

Session 8 Status Review and Session Orientation

Web Conference

8 December 2020



1. Adoption of the agenda
2. Adoption of the reports of the previous sessions
3. FRAV status and consensus to date
4. ADS level of safety
5. Elaboration of the five starting points
6. Updates to Documents 4 and 5
7. Next steps and deliverables

Agenda item	Documentation
1. Adoption of the agenda 12:30-12:35	FRAV-08-01
2. Adoption of the reports of the previous sessions 12:35-12:45	FRAV-06-02 (Secretary) FRAV-07-02 (Secretary)
3. FRAV status and consensus 12:45-12:50	FRAV-08-03 (Co-chairs)
4. ADS level of safety 12:50-13:20	
5. Elaboration of ADS safety requirements 13:20-14:20	FRAV-07-08 (Japan) FRAV-08-06 (Russia) FRAV-08-07 (Netherlands) FRAV-08-09 (Co-chairs) FRAV-08-09-Add.1 (Secretary)
6. Documents 4 and 5 updates 14:20-14:50	FRAV-08-08 (JRC) FRAV-07-04 (Secretary) FRAV-07-05 (Secretary)
7. Next Steps and Deliverables 14:50-15:00	

1. Adoption of the agenda
2. Adoption of the reports of the previous sessions
 - FRAV-06-02 (confirmation of adoption)
 - FRAV-07-02 (request for comments, if any)
3. FRAV status and consensus to date
4. ADS level of safety
5. Elaboration of the five starting points
6. Updates to Documents 4 and 5
7. Next steps and deliverables

1. “*Automated Driving System*” (ADS) means the hardware and software that are collectively capable of operating a vehicle on a sustained basis.
2. FRAV requirements specifically regard the ADS and its performance in the operation of a vehicle.
3. Operational Design Domain (ODD) refers to the operating conditions under which an ADS is designed to function.
4. ADS may be designed to function under more than one discrete set of operating conditions (i.e., more than one ODD).
5. “*(ADS) feature*” means an application of ADS hardware and software designed specifically for use within an ODD.
6. An ADS may have one or more features as defined by their unique ODD.
7. “*Operational Design Domain*” means the operating conditions under which an ADS feature is specifically designed to function.
8. In operation, the ADS continuously controls the vehicle motion, monitors the vehicle environment, interacts with other road users, and determines responses to road and traffic conditions (collectively known as the Dynamic Driving Task (DDT)).
9. The ADS has functions that collectively perform the entire DDT while the ADS is in use.
10. The ADS monitors the functions and safely manages failure modes when detected.
11. The ADS functions enable the features to operate the vehicle within the ODD of the feature.
12. An ADS feature may use all or some of the functions of the ADS.
13. ADS features may share ADS functions.
14. An ADS should be assessed based on its intended use(s) and limitations on the use of its features.
15. ADS requirements should be technology-neutral and performance-based.

16. ADS requirements should be applicable across the anticipated diversity of configurations (i.e., features and functions).
17. ADS assessments require information specific to the configuration of the ADS (i.e., features, functions, ODD, other usage specifications).
18. Manufacturers provide the information specific to the ADS design and intended uses.
19. FRAV will define mandatory requirements for ADS descriptions (i.e., ODD elements, other usage specifications).
20. The manufacturer description of the ADS provides a means to determine the application of the ADS performance requirements.
21. The NATM process should begin with a review of the ADS description to verify fulfillment of the mandatory description requirements and to determine the application of the performance requirements.
22. The ADS requirements should be derived from the following safety perspectives:
 - The ADS should drive safely.
 - The ADS should interact safely with the user.
 - The ADS should manage safety-critical situations.
 - The ADS should safely manage failure modes.
 - The ADS should maintain a safe operational state.

No comments received since the last session.

If there are reservations, concerns, or questions regarding these points, please convey them to the FRAV secretary. FRAV will address the issues at a future session.

1. Adoption of the agenda
2. Adoption of the reports of the previous sessions
3. FRAV status and consensus to date
4. **ADS level of safety**
5. Elaboration of the five starting points
6. Updates to Document 5
7. Updates to Document 4
8. Next steps and deliverables

- C&C human driver (Japan)
- State-of-the-Art (Germany)
- Safety envelope
- Statistical positive risk balance
- Combining methods (JRC)

We have discussed performance levels during the past four sessions.

- FRAV-01-13 (safety elements list)
- 142 candidates list
- WP.29-186-10 (common FPR)
- FRAV-06-04 (OICA/CLEPA administrative exercise)

- Improve road transport
- Performance based
- Technology neutral
- Measurable
- Social acceptance
- Feasibility



**Can we agree on an
“overall level of safety”
guiding principle?**

- ADS will initially be deployed in human-dominated traffic
- ADS will be used by humans
- Human error is the critical factor in 90%+ of crashes
- ADS should not cause crashes

- ADS will initially be deployed in human-dominated traffic
 - The ADS driving behavior should be consistent with norms of human driving
- ADS will be used by humans
 - The ADS should meet human user expectations
- Human error is the critical factor in 90%+ of crashes
 - \approx 40% recognition errors (inattention)
 - \approx 33% decision errors (illegal, false assumption)
 - \approx 11% performance errors (poor control)
- ADS should not cause crashes
 - All of the above while avoiding introduction of new ADS-specific risks

ADS performance should be consistent with human driving behaviors while avoiding human recognition, decision, and performance errors and the introduction of new risks.



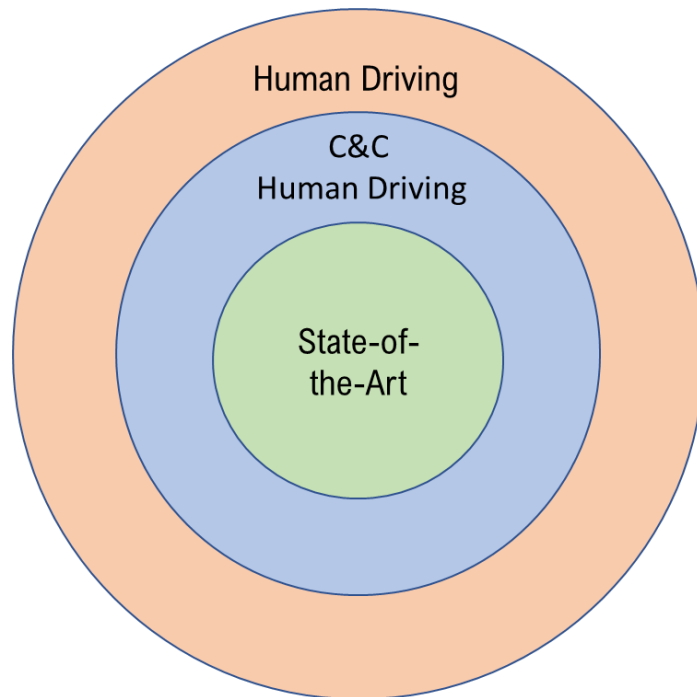
Table 2. Driver-Related Critical Reasons

Critical Reason	Estimated (Based on 94% of the NMVCCS crashes)	
	Number	Percentage* ± 95% conf. limits
Recognition Error	845,000	41% ±2.2%
Decision Error	684,000	33% ±3.7%
Performance Error	210,000	11% ±2.7%
Non-Performance Error (sleep, etc.)	145,000	7% ±1.0%
Other	162,000	8% ±1.9%
Total	2,046,000	100%

*Percentages are based on unrounded estimated frequencies (Data Source: NMVCCS 2005–2007)

- ✓ “Careful and competent human driver”
 - Build out data on human responses to traffic situations
- ✓ “State-of-the-art” based on technological feasibility
 - Define technical parameters within range of optimal human behaviors
- ✓ “Safety envelope”
 - Mathematical formulas based on technical parameters and conditions
- ✓ Statistical “positive risk balance”
 - Optimal human behaviors omitting human errors

ADS performance should be consistent with human driving behaviors while avoiding human recognition, decision, and performance errors and the introduction of new risks.



Outline of Further Work

- Research on human driver responses under scenarios
- Typical “safe driver” responses and performance ranges
- Comparison against ADS capabilities
- Define minimum ADS performance

1. Adoption of the agenda
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3. FRAV status and consensus to date
4. ADS level of safety
- 5. Elaboration of the five starting points**
 - (Japan) FRAV-07-08: Comments on Germany's review of FRAV-06-04 (FRAV-06-11)
 - (Russia) FRAV-08-06: Comments on 142 candidates (FRAV-07-09)
 - (Netherlands) FRAV-08-07: Comments on FRAV-06-04
 - Co-chair proposal for structuring further work
6. Updates to Document 5
7. Updates to Document 4
8. Next steps and deliverables

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)

**Response to request for stakeholder comments on
FRAV-07-09 and FRAV-06-04 insufficient to confirm consensus**

- Co-chairs recognize the challenges facing stakeholders under the current circumstances
 - Break down starting points into smaller topics
- Guidance is based on all 142 candidates
 - For transparency, a concordance between the guidance and the 142 candidates has been prepared.
- Guidance proposes topics for further discussion based on all stakeholder views and input
 - The guidance neither endorses nor rejects stakeholder input
 - The guidance proposes discussion topics under the five starting points.
 - The intent is to use these topics to stimulate more detailed and focused discussions at future FRAV sessions.

- The ADS should perform the entire Dynamic Driving Task.
 - The ADS should control the longitudinal and lateral motion of the vehicle.
 - The ADS should recognize the ODD conditions and boundaries of the ODD of its feature(s).
 - The ADS should detect, recognize, classify, and prepare to respond to objects and events in the traffic environment.
- The ADS should respect traffic rules.
- The ADS should interact safely with other road users.
- The ADS should adapt its behavior in line with safety risks.
- The ADS should adapt its behavior to the surrounding traffic conditions.
- The ADS behavior should not be the critical factor in causation of a collision.

- Activation of an ADS feature should only be possible when the conditions of its ODD have been met.
- The ADS should signal when conditions indicate a probable ODD exit.
- The user should be permitted to override the ADS to assume full control over the vehicle.
- The ADS should safely manage transitions of full control to the user.
 - Prior to a transition of control to the user, the ADS should verify the availability of the user to assume control.
 - Pursuant to a transition, the ADS should verify full control of the vehicle by the user prior to deactivation.
- The ADS should tolerate user input errors.
- The ADS should provide feedback to the user on its operational status.
- The ADS should warn the user of failures to fulfill user roles and responsibilities.
- The user should be provided with information regarding user roles and responsibilities for the safe use of the ADS.

- The ADS should recognize and respond to road safety agents.
- The ADS should mitigate the effects of road hazards.
- The ADS should execute a Minimal Risk Maneuver (MRM) as conditions warrant.
 - In the absence of a fallback-ready user, the ADS should fall back directly to an MRM.
 - The ADS should execute an MRM in the event of a failure in the transition of full control to the user.
 - Pursuant to an MRM, the ADS should place the vehicle in a Minimal Risk Condition prior to deactivation.
- The ADS should signal an MRM.
- Upon completion of an MRM, the user may be permitted to assume control of the vehicle.
- ADS vehicles that may operate without a user-in-charge should provide means for occupant communication with a remote operator.
- The ADS should safely manage short-duration transitions between ODD.
- Pursuant to a collision, the ADS should stop the vehicle and deactivate.

Reminder: Under this heading, SAE found a focus on emergency responses to other road user actions and sudden events clearer. Discussion of MRM here could be confusing because MRM can be associated with system failures.

Is MRM better addressed under another topic?

- The ADS should execute a Minimal Risk Maneuver (MRM) as conditions warrant.
 - In the absence of a fallback-ready user, the ADS should fall back directly to an MRM.
 - The ADS should execute an MRM in the event of a failure in the transition of full control to the user.
 - Pursuant to an MRM, the ADS should place the vehicle in a Minimal Risk Condition prior to deactivation.
- The ADS should signal an MRM.
- Upon completion of an MRM, the user may be permitted to assume control of the vehicle.

- The ADS should detect system malfunctions and abnormalities.
- The ADS should execute a safe fallback response upon detection of a failure that compromises performance of the DDT.
- Provided a failure does not compromise ADS performance of the entire DDT, the ADS should respond safely to the presence of a fault in the system.
- The ADS should signal faults and resulting operational status.

- The ADS should be permanently disabled in the event of obsolescence.
- Pursuant to a collision and/or a failure detected in DDT-related functions, ADS activation should not be possible until the safe operational state of the ADS has been verified.
- The ADS should signal required system maintenance to the user.
- The ADS should be accessible for the purposes of maintenance and repair to authorized persons.

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6. Updates to Documents 4 and 5
 - FRAV-07-04: Document 4 status
 - FRAV-07-05: Document 5 status
 - (JRC) FRAV-08-08: Comments on safety requirements and definitions
7. Next steps and deliverables

- Separated record of discussions and related background sections of Document 5 into a separate document (i.e., Document 4)
- Updated record to better reflect Japan input per the 7th session discussions.
- Presently covers decisions through the 5th session pending further consensus decisions coming out of the “level of safety” and next-level “elaboration of requirements” discussions.

- Updated definitions per the 7th session discussions
 - DDT: Description of “tactical” and “operational” functions per FRAV request
 - “Activation” of MRM and MRC definitions (unconsidered text now pertinent)
 - User-related definitions (including “fallback-ready user”)
 - “transition of control” definition
- Descriptions of the five starting points
- Please review and comment
- FRAV-08-05 will propose text based on today’s discussion and comments received on FRAV-07-05.
 - Comments welcome anytime but aim to post FRAV-08-05 by 18 December

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- Next session 12 January
 - Reach agreement on FRAV-07-05 updates
 - Review updates introduced in FRAV-08-05
 - Reach agreement on overall level of safety principle
 - Consider input on work plan and research/data needs
 - Available research and/or research centers on human driving performance
 - Available research and/or research centers on ADS driving performance
 - Discussion of topics under “ADS should drive safely”
- Provide submissions by 6 January to facilitate 9th session preparations
- Proposal for 10th FRAV session on 2 February
 - Review submission(s) to GRVA February session

- Comments on FRAV-07-05, if any
- Comments on the overall level of safety principle, if any
- Input on “drive safely” topics with a view towards measurable/verifiable descriptions
- Potential resources for data on driving norms/performance
- Deadline for written submissions: 6 January