allow a device or sensor that could breach the sanctity of the home, even one with comparatively rudimentary capabilities by today’s standards, as was used in *Kyllo*.²⁵⁵

²⁵¹ *Florida v. Riley*, 488 U.S. 445, 450 (1989) (quoting *California v. Ciraolo*, 476 U.S. 207, 215 (1986)); see McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 374–76.

²⁵² McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 377; see *Riley*, 488 U.S. at 452–56 (O’Connor, J., concurring).

²⁵³ See Jenks, *supra* note 7, at 1422.

²⁵⁴ *Id.* at 1423; see *United States v. Jones*, 563 U.S. 400, 419–31 (2012) (Alito, J., concurring).

²⁵⁵ See *Kyllo v. United States*, 533 U.S. 27, 27–28 (2001).

Next, drone operational altitudes are likely limited to those used by the public. In *Riley* it was 400 feet.²⁵⁶ The *Ciraolo* court set this mark at 1,000 feet.²⁵⁷ This is consistent with the FAA and DoJ drone guidelines which currently limits police operations of UAS to 400 feet and below.

Finally, the *Jones* court indicates that there are likely temporal limits in play. There, Justice Alito in his concurrence “claimed an inability to identify with precision the point at which the tracking of this vehicle became a search, for the line was surely crossed before the 4-week mark.”²⁵⁸ Regardless, for now, “[g]iven that current UAS are piloted from the ground, such continuous surveillance seems unlikely for the same reasons that it was unlikely that police officers would have chosen to physically follow Jones around.”²⁵⁹ However, this would only remain true if the current FAA/DOJ guidelines requiring that remotely piloted devices be operated within sight of their operators remain in place.²⁶⁰

The next step in police use of UAS or robotic technology will likely be remotely piloted devices operating in a location far removed from its operator, as a way station on the path to semi-autonomous devices, which themselves will be a way-station on the path to fully autonomous devices. Today, geographically separated, remotely piloted devices are largely the current state of the art in military UAS operations with a transition towards types with greater autonomy.²⁶¹ As this trend inevitably takes shape in the context of domestic law enforcement drone use, police departments should

²⁵⁶ See *Riley*, 488 U.S. at 445, 450.

²⁵⁷ See *California v. Ciraolo*, 476 U.S. 207, 215 (1986).

²⁵⁸ See *Jones*, 565 U.S. at 419–31 (Alito J., concurring); Jenks, *supra* note 7, at 1421 (citing to *Jones*’ discussion on technology used by the police that exceeds human capabilities of persistent surveillance). *But see* *Carpenter v. United States*, 585 U.S. ____ (2018) (concluding, seemingly, that GPS tracking in excess of seven days is likely unreasonable, but narrowly limiting the holding to the facts of that case).

²⁵⁹ Jenks, *supra* note 7, at 1422.

²⁶⁰ See Brumfield, *supra* note 7, at n.69–70.

²⁶¹ See SINGER, *supra* note 5, at 34–36. See generally Singer, TED Talk, *supra* note 29.

account for the likely temporal limits on how long a domestic law enforcement drone or unmanned vehicle may surveil a suspect.²⁶²

Here, despite all of the discussion of seeing things through the use of surveillance, it is also worth noting that it is easy to miss the proverbial forest through the trees, in that the issue may not be so much unmanned surveillance as it is about just persistent surveillance and how much easier digital imagery and data storage technology has made it for police to broadly surveil their jurisdictions.²⁶³ For instance:

[i]n 2014, residents of Compton, California learned that their city had been the subject of a 2012 experiment in total video monitoring. . . . The LA County Sheriff's Department contracted with a private surveillance company to test an airborne camera that monitored the entire city 24-hours a day using high resolution video of everything that happened inside the 10-square mile municipality. . . . The imagery was archived, so that if a crime had been reported during that period, the police could back and retrieve the video and zoom in on the location of the crime.²⁶⁴

By decoupling the on-scene human operator, “operational-level,” long range/long loiter time, unmanned vehicles with Predator-like capabilities²⁶⁵ would make it easier for police

²⁶² See McNeal, *Drones and Aerial Surveillance: Considerations for Legislators*, *supra* note 10; McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7.

²⁶³ See McNeal, *Drones and Aerial Surveillance: Considerations for Legislators*, *supra* note 10 (arguing that legislators should reject a warrant-based approach and instead focus on a property rights and duration-based approach to regulating aerial police surveillance); McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 386.

²⁶⁴ Mark Andrejevic, *Theorizing Drones and Droning Theory*, in *DRONES AND UNMANNED AERIAL SYSTEMS* 27 (Ales Zavrsnik ed., 2016); *see also* Finn, *supra* note 61; Reel, *supra* note 61.

²⁶⁵ See ARKIN, *UNMANNED*, *supra* note 4, at 18–19 (noting that it was the Predator's “wimpy[,] gas sipping” engine and “long wingspan that allowed it to stay in the air for potentially up to forty hours . . . gathering intelligence and relentlessly tracking targets”); PLAW ET AL., *supra* note 5, at 18 ([A Predator crew] “consisted of at least a pilot and sensor operator (sometimes accompanied by a data analysts) who sat in faux leather chairs and manipulated control sticks, like those of a conventional aircraft, to fly the plane [L]ow fuel consumption helped to keep the cost of operating the machine down [And] by cycling crews . . . drone surveillance could be maintained for aircraft's entire flight time

departments to engage in this type of persistent, broad range airborne surveillance.²⁶⁶ In fact, some are already engaging in using manned aircraft.²⁶⁷ It is also noteworthy that the U.S. Air Force recently terminated its Predator program in favor of the more capable (and more expensive) Reaper,²⁶⁸ and, as such, there is or will be soon a relative stockpile of “pre-owned” DoD Predators looking for homes, and ripe for 1033 transfer.²⁶⁹

Therefore, I believe it is foreseeable that after another terror event or mass shooting, a domestic law enforcement agency will challenge the FAA/DOJ guidelines to push the envelope on drone or robotic mass surveillance.²⁷⁰ If they do so, before springing for a Predator system or another likely expensive, operational-level UAS to conduct surveillance, they may be well served to pay close attention to the direction the Court is moving before expending scarce fiscal resources developing and fielding such a program.

Long loiter time, unmanned surveillance with greater-than-human sensory detection capabilities would clearly be a very useful tool in certain high risk/high consequence operations like the aforementioned Las Vegas shooting or in an ongoing Mumbai-type

of potentially up to forty hours . . . and if another drone was ready to replace the first, close surveillance could be maintained continuously.”)

²⁶⁶ See ARKIN, UNMANNED, *supra* note 5, at 23 (describing the drone mounted “Gorgon Stare” program used by the military in the war on terror, that used 368 cameras that took “video at the rate of twelve frames per second, and the 1.8 billion pixel composite image took up several terabytes of data every minute”).

²⁶⁷ See Andrejevic, *supra* note 264; Finn, *supra* note 61; Reel, *supra* note 61.

²⁶⁸ See Iain Thomson, *US Air Force Terminates Predator Drones. Now You will Fear the Reaper*, REGISTER (Feb. 27, 2017, 9:27 PM), https://www.theregister.co.uk/2017/02/27/us_air_force_put_predator_drones/ (reporting that the U.S. military is replacing the Predator with the “more powerful MQ-9 Reaper drone”).

²⁶⁹ See, e.g., Jackman, *supra* note 240.

²⁷⁰ See generally McNeal, *Drones and the Future of Aerial Surveillance*, *supra* note 7, at 384–87 (using security of a marathon to describe the challenges of applying the existing warrant paradigm to legitimate police use of UAS for public safety and security).

terror attack.²⁷¹ Thus, while it may be reasonable to read in a warrant requirement for day-to-day police drone/UAS surveillance operations of a persistent nature, especially those with enhanced sensory capabilities consistent with the *Riley*, *Kyllo*, and *Jones* line of cases, the law should not be so inflexible as to strictly prohibit such police drone/UAS operations in true exigency either with or without a post-hoc warrant.²⁷²

Rule 2: Prohibit independent “tactical” patrol operations of robotic police. Police departments may, however, deploy robotic units independently for discrete purposes, such as crime scene analysis, under the on-scene supervision by a human. Otherwise, robotic police should only deploy with human “partners” on tactical patrol.

This proposed rule maintains the momentum towards community policing, which relies heavily on human-to-human interaction, establishing and leveraging relationships, and building trust between police officers and the communities they serve.²⁷³ As I discussed above, robots, remotely-operated or otherwise, are not human, and it thus stands to reason that community members may have difficulty establishing the trust and relationships with them

²⁷¹ See *id.*; Somini Sengupta & Keith Bradsher, *Mumbai Terrorist Siege Over, India Says*, N.Y. TIMES (Nov. 28, 2008), <http://www.nytimes.com/2008/11/29/world/asia/29mumbai.html>.

²⁷² See *supra* notes 72–74. See generally George L. Blum, Romualdo P. Eclavea, Alan J. Jacobs & Eric C. Surette, *Exigent Circumstances as Justifying Warrantless Search*, 68 AM. JUR. 2D, SEARCHES AND SEIZURES § 133 (Nov. 2017) (“Exigent circumstances, justifying a warrantless search [into an area where there is a reasonable expectation of privacy], exist where there is a compelling need for official action and no time to secure a warrant. Exigent circumstances are deemed to exist if a reasonable law enforcement officer can believe that a person is in need of immediate aid, and there is a situation demanding immediate action, or there is no time to get a warrant; such circumstances arise when law enforcement officers confront a compelling necessity for immediate action that would brook the delay of obtaining a warrant.”).

²⁷³ See Mary Ann Wycoff, *The Benefits of Community Policing: Evidence and Conjecture*, in COMMUNITY POLICING: RHETORIC OR REALITY 103–16 (Jack R. Greene & Stephen D. Mastrofski eds., 1988).

necessary for successful community policing.²⁷⁴ This is important because community policing may in fact be more effective than traditional police tactics and serves as a kind of check against the trend of police militarization.²⁷⁵

Further, teaming humans with robots aligns with what many believe is the next step in the military's use of more autonomous systems.²⁷⁶ This strategy results in a kind of synergy of operation in that it allows "[t]he robot . . . [to] do what robots do best . . . [and] [p]eople [to] do what people do best."²⁷⁷ Of course, effective deployment of human/robot teams presumes further development in two critical areas—communication between the human and its robot partner and trust,²⁷⁸ which Schuller argues is grounded in predictability of action.²⁷⁹

²⁷⁴ See Timothy N. Oettmeier & Lee P. Brown, *supra* note 174, at 121–34. *But see* SINGER, *supra* note 5, at 337–42 (describing the human tendency to anthropomorphize or “give human characteristic to something not human” thereby perhaps making it easier to develop the community policing fostering relationships with a police robot).

²⁷⁵ See BALKO, *supra* note 12, at 325; Carl B. Klockars, *supra* note 238, at 239–58; WILLIAMS, *supra* note 118, at 330–32.

²⁷⁶ See SINGER, *supra* note 5, at 132–34; Spencer Ackerman, *The Pentagon Doesn't Trust Its Own Robots*, WIRED (Sept. 11, 2012, 12:00 PM), <https://www.wired.com/2012/09/robot-autonomy/>; Kelsey D. Atherton, *Robots May Replace One-Fourth of U.S. Combat Soldiers By 2030, Says General*, POPULAR SCIENCE (Jan 22, 2014), <https://www.popsci.com/article/technology/robots-may-replace-one-fourth-us-combat-soldiers-2030-says-general>; Denise Chow, *Gun-Toting Robots May Fight Alongside Soldiers in Future Battles*, LIVE SCIENCE (Oct. 21, 2013, 4:08 PM), <https://www.livescience.com/40582-military-machine-gun-robots.html>; Franz-Stefan Gady, *Super Humans and Killer Robots: How the US Army Envisions Warfare in 2050*, DIPLOMAT (July 24, 2015), <https://thediplomat.com/2015/07/super-humans-and-killer-robots-how-the-us-army-envisions-warfare-in-2050/>; Tobin Harshaw, *Uncle Sam Wants You . . . to Fight Alongside a Killer Robot*, BLOOMBERG (Sept. 9, 2017, 9:32 AM), <https://www.bloomberg.com/view/articles/2017-09-09/uncle-sam-wants-you-to-fight-alongside-a-killer-robot>.

²⁷⁷ SINGER, *supra* note 5, at 133.

²⁷⁸ See *id.* at 133–34.

²⁷⁹ See generally Schuller, *supra* note 38.

Finally, with specific regard to law enforcement's use of robotic unmanned aircraft, this rule also has the benefit of remaining consistent with the current DOJ/FAA MOU which requires UAS be operated within sight of their operator.²⁸⁰ Granted, I do not believe that this guidance will continue in force as drone, robotic, and AI technology continues to develop and proliferate, specifically from the military to the police²⁸¹ and perhaps even ultimately to the public.²⁸² The advantages provided by robotic policing are just too great to be limited to remotely-operated, line-of-sight operations. But, for now, compliance with the DOJ/FAA MOU cuts towards establishing this rule as a sort of check against the current state of technology which has yet to reach the level of maturity and predictability that Schuller argues is necessary to assuage concerns of misuse.

Rule 3: Prohibit the use of force from operational devices because doing so helps prevent the further militarization of police.

This rule is intended to prevent police departments from launching a war-on-terror-type drone strike using a high-flying, "operational-type" device like a Predator or Reaper²⁸³ that would orbit the police jurisdiction ready to employ lethal force on someone targeted by law enforcement.

The scholar Peter Kraska, who has written extensively on the militarization of American police,²⁸⁴ has generated a list of tangible indices of police militarization.²⁸⁵ They include:

²⁸⁰ Brumfield, *supra* note 7, at n.69–70.

²⁸¹ See Sandvik, *supra* note 34, at 48–50, 53–58.

²⁸² C.f. Tim Dickinson, *How the AR-15 Became Mass Shooters' Weapon of Choice*, ROLLING STONE (Feb. 22, 2018, 4:20PM), <http://www.rollingstone.com/politics/features/how-the-ar-15-became-mass-shooters-weapon-of-choice-w451452>; James Fallows, *More on the Military and Civilian History of the AR-15*, ATLANTIC (Nov. 12, 2017, 5:41 PM), <https://www.theatlantic.com/notes/2017/11/on-the-military-and-civilian-history-of-the-ar-15/545660/> (tracing the history of the AR-15).

²⁸³ See PLAW ET AL., *supra* note 5, at 20–25 (describing the developmental history of both).

²⁸⁴ See BALKO, *supra* note 12, at 206–10.

²⁸⁵ See WILLIAMS, *supra* note 118, at 322.

- (1) A blurring of external and internal security functions leading to a targeting of civilian populations, internal “security” threats, and a focus on aggregate populations as potential internal insurgents[;]
- (2) An avoidance of overt or lethal violence, with a greater emphasis placed on information gathering and processing, surveillance work, and less-than-lethal technologies[;]
- (3) An ideology and theoretical framework of militarism that stresses that effective problem solving requires state force, technology armament, intelligence gathering, aggressive suppression efforts, and other assorted activities commensurate with modern military thinking and operations[;]
- (4) Criminal justice practices guided by the ideological framework of militarism, such as the use of special operations paramilitary teams in policing and corrections, policing activities that emphasize military tactics such as drug, gun, and gang suppression, and punishment models based on military boot camp[;]
- (5) The purchasing, loaning, donation, and use of actual material products that can be characterized as militaristic, including a range of military armaments, transportation devices, surveillance equipment, and military style garb[;]
- (6) A rapidly developing collaboration, at the highest level of the government and corporate worlds, between the defense and industry and the crime control industry[;]
- (7) The use of military language within political and popular culture, to characterize the social problems of drugs, crime, and social disorder.²⁸⁶

Police use of drones and unmanned devices in general, and at the operational level specifically, implicates Kraska’s indicia numbers (1)-(3), (5), and (6).²⁸⁷ There are clear public safety and security benefits to using robotic police devices and there may come a day when operational-level drones or robots, remotely piloted or otherwise, orbit American cities. Yet in order to balance the benefits of robotic policing against the ills that robotic policing represents in terms of what would clearly be the further militarization of the American police, I propose a strict ban on *any* use of force from “operational”-level UAS, as *per se* unreasonable.²⁸⁸ Drones working

²⁸⁶ *Id.* (citing Kraska, *supra* note 230, at 16–17).

²⁸⁷ *See id.*

²⁸⁸ *See* BALKO, *supra* note 12, at 155–57 (noting that the California Supreme Court found the LAPD’s use of a battering ram “so excessive as to violate the Fourth Amendment[‘s]” reasonableness requirement).

in coordination with police on patrol, optimally in teams, to improve the capabilities of human police so that they can better do their job is one thing.²⁸⁹ High-flying, “Big-Brother-like” persistent surveillance devices coupled to the capability to engage suspects with force, either autonomously or without even really having a human present on scene, is quite another.²⁹⁰

This is not to say though, that tactical-level police employments of remotely-operated or autonomous use of force do not come with similar risks. For example, “Switchblade [is] a microdrone with a lethal payload that has been used in Afghanistan since 2012.”²⁹¹

At about 24 in. in length, and weighing between 5 and 6 lbs., and with a price tag between \$40,000 and \$150,000, the Switchblade—variously referred to by its admirers as the kamikaze drone and the ultimate assassin bug—can be transported in the trunk of a car and assembled and deployed in a matter of minutes by a . . . police officer chasing a suspect—whom it can not only find but kill [with an explosive charge].²⁹²

Switchblade can either be piloted or can fly autonomously.²⁹³

Again, there are great benefits to fielding tactical drones in U.S. domestic law enforcement, including capability benefits that departments and agencies all around the nation are currently reaping and capacity benefits that with increased levels of autonomy they may soon also do so. But there are individual and societal risks to their use, especially if domestic law enforcement agencies follow the drone use evolutionary progression of the military and begin arming their drones.²⁹⁴ Thus, I also propose the below rules on tactical police use of force to help address clear civil rights and

²⁸⁹ See *id.* at 325; WILLIAMS, *supra* note 118, at 330–32; Klockars, *supra* note 275, at 239–58.

²⁹⁰ See generally Breshears, *supra* note 7, at 203–08 (arguing that when assessing the reasonableness of police use of force, “courts have [seemingly] adopted the general notion that *presence* is somehow key in determining reasonableness”).

²⁹¹ Sandvik, *supra* note 34, at 46.

²⁹² *Id.* at 51 (internal quotes removed).

²⁹³ *Id.*

²⁹⁴ See Jenks, *supra* note 7, at n.13.

Constitutional concerns with the potential of police officers using “kamikaze drones.”²⁹⁵

Rule 4: Checks on lethality and autonomy by mitigating against uncertainty of action.²⁹⁶

This rule is broken into three parts and is intended to establish an inverse relationship between autonomy and lethality as a means of mitigating the risks inherent in equipping increasingly capable autonomous devices with the ability to employ deadly force.

A. Remotely-piloted and semi-autonomous devices on tactical-level patrol with a human partner may reasonably apply force, up to and including deadly force.

Again, the legality of U.S. police use of force is based on an objective reasonableness standard.²⁹⁷ Thus, it may be reasonable for a remotely-operated or semi-autonomous device operating on patrol, in conjunction with a human, to employ force, including deadly force, in which the human operator makes the decision on the employment of force, but we likely will not know for sure until it happens. However, as a general proposition, we know that U.S. police may use up to and including deadly force when they have “probable cause to believe the suspect poses a risk to the safety of police officers or the community.”²⁹⁸ This includes the application of force to apprehend a fleeing felon where the officer can articulate that the felon posed a serious threat to the public.²⁹⁹

Michael Palmiotto writes that *Graham v. Connor*, the last case the Supreme Court took up on police use of force, established a loose framework in analyzing the reasonableness of that force by seeking answers to the following three questions: “1. What is the nature or severity of the offense? 2. Did the suspect pose an immediate threat to the officer or others? 3. Is the suspect actively resisting or

²⁹⁵ *Id.*

²⁹⁶ See Schuller, *supra* note 38, at 415.

²⁹⁷ See Scott v. Harris, 550 U.S. 372, 378–82 (2007); *Graham v. Connor*, 490 U.S. 386, 396–97 (1989); *Tennessee v. Garner*, 471 U.S. 1, 7 (1985); Brumfield, *supra* note 7, at 557–60; Hamilton, *Excessive Lethal Force*, *supra* note 4, at 160.

²⁹⁸ Palmiotto, *supra* note 81, at 39.

²⁹⁹ See *id.* at 38–39.

attempting to escape?”³⁰⁰ In analyzing this, courts review the totality of the circumstances at the time the officer decided to use force³⁰¹ while also accounting for the inherent stress and pressure a human officer would encounter in having to make a use-of-force decision.³⁰²

Applying Palmiotto’s *Graham* factors and assuming sufficient sensor and data link technology that optimizes quality of sensory data yet minimizes latency³⁰³ along with the ability to effectively communicate both with the subject and the operator’s partner, then it is reasonable to conclude that the police operator of a remotely-piloted or semi-autonomous device in the near future will likely be able to obtain or develop enough information on scene to address all of these factors.

Depending on the circumstances, it may also be necessary for the operator to be able to first positively identify the subject to satisfy the first or second factors.³⁰⁴ Otherwise, the operator would need only to directly observe the subject and, where relevant, use the device’s sensors to observe the offense and the environment in which the subject and the device are located. Alternatively, it may also be sufficient if the operator were able to obtain some of this information on scene by communicating with their human partner,

³⁰⁰ *Id.* at 40.

³⁰¹ See Brumfield, *supra* note 7, at 558 (citing *Graham*, 490 U.S. at 396–97).

³⁰² See *Garner*, 471 U.S. at 11.

³⁰³ See Bjørn Bergersen, *Drones and Wireless Video*, DATA RESPONS, <https://www.datarespons.com/drones-wireless-video/> (last visited Nov. 22, 2017) (discussing the state of the art in minimizing drone data link latency).

³⁰⁴ See Kaveh Waddell, *Half of American Adults Are in Police Facial-Recognition Databases*, ATLANTIC (Oct. 19, 2016), <https://www.theatlantic.com/technology/archive/2016/10/half-of-american-adults-are-in-police-facial-recognition-databases/504560/>. See generally, Tom Costello & Ethan Sacks, *New Facial Recognition Tech Catches First Imposter at D.C. Airport*, NBC NEWS (Aug. 23, 2018, 5:25 PM), <https://www.nbcnews.com/news/us-news/new-facial-recognition-tech-catches-first-impostor-d-c-airport-n903236> (describing an arrest at Washington’s Dulles airport where facial recognition technology facilitated an arrest which would have been unlikely had a human reviewed the suspect’s proffered identification).

dispatch the subject, or other members of the public, as appropriate.³⁰⁵

Courts have granted great deference to police whom are forced to “make split second [use of force] judgments—in circumstances that are tense, uncertain, and rapidly evolving,” and police make those judgments by using their senses to assess their environment.³⁰⁶ The ability to rely on senses will, however, differ greatly between a device operator and a human on scene.³⁰⁷ For example, the human on scene would have access to all five of their senses³⁰⁸ whereas the robot operator would likely be limited to sight and hearing. Developments in immersive virtual reality may soon change this.³⁰⁹ Notwithstanding these developments, the robot operator’s ability to see and hear will likely be well beyond what their human counterparts see and hear, which courts may find as providing a sufficient offset for the lack of ability to touch, taste, and feel, when trying to assess the reasonableness of a decision to employ force.

³⁰⁵ See generally *United States v. Lenoir*, 318 F.3d 725, 729 (7th Cir. 2003) (“[P]olice observation of an individual, fitting a police dispatch description of a person involved in a disturbance, near in time and geographic location to the disturbance establishes a reasonable suspicion that the individual is the subject of the dispatch.”).

³⁰⁶ See *Joh*, *supra* note 7, at 536 (quoting *Graham*, 490 U.S. at 396–97).

³⁰⁷ See *Breshears*, *supra* note 7, at 204–08.

³⁰⁸ *Id.*; see generally Nicholas St. Fleur, *This Exhibition Will Help You Make Sense of Your Senses*, N.Y. TIMES (Nov. 23, 2017), <https://www.nytimes.com/2017/11/23/arts/design/our-senses-exhibition-american-museum-of-natural-history.html> (reporting on an exhibition in New York City intended to highlight human senses).

³⁰⁹ See Noor Farhan, *A Glimpse of the Future? South Korea to Pilot Next-gen ICT Technology at 2018 Winter Olympics*, CHANNEL NEWS ASIA (Nov. 4, 2017, 10:20 AM), <http://www.channelnewsasia.com/news/technology/south-korea-2018-winter-olympics-pyeongchang-ict-technology-9375108> (reporting that South Korea is developing “ultra-high speed 5G wireless data transmission system – up to 10 times faster than current 4G networks found in everyday smartphones” to facilitate “remote piloting of drones and driverless vehicles of the future”); Ben Popper, *Drones and Virtual Reality Headsets are a Delicious Combination*, VERGE (Nov. 24, 2014, 10:28 AM), <https://www.theverge.com/2014/11/24/7274997/parrot-bebop-drone-virtual-reality>.

Furthermore, physically removing the robot operator from the situation may drive more deliberative, less time compressed decision making because the robot operator would not be in individual peril.³¹⁰ This results in a dynamic, though, in which the more immersed the operator is in her access to more human-like sensory input when controlling the device, the less valuable this potential advantage may become.³¹¹ Being physically removed from the scene also eliminates individual self-defense as a justification for the robot to employ force, but would not impact use of force grounded in defense of others against an imminent threat or dangerous fleeing felon.³¹²

In ascertaining reasonableness, a “notoriously opaque and fact-dependent” assessment, courts could also consider the sufficiency of the available sensors and processing latency as compared to the state of the art, the quantity and quality of information that the device operator relied on at the time she made her decision to employ force, the amount of coordination between her and her human partner, and to what extent the operator communicated with the subject.³¹³

³¹⁰ See generally Joh, *supra* note 7, at 537 (“[C]ourts have given considerable deference to officers’ stated belief that they felt their lives were in danger.”). *But see* Breshears, *supra* note 7, at 208–09 (arguing that “[d]istance makes an actor more likely to use force”).

³¹¹ See generally James Lake, MD, *Virtual Reality Graded Exposure Therapy (VRGET)*, PSYCHOLOGY TODAY (Nov. 6, 2017), <https://www.psychologytoday.com/blog/integrative-mental-health-care/201711/virtual-reality-graded-exposure-therapy-vrget> (blogging that virtual reality environments that “provide visual, auditory, tactile, vibratory, vestibular, and olfactory stimuli” are being used for psychological treatment because they provide a realistic means to engage in exposure therapy); Jason Volentine, *Tempe-Based Company Offering Virtual Reality Training for Police Officer*, ABC15 (Nov. 2, 2017, 6:35 AM), <http://www.abc15.com/news/region-southeast-valley/tempe/tempe-based-company-offering-virtual-reality-training-for-police-officer> (reporting on a virtual reality system used to train police officer, because it “mimic[s] real-world stress”).

³¹² See Joh, *supra* note 7, at 537, n.118.

³¹³ *Id.* at 536 (quoting Brandon Garrett & Seth Stoughton, *A Tactical Fourth Amendment*, 103 VA. L. REV. 211, 218 (2017)).

B. *It will also likely be reasonable to employ tools designed and intended to apply less than lethal force, even from autonomous tactical device, when operating in conjunction with a human.*

This analysis focuses on the deployment of non-lethal or less than lethal tools from a fully autonomous, unmanned device or robot.³¹⁴ For example, “[i]n 2007, iRobot announced a “strategic alliance” with Taser International, to develop a Taser-equipped version of its popular Packbot[:]” a land-based device used by the U.S. military that could be easily converted for domestic law enforcement purposes.³¹⁵ Police departments deploying such tools from a remotely-operated device is covered by the analysis immediately above.

Further, this analysis assumes several things. First, it assumes the removal of the current FAA/DOJ guidance that essentially prohibits the operation of fully autonomous or remotely-piloted unmanned devices from being operated outside of the line of sight of their operator.³¹⁶ Again though, this FAA guidance would presumably only apply to flying devices and would not reach land based robots.³¹⁷ Second, it assume the development of sufficient sensor and artificial intelligence which would allow for on-scene decision making capabilities at least equal to that of a human patrol officer.

Scholar Alan Schuller proposed five principles to avoid illegal autonomy, in the context of autonomous weapons systems in armed conflict. Four of the five translate relatively easily to some extent or

³¹⁴ See generally Sandvik, *supra* note 34, at 56–58 (describing two proposed devices robotic devices equipped with less than lethal weapons--Chaotic Moon Studio’s “Chaotic Unmanned Personal Intercept Drone (CUPID), a ‘stun-copter’ capable of delivering an 80,000 volt shock” and Desert Wolf’s Skunk Riot Control Copter which has “four high-capacity gun barrels capable of shooting up to 4000 paintballs, pepper spray balls, or solid plastic balls at rates of up to 80 balls per second”).

³¹⁵ Joh, *supra* note 7, at 533; see SINGER, *supra* note 5, at 22–35 (describing PackBot and its big brother Warrior, with the “same basic design, but . . . bigger . . . [and able to] run a four-minute mile for five hours, while carrying 100 lbs . . . [and] agile enough to fit through a doorway and go up stairs”).

³¹⁶ See Brumfield, *supra* note 7, at 553, n.69–70.

³¹⁷ See *id.*

another to U.S. domestic law enforcement's possible future use of more autonomous devices.³¹⁸

First, Schuller states that “[t]he decision to kill may never be functionally delegated to a computer.”³¹⁹ Here, I propose that more autonomous police robots be limited in the tools they are equipped with to those that are non-lethal or at least, certainly less than lethal than a firearm.³²⁰ Courts currently disfavor this tactic as they tend to believe that “defining police use of force as lethal or not should not be an orienting focus” because “there is no obvious way to quantify the risks created by a [police] officer’s specific action.”³²¹ While non-lethal weapons can be used to lethal effect,³²² distinguishing between weapons like firearms that are designed and intended to be lethal and those that are not such as Electronic Control Devices (i.e., a Taser) and pepper spray should satisfy Schuller’s first principle given the discussion of his additional applicable principles below and “the fact that the use of a dangerous law enforcement tool is not, per se, a use of deadly force.”³²³

Second, Schuller notes that “[armed robots] may be lawfully controlled through programming alone . . . [despite not being] able to perceive, process, and act upon all the factors humans consider before employing lethal force.”³²⁴ Schuller continues by articulating that, through cataloging expected variables, establishing which variables we can expect the robot to observe, defining which variables are important to a use of force decision, and then finally determining how a learning robot may attempt to address those variables, it becomes relatively manageable to program the robot’s computer processor “to evaluate the probability of certain outcomes

³¹⁸ See Schuller, *Crossroads*, *supra* note 38, at 415–25.

³¹⁹ *Id.* at 415.

³²⁰ See *supra* note 17 and accompanying text.

³²¹ Hamilton, *Excessive Lethal Force*, *supra* note 4, at 1179–80 (citing *Scott v. Harris*, 550 U.S. 372, 383–84 (2007), and *Mullenix v. Luna*, 136 S. Ct. 305 (2015) (per curiam) (Scalia, J., concurring)).

³²² See Joh, *supra* note 7, at 534 (“While relatively uncommon, people have died in incidents in which police use Tasers . . .”).

³²³ See generally Longo, *supra* note 80, at 274–77.

³²⁴ See Schuller, *supra* note 38, at 417–18.

as compared to the expected utility of particular actions.”³²⁵ In the case of a fully autonomous law enforcement device, its operating system could relatively easily be programmed with force employment parameters that would be driven from its sensor feed and could account for the current legal standards³²⁶ and factors within the operating environment such as whether and to what extent the subject is armed, his compliance with orders, the presence of third parties, the location of the nearest police or medical support unit, and potential risks of further harm to an incapacitated subject.³²⁷

Schuller’s third principle is linked to the second, and it is that International Humanitarian Law (IHL) or the Law of Armed Conflict (LOAC) “does not require temporally proximate human interaction with [a robot] prior to lethal kinetic action.”³²⁸ Again, because this paper addresses strictly non-lethal tools in the context of autonomous devices engaged in U.S. domestic police work, Schuller’s third principle is not directly applicable, and as such, bears no further analysis here.

Schuller’s fourth principle is perhaps the most important one for these purposes because it seemingly stands for the expectation that an autonomous armed UAS’ predictability of action will be governed by the familiar reasonableness standard. This principle “means that the [learning artificial intelligence] system [of an armed UAS or robot] may in fact be lawfully unpredictable in certain ways. So long as the ways in which the system is unpredictable are reasonably unlikely [so as] to render an AWS action unlawful, the system [itself] may [still] be lawful.”³²⁹ Thus, the existing reasonableness standard already employed by courts to determine the lawfulness of the use of force should here be flexible enough to not require an AI be perfect, provided, that an unpredictable

³²⁵ *Id.*

³²⁶ *See* Palmiotto, *supra* note 81, at 40.

³²⁷ *See* Schuller, *supra* note 38, at 409–13 (describing the importance of predictability of action when given a set of stimuli, in assessing the legality of artificial intelligence employing lethal force in the context of armed conflict).

³²⁸ *Id.* at 420–21.

³²⁹ *Id.* at 421–23.

response is reasonably unlikely to result in an unlawful action.³³⁰ If we apply that standard to the idea of autonomous law enforcement devices wielding weapons designed to be less than lethal, then we can establish a rule which stands for the idea that it would be reasonable, and thus lawful for an autonomous police device to employ non-lethal tools as they are intended to be employed, provided it does so in a predictable manner.

Finally, Schuller argues “[l]imitations imposed on an [autonomous robot] may compensate for performance shortfalls” as his fifth principle.³³¹ This principle is linked to his second and fourth principles and it represents the concept that restricting actions that an autonomous armed robot otherwise may be capable of can tilt the proverbial scale towards reasonableness. For example, programming a bias that favors inaction over action unless all use of force criteria are strictly met (which is an analysis that humans struggle with in the heat of the moment), allowing a robot’s human partner to interrupt the robot’s use of force, or limiting the types of weapons it carries³³² can help account for the potential of unpredictable responses and may help drive potentially unreasonable uses of force towards objective reasonableness.

C. Autonomous police robots should not be armed with weapons that are designed and intended exclusively for the application of deadly force.

Autonomous police robots should not be armed with firearms, and they should not be programmed to use deadly force. From a pure risk management standpoint, remotely-operated devices where a human makes the use of force decision and autonomous devices equipped only with weapons intended to be non- or less-than-lethal simply do not pose the same societal or individual risk as autonomous law enforcement devices fielding *per se* lethal weapons. Yet this rule may end up as more of a policy determination than a legal one because the courts loathe categorizing the means in

³³⁰ *See id.*

³³¹ *Id.* at 423–25.

³³² *See* Brumfield, *supra* note 7, at 559–65.

which police use force as “deadly” or “non-deadly”³³³ despite significant litigation regarding “specific forms of force, such as the use of batons, handcuffs, hogties, or pepper spray” and still others that address “police dogs, tasers, beanbag projectiles, or carotid chokeholds.”³³⁴

Breaking down the factual circumstances in which police may employ deadly force and overlaying the Court’s reasonableness standard helps this analysis. As I have discussed above, police may use force, including deadly force in self-defense and in the defense of others, to counter an imminent threat and/or to apprehend a dangerous fleeing felon.

First, much like where we have a remotely-operated device where the officer operating the device is far removed from the location of the device, there is no individual “self-defense” justification when discussing autonomous police robot use of force.³³⁵ That is the easy part of the analysis.

The defense of others aspect, however, is more challenging to analyze. To start, I also categorize and analyze the “fleeing felon” justification in the same manner as the defense of others. I am lumping these two justifications together because I believe the fleeing felon rule is a form of the “defense of others” justification, in that it modifies the imminence requirement to account for the “status” of the subject as an actor who has established themselves as capable of posing serious danger to society at any time, establishing a sort of *per se* imminence, and has refused to heed a police order to stop, thereby justifying the use of force for their apprehension.³³⁶

The real question for these two justifications of police deadly force *vis-a-vis* their application from an autonomous police device is whether the societal benefit of allowing autonomous devices to

³³³ See Hamilton, *Excessive Lethal Force*, *supra* note 4, at 1179–81.

³³⁴ *Id.* at 1171.

³³⁵ See HALLEVY, *supra* note 18, at 140–44 (analyzing “self defense” as a criminal defense: while not the same as an authorization, the legal discussion between “self defense” as an authorization for police use of force and “self defense” as a legal defense is sufficiently similar so as to provide a useful framework to analyze the issue).

³³⁶ See Palmiotto, *supra* note 81, at 39.

employ deadly force outweighs the risk.³³⁷ This self-styled “autonomous police device deadly force deployment test” differs a bit from the *Tennessee v. Garner* balancing test courts have used to gauge reasonableness.³³⁸ The *Garner* test purports to weigh “the nature and quality of the intrusion on the individual’s Fourth Amendment interests [in not being subject to an unreasonable seizure] against the importance of the governmental interests alleged to justify the intrusion.”³³⁹ The Supreme Court later modified the *Garner* test in *Scott*, by looking specifically to “the use of a particular type of force in a particular situation.”³⁴⁰

My test differs from the *Garner/Scott* test because the latter may end up as too permissive in this context. If we were to apply the *Garner/Scott* test, and assume a level of technological sophistication that would allow for sensor and information fusing that drives independent, context-based computer decision making not yet here, on the horizon,³⁴¹ we could theoretically arrive at a place where a court could find it reasonable that an autonomous device used deadly force in response to an immediate threat to others or in the apprehension of a fleeing felon, where the device could positively identify the subject, the crime was sufficiently serious, and the subject did not comply with an order to stop and be arrested.

Hence, the “autonomous police device deadly force deployment test,” which should drive the analysis towards non-deployment until the point where A.I. reaches a level of technical maturity and societal acceptance³⁴² that would justify its use. To do otherwise, even though the law may currently allow for it, results in too much individual and societal risk, well beyond that posed by remotely-operated law enforcement devices or those equipped only with non-

³³⁷ See generally Sandvik, *supra* note 34, at 58–61.

³³⁸ See Hamilton, *Excessive Lethal Force*, *supra* note 4, at 1179–81.

³³⁹ *Id.*

³⁴⁰ *Id.* at 1176.

³⁴¹ See, e.g., Harris, *supra* note 203 (describing the inevitability of advanced artificial intelligence).

³⁴² See generally Reid, *supra* note 7, at 881–85 (asking if society was truly ready for robotic police).

or less-than lethal tools.³⁴³ The issue of course, is persuading law enforcement agencies and their political leadership to acknowledge and understand this, which is in part why I recommend relatively permissive rules on the use of remotely-operated and non-/less-than-lethal equipped devices. By establishing these guidelines that facilitates some use, we can allow the relevant technology to continue to develop in a deliberative, orderly way or make a collective societal decision that we are simply not interested in walking down the path of “killer” police robots.³⁴⁴

Rule 5: Strict liability for death or serious bodily injury where fully autonomous devices employ force inappropriately.

Finally, one of the most pressing concerns with robotic and autonomous devices is the perception of an accountability vacuum, which is brought into keen focus when discussing police use of these devices as equipped to employ force. This concern is lessened where a human operator makes the use-of-force decision because the existing accountability structure would remain in play.³⁴⁵ Things become a bit murkier though, if the robot makes the use of force decision, even where, as I recommend, we are consciously deciding to prohibit autonomous devices wielding weapons designed to apply deadly force.

Again, “[d]eadly force is that force, based on the circumstances,” which creates a “substantial risk of death or serious bodily injury.”³⁴⁶ Even non-lethal weapons can result in the application of deadly force.³⁴⁷ Thus, “[d]epending on the evolution of the technology involved . . . [progressing] towards an absolute responsibility regime for those who own and operate fully autonomous robots” may be the best way to address perceived

³⁴³ See Cellan-Jones, *supra* note 202; Harris, *supra* note 203; Holley, *supra* note 201.

³⁴⁴ See *supra* note 343.

³⁴⁵ See Brown, *supra* note 248, at 113–42 (describing the state and Federal criminal liability mechanisms for holding police officers accountable for excessive uses of force).

³⁴⁶ Longo, *supra* note 80, at 271.

³⁴⁷ See *id.* at 274–75; Joh, *supra* note 7, at 534.

accountability gaps with U.S. law enforcement agency deployment of autonomous devices equipped to use force.³⁴⁸

I recommend a strict civil liability regime as applied to autonomous police use of force.³⁴⁹ This recommendation does not address criminal liability, which, even in the case of human officers, seldom provides victims relief,³⁵⁰ but instead focuses on the potential for near automatic civil remedies where an autonomous law enforcement device inappropriately employs force that results in death or serious bodily injury. All normal civil procedure rules would apply under this proposal so the law enforcement agency could theoretically attempt to implead the device's manufacturer in any lawsuit,³⁵¹ but the immediate onus of responsibility would start with the agency fielding the device. This would incentivize police departments to take measures to ensure adequate programming of these tools and to develop appropriate standard operating procedures, tactics, and deployment guidelines while at the same time disincentivizing smaller departments from pursuing the capability, which could, in turn, provide a valuable check against further police militarization nationwide.

VII. CONCLUSION.

The ongoing trend of the militarization of America's police forces and the history and existing practice of U.S. domestic law enforcement agencies rapidly and quietly fielding technological advances in general, and semi-autonomous and remotely piloted devices, specifically to execute their mission,³⁵² leads one to draw

³⁴⁸ Bourbonniere, *supra* note 247, at 164.

³⁴⁹ See HALLEVY, *supra* note 18, at 104–19 (describing a strict liability regime for when robots kill).

³⁵⁰ See O'neil & Smith, *supra* note 161; Ruiz, *supra* note 162. *But see* Aamer Madhani, *Chicago Cop Gets Five Years in Federal Prison for Firing Barrage of Bullets at Teens*, USA TODAY (Nov. 20, 2017, 9:02 PM), <https://www.usatoday.com/story/news/2017/11/20/chicago-police-officer-marco-proano-sentence-five-years-prison/883151001/>.

³⁵¹ See generally FED. R. CIV. P. 14(a)(1) (setting the procedural rules for third-party defendants).

³⁵² Haley Britzky, *The Police Technology Revolution No One is Hearing About*, AXIOS (Aug. 17, 2018), <https://www.axios.com/the-controversial-technologies-police-are-using--4b849a32-834a-4661-92ec-f55f003f59e6.html>.

the conclusion that there will be a “push” for American domestic law enforcement agencies to field fully lethal, fully autonomous tools sooner rather than later. There are advantages to U.S.-law-enforcement’s use of semi-autonomous and fully autonomous tools, but it is still critically important to establish some minimum baseline which adequately accounts for the protection of individual rights *before* this occurs. The rules that I proposed will hopefully help do that. The key, however, will be consistent and early adoption. Doing so will help us avoid the inevitable problems which will come with where we are today and our patchwork of U.S. law enforcement “drone” use without seemingly much thought or public discussion of how this advanced technology fits within the existing relevant applicable legal frameworks.