UC Irvine
UC Irvine Law Review

Title
Regulating Police Robots

Permalink
https://escholarship.org/uc/item/6m98z09j

Journal
UC Irvine Law Review , 16(2)

ISSN
2327-4514

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Publication Date
2026-10-02

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Regulating Police Robots

Max Isaacs,[*] Barry Friedman,[**] & Farhang Heydari[***]

Once considered a mere novelty, ground robots and aerial drones are quickly becoming a mainstream policing tool. Autonomous police robots, equipped with a panoply of cameras and sensors, have been sent into parks, schools, and train stations. Agencies across the country are piloting "Drone as First Responder" programs, which automatically dispatch drones in response to 911 calls. Police have used robots to disorient, immobilize, and use force against suspects.

Police robots may provide public safety benefits, but they may also carry real risks. The widespread adoption of highly mobile robots equipped with cameras, sensors, and analytics will only hasten the proliferation of police surveillance, with attendant risks to individual privacy. Algorithmic bias and disparities in where policing technologies are deployed may fuel racial inequities. The advent of force-equipped robots raises profound ethical questions that require a systematic rethinking around use-of-force rules.

In the face of the harms of police robots, the existing patchwork of laws and constitutional rules governing policing is proving inadequate. As police rush to adopt these new tools, sound policymaking is needed—and urgently. To that end, this Article aims to provide a comprehensive roadmap for the regulation of robotics in law enforcement.

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The authors are grateful for the valuable feedback we received on this Article, including at the WeRobot conference at Boston University School of Law and the Policing Project's Robots & AI Salon at New York University School of Law. For their helpful input, we thank Peter Asaro, Kabbas Azhar, Meredith Broussard, Ryan Calo, Albert Fox Cahn, Franny Choi, Kate Darling, Colby Dolly, Michael Froomkin, Sue Glueck, Cindy Grimm, John Hollywood, Katie Kinsey, Michael Planty, Brendan Schulman, Stacy Stephens, Vincent Southerland, Jay Stanley, Kristen Thomason, and Jesse Woo. Much appreciation to Quincy Blair, David Leitson, and Jenna Wong for their help along the way. This research was supported by the Filomen D'Agostino and Max E. Greenberg Research Fund at New York University School of Law.
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INTRODUCTION

Police robots are no longer the stuff of science fiction. Across the country, police are testing the use of ground robots to conduct patrols and detect suspicious

activity.[1] Unmanned aerial vehicles (commonly referred to as drones) are being deployed to respond to 911 calls in an expanding number of jurisdictions.[2] Police have used robots to communicate with, disarm, and even use force against barricaded suspects.[3] Aided by advances in artificial intelligence (AI), vendors are developing these tools, and agencies are adopting them, at an astonishing pace.

Robots have tremendous potential to improve policing and public safety. Because they are controlled remotely, robots can help keep officers out of harm's way during incidents—a benefit not only to police but also to those who might interact with them.[4] Some robots, such as those used for first response, could improve response times in emergencies and help conserve scarce officer resources.[5] Vendors have claimed that the deployment of patrol robots for surveillance purposes can deter, and help solve, crime.[6]

Yet the advent of police robots also carries real risks to civil rights, civil liberties, and racial justice. The widespread adoption of highly mobile robots equipped with cameras, sensors, and analytics will hasten the proliferation of police surveillance, with attendant risks to individual privacy.[7] Algorithmic bias and disparities in where robots are deployed may fuel inequality in a field already afflicted deeply by systemic problems of racial injustice.[8] The advent of force-equipped robots raises profound ethical questions and will require a systematic rethinking around use-of-force rules.[9]

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1. *See, e.g.*, Rocio De La Fe, *Three Security Robots Have Been Deployed into San Diego Neighborhoods*, CBS8 (Apr. 3, 2024), https://www.cbs8.com/article/tech/autonomous-security-robots-deployed-tackle-crime-san-diego/509-aa0646e7-5d53-42fd-8247-659dbbba90c7 [perma.cc/69NW-QPMN]; Jeffery C. Mays, *400-Pound N.Y.P.D. Robot Gets Tryout in Times Square Subway Station*, N.Y. TIMES (Sept. 22, 2023), https://www.nytimes.com/2023/09/22/nyregion/police-robot-times-square-nyc.html [perma.cc/63PK-QZF9]; Knightscope, *Huntington Park Police Renews Knightscope Contract for 6th Year*, BUS. WIRE (Aug. 1, 2024), https://www.businesswire.com/news/home/20240801949658/en [perma.cc/29PY-5JH8].

2. *See* Beryl Lipton, *Drone as First Responder Programs Are Swarming Across the United States*, ELEC. FRONTIER FOUND.: DEEPLINKS BLOG (June 27, 2024), https://www.eff.org/deeplinks/2024/06/drone-first-responder-programs-are-latest-aerial-police-surveillance-push [perma.cc/4YS4-AQ7R]; *see also Police Drones: The Complete Guide*, AXON, https://www.axon.com/resources/police-drones [perma.cc/7UZJ-L6W4] (last visited Aug. 4, 2025) (estimating approximately 1,400 U.S. policing agencies use drones).

3. *See, e.g.*, *Munster Police Use Robot to Investigate Deadly Domestic Dispute*, CBS NEWS CHI. (Jan. 2, 2013), https://www.cbsnews.com/chicago/news/munster-police-use-robot-to-investigate-domestic-dispute [perma.cc/J52N-2MX4]; Kristin Houser, *Robot Police Dog Helps End Standoff in LA*, FREETHINK (Nov. 19, 2023), https://www.freethink.com/robots-ai/robot-police-dog [perma.cc/SS96-GCRS]; Richard Winton & Matt Hamilton, *Man vs. Machine: L.A. Sheriff's Deputies Use Robot to Snatch Rifle from Barricaded Suspect, End Standoff*, L.A. TIMES (Sept. 15, 2016), https://www.latimes.com/local/lanow/la-me-ln-robot-barricaded-suspect-lancaster-20160915-snap-story.html [perma.cc/KYK7-XX6D]; Camila Domonoske, Bill Chappell & Elise Hu, *Ambush in Dallas: What We Know Friday*, NPR (July 8, 2016), https://www.npr.org/sections/thetwo-way/2016/07/08/485202505/dallas-police-officers-killed-by-snipers-what-we-know-friday [perma.cc/K32F-59DH]; Emma McSpadden, Chelsea Collinsworth & Shaley Kidwell, *Wanted Man Barricaded in Lubbock Motel Room Shot, Gassed Out and Taken into Custody*, KCBD (Sept. 18, 2024), https://www.kcbd.com/2024/09/18/wanted-man-shot-while-barricaded-lubbock-motel-room-taken-into-custody [perma.cc/JFK8-ZT63].

4. *See infra* notes 41–44 and accompanying text.

5. *See infra* notes 63–65 and accompanying text.

6. *See infra* Part I.C (discussing these potential benefits of police robots).

7. *See infra* notes 140, 144–45 and accompanying text.

8. *See infra* notes 154–55, 158 and accompanying text.

9. *See infra* Part II (discussing these and other potential risks of police robots).

As these issues come to the fore, sound policymaking is needed—and urgently. Yet there is little regulation of police robots to speak of. Some states have enacted laws regulating police use of drones, but most of these laws leave critical issues unaddressed.[10] There are virtually no laws regulating how police use ground robots.[11] As the use of police robots proliferates, the absence of rules governing their use is increasingly untenable.

In this Article, we seek to chart a course forward for the regulation of police robots. We begin in Part I by explaining how police robots are designed and the functions they can perform. In particular, we focus on the use of robots to perform three paradigmatic police functions: first response, observation (which we subdivide into targeted surveillance and patrol), and use of force.

Part II evaluates the potential risks presented by the use of police robots, a clear understanding of which is imperative for sound regulation. For example, robots can malfunction, potentially causing injury. Then there is a set of harms that arise when interactions between police and community members are intermediated by robots. For example, robots can frighten or intimidate members of the public. Police, for their part, may behave differently when operating a robot—for example, they may be more likely to use force. There also is a significant risk that robots will increase the surveillance power of police, intruding upon individual privacy and chilling expressive activity. And each of these harms might be borne disproportionately by those communities that are already subjected to heavier policing in general. We conclude Part II by assessing a key variable as to whether all of these risks come to pass—the capacity and sophistication of policing agencies.

Part III turns to regulation. It makes the case that the current regulatory landscape is anemic, barely providing what is needed to assure responsible use of police robots. It then considers whether this gap could be filled by extending existing laws regulating officer conduct to police robots. After concluding that this would be at best an incomplete solution, we sketch out a broader regulatory framework, proposing a series of robust safeguards which would do much to mitigate the risks of police robots. We conclude with a discussion of remedies, considering the unique challenges that police robots will pose for the courts.

I. THE DESIGN AND FUNCTION OF POLICE ROBOTS

Before one can begin to think systematically about the risks and regulation of robots, one must understand what they are designed to do and how they are used. Section I.A discusses the various forms of police robots—from ground robots to aerial drones, from robots that can be thrown through the air to submersible robots which swim underwater. It also explores their various capabilities—including the hardware with which they are equipped, the software analytics they include, and the extent to which they can accomplish tasks without human intervention. Section I.B describes some of the distinct advantages that robots offer in the policing context. Finally, Section I.C examines how police use robots in relation to three paradigmatic policing functions: first response, observation, and use of force.[12]

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10. *See infra* Part III.A (discussing the current state of regulation).

11. *See infra* Part III.A (discussing the regulatory state of play when it comes to police robots).

12. *See* Barry Friedman, *Disaggregating the Policing Function*, 169 U. PA. L. REV. 925, 954–59, 967–70 (2021).

Although the definition of "robot" is the subject of much debate, in this article we adopt what is known as the "sense-think-act" paradigm.[13] That is, robots are best thought of as "mechanical objects that take the world in, process what they sense, and in turn act upon the world."[14] This capacious definition of robots encompasses devices as varied as teleoperated drones, surgical systems, and self-driving cars.[15] We adopt this definition of robots in this Article so as to capture a broad range of tools police are using today, ranging from ground patrol robots to aerial drones.

A. The Design of Police Robots

1. Form

Police robots take a variety of forms, perhaps most easily described by the way they move about. Some robots commonly used by police, such as explosive ordinance disposal (EOD) robots, maneuver through the use of wheels or treads.[16] Unmanned aerial vehicles, or drones, also have been widely adopted by agencies.[17] And in recent years, four-legged quadruped robots resembling dogs, such as Boston Dynamics's "Spot" robot, have been adopted by some of the largest policing agencies in the country, including the New York City Police Department and the Los Angeles Police Department.[18]

This is just the tip of the iceberg—new forms of robots constantly are emerging. Vendors have developed robots that can be thrown and submersible robots capable of navigating underwater.[19] Swarm robotics involves the use of multiple robots, or "swarms," that typically follow simple rules but, through their interaction, accomplish complex tasks—not unlike swarms of bees or fish.[20] These

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13. *See* Bryan Casey & Mark A. Lemley, *You Might Be a Robot*, 105 CORNELL L. REV. 287, 293 (2020) (arguing that the "overlap between people, algorithms, computers, robots, and ordinary machines is sufficiently great that there is no good legal definition of a robot"); Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CALIF. L. REV. 513, 529 (2015) (discussing the "sense-think-act" paradigm).

14. *See* Calo, *supra* note 13, at 529.

15. *See id.*; Ric Simmons, Terry *in the Age of Automated Police Officers*, 50 SETON HALL L. REV. 909, 913 (2020).

16. *See* DAN GETTINGER & ARTHUR HOLLAND MICHEL, CTR. FOR THE STUDY OF THE DRONE AT BARD COLL., LAW ENFORCEMENT ROBOTS DATASHEET (2016), https://dronecenter.bard.edu/files/2016/07/LEO-Robots-CSD-7-16-1.pdf [perma.cc/AGJ3-U636].

17. *See* Lipton, *supra* note 2.

18. *See* MARA PUSIC & JONATHAN GARON, U. MICH. FORD SCH. OF PUB. POL'Y, ROBOT DOGS FOR SURVEILLANCE AND POLICING: OVERVIEW AND POLICY RECOMMENDATIONS 1–2 (2024), https://stpp.fordschool.umich.edu/sites/stpp/files/2024-06/stpp-robot-dogs-report.pdf [perma.cc/FLG4-LBKK]; Kate Cagle, *Unleashed: LAPD SWAT Integrates 'Robot Dog' into the Unit*, SPECTRUM NEWS 1 (Jan. 1, 2025), https://spectrumnews1.com/ca/southern-california/public-safety/2025/01/01/police-robot-dog [perma.cc/WLU7-BRQN]; Gloria Oladipo, *Robot Dogs Deployed in New York Building Collapse Revive Surveillance Fears*, GUARDIAN (Apr. 26, 2023), https://www.theguardian.com/technology/2023/apr/26/robot-dogs-new-york-building-collapse-surveillance [perma.cc/HY2G-T8B7]; *see also Vision 60*, GHOST ROBOTICS, https://www.ghostrobotics.io/vision-60 [perma.cc/RZ3K-2GP] (last visited Feb. 6, 2025).

19. *See Throwbot 2 Robot*, RECONROBOTICS, https://reconrobotics.com/products/throwbot-2-robot [perma.cc/S632-H83P] (last visited Aug. 4, 2025); Joe Anuta & Cris Seda Chabrier, *Ahead of Council Hearing, NYPD Releases Trove of Info on Surveillance Tech*, POLITICO (Feb. 19, 2025), https://www.politico.com/news/2025/02/19/new-york-city-council-nypd-surveillance-00204843.

20. *See* Melanie Schranz, Martina Umlauft, Micha Sende & Wilfried Elmenreich, *Swarm Robotic Behaviors and Current Applications*, 7 FRONTIERS IN ROBOTICS & AI, Apr. 2020, at art. 36, 1.

could be used for search and rescue missions, for example.[21] Vendors are producing "humanoid" robots that—as the name indicates—resemble human beings. One company, Apptronik, hopes that its recently unveiled "Apollo" humanoid robot will be able to perform thousands of tasks and could be sold for less than the price of the average car.[22]

2. Abilities

Aside from their method of locomotion, police robots also have a wide range of practical abilities, depending on their software and hardware. On the hardware side, many robots can be equipped with accessories, or "payloads," such as maneuverable arms capable of picking up objects and opening doors.[23] Robots often come with an array of cameras and sensors, including pan-tilt-zoom cameras, thermal cameras, microphones, radar sensors, chemical sensors, and more.[24] Notably, police, for many years, have used robots equipped with "disrupters"— specialized devices that can fire a high-pressure water jet or projectile—to disable bombs and other explosives—to disable bombs and other explosives.[25] And robots can be equipped with specialized breaching tools to force entry into buildings, a tactic that can be used to apprehend barricaded suspects.[26]

Equipping police robots with weapons that can be used against people is rare but not unprecedented. In 2016, Dallas police attached explosives to a robot to kill an active shooter.[27] Police abroad have used robots equipped with munitions such as pepper spray, tear gas, and paintballs.[28] The prospect of weaponized robots has attracted considerable controversy, and legislation has been proposed in several jurisdictions to prohibit weaponization.[29]

In addition to these hardware features, police robots can also be used in conjunction with various software analytics. Once a robot has a camera with which to view the world, a wide variety of analytics can be applied to the resulting video

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21. *See* Ross D. Arnold, Hiroyuki Yamaguchi & Toshiyuki Tanaka, *Search and Rescue with Autonomous Flying Robots Through Behavior-Based Cooperative Intelligence*, 3 J. INT'L HUMANITARIAN ACTION 1, 15–16 (2018).

22. *See* Will Knight, *Humanoid Robots Are Coming of Age*, WIRED (May 25, 2023), https://www.wired.com/story/fast-forward-humanoid-robots-are-coming-of-age [perma.cc/7BHP-4W45]; Ashley Strickland, *Meet Apollo, the 'iPhone' of Humanoid Robots*, CNN (Aug. 23, 2023), https://www.cnn.com/2023/08/23/world/apptronik-apollo-humanoid-robot-scn/index.html [perma.cc/V8WT5GH3].

23. *See Impact People-Centric Environments with the Spot Arm*, BOS. DYNAMICS, https://bostondynamics.com/products/spot/arm [perma.cc/67R6-CJH8] (last visited Aug. 31, 2025).

24. *See Spot Cam+IR*, BOS. DYNAMICS (May 2023), https://bostondynamics.com/wp-content/uploads/2023/05/spot-cam-plus-ir.pdf [perma.cc/L3PZ-E2CP]; *The K5 ASR*, KNIGHTSCOPE, https://www.knightscope.com/products/k5#Overview [perma.cc/JJA4-YPP7] (last visited Aug. 31, 2025).

25. *See What Is a Disrupter?*, BOS. DYNAMICS, https://bostondynamics.com/blog/what-is-a-disrupter [perma.cc/GAF3-VSWF] (last visited Feb. 6, 2025).

26. *See* Natalie Neysa Alund, *Robocop Helps Arrest Man Wanted for Murder Inside Louisiana Home, Video Shows*, USA TODAY (Aug. 29, 2025), https://www.usatoday.com/story/news/crime/2025/08/28/robot-arrest-man-kenner-louisiana/85868962007 [perma.cc/5K95-A9ZN].

27. *See* Alina Selyukh & Gabriel Rosenberg, *Bomb Robots: What Makes Killing in Dallas Different and What Happens Next?*, NPR (July 8, 2016), https://www.npr.org/sections/thetwo-way/2016/07/08/485262777/for-the-first-time-police-used-a-bomb-robot-to-kill [perma.cc/H5LD-LK2A].

28. *See* Elizabeth E. Joh, *Policing Police Robots*, 64 UCLA L. REV. DISCOURSE 516, 521 (2016); Simmons, *supra* note 15, at 920.

29. *See, e.g.*, Assemb. B. 2681 Leg., 2023–2024, Reg. Sess. (Cal. 2024).

data.[30] Facial recognition software can be used to detect and identify individuals.[31] Automated license plate recognition—which captures the license plate and other information about passing vehicles—can be found on some police robots.[32] And certain robots use software to detect predefined events, such as a window left open or a person in a restricted area.[33]

3. Autonomy

Finally, police robots vary in the extent to which they can pursue a goal without human intervention, which is referred to as their level of "autonomy." Autonomy exists along a spectrum. Many robots, such as those used to diffuse bombs, are largely teleoperated—that is, controlled remotely by a human.[34] Some of these robots feature "assisted teleoperation," meaning that the robot can intervene to some extent with a given task.[35] For example, a robot might automatically avoid collisions if a user steers it towards an obstacle. Teleoperated robots might also provide "action support," in which the robot assists with some aspects of a task, such as gripping or picking up an object.[36]

Other robots perform tasks autonomously but with "shared" or "supervisory" control.[37] For example, a human operator might direct a robot to proceed to a given location, but monitor the robot's progress and override it or provide new objectives as they see fit.[38] Still other robots use a scheme of "executive control," in which the operator gives the robot a high-level goal that the robot implements.[39] For example, some robots can be configured to conduct autonomous patrols without any human supervision.[40] A given robot might also perform different tasks falling along various points on this spectrum—for example, a robot might be teleoperated in some cases, navigate with human supervision in others, and conduct patrols unsupervised in still others.[41]

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30. On emerging video analytics technologies and their use in law enforcement, see Andrew Guthrie Ferguson, *Video Analytics and Fourth Amendment Vision*, 103 TEX. L. REV. 1253, 1270–78 (2025).

31. *See* Mike Oitzman, *Prosegur Security Launches New Quadruped Patrol Option*, ROBOT REP. (Sep. 4, 2022), https://www.therobotreport.com/prosegur-security-launches-new-quadruped-patrol-option [perma.cc/Q22T-X4QG]; Yi Shu Ng, *China's Latest Robot Police Officer Can Recognise Faces*, MASHABLE (Feb. 20, 2017), https://mashable.com/article/china-police-robot [perma.cc/T3N2-M JE2].

32. *See The K5 ASR*, KNIGHTSCOPE, https://www.knightscope.com/products/k5 [perma.cc/V68P-NWBQ] (last visited Aug. 31, 2023).

33. *See* Simmons, *supra* note 15, at 935.

34. *See Spot to the Rescue*, BOS. DYNAMICS, https://bostondynamics.com/blog/spot-to-the-rescue [perma.cc/9SC2-HY8U] (last visited Aug. 4, 2025); *Doing More with Spot*, BOS. DYNAMICS, https://bostondynamics.com/blog/doing-more-with-spot [perma.cc/8X5V-4B24] (last visited Aug. 4, 2025).

35. Jenay M. Beer, Arthur D. Fisk & Wendy A. Rogers, *Toward a Framework for Levels of Robot Autonomy in Human-Robot Interaction*, 3 J. HUM.-ROBOT INTERACTION 74, 85 (2014).

36. *Id.* at 78, 87.

37. *Id.* at 78.

38. *Id.* at 87.

39. *Id.*

40. *See* KNIGHTSCOPE, *The K5 ASR*, *supra* note 32.

41. BOS. DYNAMICS, *Spot to the Rescue*, *supra* note 34. For general discussion about the definition of autonomy and whether the concept matters for purposes of regulation, see Simmons, *supra* note 15, at 913; Beer et al., *supra* note 35, at 75; Carolin Kemper & Michael Kolain, *K9 Police Robots: Strolling Drones, RoboDogs, or Lethal Weapons?*, 35 (WeRobot 2022 Conf., Working Paper No. 173, 2022); Bryan Casey, *Robot Ipsa Loquitur*, 108 GEO. L.J. 225, 247 (2019); Calo, *supra* note 13, at 539.

B. General Advantages of Robots

Policing agencies are adopting aerial drones and ground robots at a rapid pace, with thousands now in use. This is no surprise—robots' mobility and their ability to operate remotely and autonomously offer several distinct advantages to law enforcement.

First, because robots can be operated from a distance, they can keep officers safe and out of harm's way.[42] As discussed, agencies often use robots to detonate bombs and other explosives.[43] Robots can also be used to communicate with individuals who might pose a threat to officers.[44] In one case, police used a robot to deliver pizza to an armed man threatening suicide; after talking to negotiators, the man dropped his weapon and surrendered without incident.[45]

Second, robots can reach areas that would be difficult or impossible for human officers to reach, such as underwater or inside of a crawlspace.[46] Aerial drones can fly up to high windows or "perch" themselves in a tree.[47] Drones can also fly over traffic and other obstacles, enabling them to travel to locations more quickly than ground vehicles in many cases.[48]

Third, robots' mobility and autonomy make them quite useful as a platform to deploy *other* technologies—in other words, robots can make existing tools more effective. Thermal imaging cameras used for search and rescue missions can cover

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42. *See* N'dea Yancey-Bragg, *Police Robots Are on Patrol. Now the Questions About Them Are Piling Up*, USA TODAY (Oct. 31, 2023), https://www.usatoday.com/story/news/nation/2023/10/31/nyc-police-robots-privacy-safety-concerns/71218199007 [perma.cc/FK55-DKVQ]; DAN GETTINGER, CTR. FOR THE STUDY OF THE DRONE AT BARD COLL., PUBLIC SAFETY DRONES (3d ed. 2020), https://dronecenter.bard.edu/files/2020/04/CSD-Public-Safety-Drones-3rd-edition.pdf [perma.cc/PBH2-XMP5].

43. *See* Douglas Page, *Get Smart: A Bomb 'Bot with Know-How*, 29 L. ENF'T TECH. 7, 136 (2002), https://www.ojp.gov/ncjrs/virtual-library/abstracts/get-smart-bomb-bot-know-how [perma.cc/8AC 5-GFFQ].

44. *See* Jesse Fraga, *Robot Used in Standoff at a Warner Robins Home. Suspect Faces Battery Charge, Cops Say*, MACON TEL. (June 5, 2024), https://www.macon.com/news/local/crime/article289037064.html [perma.cc/TV9J-GGFL]; Shaun Ganley, *Massachusetts Police Robot Dog Shot Three Times by Standoff Suspect, Authorities Say*, WBAL-TV 11 (Mar. 28, 2024), https://www.wbaltv.com/article/police-robot-dog-shot-standoff-suspect/60334981 [perma.cc/3WPM-936K].

45. *See* Tekla S. Perry, *Robocop Delivers Pizza, Prevents Suicide*, IEEE SPECTRUM (Apr. 16, 2015), https://spectrum.ieee.org/robocop-delivers-pizza-prevents-suicide [perma.cc/6RJ6-FD6J].

46. *See* Madeleine Wright, *Chester's Police and Fire Departments to Use Underwater Robot for Search and Recovery Missions*, CBS NEWS PHILA. (Nov. 28, 2023), https://www.cbsnews.com/philadelphia/news/chester-police-fire-department-using-robot-search-missions [perma.cc/LX4D-PWSL]; Donovan Potter, *EOD Robots Are Potential Confined Space Lifesavers*, HILL AIR FORCE BASE (Feb. 28, 2023), https://www.hill.af.mil/News/Article-Display/Article/3314189/eod-robots-are-potential-confined-space-lifesavers [perma.cc/2UR3-AQXH].

47. *See* Charles Werner, *11 Innovative Ways Police Departments are Using Drones*, POLICE1 (Jan. 2, 2025), https://www.police1.com/police-products/police-drones/articles/11-ways-police-departments-are-using-drones-V8RZTGOKMjTbWj9Z [perma.cc/PX29-MRNK].

48. *See Interim Police Commissioner Donlon Announce 'Drone as First Responder' Program to Reduce Response Times and Keep New Yorkers Safe*, OFF. OF THE MAYOR (Nov. 13, 2024), https://www.nyc.gov/office-of-the-mayor/news/827-24/mayor-adams-interim-police-commissioner-donlon-drone-first-responder-program-to#/0 [perma.cc/K84K-6W3G] ("Drones are quickly dispatched to incident locations, reaching many areas faster than emergency vehicles on the street and officers on foot.").

more territory when attached to a drone.[49] An ordinary camera, once integrated into a robot, becomes more useful for surveillance with the ability to move from place to place.[50]

Given these advantages, police are quickly putting robots to work performing a variety of different functions, which we survey in the following section.

C. The Roles of the Robot Cop

The tasks police officers perform can be surprisingly varied.[51] Each day, officers are confronted with a variety of problems, from wild animals and disabled vehicles to individuals suffering from substance abuse or mental health challenges.[52] On a given shift, an officer might be called upon to patrol the roadways, mediate a family dispute, and investigate a noise complaint.[53] The functions that police perform, and their consequent implications for civil rights and civil liberties, are manifold.

So too for police robots. Given their broad range of capabilities, it makes little sense to evaluate police robots in the abstract. As with policing, it is only by examining the discrete functions that police robots might perform that we can fully assess their potential benefits, harms, and mitigations. This section considers how robots are used in relation to three paradigmatic policing functions: first response, patrol and observation, and the use of force.[54]

Before delving into these functions, however, there are two considerations to bear in mind.

First, in addition to the core policing functions explored in this section, robots have demonstrated considerable value in helping public safety agencies respond to special hazards and incidents. They can, for example, be deployed to detect chemical, radiological, or nuclear materials.[55] In search and rescue operations, drones and robots can help find victims—the New York City Fire Department recently used a robot to survey a collapsed parking garage.[56] The use of robots to

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49. *See, e.g.*, Alexx Altman-Devilbiss, *Heartwarming Rescue: Drones Find Missing 10-Year-Old Girl Curled Up in Forest*, NBC15 NEWS (Sep. 23, 2024), https://mynbc15.com/news/nation-world/heartwarming-rescue-drones-find-missing-10-year-old-girl-curled-up-in-forest-webster-parish-sheriffs-office-louisiana-thermal-imaging-drones-trail-camera-dense-woods-ems-drone-management-services-llc-josh-klober-volunteers-law-enforcement [perma.cc/WJB8-J2WL].

50. *See* KNIGHTSCOPE, *The K5 ASR*, *supra* note 32.

51. *See generally* IACP & U. CINCINNATI CTR. POLICE RES. & POL'Y, ASSESSING THE IMPACT OF CO-RESPONDER TEAM PROGRAMS: A REVIEW OF RESEARCH (2021) https://www.theiacp.org/sites/default/files/IDD/Review%20of%20Co-Responder%20Team%20Evaluations.pdf [perma.cc/32AF-3QUB] (last visited Nov. 7, 2025).

52. *See* Friedman, *supra* note 12, at 956.

53. *See id.* at 963, 967.

54. *See id.* at 954–59, 967–70.

55. *See* Mike Beiermeister, *Milwaukee Fire Dept. HAZMAT Team Equipped with Robotic Drone Dog to Help Secure RNC*, TMJ4 (July 17, 2024), https://www.tmj4.com/news/republican-national-convention/milwaukee-fire-dept-hazmat-team-equipped-with-robotic-drone-dog-to-help-secure-rnc [perma.cc/J475-SQ4C].

56. *See* Allie Griffin, *FDNY Deploys Robot Dog to Search for Survivors in NYC Garage Collapse*, N.Y. POST (Apr. 19, 2023), https://nypost.com/2023/04/18/fdny-deploys-robot-dog-to-search-for-survivors-in-nyc-garage-collapse [perma.cc/2HNS-JRNB]. *See, e.g.*, Bill Hutchinson, *Heat-Seeking Drone and Quick-Thinking Deputies Team Up to Find Missing California Man*, ABC NEWS (Dec. 26, 2024), https://abcnews.go.com/US/heat-seeking-drone-quick-thinking-deputies-team-find/story?id=117114352%20;%20https://www.popsci.com/environment/drones-milton-helene [perma.cc/5FWQ-KYEB].

neutralize bombs and other explosives, discussed earlier, is another example.[57] Robots have shown great promise in helping police and other emergency responders in these critical scenarios.

Second, the rapid growth in generative AI may signal a potentially momentous change in the offing. Researchers and developers are now exploring ways to incorporate generative AI into robots, enabling them to engage in meaningful conversations and respond intelligently.[58] The prospect of police robots autonomously interacting with humans—whether giving directions to a lost tourist or instructing a crowd to disperse—once seemed far-fetched. Now, however, it seems not only possible, but probable, that such robots will exist in the coming years.

1. First Response

Police have been described as "society's only 24-hour general purpose responder."[59] It is the police who are called upon to respond to a variety of problems, from vehicle breakdowns to disorderly conduct and substance abuse.[60] As Albert Reiss explained, "the public considers it the duty of the police to respond to its calls and crises."[61] And all too often, the sheer volume of incidents to which police must respond results in overwhelmed officers and slow response times.[62] It is unsurprising, then, that agencies are increasingly exploring the use of robots to assist in first response.

In 2018, the city of Chula Vista, California, undertook a novel experiment: It began deploying aerial drones from the rooftop of police headquarters to respond to 911 calls and other emergency incidents.[63] These drones stream high-definition video to Chula Vista's real-time operation center, where operators control the drone and give officers in the field information and intelligence.[64] This video can even be streamed to the cellphones of human first responders, giving them eyes on the

57. *See* Peter Ray Allison, *What Does a Bomb Disposal Robot Actually Do?*, BBC (July 15, 2016), https://www.bbc.com/future/article/20160714-what-does-a-bomb-disposal-robot-actually-do [perma.cc/MJ2V-MHBC].

58. *See, e.g.*, Matt Klingensmith, *Robots That Can Chat*, BOS. DYNAMICS, https://bostondynamics.com/blog/robots-that-can-chat [https://perma.cc/SE8A-6YAP] (last visited Jan. 26, 2025); Scott Martin, *Figure Unveils Next-Gen Conversational Humanoid Robot With 3x AI Computing for Fully Autonomous Tasks*, NVIDIA (Aug. 8, 2024), https://blogs.nvidia.com/blog/figure-humanoid-robot-autonomous [perma.cc/GNX2-NVYB].

59. Friedman, *supra* note 12, at 954; Elaine Cumming, Ian Cumming & Laura Edell, *Policeman as Philosopher, Guide and Friend*, 12 SOC. PROBS. 276, 286 (1965) ("First, the policeman has to do much of what he does because he is on a duty at times of the day when no other agent is available.").

60. Friedman, *supra* note 12, at 954.

61. ALBERT REISS, THE POLICE AND THE PUBLIC 70 (1971).

62. *See* Friedman, *supra* note 12, at 955; *Police Take Different Approaches to 'the Tyranny of 911'*, NPR (June 28, 2013), https://www.npr.org/2013/06/28/196588465/police-take-different-approaches-to-the-tyranny-of-911 [perma.cc/3RZH-N8DH].

63. *See Drone Program*, CITY OF CHULA VISTA, https://www.chulavistaca.gov/departments/police-department/programs/uas-drone-program [perma.cc/NG5E-44DT] (last visited Jan. 23, 2025).

64. *See* Don Redmond, *Chula Vista's High-Flying First Responder Reduces Costs and Response Times, Improves De-Escalation Tactics, and Saves Lives*, W. CITY (Nov. 1, 2021), https://www.westernnicity.com/article/chula-vistas-high-flying-first-responder-reduces-costs-and-response-times-improves-de [perma.cc/KW4Y-L5V5].

scene.[65] Since its inception in 2018, Chula Vista's "Drone as First Responder" (DFR) program has responded to over sixteen thousand calls for service.[66]

The concept of deploying drones to respond to 911 calls is catching on quickly. Agencies across the country are exploring DFR programs to respond to both emergency and non-emergency calls.[67] The American Civil Liberties Union (ACLU) predicted in a recent report on DFR programs that the United States is "on the cusp of an explosion in law enforcement use of drones."[68]

Proponents of DFR programs note significant advantages drones have in the context of first response. First, drones can reach the scene of incidents quickly, giving police a head start in assessing the situation at hand. According to records published by the Chula Vista Police Department in 2021, the average response time for serious life-threatening calls for service is 3.9 minutes for its drones, compared to 6.3 minutes for its ground police units.[69] For less urgent calls, the average response time is 6.2 minutes for drones, compared to 10.5 minutes for ground units.[70] More recent figures indicate that Chula Vista's drones now have an average response time of under two minutes overall.[71] Having a drone at the scene early can provide officers with crucial information, saving time once officers arrive.

Then, in over 20 percent of cases, Chula Vista's drone operators were able to clear calls without dispatching ground units to the scene.[72] This helps conserve officer resources—a particularly valuable aspect of DFR programs given that policing agencies often are flooded with calls for service, straining capacity.[73] Perhaps even more important, this can decrease unnecessary police contact. Reliance on police as first responders means that calls for service can lead to force and enforcement, even when this causes harm and does little to resolve the underlying problem.[74] By enabling agencies to clear calls without dispatching an officer to the scene, DFR programs can decrease the likelihood of such force and enforcement.

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65. *Id.*

66. CITY OF CHULA VISTA, *supra* note 63.

67. *See* Sam Biddle, *Startup Pitched Tasing Migrants from Drones, Video Reveals*, INTERCEPT (Dec. 13, 2021), https://theintercept.com/2021/12/13/brinc-startup-taser-drones-migrants/ [perma.cc/9FZ9-XWQM]; Craig McCarthy, *NYPD Buys Top-of-the-line Tactical Flying Tech, Explores Drone Usage to Answer 911 Calls Even Before Cops Get There*, N.Y. POST (Aug. 6, 2023), https://nypost.com/2023/08/06/nypd-exploring-use-of-drones-to-answer-911-calls-as-it-buys-high-tech-tactical-bots [perma.cc/XQN3-EA24]; CITY OF CHULA VISTA, *supra* note 63.; *Drone as First Responder – Explained*, BRINC (Dec. 10, 2024), https://brincdrones.com/news/dfr-explained/ [perma.cc/KLD7-DMDQ]. It should be noted that some agencies have launched DFR programs that go far beyond responding to 911 calls—the NYPD's program, for example, uses drones to conduct patrols when they are not responding to calls. *See* Barry Friedman, Max Isaacs & Jesse Woo, *How Not to Use NYPD Drones*, VITAL CITY (Dec. 13, 2024), https://www.vitalcitynyc.org/articles/how-not-to-use-nypd-dro nes-as-surveillance-tools. For clarity's sake, we will use the term "DFR" to refer only to the use of drones for first response purposes, as the name would suggest.

68. JAY STANLEY, ACLU, EYE-IN-THE-SKY POLICING NEEDS STRICT LIMITS 1 (2023), https://www.aclu.org/documents/eye-in-the-sky-policing-needs-strict-limits [perma.cc/Z2Z4-6BL7].

69. *See* Redmond, *supra* note 64.

70. *See id.*

71. *See* CITY OF CHULA VISTA, *supra* note 64.

72. *See id.*

73. *See* AMOS IRWIN & BETSY PEARL, CTR. FOR AM. PROGRESS, THE COMMUNITY RESPONDER MODEL: HOW CITIES CAN SEND THE RIGHT RESPONDER TO EVERY 911 CALL (2020), https://www.americanprogress.org/article/community-responder-model [perma.cc/WF7H-FT64].

74. *See* Friedman, *supra* note 12, at 955.

When police do need to be dispatched to the scene, drones can enhance situational awareness, potentially increasing the safety of officers and suspects alike. In one example from Chula Vista's program, a drone was deployed in response to a report that a man was waving a gun.[75] The drone operator identified that the "gun" was actually a lighter and informed responding officers that the man was not armed.[76] In another example from Montgomery County, Maryland, drone operators were able to recognize that an object reported as a possible handgun was in fact a cellphone.[77]

Finally, an important potential benefit of DFR programs that receives scant attention is the possibility that they could be used to send alternative responders, rather than police, to incidents. For example, social workers with expertise in substance abuse might be best positioned to respond to calls related to public drug use.[78] If drones and robots obviate the need to send people into harm's way, the argument for police as first responders is vastly diminished.

One could imagine DFR programs in which operators are trained to divert calls to alternative responders when the live video confirms that a police response is unnecessary. Any such programs might build upon those implemented in some jurisdictions in which teams of EMTs and social workers respond to mental health emergencies.[79] Conceivably, operators could even share the video stream with the alternative responders, helping them determine more quickly whether an ambulance should be dispatched, whether a social or outreach worker should make contact, whether co-response with police may be required, or whether no intervention is needed at all.

2. Observation

Robots have proven a potent tool for observation. Unlike stationary cameras, a robot can reposition itself, move along a preset route, or follow an individual.[80] Drones can overfly backyards or reach high apartment windows.[81] And the video

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75. *See* Redmond, *supra* note 64.

76. *See id.*

77. *See* Kate Ryan, *Drones by the Numbers: How the Montgomery Co. Police Department's Airborne Tools Are Performing*, WTOP NEWS (Apr. 25, 2024), https://wtop.com/montgomery-county/2024/04/drones-by-the-numbers-how-montgomery-county-police-departments-airborne-tools-are-performing [perma.cc/Z3X5-VW7R].

78. *See* Friedman, *supra* note 12, at 978.

79. *See Some U.S. Cities Adopt Pilot Program That Sends EMTs, Social Workers to Mental Health 911 Calls*, ABC7 NEWS N.Y. (Feb. 15, 2023), https://abc7ny.com/mental-health-emt-social-worker-b-heard/12819969 [perma.cc/BM5U-CBLL].

80. *See* Brooke Williams, *Take a Look: Denver PD's Bomb Squad Has a New Robot Dog*, FOX31 NEWS (Dec. 4, 2024, 9:48 PM), https://kdvr.com/news/local/take-a-look-denver-pds-bomb-squad-has-a-new-robot-dog/ [perma.cc/VQE9-RGGQ]; *Self Right*, BOS. DYNAMICS, https://support.bostondynamics.com/s/article/Self-Right-49951 [perma.cc/3VZC-6AKF] (last visited Jan. 27, 2025); *Introduction to Waypoint Flight Mode of DJI Fly*, DJI HELP CENTER, https://support.dji.com/help/content?customId=en-us03400007343&spaceId=34&re=US&lang=en&documentType=artical&paperDocType=paper [perma.cc/265R-T88T] (last visited Jan. 30, 2026); *Best Drones That Follow You Automatically (2024)*, DJI STORE, https://store.dji.com/content/camera-drone-that-follows-you [perma.cc/78MB-47L6] (last visited Jan. 27, 2025).

81. *See* Claire Fahy, *N.Y.P.D. Will Use Drones to Monitor Labor Day Celebrations*, N.Y. TIMES (Sep. 3, 2023), https://www.nytimes.com/2023/09/01/nyregion/drones-labor-day-nypd.html [perma.cc/X34W-YN9S]; Ryan Songalia, *The Activist Who Streamed a Bizarre Standoff With the NYPD Will Keep Fighting*, VICE (Aug. 11, 2020), https://www.vice.com/en/article/black-lives-matter-activist-nypd-drones-instagram-live [perma.cc/5RJ4-Z9HG].

data captured by robots can feed a variety of analytics, including face and license plate recognition.[82] This section discusses two ways in which police use robots to observe: first, to conduct targeted surveillance of individuals or their property; and second, to conduct general surveillance in an area.

i. Targeted Surveillance

Robots and drones offer several potential advantages when police seek to track the actions or movements of a suspect. Drones can reach spaces that would be difficult or impossible for humans to reach and can navigate unencumbered by traffic or other obstacles on the ground.[83] For example, some agencies have used drones to surveil backyards to investigate the illegal cultivation of marijuana.[84] To be sure, police have long had the ability to conduct aerial surveillance using helicopters and other conventional aircraft.[85] Drones, however, can be operated far more inexpensively than conventional aircraft, and thus it is practicable to use them in a wider range of operations.[86] In addition, because of their smaller size and quieter operation, drone surveillance can be conducted surreptitiously, giving a suspect little notion they are being monitored.[87]

ii. Patrol

Robots can also be used for general patrol, to serve as a deterrent to crime. While a drone might be used for surveillance because it will attract little attention, for patrol robots it is quite the opposite. It is hard to miss a five-foot, four hundred-

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82. *See* Simmons, *supra* note 15, at 915–16; KNIGHTSCOPE, *The K5 ASR*, *supra* note 32; NYCLU, PRYING EYES: GOVERNMENT DRONE DATA ACROSS NEW YORK STATE (2025), https://www.nyclu.org/report/prying-eyes-government-drone-data-across-new-york-state [perma.cc/L3LS-JRMS]; *Prosegur Security Debuts Yellow, the Robot Dog, as Latest Innovation in Lineup of Intelligent Security Offerings*, PROSEGUR (Aug. 30, 2022), https://www.prosegur.us/newsdetails/news/prosegur-security-debuts-yellow-the-robot-dog-as-latest-innovation-in-lineup-of-intelligent-security-offerings [perma.cc/4D7Y-7MTD].

83. *See, e.g.*, Tiffany Lewis, *EPD Launches Drone Program for Faster Response Times*, KPIC (Dec. 12, 2024), https://kpic.com/news/local/epd-launches-drone-program-for-faster-response-times-real-time-situational-awareness-thermal-capabilities [perma.cc/XN8X-ZXZ3] (describing police drone obtaining detailed, 360-degree images from four hundred feet away); Nikki Davidson, *FAA Flexible Drone Waivers Offer Boost for First Responders*, GOV'T TECH. (Feb. 26, 2025), https://www.govtech.com/public-safety/faa-flexible-drone-waivers-offer-boost-for-first-responders [perma.cc/6VL5-U3R7] (describing police drones that can detect and avoid obstacles in their flight path).

84. *See, e.g.*, Bailey Duran, *U.S. Court Sides with Montezuma County After Drone is Used in Marijuana Search*, THE JOURNAL (Nov. 6, 2023, 5:08 PM), https://www.the-journal.com/articles/u-s-court-dismisses-claims-against-montezuma-county-sheriff-in-marijuana-drone-case [perma.cc/8449-JTG6].

85. *See* Jay Stanley, *Protests, Aerial Surveillance, and Police Defunding*, ACLU (June 24, 2020), https://www.aclu.org/news/national-security/protests-aerial-surveillance-and-police-defunding [perma.cc/P2AK-69CB] (describing how police helicopters first appeared in the late 1940s); Steve Harvey, *Venice's Aero Police Enforced the Law From on High*, L.A. TIMES (Apr. 10, 2011), https://www.latimes.com/local/la-xpm-2011-apr-10-la-me-0410-then-20110410-story.html [perma.cc/729A-RKZ3] (describing how a California police officer patrolled via plane in 1919).

86. *See* Jay Stanley, *We Already Have Police Helicopters, So What's the Big Deal Over Drones?*, ACLU (Mar. 8, 2013), https://www.aclu.org/news/smart-justice/we-already-have-police-helicopters-so-whats-big-deal-over [perma.cc/ZA8F-S9YB].

87. *See 7 Police Drone Facts Worth Knowing*, AXON, https://www.axon.com/resources/police-drone-facts [perma.cc/7FCD-LLNT] (last visited Jan. 24, 2025).

pound Knightscope K5 robot wheeling around a city park.[88] That is by design: Knightscope's marketing materials claim that the K5's "commanding size along with its conspicuous lighting, strobe lights, broadcast messages and patrol sounds, effectively deter illicit activities."[89] A robot's physical prominence makes the fact of police surveillance more apparent than an ordinary CCTV camera. And this, it is hoped, will deter wrongdoers.

Vendors are quick to claim that these benefits already have been borne out, but it is worth taking such claims with a large grain of salt. Knightscope, for example, claims that the use of its K5 robots by police in Huntington Park, California, resulted in a 10 percent reduction in calls for service, a 46 percent reduction in crime reports, and a 68 percent reduction in citations.[90] But vendor claims about the efficacy of policing technology often are not independently vetted and fail to withstand scrutiny.[91] The fact is that crime rates can fluctuate for various reasons, from enforcement priorities to social factors to the weather.[92] That is not to say that robots cannot deter crime—rather, it is to say that any evaluation of the crime-fighting impact of robots must be based on rigorous evidence, not unsubstantiated vendor claims.

3. Use of Force

One of the quintessential functions of the police, and one which attracts much controversy, is the use of force. Force—indeed, the mere presence of those authorized to use it—can in some circumstances bring much-needed order.[93] "The police," it has been said, "are nothing else than a mechanism for the distribution of situationally justified force in society."[94]

To date, the use of robots by police to deploy force has been rare. As noted above, in 2016, police in Dallas used a robot equipped with explosives to kill an

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88. *See* Katie Flaherty, *A RoboCop, a Park and a Fight: How Expectations About Robots are Clashing with Reality*, NBC NEWS (Oct. 4, 2019, 6:04 AM), https://www.nbcnews.com/tech/tech-news/robocop-park-fight-how-expectations-about-robots-are-clashing-reality-n1059671 [perma.cc/5M2J-TCMA].

89. *See* Knightscope, *The Knightscope K5 is Margaritaville's Newest Team Member*, BUS. WIRE (Feb. 26, 2024), https://www.businesswire.com/news/home/20240226734819/en/The-Knightscope-K5-is-Margaritaville%E2%80%99s-Newest-Team-Member [perma.cc/L3SL-7XWG].

90. *See* Knightscope, *Knightscope Technology Credited for Reducing Crime*, BUS. WIRE (Jan. 28, 2020), https://www.businesswire.com/news/home/20200128005295/en/Knightscope-Technology-Credited-for-Reducing-Crime [perma.cc/ASR6-FZA8].

91. *See* JULIAN CLARK, BARRY FRIEDMAN, FARHANG HEYDARI & MAX ISAACS, RING & NEIGHBORS PUBLIC SAFETY SERVICE: A CIVIL RIGHTS & CIVIL LIBERTIES AUDIT (2021).

92. *See* FED. BUREAU OF INVESTIGATIONS: UNIF. CRIME REPORTING PROGRAM, VARIABLES AGAINST CRIME (CAUTION AGAINST RANKING) (2012), https://ucr.fbi.gov/nibrs/2012/resources/variables-affecting-crime [perma.cc/CY5S-G9NU]. Confusingly, the company also claims that the K5 resulted in a 27 percent increase in arrests. KNIGHTSCOPE, *The K5 ASR*, *supra* note 32. It is far from clear why a patrol robot would increase arrests to such an extent. And, notably, according to the Chief of Police of Huntington Park, there have not been many examples of arrests made because of the K5 (although it has been useful in investigating "robot tipping and vandalism against the robot itself"). *See* Cyrus Farivar, *Security Robots Expand Across U.S., with Few Tangible Results*, NBC NEWS (June 27, 2021, 3:00 AM), https://www.nbcnews.com/business/business-news/security-robots-expand-across-u-s-few-tangible-results-n1272421 [perma.cc/A8UF-4VU3].

93. *See* Friedman, *supra* note 12, at 957.

94. EGON BITTNER, THE FUNCTIONS OF THE POLICE IN MODERN SOCIETY 39 (1970).

active shooter after negotiations broke down.[95] The same year, the Los Angeles County Sheriff's Department used a robot to disarm a barricaded hostage-taker.[96] Recently, police in Lubbock, Texas used a robot to deploy tear gas against a suspect, then ran over and parked on top of him to aid in his apprehension.[97] Abroad, police have used robots equipped with "electrically charged riot controlled tool[s]," "pepper spray, tear gas, and paintballs."[98]

Although equipping robots to use force has been controversial, agencies are, in fits and starts, pressing the issue of robotic use of force. Recently, police in San Francisco and Oakland—two progressive cities with a history of scrutinizing police use of technology—sought authorization to deploy force-equipped robots.[99] In San Francisco, the proposal was approved by the Board of Supervisors before being revoked in response to public backlash.[100] In Oakland, the proposal, which was met with much controversy, was withdrawn before a vote could be held.[101] Notably, in late 2024, the Governor of California, Gavin Newsom, vetoed a bill that would have prohibited the weaponization of robots. Newsom stated that the reason for the veto was that the bill would "prohibit beneficial law enforcement use of such devices," including against "armed and barricaded suspects."[102] Some states have gone the other way, enacting laws prohibiting robot weaponization.[103]

Technology companies have both responded to and driven this emerging market. Axon Enterprise announced plans to develop Taser-equipped drones as a means to address mass shootings. Although subsequently Axon paused development, the company has made clear that the idea is still on the table.[104]

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95. *See* Isabelle Taft, *Police Use of Robot to Kill Dallas Suspect Unprecedented, Experts Say*, TEX. TRIB. (July 8, 2016), https://www.texastribune.org/2016/07/08/use-robot-kill-dallas-suspect-first-experts-say [perma.cc/CHP8-7ZNP].

96. *See* Tim Loc, *Robot Helps Sheriff's Deputies Snatch Gun From Armed Suspect*, LAIST (Sep. 15, 2016), https://laist.com/news/lancaster-robot [perma.cc/5UZY-CC45].

97. *See Robot Cop Ends Standoff by Running Over and Gassing Suspect*, LOCAL12 (Sep. 21, 2024), https://local12.com/news/nation-world/robot-cop-run-over-gas-tear-swat-robocop-bot-machine-police-officer-standoff-suspect-arrest-shooting-gunshot-gun-weapon-sheriff-sniper-negotiation-hotel [perma.cc/NG8M-EKZC].

98. Joh, *supra* note 28, at 521; *see* Simmons, *supra* note 15, at 920.

99. *See* James Vincent, *San Francisco Reverses Plans to Allow Police Robots to Kill Suspects*, VERGE (Dec. 7, 2022), https://www.theverge.com/2022/12/7/23497922/killer-robot-policy-san-francisco-reversed [perma.cc/NC27-2M2K]; Nora Mishanec, *Oakland, Calif., Police Reverse Course on Lethal Robot*, GOV'T TECH. (Oct. 20, 2022), https://www.govtech.com/public-safety/oakland-calif-police-reverse-course-on-lethal-robot [perma.cc/7LMJ-VHEY].

100. *See* Vincent, *supra* note 99.

101. *See* Sam Biddle, *Oakland Cops Hope to Arm Robots with Lethal Shotguns*, INTERCEPT (Oct. 17, 2022), https://theintercept.com/2022/10/17/police-robot-gun-oakland [perma.cc/9KSG-5PQD].

102. *See* Governor Newsom's Veto Message of Assemb. B. 2681, 2023–2024 Leg., Reg. Sess. (Cal. 2024) https://www.gov.ca.gov/wp-content/uploads/2024/09/AB-2681-Veto-Message.pdf [perma.cc/85BC-F47C] (vetoing robot weaponization bill).

103. *See, e.g.*, NEV. REV. STAT. § 493.106 (2015) (prohibiting the weaponization of an unmanned aerial vehicle); VT. STAT. ANN. tit. 13, § 4018 (2015) (prohibiting equipping a drone with a dangerous or deadly weapon).

104. BARRY FRIEDMAN, WAEL ABD-ALMAGEED, MILES BRUNDAGE, RYAN CALO, DANIELLE CITRON, REBEKAH DELSOL, CHRIS HARRIS, JENNIFER LYNCH & MECOLE MCBRIDE, AXON'S PROJECT ION: A REPORT ON AXON'S PROPOSAL FOR TASER-EQUIPPED DRONES 4–5 (2023). The authors of this Article were involved as members or staff of Axon's then-AI Ethics Committee. *See* Jeffrey Dastin & Paresh Dave, *Taser Maker Halts Drone Project; Most of its Ethics Panel Resigns*, REUTERS (June 6, 2022), https://www.reuters.com/world/us/exclusive-axon-halts-taser-drone-work-some-ethics-panel-said-resign-2022-06-06 [perma.cc/6NU6-FQYN].

Indeed, Axon recently acquired a company that markets drones with what it euphemistically calls a "sound distraction system" capable of deploying a five-round salvo of 165 decibel shots (for comparison, a shot fired from a handgun measures in at approximately 140 decibels).[105] Another company, Campus Guardian Angel, recently began marketing a drone equipped with pepper rounds for use against school shooters.[106] Ghost Robotics, another vendor, has demonstrated a robot equipped with a firearm.[107] Elizabeth Joh suggests, "[l]ethally armed robots are no longer forbidden as a mainstream policing technology."[108]

Regarding the use of force, there are several claimed advantages that force-equipped robots have over human officers. First and foremost, force-equipped robots could, in theory, help officers de-escalate in situations in which force might otherwise be used. Proponents argue that when officers have to make a force decision in person, the fear and stress they experience impairs their judgment; if police confront a situation remotely through a robot, they may utilize force more judiciously.[109] The use of robots can allow police to hold their fire in "ambiguous situations."[110] And, one would hope, by enabling police to hold their fire, robots could buy time for trained negotiators or other specialists to intervene.

Similarly, if force must be used, robots might enable police to use weapons that are less likely to be lethal. For example, the use of a Taser often is not an option for officers confronting an armed subject, since the range of a Taser requires officers to be in relatively close proximity to the person against whom it is used.[111] Officers controlling a robot from a safe distance from a subject may have more options to use Tasers or other less-lethal weapons.[112]

If these theories hold true, the potential benefits could be substantial. There are, on average, over one thousand fatal officer-involved shootings per year, and many more nonfatal shootings.[113] If—and it is a big "if"—force-equipped robots

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105. Malia Wollan, *How to Tell Gunfire from Fireworks*, N.Y. TIMES MAG. (Aug. 6, 2019), https://www.nytimes.com/2019/08/06/magazine/how-to-tell-gunfire-from-fireworks.html [perma.cc/ZRR5-SLKZ]; *Divisionary Sound Payload with Typhon: Tactical Superiority in Action*, AXON, https://sky-hero.com/products/payload-typhon [perma.cc/SN79-58QL] (last visited Feb. 6, 2025).

106. *See Frequently Asked Questions*, CAMPUS GUARDIAN ANGEL, https://www.campusguardianangel.com/faq [perma.cc/P69V-WKHC] (last visited Sep. 29, 2025).

107. *See* Benj Edwards, *Robot Dogs Armed with AI-Aimed Rifles Undergo U.S. Marines Special Ops Evaluation*, ARS TECHNICA (May 8, 2024), https://arstechnica.com/gadgets/2024/05/robot-dogs-armed-with-ai-targeting-rifles-undergo-us-marines-special-ops-evaluation [perma.cc/W4ZV-3CYV].

108. Elizabeth Joh, *Police Departments Are Not Going to Give Up on Killer Robots*, SLATE MAG.: FUTURE TENSE (Dec. 11, 2022), https://slate.com/technology/2022/12/san-francisco-police-lethal-robots.html [perma.cc/ZV6M-EPNY].

109. *See* Patrick Tucker, *The Inventor of the Taser and the Body Cam Wants to Put Them on Drones*, DEFENSE ONE: SCI. & TECH. (Oct. 13, 2021), https://www.defenseone.com/technology/2021/10/inventor-taser-and-body-cam-wants-put-them-drones/186095/ [perma.cc/E56L-924S]; Simmons, *supra* note 15, at 941.

110. PETER OLSTHOORN & LAMBÈR ROYAKKERS, RISKS AND ROBOTS – SOME ETHICAL ISSUES 2 (2014).

111. *See Evolution of the TASER Energy Weapon*, AXON, https://taser-evolution.axon.com [perma.cc/Q5EB-J825] (last visited Jan. 24, 2025).

112. *See* FRIEDMAN ET AL., *supra* note 104, at 12.

113. *See Police Shootings Database 2020-2024*, WASH. POST, https://www.washingtonpost.com/graphics/investigations/police-shootings-database/ [perma.cc/4US5-LJL4]; Justin Nix, *Unveiling the Unseen: Documenting and Analyzing Nonfatal Shootings by Police*, 114 AM. J. PUB. HEALTH 382, 382 (2024).

enabled officers to slow down and exercise better judgment, or substitute less-lethal force for lethal force, many lives could be saved.

Finally, the ability to deploy force remotely would help to ensure the safety of responding officers.[114] This may prove especially useful in situations in which a subject is barricaded or otherwise obstructed, making it difficult for human officers to ascertain their position.

II. THE RISKS OF POLICE ROBOTS

Though the potential benefits of police robots are apparent, so too are their potential costs. There are, of course, financial costs, which can prove substantial. Police robots can run into the tens of thousands of dollars, depending on their configuration.[115] And that is to say nothing of the costs of training agency personnel to operate robots, which can cost hundreds of dollars per officer.[116] Whether the benefits of a robot will justify its purchase price is a question of no small importance.

Too often, though, discussions about the costs of policing technology begin and end there—with the costs of acquisition. In reality, there are a bevy of other, nonfinancial costs which must also be considered.[117] This part describes these costs, from the potential for injury to intrusions on individual privacy.

A. Malfunctions

Robots can sometimes malfunction, creating real harm. They can lose the signal that operates them, or they can be hacked; officers might lose control, or others might gain it.[118] In one notable malfunction, a K5 robot knocked over a toddler and ran over his foot.[119] There also have been "cases in which drones have

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114. *See* Joh, *supra* note 28, at 526.

115. *See* Evan Ackerman, *Boston Dynamics' Spot Robot Dog Now Available for $74,500*, IEEE SPECTRUM (June 16, 2020), https://spectrum.ieee.org/boston-dynamics-spot-robot-dog-now-available [perma.cc/L3S5-2ZWG]; HAYWARD POLICE MANUAL: MILITARY EQUIPMENT INVENTORY § 706.4 (2025), https://www.hayward-ca.gov/sites/default/files/police/HPD-Military-Equipment-Use-Policy-250520.pdf [perma.cc/JT6W-UDYG].

116. *See Technology in Tactical Operations*, NAT'L TACTICAL OFFICERS ASS'N, https://public.ntoa.org/default.asp?action=trainingcourses [perma.cc/2MDH-NYTP] (last visited Jan. 27, 2025); *How Much Does it Cost to Get a Remote Pilot Certificate?*, FED. AVIATION ADMIN., https://www.faa.gov/faq/how-much-does-it-cost-get-remote-pilot-certificate [perma.cc/H33E-RNPC] (last visited Jan. 27, 2025).

117. *Compare* Farhang Heydari, *The Invisible Driver of Policing*, 76 STAN. L. REV. 1, 50 (2024) ("The importance of choosing the right tactic is underscored by the fact that different tactics bring with them different social costs."), *with* Farhang Heydari, *Rethinking Federal Inducement of Traffic Stops*, 2024 WIS. L. REV. 181, 248 (2024) (proposing development of a standardized measure of the benefits and costs created by traffic stops).

118. *See Why Does My Drone Controller Lose Connection During Flight?*, DRONEDEPLOY, https://help.dronedeploy.com/hc/en-us/articles/13808173367447-Why-does-my-drone-controller-lose-connection-during-flight [perma.cc/VK49-V2XW] (last visited Jan. 28, 2025); *Security and Drones –What You Need to Know*, KASPERSKY, https://usa.kaspersky.com/resource-center/threats/candronesbehacked?srsltid=AfmBOooMCGvxR4Wxvbns5rQgUTDYf4t3RyUVdUFzi_9G2gOhyeLx6Sic [perma.cc/QX29-ANKL] (last visited Jan. 28, 2025).

119. *See* Flaherty, *supra* note 88; Lilian Kim, *Parents Upset After Stanford Shopping Center Security Robot Injures Child*, ABC7 NEWS (July 11, 2016), https://abc7news.com/stanford-shopping-center-robot-kid-hurt-hurts-child-mall/1423093 [perma.cc/D7JJ-YJ2G].

fallen from the sky and struck people in the head, collided with cyclists, and even sliced the tips of noses off."[120]

Compounding these issues is the fact that robots are unpredictable by design. As Ryan Calo explains, what a robot does in the world is the consequence of code interacting with other code (sometimes from different developers), as well as inputs such as the operator's instructions and the data being collected.[121] It can be difficult or impossible to predict exactly how a robot will behave. The nature of emergent systems—that is, systems that are not instructed in how to perform each task but rather are given goals and are trained to accomplish them—contributes to this unpredictability.[122]

B. Human-Robot Interaction and Trust

When police interact with citizens through robots, the form of the robot matters.[123] For example, some quadruped robots are built to resemble dogs and even have a dog's name—such as the New York Police Department's (NYPD) "Digidog."[124] Law enforcement use of dogs has a deeply negative connotation in some Black communities—from the long historical use of dogs in hunting slaves, to Bull Connor's use of dogs against protestors in Birmingham, to the use of police canines today.[125]

Other robots take on a military guise. One robot developed for the Massachusetts State Police resembles a tank with a ballistic shield.[126] Some argue that this can reinforce a "military culture" within policing agencies, distorting law enforcement's view of its mission.[127]

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120. Nanci K. Carr, *Programmed to Protect and Serve: The Dawn of Drones and Robots in Law Enforcement*, 86 J. AIR L. & COM. 183, 204 (2021); *see also* Tim Renaud, *NYE Drone Show Canceled on Folly Beach After Drones Fall from Sky; At Least 1 Injured*, WCBD COUNT ON NEWS 2 (Dec. 31, 2024), https://www.counton2.com/news/local-news/nye-drone-show-canceled-on-folly-beach-due-to-safety-concerns [perma.cc/8YVH-S653].

121. Calo, *supra* note 13, at 534.

122. *See id.*

123. *See* Kemper & Kolain, *supra* note 41, at 27.

124. *See* Karen Matthews, *Robotic Police Dog 'Digidog' Rejoins NYPD*, PBS NEWS (Apr. 12, 2023), https://www.pbs.org/newshour/nation/robotic-police-dog-digidog-rejoins-nypd [perma.cc/9EK3-KJCY].

125. *See, e.g.*, Tyler D. Perry, *Police Still Use Attack Dogs Against Black Americans*, WASH. POST (Sep. 20, 2020), www.washingtonpost.com/outlook/2020/09/02/police-still-use-attack-dogs-against-black-americans/ [perma.cc/VWA2-FLGK]; Gahmya Drummond-Bey, *Why Do So Many Black Americans Have a Fear of Dogs?*, EVOLVED TCHR. (Apr. 22, 2021), www.evolvedteacher.com/blog/why-do-so-many-black-americans-have-a-fear-of-dogs [perma.cc/5YAN-WDYP]; Abbie VanSickle, Maurice Chammah, Michelle Pitcher, Damini Sharma, Andrew Calderon, David Eads, Challen Stephens, Ashley Remkus, Ryan Martin, Dana Brozost-Kelleher, Andrew Fan & Ellen Glover, *Mauled: When Police Dogs Are Weapons*, MARSHALL PROJECT, www.themarshallproject.org/2020/10/15/mauled-when-police-dogs-are-weapons [perma.cc/Y4QZ-6WU5] (last visited Jan. 30, 2026); L. Kevin Chapman, Lauren Vines & Jenny Petrie, *Fear Factors: Cross Validation of Specific Phobia Domains in a Community-Based Sample of African American Adults*, 25 J. ANXIETY DISORDERS 539, 543–44 (2011). *See generally* Shontel Stewart, *Man's Best Friend? How Dogs Have Been Used to Oppress African Americans*, 25 MICH. J. RACE & L. 183 (2020).

126. *See* Clarke Canfield, *'SWAT Bot' a Tactical Tool*, TELE. & GAZETTE (Apr. 19, 2013, 8:00 AM), https://www.telegram.com/story/news/local/north/2013/04/19/swat-bot-tactical-tool/48938303007 [perma.cc/J75Y-KGRV].

127. *See* John Gruhl & Michael Combs, *Police Drones: Coming to a Neighborhood Near You*, 20 NAT'L POL. SCI. REV. 56, 65 (2019); BARRY FRIEDMAN, JESSICA W. GILLOOLY, MARIA PONOMARENKO, KAREN L. MENDOLA, TOM CLARK, ADAM GLYNN & MICHAEL LEO OWENS,

Even robots resembling humans could prove intimidating or unsettling. Some have described an "uncanny valley" effect in which robots sufficiently similar to humans in appearance may trip "the same psychological alarms associated with a dead or unhealthy human," causing a fear response.[128]

In short, the form and appearance of a robot can have an impact on how both police and citizens interact with it, with potential consequences for public acceptance and trust.[129]

Another notable interaction issue, aside from the form of robots, is the possibility that negative interactions between police robots and individuals might diminish public trust in robotics generally. Research shows that mistakes made by robots can cause people to have significantly lower levels of trust in robots in future interactions.[130] In other words, even if some types of robots are shown to be safe and to improve public safety, the public may be slow to accept them if other robots have been shown to cause harm.

C. Impact of Robotics on Use of Force Decisions

Proponents of force-equipped robots argue that these tools would decrease police use of force overall—or perhaps shift uses of force to less lethal options—but there is cause to be concerned that the opposite may prove true.[131] The use of weaponized robots could lead to the dehumanization of subjects—that is, operators may be more prone to use force when a subject appears as a figure on a computer screen rather than a person in a face-to-face encounter.[132] Through the mediation of technology, officers may become detached from suspects—"the targeted 'things' on the screen do not seem to implicate [the operator] in a moral relationship."[133] Or, as one operator of military drones (which often are weaponized) put it, his job was "like a video game. It can get a little bloodthirsty. But it's fucking cool."[134]

Compounding this issue is the fact that force-equipped robots can enable multiple decisionmakers, monitoring at a distance, to participate in the decision to use force.[135] This has its advantages and disadvantages. On the one hand, in a more controlled environment in which multiple officers jointly make force decisions, cooler heads may well prevail.[136] On the other, this diffusion of responsibility could

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POLICE MILITARIZATION: A 1033 PROGRAM ANALYSIS 1, 6–7 (2021); Kristin Bergtora Sandvik, *The Political and Moral Economies of Dual Technology Transfers: Arming Police Drones*, *in* DRONES & UNMANNED AERIAL SYS. 48–49 (Aleš Završnik ed., 2016).

128. Daisy Hernandez, *The Scientific Reason Some of Us Find Robots Creepy as Hell*, POPULAR MECHS. (July 17, 2019), https://www.popularmechanics.com/technology/a28410087/uncanny-valley-robots-fear [perma.cc/75MY-257E].

129. *See* Kemper & Kolain, *supra* note 41, at 39.

130. *See* Paul Robinette, Ayana M. Howard & Alan R. Wagner, *Effect of Robot Performance on Human-Robot Trust in Time-Critical Situations*, 47(4) IEEE TRANSACTIONS ON HUM.-MACHINE SYS. 425, 433–34 (2017).

131. *See* FRIEDMAN ET AL., *supra* note 104, at 12–13.

132. *See* OLSTHOORN & ROYAKKERS, *supra* note 110, at 4.

133. Tyler Wall & Torin Monahan, *Surveillance and Violence from Afar: The Politics of Drones and Liminal Security-Scapes*, 15 THEORETICAL CRIMINOLOGY 239, 246 (2011).

134. OLSTHOORN & ROYAKKERS, *supra* note 110, at 5.

135. *See* Alaa Hijazi, Christoper J. Ferguson, Harold Hall, Mark Hovee, F. Richard Ferraro & Sherrie Wilcox, *Psychological Dimensions of Drone Warfare*, 38 CURRENT PSYCH. 1285, 1289 (2019).

136. *See* Amos N. Guiora, *Accountability and Decision Making in Autonomous Warfare: Who is Responsible?*, 2017 UTAH L. REV. 393, 407 (2017).

reduce officers' sense of personal moral culpability for their decisions.[137] More study of this issue is needed before any deployment of force-equipped robots is contemplated.

Importantly, in a world of force-equipped robots, use-of-force policies will need to be changed and officers retrained. Many use-of-force policies track the Fourth Amendment requirement that police use of force be "reasonable."[138] Agency policies and training assume, understandably, that officers making force decisions are at the scene and may fear for their safety.[139] The ability to deploy force remotely unsettles this assumption. If officer safety is not an issue, robotic force may need to be deployed more sparingly—or not used at all unless absolutely necessary.

On a related note, situations inevitably will arise in which individuals attack police robots and police must decide how to respond. There have already been a few such instances, including a recent incident in which a Spot robot was shot three times by a suspect in Massachusetts.[140] Without policies in place to address such a contingency, it is possible that police might respond disproportionately—for example, responding to an attack on a robot dog in the same manner they would an attack on a normal K9.

D. Privacy Harms

Robots, like other camera-based surveillance technologies, raise concerns about intrusions upon individual privacy. Some of the unique aspects of robotic surveillance discussed in the previous section make them potentially more intrusive than traditional cameras. A drone's ability to fly and hover, for example, enables surveillance from vantage points that would otherwise be inaccessible or impractical.[141]

These privacy concerns are perhaps at their apex when police seek to conduct surveillance of an individual's home. The home often is considered the quintessential example of a private space.[142] Indeed, the Supreme Court has recognized repeatedly the robust protection to which the home is entitled under the Fourth Amendment.[143] At the "very core" of the Fourth Amendment, the Court has said, "stands the right of a man to retreat into his own home and there be free from unreasonable governmental intrusion."[144]

Despite this, existing precedents do little to curtail the use of drones to conduct surveillance of the home, provided they do not physically enter it. Some courts have rejected claims, for example, that drone surveillance of a backyard constitutes a "search" under the Fourth Amendment thereby requiring police to

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137. *See* OLSTHOORN & ROYAKKERS, *supra* note 110, at 4; Hijazi et al., *supra* note 135, at 1291.

138. *See, e.g.*, Tennessee v. Garner, 471 U.S. 1, 2, 4–5 (1985).

139. *See* Joh, *supra* note 28, at 537.

140. *See, e.g.*, Neal Riley, *Wounded Boston Dynamics Robot May Have Saved "Real Dog" or Officer from Shooting*, CBS NEWS: LOCAL NEWS (Mar. 28, 2024), https://www.cbsnews.com/boston/news/boston-dynamics-robot-dog-shooting-massachusetts [perma.cc/J5WZ-LV7S].

141. *See* Lewis, *supra* note 83.

142. *See* Florida v. Jardines, 569 U.S. 1, 6 (2013) ("At the [Fourth] Amendment's 'very core' stands 'the right of a man to retreat into his own home and there be free from unreasonable governmental intrusion.'").

143. *See, e.g.*, Kyllo v. United States, 533 U.S. 27, 28 (2001) ("[I]n the sanctity of the home, *all* details are intimate details."); *Jardines*, 569 U.S. at 6 (2013) ("[W]hen it comes to the Fourth Amendment, the home is first among equals.").

144. *See* Silverman v. United States, 365 U.S. 505, 511 (1961).

obtain a warrant based upon probable cause.[145] These courts rely on a Supreme Court case, *California v. Ciraolo*, which held similar surveillance using manned aircraft not to constitute a search, on the grounds that one's backyard is in plain view of air passengers who might happen to fly overhead.[146]

But this fails to acknowledge the important ways in which drone surveillance differs from surveillance conducted with conventional aircraft. Drone surveillance may prove far more intrusive of a tool—drones generally can fly lower than conventional aircraft and, as discussed, can operate more quietly, enabling surreptitious surveillance.[147] Some drones are equipped with increasingly powerful zoom capabilities, potentially enabling police to see far into a home's interior.[148]

Drone surveillance may also prove more ubiquitous than surveillance by conventional aircraft, by orders of magnitude. In part, this is a function of the reduced cost of operating drones.[149] But it also is attributable to what may soon be a vast expansion in the incidental collection of data from commercial and first response drones. For example, DFR programs, which use drones to respond to 911 calls, likely will capture images of private residences as they fly to the scene.[150] Indeed, some agencies have said that their DFR drones will conduct aerial patrols when not responding to calls for service.[151] Police may also come to rely on footage captured by drones and robots that have been deployed by companies to make deliveries.[152]

Although our focus to this point has been on surveillance of the home, the use of robots to surveil public spaces also raises concerns. The physical presence of police robots in public spaces might serve as a stark reminder of police monitoring—much more so than common stationary cameras. This particularly striking form of surveillance gives rise to concerns about "chilling effects"—that is, individuals seeking to engage in activity protected by the First Amendment might be deterred from doing so.[153] Some agencies have used robots to surveil activities

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145. *See, e.g.*, State v. Stevens, 210 N.E.3d 1154, 1162 (Ohio Ct. App. 2023).

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

147. *Compare Public Safety*, FED. AVIATION ADMIN. (May 1, 2025), https://www.faa.gov/uas/public_safety_gov [perma.cc/YK7A-PJUE] (explaining that police drone night operations are limited to a 400-foot altitude), *with* Kevin Vesey, *FAA Investigating Nassau Police Helicopter Tactics at Jones Beach*, LONG ISLAND NEWS 12 (June 9, 2025), https://longisland.news12.com/faa-investigating-nassau-pds-use-of-low-flying-helicopter-during-jones-beach-chaos [perma.cc/M7F2-HAKR] (describing how police helicopters typically fly at least one thousand feet above ground). *See* AXON, *supra* note 87.

148. *See* Miriam McNabb, *DJI Unveils Zenmuse H30 Series: Versatile Aerial Payloads for Enhanced Visuals*, DRONELIFE (May 16, 2024), https://dronelife.com/2024/05/16/dji-unveils-zenmuse-h30-series-versatile-aerial-payloads-for-enhanced-visuals/ [perma.cc/EJ6F-73S4]; United States v. Taborda, 635 F.2d 131, 138–39 (2nd Cir. 1980).

149. *See Drones and Aerial Surveillance*, ELEC. PRIV. INFO. CTR., https://epic.org/issues/surveillance-oversight/aerial-surveillance [perma.cc/F5CG-YA3V] (last visited July 31, 2025).

150. *See* Lipton, *supra* note 2.

151. *See, e.g.*, *Transcript: Mayor Adams Makes Public Safety-Related Announcement*, OFF. OF THE MAYOR (Nov. 13, 2024), https://www.nyc.gov/office-of-the-mayor/news/828-24/transcript-mayor-adams-makes-public-safety-related-announcement [perma.cc/FZM4-YFBT] ("[W]hen not responding to 911 calls, the drone team should be on patrol like a regular police car.").

152. *See* Jason Koebler, *Food Delivery Robots are Feeding Camera Footage to the LAPD, Internal Emails Show*, L.A. PUB. PRESS (Oct. 3, 2023), https://lapublicpress.org/2023/10/food-delivery-robots-are-feeding-camera-footage-to-the-lapd-internal-emails-show [perma.cc/GY4A-D795].

153. *See* Frederick Schauer, *Fear, Risk, and the First Amendment: Unraveling the Chilling Effect*, 58 B.U. L. REV. 685, 693 (1978).

such as political protests; in this way, robotic surveillance, even of public spaces, can risk significant harm.[154]

E. Disparate Impact

As with many other aspects of policing, the harms of police technology are not borne equally across society. It has been well documented that policing technologies are deployed disproportionately in communities of color and lower socioeconomic status.[155] Some experts warn that drones and other robots are likely to follow this pattern and be deployed disproportionately in such communities unless there are policies and safeguards to counteract this.[156]

Notably, it may be harder for the public to hold police accountable for deployment decisions in the context of robots than traditional surveillance systems. CCTV cameras typically are installed at a particular location, and usually are plainly visible.[157] One can tell easily where a camera has been sited, and civil society groups have undertaken projects to map out where surveillance systems are, in order to detect potential disparities.[158] It will be more difficult to do this for drones or robots, which move from place to place, unless there is cooperation from the policing agencies operating them.

Also, as noted above, robots can serve as a platform for other technologies, which themselves may result in bias. One scholar has warned of the integration of place-based predictive policing algorithms—that is, systems that predict where and when crime might occur—into patrol robots.[159] If robots were to choose where to patrol based on such algorithms, then unrepresentative or skewed data that feed into such algorithms (such as past crime data, which may reflect biased patterns of policing) might result in racial and other disparities.[160] We must be mindful, in other

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154. *See* Dakotah Kennedy, *Cleveland Police Violate Drone Policy to Monitor Protestors Outside Cuyahoga County Executive Chris Ronayne's House*, SIGNAL CLEV. (Nov. 27, 2024), https://signalcleveland.org/cleveland-police-violate-drone-policy-to-monitor-protestors-outside-cuyahoga-county-executive-chris-ronaynes-house/ [perma.cc/F2AN-452Z]; Emiliano Falcon-Morano, *Eyes in the Sky: Massachusetts State Police Used Drones to Monitor Black Lives Matter Protests*, ACLU MASS. (Dec. 21, 2022), https://data.aclum.org/2022/12/21/massachusetts-state-police-used-drones-to-monitor-black-lives-matter-protests [perma.cc/L3FY-92F2].

155. *See* BARRY FRIEDMAN, FARHANG HEYDARI, EMMANUEL MAULEON & MAX ISAACS, POLICING PROJECT, CIVIL RIGHTS AND CIVIL LIBERTIES AUDIT OF BALTIMORE'S AERIAL INVESTIGATION RESEARCH (AIR) PROGRAM 30–32 (2020).

156. *See id.*; Nicol Turner Lee & Caitlin Chin-Rothman, *Police Surveillance and Facial Recognition: Why Data Privacy Is an Imperative for Communities of Color*, BROOKINGS INST. (Apr. 12, 2022), https://www.brookings.edu/articles/police-surveillance-and-facial-recognition-why-data-privacy-is-an-imperative-for-communities-of-color [perma.cc/72Q9-7CWZ].

157. *See* Rick Rojas, *In Newark, Police Cameras, and the Internet, Watch You*, N.Y. TIMES (June 9, 2018), https://www.nytimes.com/2018/06/09/nyregion/newark-surveillance-cameras-police.html [perma.cc/J9CR-NF8J] (describing how CCTV cameras are placed in various public locations, such as storefronts, neighborhoods, and bus stops).

158. *See Surveillance City: NYPD Can Use More than 15,000 Cameras to Track People Using Facial Recognition in Manhattan, Bronx and Brooklyn*, AMNESTY INT'L (June 3, 2021), https://www.amnesty.org/en/latest/news/2021/06/scale-new-york-police-facial-recognition-revealed/ [perma.cc/XU8A-2T54]; *2021 NYC Hikvision Camera Census*, SURVEILLANCE TECH. OVERSIGHT PROJECT, https://www.stopspying.org/2021-hikvision [perma.cc/E4X4-H82V] (last visited Jan. 27, 2025).

159. *See* Elizabeth Joh, *Private Security Robots, Artificial Intelligence, and Deadly Force*, 51 U.C. DAVIS L. REV. 569, 581 (2017).

160. *See id.*

words, of how policing has been shaped by human biases, so as to guard against their digital reproduction.

F. Agency Capacity and Sophistication

One variable that will influence the likelihood of all these harms coming to pass is the capacity and sophistication of the agencies deploying robots.

Consider the example of Chula Vista's DFR program. Chula Vista has been commendably transparent, as even strong skeptics of the program have noted.[161] Prior to launching its program, the Chula Vista Police Department engaged in extensive public engagement, holding town halls, publicly posting and seeking feedback on its DFR policy, and pledging to make a range of data about the program available on a data dashboard.[162]

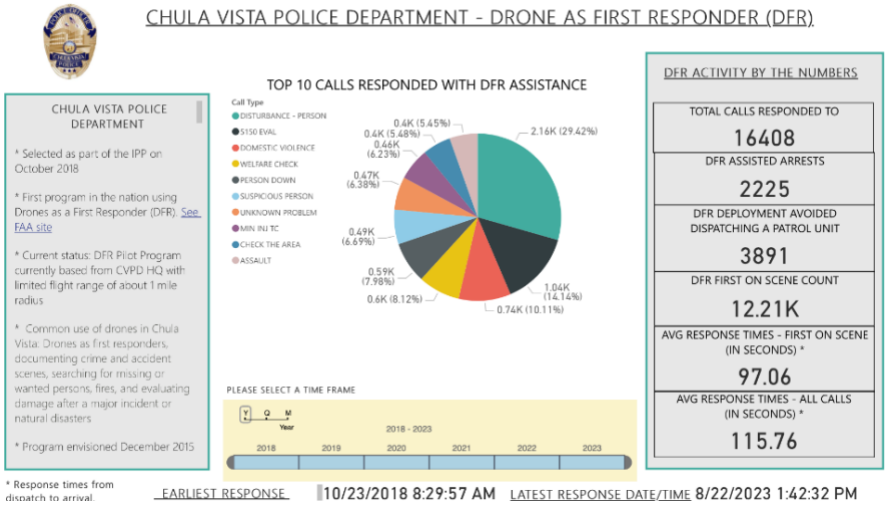

Figure 1: Excerpt from Chula Vista Police Department's DFR Dashboard

These efforts to engage with the public and ensure transparency are exceedingly rare among agencies seeking to launch new technological initiatives.[163] Many agencies will lack the ability, or will, to take these steps. Note, for example, the NYPD's failure to update its drone policy and solicit feedback from the public

161. *See* Stanley, *supra* note 68, at 2.

162. *See* Tom Dent-Spargo, *Drones as First Responders*, ROBOTICS L.J. (July 24, 2019), https://roboticslawjournal.com/global/drones-as-first-responders-28781127 [perma.cc/A5WWWSTD].

163. *See* Hannah Bloch-Wehba, *Visible Policing: Technology, Transparency, and Democratic Control*, 109 CALIF. L. REV. 917, 929–30 (2021). *See, e.g.*, Maya Lau, *Majority of Civilian Oversight Body Wants L.A. County Sheriff to Stop Flying Drone*, L.A. TIMES (July 27, 2017), https://www.latimes.com/local/lanow/la-me-ln-sheriff-drones-20170727-story.html [perma.cc/SFT9-JWR5]; Monte Reel, *Secret Cameras Record Baltimore's Every Move from Above*, BLOOMBERG BUSINESSWEEK (Aug. 23, 2016), https://www.bloomberg.com/features/2016-baltimore-secret-surveillance [perma.cc/YR3R-CHWJ].

when it launched its DFR program, in violation of a local law requiring this.[164] Likewise, while Chula Vista's drone operators receive ongoing training in various locations and settings, it is unclear whether other agencies—especially smaller ones—will have sufficient resources to maintain such a regimen.[165]

In light of these risks, it is incumbent upon lawmakers to enact sensible regulation that enables society to capture the benefits of police robots while mitigating harm. The next part envisions what such regulation might look like.

III. REGULATING POLICE ROBOTS

This part turns to the question of how the use of these tools by police ought to be regulated, in order to enhance any benefits, and eliminate or minimize any potential harms. Section III.A surveys the current regulatory landscape which, as we shall see, is paltry. Section III.B examines whether and how current laws regulating officer conduct should be extended to police use of robots. One might assume that the same set of rules that apply to police should apply automatically to police use of robots, but, as we explain, many of the assumptions undergirding these rules are inapt in the robot context. In the balance of this part, we propose a series of robust safeguards and remedies designed to help maximize the benefits of police robots while minimizing their risks.

A. The Regulatory State of Play

In general, there is far too little regulation of policing technologies. There is a panoply of reasons why this is so—from anti-regulatory pressures from police unions and organizations to a lack of information and expertise on the part of lawmakers.[166] Vendors, too, play a key role—competition between tech vendors has created a race to the bottom in which ever more intrusive products are brought to the market.[167]

It is perhaps unsurprising, then, that when it comes to regulation of police ground robots, there is relatively little to speak of. Efforts to regulate are underway but have not gone far. In recent years, some state lawmakers have proposed legislation that would prohibit the use of robotic force.[168] Other proposals have sought to regulate or prohibit certain types of robots—for example, a prohibition on police use of robot dogs.[169] In general, however, the regulatory landscape is sparse.

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164. The POST Act requires the NYPD to update its Impact and Use Policy when enhancing existing surveillance tools and provide for public comment on the policy draft. However, NYPD did not adequately update its use policy and began using its DFR program prior to its announcement. *See* JOCELYN STRAUBER & JEANINE L. BARRETT, N.Y.C. DEP'T OF INVESTIGATION, AN ASSESSMENT OF NYPD'S COMPLIANCE WITH THE POST ACT 7–8, 16, 35 (2024).

165. *See* Maria Ponomarenko, *The Small Agency Problem in American Policing*, 98 N.Y.U. L. REV. 202, 244 (2023).

166. *See* Barry Friedman, Farhang Heydari, Max Isaacs & Katie Kinsey, *Policing Police Tech: A Soft Law Solution*, 37 BERKELEY TECH. L.J. 701, 720 (2022).

167. *See id.*

168. *See, e.g.*, S.B. 3097, 2023–2024 Leg. (N.Y. 2023); Assemb. B. 6954, 2023–2024 Leg. (N.Y. 2023); Assemb. B. 79, 2023–2024 Leg., Reg. Sess. (Cal. 2023).

169. *See, e.g.*, H.R. 6071, 2023 Gen. Assemb., Jan. Sess. (R.I. 2023); S. 409, 2023 Gen. Assemb., Jan. Sess. (R.I. 2023).

Regulation of police aerial drones is further along, although it still leaves much to be desired. The Federal Aviation Administration (FAA) regulations currently prohibit the weaponization of drones.[170] FAA regulations also generally require operators to have a visual line of sight to the drone at all times, although hundreds of agencies have obtained beyond visual line of sight (BVLOS) waivers, and the FAA is likely to legalize BVLOS in the coming years.[171] Recently, the FAA issued a notice of proposed rulemaking to do just that.[172]

Although a majority of states still do not have any laws regulating police use of drones, twenty states do, nearly all of them having some form of requirement that police obtain a warrant in order to use drones for the collection of evidence.[173] Yet only seven of these states have addressed the weaponization of drones (although, as noted above, weaponization currently is prohibited by FAA regulations), and only two have addressed the use of facial recognition technology on drones.[174] Only one state has squarely addressed drone first responder programs.[175]

In short, at present, there is little robot-specific regulation to speak of when it comes to police use of ground robots. Drone-specific regulation is further along, but there are still significant gaps in many jurisdictions.

B. Application of Existing Rules

One possible regulatory direction is simply to ensure that the same rules apply whether police are acting through a robot or not. This seems a sensible default—after all, robots are simply a tool, and that police have used that tool seems little reason to exempt them from the rules that normally apply.[176] Though technological innovations often spur calls for new regulations, some have suggested that in many areas of AI, what is needed are not new laws on the books but the application and enforcement of existing laws to emerging technologies.[177] In the law enforcement context, there already is a body of law—itself inadequate in many ways—which governs the conduct of human officers along various dimensions.[178]

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170. *See* FAA Reauthorization Act, H.R. 302, 115th Cong. § 363 (2018).

171. *See* Patrick Sisson, *Welcome to Chula Vista, Where Police Drones Respond to 911 Calls*, MIT TECH. REV. (Feb. 27, 2023), https://www.technologyreview.com/2023/02/27/1069141/welcome-to-chula-vista-where-police-drones-respond-to-911-calls [perma.cc/9XUY-FRNL].

172. *See* Normalizing Unmanned Aircraft Systems Beyond Visual Line of Sight Operations, 90 FED. REG. 38212 (proposed Aug. 8, 2025).

173. *See* ALASKA STAT. § 18.65.902 (2014); FLA. STAT. § 934.50(4)(b) (2021); IDAHO CODE § 21-213 (2)(b)(iv) (2020); 725 ILL. COMP. STAT. 167/10 (2023); IND. CODE § 35-33-5-9 (2023); IOWA CODE § 321.492 (2014); KY. REV. STAT. ANN. § 500.130 (West 2018); ME. REV. STAT. ANN. tit. 25 § 4501 (2015); MINN. STAT. § 626.19 (2024); MONT. CODE ANN. § 45-5-109 (2023); NEV. REV. STAT. § 493.112 (2025); N.C. GEN. STAT. § 15A-300.1(a)(c) (2017); OR. REV. STAT. § 837.320 (2023); TENN. CODE ANN. § 39-13-609 (2024); TEX. GOV'T CODE ANN. § 423.007 (2024); UTAH CODE ANN. § 72-10-802(1) (2023); VT. STAT. ANN. tit. 20, § 4622 (2016); VA. CODE ANN. § 19.2-60.1 (2015); WIS. STAT. § 175.55 (2017).

174. *See* 725 ILL. COMP. STAT. 167/10 (2023); ME. REV. STAT. ANN. tit. 25 § 4501 (2015); MINN. STAT. § 626.19 (2024); TENN. CODE ANN. §§ 39-13-609 (2024); VA. CODE ANN. § 19.2-60.1 (2015).

175. *See* 725 ILL. COMP. STAT. 167/10 (2023).

176. *See* Farhang Heydari, *The Private Role in Public Safety*, 90 GEO. WASH. L. REV. 696, 745–52 (2022) (proposing analogous parity model of governance across public and private actors involved in police investigative activities).

177. MICROSOFT, GOVERNING AI: A BLUEPRINT FOR THE FUTURE 18 (2023).

178. Commentators call for more regulation of policing agencies and their officers, either through legislation or administrative rulemaking. *See, e.g.*, Donald A. Dripps, *Criminal Procedure,*

There is a complication, however: Lawmakers must be wary of the human analogue trap—uncritically treating robots identically to their human counterparts in ways that could undermine public safety. As one scholar writes, "assumptions baked into many of our laws can implicitly or explicitly impose all variety of strange obligations on robots, based on the false premise that they share the same relevant characteristics as human beings."[179]

To give an example of where human analogies break down, consider the rule that police are empowered to stop an individual upon reasonable suspicion of criminal wrongdoing and conduct a protective "frisk"—that is, a brief pat-down search of a suspect's outer garments.[180] As Ric Simmons argues, because the rationale for the rule is the protection of officer safety, it is difficult to see why applying the same rule here would make sense, given that robots can be operated by police from a safe distance.[181] Similarly, while police may be justified in using force against a subject who fires a weapon at human officers, this does not seem to justify the use of force against someone who fires a weapon at a police robot.

In assessing whether existing rules should apply when police act through robots, we must first examine the nature of those rules. Police are empowered to perform certain unique functions—conducting searches, using force, making arrests, and so forth.[182] These special powers are subject to various constraints. For example, the ability of police to search a home is conditional on their having obtained a warrant based on probable cause.[183]

By examining the rationales for why we empower police to perform certain functions, and why we constrain their exercise of the same, we can begin to sketch out the questions that must be answered to determine whether existing laws should be extended to police use of robots.

First, what are the rationales for the powers we give to police? For one thing, we want to empower police to perform certain activities we consider to be appropriate police functions—for example, keeping the peace and public order, detaining and arresting criminals, and preserving and collecting evidence.[184] And, relatedly, we want to afford police sufficient latitude to perform these functions in light of the nature of the job—the goal is to keep the police (and others) from

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Footnote Four, and the Theory of Public Choice; or, Why Don't Legislatures Give a Damn About the Rights of the Accused?, 44 SYRACUSE L. REV. 1079, 1079 (1993).

179. Casey & Lemley, *supra* note 13, at 331.

180. *See* Simmons, *supra* note 15, at 925.

181. *See id.* at 932.

182. *See* Rachel A. Harmon, *The Problem of Policing*, 110 MICH. L. REV. 761, 762 (2012).

183. *See* Payton v. New York, 445 U.S. 573, 602–03 (1980).

184. *See, e.g.*, Brigham City v. Stuart, 547 U.S, 398, 406 (2006) ("The role of a peace officer includes preventing violence and restoring order . . . ."); Illinois v. McArthur, 531 U.S. 326, 334, 336–3 7 (2001) (presenting an example of how the Supreme Court has upheld temporary restraints where needed to preserve evidence until police could obtain a warrant); Atwater v. City of Lago Vista, 532 U.S. 318, 354 (2001) ("If an officer has probable cause to believe that an individual has committed even a minor criminal offense in his presence, he may, without violating the Fourth Amendment, arrest the offender.").

harm.[185] This latter rationale animates many of the powers we give to police, such as their ability to conduct protective searches.[186]

But the fact that society considers certain activities to be appropriate police functions does not mean it necessarily considers them to be appropriate activities for robots to perform. Consider, for example, the power that police have to conduct stops—that is, to temporarily detain individuals. Many robots allow for two-way communications, and inevitably there will be instances in which a police operator will tell a suspect, through a robot, to "stop."[187] But there is good reason to question whether it is desirable for police to perform stops in this manner. Will individuals understand that they are required to comply with a command to stop, when it is issued through a robot? Might aspects of a robot's appearance prove intimidating or threatening, undermining procedural justice?[188] Perhaps the better policy, at least for now, would be to limit robotic stops to emergency situations.

To give another example, some agencies have used robots in executing search warrants—for example, using a quadruped robot to survey the premises before officers go in.[189] Whether police ought to be permitted to use robots for this purpose may well depend on the circumstances. Robots may evoke a strong psychological reaction, and we might conclude that the use of robots to assist in searches should be limited to cases in which there is a particular reason it would be essential—for example, searching a home in which a suspect is armed or may have set traps.[190]

A second key consideration is whether a given robot augments human abilities to such an extent that existing rules will prove untenable. We saw an example of this earlier in the context of drones.[191] The constitutional rules governing manned aerial surveillance generally are a poor fit for drones, which can fly quietly and low to the ground, and potentially can use powerful lenses to penetrate deep into a

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185. Certainly it would be unreasonable to require that police officers take unnecessary risks in the performance of their duties. American criminals have a long tradition of armed violence, and every year in this country many law enforcement officers are killed in the line of duty, and thousands more are wounded . . . . [I]n view of these facts, we cannot blind ourselves to the need for law enforcement officers to protect themselves and other prospective victims of violence in situations where they may lack probable cause for an arrest.

Terry v. Ohio, 392 U.S. 1, 23–24 (1968).

186. *See id.* at 30–31.

187. *See, e.g.*, *See, Hear, and Speak: How K5 Keeps You in Control*, KNIGHTSCOPE (Apr. 16, 2025), https://knightscope.com/blog/how-k5-keeps-you-in-control [perma.cc/KHB9-ZJJH].

188. *See* Kemper & Kolain, *supra* note 41, at 39.

189. *See* KCBS/CBS Newspath, *Authorities Deploy Robot Dog to Serve Search Warrant*, LOCAL12 (Sep. 3, 2024), https://local12.com/news/nation-world/authorities-deploy-robot-dog-to-serve-search-warrant-robotic-tools-machines-mechanical-devices-policing-safety-safe-measures-cincinnati-community-threat-involved-gun-shots-fired-arrests-unknown-tech-technology-future-society-north-hollywood-crime [perma.cc/C97F-ALQQ]; S.F. POLICE, 2023 ANNUAL REPORT: LAW ENFORCEMENT EQUIPMENT POLICY PURSUANT TO CA. GOVERNMENT CODE 7072 2 (June 11, 2024), https://www.sanfranciscopolice.org/sites/default/files/202406/SFPD_AB481_2024AnnualReport_20240611.pdf [perma.cc/83FQ-HF9A]; Asher Klein, *In a First, Mass. State Police Robot Dog Shot During Cape Cod Standoff*, NBC BOS. (Mar. 27, 2024), https://www.nbcboston.com/news/local/massachusetts-robot-dog-shot/3320889 [perma.cc/EH8M-5WUL] (describing how Boston Dynamics robot dog entered premises and got shot before police entered).

190. *See* Ryan Calo, *Robotics and the Lessons of Cyberlaw*, 103 CALIF. L. REV. 513, 545–49 (2015).

191. *See* Lewis, *supra* note 83.

home's interior.[192] A mechanical application of the rules governing manned aircraft to unmanned ones would fail to address the unique privacy concerns the latter presents.

A third and final consideration relates to the constraints we place on police power, which exist to address harms substantial enough to warrant curtailing the usual latitude afforded police. In some cases, extending these constraints to police robots will make sense; in other cases not. Some cases seem easy—consider the rule that police must have a warrant before using a thermal imaging device on a home.[193] The harm this rule seeks to address is the invasion of privacy that arises from police being able to discern details of one's home life that would be unknowable without physical intrusion.[194] There is little reason to think this harm is somehow lessened when a thermal imager is integrated in a robot rather than carried by an officer.[195]

A harder case relates to rules prohibiting vehicle pursuits except in relation to the most serious offenses. There is a good reason for such a prohibition: Pursuits very often result in crashes, resulting in injury or death.[196] Some have suggested using drones for pursuits, raising the question whether the same limitation should apply.[197] Possibly, if we believe that drivers being pursued by drones will drive recklessly to evade them; possibly not, if we think that drones trailing vehicles at a distance generally will go unnoticed. Perhaps the rule should be that police may follow a vehicle using a drone so long as there is no evidence the suspect is aware of the drone and attempting to evade it. In any event, what all of this suggests is that existing rules should not be mechanically extended to robots—they will, at the least, require careful review, and possibly modification.

In summary, in determining whether an existing rule should apply to police use of robots, a few key questions must be answered. First, do we want robots to be performing the function in question in the first place? Second, do robots augment human abilities to such an extent that existing rules will prove untenable? And third, do existing constraints on human officers need to be modified in the context of police robots—for example, because the use of robots mitigates the harm the constraints seek to address?

What is clear is that simply extending existing rules to robots, while a step in the right direction, would not go far enough. For one, police are vastly

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192. *See* McNabb, *supra* note 148; State v. Stevens, 210 N.E.3d 1154, 1162 (Ohio Ct. App. 2023).

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

194. *See id.*

195. *See S5.2 IR Argus: Thermal Imaging Dual-Spectrum Security Robot*, SMP ROBOTICS, https://smprobotics.com/security_robot/thermal-security-robot [perma.cc/2VUT-M8KT] (last visited Jan. 29, 2025).

196. *See* Susie Neilson, Jennifer Gollan & Janie Haseman, *First-of-Its-Kind Database: Majority of People Killed in Police Chases Aren't the Fleeing Drivers*, S.F. CHRONICLE (Feb. 27, 2024), https://www.sfchronicle.com/projects/2024/police-chases-database/ [perma.cc/7Z38-BX8Y]; *see An Act Restricting Vehicle Pursuits*, N.Y.U. SCH. L. POLICING PROJECT, https://static1.squarespace.com/static/58a33e881b631bc60d4f8b31/t/6706a20298e07f78c84f2760/1728487938466/Vehicle+pursuit+statute.pdf [perma.cc/339P-PR9D] (last visited Jan. 29, 2025).

197. *See* Khari Johnson, *SF Measure on Using Drones in Vehicle Chases a Major Moment for Police, Civil Rights Groups*, LOC. NEWS MATTERS: BAY AREA (Feb. 27, 2024), https://localnewsmatters.org/2024/02/27/sf-measure-on-using-drones-in-vehicle-chases-a-major-moment-for-police-civil-rights-groups/ [perma.cc/6U97-FX9V] ("Supporters [of Proposition E, a measure that would allow police to use drones in high-speed chases] say drones can play a role in high-speed vehicle pursuits and possibly reduce injuries to bystanders and police officers by reducing the number of police vehicles involved.") (alteration in original).

underregulated along a number of dimensions.[198] The extension of existing rules to robots is not a solution when those rules are themselves deficient. There are, moreover, harms unique to police robots that would not be addressed adequately through existing rules governing officer conduct (for example, issues involving data collection and use). Extending existing rules is not sufficient; what ultimately is needed is a broader regulatory framework—the topic to which we now turn.

C. What Regulation Might Look Like

As we have endeavored to show, existing rules in many ways are inadequate to rein in the harms of police robots. In this section, we set forth a vision for what regulation of police robots might look like to fill these gaps.

1. Legislative Authorization

All too often, policing agencies deploy new technologies with little in the way of legislative oversight. When, for example, the NYPD acquired K5 and Spot robots, it did so without any authorization or appropriations by the New York City Council (the NYPD paid for the robots with funds obtained through civil asset forfeiture).[199] Likewise, when police in Asheville, North Carolina, introduced their DFR program, they did so with "no clear opportunities for public engagement" or "mentions of the drone program launch on any local public safety committee agenda."[200]

It is a foundational principle of American governance that executive agencies must have legislative authorization for their activities.[201] Whether to deploy technologies that could abridge individual rights and liberties is a substantial policy question for the people's elected representatives to decide.[202] Although general instructions to police—such as to keep the peace or enforce the criminal law—may be adequate for traditional policing functions, police use of drones and ground robots should require specific authorization.[203] This is both because the use of such tools lie far outside longstanding police practice and because, as we have just seen, they raise serious and novel policy questions.

Thus, legislative authorization of police use of drones and robots is imperative. This authorization should specify the types of robots authorized and the purposes for which they may be deployed. Such specification is needed because, as discussed, society may deem some, but not other, uses of police robots to be acceptable.

As straightforward as this principle may seem, we note three complications. First, it may well be the case that certain types of police robots (or uses therefor),

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198. *See* Barry Friedman & Maria Ponomarenko, *Democratic Policing*, 90 N.Y.U. L. REV. 1827, 1835 (2015); Ponomarenko, *supra* note 165, at 267.

199. *See* Dana Rubinstein, *Security Robots. DigiDogs. GPS Launchers. Welcome to New York*, N.Y. TIMES (Apr. 11, 2023), https://www.nytimes.com/2023/04/11/nyregion/nypd-digidog-robot-crime.html [perma.cc/HJT9-C76W].

200. Laura Hackett, *Asheville Police Say Drones Help with Officer Shortage Downtown, but Program Operates With Lack of Transparency and Community Input*, BLUE RIDGE PUB. RADIO (Aug. 3, 2023), https://www.bpr.org/bpr-news/2023-08-03/asheville-police-say-drones-help-with-officer-shortage-downtown-but-program-operates-with-lack-of-transparency-and-community-input [perma.cc/ECP6-U49L].

201. *See* Friedman & Ponomarenko, *supra* note 198, at 1835.

202. *See id.* at 1861–65.

203. *See generally* Joh, *supra* note 28 (discussing the need for specific regulation of police robots because they involve unique legal and policy challenges).

but not others, will require authorization. When police activity has been subject to legal challenge on the ground that it is unauthorized, courts have taken different approaches. In some cases, courts have held that police exceeded their authority; in others, courts have found the challenged activity to be within the scope of the initial grant of authority charging police with enforcing the laws and preserving the peace.[204] Although it is not fully apparent what leads courts to decide the question in one way or the other, factors such as the impact of the practice on civil rights and civil liberties and whether the practice has widespread acceptance may be relevant.[205] Thus, courts may well conclude that the use of robots for bomb disposal does not require democratic authorization, for example, but the use of force-equipped robots or drones for airborne patrol does.

Second, there is the question of the ideal source of regulation. One approach might be to enact state-level regulation, which in turn might require local policing agencies to obtain approval from their local legislative body prior to the deployment. This is the approach taken in the initial draft of the California weaponization bill discussed earlier, Assembly Bill 79, which would have required local democratic authorization prior to the deployment of force-equipped robots.[206] The downside to this approach is that legislation is difficult to enact, and requiring authorization at two different tiers of government may prove onerous.[207] Conceivably, regulation could take place at the state level with discrete issues reserved for local governments—for example, decisions about where in a community police robots are deployed.

Third, it is important to recognize that statutory definitions of robot will become obsolete as technology advances.[208] The field is evolving quickly, and for that reason the nature of these tools and how they might be used is in constant flux. As noted at the outset, there is a debate over how to define the term "robot," and whether such a definition is even possible.[209]

There is a sense, however, in which the obsolescence of these statutory definitions may come to be seen as a virtue. This may seem at first counterintuitive: In the private sector context, commentators have focused on "future-proofing" regulation of technology—that is, drafting regulation flexibly in a way that could be adapted easily to new tools and uses.[210] But, as we have noted, police are situated differently than the private sector: They are executive agencies, and the legitimacy of their activities—including the decision to deploy robots—is contingent on their having received democratic authorization to do so.[211] The question of whether to

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204. *See* Barry Friedman, *Lawless Surveillance*, 97 N.Y.U. L. REV. 1143, 1185–87 (2022).

205. *See id.* at 1186.

206. *See* Assemb. B. 79, 2023–2024 Leg., Reg. Sess. (Cal. 2023).

207. There also are arguments against localism in policymaking around law enforcement on the grounds that this may make criminal justice more punitive, especially in suburban and rural areas. *See* Maria Ponomarenko, *Some Realism About Criminal Justice Localism*, 173 U. PA. L. REV. 789, 791, 801–03 (2025).

208. *See* Casey & Lemley, *supra* note 13, at 343.

209. *See id.* at 293 (arguing that the "overlap between people, algorithms, computers, robots, and ordinary machines is sufficiently great that there is no good legal definition of a robot").

210. *See* Co-Facilitators for the Intergovernmental Process for the Declaration on Future Generations, Explanation of the Concepts, "Future-Proofing", "Anticipatory and Forward-Looking", a "Future-Oriented Organizational Culture" and "Futures Literacy" (July 1, 2024), https://www.un.org/sites/un2.un.org/files/soft-dfg-rev2-explanation-of-concepts.pdf [perma.cc/7PFG-H2HM].

211. *See* Friedman & Ponomarenko, *supra* note 198, at 1834.

authorize police to deploy new forms of robots with new uses is for democratically accountable bodies such as state legislatures and city councils to decide.

To be sure, requiring new authorization for every iteration of a robot likely is impractical—but lawmakers could authorize the use of police robots in terms of their capabilities.[212] That is, they could permit police to use robots for specified functions, accommodating a variety of tools suited to those specifications. And when technology inevitably progresses and police seek to acquire new types of robots whose capabilities exceed those upon which existing authorizations are based, the solution is for police to seek new authorizations, returning the issue to policymakers who are accountable to the public.

2. Privacy Protections

i. Targeted Surveillance

In regulating the use of robots to conduct targeted surveillance of a person or property, a distinction might be drawn between ground robots and aerial drones. Ground robots, unlike drones, do not offer police any special vantage points. They do not fly or hover; for the most part, they offer the same view that a human officer might have.[213] There is not necessarily a need for special rules around how ground robots conduct targeted surveillance, although that may well change as new features and analytics emerge.[214]

Aerial drones, on the other hand, likely *will* require special rules, as they enable surveillance that is far more penetrating than what a human could achieve. The approach that many states have taken is to require a warrant in order to conduct surveillance via drone.[215] This would help to ensure that potentially intrusive drone surveillance is conducted only when properly justified, and an exception could be made for exigent circumstances involving a serious risk of death or injury (such as when a drone is being used as a first responder in an emergency). Given the invasiveness of drone surveillance, lawmakers might consider additional constraints going beyond a warrant requirement—for example, only permitting the use of drones in connection with serious or violent offenses.

ii. General Surveillance

As discussed, patrol robots used to surveil public spaces are a particularly visible form of police surveillance, giving rise to concerns about potential chilling effects.[216] There is a tension here, for although there is understandable resistance to the use of robots at protests and rallies, these events may draw large crowds and

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212. *See* Max Isaacs, *Policing AI Capabilities* (forthcoming) (on file with author).

213. *See* Xi Hu & Rayan H. Assaad, *The Use of Unmanned Ground Vehicles (Mobile Robots) and Unmanned Aerial Vehicles (Drones) in the Civil Infrastructure Asset Management Sector: Applications, Robotic Platforms, Sensors, and Algorithms*, 232 EXPERT SYS. WITH APPLICATIONS 1, 2 (2023).

214. *See* Joh, *supra* note 28, at 530.

215. *See, e.g.*, ALASKA STAT. § 18.65.902 (2024); FLA. STAT. § 934.50(4) (2021); 725 ILL. COMP. STAT. § 167/15 (2024); IND. CODE § 35-33-5-9 (2024); MINN. STAT. § 626.19 (2025); NEV. REV. STAT. § 493.112 (2025).

216. *See* Schauer, *supra* note 153, at 693.

pose legitimate public safety concerns.[217] Crowd control often is cited as a justification for using drones at such events.[218] The solution here is a straightforward one—if police seek to use robots at a public event for crowd control or other emergency purposes, then any collected data should be deleted once the event has concluded, provided no emergency has taken place.

For ordinary patrols (that is, outside of the context of protests and similar events), regulation should require the deletion of data after a reasonable length of time—if the data is to be retained at all. Data retention periods are an important tool to protect privacy—the more data that is collected about us, the greater the insights that might be gleaned about our personal lives.[219] Retention periods thus serve as a way to limit the overall amount of data that can be aggregated, mitigating intrusiveness.[220] After the retention period has elapsed, data should be deleted. As alluded to above, however, there is a case to be made for requiring the immediate deletion of data after a patrol has concluded without incident, as this data may prove of little practical use.

iii. Incidental Collection of Data

Regulation also should address any incidental collection of data—for example, any data collected by DFR drones during flights to and from the scene of an incident.[221] A debate has emerged on this point not unlike the one surrounding body-worn cameras when their use first became widespread—proponents argued that the cameras were a crucial tool for police accountability, while opponents noted the potential risks of expanded police surveillance.[222]

There is good reason to be concerned about DFR programs becoming a tool for police surveillance. As the ACLU argued in a recent report about DFR

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217. *See* Christian Enemark, *Armed Drones and Ethical Policing: Risk, Perception, and the Tele-Present Officer*, 40 CRIM. JUST. ETHICS 124, 126–27 (2021); Sam Biddle, *U.S. Marshals Used Drones to Spy on Black Lives Matter Protests in Washington, D.C.*, INTERCEPT (Apr. 22, 2021, 2:05 PM), https://theintercept.com/2021/04/22/drones-black-lives-matter-protests-marshals [perma.cc/44BS-S8YH].

218. *See* Lisa Evers, *NYPD Expands Drone Use for Crowd Control, Public Safety Measures*, FOX5 N.Y. (May 14, 2024), https://www.fox5ny.com/news/exclusive-nypd-expands-drone-use-for-crowd-control-public-safety-measures [perma.cc/HWJ5-NHC8]; *Public Safety Drones for Event Security*, ELISTAIR, https://elistair.com/applications/public-safety-drone-event-surveillance [perma.cc/RJU4-GFXY] (last visited Jan. 29, 2025).

219. *See Big Data for Sustainable Development*, UNITED NATIONS, https://www.un.org/en/global-issues/big-data-for-sustainable-development [perma.cc/W7EJ-9Y7E] (last visited Jan. 29, 2025); David Gray & Danielle Keats Citron, *A Shattered Looking Glass: The Pitfalls and Potential of the Mosaic Theory of Fourth Amendment Privacy*, 14 N.C. J. L. & TECH. 381, 386 (2013).

220. *See* Kara Williams & Caitriona Fitzgerald, *Data Minimization is the Key to a Meaningful Privacy Law*, ELEC. PRIV. INFO. CTR. (May 9, 2024), https://epic.org/data-minimization-is-the-key-to-a-meaningful-privacy-law [perma.cc/9UP2-SYAE].

221. *See* Lipton, *supra* note 2.

> In practice, law enforcement's desire to get "a view of the scene" becomes a justification for over-surveilling neighborhoods that produce more 911 calls and for collecting information on anyone who happens to be in the drone's path. For example, a drone responding to a vandalism case may capture video footage of everyone it passes along the way.

Id.

222. *See* WILLIAM H. SOUSA, TERANCE D. MIETHE & MARI SAKIYAMA, UNIV. NEV., L.V. CTR. FOR CRIME AND JUST. POL'Y, BODY WORN CAMERAS ON POLICE: RESULTS FROM A NATIONAL SURVEY OF PUBLIC ATTITUDES 1–3 (2015), https://bja.ojp.gov/sites/g/files/xyckuh186/files/media/document/bodyworncameras.pdf [perma.cc/LM34-G6WX].

programs, "[t]he more that drones are crisscrossing a community, the more of everyday life they have the potential to record."[223] Such concerns have been fueled by agencies' intentions to use DFR drones for surveillance purposes when they are not responding to emergencies, as the NYPD has proposed.[224] The ACLU's report concluded that drones should not record video while en route to an emergency.[225]

Still, there is a case to be made for such recording. Aside from the fact that recording can serve as a deterrent to misuse, it may be prudent to have a video record given the potential for operational issues, such as collisions, that may cause injuries or property damage. One approach might be to require operators to record video during the entirety of deployments, but to delete the data promptly unless it relates directly to an investigation. And, as with body-worn cameras, there should be strict policies requiring the public release of certain videos, such as videos capturing the use of force by officers.[226]

iv. Analytics

Robots are more than mere cameras on wheels. Many are equipped with a variety of sensors recording everything from temperature data to the presence of certain chemicals.[227] And software analytics—from face and license plate recognition to software that detects anomalous activity—can use captured video to generate other forms of data.[228]

Some of the types of data captured or generated raise few concerns. Telemetry, GPS, and other device-related data used to operate the robot itself might not require many restrictions, provided the data is being used for purely non-investigative purposes.

When robots collect and analyze data that can be associated with individuals, however, the calculus changes. As discussed, analytics such as license plate and face recognition can transform robots into powerful tools to surveil individuals. Different jurisdictions may reach different conclusions regarding what is and is not permitted, but a good guiding principle is that as more data (and more revealing forms of data) are accumulated about a given individual, the procedural requirements for accessing that data should become more stringent. For example, when police seek to use a drone or robot to track the locations and movements of an individual over time—a particularly intrusive form of surveillance—lawmakers might require police to obtain a warrant.[229]

A notable objection to this approach is that the proliferation of video analytics is not unique to robots—a variety of camera-based technologies, from ordinary

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223. Stanley, *supra* note 68, at 9.

224. *See* Friedman et al., *supra* note 67.

225. *See* Stanley, *supra* note 68, at 9.

226. *See* Tolulope Sogade, *Body Worn Camera Footage Retention and Release: Developing an Intermediate Framework for Public Access in a New Affirmative Disclosure-Driven Transparency Movement*, 122 COLUM. L. REV. 1729, 1747 (2022).

227. *See* Catherine Bernier, *Robotic Sensors: The Interface Between Robots and the World*, HOWTOROBOT (Oct. 12, 2024), https://howtorobot.com/expert-insight/robotic-sensors-interface-between-robots-and-world [perma.cc/XK67-XK4H].

228. *See, e.g.*, *S5.2 IS Prompt: AI Security Patrol Robot*, SMP ROBOTICS, https://smprobotics.com/security_robot/ai-patrol-robot [perma.cc/VSP4-EHPC] (last visited Aug. 1, 2025).

229. *Cf.* Carpenter v. United States, 138 S. Ct. 2206, 2217 (2018) (holding that police must obtain a judicial warrant prior to accessing cellphone-derived location data to conduct long-term tracking of an individual).

stationary cameras to mobile phones to car-mounted dashboard cameras, can be used with analytics.[230] And it would be unjustified, some would contend, to single out robots for more stringent treatment.

But analytics are marketed as prominent features of police robots. They are central to how many agencies use and envision using these tools. Failing to address them in regulation would mean failing to confront some of the key risks robots present. While it surely is correct that robots should not be singled out on this front, the solution is not to forgo regulation of analytics in the robot context but to ensure proper regulation of analytics across all camera-based technologies. That analytics in the robot context might be regulated before similar regulation for stationary cameras or body-worn cameras hardly seems reason not to do it.

3. Use of Force

An essential question is whether police robots should ever be weaponized to any extent. Many believe strongly that they should not be. They point to the unique dynamics of robotic force, which could lead to dehumanization and increased use of force overall.[231] Others, primarily in law enforcement, make the case for arming robots at least with non-lethal weapons.[232]

There have been some high-profile rejections of the use of weaponized robots. In 2022, Axon Enterprise's AI Ethics Board rejected the company's proposal to develop Taser-equipped robots, citing entrenched structural problems in American policing, including the lack of effective oversight and the various ways in which police are shielded from liability for wrongdoing.[233] Similarly, citing concerns about the potential for misuse and other ethical issues, Boston Dynamics, along with five other leading robot vendors, pledged not to weaponize its robots and to review "customers' intended applications to avoid potential weaponization."[234]

Despite this, policing agencies have continued to press the issue. Law enforcement agencies have used force-equipped robots on multiple occasions and, as discussed, concerns about depriving police of a potentially useful option led

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230. *See* Nikki Gladstone, *How Facial Recognition Technology Permeated Everyday Life*, CTR. FOR INT'L GOVERNANCE INNOVATION (Sep. 19, 2018), https://www.cigionline.org/articles/how-facial-recognition-technology-permeated-everyday-life [perma.cc/6F23-E7SJ].

231. *See* Jay Stanley, *It's Simply Too Dangerous to Arm Robots*, ACLU (Dec. 16, 2022), https://www.aclu.org/news/privacy-technology/its-simply-too-dangerous-to-arm-robots [perma.cc/44K2-N2TG]; Matthew Guariglia, *Don't Let Police Arm Autonomous or Remote-Controlled Robots and Drones*, ELEC. FRONTIER FOUND. (July 16, 2021), https://www.eff.org/deeplinks/2021/07/dont-let-police-arm-autonomous-or-remote-controlled-robots-and-drones [perma.cc/FA3E-K4NB].

232. California Governor, Gavin Newsom, reflected this position when he vetoed a bill that would have banned weaponized robots, including by law enforcement. *See* Joanna Putman, *Calif. Governor Vetoes Bill That Would Prohibit Weaponized Drones Without Exceptions for LE*, POLICE1 (Sep. 24, 2024), https://www.police1.com/police-products/police-drones/calif-governor-vetoes-bill-that-would-prohibit-weaponized-drones-without-exceptions-for-le [perma.cc/Y39X-Z3X4].

233. *See* FRIEDMAN ET AL., *supra* note 104, at 12. The Policing Project, in collaboration with former AI Ethics Board members, released this report offering an inside view of the Board's deliberations over the proposal for Taser-equipped drones. The AI Ethics Board was chaired by Policing Project Faculty Director Barry Friedman, and staffed by Max Isaacs and Farhang Heydari.

234. *General Purpose Robots Should Not Be Weaponized*, BOS. DYNAMICS, https://bostondynamics.com/news/general-purpose-robots-should-not-be-weaponized [perma.cc/VL5G-FX5S] (last visited Aug. 1, 2025).

to the veto of a robot weaponization bill in California.[235] Changes in public attitudes—consider, for example, a scenario in which police were barred from using a force-equipped robot that could have saved many lives—could create a rush to deregulate, leaving things worse off than if we had implemented smart regulation from the outset.

As with many debates over policing technologies, different jurisdictions will come to very different conclusions about whether to permit force-equipped robots. Policing regulation is fragmented—absent federal action, we likely will see states and localities experiment with a variety of approaches.[236] Regardless of where jurisdictions come out on the issue, it is imperative for policymakers to distinguish between lethal, less-lethal, and autonomous weapons.

Some have defended the prospect of lethal force-equipped robots—one easily can conjure up scenarios where such a robot could save lives, such as when there is a barricaded active shooter. Indeed, this is the scenario that confronted police in Dallas when they used a robot to deploy lethal force in 2016.[237] And yet, given the very real concerns around dehumanization and increased use of force described in Part II, it is understandable why some would dismiss lethally-equipped robots out of hand. In any event, it is difficult to imagine these tools existing as a mainstream policing technology in the foreseeable future, and if this ever came to pass, one would think it ought to be reserved only for the most extreme scenarios, such as those involving mass casualties.

Similar concerns about dehumanization exist with regard to less-lethal weapons such as Tasers, yet one must carefully consider the alternative: human officers, holding guns. As noted, in many cases officers simply cannot get close enough to an armed individual to deploy a Taser effectively, which often causes them to resort to lethal force.[238] The possibility that a robot equipped with a less-lethal weapon might reduce the number of officer-involved shootings may prove compelling to policymakers. Of course, this is not to say that less-lethal robots *should* be permitted, yet it does seem a closer case than lethal weapons.

A strong line should be drawn at autonomous weapons. The development of lethal autonomous weapons (LAWs) in the military context raises the specter of such weapons one day being deployed by domestic police.[239] The notion of LAWs being deployed by policing agencies should be considered a non-starter. There is, of course, the very real risk of malfunctions resulting in innocent lives being lost.[240] Moreover, the use of force in policing in the United States already is plagued by deep accountability deficits, which would be deepened still by the advent of

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235. *See* Putnam, *supra* note 232.

236. *See* Ella Wind, *Which Elected Officials Shape Law Enforcement Policy?*, PUB. WISE RSCH. (May 9, 2023), https://publicwise.org/publication/which-elected-officials-shape-law-enforcement-policy/ [perma.cc/KLJ4-MFFJ]; Gurbir Grewal & Karl A. Racine, *Criminal Justice and Laboratories of Democracy*, THE HILL (June 9, 2021), https://thehill.com/blogs/congress-blog/politics/557649-criminal-justice-and-laboratories-of-democracy/?rl=1 [perma.cc/SA7N-NDZ3]. For a call for greater federal involvement in the regulation of policing technologies, see generally Barry Friedman, Rachel Harmon & Farhang Heydari, *The Federal Government's Role in Local Policing*, 109 VA. L. REV. 1527 (2023).

237. *See* Taft, *supra* note 95.

238. *See* Putnam, *supra* note 232.

239. *See* FRIEDMAN ET AL., *supra* note 127.

240. *See* OLSTHOORN & ROYAKKERS, *supra* note 110, at 5.

LAWs.[241] Consider, for example, the doctrine of qualified immunity, which shields police from liability for violating individuals' rights unless such rights are clearly established.[242] The factual and legal novelty of the scenarios that would be presented by police deployment of LAWs would all but guarantee that serious harms would go unaccounted for.

As we mentioned, policing is highly fragmented, and jurisdictions likely will take a variety of approaches. No matter the approach, regulation in this area should be guided by the principle that robotic use-of-force standards must be far more stringent than those applicable to human officers. First, because the operator of a robot is not in harm's way, there should be strong de-escalation requirements. Second, new use-of-force guidelines will need developing, and operators should be locked out of deploying a weapon until a supervisor has approved the use of force and certified compliance with those guidelines. And third, all uses of force should be subject to independent and public after-action reviews.

This is emphatically not to say that police should deploy force-equipped robots. But it is a recognition of the fact that we likely have not seen the last instance of robotic use of force. Without rigorous standards guiding the development of policy around this issue, policing agencies will play by their own rules. This must be avoided.

4. Deployment Decisions

Police have considerable discretion in choosing where to deploy new technologies. Rarely are these decisions subject to public debate; oftentimes, in fact, the locations of new technologies are not disclosed to the public at all.

This is no trivial matter—policing technologies often are deployed disproportionately in communities of color and lower socioeconomic status.[243] But how best to address the issue is a vexing question. The problem is in essence an efficiency-equity trade-off: You could make a surveillance program more *efficient* by deploying it only in the most troubled areas, where it might provide the most benefit from a public safety perspective.[244] Or, you could make the program more *equitable*, avoiding concentrating technology in communities that already are overpoliced and oversurveilled.[245]

We do not purport to have the answer to this conundrum. But we do offer two principles that we believe would help. First, legislation should require that agencies have sound, non-discriminatory reasons for any decision to deploy robots in a particular area, and that these reasons be documented so that there is a written record.[246] Second, legislation should require agencies to disclose deployment locations to the public so that informed debate can follow. Although there may be

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241. *See* Friedman & Ponomarenko, *supra* note 198, at 1833.

242. *See infra* Part III.D (discussing qualified immunity).

243. *See* Barton Gellman & Sam Alder-Bell, *The Disparate Impact of Surveillance*, CENTURY FOUND. (Dec. 21, 2017), https://tcf.org/content/report/disparate-impact-surveillance [perma.cc/R8J6-TKY2].

244. *See* Isabel H. Correia, *On the Efficiency and Equity Trade-off*, 44 J. MONETARY ECONS. 581, 581–82 (1999); Julian Le Grand, *Equity vs. Efficiency: The Elusive Tradeoff*, 100 ETHICS 554, 554 (1990).

245. Another complication: Safety can be thought of as a public good, and if the public safety benefits of robots were proven and outweighed the harms, then what is most efficient might be the same as what is most equitable. *See* Joshua A. T. Fairfield and Christoph Engel, *Privacy as a Public Good*, 65 DUKE L.J. 385, 391 (2015); Menahem Spiegel, *Public Safety as a Public Good*, *in* TOPICS IN REGULATORY ECONOMICS AND POLICY: MARKETS, PRICING, AND DEREGULATION OF UTILITIES 183 (Michael A. Crew & Joseph C. Schuh eds., 2002).

246. *See* PRINCIPLES OF THE LAW: POLICING § 5 (A.L.I. 2025).

reasons not to disclose exact locations in some circumstances (for example, where disclosure could undermine enforcement efforts), regulation could require disclosure of deployment locations at some reasonable level of generality. This is especially important since, unlike stationary cameras, robots move about, which might stymie efforts to document their locations.

Some current legislative proposals regulating AI would require police to assess whether deployment of a given technology will cause a disparate impact.[247] These proposals are well-meaning, but that a technology has a disparate impact is only part of the question. We must know whether the impact is justified and whether it comports with the community's sense of fairness. That information can only be brought about through the type of disclosure and debate we are advocating for here.

5. Transparency

Transparency is the foundation of democratic governance. Without adequate information, the public cannot have informed opinions, and legislatures cannot make informed decisions. Yet policing agencies often fail to disclose basic information about their use of technology—from how much data is retained to which offenses the technology is used to investigate.[248] We saw in the last section the importance of disclosing deployment locations, but this is just the start—there is a variety of other information that might be disclosed.

Here, too, there are trade-offs. Police often chafe at reporting requirements, viewing them as unnecessary and onerous.[249] And there is some merit to the criticism. Policing involves a great deal of paperwork, and adding more can mean less time for conducting investigations, engaging with the public, or other activities.[250]

At the very least, however, lawmakers should require policing agencies to disclose to the public what sorts of robots they are using. And ideally they should do more than that: They should require agencies deploying robots to adopt transparency portals or data dashboards—online pages disclosing aggregated information about the use of these tools.[251] Chula Vista's dashboard for its DFR program discloses, among other things, the number and types of calls responded to and the average response time; the agency also publishes flight history maps.[252] The nature of the data disclosed should depend on the particular function the robot is performing—a dashboard for a patrol robot, for example, might disclose where the patrols were conducted and what enforcement action, if any, was taken.

At the same time, efforts should be made to reduce the onerousness of reporting obligations. Some of this might be accomplished through software tools that track and aggregate data automatically—thus, vendors have an important role

247. *See, e.g.*, N.Y.C. Int. 0480, § 14-188(10) (2024).

248. *See* Friedman et al., *supra* note 166, at 111.

249. *See* Annie McDonough, *NYPD Opposes More Stringent Reporting Requirements in POST Act*, CITY AND STATE: N.Y. (Dec. 15, 2023), https://www.cityandstateny.com/policy/2023/12/nypd-opposes-more-stringent-reporting-requirements-post-act/392820 [perma.cc/6XMY-3QY9].

250. *See* Mark Geremia, *Paperwork Burden in Policing*, POLICE CHIEF MAG., https://www.policechiefmagazine.org/paperwork-burden-in-policing [perma.cc/M8RM-SX7U] (last visited Mar. 18, 2026).

251. *See* Michael Jacobson, Diane Lacy, Dave McClure & Mark Perbix, *Designing an Effective Law Enforcement Data Dashboard*, U.S. DEP'T OF JUST.: CMTY. ORIENTED POLICING SERVS. 1 (2023), https://portal.cops.usdoj.gov/resourcecenter/content.ashx/cops-w1013-pub.pdf [perma.cc/25MS2VX2].

252. *See* CITY OF CHULA VISTA, *supra* note 63.

to play in developing robots that facilitate reporting.[253] Mitigating the administrative burden of these obligations can help ensure sound data and increase compliance.

6. Vendors

Our main focus to this point has been on the regulation of police. But vendors, too, play an important role in mitigating harm. A police robot malfunctioning could jeopardize an operation or lead to injury or death.[254] To some extent, existing liability regimes might suffice to address malfunctions, and we address these in the next section.

Lawmakers might place additional obligations on vendors, however. Policing is a unique context, one fraught with serious risks both to safety and individual rights. Regulation setting a minimum floor for police robots might help to counteract the race to the bottom among vendors that has increasingly led to the development of tools capable of misuse or abuse.[255]

A full treatment of the issue is beyond the scope of this Article, but there are a few policies that might be considered on this front. Policymakers could consider the feasibility of requiring vendors to institute "Know Your Customer" programs, in which vendors vet agency customers before agreeing to sell to them.[256] Companies should have the means to disable or claw back robots from agencies using them in an inappropriate manner—this safeguard might be implemented in existing procurement requirements. There should be clear regulatory guidance regarding the efficacy claims vendors are permitted to make about their products, and causes of action against vendors for false claims should be established.[257] And what may ultimately be needed is a licensing regime for police robots, administered by a government agency capable of thoroughly testing and vetting products before they come to market.[258]

D. Remedies

When things go wrong with police robots—as they inevitably will, at least on occasion—the question will then become how the resulting harms will be redressed. This is a complex question that turns on a great number of variables, including the conduct at issue, the cause of action, and so forth. Our goal here is not to unpack

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253. *See, e.g.*, *Police Software: The Ultimate Guide*, AXON, https://www.axon.com/resources/police-software [perma.cc/8THA-DZ82] (last visited Aug. 4, 2025).

254. *See, e.g.*, Georgia Wells, *Security Robot Suspended After Colliding With a Toddler*, WALL ST. J. (July 13, 2016), http://www.wsj.com/articles/security-robot-suspended-after-colliding-with-a-toddler-1468446311 [perma.cc/VAT3-9MU9].

255. *See* Friedman et al., *supra* note 166, at 706–07.

256. *See KYC: 3 Steps to Achieving Know Your Customer Compliance*, TRULIOO (May 5, 2022), https://www.trulioo.com/blog/kyc [perma.cc/MM5V-PREQ].

257. *See FTC Warns Almost 700 Marketing Companies That They Could Face Civil Penalties if They Can't Back Up Their Product Claims*, FTC (Apr. 13, 2023), https://www.ftc.gov/news-events/news/press-releases/2023/04/ftc-warns-almost-700-marketing-companies-they-could-face-civil-penalties-if-they-cant-back-their [perma.cc/2EPU-AHV6].

258. *See* Ryan Calo, *The Case for a Federal Robotics Commission*, BROOKINGS INST. (Sep. 15, 2014), https://www.brookings.edu/articles/the-case-for-a-federal-robotics-commission/ [perma.cc/B4NU-APXT] (providing an example of a proposed agency overseeing robotics at the federal level); Friedman et al., *supra* note 166, at 727–29.

all of these intricacies, but to consider how the advent of police robots adds another layer of complexity to this question and how this might be addressed.

We begin with a discussion of how liability might be apportioned between vendors and police, depending on the harm at issue and how it was caused. We then turn to the topic of qualified immunity, a doctrine that immunizes police from liability unless they have violated a "clearly established" statutory or constitutional right.[259] Qualified immunity is enormously consequential in litigation involving police and will affect the extent to which victims can recover for harms caused by police robots.

1. Assigning Liability

When robots cause harm, the question of who ultimately bears responsibility will arise. Robots, after all, have some degree of autonomy—they have been described by scholars as "unpredictable by design."[260] If a robot's behavior is to some extent unpredictable, should police be held liable for the harm robots cause, or should vendors?

i. On Self-Driving Cars

Important insights may be drawn from the literature on self-driving cars. First, the nature of a system's autonomy may bear on the question of liability. For example, the driver of a vehicle with technology that merely assists the driver may bear some responsibility for a crash, but in the case of a fully autonomous vehicle that the driver does not control, it is the vendor who generally should be held liable.[261] Another insight is that tort law's focus on fault and moral culpability may be inapposite in the self-driving car context. A regulatory approach in which liability is premised on how safe the product is compared to comparable products—a "robotic reasonableness test"—may be more fitting.[262]

A third, intriguing, proposal is to adapt the doctrine of *res ipsa loquitur*—a rule under which negligence may be inferred from the nature of an accident—to the robots context.[263] Courts might "look to the events surrounding the accident to infer whether the robot's code was faulty or not," using the data captured by the robot.[264] When one is harmed by a robot and there is no evidence that they themselves acted negligently, plaintiffs could make a prima facie case against the robot's vendor.[265] Vendors then could produce exculpatory evidence rebutting the inference.[266]

These frameworks are useful in thinking through liability rules for police robots, but here we note two complications. First, the relationship between vendor, operator, and victim is different in the policing context than in the self-driving car context. The harm from police robots often will arise from intentional conduct

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259. *See* Harlow v. Fitzgerald, 457 U.S. 800, 818–20 (1982).

260. *See* Calo, *supra* note 13, at 542.

261. *See* Mark Geistfeld, *A Roadmap for Autonomous Vehicles: State Tort Liability, Automobile Insurance, and Federal Safety Regulation*, 105 CALIF. L. REV. 1611, 1632–33 (2017).

262. *See* Casey & Lemley, *supra* note 13, at 317.

263. *See* Casey, *supra* note 41, at 231–32.

264. *See id.* at 273.

265. *See id.* at 275–76.

266. *See id.*

aimed at the victim—for example, an instruction to deploy force or conduct a stop—bringing questions of the operator's ends and means into play.

Second, a key premise of the literature on self-driving cars is that, in general, self-driving cars are safer than human drivers.[267] This does not necessarily hold true in the policing context. Self-driving cars make judgments about, for example, the location of objects in space. As to these and similar tasks they outperform humans.[268] But a great deal of police work involves making judgments about human nature—whether a person is acting suspiciously, whether they pose an imminent threat, whether they are engaged in deception, and so on—and there is no evidence robots outperform humans on this front.[269] And so, while automating a patrol route may well be justified, automating higher-order policing activities is not, at least at present.[270] Accordingly, what we should seek to do is create strong incentives to ensure police do not over-automate their jobs and always exercise close supervision over robots. Perhaps here, unlike in the self-driving car context, higher levels of automation should occasion more liability for operators, not less.

ii. Two Types of Robotic Harms

One approach to this dilemma might be to distinguish among two different types of harms resulting from police robots.

First, harm might arise when a police robot works as designed, but the ends to which police put the robot were harmful. For example, suppose that police used robotic force maliciously against a suspect, in violation of applicable policy and Fourth Amendment requirements. Here, police are orchestrating the harmful conduct and should be held liable. We might, therefore, treat the robot as the officer's agent, acting on their behalf and exposing them to liability for harm caused.[271]

Yet in some cases, a particular harm, one directed by police, may be so foreseeable that we might consider a claim against the vendor for their failure to implement a reasonable alternative design.[272] For example, suppose that a pattern emerged where police using force-equipped robots negligently discharged the weapon by mistake, and the vendor should have foreseen that a particular safety feature would have prevented such accidental discharges. Holding the vendor liable for failing to develop a safety mechanism will help create appropriate incentives to

267. *See, e.g.*, Mohamed Abdel-Aty & Shengxuan Ding, *A Matched Case-Control Analysis of Autonomous vs Human-Driven Vehicle Accidents*, 15 NATURE 1, 2 (2024).

268. Autonomous vehicles could dramatically reduce the 30 percent of accident fatalities that today involve drunk drivers, the 22 percent that involve high speeds, and the 17.5 percent that involve collisions with fixed objects by replacing fallible drivers with advanced sensors and algorithms. *See* ROBERT SHAPIRO & ISAAC YODER, INNOVATION HIGHWAY: UNLOCKING THE SOCIAL AND ECONOMIC BENEFITS OF AUTONOMOUS VEHICLES 20 (2023).

269. *See* Joh, *supra* note 28, at 536.

270. Closely related is the enforcement discretion that the law affords policing—giving them significant latitude in determining offenses to investigate and enforce, and declining to do so. *See* Farhang Heydari, *The Sheriff's Constitution*, 113 GEO. L. J. 1041, 1074 (2025) (describing the extent of non-enforcement discretion afforded police).

271. *See* Calo, *supra* note 13, at 543.

272. *See* Geistfeld, *supra* note 261, at 1639.

develop such mechanisms in the future, much in the same way that a firearm vendor may be held liable for failing to incorporate safety features.[273]

A second harm, which we touched upon in Part II, arises when police give their robot an appropriate task, but the robot malfunctions in some way. For example, consider a scenario in which police direct a robot to conduct a patrol and the robot collides with a bystander, injuring her. This scenario is more closely analogous to self-driving cars, in that harm is not on account of some police action or command, and we might apply some of the frameworks developed in that context—for example, a presumption against vendors absent evidence of negligence by the victim.

But in some such cases, we still might hold police liable. First, police might direct a robot to perform a task for which it was not designed. Or they might deploy a robot in circumstances in which there is a great risk of danger to bystanders were a malfunction to occur, if the malfunction were reasonably foreseeable. The NYPD's deployment of a nearly four hundred-pound autonomous patrol robot in the Times Square Subway Station—a densely crowded station with narrow platforms and deeply recessed tracks into which people may fall—comes to mind.[274]

Finally, a failure to supervise a robot adequately might give rise to liability on the part of police, especially when a robot is operating autonomously. The more responsibility that we give robots to perform functions independently, the greater the risk of harm should a malfunction occur. Thus, liability rules should give police appropriate incentives to closely monitor and direct the conduct of police robots, and, unlike the self-driving car context, higher levels of autonomy might be grounds to increase, not decrease, the operator's liability.

2. Immunities

Finally, we address the possibility that qualified immunity—which shields officials from liability unless they have violated a "clearly established" statutory or constitutional right—might insulate police from liability for harm caused by robots.[275] The purpose of this immunity, the Supreme Court has said, is to balance the need to protect the rights of citizens with the need to encourage "vigorous exercise of official authority" and to afford officials who must exercise discretion "breathing room" to make reasonable but mistaken judgments about the law.[276] Notably, some scholars have offered pointed critiques of qualified immunity as lacking a constitutional or statutory basis and for impeding the development of civil rights law.[277]

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273. *See* David Elman & Samantha Bonanno, *Failure to Implement Safety Technologies Raises Design Defect Claim*, AM. BAR ASS'N (Apr. 6, 2021), https://www.americanbar.org/groups/litigation/resources/newsletters/mass-torts/failure-to-implement-safety-technologies-raises-design-defect-claim [perma.cc/EA4A-AFKW].

274. *See Transcript: Mayor Adams Makes Public Safety Announcement with NYPD Commissioner Sewell*, OFF. OF THE MAYOR (Apr. 11, 2023), https://www.nyc.gov/office-of-the-mayor/news/246-23/transcript-mayor-adams-makes-public-safety-announcement-nypd-commissioner-sewell [perma.cc/8ZNG-H24S].

275. *See* Harlow v. Fitzgerald, 457 U.S. 800, 815–18 (1982).

276. *See id.* at 807; Ashcroft v. al-Kidd, 563 U.S. 731, 743–44 (2011).

277. *See* William Baude, *Is Qualified Immunity Unlawful?*, 106 CALIF. L. REV. 45, 45–46 (2018); Joanna C. Schwartz, *The Case Against Qualified Immunity*, 93 NOTRE DAME L. REV. 1797, 1836 (2018).

The Supreme Court has set forth a two-step test for resolving qualified immunity claims. First, a court must determine whether the facts alleged by the plaintiff make out a violation of their statutory or constitutional rights.[278] Second, the court must determine "whether the right at issue was 'clearly established' at the time of the defendant's alleged misconduct."[279] Qualified immunity, the Court has said, "provides ample protection to all but the plainly incompetent or those who knowingly violate the law."[280]

In practice, qualified immunity precludes recovery unless the right in question has been established by precedent on nearly identical facts.[281] Consider, for example, the case in which a plaintiff sought compensation for injuries caused by a police dog.[282] Although a previous case had established that police may not release a police dog on a subject who is lying down, this was deemed insufficient to "clearly establish" that police could not release a police dog on the plaintiff, who had been sitting with his arms raised.[283]

Qualified immunity may raise doubts about whether individuals harmed by police robots will be able to recover compensation. As police robots evolve, they continually will present unique facts and legal questions that courts have not addressed. Each new analytic, capability, or use case—let alone different factual circumstances—might present another reason why previous precedents are argued to be insufficient to "clearly establish" the plaintiff's rights.

Such an approach would be gravely misguided. Robots are, at bottom, a tool. That police violated one's rights through the use of one tool versus another will, in many cases, be immaterial.[284] If police conduct a warrantless search of your home with a robot, it is no less clearly established a violation of your rights than had they done so with human officers. To be sure, there also will be cases in which the use of robots *does* present novel legal questions bearing on the scope of individual rights. For example, the scope of the plain view exception in the age of drones with powerful surveillance capabilities has yet to be settled.[285] But such cases are the exception, not the rule.

CONCLUSION

We have sketched out in this Article a roadmap for the regulation of police robots. And, as we hopefully have made clear, the need for such regulation is urgent.

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278. *See* Pearson v. Callahan, 555 U.S. 223, 230–31 (2009).
279. *Harlow*, 457 U.S. at 816.
280. Malley v. Briggs, 475 U.S. 335, 341 (1986).
281. Brief for Appellants at 34, Andre v. Clayton County, No. 23-13253 (11th Cir. Jan. 12, 2024).
282. *See* Baxter v. Bracey, 751 Fed.Appx. 869, 870 (6th Cir. 2018).
283. *See id.* at 872.
284. *See* Sample v. Bailey, 409 F.3d 689, 699 (6th Cir. 2005)

> Thus, regardless of whether the incident took place at day or night, in a building or outside, whether the suspect is fleeing or found, armed or unarmed, intoxicated or sober, mentally unbalanced or sane, it is clearly established that a reasonable police officer may not shoot the suspect unless the suspect poses a perceived threat of serious physical harm to the officer or others. These factual distinctions between the cases do not alter the certainty about the law itself.

Id.

285. *See* Matthew Koerner, *Drones and the Fourth Amendment: Redefining Expectations of Privacy*, 64 DUKE L.J. 1129, 1136, 1170–72 (2015); *see, e.g.*, State v. Stevens, 210 N.E.3d 1154, 1162 (Ohio Ct. App. 2023).

It is almost cliché to say that policymaking has failed to keep pace with advances in police technology.[286] States still are struggling to enact regulation of automated license plate readers—a technology first deployed in the 1980s.[287] We must not repeat the same mistake here.

Policing touches all of our lives, and so too will police robots. The consequences of allowing these tools to be deployed and become entrenched in our society, without democratic oversight and sound regulation, are too great to abide. The time for regulation is now.

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286. *See* Friedman et al., *supra* note 166, at 718.

287. *See* Marcia Wendorf, *Automated License Plate Readers: Are We Sacrificing Privacy for Security?*, INTERESTING ENG'G (Jan. 1, 2020), https://interestingengineering.com/innovation/automated-license-plate-readers-are-we-sacrificing-privacy-for-security [perma.cc/2S3R-AF4D].