

# FRAV Task: Response to the Request from EDR/DSSAD

Input for FRAV consideration towards responding to the EDR/DSSAD  
request for FRAV views on data recording for ADS vehicles

# FRAV Starting Points

1. **ADS should drive safely.** (Ensure safe behavior of the ADS as “the driver”)
2. **ADS should interact safely with the user.** (Ensure safe use of ADS and safe interactions with the user such as transfers of control, user override, etc.)
3. **ADS should manage safety-critical situations.** (Differentiate between normal driving and emergency situations to ensure safe responses to the latter)
4. **ADS should safely manage failure modes.** (Ensure safe responses to system malfunction, physical damage, etc.)
5. **ADS should maintain a safe operational state.** (Ensure safety throughout the useful life of the ADS, such as safety critical updates, response to obsolescence)

**FRAV’s starting point indicate areas where data relevant to ADS performance and user interactions seem relevant to safety.**

# Basic principles/observations

- Data recording requirements should address the diversity of ADS applications.
  - FRAV's "high-level approach" aims to cover all ADS.
  - Requirements should allow for differences in configurations (e.g., ADS may have different degrees of user interactions, if any at all).
- Data recording should support analysis of in-use ADS performance.
  - VMAD has agreed on an "in-service monitoring/reporting pillar" involving data collection.
  - FRAV's safety requirements for ADS should support the VMAD objectives.
- Data recording should support crash event reconstruction and analysis.
  - EDR/DSSAD has agreed that EDR addresses crash event reconstruction and analysis.
  - VMAD's "in-service" pillar also refers to this aspect.

# Two basic reasons for ADS data collection

- Accident (crash) analysis
  - Was the ADS driving safely at the time of the crash (correctly performing the DDT)?
  - Did the crash event involve a safety-critical situation (were other road users or elements factors in the crash)?
  - Was the ADS operating in a safe state (managing any failure modes, acceptable software version, etc.)?
- General (non-crash) ADS fleet performance (links to VMAD in-use performance)
  - Aggregated data to enable analysis (indications of inferior performance)
  - Identify possible areas for further research or investigation

**Contexts for crash analysis and operational performance data collection differ.**

# Three levels of data

- Basic vehicle performance data (same data as collected by conventional vehicle EDR)
- ADS DDT performance data
  - Since ADS is driver, data on ADS OEDR and driving performance in crash event
  - General aggregated ADS DDT performance data (e.g., frequency of evasive maneuvers, MRC stops,...)
- User interactions where applicable to the ADS vehicle design
  - ADS-user interactions relevant to crash event
  - Aggregated user interactions data (e.g., frequency of user interventions, ADS requests/warnings to user, ...)

**ADS have vehicle dynamics like all vehicles; however, ADS performance as the driver and ADS user interactions appear relevant.**

# Data Elements Matrix

Purpose of Data Collection	Applicability of Data	Data Set	General Description
Accident analysis/ reconstruction	All vehicles	A	Data on vehicle state/performance
	Conventional vehicles (no ADS)	B	Data on actuation of manual driver controls
	Vehicles equipped with an ADS	C1	ADS data on DDT performance
	Vehicles equipped with an ADS designed to interact with a user	C2	Data on user behavior/interactions with ADS
Evaluation of system operations/research/ assistance with accident analysis ( L3-L5)	Vehicles equipped with an ADS	D1	Non-crash ADS operational performance data
	Vehicles equipped with an ADS designed to interact with a user	D2	Non-crash user interactions with ADS

Elements in the data sets are mutually exclusive (i.e., no duplication) and may be combined depending upon the vehicle configuration, for example:

- Conventional (manual only) vehicle → A + B
- ADS with human driver controls → A + B + C1 + C2 + D1 + D2
- Driverless passenger vehicle → A + C1 + C2 + D1 + D2
- Driverless commercial vehicle (no occupants) → A + C1 + D1

# Open questions

- All vehicles presumably are equipped with EDR
  - Basic data set applicable to all vehicles
  - EDR focus on crash and crash-like events
  - Would ADS data relevant to crash and crash-like events be additional EDR data applicable to an ADS vehicle?
- If EDR is intended to address crash events, would DSSAD address operational performance?
  - Aggregated, anonymous data providing indicators of performance across ADS fleets?

# Basic recommendations

- Differentiate data requirements (ref. data elements matrix)
  - Crash versus non-crash (operational) data
  - Event reconstruction versus in-service monitoring
  - ADS driving performance versus ADS interactions with users
  - Applicable across all ADS versus applicable to some ADS
- Define clear data sets based on applicability to ADS configurations
  - Under the NATM, FRAV and VMAD need to know which data requirements apply to which ADS vehicles
- Ensure alignment with the FRAV and VMAD work
  - Terminology, safety objectives, NATM methods and procedures, etc.
  - Prioritize data sets and specifications to facilitate alignment with safety requirements