

Contact

Dr.-Ing. Stefan Deutsche
deutsche@ika.rwth-aachen.de
Phone: +49 241 80 25630

Institut für Kraftfahrzeuge
RWTH Aachen University
Steinbachstr. 7
52074 Aachen, Germany



KONVOI - DEVELOPMENT AND EXAMINATION OF THE APPLICATION OF ELECTRONICALLY COUPLED TRUCK CONVOYS ON HIGHWAYS

An economy's efficiency is strongly connected with the transportation performance of the available traffic systems. Therefore mobility and traffic are the basic requirements of a modern society and important elements of everyday life. According to different studies an increase of the individual passenger traffic of 20% and in truck transport of 60% (based on 1997) until 2015 is expected, where Transit traffic (increasing to 108%) is having its share.

Railway and inland navigation will not be able to compensate this increase so that the biggest part of the expected additional traffic volume will have to be covered by truck transportation. This will have common consequences like for example the possible increase of accident rates, the increase of noise and pollutant emissions and more traffic jams. In future much stress will be laid on the reduction of the negative effects of the increasing motor vehicle traffic. In this context the concept of so called truck convoys, where the electronic coupling of trucks in short distances is accomplished with the help of advanced driver assistance systems (ADAS), it is expected that such systems will relieve the driver and result in more traffic safety. Due to short distances between the trucks the road will be used to better capacity. In the previous European projects PROMOTE CHAUFFEUR I and II savings in fuel consumption of up to 17% were achieved for vehicles in line due to slipstream.

The KONVOI-Project aims at realizing and analyzing the use of electronically regulated truck convoys on the road. Among other things the effects on traffic should be examined with the help of virtual test drives in the RWTH truck driving simulator and real test drives with the use of five experimental vehicles. Some effects have already been elaborated theoretically in the previous projects EFAS (Einsatzszenarien für FAS im Güterverkehr) and MFG (Vorbereitende Maßnahmen für den praktischen Einsatz von Fahrerassistenzsystemen im Güterverkehr) as well as in the European research projects PROMOTE CHAUFFEUR I/II. To implement truck convoys on the road the product specification that has been defined within the scope of MFG has to be taken into consideration. The legal aspects of this realization are based on the results of the projects EFAS, MFG and Response and they will be further developed concerning the commercial use of truck convoys in Germany (for further information see www.fahrerassistenzsysteme.de).

Within the KONVOI project five experimental vehicles will be provided with the necessary information, vehicle and automation technology to allow the build up of short as well as long truck convoys on highways under real traffic conditions. Hence, the experimental vehicles within this project will be provided among others with actuators for intervention in steering, drive train, brake, environmental sensors for object detection in near and far range as well as

equipment for the inter-vehicle-communication (IVC) and a man-machine-interfaces (MMI) for the system's handling.

Further on, a common controller (longitudinal and lateral control) for the automated convoy will be developed and available to all project partners for the following use. The project's aim is not only the testing of the experimental vehicle on the test track but also the evaluation of the new traffic system "truck convoy" on highways with surrounding traffic and the commercial use of such systems in forwarding agencies under realistic conditions.

For this purpose the requirement for the implementation on the basis of the performance specification of the project MFG will be drawn up in the first place. To manage the high complexity of the tasks and to guarantee the system's reliability, the development will be carried out with the help of well known simulation tools (MATLAB® / SIMULINK®, PELOPS and truck driving simulator). This allows the development process to be accelerated parallel to the construction of the experimental vehicles. Even before the experimental vehicle test, a high state of maturity results for software algorithms (e.g. for longitudinal and lateral control).

Besides the technical construction of the experimental vehicles, the project's aim is to examine the drivers' work load and acceptance by means of driving tests in the simulator. In the whole development process the security analysis of the complete system is an integrated part to guarantee the system's stability and it's reliability in the commercial operation.

After proving the system's safety and after the clarification of insurance aspects, a special authorization should be conferred in cooperation with the Bezirksregierung Köln and the BMVBW to allow the testing of the experimental vehicles on highways. The use of the vehicles in commercial operations of the participating forwarding agencies should follow up the successful testing. During the transaction of the commercial transfer order, measuring data will be collected to analyze the automation technology (longitudinal and lateral control), course of traffic, traffic safety, profitability as well as the drivers' acceptance and stress.

The potential of convoys in truck transport should be pointed out by an extensive estimation of the technologies consequences and the technical assessment. In this context the legal part (authorization procedures, changes in law) will be taken into consideration besides human beings (driver, user acceptance, forwarding agency, road users), the organization (operation, profitability, transport economics, benefit) and technology (information, vehicle and automation technology, security).

Finally launch szenarios should be developed on the basis of the impact analysis and the estimation of the technologies consequences to show possible launching strategies for electronic convoys in truck transportation.

Besides the industrial partners the KONVOI consortium consists of institutes of the RWTH Aachen University and logistics companies and it is supported by public authorities and vocational schools.

This project is promoted by the "Bundesministerium für Bildung und Forschung".

