AEROFLEX

Final event

MAN
DAF A PACCAR COMPANY
IVECO
SCANIA
VOLVO VOLVO GROUP
FCA FIAT CHRYSLER AUTOMOBILES CRF
UNIRESEARCH
SCHMITZ CARGOBULL The Trailer Company.
ECK
TIRSANSOLUTIONS
CREO DYNAMICS
MICHELIN A BETTER WAY FORWARD
CHALMERS UNIVERSITY OF TECHNOLOGY
DLR
Fraunhofer
HAN UNIVERSITY OF APPLIED SCIENCES School of Engineering and Automotive
Applus IDIADA
nlr
TRANSPORT & MOBILITY LEUVEN
TNO innovation for life
MHH Medizinische Hochschule Hannover
UIRR INTERNATIONAL UNION FOR ROAD-RAIL COMBINED TRANSPORT
ZF GROUP

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

Instructions Ride & Drive 12:00-13:00hf and 16:40-18:00hr

- Instructions Ride & Drive 12:00-13:00hr and 16:45-17:30hr
- Look at your voucher!

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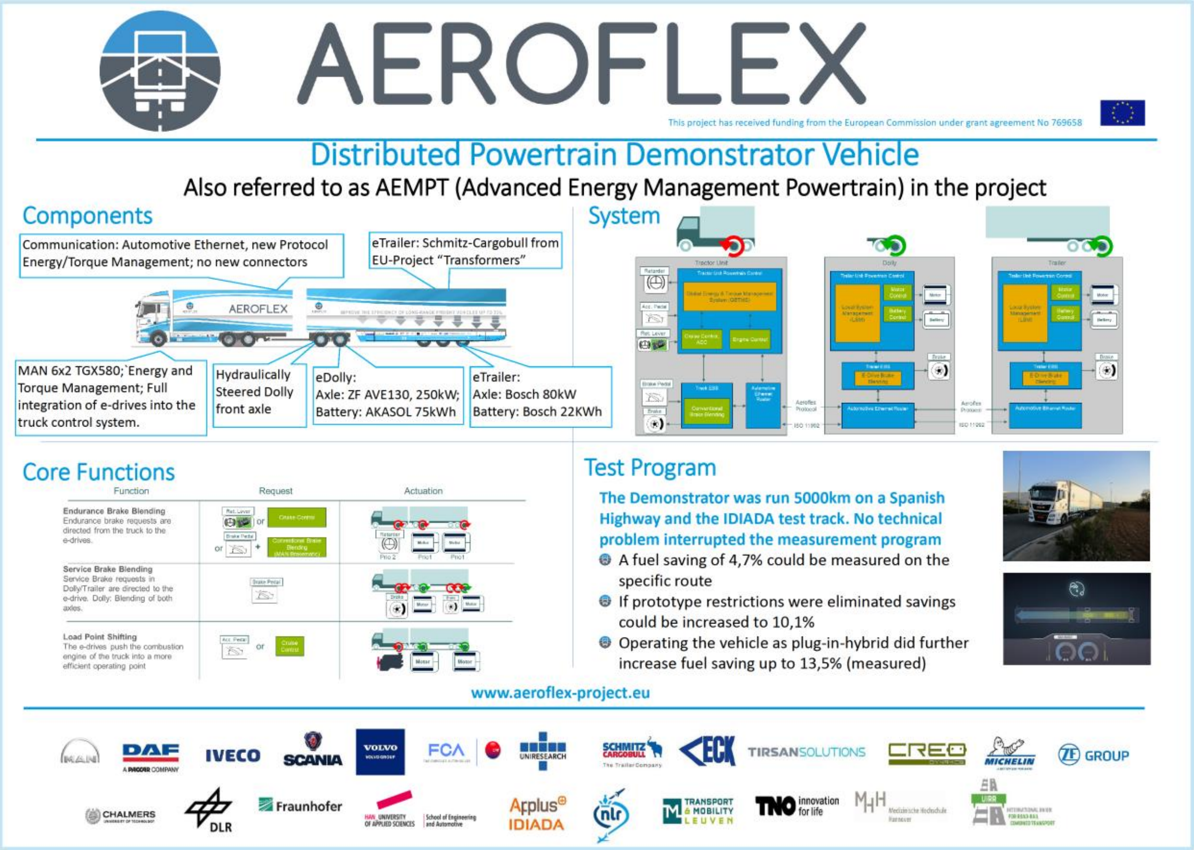
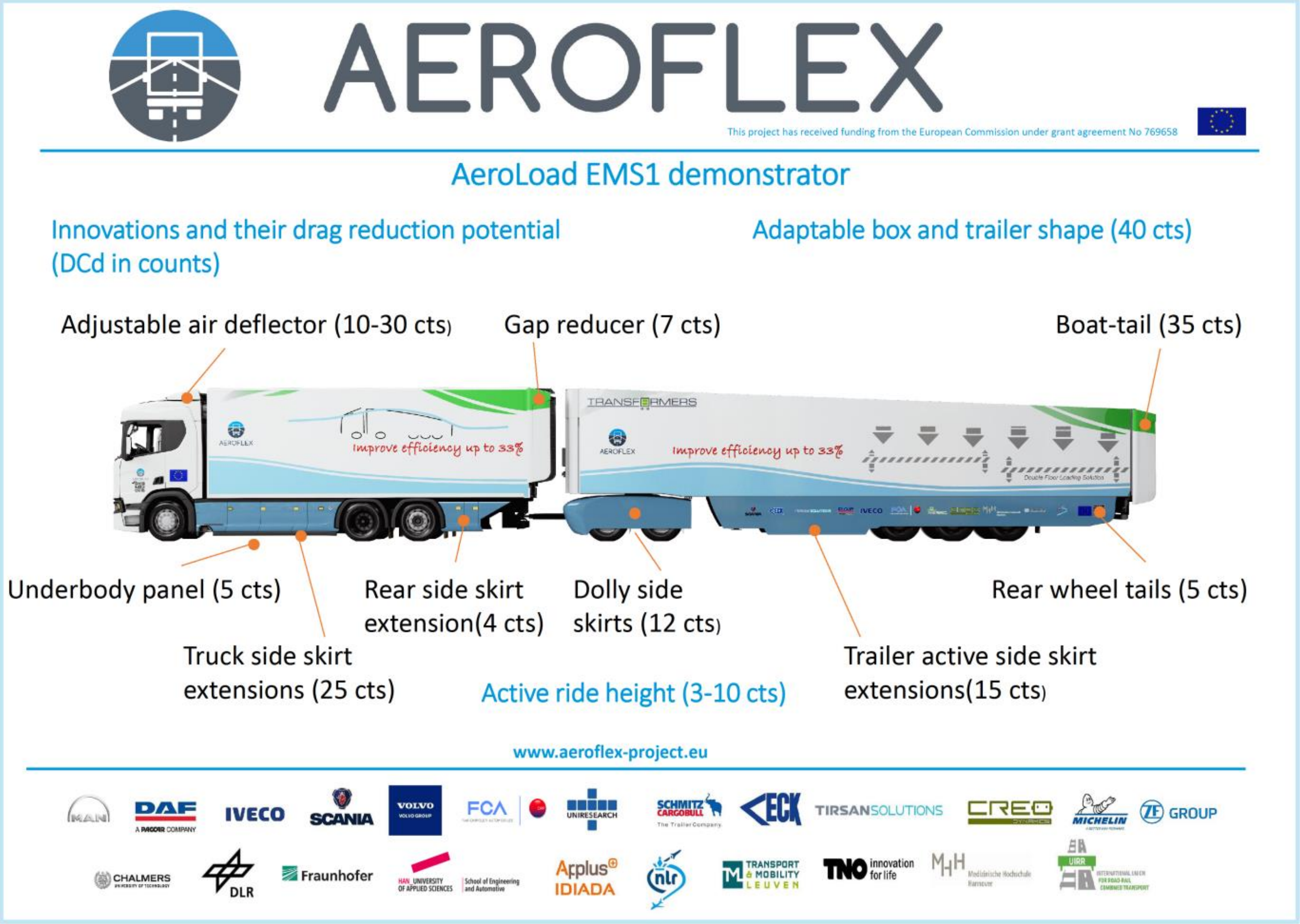
Poster AEMPT



Poster e-dolly

Poster aerodynamics



Windtunnel animation

Posters automotive ethernet communication

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Using Automotive Ethernet as backbone technology for future electrified and autonomous Truck Trailer Applications

Objectives

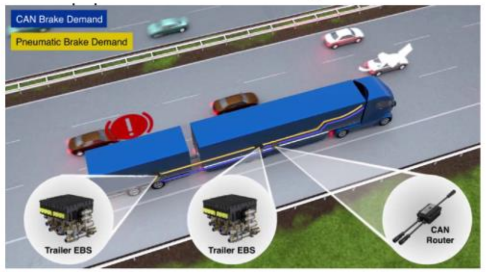
- Within AeroFlex the development of **new interface solutions for a safe communication between truck and trailers** with high bandwidth and flexibility for Advanced Energy Power-Train (AEMPT) and Aerodynamic control functions were requested.

Challenges

- The selected communication technology has to be **fast, flexible, reliable and extendable**
- The **control and monitoring of generic electric engines architectures** shall be possible
- **No additional plugs** shall be installed but **reuse of existing ISO plugs and cables** is preferred.
- **Legacy Support** for classic truck trailer combinations shall be given, no adapters wanted

State of the Art

- Since 1998 the **ISO 11992 CAN** based protocol family is commonly used in Europe. It **combines trucks and a maximum of up to 5 Trailers to build road trains**.
- ISO-CAN is over the years exploited and not promising to fulfill future application requirements where fast and time sensitive communication with high bandwidths are



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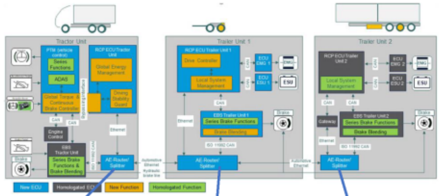
Using Automotive Ethernet as backbone technology for future electrified and autonomous Truck Trailer Applications

Approach

- Usage of **Automotive Ethernet technology (100 Mbit/s, OA BroadR Reach) on existing ISO CAN plugs and cables**
- Prototype is based on existing serial ISO CAN Router Repeater + AE module
- To support legacy CAN based vehicles, an **automated detection procedure** is implemented to **switch to Automotive Ethernet only when both vehicles supports this technology**.
- **New communication protocol draft** for control and monitoring of electrified engines

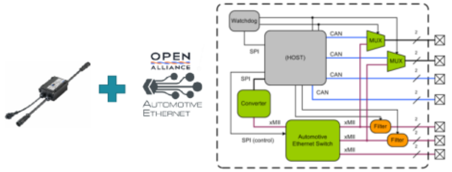


Results

- **Stable communication** with cable lengths < 20m (15m specified)
- Auto switching between CAN and Automotive Ethernet mode successful.
- Automotive Ethernet on ISO Cables does not fulfill EMC Requirements (Source: VDA FAT project)

Next steps

- Creation of **international standardisation proposal** (SAE/ISO) for Automotive Ethernet communication using 1Gbit/s on 40m (shielded twisted pair cables on additional connector) with suitable protocol.



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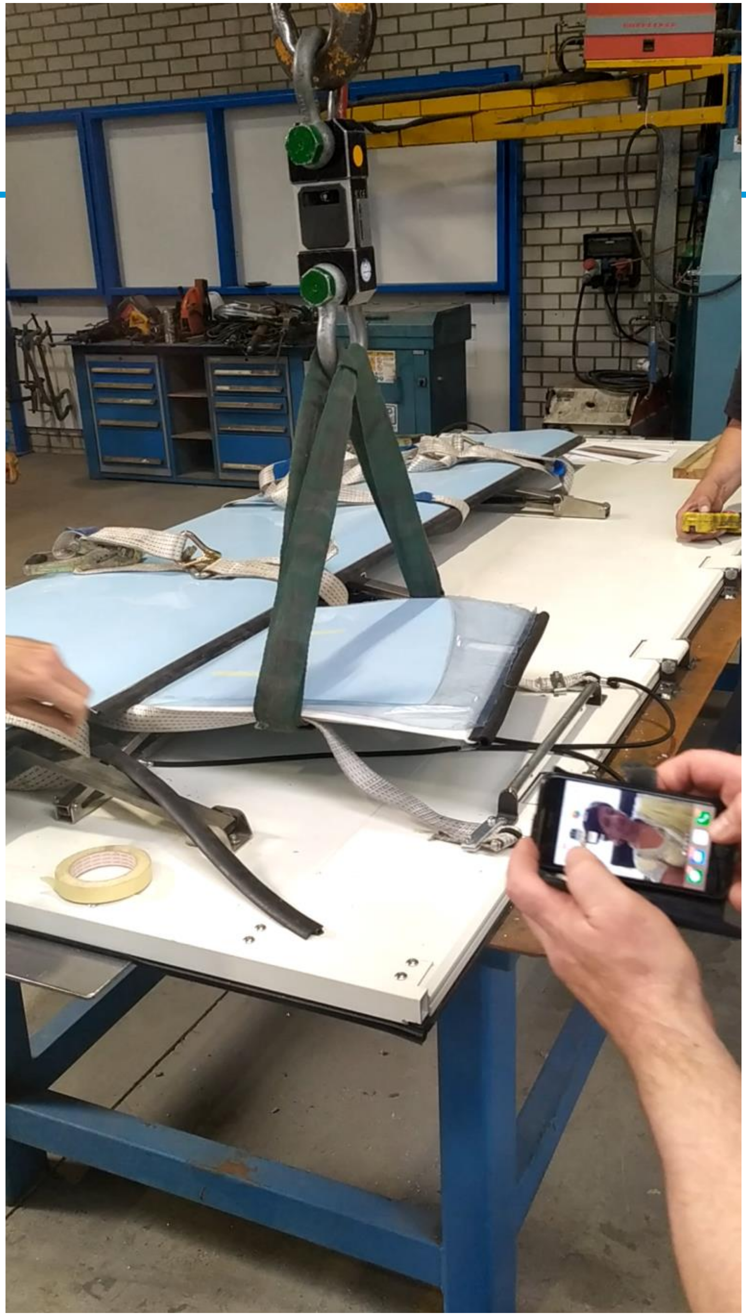
Posters Smart Loading Units

Film test of flaps



Posters Smart Loading Units

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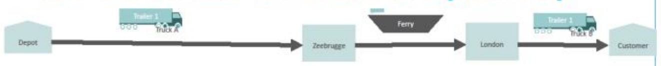
Customer use case – Germany – England – Germany intermodal

Use case:
Germany – England - Germany

- **automotive** parts from Germersheim (GER) to Milton Keynes (UK) by a Dutch logistics company.

The use case describes a typical **roundtrip delivery** from Germersheim to Milton Keynes

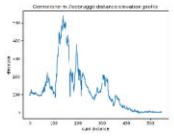
- **full truckload on outward journey**



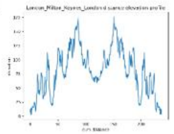
- **full truckload or empty collection and delivery on return journey**

Route profiles

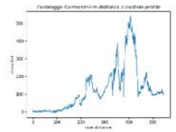
Truck A:
Germersheim- Zeebrugge



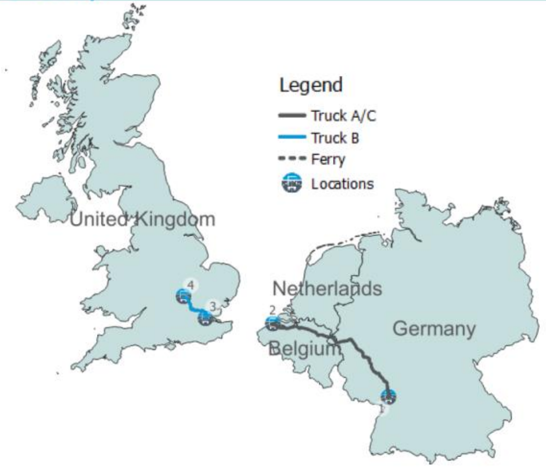
Truck B:
London – Milton Keynes – London



Truck C:
Zeebrugge – Germersheim



Route-Map



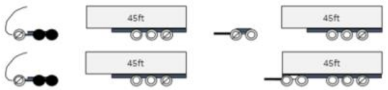
Prime candidates **Current combination**

1.3 TR4x2-ST3 (13.6m)

Possible **future combinations**

6.1 TR6x4-ST3-DY2-ST3 (2x45ft)

6.2 TR6x4-ST3-FT2+3 (2x45ft)



Prerequisites -

Freight

Product	Amount	loading unit	Weight [tonne]	Height [m]	length [m]	Width [m]	Load location	Unload location	Load time	Unload time
Automotive parts		Gitterbox	20.00		13		Germersheim (GER)	Milton Keynes (UK)	00:30	00:30
Automotive parts		Gitterbox	15.00		13		Milton Keynes (UK)	Germersheim(GER)	00:30	00:30

Routes

From	To	Ton	km	Travel time	Mod.	Trailer type	Truck/ driver
Germersheim (GER)	Zeebrugge (BEL)	20	544		Truck	Megatautliner	A
Zeebrugge (BEL)	London (UK)	20			Ferry	Megatautliner	-
London (UK)	Milton Keynes (UK)	20	118		Truck	Megatautliner	B
Milton Keynes (UK)	London (UK)	15	118		Truck	Megatautliner	B
London (UK)	Zeebrugge (BEL)	15			Ferry	Megatautliner	-
Zeebrugge (BEL)	Germersheim (GER)	15	544		Truck	Megatautliner	C

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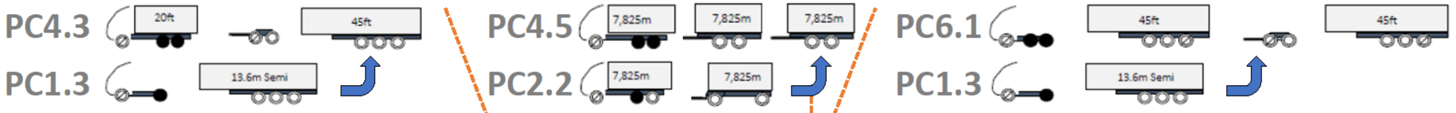
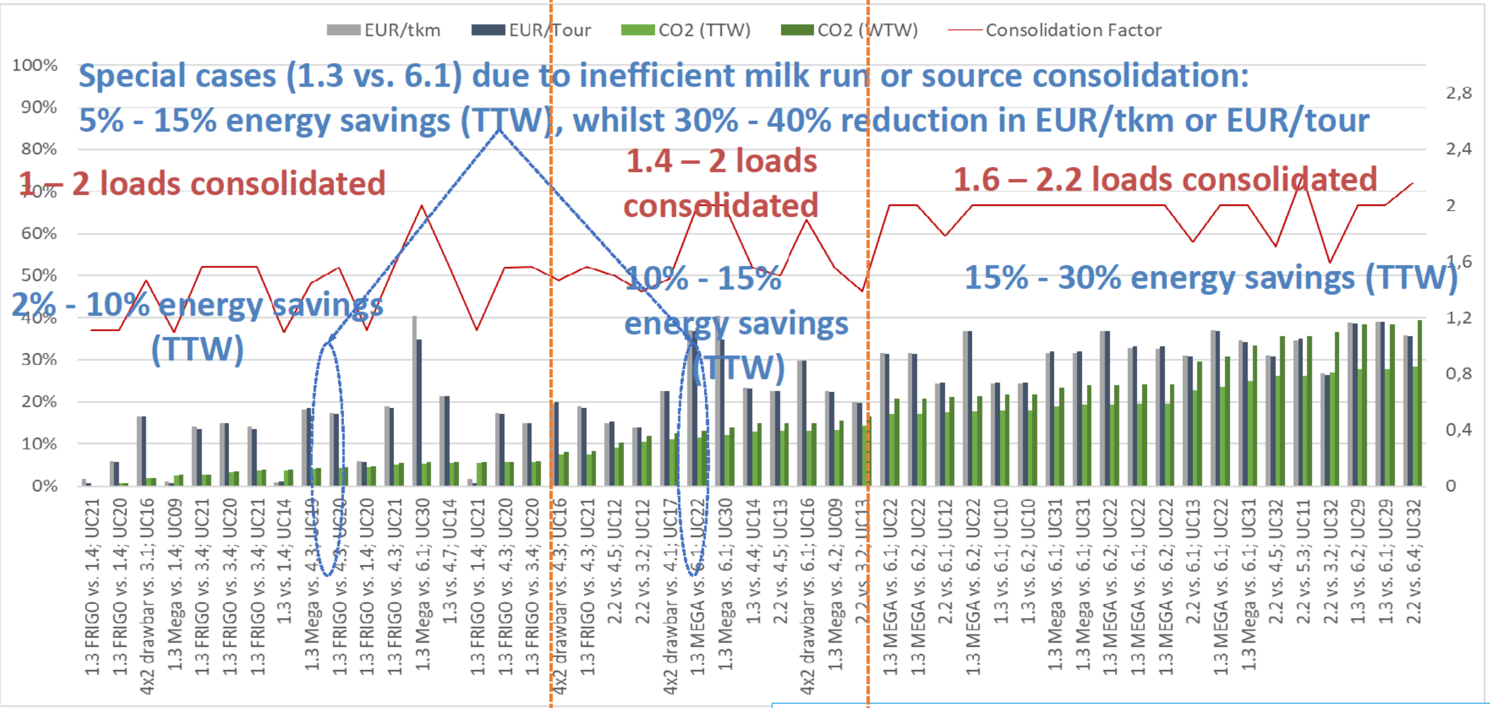
Results of use cases





source of data: expert interviews

- Impact – emission savings potentials up to 30% (TTW) due to load consolidation of up to 2.2 for use cases (see table above)
- Average savings potentials by EMS with maximum load (€/tkm, cost/tour or CO2e WTW) show high efficiency achievements related to all use cases (see table right)

- 53 % of the interviewees vote for t[…] following Prime Candidates (see ta[…] below)
- EMS 2 is the most preferred prime candidate (11.7 % of interviewees)

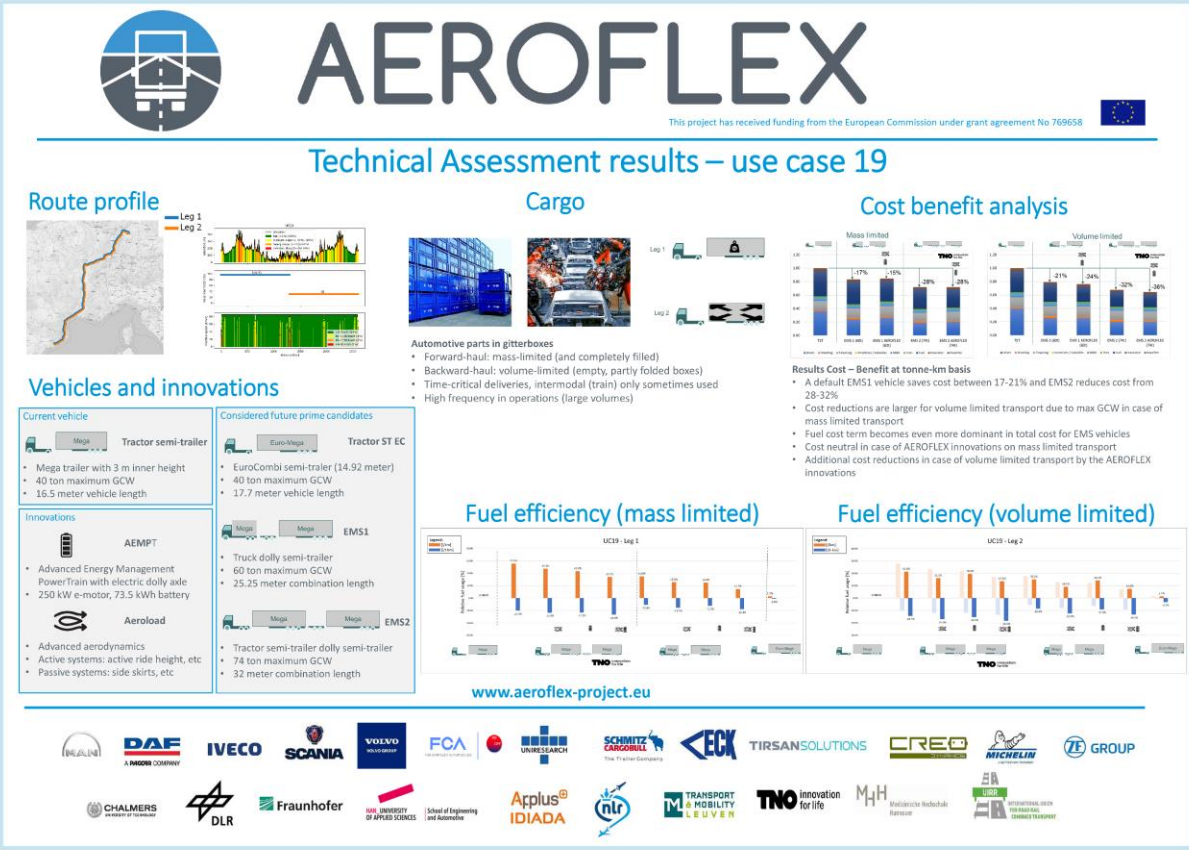
No.	Prime Candidate	Share of
6.1		11.7
2.1		9.7 %
3.1		9.7 %
1.4		9.3 %
2.2		6.6 %
4.7		6,2 %
1.3		10.1

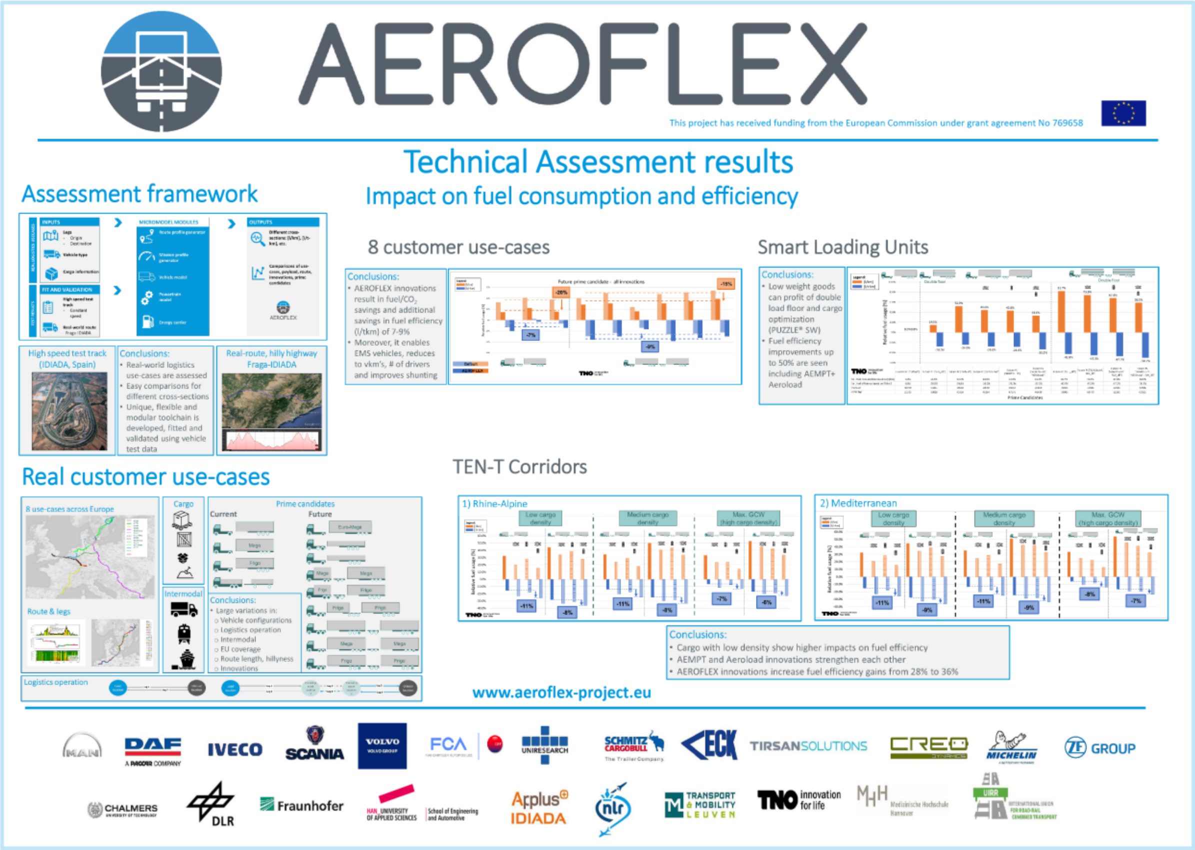
source of data: expert interviews

KPI	€/tkm	Cost/tour	CO
standard average load	18.7% (10.9)	19.0% (11.2)	2 (
maximum load; average savings for all use cases	-28.2% (16.4)	-28.1% (16.5)	-1 (

source of data: expert interviews

Posters assessment use cases

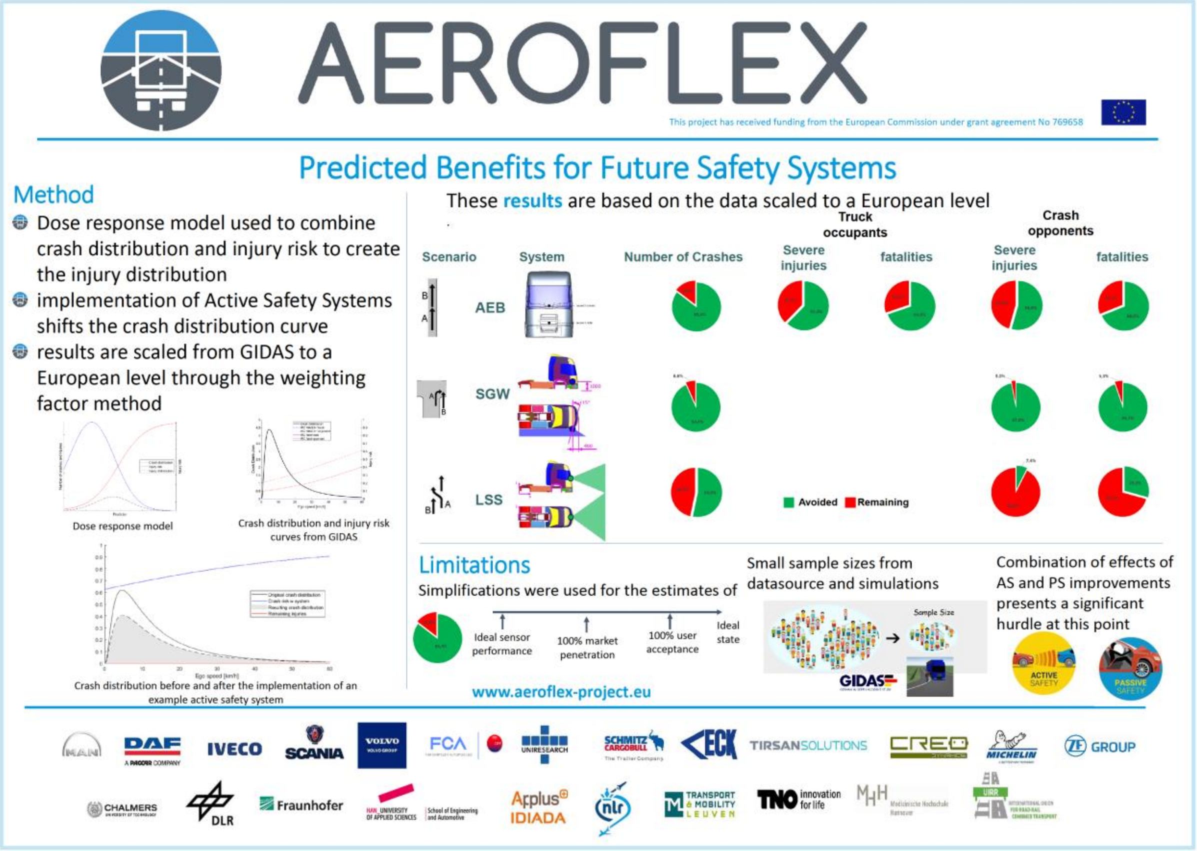


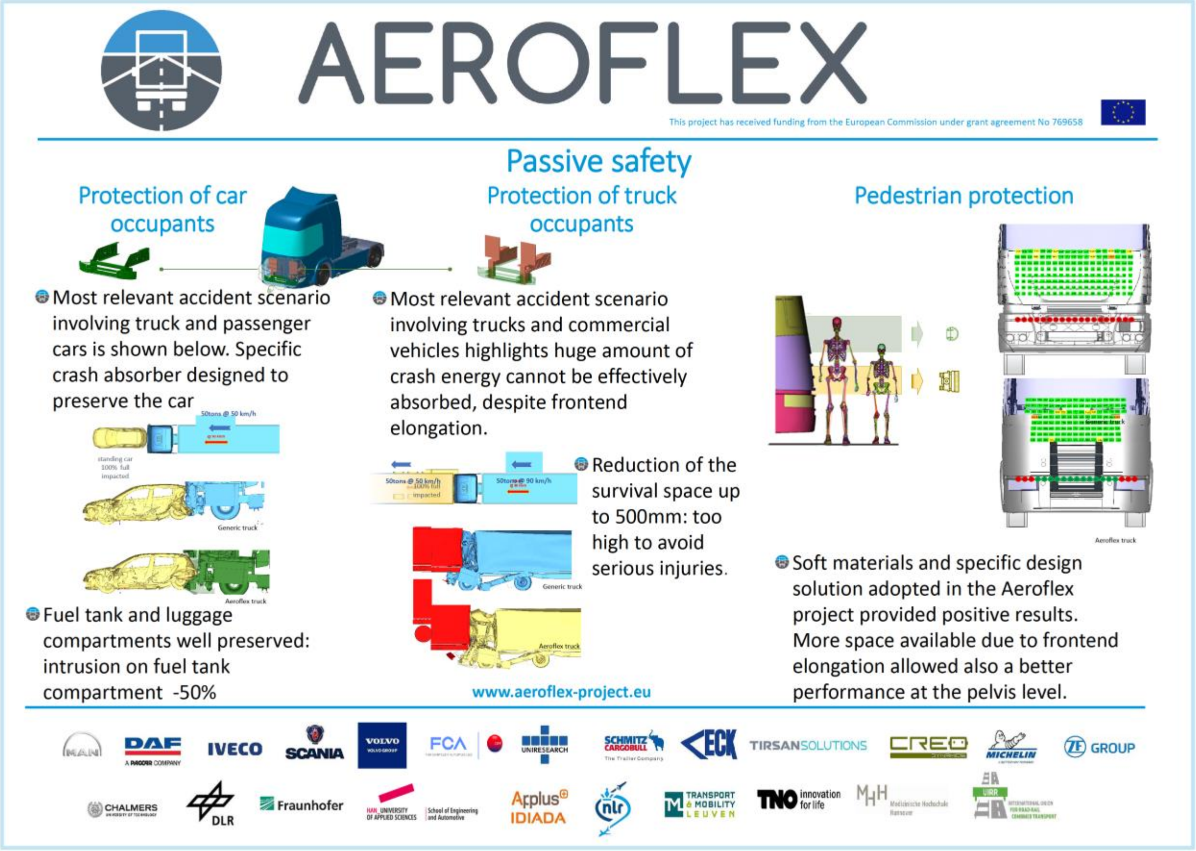


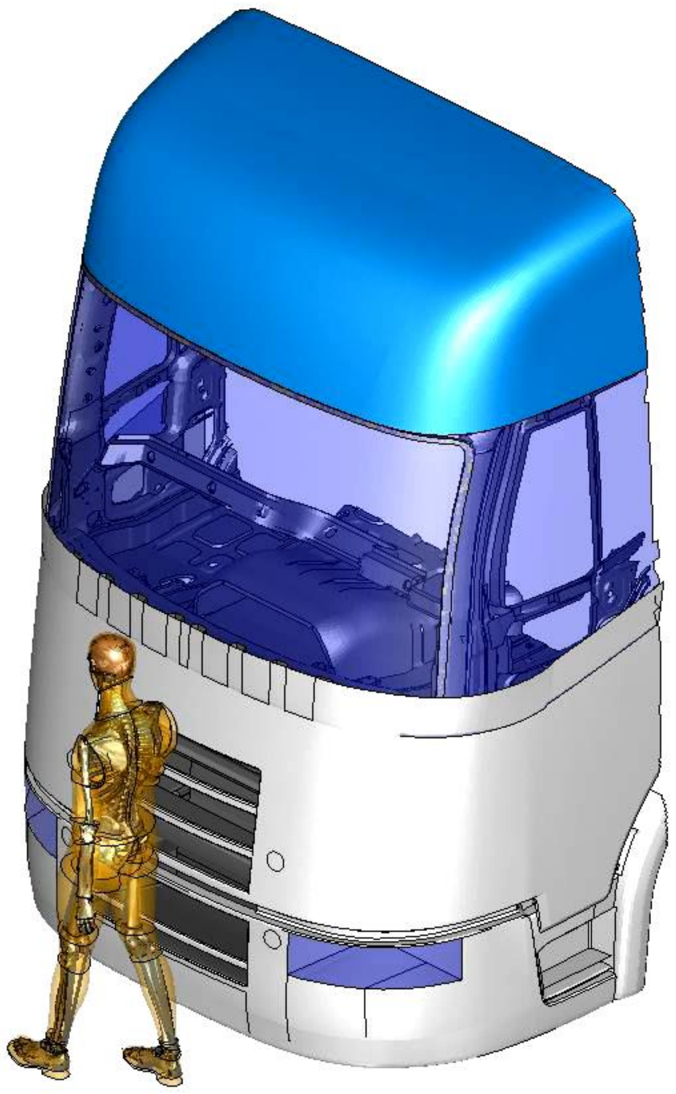
AEROFLEX – FINAL EVENT

28.09.2021

Posters safety







Poster safety

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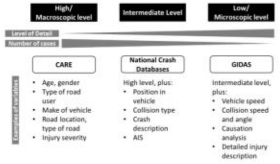
Safety Issues for Safety System Development

Background

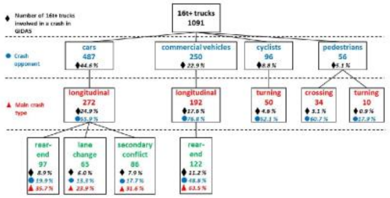
- In 2015, more than 1 million crashes happened on European roads out of which 24,000 resulted in fatalities.
- Heavy goods vehicles (HGV) were involved in 4.5% of all crashes and 14.2% of fatal crashes, indicating an over-representation of HGV involvement in fatal crashes.
- The basis for the design of active and passive safety systems is identification of target scenarios and an understanding of the influencing factors.



Overview of databases used for analysis

Method

- Identifying relevant crash scenarios comprises a three-level analysis of:
  - Community Database on Accidents
  - on the Roads in Europe (CARE)
  - National crash databases from Sweden, Spain and Italy
  - German In-Depth Accident Study (GIDAS)



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Results

- Most crashes involving HGVs in EU-28 occur in dry and clear weather conditions (81%), daylight (78%), on roads that are not highways (77%), on roads with a dry surface (72%) and additionally, the majority of crashes occur in rural areas (57%). The following most frequent and critical crash scenarios for HGVs were identified:
  - Scenario 1: rear-end crashes with cars and commercial vehicles as collision partners.
  - Scenario 2: conflicts between a HGV that is turning to the right and a cyclist that is travelling alongside with the intention to go straight.
  - Scenario 3: conflicts between pedestrians crossing the road and HGVs.

Poster scenario 2040

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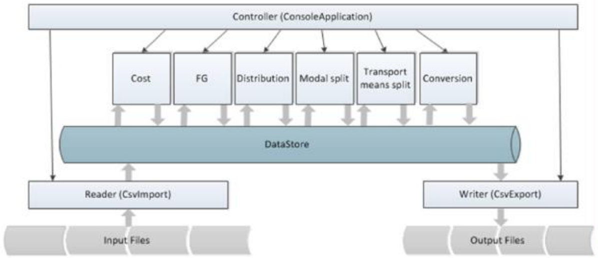
Scenario projection by freight modell DEMO-GV

Simulation of the impact of EMS 1/2 bases at **macroscopic freight model 'DEMO-GV',** NST-2007 commodity classes and continental/maritime combined transport (CT) separately

- 'DEMO-GV' includes c. **431 German and 170 foreign, European traffic cells**
- **4-step simulation:**
  - I. freight generation
  - II. distribution
  - III. modal split on three modes: rail, road, inland waterways (IWW)
  - IV. mean split on road: truck-types, corresponding to gross value mass (GVM)



Baseline scenario in 2040 (without EMS1 and EMS2

Implementation of EMS1 only without any restrictions

Implementation of EMS1 and EMS2 without any restrictions

No EMS1 and EMS2 for 'selected commodities': avoiding heavy cargo (e.g. bulk) will be shifted from rail to road

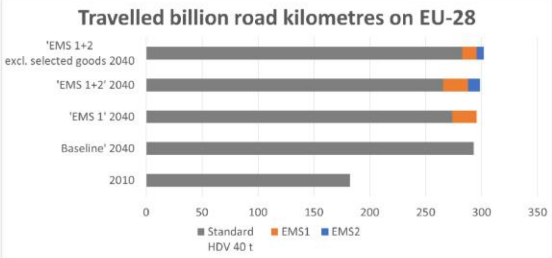
Assessment of EMS in relation to baseline: modal split and CO_2 emissions

Output data for each origin-destination-relation:

- modal split in tons [t]
- transport in ton-kilometres [tkm]
- travelled kilometres on road, each truck-type [km]

Important parameters for scenarios are transportation cost:

- fixed costs [€/vehicle]
- time costs [€/h]
- distance costs [€/km]
- toll costs on road [€/toll-km]



- Baseline: increase of road mileage between 2010 and 2040 of HDV (above 12 t GCW) by 61 %
- EMS 1 realizes up to 7 % of mileage of HDV above 12 t GCW
- EMS 2 realizes up to 5.5 % of mileage of HDV (above 12 t)

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