

Proposal for Overall requirement of System safety in Document 05

What is a goal to reach with deployment of ADS?

“Framework document on automated/autonomous vehicles” describes “WP.29 recognizes that for automated/autonomous vehicles to fulfil their potential in particular to **improve road transport**, then they must be placed on the market in a way that reassures road users of their safety.” in 3. Safety Vision. Most current traffic accidents occur because of human driver’s lack of attentiveness or human errors. So, we believe ADS could reduce traffic accidents because ADS is free from human driver’s lack of attentiveness or human errors. Japan thinks FRAV Document 05 must describe the overall requirement of System safety considering this provision.

Overall requirement of System safety

“Framework document on automated/autonomous vehicles” also describes in 3. Safety Vision “The level of safety to be ensured by automated/autonomous vehicles implies that “an automated/autonomous vehicle shall not cause any non-tolerable risk”, meaning that automated/autonomous vehicle systems, under their automated mode ([ODD/OD]), **shall not cause any traffic accidents resulting in injury or death that are reasonably foreseeable and preventable.**” FRAV should translate this statement to the measureable criterion as the overall requirement of System safety. FRAV should also consider “Technical provisions, guidance resolutions and evaluation criteria for automated vehicles will to the extent possible, **be performance based, technology neutral, and based on state of the art technology** while avoiding restricting future innovation.” which is also described in “Framework document on automated/autonomous vehicles”.

Japan recognizes we have four kinds of approach to define the overall requirement right now, Competent and Careful (C&C) human driver’s performance based proposed by Japan (as commented to FRAV-03-05-Add.5 before FRAV-03), State of the art technology proposed by Germany (FRAV-03-03), Safety envelope proposed by JRC and Positive risk balance proposed by some German manufacturers.

	Candidate	Concept
Concept of Safety Criteria	C&C human driver	ADS performance shall be equal or better than Competent and careful human driver’s performance
	State of the art	ADS shall be designed to use all available technologies
Approach concept of safety	Safety envelope	ADS shall always have Safety envelope to keep free of any collision
Concept of system safety	Positive risk balance	Overall accident occurrence ratio of ADS shall be equal or better than Human driving’s one

Japan proposes to start discussion in order to determine which one is the best or to create FRAV’s best approach considering strength and weakness of these candidates. Japan also propose to make the comparison table to evaluate these candidates. “Improve road transport”, “Performance based” and “Technology neutral” from FD should be considered. “Improve road transport” should be considered for both of “individual vehicle’s safety” and “road safety as a whole (considering fleet)”. And we suggest to add “Measurable”

meaning that Technical requirement should be measurable to reach the same judgement among TS's. "Social acceptance" is very important for Vehicle regulations. We should also consider "Feasibility" to realize ADS welcomed by customers, and "Feasibility" for TS's or the third party to test and assess ADS.

Candidate	Improve road transport		Performance based	Technology neutral	Measurable	Social acceptance	Feasibility
	individual	fleet					
C&C Human driver							
State of the art							
Safety envelope							
Positive risk balance							

Additional explanation of C&C Human driver's performance base approach

C&C Human driver's performance-based approach can translate the statement of FD, "shall not cause any traffic accidents resulting in injury or death that are **reasonably foreseeable and preventable**". "Reasonably preventable" can be defined as ADS collision avoidance performance is equal or **better than the performance which a competent and careful human driver can achieve** and reasonably foreseeable stands for **forecastable based on physics principles with a relevant exposure**.

So free of accident reasonably foreseeable and preventable is equivalent with free of crashes that are forecastable based on physics principles, that result in injury or death, with a relevant exposure and that are avoidable by a competent and careful human driver.

In reality the most of accidents are caused by human factor such as distraction. Because of the free of distraction of AD system, with the AD system with better capability than competent and careful human driver, the traffic society can get the big safety benefit from AD.

Accident Rate Caused by Human Factors of Driver (Highway) ●

- 97% of the accidents were related to the human factors of driver. **(of which 60% was due to delay in perception)**
- Most of the accidents can be prevented **if the driver's level of attentiveness is high.**

■ Data collection criteria:
Accidents occurred on highways in Japan in which the primary responsible party was a vehicle (automobile/motorcycle) (2017)

