Integrated Safety in the Transport System

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Content

Natural Mobility - a challenge

Traffic Safety Theory – to manage the complexity

Kybernetic Werkstatt – to create solutions

Innovative Holistic Approaches

What we need

ASSET – the ambitious FP7 R&D Safety Project

Natural Mobility

Fully Accident Free

(Have you everseen a bird (collission) folling from the sky?)

Highly Dynamic

(Short reaction time, *"Save Swarm Mobility"*, short stopping distance)

Very Efficient

(Selfproduction at 30-40 Degree Celsius,
low consumption of resources, selfrecycling)

Autopoietc Structures

(Anabolic and Cathabolic Processes
create the "Living Adaptive Structures")

Billions of Tons

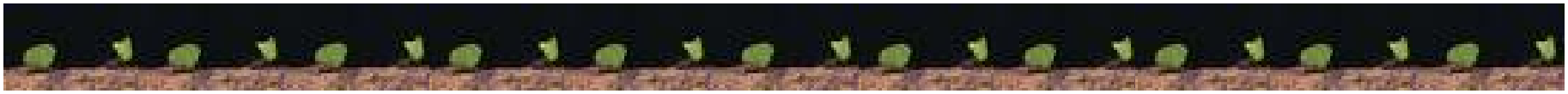
Micro (mg) and Macro (Tons) entities

Billions of Kilometers

Billions of Entities

Millions of Years

ROC Bernard ROB 8609.cdr 17.04.2008



Development Heavy Transport Vehicle Overlaod and Safety

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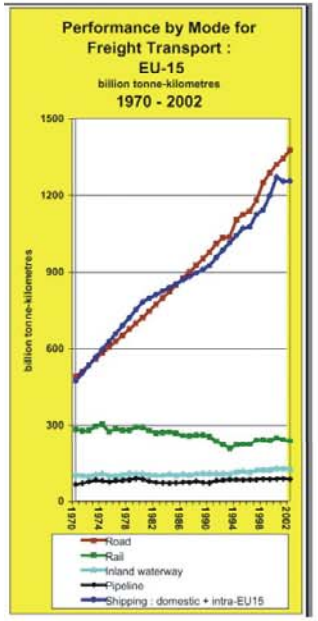
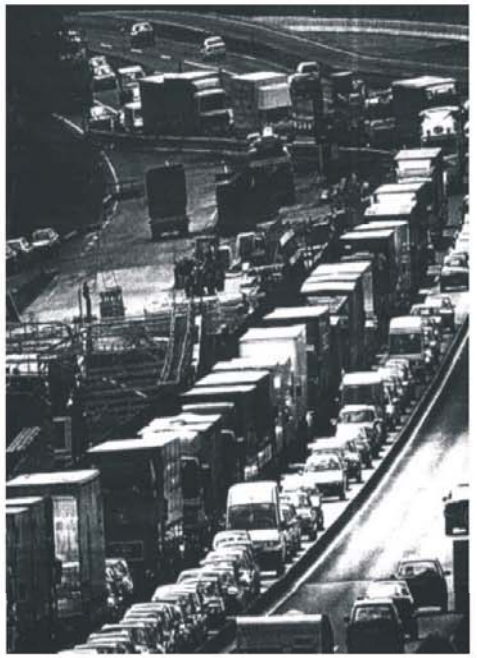


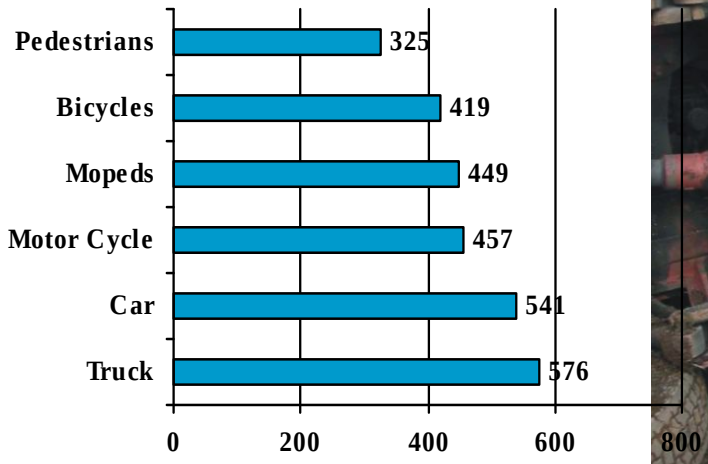


Germany
80s after
reunification

Japan:
Current
accident

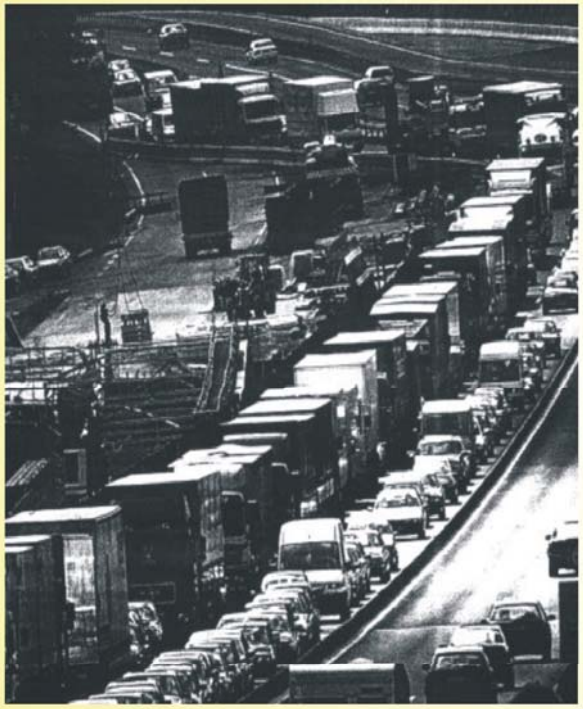
Involvements in Accidents

(per 1000 accidents)



Traffic Safety Improvement Programme
Chaines of Safety Impacts and Administrations Involved

ROC Bernard 8601 16.04.2008

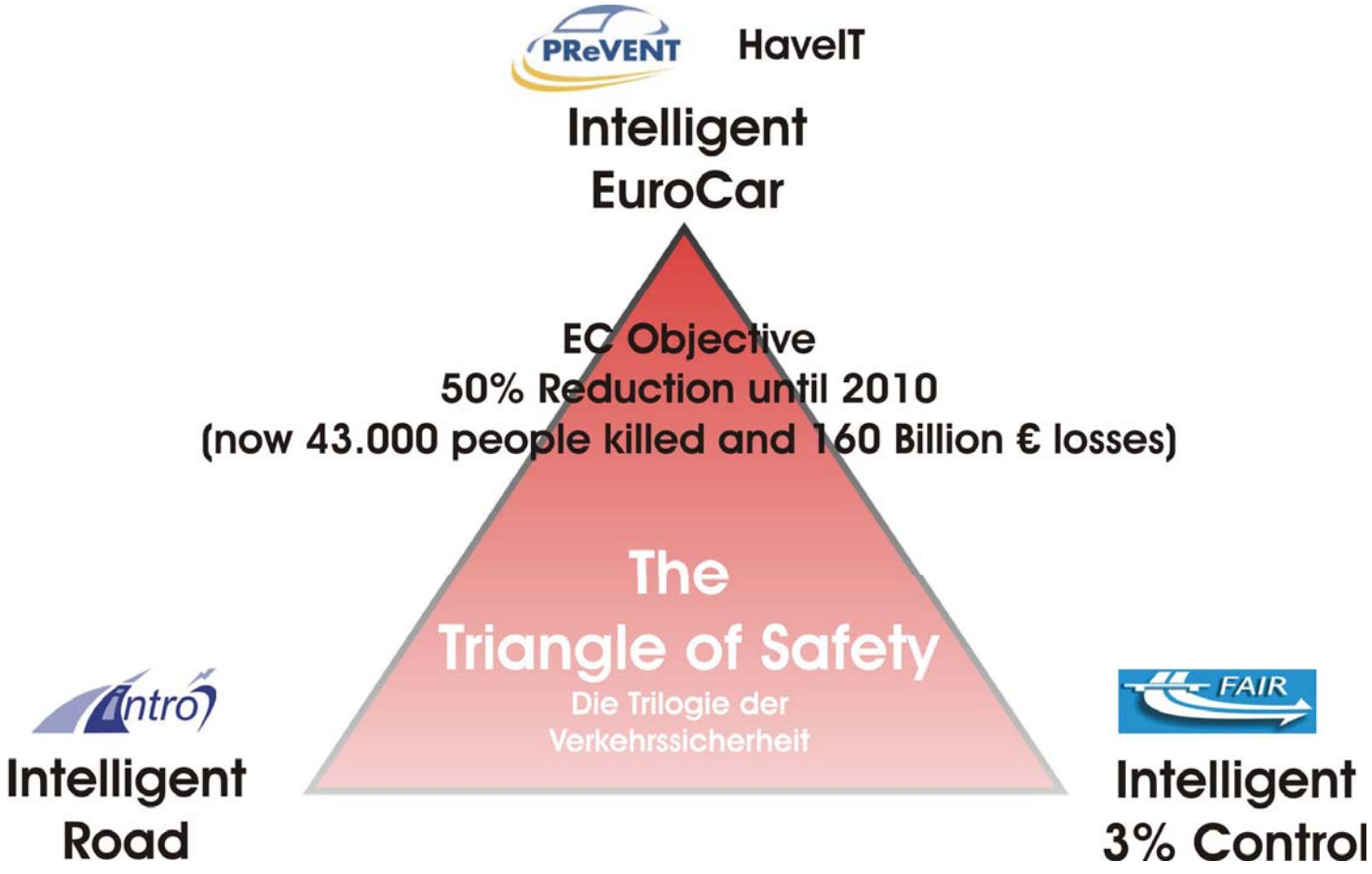


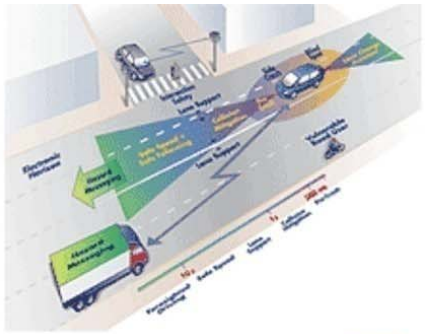
Negative Social and Economic Impacts (Transport, Environment and Road Operation)

Example: Sequence of Negative Effects "Unfair Vehicle Overload"

- **Truck Overload** → **Direct Safety Risk** (tyre failure, slow heavy truck, unstable driving, greater safety risk)
- **Damage of Roads** → **Safety Risk** (rutting of roads and skidding) **Shorter Road Lifecycle**
- **Road Repair** → **Safety Risk** (construction sites, lane changes, high accident rate) **High Costs for M&R**
- **Traffic Jams** → **Safety Risk** (higher risk taking, frustration of drivers, critical situations) **Higher Fuel Consumption**
- **Environmental Impact** → **Pollution increase** (more usage of energy) **Global Heatening**
- **Commercial Impact** → **Unfair Competition** (disadvantages for legal fleet operators)

Police | Highway Auth. | Traffic Control | Environment | Commerce


PReVENT
HaveIT
Intelligent
EuroCar
EC Objective
50% Reduction until 2010
(now 43.000 people killed and 160 Billion € losses)
The
Triangle of Safety
Die Trilogie der
Verkehrssicherheit
Intro
Intelligent
Road
FAIR
Intelligent
3% Control



Intelligent EuroCar

Investment: very high
Time Frame: 2010-2015
Safety Increase: very high
Cost efficiency: medium
Legal Frame: not yet

ROC Bernard ROC 6410 20.11.2006

PReVENT

The Trilogy (3 Columns) for Traffic Safety

Intro

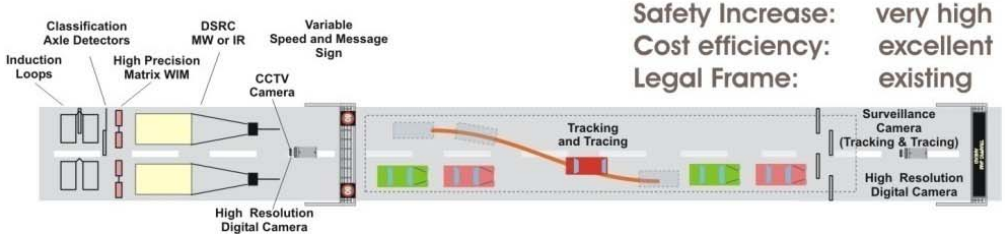
Intelligent Road

Investment: high
Time Frame: 2006-2010
Safety Increase: moderate
Cost efficiency: medium
Legal Frame: not requiered

FAIR

Intelligent Regulation

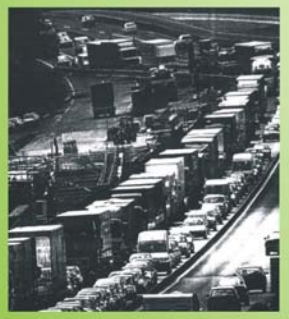
Investment: medium
Time Frame: 2006-2008
Safety Increase: very high
Cost efficiency: excellent
Legal Frame: existing

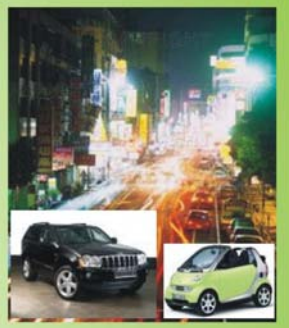


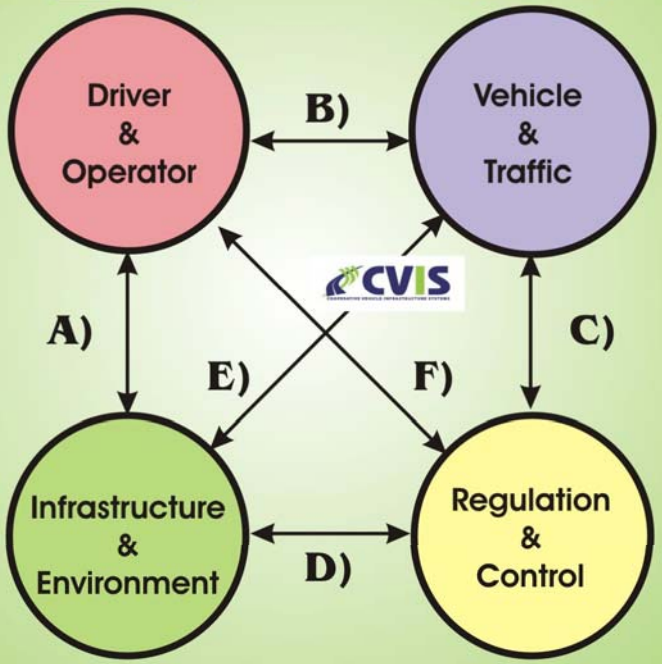
ASSET

ROB 8607
16.04.2008

Holistic Safety Theory
(Dialectic Quadropol Road Safety)





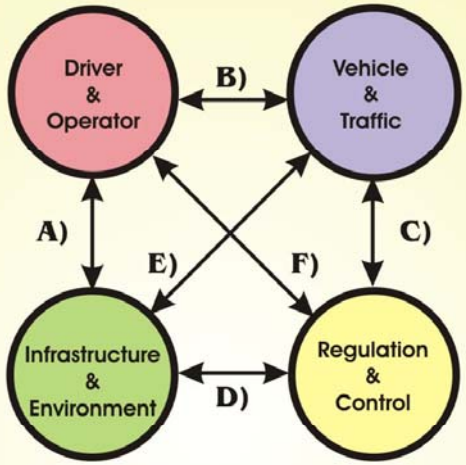


Dynamic Interactions Causing Road Safety

Holistic and Integrated Safety Concept
(Dialectic Quadropol Road Safety)

ROC Bernard 8602 10.04.2008

Dynamic Interactions Causing Road Safety



A) Driver & Operator ⟷ Infrastructure & Environment

? Driver/Operator needs and uses infrastructure (for driving, transport and travelling)
? Driver pollutes environment (energy consumption, exhausting pollution)
? Driver uses resources of environment
? Driver recognises pollution (polluted city) and reacts
? Infrastructure influences driving (road design, condition, traffic signs, signalling, restraint)
? Infrastructure depends on environmental conditions (frost, thaw, humidity, ground conditions) and driver has to consider these
? Environment influences driving (snow, rain, darkness, ice, fog, humidity)
? Each individual driver is a perceptual-cognitive entity, aware of the infrastructure and environment

B) Driver & Operator ⟷ Vehicle & Traffic

? Driver/Operator operates, uses and steers vehicles
? Many drivers with different vehicles, different objectives and behaviour form traffic dynamics
? Operators influence drivers' behaviours (time frame, loading)
? Operators depend on traffic conditions (best travel time, shortest distance)
? Operators depend on vehicle conditions (reliability, safety, capacity, economy)
? Vehicle conditions depend on operator maintenance and repair checks.

C) Vehicle & Traffic ⟷ Regulation & Control

? Vehicle safety conditions have to be regulated
? Vehicles and traffic are controlled by police according to regulations
? Traffic is regulated by signalling
? Levels of traffic control have to be reasonable to achieve reasonable adherence to regulations.

D) Regulation & Control ⟷ Infrastructure & Environment

? Regulations are projected by infrastructure (speed limit sign, access, limits)
? Regulation partially protects environment
? Infrastructure has to be controlled (system state, wear and tear)
? Control and access can depend on environmental conditions (Ozone, CO_2, pollution).

E) Vehicle & Traffic ⟷ Infrastructure & Environment

? Vehicle uses and influences infrastructure (wear and tear)
? Vehicle loading can result in failure of infrastructure (road, bridges)
? Vehicles depend upon and influence environment
? Vehicles pollute environment
? Traffic impacts environment (polluting, energy resources)
? Traffic uses and influences infrastructure
? Traffic is dependent on and influences environment
? Infrastructure impacts vehicle and traffic capacity
? Traffic flow conditions depend on infrastructure condition.

F) Driver & Operator ⟷ Regulation & Control

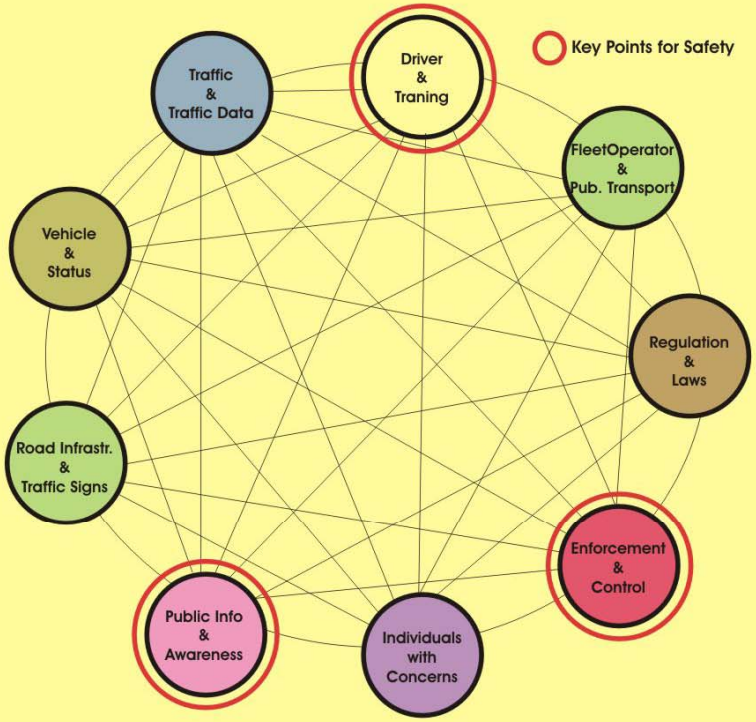
? Driver has to know and follow regulations
? Regulations have to be understandable and practical for drivers
? Driver is a key central figure for following safety regulations
? Operator has to know and follow regulations
? Regulations have to be understandable for operators

Consulting an Administration: Mission for a „Road Traffic Safety Commission“

8312
03.04.2008

TCc Administration Set up

1. Consider most important Safety Elements
2. Analyse main Interdependencies
3. Create adequate Administration
4. Create adequate covering Processes
5. Find “ BEST TOTAL SOLUTION”
6. Practise “ BEST TOTAL SOLUTION”



TCc Administration Key issues

1. Need of an Integrated Solution
2. Lean and efficient Administration
3. Effiective & Strong Organnisation
4. Competent Kex Experts and Skills
5. Embedded and Harmonised
6. International Links & Interactions

Holistic & Kybernetic Approach – Avoid Defizits

A) Wrong Objectives – don't solute single problems, create an overall optimization, avoid repair measures without any strategy, plan needs in a visionary and pragmatic conception

B) Isolated System Analysis – system analysis has to be performed network based and not for isolated or single data, consider the composition of elements (Gefüge), intercheck the principles for creating an arrangement (Ordnung) with feedbacks, limits, consider hidden parameters. Define the different "universes" from clustering, relations, relevancies up to interlinked processes. Try to find, describe and analyze the kybernetic character of traffic safety

Holistic & Kybernetic Approach – Avoid Defizits

C) Irreversible Focusing – don't concentrate only on one main item, which obviously looks as key aspect. Don't forget parallel implications, impacts, effects and processes. Practice dialectic interactions for each pair. Look on the consequences of these parallel effects.

D) Unconsidered Side effects – by linear and casual thinking often focusing is the main affect, parallel issues and consequences often are not recognized or considered.

E) Over-Compensation – first steps are done with care, if effects are not directly or in time visible, a strong "putting in question" and "over-enforcing" followed possibly by fully braking is practiced

Holistic & Kybernetic Approach – Avoid Defizits

F) Tendency to Authoritarian Measures - the p ower of being able to change a system, or the belief to understand the system leads often to a “dictator behavior”, which is for complex system not the best. Same is valid for “Gigantism” and personal prestige or “Narcismus” of managers

G) Kybernetic versus Linear - kybernetic strategies are not so common accepted compared with simple linear measures due to missing understanding of the complexity. But the reality is “Complex” and “Dynamic” and includes often many interlinked processes requiring a holistic and integrated view and a kybernetic approach for optimization and stability

H) Avoid dissymmetric Strategies - fight not against symptoms, avoid wrong objectives and irreversible focusing, consider side pass effects.

ASSET

ASSET Road

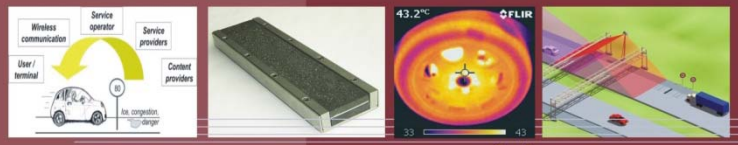
Integral System Solution For Safety

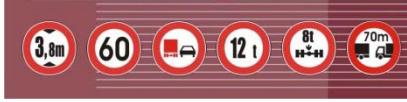
Advanced Safety and Driver Support for Essential Road Transport

ASSET vision

The ASSET vision is to substantially contribute to safe and sustainable transport by linking road traffic and safety information from all essential system elements. Improving driver awareness and behaviour is a key issue.

This will be achieved through an advanced sensor and processing network providing assistance and information for drivers, traffic control agencies and infrastructure operators.





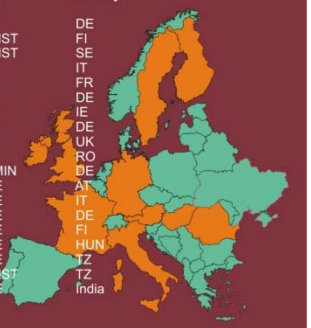
ASSET Details (planning according the project proposal)

Project duration:	01.05.2008 - 30.11.2011
Project budget:	8,16 Million Euro
Project grant:	6,15 Million Euro

ASSET Consortium

The consortium with its 19 partners is a well balanced mix of universities (7) & research institutes (3), industrial companies (1), SMEs and representation of developing countries (7) and administrations (1) as users. Furthermore, the consortium has partners from India and Tanzania.

No	Participant organisation name	Type	Country
01	PTV Planung Transport Verkehr AG (Coordinator)	IND	DE
02	VTT Technical Research Centre of Finland	R-INST	FI
03	VTI Swedish Road and Transport Research Institute	R-INST	SE
04	Università di Modena e Reggio Emilia	UNI	IT
05	Université de Technologie de Belfort-Montbéliard	UNI	FR
06	Universität Stuttgart	UNI	DE
07	National University of Ireland	UNI	IE
08	Leibnitz Universität Hannover	UNI	DE
09	University of Nottingham	UNI	UK
10	Technical University of Iasi	UNI	RO
11	Bayerisches Staatsministerium des Innen	ADMIN	DE
12	ROC Bernard GmbH	SME	AT
13	KRIA Knowledge research in imaging applications	SME	IT
14	Manfred Hügel Selektionstechnik	SME	DE
15	EMTELE Ltd.	SME	FI
16	Clarity Consulting Ltd.	SME	HUN
17	ADC-AfriDeut & Philtec	SME	TZ
18	National Institute of Transport (Tanzania)	R-INST	TZ
19	MTEL-KTEI Pvt. Ltd. (RITES & NHAI)	SME	India

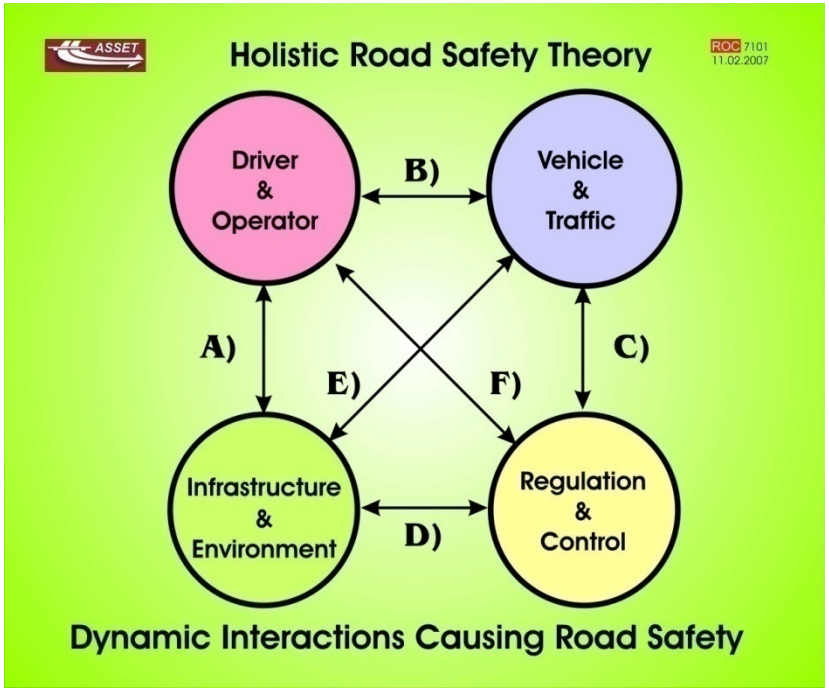


ASSET Contact Persons

Project Coordination: Walter Maibach +49 711 16270-30 walter.maibach@ptv.de
Technical Coordination: Rigobert Opitz +43 316 890923-28 rigobert.opitz@bernard-ing.com

The ASSET approach links the most important safety-related categories into a complete system, generating a number of interdependencies. Key factors for the urgently required increase of safety and transport efficiency are:

Improving ***driver knowledge*** and ***human behaviour*** aspects
Increased use of modern technologies and ***automation*** for support and ***supervision***
Introduction of innovative measures for ***safe and sustainable infrastructure***
Application of ***modern traffic control*** and networking
Achieving ***effectiveness*** in the analysis and management of system complexity



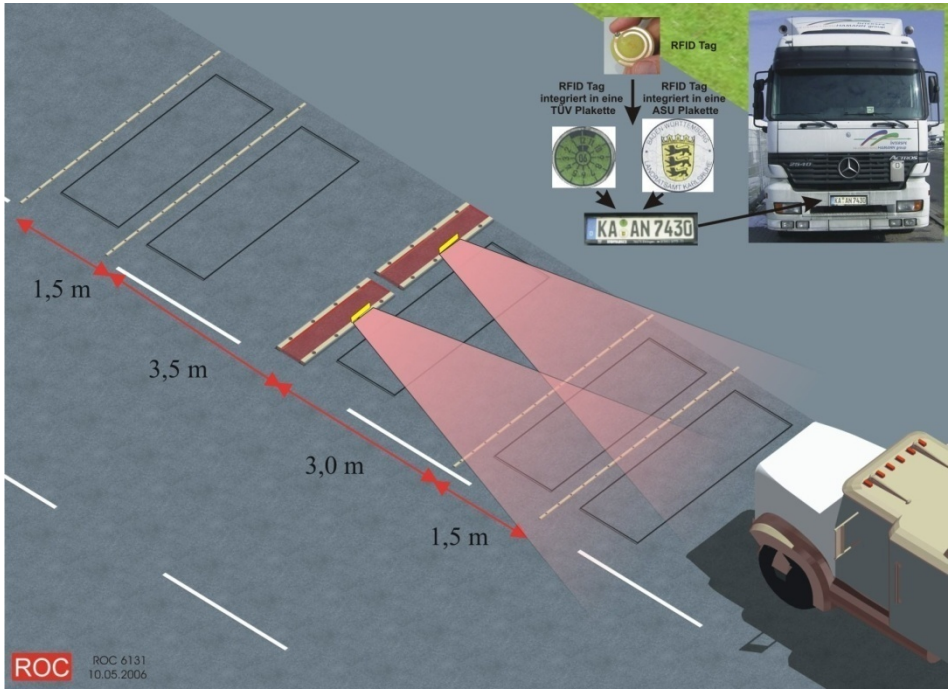
ASSET

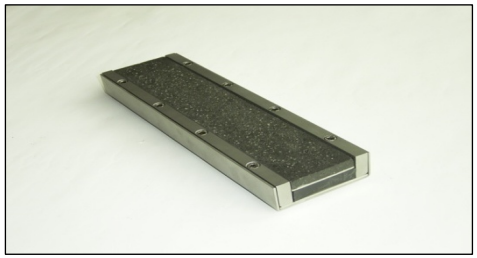
Intelligent WIM (Weigh in motion) & Road side sensing (iWIM)

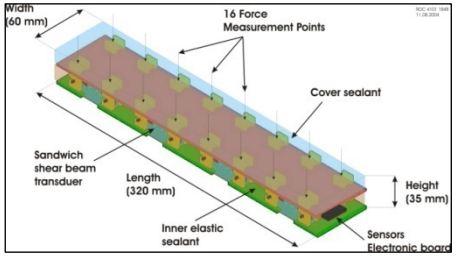
A Weigh-in-Motion (WIM) measurement technique will be enhanced in several applications:

- Enhanced dynamic weight measurement for pavement deterioration models and life cycle
- Highly accurate dynamic weight measurement for detection and automated enforcement of overloaded
- New traffic load flow data parameter to replace ESAL
- Synchronization with wheel inspection (thermal imaging) for fully automatic operation

The next-generation **iWIM** system (embedded electronics and CAN bus in the road pavement) will be able to measure the weight of individual wheels, axles and tyre pressure with a flat sensor installed in the road

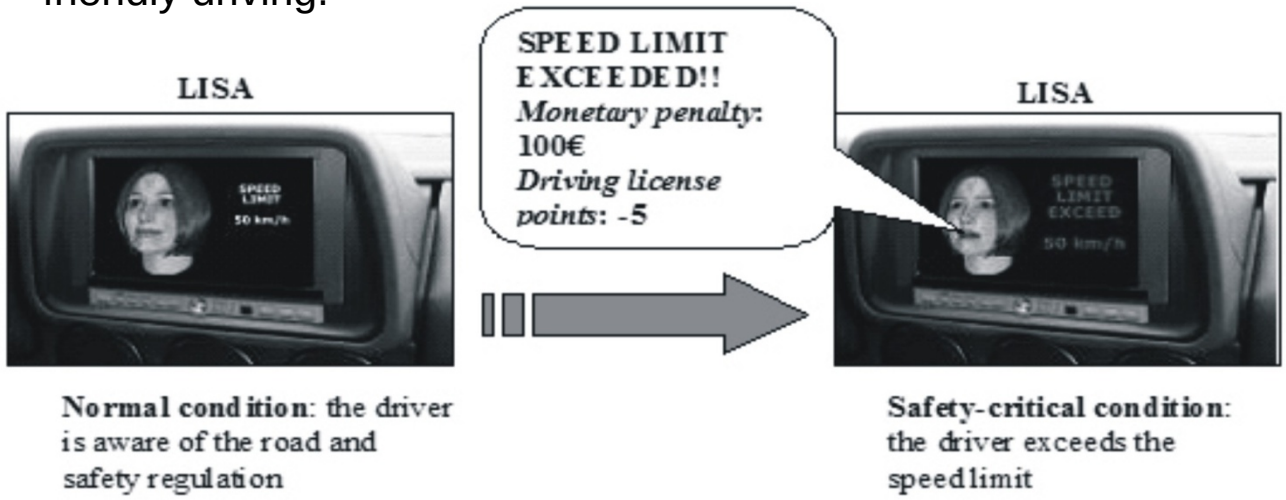






"LISA" - Live In-vehicle Smart Assistant

The smart information system can be seen as a intelligent and interactive co-pilot to the driver which provides live feedback for a driver to improve behaviour, e.g., in terms of safe or environment-friendly driving.



EU Driving Regulation Knowledge Base (first roadside - later incar)

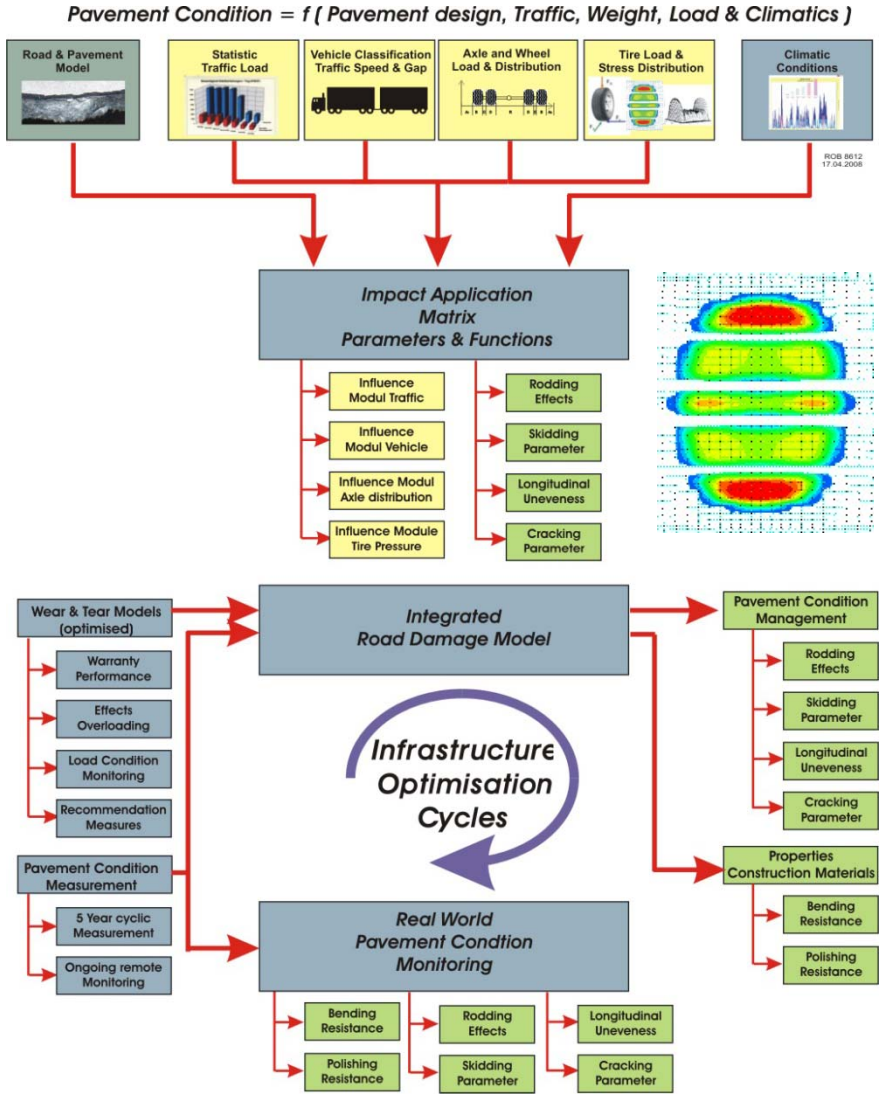
Expert System & Video Clipp/Talk Presentation Tool

HMI: Intelligent and Smart LISA

ASSET

Road modelling, Infrastructure Protection and Life Cycle optimisation

It is known that the mean pattern of force imposed by heavy vehicle fleets on pavement surfaces is repeatable for trucks of similar configurations, known as statistical spatial repeatability(SSR). ASSET will provide predictive models, in cooperate different new sensor data yielding accurate pavement life prediction models which can be used in life cycle optimisation strategies.

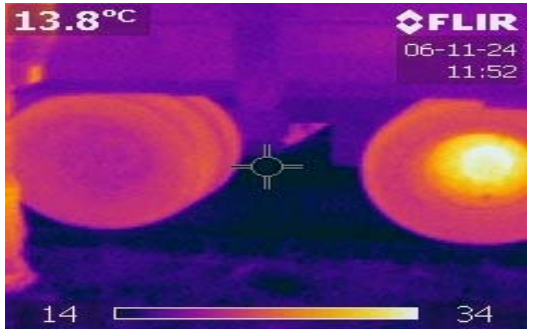


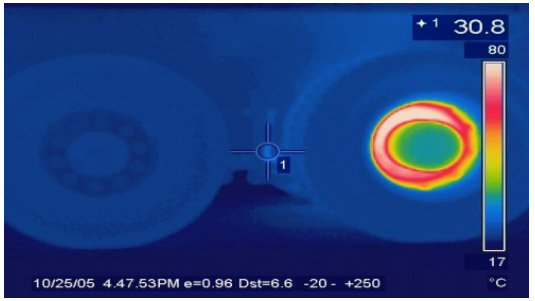
ASSET

Thermal Imaging (Vehicle Safety Status)

Ultra-sensitive far-infrared cameras have great potential for detecting the condition of HGV brakes and tyres with a massive reduction in required police time. Here, thermal imaging technology is adapted and a system is developed to automatically detect defective wheels, tyres and braking system. Two operational applications will be designed:

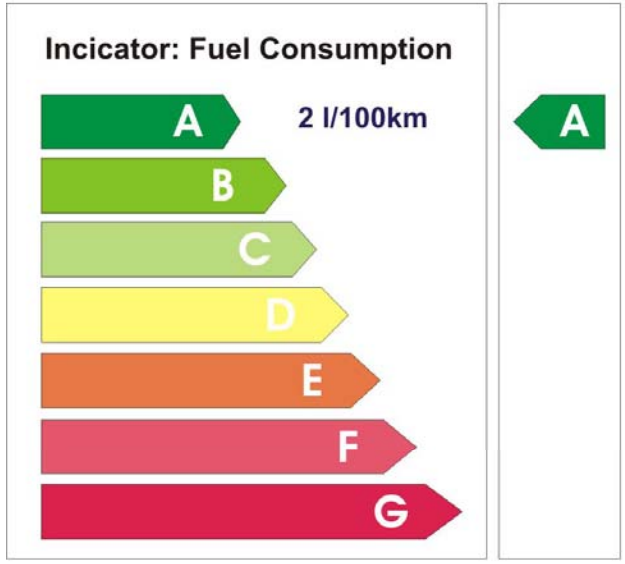
- Permanent installation, installed and synchronized with WIM sensors
- Application in moving traffic for dynamic checks on motorways





The Vehicle of the Future - What we really need

ROC Bernard ROB 8610.cdr 17.04.2008



Clear comparable EC Indicators

Optimised Vehicle Mass:
Less than 1000 kg - the 1K Car

Automated Driving
Save Swarm Mobility - the AD Car
(better dynamic reaction, kybernetic platooning, short stopping distance)

Very Efficient - 2 Liter max consumption per 100 km - the 2L Car
(Lower production costs, low energy consumption, 2L equivalent)

Energy Flex - the PP Car
(Poli-In Energies (fuel, batterie, gas, solar) - Poly-Out Energie (motor, turbine, E-motor)

Environment Clean - the EC Car
(Lower pollution, lower material resources, lower energy, modular recycling)

300.000 km Garantie
(High Life time and low life cycle costs)

Traffic of the Future - what we really need

ROC Bernard ROB 8611.cdr 21.04.2008

HGV: Long Distance Transport from the Road
(Aktive regulated LDT transport modal shift from Motorways to Rail)

Empty Trucks from the Motorways
(30% of HGVs are driving empty - better loading strategies)

Speed Limit 130km/h
(Motorways left lane, right lane 100km/h)

Automated Platooning- Save Swarm Mobility
(Fully safety and better efficiency on motorways)

Driver-Driving according the Rules
(Driver awareness and support for following regulations)

Car-Driving according the Rules
(Automated following regulations by the vehicle entity)

Road and Infrastructure Protection
(Better Roads - Active protection measures against road deterioration)

Thank You very much for Your Attention

Vielen Dank für Ihre Aufmerksamkeit

Lets solve the road transport & safety problems and create the accident free future!