



DATA ELEMENTS FOR DSSAD ALIGNMENT

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Introduction

- » Purpose: Support the identification of **triggers and data elements for DSSAD**
 - Alignment with Japanese approach
 - Technical definition of single data elements
- » European approach: VMAD occurrences
 - Answer to VMAD occurrences (for each occurrence questions are asked, which need to be answered by data elements)
- » Japanese approach: two main categories (with four sub-categories)
 - ADS Status
 - Activation/deactivation, Transition of control, Fallback to an MRC, Detected severe failure, EDR trigger input,
 - ADS Behavior
 - [Perception] - Detected Objects
 - [Judgement] - Feature activation/end/abortion
 - [Control] - Control signal to the steering, brake etc.
 - [Dynamics] - Velocity, acceleration, yaw rate

Alignment Process

- » 1. Discussion on Occurrences
 - Exclude Occurrence 1.e (Cybersecurity-related occurrences) → already in Regulation R155
 - Discussion on Occurrence 1.d (Communication-related occurrences) → will be discussed in ADS IWG beginning of next year
 - Questions on Occurrence 3.b (ADS maintenance and repair problems) and 3.e (unauthorized modifications) → is this part of DSSAD? Still under review

- » 2. Discussion on Data elements
 - 1. Identification of redundant information → exclusion of some data elements
 - 2. Technical discussion on all remaining data elements
 - 3. Checking and aligning naming of data element

- » 3. Current Status
 - Harmonised overview of data elements (time stamp and time series) for remaining Occurrences

Harmonisation of time stamp data elements

			1.a. Safety critical occurrences detected by ADS which also includes near misses	1.b. Occurrences related to ADS operation outside its Operational Design Domain (ODD)	1.c. ADS failure to achieve a minimal risk condition (MRC) when necessary	1.d. Communication - related occurrences	1.e. Cybersecurity-related occurrences (if it is being detected)	2.a. Fallback user unavailability (where applicable)	2.b. Occurrences related to transfer of control failure	2.c. Prevention (delay) of takeover under unsafe conditions (definition of what unsafe conditions are?)	3.a. Occurrences related ADS failure	3.b. ADS maintenance and repair problems	3.c. Occurrences related to unauthorized modifications (is this a function of the DSSAD?)
Table: Data elements of time-stamp data													
	Event	Additional Information	Recording condition										
Status	Activation of the system		x		x	x	(x)	x	x	x	x	x	x
Status	Deactivation of the system	Deactivation due to (i) Use of dedicated means for the driver/operator to deactivate the system; (ii) by fallback user (if applicable)	x										
Status	Transition of control to the fallback user, if applicable	Transition of control due to (i) Planned event; (ii) Unplanned event; (iii) fallback user unavailability (iv) fallback user not present or unbuckled (v) System failure (vi) System override							x				
Status	Prevention of takeover under unsafe conditions, if applicable									x			
Status	Start of Emergency Manoeuvre;				x				x	x	x		
Status	End of Emergency Manoeuvre;				x				x	x	x		
Status	Event Data Recorder (EDR) trigger input		x										
Status	Detected collision		x										
Status	Execution of a fallback to an MRC	MRC necessary because (i) exit of ODD (ii) ADS failure (iii) collision detected	x		x								
Status	Failure to achieve a MRC		x		x								
Status	Detected severe failure	The failure is occurred on (i) ADS / Sensor (ii) vehicle	x		x	x			x	x	x	x	x
Status	[Interaction with remote operator, if applicable]					x							
Status	[Communication with remote operator, if applicable]								x				
Judgement	ADS [feature/manoeuvre] activation		x						x				
Judgement	Abortion of ADS [feature/manoeuvre]		x						x				
Judgement	End of ADS [feature/manoeuvre]		x						x				

Harmonisation of time series data elements

1.a. Safety critical occurrences detected by ADIS which also includes near misses	1.b. Occurrences related to ADIS operation outside its Operational Design Domain (ODD)	1.c. ADIS failure to achieve a minimal risk condition (MRC) when necessary	1.d. Communication-related occurrences	1.e. Cybersecurity-related occurrences (if it is being detected)	2.a. Fall-back user unavailability (where applicable)	2.b. Occurrences related to transfer of control failure	2.c. Prevention (delay) of takeover under unsafe conditions (definition of what unsafe conditions)	3.a. Occurrences related to ADIS failure	3.b. ADIS maintenance and repair problems	3.c. Occurrences related to unauthorized modifications (is this a function of the ISSAD?)
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Table: Data elements of time-stamp data

	Data element	Condition for requirement	Recording interval/time (relative to time zero)	Data sample rate (samples per second)	Event(s) recorded for	Note													
Perception	Detected object distance, longitudinal	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input	Each object should be recorded independently accompanied with unique	*		*			*	*						
Perception	Detected object distance, lateral	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input	Each object should be recorded independently accompanied with unique	*		*			*	*						
Perception	Detected object relative velocity, longitudinal	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input	Each object should be recorded independently accompanied with unique	*		*			*	*						
Perception	Detected object relative velocity, lateral	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input	Each object should be recorded independently accompanied with unique	*		*			*	*						
Perception	[Detected object classification]	Mandatory if utilized for system responses	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input	Each object should be recorded independently accompanied with unique	*		*			*	*						
Perception	[GNSS positioning]	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*	*	*	*	*	*	*						
Control	Accel command	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*												
Control	Brake command	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*												
Control	Steer command	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*												
Control	Indicator command	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*												
Dynamics	Vehicle acceleration,	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*	*	*	*	*	*	*	*	*	*	*	*	*
Dynamics	Vehicle acceleration, lateral	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*	*	*	*	*	*	*	*	*	*	*	*	*
Dynamics	Vehicle yaw rate	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*	*	*	*	*	*	*	*	*	*	*	*	*
Dynamics	Vehicle indicated speed	Mandatory	-[x] to 0 sec	[TBC]	Detected collision EDR trigger input		*												

Next steps

- » Some comments are still open
 - E.g. GNSS position → this data element is inaccurate
 - Emergency manoeuvre is not defined in detail
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- » Technical definition of data elements is open
 - Recording interval for time series data elements
 - Data sample rate for times series data elements
- » Discussion on further data elements, existing data elements with the background of checking completeness/overengineering
- » Discussion on open questions on Occurrences for DSSAD, especially 3.b and 3.c
- » Discussion on Triggers for all data elements related to DSSAD → not yet started