Hi-Drive
Designing Automation

Deliverable D8.7 /

Outcomes of the educational campaign and driver training

Version: 1.0

Dissemination level: PU

Lead contractor: FIA

Due date: **30.09.2025**

Version date: 12.09.2025

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101006664.

Document information

Authors

Justyna Beckmann – FIA
Lisandra Fesalbon – FIA
David Ertl - FIA
Ruth Madigan – LEEDS
Natasha Merat – LEEDS
Soyeon Kim – TUD
Christoph Vollath – RACC
Heike Lüben – ADAC
Andreas Rigling – ADAC
Luigi Vroman – RACB
Barbara Metz - WIVW
Myriam Metzulat – WIVW
Jukka Tolvanen – AL
Sabina Lavrič – AMZS
Klemen Filipič – AMZS
Kornélia Polgár – MAK
Laure Kempf – MCF
Luigi Di Matteo – ACI
Nicholas Lyes – IAM RoadSmart
Hristiyan Stoyanov – EICT
Philippe Stehlik - EICT
Alan Vojvodić - HAK
Esko Lehtonen - VTT
Marjan Hagenzieker - TUD

Coordinator

Aria Etemad

Volkswagen AG

Berliner Ring 2

38440 Wolfsburg

Germany

Phone: +49-5361-9-13654

Email: aria.etemad@volkswagen.de

Project funding

Horizon 2020

DT-ART-06-2020 – Large-scale, cross-border demonstration of connected and highly automated driving functions for passenger cars

Contract number 101006664

www.Hi-Drive.eu

Hi-Drive

Legal Disclaimer

Table of contents

List of figures

List of tables

Executive summary

The main objective of this deliverable is to describe the implementation and outcomes of the following two main elements developed in Work Package 8.7:

- User Education Campaign.
- User Training Programme.

The WP8.7 work on the *user education campaign* began with the identification of the functions and systems to be addressed in the social media campaign. This involved defining the messages and the accompanying visual materials and animated videos, as well as identifying the online channels to be used. The social media calendar for the implementation of the campaign was also developed.

The WP8.7 work on the *user training programme* began with organisation of an expert workshop. This was followed by identifying the ADAS systems to be included in the driver training programme curriculum. The next items to be prepared were the training locations, driving scenarios, materials and methods to evaluate the participants.

The user education campaign was launched on 6 November 2023 and ran until the end of October 2024, covering 11 European countries. Its aim was to raise awareness of the various driver assistance and automated driving (AD) functions available in today's vehicles and on European roads. It aimed to rectify misconceptions about AD, encourage safe driving practices, and promote the potential benefits of automated vehicles. It covered 14 ADAS and automated driving functions ranging from driver assistance and advanced driver assistance systems to automated driving functions belonging to levels 0 to 3 of the Society of Automotive Engineers' (SAE) internationally recognised levels of driving automation.

The ADAS training programme curriculum, developed in WP8.7, includes a list of functions and an outline of the driving scenarios for each module of the public training, as well as necessary materials. The curriculum also emphasises the importance of user evaluation and feedback from participants and trainers alike. Between September 2024 and March 2025, the ADAS user training sessions were conducted in 5 European locations, providing over 150 participants with both theoretical modules and practical driving exercises. Participants gained hands-on experience of the safe use of ADAS and ADFs available in today's vehicles on European roads.

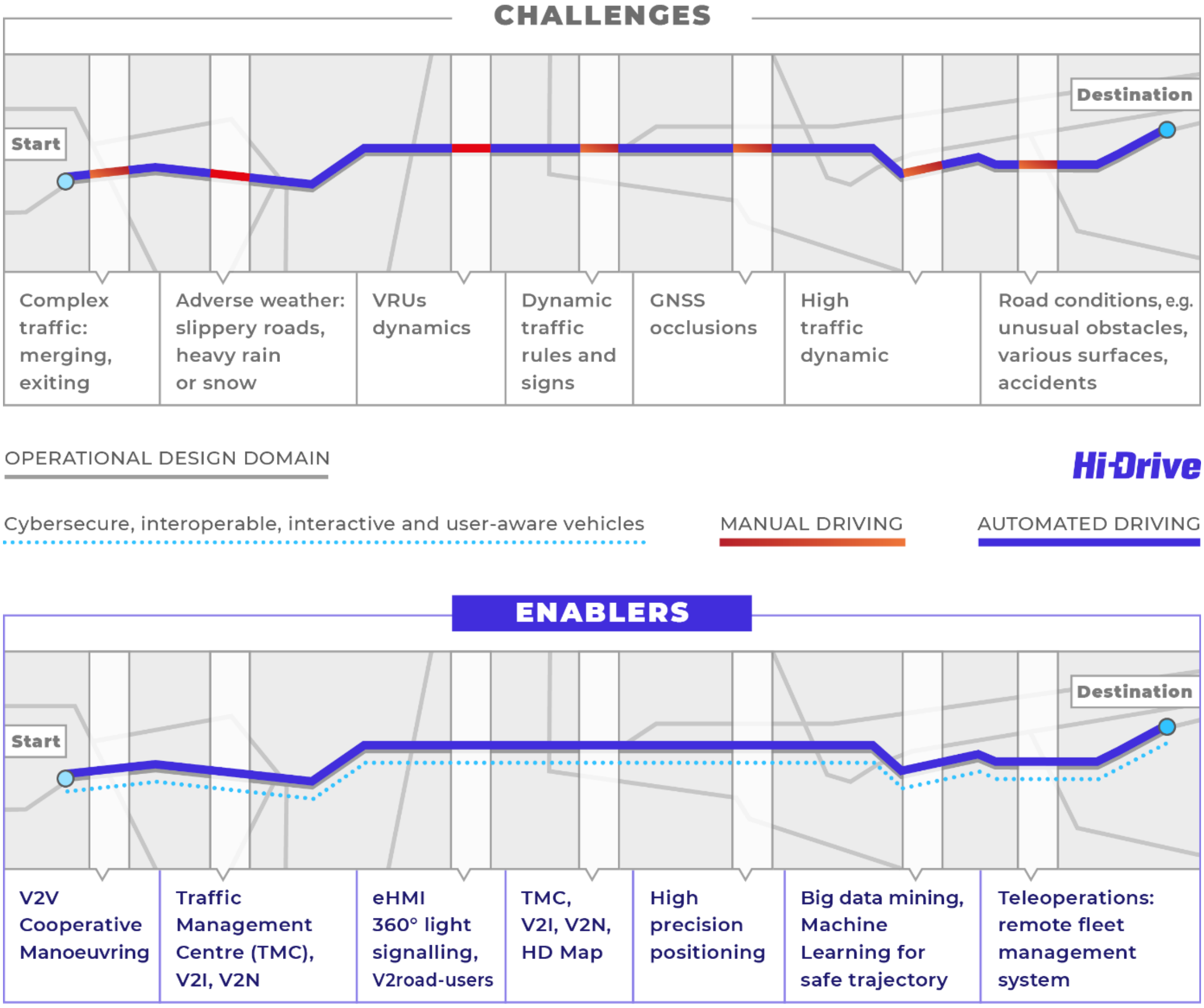
1 Introduction

1.1 The Hi-Drive project

Connected and automated driving (CAD) has become a megatrend in the digitalization of society and in the economy. CAD has the potential to drastically change transportation and create far reaching impacts. SAE level 3 (L3) automated functions were piloted in Europe by the L3Pilot project in 2017–2021 (L3Pilot consortium, 2021). Hi-Drive builds on the L3Pilot results and advances the European state-of-the-art from SAE L3 'Conditional Automation' further up towards 'High Automation'. This is done by demonstrating in large-scale trials the robustness and reliability of CAD functions under demanding and error-prone conditions with special focus on:

- connected and automated vehicles (CAV) travelling in challenging conditions covering variable weather and traffic scenarios and complex infrastructure
- connected and secure automation providing vehicles / their operators with information beyond the line of sight and on-board sensor capabilities
- complex interaction with other road users in normal traffic
- Factors influencing user preferences and reactions including comfort and trust - and eventually through a wide consumer acceptance of automated driving (AD) resulting in purchase and use, enabling viable business models for AD.

The project's ambition is to extend the AD's operational design domain (ODD) from the present situation, which frequently demands taking over control of the vehicle by a human driver. As experienced in the EU flagship pilot project L3Pilot, on the way from A to B, a prototype level 3 automated vehicle (AV) encountered several ODD boundaries, leading to fragmented availability of the AD function (ADF). Hi-Drive addresses these key challenges which are currently hindering the progress of driving automation. The concept builds on reaching a widespread and continuous ODD, where automation can operate for longer periods and interoperability is assured across borders and brands. Hi-Drive strives to extend the ODD and reduce the frequency of takeover requests (TORs) by selecting and implementing technology enablers leading to highly capable CAD functions, operating in diverse driving scenarios including, but not limited to, urban traffic and motorways. The removal of fragmentation in the ODD is expected to give rise to a gradual transition from conditional automation towards higher levels of AD.



The work in Hi-Drive started with the collection and description of the different automated driving functions, enabling technologies and ODDs. When testable functions and use cases are defined, research questions and hypotheses are formulated leading to the specification of data needed for evaluation and then actual recording of vehicle-driver behaviour. Testing will focus on three evaluation areas: 1) users; 2) AD availability and performance; 3) societal impacts (namely, on safety, efficiency, environment, mobility, transport system, and society). Furthermore, these assessments serve as input to determine whether the socio-economic benefits outweigh the costs. The project also engages in a broad dialogue with the stakeholders and the public to promote the Hi-Drive project results. Dissemination and communication are boosted by a demonstration campaign to show project achievements.

Overall, Hi-Drive strives to create a deployment ecosystem by providing a platform for strategic collaboration. Accordingly, the work includes EU-wide user education and driver training campaign and series of Code of Practices (CoPs) for the Development of ADFs and Road-Testing Procedures, while also leading the outreach activities on standardization, business innovation, extended networking with the interested stakeholders and coordinating parallel activities in Europe and overseas.

1.2 User centric approach: user education and driver training

Hi-Drive takes a user-centric approach to the development of technology and mobility. For the acceptance of CAD, it is crucial that user requirements are successfully incorporated into the development of these features. To increase the likelihood of CAD being used, factors such as trust in and acceptance of the system and its usability are essential. A dedicated sub-project (SP6) examines user behaviour, expectations and limitations in detail when interacting with CAVs. This provides a feedback loop that incorporates the needs of drivers and other road users into the design and implementation of automated vehicle functions.

The successful market introduction of CAD features hinges equally on the development of user education and driver training programmes. General knowledge training promotes safe and efficient interaction with driving automation, while practical training programmes help drivers develop an accurate understanding of automated vehicle (AV) functionalities, capabilities, and limitations. For this reason, Hi-Drive has introduced a new module to the project structure to address differences in levels of automation, as well as driver training requirements for AV.

The project involved collecting best practices from 11 EU mobility clubs, consolidating technical requirements, and considering new issues arising from user surveys, to develop an education and training programme. The main objective was to establish a harmonised user education campaign providing factual, technology-neutral information about ADFs (SAE levels 1–3), with the aim of dispelling misconceptions, promoting safe driving practices, and advocating the benefits of automated vehicles. Additionally, the driver education programme aimed to provide a sound understanding of the new opportunities, system capabilities and potential limitations of future automated mobility solutions.

1.3 Objective, scope and structure of the deliverable

This deliverable reports on the implementation of Work Package 8.7 (WP8.7): *User Education and Training*. The aim of WP8.7 was to design and implement a two-pronged programme to educate and train users about Automated Driving Functions (ADFs), and to ensure that user expectations are aligned with the capabilities of automated vehicles.

This report is in two parts:

- The first part of this document outlines the implementation of the online user education and awareness campaign.

- The second part provides the curriculum for the user training programme, as well as details on how the trainings were organised across five sites with public participation. This includes the evaluation of participants and trainers.

This deliverable is the third and final report summarising the work of WP8.7.

Figure 1 WP8.7 deliverables – timeline

2 User education campaign

This chapter presents the Hi-Drive user education campaign, including the preparation and implementation of the year-long campaign and its outcomes. The distinction between driving functions belonging to ADAS or ADF is not always clear. Automated driving (e.g. Level 2+) combines lateral and longitudinal assistance, extending them. In the following chapters, we use the more general term ADAS.

2.1 User education and awareness

Previous research into user acceptance has indicated limited trust in and understanding of automated driving functionalities among users. For example, the L3Pilot Annual Survey revealed that, although drivers expect the technology to be beneficial, they remain sceptical about its potential to improve safety and efficiency.

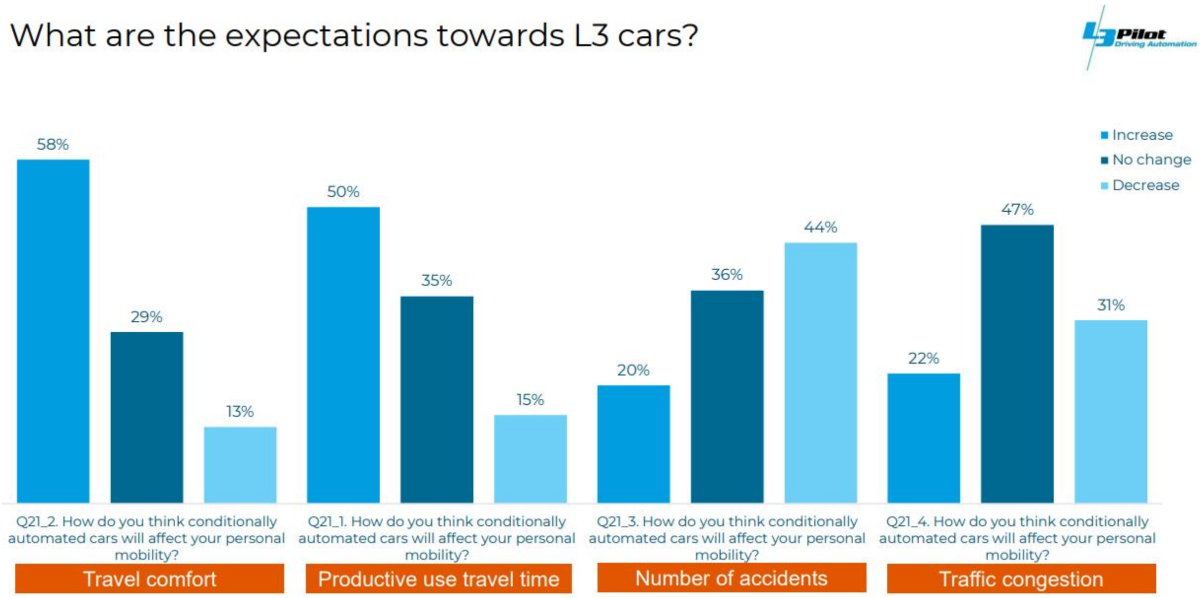


Figure 2 L3Pilot Annual Survey: Benefits of automated driving expected by users

Results from the 2023 Hi-Drive Global Survey suggested that, while most respondents expected AD to improve driving safety, accuracy, comfort, and the possibility of using travel time for other purposes, many remained sceptical. Safety and driving accuracy are also the most important factors when purchasing an AV.

For the adoption of AD technology, it is therefore important that potential buyers are aware of the potential safety benefits of AD technology, including ADAS functionalities, and know how to use them correctly. Similarly, Tsapi et al (2020) highlight the insufficient information available to buyers of vehicles with ADAS functionalities.

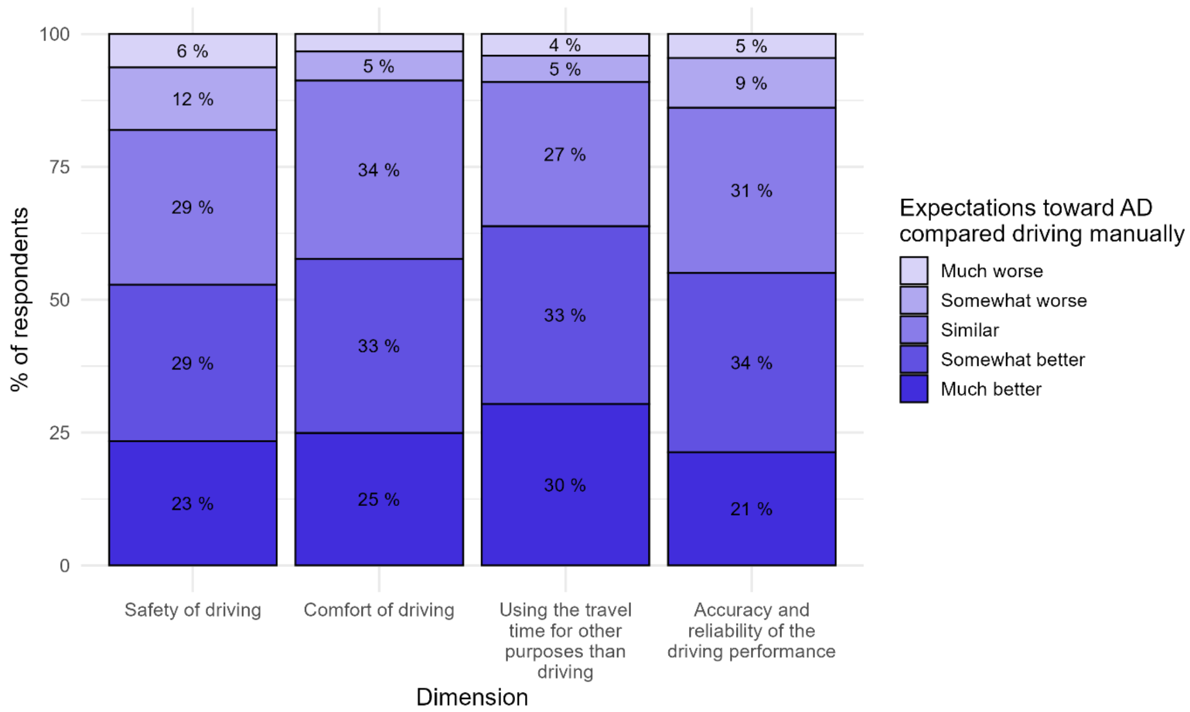


Figure 3 Public expectations of AD cars, based on the 2023 Hi-Drive Global Survey

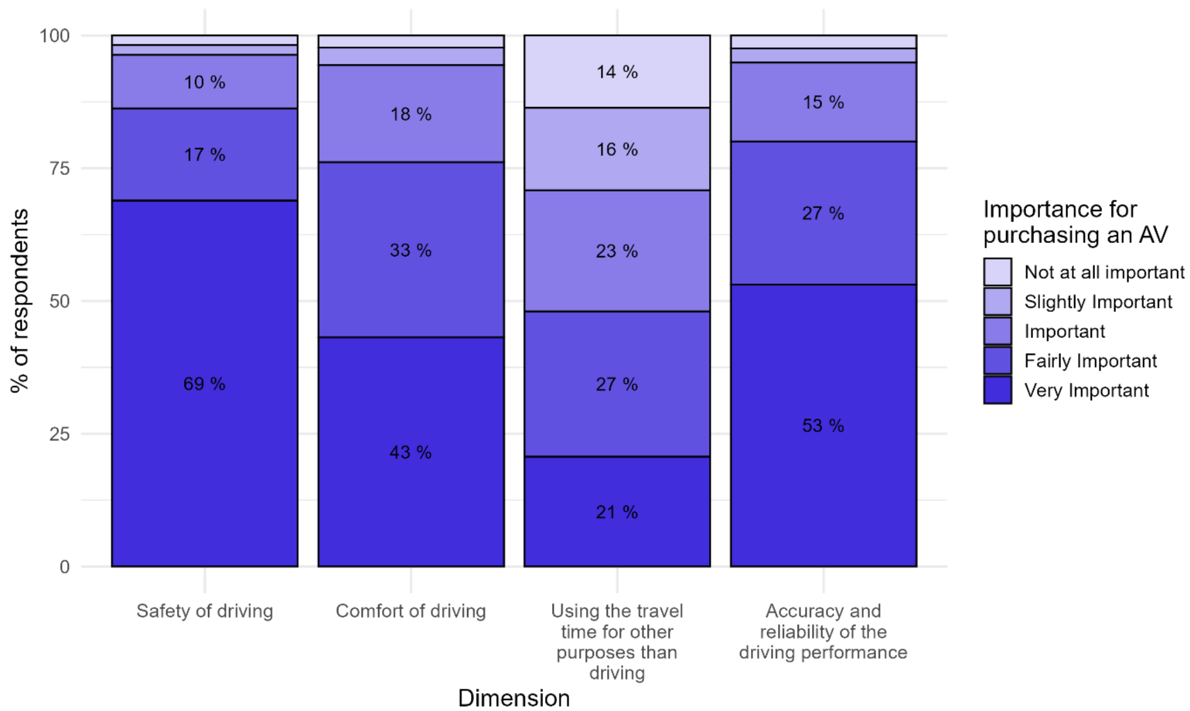


Figure 4 Importance of selected dimensions when purchasing an AV, based on the 2023 Hi-Drive Global Survey

A lack of understanding of automated driving technology poses two major risks: the technology's potential positive impact is threatened by incorrect application, and uptake may be hindered by a lack of understanding of the potential benefits. The Hi-Drive user campaign aimed to mitigate these risks by using the Hi-Drive consortium's wide-ranging expertise to deliver a Europe-wide campaign providing factual, technology-neutral information about ADFs (SAE levels 1–3). The campaign aimed to rectify misconceptions and promote safe driving practices, as well as advocating for the impact of automated vehicles.

Misunderstanding or misinterpreting an ADS can lead to the misuse or disuse of automation (Parasuraman and Riley, 1997). Technologies that could make travelling safer and more comfortable when used as intended can lead to more dangerous driving situations when misused. One study queried 50 drivers who had used a level 2 ADS for 12 months about their usage (Kim, Song and Doerzaph, 2020). The investigators found that, during safety-critical events involving the ADS, drivers had misused the technology in 57% of cases, for example by engaging in secondary tasks, using the system off-highway or taking their hands off the wheel. The study also found that the more positive the attitude towards the ADS, the more likely it was to be misused. Automation misuse is also related to an incorrect mental model of the system. Users are more likely to overestimate the system's capabilities when it is advertised as 'Pilot' rather than 'Cruise' or 'Assist' (Abraham et al., 2017b).

The way the system is introduced to the driver has a significant impact on usage and system understanding. An overly positive or overly negative system description can lead to an incorrect understanding of the system and lower trust in it. According to Beggiato and Krems (2013), the system description should realistically explain its capabilities and limitations to ensure an appropriate level of trust calibration (Lee and See, 2004). However, branding approaches that focus on system capabilities and workload reduction might lead users to over-rely on the ADS, resulting in a higher willingness to engage in distracting and risky behaviour (Singer & Jenness, 2020). One study suggests that both the owner's manual and an interactive tutorial led to a better understanding of an ADS (Forster et al., 2019). However, when purchasing a vehicle equipped with an ADS, users may receive little to no information on how to use the system. Salespeople are not always well positioned to educate customers on the system's functionality, and may even provide misinformation unintentionally (Abraham et al., 2017a).

Most studies on users’ understanding of, and behaviour when using, driving automation have focused on lower levels of automation. There is a lack of research into how drivers understand and behave when using higher levels of driving automation. However, driving simulator studies indicate that, although user education can help drivers develop a better mental model of the systems they are using, it does not necessarily improve their reactions in critical situations, such as take-over scenarios (Forster et al., 2020; Boelhouwer et al., 2019).

Drawing from their experience of training pilots to use automation, Casner and Hutchin (2019) propose a set of standards for educating users of partially automated driving systems. When automation was first introduced to the cockpit, pilots would sometimes experience 'automation surprises' when the automation functions did not behave as expected, which, in the worst cases, resulted in crashes. With the development of driving automation, the authors observe that 'history is repeating itself in cars' (p. 58). Nowadays, pilots are trained to use automated systems in a more standardised way, with a strong focus on non-technical skills and crew resource management training. This provides them with the cognitive and social skills that complement their vehicle control skills (Flin et al., 2008). However, no such procedure has been established for car drivers using automated driving systems. Casner and Hutchin (2019) argue that drivers need a certain level of technical understanding of the systems they are using; for example, they should understand sensor capabilities. They also need to understand and recognise system limitations.

From the literature, it can be assumed that there is a need for users to be educated about automated driving systems. Even owners of cars with ADS may not have a proper understanding of the technology. Experience from other fields where automation has been introduced, such as aviation, could inform decisions regarding the education of ADS users.

2.2 Target audience

The Hi-Drive user education campaign was primarily aimed at drivers and the social media followers of the FIA Region I and the 11 Mobility Clubs that participated in the campaign as partners. As the campaign content was created to be accessible, clear and easy to understand, the target audience is mainly the members and followers of the partners' social media channels.

2.3 Implementation of the education campaign

2.3.1 Social media calendar

FIA Region I produced a social media calendar for each quarter of the campaign period. This indicated the text, images and videos to be posted, how frequently they should be posted, and provided reference links with more information about the campaign, the Hi-Drive project and the selected ADAS/ADS features. The calendar was recommended to partners as a reference for communicating about the campaign. It was accompanied by a series of visuals and videos. The visuals and videos specific to each post were listed at the end of the relevant post. FIA Region I followed the calendar, and partners were asked to post on the same days wherever possible (considering cases where this was not possible due to different national contexts, internal policies, or priorities). FIA Region I recommended posting on partners' social media channels at least three times per month, with campaign content, on any of the channels where they were present. The posts created by FIA Region I were designed for LinkedIn and X (formerly Twitter). Posts for X (Twitter) could also be used on Instagram, and posts for LinkedIn could also be used on Facebook. This made it easy to adapt the campaign for all the social media platforms used by the partners. As requested by the lead partner, partners could modify the campaign posts slightly (as they were translated from English into other languages), provided the meaning remained the same in the translated language.

2.3.2 Partners involved

The digital campaign was launched in November 2023 and ran until the end of October 2024. It was translated into 11 languages to maximise its impact and reach as many people as possible. It was led and implemented by FIA Region I and its network of automobile and mobility clubs involved in the Hi-Drive project: ADAC (Germany), ACI (Italy), AL (Finland), AMZS (Slovenia), ANWB (the Netherlands), HAK (Croatia), IAM RoadSmart (UK), MAK (Hungary), MCF (France), RACB (Belgium) and RACC (Spain). Educational materials were shared via the Hi-Drive website and social media channels. These materials were made available to all WP8.7 and Hi-Drive partners for use at external events and outreach activities, with the aim of maximising the impact of the awareness campaign. Furthermore, shortly after the launch of the campaign by FIA Region I and the Hi-Drive and Mobility Clubs, RACE (a club from Spain that is not a Hi-Drive partner but is a member of Region I) expressed interest in joining the ongoing activity and supporting the campaign's implementation on social media.

2.3.3 Campaign branding

All campaign materials (digital and print) were created in accordance with Hi-Drive project branding requirements. The campaign visuals, postcards and video materials were developed in line with the Hi-Drive branding and included the Hi-Drive logo, font, tagline and colour scheme. FIA Region I prepared the design of the campaign materials in collaboration with all WP8.7 partners, and the Hi-Drive Dissemination Management at EICT and the SP Leaders approved them.

2.3.4 Social media used in the campaign

Partners were free to choose how they would publish the content of the awareness campaign. As it was an online campaign, the primary channels were the partners' social media channels, such as LinkedIn, X (formerly Twitter), Instagram and Facebook, as well as digital webpages, such as campaign landing pages on partner websites. Videos produced as part of the campaign were also shared on video-sharing platforms such as Vimeo and YouTube. Articles and updates about the campaign were also disseminated via newsletters.

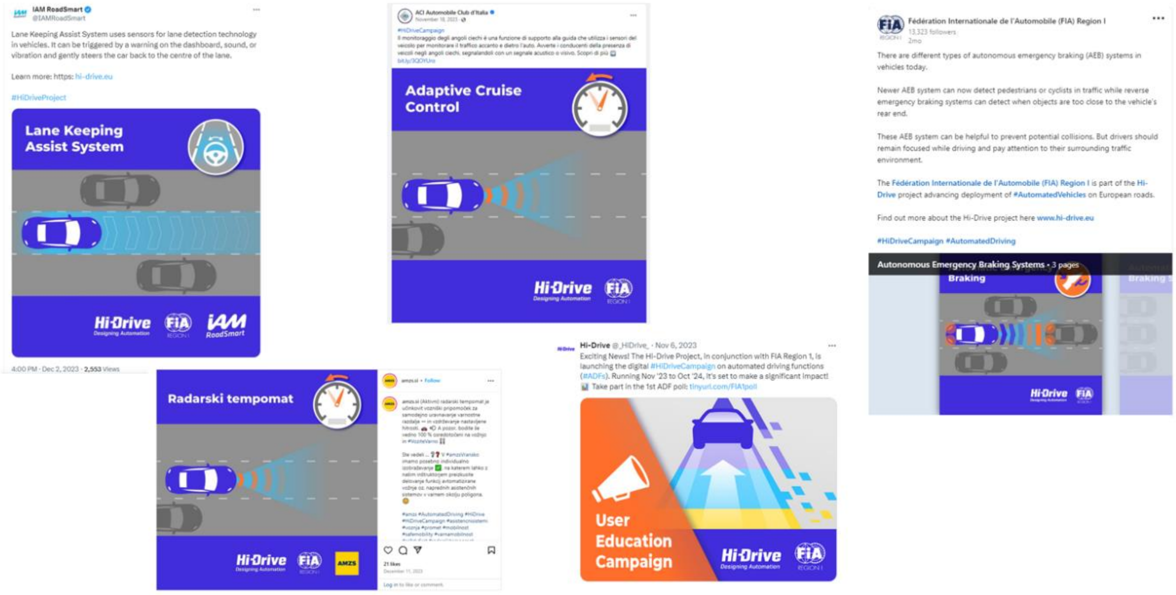


Figure 5 Examples of the campaign's social media posts

Table 1 Social media channels used in the campaign

Facebook	Instagram	LinkedIn	X (Twitter)
ACI Italy, ADAC Germany, AL Finland, AMZS Slovenia, HAK Croatia, MAK Hungary, RACB Belgium	ADAC Germany, AMZS Slovenia, AL Finland, RACB Belgium	ACI Italy, AL Finland, AMZS Slovenia, ANWB The Netherlands, FIA Region I, Hi-Drive, MAK Hungary, MCF France, RACB Belgium, RACC Spain,	ACI Italy, ADAC Germany, AL Finland, AMZS Slovenia, FIA Region I, Hi-Drive, IAM Road Smart UK, MCF France, RACB Belgium, RACC Spain

2.4 Functions addressed in the campaign

2.4.1 List of functions

The campaign covered 14 automated driving functions, ranging from driver assistance and advanced driver assistance systems to automated driving functions belonging to levels 0 to 3 of the Society of Automotive Engineers' (SAE)[1] internationally recognised levels of driving automation: Adaptive Cruise Control, Automatic Emergency Braking, Automatic Emergency Braking with pedestrian and cyclist detection, Automatic Reverse Braking System, Forward Collision Warning, Lake Keeping Assist System, Lane Centring, Lane Departure Warning, Lane Change Assist, Blind Spot Monitoring, Driver Monitoring System, Hands on wheel detection, Motorways Assist, Traffic Jam Chauffeur.

2.4.2 Key messages per function

For each function identified and agreed upon by the Hi-Drive partners, a specific message was crafted to highlight how each function works. This could include the function's purpose, how it works and its strengths and/or limitations. Most of the functions also included an underlying message about the driver's responsibility to stay alert and take responsibility for all driving tasks. For example, the following messages were crafted as social media posts for the Lane Keeping Assist function: *"Lane Keeping Assist System uses sensors for lane detection technology in vehicles. It can be triggered by a warning on the dashboard, sound, or vibration and gently steers the car back to the centre of the lane."*

Annex 1 provides examples of messages for the functions addressed in the campaign.

2.5 Campaign statistics

2.5.1 Social media channels

The online campaign received over 2,000,000 impressions across all social media platforms, with contributions from FIA Region I and the mobility clubs that took part in the campaign. An impression refers to a view of the campaign on a social media user's feed. The table below shows the total number of impressions for each platform.

Table 2 Impressions per online platform, from November 2023 to December 2024

Social media channels	Total statistics
X (Twitter)	360,650
Facebook	1,045,921
LinkedIn	108,721

[1] sae-j3016-visual-chart_5.3.21.pdf

Instagram	551,016
Partners' websites	7,823

The pie chart below shows how impressions were distributed across the various platforms throughout the entire campaign.

Digital channel platform overview - **social media impressions**

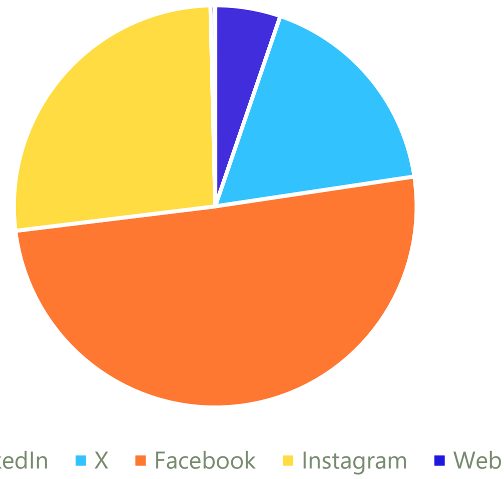


Figure 6 Overview of the digital channel distribution platform

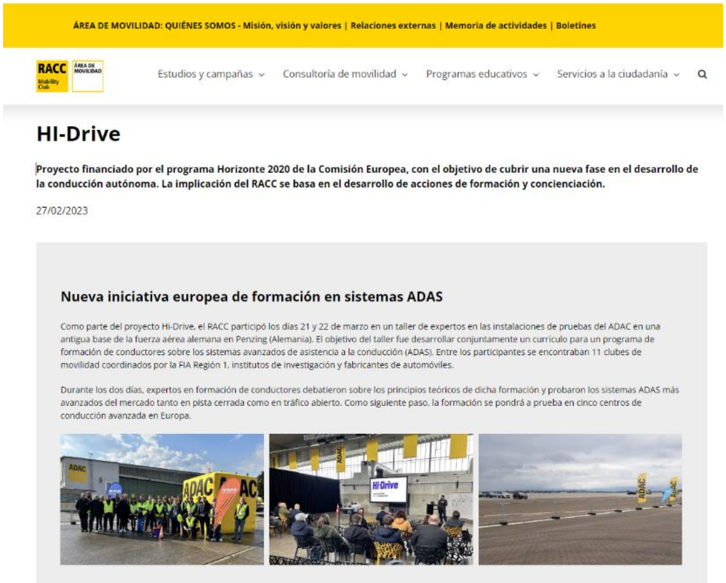
2.5.2 Partners' dissemination activities

Articles and news items containing information about the campaign were drafted and shared on social media, along with a link to more information on the campaign messages. The FIA Region I created a landing page[2] where all information about the user awareness campaign is gathered. The page features a short introduction to the Hi-Drive project and the role of FIA Region I in the user awareness campaign. All campaign visuals and videos are also available on this landing page. News about the campaign launch and the participation of Mobility Clubs was included in several editions of the FIA Region I internal newsletter, which was shared with Mobility Clubs across Europe, the Middle East and Africa.

[2] https://www.fiaregion1.com/hi-drive/

All user awareness activities, in-person meetings and workshops relating to Hi-Drive were published in the newsletter. Below are examples of partner websites, articles and newsletters dedicated to the Hi-Drive user education campaign.

The RACC Mobility Club in Spain[3] has created a website article about the Hi-Drive project. This includes general information about the project's objectives, as well as two separate articles about the expert workshop in Penzing and the social media campaign. A brief description and link to the article was also included in one edition of the RACC MobiNews newsletter, which is distributed to mobility professionals throughout Spain.



The Hi-Drive project has its own page on the ACI (Italy) website[4].

[3] https://movilidad.racc.es/hi-drive/
[4] https://www.aci.it/

Mobility Club France[5] published an article on its website about the Hi-Drive project. The article provides an overview of the project and showcases all the visuals from the campaign.

A dedicated landing page for the Hi-Drive project was created on the MAK website[6]. This page provides general information about the project, as well as weekly posts about how the various advanced driver assistance systems work. These posts are published in line with the social media campaign schedule.

Descriptions of the driver assistance systems were also published in MAK's fortnightly newsletter, which reaches over 30,000 members, with a link to the Hi-Drive landing page.

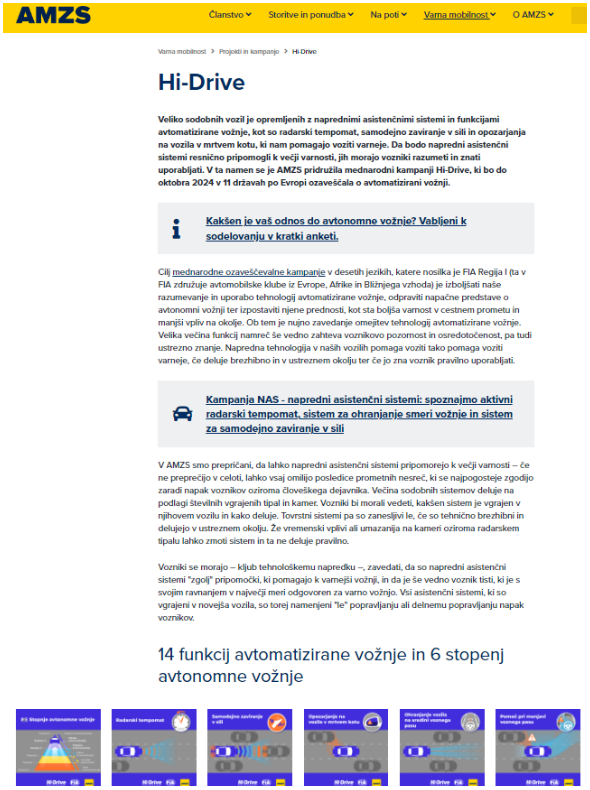
---

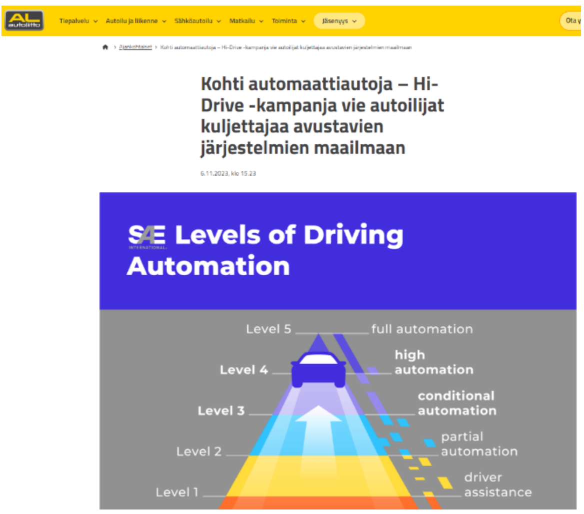
[5] https://mobiliteclub.fr/actualites/securite-routiere/campagne-europeenne-hi-drive-sensibiliser-aux-aides-a-la-conduite/

[6] https://autoklub.hu/hi-drive/

AMZS[7] created a web article about the Hi-Drive campaign, providing readers with information to raise awareness of automated driving.

The AMZS club also set up a landing page about the Hi-Drive project, which includes general information about the project and a link to the ADAS questionnaire: *"How do you feel about autonomous driving?"*, and sent a newsletter entitled 'What assistance systems does your car have?' Recipients (AMZS members) were invited to complete an online survey.





AL (Autoliitto)[8] launched the Hi-Drive campaign in Finland, publishing the news on its website and in its newsletter. The article explains that, although fully autonomous level 5 cars will not be available any time soon, more cars up to level 3 are appearing on the roads. To be able to enjoy all the benefits of these cars, it is important to understand how the systems work.

---

[7] https://www.amzs.si/hi-drive
[8] https://www.autoliitto.fi/uutiset/kohti-automaattiautoja-hi-drive-kampanja-vie-autoilijat-kuljettajaa-avustavien-jarjestelmien-maailmaan/

Adaptive Cruise Control takes it to another level. Using sensors and cameras in the vehicle, the system effectively reads the traffic ahead and will also apply the gently apply brakes to maintain distance between the drivers' vehicle and the vehicle in front.

These systems are not mandatory but drivers who use high speed roads and motorways find they can help with leg cramp on long journeys, effectively giving their feet a rest. The systems are also incredibly helpful where average speed cameras operate. Drivers who are concerned about maintaining a speed (e.g 50mph through roadworks on a motorway) can set the cruise control safe in the knowledge they will maintain a steady and safe driving experience, however if the technology is not adaptive, it will not respond to changes in the limit or automatically slow the vehicle down if there is slower traffic ahead.

FIA REGION I Hi-Drive visual explainer

FIA REGION I Hi-Drive: Adaptive Cruise Control automatically adjusts your vehicle's speed to maintain a safe distance from the car ahead, utilising advanced sensor systems. Driver attention to road conditions is required at all times.

IAM RoadSmart has launched a guide to ADAS on its website[9], accompanied by a media campaign, to further support the Hi-Drive education campaign. The guide details the most relevant assistance systems in use, as well as some of the newer features that are becoming available. The guide can be downloaded after registration and has already been accessed by over 100 individuals and organisations (at the time of writing this report). As well as explaining what these systems are, the guide also details why they are beneficial and how they help drivers.

HAK used videos produced by the Hi-Drive campaign in HAK Traffic Education, a five-minute show produced and aired by HAK on Croatian Public Television (HTV). Since January 2024, the show has consisted of two segments: a main reportage and a shorter advice segment. The show provides a platform for various road safety and educational topics that HAK deems important in relation to Croatian road safety. The videos are available on the HAK YouTube channel[10]. HAK has also been airing several short, animated videos that explain the different levels of driving automation and their respective functions. These videos are shorter Advanced Driver Assistance Systems (ADAS) pieces included in the 'advice' segments of the show.

[9] https://iamcommercial.co.uk/
[10] https://www.youtube.com/watch?v=kFJJ5ez8_Rc

2.5.3 Hi-Drive user education campaign page

A dedicated campaign page[11] has been added to the Hi-Drive website to support the user education campaign and user training programme. This page brings together all the campaign elements, including the participating Mobility Clubs and visual assets such as the campaign video and social media graphics.

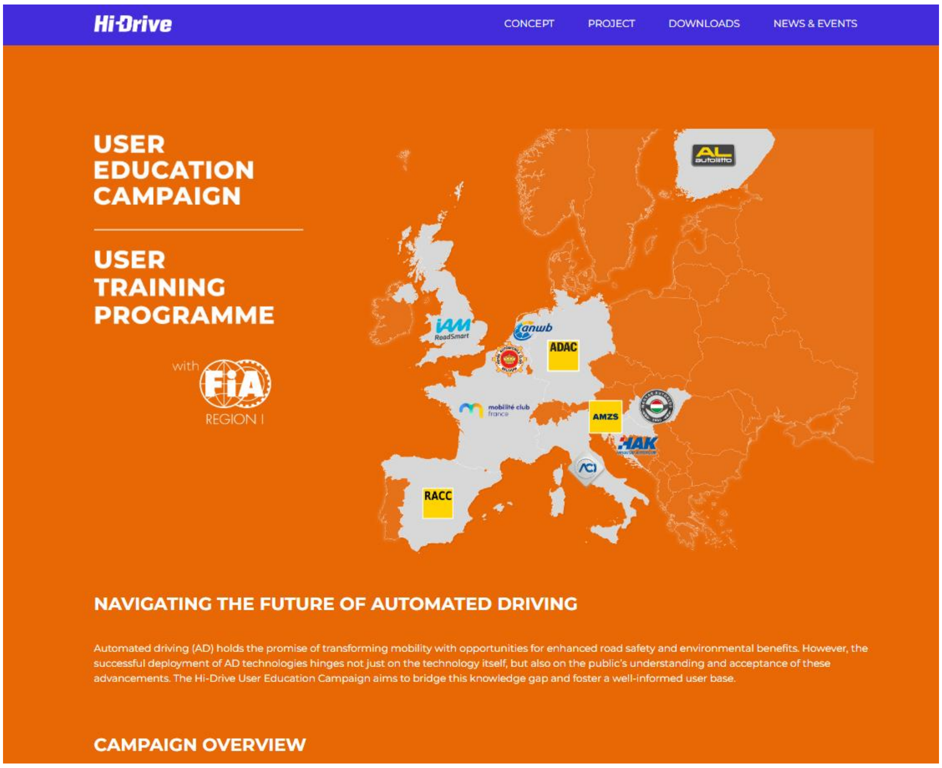


Figure 7 Screenshot of the Hi-Drive UEC page

When you arrive at the webpage, a map showing the locations of the participating Mobility Clubs across Europe is displayed. This gives an overview of where the campaign messages were disseminated. Just below the list of participating Mobility Clubs, the campaign's goals and objectives are highlighted to remind readers of its purpose. The following section features a slider that brings together all the social media visuals used in the campaign, alongside the key messages that accompanied them. This is followed by an explanation of the automated driving features and the reasons behind the campaign's emphasis on safe and informed driving.

[11] https://www.hi-drive.eu/uec/

Figure 8 Screenshot of the Hi-Drive UEC page showing visuals and messages

The campaign video is embedded, and all the campaign materials are available for download. All the campaign videos are available on the Hi-Drive YouTube channel[12]. The Hi-Drive User Education Campaign and User Training Programme page on the Hi-Drive website contains all the publicly available campaign information for those interested in learning more about Hi-Drive. This page was promoted in the social media calendar created for the campaign and served as a referral for campaign content.

2.6 Campaign visual identity and materials

2.6.1 Visual identity

The campaign's visual identity adhered to the Hi-Drive brand guidelines, respecting the typography, illustration design and colours. All visual items were developed in close coordination with the project coordinator and technical partners to ensure consistent branding and the effective dissemination of information via the campaign.

A set of 15 still visuals was developed and produced by the FIA Region I in collaboration with mobility clubs and launched at the end of 2023. Each image illustrates and explains a specific assisted or automated driving function to help users understand it. The purpose of the visuals

[12] https://www.youtube.com/@hi-drive-21-25

is to demonstrate the range of assisted and automated driving functions that exist or are being developed in modern vehicles. With the exception of one visual depicting the different levels of automated driving, the others focus on a specific function. The visual depicting the different levels of driving automation provides users with a general overview of the various stages of automation.

Figure 9 An overview of the 15 visuals developed for the campaign

All 15 of the visuals were created using English and then translated into the following languages: Catalan, Croatian, Dutch, Finnish, French, Hungarian, Slovenian and Spanish. The Mobility Clubs were also given the opportunity to add their logo to the visuals.

Figure 10 Examples of translated visuals

2.6.2 Animated videos

FIA Region I developed a short animation to explain the different levels of driving automation and their respective functions. The script and storyboard were created in collaboration with technical partners to ensure the accuracy of the information.

The 3 minute 11 second animated video covers six levels of automated driving, starting from level zero. It has been uploaded to the Hi-Drive YouTube channel and the FIA Region I Vimeo platform and shared on social media by partners participating in the campaign. The video is in English and has subtitles in ten languages (Catalan, Croatian, Dutch, Finnish, French, German, Italian, Hungarian, Slovenian, and Spanish) to accommodate the needs of participating partners and their audiences.

For a more user-friendly viewing experience on social media platforms, the video has also been shortened into six different videos, each representing a different SAE level of driving automation.

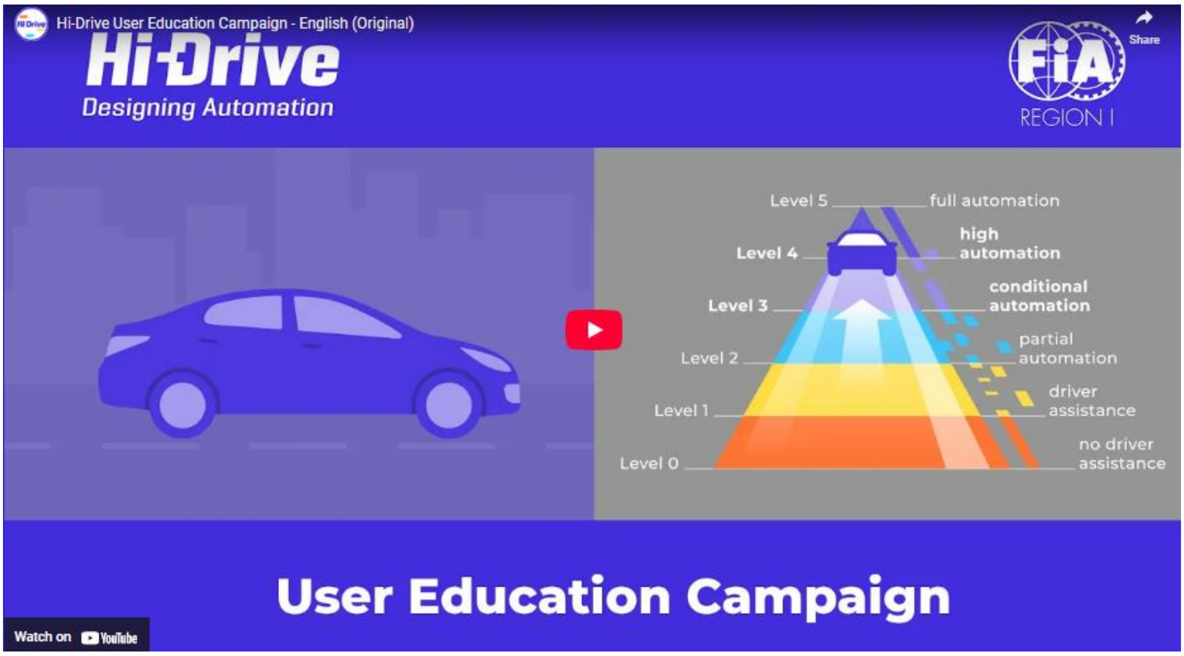


Figure 11 A screenshot of the animated video created for the campaign

2.6.3 Campaign postcards

Physical postcards containing the same visuals distributed via social media platforms were also produced to support the dissemination efforts of the Hi-Drive campaign messages. These postcards were developed by the Hi-Drive project Dissemination Manager in collaboration with FIA Region I.

The postcards were distributed at various dissemination project activities. The source files for the postcards were shared with partners so they could be printed locally in their own countries.

Figure 12 Examples of campaign postcards

2.7 Dissemination activities

The WP8.7 partners disseminated the educational awareness campaign and the driver training at various external events, supporting outreach activities and engaging with different audiences. This chapter presents a few examples of such activities.

2.7.1 WIVW at the "Traffic Safety Day of Bavaria" event (2024)

On 20 April 2024, WIVW showcased the Hi-Drive project at the Bavarian Traffic Safety Day in Würzburg. The event featured 61 exhibitors, including emergency services, who provided informative and entertaining displays. The WIVW team conducted a short interview about the Hi-Drive project, showed the campaign animated video on SAE automation levels, and engaged with visitors to discuss automation and distribute educational visuals. Participants gained valuable insights into road safety and the Hi-Drive project's role in promoting it.

Figure 13 WIVW at the "Traffic Safety Day of Bavaria"

2.7.2 FIA Region I at the EC Road Safety Conference (2024)

On 16 April 2024, a speech by FIA Region I representative at the European Commission's Road Safety Conference in Dublin[13] highlighted the efforts of FIA Region I and Hi-Drive partners to promote automated driving systems through user awareness campaigns and driver training programmes. The presentation emphasized the importance of these programmes in ensuring drivers understand the capabilities and limitations of automated driving systems, as well as the need for ongoing education to prevent complacency and over-trust as the technology evolves.

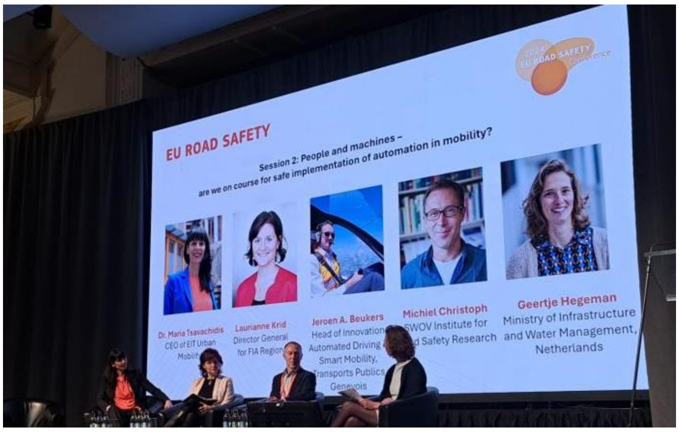


Figure 14 Thematic session 2: People and machines

[13] https://transport.ec.europa.eu/news-events/main-events/eu-road-safety-conference-2024_en

2.7.3 RACC and University of Leeds at the Tomorrow Mobility World Congress in Barcelona (2024)

RACC organised a session[14] entitled 'New Human Behaviour Challenges Towards Automated Driving', in which the latest findings on how advanced levels of automation may create new safety challenges were discussed, as well as and how these can be mitigated through user awareness campaigns and driver training programmes. The discussion included results from user behaviour studies in Hi-Drive, which highlighted the risks of complacency among users of automated systems. The Hi-Drive driver training programme, which was piloted in Barcelona, was presented as a potential solution to these issues. The session also explained how the Hi-Drive project's findings on user behaviour, as well as its awareness and training initiatives, fit into a global road safety strategy.

Figure 15 Screening of the user training video at the Tomorrow Mobility World Congress

2.7.4 Hi-Drive Thematic Session at FIA Region I Spring Meeting (2025)

On 7 May 2025, the Hi-Drive project was presented to the member clubs of FIA Region I[15] at the Spring Meeting in Marrakesh. An overview of the project and key figures of the Hi-Drive user awareness campaign were presented. Four mobility club representatives participated in a panel discussion to share their experiences with Hi-Drive. The discussion emphasized the project's extensive scope, the importance of feedback from instructors and drivers, the

[14] https://www.tomorrowmobility.com/
[15] https://www.fiaregion1.com/

enthusiasm of elderly participants in Slovenia, and the significance of multi-stakeholder collaboration.

Figure 16 Hi-Drive Thematic Session at FIA Region I Spring Meeting

2.7.5 RACC at the ITS European Congress in Seville (2025)

At the ITS European Congress in Seville[16], the results of the Hi-Drive user training pilot by RACC Spain were discussed by RACC representative in a plenary session. Three key findings were highlighted: (1) Training is effective, impactful, scalable, and necessary; (2) Perceptions shift with awareness, as post-training users reported a greater willingness to use these systems; (3) Some systems still fail to resonate with users, highlighting a mismatch between innovation and real-world expectations.

Figure 17 RACC at the ITS European Congress in Seville

[16] https://2026.itseuropeancongress.com/about/previous-congresses

3 User training programme

3.1 Background

As automated vehicles become more widespread, appropriate and standardised user training will play a crucial role in ensuring road safety in Europe. Currently, many mobility clubs, car manufacturers and driving schools offer practical training on the safe use of driver assistance systems. However, there is currently no standardised approach at a European level. The Hi-Drive approach to user training draws on the extensive expertise of its partners, including that gained from previous research projects such as L3Pilot, to deliver an international user training programme that addresses functions at SAE levels 1–2. Preparing the curriculum for this programme was a collaborative effort involving FIA Region I, mobility clubs, vehicle manufacturers, and research organisations.

Although drivers usually learn to use ADAS functions through trial and error, it has been reported that training and practice sessions increase drivers' accuracy when operating such functions (Murtaza et al., 2023), as well as improving their understanding of, confidence in, and use of these technologies (Abraham et al., 2017; Forster et al., 2019; Manser et al., 2019).

Effective training should be based on the results of a Training Needs Analysis (TNA; Arthur et al., 2003; Goldstein & Ford, 2002; Wills, 1998), which identifies the knowledge gap to be addressed and the desired learning outcomes. An effective TNA should provide statements on what trainees are expected to do and the level of performance required, as well as the conditions under which trainees are expected to achieve the desired outcomes (Goldstein & Ford, 2002). The outputs of this analysis can guide the design, development, delivery and evaluation of the training programme, enabling the training designer to specify the key features for implementing and evaluating training programmes Therefore, a key element in designing user training for driver assistance systems is identifying where consumers are likely to experience difficulties with understanding or using ADAS. Once these gaps have been identified, training developers can collect a catalogue of knowledge, skills and attitudes required to use these systems effectively and promote an appropriate level of trust in them. Salas et al. (2012) suggest using a combination of training methods to address the identified catalogue of learning outcomes.

These could include:

- Information-based strategies, in which content is delivered using methods such as lectures, presentations or web-based materials.
- Demonstration-based strategies, which provide opportunities for trainees to observe the required behaviours and actions.

- Practice-based strategies engage learners in actively using targeted knowledge, skills or attitudes during training.

3.2 Training preparations: expert workshop

FIA Region I, together with 11 mobility clubs, vehicle owners and research partners, organised the Hi-Drive expert workshop: '*Driving with ADAS: Driver Education 2.0*', which took place on 21 and 22 March 2024 at the ADAC Mobility Test Centre in Penzing, Germany. Following a preparatory phase involving several online discussion rounds to reduce the number of ADAS systems to a manageable selection; this workshop marked the first stage in preparing and implementing the public user training programme. Participants had the opportunity to experience specific ADAS functions in series vehicles on both the ADAC test track and a public road/motorway (Munich–Lindau).

The workshop's primary objectives were to validate and reach consensus on the functions to be demonstrated in public user training. The workshop aimed to outline driving scenarios, gather feedback to refine the public user training programme curriculum, and capture video footage of the test track and driving activities for Hi-Drive dissemination purposes.

Workshop objectives:

- To facilitate the preparation of user/driver training for SAE Levels 1–2.
- Contribute to raising user awareness of the different levels of driving automation, including SAE Levels 1–3.
- Carry out the user/driver training programme in five European locations with public participation.

Forty participants experienced specific ADAS and automated driving functions in production vehicles (VW, Audi, Honda, BMW, Ford and Renault) on both the ADAC test track and the motorway. The systems tested at Penzing included Adaptive Cruise Control, Emergency Braking Assist with pedestrian and cyclist detection (including when reversing), Collision Warning, Lane Keeping Assist, Blind Spot Monitoring and Driver Monitoring.

Figure 18 Expert workshop in Penzing

3.3 User training objectives

The central objective of the Hi-Drive user training programme was to educate drivers on the application of specific SAE Level 1–2 features in a variety of driving scenarios.

Through hands-on experience with suitable vehicles, participants were able to familiarise themselves with ADAS and ADS functions under supervision. Professional driving instructors, trainers and experts provided first-hand information on the proper use of vehicles and interacted with participants to answer questions about functionality.

The main objective of curriculum development was to define the training sites, the target user group, the vehicles used and the environments and driving scenarios, as well as the SAE Level 1–2 functions to be demonstrated in public training sessions. The next step was for the five training sites to recruit participants, conduct the training and collect feedback from participants and trainers.

3.4 Target groups

The user training programme targeted three segments:

- Young drivers
- Elderly drivers
- Fleet and mobility managers and their drivers.

Each of these groups plays a crucial role in improving road safety in Europe. Young and elderly drivers because they typically represent the age groups with the highest accident rates, and fleet drivers because they account for a large proportion of total kilometres driven.

The training programme developed in Work Package 8.7 can be adapted as needed to suit the requirements of each target group.

3.5 List of functions

All 14 ADAS/ADS functions that formed part of the social media campaign (all of which fall under SAE levels 1 to 3) were deemed relevant for the user training programme. Consequently, they were all covered in the theoretical section, albeit briefly in some cases.

The practical training programme focuses on functions that require active driver interaction, such as activation or monitoring, to improve safety performance. The final selection of functions for the practical training programme was based on the outcomes of the expert workshop in Penzing, in which all the potential exercises were trialled by experts from mobility clubs, OEMs, and research partners.

For example, Automatic Emergency Braking (AEB) is not included in the practical training programme because this function activates automatically in the event of a collision and does not require any interaction or activation by the driver. However, drivers should not rely on this function to avoid accidents, which is why it is covered in detail in the theoretical part of the programme, with the clear aim of avoiding overconfidence.

Table 3 Functions and the section of the user training programme in which they are covered

ADAS/AD function	Theory	On-track	On-road
Adaptive Cruise Control	x	x	x
Automatic Emergency Braking	x	-	-
Automatic Emergency Braking with pedestrian and cyclist detection	x	-	-
Automatic Reverse Braking System	x	x	-
Forward Collision Warning	x	-	-
Lake Keeping Assist System	x	x	x
Lane Centring	x	x	x

Lane Departure Warning	x	x	x
Lane Change Assist	x	-	-
Blind Spot Monitoring	x	x	x
Driver Monitoring System	x	-	-
Hands on wheel detection	x	-	x
Motorways Assist	x	-	x
Traffic Jam Chauffeur	x	-	-

3.6 The curriculum for the ADAS/ADS training programme

- General remarks, agenda and preparation

The curriculum detailed in the following sections should be understood as a general framework that can be adapted as needed to the local context of each of the five training sites involved in the project. This includes the specific target group, the design of the training programme and the local road network.

The figure below summarises the agenda for a half-day training programme lasting at least 3.5 hours.

Figure 19 Hi-Drive ADAS/ADS training agenda

Before starting the training programme, the following aspects should be considered to ensure a successful outcome:

a. Selection of vehicles: four identical vehicles with identical ADAS/ADS equipment are recommended.

b. Selection of driving instructors: only instructors with sufficient knowledge of ADAS/ADS handling should be selected.
c. Instruct driving instructors.
d. Prepare briefing documents for driving instructors.
e. Prepare liability waiver declarations.
f. Dry run the day before the event.
g. Define and document safety and behaviour rules.

3.6.1 Theory modules

Objective: The theoretical part of the training programme will provide drivers with basic knowledge of driving automation levels and ADAS/ADS system operation. This knowledge will enable them to utilise these functions to their full potential, thereby enhancing driving comfort and safety. Emphasis will be placed on raising awareness of the limitations of these functions to prevent misuse due to overconfidence.

Instructional method: Classroom-based.

Approach: Use PowerPoint slides including audiovisual material produced as part of the Hi-Drive project, such as videos, postcards from the social media campaign and images illustrating the limitations of the functions.

Modules: The theoretical part of the training programme consists of three main sections. An introduction to vehicle automation in general, including automation levels and ADAS/ADS functions; An introduction to driving support and emergency functions, which form part of the on-track training; An introduction to the driving support and emergency functions that are part of the on-track training. Please note that the Automated Emergency Braking (AEB front) function is not included in the practical training programme. Each of the three sections is further divided into three modules.

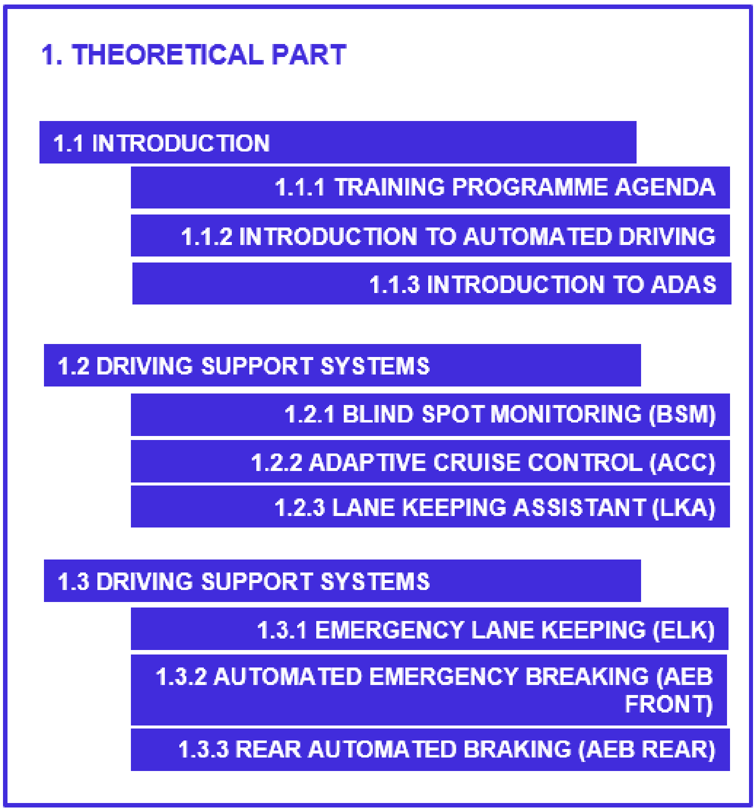


Figure 20 An overview of the structure of the theoretical part of the user training programme

Below is a box for each module containing the learning content, as well as any materials that will be used to teach and illustrate the content and convey the module's key messages.

M1.1.1	**Training programme agenda (theory and practical sessions)**
	Welcome and introduction of the instructors. Explain the agenda for the day (the theoretical part will be short, so it is important to always pay attention, and there will be an evaluation at the end). Explain the learning objectives: • To become familiar with ADAS functions. • To learn about the limitations of the functions, counteracting potential overconfidence. • To lead to more frequent and correct use by the driver.

M1.1.2	**Introduction to automated driving**

	Explain the levels of automation (6 SAE levels[17] vs. 3 automated modes). Explain the role of the driver in each level, that in any level <3 the driver is actively driving and responsible in all circumstances. From level 3 (conditional driving automation), under certain limited conditions (e.g. traffic jam chauffeur), the functions can take over the active driving role, while the driver is still responsible in a monitoring role. Drivers should be made aware of the level of automation of their current vehicle and of the vehicles used for the practical part of the training programme. ***Tips/Materials to be used*** *Show video of SAE levels produced as part of the social media campaign, ADAC graphics on 3 automated modes[18].* ***Key messages*** *"Drivers should understand the level of automation of current standard and advanced cars on the market (level 2 and 2+) and the corresponding role and responsibilities of the driver".*

M1.1.3	Introduction to ADAS functions
	Broad overview of ADAS functions, including mandatory functions (e.g. ABS, ESC) and examples of the latest optional functions. • Categorisation of systems into driving assistance and emergency systems. • Driving assistance functions: Functions that actively and continuously interact with the driver during driving. Designed to assist the driver in non-emergency situations, e.g. ACC. • Emergency functions: Those functions that only actively intervene in the driving task in the event of an identified emergency, e.g. anticipated collision (front and rear), anticipated unintentional lane departure. • Emergency functions: Designed to help the driver in emergency situations, but not 100% reliable. The driver remains responsible and should never rely on an emergency function to work.

[17] https://www.sae.org/standards/content/j3016_202104/

[18] ADAC-Driving_Modes.pdf (fiaregion1.com)

	• System can always be overridden (discussion of letting system do most vs. permanent override). • Discuss the risks and benefits of using ADAS functions. Discuss the importance of always keeping your eyes on the road and why this is particularly important when using ADAS. • At the start of the journey: Emphasise the need to activate functions and the circumstances in which functions are automatically deactivated (e.g. ACC when the brake pedal is pressed). ***Tips/Materials to be used*** *Show postcards produced as part of the social media campaign.* ***Key messages*** *"Drivers should understand the difference between support (comfort) and emergency features, and that the driver remains responsible for all current functions and should never rely on them".*

M1.2.1	Blind Spot Monitoring (BSM)
	• Start with general explanation of function (show function postcard), activation, deactivation, operating range, limitations. • Describe false positive situations to show the limitation of the system / also describe true positive situations. ***Tips/Materials to be used*** *Show the BSM postcard produced as part of the social media campaign.* ***Key messages*** *"Receiving a warning of an approaching vehicle in the blind spot helps the driver but may not always be correct, while NOT receiving a warning of an approaching vehicle does not guarantee a clear path and MUST be confirmed by the driver. The driver always remains responsible".*

M1.2.2	Adaptive Cruise Control (ACC)
	• Start with a general explanation of the function (show the function postcard), activation, deactivation, operating range, limitations.

	• Describe situations of false positives to show the limits of the system / also describe situations of plausible true positives (examples are curvy roads, out of working speed range, etc). ***Tips/Materials to be used*** *Display the ACC postcard produced as part of the social media campaign.* ***Key messages*** *"Drivers must keep their eyes on the road and the vehicles in front of them and be ready to intervene at any time, as they may lose control of the vehicle in front of them."*

M1.2.3	Lane Keeping Assistant (LKA)
	• Start with a general explanation of the function (show function postcard), activation, deactivation, operating range, limitations. • Focus on the difference between features with and without steering assistance. The former includes Lane Departure Warning (LDW) which, depending on the car model, provides visual, audible, or tactile warnings if it detects the car leaving the road unintentionally. Active steering assist features help to bring the car back into position with a gentle turn. • Describe situations of false positives to show the limits of the system / also describe situations of plausible positives (examples include adverse weather conditions, rural roads, and where the system works perfectly but the infrastructure has flaws, e.g. case in NL with continuous line to be crossed, etc). ***Tips/Materials to be used*** *Show the LKA postcard produced as part of the social media campaign.* ***Key messages*** *"Given that the system is based on camera technology and best recognises lane markings, there are currently many situations, especially on secondary road networks, where the function may not work reliably. This can also be the case on primary roads networks in adverse weather conditions such as fog, heavy rain, or snow. It is important to be aware of the type of system (and how it may react to lane departure) of the specific car model and how to detect whether the system is activated or deactivated."*

M1.3.1	Emergency Lane Keeping (ELK)

	• Begin with general explanation of function (show function postcard), activation, deactivation, operating range, limitations. • Use the operation of the LKA as a basis for describing the difference to the emergency function ELK. Focus on the difference between the gentle steering support of the LKA and the emergency steering function of the ELKs. • Describe situations of false positives to show the limits of the system / also describe situations of plausible positives (examples include adverse weather conditions, rural roads, and where the system works perfectly but the infrastructure has flaws, e.g. case in NL with continuous line to be crossed, etc). ***Tips/Materials to be used*** *Show the LKA postcard produced as part of the social media campaign.* ***Key messages*** *"ELK is based on camera systems such as LKA and therefore its reliability is similar. Under no circumstances should the drivers rely on the function to keep themselves in the correct lane, as the function is designed to intervene in an emergency that the driver may not have detected or is unable to counteract."*

M1.3.2	Automated Emergency Braking (AEB front)
	• Start with general explanation of function (show function postcard), activation, deactivation, operating range, limitations. • Describe false positive situations to show the limits of the system / also describe plausible positive situations (examples may include adverse weather conditions, urban situations, and ADAC example of pedestrian detected on sidewalk, etc). • An example of a situation of limited capability of the system is where a preceding vehicle avoids the end of a traffic jam at the last moment and consequently the AEB front of the following vehicle detects the end of the traffic jam very late. ***Tips/Materials to be used*** • *Show the AEB postcard produced as part of the social media campaign.* • *Show the video of on-track demonstration of emergency braking.* ***Key messages*** *"Under no circumstances should the drivers rely on the function to avoid an impending collision, as the function is designed to intervene in an emergency that the driver may not have detected or is unable to counteract. The function may detect the obstacle later than*

	a driver would and therefore may only be able to reduce the impact of the collision but not avoid the collision."

M1.3.3	Rear Automated Emergency Braking (AEB rear)
	• Start with general explanation of function (show function postcard), activation, deactivation, operating range, limitations. • Describe false positive situations to show the limitations of the system / also describe plausible positive situations. ***Tips/Materials to be used*** • *Show the AEB rear postcard produced as part of the social media campaign.* ***Key messages*** *"AEB rear adds an extra layer of attention in situations where the driver may not have noticed an object behind the vehicle (e.g. because it is moving or because of its size), but it CANNOT be relied upon to replace the conventional over-the-shoulder view."*

3.6.2 On-track practice modules

Objective: The on-track practice modules of the training programme aim to give drivers the confidence to use key ADAS/ADS functions in a controlled environment under the close supervision of an instructor. The restricted environment of the track enables drivers to experience the limitations of the different functions. This will encourage drivers to use the driver support functions more frequently and correctly while driving, enabling them to utilise the functions to their full potential.

Instructional method: On a closed track.

Approach: The driver performs manoeuvres under the guidance of an instructor in a car.

Modules: The practical on-track part of the training programme consists of an in-car preparation module to familiarise the driver with the car's HMI, followed by four modules, each of which covers one ADAS function.

Preparation before the start of the training programme:

- The ADAS/ADS functions of the vehicles must be tested in advance by the driving instructors.
- Test and define track sections for different on-track practice modules, e.g. the minimum length of each section.

- Define reversing lanes.
- Apply additional markings as necessary.
- Test and set speeds with the driving instructors.

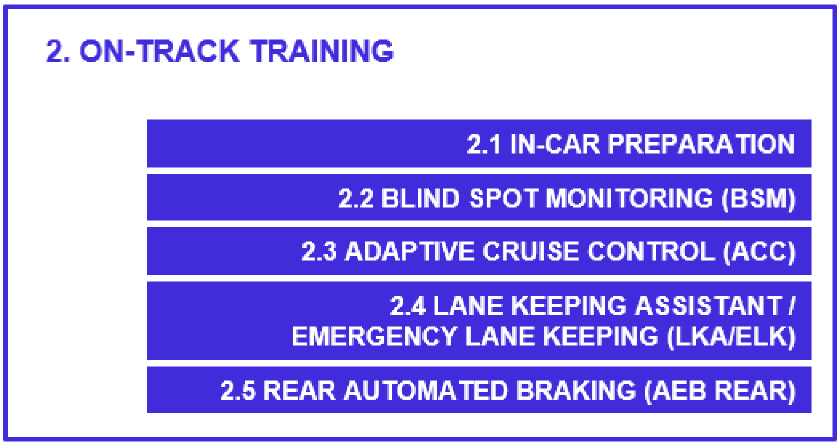


Figure 21 An overview of the structure on the on-track practice part

There is a box below for each module, containing the learning content and key messages that will be covered in that module.

M2.2	**Blind Spot Monitoring (BSM)**
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-track, dual carriageway
Duration:	20 minutes
Weather conditions:	All conditions
Speed:	50 - 70 km/h (must be determined before the event)
Procedure:	
Both vehicles follow each other and accelerate to a pre-defined speed. The vehicle behind then overtakes and the driver recognises the information from the BSM in the vehicle. On the next pass, the vehicles change positions. The driver and passenger then change positions in the vehicle.	
Detailed explanations of the BSM are given by the driving instructor.	
Special instructions	

- *Be aware of the minimum speed for activating the system depending on the type of car.*
- *Ensure that the sensors are clean from snow and ice.*

Key messages

"Receiving a warning of an approaching vehicle in the blind spot helps the driver but may not always be correct, while NOT receiving a warning of an approaching vehicle does not guarantee a clear path and MUST be confirmed by the driver. The driver always remains responsible".

M2.3	**Adaptive Cruise Control (ACC)**
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-track, straight line 200m
Duration:	20 minutes
Weather conditions:	Limited function possible in heavy rain or snowfall
Speed:	30 - 50 km/h (must be determined before the event)

Procedure:

Two cars are travelling behind each other at a set speed. ACC is activated in the rear vehicle. The vehicle in front reduces its speed (possibly to a standstill) and starts moving again. In the rear vehicle, the driver experiences the maintenance of the set time headway, by automated braking and acceleration. On the next pass, the vehicles change position. The driver and passenger then change positions in the vehicle.

The driving instructor provides detailed explanations of ACC.

Special instructions

- *The driving instructor must always ensure that ACC is engaged (risk of rear-end collision).*

Key messages

"The drivers must keep their attention on the road and the vehicles in front of them and must always be ready to intervene in the event of losing control of the vehicle in front".

M2.4	**LKA/ELK**
Vehicles:	4 vehicles with ADAS/ADS

Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-track
Duration:	15 minutes
Weather conditions:	All conditions
Speed:	50 - 70 km/h (must be determined before the event)

Procedure:

Complete at least four laps on the track. Lap 1: Accelerate to target speed and enter lane mark section. Lap 2: Slightly move out of the lane markers, transition from LKA to ELK. Lap 3: More active steering out of the lane markers. Lap 4: Lane change simulation with LKA activated.

The instructor will give a detailed explanation of LKA/ELK.

The cars must be driven at a sufficient distance to avoid activation of other ADAS functions such as ACC or BSM.

Special instructions

- *Ensure that the sensors are clean in snow and ice.*
- *Requires at least 200m of track with lane markings.*

Key messages

"ELK is based on camera systems such as LKA and therefore its reliability is similar. Under no circumstances should the drivers rely on the function to keep themselves in the correct lane, as the function is designed to intervene in an emergency that the driver may not have detected or is unable to counteract."

M2.5	Rear Automated Braking (AEB Rear)
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-track
Duration:	20 minutes
Weather conditions:	All conditions
Speed:	5 - 15 km/h (walking to running speed)

Procedure:

The driver reverses towards an obstacle (e.g. a cone) until the AEB rear brakes the vehicle. After every two passes, the driver and passenger change positions in the car. People who are not driving could observe the manoeuvre from a safe position on the outside.

The driving instructor will give detailed instructions on AEB Rear.

Special instructions

- *Ensure that the sensors are clean in snow and ice.*

Key messages

" AEB rear adds an extra layer of attention in situations where the driver may not have noticed an object behind the vehicle (e.g. because it is moving or because of its size) but it CANNOT be relied upon as a replacement for the conventional over-the-shoulder view."

3.6.3 On-road practice modules

Objective: The on-road modules of the training programme allow drivers to practise the skills acquired on the track in normal road conditions, under close instructor supervision. Drivers will experience several ADAS/ADS functions simultaneously to understand their combined benefits. This will encourage drivers to use the driver support functions more frequently and correctly while driving, enabling them to utilise the functions to their full potential.

Duration: 90 minutes.

Instructional method: On the open road network.

Approach: Drivers carry out driving exercises in a car under the guidance of an instructor. All vehicles are driven by two participants and a driving instructor simultaneously, with a driver change after half the driving time.

Modules: The practical on-road part of the training programme consists of three modules, each of which covers one ADAS function.

Preparation before the start of the training programme:

- ADAS of the vehicles tested by driving instructors
- Test and define routes (road map): route length, consider the impact of traffic (e.g. rush hour), country roads, motorways
- Test and set speeds
- Check for changes to traffic routing (e.g. roadworks) close to the event

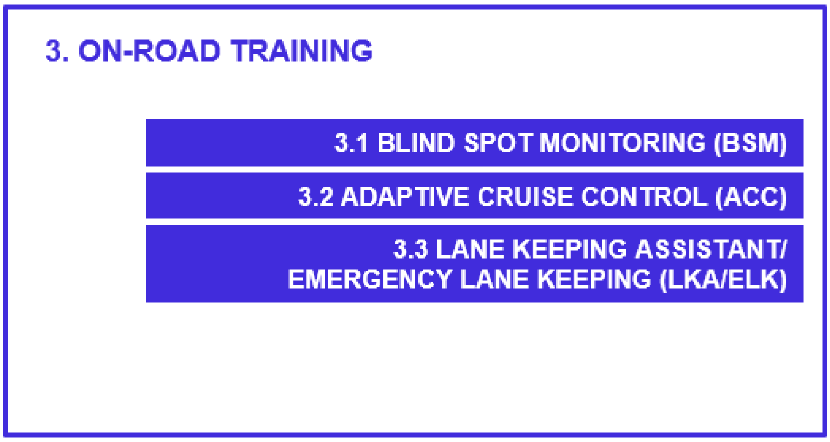


Figure 22 An overview of the structure of the on-road training session

M3.1	**Blind Spot Monitoring (BSM)**
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-road, motorway
Duration:	45 minutes
Weather conditions:	Limited function possible in heavy rain or snow
Speed:	Max 120 km/h depending on traffic regulations, road, and weather conditions

Procedure:

Driving in real traffic and observing the information through BSM for 45 minutes per driver in combination with LKA, ELK and ACC including a final discussion round at the end of the active driving part. After half the driving time, the driver and passenger change positions in the vehicle.

The driving instructor gives detailed explanations of the BSM.

Special instructions

- *Ensure that the sensors are clean in snow and ice*

Key messages

"Receiving a warning of an approaching vehicle in the blind spot helps the driver but may not always be correct, while NOT receiving a warning of an approaching vehicle does not guarantee a clear path and MUST be confirmed by the driver. The driver always remains responsible".

M3.2	Adaptive Cruise Control (ACC)
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle
Track:	On-road, country road or motorway
Duration:	45 minutes
Weather conditions:	Limited function possible in heavy rain or snow
Speed:	Max 120 km/h depending on traffic regulations, road, and weather conditions

Procedure:

Driving in real traffic and observing and experiencing the vehicle's reactions for 45 minutes per driver in combination with LKA, ELK and BSM. Independently maintaining a set distance, as well as braking and accelerating independently. Includes a final discussion session at the end of the active driving section. After half the driving time, the driver and passenger change positions in the vehicle.

The instructor will give a detailed explanation of the ACC.

Special instructions

- The instructor must always ensure that ACC is engaged (risk of rear-end collision), especially if the system has been deactivated by the driver.

Key messages

"The drivers must keep their attention on the road and the vehicles in front of them and must always be ready to intervene in the event of losing control of the vehicle in front".

M3.3	Lane Keeping Assistant (LKA)/Emergency Lane Keeping (ELK)
Vehicles:	4 vehicles with ADAS/ADS
Participants:	2 per vehicle
Driving Instructor:	1 per vehicle

Track:	On-road, country road or motorway
Duration:	45 minutes
Weather conditions:	Limited function possible in heavy rain or snow. Largely inoperative on snow-covered roads
Speed:	60-100 km/h depending on traffic regulations, road and weather conditions

Procedure:

Driving in real traffic for 45 minutes per driver in combination with ACC and BSM. Includes a final discussion round at the end of the active driving session. After half the driving time the driver and passenger change positions in the vehicle.

Focus on observing and experiencing vehicle reactions: The warning message (visual and haptic) when leaving the lane and the automatic return to the lane.

The driving instructor provides detailed explanations of LKA/ELK.

Special instructions

- Only choose routes with clear lane markings.

Key messages

"ELK is based on camera systems such as LKA and therefore its reliability is similar. Under no circumstances should the drivers rely on the function to keep themselves in the correct lane, as the function is designed intervene in an emergency that the driver may not have detected or is unable to counteract".

3.6.4 Simulator-based ADAS training

WIVW develops simulator-based driver training programmes. Examples of existing training programmes include emergency driving training and truck driving training. As part of the Hi-Drive project, a demo version of a training programme focusing on Advanced Driver Assistance Systems (ADAS) was developed, implemented and tested. The driving simulator training environment allows for the combination of dedicated scenarios for testing and experiencing ADAS, as well as visuals and standardised verbal instructions and explanations. Feedback can be provided to the driver based on their actions, and additional elements can be integrated, such as visual feedback to explain the functionality of a system.

Regarding ADAS, the simulator-based training may include the following blocks:

- Theoretical explanation of basic system functionality and purpose.

- Explanation of system operation (activation, deactivation and modification of relevant system settings).
- Explanation of system capabilities.
- Explanation of system limitations.
- Extended experience of the system during a realistic drive.

The relevance of the different blocks depends on the characteristics of a specific ADAS (see Table 4 for examples). For simulator-based training, a demo version focusing on a selection of ADAS functions will be implemented. The functionality determines how an ADAS is presented, and which aspects are trained. As in on-road training, for example, emergency functions will only be explained theoretically and not tested.

Table 4 Possible content of simulator-based training for AEB and ACC examples

	AEB	ACC
Basic system functionality & purpose	Via visuals or videos	Via visuals or videos
System handling	Activation / Deactivation; Via visuals or videos	Activation / Deactivation; Change of speed & distance; Guided hands-on experience in the driving simulator
System capabilities	-	Speed adjustment during free driving and following; Speed change until standstill & reactivation; Guided hands-on experience in the driving simulator
System limitations	-	Problems with sensor range e.g. in curves; Lack of response to stationary objects; Guided hands-on experience in the driving simulator
System experience	-	Hands-on driving simulator experience

3.6.5 Evaluation

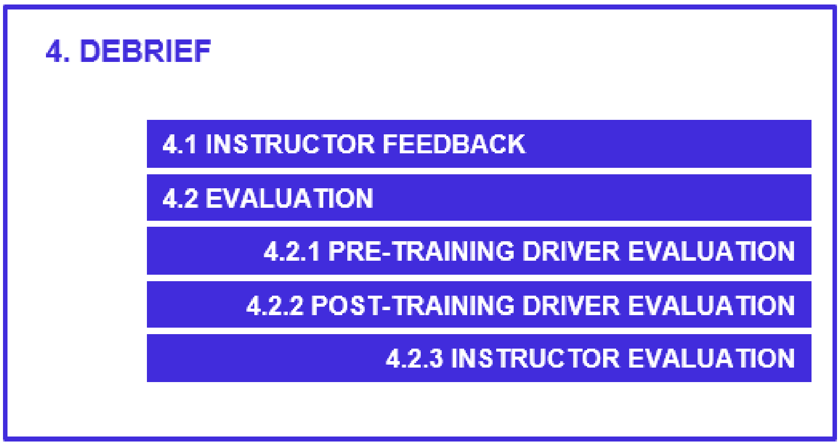


Figure 23 An overview of the structure of the debrief section

Training evaluation involves the systematic collection of relevant data on the selection, value or modification of training and development activities (Goldstein, 1986). It provides information on the effectiveness of training or development activities in achieving their aims and demonstrates their overall value. The evaluation process should be closely linked to the training needs analysis, measuring the extent to which the knowledge, skills, and attitudes identified in the TNA have been addressed.

Evaluations provide information on the usefulness and appropriateness of a programme, identifying its strengths and weaknesses so that improvements can be made (Noe, 2008). Training evaluation frameworks (e.g. Kirkpatrick, 1976) recommend measuring participants' reactions (e.g. enjoyment of the training), learning outcomes (e.g. knowledge gained), intended behaviours (e.g. system usage) and results (e.g. reduction in accidents). However, it is difficult to capture long-term training outcomes in practice. Therefore, the training evaluation in the Hi-Drive project focuses on measuring participants' reactions, learning outcomes and intended behaviours after training.

We hypothesised that several independent variables (e.g. age, gender, education and CAV experience) might predict CAV driving and feelings or opinions about CAVs. The most significant findings relate to the confidence expressed after a CAV driving session, the comparison of overall feelings after the first and last sessions, and the qualitative summary of positive and negative points at the end of the last session.

The online questionnaire, which is completed before and after the training, forms part of the overall evaluation of the training. It covers four areas: knowledge, attitude, behaviour and enjoyment (the latter only after the training). The section on knowledge assesses the mental model of a specific ADAS/ADS via statements about the system. Participants are asked to indicate whether each statement is true or false. Questions regarding the mental model can address all aspects of the trained system, such as handling, purpose, capabilities and limitations.

The intended behaviours for each system were measured to establish whether the training was successful in promoting appropriate levels of trust. The attitude items refer to feelings about using the function, while the behaviour items refer to appropriate usage. The enjoyment items are used after the training to evaluate whether it was enjoyable.

The questions of the pre- and post-training questionnaire are listed in the Annex 2.

3.7 Public ADAS user training across five locations in Europe

3.7.1 ADAC Germany

This 70,000 m^2 high-tech site is conveniently located directly on the A8 motorway, with Augsburg-Ost and Friedberg motorway exits nearby, and close to Augsburg Airport. Events and presentations can be held here all year round. The construction work took 12 months, with the opening taking place in July 1997. The site features 4,200 square metres of asphalted outdoor presentation space. There are also 310 square metres of indoor presentation space. Five training sections provide excellent training conditions. A floodlight system enables operation even after dark. The attractive and welcoming foyer creates a pleasant atmosphere. The seven seminar rooms are equipped with state-of-the-art technology. The hotel has its own catering facilities and an outdoor terrace.

Figure 24 Aerial view of the ADAC Augsburg Driving Safety Centre

Figure 25 Site plan of the ADAC Augsburg

Preparation for the training event involved several stages. Four weeks before the event, pretests were conducted for five hours using an ADAS/ADS-capable vehicle. Track tests and the creation of a road book were carried out over suitable routes related to the ADAS specified in the Hi-Drive concept, taking three hours. A trainer guide detailing the exercises to be performed on the track and in real traffic was prepared.

The day before the event, a track test was performed in the evening to check for roadworks and track closures. The routes specified in the road book were driven for one hour. Instructors were given an extensive briefing on the driver assistance system functions of the vehicles, and two vehicles were delivered in the morning. A dry run on the track was conducted to finalise the routes, test and set the speeds for the driving tasks and determine the number of runs and changeover times. A dry run on the road was also conducted to brief the instructors on the driving route.

Participants were selected via an online lottery. The competition was advertised on various ADAC channels. The competition ran for two weeks in total. There were 90 participants, 16 of whom won. They were informed of their win by email. Apart from holding a valid driving licence, there were no special requirements for participation. The participants were a diverse group of people of different ages (20–75 years), genders and backgrounds. Participants had different levels of knowledge about the function of driver assistance systems. Some had no knowledge of the topic, some had basic information about it, and some had researched it in depth.

Jetzt bewerben und kostenloses Spezialtraining beim ADAC Fahrsicherheitszentrum sichern!

Autofan und Lust auf ein Spezialtraining der besonderen Art? Dann jetzt noch bis 15. September für die Teilnahme an einem einzigartigen Fahrsicherheitstraining rund um moderne Fahrerassistenzsysteme bewerben! Am 23. September bietet das ADAC Fahrsicherheitszentrum in Augsburg zusammen mit der FIA 16 Teilnehmern die Gelegenheit, die Faszination moderner Fahrerassistenzsysteme live einem Realtest zu unterziehen. Natürlich individuell betreut durch unsere Trainer vor Ort. Voraussetzung ist Freude am Fahren, ein gültiger Pkw-Führerschein, Mindestalter 21 Jahre und Zeit, für das Training am 23. September.

» Hier geht's zur Anmeldung

Figure 26 Screenshots of the ADAC recruitment process

The Hi-Drive training took place on 23 September 2024, with two groups in attendance. One session took place in the morning and one in the afternoon. The ADAC team invited 16 participants and made plans accordingly. However, only 14 participants attended on the day. There was one no-show in the morning and one in the afternoon, for which no reason or cancellation was given.

On the training day, the schedule was divided into two groups. Group 1 started with a welcome and processing of evaluation forms, followed by theory, familiarisation with the vehicles, on-track and on-road driving, and a debriefing session. Group 2 followed a similar schedule in the afternoon.

During the training, there were two participants and one instructor in each vehicle. The training was conducted by four instructors and one chief instructor. All of the instructors had extensive experience in driving safety and knowledge of driver assistance systems.

Figure 27 ADAC training in Augsburg

A total of four BMW vehicles were used with the Driving Assistant Professional.

Figure 28 Vehicles used for ADAC training

In order to be independent of technology, the evaluation was carried out using paper forms instead of an online one. The only requirement for participation was to complete the forms. Consent had to be given at the time of registration. Participants were informed at the time that the training would be evaluated.

The pre-training evaluation took place immediately after the welcome, i.e. before the theoretical part of the training began. No information on the expected topics was provided in advance. The plan for the day was only announced once the questionnaire had been completed.

Figure 29 ADAC training - pre-training evaluation

Participants were given 20 minutes to complete the questionnaires. This was sufficient time for all participants. However, the time taken to complete the questionnaire varied greatly between individuals. Some finished in just 10 minutes, while others (mostly older participants) took 20 minutes. Older participants found it difficult to identify the individual driver assistance systems. The post-training evaluation took place once the driving part had been completed. Participants were given 20 minutes to complete the questionnaire. This was sufficient time for all participants. After the training, the questionnaires were completed more quickly, as any uncertainty about the driver assistance systems had been resolved.

All participants showed great interest in the training topics, despite having varying levels of prior knowledge. Some participants expressed a desire to learn about additional driver assistance systems that were not covered during the training session. Despite being initially sceptical, many participants were in favour of using the systems after the training.

Key lessons learned from the training include the importance of selecting the right on-road track, pre-testing vehicles and providing individual supervision for small groups. It is also essential to have a highly qualified team of instructors, and to consider all eventualities, such as weather conditions and route changes.

3.7.2 RACC Spain

RACC provides driver training through its Advanced Driving Centre, which has facilities in the metropolitan areas of Madrid and Barcelona. Both centres have a closed safety track and indoor facilities for theory training. The Barcelona site, located within the grounds of the Circuit de Catalunya, also offers guided experiences of driving race cars on the Formula 1 track. The Hi-Drive user training pilot took place at the RACC Advanced Driving Centre in Montmeló, around 30 km from Barcelona city centre. The centre is easily accessible via the public road network, with access to the AP7 motorway between Barcelona and Girona just 3 km away. This makes it easy to access different categories of road for on-road training. The site provides office space and a classroom for around 25 participants. The closed track features a straight section around 240 metres long, as well as several bendy and roundabout sections. The following figures show an aerial view of the site.

Figure 30 Aerial views of the Advanced Driving Centre in Montmeló

Following the Hi-Drive workshop in Penzing in March 2024, which one of RACC's instructors attended, the process of deploying the training at the RACC Advanced Driving Centre began.

The first step was to match the broader scope of the training to the format currently used for RACC's standard training programmes, i.e. a duration of 4 hours, allowing for two training sessions per day.

Regarding the theoretical part, the document provided by the consortium needed to be translated into Spanish. While the content of the document was not modified for the theoretical part of the training, the instructors supplemented the material with their own experience and added local context.

Figure 31 Example of a slide used in the theoretical part of the training

Regarding the practical part, preparation consisted of three main steps: final definition of the exercises, testing and a final rehearsal.

To finalise the exercises, the instructors first attempted to replicate those carried out in Penzing on the Montmeló track with the available vehicles. The vehicles available at the RACC Advanced Driving Centre are three Cupra Formentors and four Volkswagen Polos. Based on the findings of these exercises, which were carried out over several days, the final training programme exercises were defined, along with the location on the track, the maximum number of participants and the necessary number of instructors. As part of this process, vinyl road markings were added to the track to facilitate exercises related to lane departure functions. Testing consisted of recruiting nine RACC staff members and putting them through a full 4-hour training programme, including the theoretical part and both on- and off-track practical training. This step aimed to finalise the exercises and on-road route in event conditions. The findings from this stage were then used to refine the final training programme. The images below are from the testing session with RACC employees.

Figure 32 Testing session with RACC employees

The final step was to hold a final rehearsal of the refined training programme with participants from RACC's staff once again. This took place under event conditions, was carried out two weeks before the pilot training with the public, to allow time for any necessary changes.

Recruitment for the Hi-Drive training was originally planned to come from four sources: RACC club members, recent graduates of the RACC driving school, commercial partners of the RACC advanced driving centre and RACC employees. The target audience was planned to be contacted via email. These emails were designed to provide information on the type of training, as well as highlighting the opportunity to receive a free training session. The commercial price of the training was also included to demonstrate the value of the offer, and to increase commitment and consequently attendance at the pilot.

The first email was sent eight, respectively nine, days before the two event days. The aim of this relatively short notice was, on the one hand, to filter out those who were unavailable at the weekend of the event and, on the other hand, to ensure that the information was still fresh in participants' minds and that they did not forget about the event. Of the emails sent to club members, 60 expressions of interest were received for the 36 available places. This meant that all the places were filled by club members and the other recruitment sources were discarded. The image below shows a screenshot of the email sent to RACC club members.

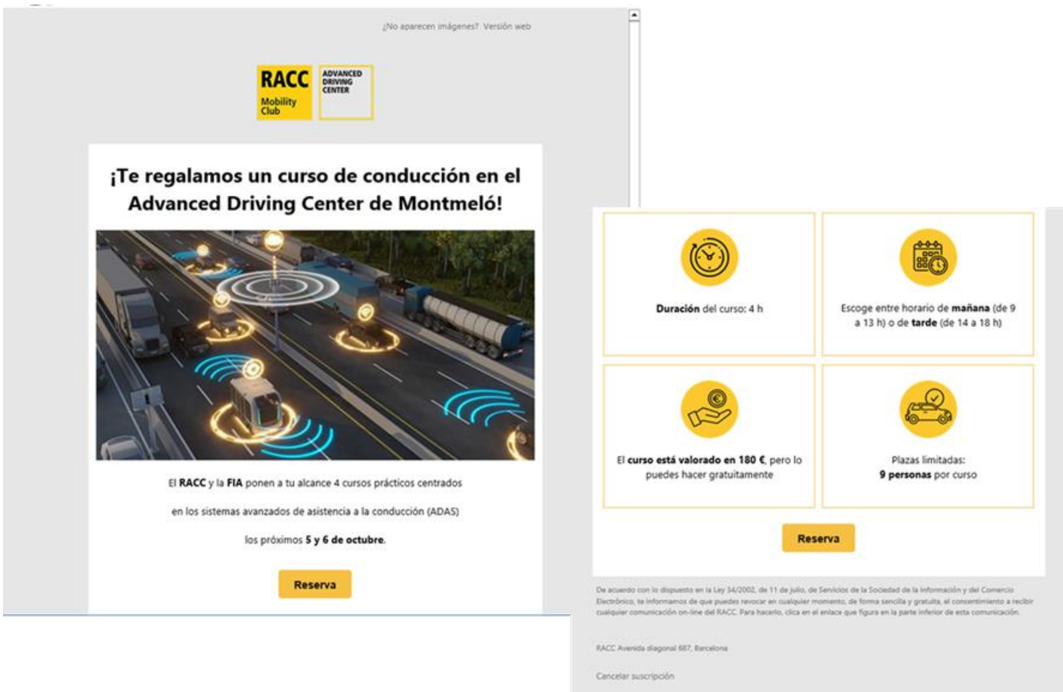


Figure 33 Screenshot of RACC recruitment email

Participants for the 36 available places were chosen based on age and gender. Specifically, candidates were ranked in order of preference, with priority given first to women and second to the youngest, as both groups were substantially underrepresented among those who expressed an interest. Eighty percent of respondents were aged between 50 and 65. For our training, we aimed to achieve an age balance, selecting all respondents under the age of 50 first. The remaining 26 participants were then chosen from the 50–65 age range, with preference given to females to maintain their representation, albeit small. The selected participants received a confirmation email five days after the initial information email and three or four days before the event.

The two-day Hi-Drive ADAS training event comprised four individual courses, with morning and afternoon sessions on Saturday 5 and Sunday 6 October 2024. The morning sessions took place between 09:00 and 13:00, and the afternoon sessions between 14:00 and 18:00.

While a total of 36 participants had registered for the four courses, only 25 attended the event. The participants were distributed as follows: Saturday: morning (6), afternoon: (9); Sunday: morning (5), afternoon (5).

A total of 25 participants took part in the two event days. Training sessions were organised so that up to three participants would share a car with one instructor. Therefore, for a maximum of nine participants per session, three cars and three instructors were required. In practice, even in sessions with five or six participants, three cars and three instructors were still used. This contrasted with the possibility of running the sessions with only two cars and two instructors. The cars are long-term leased by RACC's Advanced Driving Centre.

Figure 34 Theoretical training at the Advanced Driving Centre

Figure 35 Practical part of the training in a protected environment at the Advanced Driving Centre

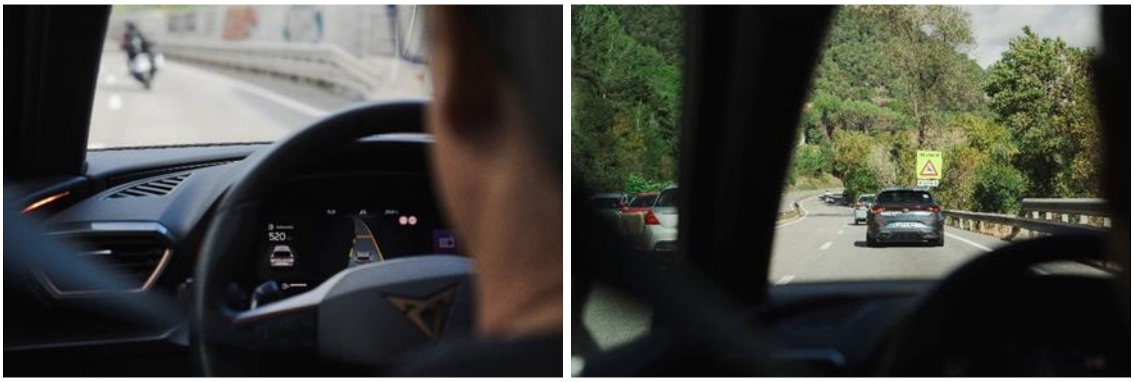


Figure 36 Practical part of the training on the public road network

All participants of the training courses offered at the RACC Advanced Driving Centre were asked to complete an online assessment form at the end of their training. This form was created using Typeform, a tool that allows dynamic online questionnaires to be created. RACC has experience in communicating the questionnaire to participants and processing the response databases. It was therefore decided to transfer the Hi-Drive pre- and post-training questionnaires to Typeform. The figure below shows the starting page and question 5b of the pre-training questionnaire as an example.

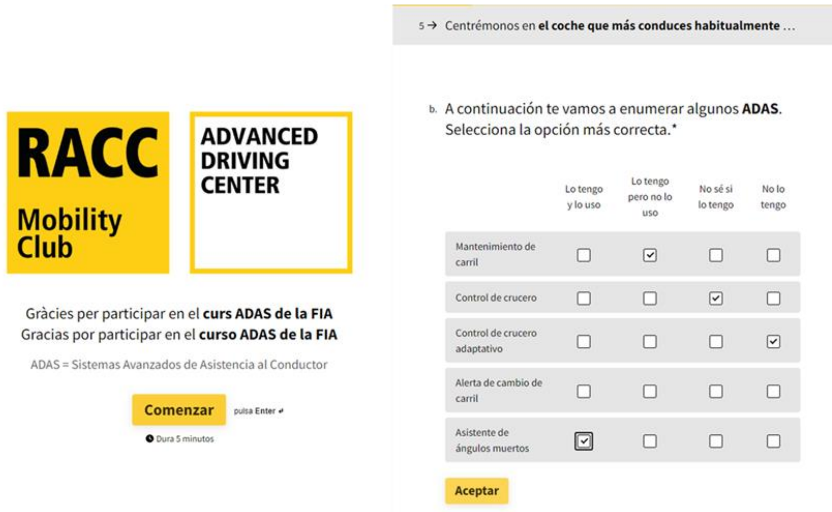


Figure 37 Online Typeform questionnaire

All questions in the questionnaire should be set as mandatory. The pre-training questionnaire was sent to participants via a hyperlink and a QR code in the confirmation email. Similarly, the post-training questionnaire was sent to participants on the same day as the training, via a reminder email.

Participants were informed that they would receive a training certificate once they had submitted their responses to the post-training questionnaire. The figure below shows the certificate.

Figure 38 An example of the RACC Certificate of Attendance

3.7.3 AMZS Slovenia

The Slovenian Hi-Drive ADAS training took place on 3 December 2024 at the AMZS Safe Driving Centre in Vransko, which is the most modern and purpose-built safe driving training facility in Slovenia. The centre covers 15 hectares, 6.6 of which are asphalted. It has 2.5 kilometres of well-maintained training tracks equipped with the latest technology to simulate various driving conditions and carry out different training exercises. The centre is located next to the Vransko motorway exit, meaning the A1 motorway is only a two-minute drive away.

Figure 39 Aerial view of the AMZS Safe Driving Centre in Vransko

Preparation for the training began in mid-October with two meetings. During these meetings, the final number of participants was agreed upon. It was established that a maximum of 54 participants could be accommodated in three groups of six cars in one day. The first group would start at 08:00, the second at 10:30 and the third at 13:00.

About a month before the event, invitations were sent to club members as part of the regular email newsletter. The application form allowed candidates to select their preferred training group. Around 400 applications were recorded within the following two weeks. Due to the high level of interest in the event, a draw was held to select 54 participants. As the training was planned for the morning and midday, it was expected that senior drivers would be the most represented group of candidates. To ensure an even spread of candidates across the age groups, they were divided into three categories: senior, junior and 'in between'. Once the senior age group was full, only candidates from the remaining groups could be selected. The first batch of invitations was sent out 11 days before the event, followed by a few more in the days leading up to it. This ensured that all the available places for the training were filled.

The pre-training evaluation form was sent via email along with the invitation. Selected participants were required to complete and return the form before the training. Reminders were sent to those who failed to complete the form correctly until they did so.

The day before the training began, the vehicles arrived on the track and the instructors performed a rehearsal. The final details of the programme were finalised. The vehicles used for the training were: Two Škoda Kodiaqs, two Opel Astras and two Hyundai Tucsons, with an additional Hyundai Ioniq 6 to be used as the leading vehicle in a specific scenario. The vehicles were obtained from car dealerships that often cooperate with the Safe Driving Centre. Eight instructors conducted the training: one for each of the seven cars, and one for the theory part for all three groups.

Figure 40 Practical training at AMZS

On the day of the training, participants arrived a few minutes before the start of their group to check in at the reception desk of the safe driving centre, where they were given a wristband after signing the relevant documentation.

The training began with a theoretical session held in the classroom. This was followed by a presentation on the Hi-Drive project, after which there was time for discussion and a safety briefing for the practical part, which was divided into two sessions. The first session took place on the track and the second took place on the open road.

Figure 41 Theory part at AMZS

At the first on-track location, participants were able to test the AEB rear using an inflatable target as an obstacle while driving the two Kodiaqs. Each participant took two turns behind the wheel while the other two observed from the rear seats. After testing the AEB rear with the inflatable target, the participants exited the vehicles. The two instructors then demonstrated how the AEB rear detects a pedestrian behind the reversing vehicle. For safety reasons, this was only a demonstration carried out by the instructors, with the participants observing from a safe distance.

Figure 42 On-track training part at AMZS

Since there was enough time, participants were also able to test the reverse parking function (Park Assist), which can park the car between two already parked vehicles without the need for human intervention. While this demonstration was taking place, the other car was used to show how to reverse park manually. During this demonstration, the instructor explained all the functions of the rear camera display, including the fixed and moving lines. Two Opel Astras were used to test AEB at the second on-track location. The scenario involved approaching an inflatable target at speeds between 30 and 40 kilometres per hour, allowing the car to brake independently. The first run was performed by an instructor, followed by each participant taking their turn. This meant that each participant experienced automated emergency braking four times.

Figure 43 On-track training at AMZS

The third on-track location was used to demonstrate ACC, blind spot monitoring, and Traffic Jam Chauffeur. Three cars were used at this location: one as a lead vehicle, followed by the two vehicles carrying participants. Each participant completed two laps. During the first lap, the ACC and Traffic Jam Chauffeur systems were tested. The lead vehicle accelerated, slowed down, stopped and started again, with the following vehicles using the automated systems to follow it. In the second lap, one of the two following vehicles moved into the adjacent lane, and the participants in the other vehicle observed the warnings when the first car entered their blind spot.

The second session took place on the open road: the A1 highway. This session was divided into three sections. The first section was from Vransko to Šempeter; the second was from Šempeter to Ločica; and the third was from Ločica back to Vransko via Trojane. Participants switched vehicles at Šempeter and Ločica. This meant that each participant was able to drive all three vehicles. During the drive, participants used and tested ACC, lane assist, emergency lane keeping (if the situation permitted) and lane departure warning and lane centring. They also observed the blind spot monitoring system in live traffic. When driving the Hyundai, they also tested Motorway Assist (Highway Drive Assist).

Figure 44 AMZS open road training

After returning to the driving centre, participants were invited back to the classroom where they were given questionnaires to complete for the post-training evaluation. After completing the questionnaire, it was quickly checked to ensure that each one was complete. Participants took between 10 and 22 minutes to complete the questionnaire.

Figure 45 The ADAS training evaluation part at AMZS

From interviews conducted by the media with participants during and after the training, it can be concluded that they enjoyed learning new or refreshing old skills and knowledge about ADAS.

Figure 46 Media interviews with AMZS training participants

3.7.4 RACB Belgium

The Belgian Hi-Drive training sessions took place over four days: 2 November, 11 November, 28 December 2024, and 28 January 2025. They were held at the state-of-the-art RACB D'Ieteren Driving Academy in Nivelles, Belgium's most advanced safe driving facility. Spanning six hectares, the centre boasts 2.5 kilometres of state-of-the-art training tracks that are fully equipped to simulate diverse road conditions, such as wet, snowy and icy surfaces, as well as a wide range of emergency scenarios. The centre is perfectly located right next to the Nivelles-Sud motorway exit and the E19 is just a 2-minute drive away.

Figure 47 Aerial view of the RACB Driving Academy in Nivelles

Preparations for the training got underway in mid-October with two focused meetings at the RACB D'Ieteren Driving Academy. These meetings were pivotal, as decisions were made, teams were formed, and the framework for the sessions was established. It was agreed that each training day would welcome up to 18 participants, split into two dynamic groups. With three cars ready and waiting, the morning session began at 09:00 sharp, while the afternoon session started at 13:00. The scene was set for a smooth, high-impact experience.

Figure 48 RACB Driving Academy in Nivelles

Around two weeks before the event, an invitation was quietly slipped into the inboxes of club members via the regular newsletter, a call to action that quickly sparked excitement. Members could choose their preferred training date through the application form. As expected, the response was overwhelming, with nearly 150 eager applications pouring in. With only 72 places available, a fair draw was held to select the lucky participants. To ensure a balanced mix, the schedule was carefully designed. Two days were dedicated to young drivers, one to senior drivers and another to fleet managers.

As the first session drew closer, excitement levels reached fever pitch. Training vehicles were positioned on the track and the instructors gathered for a full rehearsal to fine-tune every detail of the programme. The line-up included an Audi Q6, a Volkswagen ID.3 and a Volkswagen Taigo, all of which were sourced from our training fleet thanks to our partnership with D'Ieteren. Three expert instructors led the way: one in each car and one to deliver theory sessions to both groups. Everything was in place for a flawless launch.

Figure 49 RACB training

Anticipation filled the air on training day as participants arrived at the RACB D'Ieteren Driving Academy, checking in at the reception desk 15 minutes before their session began. After receiving a warm welcome, each participant was invited to complete a quick pre-training knowledge test, which was the first step in a day of learning and discovery. The day began with a classroom session, during which the Hi-Drive presentation sparked engaging discussions and questions. This was followed by a safety briefing, setting the stage for the hands-on experience. The practical part unfolded in two stages: first on the academy's dynamic track and then out on the open road, where theory met real-world driving.

Figure 50 Theory part of the ADAS training at RACB

The first stop on the track presented participants with the unexpected: a hands-on encounter with rear Automatic Emergency Braking (AEB) system. Using a foam target to mimic a real-life obstacle, each participant took the wheel for two test runs while their teammates observed closely from the passenger seats, noting every reaction and response. There was laughter, surprise and a few raised eyebrows when the system kicked in. Once everyone had taken their turn, the mood shifted as the two instructors stepped in to deliver a vital safety demonstration. With sharp precision, they demonstrated the AEB's ability to detect a pedestrian behind a reversing vehicle. Participants watched attentively from a safe distance, witnessing this potentially life-saving technology in action — a powerful reminder of how important it is to pay attention to detail on the road.

With time on their side, the participants were able to take it a step further and test the reverse parking feature (Park Assist). They watched in amazement as each car smoothly parked itself between two vehicles with no hands on the wheel or feet on the pedals. Meanwhile, the second vehicle became a live classroom. There, the instructor demonstrated manual reverse parking and took the opportunity to explain every detail of the rear camera interface, from the fixed guiding lines to the dynamic ones that adjust with the steering. The contrast between human skill and smart automation sparked curiosity and lively discussion among the group.

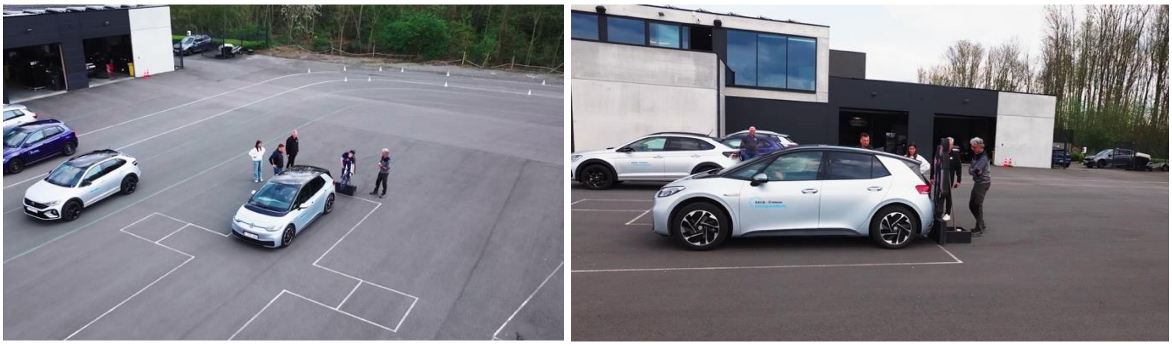


Figure 51 On-track training at RACB

At the second on-track location, the focus shifted to intelligent driving assistance, with live demonstrations of Adaptive Cruise Control (ACC) and the Traffic Jam Chauffeur system with a lead and a passenger vehicle. Over three full laps, each participant experienced the technology firsthand, observing how the lead car accelerated, slowed down, stopped completely, and pulled away again. The trailing vehicle responded smoothly and automated, demonstrating how these systems manage real-life traffic flow with impressive precision. The sensation of the car ‘thinking ahead’ sparked plenty of amazement and confidence in the future of assisted driving.

In the second half of the training, participants drove on the open road, specifically the E19 motorway, with multiple stops along the way. This setup gave everyone the chance to experience each of the three vehicles from the driver's seat. As they drove along the motorway, participants actively tested the following features: Adaptive Cruise Control, Lane Assist, Emergency Lane Keeping (when conditions allowed), Lane Departure Warning and Lane Centring. Real-world traffic added another layer of realism, especially when the blind spot monitoring system activated. With every kilometre, confidence grew, and the technology spoke for itself, turning theory into instinct.

Back at the driving academy, the participants gathered in the classroom for the final step: the post-training evaluation. Paper forms were handed out, inviting everyone to share their feedback and insights. While they thoughtfully completed the questionnaires, the trainers swiftly reviewed each one to ensure nothing was overlooked. The whole process took about 15 minutes, concluding the day with a moment of reflection and valuable input to inform the design of future sessions.

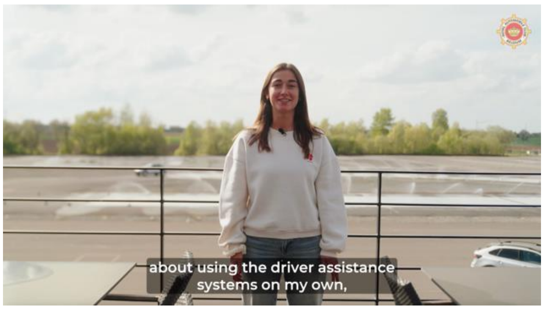


Figure 52 Interviews with RACB training participants

From interviews conducted by the media with participants during and after the training, it can be concluded that they enjoyed learning new or refreshing old skills and knowledge about ADAS. While RACB already had a well-established ADAS module woven into many of its training programmes, the arrival of the Hi-Drive training brought a fresh wave of energy. For the instructors, it was more than just another course, it was a unique opportunity to hone their skills on a larger scale by guiding a bigger group of participants simultaneously. This dynamic setting sparked lively exchanges of experience, insights and ideas, both between the instructors and with the participants. This created a vibrant learning environment where knowledge grew in real time, fuelled by collaboration and a shared passion for road safety.

3.7.5 WIVW Germany

A demo version of driving training for Adaptive Cruise Control (ACC) was implemented on a driving simulator. This took place at the Würzburg Institute for Traffic Sciences (WIVW GmbH) in Veitshöchheim, Germany.

Figure 53 Würzburg Institute for Traffic Sciences (WIVW GmbH) in Veitshöchheim

The simulator used was a small-scale driving simulator from WIVW GmbH, consisting of a simplified mock-up with a driver's seat, pedals and a steering wheel, as well as three screens displaying the environment. An additional screen on the right-hand side of the driver was used to display videos. SILAB®7.3 was used to run the simulation. As can be seen in Figure 2, the scenery was displayed on three LED screens in front of the driver, with mirrors and the instrument cluster depicted as overlays on top of the scenery.

Figure 54 The driving simulator at WIVW provides participants with theoretical input about ADAS systems via videos on an integrated display

The training consisted of three driving sessions, each of which began with a video and continued with a practical driving session in a simulated environment. During the drives, drivers were provided with automatic instructions via text-to-speech voice output. Suitable feedback was also provided by voice output.

In Drive 1, the topic of ADAS was introduced to the drivers using the presentation developed by Hi-Drive for use at the various training sites. This presentation was turned into a 13-minute video. After watching the video, the drivers had the opportunity to familiarise themselves with the driving simulator and test manual driving for about five minutes. During this time, they tested different speeds, drove along a short, curvy section of road and then continued along a rural road.

Drive 2 began with a 5:30-minute video explaining ACC, its functionality, and how to use it. This included a brief overview of how to adjust system settings such as speed and distance. Then, the participants experienced what had been explained while driving. They were guided through the drive again via voice instructions. The training drive systematically covered the topics of system activation and deactivation, changing the speed and distance settings, overriding the system, and demonstrating basic system behaviour when following a lead vehicle, such as adjusting the speed, braking to a standstill, and pulling away from a standstill. Following the introduction to system functionality, the ACC could be used for a few minutes while driving on the motorway.

Drive 3 began with a 3:30-minute video introducing the technical background of ACC in brief. Then, potential system boundaries or situations involving unexpected system behaviour were explained. During the subsequent drive, the drivers experienced some of these situations, such as failing to react to stationary vehicles, losing the lead vehicle, and accelerating in curves and before intersections. Afterwards, the ACC could be used while driving on rural roads, which included potentially challenging situations if drivers did not deactivate or adjust the ACC in time.

Figure 55 The participant drives on the motorway with ACC to get used to the system (at the end of Drive 2)

The training was conducted with seven drivers (four male and three female, with a mean age of 32.3 years and a standard deviation of 14.2 years). The training was set up as individual training, so all participants came separately. All participants were recruited via the WIVW test driver panel. The aim was to have an equally gender-balanced and age-balanced sample. Furthermore, participants with little or no experience of ADAS were selected. The training sessions took place from 11 to 12 March 2025. Each driver's training lasted about 1 hour 30 minutes. Although there was no training instructor, the theoretical content was presented via videos, and an experimenter led the training.

Figure 56 The experimenter starts the simulator drive, and the participant sits in the driving simulator

Before the training began, the participants completed a paper-based questionnaire about their experience and knowledge of ADAS, which took 5–10 minutes. The actual training then started with Drive 1, which included an introduction video on ADAS. After getting used to the simulator in Drive 1, Drive 2 followed, comprising theory and practical exercises in the simulator regarding the functionality and use of an ACC system. In Drive 3, the final stage, participants familiarised themselves with system limits. Finally, participants completed the post-training questionnaire, which took 5–10 minutes and allowed them to evaluate the training. Participants received a financial incentive for completing the training.

Overall, the feedback from the participants was very positive. The feedback that they would like to have these systems in their future car (if not already available) was frequently mentioned.

3.7.6 Video materials from the ADAS training sessions

All five Hi-Drive partners who organised the ADAS training sessions recorded video materials, which a video producer later finalised. Each training session has been captured in short videos of around two minutes, highlighting the main elements and contributions of the participants. Five videos were uploaded to the Hi-Drive YouTube channel[19], and news articles and LinkedIn posts were published on the Hi-Drive website. These were also disseminated by the organisers: ADAC, AMZS, RACB, RACC and WIVW, as well as FIA Region I.

[19] https://www.youtube.com/@hi-drive-21-25/videos

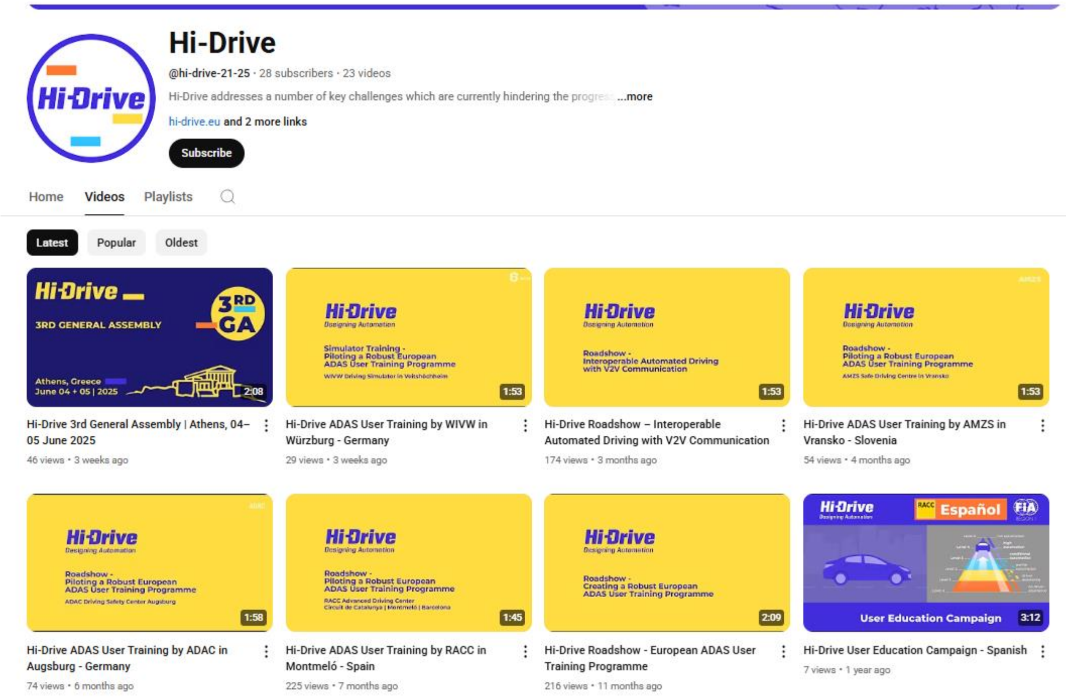


Figure 57 Screenshot of the Hi-Drive YouTube channel

3.8 Evaluation (participants and trainers)

3.8.1 Participants

3.8.1.1 Sample description

The pre- and post-training questionnaires were analysed using merged data from all five test sites. Table 5 shows the sample description for each test site and for all sites combined.

Table 5 Sample description

	ADAC	RACC	RACB	AMZS	WIVW	total
N	14	45	53	53	7	**172**
Age [M(SD)]	40.29 (22.35)	48.58 (10.51)	34.49 (19.55)	57.51 (12.30)	32.29 (14.16)	**45.65 (17.72)**
Gender	N=11 male N=3 female	N=36 male N=9 female	N=40 male N=12 female	N=44 male N=9 female	N=4 male N=3 female	**N=135 male N=36 female**
Driver's license*	22.35 (16.67)	29.93 (11.89)	15.52 (19.14)	37.80 (12.20)	14.00 (13.74)	**26.65 (17.57)**
Vehicle*	3.21 (3.86)	6.64 (5.56)	4.96 (10.67)	4.06 (4.37)	5.07 (2.71)	**4.99 (7.13)**

* in years

3.8.1.2 ADAS experience

Figure below shows the percentage of participants who have an ADAS system in their car and how often they use it. 57.2% of participants use ADAS systems daily, 15.0% use them weekly, 4.6% use them monthly, and 6.9% use them less frequently. Table 2 shows the percentage of participants who know how to turn these systems on and off.

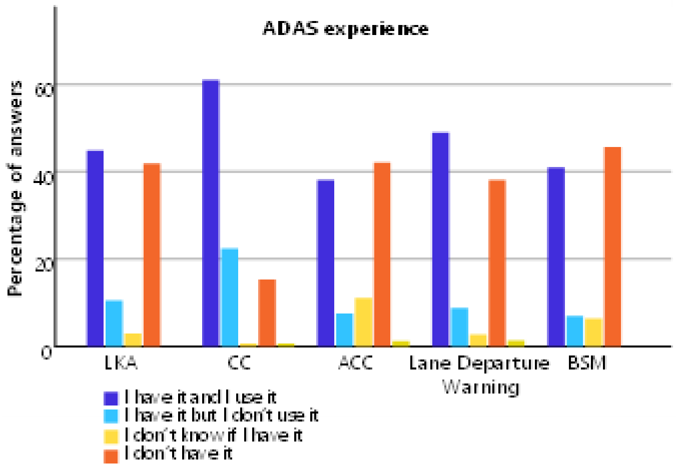


Figure 58 Percentage of use of ADAS per system

Table 6 Percentage of answers regarding question on knowledge how to turn system on and off

	Yes	No	Not applicable
LKA	51.2%	11.4%	37.4%
CC	74.1%	10.2%	15.7%
ACC	46.1%	12.0%	31.9%

3.8.1.3 Knowledge of ADAS systems

The mental model of a specific ADAS system was assessed using a series of statements about the system. Participants had to decide whether each statement was true or false. The questions addressed the system's purpose, how it worked, and other aspects such as handling, capabilities, and limitations. Participants answered these questions on two occasions: prior to and after training. The following figures show the percentage of correct answers for each system and item before and after training. For each item, it is indicated whether the correct response was 'true' (t) or 'false' (f).

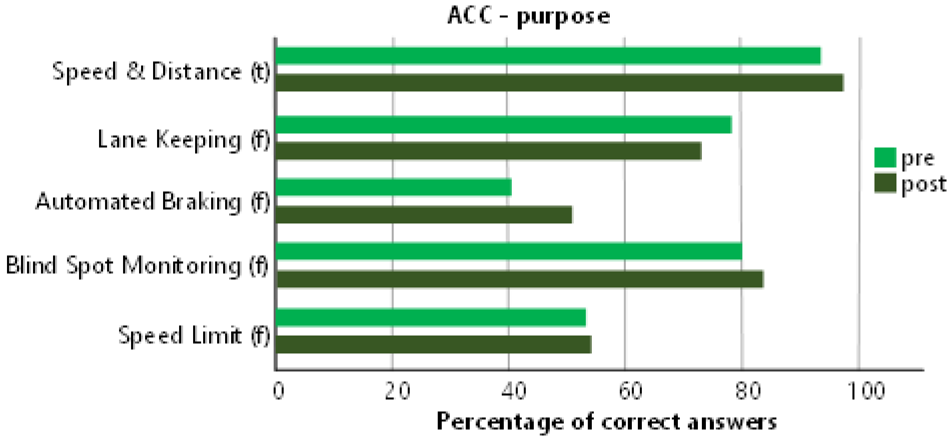


Figure 59 Knowledge items for ACC regarding its purpose. (t) = true item, (f) = false item

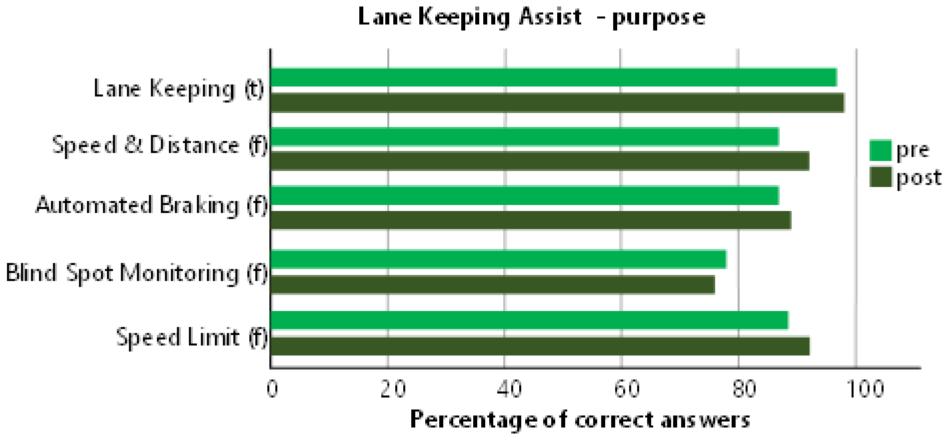


Figure 60 Knowledge items for LKA regarding its purpose. (t) = true item, (f) = false item

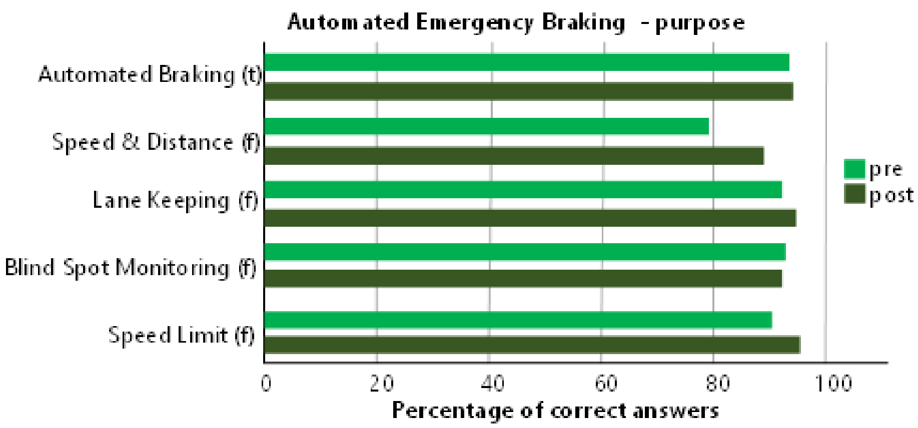


Figure 61 Knowledge items for AEB regarding its purpose. (t) = true item, (f) = false item

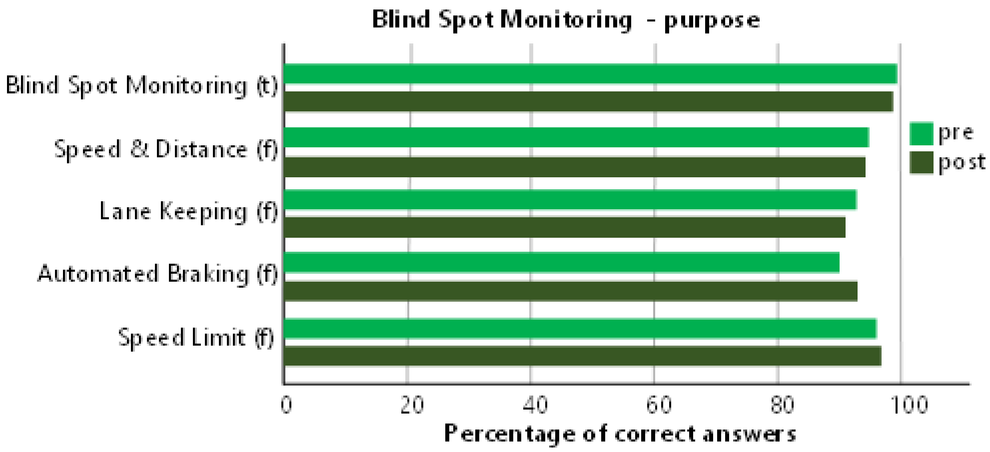


Figure 62 Knowledge items for BSM regarding its purpose. (t) = true item, (f) = false item

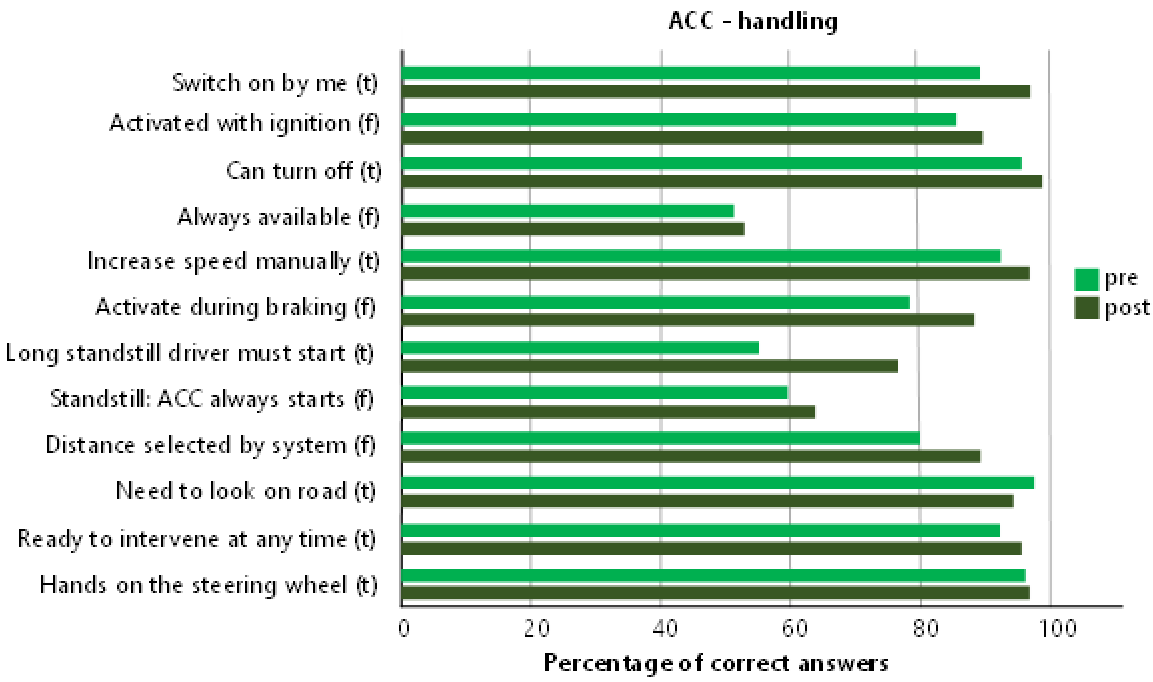


Figure 63 Knowledge items for ACC regarding its handling. (t) = true item, (f) = false item

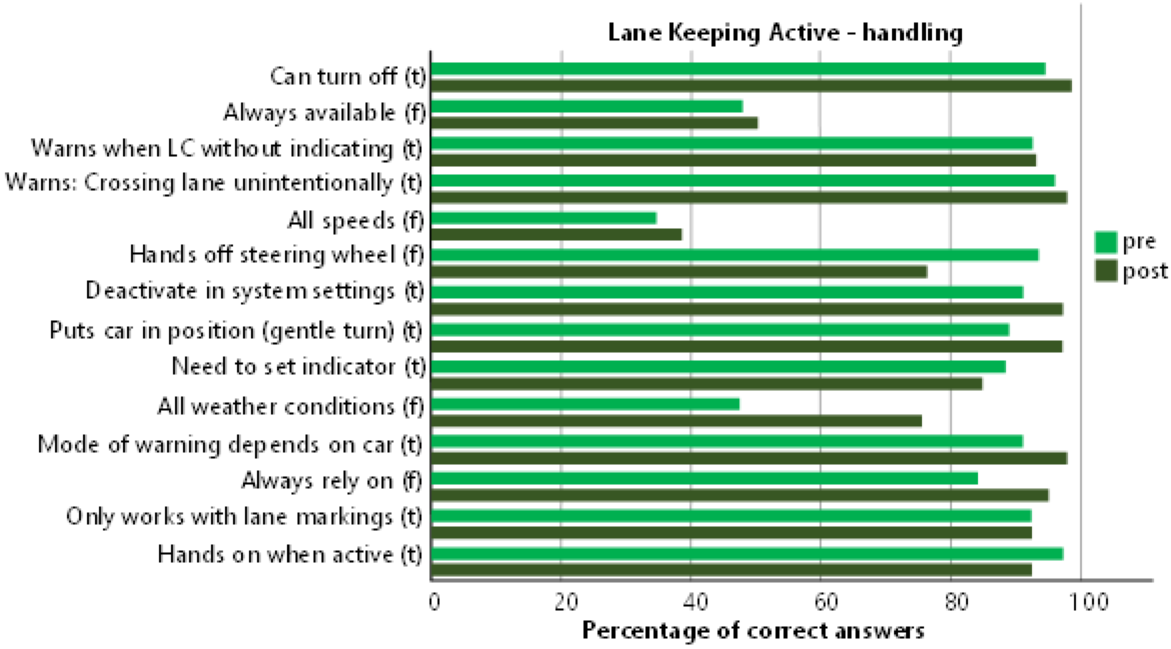


Figure 64 Knowledge items for LKA regarding its handling. (t) = true item, (f) = false item

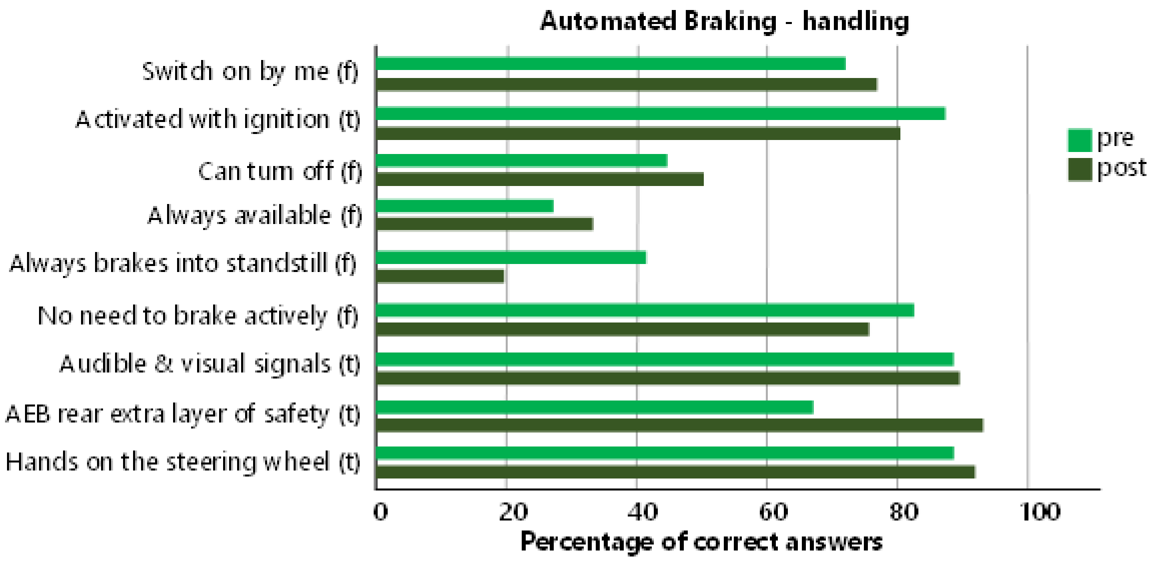


Figure 65 Knowledge items for AEB regarding its handling. (t) = true item, (f) = false item

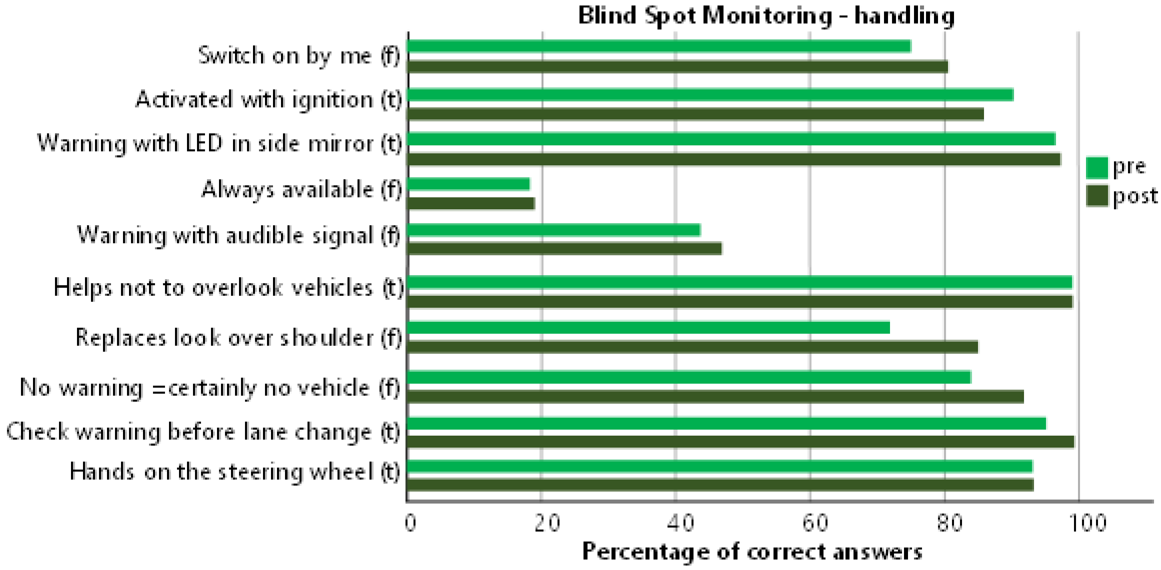


Figure 66 Knowledge items for BSM regarding its handling. (t) = true item, (f) = false item

The percentage of correct answers was higher after the training than before for all systems. A 2x4 ANOVA was performed to analyse the impact of test time (pre/post) and system type (ACC, LKA, BSM and AEB) on the total proportion of correct responses. There was a significant difference in the percentage of correct answers between the pre- and post-training time points [$F(1, 137) = 14.561$, $p < .001$, $\eta^2 = .096$], as well as between the different systems [$F(3, 411) = 36.161$, $p < .001$, $\eta^2 = .209$]. Post hoc tests comparing each system with the others show that all systems differ significantly from each other in terms of the percentage of correct answers ($p <.05$), except for LKA and BSM. There was no significant interaction between time point and system [$F(3, 411) = 3.132$, $p = .096$, $\eta^2 = .015$].

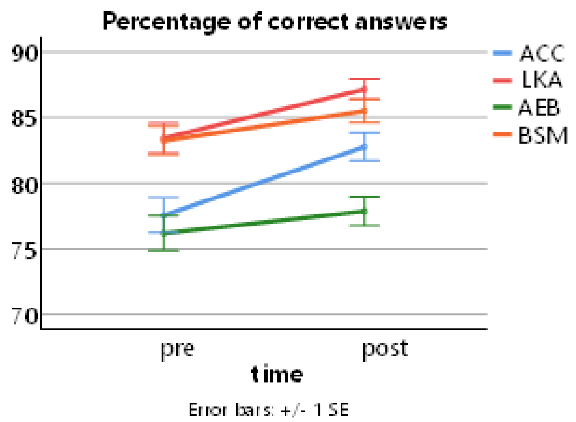


Figure 67 Percentage of correct answers for each system

3.8.1.4 Attitude and behaviour

To understand whether the training had changed participants' attitudes towards ADAS, we asked them about their perceived safety, trust in the systems, how easy they thought the systems were to use, and how useful they thought the systems were. To measure any changes in predicted use of ADAS, we asked questions about willingness to use ADAS systems. Table 3 shows the pre- and post-training values on a scale from 1 = strongly disagree to 5 = strongly agree, as well as the results of the t-tests for the pre-post comparison.

Table 7 Descriptive and statistical values (t-test) for attitude and behaviour concepts

	Pre Training M (SD)	Post Training M (SD)	t(df)	p
Willingness to use	4.13 (0.93)	4.26 (0.82)	- 2.539 (151)	**.012**
Perceived safety	4.13 (0.78)	4.12 (0.74)	0.269 (151)	.788
Trust	3.63 (0.74)	3.60 (0.71)	0.384 (150)	.702
Perceived ease of use	3.65 (0.73)	4.03 (0.76)	-5.987 (151)	**< .001**
Perceived usefulness	3.82 (0.79)	3.98 (0.81)	-2.842 (151)	**.005**

Willingness to use the ADAS, perceived ease of use, and perceived usefulness of the ADAS all increased significantly from pre- to post-training. Willingness to use was also assessed for each system separately before and after training and compared statistically using t-tests. The results are shown in Table 4. Only ACC and LKA showed a significant increase in willingness to use the system from pre- to post-training.

Table 8 Descriptive and statistical values (t-test) for willingness to use per concept

	Pre Training M (SD)	Post Training M (SD)	t(df)	p
ACC	3.96 (1.01)	4.13 (0.88)	- 2.922 (155)	**.004**
LKA	3.74 (1.15)	4.03 (0.98)	- 4.548 (152)	**<.001**
AEB	4.16 (0.87)	4.25 (0.89)	- 1.845 (147)	.067
BSM	4.34 (0.82)	4.39 (0.80)	-0.956 (149)	.341

3.8.1.5 Evaluation of training experiences

Participants were asked to evaluate their training experience using several different criteria. Figure below shows the percentage of agreement for each item. 92% of participants found the amount of information to be appropriate; 4.3% found it to be too much, and 2.5% found it to be too little. 65% rated the quality of the information as 'very good', 30.3% as 'good', and 3.7% as 'neutral'.

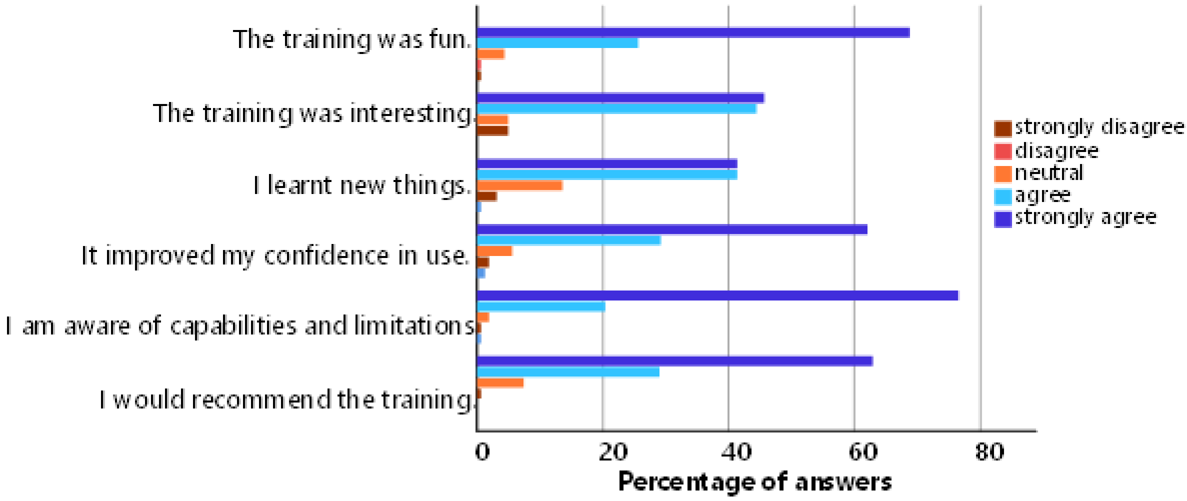


Figure 68 Percentage of responses to each training evaluation item

3.8.1.6 Summary and discussion

The percentage of correct answers to the knowledge items revealed that the training significantly enhanced participants' understanding of the systems' purpose, handling and capabilities. The training not only changed knowledge, but also attitudinal aspects such as perceived ease of use and perceived usefulness, as well as behavioural aspects measured by willingness to use. Overall, participants rated the training very positively, particularly in terms of the amount and quality of information provided.

3.8.2 Trainers

3.8.2.1 Sample description

Fourteen instructors who joined the ADAS driving training programme were interviewed. All the instructors were male with an average age of 48.64 years (ranging from 33 to 64 years). Their average experience as instructors was 14.5 years (ranging from six to 28 years). P1 and P2 participated in the ADAS driver training programme in Spain; P3 to P9 in Slovenia; P10 to P13 in Germany; and P14 in Belgium. All interviews were conducted online and took around 40 minutes to complete.

3.8.2.2 Interview questions

As outlined in Table below, the interviews were structured around the following four key themes:

- The impact of ADAS driver training based on the instructor's experience.
- The structure of the training (e.g. duration, method, number of trainees and timing).
- Differences in learning impact based on demographic factors.
- Challenges encountered during training and suggestions for improvement.

Table 9 Interview questions

Theme	Questions
Impact of ADAS driver training	What are your overall impressions of the training sessions and their impact?
	Do you think training helps trainees to use the ADAS properly?
	Do you think trainees will use ADAS more?
Training structure	How did trainees respond to learning about ADAS functions? 1. theoretical part, 2. On-track, 3. On-road sessions
	What specific methods during the training were particularly effective/non-effective?
	Do you think additional resources or methods (e.g., visual aids, simulations) would improve the training experience?
	Do you think the time range is well distributed?
	What do you think about the number of trainees who learn together?
	Were there any aspects of the training that trainees struggled with most?
	When is the good time for novice drivers to learn about ADAS in the driving school?
Learning impact among trainees' demographic	Do you think there is a difference in learning impact on trainees' backgrounds (such as age or gender)?
	Does the difference in experience with ADAS (non-ADAS drivers vs. ADAS drivers) affect the learning experience or learning impact differently?
	Were there any impacts due to the brand or car model of the training car?
Challenges and suggestions	What challenges did you face as an instructor?
	How could the training program be improved?
	Is there anything else you'd like to share about your experience or suggestions for future ADAS driver training programs?

3.8.2.3 Trainers feedback

Impact of training

All instructors agreed that the training had improved drivers' understanding of and confidence in ADAS. It addressed two key issues: lack of awareness and misuse. Many drivers were unaware that their cars had ADAS features or had a poor understanding of how they worked. The reason might be missing information and/or missing interest in the existing information or even the unobtrusiveness of some features. The training familiarised these drivers with the functions and limitations of the systems, preventing both underuse and over-reliance. It also improved trust in the systems through hands-on experience. Importantly, the training benefited drivers with varying levels of prior ADAS experience: novices gained foundational knowledge, and experienced users refined their understanding. While age and gender had some influence, prior exposure to ADAS was a more significant factor in determining the effects of the training.

Training for older drivers

Instructors noted that older drivers often struggled with Advanced Driver Assistance Systems (ADAS) due to their unfamiliarity with new technology, their reluctance to trust systems, and their experience of cognitive overload. Many lacked confidence and preferred to disable features they didn't understand. The difference between the vehicles used for training and their own car also made it more difficult for older drivers to apply what they had learnt. Suggestions to enhance the effectiveness of training included providing one-to-one instruction and using the drivers' own vehicles.

Training structure

The instructors agreed that a three-part structure comprising a theoretical session, on-track training and on-road training was effective. Theoretical sessions introduced system functions, while track exercises provided a safe environment for practice. On-road training provided real-world experience. Driving simulators were considered useful for demonstrating high-risk scenarios, although they were deemed less effective for older adults due to the risk of motion sickness and unfamiliarity. Time allocation was generally considered sufficient. Group sizes of two to three people per car were preferred for peer learning, though one-to-one formats were recommended for older drivers to accommodate their specific learning needs.

Training introduction

The instructors emphasised the need for a more extensive ADAS training programme. As individual sessions are expensive, corporate training for fleet users or dealership-based programmes were suggested as feasible alternatives. While all drivers benefit from training, the instructors cautioned against introducing it to novice drivers too early. They recommended waiting several months after learning the basics of driving. Early exposure to ADAS might overwhelm learners and reduce the effectiveness of both conventional and ADAS training. Refresher training can help experienced drivers or those changing vehicles update their knowledge and support the safe integration of new features.

Challenges in training

A major challenge in ADAS training is the variation in system design between different vehicle brands. Differences in interface, functionality and terminology can cause confusion for both trainees and instructors. Older drivers found these inconsistencies difficult to navigate. The limited availability of training vehicles equipped with a full range of features also restricted demonstration opportunities. Instructors had to invest time in learning different systems and adapting their instruction accordingly. Nevertheless, using various car models in training was considered valuable preparation for the variability of vehicle technology in the real world.

3.8.2.4 Summary and discussion

This study found that ADAS driver training reduces driver misconceptions and underuse of the system, encouraging proper utilisation. Structured training at driving academies was particularly beneficial in encouraging ADAS adoption among older drivers. Instructors emphasised the importance of a structured approach combining theoretical and practical components, and the benefits of small groups for interactive learning. They also recommended introducing ADAS driver training once novice drivers have mastered the fundamentals of driving, and suggested vehicle lease companies and car dealerships as potential channels for training. These findings are expected to enhance driver safety and experience, ultimately contributing to improved road safety through the proper use of ADAS.

4 Conclusions and outlook

The Hi-Drive project acknowledges that the successful deployment of Connected and Automated Driving (CAD) technologies hinges on both technical maturity and the informed and responsible use of these technologies by end users. This deliverable outlines the design, implementation and evaluation of a two-pronged programme to educate and train users, with the aim of bridging the gap between system capabilities and user expectations.

The user education campaign, which was conducted across multiple digital platforms in 11 countries, provided a wide audience with clear, accessible, factual information on SAE Level 1–3 automated driving functions (ADAS/ADS). Consistent branding, multilingual materials and coordinated dissemination across social media ensured high visibility and engagement. Facebook and Instagram proved to be the most effective platforms in terms of reach and impressions.

In parallel, the user training programme offered participants at five pilot sites the opportunity to gain hands-on experience and structured learning. This gave users a realistic understanding of the functionalities and limitations of CAD systems, helping them to calibrate their expectations and use the technology responsibly. The curriculum was developed based on current research, best practices and feedback from surveys and on-site evaluations.

Looking to the future, we can draw several lessons to guide our future activities.

- Standardisation of content and harmonisation of training frameworks across Europe are key to ensuring a consistent understanding of CAD technologies.
- Ongoing updates to educational material will be necessary to reflect the rapid evolution of automation capabilities and regulatory changes.
- Including a broader range of stakeholders, such as mobility clubs, driving schools, regulators, manufacturers and insurance providers, in the development of CAD training will help to embed it into existing mobility education systems.
- Further research is needed to improve our understanding of user behaviour in critical scenarios, as well as the long-term impact of education on safety outcomes and technology acceptance.

Ultimately, the Hi-Drive approach provides a replicable model for encouraging the safe and informed use of automated vehicles. By continuing to invest in user-centric strategies, Europe can accelerate the responsible adoption of CAD technologies and realise their full societal benefits.

5 References

Parasuraman R., Riley V. (1997): Human and Automation: Use, Misuse, Disuse, Abuse. Volume 39, Issue 2, https://doi.org/10.1518/001872097778543886

Kim H., Song M., Doerzap Z. (2020): Real-World Use of Partially Automated Driving Systems and Driver Impressions. DOI:10.1177/1071181320641262 https://doi.org/10.1177/1071181320641262

Abraham H. et al. (2017): Autonomous Vehicles and Alternatives to Driving: Trust, Preferences, and Effects of Age https://www.researchgate.net/publication/319269855_Autonomous_Vehicles_and_Alternatives_to_Driving_Trust_Preferences_and_Effects_of_Age

Beggiato M., Krems J. F. (2013): The evolution of mental model, trust and acceptance of adaptive cruise control in relation to initial information, Transportation Research Part F: Traffic Psychology and Behaviour, Volume 18, Pages 47-57, https://doi.org/10.1016/j.trf.2012.12.006.

Singer J., Jenness J. (2020): Impact of Information on Consumer Understanding of a Partially Automated Driving System, https://aaafoundation.org/wp-content/uploads/2020/09/ImpactOfInfoOnUnderstandingPartiallyAutomatedDrivingSystem_FinalReport.pdf

Forster et al. (2019): Learning to use automation: Behavioral changes in interaction with automated driving systems. Transportation Research Part F: Traffic Psychology and Behaviour, 599-614, https://doi.org/10.1016/j.trf.2019.02.013

Casner S. M., Hutchins E. L. (2019): What Do We Tell the Drivers? Toward Minimum Driver Training Standards for Partially Automated Cars. https://doi.org/10.1177/1555343419830901

L3Pilot Annual Survey (2021): Benefits of automated driving expected by users: https://l3pilot.eu/fileadmin/user_upload/Downloads/L3Pilot_Global_User_Acceptance_Survey_Selected_Results_for_website.pdf

Tsapi et al (2020): How to maximize the road safety benefits of ADAS? https://www.fiaregion1.com/study-how-to-maximize-the-road-safety-benefits-of-adas/

Lee, J.D. and See, K.A., (2004). Trust in automation: Designing for appropriate reliance. Human factors, 46(1), pp.50-80, https://doi.org/10.1518/hfes.46.1.50_30392

Flin, R., O'Connor, P., Crichton, M. (2008), Safety at the Sharp End. A Guide to Non-technical Skills. (Ashgate Publishing, Aldershot, UK), https://doi.org/10.1201/9781315607467

Abraham, H., Seppelt, B., Mehler, B., & Reimer, B. (2017). What's in a Name: Vehicle Technology Branding & Consumer Expectations for Automation. AutomotiveUI 2017: Proceedings of the 9th International Conference on Automotive User Interfaces and Interactive Vehicular Applications, 226-234, https://doi.org/10.1145/3122986.3123018

Forster, Y., Hergeth, S., Naujoks, F., Krems, J., & Keinath, A. (2019). User Education in Automated Driving: Owner's Manual and Interactive Tutorial Support Mental Model Formation and Human-Automation Interaction. Information, 10(4), 143, https://doi.org/10.3390/info10040143

Manser, M. P., Noble, A. M., Machiani, S. G., Shortz, A., Klauer, C., Higgins, L. L., & Ahmadi, A. (2019). Driver training research and guidelines for automated vehicle technology. https://vtechworks.lib.vt.edu/server/api/core/bitstreams/4323f9ea-476c-47f4-bade-ebccca0371e3/content, https://rosap.ntl.bts.gov/view/dot/61487

Goldstein, I. (1986). Training in Organisations, 2nd ed. Monterey, California: Brookes/Cole Publishing Company

Noe, R. (2008). Employee training and development. New York: McGraw-Hill/Irwin

Kirkpatrick, D. L. (1976). Evaluation of training. In R. L. Craig (Ed.), Training and Development Handbook (2nd ed.). New York: McGraw-Hill

Murtaza, M., Cheng, C. T., Fard, M., & Zeleznikow, J. (2023). Preparing drivers for the future: Evaluating the effects of training on drivers' performance in an autonomous vehicle landscape. Transportation Research Part F-Traffic Psychology and Behaviour, 98, 280-296. https://doi.org/10.1016/j.trf.2023.09.013

Arthur WJ, Bennett WJ, Edens P, and Bell ST. (2003). Effectiveness of training in organizations: a metaanalysis of design and evaluation features. Journal of Applied Psychology, 88(2), 234–45, https://doi.org/10.1037/0021-9010.88.2.234

Wills, M. (1998), Managing the Training Process: Putting the Principles into Practice, 2nd ed., Gower, Aldershot

Salas, E., Tannenbaum, S. I., Kraiger, K., & Smith-Jentsch, K. A. (2012). The science of training and development in organizations: What matters in practice. Psychological science in the public interest, 13(2), 74-101, https://doi.org/10.1177/1529100612436661

Lehtonen, E., Aittoniemi, E., Bjorvatn, A., Brietzke, A., Fadel da Costa, A., Edelmann, A., Happee, R., Haué, J-B., Körber, H., Lee, Y-M., Madigan, R., Madigan, N., Metz, B., Metzulat, M., Nordhoff, S., Papaioannou, G., Pham Xuan, R., Portouli, E., Skjeret, F., Wolter, S., Öztürk, I. (2025). Hi-Drive deliverable D6.1: User acceptance and awareness results. https://www.hi-drive.eu/

6 List of abbreviations and acronyms

Abbreviation	Meaning
AD	Automated Driving
ADF	Automated Driving Function
ADS	Automated Driving Systems
ADAS	Advanced Driver Assistance Systems
AV	Automated Vehicles
CAD	Connected and Automated Driving
CAV	Connected and Automated Vehicle
CoP	Code of Practice
SAE	Society of Automotive Engineers
ODD	Operational Design Domain
OEM	Original Equipment Manufacturer
SDV	Software Defined Vehicles
SP	Sub-Project
TNA	Training Needs Analysis
TOR	Take-Over Requests
VRU	Vulnerable Road Users
WP	Work Package

7 Annex 1 Hi-Drive user education campaign – examples of messages

Adaptive cruise control is a function that adjusts the speed of your car to the car in front of you, using sensor systems. Be aware; you as the driver must continue to pay attention to road traffic while using adaptive cruise control.

Blind spot monitoring is driver support feature that uses sensors on the vehicle to monitor traffic alongside and behind the car. This warns drivers about vehicles in blind spots by notifying them via an audible or visual sign.

Automatic emergency braking uses sensors, cameras, and radar systems on the car to detect when an object is too close. This is an active safety system that warns drivers and applies the brakes in case of an imminent collision.

Automatic reverse braking systems detect when objects are too close to the vehicle's rear end. This is a safety feature in modern vehicles, but drivers should remain alert and check for objects or other road users that could potentially be behind them.

Lane Keeping Assist System uses in-vehicle sensors for lane detection. It can be triggered by a warning on the dashboard, sound, or vibration and gently steers the car back to the centre of the lane.

Lane centring is an advanced driver-assistance system that keeps the car in the centre of a lane. This function supports the driver with steering.

Lane departure warning uses forward-facing cameras mounted on the windshield, or near the rear-view mirror to alert drivers when the car is about to leave a lane. Driver is responsible for the driving task and must be attentive.

Lane change assist helps drivers safely make lane changes. It uses sensors in the vehicle to actively control steering and speed to complete the lane change. Drivers must still supervise lane change manoeuvres.

Motorway assist (SAE Level 2) combines automatic cruise control and lane assist features to maintain speed and lane position for drivers. While designed for convenience, drivers should always remain alert and focused while driving.

Hands on wheel detection is a driver support feature that alerts drivers to keep their hands on the wheel while driving. Keeping both hands on the steering wheel while driving manually is beneficial for #RoadSafety and for better control of the vehicle.

Driver monitoring systems can detect driver's distraction or drowsiness with eye-monitoring interfaces in vehicles. It is a technology designed to address #RoadSafety. Drivers should always pay attention and stay focused on the road while driving.

Traffic jam chauffeur (SAE level 2) monitors the speed of surrounding vehicles in slower environments of up to 60km/h. This automated driving function relieves drivers in traffic jams by adapting the car's speed to its surroundings.

Forward collision warning alerts drivers when they are at imminent risk of colliding with another vehicle. This feature is essential for enhancing road safety by providing early warnings that allow drivers to react quickly and avoid potentially serious accidents. However, it is crucial to remember that this technology, while helpful, does not replace the driver's vigilance and responsibility. Drivers must always remain attentive and aware of their road environment. Technology can assist, but collision prevention largely depends on human responsiveness and continuous attention.

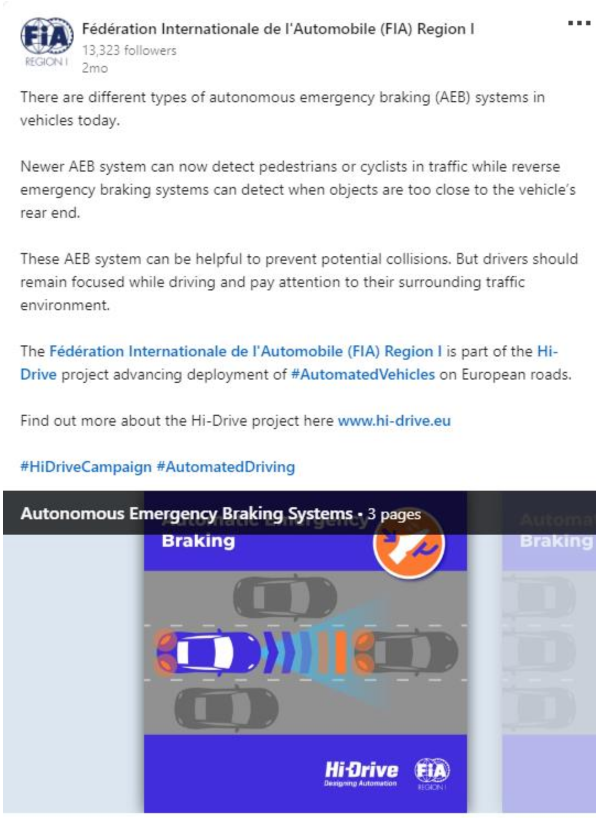


Figure 69 Example of a post from the Hi-Drive campaign

8 Annex 2 Pre- and post-training questionnaires

What gender do you identify with?
☐Male
☐Female
☐Non-binary
☐Prefer not to say

How old are you? ________years

How long have you had a car driving license? _______years

How long have you driven the vehicle you normally drive? _______years

Advanced Driver Assistant Systems (ADAS) experience

Please indicate whether the vehicle you normally drive has each of the following Advanced Driver Assistant System (ADAS), and whether you use them.

Vehicle Control Systems	I have it and I use it	I have it but I don't use it	I don't know if I have it	I don't have it
Lane keeping assistance				
Cruise Control (CC)				
Adaptive Cruise Control (ACC)				
Vehicle Warning Systems:				
Lane Departure Warning				
Blind Spot Monitoring				

If you have any of the above: How often do you use it?
☐Daily ☐Weekly ☐Monthly ☐less often ☐not applicable

Do you know how to turn these systems on and off?
Lane keeping assistance: ☐Yes ☐No ☐not applicable
Cruise Control (CC): ☐Yes ☐No ☐not applicable
Adaptive Cruise Control (ACC): ☐Yes ☐No ☐not applicable

Please indicate how much you agree or disagree with the following statements about Advanced Driver Assistance Systems (ADAS), e.g. ACC, lane keeping assistant, blind spot monitoring etc.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
If I had ADAS in my car, I **would use it** regularly.					
The next car I **buy**, should have ADAS					
I expect to **feel safe** most of the time while using ADAS					
I expect to **feel comfortable** most of the time while using ADAS					
I expect to **feel anxious** most of the time while using ADAS					
The ADAS is **dependable**					
The ADAS is **reliable**					
Overall, I can **trust** the ADAS					
Learning to use ADAS will be **easy** for me.					
I will find it **easy** to **get ADAS to do** what I **want it to do**.					
It will be **easy** for me to become **skilful** at using ADAS.					
I will find ADAS **easy to use.**					
Using ADAS will be **useful** in meeting my **driving needs.**					
Using ADAS will **decrease** my **accident risk.**					
Using ADAS will **relieve** my **stress** of driving.					

For each item regarding <u>Adaptive Cruise Control (ACC)</u>, please indicate whether you think the answer is <u>correct or not correct</u> for this system, and <u>how confident</u> you are in your answer.

	Correct	Not correct
The system must be switched on for use (by pressing a button).		

The system is automatically activated every time the ignition is turned on.		
I can turn off the system.		
The system is always available.		
The system keeps speed and distance to the lead vehicle.		
The system helps to keep the vehicle in its' lane.		
The system supports me when I need to brake in a critical situation.		
The system informs me about other vehicles in the blind-spot.		
The system warns me when I drive faster than the speed limit.		
The driver can increase/decrease the speed manually.		
The distance is selected by the system itself and cannot be adjusted.		
The system can also be activated during braking.		
If the vehicle stands still for a longer time during Stop & Go, the driver must start off independently.		
During Stop & Go, the vehicle will start up automatically in any case.		
I do not need to look at the road and the vehicle in front, when ACC is active.		
I must be ready to intervene at any time, as the ACC might lose awareness of the vehicle in front.		
I need to keep my hands on the steering wheel when the system is on.		

Please indicate how much you agree or disagree with the following statements about ACC.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
If I had ACC in my car, I would use it regularly.					
The next car I buy should have ACC					

For each item regarding Lane Keeping Assistance (LKA) and Emergency Lane Keeping (ELK), please indicate whether you think the answer is correct or not correct for this system, and how confident you are in your answer.

	Correct	Not correct
I can **turn off** the system.		
The system is **always available**.		
The system keeps **speed and distance** to the lead vehicle.		
The system helps to keep the vehicle in its' **lane**.		

The system supports me when I need to **brake** in a critical situation.		
The system informs me about other vehicles in the **blind-spot**.		
The system warns me when I drive faster than the **speed limit**.		
The system warns me if I cross the lane without indicating.		
The system warns me if I unintentionally cross the lane.		
The lane departure warning system is available for all speeds.		
When the lane departure warning system is activated, I can take my hands off the steering wheel.		
The lane departure warning system can be activated/ deactivated in the system settings.		
Active steering assist features help to bring the car back into position with a gentle turn.		
As soon as I set the indicator, I can change lanes without the intervention of the LKA.		
The system also works in adverse weather conditions like fog, heavy rain, or snow.		
It depends on the car model whether the system warns me visually, acoustically or with tactile warnings.		
I can always rely on the system, including all road types.		
The system only works reliably when there are lane markings.		
I need to keep my hands on the steering wheel when the system is on.		

Please indicate how much you agree or disagree with the following statements about LKA.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
If I had LKA in my car, I would use it regularly.					
The next car I buy, should have LKA					

For each item regarding Automated Emergency Braking (AEB), please indicate whether you think the answer is correct or not correct for this system, and how confident you are in your answer.

	Correct	Not correct
The system **must be switched on** for use (by pressing a button).		
The system is automatically **activated every time the ignition is turned on.**		

I can turn off the system.		
The system is **always available**.		
The system keeps **speed and distance** to the lead vehicle.		
The system helps to keep the vehicle in its **lane**.		
The system supports me when I need to **brake** in a critical situation.		
The system informs me about other vehicles in the **blind-spot**.		
The system warns me when I drive faster than the **speed limit**.		
The AEB always brakes to a standstill.		
If the AEB is activated, I no longer need to brake actively.		
The AEB warns me with audible and visual signals.		
AEB rear adds an extra layer of safety in situations where the driver may not have noticed an object behind the vehicle.		
I need to keep my hands on the steering wheel when the system is on.		

Please indicate how much you agree or disagree with the following statements about AEB.

	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
If I had AEB in my car, I would use it regularly.					
The next car I buy, should have AEB					

For each item regarding Blind Spot Monitoring (BSM), please indicate whether you think the answer is correct or not correct for this system, and how confident you are in your answer.

	Correct	**Not correct**
The system **must be switched on** for use (by pressing a button).		
The system is automatically **activated every time the ignition is turned on.**		
The system is **always available**.		
The system keeps **speed and distance** to the lead vehicle.		
The system helps to keep the vehicle in its **lane**.		
The system supports me when I need to **brake** in a critical situation.		
The system informs me about other vehicles in the **blind-spot**.		
The system warns me when I drive faster than the **speed limit**.		
The BSM warns me by illuminating an LED signal in the side mirror.		
The BSM warns me with an audible signal.		

BSM helps me not to overlook vehicles in my blind spot.		
The BSM replaces the look over the shoulder.		
When I do not receive a warning in the side mirror, I can be certain there is no vehicle in the blind spot.		
The warning must be confirmed by me before I change lanes.		
I need to keep my hands on the steering wheel when the system is on.		

Please indicate how much you agree or disagree with the following statements about BSM.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
If I had BSM in my car, I would use it regularly.					
The next car I buy, should have BSM					

- Additional questions for the post-training questionnaire

Please indicate how much you agree or disagree with the following statements about the training.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The training was fun.					
The training was interesting.					
I learnt new things during the training.					
The training has helped to improve my confidence in how the system works e.g. activation and deactivation.					
I am aware of all of the system capabilities and limitations.					
I would recommend the training to others.					

How do you feel about the amount of information provided during the training?
☐far too little ☐too little ☐appropriate ☐too much ☐far too much

How do you feel about the quality of information delivered during the training?
☐very poor ☐poor ☐neutral ☐good ☐very good

If you have any of the following systems in your car: Do you know how to turn these systems on and off?

Lane keeping assistance:	☐Yes	☐No	☐not applicable
Cruise Control (CC):	☐Yes	☐No	☐not applicable
Adaptive Cruise Control (ACC):	☐Yes	☐No	☐not applicable