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Code of Practice for the Design  
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## Revision chart and history log

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1.0	21.12.2005	Reformatted Annexes
1.1	20.2.2006	Included new proposal for "Requirements" chapter
1.2	24.5.2006	Chapter "Requirements2 changed to Recommendations, Updated Annexes B and C, added R
1.3	7.5.2006	Included partner contributions for preparation of workshop
1.4	17.7.2006	Reworked whole CoP during workshop, accepted revisions of discussed sections
1.7	13.9.2006	Separated SP deliverable from CoP specific chapters, excluded sections that are specific to the CoP
2.1	6.10.2006	Updated deliverable (note that the versioning corresponds with the CoP)
3.0	31.10.2006	Final check and formatting by IMC; final version

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## Executive summary

The Code of Practice (CoP) for the development, testing and market introduction of ADAS established by RESPONSE 3 is meant to provide a link between research activities and series development of advanced driver assistance systems (ADAS).

The setup of the code of practice (CoP) is a horizontal activity within the integrated project PReVENT comprising all research activities focussing on preventive safety.

ADAS research experience shows that many ideas have been applied for prototypes with safety features. However, only a few have been introduced into series production. This is mainly due to possible ADAS risks, which have not been fully considered during the early development phases. These risks may be highly complex and a standardized approach to assess the corresponding product safety issues is not established yet.

The term "defective product" is used in the European Product Liability Directive not only in a technical sense but it is also linked to human factors including system requirements such as dependability, controllability, comprehensibility, predictability and misuse resistance. Currently the technological safety issues are standardised within ISO TC22 while RESPONSE 3 is focussing on the human-machine interaction safety issues of ADAS, in particular on driver controllability, which is an ADAS key issue.

In RESPONSE 3 the knowledge of all partner companies about risk identification, risk assessment and evaluation methodology in the field of ADAS development is compiled, which aids in setting up specifications for the vertical subprojects in PReVENT including a comprehensive risk assessment and corresponding evaluation schedule.

The CoP is intended for automotive manufacturers and suppliers dealing with specification, realisation and assessment of ADAS. The CoP has been compiled by gathering best practices of the partner companies together with legal requirements and the RESPONSE 2 results.

The CoP deals with the specification and assessment of ADAS during the entire development phase. Therefore, it will not address issues arising after SOP (start of production).

The CoP structure allows implementation as part of a company specific development or quality process. Requirements are supplied for each development stage and are clearly separated from checklists and method descriptions in the annex of the document in order to provide an overview for each task. The use of the checklist procedure assists in the specification of ADAS in order to also consider aspects, which may not be obvious right from the beginning. The hazard and risk analysis procedure provides assistance in setting up a systematic analysis of driving situations in order to determine potential risks.

The CoP also comprises the description of methods and tools for the assessment of ADAS safety.

The CoP should not stipulate a uniform ADAS design. It should be valid for various vehicle types and systems with many complexity and integration levels to allow the application for all ADAS.

All these aspects are collected and the CoP aims at serving as a guideline assisting persons involved in ADAS development to adhere to the state-of-the-art knowledge with respect to risk identification and risk assessment as well as methodology for the evaluation of driver controllability.

# 1 Introduction

## 1.1 Objective

RESPONSE 3 has translated the results of the former RESPONSE projects into a 'Code of Practice' for development and testing of ADAS. This addresses two major issues:

- **A definition of "safe" ADAS development and testing.**

But this can only put things forward by also having

- **An agreement on these development guidelines between all stakeholders as a basis for the company internal translation and/or optimisation of system design specifications and complementary verification methods.**

This Code of Practice contains, on a generic level, descriptions of procedures and processes for analysis of user requirements, definition of systems according to these requirements, and validation procedures showing that these safety related customer requirements are fulfilled. This CoP has a special focus on an integrated "system safety - human factors" approach and will be a basis for future standardisation efforts. It also gives advice on the legal questions regarding product liability, driver's responsibility vs. manufacturer's liability etc.

How to use the Code of Practice?

The Code of Practice will be used as a generic process plan, i.e. depending on a specific application it will be possible to derive a corresponding process (and action) plan (with regard to specification, development, organisational requirements, validation, market introduction) by tailoring the Code of Practice.

A prerequisite of building up a Code of Practice and to implement it is a broad consensus between the automotive industry itself and also between industry and authorities. Corresponding workshops with the stakeholders shall serve for a consensus building process between industry and authorities.

## 1.2 Content

The Code of Practice (CoP) comprises a suitable ADAS (Advanced Driver Assistance System) description concept including ADAS specific requirements for system development. It summarises best practices and proposes a catalogue of methods for risk assessment and controllability evaluation.

The actual content of the CoP was separated from the deliverable to allow easy application and facilitate the usage beyond RESPONSE 3 and PReVENT [CoP 2006].

# 2 Methodology to compile a Code of Practice

The knowledge and best practices in the development of ADAS have been brought together within RESPONSE 3. Among the partner companies experts from the fields of system development, human-machine interaction, system verification, system safety and product analysis contributed to the CoP and discussed their differ-

ent approaches to consolidate the available knowledge and best practices in the CoP.

To structure the various inputs and give a guideline for the application of the available recommendations, checklists and method descriptions, a generic product development process and a flowchart for the recommended working steps regarding controllability have been introduced within the CoP.

### 3 Validation

A validation phase was used to check the comprehensibility and consistency of the CoP as well as the technical feasibility of the recommendations. This process was started within PReVENT at the mid term workshop in November 2005 where the draft version of the CoP was presented. Results from the application of the draft CoP in all PReVENT SPs were collected by means of a questionnaire. The questionnaires have been evaluated and the resultant feedback was included in the CoP.

In a second step the applicability of the CoP was evaluated in a more realistic environment. The RESPONSE 3 partner companies agreed to discuss it internally with their respective development departments and provided feedback to the group about the internally gained experience. The actual technical results of the application have not been disclosed to the project partners. The CoP has been applied to various ADAS in different development stages to make sure that the whole development cycle was covered during validation.

This second validation phase lasted from April to August 2006 (including the updates and concluding discussions within the RESPONSE 3 group).

### 4 Conclusions

The work performed so far allows the conclusion that as yet there is no standardised ADAS development procedure available. The reason for this is not only the variety of procedures in companies, but mainly the manifold functions in very specific aspects.

All these aspects have been collected and the CoP aims at serving as a guideline assisting persons involved in ADAS development to adhere to the state-of-the-art knowledge with respect to risk identification and risk assessment as well as methodology for the evaluation of driver controllability.

The objective of a safe ADAS development and testing can be achieved by using the CoP.

#### 4.1 Next steps

RESPONSE 3 was always aiming at results that will not only be valid for the PReVENT project but be also of value for the everyday application in ADAS development. To continue the work to-

wards this goal an agreement with the European Automobile Manufacturers Association (ACEA) has been made that the work will be handed over to the ACEA task force on "Active safety". The roadmap for the handing over and pursuing the work will be:

Date	Activity	
12.09.2006	Presentation of the RESPONSE 3 results to the ACEA Task Force "Active Safety".	✓
28.09.2006	Decision of the ACEA Working Group "Passenger Car Safety" to distribute and monitor the application of the Code of Practice.	✓
31.03.2007	<p>The Task Force "Active Safety" will collect feedback from its members and revise the Code of Practice. The result will be transferred to the ACEA working group "Regulations" for review.</p> <p>Members of the Task Force "Active Safety" will provide information on the current status to the eSafety Working Group "Roadmaps" on a regular basis.</p>	
	After review of the Code of Practice further actions will be recommended by ACEA.	

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We also thank the PReVENT projects for applying the CoP and giving feedback for improvements.

## References

[CoP 2006]

Schwarz, J. et al 2006, Code of Practice for the design and evaluation of ADAS, PReVENT project deliverable D11.2, [www.prevent-ip.org](http://www.prevent-ip.org)