COMPENSATION AT THE CROSSROADS

AUTONOMOUS VEHICLES AND ALTERNATIVE VICTIM COMPENSATION SCHEMES

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"America is at a historic turning point for automotive travel. Motor vehicles and drivers' relationships with them are likely to change significantly in the next twenty years, perhaps more than they have changed in the last one hundred years."
-National Highway Traffic Safety Administration, 2013[1]

On February 23, 2016, a white Lexus SUV drove down El Camino Real in Mountain View, California.[2] After signaling that it wished to turn right, the Lexus moved into the far right lane just before the intersection between El Camino Real and Castro Street.[3] However, sandbags situated around a storm drain blocked the car's path and forced it to stop.[4] The vehicles in the other lanes were stopped at a red light, so the Lexus had to wait until the light changed and the flow of traffic resumed before attempting to inch out around the sandbags and into the left lane.[5]

At first glance, this driving scenario falls far short of being exciting, novel, or even particularly interesting. Most drivers likely encounter similar situations on a weekly or perhaps even daily basis, and handle them adeptly without much thought or anxiety. Rogue garbage cans that must be avoided on residential streets, construction equipment or barriers that block portions of highways, and cars parallel parked too far from the curb are all part of the day-to-day landscape of virtually all American drivers. Yet, the sandbags and the Lexus situation was profoundly different. It was a sea change in that landscape. The Lexus was driving itself.

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[1] *Preliminary Statement of Policy Concerning Automated Vehicles*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (2013), https://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf.

[2] Report of Traffic Accident Involving an Autonomous Vehicle, Department of Motor Vehicles, https://www.dmv.ca.gov/portal/wcm/connect/3946fbb8-e04e-4d52-8f80-b33948df34b2/Google+Auto+LLC+02.14.16.pdf?MOD=AJPERES *(last visited March 8, 2018).*

[3] *Id.*

[4] *Id.*

[5] *Id.*

Like a human driver, the Lexus had to make a decision: when it was safe for the vehicle to move into the left lane to travel around the sandbags.[6] Its algorithms dictated that the vehicle wait for several nearby vehicles to pass before making its attempt.[7] Unfortunately, the car's algorithms misjudged the flow of traffic. As the vehicle reentered the left lane, it sideswiped a public transit bus.[8] Fortunately, no humans were injured.[9] Both vehicles were traveling slowly at the moment of impact, so the consequences were fairly nominal.[10] The Lexus sustained damage to its front fender, left front wheel, and driver's side sensors.[11] The bus escaped with even less damage.[12]

Google, the designer of the autonomous Lexus, quickly claimed "some" responsibility.[13] "[I]f our car hadn't moved, there wouldn't have been a collision," its monthly report stated.[14] Google also seemed to believe, however, that the vehicle's mistake had not been particularly egregious. The (human) Google employee who was monitoring—but not controlling— the Lexus at the moment of the crash noted that he had seen the bus "approaching in the left side mirror but believed the bus would stop or slow to allow the Google [autonomous vehicle] to continue."[15] If the human monitor also misjudged the situation, perhaps the failure of the autonomous vehicle was not particularly troublesome.

Regardless of whether this fender bender was the fault of poor programming or merely a minor and unavoidable blip on Google's otherwise impressive safety record (at the time of the accident, Google's autonomous vehicles had traveled over a million miles without causing an accident),[16] this incident highlights the arrival of a new and profoundly novel legal issue: who should be liable (if anyone) and how victims should be compensated (if at all) when autonomous vehicles cause injury. While the Lexus and the bus case did not result in litigation, we should expect such cases to arise and to do so at any moment. Semi-autonomous (partially driverless) cars are already available to consumers and on U.S. roads,[17] and fully autonomous ones continue to be tested on public roads in preparation for arrival on the

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[6] *Id.*
[7] *Id.*
[8] *Id.*
[9] *See id.*
[10] *Id.*
[11] *Id.*
[12] *See id.*
[13] Alex Davies, *Google's Self-Driving Car Caused Its First Crash*, WIRED (February 29, 2016 2:04 PM) https://www.wired.com/2016/02/googles-self-driving-car-may-caused-first-crash/.
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] Andrew Connor, *Semi-Autonomous Cars Bring the Self-Driving Car Closer to Reality*, GEAR PATROL (Oct. 23, 2015), http://gearpatrol.com/2015/10/23/semi-autonomous-cars-bring-self-driving-car-closer-reality/.

consumer market within the next five years (if not significantly sooner).[18] As many legal scholars have wondered: is the American legal system ready?[19]

The answer to this question has implications far beyond the resolution of individual autonomous vehicle crash cases. Whether the American legal system is capable of handling these cases fairly and efficiently implicates the likelihood that (a) consumers will adopt this new technology, and (b) the rate at which they will (or will not) do so. These implications should concern law and policy makers immensely. If autonomous cars stand to drastically reduce the number of fatalities and injuries on U.S. roadways—and virtually every scholar believes that they will—getting the adjudication and compensation piece of autonomous vehicle injuries wrong, so to speak, risks stymieing adoption of this technology and leaving more Americans at risk of dying at the hands of human drivers.

The problem, of course, is that autonomous vehicles pose "a plethora of new and unique legal issues, which will need to be analyzed to facilitate the adequate transition of this new technology to the marketplace."[20] Chief among these is the legal implications of automation itself. Given that, as one scholar has said, "the entire history of human laws has assumed that people make decisions,"[21] handing those decisions over to an algorithm places lawyers and judges into a situation in which we "currently have no legal framework for . . . liability."[22] Worse yet, the development of automated vehicle technology is already far ahead of the development of the law in this area, and continuing to advance at rates that can often seem exponential.[23] We are thus in a situation in which we need to develop jurisprudence in and around a technology that challenges many of the most fundamental assumptions of American jurisprudence. We must do so, moreover, extraordinarily quickly or risk hampering innovation and slowing adoption of a technology that will likely save tens of thousands of lives each year in the United

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[18] Samuel Gibbs, *Google's Self-Driving Car: How Does It Work and When Can We Drive One?*, THE GUARDIAN (May 29, 2014, 12:11 PM), https://www.theguardian.com/technology/2014/may/28/google-self-driving-car-how-does-it-work; Mike Murphy, *Coming in 2021: A Self-Driving Ford Car with No Steering Wheels or Pedals*, QUARTZ (Aug. 16, 2016), https://qz.com/759643/ford-self-driving-car-2012-no-steering-wheels-or-pedals-or-handover-function/.

[19] *See* Jeremy Levy, *No Need to Reinvent the Wheel: Why Existing Liability Law Does Not Need to Be Preemptively Altered to Cope with the Debut of the Driverless Car*, 9 J. BUS. ENTREPRENEURSHIP & L. 355, 365 (2016); Neal Katyal, *Disruptive Technologies and the Law*, 102 GEO. L.J. 1685, 1689 (2014); Sophia H. Duffy & Jamie Patrick Hopkins, *Sit, Stay, Drive: The Future of Autonomous Car Liability*, 16 SMU SCI. & TECH. L. REV. 453, 454–55 (2013); Kyle Colonna, *Autonomous Cars and Tort Liability*, 4 CASE W. RESERVE J.L. TECH. & INTERNET 81, 117 (2012).

[20] *See* Levy, *supra* note 19, at 357.

[21] JOHN FRANK WEAVER, ROBOTS ARE PEOPLE TOO: HOW SIRI, GOOGLE CAR, AND ARTIFICIAL INTELLIGENCE WILL FORCE US TO CHANGE OUR LAWS 56 (Praeger 2014).

[22] *See* Katyal, *supra* note 19, at 1689.

[23] John Markoff, *Google Cars Can Drive Themselves, in Traffic*, NY TIMES (Oct. 9, 2010), http://www.nytimes.com/2010/10/10/science/10google.html.

States alone. In short, the stakes are extremely high and the time extremely limited.

In this paper, I explore the liability issues posed by accidents involving autonomous vehicles and propose a way in which we can both compensate victims for injuries while also creating time and space for the civil justice system to develop a robust jurisprudence in and around the use and development of these vehicles. It is my belief that funneling autonomous car crash cases into a specially designed, no-fault, quasi-judicial victim compensation fund is a sensible way to do so. Such a fund could both protect autonomous car designers and manufacturers from high levels of uncertainty about their exposure to liability and assure consumers that they will be compensated fairly and quickly if an autonomous vehicle harms them. It would also give courts "breathing room" to adapt products liability law to the brave new world of automation and artificial intelligence.

The National Vaccine Injury Compensation Program (NVICP) provides an excellent example of the type of quasi-judicial compensation fund that could be well-suited for autonomous vehicle crash cases. While victim compensation funds in the United States have taken a variety of forms, ranging from the federally funded and publicly administered September 11th Victim Compensation Fund,[24] to the privately funded and privately administered Deepwater Horizon Oil Spill Trust,[25] the NVICP's quasi-judicial setup, non-adversarial process, and reliable funding mechanism make it a better model for adjudicating the types of cases likely to be presented by autonomous vehicles. Additionally, as discussed at length in this paper, it has a far better and more extensive track record than many of the other types of victim compensation funds created and administered in the United States, and thus appears more likely to succeed in a context like this one.

In Part I of this paper, I describe the development of autonomous vehicles in the United States, the way in which the federal government has chosen to categorize them, and the benefits and advantages they offer to consumers over human-driven vehicles. In Part II, I explore the two courses that the United States could take in handling cases that arise from autonomous vehicle crashes: (1) sending them through the existing civil justice system and applying existing products liability jurisprudence, or (2) creating a victim compensation fund to handle them, and analyze the benefits and drawbacks of both. In Part III, I explore the panoply of design options for victim compensation funds: quasi-judicial, public, private, and charitable. In Part IV, I propose a model victim compensation fund for injuries arising from the use of autonomous vehicles based on the NVICP, propose a

[24] *See September 11th Victim Compensation Fund,* SEPTEMBER 11TH VICTIM COMPENSATION FUND, https://www.vcf.gov/ (last visited March 8, 2018).
[25] *See Independent Evaluation of the Gulf Coast Claims Facility: Executive Summary,* BDO CONSULTING (April 19, 2012) http://media.nola.com/2010_gulf_oil_spill/other/BDO%20Executive%20Summary.pdf.

mechanism for funding, and lay out a series of requirements for both manufacturers and victims who wish to participate in the fund.

I. BACKGROUND

The National Highway Traffic Safety Administration (NHTSA) defines autonomous vehicles as "those in which at least some aspects of a safety-critical control function (*e.g.*, steering, throttle, or braking) occur without direct driver input."[26] In plain English, that simply means that the vehicle does not require a human driver to operate or navigate the vehicle in the way that they must in a non-autonomous vehicle.[27] Instead, the vehicle uses some combination of "cameras, radar systems, lasers (*e.g.*, LIDAR), and Global Positioning System (GPS) units to gather information about the environment and make decisions about when and how to steer, accelerate, and brake."[28] Autonomous vehicles may also eventually use vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) modes of communication to make such decisions, though these forms of technology are still in early development.[29] Both now and in the future, however, autonomous vehicles are and will continue to be "hybrid[s] between vehicles and computers."[30] At base, they are nothing more than the application of extremely complex algorithms to a mode of transportation that has existed for over a hundred years, although this in itself is a remarkable and society-altering feat.

A. Levels of Automation

In an attempt to describe the varying (and increasing) levels of automation in vehicles, NHTSA adopted a six-level measurement of automation in its 2016 Federal Automated Vehicles Policy (FAVP).[31] Based on measurements created by SAE International, a professional association of automotive engineers, the levels of automation are an attempt to provide "common terminology for automated driving," and to highlight crucial differences between, for instance, semi-autonomous and fully autonomous vehicles.[32] The levels are as follows:

- Level 0: Level 0 vehicles are those without any form of automation. In these vehicles, NHTSA explains, "the driver is in complete and sole

[26] *See* NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, *supra* note 1.
[27] *See* Kyle L. Barringer, *Code Bound and Down . . . A Long Way to Go and A Short Time to Get There: Autonomous Vehicle Legislation in Illinois*, 38 S. ILL. U. L.J. 121, 122 (2013).
[28] *Id.* at 123.
[29] *See id.*
[30] Duffy & Hopkins, *supra* note 19, at 455.
[31] NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, FEDERAL AUTOMATED VEHICLE POLICY 9 (2016), https://www.transportation.gov/sites/dot.gov/files/docs/AV%20policy%20guidance%20PDF.pdf [hereinafter FAVP].
[32] *Automated Driving: Levels of Driving Automation are Defined in New SAE International Standard J3016* 1, SAE INTERNATIONAL, https://www.sae.org/misc/pdfs/automated_driving.pdf (last visited March 8, 2018).

control of the primary vehicle controls (brake, steering, throttle, and motive power) at all times, and is solely responsible for monitoring the roadway and for safe operation of all vehicle controls."[33] Cars without cruise control or more modern features like electronic stability control are examples of Level 0 vehicles.

- Level 1: Level 1 vehicles have "function-specific automation."[34] The driver still maintains overall control of the vehicle, "but can choose to cede limited authority over a primary control (as in adaptive cruise control)," or the vehicle itself may "assume limited authority over a primary control (as in electronic stability control)."[35] In either scenario, though, the driver must still maintain some level of physical control and constant vigilance over the vehicle as a whole.[36] In Level 1 vehicles, in short, "there is no combination of vehicle control systems working in unison that enables the driver to be disengaged from physically operating the vehicle by having his or her hands off the steering wheel and feet off the pedals at the same time."[37] A vehicle with cruise control is an example of a Level 1 vehicle.

- Level 2: Level 2 vehicles have "combined function automation," meaning that they have "at least two primary control functions designed to work in unison to relieve the driver of control of those functions."[38] In a Level 2 vehicle, unlike a Level 1 vehicle, a driver could have his or her hands both off the wheel *and* off the pedals.[39] However, "the driver is still responsible for monitoring the roadway and safe operation and is expected to be available for control at all times and on short notice."[40] The 2017 Tesla Model S with Autopilot functionality is an example of a Level 2 vehicle.

- Level 3: Level 3 vehicles have "limited self-driving automation."[41] They "can both actually conduct some parts of the driving task and monitor the driving environment *in some instances*, but the human driver must be ready to take back control when the automated system requests."[42] As I have described in my earlier work, "the key difference between a Level 2 and a Level 3 vehicle is the level of monitoring

[33] *See* NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, *supra* note 1.
[34] *Id.*
[35] *Id.*
[36] *Id.*
[37] *Id.*
[38] *Id.*
[39] *Id.*
[40] *Id.*
[41] *Id.*
[42] *See* FAVP, *supra* note 31, at 9.

required by the human driver. In Level 3 vehicles, the driver need only be available for 'occasional control': when the vehicle signals to the driver that he or she must reassume control due to, for instance, changes in the traffic or environmental conditions near the vehicle."[43] In Level 2 vehicles, however, "a human must monitor the vehicle at all times, as the vehicle's ability to detect what is happening in the environment around it is much more limited."[44] Level 3 vehicles are not yet available to consumers, although experts predict that they will be available by 2020.[45]

- Level 4: Level 4 vehicles have high automation. They "can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated system can operate only in certain environments and under certain conditions."[46] The difference between a Level 3 and a Level 4 car is that the driver need not be available to resume control of the vehicle and thus could presumably sleep, work, and/or sit away from the driver's seat.[47] However, Level 4 vehicles may have limitations on the situations in which they can be utilized safely. They may, for instance, be unsafe to operate in certain types of extreme weather, on highways with significant amounts of construction, or on poorly marked roads.[48] Level 4 vehicles are not yet available to consumers although they are being tested on public roads in a number of states.[49]

- Level 5: Level 5 vehicles have full automation in that "the automated system can perform all driving tasks, under all conditions that a human driver could perform them."[50] A human driver need never be available to either supervise or control the vehicle, and the vehicle can operate in all weather and road conditions.[51] In fact, these vehicles may have no mechanism by which a human driver could take control even if he or she wanted to do so.[52] Level 5 vehicles are still in development.

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[43] Tracy Hresko Pearl, *Hands on the Wheel: A Call for Greater Regulation of Semi-Autonomous Vehicles*, ___ IND. L.J. ____ (2018).
[44] *Id.* at _____.
[45] *See* Connor, *supra* note 17.
[46] *See* FAVP, *supra* note 31, at 9.
[47] *See* NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, *supra* note 1.
[48] *See id.*
[49] Marcus E. Johnson, *The Drive for Autonomous Vehicles: Idaho's Race to Catch Up,* 59 ADVOCATE 28, 29 (2016).
[50] *See* FAVP, *supra* note 31, at 9.
[51] *See* Pearl, *supra* note 43 at ____.
[52] *See* Justin Pritchard, *How Can People Safely Take Control From a Self-Driving Car?,* ASSOCIATED PRESS (Nov. 30, 2015), http://bigstory.ap.org/article/84c6f179beb24f758a40acac1340ce78/how-can-people-safely-take-control-self-driving-car.

As of early 2018, consumers in the United States have the option of purchasing Level 0, 1, or 2 vehicles, with Level 3 vehicles expected to come to market soon and Level 4 vehicles likely not far behind them.[53] While some commentators and journalists have asserted that Level 4 and 5 vehicles are significantly further off than we've predicted,[54] if anything, thus far, "self-driving technology has developed far faster than experts envisioned when Google started developing it in 2009."[55] This history has led a number of experts to argue that the reverse is likely true: that Level 4 and 5 vehicles will arrive on the market far *sooner* than we expect.[56] Indeed, most automotive companies who are in the process of developing Level 4 and 5 vehicles are currently predicting that their fully autonomous model will be available as soon as the end of 2018 and by 2020 at the latest.[57] Even NHTSA has said that "the rapid development of emerging automation technologies means that partially and fully automated vehicles are nearing the point at which widespread deployment is feasible."[58]

B. Consumer Adoption

While it is unclear how many Level 2 vehicles are currently on U.S. roads, as of 2018, the number is likely in the low hundreds of thousands.[59] Experts predict, however, that the number of people driving automobiles with some level of automation will likely rise sharply in the coming years.[60] A 2014 study produced by IHS Automotive, for example, projected that there will be over 50 million self-

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[53] Paul Ingrassia, *et. al*, *How Google is Shaping the Rules of the Driverless Road*, REUTERS, (Apr. 26, 2016) http://www.reuters.com/investigates/special-report/autos-driverless/.
[54] Matt Burgess, *When Does a Car Become Truly Autonomous? Levels of Self-Driving Technology Explained*, WIRED (April 21, 2017), http://www.wired.co.uk/article/autonomous-car-levels-sae-ranking.
[55] *See* Ingrassia, *supra* note 53.
[56] *See* Brad E. Haas, *Autonomous Vehicles May Impact Legal Profession*, LAWYERS JOURNAL, (October 2, 2015) ("While there remains a plethora of legal and social issues that must be dealt with in this field, many experts predict that a world of driverless vehicles may be closer than many people realize."); Patrick Linn, *The Ethics of Saving Lives With Autonomous Cars is Far Murkier Than You Think*, WIRED (Jul. 30, 2013), http://www.wired.com/2013/07/the-surprising-ethics-of-robot-cars ("We can see 'robot' or automated cars what others have called 'autonomous cars,' 'driverless cars,' etc. coming in our rear-view mirror, and they are closer than they appear.").
[57] Trefis Team, *General Motors Inching Closer to Self-Driving Cars*, FORBES (Mar. 16, 2016), http://www.forbes.com/sites/greatspeculations/2016/03/16/general-motors-inching-closer-to-self-driving-cars/#725cc71116ad.
[58] *DOT/NHTSA Policy Statement Concerning Automated Vehicles: 2016 Update,* NATIONAL HIGHWAY TRANSPORTATION SAFETY ADMINISTRATION (2016).
[59] *See* Pearl, *supra* note 43, at ____.
[60] *See* Noah Buhayar & Peter Robison, *Can the Insurance Industry Survive Driverless Cars*?, BLOOMBERG BUSINESSWEEK (July 30, 2015), http://www.bloomberg.com/news/articles/2015-07-30/can-the-insurance-industry-survive-driverless-cars-; John Villasenor, *Products Liability and Driverless Cars: Issues and Guiding Principles for Legislation*, BROOKINGS (April 2014), http://www.brookings.edu/~/media/research/files/papers/2014/04/products%20liability%20driverless%20cars%20villasenor/products_liability_and_driverless_cars.pdf.

driving cars on U.S. roads by 2035 and that "nearly all of the vehicles in use are likely to be self-driving cars or self-driving commercial vehicles sometime after 2050."[61] Another scholar posits that, ten years before that, in 2040, 75% of the vehicles on the road will be fully autonomous.[62] Other experts predict that in less than 20 years, somewhere between 25 and 75% of the vehicles sold worldwide will have "some degree of autonomous capability."[63]

While the United States will presumably reach a point, at some time decades in the future, in which every vehicle on the road has Level 5 automation, the interim years will see an interesting diversity of autonomous, semi-autonomous, and non-autonomous vehicles driving in and around each another. The reasons for this diversity of automobiles will be two-fold. First, tech companies and automobile manufacturers are developing fully automated cars at different rates. Traditional automobile manufacturers are taking what has been deemed a "gradualist" approach, increasing the level of automation in their cars somewhat slowly over time to give consumers time to adapt slowly to such changes in their vehicles.[64] Tech companies and Ford, however, are taking an "all-in" approach to automation and do not intend to release any automated vehicles until they have Level 4 or 5 autonomous capacities.[65] Autonomous vehicles ranging from Level 2s to Level 5s will thus enter the consumer market at different times and at different rates depending on their manufacturer. It is possible, therefore, that Toyota will just be releasing Level 2 or 3 models of their vehicles during the year that Ford releases Level 4 models of theirs.

Second, consumers will likely adopt autonomous vehicles at differing rates depending on some combination of (a) their level of comfort with autonomous vehicles (recent polling data shows that significant numbers of Americans have fears about the safety of driverless cars), (b) their commitment to staying behind the wheel themselves (out of fear, love of driving, resistance to change, etc.), and (c) whether they have the means to purchase a new vehicle and/or one with autonomous capacities.[66] Even now, in 2018, these forces have combined to create a diversity of vehicles on U.S. roads. Many people are still driving Level 0 cars

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[61] *See* Villasenor, *supra* note 60.
[62] Andrew R. Swanson, *"Somebody Grab the Wheel!": State Autonomous Vehicle Legislation and the Road to A National Regime*, 97 MARQ. L. REV. 1085, 1094 (2014).
[63] *Compare* Richard C. Balough, *Are Your Clients Ready for the Impact of Driverless Cars?*, AMERICAN BAR ASSOCIATION (May 2016), https://www.americanbar.org/publications/blt/2016/05/03_balough.html (projecting that 75% of all vehicles sold by 2035 will have some autonomous capability) *with* Buhayar & Robison, *supra* note 60 (projecting a 25% market share).
[64] Pearl, *supra* note 43, at _____.
[65] *Id.* at ____.
[66] *See* Tom Krishner & Justin Pritchard, *Autonomous Cars Aren't Perfect, But How Safe Must They Be*?, ASSOCIATED PRESS (Mar. 17, 2016), http://bigstory.ap.org/article/dea92cb3481247a692be3a5d99f85e23/autonomous-cars-arent-perfect-how-safe-must-they-be.

without cruise control capabilities while others have rushed to adopt newer vehicles with Level 2 capabilities, like Tesla's Model S with Autopilot[67] or Cadillac's CT6 with Super Cruise.[68] This variety of cars on the road will likely continue and intensify over the coming 10-15 years. Presumably, at some point, we will have cars of all six levels of automation on U.S. roads.

C. Advantages of Autonomous Vehicles

Autonomous vehicles offer a panoply of advantages over human-driven vehicles. Adoption of these vehicles in the United States "could translate into real-life improvements" by, among other things, "reducing the fear of car crashes, increasing productivity by relieving congestion of busy commuters, and providing continued mobility for elderly persons who would otherwise be apprehensive about their ability to drive safely."[69] They also offer improved transportation accessibility to people with disabilities,[70] will likely be far more fuel efficient than human-driven cars,[71] and could double the capacity of roads "by allowing cars to drive more safely while closer together."[72] All of these benefits have led scholars to conclude that autonomous vehicles are "posed to be the next great transformative technology," having a "significant impact on how we live, work, and use our time" while also addressing "many enduring social needs . . . ."[73]

Enhanced motor vehicle safety, however, is overwhelmingly the largest benefit that autonomous vehicles stand to offer. Former U.S. Department of Transportation Secretary Anthony Foxx, for instance, has stated that he believes consumer adoption of autonomous vehicles could "dramatically reduce injuries and fatalities, perhaps by as much as 80 percent."[74] Other experts have predicted that "if 10 percent of vehicles in use were autonomous vehicles, 1,100 fewer people would die in car accidents [per year]," and that "with 90 [percent] penetration, the United States would save 21,700 lives and have 4.2 million fewer crashes per year."[75]

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[67] *Full Self-Driving Hardware on All Cars*, TESLA, https://www.tesla.com/autopilot (last visited March 8, 2018).
[68] *Giving You the Freedom to Go Hands-Free*, CADILLAC, http://www.cadillac.com/world-of-cadillac/innovation/super-cruise (last visited March 8, 2018).
[69] Frank Douma & Sarah Aue Palodichuk, *Criminal Liability Issues Created by Autonomous Vehicles*, 52 SANTA CLARA L. REV. 1157, 1158 (2012).
[70] *See* FAVP, *supra* note 31, at 12.
[71] Bryant Walker Smith, *Managing Autonomous Transportation Demand*, 52 SANTA CLARA L. REV. 1401, 1410 (2012).
[72] *See* Markoff, *supra* note 23.
[73] Leili Fatehi & Frank Douma, *Autonomous Vehicles: The Legal and Policy Road Ahead,* 16 MINN. J.L. SCI. & TECH. 615, 617 (2015).
[74] Pete Bigelow, *Anthony Foxx: Coolness Aside, Self-Driving Focus Should Be on Safety*, CAR AND DRIVER, https://blog.caranddriver.com/anthony-foxx-coolness-aside-self-driving-focus-should-be-on-safety/.
[75] Jeffrey K. Gurney, *Driving into the Unknown: Examining the Crossroads of Criminal Law and Autonomous Vehicles*, 5 WAKE FOREST J.L. & POL'Y 393, 402 (2015).

These predictions are stunning and significant, particularly in light of how many deaths and injuries motor vehicle accidents cause in the United States each year.

In 2015, more than 35,000 people were killed, and over 2.4 million people were injured on U.S. roads.[76] The number of traffic accident fatalities rose in 2016 to over 37,400,[77] one of the largest upticks in almost fifty years.[78] The cost of these traffic accidents to the U.S. economy is staggering: more than $240 billion per year.[79] Those numbers are almost entirely our fault. Research studies consistently conclude that human drivers are, by far, the leading cause of traffic accidents, accounting for nearly 94% of them.[80] The reasons are varied. Drunk driving accounts for over 30% of all motor vehicle fatalities.[81] Distracted driving is also a significant problem, accounting for 10% of motor vehicle fatalities.[82] As I have noted in previous work, one study revealed that seven in ten American drivers said "that as a result of being distracted while driving, they have slammed their brakes or swerved to avoid an accident, missed a traffic signal, or actually caused an accident."[83] Beyond drunk and distracted driving, human drivers can also cause accidents due to "inadequate surveillance, excessive speed, incorrect assumptions, misjudgments, illegal maneuvers, overcompensation, poor directional control, and simply falling asleep."[84]

Autonomous vehicles, by their very nature, can eliminate nearly all of those causes of motor vehicle accidents. They can't drive drunk, distracted, or drowsy.[85] They can also process far more data far more quickly than a human driver. One journalist explains:

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[76] *National Statistics*, NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, https://cdan.nhtsa.gov/tsftables/National%20Statistics.pdf (last visited March 8, 2018)[hereinafter NHTSA Statistics].
[77] *Id.*
[78] Peter Kurdock, *Statement From NHTSA Public Meeting on Federal Automated Vehicles Policy*, ADVOCATES FOR HIGHWAY & AUTO SAFETY (November 10, 2016), http://saferoads.org/2016/11/10/2182/.
[79] *2014 Crash Data Key Findings*, U.S. DEPARTMENT OF TRANSPORTATION- NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION (November 2015), https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812219 [hereinafter NHTSA CRASH DATA].
[80] Carrie Schroll, *Splitting the Bill: Creating A National Car Insurance Fund to Pay for Accidents in Autonomous Vehicles,* 109 NW. U. L. REV. 803, 805 (2015).
[81] *See* NHTSA CRASH DATA, *supra* note 79.
[82] *See id.*
[83] *New Allstate Survey Shows Americans Think They are Great Drivers – Habits Tell a Different Story*, ALLSTATE INSURANCE COMPANY (Aug. 2, 2011), https://prnewswire.com/news-releases/new-allstate-survey-shows-americans-think-they-are-great-drivers---habits-tell-a-different-story-126563103.
[84] *See* Smith, *supra* note 71, at 12.
[85] Burkhard Bilger, *Auto Correct: Has the Self-Driving Car at Last Arrived?*, NEW YORKER (Nov. 25, 2013), http:// www.newyorker.com/magazine/2013/11/25/auto-correct.

> I don't care how good of a driver you are (or you think you are): [an autonomous] car, being for all practical purposes a robot, can digest a huge amount of data and make a decision about the best course of action to take in approximately the same amount of time it takes for you to move your foot from the gas to the brake. Our brains just don't work fast enough to keep up, and if something goes wrong, your car will be vastly better than you are at keeping you (and your passengers) from harm.[86]

Indeed, the Level 4 autonomous vehicle that Google has been testing has a laser on its roof with 64 beams that spin around ten times per second, "scanning 1.3 million points in concentric waves that begin eight feet from the car."[87] These lasers can spot a fourteen-inch object from roughly 160 feet away.[88] Humans, by contrast, have significantly more limited powers of vision and perception and have significantly slower reaction times.

Additionally, both (a) motor vehicles law and regulations and (b) market demand will almost certainly require that fully autonomous Level 4 or 5 vehicles be significantly safer than human-driven ones *before* they can come to market. As one scholar predicts:

> Safer performance is likely to be a social if not a legal prerequisite to market introduction. In informal comments, NHTSA's administrator has suggested that automated driving should be at least twice as safe as conventional driving . . . If these sentiments reflect the eventual expectations of regulators, developers, and consumers, then automated driving will not be a commercial reality unless and until it is in fact safer than conventional driving.[89]

In the meantime, humans, as a group, are unlikely to get any better at driving (and recent motor vehicle crash data suggests they may be getting worse). Thus, any significant improvements in the safety of Level 0 or 1 vehicles will almost certainly not offset the safety gains offered by Level 4 or 5 autonomous vehicles.

In short, highly automated vehicles stand to "drastically reduce the carnage of road accidents and the colossal medical costs associated with them."[90] Reducing the number of motor vehicle crashes will, in turn, relieve "the enormous emotional toll on families" and lessen "related societal costs—lives lost, hospital stays, days of work missed, and property damage—that total in the hundreds of billions of dollars each year."[91] These overwhelming safety gains, combined with the other benefits

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[86] Evan Ackerman, *Study: Intelligent Cars Could Boost Highway Capacity by 273%, IEEE Spectrum* (June 8, 2016, 10:03 EST), http:// spectrum.ieee.org/automaton/robotics/artificial-intelligence/intelligent-cars-could-boost-highway-capacity-by-273.
[87] *See* Bilger, *supra* note 85.
[88] *Id.*
[89] *See* Bryant Walker Smith, *Automated Driving and Product Liability*, 2017 MICH. ST. L. REV. 1, 15 (2017)
[90] *Look, No Hands*," THE ECONOMIST (Sept. 1, 2012), https://www.economis.com/news/special-report/21576224-one-day-every-car-may-come-invisible-chauffeur-look-no-hands.
[91] *See* NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION, *supra* note 1.

offered by autonomous vehicles discussed above, should be at the forefront of public consciousness when contemplating whether and how to introduce and integrate highly autonomous vehicles onto U.S. roads. The stakes are exceptionally high: poorly regulating and/or mishandling the transition from human-driven vehicles to autonomous ones carries with it the risk of reducing the number of lives saved by these vehicles.

D. Risks Associated with Autonomous Vehicles

In addition to the significant benefits they offer with regard to safety, productivity, and accessibility, autonomous vehicles also bring with them a number of risks. Some of these risks only pertain to certain levels of automation, while others are of concern at all levels. Acknowledging all of these risks, however, is a critical step in designing laws, regulations, and compensation systems in and around the use of these vehicles and in promoting innovation and motor vehicle safety. Three risks, in particular, are worth noting.

First, as I have written about at length in my earlier work, Level 2 and 3 vehicles (often referred to as "semi-autonomous" vehicles) depend on human supervision and/or human intervention in ways that are highly troubling and likely unreliable. To wit:

> Despite the fact that semi-autonomous vehicles rely on continuous human supervision to operate safely, a growing body of research demonstrates the drivers of Level 2 vehicles are prone to distraction. In at least one instance, this has had deadly consequences. Furthermore, an even more troubling set of studies suggests that both drivers and sellers of Level 2 vehicles do not have a strong understanding of the limitations of the semi-autonomous features of their cars and are thus at risk of failing to intervene and retake control of the vehicle when necessary.[92]

Level 3 vehicles are likely to present much the same problem when they become available to consumers: they will rely on human drivers to retake control in certain scenarios, but it is questionable how safely and effectively human drivers will be able to do so given their tendency to become distracted while driving semi-autonomous vehicles.[93] This issue is so significant that some autonomous vehicle manufacturers have chosen to forego development of Level 2 and 3 vehicles entirely in favor of Level 4 and 5 vehicles that they believe will be safer.[94] Both Ford and Google, for instance, do not believe a "quick handoff from machine to human is feasible" and thus have focused their development efforts on more heavily automated vehicles.[95]

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[92] Pearl, *supra* note 43, at ____.
[93] Noah J. Goodall, *Machine Ethics & Automated Vehicles*, ROAD VEHICLE AUTOMATION (2014), http://people.virginia.edu/~njg2q/machineethics.pdf.
[94] Alex Davies, *Ford's Skipping the Trickiest Thing About Self-Driving Cars*, WIRED (Nov. 10, 2015), https://www.wired.com/2015/11/ford-self-driving-car-plan-google/.
[95] *See* Ingrassia, *supra* note 53.

Second, although autonomous vehicles may significantly reduce accidents caused by human driver error, "faulty technology or errors in the computer software [of these vehicles] may cause many accidents."[96] Two scholars explain:

> Serious accidents could be caused by glitches, viruses, network failures, and programming errors that commonly afflict computer-run devices. This danger is very real; car manufacturer Toyota recently settled a class action lawsuit stemming from personal injuries and property damages caused by the malfunction of autonomous acceleration systems in certain models that caused the cars to rapidly and uncontrollably accelerate and crash. While these cars were not completely autonomous, these lawsuits serve as a harbinger of the types of computer problems and injuries that can occur with autonomous cars.[97]

Another scholar states more succinctly, "surprises abound on roads as well as in software."[98] While automation-related glitches are not novel, in Level 1 or 2 vehicles, human drivers have at least some chance of intervening successfully before an accident happens if a software malfunction of, for example, the cruise control system, occurs.[99] In Level 4 or 5 vehicles, human drivers may not have not that opportunity. Google's Level 4 prototype, for instance, lacks a steering wheel and pedals.[100] For highly automated vehicles, therefore, software reliability is much more deeply intertwined with the safety of the vehicle than it is for low- or no-autonomy vehicles.

Third, scholars, journalists, and policymakers have raised concerns about third parties hacking into the computer systems of autonomous vehicles, assuming control, and then using the vehicles to achieve nefarious or even deadly purposes.[101] Unfortunately, there is already precedent for such activity:

> In July of 2015, a hacker by the name of Samy Kamkar demonstrated for *Wired* magazine how a $100 device of his own devising could hack any of the automated features of the GM OnStar system. Controlling it through an iOS or Android smart phone app called "GM RemoteLink," he was able to access the car's controls, including locating the vehicle, unlocking it, and starting its ignition . . . With [numerous] automakers developing various levels of autonomous vehicles, and with some autonomous driver assistance systems already having reached the roadways such as BMW's ConnectedDrive, it is an easy second step to start taking control of the systems from similar wireless hacks. While GM, and others, have already shored

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[96] Colonna, *supra* note 19, at 116.
[97] *See* Duffy & Hopkins, *supra* note 19, at 116.
[98] *See* Smith, *supra* note 89, at 18.
[99] *See State v. Baker*, 571 P.2d 65, 69 (Kan. Ct. App. 1977); State v. Packin, 257 A.2d 120, 120 (N.J. Sup. 1969).
[100] *See* Pritchard, *supra* note 52.
[101] *See, e.g.*, Smith, *supra* note 89, at 19; Levy, *supra* note 19, at 385-86; *Self-Driving Car Guidelines: Not Enough Protection for Consumers*, CONSUMER REPORTS (Sept. 20, 2016), http://www.consumerreports.org/self-driving-cars/self-driving-car-guidelines-not-enough-protection-for-consumers/; Douma & Palodichuk, *supra* note 69, at 1164.

> up various flaws in their system, the inventiveness of hackers has proven that even the best defenses are accessible over time.[102]

However, fears about hacking may be "overblown," according to other scholars who point out that "car hacking is already possible for the vast majority of cars on the roads today."[103] Additionally, both manufacturers (which have "powerful reputation incentives at stake here") and engineers are actively working to eliminate security vulnerabilities in autonomous vehicles,[104] and NHTSA "has initiated research on vehicle cybersecurity, with the goal of developing an initial baseline set of requirements."[105] While hacking is at least a potential risk for automated vehicles, therefore, it appears to be a somewhat unlikely one.

Autonomous vehicles thus stand to offer significant benefits to U.S. citizens and to introduce new and heightened forms of risk onto U.S. roadways. On balance, however, most scholars appear to agree that the "substantial social utility of autonomous cars" outweighs those risks.[106] If so, law and policymakers are faced with a high stakes quandary: how to regulate autonomous vehicle technology in a "safe, efficient, and timely manner" to address the risks that it poses while also promoting its development and adoption by consumers.[107] Moreover, they must address this technology extraordinarily quickly given its rate of development or risk "slower adoption of the systems, which could lead to crash injuries that could have been prevented . . . ."[108]

II. Liability & Compensation Models

One of the most significant questions that must be addressed by law- and policymakers is the avenue and jurisprudence through which victims of autonomous vehicle crashes should be compensated.[109] Indeed, since current laws and regulations surrounding automobile accident liability assume that a human driver was in control of the vehicle at the time of the accident, "existing laws do not directly address the determination of liability in a collision involving an autonomous car."[110] While, "existing vehicle and computer laws contain *some* legal tenants that can be applied . . . ."[111] they "do not provide courts with a comprehensive body of law to determine and assess liability."[112]

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[102] *See* Levy, *supra* note 19, at 385-86.
[103] Adam Thierer & Ryan Hagemann, *Removing Roadblocks to Intelligent Vehicles and Driverless Cars*, 5 Wake Forest J.L. & Pol'y 339, 375 (2015).
[104] *Id. at 377.*
[105] *See* National Highway Traffic Safety Administration, *supra* note 1, at 12-13.
[106] *See* Colonna, *supra* note 19, at 84.
[107] *See* Swanson, *supra* note 62, at 1096.
[108] *See* Smith, *supra* note 89, at 6.
[109] *See* Katyal, *supra* note 19, at 1689.
[110] *Id.*
[111] *See* Duffy & Hopkins, *supra* note 19, at 454-55.
[112] *Id.*

Members of the general public, however, are focused on who will be held liable if and when autonomous vehicles cause injuries and wonder about "how the law can bring order to an uncertain future."[113] The early assumptions seem to be that the injured parties will be in an adverse posture to the developers and manufacturers of the autonomous technology and that this conflict will play out via traditional products liability litigation:

> [I]f the human variable [is] completely removed and [a] car's autonomous technology cause[s] the crash, the injured person would sue the developer or manufacturer of the technology on a products or strict liability theory. As a result, autonomous car and technology manufacturers will be responsible for more claims under products and strict liability. As with other developing technologies, there will be technical issues that need to be addressed. The technology will inevitably cause accidents. Based on how courts currently analyze analogous autonomous technologies, it is reasonable to anticipate that courts will apply products and strict liability to the manufacturers of autonomous cars when the car is the sole cause of damage.[114]

However, given the relatively underdeveloped state of the jurisprudence surrounding liability for autonomous technologies, and the fact that autonomous vehicle cases have not yet begun arising with any regularity, it would be unwise to allow these assumptions to circumscribe the options that we contemplate as we prepare for these cases. Instead, we should give careful thought to all viable options, and choose the avenue best suited to balance both the needs of victims for compensation and the need to promote innovation and adoption of this technology.

In designing and establishing a route through which victims of autonomous vehicle crashes could obtain compensation, the two most basic options are (1) require victims to file traditional lawsuits via the civil justice system, and/or (2) give victims the option of pursuing relief via an alternative compensation scheme. Stated in the most simplified way possible, these options are, essentially, "tort system" and "not tort system." Though the "not tort system" option may seem virtually limitless, the reality is that, in the United States, this option has typically meant a victim compensation fund of some sort (although, as explained at length below, those funds have varied in type and form). Both options—the traditional tort system and a victim compensation fund approach—have advantages and drawbacks.

A. The Tort System

The structure and inner workings of the American tort system should be familiar to anyone with legal training. Its fundamental purposes are to compensate innocent parties, shift the loss to responsible parties, and deter wrongful conduct that creates an unreasonable risk of injury to others.[115] In short, tort law is a way

[113] *See* Smith, *supra* note 89, at 3.
[114] *See* Colonna, *supra* note 19, at 117; *see also* Smith, *supra* note 89, at 71.
[115] Purpose and Aims of Tort Law, 1 AMERICAN LAW OF TORTS § 1:3.

for an injured person to attempt to shift the cost of harm to another person or entity who has erred in some legally cognizable way.[116] Tort liability may be rooted in intentional conduct, negligent conduct, or strict liability.[117]

A plaintiff, or injured party, initiates a civil tort action by filing a complaint that states a cause of action with a court of jurisdiction.[118] The complaint must request relief or damages from the defendant, and outline the legal and factual reasons why the defendant is responsible for the plaintiff's injury.[119] After service of process, the defendant has a specified time in which to answer the lawsuit.[120] Once the complaint and answer have been filed with the court, attorneys for both sides may consider filing motions to dismiss.[121] The parties then begin the discovery process, during which they exchange information and documents related to the claims made in the complaint and defenses asserted in the answer.[122]

The few tort actions that are not resolved prior to trial are commonly tried before juries which constitute the fact finders. At trial, the plaintiff presents evidence first, and then the defendant has an opportunity to offer any evidence it wishes to present.[123] The plaintiff has the burden of proving his or her case by a preponderance of the evidence, meaning that it is more likely than not that the plaintiff's claims are true.[124] Once both sides have presented their case, the judge or jury decides the outcome.[125] If the judge enters a judgment in favor of the defendant, the defendant is released from liability for the plaintiff's claims, and the plaintiff receives no compensation.[126] If the judge or jury finds for the plaintiff, the defendant is found to be liable and the court will award damages and/or some other form of restitution.[127] If the losing party believes the outcome was legally incorrect, they may file an appeal.[128] An appellate court may dismiss the appeal, hear and affirm the judgment, reverse it, or send it back to the trial court with instructions to correct legal errors.[129]

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[116] Eric Baime, *Fundamentals of Tort Law*, NATIONAL JURIS UNIVERSITY https://nationalparalegal.edu/FundamentalsTortLaw.aspx (last visited Feb. 9, 2018).
[117] *Id.*
[118] 4 Fed. Prac. & Proc. Civ. CIV Rule 3 (4th ed. 2017).
[119] 4 Fed. Prac. & Proc. Civ. § 1052 (4th ed. 2017).
[120] 4 Fed. Prac. & Proc. Civ. CIV Rule 4 (4th ed. 2017).
[121] 5 Fed. Prac. & Proc. Civ. § 1190 (3d ed. 2017).
[122] 8 Fed. Prac. & Proc. Civ. CIV Rule 26 (3d ed. 2017).
[123] 20 Fed. Prac. & Proc. Deskbook § 99.
[124] RESTATEMENT (SECOND) OF TORTS § 433B (AM. LAW INST. 2017).
[125] 10 Fed. Prac. & Proc. Civ. § 2651 (3d ed. 2017).
[126] 11 Fed. Prac. & Proc. Civ. § 2781 (3d ed. 2017).
[127] 10 Fed. Prac. & Proc. Civ. § 2651 (3d ed. 2017).
[128] Fed. R. App. P. 3. 21; Fed. R. App. P. 36.
[129] Fed. R. App. P. 36.

1. Advantages of the Tort System

The tort system has two primary advantages over victim compensation funds. First, unlike victim compensation funds, the civil justice system in which tort claims are litigated is both a well-established and highly stable institution.[130] As one scholar notes, despite the fact that technology has changed over time, the civil justice system at the federal, state, and local levels has been handling tort claims successfully "for more than two centuries."[131] Citizens thus presumably have some understanding of, if not how it operates precisely, its existence and the most basic aspects of its inner workings.[132] The system does not need to undergo any institutional or procedural changes to accommodate autonomous vehicle crash cases, although, as noted below, there may be other significant issues.

Second, while scholars debate whether it would be inapposite in autonomous vehicle crash cases, a robust body of products liability jurisprudence already exists in the United States and could potentially provide an avenue of compensation for autonomous vehicle crash victims.[133] Products liability dates back to Roman times and is "a specialized area of law that imposes liability upon manufacturers or suppliers of goods."[134] Manufacturers can be liable for manufacturing defects (where a product deviates from its intended design), design defects (where a safer and cost-effective design alternative exists), and warning defects (where the manufacturer has failed to provide information that consumers need to use the product safety).[135]

While, in theory, products liability law should "deter manufacturers from selling products that are not reasonably safe without deterring these manufacturers from selling useful products that *are* reasonably safe . . . [t]he regime's actual impacts on safety and innovation, unfortunately are unclear and contested."[136] On the one hand, the potential of having to pay damages as a result of a successful products liability claim may incentivize manufactures and designers "to ensure that [autonomous vehicle systems] are responsibly deployed and continually improved."[137] On the other, products liability claims may mean that "manufacturers of autonomous technology and cars [may] incur more liability than they are currently accustomed," and thus that "some form of mitigation may be necessary in

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[130] F. Patrick Hubbard, *"Sophisticated Robots": Balancing Liability, Regulation, and Innovation,* 66 FLA. L. REV. 1803, 1811–12 (2014).
[131] *Id.*
[132] Ralph Nader, *Tort Law: The Muscle of Justice*, HUFFINGTON POST (February 2, 2015), https://www.huffingtonpost.com/ralph-nader/tort-law-the-muscle-of-ju_b_6598538.html.
[133] *See* Smith, *supra* note 89, at 4-5; Orly Ravid, *Don't Sue Me, I Was Just Lawfully Texting & Drunk When My Autonomous Car Crashed into You*, 44 SW. L. REV. 175, 199 (2014).
[134] *See* Colonna, *supra* note 19, at 105.
[135] *Id.* at 105-07.
[136] *See* Smith, *supra* note 89, at 4-5.
[137] *Id.*

order to prevent the exposure to liability from driving manufacturers out of the market entirely.[138]

2. Drawbacks of the Tort System

The drawbacks of the tort system in the context of autonomous vehicle crash cases appear to be more significant than the advantages. First, litigating a case in the civil justice system is typically an expensive, time-consuming, and unpredictable process. In recent years, the civil justice system has experienced an increase in the number of cases filed while simultaneously growing "at too slow a rate to keep up with this increase."[139] This failure to increase the size of the system to accommodate the influx of cases has meant that the system "has lost its ability to adequately handle and resolve these disputes in a timely and reasonable manner."[140] Additionally, the cost of these lawsuits is often excessive:

> [L]awsuits cost a lot of money (figures vary based on complexity of the case); even if costs are not out-of-pocket for plaintiffs, but recoupable after a win, plaintiffs often only recover half of the sums paid by the defendant. It is common knowledge that plaintiffs sometimes recover even less, such as forty or thirty percent. This seems a gratuitous price for injured plaintiffs to pay . . . .[141]

These issues are likely to be particularly acute in autonomous vehicle crash cases given the novelty of these issues and the complexity of the discovery that will almost certainly need to take place when litigating these cases.

Second, as alluded to above, while a robust body of products liability jurisprudence and tort law may already exist, cases involving autonomous vehicles—and, indeed, nearly all other forms of automated or artificial intelligence-governed consumer goods—raise novel questions of liability and fault that these sources of law may not be well-equipped to handle.[142] As one scholar points out, "the current legal system logically aligns with the cause of most accidents: human error."[143] This is particularly true of motor vehicle laws, nearly all of which presume that a human being is the driver.[144] Liability regimes will thus have to change fairly significantly to accommodate the realities of this type of technology.[145] Even the most basic issues will need careful thought:

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[138] *See* Colonna, *supra* note 19, at 117.
[139] Michael Tsur, *ADR - Appropriate Disaster Recovery*, 9 CARDOZO J. CONFLICT RESOL. 371, 372 (2008).
[140] *Id.*
[141] Ravid, *supra* note 133, at 200.
[142] *See* Smith, *supra* note 89, at 2; Gurney, *supra* note 75, at 442; Douma & Palodichuk, *supra* note 69, at 1158.
[143] *See* Schroll, *supra* note 80, at 812.
[144] *See* Markoff, *supra* note 23.
[145] *See* Douma & Palodichuk, *supra* note 69, at 1158.

> The major problem with autonomous vehicles is that it is unclear who, if anyone, is actually involved with the "driving." If no one is driving the vehicle, who should bear ultimate responsibility if something goes wrong? Is the "driver" of an autonomous vehicle like the engineer of a train or pilot of an aircraft on "autopilot," or is she simply the passenger, with little or no control of the vehicle's behavior?[146]

Even if the legal system feels comfortable placing liability on manufacturers or programmers rather than human users of autonomous vehicles, the complexity of these vehicles means that courts will still have difficult questions to answer:

> What if the autonomous or semi-autonomous vehicle is a Mercedes-Benz using a hypothetical Google geolocation product and it crashes into a barrier while headed for an off-ramp because it misjudged its location? Is fault attributed to Mercedes (acting on the information), or Google (providing the information), or the driver for not correcting for the error?[147]

Thus, even if products liability and other types of tort law can adapt to this technology successfully—and there are many reasons to feel confident that they eventually will—making these changes will likely take decades of careful thought, deliberation, and experimentation.[148] In the meantime, as the technology outpaces the jurisprudence, years of uncertainty and problematic or nonsensical verdicts are likely to be side effects of this process.[149]

Third, exposure to product liability "always looms as an obstacle to innovation in the auto industry."[150] If manufacturers of autonomous vehicles face ongoing litigation from disgruntled consumers, are compelled to pay to defend against these claims, and, in some percentage of those cases, pay money damages, manufacturers could pass those costs on to consumers via higher prices for their vehicles.[151] This, in turn, "could lead to slower adoption of these systems, which could lead to crash injuries that could have been prevented by these systems."[152] Even "liability uncertainty . . . lack of confidence about the actual product liability costs that a company will incur" can create significant issues.[153] One scholar explains:

> If an automated driving developer is unable to confidently predict its liability costs, it may either delay deployment of its system or conservatively price that system to account for the possibility of high liability costs. Similarly, insurers may decline to

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[146] *Id.* at 1160.
[147] Tom Vanderbilt, *Navigating the Legality of Autonomous Vehicles,* WIRED (Feb. 7, 2012), http://www.wired.com/2012/02/autonomous-vehicle-legality/.
[148] *See* Levy, *supra* note 19, at 358-59.
[149] *See* Markoff, *supra* note 23.
[150] *See* Vanderbilt, *supra* note 147.
[151] *See* Smith, *supra* note 89, at 6.
[152] *Id.*
[153] *Id.*

> cover that developer or the would-be buyers of its system, or they may demand higher premiums to do so.[154]

In those situations, the same set of consequences could occur: slower adoption of autonomous vehicles and preventable crash injuries.[155] In theory, significant exposure to liability could also stall the market almost entirely, a situation that has happened before in other markets as discussed below.[156]

Thus, while the tort system is well-established, stable, and has a highly-developed body of law that could be adapted to autonomous vehicle crash cases, the tort system is likely to experience significant growing pains in adapting to these cases. These changes will introduce uncertainty and liability exposure to an industry that is still largely in its early stages. This uncertainty may slow down innovation and consumer adoption of this technology. In sum:

> While products and strict liability will not act as an impregnable barrier to entry, it will probably hinder the introduction of autonomous cars into the marketplace. And while autonomous cars will eliminate many tort claims against drivers due to their increased safety and efficiency, the number of products and strict liability claims against the manufacturers of autonomous cars likely will increase upon introducing autonomous cars into the marketplace.[157]

If this is true, the tort system may not, in fact, be the best vehicle for compensating victims of autonomous crash cases, and other compensation schemes are worth exploring.

B. Victim Compensation Funds

Victim compensation funds are fairly new innovations in the American legal system.[158] Historically, "dispute resolution was primarily handled by the sovereign legal system, be it local, municipal, regional, national, federal, or international . . . ."[159] In the twentieth century, however, various governmental entities sought alternatives to litigation in a variety of fairly discrete situations, hoping to prevent an influx of a particular type of cases into the court system, to prop up failing industries, or to give victims a quicker and less adversarial process by which to obtain compensation for their injuries. Victim compensation funds were often the alternative selected. While these funds have had varying levels of success, they

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[154] *Id.*
[155] *Id.*
[156] *See National Vaccine Injury Compensation Program*, HEALTH RES. & SERVS. ADMIN., https://www.hrsa.gov/vaccine-compensation/index.html (last visited February 13, 2018).
[157] *See* Colonna, *supra* note 19, at 114.
[158] Tsur, *supra* note 139, at 371.
[159] *Id.*

have been used with increasing frequency, particularly in post-disaster situations.[160]

Victim compensation funds exist in parallel to the tort system.[161] They typically offer victims a fairly quick guaranteed payout from a fund established to compensate victims of a particular type in exchange for a waiver of the right to pursue litigation.[162] Given that litigation can be complex and expensive, and that the results of litigation are uncertain, this option can be incredibly appealing.[163]

Indeed, research reveals that the existence of a victim compensation fund can play an important role in shaping victim decisions about whether to pursue litigation in the wake of a tragedy.[164] In particular, research shows that litigation is less likely in situations in which a fund offers an alternative pathway to receiving compensation, but that some portion of the victim population will still opt to pursue conventional lawsuits.[165] The number of victims willing to opt into a fund appears to be closely tied, not surprisingly, to the amount of compensation being offered by the fund and how closely that amount mirrors the amount of compensation that would be available to the victim if they brought suit in the tort system and won.[166]

Although scholars still debate the relative merits of victim compensations funds *vis-a-vis* the tort system, the popularity of these funds in recent years suggests that they are likely to remain an appealing option when responding to large scale disasters and mass tort situations.[167] These funds, however, will never entirely replace the tort system and may not be appropriate responses to particular types of incidents or injuries.[168] A brief analysis of their major advantages and drawbacks—with the caveat that there is significant variation in these funds and thus that these issues may be stronger or weaker in *particular* funds—reveals why.

1. Advantages of Victim Compensation Funds

The primary advantages of victim compensation funds over the tort system are three-fold. First, victim compensation funds offer significantly more flexibility than the tort system because they can be tailored to the particular needs of a given

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[160] Joan Flocks, James Davies, *The Deepwater Horizon Disaster Compensation Process As Corrective Justice: Views from the Ground Up*, 84 MISS. L.J. 1, 37 (2014).
[161] Paul Heaton et al., *Victim Compensation Funds and Tort Litigation Following Incidents of Mass Violence,* 63 BUFF. L. REV. 1263, 1264 (2015).
[162] Gillian K. Hadfield, *Framing the Choice Between Cash and the Courthouse: Experiences with the 9/11 Victim Compensation Fund*, 42 LAW & SOC'Y REV. 645, 646 (2008).
[163] *Id.* at 645.
[164] Heaton, *supra* note 161, at 1265-66.
[165] *Id.* at 1265-66.
[166] *Id.* at 1279-81.
[167] *Id.* at 1263.
[168] *Id.*

set of cases.[169] In fact, several scholars have noted that "flexibility and the ability to tailor the variables to address the particular situation" are the keys to forming a successful and appealing fund.[170] Fund administrators may decide, among other things, to what extent they will or will not be guided by statutory provisions that would otherwise apply in the tort system, the process by which victims have to request compensation, what equations and factors will be utilized and considered in determining compensation awards, and whether compensation decisions are appealable (and, if so, to whom those decisions should be appealed).[171] This flexibility, in turn, can reduce the cost and burden placed on both victims and administrators in submitting and evaluating claims.

Second, victim compensation funds are typically faster and more efficient than the tort system. The victim compensation fund created in the wake of the 2007 Minnesota I-35W bridge collapse disaster, for example, guaranteed that all claims would "be decided upon and distributed within 120 days of being filed. This was *years* faster than the time required to litigate a claim to its conclusion through the tort system."[172] The speed of the process also guaranteed "that any award would be received by the victims quickly, alleviating the time and worry of trying to collect a judgment through the tort system."[173] Victim compensation funds can operate with such expediency for several reasons:

> By aggregating cases, [victim compensation funds] can compensate huge numbers of claimants more quickly than the tort system. Litigation tends to move more slowly. The process of developing the case and scheduling hearings and trials in courts with crowded dockets may result in a multi-year process (not including appeals). An administrative system, on the other hand, may be able to develop a compensation program in a matter of weeks. While it may take a significant amount of time for parties to develop the criteria and guidelines for an administrative program, once the program is established, the claims facility should be able to evaluate thousands or tens of thousands of claims in a matter of months.[174]

While some victim compensation funds may have operated more slowly than others, even the "slower" compensation funds appear to have operated faster than the tort system. Many claimants, for example, complained about "long delays" in the Deepwater Horizon Disaster Oil Spill Trust, a victim compensation fund established

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[169] Francis E. McGovern, *The What and Why of Claims Resolution Facilities*, 57 STAN. L. REV. 1361, 1375 (2005).
[170] Flocks & Davies, *supra* note 160, at 37.
[171] *See* George W. Conk, *Diving into the Wreck: BP and Kenneth Feinberg's Gulf Coast Gambit*, 17 ROGER WILLIAMS U. L. REV. 137, 156 (2012).
[172] Mike Steenson & Joseph Michael Sayler, *The Legacy of the 9/11 Fund and the Minnesota I-35W Bridge-Collapse Fund: Creating A Template for Compensating Victims of Future Mass-Tort Catastrophes*, 35 WM. MITCHELL L. REV. 524, 544 (2009).
[173] *Id.*
[174] Deborah E. Greenspan & Matthew A. Neuburger, *Settle or Sue? The Use and Structure of Alternative Compensation Programs in the Mass Claims Context*, 17 ROGER WILLIAMS U. L. REV. 97, 110 (2012)

in the wake of the catastrophic 2010 oil spill in the Gulf of Mexico.[175] Those "delays," however, amounted to mere months, rather than the years it would likely take to litigate such claims in the tort system.[176]

Third, victims who file claims with victim compensation funds typically encounter fewer costs than those who choose to litigate their claims in the tort system. For instance, the September 11th Victim Compensation Fund almost entirely eliminated any costs associated with filing a claim:

> While fees for any legal matter can be extremely costly, these costs were largely absent for claimants entering the [September 11th] Fund, thereby, making it a much more attractive alternative than the tort system. The Fund was constructed so that claimants would have little trouble representing themselves *pro se*. But, if claimants wanted assistance, it was provided *pro bono* or at greatly reduced rates.[177]

By drastically reducing—if not outright eliminating—the need for claimants to pay attorneys fees and court costs, victim compensation funds can ensure that more money winds up in the pockets of victims.[178]

2. Disadvantages of Victim Compensation Funds

The major disadvantages of victim compensation funds are three-fold. First, unlike the tort system, which is well-established, victim compensation funds must be created anew each time they are utilized.[179] While new funds can certainly be modeled on prior or preexisting funds, unique disasters and novel situations require creating new funds without much of a blueprint.[180] In these situations, funds—and their structures, operating procedures, and policies—must be created largely from scratch, an enormous and time-consuming task. Additionally, even in situations in which there *are* helpful precedents for a new fund, each new fund must be funded, staffed, advertised to victims, and housed, all of which can take significant time, expense, and effort. When smaller, but important, administrative obligations are added to the list—determining whether and how document retention will occur, creating computer networks, developing and implementing confidentiality policies, etc.—the burden of creating a new fund can begin to seem overwhelming, particularly when compared to the fairly low administrative costs of filing a lawsuit in the tort system.

Second, victim compensation funds may undermine transparency. Because these funds typically utilize a non-adversarial, non-public approach to

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[175] Flocks & Davies, *supra* note 160, at 26–27.
[176] *Id.*
[177] Steenson & Sayler, *supra* note 172, at 548.
[178] Patrick Hall, *The Return of King Solomon: The Gulf Coast Claims Facility from the Perspective of the 9/11 Fund*, 1 ARIZ. J. ENVTL. L. & POL'Y 1, 1 (2010).
[179] *See* Steenson & Sayler, *supra* note 172, at 531.
[180] *Id.*

compensating victims, those victims are unable to pursue discovery and/or air issues in a public forum. For example:

> After the terrorist attacks of September 11, 2001, scores of victims' family members decided to pursue lawsuits in federal court, bypassing a dedicated compensation fund in order to seek not only millions of dollars in damages, but also answers and accountability. Many had wanted to compel a public soul-searching, and to have the airlines and others reveal in court how their policies and actions might have allowed 19 armed hijackers to pass through airport security, board planes and carry out the attacks.[181]

The victim compensation fund that had been established had no mechanism for victims to pursue and obtain this information, or to bring it to public attention even if they had.[182] In fairness to victim compensation funds, however, pursuing litigation in the tort system is no guarantee that this will occur, either. In the September 11th lawsuits discussed above, almost all of the victims settled, thus losing the opportunity to promote the accountability of the airlines in a public setting.[183]

Third, victim compensation funds typically do not provide a public forum in which victims can air grievances, an issue that is often extremely important to victims.[184] One scholar, describing the September 11th Victim Compensation Fund's failure to give claimants more of an opportunity to speak, explains:

> A benefit of hearing and one of the key reasons they encourage people to feel fairly treated is that they offer participants what social scientists call "voice" . . . When people are allowed voice—when they can speak up and are listened to—they tend to react positively . . . Voice is so important that it can powerfully influence satisfaction in a positive direction even in situations in which claimants are not allowed to speak until after a decision has been made. The September 11th Fund regulations make virtually no allowance for voice. Efficient paper processes that avoid hearings are at the heart of the machinery. No one is instructed to take the time to listen to the victims. No time is set aside for stories of loss or the value of what is gone.[185]

By focusing almost exclusively on providing victims with compensation, funds thus often overlook something that may be similarly important to them: the opportunity to be heard. The tort system, in contrast, can and often does provide victims that opportunity via the filing of motions, the taking and giving of depositions, and the

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[181] Benjamin Weiser, *Judge in 9/11 Suits Feels No Regret That None Ever Went to Trial*, NY Times, NY TIMES (Sept. 9, 2016), https://www.nytimes.com/2016/09/10/nyregion/judge-in-9-11-suits-feels-no-regret-that-none-ever-went-to-trial.html.
[182] *See id.*
[183] *Id.*
[184] *See* Tracy Hresko, *Restoration and Relief: Procedural Justice and the September 11th Victim Compensation Fund*, 42 GONZ. L. REV. 95, 131 (2007).
[185] Stephan Landsman, *A Chance to Be Heard: Thoughts About Schedules, Caps, and Collateral Source Deductions in the September 11th Victim Compensation Fund*, 53 DEPAUL L. REV. 393, 409-10 (2003).

ability to testify in open court both during trial and, if successful, during the remedies phase of the litigation.

C. Finding a Venue for Autonomous Vehicle Crash Cases

Given the advantages and drawbacks discussed above, which venue (if either) is likely to be the most appropriate and efficient one for autonomous vehicle crash cases? Assuming (as we should) that autonomous vehicle crash victims will always have the option of pursuing conventional litigation, the question may be even simpler: given that these victims will *always* have access to the tort system, does it make sense to create a victim compensation fund as an alternative pathway to receiving compensation? I strongly believe the answer is "yes" for several reasons.

To start, as discussed at length above, there is likely to be a lengthy multi-year (if not multi-decade) time period during which courts struggle to develop and/or adapt negligence and products liability jurisprudence to autonomous vehicles.[186] The issues surrounding duty, breach, and causation are incredibly complex and fairly novel, and so it is likely that there will be some degree of trial and error (no pun intended) and jurisprudential inconsistency among jurisdictions before the jurisprudence becomes more settled. This means that victims of autonomous vehicle crashes will face even higher degrees of uncertainty than normal when seeking compensation via conventional litigation in the tort system. This, in turn, could deter consumers from purchasing and using these vehicles.

The creation of a victim compensation fund could provide consumers (and citizens in general) with greater assurance that they will be compensated if they are injured by an autonomous vehicle. Victim compensation funds, by their very nature, need not experience the same jurisprudential growing pains suffered by the tort system when faced with a novel form of injury.[187] They can begin issuing compensation via a particular method of calculation or algorithm extremely quickly and pay out to claimants much more predictably and reliably than the tort system ever could.[188] Thus, a victim compensation fund could serve as an extremely useful stop-gap method of compensating victims until the jurisprudence in this area is better developed. If popular with victims, moreover, it could provide a long-term alternative to litigation.

Next, for many of the same reasons, the creation of a victim compensation fund could offer significant protection to the manufacturers and developers of autonomous vehicles, promote innovation, and shore up the market for these vehicles. In the absence of such a fund, manufacturers and developers experience much the same uncertainty as do consumers, but with regard to exposure to

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[186] *See supra* notes 142-49.
[187] *See supra* note 169-71.
[188] Steenson & Sayler, *supra* note 172, at 544.

liability. This uncertain exposure to liability, in turn, may severely hinder the introduction of autonomous vehicles to market and the long-term viability of autonomous vehicle businesses.[189] Indeed, the biotechnology industry in the United States experienced something very similar in the 1980s. An article from that time period explained:

> One of the foremost obstacles faced by firms attempting to market biotechnological products is insuring their products against product liability claims. Product liability insurance costs in the United States have risen dramatically to keep up with increased legal claims . . . Dramatically increased premiums for product liability insurance [in turn] are forcing some manufacturers out of business . . . Companies are holding back product introductions, restricting the use of certain products, or even withdrawing from markets in order to avoid costs imposed by the U.S. product liability system . . .
>
> Insurance costs are excessive in the biotechnology industry because judicial treatment of biotechnology products is uncertain and potentially very harsh. Uncertainty arises from the fact that the U.S. biotechnology industry has not yet been tested in terms of product liability lawsuits, probably due to the relatively small number of commercially viable biotechnology products marketed to date.[190]

Uncertain exposure to liability thus creates two major potential issues: (1) it can drive up insurance costs, forcing businesses to pass on those costs to consumers via higher prices, making their products less affordable and driving down demand, or (2) in extreme cases, it may make a given product uninsurable and thus shut down the market altogether.[191]

The creation of a victim compensation fund could create significantly more "breathing room" for manufacturers and developers. By offering autonomous vehicle crash victims a quick and reliable way of obtaining compensation in exchange for waiving their right to sue, a fund could reduce the number of lawsuits filed in the tort system and thus drive down the liability exposure of manufacturers

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[189] Colonna, *supra* note 19, at 114.

[190] Michael D. Stovsky, *Product Liability Barriers to the Commercialization of Biotechology: Improving the Competitiveness of the U.S. Biotechnology Industry*, 6 HIGH TECH. L.J. 363, 373-74 (1991).

[191] Robert G. Berger, *The Impact of Tort Law Development on Insurance: The Availability/Affordability Crisis and Its Potential Solutions*, 37 AM. U. L. REV. 285, 300 (1988) ("The viability of insurance is predicated in large part on two factors: a high degree of predictability as to the magnitude of risk and effective independence among the individuals or entities at risk. When one or both of these critical factors is adversely affected, the viability of insurance as an effective risk-spreading mechanism is adversely impacted: when the insurer cannot predict the magnitude of risk, it becomes that much harder to underwrite the risk. Accordingly, if the insurer is to ensure its own economic position, it must choose either to increase premiums significantly to cover the expectation of an unknown and potentially much higher degree of exposure, or withdraw from the particular market altogether. Specifically, the 'law of large numbers' no longer functions properly when the magnitude and quantity of risk among those potentially compensable cannot be accurately predicted in advance of policies being written.").

and developers and lower insurance costs.[192] This, in turn, would allow the autonomous vehicle market to grow in parallel with the development of autonomous vehicle laws and jurisprudence rather than making the development of this industry contingent upon the resolution of thorny issues of liability, a resolution that will likely take decades.

Lastly, by providing consumers greater assurance that they will be compensated quickly if injured and manufacturers with less exposure to liability, a victim compensation fund could protect the market for autonomous vehicles and thus promote highway safety and the numerous other benefits provided by these vehicles.[193] Failing to create a victim compensation fund, however, could have the opposite effect and undermine or, in a worst case scenario, destroy a market still in its early stages. The costs would be profound and measured in human lives lost that could have been saved.

A victim compensation fund would also offer a solution to the current and growing gap between technology and the law. The law simply cannot keep up with the blistering pace of this technology, a lag that brings with it fairly significant consequences.[194] One observer notes:

> It took 100 years to create laws that widely spread the benefits of the Industrial Revolution to a prosperous middle class . . . We don't get 100 years any more. We have 20-30 years, tops, before the next big technological advance comes along. If we don't sufficiently address [artificial intelligence and technology] when we can, its benefits might never fully enrich the middle class.[195]

In the case of autonomous vehicles, that last sentence might properly be amended to read, "its benefits might never fully save the tens of thousands of lives per year that it could." In short, the stakes are too high and the uncertainties too great to leave autonomous vehicle crash cases to the tort system alone.

III. Categorizing Victim Compensation Funds

Victim compensation funds come in many shapes and sizes and can vary significantly in how they are structured, funded, and administered.[196] In my observation, however, they tend to fall into one of four broad categories: (a) quasi-judicial funds and, within a larger category of non-judicial funds, (b) public funds, (c) private funds, and (d) charitable funds. Figure 1 shows this breakdown:

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[192] *See* Heaton, *supra* note 161, at 1265-66.
[193] *See* Colonna, *supra* note 19, at 84.
[194] Gurney, *supra* note 75, at 442.
[195] WEAVER, *supra* note 21, at 184.
[196] See Linda S. Mullenix, *Prometheus Unbound: The Gulf Coast Claims Facility As A Means for Resolving Mass Tort Claims-A Fund Too Far*, 71 LA. L. REV. 819, 825 (2011).

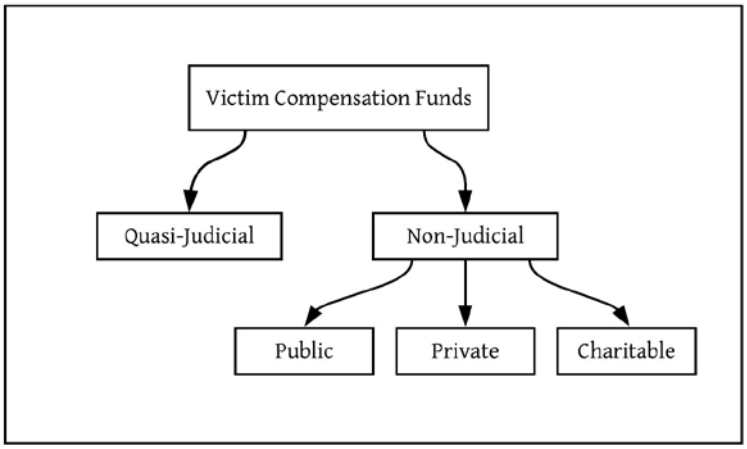

Fig. 1

A brief explanation and illustration of each of these categories is helpful in finding a workable model for an autonomous vehicle victim compensation fund. Even though the situations giving rise to a victim compensation funds "will be a unique combination of . . . factors," certain similarities between them "can determine the type of justice and process that should follow."[197]

A. Quasi-Judicial Funds

Quasi-judicial victim compensation funds are those administered by the judicial system or a federal agency but outside of a traditional, adversarial litigation context. These funds are typically financed by taxes or fines levied on particular categories of people or entities.[198] State crime victim compensation funds, which are funded by fines, penalties, and forfeitures issued in criminal cases and subject to judicial oversight, are one type of quasi-judicial fund.[199] Similarly, the compensation program established by the Radiation Exposure Compensation Act (RECA), which seeks to compensate victims of above-ground atomic testing in the mid-twentieth century and is administered by the U.S. Department of Justice, also qualifies as quasi-judicial.[200] The National Vaccine Injury Compensation Program (NVICP), however, is arguably the most famous example and provides a helpful illustration of this type of fund.

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[197] Flocks & Davies, *supra* note 160, at 36.
[198] *See* Njeri Mathis Rutledge, *Looking A Gift Horse in the Mouth-the Underutilization of Crime Victim Compensation Funds by Domestic Violence Victims*, 19 DUKE J. GENDER L. & POL'Y 223, 230 (2011); Regina Moreland, *National Vaccine Injury Compensation Program the Potential Impact of Cedillo for Vaccine-Related Autism Cases*, 29 J. LEGAL MED. 363, 368-69 (2008).
[199] *See* Rutledge, *supra* note 198, at 230; Texas Bar Journal, *Crime Victims' Compensation Fund*, 73 TEX. B.J. 614, 614 (2010).
[200] Radiation Exposure Compensation Act, Pub. L. No. 101-426, 104 Stat. 920 (1990) (codified as amended at 42 U.S.C. §2210 (2006)); *see also* Peter H. Meyers, *Fixing the Flaws in the Federal Vaccine Injury Compensation Program*, 63 ADMIN. L. REV. 785, 817-20 (2011).

The NVICP is designed to compensate victims of injuries caused by vaccines.[201] While vaccines are an important part of public health and save lives by preventing disease, a very small percentage of vaccine recipients will experience a severe adverse reaction which may cause either or both short-term or long-term injuries or side effects.[202] When that occurs, the NVICP may issue financial compensation to the injured party if they file a claim with the fund and are found to have been injured by a NVICP-covered vaccine.[203]

The NVICP is administered by the Court of Federal Claims and financed by a small excise tax on all doses of NVICP-covered vaccines.[204] The fund was established after a number of vaccine manufacturers neared financial ruin from lawsuits filed against them and threatened to stop producing vaccines altogether, raising significant concerns about a potential nationwide shortage of childhood vaccines.[205] Concerned that this shortage would lead to a revival of preventable diseases, lawmakers established the fund to pay for all injuries incurred after September 30, 1988.[206] Persons eligible to make claims and receive compensation from the Fund include any individual vaccinated in the United States, citizens vaccinated outside of the United States while serving abroad as a member of the armed forces or an employee of the federal government, or any dependent of a citizen who was vaccinated outside of the United States.[207]

A claimant must file a petition with the Court of Federal Claims to commence a claim under the compensation program.[208] The claimant must identify the vaccine that allegedly caused the injury, state where the vaccine was administered, and provide some explanation of the nature of the injuries.[209] The court then forwards the petition to a Special Master, who reviews the petition, considers evidence, and issues a determination on the merits of the claim.[210] To qualify for compensation, the claimant "must prove that the vaccine caused the condition or that an injury found on the Vaccine Injury Table occurred."[211] This table "lists specific injuries or conditions and time frames within which the reactions must occur after the vaccine

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[201] National Vaccine Injury Compensation Program, HEALTH RES. & SERVS. ADMIN., https://www.hrsa.gov/vaccine-compensation/index.html (last visited February 13, 2018)[hereinafter NVICP].
[202] *Id.*
[203] *Id.*
[204] Moreland, *supra* note 198, at 368-69.
[205] NVICP, *supra* note 201.
[206] U.S. Tax Rep. P 95, 104 (2018).
[207] *Id.*
[208] Efthimios Parasidis, *Recalibrating Vaccination Laws*, 97 B.U. L. REV. 2153, 2211 (2017).
[209] *Id.*
[210] *Id.*
[211] Karin Schumacher, *Informed Consent: Should It Be Extended to Vaccinations?*, 22 T. JEFFERSON L. REV. 89, 110 (1999).

injection."[212] It is thus "a legal mechanism for defining complex medical conditions and allows a statutory presumption of causation."[213]

The NVICP's review process is considered both no-fault and non-adversarial, although claimants may choose to be represented by an attorney.[214] While vaccine injury sufferers must initially file a claim with the NVICP rather than pursue a lawsuit in the tort system from the outset, if the petitioner is unhappy with the outcome of their case or does not successfully obtain compensation from the fund, they have the right to file suit in civil court.[215] Most scholars view this as an effective way to balance the needs of vaccine manufacturers to avoid crippling amounts of liability exposure with the needs of individuals harmed by vaccines to obtain compensation in a far more predictable way than pursuing suit in the tort system:

> Vaccine claims are few and if pursued as product liability claims, the plaintiffs' prospects were highly uncertain. If lawsuits had been filed in the tort system, few would have been paid because product liability law accepts an adequate warning as a defense to liability. The vaccine compensation program is best understood as a way to encourage citizens to accept the risk of vaccine-related injury, while relieving the burdens and risks of tort liability from manufacturers of drugs with generally irreducible side-effects.[216]

In the three decades since its creation, over 12,000 claims have been filed with the fund, suggesting that its goals are—at least in part—being achieved.[217]

B. Non-Judicial Funds

Non-judicial victim compensation funds are those administered wholly outside of the justice system by either another governmental entity, a corporation, or a charity.[218] These funds have a wide array of financing sources and can vary significantly in both size and scope.[219] A brief analysis of each type of non-judicial fund reveals their general characteristics.

1. Public Funds

Public victim compensation funds are those both funded (at least in part) and administered by the government or by a special master acting with government authority. One example of a public victim compensation fund is the Federal Black

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[212] *Id.*
[213] *Id.* (internal quotations omitted).
[214] *Id.*
[215] *Id.*
[216] Conk, *supra* note 171, at 149.
[217] *Id.*
[218] *See infra* notes 220-56.
[219] *See infra* notes 220-62.

Lung Benefits Program, which is funded in part by tax revenue and in part by employers of Black Lung sufferers, and administered by the Department of Labor and Social Security Administration.[220] Yet another, more well-known, example is the September 11th Victim Compensation Fund which perhaps best illustrates the key characteristics of a public fund.

Created just 11 days after the attacks of September 11th 2001, this fund was created by Congress via the Air Transportation Safety and System Stabilization Act to protect the airline industry from what lawmakers feared would be devastating repercussions and lawsuits.[221] The fund was designed to provide generous compensation to families and surviving victims who voluntarily waived their right to sue in favor of filing a claim with the Fund.[222] While the Fund provided a no-fault alternative to tort litigation against the involved airlines, it was restricted to any individual or relative of a deceased person who suffered physical injuries or was killed as a result of the terrorist attacks.[223] Individuals who did not suffer some discernible physical harm or death were excluded from receiving compensation.[224]

The U.S. Attorney General appointed a Special Master, Kenneth Feinberg, to be responsible for all aspects of the fund's administration.[225] The Special Master was responsible for drafting the rules and regulations of the fund, creating the application forms for claimants, and was the sole decision-maker with regard to the amounts of compensation awarded.[226] Because the legislation authorized a virtual blank check to make all necessary payments to the victims of the September 11th terrorist attacks, the amount of funding available to the Special Master was unlimited.[227] Under the Act, within 120 days from the date of a claimant's application, the Special Master was required "to complete a review of the application for compensation, make a determination of the award, and then provide written notice to the claimant of the decision."[228] Payment had to be remitted no more than 20 days later.[229] The Special Master's compensation decisions were not subject to judicial review and were final.[230]

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[220] Allen R. Prunty & Mark E. Solomons, *The Federal Black Lung Program: Its Evolution and Current Issues*, 91 W. VA. L. REV. 665, 670, 683 (1989).
[221] Heaton, *supra* note 161, at 1263; William Angelley, *The September 11th Victim Compensation Fund*, 65 TEX. B.J. 34, 34 (2002).
[222] Angelley, *supra* note 221, at 34.
[223] *Id.*
[224] Cynthia C. Lebow, *Understanding the September 11th Victim Compensation Fund: The Proper Response or a Dangerous Precedent?,* ANN.2002 ATLA-LCE 243, 243 (2002).
[225] Angelley, *supra* note 221, at 34.
[226] *Id.*
[227] Lebow, *supra* note 224, at 243.
[228] *Id.*
[229] Angelley, *supra* note 221, at 34.
[230] *Id.*

While the line between quasi-judicial and public funds can become blurred in some instances, the primary difference between the two categories is that public funds are financed in whole or in part by the federal government whereas quasi-judicial funds are financed by the parties that would be in a defensive posture were a traditional lawsuit filed.

2. Private Funds

Private funds are those both funded and administered by private organizations such as corporations. This category of victim compensation fund is the smallest of the four with, as of early 2018, only one fund fitting the description: the Gulf Coast Claims Facility (GCCF) created in the aftermath of the 2010 Deepwater Horizon oil spill in the Gulf of Mexico.[231] This kind of fund also raises the most questions and, according to at least one scholar, may "illustrate an extreme and seemingly lawless expansion of the [victim compensation] fund approach to resolving mass claims."[232] Because both (a) the fund creator and administrator in this model may also be the party at fault and (b) these funds may not be subject to judicial or governmental oversight, private victim compensation funds raise significant ethical concerns.[233] Discussing this issue in the context of the GCCF, one scholar argues,

> [T]he Gulf Coast Claims Facility represents an unnoticed incremental trend toward the lawless, private resolution of mass claims. This resolution (in the case of the GCCF) was created by a culpable defendant, unbounded by legal norms, and administered by a heroic "special master" with limitless unreviewable discretion, who also is in the employ of the malefactor. Whatever else may be argued on behalf of the GCCF, this cannot be a good development.[234]

A brief description of the development and administration of the GCCF highlights some of the sources of this concern.

British Petroleum (BP), as a responsible party for the Deepwater Horizon oil spill, established the Gulf Coast Claims Facility (GCCF) in June 2010 to compensate impacted parties for damages sustained as a result of the spill.[235] This compensation fund was established pursuant to an informal agreement between BP and the Obama administration.[236] In addition, BP agreed to be the sole source of money for the fund via a $20 billion escrow account, and to hire and pay for someone to administer the fund.[237]

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[231] *See* Mullenix, *supra* note 96, at 912.
[232] *Id.*
[233] *Id.* at 823.
[234] *Id.*
[235] Luther Strange & Kenneth Feinberg, *Perspectives on the Gulf Coast Claims Facility*, 42 No. 5 ABA TRENDS 8, 8 (2011).
[236] *Id.*
[237] *Id.*

The purpose of the GCCF was to give impacted parties a means to resolve their claims against BP in what was supposed to be a fair, efficient, and timely manner.[238] Persons eligible to make claims for compensation were individuals or businesses whose property was damaged by the oil spill or cleanup efforts, who experienced a loss of income/earning capacity, subsistence loss, and/or net loss of profits or earnings, had removal and cleanup costs for their own property, and/or suffered physical injury or death as a result of the Deepwater Horizon incident.[239]

The GCCF began considering claims on August 23, 2010.[240] The protocol allowed claimants to obtain emergency advance payments, or payments designed to cover a six-month period of loss.[241] Final claims were also allowed to be presented to the GCCF at any time.[242] However, a liability release was required for final claims, whereby in exchange for payment, claimants agreed to forgo the rights to pursue further oil spill related claims or legal action against BP and other potentially responsible parties.[243]

Under the Protocol for Interim and Final Claims, the GCCF had 90 days to decide whether to make an interim or final payment to a claimant.[244] Claimants had the option to reject an interim or final payment determination and present their claim to the National Pollution Fund Center or commence an action in court.[245] The protocol also included an appeal process.[246] As a result of the Deepwater Horizon Oil Spill in the Gulf Coast, "BP paid out more than $6.2 billion to over 220,000 claims" through the GCCF.[247]

While a cursory glance at this fund may lead one to believe this fund is much like the others discussed above, deeper analysis reveals a number of significant issues:

> To begin, it is difficult to discern the legal expansion of the fund, other than vague reference to the [Oil Pollution Act]. The GCCF was not created as a mechanism to implement a contested class action settlement, nor did Congress authorize creation of this fund. Thus, the GCCF has not been subject to the scrutiny that would accompany a class action settlement or congressional oversight.

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[238] *Id.*
[239] Gulf Coast Ecosystem Restoration Council, *File a Claim*, RESTORETHEGULF.GOV, https://www.restorethegulf.gov/file-claim (last visited Mar. 12, 2018).
[240] Mary Samuels, *Overview of the Gulf Coast Claims Facility*, 12 No. 2 A.B.A ENVTL. LITIG. & TOXIC TORTS COMMITTEE NEWSL. 13, 13 (2011).
[241] *Id.*
[242] *Id.*
[243] *Id.*
[244] *Id.*
[245] *Id.*
[246] *Id.*
[247] Heaton *supra* note 161, at 1264.

> Moreover, it is difficult to characterize exactly what the GCCF is and what legal status this entity has, if any. [The fund's hired administrator] has described the GCCF as a "compact," while federal Judge Barbier has described the GCCF as a "hybrid." The GCCF is a largely private claims-adjusting facility acting in an *ad hoc* fashion, run by a culpable party's retained autocrat.[248]

Thus, while the GCCF represents the first example of a private fund in the United States, it is a highly controversial fund and one that has been subject to such significant criticism that it is questionable whether this category of victim compensation fund is viable long-term.

3. Charitable Funds

Charitable funds are those funded entirely by private donations, typically in response to significant local tragedies, and set up to distribute those donations to victims equitably.[249] Unlike the other types of funds discussed above, charitable funds are not created as alternatives to litigation, but simply as an effort to minimize the administrative and logistical burdens associated with disbursing donations to those in need. The Minnesota I-35W Bridge Collapse Fund is one example of a charitable fund.[250] The Hokie Spirit Memorial Fund is a more famous one.

The Hokie Spirit Memorial Fund was created in the wake of the April 16, 2007 Virginia Tech shooting that claimed the lives of thirty-two victims and left scores of faculty and student injured.[251] In response to the thousands of donations after the shooting, the Virginia Tech School Foundation established the "Hokie Spirit Memorial Fund" to provide monetary compensation to victims.[252] This $7.5 million fund was entirely privately funded, and was designed to be allocated to the victims and their families pursuant to a proposed Victims Assistance Program Protocol.[253] The protocol outlined the terms and conditions of eligibility for victims and the levels of compensation.[254] Survivors of the shooting and the families of the murder victims were qualified to receive cash payments.[255] Claimants also had the option of donating the compensation to which they were entitled to a charitable organization to fund scholarships at the university.[256]

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[248] *Id.*
[249] *See* Steenson & Sayler, *supra* note 172, at 525.
[250] *See id.* at 526–27.
[251] Kenneth R. Feinberg, *Compensating the Victims of Catastrophe: The Virginia Tech Victims Assistance Program*, 93 VA. L. REV. IN BRIEF 181, 181 (2007).
[252] Heaton, *supra* note 161, at 1263-64.
[253] Feinberg, *supra* note 251, at 181.
[254] *Id.*
[255] Fed. Tax Coordinator ¶ J-1297 (2d.).
[256] *Id.*

Unlike the other types of compensation funds that use basic tort law as a reference when calculating an individual's eligibility for compensation, the Hokie Spirit Memorial Fund allocated "flat payments of $180,000 to each of the thirty-two families who lost a loved one on April 16."[257] The Fund made no attempt to value distinctions among the dead.[258] The payments for those who were physically injured during the shooting were tied directly to the number of days each individual spent at the hospital.[259] Hospitalization was viewed as an unbiased measure of payment with students and faculty who were hospitalized for more than three days, but fewer than ten days, to receive a flat payment of $40,000, plus free tuition.[260] Two students who were hospitalized more than ten days received $90,000 each and free tuition.[261] The administrator of the Fund had no discretion to vary this payment schedule.[262]

IV. A Fund for Autonomous Vehicle Car Crash Victims

If a victim compensation fund is to (1) reduce both liability uncertainty and liability exposure for the manufacturers and designers of autonomous vehicles, (2) provide assurance to consumers that they will be compensated quickly and fairly if they are injured by an autonomous vehicle, and thus (3) increase the chances that society will fully reap the benefits of autonomous vehicles, the fund must be designed and administered carefully and with an eye towards the unique and complex issues posed by this technology. One must first determine which of the models explored above provides the best template for an autonomous vehicle crash fund and then thoughtfully tailor the specifics of the fund to address the most likely concerns of industry, consumers, and government regulators.[263]

Of the four models of victim compensation funds that could be used, both the charitable fund model and the private fund model can be eliminated as options quickly. The charitable fund model is simply inapposite, too limited in scope, funding, and objective to be of any use to this issue.[264] Adopting a private fund model would likely be just as problematic. Unlike the GCCF, multiple potential defendants—all motor vehicle manufacturers who produce autonomous vehicles—would need protection from an autonomous vehicle crash fund, meaning either (a) that each individual manufacturer would have to finance and administer their own private fund, or (b) that vehicle manufacturers would have to work together to finance and administer a joint private fund, a situation that would be

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[257] Feinberg, *supra* note 251, at 181.
[258] *Id.*
[259] *Id.*
[260] *Id.*
[261] *Id.*
[262] *Id.*
[263] *See* Smith, *supra* note 89, at 74; Flocks & Davies, *supra* note 160, at 36; Steenson & Sayler, *supra* note 172, at 597-98.
[264] *See supra* notes 249-50.

unprecedented in the United States. Both consumers and policymakers would likely view either situation with a great deal of skepticism, and rightly so. Aside from the efficiency, transparency, and conflict of interest issues that such a fund (or panoply of funds) would almost certainly create—as they were by the GCCF[265]—the public might also have strong and reasonable concerns about whether such a fund(s) would disincentivize autonomous vehicle manufacturers from improving their products and keep important product safety and defect information hidden from public scrutiny.[266]

Of the two remaining models—quasi-judicial and public—a quasi-judicial model is the far more appropriate option for one primary reason: the federal government has little reason, political or otherwise, to fund an autonomous vehicle crash fund. While the government certainly has an interest in reducing highway crash fatalities and injuries, the United States does not face a sudden or significant crisis in and around highway safety and/or consumer adoption of autonomous vehicles such that the government would likely feel compelled to finance an autonomous vehicle crash fund.[267] This situation is thus fundamentally different than the one faced by the federal government immediately prior to the formation of the September 11th Victim Compensation Fund. There, the airline industry was at risk of total collapse from the loss of the four planes, the resulting rise in insurance premiums, and from the loss of business following the tragedy.[268] The government needed to act quickly to prevent the devastation of an entire industry.[269] The same is not true here. Currently, automobiles are a $1.84 *trillion* market in the United States,[270] and autonomous vehicles are projected to be an "$87 billion opportunity by 2030."[271] There is thus little reason for the government to create a public fund, and so a funding mechanism akin to the kind used in quasi-judicial funds seems far more appropriate in this context.

However, for reasons discussed at greater length below, the federal government seems far better situated to administer an autonomous vehicle crash fund than a court, which is unlikely to have particularly extensive knowledge of autonomous vehicles.[272] One government agency in particular, the National Highway Transportation Safety Administration (NHTSA) seems better qualified to serve this role than, say, the Court of Federal Claims, which administers the National Vaccine Injury Compensation Program. Assuming, therefore, quasi-judicial fund administered by NHTSA is the most appropriate model for an autonomous vehicle crash fund, five critical aspects of the fund must be determined:

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[265] Mullenix, *supra* note 196, at 841-43.
[266] *See* Hall, *supra* note 178, at 1.
[267] Gurney, *supra* note 75, at 419.
[268] Hresko, *supra* note 184, at 98-99.
[269] *Id.*
[270] Levy, *supra* note 19, at 357.
[271] Trefis Team, *supra* note 57.
[272] *See infra* notes 287-93.

(1) basic coverage limitations, (2) how it will be funded, (3) who will be its administrator, (4) what both autonomous vehicle manufacturers and victims must do to participate in the fund, and (5) how the fund will impact private automobile insurance.[273]

1. Proposed Coverage Limitations

An autonomous vehicle crash fund should only be accessible to victims who have suffered injuries or deaths caused by Level 4 and 5 vehicles. Injuries caused by Level 2 and 3 vehicles should not be covered by the fund because they are more likely to be caused by driver inattention or error than problems with the vehicle itself.[274] Compensating victims for injuries obtained in such accident, therefore, would mean compensating victims for mistakes made by a human driver rather than by the kind of product liability issue intended to be covered by the fund. Covering semi-autonomous crashes would also risk bankrupting the fund fairly quickly, as experts believe that semi-autonomous vehicles are significantly less safe than their fully autonomous counterparts and thus far more likely to be involved in accidents.[275]

Additionally, an autonomous car crash fund should only cover human injuries and fatalities. While car accidents also cause a great deal of property damage, particularly to other vehicles, covering property damage would risk, again, not only bankrupting the fund but overwhelming it with far more claims than it could possibly process.[276] Moreover, property damage typically falls well within the coverage offered by private automobile insurance policies that every state requires automobile owners to purchase, and thus there is little need for a victim compensation fund to provide greater access to relief.[277] If, at some point in the future, the number of motor vehicle accidents on United States roads falls by such a significant amount that the private automobile insurance market collapses, the fund could reconsider its coverage of property damage. Initially, however, limiting the fund to claims for compensation for injuries or fatalities seems wise.

2. Proposed Source of Funding

Much like the National Vaccine Injury Compensation Program which is funded by a small tax on every covered vaccine administered to a patient, an autonomous vehicle crash fund should be funded by a tax on the sale of every Level 4 or 5

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[273] *See* Flocks & Davies, *supra* note 160, at 36.
[274] *See* Pearl, *supra* note 43, at ____.
[275] *See* Ingrassia, *supra* note 53; Pritchard, *supra* note 52.
[276] *See* NHTSA, *The Economic and Societal Impact of Motor Vehicle Crashes, 2010*, U.S. Department of Transportation, NHTSA, May 2015, at 2, available at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812013 [hereinafter NHTSA Crash Impact Data].
[277] *See* Schroll, *supra* note 80, at 813.

autonomous vehicle. Indeed, "since autonomous cars will very likely benefit society as a whole as well as benefiting the users and the manufacturers," requiring both manufacturers and consumers to pay into the fund "would be a very manageable win/win, pro-market and pro-consumer solution for all involved."[278] Under this approach, both the purchaser and the seller of a new autonomous vehicle would pay a tax that would be deposited into the fund.

Calculating a reasonable tax amount—one that would ensure that the fund was adequately financed while not overly burdening manufacturers or consumers—is difficult and highly dependent on many factors: the number of autonomous vehicles likely to be sold in a given year, the likelihood of an autonomous vehicle causing an injury or fatality, and the average cost of such injuries and fatalities. These are all numbers, moreover, that are likely to change over time, particularly as autonomous vehicles improve and increase in market share.[279] An extremely speculative, rough, and preliminary set of calculations suggests that, based on current data and projections, a total tax of less than $1,000 per autonomous vehicle sold—half paid by the seller and half paid by the purchaser—would be sufficient and reasonable. This estimate is based on the following set of assumptions:

- In recent years, the United States has averaged roughly 35,000 fatal car crashes per year,[280] with an average cost of $1.4 million per fatality, for a total annual cost of $49 billion.[281]

- In recent years, the United States has averaged roughly 2.4 million car crash-related injuries per year.[282] Calculating the average cost of injury-causing automobile crashes is exceedingly difficult given the large variety of injuries which can occur. However, according to one recent NHTSA report, roughly 97% of all injury-causing crashes cause only mild to moderate injuries (described as Maximum Abbreviated Injury Scale Level 0-2 injuries) with an average cost of roughly $7,000 per injury, for a total annual cost of $14.4 billion.[283]

- Experts predict that, by eliminating the opportunity for human driver error, fully autonomous vehicles will reduce the number of accidents in the United States by 94%.[284]

- Assuming a 94% reduction rate in fatality-causing accidents, one can predict that Level 4 and 5 autonomous vehicles will cause

[278] Ravid, *supra* note 133, at 205.
[279] *See* Schroll, *supra* note 80, at 823-24.
[280] *See* NHTSA Statistics, *supra* note 76.
[281] *See* NHTSA Crash Impact Data, *supra* note 276, at 14.
[282] *See* NHTSA Statistics, *supra* note 76.
[283] *See* NHTSA Crash Impact Data, *supra* note 276, at 12-14.
[284] Schroll, *supra* note 80, at 305.

roughly 1,050 fatal accidents per year. Assuming that the average cost of $1.4 million per fatality remains the same, this would yield a total annual cost of $1.47 billion.

- Assuming a 94% reduction rate in injury-causing accidents, one could predict that Level 4 and 5 autonomous vehicles will be involved in roughly 72,000 injury-causing accidents per year. Assuming that the average cost of $7,000 per accident remains the same, this would yield a total annual cost of $504 million.

These back-of-the-envelope calculations—and, again, I stress their exceedingly rough nature—thus suggest that an autonomous vehicle crash fund may have to pay out somewhere around $2 billion per year to claimants, assuming both that (a) every injury and fatality are eligible for compensation from the fund, and (b) every injury and fatality results in a claim against the fund. Since one recent report suggests that, by 2040, 7.4 million autonomous vehicles will be sold in the United States each year, a total tax of only $270 per vehicle sold (divided between consumer and manufacturer) would be enough to cover the fund's annual payouts.[285] At a significantly smaller market share, say 2.5 million in 2020, a total tax of under $1,000—$800 per vehicle, to be precise—would still be sufficient. Even if the annual average payout of the fund is significantly higher than I have estimated, a total tax of between $1,000 and $1,500 would still likely cover those costs. None of these estimated tax amounts is exorbitant, particularly if it is shared between consumers and manufacturers.[286]

Thus, even under a fairly pessimistic view of the number of autonomous vehicle crashes that will likely occur per year in the United States, a tax equivalent to less than 2% of the average total price of a new vehicle—$1,500 or less—in 2018 dollars should be sufficient to finance an autonomous vehicle crash fund. As autonomous vehicle safety improves and the number of autonomous vehicles sold per year increases, moreover, it is likely that the tax per vehicle required to keep the fund fully financed could drop into the very low hundreds of dollars per vehicle sold.

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[285] *See* IHS Markit, Autonomous Vehicle Sales to Surpass 33 Million Annually in 2040, Enabling New Autonomous Mobility in More Than 26 Percent of New Car Sales, IHS Markit Says (Jan. 2, 2018), http://news.ihsmarkit.com/press-release/automotive/autonomous-vehicle-sales-surpass-33-million-annually-2040-enabling-new-auto.

[286] Obviously, manufacturers would likely pass their portion of the tax on to consumers by raising the price of their vehicles, but even if the total tax of $1,000 or less is borne by consumers in some form or another, I would still argue that it is not excessive, representing less than 2% of the overall cost of a new vehicle assuming average vehicle prices stay roughly the same.

3. Proposed Administrator

NHTSA is the federal entity best suited to administer an autonomous vehicle crash fund because it is the federal agency "responsible for keeping people safe on America's roadways."[287] NHTSA does so by promulgating and "enforcing vehicle performance standards and [by forming] partnerships with state and local governments."[288] NHTSA also seeks to reduce motor vehicle crashes and injuries by conducting research and data analysis on motor vehicle use and misuse and motor vehicle crashes, and by "setting the motor vehicle and highway safety agenda" for the country.[289]

NHTSA is already issuing guidance with regard to autonomous vehicles. In September 2016, NHTSA released the *Federal Automated Vehicles Policy* in which it "set out an ambitious approach to accelerate the [heavily autonomous vehicle (HAV)] revolution" by publishing "agency guidance . . . in order to speed the delivery of an initial regulatory framework and best practices to guide manufacturers and other entities in the safe design, development, testing, and deployments of HAVs."[290] It also requested cooperation and voluntary information-sharing from autonomous vehicle manufacturers.[291] NHTSA is thus well-aware of the characteristics of and issues surrounding autonomous vehicles and well-positioned to "create particular requirements for what must be sent to them as part of filing a claim" with an autonomous vehicle crash fund.[292] At least one scholar, though one who is proposing a different type of compensation scheme, agrees:

> The money [for the fund] would be stored in a trust fund and overseen by a department created within the NHTSA. Anyone who suffers damages from an AV accident would file a claim with the NHTSA department, who would review the claim and dole out payments.[293]

The only other logical alternatives would be to place the fund under the U.S. Department of Transportation generally, place the fund in the hands of a designated special master operating outside of any particular federal agency, or create an entirely *sui generis* federal entity to be the administrator. None of these options, however, seem to offer any advantages over situating the fund within NHTSA and may instead have fairly numerous and extensive drawbacks.

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[287] NHTSA, *About NHTSA*, NHTSA.gov, https://www.nhtsa.gov/about-nhtsa.
[288] *Id.*
[289] NHTSA, *NHTSA's Mission*, NHTSA.gov, https://www.nhtsa.gov/about-nhtsa/nhtsas-core-values.
[290] FAVP, *supra* note 31, at 68.
[291] *Id.* at 11, 15.
[292] Schroll, *supra* note 80, at 824.
[293] *Id.* at 823.

4. Proposed Participation Requirements

In all victim compensation funds, "the procedure to be utilized in determining who actually receives compensation and in what amounts is critical."[294] Similarly, fund designers must determine at the outset what fund participants must give up in exchange for participating in the fund.[295] In an autonomous vehicle crash fund, victims and vehicle manufacturers should have to confront different trade-offs:

a. Victim Participation Requirements

All victims (or their estates) who are injured by an autonomous vehicle and who wish to receive compensation should be required to initiate proceedings with the fund. Victims who intend to bypass the fund and pursue suit in the tort system should still be required to file a claim with the fund and receive a decision as to the amount of compensation to which they would be entitled before being able to reject the fund option and pursue litigation. The NVICP has a similar set of requirements.[296] Victims (or their estates) who choose to accept the fund's decision and obtain fund compensation should be required to waive their right to pursue litigation against the manufacturer, designer, or programmer of the autonomous vehicle that caused the injury or fatality at issue. Such liability waivers have been a standard feature of most other victim compensation funds, and constitute one of the primary incentives for private industry to support and participate in such compensation schemes.[297] However, to the extent that these victims wish to pursue third-party tort actions against other entities who may have been partial causes of the relevant crash—say, drivers of human-driven cars, pedestrians, construction companies, etc.— they should remain free to do.[298]

Like the NVICP, filing a claim with the autonomous vehicle crash fund should be "nonadversarial and simple relative to [filing a claim in the] civil courts."[299] The claimant should be required to file a petition setting forth "a short and plain statement of the grounds for an award of compensation"[300] and attach any supporting documentation such as medical records that would aid fund administrators in determining an appropriate award.[301] Claimants should have the

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[294] Steenson & Sayler, *supra* note 172, at 529.
[295] *See id.* at 529-30.
[296] Liane Rutkow *et al.*, *Balancing Consumer and Industry Interests in Public Health: The National Vaccine Injury Compensation Program and Its Influence During the Last Two Decades*, 111 PENN. ST. L. REV. 681, 687 (2007).
[297] *See* Samuels, *supra* note 240, at 13; Angelley, *supra* note 221, at 34; Schumacher, *supra* note 211, at 210.
[298] *See* Steenson & Sayler, *supra* note 172, at 530.
[299] Michael J. Donovan, *The Impact of "Hurricane" Hannah: The Government's Decision to Compensate One Girl's Vaccine Injury Case Could Drastically Alter the Face of Public Health*, 50 JURISMETRICS J. 229, 232 (2010).
[300] 42 U.S.C. §§ 300aa-11 (2006).
[301] *See* Schroll, *supra* note 80, at 824.

right to be represented by an attorney but should not be required to retain one. Like other funds, there should also be an internal appeals process.[302]

In exchange for waiving their right to sue manufacturers, designers, and programmers of autonomous vehicles, victims should be entitled to receive compensation for "personal injury, loss of consortium, wrongful death, [and other standard forms of] economic loss" associated with their injury or death.[303] Noneconomic losses, those associated with pain and suffering, emotional and psychological anguish, and other forms of hedonic damages are "highly intangible" and thus far more difficult to quantify.[304] Other funds have dealt with this issue by establishing presumed awards or placing caps on emotional damages. The September 11th Victim Compensation Fund, for example, had a presumed award of $250,000 for emotional damages.[305] The NVICP caps pain and suffering awards at an identical amount: $250,000.[306] Whether and at what amount an autonomous vehicle crash fund should compensate noneconomic damages should be the product of careful deliberation amongst fund administrators about the fund's annual budget, the likely number of claims each year, and the appropriate methodology to use in calculating such damages.

b. Vehicle Manufacturer Participation Requirements

All vehicle manufacturers who pay a tax on the sale of each Level 4 or 5 autonomous vehicle should benefit from reduced liability uncertainty and reduced liability exposure. As discussed above, individuals injured by taxed autonomous vehicles should be required to file claims with the fund initially rather than filing suit in the tort system immediately. Since the fund is likely to be able to provide faster and more predictable compensation than the tort system, it is reasonable to expect that the fund would significantly reduce the number of lawsuits filed against autonomous vehicle manufacturers who choose to participate in the fund.[307] Manufacturers who choose not to participate by refusing to pay a tax on each autonomous vehicle sold should not be protected by the fund if one of their vehicles injures someone; in that situation, the victim's only option would be to file a conventional tort claim.

In exchange for the protection offered by the fund, manufacturers should also be required to participate in a data-sharing and design improvement program administered by NHTSA. Such a program would greatly mitigate two significant issues: (1) the difficulty that NHTSA has had in gathering information and issuing timely guidance and regulations pertaining to autonomous vehicles, and (2) the risk

[302] *See* Samuels, *supra* note 240, at 13.
[303] Steenson & Sayler, *supra* note 172, at 528.
[304] Hresko, *supra* note 184, at 102.
[305] *Id.*
[306] Rutkow, *supra* note 296, at 687.
[307] *See* Conk, *supra* note 171, at 156; Steenson & Sayler, *supra* note 172, at 549.

that reduced exposure to liability would reduce manufacturer incentives to improve the design and safety performance of their vehicles. A brief discussion of each demonstrates why.

First, NHTSA has had difficulty "keeping pace with the development and deployment of autonomous systems."[308] In large part, this has been due to both the secrecy of manufacturers and designers and to the novelty of the technology.[309] As one representative of Tesla Motors Inc. has observed, "NHTSA [has] had to ensure the safety of [heavily automated vehicles], avoid creating regulations that would slow the deployment of life-saving technology, all without NHTSA's usual ability to observe the performance of technology prior to regulating it."[310] These are extremely difficult tasks at best, but likely impossible in the absence of manufacturer cooperation and data-sharing, a fact stressed by NHTSA throughout the 2016 FAVP.[311] Indeed, the entirety of the FAVP itself is merely guidance for autonomous vehicle manufacturers rather than rule making,[312] and there appear to be no consequences for failure to comply with it.[313] Manufacturer cooperation and voluntary disclosures, therefore, are vital to a successful, safe, and controlled release of fully autonomous vehicles into the consumer market and onto U.S. roads.

Making participation in a data-sharing and design improvement program a condition of participation in an autonomous vehicle crash fund offers a solution to this issue. NHTSA could require, for example, fund participants to disclose all identified cyber vulnerabilities, install a particular security patch in all vehicles, or address a particular design concern within a certain timeframe. Rather than having to either (a) rely on manufacturers to voluntarily disclose design flaws and vulnerabilities out of a desire to act in good faith, or (b) engage in complex and administratively burdensome formal rule making, such a program would thus induce manufacturers to engage in a prescribed set of socially beneficial behaviors. While participation in this program would always remain voluntary, the protection offered by the fund—through the reduction of liability uncertainty and liability

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[308] *Tesla's Autopilot: Too Much Autonomy Too Soon*, CONSUMER REPORTS (July 14, 2016), http://www.consumerreports.org/tesla/tesla-autopilot-too-much-autonomy-too-soon/.
[309] Matthew L. Schell, *Tesla Motor Inc's Comments Regarding "Federal Automated Vehicles Policy"*, TESLA (Nov. 22, 2016), https://www.regulations.gov/document?D=NHTSA-2016-0090-1051.
[310] *Id.*
[311] FAVP, *supra* note 31, at 15 ("To aid NHTSA in monitoring [heavily automated vehicles], the Agency will request that manufacturers and other entities voluntarily provide reports regarding how the Guidance has been followed"); *Id.* at 21-22 ("As with safety data, industry sharing on cybersecurity is important. Each industry member should not have to experience the same cyber vulnerabilities in order to learn from them . . . . To that end, entities should report any and all discovered vulnerabilities from field incidents, internal investing, or external security research . . . as soon as possible . . . .").
[312] *Id.* at 6.
[313] Stephen Selander, *Docket Number NHTSA 2016-0090-Comments on Federal Automated Vehicle Policy*, SELANDER LAW OFFICE (Nov. 22, 2016) 1 https://www.regulations.gov/document?D=NHTSA-2016-0090-1114.

exposure—would likely provide an extremely strong incentive for manufacturers to join.

Second, many scholars argue that victim compensation funds may reduce manufacturer incentives to take precautions and thus fail to provide optimal levels of deterrence.[314] Discussing the GCCF, for instance, one scholar worries: "If the Facility sets a precedent for relieving environmental marauders of full liability, it will not achieve optimal deterrence, and thus potentially open the door for future environmental disasters."[315] Here, the concern would be that reduced liability exposure would disincentivize autonomous vehicle manufacturers from continually reviewing and improving the safety features of their vehicles and the overall quality of their designs and algorithms. Again, however, making participation in a data-sharing and design improvement program a condition of participating in the fund would significantly reduce, if not entirely eliminate, this issue. Through such a program, NHTSA could identify safety issues, generate solutions, and induce manufacturers to implement them as a condition of continued participation the fund.

5. The Private Insurance Overlay

Considering the interplay between a victim compensation fund and private insurance is an important part of any fund's creation. Two issues, in particular, deserve attention and, in the case of an autonomous vehicle crash fund, are closely related: (1) treatment of collateral sources, and (b) subrogation and reimbursement.[316] First:

> One of the problems in defining the amount of compensation to which a victim is entitled to recover is the treatment of collateral sources. What sources to deduct from the fund will be a critical factor in determining the amount of compensation. Deductions could be required from a variety of sources, including health and life insurance, workers' compensation benefits, social security benefits, or even funds received by victims through charitable contributions.[317]

Here, victims may receive compensation from, among other sources, private automobile insurance, which typically offers some coverage for bodily injuries and

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[314] *See, e.g.*, Yael Ronen, *Avoid or Compensate? Liability for Incidental Injury to Civilians Inflicting During Armed Conflict*, 42 VAND. J. TRANSNAT'L L. 181, 219 (2009) ("Moreover, like any insurance mechanism, a victim compensation fund provides a disincentive to take precautions."); James A. Henderson, Jr., *The New Zealand Accident Compensation Reform*, 48 U. CHI. L. REV. 781, 794 (1981) ("Generally, if actors are not required to pay a fair share of the costs of their activities, including the accident costs, they will tend to overengage in those activities whose costs they can most successfully escape from paying.").

[315] Hall, *supra* note 173, at 1.

[316] Steenson & Sayler, *supra* note 172, at 529-30.

[317] *Id.* at 529.

medical expenses.[318] Fund administrators must determine, therefore, whether compensation from such auto insurance policies should count against any compensation to which a claimant might be entitled to receive from the fund.

Second, "subrogation and reimbursement are key factors in designing a compensation scheme."[319] Subrogation is a particularly tricky issue in the case of an autonomous vehicle crash fund. While, currently, twelve states have "pure" no-fault automobile insurance regimes,[320] drivers in the remaining thirty-eight states are required to purchase some form of traditional liability automobile insurance.[321] In those states, if a policyholder is injured by a manufacturing or design defect in a vehicle, their insurance company "become[s] subrogated to all of the insured's rights of recovery against the tortfeasor," meaning that the insurance company has the right to pursue a tort claim against the manufacturer of the vehicle.[322] These subrogation rights pose a problem for an autonomous vehicle crash fund. If, on the one hand, the subrogation rights of automobile insurance companies are *not* extinguished upon a claimant's receipt of compensation from the fund, autonomous vehicle manufacturers would still face liability uncertainty and exposure from insurance companies, thus largely undermining one of the major purposes of the fund. On the other hand, if the subrogation rights of insurance companies *are*, in fact, extinguished upon entry into the fund, automobile insurance premiums could increase dramatically for drivers of autonomous vehicles (or insurance companies might refuse to write these policies altogether) as insurance companies would have no pathway for receiving reimbursement from manufacturers.

The only sensible solution to this quandary is to compensate claimants in full for their injuries and to give automobile insurance companies the right to reimbursement from those awards based on any prior payouts to the claimant. This solution protects victims, automobile insurance companies, and autonomous vehicle manufacturers and strikes a fair balance on this issue.

V. CONCLUSION

Fully autonomous, Level 4 and 5 vehicles will almost certainly become available to consumers within the next five to seven years. Experts predict that these vehicles will be drastically safer than their human-driven counterparts and will save thousands of lives each year in the United States alone. However, crashes will still occur, and when they do, they will raise unique and troubling issues about liability and fault. Negligence and product liability jurisprudence are not yet well-

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[318] John McGown, Jr., *Automobile Insurance Coverage*, 45 ADVOCATE 28, 28 (2002).
[319] Steenson & Sayler, *supra* note 172, at 529.
[320] J. Marshall Wolman & Saba B. Hashem, *Will Health Care Reform Hasten the Demise of No-Fault Insurance?,* 14 TORTSOURCE 1, 1 (2012).
[321] *See* Jeffrey O'Connell, *Giving Motorists a Choice Between Fault and No-Fault Insurance*, 72 VA. L. REV. 61, 62 (1986).
[322] 19 A.L.R.3d § 1054.

equipped to address issues involving automation and artificial intelligence. Indeed, application of current precedent and doctrine in these areas of the law could impair development and adoption of these technologies.

Furthermore, this gap between the development of automated vehicles and development in applicable law has created a great deal of uncertainty for both manufacturers and consumers. Manufacturers currently face a great deal of uncertainty with regard to liability exposure for fully autonomous vehicles crashes. Will they be liable for all such crashes? Only some? And what will the legal definition of fault be in these cases? Consumers face a related kind of uncertainty: whether they will be compensated if they are injured or killed by an autonomous vehicle.

The answers to these questions have implications far beyond the resolution of individual autonomous vehicle crash cases. Whether the civil justice system can adjudicate these cases fairly and efficiently impacts (a) whether manufacturers can afford to produce these vehicles or whether the cost and magnitude of litigation surrounding them will destroy their market, (b) whether consumers will adopt this new technology, and (c) the rate at which they will be willing and able to do so. These issues, in turn, have an impact on how many lives can be saved on U.S. roads each year by transitioning away from human-driven and towards fully autonomous vehicles. It is thus imperative to design a method of compensating victims, protecting manufacturers, and giving courts time and space to develop jurisprudence applicable to this technology if we wish to reap the profound benefits that fully autonomous vehicles have to offer.

While filing a lawsuit in the civil justice system will always be an option for victims of autonomous vehicle crashes, a specially designed, no-fault victim compensation fund offers a sensible way to address the issues identified above and to resolve autonomous vehicle crash cases in a faster and less costly manner. While the use of victim compensation funds is a fairly recent phenomenon in the United States, these funds have been used with great success in a variety of situations and will likely continue to be popular alternatives to the tort system. In recent years, four kinds of victim compensation funds, in particular, have been used: quasi-judicial, public, private, and charitable.

A quasi-judicial fund is likely the best model for an autonomous vehicle crash fund. Under this model, the victim compensation fund would be administered by NHTSA and financed by a tax levied on the sale of all Level 4 and 5 vehicles. Preliminary calculations suggest that a tax of less than $1,000 per vehicle sold would be enough to finance the fund from year to year. Victims (or their estates) who wish to seek compensation from the fund would be able to do so via a simple claim form and non-adversarial process.

To reduce liability uncertainty and exposure for manufacturers, all victims of autonomous vehicle crashes who sought compensation would be required to file a claim with the fund and to receive a calculation of the compensation to which they are eligible to receive from the fund. Only after receiving this calculation would they be permitted to file a traditional lawsuit in the tort system. Manufacturers, in turn, would be required to participate in a data-sharing and design improvement program as a condition of receiving protection from the fund. This program would both assist NHTSA in gathering the information it needs to regulate autonomous vehicles and reduce the likelihood that a victim compensation fund would reduce manufacturer incentives to improve the safety of their vehicles.

Automobile crashes kill over 35,000 people on U.S. roads each year and injure millions of others. We are nearly at the point at which we will be able to reduce those fatalities and injuries by an overwhelming percentage. Whether we will be able to do so, however, depends upon our ability to adapt our society and our laws to autonomous vehicles. The stakes are high and the time we have is extremely limited. Botching our initial transition away from human-driven cars and towards driverless ones will cost human lives. A victim compensation fund, however, offers a way to ease this transition and make it smoother for both manufacturers and consumers alike. Given that the existing tort system will always remain a fallback option, there appear to be few reasons not to give a victim compensation fund a chance and many reasons to design and implement one before fully autonomous cars come to market.