Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

EUROPEAN COMMISSION
Horizon 2020 | GV-09-2017 | Aerodynamic and Flexible Trucks
GA - 769658

Deliverable No.	AEROFLEX D1.1	
Deliverable Title	Transport market and its drivers with respect to new vehicle concepts	
Deliverable Date	30-04-2018	
Deliverable Type	REPORT	
Dissemination level	Public	
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Status	FINAL	2018-04-30

Publishable Executive Summary

The mission of the AEROFLEX project is to support vehicle manufacturers and the logistics industry to become prepared for future challenges in road transport. The main objective of the AEROFLEX project is to develop and demonstrate new technologies, concepts and architectures for complete vehicles that are energy-efficient, safe, comfortable, configurable and cost-effective. Work package 1 contributes to the overall project objective by describing the needs of the European logistics market in order to enable a vehicle development in line with the market requirements. The present report represents deliverable 1.1. The objectives of this deliverable are:

- to describe the European transport market
- to describe trends and market drivers in logistics
- to describe variables which influences actor's modal choice in freight transport
- to derive first recommendations regarding use cases coming from the market analysis.

The results of the deliverable 1.1 are used in other work packages to support the selection of use cases. A first stakeholder workshop has shown that it is difficult to translate the requirements of the logistics service providers directly into technical details of new vehicle concepts. Therefore it wasn't possible to define primary candidates immediately and solely based on the input that was given by the FALCON project.

Instead, the results are based on the one hand on the analysis of literature and reports of European projects like TRANSFORMERS, FALCON or ALICE. On the other hand a first workshop with stakeholders (e.g. logistics service providers, shippers) have been conducted and analysed regarding user needs and requirements. The results and requirements are compiled as follows.

Increase of efficiency for freight transport

First of all, the improvement of efficiency is one important driver of European freight transport market. Co-modality and synchromodality are key elements to improve the efficiency. Freight transport should be organized by the consideration of the strength and weaknesses of the transport modes that are relevant to fulfil the requirements of the shipper that are defined by lead and transport time, weight and volume of the order /the shipment and further specific costumer and good related characteristics. The transport by only one transport mode could be the most efficient way in case the strength of this mode fulfil the given constraints, e.g. to carry goods due to time constraints, direct link between origin and destination without detours, availability of infrastructure and specialised equipment, sum of working time. Furthermore, it is necessary to fulfil the costumer related expectations regarding transport costs.

The available European data shows that in terms of tonne-kilometres, about 80 % of all freight transport is realised on long haul. Freight transport services up to 150 km are also relevant for new vehicle concepts in combination with smart loading units in order to support more efficient transport services at the interface between long and short distance transports e.g. in terminals and hubs. From the perspective of tonne-kilometres, new vehicle concepts could address all goods classes and not only selected ones due to the objective to develop a configurable and cost-efficient vehicle concept that is not dedicated for only some commodities.

Vehicle concepts should be developed for low density goods, long transport distances and high revenue logistics segments

New vehicle concepts should address good classes with high transport performance measured in tonne-kilometres (e.g. food products, beverages and tobacco, agricultural products) in combination with long transport distances. Furthermore, the potential revenues in logistics segments (e.g. Contract Logistics, full and less than truck load with palletized goods and Courier/Express/Parcel) should be considered. These segments should be addressed, because the balance between market size, expected revenues and small order sizes expect a high demand for advanced vehicle concepts using modular loading units. Finally, it is recommended to realize an optimum trade-off between payloads and transport volumes in order to maximize the use of the loading capacities.

Fast and frequent road transport between hubs and industrial sites become important

Due to the increasing amount of courier/parcel/express cargo and general cargo, hub and spoke concepts are increasingly used to consolidate the shipments and thus, to increase transport efficiency. Therefore, a promising

and growing segment for new truck concepts can be identified in transports between hubs (e.g. terminals, ports, huge warehouses) as well as between industrial sites and hubs. Here, it is essential that loading units can be optimally manoeuvred and placed at the gateways in cross-docking stations or in warehouses, even if there is a limited infrastructure conditions. Further, the organisation of a fast exchange of loading units between different vehicles or between transport modes is important.

New vehicle concepts have to be compatible with the existing infrastructure

Infrastructure conditions and constraints of the existing road infrastructure – road, bridges, yards, driveways, roundabouts, parking areas and docks – are key issues for new vehicle concepts. Currently, most parking areas and docks are not suitable for long commercial vehicles. The new vehicle concepts should be compatible with the existing road infrastructure to avoid an extensive enhancement of the European road infrastructure or sophisticated technical solutions supporting manoeuvring in confined spaces on motorways and inter-urban roads.

Platooning, autonomous driving and the digitalization of logistics processes are relevant trends

The digitalization of logistics processes supporting the driver, simplifying vehicle routing and route planning, and enabling the monitoring (e.g. smart loading units) of the whole transport chain is ongoing. Based on these digital opportunities, new transport services and processes are expected to emerge. Further approaches (in particular platooning and automated driving) reduce the stress for the driver and may contribute to a reduction of transport costs. However, they require sensors, communication technology and energy supply within the vehicle.

Further trends with an effect on the transport and the vehicle are seen in:

- Dematerialisation, i.e. the amount of materials used in products might be reduced.
- 3D-printing technology will be developed, i.e. personalised, small scale local production in regional production sizes or for spare parts retailing.
- Postponement of final product assembly, i.e. local assembly close to the consumer, leading to the transport of intermediate products (parts and components) rather than final products, with the potential to reduce the amount of space required for transport.
- Transport of Intermediary goods instead of final products is increasing and may enable a higher packaging efficiency and higher density of goods in the loading unit. This may help to meet volume restrictions.

Use Cases should represent the European transport market

The AEROFLEX project develops an innovative vehicle concept for a major percentage of the European transport market, which shall simultaneously contribute to an efficient overall freight transport system. The use cases considered in the AEROFLEX should meet the requirements of significant sub-markets in the current transport market in Europe. Based on the analyses we conducted, the uses cases should:

- include own account transports as well as transports conducted by own company and conducted by third parties (e.g. by logistics service providers)
- offer the possibility to use intermodal transport chains in cases of long transport distances
- address preferably logistics segments with high expected demand for advanced vehicle concepts like Contract Logistics, full and less than truck load with palletized goods and Courier/Express/Parcel, food products, beverages and tobacco
- address transports that are mainly conducted on motorway and inter-urban roads today.

It is not sufficient to identify and validate primary candidates only based on literature analyses and aggregated European transport and logistics data. Instead, is additionally necessary to get more information in direct contact with stakeholders and potential users of new vehicle concepts. Thus, further stakeholder workshops will be conducted within the Work Package 1. The results will be described in the deliverable 1.2.

Abbreviation

AEROFLEX	Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport
bn	Billion
B2B	Business to Business
B2C	Business to Costumer
CO_2	Carbon dioxide
CSG	Complete Sounding Group
EMS	Engine Management System
EU	European Union
ft	feet
FTL	Full Truck Load
GHG	Greenhouse Gas
HCV	Heavy commercial vehicles
ICE	Internal Combustion Engine
ITF	International Transport Forum at the Organisation for Economic Co-operation and Development (OECD)
KPI	Key Performance Indicator
LHCV	Long heavy commercial vehicles
LTL	Less than Full Truck Load
LSP	Logistics service provider
NST 2007	Standard goods classification for transport statistics (see Appendix B)
OEM	Original Equipment Manufacturers
PRCG	Policy Regulatory Consolidation Group
TAA	Technical Assessment Assembly
TEN-T	Trans-European Transport Network
tkm	tonne-kilometres
WIM	Weight-In-Motion; Data basis of Weight-In-Motion measurement devices
WP	Work Package

8 Acknowledgement

The author(s) would like to thank the partners in the project for their valuable comments on previous drafts and for performing the review.

Project partners:

#	Partner	Partner Full Name
1	MAN	MAN TRUCK & BUS AG
2	DAF	DAF Trucks NV
3	IVECO	IVECO S.p.A
4	SCANIA	SCANIA CV AB
5	VOLVO	VOLVO TECHNOLOGY AB
6	CRF	CENTRO RICERCHE FIAT SCPA
7	UNR	UNIRESEARCH BV
8	SCB	SCHMITZ CARGOBULL AG
9	VEG	VAN ECK BEESD BV
10	TIRSAN	TIRSAN TREYLER SANAYI VE TICARET A.S.
11	CREO	CREO DYNAMICS AB
12	MICH	MANUFACTURE FRANCAISE DES PNEUMATIQUES MICHELIN
13	WABCO	WABCO Europe BVBA-SPRL
14	CHALM	CHALMERS TEKNISKA HOEGSKOLA AB
15	DLR	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV
16	FHG	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
17	HAN	STICHTING HOGESCHOOL VAN ARNHEM ENNIJMEGEN HAN
18	IDIADA	IDIADA AUTOMOTIVE TECHNOLOGY SA
19	NLR	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM
20	TML	TRANSPORT & MOBILITY LEUVEN NV
21	TNO	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
22	MHH	MEDIZINISCHE HOCHSCHULE HANNOVER
23	UIRR	UNION INTERNATIONALE DES SOCIETES DE TRANSPORT COMBINE RAIL-ROUTE SCRL
24	WABCO-NL	WABCO AUTOMOTIVE BV
25	WABCO-DE	WABCO GMBH

This project has received funding from the European Union's Horizon2020 research and innovation programme under Grant Agreement no. **769658**.