Advanced Forward-Looking Safety Systems – Working Group

Introduction and Status update

Tagessymposium der GMTTB
7.12.2012

Frank Leimbach, DEKRA Automobil GmbH

Advanced Forward-Looking Safety Systems – Working Group

Nomenclature and Members

vFSS – Advanced Forward-Looking Safety Systems

Focus: M1-Vehicles

Chairmanship: Frank Leimbach
Coordination: Jens König

Terms of Reference – Objectives (I)

The aim of the Working Group is the development of test procedures for driver assistance systems (in particular advanced emergency braking systems) in order to ensure a robust assessment of such systems.

- Ensure transparency with respect to legal requirements and consumer protection initiatives, incorporating harmonisation principles and accounting for related trade offs
- Focus on traffic accident priorities by means of an evaluation of the effectiveness in real world accidents, with the aim of reducing the number of road traffic casualties.
- Assessment of the technical feasibility (of the test procedure) and the definition of possible implementation strategies.
- Consideration of test procedures with respect to other assessments for both primary and secondary safety.
- Agreement on defined evaluation criteria (e.g. faulty activation rates, level of vehicle autonomous reaction,…).

Terms of Reference – Objectives (II)

- Development scenarios for future consideration of driver assistance systems within insurance companies and their respective decision boards.
- Communication of the conclusions in relevant forums.
- Incorporation of conclusions into P-Safe and Euro NCAP working groups.
- Determination of a harmonised methodology for effective evaluation.

A comprehensive understanding of driver assistance systems will be established. Particularly agreement with respect to the performance and limits of the systems should be reached. To support this, relevant accident scenarios will be used to specify appropriate “injury/risk-curves”.

With this knowledge the development of reasonable test criteria is achievable, taking into account future technical enhancements (especially sensor technology). This is true not only for Germany but also for the whole world, hence conflicts with other evaluation methods should be anticipated.

Workpackages

Coordination

WP1 Accident Analyses

- Worldwide monitoring of activities (e.g. CAMP-CIB, Beyond NCAP, AEB-Group)
- Accident research
- Effective range analysis for pedestrian safety systems
- Effective range analysis for longitudinal traffic safety systems
- Accident scenario definition contributing to casualty reduction and injury mitigation
- Derivation of scenarios contributing to material damage reduction
- Development of an assessment scale for material damage weighting and personal damage (fatally injured/severely injured) weighting related to M1-vehicles

WP2 Pedestrian Safety

- Evaluation of the technical feasibility defined in WP1
- Assessment of system limits
- Generation and collection of pedestrian safety testing methods

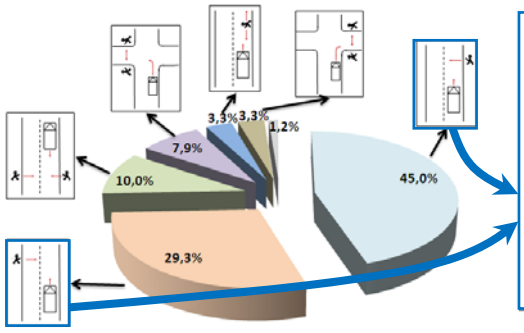
WP3 Longitudinal Traffic Safety Systems

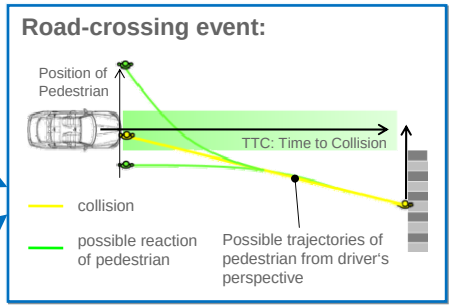
- Evaluation of the technical feasibility defined in WP1
- Assessment of system limits
- Generation and collection of longitudinal traffic safety systems testing methods

Advanced Forward-Looking Safety Systems – Working Group

Status of work WP2

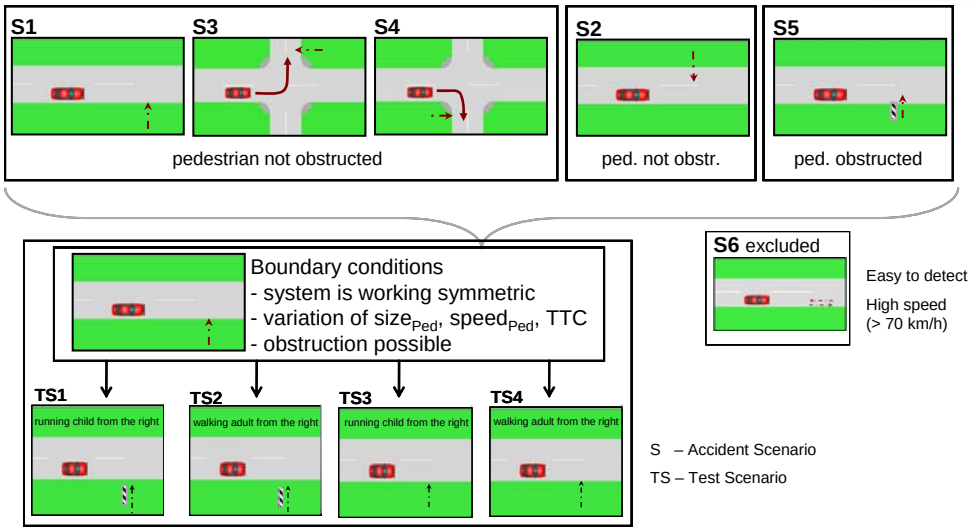
74.3% of pedestrian accidents are road-crossing events (GIDAS)





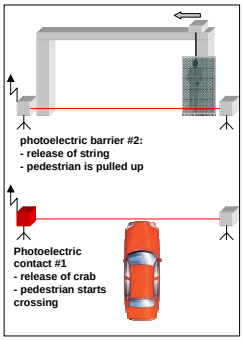
Relevant use case:
Pedestrian crossing, car going straight.

Transferring accident scenarios to test scenarios

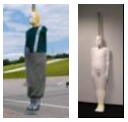


Status of work WP2

Test Procedure for Pedestrian Safety Systems



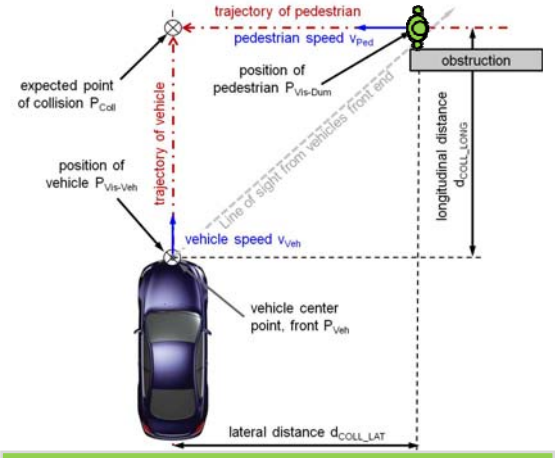
Properties of pedestrian dummies



Dummy:	Adult	Child
Height:	1.80m (5''9)	1.20m (3''9)

- Realistic clothes
- Reflectivity in IR-Range 10-30%
- Radar backscatter similar to human body

Transformation to Laboratory Test



Ideally the tests should be performed contactless to avoid damage of sensor systems

Principle

- moving vehicle
- moving dummy target
- perpendicular moving directions
- continuous velocity measuring for vehicle and dummy target

Relevant values

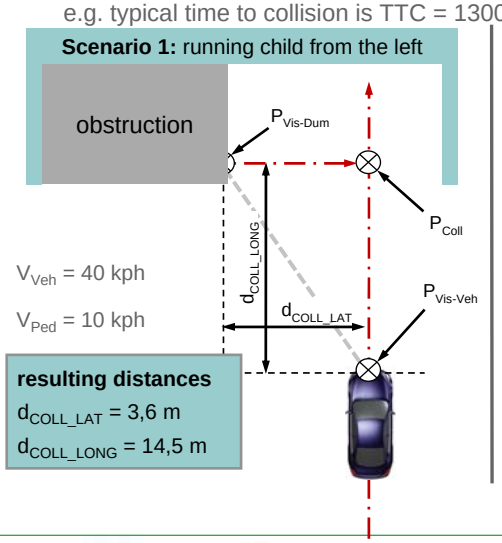
- vehicle velocity at point of first visibility of the dummy target (P_{Vis_Veh})
- vehicle velocity at the collision point (P_{Coll})
- vehicle's speed reduction is the relevant value to assess the system performance

Testing

- 4 different test scenarios
- 10 test cycles for each scenario

Test Scenarios With Obstructed Pedestrians

e.g. typical time to collision is TTC = 1300 ms



V_{Veh} = 40 kph

V_{Ped} = 10 kph

resulting distances

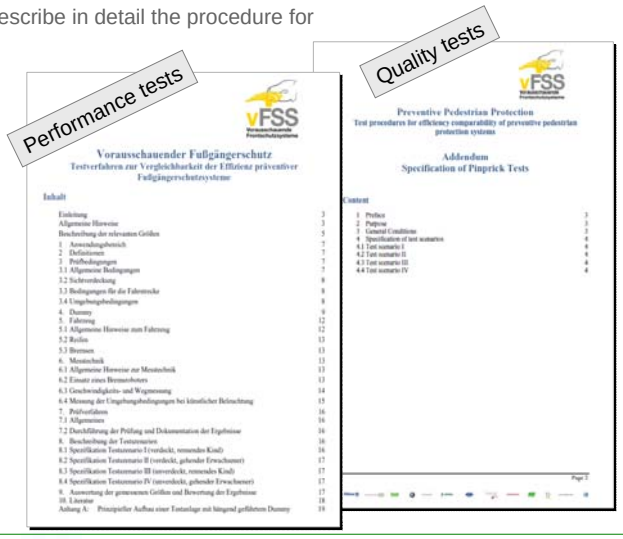
d_{COLL_LAT} = 3,6 m

d_{COLL_LONG} = 14,5 m

Test Rig – Possible Layout

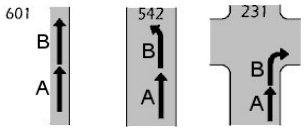
Available vFSS Protocols Pedestrian Safety

- vFSS test protocols describe in detail the procedure for
  - Entrance tests
  - Quality tests
- Content
  - Test Conditions
  - Dummy
  - Vehicle
  - Measuring Technology
  - Test Procedure
  - Description of test scenarios
  - Evaluation of Results



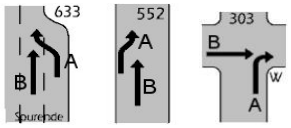
Status of work WP3

1.-step: primary interest



conflict with a vehicle in front (vif)
vif is using the same lane
since several seconds

2.-step: secondary interest



conflict with a vehicle in front (vif)
vif is „suddenly“ entering the lane

→ exchange with ASSESS project

Background WP3

- vFSS-working group initiative to compare different crash-targets used by OEMs and research institutes
- Several rounds of tests on Daimler test facility in Papenburg and IDIADA , 2010-2012
- Focus:
  - Evaluation of target-systems regarding applicability, handling, durability
  - Discussion regarding the opportunity of a harmonisation of crash target systems
  - Test of practicability of draft protocols

Status of work WP 3
Test Events

- Subjective and objective assessment of target systems

Test Vehicles

Audi A8, Audi A4	radar and camera
Audi A8	PMD
Mercedes-Benz E	short- , mid- , long-range radar
Porsche Panamera	radar
Ford Galaxy	radar
Honda Accord:	radar
Toyota Prius:	radar
VW Passat CC:	radar and lidar?
Volvo V60 (Thatcham):	radar and camera

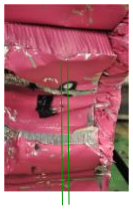
Target Characteristics - Results

	Stationary Targets					Moving Targets				
	ADAC	ASSESS 2D	MB Balloon	MB-Softcrash-target	Thatcham	ADAC	ASSESS 2D	MB Balloon	MB-Softcrash-target	Thatcham
Overall Assessment of **radar** characteristics	1,5	2,6	1,7	1,6	2,9	1,4	2,2	1,6	1,5	2,8
Overall assessment of **visual** characteristics*	1,2	2,8	1,0	2,6	3,0	1,0	3,0	1,0	1,8	3,0
Overall assessment of characteristics regarding **PMD** technology *	2,0	2,0	4,0	4,0	3,0	n.r	n.r	n.r	n.r	n.r.
mechanical properties and **target handling**	1,4	1,9	1,6	2,0	1,9	1,7	3,2	1,8	2,2	1,9

*) rated by 1 OEM only

DEKRA jubilee crash Test 18 May 2010

Retarded impact with forward-looking safety system
Initial speed 64 km/h
Impact speed 40.4 km/h
Crash according to EuroNCAP specification
BMW series 5 – latest generation, equipped with prototypical PreCrash-System and eCall
Crash test facility responds to automatic vehicle braking



64.0 km/h

40.4 km/h

Harmonisation Platforms - Objectives

	HP 1 - Scenarios -	HP 2 - Targets -	HP 3 - Effectiveness -
Chair	C. Pastor, BASt	P. Lemmen, Humanetics	A. Aparicio, IDIADA
ASSESS	**Expert exchange for technical agreement** • Identification of similarities and differences in group's approaches. • Definition of joint standards for concurrent perspectives. • In case of disagreement initiation of project studies to achieve common agreement .		
AEB			
vFSS Group			
ADAC			
Executive Board	• Executive review of platform's output. • Approval on joint standards. • Coordination of project studies. • Reporting to safety advocates.		

EURO NCAP - PNCAP · Active Test · NHTSA · INSURANCE INSTITUTE FOR HIGHWAY SAFETY

Interlink with EC-Projects

ASSESS – ASSESSMENT OF VEHICLE SAFETY SYSTEMS

Assessment of Integrated Vehicle Safety Systems for improved vehicle safety

HUMANETICS · BOSCH Technik fürs Leben · TNO Knowledge for business · DAIMLER · bast · TRL · CHALMERS · PSA PEUGEOT CITROËN · Applus IDIADA · TRW · eesar · UNIRESEARCH · TU Graz · University of Cologne · TOYOTA

Interlink with EC-Projects

aspecss

HUMANETICS

TNO innovation for life

ika

BOSCH
Technik fürs Leben

UNIRESEARCH

Applus IDIADA

bast

TRW

Autoliv

TRL

TOYOTA

PSA PEUGEOT CITROËN

Memorandum of Cooperation NHTSA-BASt

Signed 26 April 2010

MEMORANDUM OF COOPERATION
For Motor Vehicle Safety Research
between the
National Highway Traffic Safety Administration of the Department of Transportation
of the
United States of America
and the
Federal Highway Research Institute of the Federal Ministry of Transport, Building and Urban Development
of the
Federal Republic of Germany

vFSS
Advanced Forward-Looking Safety Systems

Thank you very much for your attention