Accident Causation Analysis and the Evaluation of the Safety Benefits of Technologies: The TRACE Project

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Outline

- Background: Integrated Safety and E-Safety
- The TRACE Project
- Conclusion: Research Challenges
Background: What is Integrated Safety?

- Technologies
- Pre-crash – Crash – Post Crash
- Driver / Vehicle / Environment
- Research Fields (Engineers / Psychologists/…)

Concertation meeting ICT for Transport, Leuven, Belgium, July 2006
Background: Integrated Safety

Driver

AIDE

Applications

EASIS

Communication channels

CVIS

Safe and efficient travel; Cooperative Infrastructure

Safespot

Safe driving; Cooperative Vehicles

PReVENT

Crash avoidance

APROSYS

CRASH

Post-crash

GST - On line

Time

hours

minutes

seconds

milliseconds

minutes

Co-operative Systems:

Pre-information through exchange of vehicle and traffic data

Active safety

Passive safety

eCall

Green area

TRACE

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Background: What is E-Safety?

E-Safety is a joint industry – public sector initiative at European Union level

It aims to reduce the number of casualties on European roads by encouraging the deployment of new information and communications technologies (ICT).

The first of the 28 recommendations adopted by the e-safety forum sought to consolidate analyses from existing accident data sources for a better understanding of the causes and circumstances of road accidents.
Background: What is the E-Safety Accident Causation Group?

An Accident Causation Analysis working group was established. The group intended to identify the remaining needs for:

- A Diagnosis of the safety issues
- The Evaluation of the expected and observed effectiveness of the counter measures.

The working group has collected information about a sample of 12 European databases.

The analysis confirmed the hypothesis that although many information sources already exist they are not enough to provide Europe with the analysis it needs.
In support of the eSafety initiative, and as a prerequisite for diagnosis and evaluation of the most promising active safety technologies, the Commission asked for:

- 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.
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…. Which led to TRACE (TRaffic Accident Causation in Europe)

TRACE Objectives

• The **identification** and the **assessment** (in terms of saved lives 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.

• The **determination** and the continuous **up-dating of the aetiology**, 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 behaviour analyses.
• Provide a **comprehensive and understandable definition of accident causation** at the end of the project

• 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 **promising solutions** based on technology

• Make this overview **comprehensive, understandable and operational**
• **Improve** the multidisciplinary **methodologies in analysing** the influence of **human factors** and also the **statistical methodologies** used in **risk analysis** and **evaluation**

• Generate summary documents with figures, statistics, results, or any kind of outcomes that can be used for the identification, validation of the relevance and the **evaluation** of expected or observed effectiveness of safety functions based on technology

• **Support**, if needed and requested, **participants of Integrated Projects and STREPs** under the umbrella of the Integrated Safety Program

• **Establish links** with the other projects about road safety (especially **SafetyNet** and **E-Impact**)
TRACE Organisation

- Evaluation of existing & promising safety devices
- Update the knowledge about accident causation survey

WPs operational

WPs methodology

WP5 Human factors
WP7 Statistical methods

Results of WPs operational

WP8 Data supply
WP4 Evaluation

WP1 Road Users
WP2 Type of Situations
WP3 Type of Risk Factors
TRACE : Expected Outcomes

- 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.

- This research addresses the current understanding of accident and injury causes, levels and trends through reliable exposure, accident and injury data systems. We intend to base our safety diagnosis on available, reliable and accessible existing and on-going databases.

- The duration of the project has been set to **two years** (24 months) 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.
TRACE: Expected Outcomes: A Classification

- 15% Sortie à droite
- 13% Sortie à gauche
- 9% 16%
- 6% 20%
- 7% 5%
- 13% Sortie à droite
- 18% 4%
- 5% 1%
- 5% 2%
- 5% 4%
- 4% Dépassement

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TRACE: Expected Outcomes: Driver Failures
TRACE: Expected Outcomes: Risk Factors

- Bad reaction: 17%
- Risk Taking: 14%
- Problem of anticipation: 11%
- Navigation: 2%
- Physical disease: 3%
- Monitoring Failure: 3%
- Unknown: 9%
- Information not available: 13%
- Secondary task: 4%
- Hypo vigilance: 2%
- Alcohol: 8%
- Inattention: 14%
TRACE : Expected Outcomes : Accident Mechanisms

Single driver at the origin of the situation, with a subsequent loss of control or lane departure. Possible collision with another road user coming in the opposite direction

Short description

1. Bad recognition of the road layout, low grip and excessive or unsuitable speed, mainly in a bend
2. Loss of control with excessive or unsuitable speed, mainly in a bend
3. Lane departure, whatever the reason, and subsequent loss of control
4. Initial loss of control due to a (detected) low grip and then aborted attempt to recover control
5. Bad recognition of the road layout due to lack of visibility inside the vehicle (e.g. frosted windscreen)
6. Bad recognition of the road layout due to bad weather conditions
7. Drift in a bend subsequent to excessive or unsuitable speed
8. Lane departure (reasons unknown)

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Based on a few assumptions, ESP is apparently very effective (43% reduction in the risk of being involved in an ESP-pertinent accident for ESP-equipped cars versus non-equipped cars).

Based on a few assumptions, Brake Assist is apparently effective (19% reduction in the risk of being involved in an Brake Assist-pertinent accident for Brake Assist-equipped cars versus non-equipped cars).
Main Issues – Research Challenges

- A Diagnosis of traffic safety problems at the European Level with 3 research angles (Road Users – Types of Situations – Risk Factors)

- 3 kinds of analysis: Descriptive statistics – In-Depth analysis – Risk Analysis

- Evaluation of the most promising technologies: ex ante and ex post

- Methodological improvements in Human factors Analysis and Statistical Analysis

- Rely on a set of various accident and exposure databases
The first Automobile Fatality: Mary Ward, an artist and a naturalist.

She died on a steam Carriage, which jolted on a corner and threw her occupant from her seat.

This happened in 1869!
Thanks You for your Attention