SURFACE VEHICLE INFORMATION REPORT

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(R) Active Safety Systems Terms and Definitions

RATIONALE

As the number of active safety system equipped motor vehicles has increased, the number of terms, abbreviations, and acronyms that describe these systems has increased. For the sake of industry standardization of engineering terms and definitions, the SAE Active Safety Systems Standards Committee prepared this document. Updates in this revision include additional features and their definition and revised wording for several features that were previously defined. These definitions were revised to include a basic definition along with additional detail and detail on the features.

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1. SCOPE

This SAE Technical Information Report provides a compendium of terms, definitions, abbreviations, and acronyms to enable common terminology for use in engineering reports, diagnostic tools, and publications related to active safety systems. This information report is a survey of active safety systems and related terms. The definitions offered are descriptions of functionality rather than technical specifications. Included are warning and momentary intervention systems, which do not automate any part of the dynamic driving task (DDT) on a sustained basis (SAE Level 0 as defined in SAE J3016), as well as definitions of select features that perform part of the DDT on a sustained basis (SAE Level 1 and 2).

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J3016 Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles

2.1.2 ISO/ANSI Accredited Publications

Copies of these documents are available online at http://webstore.ansi.org/.

ISO 11067:2015 Intelligent Transport Systems - Curve Speed Warning Systems (CSWS) - Performance Requirements and Test Procedures

ISO 11270:2014 Intelligent Transport Systems - Lane Keeping Assistance Systems (LKAS) - Performance Requirements and Test Procedures

ISO 15622:2018 Intelligent Transport Systems - Adaptive Cruise Control Systems - Performance Requirements and Test Procedures

ISO 15623:2013 Intelligent Transport Systems - Forward Vehicle Collision Warning Systems - Performance Requirements and Test Procedures

ISO 16787:2017 Intelligent Transport Systems - Assisted Parking System (APS) - Performance Requirements and Test Procedures

ISO 17361:2017 Intelligent Transport Systems - Lane Departure Warning Systems - Performance Requirements and Test Procedures

ISO 17386:2010 Intelligent Transport Systems - Manoeuvring Aids For Low Speed Operation (MALSO) - Performance Requirements and Test Procedures

ISO 17387:2008 Intelligent Transport Systems - Lane Change Decision Aid Systems (LCDAS) - Performance Requirements and Test Procedures

ISO 19237:2017 Intelligent Transport Systems - Pedestrian Detection and Collision Mitigation Systems (PDCMS) - Performance Requirements and Test Procedures

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ISO 19638:2018 Intelligent Transport Systems - Road Boundary Departure Prevention Systems (RBDPS) - Performance Requirements and Test Procedures

ISO 20900:2019 Intelligent Transport Systems - Partially Automated Parking Systems (PAPS) - Performance Requirements and Test Procedures

ISO 21717:2018 Intelligent Transport Systems - Partially Automated In-Lane Driving Systems (PADS) - Performance Requirements and Test Procedures.

ISO 22078:2020 Intelligent Transport Systems - Bicyclist Detection and Collision Mitigation Systems (BDCMS) - Performance Requirements and Test Procedures

ISO 22839:2013 Intelligent Transport Systems - Forward Vehicle Collision Mitigation Systems - Operation, Performance, and Verification Requirements

ISO 22840:2010 Intelligent Transport Systems - Devices to Aid Reverse Manoeuvres - Extended-Range Backing Aid Systems (ERBA)

3. FEATURE ABBREVIATIONS

ACC Adaptive Cruise Control

AEB Automatic Emergency Braking

AES Automatic Emergency Steering

BSW Blind Spot Warning

FCW Forward Collision Warning

HUD Head-Up Display

LDW Lane Departure Warning

LKA Lane Keeping Assistance

PCW Parking Collision Warning

4. GENERAL ABBREVIATIONS AND DEFINITIONS

4.1 Active Safety Systems

Active safety systems are vehicle systems that sense and monitor conditions inside and outside the vehicle for the purpose of identifying perceived present and potential dangers to the vehicle, occupants, and/or other road users, and automatically intervene to help avoid or mitigate potential collisions via various methods, including alerts to the driver, vehicle system adjustments, and/or active control of the vehicle subsystems (brakes, throttle, suspension, etc.).

NOTE: For purposes of this report, systems that meet the definition of active safety systems are considered to have a design purpose focused on improving safety, comfort, convenience, or other driver assistance. Active safety systems warn or intervene during a maneuver or a high risk event.

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4.2 Dynamic Driving Task (DDT)

All of the real-time operational and tactical functions required to operate a vehicle in on-road traffic, excluding the strategic functions such as trip scheduling and selection of destinations and waypoints, and including without limitation:

- Lateral vehicle motion control via steering (operational);
- Longitudinal vehicle motion control via acceleration and deceleration (operational);
- Monitoring the driving environment via object and event detection, recognition, classification, and response preparation (operational and tactical);
- Object and event response execution (operational and tactical);
- Maneuver planning (tactical); and
- Enhancing conspicuity via lighting, signaling and gesturing, etc. (tactical).

Refer to SAE J3016.

4.3 Subject Vehicle

The vehicle that contains the active safety system.

5. SYSTEM TERMS AND DEFINITIONS

This section contains terms and definitions related to active safety systems and comfort and convenience-oriented driver assistance systems. The definitions are not meant to replace an automaker's proprietary system or package names, but rather to help identify key functions and capabilities within those packages and provide clarity to industry, governmental entities, and consumers.

Most features that provide a warning or intervention action contain a means to estimate if the driver would benefit from the action or not. In certain circumstances, based on driver inputs, a particular warning, or intervention action could be suppressed before it occurs or could terminate early (overridden).

In addition, many features can be tailored to the driver's preference. Many of the timings for warnings and motion control can be adjusted or shut off entirely. Such customizations may be remembered over subsequent ignition cycles or they may revert back to the default setting.

Where actions described for system definitions in this document are dependent on traffic, weather, and roadway sensing, those actions should be understood as probabilistic, rather than deterministic. Systems are intended to notify, alert, intervene, or control, but sensing may not correctly interpret the driving environment in all cases, and these actions may not occur or may occur unnecessarily. The systems are intended to support drivers in driving, not replace them.

Where new definitions have been developed, terms from the prior version of this document are provided for reference under "includes."

5.1 Collision Warning

Collision warnings provide alerts to the driver; they do not perform interventions to prevent possible collisions.

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5.1.1 Blind Spot Warning (BSW)

Detects vehicles in the blind spot while driving and notifies the driver to their presence. Some systems provide an additional warning if the driver activates the turn signal.

NOTE 1: The blind spot is an area to the side and rear of the subject vehicle in an adjacent lane.

NOTE 2: This notification is most often visual and typically is found on the corresponding A-pillar or side mirror.

Variants:

- Some systems provide an additional warning (e.g., audible or haptic) if the driver activates the turn signal in the direction of a vehicle detected to the side and the rear of the subject vehicle and moving in the same direction as the subject vehicle. Some systems provide a warning if there is a vehicle quickly approaching the blind spot from behind

Refer to ISO 17387:2008.

Includes:

- Lane change decision aid systems (LCDAS).

5.1.2 Forward Collision Warning (FCW)

Detects a potential collision with a vehicle ahead and alerts the driver. Some systems also provide alerts for pedestrians or other objects.

NOTE 1: Alerts are provided typically for other vehicles seen moving in the same direction in the path of travel.

NOTE 2: This warning is typically multimodal, and can include an auditory alert, visual alert, haptic vibration, kinesthetic cue (for example, braking vibration, steering vibration, or seat vibration), or any combination thereof.

Variants:

- Some systems provide alerts for pedestrians, cyclists, and/or large animals.
- Systems present the visual warning in different locations, such as the instrument cluster or a head-up display.
- Some systems provide an alert for a vehicle crossing the path of travel or oncoming traffic.

Refer to ISO 15623:2013.

Includes:

- Forward vehicle collision warning systems (FVCWS).
- Cross traffic alert (in front of vehicle, for vehicles approaching from the side).
- Cooperative intersection collision avoidance systems (CICAS).

5.1.3 Lane Departure Warning (LDW)

Monitors vehicle’s position within the driving lane and alerts driver as the vehicle approaches or crosses lane markers.

NOTE: This warning is typically multimodal, and can include an auditory alert, visual alert, haptic vibration, or any combination thereof.

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Variants:

- Some systems also provide a warning when the vehicle approaches or crosses the road edge in the absence of lane markers.
- Some systems provide a warning for oscillations or drifting within the driving lane.

Refer to ISO 17361:2017.

Includes:

- Lane sway warning.

5.1.4 Parking Collision Warning (PCW)

Detects objects close to the vehicle during parking maneuvers and notifies the driver.

Variants:

- Some systems only provide warnings corresponding to the rear of the vehicle, others provide front and rear, while others provide warnings all around.
- Some systems provide progressive warnings.
- Some systems provide a longer detection range to the rear.

Refer to ISO 17386:2010 and ISO 22840:2010.

Includes:

- Backup aids.
- Backup warning systems.
- Extended range backing aid (ERBA).
- Maneuvering aid for low speed operation (MALSO).

5.1.5 Rear Cross Traffic Warning

Detects vehicles approaching from the side at the rear of the vehicle while in reverse gear and alerts the driver. Some systems also warn for pedestrians or other objects.

Includes:

- Cross traffic alert (behind subject vehicle, for vehicles approaching from the side).

5.2 Collision Intervention

Collision intervention systems provide momentary intervention during potentially hazardous situations. Depending on the situation, the collision intervention system intervention may result in collision avoidance or it may result in a reduction in the severity of the collision. Due to the momentary nature of the actions of these systems, their intervention does not change or eliminate the role of the driver.

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5.2.1 Automatic Emergency Braking (AEB)

Detects potential collisions with a vehicle ahead, provides forward collision warning, and automatically brakes to avoid a collision or lessen the severity of impact. Some systems also detect pedestrians or other objects.

NOTE 1: Automatic braking is typically provided for other vehicles seen moving in the same direction in the path of travel.

NOTE 2: These systems provide braking without driver input and they also increase the vehicle braking beyond that commanded by the driver when the system senses the driver-initiated braking is not sufficient to avoid a crash.

Variants:

- Some systems provide braking for pedestrians, cyclists, and/or large animals in various paths of travel.
- Some systems provide braking for a vehicle crossing the path of travel or oncoming traffic.
- Some systems also reduce the acceleration available to the driver when a potential collision is detected.

Refer to ISO 22839:2013, ISO 19237:2017 (pedestrians), and ISO 22078:2020 (cyclists).

Includes:

- Brake assist systems.
- Dynamic brake support (DBS).
- Forward vehicle collision mitigation systems (FVCMS).
- Pedestrian collision mitigation systems (PCMS).
- Pre-collision throttle management.

5.2.2 Automatic Emergency Steering (AES)

Detects potential collisions with a vehicle ahead and automatically steers to avoid or lessen the severity of impact. Some systems also detect pedestrians or other objects.

NOTE: Automatic steering is typically provided in response to other vehicles seen moving in the same direction in the path of travel.

Variants:

- Some systems increase the vehicle steering beyond that commanded by the driver when the system senses the driver-initiated steering is not sufficient to avoid a crash.
- Some systems provide steering without driver input.
- Some systems intervene while staying within the lane.
- Some systems intervene for pedestrians, cyclists, and/or large animals in various paths of travel.
- Some systems provide steering for a vehicle crossing the path of travel or oncoming traffic.

Includes:

- Automatic evasive steering systems.

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5.2.3 Reverse Automatic Emergency Braking

Detects potential collisions while in reverse gear and automatically brakes to avoid or lessen the severity of impact. Some systems also detect pedestrians or other objects.

NOTE: These systems typically provide automatic braking with or without driver braking.

Variants:

- Some systems provide braking for pedestrians or other objects. Some systems provide braking for crossing traffic while reversing.

5.2.4 Blind Spot Collision Intervention

Detects potential collisions with adjacent vehicles and automatically steers and/or brakes to avoid or lessen the severity of impact.

Variants:

- Some systems only intervene if the driver engages the turn signal in the direction of the adjacent vehicle.
- Some systems intervene when there are adjacent vehicle(s) that may be in the subject vehicle's blind spot.
- Some systems intervene when there are adjacent vehicle(s) that are ahead of the subject vehicle.
- Some systems intervene for vehicles that are quickly approaching the blind spot from behind.

5.3 Driving Control Assistance

Driving control assistance systems provide sustained support to the driver during the dynamic driving task (DDT). They provide assistance to the driver, up to partial automation of the driving task. The driver performs the rest of the DDT, continually supervises the performance of the system, and has the authority to override the system at any time.

5.3.1 Adaptive Cruise Control (ACC)

Cruise control that also assists with acceleration and/or braking to maintain a driver-selected gap to the vehicle in front. Some systems can come to a stop and continue while others cannot.

Variants:

- Some adaptive cruise control systems will bring the vehicle down to a low speed before disengaging, while others are able to bring the vehicle down to a stopped condition.
- Some systems will adjust the set speed based on the detected speed limits.
- Some systems will react to traffic signals and stop signs.
- Some systems are able to maintain a driver selected gap to other objects such as scooters and pedalcyclists.

Refer to ISO 15622:2018.

5.3.2 Lane Keeping Assistance (LKA)

Provides steering support to assist the driver in preventing the vehicle from departing the lane. Some systems also assist to keep the vehicle centered within the lane.

NOTE: These systems typically provide steering assistance for detected lane markings.

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