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

Safety as a measurement
Safety as a process
Safety as a threshold

based on SoA performance

New Assessment Method

GENERAL SAFETY REQUIREMENTS

Pillar I
AUDIT of SMS
ADS SAFETY ASSESSMENT (including simulation)

Pillar II
TRACK TESTING
REAL WORLD TESTING

Pillar III
IN-SERVICE MONITORING

SCENARIOS CATALOGUE

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

SAFETY CULTURE

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

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

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