



Real World Test Drive – OICA views

2018-06-05, Den Haag, TF AutoVeh, 1st meeting of the subgroup Real World Test Drive
Submitted by the experts of OICA

Road test for AVs: Understanding its role in the certification process

- What is the road test supposed to demonstrate? What is its role in the entire certification process?
- What is the suggested content?
- Which assessment approach is considered?
- How could the road test look like from a procedural and timing perspective?

WHAT IS THE ROAD TEST SUPPOSED TO DEMONSTRATE? WHAT IS ITS ROLE IN THE ENTIRE CERTIFICATION PROCESS (1/2)?



Hypothesis:

The road test is going to demonstrate the capability of the vehicle to adhere to traffic rules [and maneuvers according to the general expectations of other road users].

This capability is brought to the driving task currently by the experienced / approved driver.



WHAT IS THE ROAD TEST SUPPOSED TO DEMONSTRATE? WHAT IS ITS ROLE IN THE ENTIRE CERTIFICATION PROCESS (2/2)?

The road test is an integral building block in the assessment and certification of automated vehicles. That said it is not suggested that this is the only and only deciding criteria for certification.

The road test is going to address typical / normal traffic scenarios that a human driver is exposed to on a regular basis.

After this road test the generic „competence“ of the vehicle is documented to adhere to traffic rules and the assessor has the ability to declare if it moves in traffic without becoming an obstacle.

WHAT IS THE SUGGESTED CONTENT?

Hypothesis:

Automated/ autonomous vehicle will not operate at the beginning under all conditions and on all roads. The initial focus will be on the use cases called „highway“ and „urban“ driving.

Consequently, the content of the road test will have to be adjusted to these use cases (i.e. test scenarios of traffic situations).

WHAT IS THE SUGGESTED CONTENT?



The selected scenarios will have to be derived after assessment from various sources. Ultimate goal is to generate a data base filled with traffic scenarios with which the statistical relevance of scenarios can be assessed and changes to traffic scenarios can be documented.

A vehicle can – based on the input of the vehicle manufacturer – be nominated for one or more use case related road tests.

Limitations of the automated / autonomous system will be reflected, assessed and documented based on the input provided by the vehicle manufacturer. This includes weather conditions, speed restrictions, non supported roads (e.g. tunnels).

WHICH ASSESSMENT APPROACH IS CONSIDERED?



Hypothesis:

Based on a checklist the assessor exposes the vehicle to a pre-defined number of mandatory scenarios to maintain objectivity and comparability between road tests. Additional scenarios (supplementary ones) can be tested as well according to availability.

Comments should be provided on the checklist after a scenario has been completed indicating whether it was successful or not. Additional comments – if necessary – can be provided as well.

OICA proposal for checklists as integral part of the road test

- Suggests splitting into a mandatory and a supplementary section
- All mandatory aspects need to be covered while supplementary aspects can help to refine the understanding of the vehicle performance in real traffic

Additional considerations:

- Across the markets (e.g. the EU) similar but not same traffic rules and expected behaviors apply (example: how to approach a pedestrian crossing and when to stop)
- OICA suggests to not make this part of the road test but consider this for the „Audit“ pillar

Brief description of test route/location				
Date/time of test drive				
Item #	Situation	Pass		Comments (must be filled out in case of "no/unclear")
		Yes	No/unclear	
Part A: mandatory		All lines in Part A have to be evaluated during the test drive		
HA.1	Entering the highway			
HA.2	Following other vehicle in same lane			
HA.3	Passing a slower vehicle: lane change/Passing/merging back in previous lane			
HA.4	Adapting to changing speed limits			
HA.5	Merging from an ending lane			
HA.6	Exiting the highway			
HA.7				
HA.8				
HA.9				
HA.10				

Part B: supplementary		If any of the following situations is encountered during the test drive this shall be noted in the respective line. Additional lines may be added for situations not listed which were observed.		
HB.1	Situation involving an emergency vehicle (police, ambulance, fire brigade)			
HB.2	Policeman or roadman directing traffic			
HB.3	Objects/obstacles on the road (e.g. lost cargo)			
HB.4	Driving through construction site (if possible with modified lane markings)			
HB.5	Driving through area with no/bad lane markings			
HB.6	Safely approaching end of traffic jam			
HB.7	Driving in traffic jam			
HB.8	Driving through area with bad road surface conditions			
HB.9				
HB.10				

EXAMPLES FOR A CHECKLIST – HIGHWAY DRIVING (1/2)



Brief description of test route/location				
Date/time of test drive				
Item #	Situation	Pass		Comments (must be filled out in case of “no/unclear”)
		Yes	No/ unclear	
Part A: mandatory		All lines in Part A have to be evaluated during the test drive		
HA.1	Entering the highway			
HA.2	Following other vehicle in same lane			
HA.3	Passing a slower vehicle: lane change/Passing/merging back in previous lane			
HA.4	Adapting to changing speed limits			
HA.5	Merging from an ending lane			
HA.6	Exiting the highway			
HA.7				
HA.8				
HA.9				
HA.10				

EXAMPLES FOR A CHECKLIST – HIGHWAY DRIVING (2/2)



Part B: supplementary		If any of the following situations is encountered during the test drive this shall be noted in the respective line. Additional lines may be added for situations not listed which were observed.		
HB.1	Situation involving an emergency vehicle (police, ambulance, fire brigade)			
HB.2	Policeman or roadman directing traffic			
HB.3	Objects/obstacles on the road (e.g. lost cargo)			
HB.4	Driving through construction site (if possible with modified lane markings)			
HB.5	Driving through area with no/bad lane markings			
HB.6	Safely approaching end of traffic jam			
HB.7	Driving in traffic jam			
HB.8	Driving through area with bad road surface conditions			
HB.9				
HB.10				

EXAMPLES FOR A CHECKLIST – URBAN DRIVING (1/2)



Brief description of test route/location				
Date/time of test drive				
Item #	Situation	Pass		Comments (must be filled out in case of “no/unclear”)
		Yes	No/ unclear	
Part A: mandatory		All lines in Part A have to be evaluated during the test drive		
UA.1	Wake/initial start of journey (with objects in close-proximity of the vehicle)			
UA.2	Pass intersection regulated by traffic light			
UA.3	Pass intersection regulated by signs			
UA.4	Pass intersection without explicit regulation concerning right of way			
UA.5	Merge lane (two flows of traffic become one)			
UA.6	Make a left turn from a priority road (in case of right hand traffic)			
UA.7	Make a turn which requires previous lane change			
UA.8	Make a turn which crosses a bicycle path / pedestrian walkway			
UA.9	Pass a roundabout			
UA.10	Pass a pedestrian walkway (with pedestrian present)			
UA.11	Park vehicle at destination			
UA.12	Adherence to speed limits			
UA.13	Adherence to stop sign			
UA.14	Adherence to other road signs			

EXAMPLES FOR A CHECKLIST – URBAN DRIVING (1/2)

Part B: supplementary		If any of the following situations is encountered during the test drive this shall be noted in the respective line. Additional lines may be added for situations not listed which were observed.		
UB.1	Situation involving an emergency vehicle (police, ambulance, fire brigade)			
UB.2	Policeman or roadman directing traffic			
UB.3	Objects/obstacles on the road (e.g. lost cargo)			
UB.4				
UB.5				
UB.6				
UB.7				
UB.8				
UB.9				
UB.10				

How could the road test look like from a procedural and timing perspective?

Hypothesis:

The road test should be aligned with the existing driving test in terms of duration, acceptance and general conditions.

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HOW COULD THE ROAD TEST LOOK LIKE FROM A PROCEDURAL AND TIMING PERSPECTIVE?

Process:

Duration per “use case”: 30-60 Minutes in a realistic traffic environment, i.e. not in the middle of the night or during rush hour.

The assessor identifies the route to be taken and programs the route for the use case to be tested in to the navigation system.

During the road test the scenarios are being checked (not necessarily in the listed sequence) and assessed.

At the end an overall assessment is provided (successful: yes / no) and potentially additional comments created and recorded.

Back-Up

Current assessment scheme in Germany (8x5 Matrix)



Kompetenz Driving task	Observation of traffic	Positioning of vehicle	Speed adjustment Anpassung	Communication	Operation of vehicle	Overall assessment Gesamtwertung
Access, exit lanes Lane change						⊕
Curve						⊕⊕
Passing, taking over						⊕
Crossing, entering roads						0
Roundabout						⊕
Schienerverkehr						⊖
Bus stop, cyclist, pedestrian						⊕
Straight ahead driving						⊕⊕
Assessment of competency areas	⊕⊕	0	⊕	⊕⊕	0	

Gemeinsame Anforderungsstandards

Fahraufgaben (situationsspezifische Anforderungen)

Ein- und Ausfädelungstreifen, Fahrstreifenwechsel	Kreisverkehr
Kurve	Schienerverkehr
Vorbeifahren, Überholen	Haltestelle, Fußgängerüberweg
Kreuzung, Einmündung, Einfahren	Geradausfahren

Gemeinsame Anforderungsstandards

Fahrkompetenzbereiche/Beobachtungskategorien (situationsübergreifende Anforderungen)

Verkehrsbeobachtung	Fahrzeugpositionierung
Geschwindigkeitsanpassung	Kommunikation
Fahrzeugbedienung / Umweltbewusste Fahrweise	

What do the symbols stand for?

⊕⊕	Very good	You have reacted correctly and were looking ahead in all traffic situations
⊕	Good	You have mostly reacted correctly and were looking ahead in various traffic situations. „minor mistakes“ represented an exception.
0	Satisfactory	You have reacted correctly and generally looking ahead in standard situations. In uncommon and difficult situations „minor mistakes“ occurred.
⊖	Not satisfactory	You have mostly not reacted correctly and were not looking ahead even in standard situations. „Severe mistakes“ occurred or an increased amount of „minor mistakes“
⊘	Not evaluated	The driving task could not be evaluated

- The contacts argued that AVs should
 - Never conduct „minor“ or „severe mistakes“
 - i.e. get a default rating of „very good“ for all driving tasks in order to achieve the desired improvements in road safety

„8 x 5“ Matrix details (1 / 2)

- For each and every box in this matrix a detailed list of expected behavior, „minor“ and „severe“ mistakes is available



Prototypische Indikatoren

Ankerbeispiele auf der Grundlage von Rechtsvorschriften, Rechtsprechungen, Kommentierungen, untergesetzliche Normen (Auslegungshilfen)...

Ein- und Ausfädelungstreifen,
Fahrstreifenwechsel

Fahrzeugpositionierung

Leichte Fehler:

- **Geringfügige** Unterschreitung des Sicherheitsabstands nach vorne zu anderen Verkehrsteilnehmern mit zeitnaher Korrektur

[Abstand zum vorausfahrenden Fahrzeug **kleiner als die Hälfte und mehr als ein Viertel der Tachoanzeige** in Metern mit zeitnaher Korrektur. Eine zeitnahe Korrektur liegt vor, wenn der Sicherheitsabstand innerhalb von 3 Sekunden und mit verkehrsüblicher Verzögerung angepasst wird]

Schwere Fehler:

- **Erhebliche** Unterschreitung des Sicherheitsabstands nach vorne zu anderen Verkehrsteilnehmern mit zeitnaher Korrektur

[Abstand zum vorausfahrenden Fahrzeug **kleiner als ein Viertel der Tachoanzeige** in Metern mit zeitnaher Korrektur. Eine zeitnahe Korrektur liegt vor, wenn der Sicherheitsabstand innerhalb von 3 Sekunden und mit verkehrsüblicher Verzögerung angepasst wird.]