

System for effective Assessment of driver vigilance and Warning According to traffic risk Estimation



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Recommendations to Authorities & the Industry

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List of Terms

(E)EC	European Community
EC	European Commission
EU	European Union
EuroNCAP	European new Car Assessment Programme

Executive Summary

Driver fatigue warning systems may significantly contribute to traffic safety. The successful implementation, however, is not only influenced by the state of technology but also by a variety of social and institutional conditions. For this reason research into the legal and insurance issues of implementing AWAKE-systems was included in the project. The results of these research activities have been documented in Deliverable 1.1 and Deliverable 1.2/9.2. In this report the legal and insurance implications of driver fatigue warning systems as described in these deliverables are analysed and translated in recommendations addressed to the different stakeholders involved.

In this report we first shortly describe the position of the different stakeholders (section 2). This is followed by a description of the recommendations towards the industry, authorities/policy makers, and insurance companies (section 3). What actions can be taken by the different stakeholders to help making the implementation of AWAKE-systems a success?

The recommendations in this deliverable are framed into a uniform recommendation template including identification of the key actor (the industry, authorities/policy makers, insurance companies), type of recommendation (technical, human factors, legislative, etc), actions to be taken (recommendation description), and other involved actors.

1. Introduction

The aim of the AWAKE project is not only to demonstrate the technological feasibility of driver vigilance monitoring systems but also to explore the non-technical issues that may influence the success of implementing these systems in real life traffic.

Driver fatigue warning systems intend to warn the driver when the driver's alertness is below a level that is no longer consistent with safe operation of the vehicle. The device should temporarily enhance driver alertness to avoid a crash situation, but it is not intended to be used by the driver as a means to stay awake over long periods of driving, although it might be used as such. Driver alertness monitors attempt to detect periods of driver impairment due to drowsiness or other lapses of alertness. The impaired state might be brought on by drowsiness, fatigue, sleep deprivation, or even medication, drug abuse, alcohol, naturally occurring stressors, and environmental factors. Research indicates that drivers are able to recognize their drowsy condition but are not good at recognizing the point of sleep onset. These devices provide the driver with an aid for recognizing this condition.

Driver fatigue warning systems may significantly contribute to traffic safety. The successful implementation, however, is not only influenced by the state of technology but also by a variety of social and institutional conditions. In this report the legal and insurance implications of driver fatigue warning systems as described in Deliverable 1.2 are analysed and translated in recommendations addressed to the different stakeholders involved.

In this report we first shortly describe the position of the different stakeholders. This is followed by a description of the recommendations towards the industry, authorities and policymakers, and insurance companies, using as reference documents the results of the user needs survey referred in Deliverable 1.1 and the results of the legal issues survey presented in Deliverable 1.2/9.2 of AWAKE.

2. The position of the different stakeholders

2.1 Industry

The industry is primarily responsible for developing driver fatigue warning systems, which prove to be an efficient, safe and reliable device for detecting sleepy drivers. Deliverable 9.1.2 gives an overview of already available guidelines for driver information systems in future vehicles and some additional guidelines that derived from the AWAKE-project. Apart from the motive of 'simply want to build a good product' there are also legal perspectives to consider in this context. One of these perspectives is that of product liability.

As is described in Deliverable 1,2 liability of manufacturers is established when a product does not provide the safety a person is entitled to expect, taking all circumstances into account. As such, the EC Directive defines "defect" in terms of consumer expectations. A product being defective in this legal sense means being unsafe rather than inadequate for its intended use and includes not only technical aspects but also "user aspects".

In this context different duties of care apply to manufacturers

- a duty to investigate the potential risks of the use of driver fatigue warning systems;
- a duty to anticipate to these risks through a proper design;
- a duty to warn and inform users to mitigate these risks;
- a duty to monitor their products.

2.2 Authorities and policy makers

AWAKE-systems may help to enhance traffic safety by reducing fatigue related traffic accidents. However, there may also be the threat of potential side effects such as over reliance (complacency). Policymakers, legislators and authorities therefore have the two-sided task to:

- 1) Facilitate and support the rapid introduction of driver fatigue warning systems where these systems contribute to traffic safety.
- 2) To insure that the use of these systems does not jeopardise traffic safety, for example due to complacency.

Different policy and legislative actions can be taken to fulfil this task, including the following:

- Initiate and fund R&D to get more and reliable knowledge on the positive and negative safety effects of driver fatigue warning systems.
- Promote and support the set up of safety-standards for driver fatigue warning systems and implement theme in adequate legal frameworks.

If AWAKE-systems prove to be a reliable and valid device for measuring driver fatigue, then policymakers and legislators may explore ways to incorporated these devices in road safety policies and regulations. The following types of policy instruments and regulations could be considered:

- Use instruments to stimulate market demand for these systems (financial subsidies, incorporation of driver fatigue warning systems in the euroNCAP test).

- Regulatory policies concerning the issuing of a driver license, i.e. that driver fatigue warning systems may be used as an additional requirement for issuing a licence for drivers who are suffering from sleeping disorders such as insomnia and narcolepsy.
- Working (driving) time regulations for professional drivers.
- Mandatory vehicle requirements.

2.3 Insurance companies

Insurance companies can be considered as an important stakeholder because of two reasons

- Their 'information position'.
- Their direct relation with insured motorists.

When discussing the position of policymakers and legislators, the importance of gaining more and reliable knowledge on the positive as well as the potential negative side effects of fatigue warning systems was stressed. Insurers may play their part fulfilling this goal by opening up their accident databases for traffic safety research purposes.

Furthermore insurance companies can play a key role through their premium and acceptance policies (for instance offer premium reductions for vehicles equipped with a driver fatigue warning system). Although insurance companies are generally interested in improving traffic safety, it can be concluded that current practice is not as 'innovative' as may be hoped or expected. It seems that insurers often can make better use of their possibilities to promote safety-enhancing technologies, such as driver fatigue warning systems, through their insurance policies.

3. Recommendations

Recommendation title: Increase knowledge in the safety effects of driver fatigue warning systems			
Recommendation to	<input type="radio"/> Industry	<input checked="" type="radio"/> Authorities, policy makers	<input type="radio"/> Insurance companies
Area:	<input type="radio"/> Technical <input checked="" type="radio"/> Human factors <input checked="" type="radio"/> Market demand	<input type="radio"/> Legislative/legal	<input type="radio"/> [anything else?]
Recommendation description: Increasing the knowledge in the technical possibilities and the safety effects of driver fatigue warning systems first of all can be regarded a necessary basis for sound policymaking in relation to driver fatigue warning systems. Secondly it provides other stakeholders such as consumers and insurance companies with reliable information that may influence their 'market-behaviour' (consumers may be convinced to buy such a device, insurance may offer premium reductions for cars equipped with driver fatigue warning systems). Therefore public funds should be allocated to initiate and support future R&D projects such as the AWAKE-project.			
Effect on:	<input checked="" type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input type="radio"/> Context (setting)		
Expected Risks: Complacency ("as soon as it is available the problem is over")	Mitigation:		
Key actor: European Commission, national governments	Role: initiating and funding R&D projects to increase knowledge in benefits and risks		
Other involved actors: Research institutes, Industry			

Recommendation title: Product liability law manufacturers duties of care			
Recommendation to	X Industry	O Authorities, policy makers	O Insurance companies
Area:	O Technical	O Legislative/legal	
	O Human factors	O [anything else?]	
	O Market demand		
Recommendation description:			
<p>Due to lack of experience with AWAKE-like systems there may always be a danger that users have incorrect expectations, especially concerning the inherent limitations of the system (leading to over-reliance or misperceptions). Wherever there are indications that the use of hypo-vigilance systems may have some dangerous 'side effects', this might create liability risks for manufacturers, if these effects could be avoided through an alternative design or adequate warnings or instructions.</p> <p>However, it can be concluded that given the characteristics of driver fatigue warning systems (informing systems, risks of over-reliance will be quite clear for drivers) product liability risks can be estimated to be limited, nor are there any indications that this will be an obstacle for the successful implementation.</p> <p>Nonetheless manufacturers should be aware of the following:</p> <ul style="list-style-type: none"> - Given the innovative nature of such a product, manufacturers cannot passively rely on the current state of knowledge (RESPONSE). They have a duty to actively investigate the potential risks involved in the use of their product. - Testing such systems cannot be limited to technical safety alone, but should include human factors as well, especially including 'vulnerable' driver categories (RESPONSE). - System limitations should be clearly communicated to the user, for example through warnings in the manual. Manufacturers should refrain from unrealistic claims about system performance to avoid - Development and application of commonly agreed guidelines, performance requirements, code of practices, etc. (as described in Deliverable 9.1 and as being developed in the RESPONSE-projects) will be an important strategy to mitigate product liability risks. These may be seen as the written expression of 'the safety a person is entitled to expect' or the duty of care to be applied by manufacturer 			
Effect on:	X Behaviour (consequence) O Structure (requirements) O Context (setting)		
Expected Risks: Complacency ("having such a system in my car takes care of my safety")	Mitigation:		
Key actor: Industry	Role: Applying the state of the art/state of the		

Other involved actors: Standardisation organisations and other guidelines or standard setting fora, certification organisations and test houses	industry
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Recommendation title: Promote and support the setting up of safety-standards for driver fatigue warning systems and implement theme in adequate legal frameworks			
Recommendation to	Industry	X Authorities, policy makers	O Insurance companies
Area:	X Technical X Human factors O Market demand	X Legislative/legal O [anything else?]	
Recommendation description: Governments may want to set minimum test and performance requirements to keep unsafe systems from the market. Furthermore, commonly agreed safety standards may be needed to build up confidence in the functionality/reliability of these systems (for example to convince automobile clubs and car insurers to promote these systems), as well as to promote uniformity of these systems to make them successful in the marketplace. Therefore governments should (continue to) promote the relevant activities within standardisation organisations or other fora such as e-Safety and the RESPONSE-projects. Furthermore, the legislator should consider implementing performance requirements and test procedures into adequate legal framework such as the European type approval system (Directive 70/156/EEG)			
Effect on:		O Behaviour (consequence) O Structure (requirements) X Context (setting)	
Expected Risks:		Mitigation:	
Key actor: EC, national governments		Role: Initiating/funding/coordinating	
Other involved actors: Industry, Research institutes, Standardisation organisations			

Recommendation title: Use instruments to stimulate market demand for driver fatigue warning systems	
Recommendation to	<input type="radio"/> Industry <input checked="" type="radio"/> Authorities, policy makers Insurance companies
Area:	<input type="radio"/> Technical <input type="radio"/> Legislative/legal <input type="radio"/> Human factors <input type="radio"/> [anything else?] <input checked="" type="radio"/> Market demand
<p>Recommendation description: European and national authorities may support the swift deployment of driver fatigue warning systems by policy measures that positively influence market demand. These measures may take different forms, such as:</p> <ul style="list-style-type: none"> - Subsidising the new technology For instance in the Netherlands tax reductions are offered for vehicles that are equipped with Cruise Control because of the positive effects on fuel consumption. The same kind of tax reductions could be applied on safety enhancing technologies such as driver fatigue warning systems. - Informing the public Making the public aware of the impact of driver fatigue on road safety and the contribution that AWAKE-systems may have in reducing the danger of driver fatigue may help to create market demand. <p>In particular the euroNCAP tests may be of relevance here. In the past years the euroNCAP-programme has developed into a very effective instrument to promote the safety of motor vehicles. Through crash tests, it provides the public with information about the safety level of the different models available on the market. Within EuroNCAP discussions have started how to take account of the fast development of active safety systems such as electronic stability, collision avoidance systems, lane departure warning systems and also driver fatigue warning systems. Incorporating driver fatigue warning systems in the test (i.e. rewarding vehicles with driver fatigue warning systems with a higher score in the test) will support the rapid deployment of these systems.</p>	
Effect on:	<input checked="" type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input type="radio"/> Context (setting)
Expected Risks:	Mitigation:
Key actor: EuroNCAP-consortium, EC, national governments	Role: Providing financial incentives/consumer information
Other involved actors:	

Recommendation title: Explore possibilities to incorporate into traffic safety policies issuing driver licences	
Recommendation to	<input type="radio"/> Industry <input checked="" type="radio"/> Authorities, policy makers <input type="radio"/> Insurance companies
Area:	<input type="radio"/> Technical <input checked="" type="radio"/> Legislative/legal <input type="radio"/> Human factors <input type="radio"/> [anything else?] <input type="radio"/> Market demand
<p>Recommendation description: European and national legislators are searching for an acceptable balance between traffic safety and the 'right' to personal mobility. To guarantee that only drivers are allowed to drive who are physically capable to drive, people with certain medical conditions (inter alia sleeping disorders or other consciousness disorders) are not granted a licence or only under certain conditions (regular medical check ups, technical adaptations to the vehicle, etc.). These conditions and restrictions are to an important extent governed by national laws and differ from state to state. Scientific or technical developments lead to modifications in (national) driver licence issuing policies (for instance because the effects of certain medical conditions were overestimated or because new treatments or medical devices are available to minimize the impacts of a medical condition on driving capabilities). If proven to be an effective and reliable device national authorities may consider driver fatigue warning systems to serve as a conditional requirement for issuing a drivers licence if these systems prove to be a reliable and valid device for detecting driver fatigue or other consciousness disorders and an effective instrument to counter the impact of the driver's impairment. This would also require an adequate enforcement strategy.</p>	
Effect on:	<input type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input checked="" type="radio"/> Context (setting)
Expected Risks:	Mitigation:
Key actor: National governments	Role: Legislative
Other involved actors: EC, medical test and enforcement authorities	

Recommendation title: Explore possibilities to incorporate driver fatigue warning systems into traffic safety policies/ working time regulations for professional drivers	
Recommendation to	<input type="radio"/> Industry <input checked="" type="radio"/> Authorities, policy makers <input type="radio"/> Insurance companies
Area:	<input type="radio"/> Technical <input checked="" type="radio"/> Legislative/legal <input type="radio"/> Human factors <input type="radio"/> [anything else?] <input type="radio"/> Market demand
<p>Recommendation description: Regulation of driving time and rest hours to reduce the impact of fatigue on driving safety. Within this type of regulation a balance is sought between traffic safety and economic interests. Weakness of this type of regulation is that 'time at the wheel' may not be the most relevant variable to address the stated objective of reducing fatigue related accidents. In concept, driver fatigue warning systems could allow for a more flexible, more effective and more acceptable driving hours regulation if:</p> <ul style="list-style-type: none"> - reliable and effective, - strongly enforced. <p>However, given the state of technology, as well as the current flaws in the enforcement of driving times regulations it is not likely that driver fatigue warning systems will, at least in the short term, may become a substitute for a rigorous regime of enforcement of driving hours regulations.</p>	
Effect on:	<input type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input checked="" type="radio"/> Context (setting)
Expected Risks:	Mitigation:
Key actor: EC	Role: Legislative
Other involved actors: National governments, enforcement authorities, transport industry	

Recommendation title: Explore possibilities to incorporate driver fatigue warning systems into traffic safety policies/ mandatory vehicle equipment	
Recommendation to	<input type="radio"/> Industry <input checked="" type="radio"/> Authorities, policy makers <input type="radio"/> Insurance companies
Area:	<input type="radio"/> Technical <input checked="" type="radio"/> Legislative/legal <input type="radio"/> Human factors <input type="radio"/> [anything else?] <input type="radio"/> Market demand
<p>Recommendation description: If driver fatigue warning systems prove to be a reliable device to counter the danger of driver fatigue in traffic, it may be considered to incorporate these devices into the mandatory vehicle equipment requirements (also for other vehicles than those governed by driving hours regulation) (Directive 70/156/EEC). However, given the early state of the technology, and the requirement of international consensus needed to adopt new mandatory vehicle requirements this should certainly not be regarded a realistic option for the short term. Furthermore, such a policy measure would only be effective if drivers are monitored and generated warnings are stored in some kind of electronic data recorder (EDR) for enforcement purposes. This will seriously reduce acceptance. It is still feasible to be applied for certain categories of professional drivers; i.e. drivers of dangerous goods, school buses, etc.</p>	
Effect on:	<input type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input checked="" type="radio"/> Context (setting)
Expected Risks: Drivers' Acceptance	Mitigation:
Key actor: EC	Role: Legislative
Other involved actors: Industry, national governments, approval authorities	

Recommendation title: Insurance companies can play a more active role/ supporting research and promote the use safety enhancing technologies such as driver fatigue warning systems through insurance policies			
Recommendation to	<input type="radio"/> Industry	<input type="radio"/> Authorities, policy makers	<input checked="" type="radio"/> Insurance companies
Area:	<input type="radio"/> Technical	<input type="radio"/> Legislative/legal	
	<input type="radio"/> Human factors	<input type="radio"/> [anything else?]	
	<input type="radio"/> Market demand		
Recommendation description:			
<p>Insurers may in theory play a key role in actively promoting the use of safety enhancing technologies such as driver fatigue warning systems through insurance policies. If these systems contribute to reduce sleep-related accidents this will commercially benefit motor vehicle insurers. Furthermore, promoting safety-enhancing technology is a way of showing their commitment with the traffic safety problem and to show that they are a 'responsible and caring' company.</p> <p>From this point of view insurers are interested in safety enhancing technology such as driver-hypo vigilance systems, if they are convinced that they have the promised effect. However, to promote safety insurance companies first of all generally prefer 'soft' instruments (i.e. educational campaigns, driver training, etc) over 'hard' instruments (i.e. premium reduction, for example if you drive a vehicle equipped with a driver fatigue warning system) or bonus-malus arrangements (no damage recovered if a warning was denied), Hard measures however, are being considered more effective.</p> <p>The following factors can be identified that hinder an 'optimal role' of the insurance industry in promoting AWAKE-systems through there insurance policies:</p> <ul style="list-style-type: none"> ➤ Premium setting is based on statistical principles (time lag problem). ➤ Market appeal of insurance product. ➤ Competition/sensitive relation with client. ➤ Investment costs (in case of after market installation). ➤ Administrative costs. ➤ Market regulation. <p>Therefore, practice is mildly saying "less then optimal" for innovations like driver fatigue warning systems. Nevertheless, differences between countries show the potential for a more active role of insurance companies in terms active premium policies (safety culture). Insurance products for fleet owners offer the best potential because of a more optimal cost/benefit ratio and a more businesslike relation with the client.</p>			
Effect on:	<input type="radio"/> Behaviour (consequence) <input type="radio"/> Structure (requirements) <input checked="" type="radio"/> Context (setting)		
Expected Risks:	Mitigation:		
Key actor: Insurance companies	Role:		
Other involved actors:			

4. Conclusions

This document offers specific recommendations to all the involved key actors (i.e. industry, authorities, insurance leagues) on how to promote AWAKE-similar systems and guarantee their safe and optimal application. These are based to the work performed on legal and organizational issues within the project, as well as the impact analysis of several project validation Pilots. They deliberately remain at a qualitative level, as it is not possible to define at this stage the exact details of each policy (i.e. exact insurance fee premium reduction or the required funds for research results uptake). Still, they are supported by detailed analyses within D1.1, D1.2/9.2 and D7.3, that can guide further any key actors wishing to apply any of those recommendations.

4. References

- Bekiaris E., Nikolaou S., Panou M., Van Wees K., Deliverable 1.1 'User needs analysis per category of drivers group', AWAKE Project, June 2002.
- Van Wees K., Deliverable 1.2/9.2 'Proposed legal framework, recommendations and insurance policies for driver hypovigilance monitoring systems', AWAKE Project, September 2004.
- RESPONSE, Final Report. S. Becker, T. Johanning, J. Feldges & M. Kopf, The integrated Approach of User, System, and Legal Perspective: Final Report on recommendations for Testing and Market Introduction of ADAS, Telematics Applications Programme - Sector Transport, Deliverable D2.2, 2002.
- RESPONSE 2, Deliverable D.1, ADAS market introduction scenario's and Proper Realisation.

Annex 1: Template Instruction

Recommendation title: The guideline / focus in a few words

Recommendation to: differentiate between Authorities (e.g. legal restrictions), industry (e.g. design guidelines, system requirements), and insurance companies.

Area: Differentiate between technical guidelines, human factors guidelines, guidelines for market demand and legal guidelines.

Effect on: differentiate between

Behaviour: e.g., informing the public about potential effects

Structure: e.g., system requirements to avoid incompatibility

Context: the setting, compatibility with user needs, enforcement

Expected Risks: potential negative effects, e.g. expected compliance or over reliance (complacency)

Mitigation of these risk concerns

Key Actor: specify the key actor the recommendation applies to, e.g. road authority

Other actors: Specify other actors involved (if applicable)

Role Specify their role (if applicable)

[Partly based on A. Stevens Advisors Designing implementation strategies - an advisors guide, WP7, TRL]