Automotive Safety Council
Prevent Protect Notify

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Room W12-140
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[**Docket No. NHTSA–2021–0002**]

RFC – NHTSA's New Car Assessment Program (NCAP)

Subject: RFC seeking public comment on upgrading the NHTSA New Car Assessment Program (NCAP)

The Automotive Safety Council (ASC) is an industry trade association of 45 of the world's leading suppliers of Autonomous, Crash Avoidance and Occupant Protection automotive safety systems to the automobile industry. The mission of the Automotive Safety Council is to improve the safety of people through-out the world through the development, production and implementation of the latest automotive safety equipment by preventing accidents, protecting occupants and pedestrians when in a collision and to notify emergency responders after the collision when necessary.

The ASC is providing comments to the recently published RFC, Docket No. NHTSA–2021–0002, on revising and upgrading the NCAP. The ASC appreciates the opportunity to comment on this topic

General Comments:

The Automotive Safety Council appreciates that NHTSA seeks to improve the NCAP. In addition to the comments requested in this response, we feel there are significant opportunities to update the NCAP with new technologies to improve occupant safety, prevent accidents and harmonize with EuroNCAP.

III. ADAS Performance Testing Program

A. Lane Departure Warning / Lane Keep Assist

In general, Automotive Safety Council (ASC) supports the proposed test procedure for LDW / LKS. We believe the proposed test parameters will allow NHTSA to quantify the benefits of Lane Departure Prevention (LDP) systems and are encouraged by NHTSA's approach to harmonize with the Euro NCAP "lane keep assist" evaluation criteria wherever possible. In response to NHTSA's specific questions, we offer the following comments and suggestions.

For both LDP systems, NHTSA specifies lane width of 12'-14'. It is recommended that NHTSA align with U.S. Lane width standards. AASHTO standards specify a lane width of 2.7 to 3.6 m (9 to 12 ft) depending on the type of road. The test procedures should align with U.S. Lane width standards and specify a 12 ft maximum lane width. This will also result in harmonizing with Euro NCAP standards which specify 3.5 to 3.7 m (11.5 to 12 ft).

With regards to LDW alert, NHTSA is highly encouraged to eliminate audible LDW alert/warning requirements. We believe this will improve consumer acceptance / satisfaction and system usage. As indicated in the RFC, 90% of UMTRI test participants opted for haptic vs. audible alerts, and when audible warning was the only option, it was turned off 71% of the time.
We concur with the statement in the RFC; "NHTSA believes an LDW system integrated with LKS may be a better approach for the Agency to consider rather than replacing LDW with LKS." ASC estimates electric power steering penetration in the US market at 85% in 2022 and 92% in 2027, so not all vehicles will be able to support LKS initially. Testing in accordance with Euro NCAP LSS protocol for the Agency's LKS test procedure is possible by turning off LKS for the LDW test, or testing LDW only, if that is the only system present on the SV. Successful tests for LDW/LKS systems should measure for the SV to not cross lane boundaries more than 0.3m.

NHTSA is also encouraged to incorporate Euro NCAP's road edge detection test to its NCAP program to begin addressing crashes where lane markings may not be present, as well as testing where only one lane boundary is present.
False positive testing, similar to BSI intervention false positive testing is not required as a specific false positive test, rather LKS system performance should be tested to assure that the test criteria applies both sides of the vehicle (the initial tested side, as well as the side not initially tested).

While testing at higher lateral velocities on straight roads can be correlated with improved performance on curved roads, it is recommended that NHTSA investigate future expanded testing on curved roads.

Lastly NHTSA should encourage the migration of LKS systems to Lane Centering (LCS) systems – systems that provides continuous assistance to the driver to keep their vehicle centered within the lane. Lane Centering systems can be evaluated with the same testing protocol, with the expectation that they should well exceed LKS performance. For LCS systems, it would be highly appropriate to include enhanced curved road testing.

NHTSA should always reference the latest MUTCD for lane stripping and road configurations.

Q1

> **Should the Agency award credit to vehicles equipped with LDW systems that provide a passing alert, regardless of the alert type? Why or why not? Are there any LDW alert modalities, such as visual-only warnings, that the Agency should not consider acceptable when determining whether a vehicle meets NCAP's performance test criteria? If so, why? Should the Agency consider only certain alert modalities (such as haptic warnings) because they are more effective at re-engaging the driver and/or have higher consumer acceptance? If so, which one(s) and why?**

Response: Unclear what a passing alert is – possibly some type of LDW / BSW combination. Recommendation would be to limit to LDW/LKS performance, and not award credit for this feature. Additionally, the recommendation is to eliminate audible LDW alert/warning. It is believed this will improve consumer satisfaction and system usage. As indicated in the RFC, UMTRI 90% opted for haptic vs. audible, and when audible warning was the only option, it was turned off 71% of the time.

Q2

If NHTSA were to adopt the lane keeping assist test methods from the Euro NCAP LSS protocol for the Agency's LKS test procedure, should the LDW test procedure be removed from its NCAP program entirely and an LDW requirement be integrated into the LKS test procedure instead? Why or why not? For systems that have both LDW and LKS capabilities, the Agency would simply turn off LKS to conduct the LDW test if both systems are to be assessed separately. What tolerances would be appropriate for each test, and why?

Response: LDW test procedure can be eliminated presuming the Agency adopt the testing procedure suggested where LKS is turned off to conduct LDW tests. Tests for vehicles with LDW only, would assess this stand-alone feature. The suggested system performance measure where a positive result occurs when the SV does not cross the inboard leading edge of the lane line by more than 0.3 m (1.0 ft.) is appropriate.

Q3

LKS system designs provide steering and/or braking to address lane departures (e.g., when a driver is distracted). To help re-engage a driver, should the Agency specify that an LDW alert must be provided when the LKS is activated? Why or why not?

Response: ASC concurs with the statement in the RFC "NHTSA believes an LDW system integrated with LKS may be a better approach for the Agency to consider rather than replacing LDW with LKS"

Q4

Do commenters agree that the Agency should remove the Botts' Dots test scenario from the current LDW test procedure since this lane marking type is being removed from use in California? If not, why?

Response: Yes, as stated, they are being removed from use in California consistent with MUTCD's proposal.

Q5

Is the Euro NCAP maximum excursion limit of 0.3 m (1.0 ft.) over the lane marking (as defined with respect to the inside edge of the lane line) for LKS technology acceptable, or should the limit be reduced to account for crashes occurring on roads with limited shoulder width? If the tolerance should be reduced, what tolerance would be appropriate and why? Should this tolerance be adopted for LDW in addition to LKS? Why or why not?

Response: 0.3m is acceptable.

Q6

In its LSS Protocol, Euro NCAP specifies use of a 1,200 m (3,937.0 ft.) curve and a series of increasing lateral offsets to establish the desired lateral velocity of the SV towards the lane line it must respond to.

Preliminary NHTSA tests have indicated that use of a 200 m (656.2 ft.) curve radius provides a clearer indication of when an LKS

intervention occurs when compared to the baseline tests performed without LKS, a process specified by the Euro NCAP LSS protocol. This is because the small curve radius allows the desired SV lateral velocity to be more quickly established; requires less initial lateral offset within the travel lane; and allows for a longer period of steady state lateral velocity to be realized before an LKS intervention occurs. Is use of a 200 m (656.2 ft.) curve radius, rather than 1,200 m (3,937.0 ft.), acceptable for inclusion in a NHTSA LKS test procedure? Why or why not?

Response: Seems reasonable – and maybe the test can be performed with less time / effort.

Q7

Euro NCAP's LSS protocol specifies a single line lane to evaluate system performance. However, since certain LKS systems may require two lane lines before they can be enabled, should the Agency use a single line or two lines lane in its test procedure? Why?

Response: For harmonization reasons, the existing Euro NCAP protocol should be used whenever possible. Single lines will provide incentive for system performance for road situations where only a single line is present.

Q8

Should NHTSA consider adding Euro NCAP's road edge detection test to its NCAP program to begin addressing crashes where lane markings may not be present? If not, why? If so, should the test be added for LDW, LKS, or both technologies?

Response: Yes. This will improve the safety benefit of LDW and LKS systems.

Q9

The LKS and "Road Edge" recovery tests defined in the Euro NCAP LSS protocol specify that a range of lateral velocities from 0.2 to 0.5 m/s (0.7 to 1.6 ft./s) be used to assess system performance, and that this range is representative of the lateral velocities associated with unintended lane departures (i.e., not an intended lane change). 209 However, in the same protocol, Euro NCAP also specifies a range of lateral velocities from 0.3 to 0.6 m/s (1.0 to 2.0 ft./s) be used to represent unintended lane departures during "Emergency Lane Keeping – Oncoming vehicle" and "Emergency Lane Keeping – Overtaking vehicle" tests. To encourage the most robust LKS system performance, should NHTSA consider a combination of the two Euro NCAP unintended departure ranges, lateral velocities from 0.2 to 0.6 m/s (0.7 to 2.0 ft./s), for inclusion in the Agency's LKS evaluation? Why or why not?

Response: Yes – lateral velocities from 0.2 to 0.6 m/s (0.7 to 1.6 ft./s) should be used for LKS to harmonize with Euro NCAP and its various scenarios. Compliance to higher lateral velocities should lead to more robust systems, improving safety and consumer acceptance.

Q10

As discussed above, the Agency is concerned about LKS performance on roads that are curved. As such, can the Agency correlate better LKS system performance at higher lateral velocities on straight roads with better curved road performance? Why or why not? Furthermore, can the Agency assume that a vehicle that does not exceed the maximum excursion limits at higher lateral velocities on straight roads

will have superior curved road performance compared to a vehicle that only meets the excursion limits at lower lateral velocities on straight roads? Why or why not? And lastly, can the Agency assume the steering intervention while the vehicle is negotiating a curve is sustained long enough for a driver to re-engage? If not, why?

Response: While it is possible that higher lateral velocities on straight roads would yield improve performance on curved roads, NHTSA is encouraged to develop actual curved road testing.

Q11

The Agency would like to be assured that when a vehicle is redirected after an LKS system intervenes to prevent a lane departure when tested on one side, if it approaches the lane marker on the side not tested, the LKS will again engage to prevent a secondary lane departure by not exceeding the same maximum excursion limit established for the first side. To prevent potential secondary lane departures, should the Agency consider modifying the Euro NCAP "lane keep assist" evaluation criteria to be consistent with language developed for NHTSA's BSI test procedure to prevent this issue? Why or why not? NHTSA's test procedure states the SV BSI intervention shall not cause the SV to travel 0.3 m (1 ft.) or more beyond the inboard edge of the lane line separating the SV travel lane from the lane adjacent and to the right of it within the validity period. To assess whether this occurs, a second lane line is required (only one line is specified in the Euro NCAP LSS protocol for LKS testing). Does the introduction of a second lane line have the potential to confound LKS testing? Why or why not?

Response: The introduction of a second lane line will not have any impact on the LKS performance. It is a reasonable expectation, and therefore valid test criteria for the steering correction to return the vehicle to its lane, and not cause a lane departure on the 'other' side of the vehicle. The same requirements of a successful LKS event can / should be applied, such that the POV should not cross lane markers by more than 0.3m.

Q12

Since most fatal road departure and opposite direction crashes occur at higher posted and known travel speeds, should the LKS test speed be increased, or does the current test speed adequately indicate performance at higher speeds, especially on straight roads? Why or why not?

Response: ASC considers that the current test speed of 45mph is sufficient to evaluate LKS performance on higher speed roads.

Q13

The Agency recognizes that the LKS test procedure currently contains many test conditions (i.e., line type and departure direction). Is it necessary for the Agency to perform all test conditions to address the safety problem, or could NCAP test only certain conditions to minimize test burden? For instance, should the Agency consider incorporating the test conditions for only one departure direction if the vehicle manufacturer provides test data to assure comparable system performance for the other direction? Or should the Agency consider adopting only the most challenging test conditions? If so, which conditions are most appropriate? For instance, do the dashed line test conditions provide a greater challenge to vehicles than the solid line test conditions?

Response: The tests as proposed are sufficient. Required test conditions will be reduced by eliminating tests with Botts Dots.

Q14

What is the appropriate number of test trials to adopt for each LKS test condition, and why? Also, what is an appropriate pass rate for the LKS tests, and why?

Response: The pass criteria of 3 of 5 individual trials for each combination of departure direction and lane line type (60 percent) and pass twenty of the thirty trials overall (66 percent) is reasonable.

Q15

Are there any aspects of NCAP's current LDW or proposed LKS test procedure that need further refinement or clarification? Is so, what additional refinements or clarifications are necessary?

Response: LCS systems can certainly be tested to the same LDW / LKS test protocol, however, consideration should be given how the test protocols could be enhanced to better validate these types of systems.

B. Blind Spot Warning & Blind Spot Intervention

Rear-facing lateral assist ADAS systems for Blind Spot Warning have been developed in the past for two different applications:

Blind Spot Assist (BSA), where the detection area is relatively small and close to the Subject Vehicle (SV) (e.g. a 6m x 3m box centered at the rear of the SV), and is intended to notify the driver of a vehicle in an adjacent lane in close proximity, travelling at a similar speed, that may be out of sight of the driver's mirrors. This system is commonly used in markets with posted speed limits of 80mph or less, where relative speeds between travel lanes are typically low.

Lane Change Assist (LCA), where the detection area is large and extends far behind the SV (e.g., a 100m x 3m box behind the rear of the SV) and is intended to notify the driver of a vehicle in an adjacent lane, approaching at a high relative speed, which may be out of sight of the driver's mirrors. This system is commonly offered in markets without posted speed limits (e.g., Germany) where there can be high relative speeds between travel lanes, to alert the driver that a lane change could bring them onto a collision path with an approaching vehicle.

Q16

Should all BSW testing be conducted without the turn signal indicator activated? Why or why not? If the Agency were to modify the BSW test procedure to stipulate activation of the turn signal indicator, should the test vehicle be required to provide an audible or haptic warning that another vehicle is in its blind zone, or is a visual warning sufficient? If a visual warning is sufficient, should it continually flash, at a minimum, to provide a distinction from the blind spot status when the turn signal is not in use? Why or why not?

Response: BSW systems can be configured to activate in three scenarios:

- An unplanned lane change, where the turn signal indicator is not activated, and the driver unintentionally drifts into an adjacent lane on a highway
- A planned lane change, where the turn signal indicator is not activated, and the driver intentionally changes lanes on a highway
- A planned lane change, where the turn signal indicator is activated, and the driver intentionally changes lanes on a highway

However, a collision with an unseen adjacent or approaching vehicle can take place whether or not the driver has activated the turn signal indicator, so BSW testing should be conducted with the turn signal activated and deactivated, to determine if a warning is given in all cases and to identify if the BSW warning is being suppressed for planned lane changes where the turn signal indicator is activated, e.g. to reduce false activations.

In terms of driver notifications, visual warnings using mirror-mounted indicators may be less effective in bright daylight conditions or with the sun behind the vehicle, so an additional notification method could improve the robustness of the warning. One option would be to use the same haptic or audible warnings used for Lane Departure Warning, as the purpose is the same – to alert the driver to a departure from the lane into a potentially hazardous situation.

In terms of a visual warning, typically the icon illuminates continuously when a vehicle is adjacent to the host vehicle. Continual flashing if the driver begins a planned or unplanned lane change and there is a risk of collision may increase the likelihood of the driver noticing the visual warning.

Q17

Is it appropriate for the Agency to use the Straight Lane Pass-by Test to quantify and differentiate a vehicle's BSW capability based on its ability to provide acceptable warnings when the POV has entered the SV's blind spot (as defined by the blind zone) for varying POV-SV speed differentials? Why or why not?

Response: As per the definitions above, NHTSA may encounter vehicles equipped with Blind Spot Assistance and / or Lane Change Assistance functions. A Straight Lane Pass-by Test can be used to determine which functions are available in a tested vehicle. Although the US has speed limits on all highways, high relative speeds between traffic lanes can still occur, even on roads with lower posted speed limits, for example at busy interchanges or approaching a construction zone. A system which can accommodate higher speed differentials is likely to improve safety in a broader range of lane changing scenarios and could therefore achieve a higher rating or scoring.

Q18

Is using the GVT as the strikeable POV in the BSI test procedure appropriate? Is using Revision G in NCAP appropriate? Why or why not?

Response: The GVT Revision G (ISO 19206-3) is designed to be representative of a typical passenger car for optical-based sensors including camera and lidar and well as radar-based sensors, and therefore is an appropriate strikeable POV to provide a safe way to evaluate higher speed test scenarios with minimal damage risk, especially where human drivers are participating. NHTSA's proposed use of the GVT provides welcome standardization of testing equipment internationally and reduces testing complexity and equipment costs for OEMs and ADAS manufacturers, as it its already in use in the European market.

Q19

The Agency recognizes that the BSW test procedure currently contains two test scenarios that have multiple test conditions (e.g., test speeds and POV approach directions (left and right side of the SV)). Is it necessary for the Agency to perform all test scenarios and test conditions to address the real-world safety problem adequately, or could it test only certain scenarios or conditions to minimize test burden in NCAP? For instance, should the Agency consider incorporating only the most challenging test conditions into NCAP, such as the ones with the greatest speed differential, or choose to perform the test conditions having the lowest and highest speeds? Should the Agency consider only performing the test conditions where the POV passes by the SV on the left side if the vehicle manufacturer provides test

data to assure the left side pass-by tests are also representative of system performance during right side pass-by tests? Why or why not?

Response: Assuming that the vehicle sensor configuration is symmetrical, and the OEM provides suitable test data to confirm similar performance side-to-side, NHTSA could consider just performing testing for one side of the vehicle.

The Straight Lane Converge and Diverge Test is suitable to evaluate the performance of Blind Spot Assistance functions as described above and includes a single set of test parameters.

Response: The Straight Lane Pass-by Test is suitable to evaluate the performance of Lane Change Assist functions as described above. If the BSW system is tested first at the lowest and highest speeds and test performance is similar, the intermediate speed tests could be skipped. However, if there is a significant difference in system performance between these two boundary tests, the intermediate speed tests could be conducted to better characterize the BSW system's performance.

NHTSA could also consider a low SV speed test scenario to replicate situations where a vehicle in a slow-moving lane travelling at e.g., 15mph changes lane into a free-flowing lane with vehicles travelling at e.g., 45mph, as can happen during traffic congestion and construction zones. In this case, the BSW system could be evaluated independently of an LKS system if the SV is suitable equipped (see comments below).

Both tests should be conducted, as BSW systems may be designed to provide only BSA functionality, or only LCA functionality, or both.

Q20

Given the Agency's concern about the amount of system performance testing under consideration in this RFC, it seeks input on whether to include a BSI false positive test. Is a false positive assessment needed to insure system robustness and high customer satisfaction? Why or why not?

Response: When considering the inclusion of a BSI false positive test, NHTSA should consider what real-world situation could trigger as false positive activation (e.g., detection of stationary objects, or oncoming traffic in the adjacent lane).

Q21

The BSW test procedure includes seven repeated trials for each test condition (i.e., test speed and POV approach direction). Is this an appropriate number of repeat trials? Why or why not? What is the appropriate number of test trials to adopt for each BSI test scenario, and why? Also, what is an appropriate pass rate for each of the two tests, BSW and BSI, and why is it appropriate?

Response: Performing a test seven times with an acceptable pass rate of five cases has been previously proposed and reviewed as part of NHTSA's FCW and AEB testing protocols from 2015. Maintaining these trial and pass rates for new ADAS systems provides consistency with existing ADAS test procedures.

Q22

Is it reasonable to perform only BSI tests in conjunction with activation of the turn signal? Why or why not? If the turn signal is not used, how can the operation of BSI be differentiated from the heading adjustments resulting from an LKS intervention? Should the SV's LKS system be switched off during conduct of the Agency's BSI evaluations? Why or why not?

Response: Depending on how the vehicle BSI function is configured, it may operate with or without the turn signal being activated by the driver, to provide protection against a collision with a vehicle in an adjacent lane. Testing in both conditions would identify whether there is any difference in operation due to the turn signal status. As BSI is normally a proximity-based function and independent of lane markings, the function could be tested on a roadway without lane markings – e.g. a runway or with SV speeds below the LKS activation threshold – to differentiate a BSI intervention from a LKS intervention, without needing to disable an installed LKS system by e.g. temporarily covering the camera lens if the LKS system can't be independently switched off. As a BSI system can protect drivers in situations where an LKS system might not be active (e.g., at low SV speeds, on snow-covered roads etc.) it is logical to evaluate the system operation independent of LKS.

C. Pedestrian Automatic Emergency Braking

ASC strongly supports adding PAEB tests as part of the NCAP update and recommends that supports cyclists to be added as well. ASC applauds NHTSA's efforts to establish test conditions that accurately represent real-world scenarios where the majority of pedestrian fatalities are occurring including poor driver visibility conditions due to harsh weather or lighting conditions. Given the increase of fatalities of VRUs, ASC recommends NHTSA consider mandating PAEB in addition to adding it to NCAP.

Q23

Is the proposed test speed range, 10 kph (6.2 mph) to 60 kph (37.3 mph), to be assessed in 10 kph (6.2 mph) increments, most appropriate for PAEB test scenarios S1 and S4? Why or why not?

Response: ASC agrees with NHTSA's proposed test speed range of 10kph (6.2 mph) to 60 kph (37.3 mph) for the PAEB test scenarios S1 and S4 as it corresponds with urban area driving conditions with speed limits up to 35 mph where pedestrians are commonly present. ASC proposes testing at 10 kph, 35 kph, and 60 kph rather than testing in 10kph increments to conduct tests more efficiently over the entire speed range.

Q24

The Agency has proposed to include Scenarios S1 a-e and S4 a-c in its NCAP assessment. Is it necessary for the Agency to perform all test scenarios and test conditions proposed in this RFC notice to address the safety problem adequately, or could NCAP test only certain scenarios or conditions to minimize test burden but still address an adequate proportion of the safety problem? Why or why not? If it is not necessary for the Agency to perform all test scenarios or test conditions, which scenarios/conditions should be assessed? Although they are not currently proposed for inclusion, should the Agency also adopt the false positive test conditions, S1f and S1g? Why or why not?

Response: ASC agrees with NHTSA's proposal to include Scenarios S1 a-e and S4 a-c in its NCAP assessment, and at 3 test speeds (10 kph, 35 kph, 60 kph). In addition, ASC supports adding Scenarios S2 & S3 at this time at test speeds of 10 kph for right turns (S2) and 10 kph & 20 kph for left turns (S3), which is in alignment with Euro NCAP tests. ASC proposes conducting all scenarios / test speed combinations above in both day and night lighting conditions. This results in a total of 54 unique combinations. Once comprehensive study data can be compiled through NCAP testing, ASC would like to recommend that NHTSA re-evaluate the need for all testing conditions and remove tests that are not needed after a request for comment (RFC) is issued.

Q25

Given that a large portion of pedestrian fatalities and injuries occur under dark lighting conditions, the Agency has proposed to perform testing for the included test conditions (i.e., S1 a-e and S4 a-c) under dark lighting conditions (i.e., nighttime) in addition to daylight test conditions for test speed range 10

kph (6.2 mph) to 60 kph (37.3 mph). NHTSA proposes that a vehicle's lower beams would provide the source of light during the nighttime assessments. However, if the SV is equipped with advanced lighting systems such as semiautomatic headlamp beam switching and/or adaptive driving beam head lighting system, they shall be enabled during the nighttime PAEB assessment. Is this testing approach appropriate? Why or why not? Should the Agency conduct PAEB evaluation tests with only the vehicle's lower beams and disable or not use any other advanced lighting systems?

Response: ASC strongly agrees with NHTSA's proposal to perform PAEB testing under dark lighting conditions and that a vehicle's lower beams, or if the vehicle is equipped with advanced lighting systems including automated high beam control, provide the only source of light during the nighttime assessment. No other lighting source should be used during testing. (Refer to question 26 below.)

Q26

Should the Agency consider performing PAEB testing under dark conditions with a vehicle's upper beams as a light source? If yes, should this lighting condition be assessed in addition to the proposed dark test condition, which would utilize only a vehicle's lower beams along with any advanced lighting system enabled, or in lieu of the proposed dark testing condition? Should the Agency also evaluate PAEB performance in dark lighting conditions with overhead lights? Why or why not? What test scenarios, conditions, and speed(s) are appropriate for nighttime (i.e., dark lighting conditions) testing in NCAP, and why?

Response: ASC does not support the use of the vehicle's upper beams as a light source for performing PAEB testing under dark conditions if the driver must manually activate them, as it does not accurately represent the real-world conditions. Individual state laws require drivers to dim high, or upper, beam headlights whenever there is a risk of blinding other drivers. In addition, a 2016 IIHS study found that few drivers use their high beams. (Refer to question 25 above.)

Q27

To reduce test burden in NCAP, the Agency proposed to perform one test per test speed until contact occurs, or until the vehicle's relative impact velocity exceeds 50 percent of the initial speed of the subject vehicle for the given test condition. If contact occurs and if the vehicle's relative impact velocity is less than or equal to 50 percent of the initial SV speed for the given combination of test speed and test condition, an additional four test trials will be conducted at the given test speed and test condition, and the SV must meet the passing performance criterion (i.e., no contact) for at least three out of those five test trials in order to be assessed at the next incremental test speed. Is this an appropriate approach to assess PAEB system performance in NCAP, or should a certain number of test trials be required for each assessed test speed? Why or why not? If a certain number of repeat tests is more appropriate, how many test trials should be conducted, and why?

Response: ASC is in support of the five test trials per speed with three passes or more needed to progress to the next speed level.

Q28

Is a performance criterion of "no contact" appropriate for the proposed PAEB test conditions? Why or why not? Alternatively, should the Agency require minimum speed reductions or specify a maximum allowable SV-to-mannequin impact speed for any or all the proposed test conditions (i.e., test scenario and test speed combination)? If yes, why, and for which test conditions? For those test conditions, what speed reductions would be appropriate? Alternatively, what maximum allowable impact speed would be appropriate?

Response: ASC is in support of the performance criterion of "no contact" as it is impossible to develop models and pedestrian mannequins that accurately represent our diverse population to ensure everyone's safety if contact with a vehicle occurs. This is quite different from vehicle-to-vehicle impact which can be more accurately modeled and regulated to help ensure that impact results in little to no harm of the occupants.

Q29

If the SV contacts the pedestrian mannequin during the initial trial for a given test condition and test speed combination, NHTSA proposes to conduct additional test trials only if the relative impact velocity observed during that trial is less than or equal to 50 percent of the initial speed of the SV. For a test speed of 60 kph (37.3 mph), this maximum relative impact velocity is nominally 30 kph (18.6 mph), and for a test speed of 10 kph (6.2 mph), the maximum relative impact velocity is nominally 5 kph (3.1 mph). Is this an appropriate limit on the maximum relative impact velocity for the proposed range of test speeds? If not, why? Note that the tests in Global Technical Regulation (GTR) No. 9 for pedestrian crashworthiness protection simulates a pedestrian impact at 40 kph (24.9 mph).

Response: ASC in is support of NHTSA conducting additional test trials only if the relative impact velocity is less than or equal to 50 percent of the initial speed of the SV as the reduction of velocity indicates that the PAEB system was activated, and the resulting velocity is less than the GTR No. 9 for pedestrian crashworthiness production simulation impact speed.

Q30

For each lighting condition, the Agency is proposing six test speeds (i.e., those performed from 10 to 60 kph (6.2 to 37.3 mph) in increments of 10 kph (6.2 mph)) for each of the 8 proposed test conditions (S1a, b, c, d, and e and S4a, b, and c). This results in a total of forty-eight unique combinations of test conditions and test speeds to be evaluated per lighting condition, or 96 total combinations for both light conditions. The Agency mentions later in the ADAS Ratings System section, that it plans to use check marks, as is done currently, to give credit to vehicles that (1) are equipped with the recommended ADAS technologies, and (2) pass the applicable system performance test requirements for each ADAS technology included in NCAP until it issues (1) a final decision notice announcing the new ADAS rating system and (2) a final rule to amend the safety rating section of the vehicle window sticker (Monroney label). For the purposes of providing credit for a technology using check marks, what is an appropriate minimum overall pass rate for PAEB performance evaluation? For example, should a vehicle be said to meet the PAEB performance requirements if it passes two-thirds of the ninety-six unique combinations of test conditions and test speeds for the two lighting conditions (i.e., passes sixty-four unique combinations of test conditions and test speeds)?

Response: ASC supports adding Scenarios S1 a-e and S4 a-c to the NCAP assessment at 3 test speeds (10 kph, 35 kph, 60 kph). In addition, ASC supports adding Scenarios S2 & S3 at test speeds of 10 kph for right turns (S2) and 10 kph & 20 kph for left turns (S3), which is in alignment with Euro NCAP tests. ASC proposes conducting all scenarios / test speed combinations above in both day and night lighting conditions. This results in a total of fifty-four unique combinations.

Q31

Given previous support from commenters to include S2 and S3 scenarios in the program at some point in the future and the results of AAA's testing for one of the turning conditions, NHTSA seeks comment on an appropriate timeframe for including S2 and S3 scenarios into the Agency's NCAP. Also, NHTSA requests from vehicle manufacturers information on any currently available models designed to

address, and ideally achieve crash avoidance during conduct of the S2 and S3 scenarios to support Agency evaluation for a future program upgrade.

Response: ASC supports adding S2 and S3 scenarios now. Perception technology is available to support adding this functionality.

Q32

Should the Agency adopt the articulated mannequins into the PAEB test procedure as proposed? Why or why not?

Response: ASC supports the adoption of the articulated mannequins for PAEB testing as this is more representative of actual pedestrians, and it is in harmony with the articulated mannequins specified in ISO19206-2 and EuroNCAP's current PAEB test procedure.

Q33

In addition to tests performed under daylight conditions, the Agency is proposing to evaluate the performance of PAEB systems during nighttime conditions where a sizable percentage of real-world pedestrian fatalities occur. Are there other technologies and information available to the public that the Agency can evaluate under nighttime conditions?

Response: High resolution imaging radar, lidar, and thermal imaging, or IR, cameras for automotive applications are alternative technologies to conventional object recognition cameras that can all be used to detect pedestrians at night. These technologies are used on vehicles today for a multitude of different functions. In addition to the perception sensing technologies referenced above, there are also V2X technologies that can utilize smartphone location data to help detect and track VRUs. For vehicles equipped with this V2X technology, PAEB tests should be conducted with location data enabled smartphones attached to the VRU targets.

Q34

Are there other safety areas that NHTSA should consider as part of this or a future upgrade for pedestrian protection?

Response: All VRUs (pedestrians, motorcyclists, E-scooters, and pedal-cyclists) should be equally represented in NCAP tests. These tests should accurately represent real-world scenarios whereas the most severe injuries and fatalities occur such as when a vehicle is turning and in poor visibility conditions. ASC recommends adding additional tests that represent a scenario whereas a pedestrian crossing the roadway with another vehicle travelling in the opposite direction also coming upon the pedestrian from the other direction under both daylight and nighttime lighting conditions. ASC recommends that NHTSA consider additional scenarios involving children beyond S1d as part of this and/or a future update for pedestrian protection. In 2020, 177 child pedestrians and forty-eight child pedal-cyclists were killed in the US.[1]

A 2014 Ircobi presentation, http://www.ircobi.org/wordpress/downloads/irc14/default.htm, article IRC-14-69, showed how integrated passive and active safety measures could greatly reduce VRU injuries by combining hood lifters and external airbags with AEB. ASC recommends that NHTSA investigate these and other types of alternative VRU safety features for future inclusion to reach vision zero. Additionally, NHTSA should consider the adoption of Global Technical Regulation (GTR) No.9: Pedestrian Safety

Q36

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[1] https://explore.dot.gov/views/DV_FARS_CD/Home?%3Aiid=1&%3AisGuestRedirectFromVizportal=y&%3Aembed=y

Considering not only the increasing number of cyclists killed on U.S. roads but also the limitations of current AEB systems in detecting cyclists, the Agency seeks comment on the appropriate timeframe for adding a cyclist component to NCAP and requests from vehicle manufacturers information on any currently available models that have the capability to validate the cyclist target and test procedures used by Euro NCAP to support evaluation for a future NCAP program upgrade.

Response: ASC supports the harmonization of ADAS cyclist targets with ISO19206-4, ISO19206-5 (in development), and Euro NCAP. ASC strongly supports adding cyclist AEB to NCAP as soon as reasonably possible. To support this, ASC requests that NHTSA commissions characterization studies of both the motorcycle and bicycle targets (ISO19206-5 (in development) and ISO19206-4 respectively) similar to NHTSA's "Pedestrian Test Mannequins Objective Criteria for Evaluating Repeatability and Accuracy of PCAM Systems" conducted by H. Albrecht in order that cyclist AEB tests can be added to NCAP in a timely fashion. ASC supports NHTSA modifying the Euro NCAP test procedures to best model the crash scenarios whereas cyclists are being seriously injured or killed in the US. (See question 37 below.)

Q37

In addition to the test procedures used by Euro NCAP, are there others that NHTSA should consider to address the cyclist crash population in the U.S. and effectiveness of systems?

Response: NHTSA should consider additional studies on the potential impact that roadway infrastructure, such as guardrails and other barriers, have on accurately detecting cyclists in a blind spot scenario. In addition, ASC recommends NHTSA consider additional tests built upon actual crash scenarios where cyclists are being seriously injured or killed such as when a cyclist is travelling in the same direction in front of the SV (10% overlap), when a cyclist is travelling in the adjacent lane in the blind spot of the SV, and lastly when a cyclist is travelling in the same direction as the SV and behind a POV.

A recent IIHS study showed that over 70% of fatalities occurred at greater than 55MPH. The agency should study at what speed the testing should be done at to achieve the greatest reduction in injuries and fatalities versus the cost of implementing solutions.

Q48

Should the Agency pursue research in the future to assess AEB system performance under less-than-ideal environmental conditions? If so, what environmental conditions would be appropriate?

Response: ASC requests NHTSA to pursue additional research of AEB system performance in low, reduced, or degraded driver visibility environments including harsh weather conditions such as fog, smoke, ash, rain, hail, and snow, as well as less than ideal lighting conditions including at night in the dark and when the vehicle is travelling in the direction of direct sunlight resulting in glare or temporary blindness for the driver.

VII. Adding Emerging Vehicle Technologies for Safe Driving Choices

ASC encourages the Agency to place priority on Driver Monitoring – specifically Driver Monitoring systems that utilize direct sensing method (i.e., utilize vision sensing to monitor the driver's head pose, gaze direction, eye closure, etc.), as opposed to indirect sensing systems that infer driver state based on estimation approaches.

Driver Monitoring: ASC recommends NHTSA to go beyond just highlighting vehicles with this technology and include direct sensing driver monitoring systems this revision of NCAP. This technology is mature and has been introduced by several OEMs on various vehicle models.

Driver Distraction: Direct sensing driver monitoring systems can also improve safety through the detection of driver distraction, acting in a complementary fashion to current activities like improved Human-Machine Interfaces (HMI), public awareness campaigns regarding distracted driving, and encouraging enforcement of existing distraction related state traffic laws.

Additionally, automakers are increasingly introducing vehicles with increasing levels of automation (L2 hands-off, feet-off that require active supervision by the driver, and eventually L3 systems that do not require active supervision but assessing the readiness of the driver to resume vehicle control becomes key). IIHS is developing a new Level 2 system safeguards evaluation program, with one of the key requirements that monitors both the drivers gaze and hand position. Current direct monitor driver monitoring systems available on the market today can provide this functionality.

Impaired Driving: NHTSA efforts to address impaired driving through public awareness campaigns, encouraging enforcement of existing drunk / impaired driving related state traffic laws and the initiatives with the DADSS program should continue. However direct driver monitoring systems have the potential to evolve, in the mid-term, to add more extended safety features such as alcohol/drug intoxication detection and health monitoring. The expanding functionality direct monitoring driver monitoring systems to detect driver impairment in an unintrusive manor, provides more supporting rationale for NHTSA focus attention and emphasis on the deployment of these systems

Driver monitoring functionality is currently being / have been addressed by other global NCAP bodies. Research may be available that could be leveraged. The Agency is highly encouraged to harmonize features, requirements, and testing with organizations like IIHS, and the other Global NCAP bodies.

Vehicle Submersion: Vehicle submersion has historically been ignored by manufacturers, and yet submersion crashes have one of the highest mortality rates of any type of single-vehicle accident[2]. The 350-400 fatalities per year in North America account for up to 10% of all drownings.[3,4] According to statistics from the World Health Organization, vehicle submersion drownings claim the lives of 2,000 to 5,000 individuals annually in industrialized nations.[5] Such statistics are generally unavailable from developing nations, where submersion occurrences are more frequent. Importantly, unlike many other types of fatal car crashes, submersion fatalities are rarely due to trauma. Rather, vehicle occupants drown in their vehicle even though they are usually conscious and physically functional after impact with the water. There are few rescue missions for submersion victims, but rather cadaver-recovery missions. The problem of vehicle submersion is exacerbated by the fact that electronic systems fail early in water and shatter-resistant windows (laminated and polycarbonate) trap occupants in the vehicle. As of 2018, approximately 33 percent of new vehicles sold in the US had laminated glass side windows.[6] A study released by the American Automobile Association (AAA) tested the six leading manual tools available to the public, and all six tools failed to break laminated glass[7]. Considering this data, manual tools are increasingly becoming obsolete as an effective means of preventing vehicle submersion fatalities.

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[2] Baker S, O'Neill B, Marvin M, Li G. The injury fact book: vehicle immersion. Second ed (pp. 1242-1243). New York: Oxford University Press, 1992
[3] Austin R. Drowning Deaths in Motor Vehicle Traffic Accidents. 2011:1-8 Accessed from www-nrd.nhtsa.dot.gov/departments/ESV/22nd/, July 18, 2011. www-nrd.nhtsa.dot.gov/departments/ESV/22nd/.
[4] Wintemute, G. J., Kraus, J. F., Teret, S. P., & Wright, M. A. (1990). Death resulting from motor vehicle immersions: The nature of the injuries, personal and environmental contributing factors, and potential interventions. American Journal of Public Health, 80, 1068–1070.10.2105/AJPH.80.9.1068]
[5] An Automatic Window Opening System to Prevent Drowning in Vehicles Sinking in Water, Gordon G. Giesbrecht, Michael Percher, Pierre Brunet, Yanik Richard, Marion Alexander, Alixandra Bellemare, Yash Rawal, Aram Amassian & Gerren Mcdonald, Cogent Engineering (2017), 4: 1347990.
[6]American Automotive Association (AAA) (2021, July). Vehicle Escape Tool Evaluation. NewsRoom.AAA.com. https://www.aaa.com/AAA/common/AAR/files/Research-Report-Vehicle-Escape-Tools.pdf
[7] American Automotive Association (AAA) (2021, July). Vehicle Escape Tool Evaluation. NewsRoom.AAA.com. https://www.aaa.com/AAA/common/AAR/files/Research-Report-Vehicle-Escape-Tools.pdf

Finally, submersion is often understood in terms of vehicles accidentally entering large bodies of water. However, this does not capture the threat of floods, in which water floods roadways and transportation infrastructure. Climate change is increasing the frequency and intensity of extreme rainfalls, as seen throughout 2021 in Germany, the USA, Canada, China and several other major automotive markets. In September 2021, Governor Phil Murphy (NJ), when commenting on the forty-six fatalities that happened in New Jersey because of Hurricane Ida, said, *"the majority of the deaths were people caught in their vehicles by flooding and were overtaken by the water*"[8]. In 2021, submersion fatalities due to flood waters reached a five-year high, fueled mostly by extreme rainfall, a trend that is anticipated to worsen as our climate continues to warm[9].

The ASC is aware of research from a not-for-profit organization called Operation ALIVE[10] (Automobile submersion: Lessons in Vehicle Escape), led by Dr. Gordon Giesbrecht of the University of Manitoba, Canada. Since 2005, Dr. Giesbrecht has performed over one hundred human vehicle submersions and published ten papers in refereed journals (see references). This evidence-based work has led to the development of the "Vehicle in Water" and "Vehicle in Flood Water" emergency response protocols[11,12] used by emergency operators in 60% of the English-speaking world, including the Fire Priority Dispatch System™ (FPDS®), International Academies of Emergency Dispatch (IAED®), and the Police and Medical Priority Dispatch Systems™ (PPDS®).

This dedicated research identifies that a road vehicle sinks in three (3) distinct phases[13], and forms the basis that enables technological solutions that prevent entrapment in the vehicle to emerge. These phases are:

1. Flotation Phase: begins when the vehicle impacts the water and lasts until the water level reaches the vehicle's side windows. On average, this phase lasts for approximately 60 seconds. During this phase, hydrostatic pressure prevents the doors from being opened, but the windows can be lowered due to being above the water line. Escape is possible during this phase, through the lowered side windows. Note: If a door is forced open early in this phase, water rushes in causing the vehicle to sink faster and the door to shut, causing occupants to drown.
2. Sinking Phase begins once the water level has reached the side windows and lasts until the vehicle becomes completely submerged. In this phase, hydrostatic pressure prevents the windows from being lowered, due to pressure differential. In a front-heavy vehicle, the front windows will submerge first and become inoperable, followed by the rear windows as the vehicle tilts forward while sinking. The reverse is true in a rear-heavy vehicle. Occupants may still be able to breathe due to air pockets but will be unable to exit the vehicle.
3. Submerged Phase: the vehicle is now completely below the surface of the water. Pockets of air may remain for a time, as the vehicle continues to fill with water. The pressure differential that prevents the opening of doors and the lowering of windows will remain until both the passenger compartment and trunk are filled with water. Unfortunately, occupants will have drowned by that time.

Vehicle escape is therefore possible within at most 60 seconds, during the Flotation Phase[14], as the side windows are above the water line. Anyone remaining in the vehicle after this phase has little-to-no chance of survival. In consideration of the presence of laminated and other shatter-resistant glazing, lowering the side windows is overwhelmingly preferred over shattering them. The doors should not be opened, as this increases the rate of water ingress and causes the vehicle to sink rapidly, significantly reducing the sixty second opportunity to exit the vehicle[15].

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[8] Steve Almasy, Jason Hanna and Madeline Holcombe, CNN (2021, September 2) At least 46 people have died after floodwaters from Ida's remnants swamp cities from Virginia to New England. https://www.cnn.com/2021/09/02/weather/ida-northeast-flooding-thursday/index.html
[9] Dinah Voyles Pulver, USA TODAY (2022, February 20). 'Heartbreaking': Warnings not enough to prevent vehicle flood deaths from 5-year high. https://www.usatoday.com/story/news/2022/02/20/weather-service-flood-deaths/6735981001/?gnt-cfr=1
[10] Giesbrecht GG, McDonald GK. My Car is Sinking: Automobile Submersion, Lessons in Vehicle Escape. Aviat Space Environ Med 2010; 81: 779 – 84
[11] Giesbrecht G. The Evidence Base for a New "Vehicle in Water" Emergency Dispatch Protocol. Annals of Emergency Dispatch & Response. 2016;4(1):5-9.
[12] Giesbrecht GG. The Evidence Base for a New 'Vehicle in Floodwater' Emergency Dispatch Protocol. Annals of Emergency Dispatch & Response. 2016;4(2):7–11.
[13] Giesbrecht GG, McDonald GK. My Car is Sinking: Automobile Submersion, Lessons in Vehicle Escape. Aviat Space Environ Med 2010; 81: 779 – 84
[14] Giesbrecht G. The Evidence Base for a New "Vehicle in Water" Emergency Dispatch Protocol. Annals of Emergency Dispatch & Response. 2016;4(1):5-9.
[15] Giesbrecht G. The Evidence Base for a New "Vehicle in Water" Emergency Dispatch Protocol. Annals of Emergency Dispatch & Response. 2016;4(1):5-9.

automatically notifying emergency responders for vehicles that have on-board remote emergency response systems. This would in turn render rescue missions possible, as opposed to recovery missions.

Other solutions: Pyrotechnic devices have been proposed but may create a safety hazard due to broken glass. Other solutions that aim to balance the pressure differential more rapidly have also been proposed but would still require that the passenger cabin and trunk be filled with water before opening of the doors or windows becomes possible, which would present occupants with a serious risk. Based on research, occupants should exit the vehicle as early as possible, during the flotation phase, and not when the vehicle has submerged.

Euro NCAP has introduced vehicle submergence in the Rescue and Extrication section of the 2023 protocol. Although some of the requirements are either not possible, or need updating for the 2025 Euro NCAP, some of the priorities that have been included are based on extensive research provided by Operation ALIVE. As per the research and the emergency response protocols in place, occupants should waste no time to exit the vehicle using the SWOC model[16]:

1. **S**eatbelts off
2. **W**indow(s) open
3. **O**ut immediately
4. **C**hildren first

Many occupants are either unfamiliar with this advice or forget it due to the high degree of stress in a submersion. In fact, the 60-second opportunity is usually wasted on the wrong actions, which include: doing nothing; waiting for the vehicle to fill with water to equalize the pressure; placing emergency calls for help on their cell phone. Emergency responders simply cannot get to the site of a submersion in less than 60 seconds. Reported EMS times from notification until arrival at serious (i.e., ALS or fatal) vehicle crashes in urban areas have ranged between 4.8 minutes (Syracuse, NY) and 6.5 minutes (US average) over the past 15 years.[17,18] Response times are higher in rural areas, ranging from 7.2 minutes (Miami Dade County, FL) to 12.1 minutes (Becker County, MN).[19],[20] In the U.S., 48% of national response times are greater than 8 minutes. This data exemplifies why self-rescue is essential in submersion scenarios, and why dispatchers must rapidly lead the caller through the self-rescue process rather than encouraging them to relax and wait for rescue.[21,22,23, 24] More recent surveys report similar response times.[25]

The ASC supports, in general, all methodologies that result in increased public awareness of the safety benefits of vehicle escape protocols and technologies. ASC recommends that this information be made readily available to vehicle owners, by inserting it in the owner's manual or other location that has a high likelihood of being seen. The ASC also recommends clear labeling of all window types in vehicles, as well as inserting notes in owner's manual about SWOC and whether manual tools can be effective at breaking the vehicle's windows in case of an emergency.

ASC is aware of and supports technological solutions that reduce the potential for human error regarding the above-mentioned steps. While steps 1 (Seatbelts off), 3 (Out immediately) and 4 (Children first) represent actions to be performed by occupants, technological solutions that detect when a vehicle is in water and automates step 2 (Windows open) would ensure that occupants have a viable exit strategy from the sinking vehicle, which would significantly reduce the number of fatalities that occur due to entrapment in the vehicle. Solutions that lower windows circumvent the barrier presented by shatter-resistant glazing, can be tested

[16] McDonald GK, Giesbrecht GG. Vehicle Submersion: A Review of the Problem, Associated Risks, and Survival Information. Aviat Space Environ Med 2013; 84:498 – 510.
[17] Brown LH, Whitney CL, Hunt RC, Addario M, Hogue T. Do warning lights and sirens reduce ambulance response times? Prehospital Emerg Care. 2000; 4(1):70-74.
[18] Lambert TE, Meyer PB. Ex-urban sprawl as a factor in traffic fatalities and EMS response times in the southeastern United States. J Economic Issues. 2006; XL (4):941-953
[19] Lambert TE, Meyer PB. Ex-urban sprawl as a factor in traffic fatalities and EMS response times in the southeastern United States. J Economic Issues. 2006; XL (4):941-953.
[20] Ho J, Lindquist M. Time saved with the use of emergency warming lights and siren while responding to requests for emergency medical aid in a rural environment. Prehospital Emerg Care. 2001; 5(2):159-162.
[21] Pons PT, Haukoos JS, Bludworth W, Cribley T, Pons KA, Markovchick VJ. Paramedic response time: does it affect patient survival? Academic Emerg Med. 2005; 12(7):594-600
[22] Blanchard IE, Doig CJ, Hagel BE, Anton AR, Zygun DA, Kortbeek JB, Powell DG, Williamson TS, Fick GH, Innes GD. Emergency medical services response time and mortality in an urban setting. Prehospital Emerg Care. 2011; 16(1):142-151.
[23] Trowbridge MJ, Gurka MJ, O'Connor RE. Urban sprawl and delayed ambulance arrival in the U.S. Am J Preventive Med. 2009; 37(5):428-432
[24] Giesbrecht G. The Evidence Base for a New "Vehicle in Water" Emergency Dispatch Protocol. Annals of Emergency Dispatch & Response. 2016;4(1):6
[25] Andrew M. Seaman, Reuters Health, Healthcare & Pharma (2017, July 19). Be prepared for ambulance wait times. https://www.reuters.com/article/us-health-emergency-response-times/be-prepared-for-ambulance-wait-times-idUSKBN1A42KQ

without destruction to the vehicle or the windows, and do not present safety risks from flying, broken glass. Such systems can even prompt occupants to exit the vehicle, while

ASC recommends that automatic systems that detect when a vehicle is in water and automatically lowers electric side windows should be considered as an addition to the revised NCAP.

V2X:

ASC appreciates NHTSA's strong history of interest in V2X technologies and its acknowledgement that V2X technologies have the potential to improve vehicle and roadway safety.

As NHTSA considers ways NCAP could be used to encourage technologies that reduce roadway fatalities and protect VRUs, such as pedestrians and pedal-cyclists, it should embrace this C-V2X market momentum and explore opportunities to encourage the development and deployment of this technology.

Regional NCAPs are incorporating V2X technologies into their ratings and roadmaps as ongoing collaboration between automotive, telecommunications, and technology stakeholders is accelerating the development, deployment, and evolution of C-V2X around the world.

As NHTSA moves forward with its NCAP upgrades, it should closely follow how other NCAPs are incorporating V2X and consider harmonization when appropriate.

Q 52:

The components and development of a full-scale ADAS rating system,

Response: ASC believes that NCAP's rating of ADAS technologies should distinguish ADAS grades from crashworthiness ratings. ADAS technologies provide active safety with the goal of avoiding accidents whereas crashworthiness relies on passive safety technologies (seat belts/airbags/crush-zones etc.) that work to reduce injury when an accident occurs.

Q 55:

The use of a baseline concept to convey ADAS scores/ratings,

Response: ASC sees merit in the notion of conveying a vehicle's performance relative to the baseline (or average) performance observed for today's vehicle fleet. That baseline performance will improve over time as new vehicles with improved implementation/performance of a given ADAS technology arrive at dealerships. The use of a baseline (or average) performance metric that adjusts as the years roll by helps ensure that the overall rating system is dynamic and reflective of the present.

Q 56:

How best to translate points/ratings earned during ADAS testing conducted under NCAP to a reduction in crashes, injuries, deaths, etc., including which real-world data metric would be most appropriate,

Response: ASC supports that the Agency stimulates and not just regulates the adoption of active safety. We also suggest that the Agency periodically reviews crash avoidance and pedestrian protection technologies included in NCAP to keep abreast of advances in such technologies; a review every 2-3 years are appropriate. In addition, passive safety improvements should not be ignored, but also reviewed regularly, especially as they are combined with active safety systems.

Q 58:

Effective communication of ADAS ratings, including the appropriateness of using a points based ADAS rating system in lieu of, or in addition to, a star rating system

Response: ASC supports a point-based system and view such to be fully compatible with and accretive to a star rating (or equivalent) system.

Q62

What are the capabilities of the various available approaches to driver monitoring systems (e.g., steering wheel sensors, eye tracking cameras, etc.) to detect or infer different driver state measurement or estimations (e.g., visual attention, drowsiness, medical incapacity, etc.)? What is the associated confidence or reliability in detecting or inferring such driver states and what supporting data exist?

Response: ASC recommends direct sensing technologies such as 'Hands On' Wheel, including grip with multiple zones, to provide reliable confirmation of ADAS cooperative mode, enhance robustness of driver state detection and provide accurate and reliable transitions to/from automation in L2+ to classify driver state with eye tracking DMS systems. Also, additional physiological sensing with sensor fusion will improve accuracy, reliability and reduce latency. Consideration of the location of the DMS camera(s) placement and the optical and image processing properties to provide the highest accuracy and reliability should be strongly considered.

Q63

Of further interest are the types of system actions taken based on a driver monitoring system's estimate of a driver's state. What are the types and modes of associated warnings, interventions, and other mitigation strategies that are most effective for different driver states or impairments (e.g., drowsy, medical, distraction)? What research data exist that substantiate effectiveness of these interventions?

Response: Using driver state sensors as described above within a "driver in the loop" state machine which includes warnings and actuators in an escalation strategy can potentially help assess the actual driver state and the appropriate countermeasures (e.g., distracted ... incapacitated). The 'driver in the loop' system with grip detection/HOD 'On' enables vehicle ADAS features to be in assist/cooperative mode NOT automated mode. When HOD is 'OFF' i.e., hands free mode, then ASC recommends vehicle should be in Automated driving mode.

Q64

Are there relevant thresholds and strategies for performance (e.g., alert versus some degree of intervention) that would warrant some type of NCAP credit?

Response: Some driver state conditions might benefit from warnings and countermeasures to engage the driver (e.g., inattention or distraction). However, in other cases engaging automation to achieve the safest state should be considered (e.g., a drowsy or incapacitated driver does not respond to escalation strategies). ASC recommends that NHSTA should monitor Consumer Reports and IIHS efforts to rate automation to provide some insights into potential methods which could be adopted within NCAP.

Q65

Since different driver states (e.g., visual distraction and intoxication) can result in similar driving behaviors (e.g., wide within-lane position variability), comments regarding opportunities and tradeoffs in mitigation strategies when the originating cause is not conclusive are of specific interest.

Response: ASC recommends that the driver's visual distraction state should be treated distinctly from intoxicated driving for reasons mentioned above. Driver monitoring and escalation strategies should be considered which seek the safest "driver in the loop" outcomes, based on the effective "state" condition.

Q66

What types of consumer acceptance information (e.g., consumer interest or feedback data) are available or are foreseen for implementation of diverse types of driver monitoring systems and associated mitigation strategies for driver impairment, drowsiness, or visual inattention? Are there privacy concerns? What are the related privacy protection strategies? Are there use or preference data on a selectable feature that could be optionally enabled by consumers (e.g., for teen drivers by their parents)?

Response: Inclusion of driver monitoring systems which are required to enable new driver features such as advanced ADAS, conditional automation (e.g., level 2+, Autopilot, Super Cruise, etc.) should provide an incentive for drivers to inherently accept such systems to take advantage of the comfort, convenience, and safety such systems offer. A deeper look into the best practices of cellular phone applications acceptance (e.g., considering user acceptance, personal privacy, data abstraction, data retention, etc.) would inform a starting model for NCAP to consider. A May 2022 Consumer Reports study (titled Consumer Perceptions of ADAS: Driver Monitoring Systems) reported that 'Drivers of L2 systems want direct driver monitoring systems in their vehicles'.

Q67

What in-vehicle and HMI design characteristics would be most helpful to include in an NCAP rating that focuses on ease of use? What research data exist to support objectively characterizing ease of use for vehicle controls and displays?

Response: A holistic strategy and implementation must be considered to consolidate the various ADAS features in the best viable way (e.g., reduce unintended negative consequences, confusion, etc.) ASC recommends NHTSA implements standardization of icons/lights to identify alerts in conjunction with haptic/audio alerts for driver engagement.

Existing SAE, ISO, ANSI, JAMA (Japan Automotive Manufacturers Association) and other global regional committees and working groups including Consumer Reports organization in NA that consider automotive HMI standardization should be engaged to determine potential appropriate warning countermeasures and requirements. Regarding evaluating advanced ADAS and conditional automation systems, the use of naturalistic driving simulators could provide a potential basis for establishing statistically relevant performance rankings based on driver engagement and performance metrics.

Q69

What distraction mitigation measures could be considered for NCAP credit?

Response: See comments as above (e.g., clinical driving simulator studies) that could be objectively used to safely assess driver engagement (e.g., % Of time eyes on the road, % time hands on the wheel statistics) and driving performance through repeatable, naturalistic human driver clinical studies.

Q70

Are there opportunities for including alcohol-impairment technology in NCAP? What types of metrics, thresholds, and tests could be considered? Could voluntary deployment or adoption be positively influenced through NCAP credit?

Response: ASC would recommend Alcohol detection adoption by regulation, not just by USNCAP rating. Considering the annual fatalities due to alcohol impairment, NHTSA should prioritize the adoption of this technology as a standard feature. In the future NCAP would have the opportunity to reconsider a redefinition (wider scope encompassing any driver) of impairment and associated potential inclusion in NCAP.

Q71

How can NCAP procedures be described in objective terms that could be inclusive of various approaches, such as detection systems and inference systems? Are there particular challenges with any approach that may need special considerations? What supporting research data exist that document relevant performance factors such as sensing accuracy and detection algorithm efficacy?

Response: ASC recommends proposed engagement with DADSS to determine best practices.

Q72

When a system detects alcohol-impairment during a trip, what actions could the system take in a safe manner? What are the safety considerations related to diverse options that manufacturers may be considering (e.g., speed reduction, performing a safe stop, pulling over, or flasher activation)? How should various actions be considered for NCAP credit?

Response: ASC recommends proposed engagement with DADSS to determine best practices.

Q73

What is known related to consumer acceptance of alcohol-impaired driving detection and mitigation functions, and how may that differ with respect to direct measurement approaches versus estimation techniques using a driver monitoring system? What consumer interest or feedback data exist relating to this topic? Are there privacy concerns or privacy protection strategies with various approaches? What are the related privacy protection strategies?

Response: ASC would recommend Alcohol detection should be implemented by regulation, not just by USNCAP rating. Alcohol detection is preferred to be measured through direct measurement system and not just by indirect/inference from a DMS system. Privacy concerns can be mitigated by keeping data on vehicle and can be shared as a driver option. Proposed engagement with DADSS to determine best practices.

Q74

Should NCAP consider credit for a seat belt reminder system with a continuous or intermittent audible signal that does not cease until the seat belt is properly buckled (i.e., after the sixty second FMVSS No. 208 minimum)? What data are available to support associated effectiveness? Are certain audible signal characteristics more effective than others?

Response: Seat Belt reminders should be included for all seating positions as they are an inexpensive and widely available technology. NHTSA data shows 50% of all fatalities did not use seat belts. This straightforward way to increase seat belt usage should be incorporated and rated like Euro NCAP.

Q75

Is there an opportunity for including a seat belt interlock assessment in NCAP?

Response: SB interlock should be in regulation, not by rating initially to promote 100% usage of seatbelts. As proper seatbelt use evolves to 100% levels as a natural result of incentives from the improving ADAS and automation, it could be re-considered within NCAP. IIHS announced plans to provide ratings on safeguards for conditional automated driving includes reference to seatbelt use.

Q77

Should seat belt interlocks be considered for all seating positions in the vehicle, or only the front seats? Could there be an opportunity for differentiation in this respect?

Response: All seating positions should be considered with the goal to provide equivalent protection to occupants in all seated positions.

VIII. Revising the 5-Star Safety Rating System

Q88

What approaches are most effective to provide consumers with vehicle safety ratings that provide meaningful information and discriminate performance of vehicles among the fleet?

Response: ASC supports NHTSA planning for a new NCAP vehicle safety rating. We believe that an effective rating system provides consumers with easy-to-understand information about vehicle safety. Additionally, it provides meaningful comparative information about the safety of vehicles. Furthermore, such system provides incentive for the design of safer vehicles.

We believe that for continuity an overall star rating scheme is preferred for the new US NCAP.

Additional detailed information should be provided by separate ratings for the different sub-disciplines (Crash Worthiness, Crash Avoidance, Pedestrian Protection…). In addition, Crash Worthiness safety ratings should not be diminished for related Crash Avoidance features if the features can be manually shut off by the consumer.

An effective rating program must discriminate superior performance in safety. As this consists of different subdisciplines, the method of sub-disciplines rating combination needs to be well defined. One concern is if ADAS rating points or Crashworthiness points could be used to diminish the other in an overall rating. The public should know if occupant safety is poorer in one vehicle vs another even though they have the same overall rating due to other safety categories being rated higher than crashworthiness.

The continuous technological development progress should be reflected in rating updates with a regular cadence.

The combination of an overall star rating and more detailed information on sub-discipline performance can provide a comprehensive safety performance overview of new vehicles. However, we encourage NHTSA to make the test types more transparent to the public.

The ASC encourages NHTSA to consider injuries that are more prevalent to specific population demographics in this and all future NCAP modifications. NHTSA should assess the safety performance of vehicles for a greater representation of the US population (most significantly large/tall/heavy and small/light/elderly) by testing for both low and high severity load cases with the appropriate dummy configurations. As an example, recent statistical analysis has indicated a higher frequency of lower extremity injuries to women as compared to men. In addition, all AIS 2 injuries are more prevalent in women as compared to men. There are also unique injury trends related to elderly and obese members of our community.

ASC also encourages NHTSA to 1) test vehicles in a way to reduce these injury trends and promote equity in auto safety and 2) rate vehicles with enough granularity to fully understand the injury risk of a particular population as compared to the overall population. To accomplish these tasks, the latest test tools and crash test dummies that represent these populations should be considered for NCAP testing.

The ASC encourages NHTSA to pursue additional space on the Monroney window sticker for Safety information. With the recent rise in vehicle-related fatalities, it may be an appropriate juncture to seek additional label space to communicate critical Safety information to the consumer.

We encourage NHTSA to share information on their ratings and rating system on their website. In addition, it should be considered to share these with other entities that are sources for consumer information (Consumer Reports, AAA, …) by requesting these organizations provide at least a link to the NHTSA website information.

We believe there is significant value in having that information available to the consumer in as many spots as possible.

On top of that, QR codes with detailed information will help to inform interested consumers on advantages and effectiveness of recent technology.

Q89

Is the use of additional injury criteria/body regions that are not part of the existing 5-star ratings system appropriate for use in a points-based calculation of future star ratings?

Some injury criteria do not have associated risk curves. Are these regions appropriate to include, and if so, what is the appropriate method by which to include them?

Response: The ASC supports NHTSA's approach to enhance the crashworthiness requirements through utilization of advanced ATDs. These offer additional measurement capabilities to detect further injury risks. ASC believes that it is appropriate to include additional injury criteria/body regions in general.

Advanced injury criteria will potentially stimulate avoidance of serious injuries and the reduction of harm.

ASC also support the implementation of these new criteria to the overall rating system.

In general. the assessment of injury risks could be done in different ways:

- Based on calculated injury risk
- Based on a fixed range of performance criteria
- Based on current fleet performance

The ASC recommends an approach combining injury criteria that do not have existing injury curves with those that do. Such limits could be incorporated into the overall rating with a lower weighting.

A point-based rating would easily enable such an approach by providing the flexibility of a demerit and/or bonus point system.

The main principle of rating based on IRF will remain and the other injury criteria will be used to evaluate which risk is better or worse (avoid excessive loading). By excluding injury criteria that do not have risk curves, we run the risk that the US is not providing the same level of safety by removing safety equipment fitted in other regions.

In general, ASC recommends harmonizing with other NCAPs.

Q90

Should a crashworthiness 5-star safety ratings system continue to measure a vehicle's performance based on a known or expected fleet average performer, or should it return to an absolute system of rating vehicles?

Response: ASC does not recommend a fleet average performer approach because such a system allows that a vehicle rating changes from one year's rating to the next even if the vehicle performance remains unchanged. Of course, the continuous improvements of other vehicles in the fleet will show safety has declined in unchanged vehicles due to their lower rating, which is not true.

The ASC believes that consumers are most interested in the assessment of a model of a particular model year (MY). The rating changes by changed fleet performance will be difficult for the consumer to understand.

In general, ASC encourages NHTSA to provide guidance on the necessary safety equipment / safety performance of vehicles, even if the best performer cannot achieve it yet in the first year of a rating period.

Q91

Considering the basic structure of the current ratings system (combined injury risk), the potential overlapping target populations for crashworthiness and ADAS program elements, as well as other potential concepts mentioned in this document such as a points-based system, what would the best method of calculating the vehicle fleet average performance be?

Response: In general, all methods should be data driven and evolve with the changing experience in the field.

No specific calculation method is recommended.

ASC recommends the rating of the sub-disciplines be displayed side by side and the overall rating be either an average or a weighted average of performances.

However, the vehicle should be rated with a certain minimum performance in all sub-disciplines to be awarded to the top star ratings.

The balancing of crash avoidance and crashworthiness are difficult, as potential gaps in one of these disciplines could not necessarily be compensated by satisfactory performance in the other one.

Many crash avoidance features can be manually turned off by the consumer and as such, the auto owner relies completely on crashworthiness for occupant protection. Many crash avoidance systems have different performance specifications and/or expectations; as such, do not provide a consistent performance anticipation for consumers or can provide an over-reliance or over-confidence effect for the consumer which could put them more at risk. Therefore, crashworthiness ratings should not be reduced by the addition of crash avoidance features that can be manually turned off or who's performance is not robust or consistent for consumers.

So, the relation to a fleet average performance is not meaningful for the overall star rating.

Finally, the ASC underlines that crashworthiness continues to play a critical role in occupant protection even as additional crash avoidance technologies are introduced into the field. The ASC suggests that a minimum crashworthiness rating should be met for a crash avoidance rating to be assessed.

Q92

Should the vehicle fleet average performance be updated at regular intervals, and if so, how often?

Response: In general, the ASC does not recommend a fleet average performer approach; see Q91.

If the Agency will apply it to an updated NCAP rating scheme, it will become necessary to update the reference performance data at regular intervals to keep connection to state-of-the-art technology.

Such changes need to be transparent for the consumer and not so frequent that it causes consumer confusion.

The ASC recommends to the Agency to consider a fleet performance reference data set based on a rolling average of the last couple of years, e.g. [3-4] years. Depending on the amount of available test data per year, a sufficient number of reference vehicle data is needed to create statistical robustness.

Q93

What is the most appropriate way to disseminate these updates or changes to the public?

Response: The most common way of NHTSA safety information dissemination is the Monroney label and their website.

The ASC support these additional options also for sharing these updates and change information.

The safety information on the window sticker should include a link to the assessment content the rating is based on, e.g., by a specific model year the rating is related to.

The ASC encourages NHTSA to add a QR code on the Monroney label for a link to all details of the safety rating, including the applied requirements for the rating.

We believe there is significant value in having this information conveniently available to the consumer.

Q94

Should the Agency disseminate its 5-star ratings with half-star increments?

Response: The existing NCAP rating will be expanded to new areas like ADAS/ crash avoidance and pedestrian protection.

The ASC encourages the Agency to provide the safety information with a higher granularity.

In addition, the new scheme should be capable of providing easy-to-understand safety information even with a much more complex rating content.

The ASC recognizes that consumers want the ability to compare vehicles. This means that we recommend keeping it simple with higher value equaling better performance.

The ASC is not opposed to half star increments to provide the consumer greater granularity in performance. However, another (and perhaps better) option is to keep the existing whole star rating (i.e., 5, 4 etc.) but give next level granularity to help consumer make informed decision (this can be done with percentage for sub-disciplines for additional clarity).

In these sub-ratings with higher granularity, a clear visibility of poor results should be provided.

Other NCAP organizations (e.g., Euro NCAP) use colors to visually explain injury risks for rating segments e.g., body regions of occupants. A red rating segment can easily transport the safety information regarding a poor performance in a certain area/ discipline.

Better performance could be displayed by showing a percentage figure saying how many of the available points/ requested performance were/was achieved.

Q95

Should the Agency assign star ratings using a decimal format in addition to or in place of whole- or half-stars?

Response: The ASC supports the NHTSA's approach to provide most comprehensive safety information to consumers and their purchase decisions. We recognize that consumer wants the ability to compare vehicle safety levels and recommend keeping it simple with higher value equaling better performance.

For the top level (overall star) rating, we support keeping the whole star rating (i.e., 5, 4 etc.), but include greater granularity at the next level to help the consumer make an informed decision. This can be done with percentage for sub-disciplines for additional clarity.

Q96

Should the Agency continue to include rollover resistance evaluations in its future overall ratings?

Response: The ASC encourages the Agency to evaluate if rollover scenarios are still relevant in their national accident statistics. The implementation of ESC technology and FMVSS226 compliant occupant protection countermeasures should have improved the field situation compared to the time before.

Based on these data, the benefit of implementing a new future rating can be evaluated. The ASC believes the rollover static stability factor risk curve needs to be updated to account for newer ESC-equipped vehicles that are less likely to be involved in rollover crashes.

If necessary, both parts of the rollover resistance rating should become part of the sub-discipline "crash avoidance" and its relative power in the rating should be driven by its road safety relevance.

Q 98

As the ADAS assessment program in NCAP continues to grow in the future to include new ADAS technologies and more complex test procedures, what other means would best address the following program challenges: Methods of data collection, maintaining data integrity and public trust, and managing test failures, particularly during verification testing?

Response: One critical point here would be for efforts to be made to also introduce virtual proofs of system functionalities. This would have the advantage that systems could be evaluated much more comprehensively. It would also reduce the testing effort, which is currently very considerable. Especially at the beginning, a combined procedure between real tests and virtual testing would be useful.

In conclusion, the ASC welcomes this opportunity to comment on the RFC to upgrade and improve the NCAP. We welcome any invitation to visit the NHTSA office for a detailed discussion of these comments should the need arise.

Sincerely,

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President
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