Block 14:00-14:40hr

- EU Freight transport market and impact analyses
- Front End Design for more survivability in crashes

The AEROFLEX project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 769658

EU Freight transport market and impact analyses

Industry

Research

Andreas Lischke, DLR Institute für Verkehrsforschung,
AEROFLEX, EU Freight transport market and impact analyses

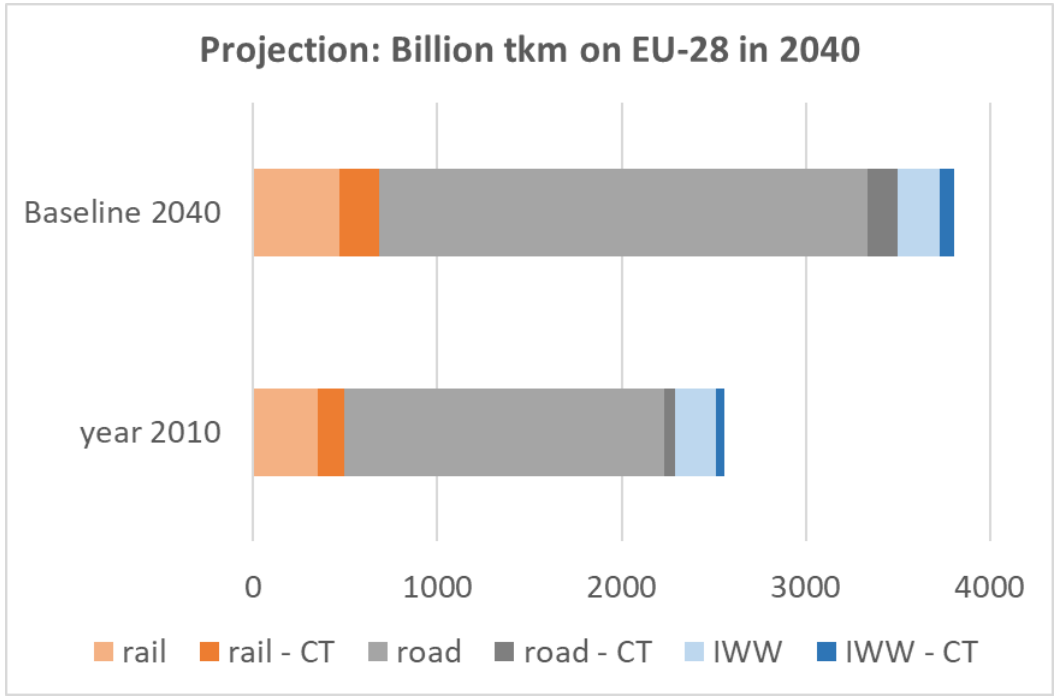
Gernot Liedtke, DLR Institute für Verkehrsforschung,
AEROFLEX, EU Freight transport market and impact analyses

Service and validation

Fernando Liesa, Secretary General at ALICE

Assessment - General approach

- **Baseline: freight transport projection** (reference scenario)

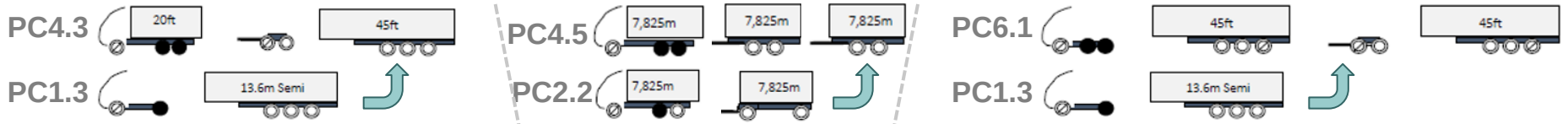


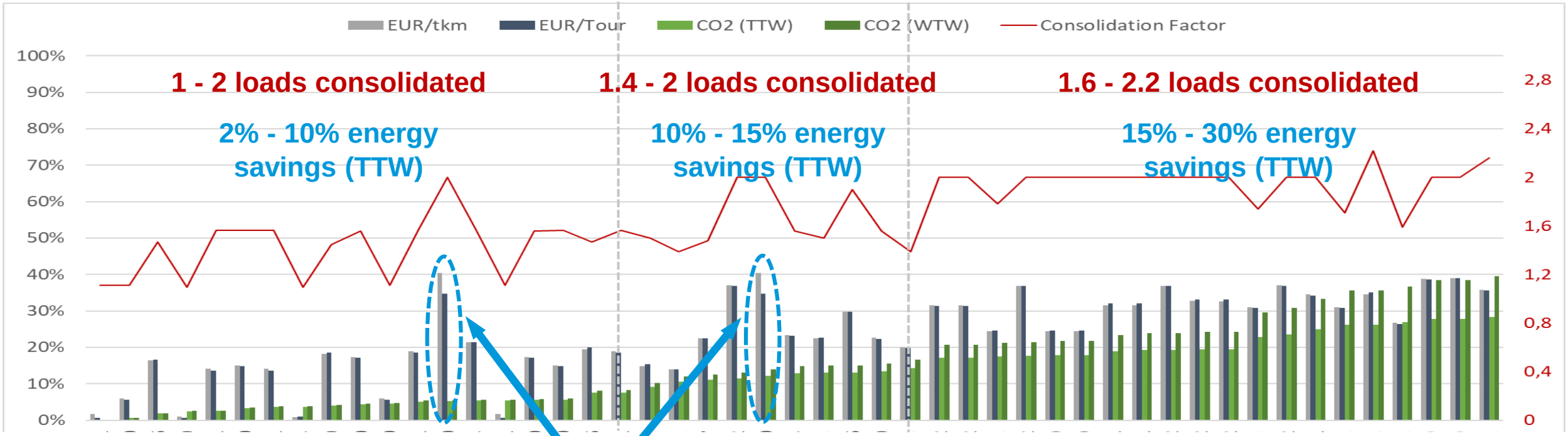
source: DLR; results of the model Demo-GV

- **STEP 1: use cases** (interviews: real road transp.)
  - 32 use cases representing several logistics segments
- **STEP 2: impacts** of road High-Capacity Transport (European Modular System – EMS)
  - on transport costs
  - on modal shares
  - on CO_2-emissions of EU-wide freight transport
- **STEP 3: impact** on future on transport logistics and on the Physical Internet

Impacts in use cases - Emission savings potential up to 30% (TTW) due to load consolidation

source of data:
stakeholder surveys
and expert interviews



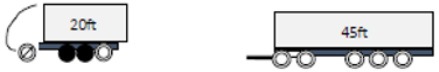


Overview: 32 use case calculations – based on interviews with logistics serv. provider/transp. comp.

Special cases (Prime Candidates 1.3 vs. 6.1) due to inefficient milk run or source consolidation:
5% - 15% energy savings (TTW), whilst 30% - 40% reduction in EUR/tkm or EUR/tour

Impact – overall results of all use cases with EMS

- **53 % of the interviewees** vote for the TOP6 Prime Candidates (PC)
- **EMS 2 is the most preferred PC** (11.7 % of interviewed logistics stakeholders)

No	Prime Candidate	Share of votes
6.1		11.7 %
2.1		9.7 %
3.1		9.7 %
1.4		9.3 %
2.2		6.6 %
4.7		6,2 %
1.3		10.1 %

Source of data: stakeholder surveys and expert interviews

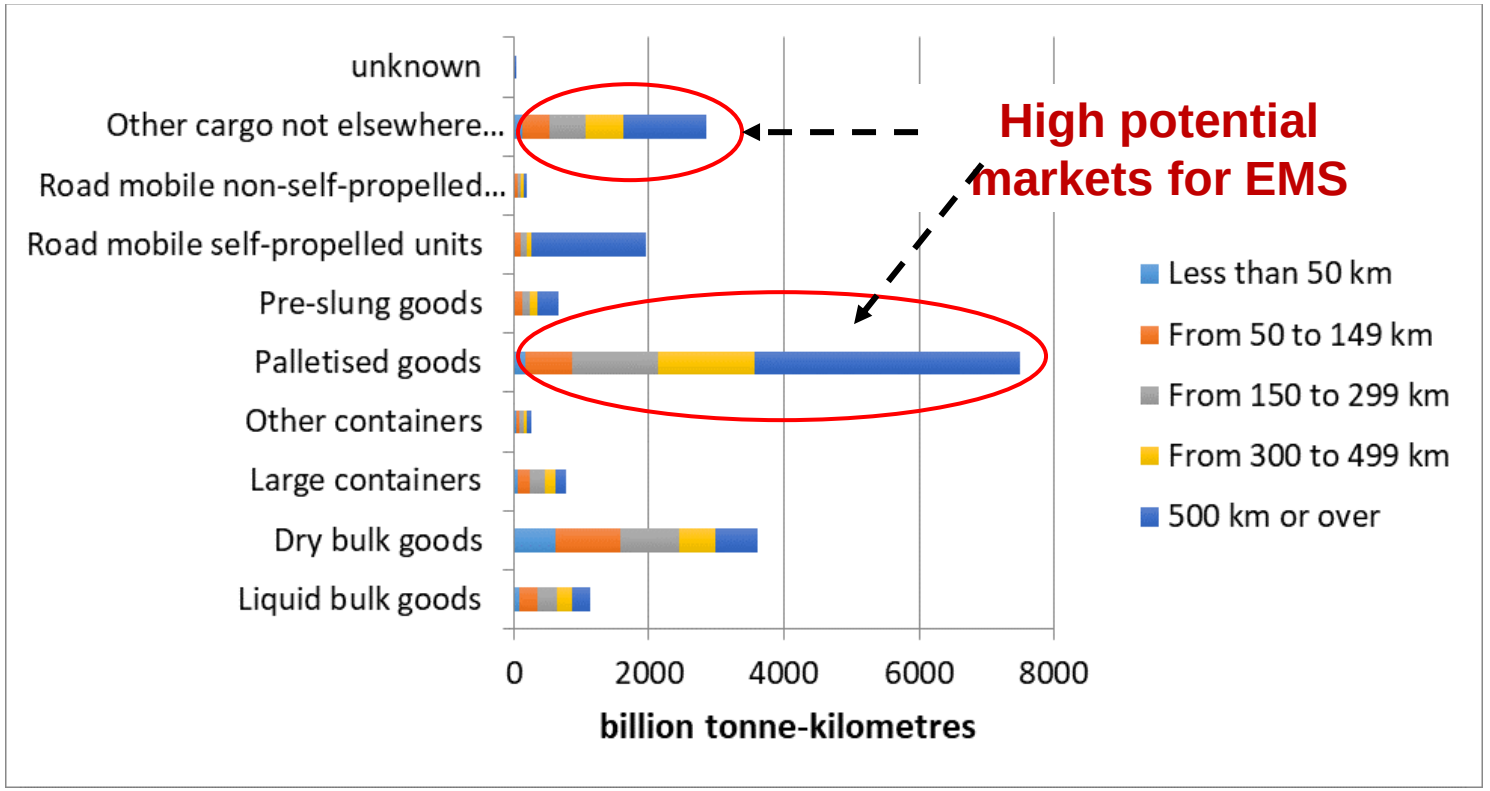
- **Average savings potentials** by EMS with maximum load (€/tkm, cost/tour or CO2/tour) show **high efficiency achievements** related to all 32 use cases (standard deviation in parentheses)

KPI	€/tkm	Cost/tour	CO_2/tour TTW
Maximum load; average savings for all use cases	-28.2% (16.4)	-28.1% (16.5)	-16.9% (14.4)

Impact – addressing growing freight transport market

- **Premises for sustainable use of EMS:**
- Addresses segments **with high transport performance**
- Addresses **growing cargo groups**
- **Limitation a reverse modal shift** from rail/IWW to road transport by **accompanying measures**
- Embedded in **CO2 reduction strategies** of manufacturing and logistics firms

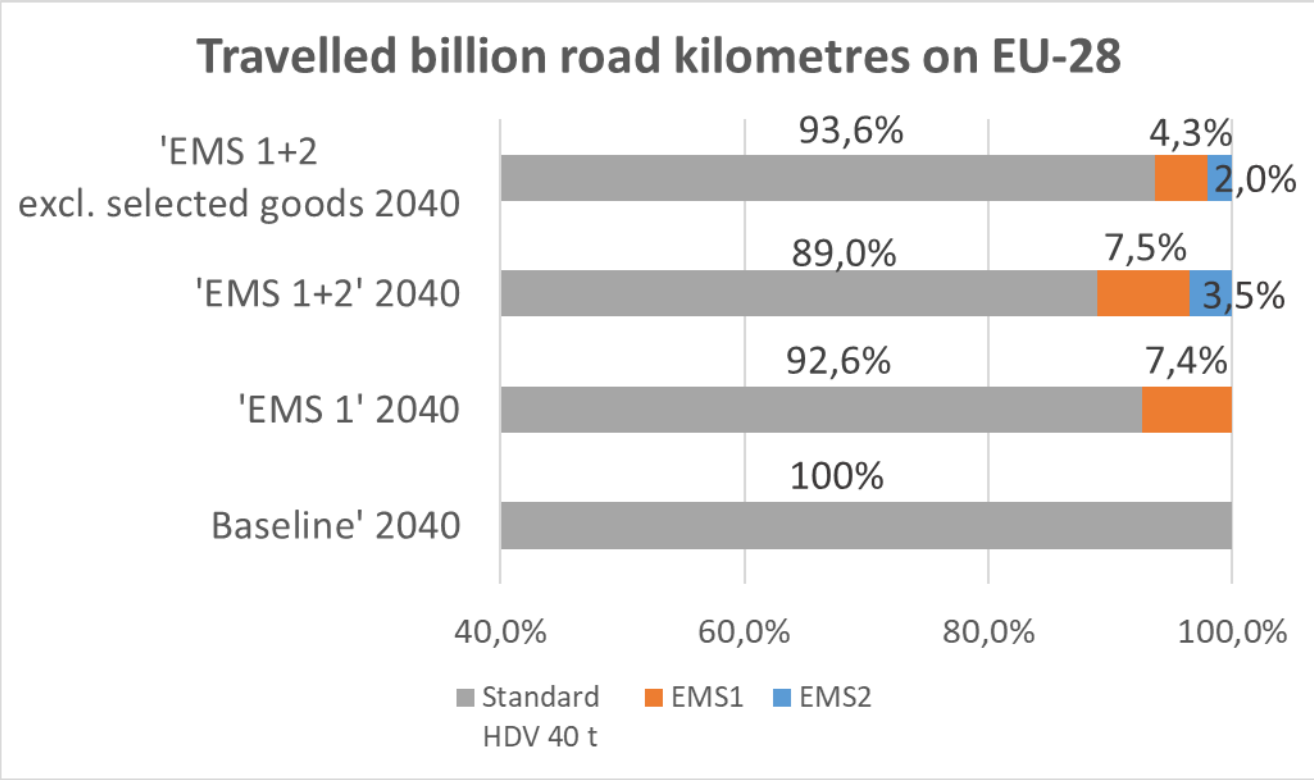
Structure of EU freight transport in 2016 (SCL - Type of cargo)



source: DLR; based on EUROSTAT 2017

Impact – on road vehicle mileage (modelling approach) market share EMS1 and EMS 2 in 2040

- Baseline: **increase of road mileage** between 2010 and 2040 of HDV (above 12 tons GCW) **by 61 %**
- EMS 1 could realize up to 7 % of mileage of HDV above 12 tons GCW
- EMS 2 could realize up to 3.5 % of mileage of HDV (above 12 tons GCW)

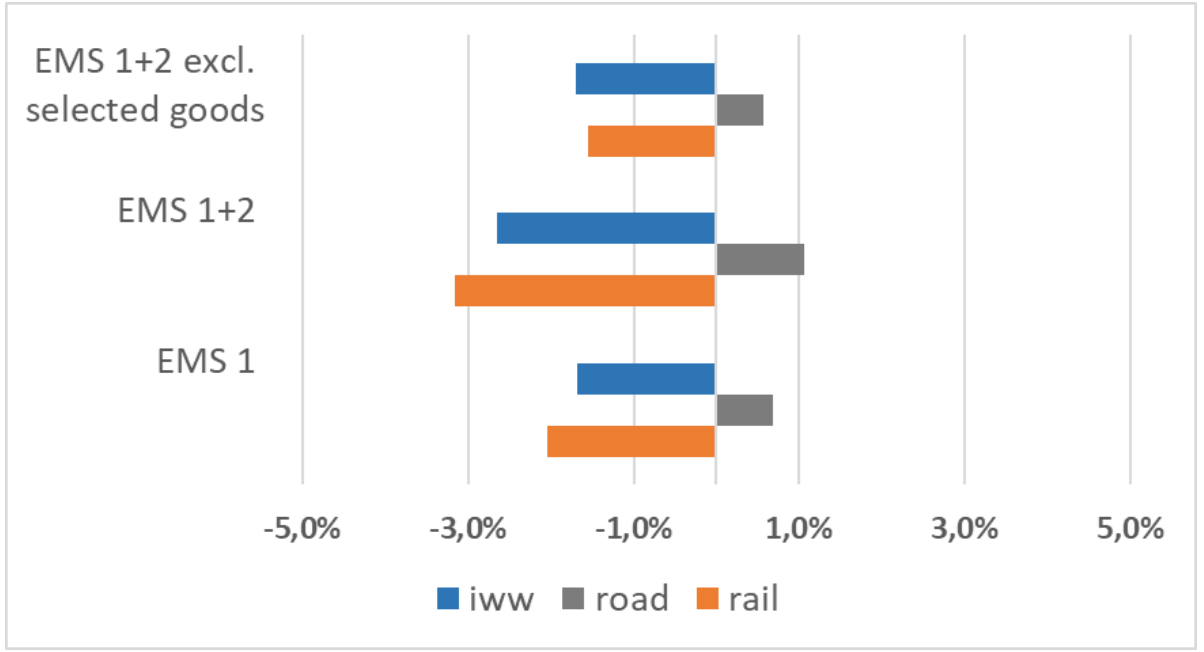


source: DLR; results of the model Demo-GV

Impact – modal split (modelling approach)

- Road freight transport performance increases; losses for rail and inland waterway transport
- **Not significant but an undesired effect!**
- Policy: Measures for a level playing field in EU freight transport

Relative impacts on modal shares



source: DLR; results of the model Demo-GV

Level playing field – electrification and intermodality

- High efficiency of EMS as an **enabler for Zero-Emission HDV**
- **Intermodal transport benefits:** more efficient pre- and post-haulage on road in intermodal transport chains due to higher efficiency in round trips

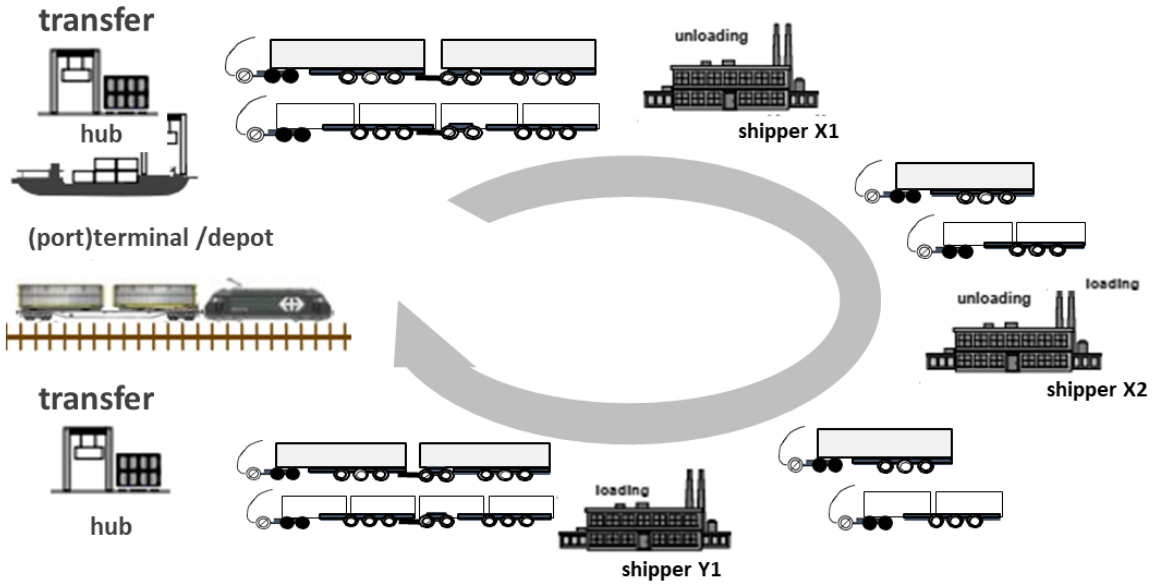


Figure:
EMS increases the **efficiency of pre- and post-haulage on road** in intermodal transport chains

EU Freight transport market: an impact analyses

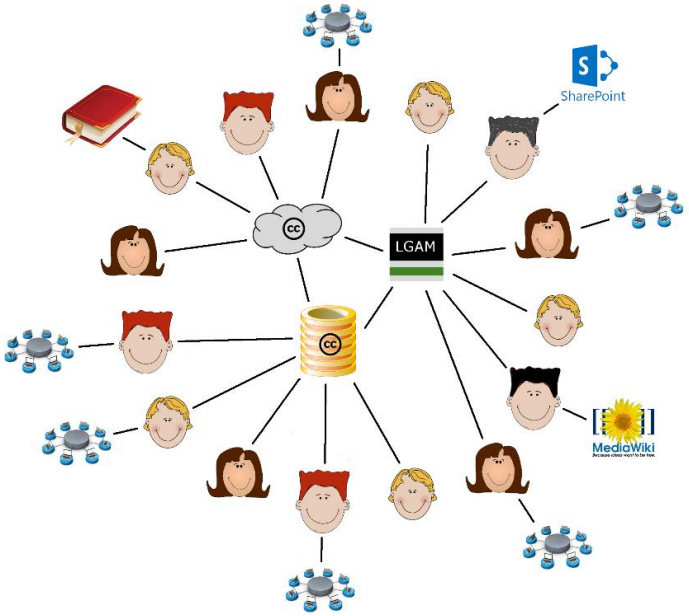
alice | Alliance for Logistics Innovation through Collaboration in Europe

Fernando Liesa
Secretary General ALICE

ALICE membership is bringing an holistic approach → All key logistics stakeholders represented!		
Type of Organization	**Members**	**EU/International Associations**
Shippers & Retail	P&G, L'ORÉAL, proximus, Atlas Copco, HOFER, COLRUYTGROUP, Unilever	ESC, cefic, ELUPEG, GS1
Logistics Service Providers, Courier and Postal operators & Freight Forwarders	Gebrüder Weiss, GEODIS, BORUSAN LOJİSTİK, FM LOGISTIC, Posteitaliane, sennder, GRUBER LOGISTICS, an post, ups, LINEAS, MULTILOG, CHEP, TRI VIZOR, CODOGNOTTO, Sesé	CLECAT, EALTH, ECG
Ports, Hubs, Intermodal terminals & Transport Infrastructure	Port of Rotterdam, INTERPORTO BOLOGNA, HUTCHISONPORTS ECT ROTTERDAM, Port de Barcelona, De Vlaamse Waterweg, TRAFIKVERKET, JLL, ECO SLC, Puerto de Algeciras, duisport	INE, EPORT, European IWT Platform
Transport and industry vehicles, packaging & material handling	VOLVO, SCANIA, TEVVA, PONERA, LOGIFRUIT, KION GROUP	eucar
Information and Communication Technologies & Consultancy	MARLO, SILENT SENSORS, algoWATT, URNet, PRODUCTBLOKS, URBAN RADAR, TRAXENS, RINA, NIXMOVE, DAC, VISMA, mosaictactor, LastMile, inlecom, HACON, PTV GROUP, TRANSPOREON	ERTICO, LEAN & GREEN
Regional & National Logistics Clusters & Associations	CLOSER, EffizienzCluster LogistikRuhr, AirCargoBelgium, Euralogistic, LIMOWA, CARA, logistop, CESMAD BOHEMIA, CPLS, POM	Smart Freight Centre
Research and technology Centers	Fraunhofer, KLU, ICOOR, ZLC, BIBA, LRQA, Newcastle University, Amsterdam University of Applied Sciences, TUDelft, TNO, XAMK, RISE, TU/e, UCA, howest, imec, cenit, ITENE, CATAPULT	ectri, ELA, European Logistics Association
European Technology Platforms /PPPs	WATERBORNE, ERRAC, ERTRAC, EFFRA, MANUFUTURE-EU	
Member States and innovation Funding*	Department for Transport, CDTI, Vlaanderen, bmvit, TÜBİTAK, TKI DINALOG, VINNOVA	

** Involved in ALICE Mirror Group*

The vision for ALICE organization

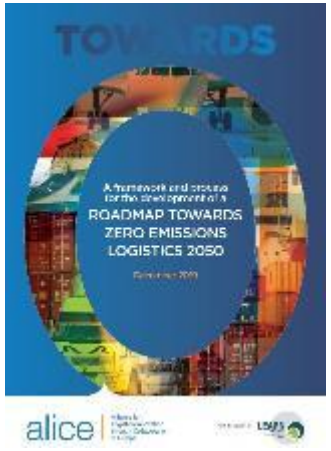


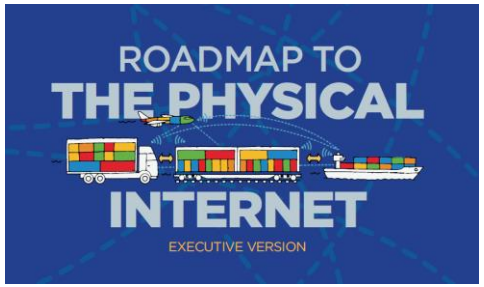
European leading companies and experts in
logistics and supply chain innovation

New concepts – knowledge management – collaboration-acceleration

The challenge: What can we do about it?

Challenges for decarbonization of regional and long-haul road freight transport





More focus needed!

Current focus

New vehicle & energy systems combined with logistics efficiency to make the transition affordable

Empty trips, low load factors (volume & weight), overloaded vs unused infrastructure, congestion…

AEROFLEX developed great potential and needed concepts/ technologies

AEROFLEX Innovations to make transport more efficient
- Distributed powertrain
- Smart Powered Dolly
- Active and passive aerodynamic devices

- Consolidation
- NMLU
- PUZZLE
- CARGOCAM
- Trailer2Train

Cost of Inefficiency vs Transition Cost

Will this be forever?

How will this evolve?

Some further reflections

- **We need to engage with freight transport and logistics companies to test these technologies in real operations – use cases and learn from them…**

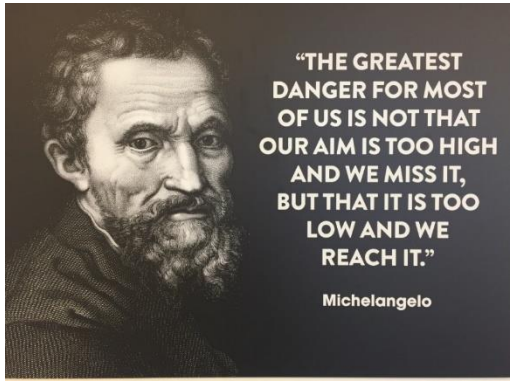
- **More focus on Palletised goods is needed: Intra-European road flows**
  - Which segments are the most inefficient? (empty kms/low load factors)

- **Impact may change from industry to industry and across regions**
  (e.g., if no intermodal options available). More granularity is needed to assess impact

- **It is worth to combine EMS systems with zero emissions technologies**
  - Efficiency gains used to transition assets not to reduce prices!
    To avoid reverse modal shift (i.e., AEROFLEX model) but having a positive impact.
  - Review Weight and Dimensions directive to allow innovations

- **Work on concrete use cases for which EMS can be truly integrated in intermodal operations even enable them.**

Thank you!



If you want to go fast, go alone If you want to go far, go together

The Best Way To Predict The Future Is To Create It!

Source: President Abraham Lincoln

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Front End Design for more survivability in crashes

Industry

Giuseppe Cordua,
passive safety simulation technology manager at CNH,
AEROFLEX leader front end design

Research

Ron Schindler, PhD student at the Division of Vehicle Safety in the Accident Prevention Group, Chalmers
AEROFLEX, leader accidentology study

Service and validation

Innovative Front-End Design for more Safety

Aim

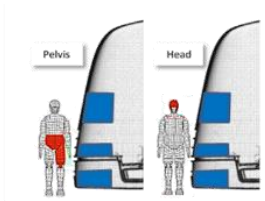
- To develop an innovative **safer truck front end**, in order to **reduce injuries** and fatalities
  Short term benefit → **up to 50%** fewer injuries and fatalities; Long-terms benefit → **zero fatalities** by 2050

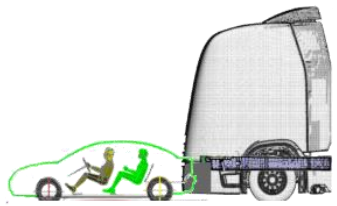
Objectives

- Evaluate **critical safety factors** and the causes of accidents
- Identify **active safety and passive safety solutions** to address accident scenarios
- Evaluate the **benefits** of new solutions
- Provide **recommendations** for updating current regulations

Approach

Detailed accidentology analysis





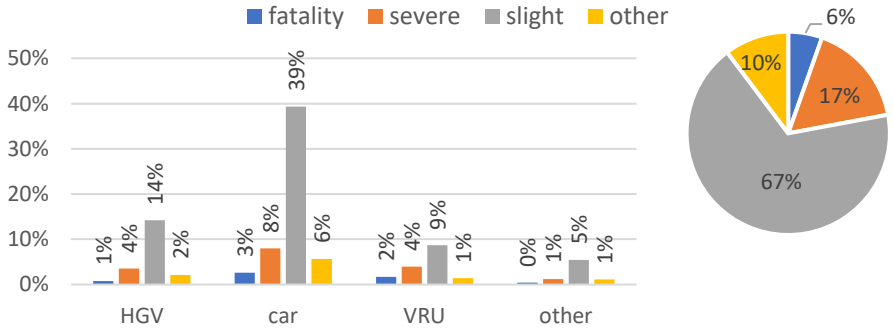
Evaluation scenarios

Definition active and passive safety solutions

Benefits analysis

Accidentology study outcomes

Injury distribution

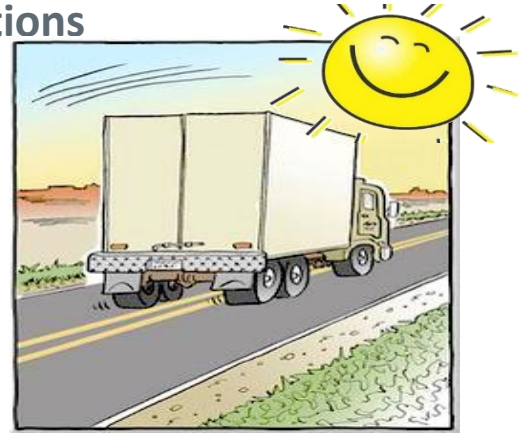


Accidents with at least one HGV involved

(Source: CARE EU27)

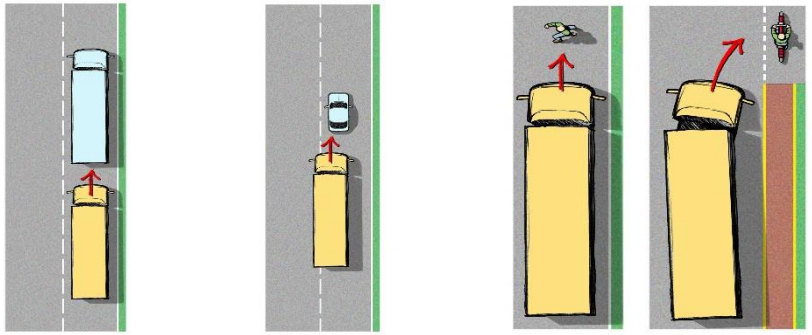
Environmental conditions

- Dry/clear weather (81%)
- During daylight (78%)
- Non-highway roads (77%)
- Dry road surface (72%)
- Rural areas (57%)



(Source: CARE EU27)

In-depth crash data



Truck vs Truck 23%

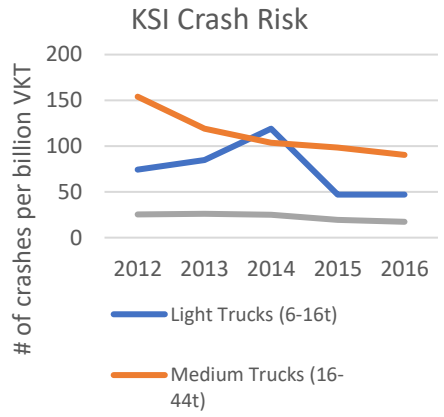
Truck vs Car 45%

Truck vs VRUs 14%

(Source: National crash data, GIDAS)

Effect of Mass on Safety

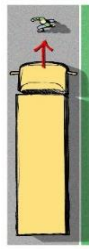
- Trucks above 44t don't have more serious crashes than below 44t.



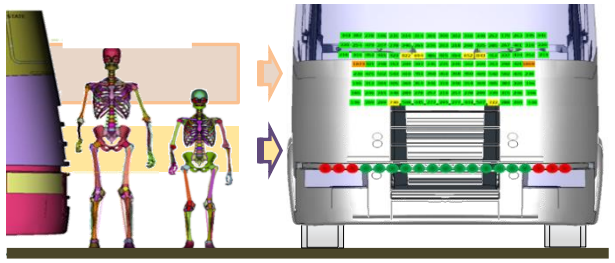
(Source: Sweden National crash data)

Front-end design - Passive safety

Aeroflex truck vs VRU

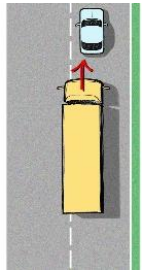


- Introducing soft materials and more space in the front-end allowed the adoption of specific design solutions to enhance VRU protection

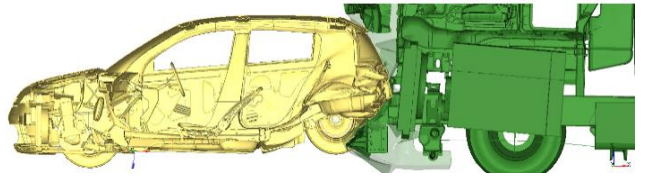


Aeroflex truck

Aeroflex truck vs car

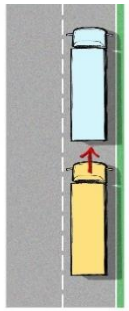


- Increasing space in the front-end significantly reduced intrusions in the opponent vehicle

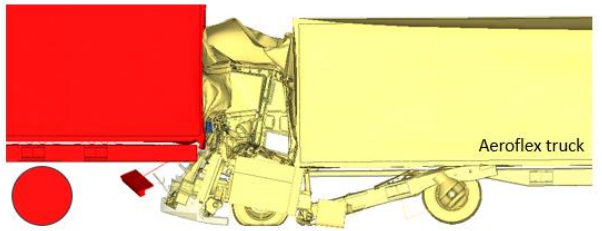


Aeroflex truck

Aeroflex truck vs trucks



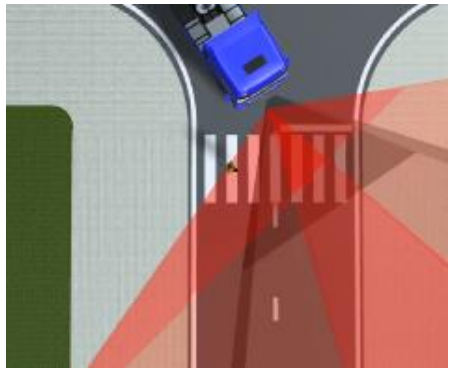
- Given the huge amount of crash energy that cannot be effectively absorbed this protection is addressed to active safety system



Front-end design - Active safety

- ADAS aimed to prevent or mitigate most of the common accident scenarios involving HGV +16t and other road users. Furthermore, ADAS provides enhanced protection to the truck occupants
- Three ADAS were virtually installed, configured and tested on the Aeroflex truck:

Automated Emergency braking (AEB)



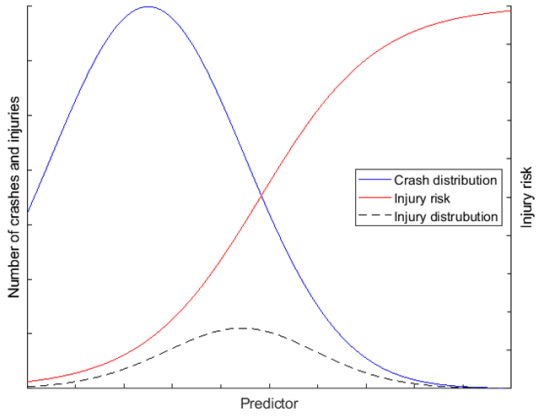
Side guard warning (SGW)

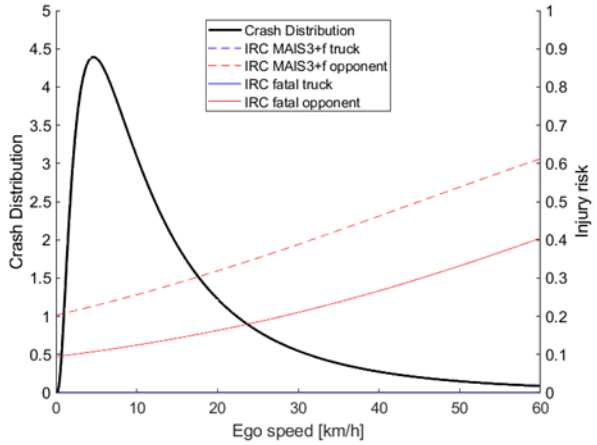
Line support system (LSS)

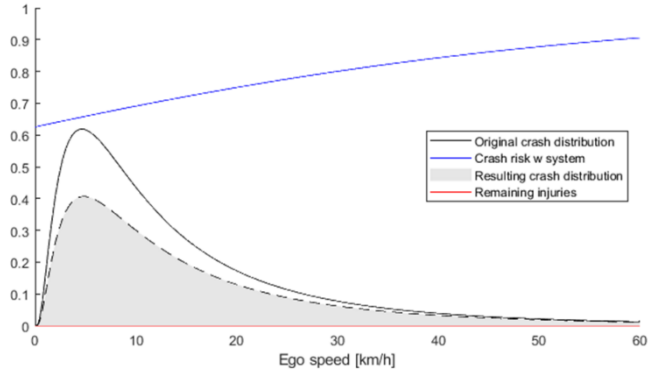
- Results were obtained by simulation for a high number of scenarios and test cases variants confirming a significant reduction of accident occurrence using ADAS systems
- Those results can be used as reference for Truck AEB and Blind Spot European WG

Benefit analysis

- Dose response model
  - Combination of crash distribution and injury risk to create injury distribution
  - Implementation of Active Safety Systems shifts the crash distribution
  - Scaling to European level

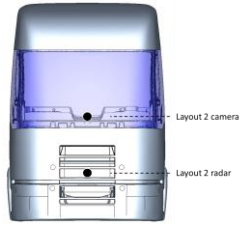
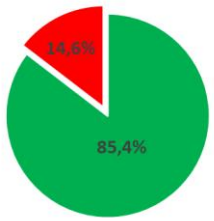
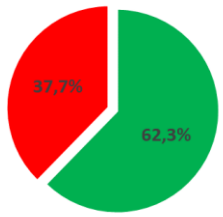
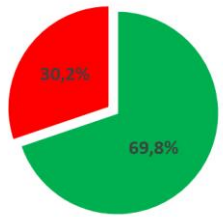
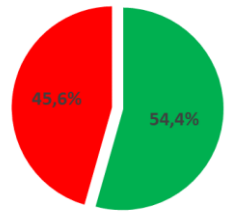
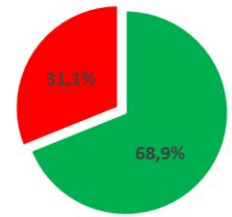
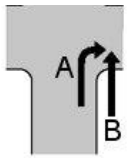
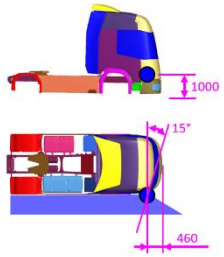
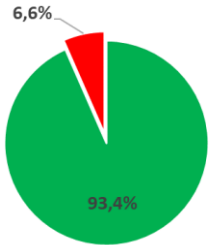
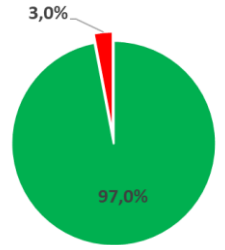
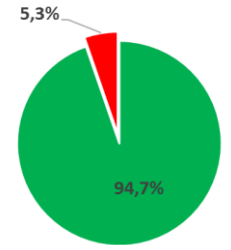
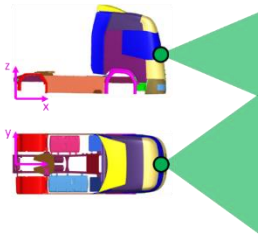
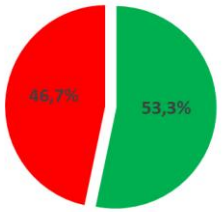
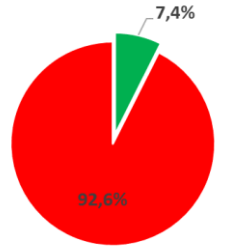
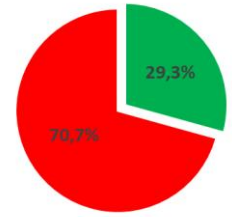






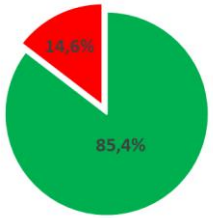
GIDAS
GERMAN IN-DEPTH ACCIDENT STUDY

Benefit results AS – best performing configurations

Scenario	System	Number of Crashes	Truck occupants: Severe injuries	Truck occupants: Fatalities	Crash opponents: Severe injuries	Crash opponents: Fatalities
	AEB						
	SGW						
	LSS						

Avoided Remaining

Assumptions / Limitations



Ideal sensor performance

100% market penetration

100% user acceptance

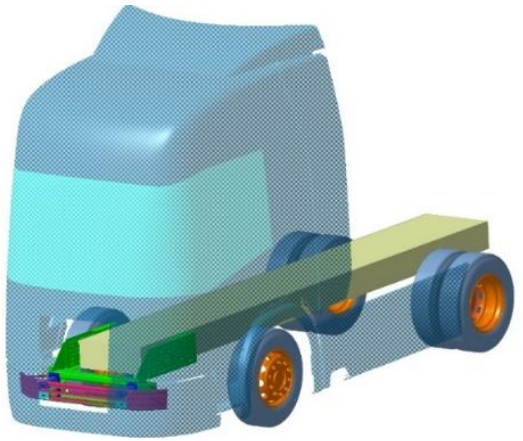
Ideal state

Presents a significant hurdle at this point

Combination of AS and PS improvements

Conclusions and opportunities

- The combination of safety measures, such as an elongated front-end design with specific passive and active safety systems, **provides optimal protection** in case of ‘truck vs truck’, ‘truck vs car’ and ‘truck vs VRU’ accident scenarios



- The AEROFLEX elongated front-end have some influence on several existing regulations like **UN29** (cab strength) **and UN93** (front underrun protective devices).

- Results from AEROFLEX WP5 would support **the creation of a consumer assessment program Euro NTAP,** similar to Euro NCAP for passenger cars, to motivate the introduction of active and passive safety measures in trucks and reduce its overrepresentation in fatal crashes

FOR SAFER TRUCKS
EURO NTAP

AEROFLEX

Thank you!

The AEROFLEX project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no 769658

Coffee break 14:40 – 15:00hr