

## safe drivers safe vehicles secure identities saving lives!

December 6, 2018

Docket Management Facility U.S. Department of Transportation 1200 New Jersey Avenue, SE Room W12-140 Washington, DC 20590-0001

## RE: Pilot Program for Collaborative Research on Motor Vehicles With High or Full Driving Automation [Docket No. NHTSA-2018-0092]

AAMVA welcomes the opportunity to comment on the National Highway Traffic Safety Administration's (NHTSA) proposed pilot program on collaborative research on motor vehicles with high or full driving automation capabilities. As this technology enters the market, it carries the potential to impact not only the transportation sector, but every aspect of life. With this in mind, it is important that a continued emphasis on safety be placed on these nascent technologies so that public acceptance and consumer trust accompany their continued evolution. AAMVA welcomes the opportunity to partner with federal authorities as we continue to work together towards realizing the life-saving benefits of new technology and offers the following comments to the docket.

#### 1. NHTSA's Safety Mission, Authority, and Programmatic Needs With Respect to ADS

A. NHTSA Has Authority Over All Aspects of ADS Design; and

B. NHTSA's Flexibility to Develop and Implement Non-Traditional Standards for ADS

Section A cites that, "NHTSA's authority over ADS is broad and clear," and provides a prior citation to its legislative directive "(1) to prescribe motor vehicle safety standards for motor vehicles and motor vehicle equipment in interstate commerce; and (2) to carry out needed safety research and development." AAMVA recognizes the indispensable role NHTSA plays in the development and application of federal safety standards for vehicles and vehicle components. These standards serve as the platform for exercising any federal oversight authority for noncompliant, unsafe, or defective vehicles. However, there are numerous essential issues concerning advanced driving systems that disrupt the applicability of current Federal Motor Vehicle Safety Standards (FMVSS). Considering the fundamental role traditional FMVSSs have played in ensuring vehicle safety oversight, AAMVA offers the following comments in addressing both this section and the following section on "non-traditional standards."

#### 1. The understanding of "performance" needs to be more clearly defined

The National Traffic and Motor Vehicle Safety Act of 1966 does not clearly define what "performance" means. FMVSSs were developed with the common perception that performance

of a vehicle function relied on sufficient mechanical engagement of a vehicle component. The application of mechanical engagement in the realm of decision-making systems is substantially more complex. Given that timing and other associated environmental factors may contribute to the appropriate engagement of a vehicle's safety system, advanced driving systems that presume to replace a human driver's decision-making abilities cannot be judged on whether the system was engaged or not – but should rather be deemed to provide an equitable level of safety once the system has provided oversight authorities with a sufficient amount of testing data. AAMVA also understands that rather than a wholesale revision of the FMVSS to adapt them to these new technologies, NHTSA may consider an entirely new set of FMVSS that are specifically applicable to ADS. Given the number of exemptions that may be applied to ADS, and the integration of mechanical and system technologies, it may be advisable to ensure the new standards don't entirely eclipse the necessary mechanical and safety functions a vehicle is expected to conform to in order to ensure roadway safety.

#### 2. Safety Certification and Exemptions

AAMVA's Jurisdictional Guidelines for the Safe Testing and Deployment of Highly Automated Vehicles recognizes that certifying vehicles conform to all applicable FMVSS is a critical element for manufacturers or other entities testing ADS. AAMVA recommends jurisdictions require manufacturers or other entities testing ADS within their jurisdictions certify the vehicles comply with all applicable FMVSS and that no required safety devices have been made inoperable. In lieu of certification, AAMVA recommends that in the case of vehicles where an exemption from the FMVSS has been made, evidence that the vehicle(s) have been exempted from regulations be provided. NHTSA can further assist jurisdictions in streamlining the certification of vehicle safety process by maintaining a vehicle-specific, easily accessible, easily identifiable resource of all NHTSA-granted exemptions from the FMVSS. AAMVA encourages close collaboration between the states and federal agencies in providing clear communication on which exemptions are applicable to each vehicle.

#### 3. Combination of system elements

With the proliferation of layered system components coming together to detect, respond, and react to the surrounding environment, it becomes increasingly important for NHTSA to be able to provide clear guidance on whether vehicles have specifically satisfied manufacturer safety certifications. Because a system of components may satisfy a singular vehicle operation, it becomes increasingly important for NHTSA to maintain a catalogue of which vehicles are employing individual system or software components. This becomes even more important in the integration of software packages that are applicable to multiple technology platforms. As NHTSA indicates in the ANPRM, "NHTSA has also repeatedly exercised its authority under the Act when the software and/or hardware components of computerized electronics have been the subject of safety defect recall and remedy campaigns." Consumers will need active notice of the exercise of federal recall authority. The potential to combine notification of NHTSA safety findings with the increased ability of vehicles to directly notify owners of their operational status naturally lends itself to the potential for NHTSA to directly notify the operator/owner of a vehicle in the event of a safety defect. AAMVA is encouraged that NHTSA is eager to exercise control over software instruction to safety components, but has concerns over how this can be effectively accomplished outside the realm of extensive conditional testing rather than line-byline code oversight.

#### 4. Updates to systems changing the functionality of the components

Over-the-air updates to existing software pose an interesting challenge in safety oversight. While these software updates have the capacity to remedy safety issues with vehicles, they also present the ability to change operational functionality of vehicle components. AAMVA urges consideration of how over-the-air updates will fit into the overall safety certification process and how federal and state authorities will have transparent access to software updates that change vehicle safety and performance capabilities. If NHTSA asserts that this is considered a design element of the vehicle and therefore falls under their oversight authorities, there needs to be a dedicated mechanism for communicating any changes to initial design functionalities in the post-production environment.

## 5. Clear Understanding of NHTSA's Use of Term "Operational Safety"

The conclusion to Section A states that "Other software, e.g., forward crash warning and remote automated parking systems, affects motor vehicles when they are moving, i.e., "operational" safety. The Act's definition of "motor vehicle safety" encompasses both aspects of safety." AAMVA recommends that NHTSA clarify that this assertion be strictly bound to the vehicle during the design phase of its lifecycle. While AAMVA agrees that NHTSA should retain all aspects of oversight of vehicle design features, AAMVA urges caution in expanding the use of the term "operational safety." The ability of state authorities to retain oversight of how a vehicle conforms with state traffic laws remains essential. Vehicles considered to be "in-use" must be accountable to obeying all conditions of safe operation, and state authorities must retain the enforcement powers to act on noncompliant vehicles that do not conform to their own requirements.

#### 6. FMVSS Adaptability to Testing

Section B states that "Although the existing FMVSS rely on physical tests and measurements to evaluate safety performance, there is no requirement in the Act that they rely exclusively or even at all on such tests and measurements so long as they are objective and meet the other statutory requirements. In the future, other approaches such as simulation and requirements expressed in terms of mathematical functions might be considered." While AAMVA agrees that a theoretical environment may assist in testing functionality, the current considerations of how these systems will ultimately perform should be based on physical testing of a completely assembled vehicle and evaluation of the vehicle as a whole. Provision of data on a succession of tests, both as an individual component and as a component applied to a complete vehicle will prove essential in evaluating the performance of the vehicle. AAMVA understands the manufacturers' sensitivity towards providing safety data as a precondition, but there must be some availability of performance-based testing data available to the states prior to public road testing or deployment.

## 7. Unpredictability in testing environments

AAMVA supports the NHTSA assertion that the agency should incorporate random elements into its testing procedures in order to avoid occurrences of a test vehicle being pre-programmed to anticipate safety testing conditions rather than functionally responding to unanticipated events.

## C. Research is Needed to Generate Data on ADS

NHTSA provides that it is equipped with the appropriate authority to "facilitate research and data gathering involving new and developing technologies in their various iterations and

configurations." NHTSA anticipates that this research is expected to generate the data needed to assist in developing methods of validating the safety performance of vehicles with high and full driving automation. AAMVA agrees that research will play a critical role in providing insight into the potential of the technologies, but remains concerned that research data not play too critical a role in validating the technology's safety performance. It is important not to inadvertently replace performance-based safety testing with research data.

## E. A Pilot Program Can Provide Relief and Promote Research on ADS

This section reiterates that NHTSA has authority over "all relevant aspects of ADS design, including vehicles with high and full driving automation. NHTSA, therefore, has an affirmative duty to establish the measures necessary to ensure the safe design and operation of these types of vehicles." AAMVA reiterates its earlier comments regarding NHTSA's use of the term "operational safety." The states assert the need for a recognized federal-state partnership to provide the immediate oversight and enforcement resources on federal design standards. The innovation associated with ADS design will be accompanied by relative fluidity in vehicle functionality across a broad spectrum of technologies. Blanket statements that cite NHTSA as the sole authority could undermine the ability to effectively oversee post-production operation of ADS on public roadways. Any confusion could lead to long-term liability issues regarding state authority to exercise their own laws with regards to public safety. It is absolutely essential that clarity of this federal-state partnership be reinforced from the outset so that bad actors do not erode public confidence or degrade the potential for innovation. AAMVA urges the focus of this pilot to remain on the safety of the vehicle technologies being sampled, and not to extend the scope of the pilot to include any discussion on oversight authority. The ideal focus should be on transparency of data, voluntary partnerships towards innovation, and the establishment of shared resources for effective oversight.

# III. Pilot Program for the Safe Testing and Deployment of Vehicles with High and Full Driving Automation

## QUESTIONS

Question 1. What potential factors should be considered in designing the structure of a pilot program that would enable the Agency to facilitate, monitor, and learn from on-road research through the safe testing and eventual deployment of vehicles with high and full driving automation and associated equipment?

AAMVA provides a great deal of background on how to safely test highly automated vehicles through its "Guidelines for the safe Testing of Highly Automated Vehicles," available at: <u>https://www.aamva.org/GuidelinesTestingDeploymentHAVs-May2018/</u>. This document provides in-depth information on exactly the types of considerations NHTSA should consider in the development of its pilot. States are currently dealing with the exact same issues at the intrastate level. While AAMVA offers the entire document for NHTSA consideration, we provide a listing of pilot-specific suggestions here.

• A transparent application and permit package for manufacturers or other entities to be engaged in the pilot program.

- Consideration of how submission of a pre-pilot safety package will provide NHTSA with the appropriate level of safety data while still considering industry sensitivity to "proprietary" data.
- The ability to differentiate participating pilot vehicles from the general vehicle fleet that is visible and distinguishable for law enforcement and other oversight authorities.
- Collection and transparency of real-time participant data.
- Crash and incident management of pilot vehicles.
- Financial responsibility and liability issues for participating vehicles.
- Oversight of vehicle Operational Design Domain (ODD) limitations with geographic or climatic pilot selection.
- Law enforcement and first responder safety.
- Vehicle response to emergency vehicles, manual traffic controls, and differences in observed traffic laws.
- Easily identifiable communication channels between any party and the party responsible for the legal "operation" of the vehicle.
- How the pilot will deal with environments with atypical road conditions or degraded markings or signals.

Question 2. If NHTSA were to create a pilot program, how long would there be a need for such a program? What number of vehicles should be involved? Should NHTSA encourage the conducting of research projects in multiple locations with different weather conditions, topographical features, traffic densities, etc.?

There are too many variables contingent on the pilot program's anticipated goals for AAMVA to effectively comment on length of time and number of vehicles in detail. However, the penetration of untested vehicles being introduced to public roads should not be significant enough to represent an immediate danger to the current makeup of the existing fleet. Further, if NHTSA does choose to pilot in multiple locations with different weather conditions or features, the vehicles chosen for participation in the pilot must be certified as having an operational design domain capable of operating safely in those conditions, be attested to by the manufacturer as having matching ODD for expected conditions, and NHTSA should make officials and constituents of chosen pilot locations aware of the limitations on operation for piloted vehicles. Consent of state officials in areas of a prospective pilot should be given willingly and voluntarily in advance of the pilot.

Question 3. What specific difficulties should be addressed in designing a national vehicle pilot program for vehicles with high and full driving automation either through the exemption request process relevant for FMVSS or more broadly related to other areas of NHTSA and/or other authorities?

Assuming the pilot will be data-driven, the ability to effectively share data between authorities will be critical. The reporting mechanism for that exemption data must be clearly defined from the outset, and transparency of that data will allow for recognizable anomalies in the data to be addressed before it becomes too problematic. NHTSA will have to carefully consider numerous factors in the data analysis for the pilot to be effective. This includes:

- What data is required to be shared as a condition of participation
- How data is captured

- How data is recorded
- How data is transmitted to oversight authorities and in what intervals
- How data will be standardized for uniform presentation and comparison
- How data will be protected
- How data will be shared, and who "owns" the data
- Data retention standards
- Sufficiency measures for when data indicates "unsafe operation"
- Crash and incident data collection
- Clear communication of exemptions issued by NHTSA, specific to each individual vehicle
- Retention of all exemptions ever issued for a particular vehicle
- How to deal with "denied" exemptions
- Records of rationale for exemption
- Running tally on the number of total exemptions issued
- Number of vehicles of the same model being granted exemptions
- Destruction of data once the pilot has concluded and data has been analyzed

Question 4. How can existing statutory provisions and regulations be more effectively used in implementing such a pilot program.

AAMVA has no comment on how best to utilize existing authorities.

Question 5. Are there any additional elements of regulatory relief (e.g. exceptions, exemptions, or other potential measures) that might be needed to facilitate the efforts to participate in the pilot program and conduct on-road research and testing involving these vehicles, especially those that lack controls for human drivers and thus may not comply with all existing FMVSS?

AAMVA has no comment on what additional measures may be needed for testing beyond reiterating that any participating vehicles must be clearly identifiable as participating vehicles, and must be accompanied by evidence of any exemptions or exceptions from the FMVSS as authorized by NHTSA.

- A. Considerations in Designing the Pilot Program
- 1. Vehicle Design for Safe Operation

Question 6. What vehicle design elements might replace existing required safety equipment and/or otherwise enhance vehicle safety under reasonably anticipated operating conditions?

AAMVA has no comment on vehicle design elements.

2. Vehicle Design for Risk Mitigation

This section cites that "the Department of Transportation described a voluntary safety selfdisclosure approach recommended to innovators seeking to test and deploy vehicles with high and full driving automation on public roadways." AAMVA recommends that NHTSA consider making the submission of safety certifications and evaluations of untested vehicles mandatory. Recorded manufacturer safety assertions will play a pivotal role in developing a history of trust in the deployment process and will provide much needed consumer confidence in new technologies. Further, mandated safety assertions will help document essential safety information that may not be readily apparent in the granting of safety exemptions.

Question 7: What types of performance measures should be considered to ensure safety while allowing for innovation of emerging technology in vehicles with high and full driving automation participating in a pilot program?

In order to effectively grasp the scope of this question, it is important to understand whether NHTSA is requesting information on performance measures to be satisfied prior to a vehicle's participation in the pilot or during the pilot itself.

AAMVA would recommend that, at a minimum, NHTSA consider a requirement that a participating vehicle demonstrate that it can safely and effectively navigate public roads *prior* to the vehicle's deployment. Further, NHTSA should make a clear connection between which FMVSS are satisfied under the traditional model, and which have been granted exceptions. For those vehicle elements that have been supplanted by nonconforming technologies, such as the removal of mirrors, steering wheel, or brake pedal, NHTSA should require a sufficient amount of safety data that illustrates the participating vehicle can accomplish those parallel functions (detection, navigating, steering, braking) effectively, and without human assistance, prior to participation in the pilot. Unmanned vehicles must be held to the same performance standards as any other vehicle. Provision of safety testing data will be essential in ensuring the vehicles' performance is functionally so und before the pilot.

Given that the intention of the pilot program is to collect data, any vehicle that is involved in a crash during the pilot should be removed (at least temporarily) from the program for further analysis of contributing factors. Further, during the pilot, NHTSA must develop a data exchange capability that allows essential safety data to be recorded for each individual vehicle to ensure they are operating safely. While these vehicles may report the data to NHTSA, state oversight agencies in jurisdictions where the pilot is operating must also have access to this performance data in order to ensure the vehicles are not violating state safety laws.

#### 3. Vehicle Design Safety Elements

AAMVA supports NHTSA's description of Operational Design Domain (ODD) and the role state and local authorities will have to play in establishing and enforcing their own rules of the road. State and local authorities have described their road safety laws over the course of many years and through many detailed safety plans. These collaborative safety plans have utilized best practices and U.S. DOT guidance in driving the overall crash and fatality factors down for all road users. It is important that all vehicles, whether operated by a human or advanced system comply with and comport to those state and local laws regardless of described ODD. Further, it is assumed, though not directly stated, that a complete description of ODD, including the fall back minimal risk condition be mandated as a precursor to pilot participation.

Question 8: How should the Operational Design Domains of individual vehicle models be defined and reinforced and how should Federal, State and local authorities work together to ensure that they are observed. Clearly, enforcement of pilot vehicles not operating within the parameters of the vehicle's described Operational Design Domain is a necessary aspect of the pilot. NHTSA lacks the ability to perform continuous situational oversight of every aspect of a significant fleet of ADS-equipped vehicles. NHTSA will have to establish a reporting mechanism for enforcement agency (and potentially general public) complaints, citations, and enforcement actions against ADS-equipped vehicles. Further, given that some of the vehicles will not have a traditional "single" owner, there must be a clear and conspicuous ability for all oversight agencies to get in touch with the legally responsible operator of the vehicle to ensure that, if necessary, any immediate actions (such as total vehicle shutdown or removal from public roadways) can be initiated.

NHTSA should also consider how it will exercise its federal authority with regards to broader vehicle populations should it choose to exercise blanket enforcement actions (such as a recall authority) against numerous participating vehicles. While state authorities may be able to assist in an event should they incidentally encounter the vehicles, a more effective solution will be to ensure participating manufacturers describe and attest to the ability to remove any and all safety dangers that result from integration into the mixed fleet immediately upon notice from NHTSA or state and local authorities.

All of the above will require a robust national communication system whereby the federal government can communicate information directly to the responsible state oversight authorities (and vice versa) to establish effective controls over pilot program vehicles.

Given that different vehicles will have different ODD, NHTSA may have to classify and differentiate vehicles by the ODD. The classifications may or may not exclude them from participation in the pilot. The simplest way to approach the pilot would be to describe the parameters of the pilot and control them such that only certain vehicles that meet the required ODD may participate. If the pilot considers a large population of vehicles with vast differences in their ODDs, then there are not only complexities associated with the ability to differentiate the vehicles, but also the abilities for law enforcement and first responders to safely interact with the vehicle. NHTSA should consider that the ODD needs to be something that is not only easily identifiable for pilot participation, but must become an inseparable part of the vehicle and its records for the entirety of the vehicle's lifecycle.

## 4. Data and Reporting

Question 9. What type and amount of data should participants be expected to share with NHTSA and/or with the public for the safe testing of vehicles with high and full driving automation and how frequently should the sharing occur.

Objectively, the most effective data is real-time data, or its closest proxy given that the vehicles represent an untested fleet. At a bare minimum, AAMVA has recommended that ADS manufacturers or other entities should submit incident and crash-related information. This information should include instances of a crash when ADS-equipped vehicles are operating in automated mode or disengaged (by the use or by the system.) The information should also include incidents in which the users of ADS are unexpectedly prompted to transition into manual mode because of a failure of the automated system. Certain elements of the ADS vehicle's recorded data should also be considered. The data recorded should include, but not be limited to, the mode of operation, speed, throttle or brake application, and a 360-degree video

sample of the vehicle surroundings if so designed or equipped. Manufacturers and other entities should also provide a summary analysis of the incident to ensure safety trends can be detected.

Participating vehicles should record both vehicle behavior and the driver-vehicle interface to identify the actions of the vehicle and the actions (or lack thereof) by the driver at all times. AAMVA recommends that law enforcement be provided with access to vehicle information such as sensor data, the driver-vehicle interface, and a minimum of 30 seconds of pre-crash and post-crash data in order to complete a proper investigation. AAMVA recommends that manufacturers should make event data recorder (EDR) information retrievable in a standard, nonproprietary format for ready access by those duly authorized. AAMVA also recommends that manufacturers should include time stamping and GPS location in EDR data. Current precedent for standardization of data recording is provided in 49 CFR 563, but this information is not time or geo-stamped and is only triggered by the airbag module when the airbag is deployed.

AAMVA has also recommended that manufacturers should ensure ADS leave an electronic fingerprint that can allow tracing of input data to whoever initiated them. This is to assist law enforcement in investigating criminal activity in which a vehicle with automation was implicitly involved as a tool for committing a crime.

Question 10: In the design of a pilot program, how should NHTSA address the following issues – a. confidential business information?

- b. privacy?
- c. data storage and transmission?
- d. data retention and reporting?
- e. other elements necessary for testing and deployment?

In general, AAMVA has no comment on how NHTSA should use existing data privacy laws for conforming with each of the elements described above. However, with respect to data storage and transmission, AAMVA generally advises that the critical operational safety data described in question 9 above be recorded for at least the entirety of the pilot program. If the data is not captured and retained by the vehicle for the entirety of the pilot, it should be transmitted and retained by NHTSA and shared with state and local partners at the pilot's conclusion.

5. Additional Considerations in Pilot Program Design

Question 11. In the design of a pilot program, what role should be played by –

a. The 12 safety elements listed in A Vision for Safety?

These elements should be incorporated into a mandatory disclosure requirement by NHTSA as a condition for participation into the pilot and should be retained by NHTSA and be made available to state and local authorities.

## b. The elements listed below

i. Failure risk analysis and reduction during design process.

This should be evaluated by NHTSA as the oversight agency responsible for design, but again, made available to state and local authorities as part of consideration should NHTSA choose to conduct the pilot in their jurisdiction.

ii. Objective performance criteria, testable scenarios and test procedures for evaluating crash avoidance performance of vehicles with high and full driving automation?

Established objective performance criteria should be made publicly available once finalized and be subjected to the opportunity to comment on established standards and testing prior to establishment. Given that these scenarios and testing procedures will serve as the foundation for safe integration to public roadways, it is important that people fully consider how to best test for an equitable level of safety prior to their deployment.

iii. Third party evaluation?

AAMVA has no comment on how NHTSA should conduct third party evaluation other than to designate and record who may be responsible for certified third-party evaluation. The ideal oversight of third party evaluation would be to control bias and remove influence from independent evaluation.

A. Failure risk reduction.

As mentioned above in b.i. failure risk reduction should be a mandatory pre-pilot submission made by manufacturers and retained by NHTSA.

B. Crash avoidance performance of vehicles with high and full driving automation. AAMVA has noted in previous comment that crash avoidance performance will serve as a key safety indicator on the suitability of introducing untested technologies to the public. Any lapse in crash avoidance performance must be considered cause for removal from the pilot and subject the vehicle to additional scrutiny for any potential enforcement actions.

iv. Occupant/non-occupant protection from injury in the event of a crash (crashworthiness)?

Occupant protection data in terms of number of injuries and fatalities should be a required data element accompanying the pilot vehicle's crash report and record. v. Assuring safety of software updates?

Any software update that changes the functionality of the vehicle must be reported to NHTSA, recorded, and communicated with state and local authorities. NHTSA must also consider how to handle vehicles that have not completed any "safety essential" updates and whether those vehicles should be considered immediate cause to be put out of service or subject to enforcement actions to protect the general public. AAMVA has no comment on how NHTSA can best leverage pre-deployment software oversight. vi. Consumer education?

Consumer education will play a vital role in public acceptance. It is essential that NHTSA work to make as much of the data and performance outcomes of the pilot available to as broad a swath of the public as appropriate. While the pilot is a research activity, being transparent on the associated data gleaned from the pilot will help the public make an educated guess as to the technology's readiness on a global scale. AAMVA also recommends that if the pilot is to incorporate the general population, manufacturers of the vehicles must have tailored consumer education products for all those who interact with the vehicle. Manufacturers or other participating entities need to develop quality ADS driver training programs to operate ADS-equipped vehicles safely and reasonably if they are not fully autonomous vehicles. The training should educate consumers on the limitations and capabilities of ADS, how to engage and disengage the system functions, risks of misuse, and how to deal with emergency situations related to the ADS. The training should encompass all safety features to ensure consumers will use the products within any established parameters.

vii. Post-deployment ADS updating, maintenance and recalibration?

NHTSA must be very clear that if any safety defects are identified, or if a sufficient number of pilot vehicles are demonstrating unlawful behaviors, that pilot participants are ultimately responsible for remedying the issue within a very strict amount of time before federal recall authorities are exercised. Further, NHTSA should consider penalties against legally responsible parties for nonconformance with safe operation as part of the parameters for a participatory agreement. NHTSA should use discretion on how this applies to regular maintenance and recalibration when compared with observed safety and performance data communicated to the agency.

6. Issues Relating to Establishing a Pilot Program

i. Applications for Participation and Potential Terms of Participation

Question 13. Which of the following matters should NHTSA consider requiring parties that wish to participate in the pilot program to address in their applications?

a. "Safety case" for vehicles to be used in the pilot program (e.g. system safety analysis including functional safety analysis), demonstration of safety capability based on objective performance criteria, testable scenarios and test procedures, adherence to NHTSA existing voluntary guidance, including the submission of a voluntary safety self-assessment, and third party review of those materials).

AAMVA encourages all of this, with the caveat that the submission of a self-assessment be mandatory. Further, given that the pilot is intended for level 4 and level 5 vehicles, AAMVA recommends NHTSA require participants to file a Law Enforcement/First Responder Interaction Plan. Several states are currently requiring this type of information be filed in advance of public roads testing. While the Voluntary Safety Assessment is critical, the requirement for an ADS interaction plan represents a more forward-thinking framework. These plans provide critical safety information for first responders, but can also ease public concerns and build consumer confidence. They would also further serve NHTSA's stated objective of partnering effectively with State and local governments.

i. What methodology should the Agency use in assessing whether an exempted ADS vehicle would offer a level of safety equivalent to that of a nonexempted vehicle? For example, what methodology should the Agency use in assessing whether an ADS vehicle steers and brakes at least as effectively, appropriately, and timely as an average human driver?

The establishment of a performance standard for these types of activities for an "average" driver may be difficult to ascertain, but that should not prevent NHTSA from pursuing what it envisions as a reasonable performance measure for detection, engagement, and performance of an ADS. Ideally, the performance should be gauged by how effectively the system responds to testing scenarios by limiting the response time from hazard detection to crash avoidance. NHTSA has historically made broad statements on equitable levels of safety - ultimately, oversight authority access to verifiable testing data seems appropriate.

b. Description of research goals, methods, objectives, and expected results.

AAMVA would hope that one of the achievable results of the pilot is to create a communications channel between all levels of government that facilitates the federal oversight of design and the state and local oversight of performance for AVs. The sharing of performance data will be a critical element for effective oversight and the continued assurance of public safety. AAMVA urges NHTSA to capture as much data as possible, and to be as transparent with that data as possible. Given that this is a pilot, NHTSA should not confuse the pilot with plans for unilateral

c. Test design (e.g. route complexity, weather and related road surface conditions, illumination and institutional review board assessment.)

As noted previously, AAMVA recommends that the testing procedures allow for unanticipated events and conditions that fit within the vehicle's described ODD. Unpredictability is important to ensure that the vehicles are not pre-programmed to simply navigate the test without responding to the unexpected.

d. Considerations for other road users (e.g. impacts on vulnerable road users and proximity of such persons to the vehicle).

Participating vehicles must be able to detect and share the road with all users.

e. Reporting of data, e.g. reporting of crashes/incidents to NHTSA within 24 hours of their occurrence.

AAMVA supports the reporting of data in as close to real-time as possible.

f. Recognition that participation does not negate the Agency's investigative or enforcement authority, e.g. independent of any exemptions that the Agency might issue to program participants and independent of any terms that the Agency might establish on those exemptions, the Agency could conduct defect investigations and order recalls of any defective vehicles involved in the pilot program. Further, the Agency could investigate the causes of crashes of vehicles involved in the program.

AAMVA supports this statement.

g. Adherence to recognized practices for standardizing the gathering and reporting of certain types of data in order to make possible the combining of data from different sources and the making of statistically stronger findings.

AAMVA is supportive of the standardization of collected data. This has traditionally leant itself to more potential data exchange and use across safety platforms.

h. For which types of data would standardization be necessary in order to make such findings and why?

Standardization of crash, near miss, and standard safety data would be key in being able to make comparisons, recognize deficiencies, or realize anomalies in the data.

i. To what extent would standardization be necessary for those types?

AAMVA would only comment that in its own practice, non-standardized data makes the ability to collect and use that data more difficult.

j. Occupant non-occupant protection from injury in the event of a crash (crashworthiness).

This was asked and described previously in the ANPRM.

k. Assuring safety of software updates.

This too was asked in a previous section of the ANPRM.

I. Consumer education.

See previous section of vi of this ANPRM; however, specific to data, it may be important to ensure interacting parties have access to, and can inform the pilot, that consumer education materials are available and present in the vehicles.

m. Post-deployment monitoring - See previous section of the ANPRM.

n. Post-deployment maintenance and calibration considerations. – See previous section of the ANPRM.

Question 14. What types of terms and conditions should NHTSA consider attaching to exemptions to enhance public safety and facilitate the Agency's monitoring and learning from the testing and deployment, while preserving the freedom to innovate, including terms and conditions for each of the subjects listed in question 13? What other subjects should be considered, and why?

AAMVA has previously cited numerous areas that NHTSA should consider as requirements of the pre-participation agreement throughout these comments.

ii. Potential Categories of Data to be Provided by Program Participants

Question 15. What value would there be in NHTSA's obtaining one or more of the following potential categories of data from the participants in the pilot program? Are there other categories of data that should be considered? How should these categories of data be defined?

a. Statistics on use (e.g. for each functional class of roads, the number of miles, speed, hours of operation, climate/weather and related road surface conditions.) This data would be valuable in evaluating tested vehicles during the pilot.

b. Statistics and other information on outcome (e.g. type, number and cause of crashes or near misses, injuries, fatalities, disengagements, and transition to fallback mechanisms, if appropriate.) This data is essential to the pilot, without this type of data being collected, the program would not be able to conduct safety evaluations of the technology at all.

c. Vehicle/scene/injury/roadway/traffic data and description for each crash or near miss (e.g. system status, pre-crash information, injury outcomes). As with b above, AAMVA specifically requests that in the event of a crash or near crash, the vehicle capture this data for law enforcement and causality investigations.

d. Sensor data from each crash or near miss (e.g. raw sensor data, perception system output, and control action.) This data would be valuable.

e. Mobility performance impacts of vehicles with high and full driving automation, including string stability of multiple consecutive ADS vehicles and the effects of ADS on vehicle spacing, which could ultimately impact flow safety and public acceptance. Depending on the ultimate goals of the pilot this could be valuable.

f. Difficult scenarios (e.g., scenarios in which the system gave control back to an operator or transitioned to its safe state by, for example, disabling itself to a slow speed or stopped position). This data would be valuable.

g. Software updates (e.g. reasons for updates, extent to which updates are made to each vehicle for which the updates are intended, effects of updates). This data would be valuable.

h. Metrics that the manufacturer is tracking to identify and respond to progress (e.g. miles without a crash and software updates that increase the operating domain). This data would be valuable.

i. Information related to community driver and pedestrian awareness, behavior, concerns and acceptance related to vehicles with high and full driving automation operation. For example, if vehicles with high and full driving automation operated only in limited defined geographic areas, might that affect the routing choices of vehicles without high and full driving automation? For another example, if vehicles with high and full driving automation are programmed to cede right of way to avoid collision with other vehicles and with pedestrians and cyclists, might some drivers of vehicles without such automation, pedestrian and cyclists take advantage of this fact

and force vehicles with high and full driving automation to yield to them? This data would be valuable.

j. Metrics or information concerning the durability of the ADS equipment and calibration, and need for maintenance of the ADS. This data would be valuable.

k. Data from "control groups" that could serve as a useful baseline against which to compare the outcomes of the vehicle participating in the pilot program. This data would be valuable.

I. If there are other categories of data that should be considered, please identify them and the purposes for which they would be useful to the Agency in carrying out its responsibilities under the Act.

m. Given estimates that vehicles with high and full driving automation would generate terabytes of data per vehicle per day, how should the need for data be appropriately balanced with the burden on manufacturers of providing it and the ability of the Agency to absorb and use it effectively? Provision of data can be managed effectively by allowing for rolling data uploads within flexible periods of time. Further, data management can be streamlined by the provision of mandatory incident-based reporting, or reporting under certain circumstances requiring further evaluation. Some data sets provide rolling data points that are constantly changing. Reliance on incident-free vehicle reporting of statistical aggregates on a periodic basis may reduce data volumes.

n. How would a submission of a safety assurance letter help to promote public safety and build public confidence and acceptance? Safety assurance letters are indispensable in building accountability ties between the submitting technology experts and the end users. These evaluations are submitted by those most familiar with the technology and provide a baseline of expectations for public performance. They also serve as a foundational establishment of trust – detailing what the manufacturer believes the vehicles are capable of versus what its documented performance record entails. It is important to understand that the space for innovation cannot be void of consumer protections. Consumer confidence and acceptance of new technologies cannot be accomplished without providing a basic level of safety assurance, and holding manufacturers accountable to that expected level of safety in a publicly declared and recorded manner.

o. For all the above categories of information, how should the Agency handle any concerns about confidential business information and privacy? AAMVA has no comment on this.

Question 16. How should the Agency analyze safety in deciding whether to grant such exemptions under each of the separate bases for exemptions in section 30113? Can the exemption process be used to facilitate safe and effective ADS development in an appropriate manner?

AAMVA has previously commented on the intersection of safety certification and exemptions in sections entitled, "2. Safety Certification and Exemptions" and "6. FMVSS Adaptability to Testing" provided above.

Question 17. Could a single pilot program make use of multiple statutory sources of exemptions or would different pilot programs be needed, one program for each source of exemption? AAMVA has no comment on this. Without the specific scope of the pilot, an understanding of the reliant authorities is too difficult.

Question 18. To what extent would NHTSA need to implement the program via new regulation or changes to existing regulation? Conversely, could NHTSA implement the program through a

non-regulatory process? Would the answer to that question change based upon which statutory exemption provision the agency based the program on? AAMVA has no comment on this.

Question 19. How could the exemption process in section 30113 be used to facilitate a pilot program? For vehicles with high and full driving automation that lack means of manual control, how should NHTSA consider their participation, including their continued participation, in the pilot program in determining whether a vehicle would meet the statutory criteria for an exemption under section 30113? AAMVA has no comment on this.

Question 20. What role could exemptions under section 30114 play in the pilot program? Could participation in the pilot program assist a manufacturer in qualifying for an exemption under section 30114? Could participation be considered part of the terms the Secretary determines are necessary to be granted an exemption under section 30114 for vehicles that are engaged in "research, investigations, demonstrations, training, competitive racing events, show, or display"? AAMVA has no comment on this.

Question 21. What role could a pilot program play in determining when to grant an exemption from the "make inoperative" prohibition under section 30122 for certain "dual mode" vehicles? Relatedly, what tools does NHTSA have to incentivize vehicles with high and full driving automation that have means of manual control and thus do not need an exemption to participate in the pilot program? AAMVA has no comment on this.

AAMVA thanks NHTSA for the opportunity to comment on the safe integration of autonomous vehicles on public roadways. AAMVA recognizes that the parameters of this pilot program may assist the agency in understanding how to best transition unproven technologies into lifesaving technologies. As the representative of agencies that will be highly engaged in ensuring safety at the deployment level, AAMVA looks forward to continued collaboration with NHTSA as the pilot moves forward and facilitating our shared commitment to saving lives.

Cian Cashin Director, Government Affairs <u>ccashin@aamva.org</u>