

To: California Department of Motor Vehicles
LADRegulations@dmv.ca.gov

Re: Proposed Autonomous Vehicles Regulations

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Allow me to comment on the DMV's proposed autonomous car regulations. My comments will include my opinions, but I like to think that they are reasonably informed opinions. I have been commenting and lecturing on autonomous vehicles for several years. I also attended the January 28 public workshop in Sacramento and reviewed the full February 2 workshop after it was posted on line.

My comments may also, at times, be blunt – perhaps too blunt. Please forgive. I would be more tactful, but there is too much at stake.

Let me start with some general observations before moving into comments about the blackletter regulations.

First, let me offer my condolences that the legislature dropped this task on the DMV. As you have noted on several occasions, the DMV's core competence lies in vetting drivers, not sophisticated vehicle technology. In addition, portions of section 38750, the enabling legislation, are ill suited for the purpose. This is not surprising, given that section 38750 was adopted in a vacuum – the legislature used language that does not neatly fit technological developments that were unknown at the time. In important ways, technology soon bypassed both section 38750 and these proposed regulations.

These regulations fall very wide of the mark. Rather than regulating NHTSA Level 3 (“The driver is expected to be available for occasional control, but with sufficiently comfortable transition time. . . . The major distinction between level 2 and level 3 is that at level 3, the vehicle is designed so that the driver is not expected to constantly monitor the roadway while driving.”) and Level 4 AVs, they prohibit the safer Level 4 vehicles and reduce or confine Level 3 vehicles to Level 2 vehicles. They would also make illegal some vehicles on the road today, or soon to be introduced, unless they complied with California's certification requirements. These vehicles, then, would be legal in every state except California.

The proposed regulations are completely inflexible. Were a manufacturer to develop Level 3 or Level 4 vehicles as safe as distilled water, they could not even present them for certification in California. This is because the regulation would have to undergo the entire regulatory process again to change the definition to include Level 3 vehicles and to remove the ban on the testing and deployment of Level 4 vehicles. This could take many years. The current

enabling legislation was adopted in 2012, and deployment regulations were due January 1, 2015. To date there are not even proposed deployment regulation for Level 3 or Level 4 vehicles. This does not bespeak a regulatory approach consistent with the pace of technology. It is not in the public interest for the DMV to box itself in with respect to a future it does not yet know. The regulation should be modified so that when Level 3 and Level 4 vehicles are ready for deployment, they may apply for certification in California.

Although section 38750 attempts to assign the regulation of “autonomous vehicles” to the DMV, the definition of “autonomous vehicle” was unworkable and outdated soon after its adoption. The definition attempts to draw a distinction between systems that “enhance safety or provide driver assistance” (listing, but not limiting them to a list of systems that existed at the time), but attempts to exclude from these safety enhancing features, those technologies “capable” of driving the vehicle “without active control or monitoring of a human operator.”

There are two faults in this definition. First, it seems to attempt a distinction between safety enhancing features and autonomous vehicles. This is a false dichotomy. By taking drunk, distracted, careless, and sleepy human drivers with their limited skills out of the primary role of driving, autonomous technology is safety enhancing. It just happens to bring in its train a number of additional utilities and benefits that most safety features do not deliver. This is hardly a vice.

Secondly, the definition turns on “capability,” not the OEM’s purpose or intention. 227.02(d). Almost as soon as section 38750 was adopted, and before these proposed regulations were published, vehicles “capable” of driving themselves within the parameters for which they were designed were on the roads and legal in every state, including California. Here is a video clip (from Germany) showing a vehicle driving itself on public roads with the careless drivers in the back seat. This was August, 2014!¹ It is appropriately set to the Ride of the Valkyrie. Recall that the Valkyrie descended to earth to fetch the souls of dead warriors to Valhalla.

Indeed, seldom does a month pass without the announcement of additional self-driving technologies for cars already or soon to be deployed.² “Although these systems (e.g., lane keep and adaptive cruise control, or “Autopilot”) are expected to be continuously monitored by the driver, the simple fact is that they are “capable” of driving themselves in the contexts for which they were designed. Thus, while they do not legally deliver the utility of Level 3 or 4 vehicles, they have the “capability” of delivering Level 3 within their design parameters. Indeed, several speakers at the 1.28 hearing pointed out that these vehicles are currently on the road.

The DMV’s proposed regulations are also inconsistent with the direction being taken at the federal level. NHTSA recently exempted BMW’s self-parking feature from the requirement

¹ <http://spectrum.ieee.org/cars-that-think/transportation/self-driving/warning-this-robocar-video-is-nsfl>

² See, e.g., <https://www.yahoo.com/autos/elon-musk-two-years-tesla-able-drive-york-202858906.html> (announcing its new download installing its “Summons” self-parking feature. announcing safety related restrictions on its earlier downloaded Autopilot program, and asserting that in two years you will be able to summon your car from New York, and it will find you in L.A.)

that the brake be applied prior to moving from the “park” position.³ At Google’s request, NHTSA also interpreted “driver” to include the self-driving computer system in Level 4 vehicles. They also invited Google to document and apply for a number of exemptions from their vehicle standards where the standards are inconsistent with Level 4 vehicles. They suggested that where there is no room for interpretation or exemption, they would move forward with rulemaking or seeking appropriate authority to accommodate these vehicles.⁴ In addition, Anthony Foxx is moving NHTSA forward at all deliberate speed (within 6 months) to develop guidelines for testing and deployment of vehicles at all levels, including Level 4.⁵

AVs are not being introduced into a vacuum, but into a real world where vehicles driven in “conventional mode” kill 33,000 to 35,000 people per year and send 2.2 million or more to emergency rooms - and that is just in the U.S. NHTSA (not Google, as the press often asserts) reports that driver error is responsible for about 93% of these deaths and injuries. The one-year death rate in the U.S. alone is two to three times the total worldwide deaths from the recent Ebola epidemic. After years of declining, deaths rose by 10% in the first three quarters of 2015.⁶ Of course, the DMV knows all of this.

This means the choice is not between introducing AVs, which will present some level of risk, or not introducing them and sparing the public the risk of being injured or killed by automobiles. We already live and die by the latter risk. A statistic not mentioned at the hearings was the fact that in 35% of fatal accidents in California the brakes were not even applied. Something AVs are exceptionally good at is avoiding or mitigating accidents by applying the brakes. Both their field of view, their reaction time, and the force of application far exceed human potential. Adopting these regulations will deter deployment and needlessly send countless drivers and pedestrians to emergency rooms or graves.

The DMV has ample discretion under 38750 to choose how it regulates autonomous vehicles, however defined. I would suggest the DMV define the autonomous vehicles to which it extends its regulation to be only those vehicles that match NHTSA Level 3 and Level 4. Level 2 vehicles are on the road today and will continue to evolve regardless of what the CA DMV does. That ship has left the port.

The appropriate standard for “safe”

This brings me to my first substantive point. Section 38750 requires that the DMV adopt a certification program to ensure that AVS “are safe to operate on public roads.” Subsection

³ [49 CFR 571.114 - Standard No. 114; Theft protection and rollaway prevention, see: <http://www.autoblog.com/2016/01/18/bmw-exemption-self-parking-7-series/>]

⁴ NHTSA’s letter is available at: <http://isearch.nhtsa.gov/files/Google%20--%20compiled%20response%20to%2012%20Nov%20%2015%20interp%20request%20--%204%20Feb%2016%20final.htm>

⁵ <http://www.theverge.com/2016/1/14/10767502/us-dot-anthony-foxx-self-driving-rules-ford-volvo-google-gm-tesla>

⁶ <https://www.consumeraffairs.com/news/traffic-deaths-up-nearly-10-driver-behavior-blamed-020816.html>

(e)(1). The section, however, does not define “safe.” The proposed regulation merely carries this language forward. 227.62(e). See also 227.74(b)(6) permitting revocation of a Permit to Deploy if the vehicles are not “safe.”

As a metric, this is an unworkable standard. No dangerous product is “safe,” be it car, peanut butter or tea cozy.⁷ The question is whether it is safe enough, and that requires elements of comparison, probabilities, and judgment. The regulations appear to require perfection before AVs can be deployed into a world already encumbered with the carnage of imperfection. AVs that reduce deaths from the present 11.1 per billion VMT to just one per billion VMT could be considered unsafe because they can still cause death. That is contrary to sound public policy.

Compare the general rules governing NHTSA’s adoption of regulations setting safety standards for automobiles in 49 USC sections 30111 and 30102.⁸ The Secretary must “consider whether a proposed standard is reasonable, practicable, and appropriate for the particular type of motor vehicle or motor vehicle equipment for which it is prescribed.” Sec. 30111(a)(3)[Emphasis added]. In addition, “motor vehicle safety” is defined as “the performance of a motor vehicle or motor vehicle equipment in a way that protects the public against unreasonable risk of accidents occurring because of the design, construction, or performance of a motor vehicle, and against unreasonable risk of death or injury in an accident, and includes nonoperational safety of a motor vehicle.” Sec. 30102(a)(6)[Emphasis added]. Both sections contemplate balancing safety against an array of other, sometimes competing, factors.

Compare also what the DMV licenses today – people. People are not “safe.” The last behind-the-wheel test I took was when I was 16 years old. I am now 73. Both my wife and I recently renewed our licenses and had to take the written test (along with reading the eye chart, but not at night, I might add). Of the few questions asked, I am pleased to report that I got a perfect score. My wife (she has given me permission to report this) missed two questions. I do not know the substance of the two questions, but she could have chosen the maximum speed in a school zone of 70 mph, the double-yellow line means safe to pass, or the maximum speed is the highest speed shown on the speedometer. It would have made no difference, we both got our licenses! I believe six or fewer is a pass for a new applicant, and 3 or fewer is a pass for a renewal. Must an autonomous vehicle, then, be perfect! I would hazard that any autonomous

⁷ See, e.g., *Fraust v. Swift and Company*, (U.S. Dist. Ct., W.D. Pa)(1985)(Peter Pan peanut butter may be defective in absence of warning about choking hazard for the very young), available at http://pa.findacase.com/research/wfrmDocViewer.aspx/xq/fac.19850523_0000045.WPA.htm/qx, See also: (<http://www.scotsman.com/lifestyle/beware-of-the-tea-cosy-it-could-put-you-in-hospital-1-922448>)

⁸ Available at: <http://uscode.house.gov/view.xhtml;jsessionid=B218CA396ED0F468496B4D52E7CA41E8?req=granuleid%3AUSC-prelim-title49-chapter301&saved=|Z3JhbnVsZWlkoIVTQy1wcmVsYW0tdG10bGU0OS1zZWNoaW9uMzAxMDE%3D||0|false|prelim&edition=prelim>

vehicle offered for deployment will have a comprehensive knowledge of the Vehicle Code surpassing that of many CHP officers.

Keep in mind, too, who those foolish drivers are who video themselves in the back seat of AVs on the road today. They have been licensed by the DMV (or in one well known example, a European country).⁹

As an old saying goes, licensing people who only know most of the rules of the road, then requiring perfection of AVs is “swallowing the camel only to choke on the gnat.”

Since 38750 does not define “safe,” and 38750 give the DMV broad discretion to adopt implementing regulations, the DMV can articulate the standard of safety required of AVs prior to deployment. I would suggest that you include a definition of “safe” in your definition section. The standard should be one promoting the saving of lives and lowering of injuries. See also the discussion of “defect,” below. If AVs will result in fewer deaths or fewer or less severe injuries, than they should be deployed. This is for the reason that they will save real lives. These are living people, not just numbers.

Let me try to draw a picture. There is no venue large enough to accommodate the 2.2 million or so who will be sent to emergency rooms next year due to vehicle injuries, but let’s invite the 33,000 or so who will die next year to Levi Stadium for a game. It’s the least we can do. At the end of the game the announcer says:

“You may wonder why we invited you to this game. Well, the bad news is that, although we don’t know your names, you are the men, women and children who will die in the coming year from car accidents. The good news is that, right here in the heart of Silicon Valley, companies have developed autonomous vehicles which, if deployed at the normal rate, will save 500 of you from that fate next year. The less good news is that we have decided to allow their deployment only incrementally. So only enough autonomous vehicles will be deployed next year to save 50 of you. Those 50 randomly chosen seat numbers will appear on the scoreboard. Please report to Gate 8. Your autonomous car will be waiting.

For the other 450 and the rest of you, so sorry we won’t see you next year. We hope you enjoyed the game. Drive carefully. For now.”

Organ music. Fade.

Repeat this next year. “If deployed at the normal rate, they would save the lives of 2,000 of you, but we are deploying them at an incremental rate, so only 200 of you will be saved. Your seat numbers will appear on the scoreboard.” Etc.

But, contrary to this scenario, if past be prologue, there are names. Consider seven examples plucked from the flotsam of the river of death and injury on which we presently float.

⁹ See: <http://spectrum.ieee.org/cars-that-think/transportation/self-driving/warning-this-robocar-video-is-nsfl>

1. On September 21, 2015, police officer Pedro Abad pled not guilty to first degree vehicular manslaughter, among other charges. What happened? On March 20, after a night of drinking with friends, he drove himself and his friends the wrong way on Staten Island's West Shore Expressway. His car smashed head-on into an oncoming tractor-trailer. Officer Viggiano, 28, and Mr. Rodriguez, 28, were killed. The third passenger, Officer Patrick Kudlac, 23, was hospitalized, as was the truck driver and Officer Abad. Authorities estimated Officer Abad's blood-alcohol level was around three times the legal limit.¹⁰

Had Mr. Abad's Honda been an AV, it would not have entered the West Shore Expressway going in the wrong direction. Multiple tragedies prevented, and multiple co-signers to this memo.

2. Hy 17 between Santa Cruz and San Jose is a notorious harvester of bodies and souls. It is blessed with blind curves, sharp turns, dense traffic, steep grades, wild animals (deer, mountain lions), sudden changes in traffic speed, fog, wet winter weather, and careless drivers. On July 10, 2014, 25-year-old Daniel McGuire was driving on Hy 17. Soon he was planning on proposing to his girlfriend. The traffic had come to a near stop at the Bear Creek Road off ramp when a big-rig driver, with only modest big-rig driving experience, failed to see the slowed traffic in time. With enormous force, the truck plowed into 10 cars, ejecting and killing Mr. McGuire from the fifth car in the line and injuring 7 more people.¹¹ The driver later pleaded no contest to vehicular manslaughter.¹² Had this truck been equipped with AV technology (not permitted by current regulations), it would likely have detected the traffic ahead and either braked in time or slowed enough to mitigate the carnage. Again, multiple tragedies prevented.
3. On May 4, 2013, Anna Leah (17) and Mary (13) Karth were killed when their car crashed into the back of a truck. Their parents have since pursued a safety agenda hoping to achieve "Vision Zero"—i.e., no deaths or serious injuries from vehicles. This future might be achieved, but only with self-driving cars.¹³ "Vision Zero" is also the stated goal of Volvo's AV deployment by the year 2020. If deployment of AVs is delayed, "Vision Zero" will likewise recede into the future.

¹⁰ See: http://www.nytimes.com/2015/09/22/nyregion/new-jersey-police-officer-accused-of-killing-2-while-driving-drunk-pleads-not-guilty.html?_r=0

¹¹ http://www.mercurynews.com/central-coast/ci_26131299/santa-cruz-man-identified-victim-fatal-highway-17?source=infinite-up

¹² <http://www.timesheraldonline.com/general-news/20151211/san-jose-truck-driver-sentenced-in-big-rig-collision-that-killed-santa-cruz-man>

¹³ <http://annaleahmary.com/2016/02/soon-to-come-the-delivery-of-a-vision-zero-petition-to-washington-dc/vision-zero-petition-book-back-cover-draft/>

4. On New Year's Eve, 2013, the Liu family was enjoying an outing in San Francisco. As they entered the crosswalk on Polk Street, an Uber driver, while apparently consulting his cell phone, struck and killed their daughter, six-year-old Sophia, and injured other members of the family.¹⁴ Had the Uber driver been driving a Level 3 or 4 AV, Sophia would be alive today to co-sign this memo. And the Uber driver would not have faced manslaughter charges. Once again, multiple tragedies averted. This tragedy directly resulted in California's enactment of legislation governing transportation network companies such as Uber and Lyft.
5. On March 9, 2008 sheriff officer James Council apparently fell asleep at the wheel of his cruiser. He crossed the double yellow line on Stevens Canyon Road in Cupertino and crashed into three bicyclists – Matt Peterson, 29, Kristy Gough, 30, and Christopher Knapp. Matt and Kristy (both triathletes) were killed, and Christopher was badly injured. Officer Council later pled guilty to vehicular manslaughter. Had his cruiser been equipped with autonomous technology, all of these tragedies would have been avoided. AVs do not fall asleep, and they stay in their lane. Sadly, the technology came too late for Matt, Kristy, Christopher and their families.¹⁵
6. At 12:30 in the morning on May 6, 2006, young Marcus Keppert made a choice that proved to be his last. Mark, who was 6'7" and weighed approximately 260 pounds, was dressed in dark clothing. He began crossing Almaden Expressway at Camden Avenue in San Jose. He was crossing against the light. He only made it part way. As he stepped into the No. 1 lane next to the left turn lane, he was struck and killed by a car driven by an intoxicated driver.

Had the driver's vehicle been in autonomous mode, Mark would be alive today. Another co-signer for this memo? And the driver and the driver's family would not have faced the unpleasant prospect of the driver's incarceration. Yet again, multiple tragedies averted.

7. As this memo is being written the National Transportation Safety Board is investigating a January 19 Greyhound bus crash on Hy 101 in San Jose. The bus rolled onto its side. Fely Olivera and Maria de Jesus Ortiz Velasquez died when ejected from the bus. The eighteen other occupants were injured. Two deaths, multiple injuries, and major disruption on a main highway. The cause has not yet been determined, but the driver reportedly complained of fatigue. AVs do not fatigue.¹⁶

¹⁴ See: <http://time.com/3625556/uber-manslaughter-charge-san-francisco/>

¹⁵ <http://www.sfgate.com/crime/article/Deputy-pleads-guilty-in-bike-crash-deaths-3162341.php>

¹⁶ http://www.mercurynews.com/bay-area-news/ci_29416035/mechanical-failure-ruled-out-greyhound-bus-crash-san

These are hardly isolated examples of real people for whom AVs came too late. Between 2006 and today, preventable deaths like these have been repeated thousands of times in California and hundreds of thousands of times throughout the United States. A simple search will find more tragic news articles than one could read in a day, or even a week. It would require ledgers to accommodate the ghostly co-signatures to this memo.

Put another way - if unnecessary delay today postpones 95% deployment of AVs for one year (say from 2030 to 2031, just to pick a date), then during that arc of time, one might expect 33,000 needless deaths and 2.2 million needless injuries. Double that if the delay is two years. Delay it five or more years, and well

Doubtless with full deployment there will still be some deaths. Even with current capabilities, AVs cannot yet cope with snow and seriously bad weather. Thus, human drivers will still take their toll. Cut the number in half (a recent Casualty Actuarial Society study suggests that about one-half is the best that can be expected with current technology), and still the number of people who will be spared so that they and their families may go on with their lives is enormous. See: Casualty Actuarial Society study - "49% of accidents contain at least one limiting factor that could disable the technology or reduce its effectiveness."¹⁷ Once mature and fully connected, the Secretary of Transportation has suggested that non-alcohol related accidents could be reduced by as much as 80%.¹⁸ As noted above, many alcohol related accidents could also be prevented. Since motorcycles are unlikely to be automated, they will still present a higher risk profile. Still, AVs will save many motorcyclists because they will "see" them where human drivers do not. Nevertheless, other motorcyclists will continue to crash into vehicles or crash into trees and ditches.

Reducing the number and severity of accidents per VMT below current levels should be enough to justify deployment. This seems to be the target standard for NHTSA.¹⁹

After deployment, the appropriate standard of safety for AVs, as for any product, is that they be made as safe as they reasonable may be made to be. This, however, is an even more fluid and dynamic standard. It is not readily amenable to the clumsy, and often untimely or ill-informed regulatory process. After the gathering of sufficient data, agencies from time to time

¹⁷ http://www.casact.org/pubs/forum/14fforum/CAS%20AVTF_Restated_NMVCCS.pdf

¹⁸ https://www.washingtonpost.com/local/trafficandcommuting/direct-communication-between-car-computers-may-reduce-accidents-by-up-to-80-percent/2014/02/03/b55e9330-8d1a-11e3-833c-33098f9e5267_story.html?tid=a_inl

¹⁹ <http://www.theverge.com/2016/1/14/10767502/us-dot-anthony-foxx-self-driving-rules-ford-volvo-google-gm-tesla> ("DOT and NHTSA will develop the new tools necessary for this new era of vehicle safety and mobility, and will seek new authorities when they are necessary to ensure that fully autonomous vehicles, including those designed without a human driver in mind, are deployable in large numbers when demonstrated to provide an equivalent or higher level of safety than is now available.") [Emphasis added]

promulgate specific safety standards. NHTSA does this for cars.²⁰ The Consumer Product Safety Commission does it for many other products. There are, of course, other more specialized agencies that do likewise. Outside these specific instances of regulation, the products liability system also creates the incentive on the part of commercial entities to advance safety to reasonable standards. Thus, there is already a regulatory system in place to advance safety, when reasonably possible, beyond that of the average pool of drivers. See also the discussion of “defect” below.

As an alternative, I would suggest that the standard for reasonable safety be compliance with the behavioral competencies outlined in OL318. This, at least, would both protect the public and give OEMs a reasonable standard for certification.

This all suggests that these proposed regulations are not cautious. Indeed, by largely perpetuating the dangerous status quo, they may be quite dangerous.

The proposed regulations are two much too late

The proposed regulations do not regulate the deployment of NHTSA Level 3 and Level 4 automobiles, as intended. They simply ban Level 4 automobiles, which are the safest vehicles in development today, and purport to regulate the future deployment of vehicles that are in fact already on the road. Put another way, while the legislature and DMV were pondering these regulations in the slow lane, technology passed both on the right. The DMV is now looking into technology’s tail lights.

Even the enhanced safety and driver assistance exclusion from the definition does not include vehicles capable of driving or operating without the active physical control or monitoring of a natural person. Perhaps “monitoring” could be interpreted in a broad sense, but 227.84 makes it clear that the word monitoring means “at all times,” including being “capable of taking over immediate control.” Thus, there is no room for Level 3 vehicles in which the operator may do other things, but must be available to take over with a comfortable transition time.

As earlier mentioned, another difficulty with this definition is that cars fitting the definition are already on the road. Tesla’s Autopilot, and others are capable of driving the car under conditions for which they were designed (e.g., freeways, congested traffic, parking) without the physical control of the driver. As noted, there are some rather notorious examples both here and in Europe of foolish drivers climbing into the back seat while the car drove itself. Although these features are marketed as safety enhancing or driver assisting features, and it is expected that drivers will monitor these vehicles at all times, the simple fact is that they are “capable” of driving themselves.

The Devil, I would suggest, is in the phrase “active physical control or monitoring.” 227.02(d). For deployment purposes, there is nothing in 38750 defining or requiring “monitoring,” either active or otherwise. The proposed regulation has simply borrowed the monitoring requirement for testing found in 38750(b)(2) (test drivers responsible for “monitoring the safe operations of the autonomous vehicle, and capable of taking over immediate manual control”) and imposed it on the operators of what would otherwise be Level 3

²⁰ See, e.g., Federal Motor Vehicle Safety Standards, 49 CFR 571, available at http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title49/49cfr571_main_02.tpl .

vehicles (“responsible for monitoring the safe operation of the vehicle at all times and be capable of taking over immediate control of the vehicle”. 227.84(c)).

Perhaps I am reading these provisions too narrowly. If the DMV has in mind a level of monitoring more consistent with NHTSA Level 3 vehicles, the regulations should define “monitoring” in the broader language of Level 3.

This requirement also displays an overly enthusiastic regard for the efficacy of continuous human monitoring. Studies at Stanford and other experience suggest that once vehicles are capable of driving themselves, drivers become confident, their attention wanders, and they often begin to doze. In fact, similar studies have shown that doing other tasks (reading a book, texting, etc.) may keep the driver more alert.²¹ These activities, however, are currently banned in California. Nevada, Florida and Michigan have no texting ban while a vehicle is in autonomous mode.

I had an opportunity to participate in a Stanford study by driving their AV simulator while they asked me to perform different tasks. The simulator presented various challenges during the hour or so of driving. One challenge presented a car or two swerving into my lane while the vehicle was in autonomous mode. I instinctively grabbed the wheel, turned it and slammed on the brakes. I expect (although I do not know – it was a simulation and they did not kill me) that this was exactly the wrong thing to do. This intervention would likely have left me overturned in a ditch. Had the vehicle been left to react as programmed, I expect it would have either avoided or greatly mitigated any collision. My point is that in an AV human intervention may well be the poorer option.

This brings me to my next point. This regulation would ban the safest vehicles in development today – the low speed, fully autonomous vehicle. Let’s start with the obvious. The leading developer, Google, is testing a car that goes only 25 miles per hour. Not only is the alert reaction time and the unexpected reaction time cut to nearly zero, but at that speed it can stop in very few feet (braking distance at 20 mph is about 20 feet). And it is soft and rounded. And, although it is occasionally bumped from behind, it has a perfect driving record. And the vehicle’s utility (remember why we tolerate vehicle crashes at all) surpasses other AVs in the areas where it is programmed to operate.

Google introduced its Level 4 Prototype (as they call it) in May, 2015. Since then Google reports that it has driven 279,830 autonomous miles. Although Google does not break down these miles between its 25 mph Prototype and its Level 3 Lexus, there have been only 2 “simulated contacts” in these 279,830 autonomous miles. That is more than 10 times around the earth. Prior to May, 2015 there had been 11 others, but it is fair to say that the technology was only in its adolescence then. Perhaps even in its diapers.²² Note, too, that these were only simulated “contacts,” not “simulated crashes,” as the popular press likes to report. To the extent any of the two were assigned to the 25 mph Prototype, they likely would have been of low, or

²¹ See: <http://www.dailymail.co.uk/sciencetech/article-3339387/Could-self-driving-cars-send-motorists-SLEEP-Experts-warn-drivers-need-distracted-illegal-activities-reading-watching-TV-stay-alert.html>

²² *Google Self-Driving Car Testing Report on Disengagements of Autonomous Mode, December 2015*, Table 3.

even *de minimis*, severity. Note, too, that this sterling record was largely achieved in the challenging urban, as opposed to the more linear highway environment.²³

Of course, no one, including Google, asserts that they are yet ready for deployment. But they appear much closer. This progress hardly justifies a regulatory ban on future deployment when they are ready and certifiable. Indeed, given the stately pace of the regulatory process, if this ban indeed becomes a regulation, it will likely add many more years to their deployment in California. There is also the 180 day oversight notice to the legislature for a Level 4 application. Many more unnecessary deaths.

I have not heard a persuasive argument against these vehicles. One opponent has asserted that, since they have no steering wheel or pedals, if the vehicle pulled over for some reason, the passenger would be “at the mercy of Google.” They do not explain what this rather vague and sinister sounding assertion means. Is it that Google will try to sell Marcie, our passenger, laundry detergent? Kidnap Marcie for ransom? When my Capitol Corridor train hit a car at a crossing (abandoned in time by the occupants), all of the passengers were at the mercy of the Capitol Corridor Joint Powers Authority for nearly 2 hours while they investigated.

I would submit that this is the more probable scenario: Google will dispatch the nearest available AV to Marcie, and she will be on her way. Or, when she contacts them, they will tell her that the vehicle has stopped at its destination. Marcie will say, “Oh, I entered A Street when I meant to enter B Street.” “OK, Marcie, just reenter B Street and push ‘Go’ and you will be there in a few minutes. It is only 1 mile away.” Or, they will dispatch the equivalent of AAA.

Compare this with what happens when you are at the mercy of General Motors. A few years ago I was driving my former GM pickup on Highway 9 above the town of Saratoga when the radiator hose parted. Wreathed in pungent clouds of coolant, I pulled over in a turnout. I walked about a mile to get cell phone reception and called my wife, Bonnie (remember, she is the one that missed two questions on her driving test). She nevertheless arrived safely with water and tools. I reconnected the hose, and I went on my way after about an hour and one-half. During that time I was at the “mercy of GM.” GM showed me no mercy.

So, the question is, which is preferable?

At the 1.28 and 2.2 hearings the same opponent displayed a chart showing why, during development, test drivers took control. So? That is exactly what one would expect during the development of a new and sophisticated technology. The witness did not mention that in over 279,000 miles of driving since last May, there were only 2 “simulated contacts.” These comments would have some merit if the vehicles were offered for deployment last February. They might have some merit if they were offered for deployment today. No one is of the opinion that these vehicles are ready to be deployed today, but their “contact” trajectory may already have passed well beyond the ability of human drivers to avoid “contacts.”

Banning the testing or future deployment of low-speed, Level 4 vehicles would also leave the ill and elderly in California to rely on charity, friends, or relatives to go to medical visits. At the hearings you also heard a number of disabled people explain how the challenge of transportation, even with the availability of T.N.C.s, excludes them from fuller participation in

²³ *Id.* at p. 1.

society. While this transportation is essential to the disabled, there is an even larger and rapidly growing group for whom it will likewise be essential – those fortunate to live long enough to lose their licenses. Although the DMV may not owe a legal obligation, it owes a moral obligation to extend reasonable accommodation to the disabled. That would include a transportation system that can be used if reasonably safe.

Included with this letter is a full page ad from the American Cancer Society virtually begging for volunteers to drive patients to and from their therapy.

There has been some suggestion in the blogosphere that developers of Level 3 and Level 4 cars may now abandon California, the cradle of technology. This would be a shame. It is also not true. They will have been evicted from California.

One witness at the 2.2 hearing suggested that at the Sacramento hearing Google tried to pressure the DMV by threatening to “pick up their toys” and leave California. See the 2.2 hearing at minute 27:00. This is false. See the Sacramento hearing at minute 37:00 (“On the basis of the DMV proposed regulation we are discussing here today, it [Level 4 testing and deployment] will not be available in California”). This is a factual statement - the proposed regulation bans both the testing and the deployment of Level 4 vehicles in California and the deployment of Level 3 vehicles.

Beware of Sheep’s Clothing

While arguments against moving forward with deployment will be expressed in terms of safety, be aware that there may be other agendas beneath the surface. Funeral parlors and private prisons are unlikely to couch arguments in terms of their desire for more business.

Some OEMs (although, I am pleased, none who spoke at either workshop) may wring their hands about overregulation, but quietly they may be pleased that these regulations allow them to continue business as usual. Their preferred business plan may be gradually to increase the features of vehicles, while keeping responsibility on the drivers. As long as vehicle utility is suppressed because drivers must pay 100% attention to monitoring the vehicle, they can sell many more vehicles. Whatever you do, “Please don’t through me in the briar patch!”

They will be especially pleased that these regulations eliminate pressure from their main competitor, Google. There is nothing more likely to move a family from a two-car family to a one-car (or no-car) family than the availability of a service as cheap and convenient as a fleet of fully autonomous AVs. Various estimates suggest that each Level 4 vehicle deployed on a fleet basis will replace 6 or more standard vehicles.²⁴ If true, then even a 5% deployment could replace 30% of the standard vehicles in the area of deployment. Also, by stalling Google, this gives other competitors the opportunity to catch up. This is like suspending the sale of Apple while Microsoft catches up. Or vice versa, depending on which you consider to be “ahead” at the time.

Insurers of passenger automobiles will also be pleased. A number of insurers have noted in their SEC filings that AVs present an existential threat. They already face pressure on

²⁴ See: https://unmannedsystems.ca/wp-content/uploads/2016/01/CAVCOE_AV_White_Paper1.pdf

premiums from advanced collision avoidance technology. If Level 4 AVs are deployed in fleets, there is less need for personal auto insurance. Likewise, if a fleet of AVs is deployed 24/7, it may replace any number of conventional cars. As noted above, if one fleet AV replaced 6 conventional vehicles, then a 5% deployment might replace as many as 30% of the vehicles in the relative territory! Thus, fewer cars needing personal insurance.²⁵ These regulations guarantee that insurers can continue with business as usual for the foreseeable future. There will simply be no Level 3 or Level 4 AVs in the near future in California, the largest insurance market in the U.S.

Drivers of T.N.C.s, taxis and similar livery vehicles will see Level 4 vehicles as a threat to their livelihood. Of course, they will couch their arguments in terms of safety. The DMV got a flavor of this on 2.2 when the representative of the App Based Drivers Association suggested that Level 4 vehicles might lead to misbehaving teenagers or even rape. Given the number of incidences where the T.N.C. driver has been the problem (including rape),²⁶ this is hardly a self-evident proposition. Parental discretion and teenager supervision is surely a matter beyond the scope of these regulations. Although children the age of 16 can drive in California, he suggested that minors in the back seat of Level 4 cars need adult supervision (although not, apparently, in other contexts.) Requiring licensed drivers in any livery vehicle would, of course, frustrate the needs of the many disabled people you heard from. T.N.C.s are available to that community now, and the DMV repeatedly heard that these services are inadequate. In any event, special rules governing livery T.N.C.s are usually up to the California Public Utilities Commission.

Groups that fund themselves by intervening in insurance rate filings will be pleased. One group has been crowing that these proposed regulations are somehow a great victory for consumers. Tell that to Mr. Keppert and Officer Abad's two deceased passengers, if they were alive to hear, or the parents of Sophia Liu, or the parents and girlfriend of Daniel McGuire. Tell that to bicyclists Matt Peterson, Kristy Gough or Christopher Knapp. Tell that to the drivers facing possible prison because of these needless collisions. These opponents consistently refer to AVs as "robot cars." I expect this is to trigger an irrational response to creepy robots. So long as passenger auto insurance is vibrant, so is a major funding source.

The DMV may overweigh the inevitable criticism it will receive following the first serious injury or fatality from an AV. The political reality is that, since a name and face may be put to the victim, the DMV will not receive credit for the nameless and faceless people who have escaped death or injury because of AVs. Newspapers will likely make a meal out of the first serious accident. They do that now with trivial accidents, even though their assertions that crash

²⁵ See <http://www.out-law.com/en/articles/2016/january/insurers-profiling-will-change-as-autonomous-vehicles-hit-the-road-says-expert/>

²⁶ See: <https://finance.yahoo.com/news/uber-scandals-timeline-michigan-shooting-140035801.html#> See also: <http://www.whosdrivingyou.org/rideshare-incidents> (This web site collecting incidences with Uber drivers is compiled by taxi and limousine companies who, of course, have their own agenda. It does not, therefore, include similar incidences with taxi and limousine drivers.)

rates for AVs are higher are likely very flawed.²⁷ Let's draft the headline now, and have done with it -- "DMV Unleashes Killer Robot Cars." While this is an awkward public relations reality, hyperbole and headlines can lead to very poor public policy.

Municipalities may fear loss of traffic and parking ticket revenue. Making operators responsible without fault for traffic violations committed only by the AV is one way to tax AV drivers. More on this later.²⁸

A little imagination yields many others who may find deployment of AVs inconvenient for their special interests. "Public safety" will be their mantra for advancing their private interests.

51 Shades of Deployment?

In the absence of overarching federal standards, AV developers have lived in fear of a 51 jurisdiction patchwork of regulations. California's proposed regulations make that fear a reality. If these regulations are the best policy for California, then they must likewise be the best for all states.

For example, all third-party certification testing must take place in California. 227.58(d)(5). Should California's regulations prove a template for the 49 other states and the District of Columbia, then all third-party certification driving would have to be done in each of them. This would be great business for third-party certifiers, but unnecessarily burdensome for the deployment of lifesaving technology. Similar requirements have not been imposed on current safety enhancements that are "capable" of driving the car. It is not acceptable that a vehicle certified in California could not even cross the state line at Lake Tahoe, or a vehicle certified in D.C cannot cross into Virginia or Maryland. It is hard to imagine something more debilitating to the deployment of safer vehicles.

Although representatives of the DMV sit on various state, federal and Canadian planning groups, these regulations do not reflect that. Indeed, they are inconsistent with Secretary Foxx's recent enthusiastic endorsement of Level 3 and Level 4 vehicles for future deployment. Perhaps catalyzed by the publication of California's restrictive regulations, Department of Transportation Secretary Anthony Foxx announced that NHTSA aims to develop federal best practices guidelines and model policies within the next six months.²⁹

One can appreciate that a certification system that extends certification in one state to all states may create a race to the bottom. A self-certification system, as is used for NHTSA's

²⁷ See: "Automated Vehicle Crash Rate Comparison Using Naturalistic Data", available at: <http://www.vtti.vt.edu/featured/?p=422> (note—Google funded study) See also: <https://www.vtnews.vt.edu/articles/2016/01/010816-vtti-researchgoogle.html>

²⁸ See: *Local government 2035: Strategic Trends and Implications of New Technologies*, available at <http://www.brookings.edu/~media/research/files/papers/2015/05/29-local-government-strategic-trends-desouza/desouza.pdf>

²⁹ <http://www.theverge.com/2016/1/14/10767502/us-dot-anthony-foxx-self-driving-rules-ford-volvo-google-gm-tesla>

various requirements, avoids this problem. If a third-party certification procedure is to be used, it should be either federally sanctioned or generalized through something like interstate compacts. Perhaps reciprocity could be extended to one or more states if all agree the states are sufficiently rigorous.

One witness suggested that California should further delay these regulations until they can be conformed to whatever may be adopted at the federal level. Since no rulemaking at the federal level has been initiated, this could be a very long time. At both workshops the DMV dismissed the argument because, without California regulations on the books, no applications for deployment in California could be adopted. This response may not be as reasonable as it sounds at first blush. This is because if these regulations are adopted as drafted, there will be no applications for NHTSA Level 3 or Level 4 vehicles in California. They are banned by the proposed regulation. Vehicles that can drive themselves but must be monitored at all times by licensed drivers behind the wheel are on the roads today and will continue to evolve. They are legal in every state and apparently need no California certification.

Am I? Am I not?

Much turns on whether an AV is or is not in autonomous mode. Liability, responsibility for citations (in my view), and how other drivers may react. Many news articles and blog posts have been devoted to the fact that older people like me (73) drive very much like AVs – carefully, conservatively and cautiously. If so, so? No one has suggested banning people like me. At least not yet. Impatient and more aggressive drivers are not entitled to the road to themselves.

Nevertheless, it would be helpful to others to know that a vehicle is in autonomous mode. Just as drivers adjust to bicycles, pedestrians, farm equipment and trucks, it would be helpful to know that a car is in conservative, careful and law-abiding mode. It actually stops for pedestrians. Again, like me.

In England student drivers put a large, red “L” in the window to help other drivers adjust. One occasionally sees similar notices here. Until AVs are commonplace, a similar indicator would be in the public interest.

Apparently students at the University of Washington have developed a proposal for a system of indicator lights surrounding the license plate that would indicate when the vehicle is in autonomous mode.³⁰ I understand that AV developers resist this, and the proposed regulations do not mention an indicator. I would urge the DMV to revisit this issue.

The importance of identifying whether a vehicle is or is not in autonomous (or automated) mode is noted and discussed in the Australia National Transportation Commission’s February, 2016 report at pages 8 and 30.³¹

³⁰ Uniform Law Commission, Study Committee on State Regulation of Driverless Cars, Revised Report of the Subcommittee, p. 11 (2015).

³¹ See: <http://www.ntc.gov.au/Media/Reports/%2866E42530-B078-4B69-A5E3-53C22759F26E%29.pdf>

The blackletter

227.02(d)--The definition of autonomous vehicle is defective for the reasons stated above. Combined with 227.84 (c) (must monitor at all times) and 227.52(a)(5)(no fully autonomous vehicles), these regulations do not regulate autonomous vehicles. They prohibit them. The DMV should either do what it was charged to do or tell the legislature that it respectfully declines.

Allow me a personal anecdote. A number of years ago I parked my car perpendicular to the curb on a hill in San Francisco. When I returned, it was hemmed in to the extent that I could not get in either door. I called the police to see if we could identify an owner. If nearby, we could ask them to move. No luck. While discussing with the officer whether to tow out either my or another car, I managed to slip my hand into the door and roll down my window (a feat impossible with a modern car, as you would have to reach and turn on the ignition). Being more agile than I am today, I then wriggled through the window and pulled my car out.

Today, there are parking programs that would have allowed my car to pull out of the space on its own. Although BMW has received a waiver of the NHTSA design requirement that the brake be first applied before moving out of park³², use of any of these programs on a public street in California, as opposed to a private parking space, would be illegal. There would be no one behind the wheel. The only legal choice would be to block the street while towing one of the cars, or abandoning my car for the time being. The camel and the gnat again?

At the 1.28 hearing Mr. Soublet stated that vehicles with self-parking features “are not autonomous vehicles” under California’s definition (hearing at about 1:16). I would like to believe that this is true, but I am going to assert rather boldly that this is incorrect. 38750(a)(2)(B) excludes from the definition of autonomous vehicle various systems, including “park assist,” but only so long as it is “not capable . . . of driving the vehicle without the active control or monitoring of a human operator.” Subsection (b)(4) then defines “operator” as “the person who is seated in the driver’s seat, or, if there is no person in the driver’s seat, causes the autonomous technology to engage.” 227.02(p), however, narrows the definition of operator to one who “has engaged the autonomous technology while sitting in the driver seat of the vehicle.” [Emphasis added]. Since the newer park assist programs operate without anyone in the driver seat, they drive without the control of an “operator” as defined. I recall, too, that at an earlier hearing, it was represented that a Level 4 parking feature would also require the 180 day notice to the legislature.

Perhaps my reading is too pinched. I like to think so, but it at least deserves clarification in the proposed regulations. At present some OEMs are confining their park assist feature when the operator is not in the vehicle, like “Summons,” to private property.

³² [49 CFR 571.114 - Standard No. 114; Theft protection and rollaway prevention, see: <http://www.autoblog.com/2016/01/18/bmw-exemption-self-parking-7-series/>]

227.02(h)—The definition of “critical driving error” in combination with the testing regulation section 227.58(d)(6) leads to unacceptable results. If the autonomous vehicle performs a critical driving error, then the test is a failure and the test is to be stopped immediately. This is because a critical driving error is defined as any maneuver that requires an emergency disengagement or even evasive action by another vehicle or pedestrian. If an oncoming driver comes into the AV’s lane, and the AV driver takes control, this is a “critical driving error.” In addition, if the oncoming car brakes, this is “evasive action” and constitutes a critical driving error on the part of the AV. If a cement truck forces the AV to move out of its lane and another driver slows to allow the AV room to avoid a collision, that is a critical driving error. If another driver pulls in front of the AV, causing the AV to slow down (a maneuver), and the car following the AV also slows down or changes lane (evasive action), that is a critical driving error.

This section needs to be more tightly defined to include only those instances where the action, if done by a human, would be faulty driving.

One example of “Critical Driving Error” is in error. OL 318 provides that it is a critical driving error if the test vehicle

“Drives 10 mph:

- Over the speed limit
- Under the speed limit when road and/or traffic conditions do not warrant a lower speed”

Low Speed Vehicles (LSVs) are limited to a maximum speed of 25 mph. Unless prohibited by local ordinance or the California Highway Patrol and properly posted, they are permitted to drive on roads with a 35 mph speed limit. Motor Vehicle Code sec. 21260. Thus, they are legal in 35 mph zones even though limited by law to 10 mph below the speed limit. It cannot, therefore, be a critical driving error for a LSV to travel at 25 mph in a 35 mph zone. In addition, it would make no sense for a manually driven LSV to be legal, but an autonomous LSV, which under the proposed regulations is to be continuously monitored by an operator who can take immediate control, to be in a continuous state of “critical driving error.” I doubt the DMV had this odd result in mind. Of course, other laws may apply, as, for example, the rule requiring a car to safely pull over to allow 5 or more cars to pass.

This definition of “Critical Driving Error” should be redrafted to reflect the rule governing LSVs in California. Perhaps this language would serve: “Under the speed limit when road and/or traffic conditions do not warrant a lower speed. This section does not apply to Low Speed Vehicles when otherwise operated lawfully.”

I would also point out that when I took my behind the wheel driving test at 16, I do not think I scored 100%. I wonder why an AV should be held to this higher standard. Choking on the gnat again?

227.44—This provision is unworkable as written. It puts an obligation on the manufacturer to report all accidents involving, for example, damage to property (not defined). The difficulty is that the vehicles will be in the hands of the leasees, not the manufacturer. The

driver only has an obligation to report accidents involving property damage over \$750. Vehicle Code sec. 1600 (automatically repealed on Jan. 1, 2017 unless extended). For minor accidents, this obligation, I believe, is largely ignored by the public. So there is no way that the manufacturer can know that the driver hit a dog or a cat (property). Most of the accidents that have occurred in the hands of test drivers (bumped in the rear by other drivers) have been so minor that they were “walk-aways.”³³ This section should be revised to impose the obligation to report damage only when reported to the manufacturer. Drivers should be reminded that they are obliged to report damage to the DMV when more than \$750.

Collisions with deer are not uncommon where I live. As *ferae naturae*, they are property, but they are not the property of anyone until reduced to possession. The same for opossums. Since it is not damage to the property of any one person, it would not fall within the reporting requirement of sec. 16000. Would deer strikes fall within the reporting requirement of 227.44?

This section also puts too much emphasis on accidents. Accidents are quite rare, but infractions that may cause accidents are both more frequent and more useful for improving the technology. There is no provision for reporting these to manufacturers, and, indeed, reporting will be discouraged by making the operator “responsible” for citations. See discussion below.

“Accident” is not defined. Does the DMV mean “collisions?” If the operator of the car brakes and the coffee spills on the seat, is that an accident?

227.52—This provision, as drafted, not only bans the deployment of Level 4 vehicles, but it also bans the testing that is proceeding at present. “The following vehicles shall not be approved for testing . . . (5) Vehicles that are capable of operation without the presence of an operator inside the vehicle.” Whether they have a test driver or are empty, Google’s Prototype, and I expect a few others by the time you receive this memo, are “capable” of driving without the presence of an operator inside the vehicle. They, like vehicles with a weight rating of 10,001 or more pounds, will be banned from even testing in California. Even closely controlled pilot tests (as proposed by the representative of Beverly Hill at the 2.2 hearing at 34:00) are banned.

I do not think that this was the DMV’s intention. This should be amended so that the blackletter does not exclude Level 4 vehicles from testing.

227.54(c)—This section refers to “vehicle owner.” Since these are only available by lease, the “owner” is the manufacturer. Does the DMV want to clear up this ambiguity?

227.56(a)(6)—Why limit the 30 seconds to accidents while in autonomous mode? It would be very useful to diagnose all accidents, and it may be that the accident occurred while moving to autonomous mode or immediately after disengaging autonomous mode. This is important information.

227.56(b)(5)(D)—“purchasing a previously-owned vehicle.” It will be previously owned by the manufacturer, but not “purchased” when it may only be leased.

227.56(b)(6)(C)—This appears to require that emergency services be alerted in all cases. As with any other car, whether emergency services should be alerted should depend on the

³³See: “Automated Vehicle Crash Rate Comparison Using Naturalistic Data”, available at: <http://www.vtti.vt.edu/featured/?p=422>

circumstances. The car may be perfectly and safely parked with no need for emergency services. In addition, deployment of emergency services may trigger annoying fees known colloquially as “crash taxes.”

227.58(c)(1)(A) and (c)(3)(C). This section seems to include requirements for disclosure of any number of things “throughout the autonomous technology development process.” In some cases, the development process has spanned more than a decade, going back to the 2004 DARPA challenge and earlier.³⁴ At the 1.28 hearing the Ford representative said that Ford has been working on AVs for over a decade. If I am reading this correctly, this is a burdensome and useless requirement. It is probably impossible to fulfill. If truly needed, testing information of this sort should be limited to the testing of the final version, and should be limited to a reasonable number of miles (or perhaps time). Some issue that appeared years ago and has long ago been addressed is of no use. It is like asking a college student how well he or she could read in the fourth grade, or asking Apple how many times 1985 Macintoshes crashed.

227.58(c)(3)(B)—The significance of a stop or lateral acceleration of 0.2g is unclear. Without more information, it is quite possible that the AV was avoiding careless drivers, a tree or rock in the road, etc. - i.e., the AV did just what it was supposed to do. I think I am correct that accelerating from 0 to 60 in any modern, powerful car (not my '96 Saturn) will greatly exceed 0.2g.

Is there any human driver baseline against which the significance of a 0.2g stop may be measured? It is illegal for insurers in California to even collect this information.³⁵ One baseline does exist in California – in 35% of fatal crashes, the brakes were not applied. In all of these cases a 0.2g or greater stop would have been helpful. When I recently renewed my license, I was not asked if I ever had a 0.2g stop. I expect I have, and that may be why I have achieved the crusty age of three score and thirteen.

227.58(d)(2)—“the autonomous technology and vehicle intended for deployment.” Unless you mean every single vehicle is to be tested, I think you mean something like “the final version of the subject autonomous vehicle that is intended for deployment.”

227.58(d)(3)—This is a very dangerous provision because it will cause manufacturers to leave unnecessarily dangerous vehicles on the road. In any sensible world, manufacturers will constantly update and improve the technology.

Programs driving AVs are not static, “If-Then” programs. They employ learning algorithms that, like human drivers, constantly integrate experience and improve. Once vetted by the manufacturer, improvements are shared on a fleet-wide basis. The knowledge of each car is the knowledge of all, and vice-versa. Much like the Three Musketeers – “All-for-One-and-

³⁴ See: <http://www.techinsider.io/the-first-self-driving-cars-that-competed-in-darpa-grand-challenge-2015-10>

³⁵ Cal. Code Regs. Tit. 10, sec. 2632.5(i)(5)(a)(insurer may use a technological device only for “determining actual miles driven”)

One-for-All.”³⁶ Indeed, I understand that a Google test vehicle will not engage autonomous mode until it has received its daily update (The DMV would have to confirm this with Google).

When Tesla distributed its Autopilot, it soon discovered that a few drivers were doing foolish things with it. Tesla then downloaded some restrictions (“changes to the autonomous vehicle’s autonomous technology,” in the words of (d)(3)). This precaution would not be permitted under this provision. As drafted, this section reads as if a driver, licensed at age 16, must refuse to learn from experience and continue to drive at a 16-year-old level until retested.

Does this section, then, create an immunity from liability for the OEM who learns of an improvement? Can they argue that when they discover a correctable hazard or a persistent misuse, they are powerless to improve the program without resubmitting the vehicle for recertification?

Perhaps the DMV has something more narrow in mind for section 227.58(d)(3). Is the purpose to freeze the technology only during testing, except with respect to the correction of deficiencies discovered during testing? If so, the section needs to be more explicit, since, as drafted, it forbids any future changes whatsoever except as to those deficiencies discovered during the test. It might serve the purpose to change the language from “Once the subject autonomous vehicle has been submitted for third-party vehicle demonstration test” to something like “During the third-party vehicle demonstration testing.”

The problem is not made any better by 227.64(b). This section purports to forbid “material change,” but 227.58(d)(3) prohibits “any further changes.” Apart from perpetuating possible dangers, the two sections are inconsistent. In addition, 227.64(b)(2) prohibits any “new behavioral competency.” Behavioral competency is defined so broadly that it would prohibit the addition of a new and more effective way to identify a bicyclist signaling a turn, recognize a child running into the street with a beach ball, or distinguish a piece of cardboard from a piece of plywood. It would even prohibit a mapping update to reflect the fact that a one-way road has changed direction. Put another way, if the car could read at only a fourth grade level when certified, it will likely remain that way until recertified. It appears that this section, too, would ban improvements that flow in due course from learning algorithms.

If the DMV wants to keep something along the lines of control over changes, the DMV may consider providing that the vehicle models that have been updated with material changes (however that may be defined) be recertified every three years. An exception can be made if serious incidents implicating any changes emerge.

227.66—Without further definition, “defect,” like “safe,” has little useful meaning in this context. In product liability jurisprudence, a subject that I have had the privilege of teaching many times, much of the course is spent attempting to define in various contexts whether a

³⁶ See: *Top Misconceptions of Autonomous Cars and Self-Driving Vehicles*” (Misconception 4: Self-driving cars are controlled by classical computer algorithms (“if-then” rules)), available at www.driverless-future.com/?page_id=774 See also: <http://www.citylab.com/tech/2015/05/googles-new-self-driving-car-is-about-to-hit-the-streets/393323/> (“And keep in mind that everything one car learns, the entire fleet learns, whether Lexus or Prototype, because they all share a brain.”)

danger is also a “defect.” For example, a knife, though dangerous, is not defective, but a gun without a safety is. All automobiles are dangerous. That does not mean that all are defective.

The modern definition of “defect” began with the adoption of Restatement (Second) of Torts §402A (1965). That section provided

- (1) One who sells any product in a defective condition unreasonably dangerous to the user or consumer or to his property is subject to liability for physical harm thereby caused to the ultimate user or consumer, or to his property, if
 - (a) the seller is engaged in the business of selling such a product, and
 - (b) it is expected to and does reach the user or consumer without substantial change in the condition in which it is sold.
- (2) This rule applies even though
 - (a) the seller has exercised all possible care in the preparation and sale of his product, and
 - (b) the user or consumer has not bought the product from or entered into any contractual relation with the seller.

After courts struggled with the definition of “defect” for over three decades, the American Law Institute, the drafters of the Restatement, revisited the issue and adopted the Restatement (Third) of Torts. Today, many states (like California) still hew to the Restatement (Second), while others have adopted all or part of the Restatement (Third).³⁷

To simplify a bit, a product may suffer from (1) a manufacturing defect (usually when it does not meet the manufacturer’s own standards – e.g., a screw is missing), (2) a design defect (usually couched in terms of balancing risk versus utility, but in California also including failure to meet the expectations of an ordinary consumer), and (3) a defect due to a failure adequately to warn or instruct.

In addition, and especially when there is a continuing relationship with the consumer, a product that was not defective when first sold or distributed may become defective because new advances in design or information make the product or its use unreasonably dangerous. Under

³⁷ For a discussion of the evolution of the definition of “defect” and the sometimes controversial differences between the two versions of the Restatement, see Michael J. Toke (1996) *Restatement (Third) of Torts and Design Defectiveness in American Products Liability Law*, Cornell Journal of Law and Public Policy: Vo 5:Iss 2, Article 5, available at <http://scholarship.law.cornell.edu/cjlp/vol5/iss2/5/>

appropriate circumstances, manufacturers have an affirmative duty to update or improve products after distribution.³⁸

The definition of “defect” should be clarified. It may be too daunting to attempt a stand-alone definition in the regulation, but perhaps a general definition found in products liability law would serve. E.g., “Defect,” as used in this regulation means “defect” as defined by applicable statute, regulation or the California courts in products liability cases. Alternatively (or in addition), “defect” might be defined as inability to perform the competencies listed in OL318.

227.68(a)—Given that the proposed regulations make it burdensome to improve a car’s technology, I can understand why AVs should have a 3 year sunset. This, however, is because inability to improve the program is a defect, if I may use that word, in the regulations. Note, too, that the duty in tort law to improve some products after distribution would also be frustrated by 227.64(b).

227.68(c)—Why only a lease? If it is to maintain some control over the technology, that will undoubtedly be distributed on the basis of a license, or End User License Agreement (EULA). The manufacturer will own and control it, so it should make no difference that the purchaser owns the rest of the metal.

More to the point, if these cars are safer, development and deployment should be encouraged, or at least not discouraged. Purchasing or leasing a car that must be retired after only three years is not economically attractive, so it is unlikely to attract many participants. Likewise, investing in the development of a product with a 3-year sunset is not very attractive. Again, unsound public policy.

Is this a consumer protection measure – if the vehicle does not work well enough, the purchaser may walk away? That may give some protection, but surely, if this is a concern, consumers will demand leases rather than purchases. Is that an appropriate area into which the DMV should intervene? There is no similar restriction on other “automated” or “autonomous” technology.

227.68(d)—“The manufacturer shall gather data regarding the performance, usage and operation” of the vehicle. This information, however, is not limited to that required by subdivisions (1)-(4). Much of this information, along with other information, will be useful, though not “necessary” for improving the safety of the vehicle. This potentially conflicts with 227.76, which requires disclosure of the collection of information that is “not necessary for the safe operation of the vehicle.” The usual meaning of “necessary” is “absolutely needed.” Since the manufacturer is required to collect information that is not “necessary,” there must be a disclosure and “approval of the operator” in every case. It would be helpful, therefore, for the DMV to adopt a safe harbor disclosure form that can be routinely used.

It is also not possible to get approval from the operator of the vehicle because any properly licensed person can drive any AV for which the license is valid. Likewise, there are growing numbers of car-sharing arrangements. The approval of the original purchaser/leasee

³⁸ See Bryant Walker Smith, *Proximity-Based Liability*, 102 *Georgetown Law Journal* 1777 (2024), available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2336234

must be binding on any other operator of the vehicle. AVs deployed as T.N.C.s also present unique challenges which you heard about at the 2.2 hearing.

It should be noted that the information mandated to be collected by manufacturers under 227.68 goes beyond that permitted under the regulations applicable to insurers. Insurers may collect only mileage.³⁹ Since manufacturers are required to insure these cars, their insurers will want access to the same usage information that their insureds are using to price the cars, assess their risk, and monitor and improve the safety of their cars. Moreover, operators have no legitimate privacy interest in this information because collection is a mandated precondition to their leasing an AV. This potential conflict may need to be resolved.

227.82—Why must the label be verified by the department or a dealer? Why not the manufacturer? Tesla, for example, does not sell through dealers (again, as I understand it).

227.84(c)—Imposing responsibility for monitoring the vehicle at all times and being able to take “immediate control” is a bad provision for the reasons stated in the introduction.

Also, what, exactly, does “shall be responsible” mean? Does it carry with it responsibility for personal liability when the automobile, through no fault of the operator, runs a stop sign or mounts the curb? Three OEM’s have stated that they will take responsibility for accidents caused by their vehicles in AV mode. Does this provision undermine this guarantee by making the operator also responsible? If this provision fastens potential liability on the operator, I expect that this may discourage other OEMs from following suit (or the three to backtrack on their initial representations). Now this may have to be litigated in every case.

If an operator may share responsibility with the OEM when the car unexpectedly runs down a pedestrian (“In the 2.5 seconds before the collision, you should have taken over,” argues the OEM), this may be very detrimental to the pedestrian.

Assume grave injuries, with pain and suffering at \$6,000,000. If the operator has a \$15,000 policy (a minimum not raised since 1967) and is found to be 50% responsible for the injury, then the pedestrian will likely collect only \$15,000 from the operator and the remaining \$3,000,000 from the OEM. If only the OEM were responsible, the pedestrian would collect the full \$6,000,000. This shared responsibility has cost the pedestrian \$2,985,000! If only the operator is responsible, then the pedestrian has been deprived of \$5,985,000 in recovery.⁴⁰

To the extent that the proposed regulations fasten financial responsibility on operators, the regulations cause even more adverse consequences. Assume an algorithm malfunction in the vehicle injures the operator. If only the operator is responsible, then the operator may have no claim against the manufacturer. Likewise, if a malfunction in the AV injures a family member riding with the operator, the family member has no claim against the manufacture, and the family

³⁹ Cal. Code Regs. Tit. 10, sec. 2632.5(i)(5)(a)(insurer may use technological device only for “determining actual miles driven . . .”).

⁴⁰ See California’s Proposition 51 (Civil Code sec. 1431.2). See https://ballotpedia.org/California_Proposition_51,_Non-Economic_Damages_Assessed_in_Lawsuits_%281986%29

member's claim against the operator is not insured. There is no claim against the manufacturer because the operator is responsible. The operator is not insured because virtually all personal auto policies contain an exclusion for injury to family members residing in the home. If, however, the manufacturer is responsible, as they should be, both the operator and the family member would have a claim against the manufacturer.

Placing responsibility on the operator can have further adverse consequences. If an operator is operating an AV in the scope of employment and the vehicle malfunctions causing injury to the operator, the operator, if responsible, would be limited to a workers compensation claim against the operator's employer. If, however, the responsibility for the malfunction is on the manufacturer, then the operator also has a fully compensable tort claim against the manufacturer.

The tort responsibility for Level 3 cars in autonomous mode and for Level 4 cars should remain squarely on the OEMs. They manufacture and market the vehicles, and they maintain and update the technology. These regulations should not undermine that responsibility.

A related issue, but perhaps beyond the purview of the DMV, is the issue of insolvency. Vehicles may outlast their creators. The DeLorean company is long gone, but there are still approximately 6,500 DeLorean vehicles on the road today.⁴¹ Old GM, the maker of my '96 Saturn, is also gone. Looking at the eleven manufacturers who have taken out testing permits in California, can one say with confidence that they will all outlast their cars? Bankruptcy, generally speaking, discharges tort liabilities. Injured parties may have viable product liability claims against dealers, if they exist and are solvent, but if the manufacturer deals directly (e.g., Tesla), then even that avenue is foreclosed. The \$5,000,000 bond/insurance/net worth requirement will not solve this. It is too little for a major OEM, and the terms of the policy are not likely to reach accidents following bankruptcy. One possible solution is to create a fund, much like insurance guarantee funds, to cover injuries from bankrupt OEMs. Another might be to approach the matter more like the federal fund for compensating vaccine injuries. Social Security and Medicare benefits may be another model. This, however, is probably a longer conversation.⁴²

Subsection (d) ("responsible for all traffic violations") is also very poor public policy. Fixing strict liability for tickets on innocent operators has far reaching adverse consequences. AVs not only present some utility to operators, but they also generate positive externalities that benefit many others –e.g., pedestrians, bicyclists and others who are spared injury or death, lower congestion, and more efficient use of infrastructure and land.⁴³ The operator, however, pays the price for the technology from which these benefits flow.

⁴¹ See: https://en.wikipedia.org/wiki/DeLorean_DMC-12

⁴² See Carrie Schroll, Note. *Splitting the Bill: Creating a National Car Insurance Fund to Pay for Accidents in Autonomous Vehicles*, 109 Nw. U. L. Rev. 803-833 (2015).

⁴³ See: "Self-Driving Vehicles Offer Potential Benefits, Policy Challenges for Lawmakers," available at: <http://www.rand.org/news/press/2014/01/06.html>

Sound public policy should encourage this individual investment rather than discourage it with an arbitrary tax on innocent operators who cannot possibly be deterred (other than from adopting an AV) by the tax. It will certainly discourage the deployment of these safer vehicles because human nature does not warm to being punished for something that is the responsibility or fault of others (the manufacturer). If the car runs a stop sign, there is simply nothing the operator could have done about that. In that event, there should be no citation to the operator. This view was also endorsed by the representative from Volvo at the 1.28 workshop. I heard no one speak in support of the proposed regulation.

Fixing responsibility on operators for faults in the vehicle's programming also misaligns the operator's interests and the public's interest in safer vehicles. Proving that the vehicle, rather than the operator, committed the infraction boots the operator nothing, since the operator remains responsible for the fine, points, etc. In addition, since there was no accident triggering the 30 second preservation rule, and there is no external indicator on the vehicle that it was in autonomous mode, there is no independent proof that the vehicle was in autonomous mode at the relevant time (unless the vehicle was a Level 4 AV). If the operator immediately informed the manufacturer that the vehicle committed an infraction, that would be an evidentiary admission that could be used to convict the "responsible" operator. Consequently, the operator's interests may be best served by contesting the citation even if there is, in fact, room for improvement in the vehicle's performance. One would expect, then, that citations for failure to yield, unsafe lane change, unjustified stop, failure to proceed on green, following too closely, etc. will often be contested. The operator may prevail, or perhaps the officer will not appear.

Public interest in safety, however, would be better served if, rather than contesting the underlying vehicle behavior, the operator were encouraged to call the possible fault to the attention of the manufacturer so that the vehicle's programming might be improved.

What is a more sensible approach to traffic infractions by AVs? Sending a frustrated, innocent and angry operator before a court to have his pocket picked (in the operators very reasonable opinion), is not. Rather, the infraction should take the form of a notice of the apparent violation to the manufacturer with a copy to the DMV (or NHTSA?). There should be a reasonable administrative fee based on cost assessed on the manufacturer for issuing the notice. The registrations of all AVs should include the manufacturer's contact information for this notice. If possible, the operator should be able to bookmark the incident in the vehicle's memory and forward that information to the manufacturer. The manufacturer could, then, examine the event and determine whether the incident requires remedial action.

In this way, not only are manufacturers put on notice of possible issues (notice may be relevant should the issue arise in future regulatory or litigation contexts), but, if necessary, they could fix it not only for the subject vehicle, but for the entire fleet.

Or could they? See section 227.58(d)(3) ("the manufacturer shall not make any further changes to the autonomous vehicle's autonomous technology") This dangerous aspect of the regulations is discussed above.

This section is, however, even more insidious. An operator who is responsible for traffic tickets incurred because of faults in the AV will incur points. These, then, will cause the operator to lose the Good Driver Discount on not only the AV (if any) but also on any other

standard vehicle the operator owns. This is a nonsense result. It is much like raising the price of a person's manual vacuum cleaner because their self-driving Roomba vacuum cleaner ran over someone's foot. The situations are so different that they should have no bearing on each other.

This section presents yet a further problem. If the operator is "responsible for all traffic violations," then if the AV violates a traffic law, this section puts the operator in violation of a statute, ordinance or regulation. Evidence Code sec. 669, then, raises a rebuttable presumption that the operator was negligent. This presumption shifts the burden of proof to the operator to show that the operator was not negligent. This, then, will have to be litigated in virtually every civil case even if there is little doubt the AV, not the operator, violated the rule of the road.

I would suggest that this section be changed. Operators should not be mulched in fines when they have done nothing wrong. Making the operator "responsible" is neither fair nor responsible public policy.

Failing that, I would suggest that a provision be added that nothing in these regulations is intended to affect issues of civil liability. For an example of such a provision, see *Richards v. Stanley*, 43 Cal 2d 60, 62, 271 P.2d 23, 25 (1954) ("nor shall this section or any violation thereof be admissible as evidence affecting recovery in any civil action for theft of such motor vehicle, or the insurance thereon, or have any other bearing in any civil action.")

These questions can, then, be left to the courts without the burden of attempting to determine just what "responsible" means in these regulations.

Miscellaneous

Special licensing/instruction

No one can quarrel with adequate training for drivers, but one must be both practical and trust to drivers' good sense. Our daughter, when she was learning, simply could not conquer the stick shift in our '96 Saturn or our '93 pickup. We finally capitulated and bought her a used car with an automatic transmission. She passed her test and is now licensed. Her license is valid for driving anything from a stick shift to a full-size diesel truck towing a large motorboat. I have also had the personal experience of renting a car and discovering that I did not know how to turn on the lights, turn off the rear windshield wiper, or, in one case, open the gas tank cover (it was a button in the glove compartment!). The electronic amenities on dashboards increasingly invite a good deal of fiddling and frustration to those not completely fluent with the technology.

Level 3 cars are likely to be driven by any number of people (especially members of the family), not just the purchaser. If special licenses were required, it would be impractical. Even if one were "licensed" to drive Model X, would one need a new license to drive Model Y?

Level 4 cars, especially if deployed on a fleet or shared basis, would be occupied by many people. Again, it is impractical to require all passengers to have special licenses or training, and it would be a very serious impediment to the deployment of safer technology. I would suggest that the DMV revise or abandon this requirement.

Weather Challenges

At present no Level 3 or Level 4 car is ready for deployment. Also at present snow, fog and heavy weather present some challenges. Whether these will present serious challenges when ready for deployment is simply guesswork because major OEMs are all working on this.

I would suggest, however, that it makes little difference. Level 3 cars will turn over driving to the operator who, like most of us, will probably, and foolishly, soldier on through snow, rain and fog. Much like the Postal Service.

Level 4 cars will not drive in conditions for which they are not programmed. In California, that will seldom be the case, but when it is the case, the car will pull over. You will not find any Level 4 cars in 50-car pileups on highway 5 or 99. More likely, whether individually owned or deployed on a fleet or shared basis, the vehicle will know through crowd sourcing and otherwise, that it will not be able to take the passenger to the destination at the time requested. It will say, "Please check back later. Weather conditions prohibit autonomous travel to your destination at this time." This is inconvenient, but it is not unsafe. Take, instead, a conventional vehicle, a Level 3 vehicle, a T.N.C. or a taxi. After all, tens of thousands of travelers are frequently inconvenienced by airline delays caused by snow, fog and heavy weather.

If Level 4 cars are reasonably convenient in California, but insufficiently convenient in North Dakota, public acceptance may be delayed in North Dakota. One might expect 4-wheel drive vehicles to be more popular in North Dakota than in California. This, however, is not a significant safety issue for the CA DMV.

The Trolley Problem

The Trolley Problem⁴⁴ has engaged philosophers for over a generation. I have used it in the classroom for nearly as long. It will likely bedevil philosophers for another generation or more and offer no generally accepted solution. Fortunately, none is required to move forward with AVs. Were it otherwise, we would have to ban trolleys.

We would also have to ban minivans (urban assault vehicles, as my colleague calls them) which people often purchase to protect themselves and their families at the expense of others with whom they may collide. We would also have to ban airplanes because pilots, when crashing, sometimes have Trolley-Problem choices and enough time in which to make them. Watch this airplane landing on a crowded highway (and notice the car in the distance lose control and cross the grass divider into oncoming traffic).⁴⁵ In another video, did this airline pilot avoid

⁴⁴ <https://www.washingtonpost.com/news/innovations/wp/2015/12/29/will-self-driving-cars-ever-solve-the-famous-and-creepy-trolley-problem/>

⁴⁵ <http://www.nbcphiladelphia.com/news/local/Video-Skydiving-Plane-NJ-Highway-Jersey-Shore-315067961.html>

Unfortunately, plane landings on highways are not uncommon. See:

<http://k2radio.com/plane-crash-on-i-80-near-laramie/>

apartment buildings, but put the taxi driver's life at risk?⁴⁶ The apartment dwellers may be grateful, but ask the taxi driver and the taxi driver's family.

Hypotheticals presenting the Trolley Problem are engaging, but they are hypotheticals. Life is seldom so clear. In the first airplane crash above, the pilot was faced with almost certain death to himself and his passengers if he went into the trees next to the highway. Landing on the highway presented an array of possibilities, ranging from a safe landing to the death and injury of many more people than those in the plane. In the second case, crashing into an apartment likely meant death to many apartment dwellers and all aboard, while the river presented a chance that some would survive. When the Concorde crashed in 2000, it completely destroyed a hotel and killed 5 people on the ground (along with all on board). There was a slightly larger hotel next door.⁴⁷ Did the pilot choose the smaller hotel over the larger? I think not – they were completely out of control. But what if?

The Trolley Problem hypotheticals are edge cases that, fortunately, will exist in hypotheticals, but will be extremely rare in real life.⁴⁸ With broader fields of vision and cautious algorithms, autonomous cars will reduce, and possibly eliminate, the Trolley Problem altogether.

http://bismarcktribune.com/news/local/plane-lands-safely-on-interstate/article_75cc29af-0c3d-5dcd-a295-ed781a139280.html

<http://www.cowichanvalleycitizen.com/news/368250651.html>

<http://www.sun-sentinel.com/local/broward/pembroke-pines/fl-pines-small-plane-highway-20160217-story.html>

<http://www.vcstar.com/news/local/moorpark/small-plane-lands-along-highway-23-in-moorpark-no-one-injured-29147f8c-8e28-3e56-e053-0100007f6e95-364928211.html>

<http://juneauempire.com/state/2015-08-18/small-airplane-lands-highway-south-anchorage>

⁴⁶ <http://www.wilx.com/home/headlines/-Taiwan-Plane-Crash-Caught-on-Dash-Cam-290782181.html> (“The aircraft appeared to just barely miss nearby apartment buildings - though its not clear whether the pilot deliberately steered the stricken plane into the river in an attempt to avoid a greater disaster.” It does clip a taxi driver on the bridge).

⁴⁷ <http://www.concordesst.com/accident/pictures/a3.jpg>

⁴⁸ But they do exist. In 2003 a freight train broke loose and rolled 30 miles towards Central Los Angeles at speeds up to 70 mph. What did the railroad do? They diverted it onto a side track in order to derail it in a working class neighborhood.

Downtown Los Angeles? Or working class neighborhood? To avoid what they judged to be the greater harm, they threw the switch, destroying a number of homes and injuring a dozen people

But put the Trolley Problem in the larger perspective. Autonomous vehicles will save tens of thousands of lives. If the Trolley Problem derails deployment because in rare cases Trolley Problem dilemmas may materialize, then we have condemned thousands to death and injury. There may be no “right” solution to the Trolley Problem, but that would certainly be the wrong solution.

Conclusion

At the 1.28 workshop, the DMV responded to criticisms of the proposed regulations by suggesting that it only takes a wrecking ball to tear down a house, but it takes a crew of carpenters to build one. I would suggest that it takes flexibility and a legion of effort to build safer autonomous vehicles, but it takes only one regulation to destroy them.

At the same workshop the DMV repeatedly asked for suggestions on language. Numerous speakers, in fact, were making the most important two suggestions on language. Section 227.52(a)(5) bans both testing and deployment of fully autonomous vehicles in California. It should be deleted. Secondly, modify 227.84(c) so that the definition of monitoring is consistent with NHTSA Level 3 vehicles. Without these two modifications, the remaining suggestions outlined above are largely lace around the window.

I hope this memo is helpful. I hope this memo is productive and provocative – it shares those intents. And I hope that our seats in Levi Stadium might soon be populated with the living, rather than with the ghosts and hopes of those who might have been.

Respectfully submitted,

/S/ Robert w. Peterson

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Professor of Law

Enc.

in Commerce, CA. See: <http://articles.latimes.com/2003/jun/22/local/me-train22> and <http://articles.latimes.com/2003/jun/21/local/me-train21>

Like the vast majority of vehicle accidents, the cause of this Trolley Problem was human error – failure to set the air brakes.