THE TRACE PROJECT: AN INITIATIVE TO UPDATE ACCIDENT CAUSATION ISSUES AND EVALUATE THE SAFETY BENEFITS OF TECHNOLOGIES

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ABSTRACT

The Integrated Safety programme and the eSafety initiative stress that the development of Intelligent Transport Systems in vehicles or on roads (and especially in the safety field) must be preceded and accompanied by a scientific accident analysis encompassing two main issues:

- The determination and the continuous up-dating of the etiology, i.e. causes, of road accidents (as well as the causes of injuries) and the assessment of whether the existing technologies or the technologies under current development address the real needs of road users inferred from accident and driver behavior analyses.

- The identification and the assessment (in terms of lives saved, injuries mitigation and accidents avoided), among possible safety technologies, of the most promising solutions that can assist the driver or any other road users in a normal road situation or in an emergency situation or, as a last resort, mitigate the violence of crashes and protect vehicle occupants, pedestrians, and two-wheelers in case of a crash or a rollover.

The general objective of the TRACE project (TRaffic Accident Causation in Europe) is to address these two issues by providing the scientific community, the stakeholders, the suppliers, the vehicle industry and the other Integrated Safety program participants with a global overview of the road accident causation issues in Europe, and possibly overseas, based on the analysis of any and all current available databases which include accident, injury, insurance, medical and exposure data (including driver behavior in normal driving conditions). The idea is to identify, characterise and quantify the nature of risk factors, groups at risk, specific conflict driving situations and accident situations; and to estimate the safety benefits of a selection of technology-based safety functions. Expected outcomes are essentially reports.

Beside this, TRACE proposes three different research angles for the definition and the characterization of accident causation factors, and to improve the methods actually used in accident analysis (diagnosis and evaluation, especially with regards to statistical techniques and human behaviour analysis).

Finally, TRACE intends to base the analyses on available, reliable and accessible existing and on-going databases (access to which is greatly facilitated by a series of partners highly experienced in safety analysis, coming from 8 different countries and having access to different kinds of databases, in-depth or regional or national statistics in their own country, and for some of them in additional countries).

The project is to last 2 years (January 2006 – December 2007) and involves 16 full partners and 6 sub contractors for a total of 386 men-months.

INTRODUCTION

Our planet shelters about 6 billion people, more than 22 million kilometres of roads, 470 million passenger cars and 145 million station wagons, vans and trucks[1]. One third of motorized vehicles move in the U.S.A. and another third in the European Union. According to the World Health Organization and other sources, the total number of road deaths, while not completely accurate, is estimated 1,2 million, with a further 50 million injured every year in traffic accidents. Two thirds of the casualties occur in developing countries. 70 % of casualties in these countries are vulnerable road users such as pedestrians, cyclists and motorcyclists.

[1] Estimated figures excluding the length of Chinese roads and Chinese vehicle fleet.

The European Union (E.U., 25 countries) is home to about 456 million inhabitants and about 270 million motorized vehicles. 2.000.000 personal injury road accidents and over 45 000 fatalities occur every year, which is now significantly higher than in the U.S.A. (42 000) which has a noticeably lower population, 290 million inhabitants and a smaller vehicle fleet (230 million motorized vehicles).

In most countries, economic losses due to road accidents represent 1 % or 2 % of GNP. In 1997, the European Transport Safety Council (ETSC) estimated the total cost of transport accidents in Europe at 166 billion Euros. 97 % of these costs, i.e. 162 billion Euros, were directly related to road transport.

Overall road safety has been increasing in industrialized countries for 30 years and this increase shows that political willingness and the application of countermeasures produce results. For example, the recent SUNFLOWER report, concludes that, between 1980 and 2000, in out of 3 of the most successful countries, fatality trends dramatically decreased, due to:

- Passive Safety measures: 15 % to 20 %
- Safety Belt wearing: 15 % to 20 %
- Alcohol countermeasures: 15 % to 20 %
- Specific Measures for vulnerable road users: 30 % to 40 %
- Actions targeting the Infrastructure: 5 % to 10 %
- Education – Training – Communication: 7 % to 18 %

Integrated Safety

However, Road Safety is still one of the main societal concerns today. It is not only a matter of concern for the European Commission and National Governments but also for the vehicle industry, insurance companies, driving schools, non-governmental organisations and more generally people who care about others. Especially, car manufacturers have made strong efforts and have dramatically improved their vehicles' passive (and also active) safety for the past 15 years. However, current road safety research has shown that an asymptote is about to be reached in most countries (even though France recently showed up an unprecedented success in fatalities prevention by the introduction of a voluntary enforcement policy for which automatic speed cameras are the most well-known aspect) and many experts agree that preventive (prevention of accidents) and active safety (recovery of an emergency situation) should now, particularly, be brought forward.

This is why the EUropean Council for Automotive Research (EUCAR) has launched in 2001 an initiative to develop a systemic approach to the problem of road safety: **Integrated Safety**. The idea is to revisit the Safety problem with a holistic System Approach. In 2006, 4 IP's and one STREP (AIDE, PREVENT, EASIS, APROSYS, GST) are on the way and are starting producing methodologies and results. Just a few of these research integrated projects or sub projects (i.e. Aprosys, Prevent-Intersafe) called for prior accident analysis in order to start further tasks (development of models, simulations, technologies, demonstrators, tests, etc.) on a thorough understanding of the real-world problems. Consequently, this knowledge is sometimes considered as a missing plinth.

eSafety

Simultaneously, an eSafety Forum was established by the European Commission DG Information Society in 2001 as a joint platform involving all road safety stakeholders. The Forum adopted twenty-eight recommendations towards the better use of Information and Communication Technologies (ICT) for improved road safety. But, even though former research in accident causation and impact assessment produced a tremendous amount of knowledge, the exact nature of the contribution that ICT can make to road safety could not be determined because consistent EU-wide accident causation analysis was not sufficiently available to gauge this impact. Consequently, the first of these recommendations sought to consolidate analyses from existing accident and risk exposure data sources for a better understanding of the causes and circumstances of road accidents and to determine the most promising and/or effective counter measures. The second recommendation called for the establishment of a common format for recording accident data to develop an information system covering all EU Member States.

When working groups were established to undertake the work required by the recommendations, one of the first to be established was an Accident Causation Analysis working group. The overall job of this working group was to establish the requirements for the results of the recommendations to be made available. The group intended to identify the remaining needs for a diagnosis of the safety issues and for an evaluation of the expected and observed effectiveness of the counter measures.

On the one hand, although neither in the EU nor in any of the member states there is anything like the major NHTSA accident database systems, i.e.

NASS (National Accident Sampling System) and FARS (Fatal Accident Reporting System), Europe does not start from scratch in this area of course. A number of data sources already exist but they fulfil varied objectives, are often at different levels, use different methodologies, are inconsistent and do not provide a "European" analysis of accident causation.

Simultaneously, The EU was and still is funding an important project, SafetyNet (The European Road Safety Observatory), which particularly aims at making consistent accident data collection protocols in several EU countries and at constituting an accident databank on injury and fatal accidents. But the project would provide neither accident data, nor accident analysis in the short term. Moreover this project does not aim at identifying relevant methodologies to evaluate the effectiveness and efficiency of safety systems based on technology.

To try to overcome these problems in the short term, the (Accident Analysis) Working Group has examined available data sources which were known to them. These sources are sometimes at EU level, sometimes Member State level sometimes company specific or complied by road safety institutions. Occasionally the sources cover a number of Member States. Some sources are high-level statistics while others are in-depth studies of small numbers of accidents. All these sources contain useful data so one of the first tasks of the working group has been to see how these varied sources could be better used to yield a more consistent European picture that would provide a safety diagnosis enabling the assessment of impact and thereby identify priorities for action.

The working group has collected information about a sample of twelve current databases that already exist in Europe or will be existing soon, such as CARE, MAIDS, GIDAS, EACS, CCIS, OTS, IRTAD, etc. Data exist outside Europe too of course but this has not been included since it is not always completely relevant for European experience. Some of these data sources are either private or commercial with significant access restrictions brought about by intellectual property right issues. Since there is little prospect of overcoming these restrictions there is no prospect of making disaggregated data publicly available. To overcome these problems the working group undertook some qualitative analysis of the data sources. This analysis assessed the essential characteristics of the data and secondly assessed the potential for the different sources to be used in conjunction with each other. Four criteria were used for this assessment:

- The degree of qualitative description of accidents in the data source; content, reliability, size/scope and relevance;

- The degree to which the source contains a statistical representativeness: content, size/scope, sub-samples, reliability and relevance;

- An evaluation of the sources;

- Whether or not the source contained case studies.

The analysis confirmed the hypothesis of the working group that although many information sources already exist they are not enough as they currently exist to provide Europe with the analysis it needs because the picture obtained was a mixed one. Some data sources were never designed for the purpose of coordinated analysis and therefore have little potential. Some others have their main focus on passive safety, biomechanics or traumatology and do not give much insight into the *causes* of the accidents they contain. Others have considerable potential.

Based on this qualitative analysis of existing sources the working group recommended to the eSafety Forum that existing sources can nevertheless help to give a better understanding on accident causation and to evaluate (at least partially) the effectiveness of some on-board safety functions, if shared analysis mechanisms are employed to interrogate the different data sources and share the results. This of course requires the formulation of a set of appropriate questions to establish what the analytical focus should be on and which can be used in the interrogation. To devise this list of questions a multi-stakeholder workshop was organised where participants shared and agreed items in a list of questions. Since the list was long and that resources to carry out the shared analysis were limited, the list was reordered by priority.

So far the work on this task had been done by a group of volunteers. The next stages of the task were assumed to be considerable and could only be done when resources are available to support the work. The necessary resources were expected to be made available at the end of 2004 and the work carried out over the next two years.

THE TRACE PROJECT

This dual context (The **Integrated Safety** program and the **eSafety** initiative) stressed that the development of Intelligent Transport Systems in vehicles or on roads (and especially in the safety field) must be preceded and accompanied by a

scientific accident analysis encompassing two main issues:

- The **determination** and the **continuous up-dating** of the **etiology,** i.e. causes, of road accidents (as well as the causes of injuries) and the **assessment** of whether the existing **technologies** or the technologies under current development address the **real needs** of the road users inferred from the accident and driver behavior analyses.

- The **identification** and the **assessment** (in terms of saved lives, injuries mitigation and avoided accidents), among possible technology-based safety functions, of the **most promising solutions** that can assist the driver or any other road users in a normal road situation or in an emergency situation or, as a last resort, mitigate the violence of crashes and protect the vehicle occupants, the pedestrians, and the two-wheelers in case of a crash or a rollover.

These two main orientations (Diagnosis of the road safety problems and Evaluation of the most promising technological solutions) were the plinth of the TRACE (Traffic Accident Causation in Europe) proposal submitted to the European Commission in 2005. Actually, the European Commission has expressed two kinds of interest as regards accident analysis (cf. Strategic Objectives 2005-2006: 2.4.12: eSsafety – Co-operative systems for road Transport):

"In support of the eSafety initiative, and as a pre requisite for diagnosis and evaluation of the most promising active safety technologies:

- Research in consistent accident causation analysis to gain a detailed knowledge about the real backgrounds of European traffic accidents using existing data sources.

- Research to assess the potential impact and socio-economic cost/benefit, up to 2020, of stand-alone and co-operative intelligent vehicle safety systems in Europe".

TRACE addresses the first concern (accident causation) and the safety benefit part of the second one (impact assessment of technologies).

TRACE Objectives

In accordance to these concerns, the TRACE Consortium has identified the following objectives:

1. The definition of Accident Causation is not that clear. Numerous factors influence a country's transportation safety level. These factors are concerned with road safety policy, distribution and crashworthiness of the fleet, road network characteristics, human behaviour and attitudes, conditions of the trip, environment, etc. These issues have been studied for decades and considerable prevention efforts have been inferred from the analysis and comprehension of these factors. Nevertheless, further efforts are needed: all these factors have to be put forward and studied altogether in order to end up with a comprehensive and understandable definition of accident causation at the end of the project.

2. The second objective is to provide the scientific community, the stakeholders, the suppliers, the vehicle industry and the other Integrated Safety program participants with a global overview of the road accident causation issues in Europe, and possibly overseas, based on the analysis of any and all current and available databases which include accident, injury, insurance, medical and exposure data (including driver behavior in normal driving conditions). The idea is to identify, characterise and quantify the nature of risk factors, groups at risk, specific safety-related or risk-related societal issues, specific conflict driving situations and accident situations.

This objective will be achieved at the end of the project with the public dissemination of most of the final reports.

3. The third objective is to make this overview comprehensive, understandable and operational. Hence all aspects of safety are taken into account in order to achieve the following level of knowledge: when, where, how, why, to whom accidents happen? When, where, how, why, to whom injuries happen?

4. The fourth objective is to improve the multidisciplinary methodologies that are considered to be necessary to achieve this knowledge and especially methodologies in analysing the influence of human factors and also the statistical methodologies used in risk and evaluation analysis.

5. The fifth objective is to generate summary documents with vulgarised figures, statistics, results, or any kind of outcomes that can be used for the identification, validation of the relevance and the evaluation of expected[2] or observed effectiveness of safety functions based on

[2] The evaluation of the **potential** benefits concerns safety functions that are not yet implemented. The idea is to evaluate existing databases and accurately predict the expected effectiveness of such functions. The evaluation of the **observed** benefits concerns safety functions that are already implemented (e.g. Electronic Stability Programs or Emergency Brake Assist Systems) and need to be assessed.

technology that are already implemented in vehicles or could be put in vehicles in the future (i.e. in communication with the infrastructure or not, co-operating between vehicles, cooperating with the user, assisting or substituting the driver or not).

6. The sixth objective is to support, if needed and requested, participants of Integrated Projects and STREP's under the umbrella of the Integrated Safety Program, which would need accident causation inputs for the development of relevant technologies.

7. The seventh objective is to establish links with the other projects about road safety (especially SafetyNet, which own objective is to establish a Road Safety Observatory in Europe by the construction of several accident and exposure databases at a pan European level), and also the eImpact research project(s) that is dealing with the assessment of the potential impact and socioeconomic cost/benefit, up to 2020, of stand-alone and cooperative intelligent systems in Europe.

STRUCTURE OF THE PROJECT

Work Packages

TRACE is divided into 4 series of Workpackages:

- The first four workpackages propose three different research angles for the definition of accident causation, the quantification of the risk factors, and the evaluation of the effectiveness of safety functions. These are so-called operational workpackages.

  - **WP1**: Road Users

  - **WP2**: Types of driving situations and types of accident situations

  - **WP3**: Types of risk factors.

  - WP4: Evaluation. This fourth work package proposes to evaluate the effectiveness of safety functions in terms of expected (and observed) avoided accidents and saved lives.

  Evaluation is one of the core aspects of the project. We can split the safety systems into three concepts: the **safety functions**, i.e. the problems addressed (e.g. the reduction in braking distance); the **safety systems** (e.g. brake assist in case of braking distance reduction); and finally the **technologies** that address the safety system. Our ambition is to evaluate the effectiveness of a set of **safety functions** that are assumed to address some of the accident causation issues that we would have identified in the aforementioned work packages. This is needed both to complete the picture of accident causation and to assess what kind of systems can produce what can of results for what kind of problems.

Each WP is divided in tasks. For each task, the main objective is to identify the accident causation aspects through three kind of analysis:

- A macroscopic (essentially) statistical analysis (aimed at describing the main problems),

- A microscopic analysis (aimed at determining the accident mechanisms with the help of in-depth data), and,

- A risk analysis (aimed at quantifying the risk factors in terms of risk, relative risk and, if possible, attributable risks).

- The other three work packages propose to support the operational work packages by providing them with enhanced methodologies with regards to, especially, human factors and statistical techniques. One work package is also devoted to the listing of existing and potential safety functions and technologies.

These are called the **Methodologies work packages** (WP5: Human factors; WP6: Safety Functions; WP7: Statistical Methods).

- The eighth work package (WP8: Data Supply) acts as a technical support to the operational WP's. WP8 brings together a wide range of existing data sources from across Europe to aid analyses taking place in other workpackages in TRACE. In addition, this WP provides information to help TRACE partners make best use of data. This WP serves an essential purpose, because the methodological WP will not have a sufficient range of data sources available to their partners or the resources necessary to collate a range of data wide enough to support their work. However, all sixteen partners participate in WP8, and they can potentially bring 39 European data sources, with additional data from other countries, which together provide information for TRACE at 3 levels: descriptive data, in-depth data and risk exposure data. Data is collated and reviewed before being packaged for despatch to other WP's where it is analysed. Thirty separate data packages will be prepared over the lifetime of TRACE.

- Finally, there is a **Management Workpackage** which aims at leading, managing and monitoring the whole project.

Additional issues

- This research addresses the current understanding of accident and injury causes, levels and trends through reliable exposure, accident and injury data systems. TRACE intends to base its safety diagnosis on available, reliable and accessible existing and on-going databases (access to which is greatly facilitated by a series of partners highly experienced in safety analysis, coming from 8 different countries and having access to different kinds of databases, in-depth or regional or national statistics in their own country, and for some of them in additional countries).

- TRACE is also putting its efforts into the development and improvement of methodologies, in particular those applicable to data analysis. Special care and attention is brought to methodologies which enable the linking of different databases and methodologies which make it possible to combine clinical analysis (or micro accidentology) and statistical analysis (or macro accidentology) into a predicted meso-accidentological analysis, combining in-depth accident analysis and accident epidemiology.

The same effort in developing and applying methodologies holds for human factors, risk analysis and applied epidemiological and statistical methodologies for safety impact assessment.

- A review of available knowledge and effective methodologies is systematically performed and reported by the WP's in order to start the work on the basis of a 'level-of-art' knowledge.

- The expected outcomes of the project are mainly reports**,** focussing on operational results, methodological aspects, and of course a large set of descriptive and analytic statistics about accident causation (identification and quantification of risk factors). Reports will also make extensive qualitative examinations of mechanisms which cause accidents from the perspective of the road users, the types of factors, and the accident scenarios (the 3 different angles proposed by TRACE).

Other expected outcomes are workshops, especially with the eImpact and SafetyNet projects, and two TRACE-related events: a mid-term seminar (internal assessment of the project after one-year duration) and a *End-of-Project* Conference with a higher expected number of attendees coming from outside the consortium in order to broadly disseminate the results achieved during the course of the project.

As it is anticipated that outcomes are expected in the short term, the duration of the project has been set to two years (24 months friom January 2006 to December 2007) in order to be in line with the expectations and also to keep the possibility to make some noticeable improvements in methodology needed for the exploitation of databases.

EXPECTED USE OF TRACE OUTCOMES

The fundamental objective of the TRACE project is to prosaically search for a dramatic reduction in road accidents and casualties by an increase in accident causation and injury causation knowledge leading through the identification of road users needs and the assessment of safety functions able to cover these needs. This general societal issue (in terms of life savings) can be split up into several issues impacted by TRACE.

1. The first expected outcome concerns the results drawn from accident analysis. The identification of complex accident causation schemes and the evaluation of the effectiveness (potential or observed, depending on the current existence of safety functions to be defined or validated) of safety functions will be of great help to stake holders in charge of selecting and prioritising the development of safety functions or in charge of evaluating the benefits of the functions that are already on the market. As this evaluation will have been carried out with information available from throughout Europe instead of information available locally, this is, again, an added value of working at a European level.

2. The second outcome concerns improvements or innovation in accident analysis methodologies.

Why are methodological improvements needed? For three complementary reasons:

- A good understanding of accident causation requires, among others, the use of in-depth accident investigations and not only national or international accident census based on the collection of police reports, because the information available in census is purely descriptive and quite poor. Despite the fact that the scientific literature about accident analysis is quite abundant, some improvements in the methods of analysing accidents could still be made from different research angles, which is one the basics of our project.

- It is well known that in-depth investigations can produce interesting results about accident mechanisms and accident factors. Unfortunately, these results are usually not statistically representative of national or international accident patterns and should not be used for the estimation of the prevalence of such accident patterns. TRACE intends to find a method which can combine in-depth accident data and national or international accident census in order to try to estimate the prevalence of accident factors, specified on the basis of in-depth data, in the total number of accidents.

- Evaluation of the effectiveness of safety functions (a priori or a posteriori) is more widespread in the United States of America than Europe where it remains more or less confidential. Consequently, and with special regards to the evaluation of the observed effectiveness, methodologies and data availability for these evaluations are not sufficiently covered by research. We are facing two important problems: the first one is the availability of data. It is indeed assumed that it is not easy to identify and select the involved vehicles with such or such device implemented from the accident files because the identification of the vehicle in the accident files does not show, in most cases, whether the vehicle was equipped or not. It is even more difficult to get exposure measures of fleets of vehicles equipped with the safety devices. These barriers must be investigated seriously. The second problem concerns the epidemiological methods used in such evaluation. Even though traditional methods (such as the so-called odds ratio methods used in the Daytime running lights studies or the above mentioned ESP studies for example[3]) are known, they have limits, have been questioned by some experts and should be highly revisited. TRACE offers an opportunity for such a re-visitation.

3. The third outcome concerns the establishment, within the STREP, of a parallel European forum for accident experts (SafetyNet can also be considered as a forum but is more focussing on data collection than data analysis). In that sense, TRACE would act as a network of excellence since many European accident experts are TRACE partners. This unique assembly of experts is providing a good opportunity to link the different research institutes together, to perform parallel identical analyses on different databases coming from different national sources (be they private, public, vehicle industry or international organisation) even more than now and to enhance European research in accidentology. This is, again, an additional benefit of running the project at a European level.

[3] See for example *The safety effects of Daytime Running Lights* (1997) by Matthijs Koornstra, Frits Bijleveld and Marjan Hagenzieker. Swov.

PARTNERS

The TRACE Consortium is composed with 16 partners (table 1) and five sub contractors (Accident Research Center, Monash University, Aus / HIT, Gr., Technical University of Graz, A / Ecole Normale de Cachan, F / Medial University Hannover, D).

Table 1. TRACE Partners

Participant Organisation Names	Participant Organisation short name
Laboratoire d'Accidentologie, de Biomécanique et d'études du comportement humain PSA-RENAULT	LAB (Coordinator),F
University of Birmingham	BASC, UK
Fundacion para la Investigacion y Desarollo en Automocion	CIDAUT, E
Idiada Automotive Technology S.A., E	IDIADA, E
Institut National de Recherche sur les Transports et leur Sécurité	INRETS, F
Institut für angewandte Verkehrs- und Tourismusforschung e.V.	IVT, D
University of Patras – Laboratory for Manufacturing Systems and automation	LMS, Gr
Lundwig-Maximilians Universitaet Muenchen (Munich University)	LMU, D
Loughborough University	VSRC, UK
Allianz Center for Technology	AZT, D
Bundesanstalt für Strassenwesen	BAST, D
ELASIS S.C.p.A	ELASIS, I
Netherlands Organisation for Applied Scientific Research	TNO, NL
Volkswagen AG	VOLKSWAGEN, D
Institut for Mathematical Stochastics, (Technische Universität Braunschweig)	TUBS, D
Centrum Dropravniho Vyzkumu	CDV, CZ

The highest number of partners (6 out of 16) come from Germany. After that France, Spain and UK are represented by 2 partners, then Greece, Italy, The Netherlands and the Czech Republic with 1 partner. In total 12 partners are from car-producing countries, which might be expected for a project on traffic eSafety.

The geographic distribution of the consortium covers different parts of Europe in order to give

insight into the traffic safety situation throughout Europe. Central Europe is well represented by Germany, the United Kingdom and The Netherlands. France, Italy, Spain and Greece cover the southern part of Europe. The eastern part of Europe is represented by the Czech Republic.

Actually, France (22%), Germany (22%), United Kingdom (17%) and Spain (17%), and are the largest contributors in terms of resources (i.e., man – months).

Within the project, the car industry is represented as full partners by 4 major European car manufacturers: LAB (representing Renault and PSA), ELASIS for FIAT, and VOLKSWAGEN. Together they are responsible for almost 50 % of the market share of cars sold in Europe. The car manufacturers participating in this project have a perfect understanding of the latest developments in car safety and important new trends. Also, they have the capability to deliver accident analysis and databases as they are collecting themselves accident data and conduct their own accident research.

The second group of participants are the research institutes throughout Europe. In this category important traffic safety research institutes from 5 different EU countries are represented (France, Germany, Spain, The Netherlands, Czech Republic). Since traffic safety is more and more seen as a European (or even worldwide) matter, all these institutes have very broad contacts throughout Europe, but often also with associations with the national authorities on road safety.

Also one organisation of insurance companies is involved, which can provide interesting, unique and very useful insight based on the special knowledge they have on traffic accidents. The category of research institutes covers a wide range of research areas, from the vehicle and infrastructure aspects to more specific aspects of traffic accidents and accidentology.

The third group is formed by 6 universities from 3 different countries in Europe (United Kingdom, Germany, Greece). For an innovative research project, it is very important to have the support and involvement of university groups that move on the front line of innovations and research. Most of the universities participating in this project are technical institutes of which a department is involved directly in transportation research. Other universities include medical universities or transport-related laboratories with epidemiology expertise.

MANAGEMENT

The scientific activities of the TRACE STREP Project are all intended to strive towards an overall common goal, and each activity is defined as a necessary contribution towards this goal. The size of TRACE does not allow for only one organisational level, which should be in control of every detail of TRACE. On the other hand, a heavy and hierarchical organisation can often be too costly and too inflexible for research and development processes. Considering these aspects, TRACE has a simple but effective management structure where responsibilities are distributed vertically between the steering committee and workpackages and horizontally, across workpackages.

The monitoring, control and steering of TRACE are executed by the Coordinator and the Steering Committee. The Steering Committee consists of representatives of major partners of TRACE (i.e. WP leaders). They monitor the progress of TRACE, consolidate its activities and propose decisions.

The Coordinator of TRACE chairs the Steering Committee and acts as the speaker of TRACE.

A General Assembly of TRACE meets thrice in the project (beginning of the project, end of the project and one meeting in-between) and aims at reviewing all work done within all WP's up to the date meeting. All partners, observers and sub contractors are invited.

A scientific committee (also so-called *Wise Guys* committee) has been considered at the beginning of the project. But the project runs out of time and the steering committee has decided to do another way. The role of this committee would have be to give external advices and comments on the reports delivered by the Consortium. Actually, all reports will be commented in order to increase their quality by experienced external experts in each WP.

CONCLUSION

TRACE has started in January 2006 and will be soon beginning releasing the expected 40 reports. The work has followed and will keep on following this schedule:

1. Make an **analytical overview** (contents, quality, consistency, pertinence, applicability, representativity, extensive/intensive, etc.) **of current safety databases** available in Europe (accident databases, exposure databases, driver behaviour databases, insurance, medical databases,

etc.) and select those which are accessible, high-quality rated and relevant for the analysis[4].

2. Make an **analytical list** of the known safety functions, underlining their objective and they work.

3. Perform a **systematic and comprehensive literature review of methodologies** in accident analysis, human factors and evaluation of the effectiveness of safety measures.

4. Use available accident data or available knowledge in order to set an up-to-date descriptive **diagnosis of the accident causation issues**, hopefully in Europe but at least in the countries where the data (and especially but not only accident data) is available.

If available, exposure databases are put in perspective in order to estimate risks and relative risks of being involved in road accidents for different categories of road users on different road networks and environment conditions. Traditional methods for alternative exposure measurements (such as induced exposure or quasi induced exposure) are also considered.

In addition, large or small in-depth databases, oriented to primary or secondary safety (such as CCIS, GIDAS, LAB, EACS, MAIDS, etc.) are exploited, if available, in order to identify and assess the accident mechanisms for vehicle occupants, pedal cyclists, pedestrians, powered two-wheelers.

Most of these databases belong to TRACE participants and access to them should not be a problem except in a few cases where an official request for access are to be made to the owners.

Also, we are establishing and applying a sociological and socio-psychological approach, aimed to analyze the relevance of different socio-cultural frameworks for accident causation factors. Within this dimension, we address issues such as gender and age (or 'generation'), as well as contextual issues like education or the paradigm of our 'automobile culture'. In this sociological approach, a special emphasis is made on the multidimensional topic of 'risk' in its socio-cultural context.

As a whole, TRACE intends to take a picture (as comprehensive as possible) of the accident causation problems on European roads by combining explicitly in-depth accident analysis, road epidemiology, and human factors analysis.

5. Use all these analyses in order to **infer drivers' needs** and subsequently **recommend safety functions** that would be promising for the avoidance or the mitigation of accidents and their severity

6. Select amongst the list of functions that will have been defined beforehand, some relevant functions that are **not currently on the market** or currently undeveloped, and develop specific methodologies capable of estimating the **expected effectiveness** of this set of safety functions. Then, estimate this potential in terms of accident savings and life savings.

7. Select amongst the list of functions that would have been defined beforehand, some relevant functions that are **already on the market** (such as ABS, Brake Emergency Assist, ESP, Navigation systems, etc.) and develop specific methodologies capable of estimating the **observed effectiveness** of this set of safety functions. Then, estimate this potential in accident savings and life savings.

These two aspects of evaluation of the effectiveness of safety functions are crucial in TRACE. They will serve as an assessment of previous choices (for existing safety functions) and as a support for future decisions since the methodology should be able to prioritise, amongst the most promising safety systems, those with the highest potential influence on safety.

8. **Disseminate** the results to the scientific community, stakeholders, vehicle industry, suppliers, and research labs either by reports or directly on the Web. No industrial product is foreseen.

All results will be available for the duration of the project (2 years) to the partners within each of the Work Packages. All reports will then be fully public at the end of the project.

As a summary, these TRACE activities could be well resumed with these four keywords:

- **Diagnosis** of the accident causation issues (with the help of clinical, epidemiological and psycho sociological methods)

- Inference of road users' needs

- Identification of safety functions potentially effective in tackling the problems

[4] A provisional assessment of these databases is provided in Annex 1 of this proposal.

- Evaluation of the effectiveness of the functions (in terms of reduction of road toll)

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Further information can be found in the public area of the TRACE web site:

www.TRACE-project.org