ALLIANCE FOR AUTOMOTIVE INNOVATION

June 24, 2024

Sophie Shulman
Deputy Administrator
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: Petition for Reconsideration of Final Rule NHTSA Docket 2023-0021

Dear Deputy Administrator Shulman,

On behalf of its members, the Alliance for Automotive Innovation (Auto Innovators) hereby petitions the National Highway Traffic Safety Administration (NHTSA or agency) for reconsideration of the Final Rule on Automatic Emergency Braking (AEB) and Pedestrian Automatic Emergency Braking (PAEB), NHTSA docket number 2023-0021.

The Final Rule was published May 9, 2024 at 89 Fed. Reg. 39686 and establishes requirements for new light duty motor vehicles to be equipped with AEB, including PAEB, with compliance required in new vehicles built on and after September 1, 2029. The rule was initially proposed on June 13, 2023[1] (the NPRM), and generated over 1,000 public comments, many of which appeared to be identical form letters, but some of which raised significant concerns about the proposal.

NHTSA's Final Rule noted that the Bipartisan Infrastructure Law, codified as the Infrastructure Investment and Jobs Act (Public Law 117-58), added a new section 30129 to the Vehicle Safety Act, directing the promulgation of a rule establishing minimum performance standards that require all passenger motor vehicles manufactured for sale in the United States to be equipped with a Forward Collision Warning (FCW) system and an AEB system.

Auto Innovators seeks reconsideration of five aspects of the Final Rule:

1. The impracticability of the performance requirement for "no contact" with the lead vehicle or the pedestrian test mannequin, including the likelihood that this requirement will lead to unsafe unintended consequences which have not been analyzed for likely adverse public

[1] 88 Fed.Reg. 38632

acceptability concerns, as well as the lack of objective performance requirements for the equipment requirements of the Final Rule;

2. The failure of the Final Rule to account for the impracticability of achieving the performance requirements in every test and, in particular, failing to reconcile the test procedures with the existing procedures for light vehicle braking performance (Federal Motor Vehicle Safety Standard 135) that allow for compliance to be determined based on performance over multiple test runs;
3. The lack of objectivity and the impracticability of the requirements of the Final Rule to illuminate the malfunction indicator lamp (MIL) under all conditions of malfunction, including sensor degradation, and under all possible conditions of "adjustments in performance," as well as the impracticability of NHTSA's decision to disallow manual deactivation even under conditions where continued AEB operation would be unexpected or even hazardous;
4. The lack of an objective standard for the requirement to suppress the audio in a vehicle when the Forward Collision Warning (FCW) is presented, and the lack of objective criteria and a corresponding test procedure for evaluating compliance with that requirement; and
5. The failure of the agency to consider adequately the costs of the new requirements, including the failure to consider the likely disbenefits that will be induced by the new standard, at least for the next decade.

Auto Innovators respectfully requests that NHTSA respond to these five concerns with the following major recommendations:

- Regarding the impracticability of the specific performance requirements related to contacting the lead vehicle or the pedestrian test mannequin, Auto Innovators requests that NHTSA address these issues by –
    - reducing the maximum test speed for the Lead Vehicle requirements and for the pedestrian AEB requirements;
    - making appropriate adjustments to the headway requirements to align with the results of NHTSA's research; and
    - issuing a Supplemental Notice of Proposed Rulemaking (SNPRM) to propose objective performance requirements for the equipment requirements, including specifying what it means to "operate" the equipment, defining when a crash is "imminent," and defining objective test procedures for evaluating compliance with the FCW visual signal requirements.
- Regarding the failure of the Final Rule to provide a compliance allowance, Auto Innovators requests that NHTSA address this impracticability by providing an allowance to determine compliance in multiple test runs, similar to the current NCAP procedures. Auto Innovators

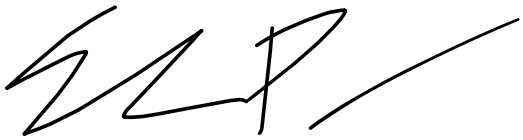
notes that, if NHTSA provides sufficient relief for the concerns identified with the requirements related to contacting the Lead Vehicle and pedestrian mannequin, then the practicability issues leading to this request may have been resolved and this relief may not be necessary.

- To address the issues related to MIL illumination and deactivation of the AEB system, Auto Innovators requests that NHTSA address these issues by eliminating the impracticable provision requiring the AEB to detect any and all modifications that could affect compliance, and by issuing an SNPRM proposing:
    - An objective and practicable definition of each "malfunction" that would require illumination of the MIL and an associated test procedure;
    - An objective and practicable definition of each type of "modification" that would require illumination of the MIL and an associated test procedure; and
    - To allow manual deactivation under limited conditions.
- To address the concerns related to suppression of audio sounds, Auto Innovators requests that NHTSA address this issue by eliminating the audio suppression requirement entirely or, in the alternative, issuing an SNPRM proposing:
    - An objective definition of "masked threshold" with an associated repeatable test procedure that does not include uncontrolled and undefined variables;
    - An objective definition of the audio sources that must be suppressed;
    - An objective definition of the "safety purpose or safety system" sounds that would be exempted from the suppression requirements; and
    - An objective performance requirement defining the threshold for when the audio suppression must begin, with an associated repeatable test procedure.
- Finally, Auto Innovators requests that NHTSA revise its cost assessment to take into account more realistic assessments of the hardware additions and other changes that will be required by the Final Rule, as well as identify and quantify the disbenefits in terms of increased rear-end collisions and other crashes that will be induced by the Final Rule, at least for several more years.

Attached you will find an appendix with additional legal and engineering grounds to support Auto Innovators' petition.

We stand ready to work with the agency to assure this life-saving technology developed by automakers and suppliers is clear, objective, practicable and aligned with other NHTSA requirements and procedures while minimizing costs to consumers.

Regards,



Sarah Puro
Vice President, Safety and Technology Policy
Alliance for Automotive Innovation

Enclosure: Appendix A *Legal and Engineering Support of Petition for Reconsideration of the Final Rule Adopting Requirements for Automatic Emergency Braking*

Appendix A

Legal and Engineering Support of Petition for Reconsideration of the Final Rule Adopting Requirements for Automatic Emergency Braking

NHTSA Docket 2023-0021

89 Fed. Reg. 39686 (May 9, 2024)

I. INTRODUCTION

Federal Motor Vehicle Safety Standards (FMVSSs) are required to be "practicable, meet the need for motor vehicle safety, and be stated in objective terms." In addition, NHTSA must consider whether a proposed standard is reasonable, and must address in the Final Rule the significant comments that were filed in response to the proposal. Finally, NHTSA must explain its decision to adopt (or reject) a particular alternative, particularly when that alternative will make the roadways less safe, and the agency must identify where it is departing from its own precedent and justify those departures.

On May 9, 2024, NHTSA published a Final Rule adopting requirements for automatic emergency braking (AEB), including requirements for Lead Vehicle AEB and pedestrian automatic emergency braking (PAEB). The Final Rule, establishing a new FMVSS No. 127, was published at 89 Fed. Reg. 39686.

In several respects, the Final Rule establishes requirements that are not objective, not practicable or neither of these. In addition, the Final Rule failed to address some significant comments raising serious concerns related to feasibility, practicability and unintended consequences. As a result, there are questions as to whether the Final Rule, "meets the need for motor vehicle safety." The rule also fails to explain the rationale for some of the adopted requirements and fails to acknowledge that it is departing from decades of precedent in regulating motor vehicle stopping distance.

The Alliance for Automotive Innovation (Auto Innovators)[1] is a strong supporter of an effective, practicable mandate for AEB systems. Nearly a decade ago, members of Auto Innovators joined with NHTSA and the Insurance Institute for Highway Safety (IIHS) to agree to install AEB as standard equipment across the light vehicle fleet. By all measures, this voluntary commitment has been a success. This technology has been made available in new vehicles faster than it could have been mandated, and its availability has helped to build customer acceptance of the concept of AEB. Nevertheless, Auto Innovators cannot support the Final Rule as adopted. For all of the reasons identified in the petition and expanded upon in this Appendix, Auto Innovators is seeking reconsideration of the Final Rule and provides the following data, information and arguments in support of its petition.

The Regulatory Framework. Under the National Traffic and Motor Vehicle Safety Act, NHTSA is authorized to adopt Federal Motor Vehicle Safety Standards (FMVSSs). By law, each FMVSS must be "practicable, meet the need for motor vehicle safety, and be stated in objective terms."[2] The Federal Courts have explained that these requirements were placed in the statute by Congress to achieve specific policy goals.

The requirement for objective criteria is in the statute so that "the question of whether there is compliance with the standard can be answered by objective measurement and without recourse to any subjective determination." *Chrysler Corporation v. DOT*, 472 F.2d. 659, 675 (6th Cir. 1972)(quoting from H. Rep. 1776, 89th Cong. 2d Sess.1966 P. 16.)

[1] From the manufacturers producing most vehicles sold in the U.S. to autonomous vehicle innovators to equipment suppliers, battery producers and semiconductor makers – Alliance for Automotive Innovation represents the full auto industry, a sector supporting 10 million jobs and five percent of the economy. Active in Washington, D.C. and all 50 states, the association is committed to a cleaner, safer, and smarter personal transportation future. www.autosinnovate.org.

[2] 49 U.S.C. § 30111(a)

The requirement for practicability encompasses several considerations, including avoidance of unsafe, unintended consequences: "The agency has a heavy responsibility indeed, a responsibility to ascertain, with all reasonable probability, that its regulations do not produce a more dangerous highway environment than that which existed prior to governmental intervention." *Paccar v. NHTSA*, 573 F.2d 632, 643 (9th Cir. 1978).

"Practicability" also includes the requirement to establish a repeatable test procedure. A test procedure is not "practicable" if it does not allow manufacturers to conduct tests that will assure that their vehicles will exactly meet the objective standard when tested by NHTSA. "Manufacturers are entitled to testing criteria that they can rely upon with certainty." *Paccar*, 573 F. 2d 632 at 644.

NHTSA must also consider the "reasonableness of the monetary and other costs" imposed by the regulation as part of the assessment of "practicability." *MVMA v. State Farm*, 463 U.S. 29, 55 (1984).

And finally, NHTSA must consider the public acceptance of a technology it is requiring, as an element of both "practicability" of an FMVSS as well as whether the FMVSS "meets the need for motor vehicle safety." "[M]otor vehicle safety standards cannot be considered 'practicable' unless we know both that the needed production capability is within reach and that motorists will avail themselves of the safety system. … We believe that the agency cannot fulfill its statutory responsibility unless it considers popular reaction. Without public cooperation there can be no assurance that a safety system can 'meet the need for motor vehicle safety.' And it would be difficult to term 'practicable' a system … that so annoyed motorists that they deactivated it." *Pacific Legal Foundation v. DOT*, 593 F. 2d. 1338, 1345-1346 (D.C. Cir. 1979).

In addition to these requirements imposed by the Vehicle Safety Act, general principles of administrative law require NHTSA to acknowledge when it is departing from past precedents, and to explain why it is justified in doing so. *MVMA v. State Farm*, 463 U.S. 29, 57 (1984)("An agency's view of what is in the public interest may change, either with or without a change in circumstances. But an agency changing its course must supply a reasoned analysis …".) (Citation to *Greater Boston Television Corp. v. FCC* omitted.)

II. THE FIVE ISSUES FOR WHICH AUTO INNOVATORS IS SEEKING RECONSIDERATION

A. The Stringent Stopping Distance ("No Contact") Requirements Are Not Practicable.

The Final Rule requires that the subject vehicle avoid any collision with the lead vehicle (for the AEB test) or with the pedestrian test mannequin (for the PAEB test) under a broad set of test conditions, including conditions of darkness (for PAEB systems) that do not take into account the forward lighting systems that will be available on motor vehicles in 2029 or their minimum performance requirements. The AEB and PAEB systems must "operate" at speeds up to 90.1 mph (145 km/h) (for AEB) and 45.4 mph (73 km/h) (for PAEB), which are speeds far higher than the available data support, and must avoid contact with the lead vehicle and pedestrian mannequin at speeds up to 62.1 mph (100 km/h) and 40.4 mph (65 km/h), respectively. In the most stringent provisions where the obstructed pedestrian is crossing the road and shielded by vehicles parked on the side of the road, the subject vehicle travelling at 31 mph (50 km/h) is required to stop in as little as 15 m from the time the pedestrian mannequin is revealed. Importantly, these *de facto* stopping distance requirements do not account for the additional response times needed for AEB systems to recognize, process, and signal to the braking actuator to achieve peak braking force.

1. NHTSA has not demonstrated that the Final Rule is Practicable.

Although NHTSA has named these performance criteria as the "no contact" requirements, they are in fact just another way of expressing stopping distance requirements, which have been a feature of NHTSA's vehicle braking standards for decades. In all of these tests, in order for a subject vehicle to avoid contacting the lead vehicle or the mannequin, it must stop short of that target under the test conditions specified in the standard, which is the same as a stopping distance requirement.

FMVSS No. 135, which regulates the braking performance of passenger cars, multipurpose passenger vehicles, trucks and buses with GVWR less than 3500 kg (7716 lbs), specifies that from a vehicle speed of 62.1 mph (100 km/h), the stopping distance must be less than or equal to 230 feet (70 m). At a vehicle speed of 31 mph (50 km/h), the stopping distance must be less than or equal to 66 feet (20 m).

The figure below, from SAE J2909, "Light Vehicle Dry & Wet Stopping Distance Test Procedure" demonstrates the range of surface frictional coefficients that can occur across the allowable ambient temperature range specified in the Final Rule (0° C - 40° C).

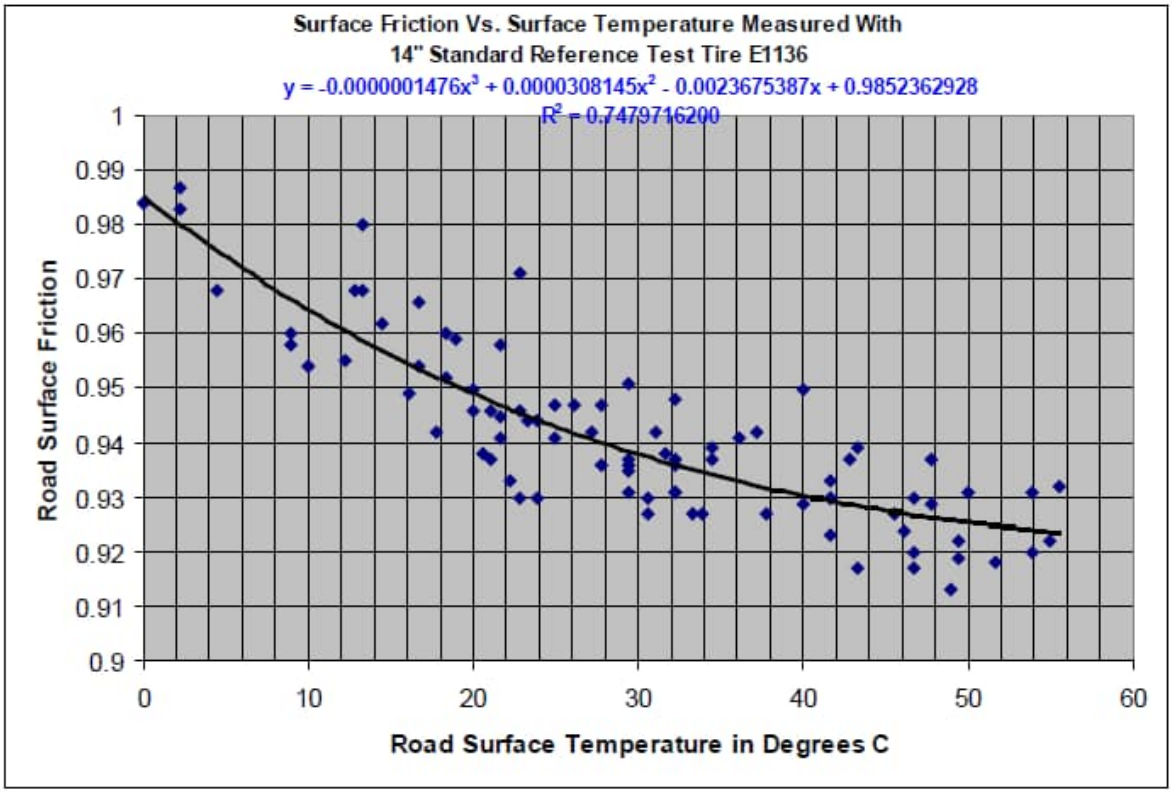


Figure 1 - Surface friction versus surface temperature example

In addition to temperature, other ambient conditions contributing to test performance variation include things like cloud cover (or intermittent cloud cover, especially), dust, debris, pollen effects, recent rainfall, and other noise factors. These variations in ambient conditions can easily translate into about 8-10 feet (2.5-3m) or more variation in absolute stopping distance on any given test surface.

Added to these conditions is the fact that the Final Rule does not adequately define the visibility test conditions. S6.1.4 states only that "[t]esting is not conducted during periods of precipitation or when visibility is affected by fog, smoke, ash or other particulate." While these restrictions on testing are good, they do not go far enough to define objectively when the Final Rule will require compliance. NHTSA recognized that "[r]educed visibility in the presence of

fog and other particulate matter is difficult to reproduce in a manner that produces repeatable results."[3] Yet, the Final Rule does not define a precise and comprehensive definition for "visibility," or provide the objective parameters for determining when compliance is required and when it is not.

Moreover, vehicle conditions, such as tire burnish, brake burnish (See Appendix A of SAE J2909), brake wear and brake bleed will further amplify these environmental effects, especially since the Final Rule requires compliance after the vehicle has been driven "at any speed, in any direction, on any road surface, for any amount of time" prior to conducting the test and unlimited test runs of a subject vehicle even after it has demonstrated compliance.

Actual test track conditions also contribute to stopping distance variability, such as the age and degradation of the asphalt since it was last resurfaced, the type of aggregate used on the test track and other variables. It is also worth noting that compliance tests will be run at any number of test tracks throughout the US, which will further amplify variability of the test by contributing their own unique characteristics.

All of these factors support the reason why NHTSA's FMVSS No. 135 recognize that regulating vehicle stopping distance requires an acknowledgement and accommodation of these inherent and uncontrollable contributions to outcome variability.

Although NHTSA stated that the Final Rule "is not intended to force changes to the underlying braking performance of vehicles," it also relied on NHTSA's evaluation of FMVSS No. 135 test results showing that "braking performance of nearly all vehicles was much better than what FMVSS No. 135 requires …".[4] But of course, these data reflect only that manufacturers build compliance margins into their designs for FMVSS compliance. These data

[3] 89 Fed. Reg. at 39755
[4] 89 Fed. Reg. at 39710.

do not mean that an FMVSS ***mandating*** those better performance results would be practicable, nor do they support a conclusion that the requirements of this Final Rule are practicable. Moreover, FMVSS No. 135 provides an allowance permitting compliance to be demonstrated in one of several test runs. (See further discussion below in the "No Allowance" Section of this petition.) Since the Final Rule demands compliance with lead vehicle AEB performance requirements at speeds up to 62.1 mph (100 km/h) with no allowance for variability, the FMVSS No. 135 test results are not comparable. Compounding this is the fact that FMVSS No. 135 is evaluating service brakes, with known variability limitations, whereas the Final Rule is requiring performance from both the service brakes ***and*** a perception system (sensors, etc.) that are not currently regulated and with which NHTSA has limited experience.

The actual test conditions of FMVSS No. 135 and the specified test conditions for the Final Rule are fundamentally different such that FMVSS No. 135 results are not indicative of AEB performance. The FMVSS No. 135 maneuvers, such as the Cold Effectiveness scenario, are conducted with a human driver putting muscular effort into the brake pedal. The Electronic Stability Control (ESC) system in this case takes no action. It merely allows for fluid pass through to the wheels. Compliance to FMVSS No. 135 requires mainly the methods of base brake sizing commonly understood by the industry (e.g. - selecting calipers, rotors, friction, pedals and the like) as if the ESC device were not present. By contrast, in most AEB use cases contemplated by the Final Rule, there is no human driver input to the system. This creates a completely new functional requirement for the ESC to serve as the brake actuator which does not exist at all within the FMVSS No. 135 compliance targets.

Adding further complexity is the fact that the performance (brake response time – the time taken to develop full braking pressure) of the various ESC systems which are currently

offered in the market is not uniform. A typical ESC product portfolio starts with a basic unit which is ideal to support the single wheel pressure build requirements of a maneuver such as is evaluated by FMVSS No. 126. When a vehicle manufacturer desires to equip a vehicle with more advanced driver assist functions such as AEB, typically this will prescribe incrementally more capable hardware, which can include ESC system with larger valves flow holes, electrically commutated (EC) motors and 6-piston pump elements (compared with 2-piston base units). These hardware upgrades and the associated system development and integration efforts have associated costs that NHTSA did not identify or quantify.

But additionally, even these improvements do not fully address the scope of vehicles on the market. As vehicles approach the top of the weight range covered by the Final Rule, brake caliper volumes increase and therefore fluid flow rates must scale to match. At some point, alternative measures aside from even the most capable ESC systems available become necessary. For this situation, there are "Electronic Power Brake Boosters" of various designs on the market. These devices replace the traditional vacuum booster with a new type of motorized hydraulic plunger piston better-suited than an ESC pump to deliver a large volume of fluid quickly to all four wheels. The AEB pressure build can be taken over by the most suitable hydraulic device for the task. Here again, there is some multiple of higher complexity in the development effort, which introduces increased costs because of the replacement of the traditional brake booster with an electrohydraulic device with the coordination of the function distribution between the multiple brake actuators.

Auto Innovators acknowledges that there are vehicle models in the market which already have some or all of these enhancements (although that does not mean that vehicles with these enhancements necessarily comply with the Final Rule). But NHTSA's failure to acknowledge

the need for such enhancements on at least some vehicle models magnifies the differences between the systems NHTSA evaluated in its research program and the systems likely to be needed for compliance with the Final Rule. This highlights another reason why NHTSA's research program does not demonstrate that the Final Rule is practicable, and why NHTSA's evaluation of the costs of compliance with the Final Rule was inadequate.

For all of these reasons, the FMVSS No. 135 test results do not support the Agency's conclusion that the Final Rule requirements are practicable.

The Final Rule asserts that its requirements are "practicable" in conclusory terms, but there is no evidence cited in the Final Rule or the Final Regulatory Impact Analysis (FRIA) to support those conclusory assertions. In the Final Rule, NHTSA states that it agrees with IIHS that "some current systems are already completely avoiding collisions under the proposed vehicle AEB testing."[5] But IIHS did not test any vehicles at speeds faster than 43.5 mph (70 km/h), and only three of the six tested vehicles avoided the lead vehicle target in all of the test runs.[6]

And NHTSA cites its own testing of MY 2023 vehicles and concludes that "one vehicle … performed very well and passed all lead vehicle AEB requirements except for only the most stringent condition under the lead vehicle decelerating scenario – satisfying the requirements in two out of five tests."[7] In response to comments noting that no vehicle in NHTSA's previous test program met all the lead vehicle requirements, NHTSA said that those vehicles were designed to meet the 2016 voluntary commitment requirement and the agency's own New Car

[5] 89 Fed. Reg. at 39728
[6] IIHS Comments, NHTSA Docket 2023-0021-0718 at page 3
[7] 89 Fed. Reg. at 39728

Assessment Program (NCAP) criteria, , but that "these programs demand a much lower level of AEB performance than those of this final rule."[8]

NHTSA continued its discussion by noting its 2023 research test program, which it described as "using the performance requirements and test procedures of this final rule."[9] NHTSA conceded that only one tested vehicle was able to meet the requirements. NHTSA indicates that vehicle met the requirements "at least once," but asserted that this single vehicle's performance proves that "some existing AEB systems are able to completely avoid collisions in the required lead vehicle AEB testing conditions."[10] NHTSA made similar observations about its research program involving PAEB research, in which no vehicle met all of the proposed requirements.[11] The ability of a single vehicle to meet these tests *some of the time*, does not support the conclusion that the Final Rule is practicable.

What is more, NHTSA later concludes that the more demanding performance criteria of the Final Rule (which almost no vehicle could meet in the research) can be met with relatively inexpensive software improvements in most vehicles, and that only five percent of new light vehicles would require new hardware to come into compliance. A recent (May 17, 2024) letter to NHTSA from Robert Bosch LLC (Bosch) undermines this conclusion. As Bosch noted in this letter, it had previously pointed out to NHTSA during the rulemaking process that certain vehicle models "may require significant hardware updates, such as the inclusion of more advanced sensors (e.g. radar, cameras), increased computing power, and/or improved brake systems to meet the specified requirements." Bosch letter at page 2, referring to a previous Bosch

[8] 89 Fed. Reg. at 39728
[9] 89 Fed. Reg. at 39728
[10] 89 Fed. Reg. at 39728
[11] 89 Fed. Reg. at 39731

presentation to NHTSA.[12] NHTSA cited to that presentation in support of its conclusion that only about five percent of new light vehicles would require additional hardware to meet the new requirements.[13] However, as pointed out in Bosch's recent letter, the Bosch presentation does not support that conclusion; in fact, it points to the opposite conclusion -- that significant investments in hardware will be required to achieve compliance in light vehicles.

In sum, NHTSA has not cited to any evidence demonstrating that the Final Rule is practicable for the fleet of regulated vehicles, or that current technology AEBs are capable of meeting these requirements without significant changes.

2. NHTSA's Own Data Show That the Final Rule Stopping Distance Requirements Are Not Practicable.

NHTSA acknowledges that only a single vehicle in its 2023 test program was able to meet the "performance requirements and test procedures of this Final Rule.[14] But NHTSA's 2023 test program did not evaluate the "performance requirements and test procedures of this Final Rule." Rather, the 2023 test program evaluated lead vehicle AEB performance with subject vehicles speeds up to a maximum of 80 km/h, which is slightly less than 50 mph. The Final Rule requires compliance with the Lead Vehicle AEB requirements at speeds up to 62.1 mph (100 km/h) which is 25% faster than the top speed evaluated in the 2023 test program.

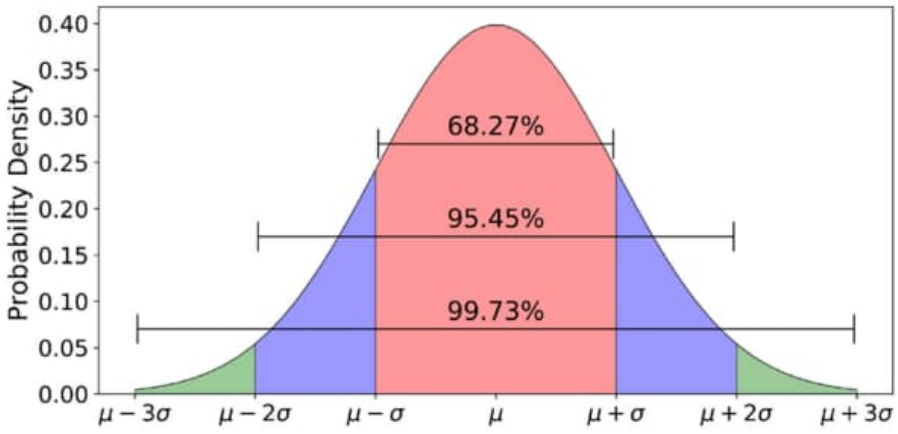
Moreover, NHTSA is assuming that the performance of a single vehicle in a single test run is adequate evidence of practicability for a fleet encompassing tens of millions of new vehicles per year, without considering whether variability between vehicles (or between laboratories performing compliance tests) would make compliance more challenging by dictating a *de facto* compliance margin that manufacturers would have to meet in order to assure

[12] NHTSA Docket 2023-0021-1058
[13] 89 Fed. Reg. at 39766, Footnote 163
[14] 89 Fed. Reg. at 39728 and NHTSA Docket 2023-0021-1066

compliance of 100% of their regulated vehicles. NHTSA addressed this topic in the Final Rule in the FRIA, dismissing the concerns with the observation that "[m]anufacturers are free to choose what compliance margins make sense for their organization and their products, and NHTSA does not dictate that."[15]

But NHTSA's own data highlights the problem. NHTSA assessed the variability in time to contact ("TTC") values at brake activation in the FRIA.[16] NHTSA assumed that TTC values are "normally distributed," meaning that they would be graphed on a bell curve shaped and centered around the mean value, with the expectation that 68% of the values would fall within one standard deviation of the mean; 95% of the values fall within two standard deviations and 99.7% fall within three standard deviations. The following figure is from NHTSA's FRIA[17] .

Figure 29: 68-95-99.7 Rule



Using this assumption, NHTSA analyzed TTC at brake activation for three vehicle models in a series of test runs (21 to 24 trials, depending on the model). One model was assessed at 9.9 mph (16 km/h) , and the other two were assessed at 24.9 mph (40 km/h) . None

[15] 89 Fed. Reg. at 39730
[16] NHTSA Docket 2023-0021-1069 at pages 355-359
[17] FRIA at page 356

was assessed at the Final Rule speed of 62.1mph (100 km/h). Even at these lower speeds, the NHTSA data show a variation of at least 0.15 seconds in TTC, in addition to any other stacking variations due to test set up and other variables. Below are three figures from NHTSA's FRIA showing this variability:

Figure 30: Distribution of TTC for Nissan Altima for S1 Tests Conducted at 16 km/h

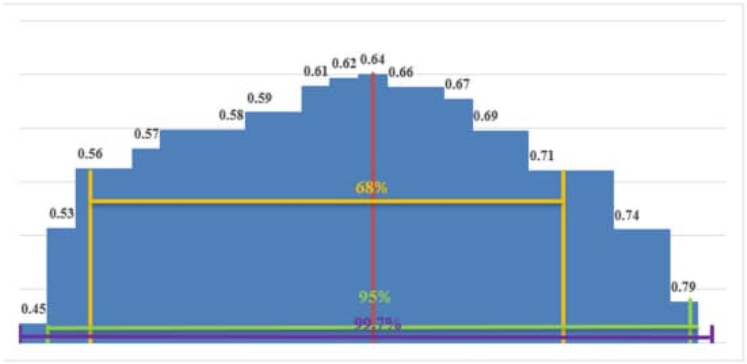


Figure 31: Distribution of TTC for Volvo S60 for S1 Tests Conducted at 40 km/h

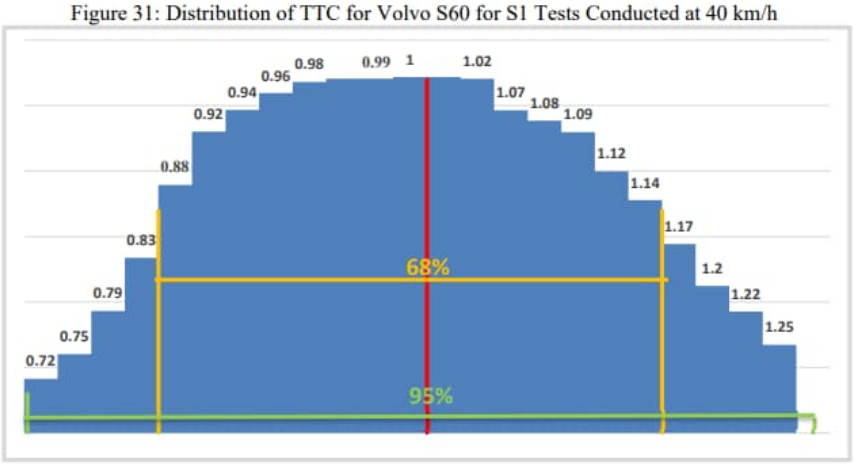
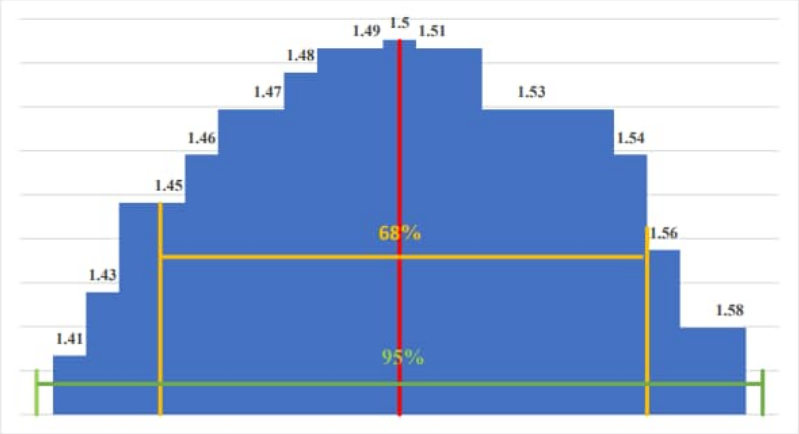


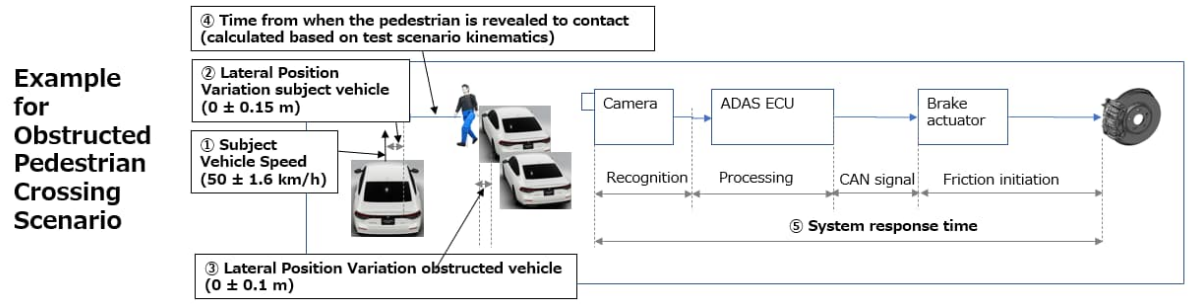
Figure 32: Distribution of TTC for Subaru Outback for S1 Tests Conducted at 40 km/h



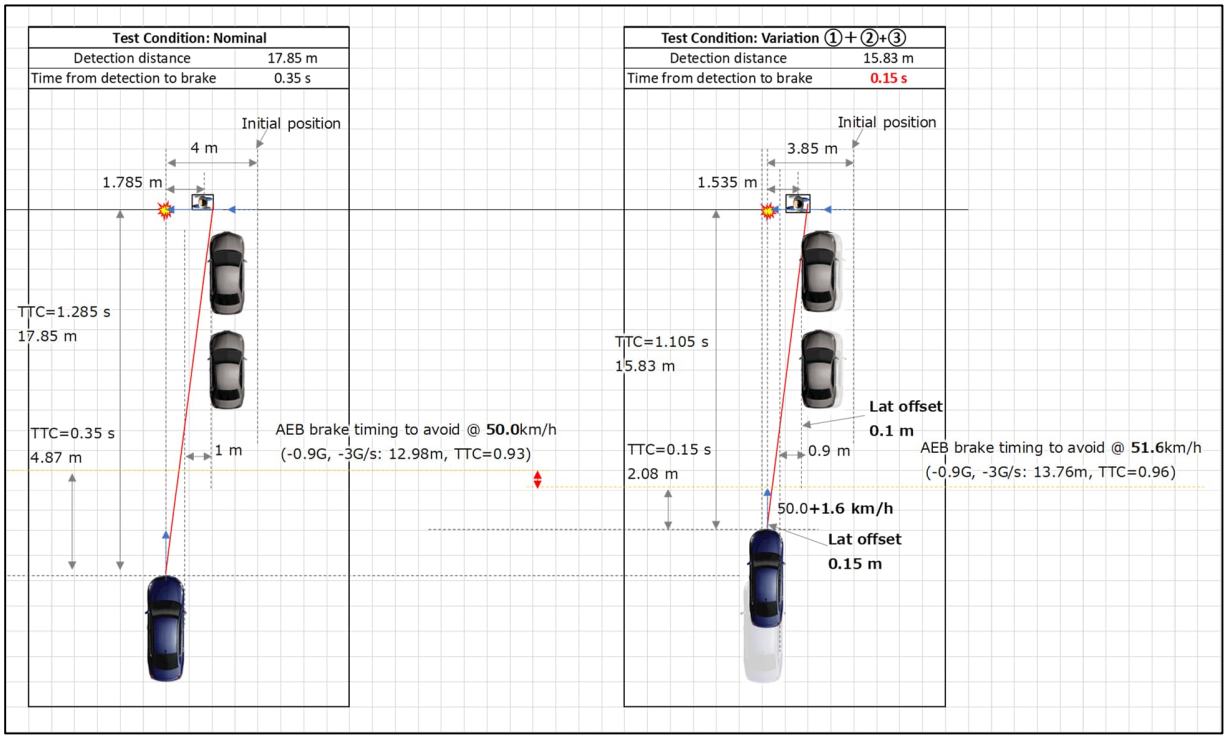
When these data are considered in the context of the requirements of the Final Rule, the practicability problems become clear. The following example illustrates the problem:

For the obstructed pedestrian crossing road scenario required in S8.2, assuming the following:

- Variation in subject vehicle test speed of 31 mph ± 1 mph (50 km/h ± 1.6 km/h) as specified by S7 of the Final Rule (tolerance 1 in the chart below);
- Variation in subject vehicle lateral position (overlap to pedestrian) of 0 ± 0.15 m as specified by S8.1.2 (tolerance 2 below);
- Variation in the lateral position of the obstructing vehicles (with respect to pedestrian position) of 0 ± 0.1 m as specified by S8.3.3 (tolerance 3 below); and
- AEB can achieve peak braking deceleration of 0.9 G with an initial braking input rate of 3 G per second. This is considered ideal best case but for the purposes of this example, variation is not included.



Under nominal test scenario conditions, the pedestrian is revealed from behind the obstructing vehicle at 1.285 seconds TTC, which demands that the AEB system respond (recognize, process, signal, and initiate braking friction) within 0.35 seconds to avoid contact (i.e. 0.93 sec TTC at brake activation). However, considering the aforementioned variation in testing choreography for speed and position, the pedestrian is revealed in as little as 1.015 seconds TTC. Therefore, the Final Rule actually demands 0.15 seconds response time, which is well beyond the capability of any known AEB system.



Test Condition	①Subject Vehicle Speed	②Lateral Position Variation subject	③Lateral Position Variation obstructed	④TTC from Ped reveal	⑤System response time	AEB timing		Collision avoidance distance (Braking profile: -0.9G peak, -3G/s input)
	Km/h	m	m	sec	Sec	Sec	m	m
Nominal	50.0	0	0	1.285	**0.35**	0.93	12.9	**0.01**
②+③	50.0	0.15	0.1	1.177	0.17	0.94	13.0	0.03
①+②+③	51.6	0.15	0.1	1.105	**0.15**	0.97	13.8	**0.07**

These theoretical variations in calculated AEB system response times directly support the TTC variation that NHTSA highlights in the FRIA. Together, these demonstrate that the Final Rule TTC requirements (i.e. AEB system response times) are not practicable for the current fleet.

NHTSA's own data also illustrate the difficulties in compliance with the test condition involving a decelerating lead vehicle with both the lead and subject vehicles traveling at 50 mph (80 km/h) at any headway between 12 and 40 meters (S7.5.1(a), S7.5.2(b)(2), S7.5.3(a) and S7.5.3(d) of the Final Rule.). NHTSA's 2023 test data evaluated the decelerating lead vehicle condition only with a 12 meter headway, and even then, only one tested vehicle was able to pass.[18] NHTSA did not provide any data supporting the feasibility of any vehicle meeting this requirement with a headway greater than 12 meters, nor is there data supporting a conclusion that this requirement is practicable for the fleet as a whole.

3. NHTSA Has Not Adequately Considered the Likelihood that The Rule Will Induce "False Positives" as well as More Rear Collisions

Meeting the performance requirements of the Final Rule will predictably generate "false positives" [i.e. braking when there is no crash imminent scenario warranting braking], or in some

[18] NHTSA Docket 2023-0021-1066, *NHTSA's 2023 Light Vehicle Automatic Emergency Braking Research Test Summary* at Table 1 (page 5) and Table 5 (page 16)

cases, the perception of false positives, and will induce new incremental rear-end collisions precipitated by vehicles following the rule-compliant AEB vehicles that are not expecting the AEB vehicle to brake in certain conditions (e.g., acute changes in pedestrian direction or speed in proximity to the roadway (or travel lane) when traveling at higher speeds). Furthermore, increases in relative speed may increase the likelihood for false positives, or perceived false positives, due to the requirements driving the need for earlier prediction and intervention. NHTSA's FRIA acknowledges that false positives "can generate consumer distrust or distaste for [AEB] systems or potentially generate a safety risk."[19] The FRIA also notes that "if vehicles were to exhibit false positives during real world conditions, this could be considered a safety risk."[20]

Yet, despite acknowledging that false positives could generate problems with public acceptance of AEB as well as actual safety issues in the field, NHTSA dismisses the concern with the following observation: "Currently most new vehicles are already equipped with AEB systems and the agency believes that false positives on those systems are rare, and that the new requirements will not significantly impact the incidence of false positives."[21] This statement by NHTSA confirms the agency's underestimation of the significant investments in hardware that will be required to achieve compliance with the Final Rule, as the Final Rule will demand effectively different systems than the AEBs currently installed in vehicles. Later, the FRIA asserts "[i]t may be the case that Lead Vehicle AEB may …. create another imminent rear-end crash scenario." But NHTSA dismisses this possibility with the statement that "since the current

[19] FRIA at page 22.
[20] FRIA at page 22.
[21] FRIA at page 22.

market penetration rate of AEB is near 100 percent, any incremental disbenefits resulting from requiring all applicable vehicles to have AEB [meeting the requirements for avoiding rear-end collisions with] Lead Vehicles under this rule would be insignificant."[22]

But the concern cannot be dismissed so easily. First, not all vehicles on the road have any AEB. Applying NHTSA's own Vehicle Survivability and Travel Mileage Schedule, the turnover of vehicles is such that the light vehicle fleet is unlikely to have significant rule-compliant AEB penetration until after 2045, or even later, given the increasing age of the vehicle fleet. Second, NHTSA has justified the stringent requirements of this rule in part on its rejection of the capabilities of current AEB systems, stating that these current systems were not designed to meet the performance requirements of the Final Rule.[23] NHTSA cannot rely on the presence of these early AEB systems in the fleet to justify a conclusion that there will be no significant risk of an increase of unwanted rear-end collisions caused by AEB activation of rule-compliant systems, and at the same time dismiss these early AEB systems as inadequate. At a minimum, NHTSA should have attempted to quantify this risk, identify the number of incremental new rear-end collisions that will be caused in the fleet by the activation of rule-compliant AEBs, and assessed the disbenefits of those incremental crashes with an explanation of why these disbenefits are reasonable to accept.

NHTSA offers no data to support either of these conclusions, either that "false positives" on current systems are rare, or that the Final Rule's requirements will not "significantly impact" the incidence of false positives. Indeed, the agency admits that, "due to data limitations," it did

[22] FRIA at 251-252 [Added text was presumably unintentionally omitted from the FRIA.]
[23] See, for example, 89 Fed. Reg. at 39688 and 39728

not evaluate the "disbenefits from false positives or rear-end crashes resulting from vehicles without AEB."[24]

We anticipate that the Final Rule's requirements will significantly impact incidents of false positives. The obstructed pedestrian crossing scenario highlighted above raises two specific examples. First, under nominal test conditions, a rule compliant AEB system must respond within 0.35 seconds of the pedestrian being revealed. NHTSA's own data has shown that human drivers, such as those in a following vehicle, are not capable of matching such rapid braking reaction times.[25] Second, a rule compliant AEB system must start aggressively braking before the pedestrian has entered the roadway, under the requirement that the pedestrian will continue crossing as specified in FMVSS. In reality, it is likely that a pedestrian would stop short of entering the roadway.

It is not sufficient, or fair, to suggest that NHTSA will address "false positives" through its safety defect authority, presumably by requiring recalls.[26] While NHTSA certainly has ample authority to address safety ***defects*** in motor vehicle, performance required by an FMVSS, even indirectly, cannot reasonably be deemed a safety defect. This issue is reminiscent of the unwanted side effects of higher-powered air bags, which NHTSA eventually had to address through rulemaking to change the performance standards for frontal air bags.[27] Here, the need to activate the AEB (or PAEB) is dictated by the performance requirements of the Final Rule, and will undoubtedly result in some braking events that, in hindsight, may appear premature or

[24] FRIA at pages 47 and 251-252
[25] *Forward Collision Warning Requirements Project*, Tasks 2 and 3a Final Report, NHTSA DOT HS 809 902, August 2005.
[26] 89 Fed. Reg. at 39732
[27] 65 Fed. Reg. 30680 (May 12, 2000)

even unneeded. But to the extent the activation is reasonably required by the technical capabilities of rule-compliant AEB systems, that performance cannot reasonably be deemed a safety defect.

4. NHTSA Has Not Established Performance Requirements for the Equipment Requirements in the Standard

The Final Rule establishes requirements that the lead vehicle AEB and PAEB systems "operate" at speeds up to 90.1 mph (145 km/h) and 45.4 mph (73 km/h), respectively, but does not provide any definition of "operate." The preamble describes an expectation that the FCW will be provided when a collision with a lead vehicle or pedestrian is "imminent," but this term is not objectively defined. Also, the preamble describes an expectation that the lead vehicle AEB and PAEB systems will apply the brakes automatically at the referenced speeds (90.1 mph (145 km/h) and 45.4 mph (73 km/h), respectively) when a collision is imminent. Again, an "imminent" crash is not defined in the text of the FMVSS.

Similarly, NHTSA has not established a sufficient set of objective requirements for evaluating compliance with the FCW visual signal requirements. S5.1.1(b) of the Final Rule provides that the visual signal must be located in an ellipse formed around the forward-looking eye midpoint of the driver "as described in S14.1.5 of FMVSS No. 111." However, FMVSS No. 111 also specifies test conditions for the driver's seating position (S14.1.2.5.1 and S14.1.2.5.2), the seat back angle (S14.1.2.5.3) and the steering wheel adjustment (S14.1.7), none of which is specified in the Final Rule, raising questions about how NHTSA intends to set these parameters when testing for compliance with new S5.1.1(b) of the Final Rule, which also does not define the required size of the visual signal. Furthermore, the requirements related to the auditory signal in S5.1.1(a) also lack specificity regarding several key parameters including the frequency, intensity

and duty cycle calculation (or percentage of time the sound should be present), including the potential need for multiple frequencies to meet the minimum intensity levels at different. There may also be a need for reasonable exceptions for high ambient noise conditions, such as convertibles with an open top configuration.

The lack of sufficient objective requirements or associated test procedures for the requirements means that they do not meet the criteria of the Vehicle Safety Act for an FMVSS requirement.

B. The "No Allowance" Requirement.

NHTSA sought comment in the NPRM on whether to provide that the performance requirements of the standard could be met in a series of repeated test runs, with compliance determined as a function of the number of allowable runs (such as showing compliance in 5 out of 7 test runs, as specified in the NCAP test procedures for crash imminent braking.)[28] This proposal (or a variation) was supported by Auto Innovators and numerous other industry commenters. As noted by NHTSA in the Final Rule, allowing multiple test runs to achieve the required performance would provide NHTSA with "more statistical power" in characterizing the performance of a vehicle.[29] Given NHTSA's experience with the NCAP program, and with the compliance allowance built into FMVSS No. 135, NHTSA has not explained or justified why the Final Rule does not likewise provide a compliance allowance to accommodate the inherent statistical variability of stopping distance tests.

There are numerous environmental and other external factors that can affect the outcome of a compliance test that go beyond the capabilities of the vehicle itself and are not controlled in

[28] NHTSA Docket 2015-0006-0025) *NHTSA Report on Crash Imminent Brake System Performance Evaluation for NCAP* at Section 12.6, at page 38

[29] 89 Fed. Reg. at 39731

the test conditions set forth in the Final Rule. For example, several provisions of NHTSA's Final Rule specify driving the subject vehicle "at any speed, in any direction, on any road surface, for any amount of time" prior to conducting the FCW onset test. See, for example, S7.3.2(b) of the Final Rule. This test condition will predictably result in tire wear and other vehicle changes that could affect the outcome of the compliance test. This issue of uncontrolled contributors to variable test outcomes is particularly relevant at the higher speeds required by this rule, where the potential for false positives is increased, and achieving full velocity reduction is more challenging.

In the Final Rule, NHTSA declined to adopt any allowance for multiple test runs. NHTSA said that "a single test run, and the expectation that a manufacturer pass all test runs if NHTSA chooses to run the same test several times, provides the performance consistency that consumers expect and safety demands."[30] NHTSA went on to state that it would be conducting tests in "idealized, controlled conditions when compared to real-world situations.[31] And, although NHTSA noted that both NCAP and other global programs have permitted repeated test runs for demonstrating performance of AEB, NHTSA now says that "for more mature systems with a long record of real-world use," it is necessary to require compliance in every single test. NHTSA stated that an allowance for multiple test runs would be "even more unacceptable"

for the pedestrian component of the Final Rule because of the vulnerability of pedestrians in vehicle-to-pedestrian collisions.[32]

NHTSA's Final Rule fails to account for the practicability problems posed by requiring compliance in every test run. NHTSA asserts that its test conditions are "idealized" and

[30] 89 Fed. Reg. at 39731
[31] 89 Fed. Reg. at 39731
[32] 89 Fed. Reg. 39731

"controlled," but in fact the test procedures do not control for all the variables that could affect the outcome of the test, such as headlight aim that affects object detection capabilities in low lighting and sun positioning requirements to avoid camera glare issues. The test dummies are simplified, only partially representative models of real targets, which makes the test conditions far from "idealized". The construction of the current pedestrian mannequin lacks the design attributes to sufficiently mimic a real pedestrian thereby creating additional challenges for a modern video perception to classify it as a pedestrian. Moreover, it is reasonable to assume that the pedestrian mannequins will be affected, or even damaged, from repeated outdoor exposure during the tests, changing their visual properties in a way that could influence the object recognition requirements for the sensors, cameras and other components in the AEB systems.

As discussed in detail in the Section on Stopping Distance (No Contact) above, NHTSA's own data show the difficulty in achieving compliance. In NHTSA's tests, there is no scenario in which all the tested vehicles could meet the performance requirements for Lead Vehicle AEB, and beginning at 40 mph (64 km/h), fewer than half the tested vehicles could meet the performance requirements in all the test trials.[33] NHTSA's test runs stopped at 45 mph (72 km/h), in which only two models were capable of avoiding contact with the lead vehicle. Yet, NHTSA's Final Rule requires compliance with the stopping distance requirements for the Lead Vehicle tests at speeds up to 62 mph (100 km/h), the feasibility and practicability of which have never been demonstrated.

For the PAEB testing, the difficulties are even more acute. At the lowest speed tested by NHTSA (9.9 mph (16 km/h)), more than 25% of the test runs resulted in contact with the test mannequin. By the time NHTSA's test speeds reached 40.7 mph in dark conditions, no vehicle

[33] FRIA at 67 and following

could avoid the test mannequin 100% of the time. Yet, NHTSA's Final Rule requires compliance with the PAEB stopping distance requirements at speeds up to about 40 mph (64 km/h), the feasibility and practicability of which have never been demonstrated.

For both AEB and PAEB systems, NHTSA dismisses the practicability concerns with an assertion that "NHTSA has the authority to issue technology-forcing standards when it is shown, as it is here, that meeting the standard is practicable."[34] But asserting that meeting the standard is practicable does not make it so. NHTSA's own test evidence shows that most vehicles do not meet the standard's requirements, and NHTSA has not provided any analysis showing why these data (or other information) prove the practicability of meeting these challenging performance requirements.

And, NHTSA's assumption that AEB and PAEB systems are "mature" is incorrect. While vehicle manufacturers have been introducing AEB systems on new vehicles under the 2016 voluntary agreement, these systems were not designed to meet the performance requirements announced in the Final Rule. Indeed, NHTSA's FRIA acknowledges that existing AEB systems do not meet the Final Rule requirements, and claims "significant benefits" for the Final Rule as compared with the systems being installed under the voluntary agreement.[35] These benefits are summarized in the Final Rule as a savings of 362 lives and 24,321 injuries avoided.[36]

Since NHTSA is claiming these significant benefits for the new, "rule-compliant" AEB and PAEB systems, then the AEB systems being installed under the voluntary agreement cannot reasonably be considered "mature." In fact, they will have to be modified substantially to meet the new performance requirements, the costs of which we believe NHTSA underestimated in its

[34] 89 Fed. Reg. 39731
[35] FRIA at pages 22 and 247
[36] 89 Fed. Reg. 39766

analysis, as discussed further below. NHTSA acknowledged in the Final Rule that allowances for multiple test runs "is appropriate for a technology that is new or being developed."[37] Given the substantial changes needed to allow existing AEB and PAEB systems to meet the Final Rule requirements, these systems should be considered "new or being developed," and therefore should be permitted to demonstrate compliance in the multiple test run scenario that NHTSA agrees is appropriate for systems that are "new or being developed."

For decades, NHTSA's braking standards have recognized that brake systems have inherent variability in performance such that performance cannot reasonably or fairly be evaluated in a single test run. FMVSS 135 (and other NHTSA braking standards) have accounted for this variability by specifying compliance parameters that allow for performance differences between test runs, and typically require that compliance be demonstrated within a specified allowance (such as one test run out of six test runs). See, e.g. S 6.5.3.2 of FMVSS 135 ("Where more than one stop is required for a given set of test conditions, a vehicle is deemed to comply with the corresponding stopping distance requirements if at least one of the stops is made within the prescribed distance.")

AEB is also a braking system and, like foundation brakes, has variations and limitations that present practicability concerns for a test requirement that does not have an allowance for multiple test runs. In fact, AEB encompasses the variations due to foundational braking as well as the additional variations due to AEB system response. NHTSA has not acknowledged that it is reversing its longstanding position that braking regulations require an allowance for multiple test runs, nor has it explained why it is departing from that well established precedent in this Final Rule.

[37] 89 Fed. Reg. 39731

This issue is exacerbated by the Stopping Distance ("no contact") requirements discussed above, and may be ameliorated to some extent if NHTSA grants relief of those requirements.

Auto Innovators separately seeks reconsideration of the provisions of the Final Rule allowing NHTSA to conduct unlimited pretest driving of the subject vehicle and permitting the subject vehicle to be driven "at any speed, in any direction, on any road surface, for any amount of time" prior to conducting the test[38], as well as unlimited test runs of a subject vehicle even after it has demonstrated compliance.[39]

Unlimited pretest driving of a subject vehicle is simply inconsistent with the Vehicle Safety Act's requirement for repeatable, objective test procedures. Under NHTSA's "unlimited pretest" provision, NHTSA could literally accrue thousands of miles on the test vehicle, degrading the tires and other wear-out components, before running the Final Rule's compliance test. Manufacturers would have no way to predict what NHTSA's pretest driving scenarios will do to the test vehicle, making it impossible to certify compliance under such unknown and unknowable test conditions. Likewise, NHTSA's reservation of the choice to run a compliance test repeatedly on an already-tested vehicle is unreasonable and fails to meet the requirements for objectivity and repeatability commanded by the Vehicle Safety Act.

C. The Deactivation Provisions Are Lacking in Objective Specifications and Test Procedures.

1. NHTSA Did Not Provide an Objective Definition of "Malfunction" that Must Trigger the Malfunction Indicator Lamp

[38] See S7.3.2 (b), S7.4.2(c), S7.5.2(a), S8.3.4(a), S8.4.2(a), S8.5.2(a), S9.2.2(a), S9.3.2(a) of the Final Rule

[39] 89 Fed. Reg. at 39731 (referring to NHTSA potentially choosing to run the same test several times)

S5.4 requires activation of the malfunction indicator lamp (MIL) telltale under two separate sets of conditions: (1) when a malfunction is detected, including sensor degradation, and (2) when the system has adjusted its performance in any way (including, but not limited to, when an owner or operator has modified the vehicle) such that the performance of the AEB or PAEB will no longer meet the requirements of the FMVSS.

In general, a requirement to activate the MIL when a malfunction in a safety system is detected is unremarkable, and consistent with other FMVSSs. For example, FMVSS No. 135 S5.5 lists the explicit conditions under which a warning must illuminate. Likewise, FMVSS No. 138 regarding Tire Pressure Monitoring Systems requires MIL illumination "after the occurrence of a malfunction that affects the generation or transmission of control or response signals" in the TPMS itself. FMVSS No. 138 also has a malfunction simulation test procedure specified in S6(k), including a specification permitting the installation of an "incompatible tire." However, in this Final Rule, "malfunction" is not defined, has no associated test procedure, and in fact, is expanded to include "sensor degradation," which goes beyond ordinarily MIL illumination requirements in the FMVSSs.

In the absence of an objective definition of "malfunction," a "malfunction" determination will be based on how a manufacturer, at its discretion, defines a malfunction in its system design. When a malfunction is detected accordingly, the manufacturer can also adjust the AEB performance to any performance level, including complete deactivation, that does not meet the requirements of S5.1, S5.2, or S5.3. If this interpretation is correct, the allowance to adjust, including deactivate, AEB during a defined (objective) malfunction state should also be clearly defined in objective terms.

2. NHTSA Did Not Establish an Objective Requirement or Test Procedure for the Automatic Detection of System Changes that May Affect AEB Performance

The second MIL requirement, to detect owner modifications that take the AEB or PAEB system out of compliance with the Final Rule's requirements and illuminate the MIL upon detection of such modifications, is a boundless requirement that has no associated objective performance requirement or test procedure. As noted above, FMVSS No. 138 (TPMS) requires illumination of the MIL if an incompatible tire is installed on the vehicle. The Final Rule contains no such specification or limit on owner modifications that must be detected and trigger illumination of the MIL. The potential vehicle modifications that could theoretically affect AEB or PAEB performance are unlimited. It is not reasonable or practicable to expect vehicle manufacturers to anticipate every possible modification that NHTSA could simulate, regardless of plausibility or predictability, and design their AEB and PAEB MIL detection strategies to recognize all such modifications. The Vehicle Safety Act requires that the MIL illumination requirements be established in objective terms with repeatable test procedures, which this Final Rule does not accomplish.

3. NHTSA Should Allow Manual Deactivation of the AEB Under Certain Circumstances Beyond Those Allowed in the Final Rule

Many commenters to the proposed rule supported allowing manual deactivation of the AEB/PAEB system in certain situations in which AEB operation would be inappropriate, or even potentially hazardous. For example, AEB operation during off-highway driving scenarios requiring maneuvering around objects, or performance driving on closed circuits with highly dynamic and close-quarters operation around other vehicles would be inappropriate and potentially dangerous. In these examples, unexpected and sudden AEB operation could prove

disruptive to the driver and result in erratic vehicle behavior that could endanger the driver and other vehicles around them.

Auto Innovators acknowledges that the Final Rule provides for automatic deactivation of AEB in certain limited circumstances, such for when a "tow mode" is activated or when a snowplow is attached to a vehicle. But customers are free to install a wide variety of equipment which may not be readily interpreted by AEB sensors as a malfunction or otherwise needing to trigger an automatic deactivation.

For off-road driving, the regulatory approach specified in S5.4.3 of the Final Rule is too narrow to account for modern vehicle technology. It applies only to vehicles operating in a low-range four-wheel drive configuration. While this configuration may be common on traditional off-road models, some vehicles with All-Wheel Drive systems (typically without a transfer case), or more importantly, for electrified vehicles using only electric motors or a combination of combustion driven axles and electric motors, may not have a low-range system, but still be capable of off-road operation and in need of the regulatory relief provided by S5.4.3. NHTSA should broaden the applicability of S5.4.3 to vehicles operating in any "Off-Road" mode or mode designated to the driver as being appropriate for low-speed off-highway operation.

Dynamic driving events pose another situation in which AEB disablement would be necessary to prevent unexpected or erratic braking which can negatively impact safety. These events are typically held on closed courses such as racetracks or parking lots (i.e., autocross events). AEB systems would not automatically differentiate tracks or parking lots from public roads and would likely intervene in the middle of a dynamic maneuver disrupting the driver and endangering other vehicles operating in close proximity. Drivers would need to be able to

disable AEB under these conditions to safety participate in the event. In addition, other edge cases are conceivable in which a vehicle is operated on a public roadway, but under non-normal conditions such as parades, car shows, or sporting events in which the vehicles are operated near pedestrians and other vehicles.

Regarding installed equipment, NHTSA's approach for "automatic deactivation only" may cover certain scenarios in which the AEB system is clearly interfered with, such as when a driver installs a snowplow. However, this approach is flawed because not all potentially unsafe scenarios are covered. Examples include situations in which drivers install other equipment or modifications to their car which cannot be detected or for which the AEB system cannot reasonably determine a malfunction. These scenarios could include installing equipment such as a roof mounted kayak/canoe or ski rack in which parts may overhang the front windshield (where sensors may be mounted). In these cases, cameras or other sensors may pick up on shapes that would not result in a malfunction, but which might trigger AEB operation. Drivers would need to be able to deactivate the systems manually in these cases in order to operate the vehicle.

NHTSA should reconsider its decision declining to allow a manual deactivation feature in vehicles. Auto Innovators supports requiring a multi-step process for drivers to be able to manually deactivate their vehicles AEB/PAEB systems similar to the criteria of the United Nations Economic Commission for Europe (UNECE) Regulation No. 152. The approach used in R152 requires several steps by the driver in addition to having the system reset following a key-off / key-on restart. The return to the original active mode on the next ignition cycle is similar to the approach to manual deactivation in FMVSS No. 126. Data will be provided to the docket

under separate cover from an Auto Innovators member (Volkswagen Group Of America) that will demonstrate that in an aggregated fleet of over 30,000 R152 compliant vehicles, taking more than 12 million trips, only 0.2% of the vehicles deactivated their AEB system more than 10 times, meaning less than 0.005% of all trips had AEB deactivated. This means that the manual deactivation feature was used by drivers, but only in a very limited capacity. These data support allowing manual deactivation (with appropriate multi-step procedures to avoid inadvertent or easy deactivation) would accommodate the special situations described above without reducing the overall benefits of AEB.

D. The Provisions Requiring Suppression of In-vehicle Audio Do Not Provide Objective Requirements or Test Procedures.

S5.1.1(a)(4) requires that an "in-vehicle audio that is not related to a safety purpose or safety system (i.e. entertainment and other audio content not related to or essential for safe performance of the driving task) must be muted or reduced in volume to within 5 dB of the masked threshold during presentation of the FCW auditory signal."

A similar requirement appears in S5.2.1.

The proposed rule did not contain any proposed regulatory text for this requirement. Instead, the proposal noted that, "[b]ecause sound levels inside a vehicle can vary based on any number of different factors, such as vehicle speed and pavement condition, NHTSA is not proposing a specific sound level at this time."[40] However, in the Final Rule, NHTSA characterized the omission of a specific proposal as "inadvertent."[41] In any event, Final Rule is lacking any objective test requirement or associated procedure for this requirement.

[40] 88 Fed. Reg. at 38657
[41] 89 Fed. Reg. at 39718

The Final Rule requires suppression of in-vehicle sound "to within 5dB of the masked threshold," which is defined vaguely as "the quietest level of a signal that can be perceived in the presence of noise. There is no further explanation of what "quietest level" means, or how the perception is to be measured. Does it refer to a person with normal hearing? A person with impaired hearing? And how much "noise" is present when the "quietest level" is determined? At what speed is the vehicle travelling? What level of engine, tire/road, or wind noise should be accounted for? For this requirement to be objective, NHTSA must clearly define several key characteristics, including the test conditions under which both the ambient noise and the masked threshold are measured as well as the methodology to measure and compute the sound level of the FCW warning and the noise separation amount (i.e. 5 dB). The masked threshold largely depends on the ambient noise at a given moment in time. The lack of specified conditions raises many questions on how such complex tonal analyses will be assessed, similar to those unresolved issues that still remain open with FMVSS No. 141.

The regulatory text requires suppression of the in-vehicle audio that is "not related to a safety purpose or a safety system," but these terms are not defined or even explained except with a parenthetical reference to entertainment. Modern motor vehicles generate audio sounds for the benefit of drivers and passengers that go beyond mere entertainment. For example, vehicles are often equipped with navigation systems that can provide audio route guidance to a driver, thereby avoiding the need for the driver to take eyes off the road to consult a map. While this seems like information that is "related to a safety purpose," it is not obvious that audio map guidance is permitted to remain at full volume under the Final Rule. Likewise, in-vehicle audio systems are one element of the "comprehensive system" for FEMA's Integrated Public Alert and Warning System (IPAWS) established by Executive Order 13407 to ensure that the public has

access to critical alerts about weather and other emergencies. Auto manufacturers have no ability to design audio suppression systems that can distinguish between a radio broadcast of a talk show host versus a radio broadcast of an emergency weather alert. Both would have to be suppressed under NHTSA's Rule, because content discrimination to allow continued broadcast of the emergency information (but not talk host interviews) is not feasible.

Other sources of sound in a vehicle include the HVAC system, noise from defrosting, seat belt reminder alarms, intelligent speeding assist indicators, road departure alerts and other sounds that are now routinely present in a motor vehicle. The lack of an objective definition of the suppression requirement means that manufacturers do not know whether any, or all, of these sounds would have to be suppressed under the Final Rule.

Moreover, the requirement for suppression applies "during presentation of the FCW auditory signal." There is no definition of "presentation," and no common understanding of what this term means. When must the FCW "present"? Must the suppression of the unnecessary in-vehicle audio occur immediately upon FCW presentation? Or within a specified period of time? The NCAP procedures, the IIHS procedures and the European standards all specify a value related to TTC for when the FCW must "present," but this Final Rule contains no such requirements.

These requirements are lacking in the statutorily required objectivity. And, there is no test procedure established for evaluating compliance with either of these requirements, which also means that they fail to meet the statutory requirement for objectivity.

Finally, Auto Innovators expects that there will be widespread customer dissatisfaction with the suppression of their audio systems every time the FCW is required to manifest. Audio suppression is not a safety countermeasure that consumers will find familiar, and it will be

difficult to explain in simple terms. Consumers are more likely to assume that their audio systems are not working correctly, and seek repairs to prevent the suppression from occurring. Since authorized repair facilities will not be permitted to disable the audio suppression feature, consumers may look for alternative ways to retain their audio. At a minimum, NHTSA needs to consider the likelihood that consumers will seek to disable the audio suppression feature. As noted by the Court of Appeals, "[we believe that the agency cannot fulfill its statutory responsibility unless it considers popular reaction. Without public cooperation there can be no assurance that a safety system can 'meet the need for motor vehicle safety.' And it would be difficult to term 'practicable' a system … that so annoyed motorists that they deactivated it." *Pacific Legal Foundation v. DOT*, 593 F. 2d. 1338, 1345-1346 (D.C. Cir. 1979).

E. The Cost-Benefit Analysis Fails to Consider All Relevant Costs or Analyze Likely Disbenefits of the Final Rule.

NHTSA assumed that new vehicles can meet the requirements of the Final Rule "primarily through upgraded software, with a limited number of vehicles needing additional hardware."[42] NHTSA assumed that only five percent of new vehicles would need any new hardware, and even then, they would need only "a second sensor."[43] These conclusions, which are not based on the record of this rulemaking or on the facts in the market, led NHTSA to underestimate substantially the costs of compliance with the new standard.

With respect to new hardware that may be needed, Auto Innovators provided information to NHTSA earlier this year drawn from a survey of its members, stating that the additional costs to make current systems compliant range from $200/vehicle on the low end to $4,200/vehicle on

[42] 89 Fed. Reg. at 39689
[43] 89 Fed. Reg. at 39689

the high end, a range which is far higher than NHTSA's estimates. Auto Innovators pointed out that existing vehicle architectures may not be capable of handling the additional communications bandwidth needed for the additional sensors, or the additional computing processing power needed to support the AEB/PAEB systems, without additional hardware.

Two specific examples illustrate the shortcomings of NHTSA's analysis:

- NHTSA's Final Rule cannot reasonably be met by existing vacuum brake systems that are prevalent in mid-price and lower-price vehicles; yet, NHTSA did not account for the higher costs of electric brake systems for these vehicles.
- The requirements to detect the pedestrian mannequin under conditions of darkness may require a combination of different sensors, including infrared cameras or Lidar systems that are not widely installed on current vehicles or new headlamps to improve the lighting conditions; yet, NHTSA did not account for this hardware or the potential need for additional redundancy when classifying pedestrians, particularly at higher speeds.

A supplier of AEB systems, Robert Bosch LLC, provided comments to NHTSA after the Final Rule was published, taking issue with NHTSA's conclusions about hardware needed for compliance.[44] As the Bosch letter points out, hardware updates may be needed for more advanced sensors, increased computing power and/or improved brake systems. None of these issues was adequately addressed by NHTSA in the Final Rule or the FRIA.

And, as discussed in detail in Section II.A.3 above, the performance requirements of the Final Rule will result in an increase in rear-end collisions caused by vehicles following the vehicles equipped with rule-compliant AEB systems when those rule-compliant AEB systems

[44] Letter to Deputy Administrator Shulman dated May 17, 2024.

apply the brakes more rapidly than the following vehicle drivers can react. NHTSA dismissed this issue without analysis, stating only that most new vehicles have AEB systems.[45] NHTSA also dismissed the likelihood of "false positives" with the observation that "[w]e maintain the assumption that there will be no additional negative safety impacts associated with false positive PAEB activations. Removing that assumption would reduce the magnitude of the safety benefits."[46]

But as NHTSA notes frequently throughout this rulemaking, the existing AEB systems were not designed to be compliant with the stringent requirements of the Final Rule. Systems fulfilling the requirements of the Final Rule will need to trigger AEB interventions in certain situations earlier than comparable systems of today in order to achieve full avoidance at higher relative speeds. Even with idealized sensors, ever earlier system reactions imply making assumptions about the future of the situation for a longer period of time, which is in itself more uncertain. Moreover, this conclusion overlooks the transition time needed before most vehicles on the road have AEB at all, much less rule-compliant AEB systems. In the interim, the Final Rule is going to result in an increased number of rear-end collisions compared with the baseline before the Final Rule takes effect. The "practicability" requirement of Vehicle Safety Act commands that NHTSA acknowledge this disbenefit, quantify it and consider its effect on public acceptability of this Final Rule, at least for the fifteen years or so before the majority of the fleet will have rule-compliant AEB systems.

III. Conclusion.

[45] FRIA at pages 251-252
[46] FRIA at page 285

Auto Innovators reiterates its support for a well-justified AEB standard that can improve public safety in a practicable manner. Auto Innovators submits that the revisions sought by its petition would achieve this goal and allow NHTSA and industry to move forward constructively to implement an effective, reasonable mandate for AEB and PAEB.