

## Draft Text for FRAV Recommendations on ADS External Light-Signalling

*This text has been prepared for consideration by FRAV during its 31<sup>st</sup> session (September 2022). The text aims to summarize the consensus outcomes of FRAV deliberations on ADS external light signals for ADS vehicles to date.*

### Summary

- FRAV does *not* recommend requirements for *mandatory* installation of additional light-signalling devices beyond those requirements established for manually driven vehicles.
- FRAV recommends the use of ~~existing light-signalling devices to signal~~ initiation when necessary and in accordance with national laws, that of an automated fallback response designed to place the ADS vehicle in a minimal risk condition is occurring.
- FRAV ~~recommends~~ supports the establishment of uniform provisions for a light signal to communicate the operational status of the ~~ADS if fitted~~ mandated by a contracting party on an ADS vehicle and under certain conditions.

### Background

Pursuant to deliberations during its November 2021 session, AC.2 tasked GRVA and its Informal Working Group on Functional Requirements for Automated Vehicles (FRAV) to determine the conditions, if any, under which an ADS external lighting signal should be activated and recommend to GRE to whom the signal should be displayed (drivers in other vehicles, other road users) and from where it should be visible (e.g., front, rear, side).

FRAV consulted with the GRE Task Force on Autonomous Vehicle Signalling Requirements (AVSR), reviewed outcomes of these and other deliberations and research projects, surveyed its experts, and deliberated on the issue across its sessions between March 2021 and September 2022.

### Recommendations

1. FRAV does not recommend requirements for mandatory installation of additional light-signalling devices beyond those requirements established for manually driven vehicles.

FRAV recommends that ADS be required to operate the vehicle in accordance with traffic laws. These laws prescribe requirements for signalling to other road users<sup>1</sup> (ORU) and are deemed sufficient to address road-safety needs.

Research and documented real-world cases indicate that identifiers unique to ADS vehicles raise risks of changes in ORU behaviours that adversely impact road safety or they will simply fail to be understood. ADS safety requirements aim to ensure predictable ADS behaviours designed to

<sup>1</sup> FRAV defines “other road user” as any entity using a roadway and capable of safety-relevant interaction with an ADS vehicle.

**Commented [DH1]:** This needs to be according to national laws. In the UK we have specific requirements as to when hazard warning lights can be used. This would not permit it to be used at the initiation of an MRM.

**Commented [DH2]:** It is potentially rather strong to say that FRAV “recommends” since this is not a universal view. It may be better to say that FRAV “supports”.

**Commented [PE3]:** We consider it necessary to say “if mandated by the contracting party” rather than “if fitted” to prevent use in regions where it is not required. It should be a decision by the authority not the manufacturer over whether it is installed as it would be very confusing for other road users if some but not all automated vehicles had this signal.

prioritize collision avoidance. Foreknowledge of ADS operation of a vehicle has been shown to alter risk assessments of other road users, resulting in higher-risk behaviours when interacting with these vehicles. ADS responses to mitigate these higher-risk ORU behaviours may result in traffic disruptions that may introduce further road-safety risks.

2. FRAV recommends the use of existing light-signalling devices to signal, initiation-of-where necessary and in accordance with national laws, that an automated fallback response designed to place the ADS vehicle in a minimal risk condition (MRC) is occurring.

Under certain conditions, an ADS may need to place the ADS vehicle in a stable and stopped condition that minimizes the risk of a crash. Depending upon the ADS configuration, such conditions may include fallback-user incapacitation (e.g., medical emergency), failed fallback-user response to an ADS transition demand, or a condition that prevents the ADS from safely performing the Dynamic Driving Task.

FRAV recommends that ADS signal (initiation) of a in relation to these safety-critical automated fallback response events to ORU in a manner consistent with similar expectations applied to human drivers and in compliance with local traffic laws (such as via activation of a hazard-warning signal).

3. FRAV recommends supports the establishment of uniform provisions for a light signal to communicate the operational status of the ADS if fitted-mandated by contracting party on an ADS vehicle and under certain conditions.

While FRAV does not recommend mandatory installation of light-signalling devices unique to ADS vehicles, neither does FRAV recommend a prohibition against the use of light-signalling to indicate the ADS operational status under certain conditions if deemed necessary by an individual authority.

As noted above, FRAV does not support ADS-specific light-signalling to all road users; however, FRAV notes instances where signalling to road-safety agents<sup>2</sup> such as law enforcement may be justified. For example, FRAV notes traffic laws that prohibit human drivers from engaging in certain non-driving-related activities (NDRA). However, FRAV anticipates traffic laws that may permit additional NDRA while an ADS is operating the vehicle. Means to enable law enforcement to determine whether a vehicle is under ADS operation may therefore be justifiable in order to facilitate enforcement of such laws regarding permissible NDRA.

In this regard, FRAV does not exclude the potential usefulness of a light signal to address specific interactions with road-safety agents. FRAV notes that means other than a light signal may address such interactions may be more beneficial. For example, telecommunications technologies may enable dissemination of information to designated or authorized recipient(s). [This is in part related to concerns that a light signal is a relatively crude solution which could result in fraudulent use by those wishing to operate non-ADS vehicles inappropriately.]

In the event that Contracting Parties wish to mandate permit the use of a light-signal to communicate the operational status of ADS vehicles, FRAV recommends the establishment of uniform provisions

**Commented [DH4]:** It may not always need to be at the initiation.

**Commented [DH5]:** It may not always need to be at the initiation. If the vehicle does not immediately slow down then it shouldn't activate its hazard-warning lamps (this would contravene UK traffic laws)

**Commented [PE6]:** Did we discuss V2V or wireless communication as an options in the Paris FRAV meeting?

**Commented [DH7]:** As noted above, any installation should be at the discretion of the authority not the manufacturer.

**Commented [DH8]:** We believe that this is a key point that needs to be noted as it also supports our view that the use of the signal is at the discretion of the authority.

<sup>2</sup> "Road-safety agent" is defined by FRAV as a human being engaged in directing traffic, enforcing traffic laws, maintaining/constructing roadways, and/or responding to traffic incidents.

to facilitate harmonization of such devices, if ~~fitted~~required on the vehicle. FRAV recommends that such signals avoid confusion or interference with other lighting or light signals ~~and be:~~

- ~~Activated upon ADS detection of the road-safety agent involved in the interaction,~~
- ~~Discretely positioned to minimize visibility by other road users, and~~
- ~~Illuminated for a duration necessary to meet the relevant safety need.~~

**Commented [DH9]:** The point should also be made that it should not dazzle or be a distraction to ORUs.

**Commented [DH10]:** Don't believe such recommendations were made by FRAV and these should not be being made here. They could potentially limit the utility of the signal which might prove to be useful for other aspect so should leave it more open at this stage.

Submitted by the experts from the United Kingdom

Document FRAV-31-11  
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13-15 September 2022

List of reference documents

*Reference documents in addition to those identified by the AVSR Task Force (see AVSR-05-06 for literature review and especially the 2<sup>nd</sup> AVSR session for studies).*

European Commission, Directorate-General for Mobility and Transport, Montalvo, C., Willemsen, D., Hoedemaeker, M. (2020). Study on the effects of automation on road user behaviour and performance: final report, Publications Office. <https://data.europa.eu/doi/10.2832/431870>.