



# EU approach to assess ADS safety and applicability DCAS

ADAS TF #13

*EC-JRC*

*1 June 2022*

# The new EU ADS Regulation (2022)

**Commission Implementing Regulation** laying down rules for the application of Regulation (EU) 2019/2144 of the European Parliament and of the Council as regards uniform procedures and technical specifications for the type-approval of motor vehicles with regard to their automated driving system (ADS)

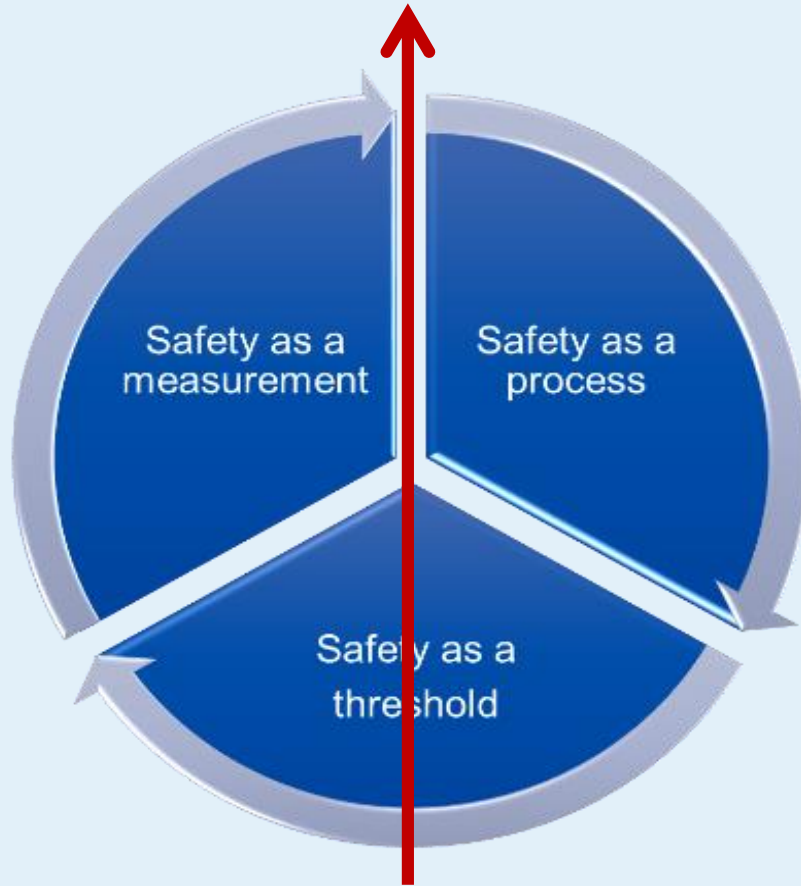
## **ANNEXES** to the Commission Implementing Regulation

- 1) Information Document
- 2) Performance Requirements
- 3) Compliance Assessment
  - PART 1 Traffic Scenarios
  - PART 2 Audit of SMS and safety assessment
  - PART 3 Tests
  - PART 4 Guidelines for the credibility assessment
  - PART 5 In-service reporting
- 4) EU Type approval certificate

Draft text available ([link](#))

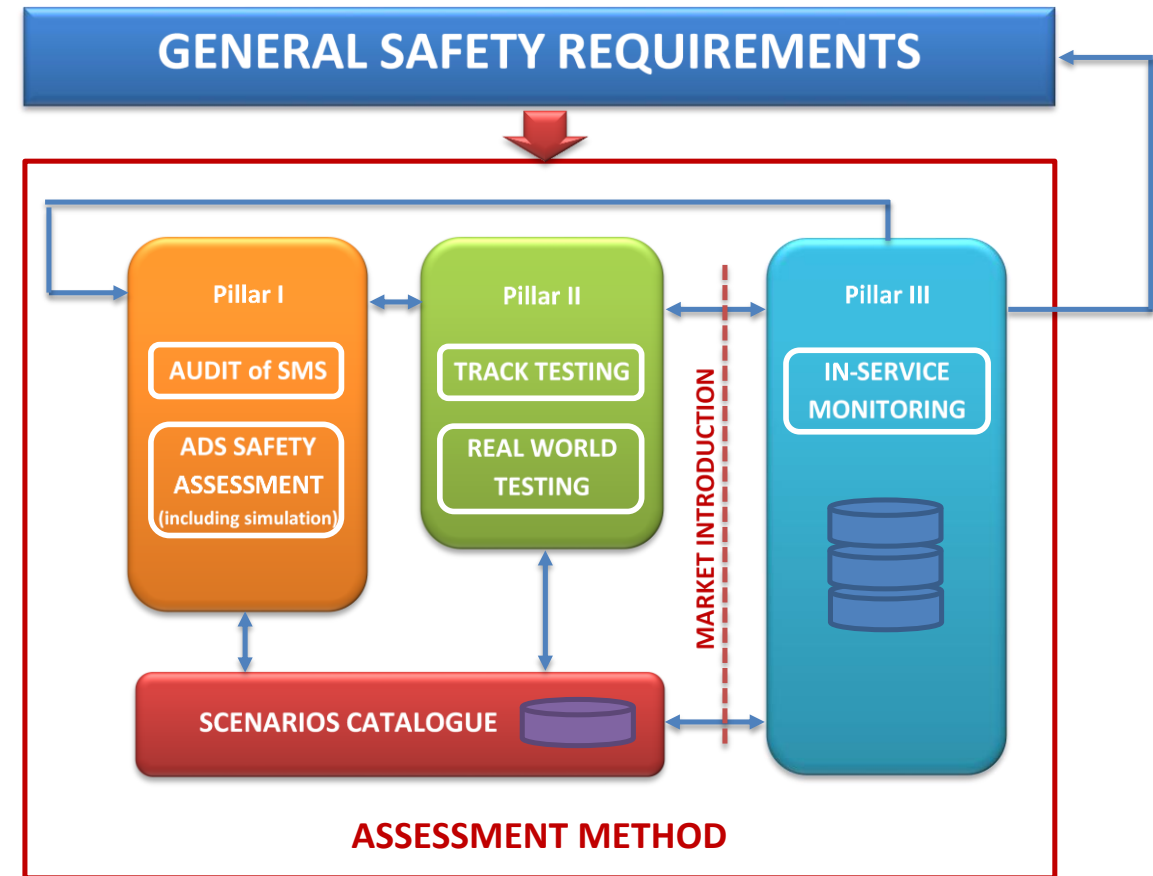
# Safety Requirements

VISION ZERO

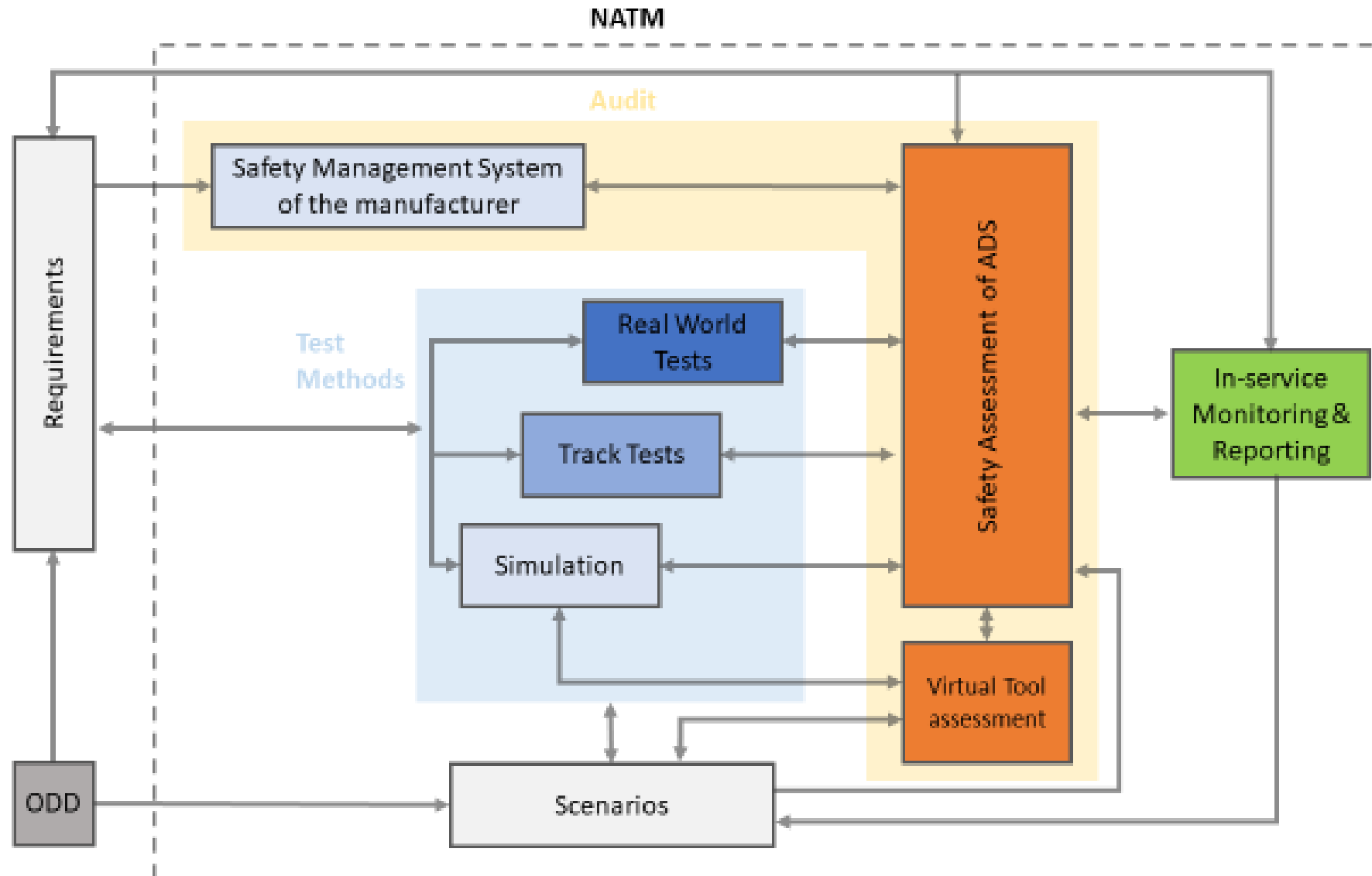


based on SoA performance

# New Assessment Method



# VMAD NATM



# Annex 1 – Information Document

To be submitted in 3 copies

Provides general and detailed information on the ADS, the design concept, validation process, data storage, cybersecurity, information to users

Does not contain sensitive information related to the safety analysis

Is part of the documentation package that will be shared with all TAAs

# Annex 2 – Performance Requirements

ADS performance is defined based on desired behaviour

- "Nominal Scenarios" (normal operation)
- "Critical Scenarios" (emergency operation)
- "ODD Boundaries"
- "Failure Scenarios"
- MRM
- Human-Machine Interaction

Functional and operational safety must be ensured

The **residual risk** is evaluated according to the declared acceptability criteria

# Annex 3 – Compliance Assessment

Part 1: The consideration of the most relevant scenarios for the ODD

Part 2: The assessment of the ADS design concept and the audit of the manufacturer safety management system.

Part 3: The tests of the most relevant traffic scenarios.

Part 4: The credibility assessment for using virtual toolchain to validate ADS

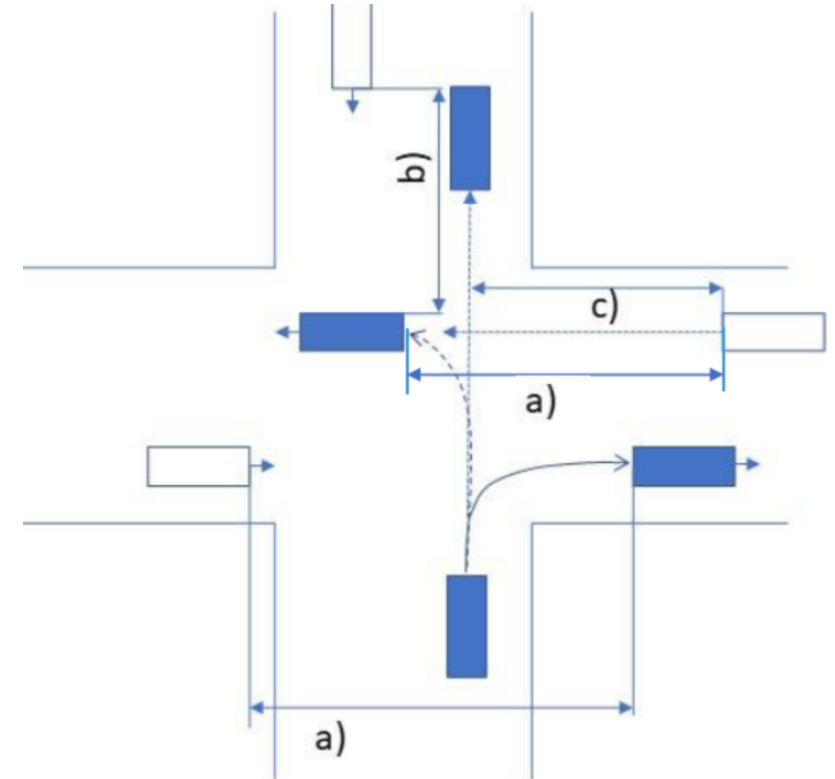
Part 5: The in-service reporting to demonstrate the safety performance in the field.

# PART 1: Scenarios

## Minimum set of scenarios

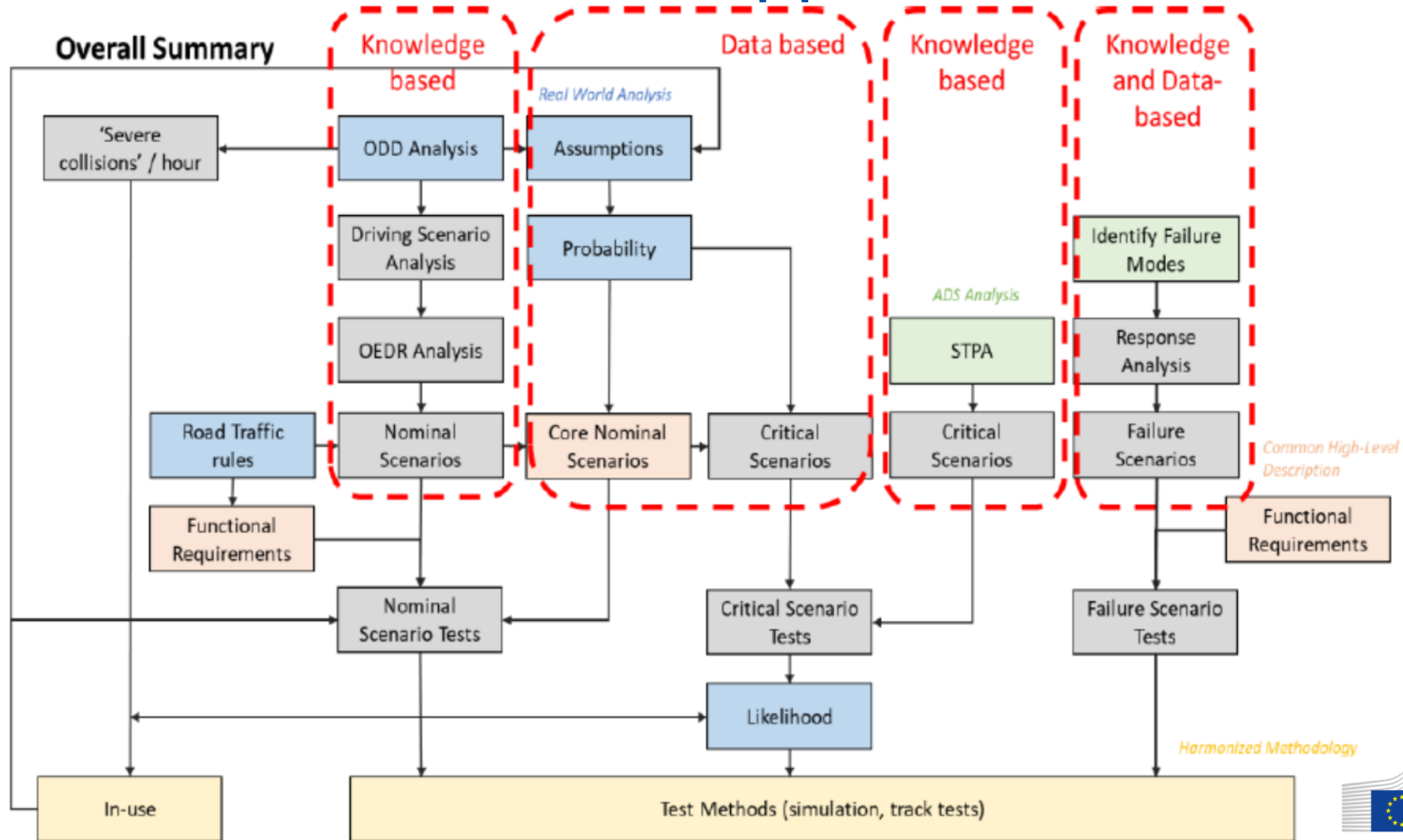
- Lane change
- Crossing, turning
- Emergency manoeuvre
- Pedestrian/cyclist crossing (urban&rural, motorway)
- Hub-to-hub (motorway entry, exit, toll station, ...)

Appendix 1: Methods to generate scenarios relevant to the ADS ODD and not covered in PART 1





# ODD-based scenarios approach



# PART 2 – AUDIT SMS & SAFETY ASSESSMENT

## SAFETY ASSESSMENT

The manufacturer shall provide a documentation package which gives access to the design and validation of the ADS.

## AUDIT of the SMS

The Manufacturer shall demonstrate that effective processes, methodologies, training and tools are in place, up to date and being followed within the organization to manage the safety and continued compliance throughout the ADS lifecycle.

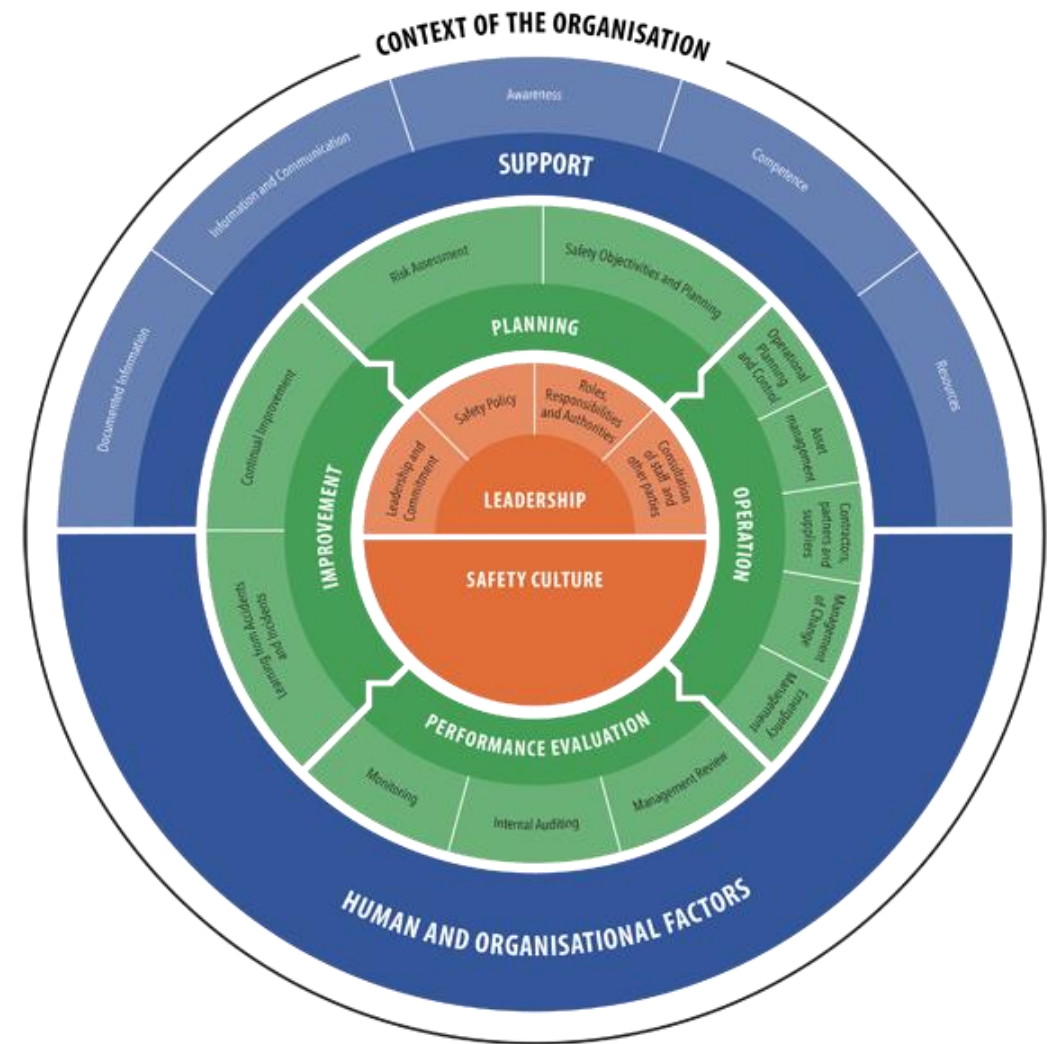
**Manufacturer's Declaration of Compliance for SMS**

**Certificate of Compliance for SMS** (by TAA/Technical Service)

# Process Audit



*to verify the maturity of the manufacturer's processes related to safety management and their correct implementation*



[European Railway Agency – European Union Safety Management System](#)



# ADS Safety Assessment

- The safety concept complies with the legislative requirements
- It has been correctly implemented into the design
- It has been validated (through virtual, track and real world testing)
- Is correctly documented
- **Assessment report** by Authority



# PART 3 - TESTS

- These tests shall confirm the minimum performance requirements
- Test results shall be documented and reported in accordance with point 6 of part 2
- Tests scenarios to assess the performance of the ADS **on a test track** (e.g. lane keeping and changing, response to road infrastructure, collision avoidance, cut-in, etc...)
- The ADS shall also be tested **on-road** in accordance with the applicable law of the Member State granting the type-approval and provided that tests can be carried out safely and without any risk to other road users.



# Physical testing

## TRACK TESTING

- Basic capabilities
- **Critical/emergency situations**
- Repeatability



## PUBLIC ROAD TESTING

- Final verification
- **Normal operation in real world**
- Representativeness

# PART 4 - CREDIBILITY ASSESSMENT

Principles for the credibility assessment for using virtual toolchain in ADS validation

The credibility assessment framework provides a general description of the main aspects considered for assessing the credibility of an M&S solution together with guidelines of the role played by third parties assessors in the validation process with respect to credibility.

Team's Experience and Expertise is also assessed

“Simulation Handbook” providing evidence of the credibility assessment

# Simulation and Virtual testing



- Simulation tools needed to tackle the complexity of ADS
- Lower testing cost/time, safer, repeatable...
- Tools/tool-chains validation and results reliability



# PART 5 – IN-SERVICE REPORTING

The manufacturer shall report relevant occurrences during ADS operation:

The manufacturer shall report within one month any short-term occurrences, as described in Appendix 1, which needs to be remedied by the manufacturer to the type-approval authorities, market surveillance authorities and the Commission

The manufacturer shall report every year to the type-approval authority that granted the approval on the occurrences listed in Appendix I. The report shall provide evidence of the ADS performance on safety relevant occurrences in the field.

# List of occurrences to be reported

OCCURRENCE	SHORT-TERM REPORTING [1 Month]	PERIODIC REPORTING [6 Month/1 Year]
1.a. Safety critical occurrences known to the ADS manufacturer or OEM	X	X
1.b. Occurrences related to ADS operation outside its ODD	X	X
1.c. ADS failure to achieve a minimal risk condition when necessary	X	X
1.d. Communication-related occurrences		X
1.e. Cybersecurity-related occurrences		X
1.f. Interaction with remote operator if applicable		X
2.a. Driver unavailability (where applicable) and other user-related occurrences		X
2.b. Occurrences related to Transfer of Control failure		X
2.c. Prevention of takeover under unsafe conditions		X
3.a. Occurrences related ADS failure		X
3.b. Maintenance and repair problems		X
3.c. Occurrences related to unauthorized modifications		X
3.d. Modifications made by the ADS manufacturer or OEM to address an identified and significant ADS safety issue		X
4. Occurrences related to the identification of new safety-relevant scenarios	X	X

# In-Service Monitoring and Reporting

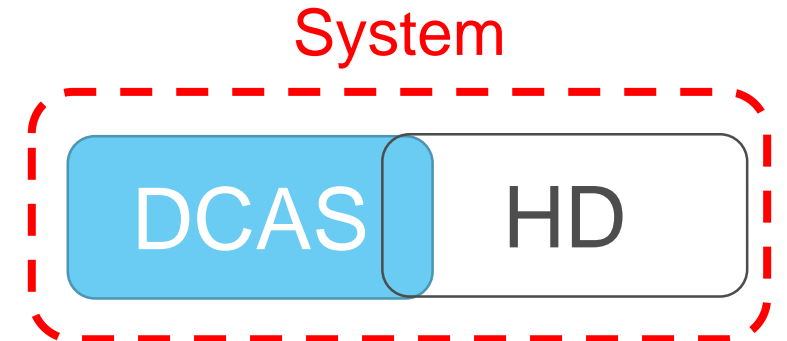


- **Learning from in-service data** is a central component to the safety potential of ADS
- **Guiding principle** that safety is of global concern and its improvement should not be limited by geographical or organizational borders (ECCAIRS)
- **Objectives:** Safety confirmation, scenarios generation, safety recommendations

# Conclusions (1/2)

Opportunities for application of ADS safety requirement to DCAS

- Actions initiated by DCAS
- Actions to prevent imminent collisions (e.g. classification from R157)
- Anticipatory behaviour
- String stability



# Conclusions (2/2)

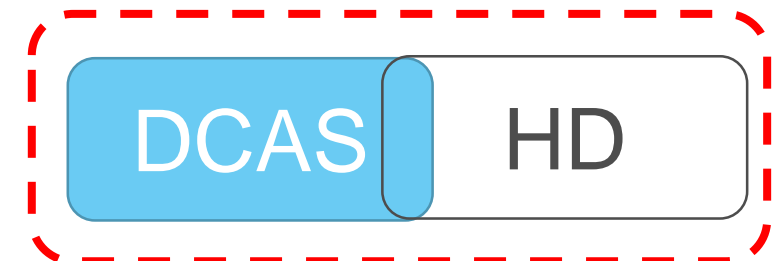
Opportunities for implementation of the safety assessment approach in DCAS

- **Scenarios database:** logical scenarios applicable, to be discussed
- **Audit and Assessment:** applicable with minor revision of the text
- **Physical testing:** confined vs public road, involving safety driver vs normal user, to be defined according to requirements
- **Simulation and Virtual testing:** credibility assessment is applicable
- **In-Service Monitoring and Reporting:** principles are relevant, new list of occurrences to be defined

System



System



# Thank you!



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