Impact Assessment Methodology in interactIVe

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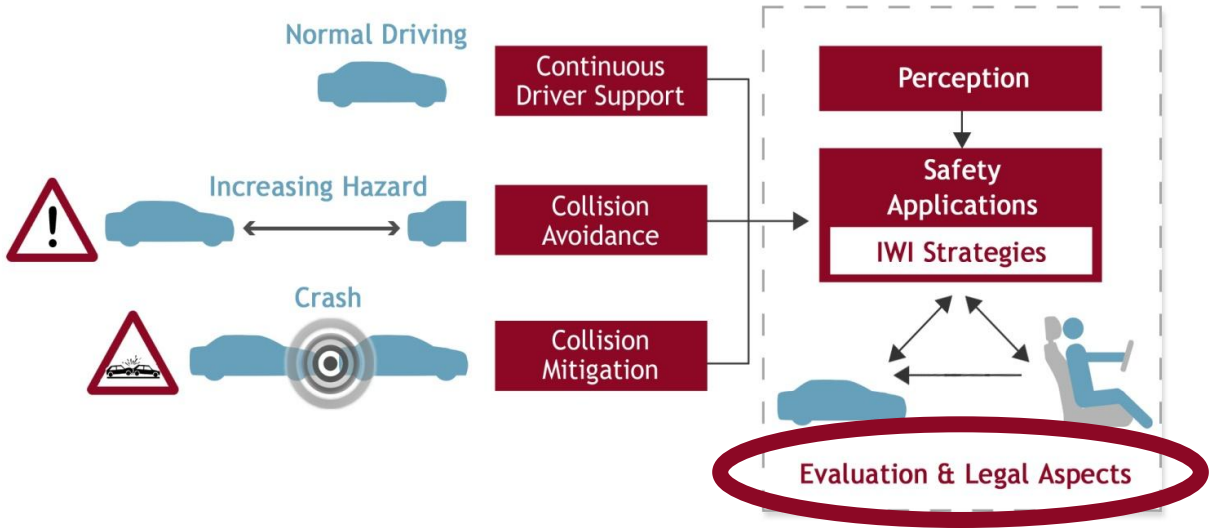
Content

- Overview on “Evaluation and legal aspects”
- Safety Impact Assessment methodology
- Input data from technical and user-related assessment
- Direct and indirect effects
- Safety Impact Assessment results



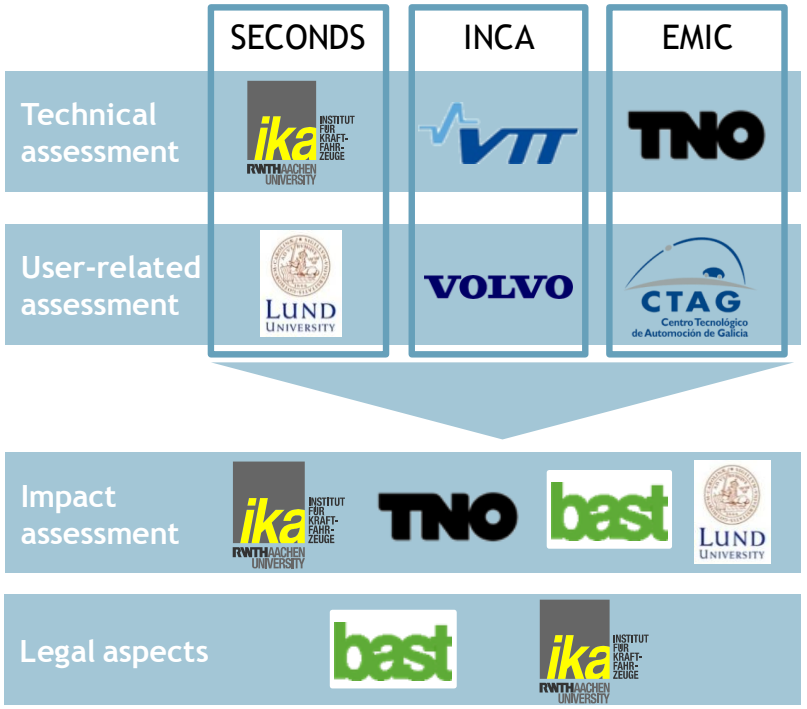
Overview on “Evaluation and legal aspects”

Role in interactIVe:

- Definition of evaluation framework;
- Development of test scenarios, procedures and evaluation methods;
- Provision of tools (e.g. test catalogues, questionnaires or software) and test support;
- Definition of test and evaluation criteria;
- Analysis of legal aspects.

Evaluation divided into:

- Technical assessment (on function level);
- User-related assessment;
- Impact assessment.



Safety Impact Assessment – Methodology

- Literature review on impact assessment methodologies
  - Safety Mechanisms
  - Accident Reconstruction
  - Neural Network
  - FOT – Approach
- Selection of appropriate methodology by considering available data as well as advantage and disadvantages of the methodologies
  - Nine Safety Mechanisms

- Direct effects
1. Direct in-car modification of the driving task,
2. Direct influence by roadside applications,
   - Indirect effects on user
3. Indirect modification
4. Effects on non-users of user behaviour,
4. Indirect modification of non-user behaviour,
5. Modification of interaction between users and non-users,
   - Exposure effects
6. Modification of road user exposure,
7. Modification of modal choice,
8. Modification of route choice,
   - Effects on post-accident consequence modification
9. Modification of accident consequences.

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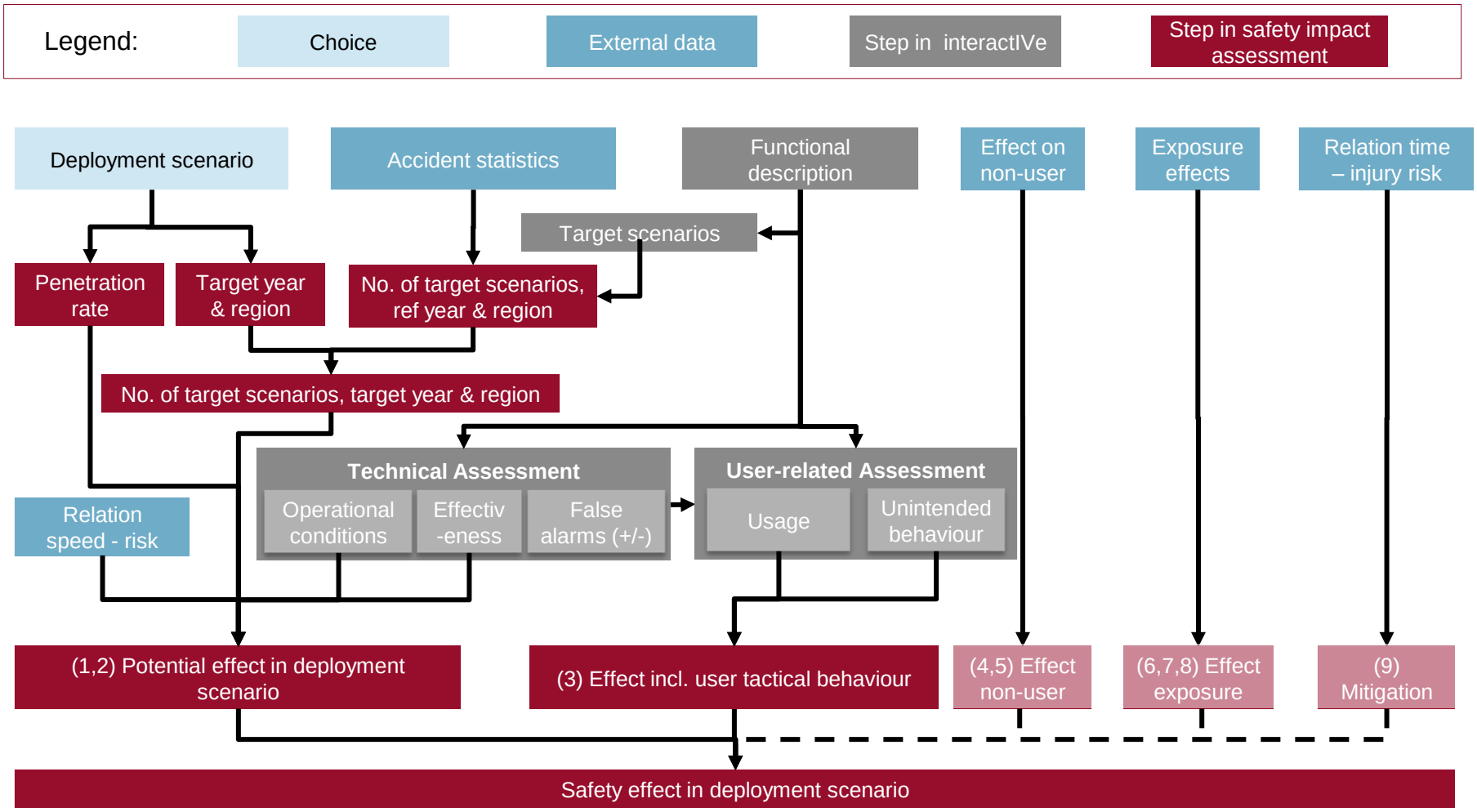
  4. Indirect modification of non-user behaviour,
  5. Modification of interaction between users and non-users,
     - Exposure effects
  6. Modification of road user exposure,
  7. Modification of modal choice,
  8. Modification of route choice,
     - Effects on post-accident consequence modification
  9. Modification of post-crash consequences.

Only in-car functions

Exposure effects, typically small

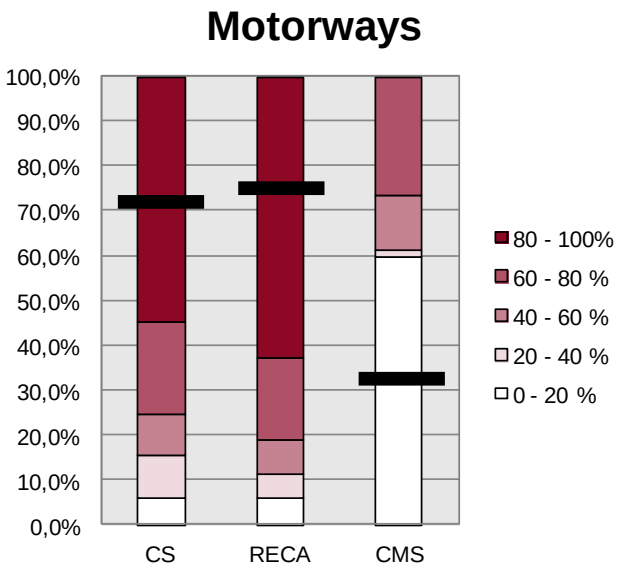
Only post-collision

Safety Impact Assessment – Approach

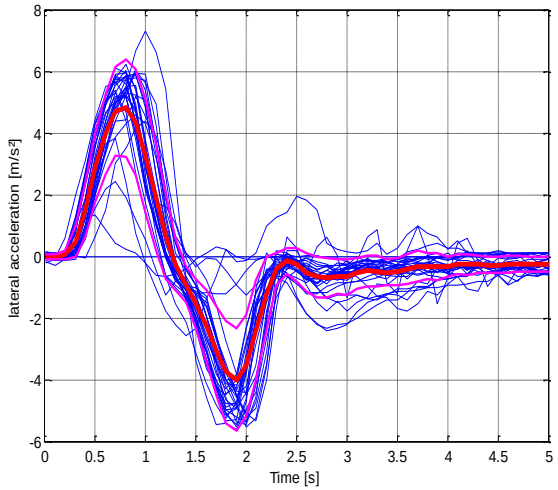


Input data from technical and user-related Assessment

- Input from the technical assessment:
  - Warning / intervention point in time
  - Intervention strength (e.g. long./lat. acceleration)
  - Overall 908 test runs considering in 8 accident related test scenarios



Lat. acceleration for evasive manoeuvre



- Input from the user-related assessment
  - Intended usage of the functions for motorways, urban and extra urban road
  - Results base on the questionnaires during interactIVe user studies
  - Literature review on long term effects

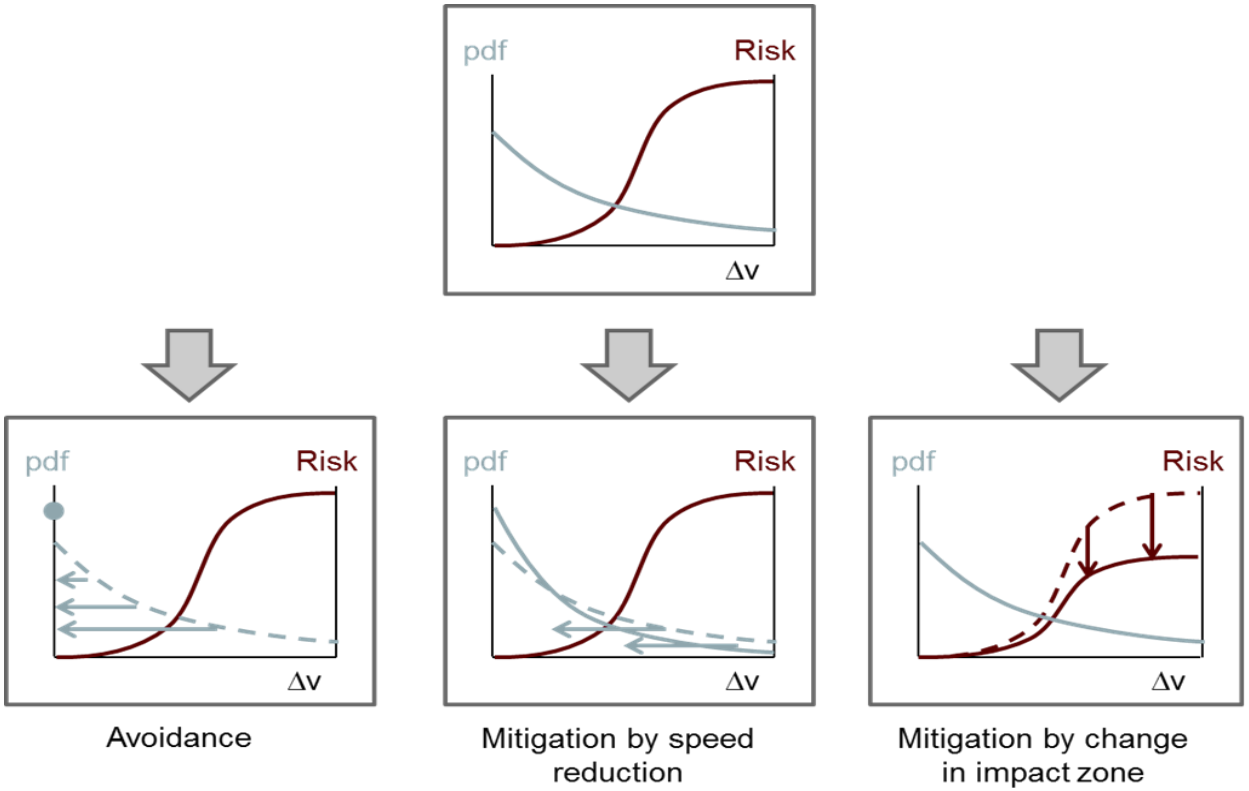
Use of Accident Database for the Impact Assessment

- GIDAS Database
  - Real Accidents are used in order to re-simulated real accidents;
  - Determine the change in the accident risk base.

- CARE Database / National accident databases
  - Scaling up of the reconstruction results on European level;
  - Identify potentially affected accidents, for which reconstruction was not possible (e.g. speed related accidents, pedestrian accidents).

Direct effects - Possible effects of interactIVe ADAS

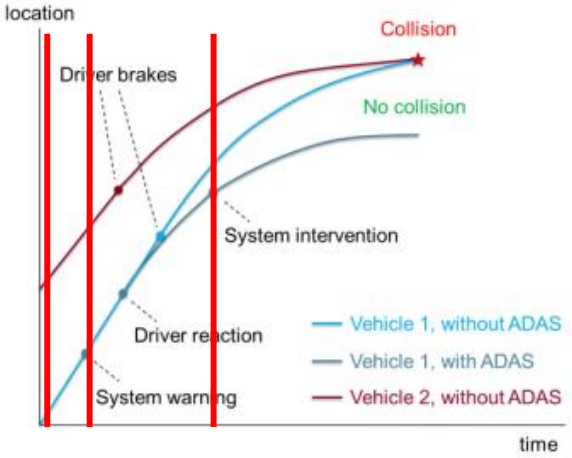
- How can interactIVe functions affect accidents?

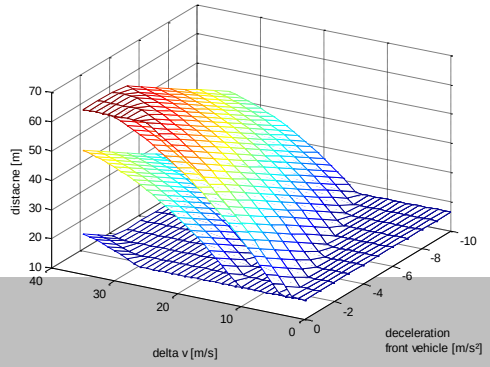


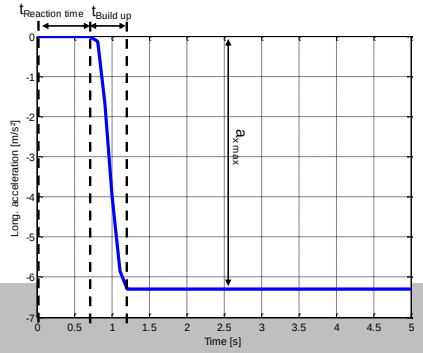
pdf (probability density function): probability to be involved in accident
risk: injury risk in accident

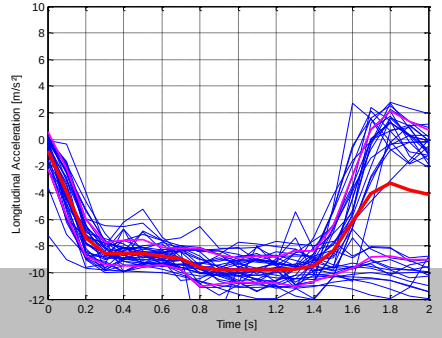
Direct effects – Rear-end scenario (Braking)

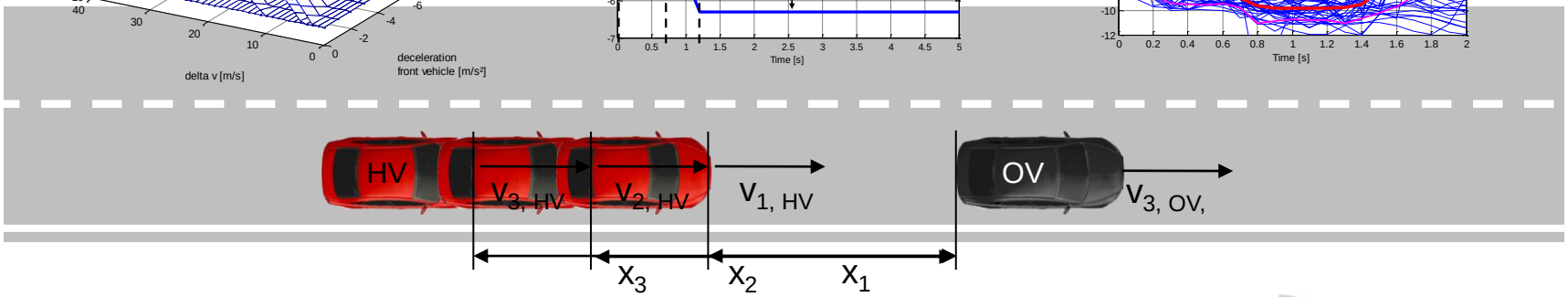
- Initial condition (in-depth accident database)



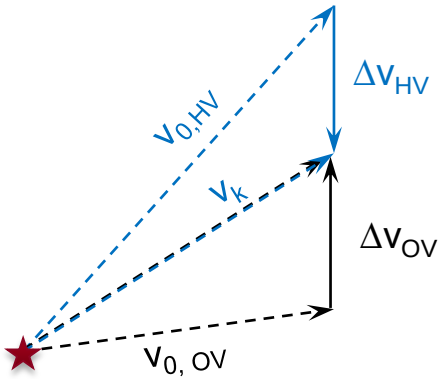




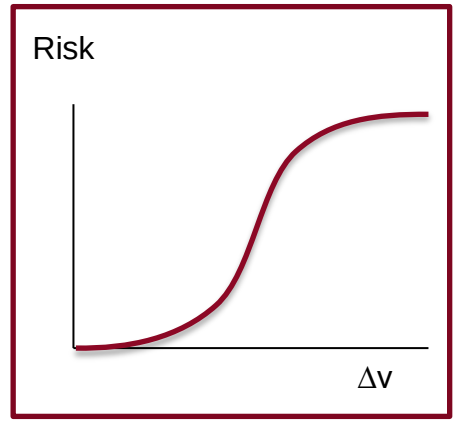




Direct effects – Rear-end (collision mitigation)



$(m_{HV} + m_{OV})\, v_k = c_k\, (m_{HV}\, v_{0,HV} + m_{OV}\, v_{0,OV})$



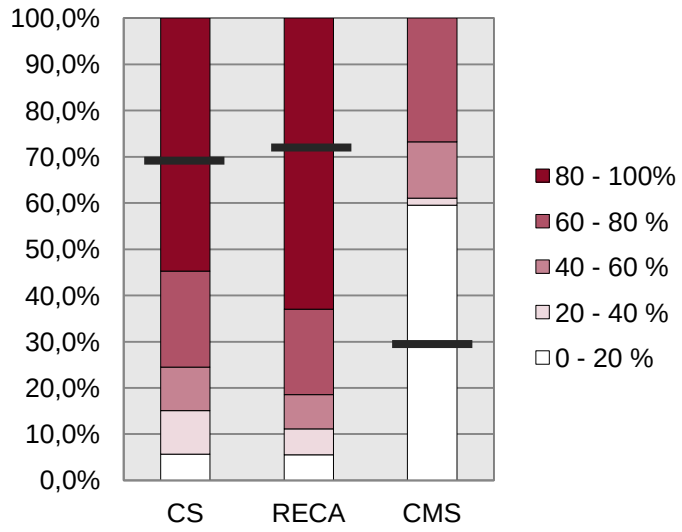
- Speed $v_{0,HV}$ and $v_{0,OV}$ collision are known!
- Derive speed v_k from just after collision based billiard mechanics (correction factor c_k)
- Calculate $\Delta v_{HV} = v_k - v_{0,HV}$ and $\Delta v_{OV} = v_k - v_{0,OV}$, the change of speed at collision for the host and the other vehicle, with and without the system
- Use known relations between Δv in order to calculate injury risk…

Indirect effect

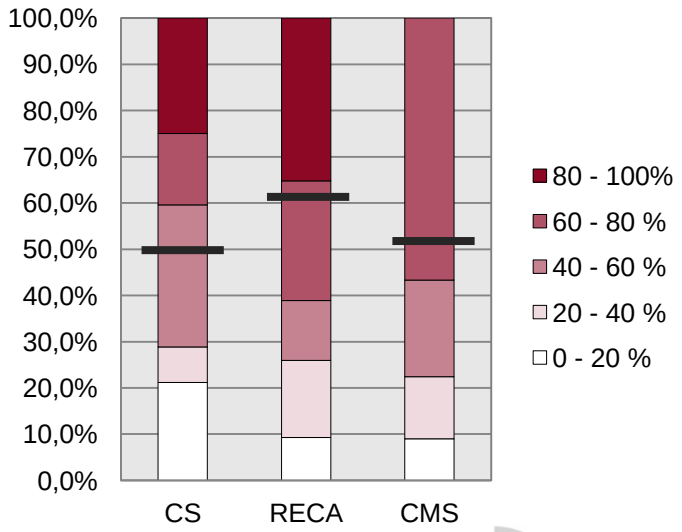
- Different indirect effects are known (e.g. distraction, workload, usage, misusage)
- Consideration of indirect effects in interactIVe:
  - Most of the indirect effects are difficult to quantify
  - Based on the short term tests in interactIVe long-term effects are not derived

- **Usage** of the function is considered

Motorways

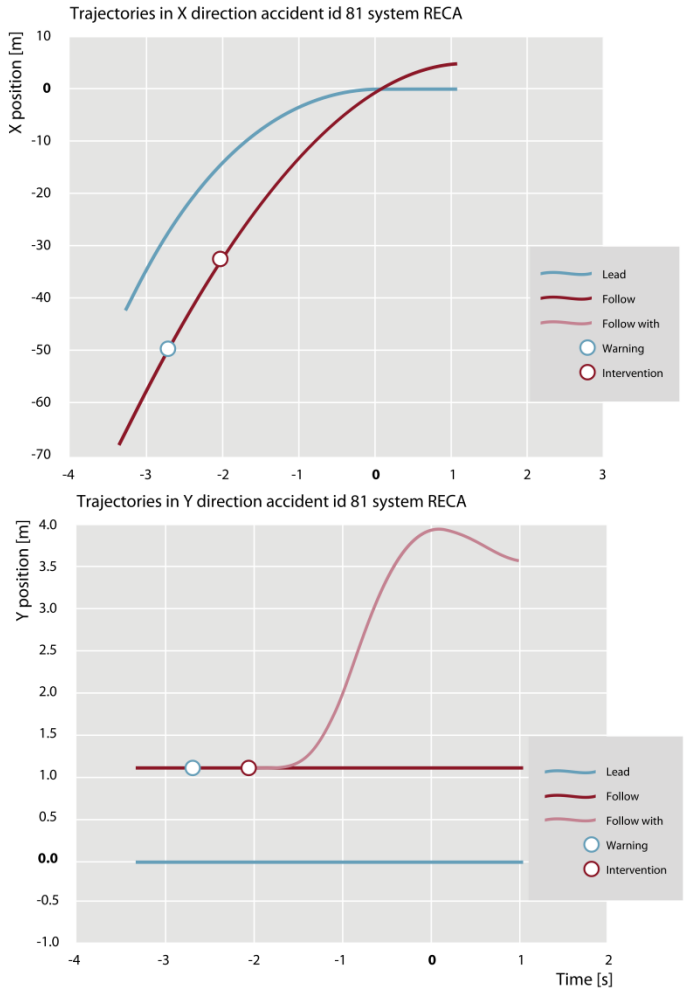


Urban roads



Safety Impact Assessment - Results

- **Sample result for a rear-end collision avoidance system (warning & intervention):**
  - 364 in-depth rear end accident scenarios analyzed
  - 24.2% (with driver reaction) collision avoided
  - 75% (with driver reaction) collision mitigated
- **Sample result for a rear-end collision mitigation system (no warning):**
  - 364 in-depth rear end accident scenarios analyzed
  - 33.5% collision avoided
  - 42% collision mitigated
  - 24% not affected



Conclusion

- Safety Impact Assessment for interactIVe functions successfully conducted.
- Basis for the Safety Impact Assessment are the results of the
  - Technical Assessment (e.g. warning / intervention time point, intervention strength w.r.t. achieved accelerations).
  - User-related Assessment (e.g. usage and driver reaction).
- The effects of the functions were analysed in detailed in three accident scenarios (rear-end, blind spot, run-off-road) by re-simulation of real accident scenario.
- Results were scaled up to European level by means of the CARE database.
- Analysed functions show positive effects with respect to the European road safety.

- **Acknowledgement**
  - interactIVe “Evaluation and Legal Aspects” team

Thank you.

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SEVENTH FRAMEWORK
PROGRAMME

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