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**Economic Commission for Europe**

Inland Transport Committee

**Working Party on Road Traffic Safety**

**Group of Experts on Improving Safety at Level Crossings**

**Seventh session**

Geneva, 21-22 March 2016

Item 2 (e) of the provisional agenda

**Programme of Work**

**Identification of the key causes and possible solutions related  
to human factors contributing to unsafe conditions at level  
crossing**

**Submitted by Austria, the German Aerospace Center (DLR) and  
Cognito Ltd, Israel**

This document submitted by Austria, the German Aerospace Center (DLR) and Cognito Ltd, Israel provides further input to the considerations of human factors at level crossings.

## **I. Background**

1. It is a common knowledge – proven by numerous studies and statistics from all over the world – that accidents at level crossings are primarily due to faulty or maladaptive behaviours of road users, both motorists and pedestrians.
2. In 2011 the Inland Transport Committee recommended establishing a Group of Experts of limited duration to work on enhancing safety at level crossings. The charter of the Expert Group, in general, was to aim at bringing together safety specialists from the road and rail sectors so as to better understand the issues at this intermodal interface.” (ECE-TRANS-WP.1-2011-6-Rev.1.pdf)
3. The Terms of Reference of the Group of Experts on Safety at Level Crossings states the overall aim of work is to “describe, assess and better understand the safety issues at a road/rail interface as well as to develop a multidisciplinary strategic plan aimed at reducing the risk of death and/or injury at level crossings.”
4. In its first session the members of the Group of Experts decided on the programme of work and divided themselves into subgroups. One subgroup was dedicated to human factors; “The identification of the key causes and possible solutions related to human factors contributing to unsafe conditions at level crossings” (ECE-TRANS-WP1-GE1-2e.pdf). Members of this subgroup are Dr. rer.nat Michael Cale’, Mr Günter Dinhobl and Mr Jan Grippenhoven.

## **II. Analysis of the questionnaire on human factors at level crossing-accidents**

5. In 2014, the human factors subgroup created a questionnaire on the topic of human factors in level crossing accidents. This questionnaire was handed out to 24 representatives of the 22 participating UNECE countries. From the responses to these questionnaires a broad international overview about key problems related to human factors at level crossings could be obtained.
6. The results of the questionnaire clearly points to a number of highly important facts:
  - (a) Human factors are considered a major issue in level crossing safety in all of the participating countries and, according to the responses received, have to be addressed seriously.
  - (b) Most accidents at level crossings are based on inappropriate or faulty human behaviour. Nevertheless it was found that faulty and dangerous behaviour of road users at level crossings are seldom recorded systematically and are thus seldom properly analysed.
  - (c) The lack of scientific data documentation frequently leads to ineffective or irrelevant countermeasures.
  - (d) There is limited knowledge of the vast accumulation of relevant, scientific literature. Countermeasures e.g. public awareness campaigns are frequently used in spite of the fact that the reasons for accidents may be due to issues very different from the messages in the campaign.
  - (e) The accident reports merely document if the employee(s) of the rail companies behaved according to regulations and sometimes provide assumptions about the behaviour of other level crossing users. These assumptions tend to lack any theoretical or scientific validity.

### **III. Summary:**

7. The current situation is characterised by a lack of scientific comprehension relating the reasons of accidents at level crossings. This is based on insufficient and frequently irrelevant accident documentation and leads to the incapability to develop and produce effective countermeasures to existing dangers.

8. Public awareness campaigns relating to the risks of crashing with trains cannot improve vision of hidden crossings nor can it solve issues of attention disorders or competing stimuli. Traffic calming measures cannot improve things if a social norm is developed which favour dangerous crossings and the lack of driving skills will not be solved by improving traffic signs. Based on the results of the questionnaire the members of the human factors expert group came to the conclusion that the first step towards reducing accidents at level crossings must be the development of a scientifically based analysis system of accidents at level crossings.

9. Scientific literature:

10. For an extensive report of scientific studies relating to level crossing accidents please refer to Jan Grippenhoven from DLV.

### **IV. Possible solution**

11. Analytic System for Accident Prevention

12. In an attempt to provide a practical and effective, low cost and high efficient tool, the members of the sub-group developed an internet based questionnaire called Analytic System for Accident Prevention (ASAP). ASAP includes nearly 100 questions which are used to analyse an accident at level crossing and help to produce a scientifically based report.

13. ASAP is based on a cognitive psychological theory according to which the reasons for behaviours relating to using level crossings can be divided into five groups:

- (a) Attention and concentration
- (b) Perception
- (c) Cognition
- (d) Motivation
- (e) Performance

14. The electronic questionnaire is a guideline for searching reasons which led to maladaptive level crossing behaviour. If, for instance, a person is not attentive it is more likely this person has an accident even if he or she knows all rules by heart. Another example would be problems with perception due to issues like blinding, confusing surroundings or speeding which can frequently be solved with little effort. If the member countries would analyse and document level crossing accidents with a tool such as ASAP, it is likely that practical and effective solutions could be developed and tested in a relatively short period of time.

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