Accident prevention

• Prevent possible human errors in road traffic
• Vehicles that are designed and equipped such that the driver can minimise the risk of accidents
• Optimise road infrastructure by using knowledge of driver and road users behaviour
• Education (Awareness and attitudes)

How can the driver be supported in the best possible way?
The safety circle

Assessment methods of safety systems - Crucial for how road safety in the future will develop
Safety systems – OEM perspective

- Which systems to select for market introduction?
- How can the systems be optimised?
- How shall they be integrated?

=> Precise and reliable methods to analyse accident causation and safety systems effects needed.

- Important bits in the puzzle can will given by projects like eIMPACT and TRACE
Safety - Assessment methods

The three main types of assessment methods:

Prediction of effects:

Predict the expected safety impact/effect of the ITS system on road and traffic safety

Field Operational Tests (FOT)

Assessment of real effects:

Studies to identify the real safety impact/effect of the ITS system after being on the market a certain time

Supporting projects
PReVAL
AIDE
eIMPACT
e-VALUE
TRACE
FESTA
euroFOT
eCALL evaluation

Accident based safety benefit analysis
Simulations
Accident databases
 Accident analysis

Time on market
Safety - Gaps and next steps 1/2

• **Cooperative systems**
  – Few results or studies are available on potential impact but…
    • Some studies done in eIMPACT & TRACE
    • Field Operational Tests with Cooperative systems are planned for the ICT call 4
    • A pre study on FOTs for cooperative systems starts 2008 (PREC2X)

• **Multiple systems and/or integrated systems**
  – Few studies are available on potential impact
  – Importance of structured integration and analysis of multiple systems

• **Accident data bases**
  – No common format in Europe which makes the data very difficult to analyze
  – Constraints for accidentology research – not possible for the OEMs to solve
Safety - Gaps and next steps 2/2

• Assessment methods is a difficult area
  – Get better grasp of the confidence intervals
  – Driver behaviour and behavioural effects are extremely difficult to judge and predict – more research is needed

• FOT’s will bring important input in the analysis

• Naturalistic field studies -> accident causation knowledge

• “Traditional” accidentology and databases must not be forgotten
Thanks for your attention!
Backup slides
Global outlook

Global road fatalities

Early motorized countries

Newly motorized countries

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Volvo Technology Corporation / Magnus Rilbe
9  2008-06-22
Safety – Prediction of effects

• Accident based safety benefit analysis
  – To assess systems based on potential benefit in a certain accident situation, e.g. the safety effect of a lane departure warning system in a run off road accident: applicable accidents (20%) x possible effect of LDW in accident situation (5%) = safety impact
  – Behavioral based safety benefit analysis: adding the potential behavioral effects of a certain systems

• Simulations
  – Simulation of the vehicle, the driver and the traffic situation (including road conditions)
  – By varying different factors e.g. road width or reaction time, it is possible to simulate how effective a certain system (e.g. lane departure warning) would be in certain situations
  – Not frequently used in Europe, more common in US
  – FOTs will give the possibility to improve the models to use in the simulations
Safety – Field Operational Tests

- **Field Operational Test (FOT)**
  - FOT means *in-the-field testing* (real vehicles, systems, drivers and roads)
  - An FOT is carried out in **large fleets** (50-100 vehicles for each system to be evaluated) during **long periods** (several months up to a year)
  - The **vehicles are equipped** with data and CAN loggers, video and other type of sensors
  - FOTs can be used to evaluate the **effects on safety, environment, efficiency and user & acceptance**
Safety – Real effects

- **Accident analysis**
  - Review accident data and draw statistical conclusions regarding the effects of different ITS systems
Three strategies

• Accident prevention
• Injury prevention
• Rescue, care and rehabilitation of victims
Safety steering wheel
Safety – Definition of ITS systems

<table>
<thead>
<tr>
<th>Primary safety</th>
<th>Secondary safety</th>
<th>Tertiary safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forward Collision Warning</td>
<td>Collision mitigation</td>
<td>E-call</td>
</tr>
<tr>
<td>Adaptive Cruise Control</td>
<td>Electronic stability control</td>
<td>Etc…</td>
</tr>
<tr>
<td>Speed limiter</td>
<td>Impairment warning</td>
<td>Etc…</td>
</tr>
<tr>
<td>Lane departure warning</td>
<td>Blind spot information systems</td>
<td>Etc…</td>
</tr>
<tr>
<td>Impairment warning</td>
<td>Safe Human Machine Interaction</td>
<td>Etc…</td>
</tr>
<tr>
<td>Blind spot information systems</td>
<td>Curve Speed Warning</td>
<td>Etc…</td>
</tr>
<tr>
<td>Safe Human Machine Interaction</td>
<td>Crash</td>
<td>Etc…</td>
</tr>
<tr>
<td>Curve Speed Warning etc….</td>
<td>Cooperative systems</td>
<td>Etc…</td>
</tr>
<tr>
<td>Autonomous systems</td>
<td>Cooperative systems</td>
<td>Etc…</td>
</tr>
<tr>
<td>Safe Lane Change Maneuvers</td>
<td>Cooperative Situation Awareness</td>
<td>Etc…</td>
</tr>
<tr>
<td>Frontal Collision Warning</td>
<td>Cooperative Tunnel Safety</td>
<td>Etc…</td>
</tr>
<tr>
<td>Cooperative Situation Awareness</td>
<td>Cooperative Vulnerable Road User Detec.</td>
<td>Etc…</td>
</tr>
<tr>
<td>Cooperative Tunnel Safety</td>
<td>Cooperative Anti-Rollover</td>
<td>Etc…</td>
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## Safety – On going projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Objective</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>eIMPACT</td>
<td>Socio-economic Impact Assessment of stand-alone and co-operative intelligent vehicle safety systems (IVSS) in Europe</td>
<td>Jan 2006-April 2008</td>
</tr>
<tr>
<td>e-VALUE</td>
<td>The aim of eVALUE is to define objective evaluation and testing methods for ICT-based safety systems.</td>
<td>Jan 2008-Jan 2011</td>
</tr>
<tr>
<td>PReVAL</td>
<td>Estimate the potential safety impacts of PReVENT functions in cooperation with ongoing other relevant projects.</td>
<td></td>
</tr>
<tr>
<td>AIDE</td>
<td>Create an evaluation methodology and workload and distraction assessment methods and tools, estimating the risk reduction potential of integrated adaptive HMI (prototype evaluation).</td>
<td>April 2004-April 2008</td>
</tr>
</tbody>
</table>
# Safety - On going projects

<table>
<thead>
<tr>
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<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>eCall evaluation (VTT)</td>
<td>The aim of the study was to estimate the impacts of an automatic emergency call system on accident consequences in Finland</td>
<td>2005-2006</td>
</tr>
<tr>
<td>FESTA</td>
<td>FESTA will develop a common methodology and guidelines (handbook) for future European FOT</td>
<td>Nov 2007-April 2008</td>
</tr>
<tr>
<td>euroFOT</td>
<td>To increase the amount of data regarding real life operation of Intelligent Vehicle Technologies in ordinary traffic and to demonstrate the impact of Intelligent Vehicle Systems on European roads.</td>
<td>April 2008-Aug 2011</td>
</tr>
</tbody>
</table>
## Safety – On going projects

<table>
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</thead>
<tbody>
<tr>
<td>TRACE</td>
<td>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</td>
<td>2006-2008</td>
</tr>
</tbody>
</table>
Safety - Example 1: eIMPACT

eIMPACT will:

- Identify the most promising stand-alone and co-operative IVSS technologies
- Develop scenarios for IVSS 2010 and 2020, and assess impact of IVSS on traffic safety and efficiency in these scenarios
- Identify policies to enable the implementation of IVSS
- The output will be an assessment of the socio-economic impact including a picture of the costs and benefits for the stakeholders and the macroeconomic effects

General approach of socio-economic impact assessment

Society Perspective
- Impact Assessment: Traffic and Safety
- Socio-Economic Assessment of Impacts

Stakeholder Perspective
- Cost-Benefit Analysis
- Macro-economic Impact Analysis (Production, Income, Employment)
- Distributional Impact Analysis (who profits?)

Society Level

Stakeholder Level

Socio-Economic Impact Assessment

Market Introduction of IVSS
- Technology: Functional System Specification
- Traffic and Safety Performance in EU-25

Market Conditions/Scenarios in EU-25

Extension of the methodological framework in eIMPACT

- Cost-Benefit Analysis
- Macro-economic Impact Analysis (Production, Income, Employment)
- Distributional Impact Analysis (who profits?)

Society Perspective

Stakeholder Perspective

- Financial Analysis
- Break-Even Analysis

- system users
- OEMs & suppliers
- insurance companies

Impact Assessment:
Traffic and Safety
Socio-Economic
Assessment of Impacts

Market Conditions/Scenarios in EU-25

Technology: Functional System Specification

Traffic and Safety Performance in EU-25

Society Level

Stakeholder Level
Safety - Example 2: euroFOT

- The goal of euroFOT is to identify and coordinate an **in-the-field testing** of new Intelligent Vehicle Systems, this gives the possibility for:
  - Assessing the effectiveness of the systems on actual roads
  - Analysis of the user acceptance
  - Potential for market penetration
  - Early publicity of the technologies

- 8 functions will be evaluated
- 1500 vehicles will be used as test vehicles
- 11 vehicle OEMs participate

- Results ready by Q3 2010
Contents

- Introduction
- Assessment of the potential impact of ITS on
  - Road and traffic safety
  - Environment
- Enabling
  - Generic platform in vehicle
  - Commercial vehicle ITS platform
- Conclusions and next steps