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WHITE PAPER

National Highway Traffic Safety Administration Updates NCAP in the United States

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Abstract

In early 2022, the National Highway Traffic Safety Administration (NHTSA) released proposed updates to its new car assessment program (NCAP), seeking feedback from stakeholders on its proposal and explaining the rationale behind these updates. These updates include the addition of four new ADAS technologies, namely blind spot detection (BSD), blind spot intervention (BSI), lane keeping support (LKS) and pedestrian automatic emergency braking (PAEB). The NHTSA also proposes modifying the existing test criteria of lane departure warning systems to encourage user adoption of the technology. As a key automotive software provider directly involved in enhancing safety and making roads safer, LeddarTech welcomes the proposed changes and goes so far as to recommend making vulnerable road users (VRU) such as bicyclists, motorcycles and pedestrians a key element of its ADAS-driven NCAP changes.

Proposed NCAP Changes

NHTSA's existing NCAP is built on three factors, i.e., vehicle crashworthiness, rollover protection and advanced driver assistance system (ADAS) technologies in the vehicle. NHTSA proposes adding four new ADAS technologies for testing. The focus of this update is to seek comments on the introduction and rating system for new ADAS technologies proposed to NCAP. Currently, U.S. NCAP tests four ADAS technologies in its program, namely lane departure warning (LDW), forward collision warning (FCW), dynamic brake support (DBS) and crash imminent braking (CIB), the last two technologies combining to form what is known as automated emergency braking (AEB). This notice also proposes updates to the testing and performance criteria of existing lane departure warning (LDW) ADAS technology. NHTSA proposes adding four new technologies:

- Blind spot detection
- Blind spot intervention
- Lane-keeping support
- Pedestrian automatic emergency braking

Currently, vehicles sold in the United States are provided an NCAP rating based on the first two components of NCAP, namely crashworthiness and rollover protection, but not on ADAS technologies fitted on the vehicle. Customers are only informed of whether a particular ADAS technology has passed the NCAP tests or not and whether the technology is provided as standard or optional on the vehicle. Examples are provided below.

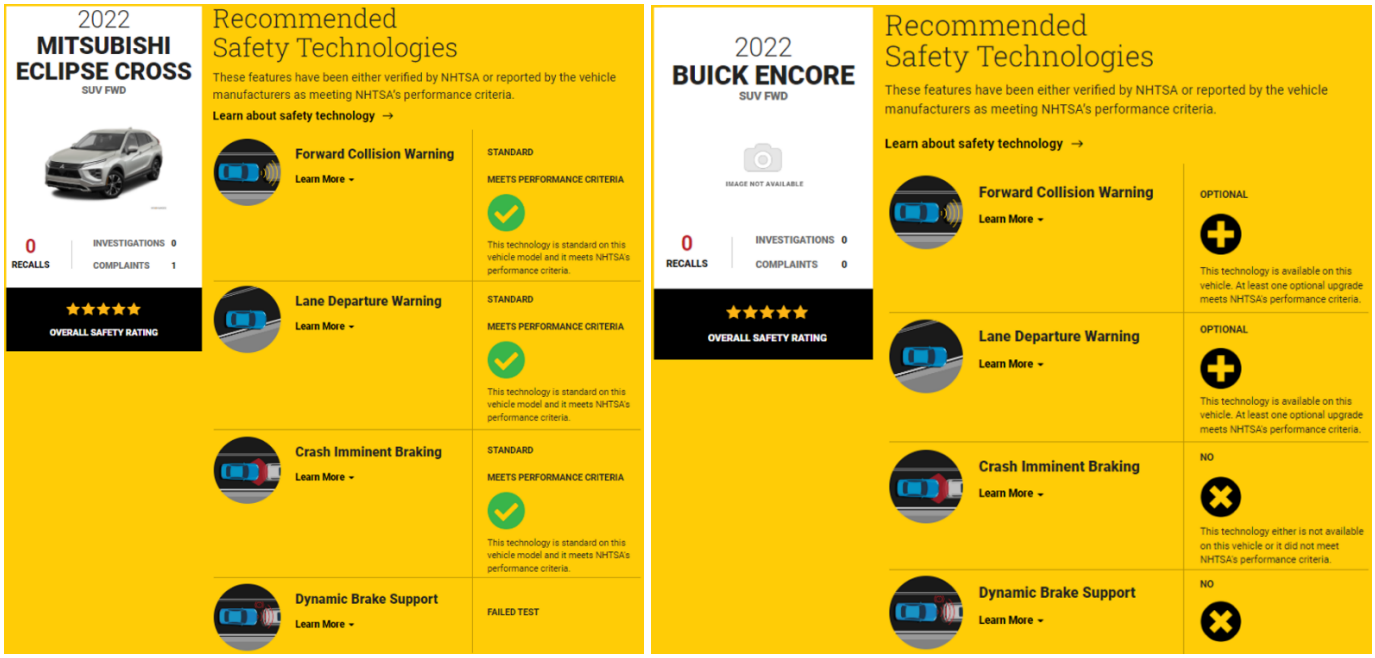

Figure 1 – Vehicle's ADAS performance under USA NCAP (source: nhtsa.gov)

Addition of Blind Spot Detection Technologies to NCAP

Blind spot detection technologies consist of blind spot warning and blind spot intervention systems. Blind spot detection systems typically use a radar-camera system.

Three test procedures have been proposed for blind spot warning systems, namely straight-line converge test, straight line diverge test and straight lane drive-by test. Depending on the type of test, a principal "other" vehicle (vehicle A) enters, exits or drives by the blind spot zone of the subject vehicle being tested. Each of these tests is performed from the left and right of the vehicle. Proposed testing regulations state that the blind spot warning must be presented to the driver within 300 milliseconds of vehicle A entering the blind spot zone of the vehicle being tested. Similarly, the blind spot warning must not be active once the lateral distance between the vehicle being tested and vehicle A exceeds 6 meters (19.7 feet).

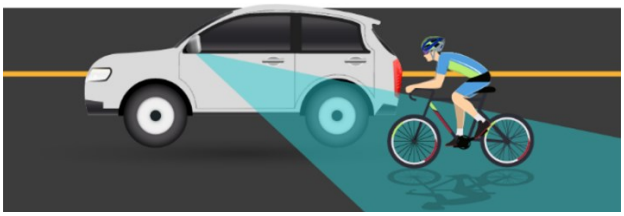

Figure 2 – Blind spot detection and intervention system

NCAP Extends Reach With Pedestrian Automated Emergency Braking

For the first time in its history, U.S. NCAP will extend to the safety of road users outside the vehicle. NHTSA proposes adding pedestrian automated emergency braking (PAEB) to its new car assessment program. PAEB system detects potential collisions with pedestrians or bicyclists while the car is traveling and automatically applies brakes to avoid a collision or reduce the impact. Four common pedestrian crash scenarios are covered, i.e., when the vehicle is:

1. Heading straight and a pedestrian is crossing the road
2. Turning right and a pedestrian is crossing the road
3. Turning left and a pedestrian is crossing the road
4. Heading straight and a pedestrian is walking along or against traffic

Figure 3 – Pedestrian automated emergency braking

Scenarios 1 and 4 are proposed for inclusion in U.S. NCAP, but not scenarios 2 and 3. The latter two scenarios have not been added because commenters mentioned that the available technology would add a significant number of false positive detections and that ADAS sensors would need an expanded field of view.

Lane Departure Warning Update and Introduction of Lane Keep Support

Lane departure warning (LDW) systems typically employ a camera-only solution. The existing NCAP test procedure for lane departure warning systems does not include testing the system in adverse visibility conditions, such as rain, snow, hail, fog, smoke or ash. Similarly, the camera must not be saturated during tests such as in situations where the sun is oriented 15 degrees or less from the horizontal.

Through a notice, in December 2015, NHTSA highlighted concerns about missed detections resulting from reflecting sunlight, lines being covered with water or other unforeseen anomalies resulting in missed detections. The agency was also concerned about consumers disabling LDW due to high false positive rates and sought feedback from the industry. To increase adoption and discourage disabling, NHTSA proposes changes in testing requirements and performance benchmarks.

NHTSA proposes lowering the LDW trigger from 0.8 meter to 0.3 meter. Current NCAP testing of LDW states that a warning must not occur if the distance between the inner side of the lane marking and the vehicle is 0.8 meter or more, and the warning must occur before the vehicle has exceeded 0.3 meter in departure. This range of when the LDW trigger must be activated is proposed to be reduced to ±0.3 meter. To pass the test, the vehicle must complete three out of five attempts. Furthermore, NHTSA proposes adding lane keep support as a new ADAS technology to NCAP.

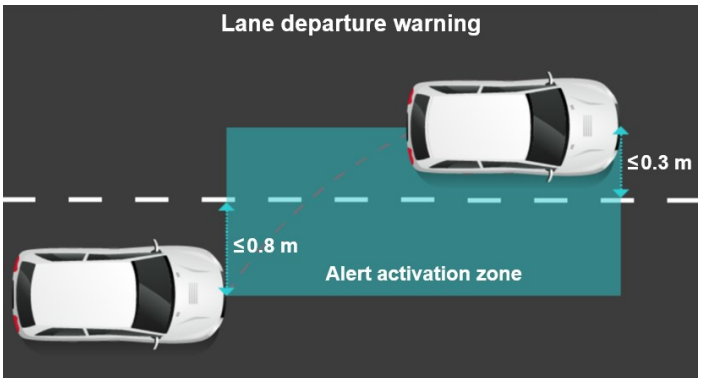

Figure 4 – Existing lane departure warning alert activation criteria

While LDW systems provide only a warning (acoustic, haptic, visual or a combination thereof), lane-keep support systems also gently bring the vehicle back to its lane by counter-steering or applying differential braking.

LeddarTech not only welcomes the lowering of the LDW trigger threshold but also encourages NHTSA and the industry to introduce inclement weather and day and night performance testing. Road users must always be protected, especially when driving conditions are challenging, e.g., in the presence of snow, rain or fog, or in poor lighting conditions. LeddarTech aims to make ADAS and AD safer and smarter by providing a low-level sensor fusion and perception solution that delivers superior detection, perception and classification performance. The software supports all SAE autonomy levels by fusing the raw data from sensors employed in L2 to L5 applications.

LeddarTech Solutions for ADAS Implementation

LeddarVision™ is a flexible, robust, cost-effective software stack that delivers highly accurate 3D environmental models. This scalable, sensor-agnostic perception platform leverages AI and computer vision algorithms to fuse the sensors' raw data, resulting in superior performance in adverse weather conditions and in detection of small objects. LeddarTech's use of raw data fusion results in fewer false alarms than legacy "object fusion" solutions. Of all the submissions made between 2019 and 2021 to nuScenes, LeddarVision's RCF360v2 is the top-ranking radar/camera solution for 3D object detection. LeddarVision is a key enabler for OEMs and Tier 1 suppliers by enabling the efficient development of L2, L2+ and L3 ADAS features that exceed NCAP performance requirements.

For more information:

LeddarVision software stack

Raw data sensor fusion White Paper

Performance video

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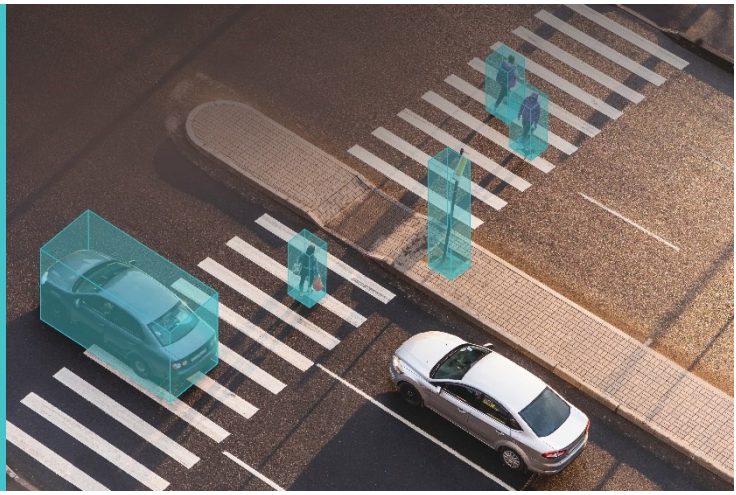
About LeddarTech

A global software company founded in 2007 and headquartered in Quebec City with additional R&D centers in Montreal, Toronto and Tel Aviv, Israel, LeddarTech develops and provides comprehensive AI-based low-level sensor fusion and perception software solutions that enable the deployment of ADAS, autonomous driving (AD) and parking applications. LeddarTech's automotive-grade software applies advanced AI and computer vision algorithms to generate accurate 3D models of the environment to achieve better decision making and safer navigation. This high-performance, scalable, cost-effective technology is available to OEMs and Tier 1-2 suppliers to efficiently implement automotive and off-road vehicle ADAS solutions. LeddarTech is responsible for several remote-sensing innovations, with over 150 patent applications (80 granted) that enhance ADAS, AD and parking capabilities. Better sensory awareness of the environment around the vehicle is critical in making global mobility safer, more efficient, sustainable and affordable: this is what drives LeddarTech to seek to become the most widely adopted sensor fusion and perception software solution.

For more information: sales@leddartech.com



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