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A COMPARISON OF TRUCK DRIVER SAFETY BETWEEN THE EU AND THE USA

Summary. Road transportation is playing an important role in almost all freight movements and contributes to the economy. It has the highest share in the modal division of transported goods. This situation is not about to change in the coming years. Therefore, it is necessary to change the current situation and modify rules and regulations, which could lead to a decrease in the number of accidents in either the EU or the USA. This paper identifies and compares different safety measures, rules and regulations governing the safety of truck transport in the EU and the USA. The number of accidents is a good safety indicator. Finally, suggestions for improvements in terms of truck drivers' safety in the EU and the USA are proposed.

Keywords: road truck transportation, accident rates, rules and regulations, safety systems, suggestions for improvement

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1. INTRODUCTION

Road transportation is playing a prominent role in the continuous health and growth of Europe's economy. Billions of tons of goods are transported on all road networks by big and heavy trucks. Freight forwarders and logistics companies, which specialize in freight transportation, focus mostly on customer satisfaction and the quality of the services they provide. People expect their goods to be delivered from door to door as quickly as possible and always on time. This makes truck transportation the only possible mode to meet the demand for such high levels of efficiency and mobility. Trucking is an essential part of an international trade because it plays, at least, a small part in almost all freight moves. This situation is not about to change despite increasing investment in other modes of transportation [1].

The situation in the USA is similar, since the trucking industry is crucial to the modern US economy. The combination of local and intercity trucking dominates expenditure for freight transportation services in the USA and this dominance has grown over time. The trucking industry had increased its revenue share to 84.3% of the total amount spent on all modes of freight transportation in the USA [2].

2. ACCIDENTS IN ROAD FREIGHT TRANSPORTATION

The relatively low level of fatalities in rail, sea and air transport accidents, in either the EU or the USA stands in sharp contrast to the number of road fatalities that occur every year. Major progress has, however, been made in road safety, with a noticeable yearly decrease in road fatalities throughout recent years. The main aspect of road safety measures has been implemented in order to lower the number of deaths in subsequent years. Numerous initiatives by the European Commission are underway, for example, to raise awareness and make trucks technically safer. The number of accidents is a good safety indicator [3].

Road traffic safety refers to methods and measures for reducing the risk of a person using the road network being killed or seriously injured. Road traffic crashes are one of the world's largest public health and injury prevention problems. The problem is all the more acute because the victims are overwhelmingly healthy prior to their crashes. According to the World Health Organization, about 1.24 million people die each year as a result of road traffic crashes [4].

A road traffic accident, also known as a traffic collision or a motor vehicle collision, takes place when a vehicle collides with another vehicle, pedestrian, animal or other stationary obstruction, such as a tree or utility pole. Such an accident may have many different results. Few of them are injury, death, vehicle damage and property damage. This chapter provides the comparison of road traffic accidents involving fatalities and injuries. These comparisons will be made between the EU and the USA, and Slovakia and Texas, so as to provide a good overview of the truck accident situation in these four areas.

Road accidents are caused mainly by humans when they neglect or refuse to follow laid down rules, signs and regulations concerning the use of roads. Smeed's law is an empirical rule relating traffic fatalities to traffic congestion as measured by proxy according to motor vehicle registrations and country population. Smeed interpreted his law as a law of human nature. The number of deaths is determined mainly by psychological factors, which are independent of material circumstances. People will drive recklessly until the number of deaths

reaches the maximum they can tolerate. When the number exceeds that limit, they drive more carefully [5]. This law provides a good example of how people think while driving.

A study by Rumar (1985), using crash reports from the UK and the USA as data, found that 57% of crashes were due solely to driver factors, 27% were due to combined roadway and driver factors, 6% were due to combined vehicle and driver factors, 3% were due solely to roadway factors, 3% were due to combined roadway, driver and vehicle factors, 2% were due solely to vehicle factors and 1% were due to combined roadway and vehicle factors.

Human factors in vehicle collisions include all factors related to drivers and other road users, which may contribute to a collision. Examples of such factors include driver behaviour, visual and auditory acuity, decision-making ability and reaction time. Driver impairment describes factors preventing drivers from driving at their normal level of skill. Common impairments are, for example, alcohol, physical impairments (such as poor eyesight), age, fatigue (sleep deprivation), drug use and distractions, such as conversations and operating a mobile phone while driving. Road design is crucial for safe driving. Research has shown that careful design and maintenance, with well-designed intersections, road surfaces, visibility and traffic control devices can result in significant reduction in accident rates. The last factor is vehicle design and maintenance. A well-designed and well-maintained vehicle, with good brakes, tyres and well-adjusted suspension would be more controllable in an emergency and, therefore, be better equipped to avoid collisions. Seat belts and centre of gravity are also very important parts of this category [6].

One approach to understand accident severity is to investigate the relative frequency of accident severity. This concept can be visualized as a pyramid, in which fatal accidents stand at the top of such a pyramid. These accidents are relatively rare. At the base of the pyramid are traffic conflicts, such as interactions between road users, which do not result in an accident. The levels in-between consist of accidents resulting in severe and slight injuries, as well as accidents that only result in property damage [7].

In this section, some comparisons of accidents involving trucks will be made based on two severity categories: fatal accidents and accidents involving serious injuries. Fatal injuries include all the victims who die within 30 days of an accident as a result of injuries sustained.

The highest number of accidents occurs in the US. Figure 1 shows the number of fatal accidents per 1,000 registered heavy trucks. The worst situation is by far in Texas, caused by a high number of accidents and a low number of vehicles registered in the US state. The best situation during this period was in the EU with as low as 0.013 fatal accidents per 1,000 registered vehicles. Rates have a downwards trend in the EU, including Slovakia. On the other hand, accident rates in the USA, including Texas, rose from 2009 to 2012.

Injuries are not always correctly classified by severity in police accident reports. Definitions of injuries are often not clear and there is no standardization, whether in the EU or the USA. Long-term impacts of traffic injuries are poorly documented. There are reasons to believe that the number of people living with lasting impairments as a result of a traffic injury is likely to be increasing [8].

Since the number of fatal accidents is almost seven times higher in the USA than in the EU, one can expect the same ratio in relation to injury accidents. In reality, the difference in injury accidents is not as big as in fatal ones. The main concern of EU authorities is to reduce the number of all road accidents to a minimum throughout the EU. After the implementation of new road safety policies, the expected decrease in road fatalities and injuries is noticeable for 2011. In the USA, the situation is much worse since the number increases each year by a big margin.

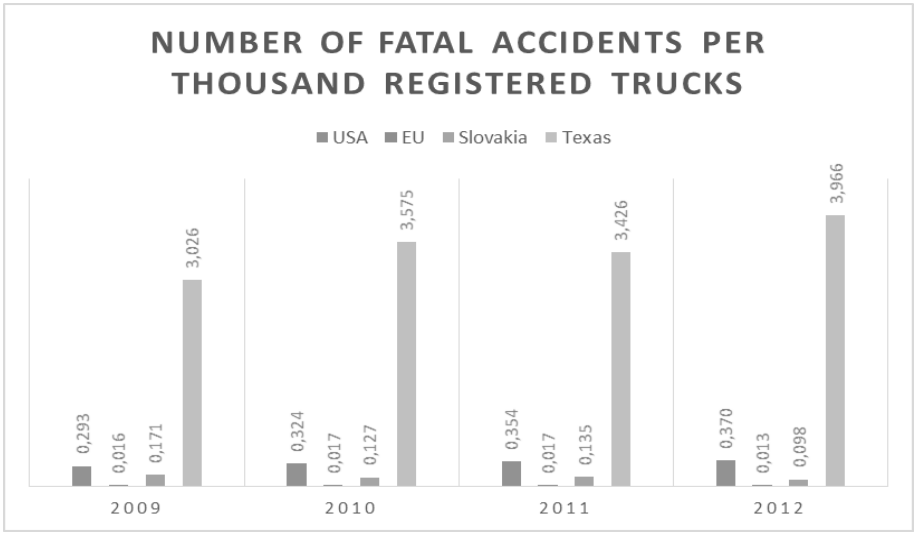

Fig. 1. Fatal accidents per 1,000 registered heavy trucks [12, 13, 14, 15]

Figure 2 shows the numbers of injury accidents per 1,000 registered heavy trucks. The lowest ratio from 2009 to 2012 was found for every year in the EU. Numbers relating to Texas and Slovakia have a tendency to decrease over the years. On the other side, the situation in the USA is getting worse. The worst situation overall is in Texas, where there are not many heavy trucks registered since the registration taxes are high, meaning that operators tend to register their trucks in different states with lower fees.

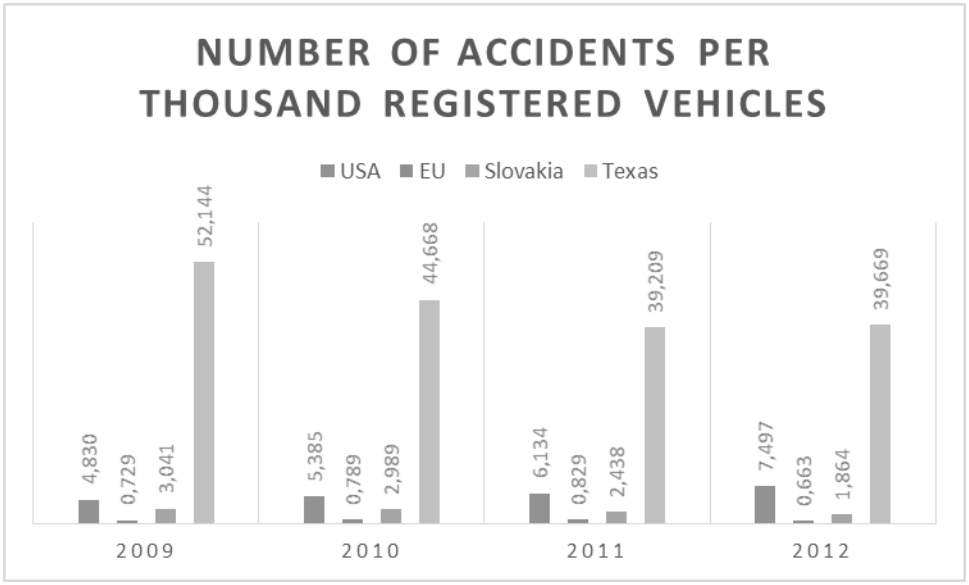

Fig. 2. Number of injury accidents per 1,000 registered heavy trucks [12, 14, 15, 16]

3. LEGISLATION OF ROAD FREIGHT TRANSPORT IN THE EU AND THE USA

As can be seen in Table 1, 13 different aspects of rules and regulations governing trucking in the EU and the USA are compared. Out of these 13 aspects, only two of them (training and medical certification) are the same. The remainder of the compared measures are mostly concerned with driving and rest times, as well as the design of heavy trucks or highway infrastructure. Some of the measures compared are similar, but mostly the differences are noticeable. Every one of these issues potentially contributes to the different accident occurrence in the compared areas.

The accident rate involving trucks is much lower in the EU in comparison with the USA. Based on this fact, the assumption is that most of the rules in place in the EU have a greater impact and are better at protecting the truck drivers from getting involved in road accidents, thereby protecting all other road users. Suggestions for improvements based on these findings are provided in the next chapter of this paper.

It is shown in Table 1 that qualified training and medical certification requirements are similar in both the EU and the USA. There may be slight differences on how the tests are done.

Table 1.

Comparative analysis of rules and regulations

	EU	**USA**
Qualified training	Yes	Yes
Medical certificate	Yes (two-year validity)	Yes (two-year validity)
Driver card	Yes	No
Daily driving time	Nine hours (10 twice a week)	11 hours
Mandatory breaks	Yes (45 minutes)	No
Daily rest period	11 hours (nine hours three times a week)	10 hours
Weekly driving time	56 hours	60 hours
Hours of operation monitoring device	Tachograph	Logbook
Cab design	Cab over engine	Conventional cab
Drivetrain	Up to 16 speeds	Up to 18 speeds
Speed limit	Different for trucks	Same for all users
Left-lane use	Prohibited for trucks	Mostly allowed
Driver feedback	No	Yes

Speeding as a factor of truck accidents is more than twice as high in the USA in comparison with the EU. This is an alarming fact, which needs closer attention from the responsible authorities. There are several factors contributing to this situation, which need to be changed. The main factor is the wage structure. In the EU, it is strictly prohibited to pay drivers by distance. The most common type of wage is an hourly rate. In the USA, paying the drivers by the number of miles they drive is used in almost all companies. This means that US drivers will try to drive as a long a distance as they can every day to earn as much money

as possible. Normally, the wage is somewhere between 0.30 and 0.39 cents per mile. Each driver drives about 3,000 miles every week. The US agencies responsible for this should examine this aspect and change to an hourly wage to discourage speeding and accidents.

Road transportation of goods in the EU accounts for 46% in comparison with 30% in the USA. Since there are other available modes, it would be a good idea to distribute some of the goods transported by trucks to other modes, such as rail or pipeline. Rail transportation in the EU is underused, as only 10% of goods are transported by this mode. It should also play a larger part in intermodal moves with road transportation.

The EU has a considerably denser highway network per 1,000 km^2 than the USA. On the other hand, the US highway system used to be the largest highway system in the world in terms of distance in one country, based on data from 1996. Since then, there has been a stagnation (or only a small increase) in building new highways, such that highways built in the past are becoming more congested as a number of registered vehicles (not only trucks) slowly rises every year.

Another important factor involves driving time regulations. In the EU, the daily driving time is nine hours (on two occasions per week, it is possible to increase this to 10 hours). In the USA, the daily driving time is 11 hours. Compared to the normal working time for office workers, which is around eight hours, US truck drivers work up to three more hours per day. The worst aspect of this, however, is that there is no regulation concerning breaks for US drivers, who can drive 11 hours continuously. In the EU, every driver is allowed to drive at most 4.5 hours before taking a 45-minute break. This is an important factor, which should be implemented by US regulation. This goes hand in hand with mileage-based wages. Drivers in the USA should be forced to take a break after a certain number of hours of driving. It is important to take some rest in order to stay awake and be able to pay attention to the road conditions.

Monitoring the activities of drivers also differs between the EU and the USA. In the EU, tachographs have to be installed in every vehicle over 3.5 t performing freight transportation. On the other hand, in the USA, devices for tracking the driver are not mandatory. This means that drivers can still use logbooks, in which they are supposed to record the times and activities they are doing. Drivers can easily fail to comply with the right way of recording the data into the logbooks. For example, Mesilla Valley Transportation Company in El Paso, Texas, is one of the few US companies using a device similar to the tachographs used in the EU. This device tracks all of the activities of the driver and automatically sends it to the safety department of the company. These data are stored for at least two months. This is done for every truck the company owns. These devices are also used for communication between the driver and the dispatcher. Another good thing about this device is the fact that there is a limiter installed, which limits the truck to a maximum speed of 62 mph (100 km/h). This is a good example of how the driver should be tracked nowadays. The responsible authority should make the use of these devices mandatory for all the trucks registered in the USA.

One of the important factors of road safety is to see and be seen on the road. Based on this fact, the need for lighting equipment on trailers is in place. We can divide them into basic and additional equipment. Tail lamps, stop lamps, rear-turn signal lamps, rear- and front-side reflex reflectors are considered as basic equipment. They are used to indicate a vehicle's presence and length. In the USA, they are used by drivers as a sign of slowing down while going up a hill and decreasing speed, as well as when there is an unexpected situation ahead such that other users need to be warned of potential danger. In the USA, there are additional mandatory requirements for equipment. This includes rear upper body marking, bumper bar

marking, rear lower body marking and side marking [9]. On the other hand, in the EU, only basic equipment is mandatory. There is a possibility to put additional lights on the trailer, but it is up to the individual company [10, 17].

3.1. New safety features

Evolving technological advancements offer great potential in terms of improving the safety of trucking operations and truck drivers. Safety and security systems are being developed by truck-producing companies in order to protect truck drivers, as well as other users of the network. Their impact is not noticeable right now. In the years to come, most of them will become a part of all new vehicles built in either the EU or the USA, such as:

- Lane departure warning systems, which monitor the position of a vehicle within a lane and are set to warn the driver if the vehicle deviates or is about to deviate outside the lane unexpectedly.
- Collision warning systems, which monitor the roadway ahead and are supposed to warn a driver when potential danger, such as another vehicle or object, is detected in the same lane.
- Adaptive cruise control systems are in-vehicle electronic systems, which can be integrated with a collision warning system and automatically maintain a minimum interval in relation to the vehicle in front in the same lane. If there is no vehicle ahead, it works as a conventional cruise control so the speed is set by the driver.
- Rear object detection systems, which detect moving and stationary objects located within a specific area behind a commercial motor vehicle while it is backing up. Currently used systems can be integrated with other sensors, such as side object detection sensors to cover other blind spots around the vehicle. The European Commission estimated that the blind spot problem causes about 500 fatalities a year on Europe's roads. In response, a directive that requires rear-view mirrors to be upgraded to reduce this blind spot was implemented [11, 18].
- Tyre pressure monitoring systems, which automatically detect and relay tyre air pressure information through sensors attached to the tyres, wheels or valve stems. These might be integrated with tyre pressure equalizer or maintenance systems, which monitor and automatically inflate tyres to a specific tyre pressure. This can be a valuable aid for proper tyre maintenance, which will enhance the safety of truck operations and drivers.
- On-board brake stroke monitoring systems can detect major brake problems in real time. They use sensors located at each brake actuator to monitor pushrod travel and determine if a brake on an air-braked vehicle is overstroking, not releasing or inoperative and then display the existence and location of the problem to drivers.
- Vehicle stability systems monitor lateral acceleration from on-board sensors to reduce rollovers due to excessive speed in a curve and prevent loss-of-control crashes due to the instability of a truck. They can be used as passive (warning of potential instability) or active systems (intervene by reducing the throttle and applying different brake pressure in order to correct instability) [2].

4. SUGGESTIONS FOR IMPROVING THE CURRENT SITUATION

Suggestions for the EU:

- Make it mandatory to use flashing lights while going slow (for example, while going up a hill) in order to warn other road users of potential danger coming on ahead at high speeds.
- Use conventional cab design, which is safer for truck drivers, because they are not seated directly on top of the engine. Conventional cab design also has better aerodynamics, resulting in fuel savings.
- Provide a feedback channel for other road users through the provision of the respective company's telephone number at the back of the trailer (the number of the dispatcher or another company representative, not the driver).
- Use other modes of transport (rail transportation or pipelines), since almost half of all goods transported are by truck transportation.
- Promote the use of intermodality.

Suggestions for the USA:

- Change the type of wages (from mileage-based), which are in place right now, because the current arrangement has a negative effect on the driving style of the drivers.
- Revise driving time regulations. The current rule allows long driving times every day (11 hours per day) with no mandatory break.
- Make it mandatory to use some kind of tracking device (for example, a tachograph) since the use of logbooks is out of date and subjective.
- Limit the speed of trucks by the use of a speed limiter.
- Restrict trucks from using left lanes whenever possible and overtaking each other and other road users.
- Establish a lower speed limit for trucks on highways compared to cars in order to decrease the number of accidents caused by speeding factor.
- Implement zero alcohol tolerance for professional drivers, even though alcohol involvement in truck accidents is present in only a small percentage of all accidents.
- Use winter tyres for all of the trucks when the temperature drops to freezing point anywhere along the route of the transportation.
- Use lights at all times, even though the difference in crash rates concerning this factor is not big. This should apply to all users since the most important feature on the road is to see and be seen by others.

5. CONCLUSION

Based on the analysis of accident statistics from the EU and the USA, it was found that the situation in the EU is better than in terms of accident rates over a period of four years from 2009 to 2012. Even though the total number of fatal accidents in the EU and the USA is very similar, there is a big difference in the number of fatal and injury accidents involving large trucks. Road accidents are caused mainly by drivers when they neglect or refuse to follow laid-down rules, signs and regulations concerning the use of roads. It was concluded that the regulations in place in the EU are much stricter and thus provide a better background for the attempts to reduce the number of truck accidents occurring on the roads each year.

As can be seen in the previous chapters, there is a strong need to regulate the truck industry more strictly in the USA. There are several factors mentioned in the recommendations, which might be a good starting point in any attempt to reduce the number of fatal truck accidents in the USA in the coming years. This paper provides a better insight into the problem of truck safety by comparing different attributes of road transportation in the EU and USA. Suggestions should lead to improvements in crash rates as they ought to provide safer, stricter and more controlled working environments involving truck transportation. Furthermore, the comparison with other countries, such as China or Australia, should provide a better understanding of this worldwide problem, while the regulations that are in place in other countries might provide some good ideas for possible enhancements. The decrease in truck-related accidents is encouraging. There is still a need to enforce innovative rules and regulations in truck transportation to minimize this number.

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