Recommended Practice

RP 1801

VMRS Various

SELECTION AND SPECIFICATION OF ADVANCED DRIVER ASSISTANCE SYSTEMS (ADAS)

PREFACE

The following Recommended Practice is subject to the Disclaimer at the front of TMC's *Recommended Engineering Practices Manual*. Users are urged to read the Disclaimer before considering adoption of any portion of this Recommended Practice.

PURPOSE AND SCOPE

This Recommended Practice (RP) offers general guidelines for the selection and specification for Advanced Driver Assistance System (ADAS) technologies available on commercial vehicles in North America. For specific details pertaining to a particular manufacturer's product, consult the original equipment manufacturer's service information.

GENERAL INFORMATION

As of this writing, ADAS technologies and functionalities are generally available through many North American manufacturers of equipment. These systems include offerings such as Bendix Wingman, Daimler Detroit Assurance, Volvo Active Driver Assist (VADA), and ZF/WABCO OnGuard/OnSide/OnLane. These systems, and others like them, have great potential to improve safety and operational efficiency, based on industry performance research.

In cooperation with the Federal Motor Carrier Safety Administration (FMCSA), ATA's Technology & Maintenance Council (TMC) and other industry stakeholders have cooperated under FMCSA's Tech-Celerate Now Program to increase awareness, acceptance and adoption of ADAS technologies. The Tech-Celerate Now program has concentrated on four general performance categories of ADAS which have the most potential to prevent fatalities, injuries, and crashes:

- ***Braking Systems*** — including automatic emergency braking (AEB), and adaptive cruise control systems (ACC),
- ***Steering Systems*** — including lane keep assist (LKA), lane centering (LCA), Blind Spot Assist (BSA) and adaptive steering control (ASC),
- ***Warning Systems*** — including lane departure (LDW), forward collision (FCW), and blind spot detection (BSW), and;
- ***Monitoring Systems*** — including driver- and road-facing cameras for driver training, and camera-based mirror systems, auto wipers and adaptive headlights for enhancing driver field-of-view.

For more detailed information regarding the defined functions of various ADAS technologies and commonly used names and acronyms, see TMC RP 547, *Nomenclature Guide To Advanced Driver Assistance System (ADAS) Technologies*.

METHODOLOGY

This RP presents a process through which a fleet can evaluate the potential benefits of the various ADAS systems and technology options available against its own specific fleet operational profile. Active dialogue between fleets and manufacturers is key to ensuring that the technologies and parameters set for ADAS systems will have the most benefit to safety, reliability and performance. This RP offers a two-step process — consisting of a fleet self-assessment evaluation, and a technology evaluation matrix.

FLEET EVALUATION

A critical part of selecting and specifying ADAS is an evaluation of the fleet's operating profile and identification of safety exposures (both actual and potential). This is important in determining the areas where incorporation of an ADAS component or performance characteristic may have the greatest impact on reduction of frequency and severity of accidents or exposures to accident-causing factors.

In conducting this assessment, a fleet may use its own/insurer accident and loss data, industry-wide data, driver, technician, supervisor interviews, publicly available resources (such as the Tech-Celerate Now program at *https://www.fmcsa.dot.gov/Tech-CelerateNow*).

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Some factors that can be used in conducting the assessment can include:

- fleet size,
- operational demographics,
  - local pickup and delivery (P&D)
  - on-highway (e.g., regional/super-regional long haul)
  - vocational
- hours of operation (day/night),
- prevailing weather/climate,
- prevailing traffic conditions,
- crash/loss history/Incidents/near misses,
  - interaction with vehicles ahead
  - lane departure
  - roadway departure
  - rollover/stability
  - driver/in-cab visibility
  - driver inattention
  - backing
  - cross traffic
  - pedestrian/non-vehicular user
- driver experience,
- prior fleet experience with ADAS,
- industry experience with ADAS,
- ADAS experience in similar fleets,
- insurance experience
- situational weather,
- terrain, and;
- vehicle pitch and yaw.

An example of a Fleet Evaluation Survey is presented in **Appendix I.**

ADAS TECHNOLOGY EVALUATION MATRIX

ADAS system suppliers and vehicle OEMs work closely together to develop vehicle specifications for the expected uses of various models which the OEM offers to the market. Accordingly, ADAS features and parameters vary from model to model, even within a single supplier's system.

An important element of successful ADAS deployment is ensuring drivers experience ADAS reactions in a manner corresponding to the training they receive when it comes to expected system performance. Attaining this objective requires thoughtful vehicle specification and parameter settings that are meaningful in context the fleet's operational profile(s), as drivers move from one vehicle to another. For example, a fleet with multiple operational profiles may well have ADAS features and settings in a local P&D operation that differ in a hub-to-hub operation.

In order to create a vehicle specification or set of specifications that will attain maximum safety benefit, return on investment (ROI), reliability and maintainability, fleet managers should compare their needs to the various available ADAS features and performance settings and select those that will achieve the best results for a given application.

TMC recommends that once a fleet has established its ADAS needs, it should actively engage OEMs and suppliers regarding specification and preparation of the appropriate ADAS for the deliverable vehicles. A combination of fleet experience and OEM/ supplier expertise can best determine the optimum specification needed.

Appendix II presents an example matrix that can assist in taking the results of the fleet's needs assessment and mapping those needs against the ADAS components that present the best options for the desired potential safety and performance improvements.

The fleet can either use an empirical (quantitative) approach in completing the matrix, should it have sufficient detailed data available, or a more “subjective” (qualitative) approach based upon “hands-on” experience and interviews.

Vehicle specifications may vary based on operational needs. For example:

- A fleet which operates Class 8 straight trucks in a local P&D operation with little or no limited access highway driving may decide the key ADAS components to include are AEB, BSW, rear cross traffic assist (RCTA)and vulnerable road user detection (VRUD).
- A fleet which has a high percentage of rural road night driving and a history of off-road excursions may include ASC, LKA, road departure warning, and adaptive headlamps as its "must have" ADAS features.
- A fleet operating in a very rainy/wet or snowy regional operation may specify optional auto wipers to keep the ADAS cameras’ (and driver's) field of vision unobstructed without the need to constantly cycle the wiper control.
- A fleet with a high percentage of over-the-road driving with a crash history related to driver inattention may select a full suite of assistive (vs. warning) ADAS features along with ACC, camera rear vision and driver facing camera systems and warnings.
- A fleet with a high percentage of congested

traffic driving may specify driver adjustable following distance for ACC rather than a set parameter to enhance driver adaptation.

DRIVER TRAINING AND ACCEPTANCE

The methodology suggested in this RP has the additional benefit of assisting in driver training and adaptation/acceptance to ADAS technology implementation in the fleet. In researching the benefits of spec'ing various ADAS features and options, drivers will be able to see the direct, tangible, positive impact upon their equipment and driving environment. This impact is enhanced if the drivers themselves have been actively involved in the fleet evaluation survey.

REFERENCE

- RP 547, *Nomenclature Guide To Advanced Driver Assistance System Technologies*
- Tech-Celerate Now Program, Federal Motor Carrier Safety Administration, *https://www.fmcsa.dot.gov/Tech-CelerateNow*

APPENDIX I
SAMPLE FLEET EVALUATION SURVEY

A. Fleet Demographic (Number of Vehicles)

Class/Type	Age: 0-3 years ADAS/Retrofittable	Age: 3-6 years ADAS/Retrofittable	Age: 6-9 years ADAS/Retrofittable	Age: > 9 years ADAS/Retrofittable
Class 8: Tractor Straight Vocational				
Class 7: Tractor Straight Vocational				
Class 6				
Class 5				
Class 4				

B. Operations Demographic (Miles/Percentage/Hours?)

Class/Type	**Local P&D/Urban**	**Limited Access/ Over-the-road congested**	**Limited Access/ Over-the-road open**	**Rural roads**
Class 8: Tractor Straight Vocational				
Class 7: Tractor Straight Vocational				
Class 6				
Class 5				
Class 4				

Operating Environment

Class/Type	**C. Hours of Operation (% Day/Night)**	**D. Prevailing Weather**	**E. Prevailing Traffic Conditions**
Class 8: Tractor Straight Vocational			

(Continued)

Class/Type	C. Hours of Operation (% Day/Night)	D. Prevailing Weather	E. Prevailing Traffic Conditions
Class 7: Tractor Straight Vocational			
Class 6			
Class 5			
Class 4			

NOTE: Correllate F through M based on the fleet's operations demographic.

F. Accidents/loss history/Incidents/near misses

- Interaction with vehicles ahead
- Lane departure
- Roadway departure
- Rollover/stability
- Driver/in-cab visibility
- Driver inattention
- Backing
- Cross traffic
- Pedestrian/non-vehicular user

G. Driver experience

H. Prior fleet experience with ADAS

I. Industry experience with ADAS

J. ADAS experience in similar fleets

K. Insuranace implications

- ADAS related credits/premium adjustments
- Potential SIR/deducticle impacts

L. Situational Weather

M. Terrain

N. Vehicle Pitch and Yaw

APPENIDX II
SAMPLE ADAS TECHNOLOGY EVALUATION MATRIX

(Rate on potential impact of technology on mitigating causation exposure — qualitative or quanitiative)

ADAS Technology	Interaction With Vehicles Ahead	Lane/ Roadway Departure	Cross Traffic	Backing and Pedestrian	Driver Visibilty/ Inattention
Braking: ACC/ISA AEB HSA HDC FCTB RCTB TSR					
Steering: BSA LC LKA/RDA					
Warning: BSM FCW FCTA LDW/RDW RDW RCTA TLI TPMS					
Monitoring: Adaptive Headlamps Bird's Eye View Camera Driver Facing Camera/Drowsiness HBA/Auto Headlamp CameraRear/Side Vision Rain Sensor/Auto-Wiper TSR VRUD					

Key to Acronyms:

ACC/ISA	Adaptive Cruise Control/Intelligent Speed Assist
AEB	Automatic Emergency Braking
BSA	Blind Spot Assist
BSM	Blind Spot Monitoring
FCTA	Forward Cross Traffic Alert
FCTB	Front Cross Traffic Braking
FCW	Forward Collision Warning
RCTB	Rear Cross Traffic Braking
LC	Lane Centering
LDW/RDW	Lane Departure Warning/Rpadway Departure Warning
LKA/RDA	Lane Keeping Assist/Roadway Departure Assist
RCTA	Rear Cross Traffic Alert
TLI	Traffic Light Indicator
TPMS	Tire Pressure monitoring System
TSR	Traffic Signal Recognition/Response
VRUD	Vulnerable Road User Detection