The Vehicle Suppliers Association

Comments of

MEMA, The Vehicle Suppliers Association

to the

National Highway Traffic Safety Administration

on the

Automatic Emergency Braking Systems for Heavy Vehicles, Notice of proposed rulemaking

September 5, 2023

Docket#: NHTSA-2023-0023

Introduction

MEMA, The Vehicle Suppliers Association, is the leading trade association in North America for vehicle suppliers, parts manufacturers, and remanufacturers. It has been the voice of the vehicle supplier industry since 1904.

Automotive and commercial vehicle suppliers are the largest employer of manufacturing jobs in the United States employing over 900,000 people throughout the country. Direct, indirect, and induced vehicle supplier employment accounts for over 4.8 million U.S. jobs and contributes 2.5 percent to U.S. GDP.

Suppliers lead the way in new vehicle innovations. Member companies conceive, design, and manufacture the OE systems and technologies that make up two-thirds of the value of every new vehicle and supply the automotive aftermarket with the parts that keep millions of vehicles on the road, fueling international commerce and meeting society's transportation needs. MEMA members are committed to safety and sustainability.

Executive Summary

MEMA supports incorporating advanced technology for electronic stability control (ESC) and automatic emergency braking (AEB) in heavy-duty (HD) vehicles in order to improve the safety of our roadways. Our members develop, manufacture, and supply significant amounts of this technology and these comments focus on essential improvements and challenges that need to be incorporated and addressed by NHTSA to ensure the best outcome possible. MEMA would welcome the opportunity to provide further technical assistance to the agency.

Several aspects of the proposed rule must be improved in order for the final rule to be technologically feasible and cost effective. These include:

1. The final rule must provide regulatory certainty to industry in the form of clear, concise performance and testing requirements that are technologically feasible and which are given sufficient time to develop, test and implement.

2. NHTSA and FMCSA must embrace collision mitigation, versus collision avoidance, as the primary function and benefit of AEB and align the regulatory expectations of this rule with that mindset.
3. NHTSA and FMCSA should finalize and implement AEB requirements for class 7 and 8 trucks first through this rulemaking, and continue to research, examine and test AEB technology in classes 3- 6 for a follow-on rulemaking. AEB in class 3-6 vehicles is not as technologically mature, and, in some cases, the necessary supporting technology for braking and electronic stability control, for example, needs further improvement and development before AEB can realistically be mandated for many, but not all, vehicles in these classes.
4. Certification testing requirements should be minimized and streamlined to reduce time and resource burdens on test tracks and manufacturers. Any potential redundancy in performance test requirements should be avoided.
5. The final rule must clearly identify instances in which AEB might be purposefully disabled or not required at all for a given situation and vehicle, along with the process by which disabling is conducted and the duration of this condition (e.g., temporary or permanent).

Collision Avoidance versus Collision Mitigation

Collision avoidance and collision mitigation are very distinct requirements. Even with a fully operational AEB system, the driver of the vehicle is still ultimately responsible for the safe operation of the vehicle. Likewise, passive safety systems such as airbags, restraints, and other technology are also part of the overall safety ecosystem. The drivers of the vehicles in scope of this regulation, in most cases, are trained and certified professionals, and thus are an important part of the collision mitigation strategy of their vehicle.

NHTSA must also consider these other factors in this rulemaking and not focus solely on one technology, e.g. AEB. AEB is a tool to help reduce severity of collisions and enhance crash mitigation. Complete crash *avoidance* for all speeds and scenarios is not a realistic expectation of AEB. As noted in more detail below, total avoidance is also inconsistent with well-established European Union motor vehicle safety standards and U.S. region test procedures from entities like the SAE. Departure from these well-established methods and standards will cause confusion, increase burden, and loss of economies of scale by creating more U.S.-only requirements than necessary. This in turn will make the transition to AEB more expensive for fleets and may lead to slower adoption with the retention of existing vehicles on the road.

Collision Avoidance Responsibility Lies with the Driver

In proposing total avoidance of contact as the only acceptable outcome of a successful test, NHTSA fails to recognize the responsibilities of the motor vehicle operator. Advanced Driver Assistance Systems (ADAS) such as AEB and ESC, along with airbags, seat belts, and other active and passive systems, all work together to inform and assist the driver in safe piloting and operation of the heavy-duty vehicle. AEB is in no way a substitute for a qualified,

alert, capable driver. FMCSA regulations are very clear as to driver training and certification requirements, and the long list of requirements serves to evidence drivers' responsibilities for safety. NHTSA must recognize the suite of active and passive systems, managed by the driver (and vehicle mechanics) which serve to increase and improve safe motor vehicle operation. AEB can only attempt to prevent collisions in a vehicle ultimately controlled by a human operator.

Detailed Response to NHTSA/FMCSA Proposals and Assumptions

NHTSA Decision to Require AEB for all Medium-Duty and Heavy-Duty Classes

NHTSA notes that it may decide to issue final rules adopting the AEB requirements for light and heavy vehicles in a way that incorporates the AEB requirements into a single Federal motor vehicle safety standard for all vehicle classes.

MEMA Comment: As noted in our introduction and summary, NHTSA should focus on and finalize AEB requirements for class 7 and 8 trucks first and continue needed research and development on class 3-6 trucks for a future rulemaking. Additionally, the agency should develop separate FMVSS' for light-, medium- and heavy-duty vehicles due to the differences in vehicle size and weight and application. Also important is the consideration of applications or vocations for medium- and heavy-duty single unit chassis' which may require different setups that could impact both the performance of ESC and collision mitigation systems (CMS) on the vehicle. Appropriate time must be given to develop stability control and collision mitigation technologies for application types that currently do not have these technologies available. While AEB is deployed on many class 7 and 8 vehicles today, it is less common in classes 3-6 single-unit trucks for a variety of reasons, including those noted above. NHTSA therefore should not combine all classes into a single FMVSS and single requirement.

The finalization of AEB regulations for class 7 and 8 trucks first is consistent with the intent of Congress in the Infrastructure Investment and Jobs Act (IIJA). MEMA can confidently say this because MEMA staff and members assisted with the creation and finalization of the wording of those requirements. The IIJA intended for AEB in class 7 and 8 vehicles to precede AEB in other medium- and heavy-duty trucks, following more research and study.

Section 23101 of the Infrastructure Investment and Jobs Act obliges NHTSA and FMCSA to conduct this rulemaking for class 7 and 8 vehicles and to conduct

research on limitations of the technology and accommodate AEB in other classes.[1] MEMA strongly advocated for this delineation and it remains necessary today.
MEMA perceives the lack of AEB technology maturation in certain vehicle classes as a deficiency the Secretary should address, and that it is practicable to address. The best way to address this is by separating vehicles by class and type, as intended by Congress, and addressing each in turn in a manner consistent and appropriate for each subset's particular concerns, not by lumping them all together.

Furthermore, it is our assessment that sufficient research into system performance, limitations, malfunctions, and other issues, has not yet been made, and that this rulemaking is not a substitute for this research and consultation. For example, many class 3-6 vehicles have hydraulic braking systems which may need significant upgrade or replacement to effectively employ ESC with AEB. Similarly, specialized complex vehicles such as heavy-duty trucks with more than four axles, articulated buses, and tiller fire trucks also need separate consideration.

Additionally, it is an oversimplification to assume that class 7 and 8 AEB systems which pair with pneumatic braking can be readily adapted to other classes with hydraulic braking within the short implementation period proposed for this rule. Consideration of braking system types and their suitability for AEB systems should be part of the aforementioned class and type breakdowns and studies.

NHTSA and FMCSA seek comment on whether and how this proposal may disproportionately impact small businesses and how NHTSA and FMCSA could revise this proposal to minimize any disproportionate impact.

MEMA Comment: Test and certification requirements could create burdens for small multi-stage truck manufacturing businesses. One way to mitigate these could be to require chassis suppliers to test and certify vehicles before they are

[1] Clause (b)(2) of Section 23010 states:
(b)
(2) Considerations.--Prior to prescribing the motor vehicle safety standard under paragraph (1)(A), the Secretary shall--
(A) conduct a review of automatic emergency braking systems in use in applicable commercial motor vehicles and address any identified deficiencies with respect to those automatic emergency braking systems in the rulemaking proceeding to prescribe the standard, if practicable; and
(B) consult with representatives of commercial motor vehicle drivers regarding the experiences of drivers with automatic emergency braking systems in use in applicable commercial motor vehicles, including any malfunctions or unwarranted activations of those automatic emergency braking systems.

finished. A set of criteria would need to be created to verify the finished vehicle has not been altered to the point that ESC and AEB no longer function correctly. For instance, if the final vehicle alteration involves a front-end device (such as a plow) that will cause the collision mitigation system to be inoperable, then the alterer may deactivate the system using diagnostic software. This could cause a signal to be engaged to indicate to the driver and to inspectors that the system has been deactivated.

There are two potential unintended consequences that cannot be quantified: the impact of false activations on safety and the potential impact of sensor degradation over time on AEB performance…We seek comments on these two issues and ask for any data that can help us to quantify these impacts.

MEMA Comment: False activations, while an irritation to the driver, should not be considered a deterrent to implementing this regulation. It is extremely rare that a system would have a false braking event that would bring the vehicle to a complete stop and create a road hazard.

Furthermore, stability control helps to alleviate potential loss of control situations due to automatic brake applications on wet, snow or ice-covered roads.

NHTSA requests comments on how this proposal may impact multi-stage manufacturers and alterers.

MEMA Comment: Vehicles should have AEB engaged by default by the manufacturer. If a special application were to require something that would impact performance of the systems ESC/CMS, then the alterer should be able to turn off the AEB system via diagnostic software.

FMCSA proposes that vehicles currently subject to FMVSS No. 136 would be required to comply with FMCSA's proposed ESC regulation on the final rule's effective date.

MEMA Comment: We disagree. Not all vehicles subject to FMVSS 136 may be currently being built with CMS. Therefore, having time to develop, test and validate a system for these vehicles will take time.

The NPRM also proposes new Federal Motor Carrier Safety Regulations requiring the electronic stability control and AEB systems to be on during vehicle operation.

MEMA Comment: As stability control is a foundation for collision mitigation technology, we agree that if AEB is required, then stability control needs to be required.

This proposal would amend FMVSS No. 136 to require all heavy vehicles to have an ESC system that meets the equipment requirements, the general system operational capability requirements, and malfunction detection requirements of FMVSS No. 136.

MEMA Comment: The incremental hardware needed to extend ESC according to FMVSS136 should not be significant in many cases. However, ESC hardware alone may not be enough to meet the pressure build demands of AEB, depending upon the performance targets. Thus, the software and hardware challenges are not trivial. Additionally, the needs may vary by vehicle type and class. Cases that alter a vehicle's center of gravity, wheelbase, or other aspects may cause the system installed on the vehicle to fall out of specification. In these cases, modification and retesting may be needed to ensure proper performance. The final rule must be clear on when ESC and AEB must be reexamined or recertified for a vehicle chassis that is modified by a customizer or owner.

Additionally, the implementation of light-duty ESC and AEB requirements into heavy vehicle classes will require ESC regulations to be adapted to the unique challenges of the heavy vehicle market, including the much larger brake volumes, higher inertial effects, and diversity of build configurations. Thus, it may be necessary to develop new or modified performance procedures for the class 3-6 truck market. We do not intend our comment to be taken as a reason to delay implementation of AEB in heavy vehicles, only that each class or application may need to address its own considerations for performance and feasibility, and there should not be one single requirement for all unless it is very broad. This is another reason to ensure maximum alignment with existing (European) regulations.

Specifically with regards to the test requirements of FMVSS 136 for the J-turn maneuver, we are concerned that the test will not reliably represent real-world driving conditions for class 6-7 vehicles with hydraulic ESC systems. In some cases, calibration of ESC to enable certification to the J-turn maneuver at full gross vehicle weight loading could result in performance compromises in lightly loaded conditions.

NHTSA is advised to investigate the lightly loaded drivability of vehicles to which NHTSA would propose to extend the J-turn maneuver to, especially within

vehicle classes 6-7 with hydraulic ESC. Pursuant to our comment above about separating vehicles by class and vocation, when NHTSA studies class 6 and 7 we propose the J-turn maneuver receive special consideration for this subset.

[The final rule] would not, as proposed, require vehicles not currently required to have ESC systems to meet any test track performance requirements for ESC systems, though the agency does request comment on whether to include a performance test and, if so, what that test should be.

MEMA Comment: System suppliers should be able to validate stability performance for specific applications based on their testing methodologies. A specific requirement should not be necessary.

This NPRM proposes that all heavy vehicles be subject to the same performance requirements such that the entire heavy vehicle fleet benefits from improvements in AEB technology.

MEMA Comment: As we note in the preceding comments, it is an oversimplification to apply standards universally across weight classes. Consideration of different requirements for different classes is needed, especially due to the basic physics of stopping distance versus vehicle weight. Lighter vehicles may have more of an opportunity to avoid a crash, given a certain level of technology versus heavier vehicles which may provide a speed reduction that mitigates, but does not avoid, the crash.

FMCSA seeks comment on other types of operations for which an exemption from the AEB or ESC requirements may be appropriate.

MEMA Comment: Any application that would inhibit the system from being able to perform its primary function to mitigate the rear-end collision may warrant an exemption from AEB or ESC, or temporary disabling, (e.g., snowplows).

[This] NPRM proposes to require both AEB and ESC for the class 3 through 8 vehicles not currently subject to FMVSS No. 136.

MEMA Comment: We agree with the intent of this proposal, with the understanding that NHTSA will incorporate our previous comments regarding tailoring requirements to each class or application.

NHTSA also seeks comment on whether manufacturers of these vehicles should have the option to certify to FMVSS No. 126 or FMVSS No. 136, whether a new ESC

test procedure should be developed for some or all of these vehicles, or whether NHTSA should give the manufacturer the option to choose the ESC standard to which to certify.

MEMA Comment: The option to certify some vehicles to FMVSS 126 could be useful, however it is not without concern.

First, we note that our position is that NHTSA complete this current rulemaking and set AEB requirements only for class 7 and 8 trucks. Furthermore, the class 3-6 vehicle market, the sine with dwell test may not be practicable for all vehicles within these classes, especially in the heaviest weight classes.
There are market examples of vehicle platforms which have a portion of their variants (class 2b vehicles) compliant with FMVSS 126 while another portion exceeding 4.5-ton GVWR are not required to comply.

- Within these vehicle platforms, ESC is frequently offered in the class 2b-5 vehicles.
- Based on member experience, some of the heavier vehicle variants may struggle with the sine with dwell procedure, while others might be capable of passing.
- Larger system brake volume increases the challenges to meet the sine with dwell performance targets due to longer response time to reach the required stabilizing brake torque.
- Within the class range 4-5, configurations such as a chassis cab may be finished by a low volume third party upfitter. The diversity of vehicle configurations (i.e., mass, wheelbase, center of gravity, etc.) would be very challenging to certify.
- The number of unique configurations may drive higher costs due to development time and resources.
- Certification may need to be done with an envelope approach, looking at the worst case of the possible variants. Responsibility would be placed on the final vehicle manufacturer that the vehicle's build out was within the permitted variation envelope.
- Simulation tools may be useful to enable the extension of certification to a broader variety of build configurations.
- For class 6 and above, sine with dwell may not be an applicable test scenario. Due to the inertia of vehicles within this weight class, there are limitations to the rate at which the vehicle will respond to a sudden steering request. Additionally, there will be limitations to the capability of ESC to build brake torque sufficiently and quickly enough to counteract the vehicle yaw given the inertia of the vehicle. As such, the typical driver of these vehicles may strongly favor braking interventions to steering interventions

when faced with an emergency lane change scenario. As such, the J-turn maneuver more closely resembles a real-world use case for these vehicles for which ESC provides benefits for vehicle safety.

- We further suggest NHTSA consider the limits of capability of the steering robot which is used to conduct the sine with dwell maneuver to verify if the current robots are capable of making the required steering responses quickly enough to follow the target steering profiles for heavier vehicles.
- Because significant study may be required to modify FMVSS 126 and 136 for heavier vehicle classes with regards to the J-turn maneuver, NHTSA should consider making it voluntary for heavier vehicles until studies are concluded.

NHTSA requests comment on this tentative conclusion that ESC is necessary to ensure safe AEB operation or whether ESC systems are necessary prerequisites for AEB systems for any other reason.

MEMA Comment: ESC is a prerequisite for AEB because the collision mitigation technology typically uses the stability control system as part of the braking strategy. ESC also helps drivers avoid the crash by helping maintain stability during an evasive maneuver on various surfaces.

NHTSA further requests comments on specific safety scenarios where ESC systems would be necessary for safe operation of an AEB system.

MEMA Comment: The automatic application of the brakes on a slick surface could result in loss of control. Including stability control with collision mitigation braking could help alleviate driver concern for loss of control. It is important to note that training will also help drivers better understand what to expect in different conditions. In setting the requirements of this regulation, the agencies should bear in mind the importance of the driver and associated certifications and training drivers are required to possess. These qualifications exceed those of light vehicle drivers in most cases.

Although this NPRM does not propose requiring pedestrian AEB, NHTSA believes the [collision] warning should not be directed specifically at lead vehicle AEB.

MEMA Comment: Pedestrian detection and mitigation may be best left for future updates to the regulation as not all current systems offer this feature, and where offered, most offer only low speed mitigation.

Response on Deactivation Capabilities

The proposed regulatory text does not permit vehicle manufacturers to install a manual deactivation switch that would enable the vehicle operator to switch off the AEB.

> MEMA Comment: We agree that a manual deactivation switch should not be permitted. Manual deactivation would negate the benefits of the system. As noted, a software solution with a temporary or permanent shutdown for specialty modifications is warranted. This solution should be reserved for specific vehicle classes, (e.g., dump trucks that can be converted to snowplows), to avoid using this approach to turn off systems simply for the sake of turning them off.

NHTSA seeks comments on the merits of and need for manual deactivations of AEB systems.

> MEMA Comment: As noted, in some cases, a manual activation is needed, but a switch should not be the approach. A software approach using diagnostic software or similar is a better alternative.

Alternatively, NHTSA is interested in comments on the approach of the standard's restricting the automatic deactivation of the AEB system generally but providing for special conditions in which the vehicle is permitted to automatically deactivate or otherwise restrict braking authority given to the AEB system.

> MEMA Comment: We agree, as noted previously, that there should be restrictions on disablement of AEB and it should be permitted in certain situations. Additionally, it must be clear to drivers, mechanics, and inspectors when the system is deactivated and the nature of the reason for deactivation (e.g., malfunction vs. voluntary).

The agency seeks comment on the appropriate performance requirements if the agency were to permit the installation of a manually operated deactivation switch.

> MEMA Comment: If the agency deems this approach viable, then the system should automatically return to functionality within a reasonable time frame. Currently in some systems, lane departure warnings can be turned off by a driver for 15 minutes or until the next ignition cycle. This enables the driver to reduce alerts in areas where lane lines are not clear (e.g., work zones). Excessive use of the switch can be tracked in software on the vehicle. Also, when the system is unavailable, this needs to be recorded in the vehicle data recorder should an incident occur.

The agency seeks comment on the specific challenges that would be faced by the manufacturers in certifying to the proposed AEB or ESC or in altering a vehicle certified to the proposed requirements, and on whether and how NHTSA could revise this proposal to minimize any disproportionate impact.

MEMA Comment: Ensuring a definitive testing protocol with specific, quantified targets will help reduce costs and ensure testing results will represent real world outcomes.

With respect to questions about modification of vehicles which impact AEB or willful disabling of AEB:

MEMA Comment: We propose the following considerations for disengaging an AEB system in a vocational application.

1) All highway tractors should be equipped with a functional system by the OEM.
2) All on-road vocational vehicles should be equipped with a functional system by the OEM.
3) An alterer can choose to turn the stability system off only if:
    a. The application changes the vehicle configuration in such a way that the stability system becomes inoperable.
4) An operator can choose to turn the collision mitigation system off only if:
    a. The stability system is not functional based on the changes required to meet the specification of the application.
    b. The application requires a permanently placed obstruction (e.g., a snowplow) that would inhibit the performance of the collision mitigation sensors.
    c. Systems could only be shut down via software; no switch.
    d. If the application requires a temporary blocking of the system, such as a snowplow which is removed in summer, then the fleet will take responsibility for turning the system on or off.
    e. In order to ensure compliance, a telltale will be used to indicate functionality of the system
        i. Green – system is operational
        ii. Yellow – system has a diagnostic fault
        iii. Red – system has been manually shut off

f. Roadside inspection will include the observation by the officer that if the system is shut off, there is something blocking the system.
g. As part of the diagnostic software, the system will require a signoff by the vehicle owner that the system has been turned off and why the vehicle is out of compliance with the regulation.

Proposed Effective Date Schedule

NHTSA proposes a two-tiered phase-in schedule for meeting the proposed standard. For vehicles currently subject to FMVSS No. 136, "Electronic stability control systems for heavy vehicles," any vehicle manufactured on or after the first September 1 that is three years after the date of publication of the final rule would be required to meet the proposed heavy vehicle AEB standard. For vehicles with a gross vehicle weight rating greater than 4,536 kilograms (10,000 pounds) not currently subject to FMVSS No. 136, any vehicle manufactured on or after the first September 1 that is four years after the date of publication of the final rule would be required to meet the proposed AEB requirements and the proposed amendments to the ESC requirements. Small-volume manufacturers, final-stage 3 manufacturers, and alterers would be provided an additional year to comply with this proposal beyond the dates identified above.

MEMA Comment: We support the NHTSA approach to implementing the regulation timeline, for FMVSS 136 compliant vehicles (tractors and motorcoaches) manufactured on or after September 1st, three years after final rule publication meet the requirements of the rule, we agree with this proposal.

We disagree with the proposal to mandate AEB on what today are non-FMVSS 136 vehicles (e.g., single unit trucks, school buses, etc.) manufactured on or after September 1st four years after the final rule publication. These should *not* be required to meet the proposed requirements of the rule or added to FMVSS 136 prior to finalization of this rulemaking.

Requirements for developing, testing, and validating ESC and CMS on chassis that currently do not have ESC are very resource intensive and would be overly burdensome on OEMs, suppliers, and alterers. More time for study and development of AEB in class 3-6 is consistent with the intent of Congress in the IIJA. Our position does not mean to imply or require that there will not be trucks that meet the regulation in this category earlier, but given the many vehicle types and the complexity of developing two systems to meet the requirement, a longer time frame is more realistic. Additionally, small volume manufacturers, final stage manufacturers, and alterers may need more time to conform.

MEMA supports the NHTSA approach, with modifications as noted, over the FMCSA approach.

Response on Forward Collision Warning

NHTSA is proposing that the forward collision warning be auditory and visual with limited specifications for each of the warning modalities. NHTSA has tentatively concluded that no further specification of the warning is necessary.

MEMA Comment: We perceive value in a standardized disable and warning human machine interface (HMI). Currently, OEMs provide different alerts which can vary in effectiveness. A single HMI across all platforms could help ensure more effective alerting and reduce confusion for drivers that drive multiple OEM vehicles in their fleet or business. Also, the signal can alert the driver to a system malfunction and inspectors to a system off (when it should be on) state.

For this NPRM, NHTSA proposes that the FCW be presented to the vehicle operator via at least two sensory modalities, auditory and visual.

MEMA Comment: We perceive added value in a haptic alert, especially for drivers with hearing issues and for team driver situations, in particular. Haptic alerts can be located in seats, pedals, restraints (seat belts), steering wheels, or other driver-contact points. For example, coupling a seat belt haptic alert with a belt tensioning device could improve both driver awareness and safety in the event of unexpected contact or deceleration.

NHTSA is not proposing a specific sound level at this time, but requests comments on suitable and reasonable approaches for ensuring that the FCW auditory signal can be detected by drivers under typical driving conditions.

MEMA Comment: The agencies should be considerate of team drivers and the impact of loud alerts on the resting driver. This is a situation where a haptic alert may be a better alternative.

NHTSA invites comments on the feasibility of specifying a common FCW auditory signal.

MEMA Comment: As noted, there should be a single HMI across all vehicles.

NHTSA requests comments on any available objective research data that relates to the effectiveness of word-based FCW visual signals in instrument panel versus head-up display locations, whether permitting word-based warnings that are customizable in terms of language settings is necessary to ensure warning comprehension by all drivers and location of the haptic signal.

MEMA Comment: The use of a universal graphic would eliminate the need for a word-based approach and address driver language differences. We perceive value in haptic alerts and urge the agencies to consider them, especially in team driver situations and situations where a driver may have hearing issues.

Response to Questions for Multi-Stage Manufacturers and Alterers

Are certain multi-stage or altered vehicles manufactured or altered in a manner that makes it impracticable to comply with this proposed rule? If so, please explain which vehicles and why it is impracticable.

MEMA Comment: There are certain multi-stage or altered vehicles manufactured or altered in a manner that makes it impracticable to comply with this proposed rule. For example, in cases where anything is permanently affixed to the front end of the vehicle, (e.g., a plow), that would block the various components from delivering needed information to the system. This could result in AEB system compromise or false activations.

If an incomplete vehicle were equipped with sensors for AEB that could become obstructed by equipment added in later manufacturing steps, how should NHTSA apply an AEB requirement to that vehicle?

MEMA Comment: Offsetting radar is a feasible alternative to address concerns with winches and other PTO devices on the vehicle, in some cases. However, vehicles with attachments like snowplows which would block radar need to have a means of disabling the radar. Rather than allow a dash switch, which could more easily be used inappropriately, radar deactivation could be accomplished utilizing diagnostic software to shutdown radar for a period of time, e.g., one month increments for seasonal vehicle modifications.

Are there any requirements in this proposal that ought not to apply to multi-stage vehicles or altered vehicles? Are there proposed requirements that should be lowered in stringency to better enable pass-through certification? Please provide details on those requirements and provide associated rationale.

MEMA Comment: As with stability, any modifications that change the performance characteristics of the ESC system should not be allowed with a collision mitigation system. The second and third life of vehicles may require a change to a non-CMS state or recalibration or issues with ESC may occur. Alternatively, the agency can choose to limit the changes available to vehicles

in future states, e.g., a tractor cannot be turned into a single-unit chassis in the future.

Would intermediate manufacturers, final-stage manufacturers, and alterers have sufficient information to identify when an impermissible change has been made? Please explain why or why not.

MEMA Comment: Identification of system compromise would likely occur with the ESC system or the radar system via a diagnostic fault such as "blocked sensor" or a yellow telltale on the dash (in the future) if an impermissible change has been made. This is why the HMI telltales become more important in alerting drivers and technicians regarding the issue.

Assuming there would be cases where it may not be practical to comply with the proposed requirements, are the existing exemption processes detailed in 49 CFR 555, "Temporary exemption from motor vehicle safety and bumper standards," sufficient to accommodate unique vehicles, or should NHTSA explicitly consider applicability exclusions for certain multi-stage vehicles? If applicability exclusions are needed, please explain what they include and why the exclusion is needed. For example, should there be exclusions for vehicles with permanently installed work-performing equipment installed on the front of or extending past the front of the vehicle (e.g., auger trucks, bucket trucks, cable reel trucks, certain car carriers, etc.) or vehicles with a GVWR equal to or greater than 120,000 pounds (i.e., heavy haulers)?

MEMA Comment: Exemptions would be warranted in certain cases, for example, when frontal equipment mounting is permanent. However, in cases where equipment is temporarily mounted, such as snowplows, then a software solution with a timeout may be more appropriate. In the final rule, NHTSA and FMCSA should be as specific as possible in setting out the instances when AEB may be deactivated, why, and for how long.

Response on Retrofitting

NHTSA and FMCSA have jointly determined not to propose retrofitting requirements AEB for existing heavy vehicles and ESC for vehicles not currently subject to FMVSS No. 136. For technical reasons, AEB and ESC retrofits are difficult to apply broadly, generically, or inexpensively and thus this NPRM does not propose a retrofit requirement.

MEMA Comment: We agree that retrofitting should not be mandated. Retrofitting would require the installation of a stability control system, which is not often retrofittable due to the complicated nature of the technology, along with integration with other parts of the vehicle system. While it may be possible to retrofit lower levels of collision mitigation technology – those that do not require certain integration with the engine control system, this particular technology may or may not be adequate enough to meet the standards NHTSA has proposed.

Approaches NHTSA could take to identify portions of the on-road fleet to which a retrofit requirement could apply. For a retrofitting requirement, should the requirement distinguish among in-service vehicles based on the vehicles' date of manufacture? Is it reasonable to assume that older in-service vehicles would have greater challenges to meet a retrofit requirement? What should, for example, the original manufacture date be of vehicles that should be subject to a retrofit requirement?

MEMA Comment: A vehicle suitable for retrofit would need to have a certain level of network capability along with an ESC braking system. Such a requirement would likely limit applicability to highway tractors built within the last five years. Differences in manufacture would mean that not every recently made vehicle might be more readily retrofittable. Per our above comments, and the agencies' proposal, retrofit of AEB should not be mandated.

Should there be provisions to ensure that the various components related to AEB performance (e.g., brakes and tires) are at an acceptable level of performance for a compliance test, given the uniqueness of the maintenance condition for vehicles in service, especially for items particularly subject to wear-and-tear (e.g., brake components and tires)?

MEMA Comment: To ensure that the targets for return on investment and benefit in the regulatory impact analyses for this proposal are met, it is important that proper brake, tire, and system maintenance is performed throughout the life of the vehicles covered by this rule. For example, brake system performance can be impacted by the condition of brakes, which, in turn can impact the performance of the collision mitigation system and stability control. Historically, the agencies have tended to leave the requirement for proper performance with the OEM; performance of the system can be degraded unintentionally using cheaper, less effective maintenance components. The agencies need to determine a means of ensuring that when repairs are made, they are made to ensure the OEM standards of

performance are met. This could mean using only materials certified by suppliers to meet the performance standards of the regulation. FMCSA should consider adding AEB system maintenance and operations checks to other routine inspections to help ensure proper, safe operation of these vehicles in the field.

Relatedly, would it be warranted to vary the performance requirements for retrofitted vehicles, so that the requirements would be less stringent for used vehicles? If yes, what would be appropriate level of stringency? If not, how can the requirements be adjusted for in-service vehicles?

MEMA Comment: Used vehicles should not have less stringent requirements than new vehicles. Retrofitted vehicles should also be required to meet the same standards of performance for new vehicles in scope of this rule. However, if a vehicle is altered from its original intent – such as a tractor becoming a single unit truck, then the ESC and AEB systems may not function properly and should be turned off or recalibrated. Additionally, vehicle modifications that might negate the use of collision mitigation technology should not be allowed for vehicles that will travel on roadways.

Response to Alternative Regulatory Proposals

The second alternative would require all class 3-6 heavy vehicles to have AEB and ESC within four years, as with the primary agency proposal. However, this alternative would include a one-year phase-in period beginning three years after publication of the final rule in which 50 percent of class 3-6 vehicles would be required to install AEB and ESC. … The agency seeks comment on the feasibility of the second alternative.

MEMA Comment: First we note that our position is that NHTSA complete this current rulemaking and set AEB requirements only for class 7 and 8 trucks. We note that consideration must be given to those vehicles within class 3-6 where collision mitigation will not function due to a front-end device needed for the application, e.g., snowplows. Also, there are other vehicles, for example, a front loading garbage trucks, where the application can be inhibited from performing while the vehicle executes its primary function, (e.g., lifting a container to dump), but could function in other instances, such as driving down the highway. In these cases, a switch to turn on/turn off the system may be applicable; however, the switch should be limited in terms of time system is off or be limited by speed or other factors to maximize safe system operation. The agencies must therefore consider the application of a vehicle to truly determine if collision mitigation technology will work some of the time or at all.

Response to AEB Test Procedures and Devices

NHTSA has included three test scenarios in this proposed rule for AEB when approaching a lead vehicle – a stopped lead vehicle, a slower moving lead vehicle, and a decelerating lead vehicle.

MEMA Comment: The proposed scenarios are relevant and represent the use cases our members consider in demonstration and testing of system capabilities. However, some fleets have indicated to us a need for performance on offset vehicles (e.g., rear-end, partially in lane) so the agencies should also consider testing to determine system capabilities to provide offset vehicle performance while minimizing interference with vehicles in other lanes.

NHTSA proposes to conduct this scenario both with no manual brake application and with manual brake application.

MEMA Comment: Manual brake application testing scenarios are unnecessary. Existing ESC and AEB systems are designed to ensure optimal braking occurs whether or not driver adds braking. The use of a braking robot or driver just for manual braking would add testing cost and time to system developers and to small businesses. While it is true that past systems may have limited the amount of automatic braking to less than 100%, in the experience of our members current, AEB systems make 100% of braking potential available to the system. As a result, a partial but insufficient braking action by the driver will be overridden automatically and without delay by modern AEB systems. As such, the manual brake application test is redundant and only adds test costs without corresponding benefit. Therefore, it should be eliminated from test requirements.

Testing without manual brake application would be conducted at any constant speed between 10 km/h and 80 km/h…However, with manual brake application, NHTSA proposes to test vehicles up to 100 km/h.

MEMA Comment: Per our preceding comment, the manual braking test is unnecessary and can be omitted.

The lower speed limit of 10 km/h is too low to be practicable. Fifteen km/h is the current standard within the market and has been widely accepted. At lower threshold speeds, AEB could be falsely triggered during vehicle parking and depot navigation. Reducing the lower limit of the AEB function range could lead

to wider driver annoyance and increased rates of disabling of or tampering with AEB.

[Stopped Lead Test] To satisfy the proposed performance requirement, the subject vehicle must provide an FCW and stop prior to colliding with the lead vehicle.

MEMA Comment: We disagree. The test scenario should also allow for other types of collision avoidance and mitigation, such as automatic emergency steering or manual driver steering. Braking, in and of itself, is a collision mitigation tool, though not specifically a collision prevention tool. As noted in our introduction and elsewhere in our comments, AEB is part of an overall safety system, which includes the driver.

[Slower Moving Lead Test] To satisfy the proposed performance test requirement, the subject vehicle must provide an FCW and slow to a speed equal to or below the lead vehicle's speed without colliding with the lead vehicle.

MEMA Comment: As noted above, the test scenario should also allow for other types of collision avoidance and mitigation, such as automatic emergency steering or manual driver steering.

[Decelerating Lead Test] To satisfy the proposed performance test requirement, the subject vehicle must provide an FCW and slow to a speed equal to or below the lead vehicle's speed without colliding with the lead vehicle.

MEMA Comment: We agree with this proposed requirement.

This NPRM proposes to require heavy vehicles to have AEB systems that enable the vehicle to completely avoid an imminent rear-end collision under a set of test scenarios.

MEMA Comment: This requirement is not realistic, especially for heavier weight vehicles in classes 7 and 8. As we note previously in these comments, the goal of this regulation should be collision mitigation.

Additionally, the agency is proposing that these requirements would not apply at speeds below 10 km/h.

MEMA Comment: Per our preceding comment, AEB requirements should not apply at speeds below 15 km/h.

NHTSA is proposing that AEB systems must be capable of activating across a wide spectrum of speeds. Additionally, the agency is proposing a brake pedal application that results in a mean deceleration of 0.3g, and that the brake will be applied 1.0 second after the vehicle has provided a FCW; this is based on the average time it takes a driver to react when presented with an obstacle.

> MEMA Comment: We agree, but caution that testing needs to focus on ranges of performance. The final rule should clearly specify test points and ranges so as to reduce potential confusion and improve understanding and compliance.
>
> The time between FCW and initiation of automatic emergency braking remains a matter of discussion. We recommend NHTSA perform continued outreach on this topic to gain the largest perspective possible before finalizing this requirement.

NHTSA is proposing to incorporate by reference ISO and ASTM standards into this proposed rule.

> MEMA Comment: We concur with the agency's proposal to incorporate these standards by reference and further encourage the agencies to align with European standards to the maximum extent possible. Further, it is important these references to the standards should not limit the performance capability or the improvement of those capabilities of the collision mitigation technology.

NHTSA is not proposing to use the performance requirements from the SAE tests because the agency believes they are not stringent enough to provide the level of safety benefit the agency seeks for this NPRM.

> MEMA Comment: We disagree in principle with the agency's dismissal of the SAE performance requirements on the grounds that alignment with existing programs and references is of great importance to maximize harmonization and reduce confusion and improve conformance. We also agree with the SAE approach that allows for more test runs with less than 100% avoidance, though we disagree with limitations on the number of runs allowed to be run. In the case of the SAE standards, this is 10 runs. Per our opening comments, collision mitigation should be the goal not total avoidance.
>
> Additional testing comment: NHTSA indicates that tractor testing is to be done using an FMVSS 121 compliant non-braked trailer. While we consider this to be less than ideal, and arguably not a likely real-world situation, we concede it is simple and straightforward for the purposes of certification testing.

Response to Proposed Environmental Conditions

The ambient temperature range specified in this proposal is 2 to 40 degrees Celsius; this is the same range as specified in FMVSS No. 136, which avoided testing at 0 degrees Celsius because it could impact tire performance and in turn the variability of test results.

MEMA Comment: We agree with the proposed ambient temperature range.

NHTSA is proposing that the test track surface have a peak friction coefficient of 1.02 when measured in accordance with ASTM International (ASTM) E1337165 using an ASTM F2493 standard reference test tire and without water delivery.

MEMA Comment: We note the potential for confusion stemming from the mention of both 0.90 and 1.02 as possible friction coefficient values in this and the related light-duty AEB rulemaking's documents. A review of several references provides the following clarifying comparison:

Description	Regulation	Test Procedure
FMVSS 105	1.02	0.9 pg. 19
FMVSS 121	1.02	0.9 pg. 6
FMVSS 126	1.02	0.9 pg. 19
FMVSS 135	1.02	0.9 pg. 19
FMVSS 136	1.02	0.9 pg. 16

It is apparent from this table that the test procedures all need to be updated to reflect new reference tire friction coefficients. We trust NHTSA is aware of this and will take appropriate action.

We further urge NHTSA to monitor research and development in tire formulations and consider review of the above listed FMVSS to align these references with any new innovations in tires and to consider changes to reference tire specifications through the public process as appropriate.

This proposal specifies up to two straight lines be marked on the test surface to simulate lane markings.

MEMA Comment: We agree with this proposal regarding test surface lines.

The agency also proposes that the brake temperatures be between 66 and 204 degrees Celsius prior to the beginning of a test, which is the same as specified in FMVSS No. 136.

MEMA Comment: We agree with these proposed brake temperatures.

NHTSA is proposing that the radar cross section of the vehicle test device fall within an "acceptability corridor" when measured using an automotive-grade radar sensor.

MEMA Comment: NHTSA's proposal does not specify that the VTD's radar cross section during in-the-field verifications be measured to objectively assess whether the radar cross section still falls within the acceptability corridor. MEMA recommends NHTSA use the same RCS corridor values for the rear and side of the vehicle test device that are included in ISO Standard 19206-3:2021.

In terms of the vehicle orientations tested, we recommend that NHTSA consider including rear view, side view, and angled rear view (e.g., 30 degrees). The angled rear view is especially useful for representing a vehicle making a right-hand turn, a maneuver that can be especially dangerous, considering that right-turn collisions at intersections with traffic signals account for 24 percent of roadway fatalities each year[2]. As NHTSA considers different target vehicle orientations for testing it should bear in mind the need to limit the number of test scenarios to contain cost and burden on manufacturers as well as potential limitations on availability of the limited number of domestic test tracks.

Response to Testing Performance Requirements

NHTSA is proposing that the minimum performance requirement is complete avoidance of the lead vehicle.

MEMA Comment: We disagree. ESC and AEB are collision *mitigation* tools and cannot be relied upon for total avoidance. Ultimately, safe operation of the vehicle is the responsibility of the driver. We remind the agencies that drivers of heavy-duty vehicles often must obtain special certifications, licensing, and training.

NHTSA also seeks comment on the potential consequences if vehicle contact were allowed during testing.

MEMA Comment: Depending on speed, contact could result in vehicle damage to the truck which may interfere with radar testing and negate further testing. Drivers should familiarize themselves with vehicle performance on a target vehicle before testing on real vehicles. We refer to our comments below on the use of a soft target.

NHTSA is concerned that any performance test requirement that allows for vehicle contact not resulting in immediate test failure could result in the non-repeatability of testing without expensive or time-consuming interruptions to testing, and seeks comment on this concern.

MEMA Comment: While we understand the potential for risk, additional testing time, and expense, we continue to disagree with the proposed requirement of total collision avoidance. This is impractical and inconsistent with other established global regulations.

Response on Vehicle Test Devices

In addition to the vehicle test device specifications, NHTSA seeks comment on specifying a set of real vehicles to be used as vehicle test devices in AEB testing.

The surrogate vehicle NHTSA currently uses in its research testing is the Global Vehicle Target (GVT). Although NHTSA has tentatively concluded that the specification in UN ECE Regulation No. 152 of any high-volume passenger sedan is not sufficiently specific for an FMVSS, NHTSA seeks comment on whether it should create a list of vehicles from which NHTSA could choose a lead vehicle for testing. NHTSA seeks comment on the utility and feasibility of test laboratories safely conducting AEB tests with real vehicles, such as through removing humans from test vehicles and automating scenario execution, and how laboratories would adjust testing costs to factor in the risk of damaged vehicles. NHTSA seeks comments on the merits and potential need for testing using real vehicles, in addition to using a vehicle test device, as well as challenges, limitations, and incremental costs of such.

MEMA Comment: Before setting a single vehicle surrogate for testing, we recommend NHTSA provide a statistically significant body of test data for public review regarding the performance of the GVT versus a real vehicle.

Response on False Activation Testing

NHTSA seeks comment on the anticipated impacts on safety and the certification burden if the agency were to finalize a rule that did not contain one or both of the proposed false positive tests.

MEMA Comment: The false positive tests are important for driver satisfaction and therefore we support the intent of NHTSA's proposal to include false positive tests, with the limitation that they note require a 100% pass rate. Systems today may provide false alerts and interventions, but this does not mean they are unsafe. False interventions are not typically the cause of crashes, though we acknowledge they can be a big driver dissatisfier.

The agency seeks public comment on all aspects of requiring that manufacturers document that they have followed process standards in the consideration of the real-world false activation performance of the AEB system.

MEMA Comment: NHTSA needs to be more specific with respect to the proposed test procedures that need to be followed. Currently, as noted in earlier comments, the procedure leaves a lot to interpretation; a more concise and specific standard is needed. Additionally, NHTSA should consider whether concerns about false activations might also be served by allowing manufacturers to provide documentation of their individual mitigation efforts and testing for their systems, rather than each manufacturer have to conduct overly specific and potentially costly false activation testing.

System Documentation

FMCSA's proposal would require the ESC and AEB systems to be inspected and maintained in accordance with 49 CFR part 396, Inspection, Repair, and Maintenance (§ 396.3).

MEMA Comment: Per above, we propose FMCSA add ESC/AEB to inspection and certification requirements in the field.

NHTSA believes that manufacturers that have installed AEB systems in their fleet may already be meeting many of the documentation requirements above. The agency seeks comment on the suitability of these requirements and on any changes that manufacturers would have to introduce in their internal processes and consumer-facing documentation (e.g., owner's manuals).

MEMA Comment: Owner's manuals are a critical reference, but training is also important in ensuring drivers understand how the system may react in different situations – including both low coefficient of friction surfaces and high coefficient of friction surfaces.

We propose FMCSA require that fleets provide drivers a minimum of three hours of training on the collision mitigation systems on their vehicles. This training should include:

- Classroom and on-the-road events with testing to ensure understanding of the AEB system capabilities, potential driver overrides and system impacts; repercussions for tampering with the system; data collected; and what the AEB system does not do to support driver.
- Review of driver tools and references, to include a review of the operator's manual, OEM training/supplier videos, Tech-Celerate information and other tools that the fleet deems necessary to ensure understanding of system capabilities.
- Information on collision mitigation technologies, along with stability control, included in the CDL standard test approach.

Additional Comment

The agencies' research into incorporation of heavy-duty passenger vehicles into FMVSS 136 (or 126) and the requirement that they possess AEB systems should include special consideration of those vehicles with unsecured passengers, (e.g., transit buses or school buses), and the potential for injury of unsecured passengers during an AEB event. While the potential for AEB-related injury should not preclude the deployment of AEB into these vehicles, the cost benefit research for personal injuries should include injuries resulting from unexpected falls or displacement of unsecured passengers in buses and similar vehicles.

Finalizing AEB for class 7 and 8 vehicles as MEMA proposes will also help mitigate demand on the limited number of test tracks. The number of test tracks available to manufacturers is finite, and depending on the requirements of the final rule some might not be able to conduct all required tests. NHTSA should also coordinate the timing and requirements of the light-duty and heavy-duty AEB rules to minimize associated scheduling and testing demands on test tracks to avoid unnecessary burdens and cost on implementation of both of these regulations.

Conclusion

MEMA supports the intent of the proposed rule for heavy-duty vehicle automatic emergency braking and the goals of NHTSA and FMCSA to improve safety on our roadways. The final rule for HD AEB must satisfy the intent of Congress and accommodate the many differences in vehicle type, performance, application, readiness to incorporate ESC and AEB by type and class. We stand ready to assist the agencies by answering any questions about these comments or technical questions about our products, systems, and their proper implementation. We hope the agencies will not hesitate to reach out to us if we may be of any assistance.