The Future of Autonomous Vehicle Technology as a Public Safety Tool

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ABSTRACT

Every year, clever people with wonderfully innovative ideas bring legislation to their state capitols and to Congress. They have great hope that their innovations will make the world a better place. It does not always work out. Often these smart people can be seen standing in the corridor outside meeting rooms whispering to each other anxiously. They have looks of shock and disappointment on their faces, usually just after their bill was unceremoniously disemboweled in a committee hearing.

The legislative process necessarily is one of compromise, and few competing interests demand more compromise than those brought to the table by Public Safety and Homeland Security representatives.

This Article is a satirical exploration of how autonomous vehicle regulation may unfold in public policy forums over the next few decades. The piece will be perceived as dystopian by some, utopian by others.

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I. INTRODUCTION

The Department of Homeland Security's Complete and Utter Security Program (CUSP) was established by Congress in 2025 to leverage existing and emerging technologies that enhance the security of the American people and the stability of our society. Among its many functions, CUSP partners with the National Highway Traffic Safety Administration (NHTSA) and Public Safety stakeholders to implement the Autonomous Vehicle Avoidance of Serious Terrorism Act (AVAST) by assuring that autonomous vehicle design features comply with federal mandates. In this way, we can fulfill Congress's promise to the American People that they will be kept completely and utterly safe from all evils, foreign and domestic.

II. HISTORY

Autonomous Vehicle (AV) design history goes back about seventy years.[1] In the late 1950s, cruise control features first appeared in Chrysler products.[2] Manufacturers produced antilock brake technologies in the 1980s.[3] These advances allowed drivers to cede acceleration and braking control to an onboard computer for enhanced performance and safety.[4] Related technologies advanced at a logarithmic rate. NHTSA in the early 2000s worked with vehicle manufacturers as they rolled out several logical "next step" sensor and

1. Tom Vanderbilt, *Autonomous Cars Through the Ages*, WIRED (Feb. 6, 2012, 6:30 AM), http://www.wired.com/2012/02/autonomous-vehicle-history (noting that autonomous vehicles first garnered widespread attention at the 1939 World's Fair).

2. Frank Rowsome, Jr., *What It's Like to Drive an Auto-Pilot Car*, POPULAR SCI., Apr. 1958, at 105–07, 248, 250.

3. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., THE LONG-TERM EFFECT OF ABS IN PASSENGER CARS AND LTVS 5 (2009), *available at* http://www-nrd.nhtsa.dot.gov/Pubs/811182.pdf.

4. *See id.* at 1; Rowsome, *supra* note 2, at 105–07.

communications technologies.[5] The family mini-van was soon bristling with backup alarms and cameras. Telematics—cellular telephone interfaces that allowed for communication with a central control service (the most well-known was called OnStar)—summoned police and paramedic assistance when a collision was detected.[6] Autonomous Cruise Control (ACC) began to utilize radar and lasers to eliminate the risk of rear-end collision caused by inattentive use of cruise control; these features were refined by Global Positioning System (GPS)-guided ACC to predict when forward-located vehicles were slowing to accommodate a planned freeway exit rather than presenting a hazard.[7] Collision preparation ability was soon available in production models; when sensors predicted imminent impact, the vehicle responded by pre-tensioning seatbelts, aligning seat angles for optimal impact survival, closing windows, activating warning lights, and preparing components for most effective braking.[8] Sensors detected driving challenges or inattentiveness and turned down loud music when needed to enhance driver awareness;[9] sensors beeped, blinked, and scolded drivers who let the tire pressure

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5. *See* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., SECOND ANNUAL REPORT OF THE CRASH AVOIDANCE METRICS PARTNERSHIP 28 (2003), *available at* http://www.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/Crash%20Avoidance/2003/CampII.pdf (discussing a partnership with BMW, DaimlerChrysler, Ford, GM, Nissan, Toyota and VW aimed at studying "vehicle safety applications enhanced or enabled by external communications").

6. *E.g.*, *Emergency*, ONSTAR, https://www.onstar.com/us/en/services/emergency.html (last visited Feb. 2, 2015).

7. *See, e.g.*, Ford Global Technologies, Inc., Ramp Identification in Adaptive Cruise Control, U.S. Patent No. 20,030,204,299 A1, (filed Apr. 30, 2002), *available at* http://www.google.com/patents/US20030204299.

8. *See, e.g.*, AutoLiv ASP, Inc, System for Sensing Impending Collision and Adjusting Deployment of Safety Device, U.S. Patent No. EP 1,807,714 A1 (filed Nov. 3, 2005), *available at* http://www.google.com/patents/EP1807714A1?cl=en; *AAA Releases Its Top Picks for New Vehicle Technology*, AAA (Apr. 15, 2009), http://newsroom.aaa.com/tag/collision-preparation-system/.

9. Conference Paper, Chuang-Wen You et al., CarSafe App: Alerting Drowsy and Distracted Drivers Using Dual Cameras on Smartphones, 11 Proc. Ann. Int'l Conf. on Mobile Systems, Applications & Services (June 25–28, 2013), *available at* http://mclab.citi.sinica.edu.tw/cwyou/papers/carsafe_mobisys_2013.pdf (discussing a smartphone application aimed at correcting drowsy-driving, inattentiveness, and other driving hazards).

get too low.[10] Lane-departure technology then appeared, using cameras to monitor road markings and vibrating the steering wheel to alert drifting drivers.[11] Drivers accepted monitoring by GPS devices, allowing their speed and location to be monitored by insurance companies;[12] adolescents accepted similar monitoring by their parents—complete with audio and video streams showing activities in the car.[13] Pedestrian-detection sensors alerted drivers with audible warnings.[14] By 2014, self-parking ability emerged, allowing drivers to control the process remotely with a smartphone.[15] Vehicles in stop-and-go traffic were able to use proximity detection and automated braking/accelerator control to proceed safely on congested freeways.[16] These systems were augmented by night-vision technology and thermal imaging that further increased a vehicle's situational awareness and ability to respond safely.[17]

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10. *See generally* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., AN EVALUATION OF EXISTING TIRE PRESSURE MONITORING SYSTEMS (2001), *available at* http://www.nhtsa.gov/DOT/NHTSA/NRD/Multimedia/PDFs/VRTC/ca/capubs/tpms.pdf.

11. Ksenia Kozak et al., *Evaluation of Lane Departure Warnings for Drowsy Drivers*, 50 PROC. HUMAN FACTORS & ERGONOMICS SOC'Y ANN. MEETING 2400, 2401 (2006), *available at* http://www.hfes.org/Web/HFESNews/lanedeparture.pdf.

12. Adam Tanner, *Data Monitoring Saves Some People Money On Car Insurance, But Some Will Pay More*, FORBES (Aug. 14, 2013, 4:21 PM), http://www.forbes.com/sites/adamtanner/2013/08/14/data-monitoring-saves-some-people-money-on-car-insurance-but-some-will-pay-more.

13. Matt Richtel, *In-Car Cameras Protect Teenage Drivers, Study Finds*, N.Y. TIMES (Apr. 1, 2011), http://bits.blogs.nytimes.com/2011/04/01/in-car-cameras-protect-teenage-drivers-study-finds.

14. Bill Howard, *Ford and Honda Stop Collisions Before They Happen with Pedestrian Detection*, EXTREMETECH (Oct. 25, 2014), http://www.extremetech.com/extreme/192863-ford-and-honda-stop-collisions-before-they-happen-with-pedestrian-detection.

15. Associated Press, *Smartphones Will Soon Help Cars Park Themselves*, N.Y. POST (Sept. 9, 2014), http://nypost.com/2014/09/09/smartphones-will-soon-help-cars-park-themselves.

16. *See, e.g.*, Matthew de Paula, *Autonomous Driving Tech Package Will Be an Option on Mercedes Vehicles by 2020*, FORBES (Sept. 30, 2013), http://www.forbes.com/sites/matthewdepaula/2013/09/30/autonomous-driving-will-become-an-option-on-regular-mercedes-models-by-2020/.

17. *See, e.g.*, *Driver Assistance Systems of Today*, AUDI MEDIASERVICES (Mar. 8, 2012), https://www.audi-mediaservices.com/publish/ms/content/en/public/hintergrundberichte/2012/03/08/networked_mobility/driver_assistance.html; *Everything in View*, BMW, http://www.bmw.com/com/en/insights/technology/connecteddrive/2013/driver_assistance/intelligent_vision.html#nightvision (last visited Mar. 21, 2015).

III. MOONSHOT

After fifty years of gradual evolution toward autonomy, progress accelerated when Google's Self-Driving Car program put its first fully autonomous test vehicle on the road in early 2015.[18] Google's "moonshot" approach promised full self-driving automation in production models after only five or ten more years of testing.[19]

If all roadways in the nation were as dry and clear as those in Google's sunny Palo Alto, California home, production vehicles may have been available on a timetable closer to that predicted by the Self-Driving Car program. Alas, Google's technology at the time relied on onboard analysis of reflected laser light (a system called Lidar, for "light and detection ranging");[20] those reflections became so unreliable in rain and snow that lane markings were imperceptible, causing Self-Driving Cars to become dazed and confused.[21]

A much older reflective technology—Radio Frequency Identification (RFID)—saved the day. Military radar beginning in World War II used RFIDs to differentiate between friendly and hostile aircraft.[22] "Friendlies" carried a coffee table-sized RFID device that reflected a known signature back to antiaircraft gunners.[23] As simple reflectors, these RFID devices needed no power source.[24]

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18. Alex Davies, *Google's Self-Driving Car Hits Roads Next Month—Without a Wheel or Pedals*, WIRED (Dec. 23, 2014, 1:24 PM), http://www.wired.com/2014/12/google-self-driving-car-prototype-2/.

19. *Id*.

20. JAMES M. ANDERSON ET AL., RAND CORP., AUTONOMOUS VEHICLE TECHNOLOGY: A GUIDE FOR POLICYMAKERS 61–62 (2014), *available at* http://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR443-1/RAND_RR443-1.pdf.

21. *See* Lee Gomes, *Hidden Obstacles for Google's Self-Driving Cars: Impressive Progress Hides Major Limitations of Google's Quest for Automatic Driving*, MIT TECH. REV. (Aug. 28, 2014), http://www.technologyreview.com/news/530276/hidden-obstacles-for-googles-self-driving-cars/.

22. Stephen A. Weis, *RFID Privacy Workshop*, IEEE PRIVACY & SECURITY, no. 2, Mar.–Apr. 2004, at 48, 48, *available at* http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=1281245.

23. Harry Stockman, *Communication by Means of Reflected Power*, 36 PROC. INST. RADIO ENGINEERS 1196, 1201 (1948) (describing RFID technology shortly after World War II, Stockman details tests with a triangular-shaped reflector that had edges two feet in length).

24. Sanyi Zahn, Analysis and Design of Metal Surface Mounted Radio Frequency Identification (RFID) Transponders (2008) (unpublished Ph.D.

RFIDs in the twenty-first century were so small that by 2020 an inexpensive "RFID powder" was incorporated into lane marking material.[25] Each type of lane marking—fog lines, dashed lane dividers, double-yellows—now reflect a unique signal that is read by each AV's side- and under-mounted radar. RFID technology long-served pilots and gunners in all weather conditions[26] and it now just as reliably serves AVs. Its drawback was immense, however. The nationwide refitting of highway infrastructure took a decade to complete and delayed widespread AV deployment until the late 2020s.

Almost twenty years ago, NHTSA announced its intention to mandate vehicle-to-vehicle (V2V) communications.[27] V2V sharing of sensor-acquired data had been shown to reduce collisions involving unimpaired drivers by seventy to eighty percent.[28] The mandate was timed to occur with maturation of Google's Self-Driving Car program, which by 2020 had achieved statutory authorization for AV use in all fifty states and the District of Columbia.

IV. KILL SWITCH

The first generations of production vehicles were merely "semiautonomous"—close to what NHTSA called "Limited Self-Driving Automation."[29] Manufacturers had not yet embraced full self-driving automation, perhaps in an effort to avoid

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dissertation, Iowa State University), *available at* http://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=2701&context=etd (noting that a passive RFID device, as opposed to an active RFID device, needs no fixed power supply).

25. Tim Hornyak, *RFID Powder*, SCI. AM., Feb. 2008, at 68, 68, *available at* http://www.cs.virginia.edu/~robins/RFID_Powder.pdf. Manufacturers have produced working RFID chips as small as .05 x .05 x .0005 mm. *Id.*

26. *See supra* text accompanying notes 22–24.

27. *See* NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., VEHICLE-TO-VEHICLE COMMUNICATIONS: READINESS OF V2V TECHNOLOGY FOR APPLICATION 43 (2014), *available at* http://www.nhtsa.gov/staticfiles/rulemaking/pdf/V2V/Readiness-of-V2V-Technology-for-Application-812014.pdf (providing an overview of various government programs intended to study autonomous vehicle technologies and their implementation in road-going vehicles).

28. *See id.* at 17–18.

29. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T TRANSP. PRELIMINARY STATEMENT OF POLICY CONCERNING AUTOMATED VEHICLES 5 (2013), *available at* http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development.

liability for accidents.[30] AV operators and their computerized vehicles still shared control, albeit limited to a single interface: an emergency kill-switch that commanded the vehicle to quickly slow to a stop.[31]

Kill-switch responsibility was a terrible disappointment for those who long-anticipated AV technology to be as servile, domesticated, and independent as a Roomba. These consumers had looked forward to having a fully-autonomous AV appear at the front door delivering Chinese take-out, returning smiling offspring from soccer practice, or chauffeuring a tipsy spouse after an office holiday party.

The possibility of full autonomy not only drove manufacturer liability lawyers into a tizzy, it caused hyperventilation at the Department of Homeland Security. Unoccupied AVs, they feared, would be far too easily utilized by a depraved individual as a terrorist tool.[32] Public Safety officials therefore joined manufacturers' legal counsel in making certain that the law required every AV to be occupied by the person responsible for its safe operation.

Because AV drivers retained legal responsibility to use vehicle kill-switches to prevent accidents not detected by the AV's sensors, state motor vehicle departments continued to screen and license vehicle operators. Though most states relaxed training and license requirements, the remaining restrictions were subject to extensive debate in state legislatures. Children were not licensed by any state, eliminating the hope by some parents that AV technology would free them of their "Mom's Taxi" burden. People with

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30. *See* ANDERSON ET AL., *supra* note 20, at 133.

31. *See generally* Michael Vincent Avitabile, Development of a Multi-Level Emergency Stop System for Unmanned Vehicles (Dec. 7, 2006) (unpublished M.S. thesis, Virginia Polytechnic Institute), *available at* http://scholar.lib.vt.edu/theses/available/etd-12182006-152131/unrestricted/MLES.pdf (noting that remotely operated emergency stop systems had already been in operation for a number of years in industrial automation); *see also TORC Robotics, Unmanned and Autonomous Vehicle Developer Uses EAO for Emergency Stop System*, NEWARK, http://www.newark.com/pdfs/techarticles/eao/TorcRobotics.pdf (last visited Feb. 14, 2015) (showing use of a wirelessly activated emergency stop switch alongside an in-vehicle, manually operated emergency switch).

32. *E.g.*. Mark Harris, *FBI Warns Driverless Cars Could Be Used as 'Lethal Weapons,'* GUARDIAN (July 16, 2014, 6:14 AM), http://www.theguardian.com/technology/2014/jul/16/google-fbi-driverless-cars-leathal-weapons-autonomous.

physical disabilities had eagerly anticipated that AV technologies would mitigate a broad range of disadvantages,[33] but the mandated kill-switch put those benefits beyond the reach of the visually impaired and those with disabilities that otherwise interfered with necessary situational awareness. Drinking while operating an AV remained a crime, as impaired operators were unable to reliably hit the kill switch.

Kill-switch complications continued to vex insurers, however. Multiple occupants in a single AV created a "who's in charge?" confusion when each thought the other to have responsibility to hit the kill-switch. With no pedals and no wheel, there was no clear "driver's seat," so actual responsibility remained somewhat ambiguous.

V. HAZARD AVOIDANCE

The rapid advance of AV technology was accompanied by a rapid degradation of aging transportation infrastructure such as roadway surfaces and bridge decks. Parts of the interstate highway system were by the 2020s as old as seventy-five years,[34] and several spectacular infrastructure failures caused tragic loss of life. Bridge decks collapsed, chunks of concrete fell from bridge superstructures onto traffic, and roadway surfaces exposed to extreme climate changes separated or buckled violently and unpredictably.[35] The hazards occurred abruptly and their angle of arrival (from underneath or overhead the vehicle) was not a vector that AV technology was designed to monitor. To address this safety issue, the first push by state policy makers was for legislation that required autonomous

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33. ANDERSON ET AL., *supra* note 20, at 16–17.

34. *See generally* David A. Pfeiffer, *Ike's Interstates at 50: Anniversary of the Highway System Recalls Eisenhower's Role as Catalyst*, PROLOGUE MAG., Summer 2006, *available at* http://www.archives.gov/publications/prologue/2006/summer/interstates.html. Existing toll roads and freeways were incorporated into the interstate highway system at the time of the Federal-Aid Highway Act passage in 1956. *Id.*

35. *See, e.g.*, NAT'L TRANSP. SAFETY BD., HIGHWAY ACCIDENT REPORT: COLLAPSE OF I-35W HIGHWAY BRIDGE AUG. 1, 2007 (2008), *available at* http://www.dot.state.mn.us/i35wbridge/ntsb/finalreport.pdf; Kevin Harter & Nick Ferraro, *St. Paul/35E Open; Overpass Needs Repair: Legislators to Push for Safer Bridges*, PIONEER PRESS (July 28, 2008, 12:01 AM), http://www.twincities.com/localnews/ci_10016546; Esme Murphy, *Heat Buckles Roads, Sends Car Flying In Eau Claire*, CBS MINNESOTA (July 3, 2012, 6:48 PM), http://minnesota.cbslocal.com/2012/07/03/heat-buckles-roads-sends-car-flying-in-eau-claire/.

vehicles to respond to state Public Safety department-controlled signals rather than relying exclusively upon local vehicle sensor data and data shared by V2V signals. In this way, autonomous vehicles heading toward a known hazard were able to be stopped or rerouted many miles before the hazard upon receiving radio signals from state Public Safety authorities. Legislation mandating Hazard Avoidance functionality was quickly adopted by all states except New Hampshire, where the state motto "Live Free or Die" took on real meaning.[36]

State-by-state regulation of nationally-deployed technology presents obvious impediments for any product manufacturer. Motor vehicle manufacturers reasonably expect their customers to be able to move across the country without vehicle design variously running afoul of local laws; oddball vehicle regulation has even been found to violate the Commerce Clause.[37] Vehicle safety regulation historically had been regulated by NHTSA[38] so the federal preemption doctrine ensured that manufacturers were held to a single standard rather than fifty shifting ones.[39] Instead, the evolution of AV statutory authorization was accomplished at the state level and this led to an innovation-stifling patchwork of local regulation.

VI. AMBER STOPS

In an effort to consolidate AV regulation at the federal level, Congress repeatedly attempted to enact AVAST and to fund CUSP to implement it. From 2025 to 2032, Congress was unable to pass legislation and state regulations continued to be promulgated on an uncoordinated basis. Hazard Avoidance ability proved wildly popular; the driving public soon demanded features to address additional public safety

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36. *Cf.* ANDERSON ET AL., *supra* note 20, at 140 (noting that all states but New Hampshire require drivers to maintain liability insurance).

37. See, for example, Bibb v. Navajo Freight Lines, Inc., 359 U.S. 520, 530 (1959), where Illinois's one-off requirement of contoured mud flaps on trucks placed an unconstitutional burden on interstate commerce.

38. *See Who We Are and What We Do*, NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., http://www.nhtsa.gov/About+NHTSA/Who+We+Are+and+What+We+Do (last visited Feb. 6, 2015).

39. Williamson v. Mazda Motor of Am., Inc., 131 S. Ct. 1131, 1135 (2011) (noting that states are preempted from passing conflicting regulations, but that state common law tort claims may not be preempted in certain circumstances).

concerns. The abduction of a child in Indiana by a perpetrator using an autonomous getaway vehicle prompted legislation allowing Public Safety officials issuing Amber Alerts to stop all AVs in areas where law enforcement reasonably expected the abducted child to be located. Working in cooperation with local police and sheriff departments, stopped vehicles were then inspected and re-enabled for movement upon being cleared by law enforcement. Widespread inconvenience to innocent drivers caused by "Amber Stops" was acknowledged, but the burden was accepted by Indiana's legislature and governor after the legislation's chief author successfully argued: "if we can save just one child, isn't it worth the inconvenience of being a half hour late for work?" Within four years, Amber Stop legislation was adopted by twenty-seven additional states.

VII. KOPS STOPS

Great numbers of police pursuits end in a crash; they are the major cause of fatality of law enforcement officers.[40] Related casualties have worried public safety officials since Ford invented the Model T.[41] Though states long ago added "fleeing police in a motor vehicle" to their criminal codes,[42] the offense is a crime of impulse[43] and therefore difficult to deter. After high-profile incidents in which dedicated law enforcement personnel perished while engaging in high-speed pursuits, police unions nationally coordinated a successful lobbying effort to enact "Keep Our Police Safe" (KOPS) legislation. KOPS empowered police to remotely activate the kill switch on any

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40. NAT'L HIGHWAY TRAFFIC SAFETY ADMIN., U.S. DEP'T OF TRANSP., CHARACTERISTICS OF LAW ENFORCEMENT OFFICERS' FATALITIES IN MOTOR VEHICLE CRASHES 1 (2011), *available at* http://www-nrd.nhtsa .dot.gov/Pubs/811411.pdf.

41. *See* Hunter Oatman-Stanford, *Murder Machines: Why Cars Will Kill 30,000 Americans This Year*, COLLECTORS WEEKLY (Mar. 10, 2014), http://www.collectorsweekly.com/articles/murder-machines/.

42. *E.g.*, MINN. STAT. § 609.487 (2014) (originally enacted in 1981); *see also* Aaron Baca, Comment, *State v. Padilla, An Aggravated Reading of the State's Aggravated Fleeing a Police Officer Statute*, 39 N.M. L. REV. 485, 487–88 (2009) (noting how New Mexico's evading and fleeing laws originated before statehood and were modified over time to accommodate the particular concerns raised by motor vehicles).

43. Patrick T. O'Connor & William L. Norse, Jr., *Police Pursuits: A Comprehensive Look at the Broad Spectrum of Police Pursuit Liability and Law*, 57 MERCER L. REV. 511, 512–13 (2006) (noting that those who flee make instantaneous decisions).

AV that did not immediately respond to an officer's attempt to pull it over. In light of Hazard Avoidance and Amber Stop successes, KOPS Stops seemed a mere incremental expansion of police authority. Though the American Civil Liberties Union objected to KOPS Stops as being an unconstitutional encroachment upon personal liberty, it was clear that the new regulation began to save lives virtually on the day it became law and led to dramatic public safety benefits. Judges asked to review KOPS Stops noted that constitutional rights are not absolute (we all have freedom of speech, yet we do not have freedom to shout "fire!" in a crowded theater);[44] court rulings established that liberty interests were minor when compared to the number of lives saved.

VIII. HIGHWAY ROBBERY

Legislators also responded to evolutions in criminal behavior related to widespread AV use. A crime of ancient origin—highway robbery[45]—became much easier when perpetrators realized vehicles were guaranteed to stop: standing in the roadway in front of a vehicle was no longer a risky behavior. Increasing economic disparity in the United States resulted in greater populations of desperate people who came to view autonomous vehicles as cash and jewelry delivery systems. Robbery victims and their families called upon elected representatives for relief.

Old-school legislators favored tough-on-crime, after-the-fact responses: each AV's multiple high-definition cameras preserved images of robbers for use in their apprehension and prosecution. Those convicted faced dramatically increased prison sentences.

Other legislators designed more innovative—if functionally problematic—solutions. These solutions required AVs to respond preventively by taking evasive action. Such a great number of robberies had been recorded by vehicle sensors that a massive, crowd-sourced "robbery digital signature" emerged, allowing sensors to detect the characteristic movements of

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44. *See* Schenck v. United States, 249 U.S. 47, 52 (1919) ("The most stringent protection of free speech would not protect a man in falsely shouting fire in a theatre and causing a panic.").

45. *See* THE CODE OF JUSTINIAN, *in* CORPUS JURIS CIVILIS, vol. XV 1, 21–22 n.1 (S.P. Scott trans., AMS Press 1973) (1932) (discussing early laws against highway robbery in Ancient Rome, India, and Babylon).

potential malefactors and recognize them as an imminent robbery.[46] Robbery detection ability was enhanced as law enforcement facial recognition databases became available for real-time searches, allowing the system to compare AV-captured facial images of potential attackers with those of known felons and fugitives. The AV was then able to go into Panic Response Mode by taking protective measures: closing windows and turning on hazard flashers, using Telematics to notify authorities, and taking evasive maneuvers like an abrupt U-turn. Sadly, many AV drivers have been inconvenienced when mischief-makers with too much time on their hands run into traffic just to be amused by the AVs' panic response.

IX. SHOE LEATHER

Law enforcement officers historically expended great effort to learn the location and movement of motor vehicles. When crimes occur, police have always needed to know which vehicles were seen near the crime scene. Who drove away from the robbery location? Which vehicles were on the street near the time the child disappeared? Where is the truck belonging to the fugitive felon?

For over a century, the principal resource deployed in this effort was shoe leather.[47] Investigators walked door-to-door and asked witnesses simply, "what did you see?"[48] Investigators gleaned valuable information with this method, but the value-to-effort ratio was vanishingly small.[49]

Law enforcement improved this ratio in the early 2000s with the advent of Automated License Plate Reader (ALPR) technology.[50] ALPR cameras mounted in stationary locations

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46. Flaws in this method quickly became apparent as clever robbers realized they could game the algorithm by approaching their victims while hopping on one foot, while doing the chicken dance, or making other non-characteristic movements.

47. *See* Chris Jay Hoofnagle, *Big Brother's Little Helpers: How ChoicePoint and Other Commercial Data Brokers Collect and Package Your Data for Law Enforcement*, 29 N.C.J. INT'L L. & COM. REG. 595, 595 (2004) ("Traditionally, law enforcement officers obtained information by speaking with suspects' neighbors, employers, or friends.").

48. *Id.*

49. *Cf. id.* at 595–96.

50. *See* DAVID J. ROBERTS & MEGHANN CASANOVA, INT'L ASS'N OF CHIEFS OF POLICE, AUTOMATED LICENSE PLATE RECOGNITION (ALPR) SYSTEMS:

and on moving vehicles captured images of vehicle license plates, converting them to digital data.[51] Each plate number was tied to its geolocation data, allowing investigators to build databases of vehicle locations, times, and historical patterns of movement.[52] Some civil libertarians complained that it was inconsistent with the principles of a free democracy when police monitored and recorded the movements and habits of law-abiding people.[53] However, policy makers tended to support the undeniable public safety benefits ALPR offered.

Compared to the shoe leather approach, ALPR enhanced vehicle-monitoring ability by many orders of magnitude.[54] But ALPR was crude and random, relying on not much more than dumb luck that an ALPR camera was present when and where crimes occurred.

ALPR became obsolete when Hazard Avoidance functionality was authorized by law. Public Safety then had real-time location data streaming into police databases from every AV on the road. The lifetime record of each vehicle's movements became available to investigators working to protect the public's safety.

An obvious flaw remained: as far as AV systems were concerned, operators were anonymous. Just because a particular vehicle drove down a certain street at a known time did not guarantee that anyone knew who was operating it. For that, investigators still relied on shoe leather. Police still depended on the often-unreliable recollections of eyewitnesses: "Did you see a blue Subaru heading down your street? Did you

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POLICY AND OPERATIONAL GUIDANCE FOR LAW ENFORCEMENT 1 (2012), *available at* http://www.theiacp.org/Portals/0/pdfs/IACP_ALPR_Policy_Operational_Guidance.pdf (noting that ALPR technologies were adopted "to enhance their enforcement and investigative capabilities, expand their collection of relevant data, and expedite the tedious and time consuming process of manually comparing vehicle license plates with lists of stolen, wanted, and other vehicles of interest").

51. *Id.* at 28.

52. *Id.* ("[L]aw enforcement users could search ALPR records to identify vehicles that were recorded in a specific geographic region within a defined date and time range, or whether a particular vehicle was 'observed' entering or leaving a geographic region.").

53. *See, e.g.*, *You Are Being Tracked: How License Plate Readers Are Being Used to Record Americans' Movements*, AM. CIV. LIBERTIES UNION, https://www.aclu.org/alpr (last visited Feb. 7, 2015).

54. *See supra* note 50 and accompanying text.

notice who was inside it?" With the security of our Homeland at stake, reliance on mere analog memory was unacceptable.

X. AVAST

Congress finally responded with comprehensive legislation. AVAST wrote into federal law the many successful components of AV legislation that had been tried by the states. Hazard Avoidance, Amber Stops, and KOPS Stops became a nationwide standard for autonomous vehicle regulation. But AVAST magnified the effectiveness of all these initiatives with the Trusted OperatOr License program (TOOL).

Initially, AV operators certified by the TOOL program received favorable routing advantages and lane assignments that allowed traffic congestion bypass. To take advantage of the program, operators needed only to submit to a criminal background check and agree to a biometric ignition interlock on their AV. Biometric identification erased a broad range of public safety hazards by allowing law enforcement in real time to know exactly *who* was operating *which* vehicle at every moment.

The program was wildly popular. Everyone wanted to be a TOOL. Within a few years, Congress expanded the program to require biometric interlocks on all vehicles, with the coveted congestion-bypass feature available as a paid subscription service.

TOOL found support from the civil bar, especially the American Society of Matrimonial Attorneys. For decades, lawyers had used vehicle location data from tollway passes to help establish infidelity in divorce cases.[55] With TOOL, there was no longer just the implication that a party to marital dissolution used the tollway exit nearest his mistress's home—now there was objective proof that he arrived at his destination.

Insurers enticed their customers with rate incentives to sign up for TOOL; insurers supported the program for many reasons, not the least of which was that it removed ambiguity from the "who's in charge?" conundrum. With TOOL, it was

55. *See, e.g.*, Peter Valdes-Dapena, *6 Ways Your Car Can Spy on You: Thanks to Computers, Global Positioning Satellites and Various Sensors Your Movements Are Being Tracked*, CNN MONEY, http://money.cnn.com/galleries/2011/technology/1109/gallery.autos_privacy/ (last updated Jan. 18, 2012).

clear that the biometrically-identified operator was the one responsible to stop the AV in emergencies.

AVAST's biometric requirement also streamlined the Amber Stop process, as vehicles with a known driver could be dealt with individually rather than inconveniencing everyone in an area where an Amber Alert became active. In any type of kidnapping, car-jacking or other unlawful behavior (such as outstanding warrants), law enforcement professionals are now able to take remote control of a vehicle, lock its doors, and deliver it to a location where police can respond to the threat in a manner that best protects public safety.

XI. CONCLUSION

These advancements in the security of our Homeland have not been without criticism. The American Civil Liberties Union has been particularly shrill, even going so far as to suggest that the recent unfortunate structural problem at the Statue of Liberty (causing the Lady's torch to fall to the ground because of undetected internal corrosion) serves in some way as a cheap metaphor. But CUSP takes its Congressional mandate seriously: to provide complete and utter security for the American people. Advance of AV technology is essential to this mission. CUSP will never apologize when it confronts those whose goal it is to unleash chaos on a peace-loving people. We will ensure social stability for the honor, glory, and security of our Homeland.

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