Summary

Road crashes among unlicensed drivers – preventable by new technology?

Drivers or riders without a license or with a stolen vehicle are involved in more than 10% of fatal road crashes in Norway. This was shown by an analysis of data from all fatal crashes in the period 2005-2014. A literature review shows that unlicensed drivers have a considerably increased crash risk. Such crashes could be prevented by electronic driver authentication, i.e., a technical system for checking that a driver or rider has legal access to a vehicle before driving is permitted. This can be done by requiring the driver/rider to identify themselves with a national identity number and a unique code or biometric information before driving may commence, and that the vehicle thereafter verifies license availability and vehicle access by communication with a central register. In more than 80% of fatal crashes with unlicensed drivers/riders, speeding and/or drug influence contributed to the crash. This means that a majority of crashes with unlicensed drivers alternatively could be prevented by available systems, such as alcolock and speed-limit-dependent speed adapters. However, there are many crashes that are not influenced by those measures, and there is consequently a potential for additional safety improvement by means of an electronic driver authentication system.

Studies from several countries indicate that a considerable share of road crashes are caused by drivers that are unlicensed and/or driving a stolen vehicle. Therefore, various ideas have been suggested regarding development of technical systems for preventing both unlicensed driving and driving a stolen vehicle, and thereby reduce the number of crashes. In this report we present an analysis of the prevalence of unlicensed driving among at-fault drivers for fatal crashes in Norway during the ten-year period 2005-2014. In addition, we give an overview of articles and reports discussing possible technological solutions to this problem.

Estimations of the share of crashes with unlicensed drivers or stolen vehicles are based on data from the accident investigation boards (UAG, "ulykkesanalysegruppe") of the Norwegian Public Roads Administration, which carry out in-depth investigations of all fatal crashes in Norway. Out of approximately 1800 fatal crashes analysed, the at-fault driver/rider was unlicensed in 185 crashes, i.e. more than 10%. The at-fault vehicles included 122 cars or trucks and 49 motorcycles, whereas the remaining vehicles were mopeds, ATVs, snowmobiles, and one tractor. In addition, there were six crashes with stolen vehicles with a licensed driver.

We investigated the prevalence of additional risk factors among the unlicensed drivers, compared to other drivers involved in fatal crashes. Influence of alcohol or drugs were found among almost 70 % of drivers and about 50 % of riders without a valid license, compared to 17 % of licensed drivers/riders. Speeding (considerably above the speed limit, and/or clearly inappropriate to traffic and driving conditions) also was much more prevalent among unlicensed drivers. Looking at alcohol/drugs and speeding together, it appears that one or both of these factors were present among 86 % of car drivers and 79 % of motorcycle and moped riders. Among unlicensed drivers/riders there was a higher proportion of persons younger than 25 years, especially for motorcycle and moped riders. A higher share of unlicensed persons were previously registered in police records, and as many as 29 out of 185 were driving or riding a stolen vehicle. We also found that unlicensed drivers are overrepresented in running-off-the-road crashes and in crashes during weekend nights.

The results from our analyses of fatal crashes show prevalence rates in the same order of magnitude as studies from other countries, so unlicensed driving seems to be a widespread problem.

The high share of unlicensed driving in fatal crashes implies that there is a large potential for crash reduction by technical systems making it impossible to start a motor vehicle without documenting the possession of a valid license for the vehicle type in question as well as a permission to use the actual vehicle. In the 1990's a so-called "electronic driving license" system was developed in Sweden, consisting of a smartcard with license information and a card reader in the vehicle. The system was trialled in a field study with 15 cars, with largely positive results regarding user acceptance and satisfaction. We are not aware of other examples of similar systems that have been tested in practice, even though further development of such systems has been pointed out in several articles and reports as a potentially effective safety measure.

With today's technology it is probably feasible to develop systems for electronic driver authentication that are both cheaper and more effective than what was possible in the 1990's. In this report we describe certain prerequisites for a driver authentication system to function as intended. The system has to be user-friendly, so that starting a vehicle will not be more complicated than it is today. For the system to be effective, we assume that the driver/rider has to identify themselves before each trip, e.g. by entering a national identity number combined with registering biometric information (e.g. fingerprint) and/or entering a PIN-code, and that the vehicle sends a verification request to a central register of licenses and vehicle access information. If the verification is positive, driving can proceed as normal. If not, the driver receives a request to stop as soon as possible and a warning that the engine will be turned off.

The system must handle different user scenarios, including borrowing a vehicle, driving a rental vehicle, temporary access by service and repair personnel etc., driving in emergency situations, and vehicle fleets where drivers have access to several vehicles. Conceivably, it could be possible to drive in emergency situations without a valid authentication, assuming that a message about illegal driving is sent to a surveillance centre. On the basis of discussions in the research literature as well as our own considerations we have sketched principles for managing all the mentioned challenges.

A simple and effective system for electronic driver authentication will require the following components:

- A central register of licenses and vehicle access information, with connection to all registered vehicles.

- An authentication unit in the vehicle, for receiving input from the driver, communicating with the central register and providing feedback to the driver.

- A surveillance centre for handling cases of illegal driving, with possibility of remote control of vehicles.

The primary advantage of a system based on central license verification compared to license information stored in a smartcard chip is that the license information will be updated continuously. A system based on a physical driver's license card will allow more opportunities for using false cards, e.g. a card where a recent license withdrawal is not registered.

For an electronic driver authentication system to be effective, it has to be implemented on a mandatory basis, i.e., it must include all vehicles of the categories for which it is developed. This also implies that implementation has to be organised at the EU level and that necessary changes in legislation for licensing and vehicles are also implemented.

On the background of the fatal crash analysis the crash reduction potential of an electronic driver authentication system alone is estimated at 10% percent of the crashes. But since alcohol/drug influence and/or speeding occur in more than 80% of crashes among unlicensed drivers, one should consider carefully whether mandatory implementation of existing systems like alcolock and speed limiters would be a more cost-effective solutions. On the other hand, there will still be a considerable number of crashes that cannot be prevented by alcolock or speed limiters. A modest estimate is that electronic driver authentication can prevent around 2 to 3% of fatal crashes, assuming that both alcolock and speed limiters (preventing driving above current speed limit) are already made mandatory. Without these additional measures, 10% is a more realistic estimate.

An alternative solution could be a digital tachograph like the system already used in heavy vehicles. A tachograph will enable authorities to verify in retrospect whether the vehicle has been driven by a driver with a valid license, and otherwise in accordance with laws and regulations. The main advantage of using a tachograph-based system is that the technology is already available and has been tried out. However, the tachograph alone will not prevent illegal driving, and it allows more possibility for cheating, for example by using another driver's tachograph card. In order to achieve the largest possible reduction in crash rates, further development and field studies of a system for electronic driver authentication as described here is therefore clearly recommended.