

SMART DRIVING CARS



<http://smartdrivingcar.com/GreenLight-092316>

Friday, September 23, 2016



Federal Automated Vehicles Policy: Accelerating the Next

Revolution In Roadway Safety

September 2016, "Executive Summary...For DOT, the excitement around highly automated vehicles (HAVs) starts with safety. (p5)

...The development of advanced automated vehicle safety technologies, including fully self-driving cars, may prove to be the greatest personal transportation revolution since the popularization of the personal automobile nearly a century ago. (p5)

...The benefits don't stop with safety. Innovations have the potential to transform personal mobility and open doors to people and communities. (p5)

...The remarkable speed with which increasingly complex HAVs are evolving challenges DOT to take new approaches that ensure these technologies are safely introduced (i.e., do not introduce significant new safety risks), provide safety benefits today, and achieve their full safety potential in the future. (p6) *Hmmm...Fantastic statements and I appreciate that the fundamental basis and motivator is SAFETY. We all have recognized safety as a **necessary** condition that must be satisfied if this technology is to be successful. (unfortunately it is not a **sufficient** condition, (in a pure math context)). This policy statement appropriately reaffirms this necessary condition. Alain*

"...we divide the task of facilitating the safe introduction and deployment (...defines "deployment" as the operation of an HAV by members of the public who are not the employees or agents of the designer, developer, or manufacturer of that HAV.) of HAVs into four sections: (p6) *Hmmm...Perfect! Alain*

"...1. Vehicle Performance Guidance for Automated Vehicles (p6)..." *Hmmm... 15 Points, more later. Alain*

"...2. Model State Policy (p7) The Model State Policy confirms that States retain their traditional responsibilities...*but...* The shared objective is to ensure the establishment of a consistent national framework rather than a patchwork of incompatible laws..." *Hmmm... Well done. Alain*

"...3. NHTSA Current Regulatory Tools (p7) ... This document provides instructions, practical guidance, and assistance to entities seeking to employ those tools. Furthermore, NHTSA has streamlined its review process and is committing to..." *Hmmm... Excellent. Alain*

"...4. New Tools and Authorities (p7)...The speed with which HAVs are advancing, combined with the complexity and novelty of these innovations, threatens to outpace the Agency's

conventional regulatory processes and capabilities. This challenge requires DOT to examine whether the way DOT has addressed safety for the last 50 years should be expanded to realize the safety potential of automated vehicles over the next 50 years. Therefore, this section identifies potential new tools, authorities and regulatory structures that could aid the safe and appropriately expeditious deployment of new technologies by enabling the Agency to be more nimble and flexible (p8)..." *Hmmm... Yes. Alain*

"...**Note on "Levels of Automation"** There are multiple definitions for various levels of automation and for some time there has been need for standardization to aid clarity and consistency. Therefore, this Policy adopts the SAE International (SAE) definitions for levels of automation.) *Hmmm... I'm not sure this adds clarity because it does not deal directly with the difference between self-driving and driverless. While it might be implied in level 4 and level 5 that these vehicles can proceed with no one in the vehicle, it is not stated explicitly. That is unfortunate, because driverless freight delivery can't be done without "driverless"; neither can mobility-on-demand be offered to the young, old, blind, inebriated, ...without "driverless". Vehicles can't be "repositioned-empty" (which (I don't mean to offend anyone) is the real value of a taxi driver today). So autonomousTaxis are impossible.*

Also, these levels do not address Automated Emergency Braking (AEB) Systems and Automated Lane Keeping Systems which are the very first systems whose on-all-the-time performance must be perfected. These are the Safety Foundation of HAV (Highly Automated vehicles). I understand that the guidelines may assume that these systems are already perfect and that "[20 manufacturer have committed](#)" to have AEB on all new cars, but to date these systems really don't work. In 12 mph IIHS test, few stop before [hitting the target](#), and, as we may have seen with the Florida [Tesla](#) crash, the Level 2/3 AutoPilot may not have failed, but, instead, it was the "Phantom Level 1" AEB that is supposed to be on all the time. This is not acceptable. These AEB systems MUST get infinitely better now. It is a shame that AEBs were were not explicitly addressed in this document.

"...**. Vehicle Performance Guidance for Automated Vehicles** (p11) A. Guidance: if a vehicle is compliant within the existing FMVSS regulatory framework and maintains a conventional vehicle design, there is currently no specific federal legal barrier to an HAV being offered for sale.(footnote 7) **However**, manufacturers and other entities designing new automated vehicle systems

are subject to NHTSA's defects, recall and enforcement authority. (footnote 8) . *and the "[15 Cross-cutting Areas of Guidance](#)" p17)*

In sum this is a very good document and displays just how far DoT policy has come from promoting v2v, DSRC and centralized control, "connected", focus to creating an environment focused on individual vehicles that responsibly take care of themselves. Kudos to Secretary Foxx for this 180 degree policy turn focused on safety. Once done correctly, the HAV will yield the early safety benefits that will stimulate continued improvements that, in turn, will yield the great mobility, environmental and quality-of-life benefits afforded by driverless mobility. What are not addressed are commercial trucking and buses/mass transit. NHTSA is auto focused, so maybe [FMCSA](#) is preparing similar guidelines. [FTA](#) (Federal Transit Administration) seems nowhere in sight. Alain



[The 15-Point Federal Checklist for Self-Driving Cars](#)

C. King, Sept 20. "Federal regulators announced their first safety checklist ever for semiautonomous and driverless cars this week. In the guidelines, the United States Department of Transportation urged automakers and tech companies to prove that their semiautonomous and autonomous vehicles could meet a 15-point list of safety expectations before the autos hit the road.

We broke down the 15 points:

DATA SHARING These giant computers on wheels collect piles of driving data. Carmakers should store that data and share it with regulators who can use the information to reconstruct what went wrong in a crash or system breakdown. *Hmmm... A sanitized version of data that describe the so-called "corner cases" (rare events that lead to crashes or near crashes) should be placed in the public domain so as to not require each developer and investigator to discover these on his/her own. Alain*

PRIVACY Car owners should have a clear understanding of what kind of data is being collected by the vehicles. They should also be able to reject any collection of personal information such as on biometrics or driver behavior. *Hmmm... Also, there should be "hold-harmless" legislation that allows individuals to freely share their driving data without fear of being charge with "running a red light 2 months ago". Alain*

HUMAN-MACHINE INTERFACE Carmakers must show how their vehicles can safely switch between autopilot and human control. *Hmmm...Necessary but not easy; however, because essentially nothing happens instantaneously, these systems need to anticipate far enough ahead so as to achieve and simple hand off or they should pull over and stop or just stop. . Alain*

CRASHWORTHINESS Driverless cars must meet the National Highway Traffic Safety Administration's regular standards for "crashworthiness,..." *Hmmm...Of course. Alain*

CONSUMER EDUCATION Automakers must train their sales representatives ..." *Hmmm...Of course. Alain*

CERTIFICATION Any software updates or new driverless features must be submitted to NHTSA..." *Hmmm...OK Alain*

POST-CRASH BEHAVIOR Automakers should prove their cars are safe to use again after a crash. *Hmmm...Of course. Alain*

LAWS AND PRACTICES The vehicles should follow various state and local laws and practices that apply to drivers. *Hmmm...This is a tough one. Current laws apply to human drivers in order to obtain, as best as possible, a human behavior that conforms to the rules of the road and achieves a safe outcome. Some of these laws, when followed by an algorithm, may have non-safe outcomes. New laws, our new interpretations of those laws, will undoubtedly be necessary. Alain*

ETHICAL CONSIDERATIONS Many human driving decisions carry ethical considerations, so the way a car is programmed also carries ethical consequences. *Hmmm...Another very tough one. Fortunately these are very rare and the whole purpose of the HAV technology is to avoid*

situations where not even one, let alone two, of these bad outcomes are being confronted at any time. Alain

OPERATIONAL DESIGN This is similar to a manual that describes where, when and under what conditions a driverless system works. *Hmmm...Of course and should be readily available on the vehicle. Alain*

DETECTION AND RESPONSE How will a car respond to other cars, pedestrians, animals and falling trees? *Hmmm...Falling trees??? Really? Not possible! Or do they mean Fallen trees? (Let's please just focus on avoiding the crashes that involve human error.) Alain*

FALLBACK The car should be able to change modes safely when there is a technological malfunction. *Hmmm...Of course. Alain*

VALIDATION Automakers need to develop testing and validation methods that account for the wide range of technologies used in driverless cars. *Hmmm...Of course. Alain*



[Tesla's major Autopilot update starts rolling out today](#)

J. Rigg, Sept 21, "Tesla CEO Elon Musk has taken to Twitter to announce the latest update to his company's EVs will begin rolling out tonight. ...Autopilot will rely [more heavily on radar](#), rather than these sensors playing second fiddle to camera feeds. The idea is radar is much more reliable than cameras when visibility is poor, such as when you're driving through snow or fog..." [Read more](#) *Hmmm...But the Florida crash was at 4:xx in the afternoon with partly cloudy skies???) Alain*



[Upgrading Autopilot: Seeing the World in Radar](#)

Team Tesla, Sept 11, "...After careful consideration, we now believe it can be used as a primary control sensor without requiring the camera to confirm visual image recognition....*Hmmm...What does this mean??? Does it brake if the camera sees something? If so, then the camera is "a primary control sensor" and they are co-primary ..., No???) Alain*

"...Therefore, the big problem in using radar to stop the car is avoiding false alarms..." *Hmmm...yes! AND "false negatives" (which, with respect to vision, motivated this upgrade.) Alain*

"...As the system confidence level rises, the braking force will gradually increase to full strength when it is approximately 99.99% certain of a collision. This may not always prevent a collision entirely, but the impact speed will be dramatically reduced to the point where there are unlikely to be serious injuries to the vehicle occupants..." *Hmmm...This is so depressing. Do we really have to wait until 99.99?? Can't we do this a little earlier so that we have collision avoidance rather than collision mitigation? This is so depressing! Alain*

"...The net effect of this, combined with the fact that radar sees through most visual obscuration, is that the car should almost always hit the brakes correctly even if a UFO were to land on the freeway in zero visibility conditions...." *Hmmm...Zero visibility is readily detected ahead and AutoPilot should pull over and stop or just stop before the Tesla enters the zero visibility condition (and inform the driver that it is ill-advised (crazy) to proceed in zero visibility conditions under manual control. Please! Alain*

"...Taking this one step further, a Tesla will also be able to bounce the radar signal under a vehicle in front - using the radar pulse signature and photon time of flight to distinguish the signal - and still brake even when trailing a car that is opaque to both vision and radar. The car in front might hit the UFO in dense fog, but the Tesla will not..." *Hmmm...Now you've gone too far again. Calling the system AutoPilot was reckless, suggesting that AutoPilot or anyone can drive in dense fog is totally irresponsible. Can't you see it now: "Man crashes Tesla in dense fog; man blames Tesla". These systems aren't meant to solve the Fog Problem, at least not yet. Alain*

Some other thoughts that deserve your attention



[Siemens presents Riyadh metro train](#)

K. Barrow, Sept 21, "SIEMENS presented the first driverless Inspiro metro train for Riyadh metro Line 1 (Blue Line) to representatives of Arriyadh Development Authority (ARA) at InnoTrans on September 20.

As E&M partner in the Bechtel-led Bacs consortium, Siemens is supplying 45 four-car trains for Line 1 and 29 two-car trains for Line 2 (Red Line) under a turnkey contract which also includes automatic train control systems and electrification for the two lines. ..."[Read more](#)
Hmmm...Driverless trains are now the norm :-) Alain

[On the More Technical Side](#)

<http://orfe.princeton.edu/~alaink/SmartDrivingCars/Papers/>



[Public priorities and consumer preferences for selected attributes of Automated Vehicles](#)

Paulina Lustgarten & Scott Le Vine. Under review for presentation at the 96th Annual Meeting of the Transportation Research Board and publication in *Transportation Research Record* (2017).
[Read more](#)

Calendar of Upcoming Events:



[F1/10 Autonomous Racing Competition](#)

[Oct 1-2](#)

[Wean Hall, Carnegie Mellon U.](#)