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Report of the Working Party on Road Traffic Safety on its seventy-fourth session

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I. Attendance

1. The Working Party on Road Traffic Safety (WP.1) held its seventy-fourth session in Geneva from 21 to 24 March 2017, chaired by Ms. L. Iorio (Italy). Representatives of the following ECE member States participated: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Latvia, Luxembourg, Netherlands, Norway, Romania, Russian Federation, Slovakia, Spain, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland and United States of America.

2. The representatives of non-ECE member States also participated: Brazil, India, Japan, and United Arab Emirates.

3. The European Commission, International Labour Organization, World Health Organization (WHO) and the following non-governmental organizations were also represented: Federation of Alliance Internationale de Tourism, Fédération Internationale de l'Automobile (FIA), Federation of International Motorcycling (FIM), Global New Car Assessment Programme (Global NCAP), Institute of Road Traffic Education (IRTE), International Motorcycle Manufacturers Association (IMMA), International Organization of Motor Vehicle Manufacturers (OICA), International Organization for Standardization (ISO), Laser Europe, National Road Safety Policies and Programs and University of Birmingham.

II. Adoption of the Agenda (agenda item 1)

4. The Working Party on Road Traffic Safety (WP.1) adopted the session's agenda (ECE/TRANS/WP.1/156). WP.1 welcomed the participation of delegations from Canada and India in this session.

III. Activities of interest to the Working Party (agenda item 2)

5. The WP.1 Chair provided information about the relevant outcomes of the February 2017 Inland Transport Committee (ITC) session which may be found in Informal document ITC (2017) No. 11. WP.1 welcomed the ITC decisions, which include the approval of extending the mandate of the Group of Experts on Road Signs and Signals until 31 December 2017; endorsement to change WP.1 name to "Global Forum for Road Traffic Safety".

6. WP.1 noted ITC decision on strong support for improving road safety and the importance of ensuring finances for road safety. It also took note of the development of, and consultation processes to prepare, a proposal on establishing the United Nations Road Safety Fund; and the request to relevant Working Parties, especially WP.1, Working Party on Transport Statistics (WP.6) and World Forum for the Harmonization of Vehicle Regulations (WP.29), to emphasize the importance of including targets related to accession and effective implementation of United Nations road safety legal instruments (para. 28, Informal document ITC (2017) No. 11). In particular, WP.1 welcomed the ITC decision to agree that the Republic of Korea become a full WP.1 member.

7. WP.1 appreciated a video message from the United Nations Secretary-General's Special Envoy for Road Safety, Mr. Jean Todt, about his efforts and initiatives in promoting road safety and accessions to United Nations road safety legal instruments. It noted that Mr. Todt also appreciated the engagement of WP.1 in activities for road safety in South East Asia. It welcomed the extension of the appointment of the Special Envoy for another year.

8. WP.1 also appreciated the Chair's presentation on the ITC session which included a historical overview, the road safety film festival, the Ministerial Declaration and the Meeting of the Chairs.

9. The World Health Organization presented a discussion paper entitled “Developing voluntary global targets for road safety risk factors and service delivery mechanisms” (Informal document No. 5). With the support of the Chair, the secretariat presented an analysis of the discussion paper of WHO (Informal document No. 6) and provided alternative suggestions for developing the voluntary global performance targets. WP.1 appreciated the efforts of the secretariat and WHO, and encouraged closer cooperation. It noted that the WP.1 Chair and secretariat would emphasize the importance of including targets related to the accession and effective implementation of United Nations road safety legal instruments in their feedback to WHO. It also noted that countries have the opportunity to provide comments directly to WHO.

10. WP.1 appreciated a presentation on “Traffic Management as a Service” from a representative from the city of Ghent, Belgium.

11. The Swedish delegation informed WP.1 in writing that: Swedish road safety work based on Vision Zero is a success. Fatalities in road traffic have been halved since the turn of the millennium. Furthermore, Vision Zero has captured the interest of the world. However, all successful work should be regularly reviewed and there are both challenges and opportunities inherent in continued road safety work. The reduction in fatalities seems to have levelled off in recent years. It is, therefore, a matter of urgency to bring about intensified transport safety work—a renewed commitment to the work to achieve Vision Zero. For that reason, the Swedish Government has developed a “Renewed Commitment to Vision Zero” document with the aim to present the current state of affairs, targets and challenges in the area of transport safety and, based on this, to indicate directions for future work. The “Renewed Commitment to Vision Zero” is intended to function as a platform for future initiatives in transport safety.¹ On 14 and 15 June 2017, an international Vision Zero conference will be held in Stockholm. The topic of the conference is the question how to reach Vision Zero in the light of United Nations’ Sustainable Development Goals. The aim of the Vision Zero Conference is to provide new impetus to the promotion of road transport safety at the strategic level.²

IV. Convention on Road Traffic (1968) (agenda item 3)

A. Consistency between the Convention on Road Traffic (1968) and Vehicle Technical Regulations

12. At the last session, WP.1 requested France, Italy and Laser Europe to prepare for this session a document presenting a complete, consolidated text of the relevant parts of the Convention which contain the already adopted and still to be adopted amendment proposals. As the document is still being prepared, WP.1 decided to defer its discussion on this item until the next session.

B. Driving permits

13. The secretariat informed WP.1 that the English version of the International Driving Permits (IDPs) Brochure based on ECE/TRANS/WP.1/2014/8/Rev.1 has been prepared and is available on the WP.1 website. This brochure will be also issued in five other United

¹ Further information about the “Renewed Commitment” is available from: www.regeringen.se/4a800b/contentassets/835015718fdb4e9f8f7590aeb1948dca/trafiksakerhet_160927_webny.pdf.

² Further information about the conference is available from www.trafikverket.se/en/visionzero/.

Nations official languages with funding support from the United Nations Secretary General's Special Envoy for Road Safety.

14. The Government of the United Arab Emirates and FIA provided WP.1 with information on its pilot project to introduce security features into IDPs issued in the United Arab Emirates (Informal document No. 8). WP.1 was invited to support this pilot project. FIA invited other Contracting Parties interested in this pilot project to join it. It also reminded WP.1 of its proposal to amend Annexes 6 and 7 of the 1968 Convention and suggested changes to the IDP to be modelled on the ICAO specifications for passports. FIA further presented the key differences between its amendment proposal and International Organization for Standardization's (ISO) proposal from the last session concerning domestic driving permits for international use.

15. ISO provided an updated presentation based on ECE/TRANS/WP.1/2016/2/Rev.1. This document, prepared by France, Grand-Duché de Luxembourg and ISO, contains amendment proposals related to domestic and international driving permits. It suggests amending the 1949 and 1968 Conventions by stipulating the standard of the Domestic Driving Permit (DDP) for both domestic and international travel supported with a translation booklet. It also proposes to introduce into the Convention a simplified standard for the DDP intended for domestic use only.

16. WP.1 identified a number of critical issues in both proposals such as the validity of IDP when DDP is revoked, DDP and IDP requirements in the 1949 and 1968 Conventions, costs of creating registers and other setup costs, application of ISO standards, technological progress and the forthcoming use of electronic (mobile) versions of driving permits.

17. WP.1 invited France, Luxembourg, Russian Federation, FIA and ISO and other interested parties to work together to address these and other critical issues and to table a new common proposal at the next session.

C. Automated driving

18. The Chair of Informal Group of Experts on Automated Driving (IGEAD) provided information on the Group's progress (Informal document No. 2). The document covers:

- automated driving issues in relation to the relevant provisions in 1949 and 1968 Conventions on Road Traffic;
- the question whether a driver could engage in other activities when a vehicle is driven by systems i.e. interpretation of Article 8 (as requested by WP.1, paras. 17-20, ECE/TRANS/WP.1/155);
- the question whether the "remote parking function" is consistent with the 1968 Convention, i.e. can a driver exercise the control over the vehicle from outside of it; and
- IGEAD discussion on highway pilot functions (with lane keep and lane change assist).

19. Following the presentation, a discussion ensued. On the issue of whether the driver can or cannot engage in other activities when the vehicle is driven by the vehicle systems, the discussion concluded with WP.1 agreeing on the principles in the context of para 6, Article 8 as follows:

When the vehicle is driven by vehicle systems that do not require the driver to perform the driving task, the driver can engage in activities other than driving as long as:

Principle 1: these activities do not prevent the driver from responding to demands from the vehicle systems for taking over the driving task, and

Principle 2: these activities are consistent with the prescribed use of the vehicle systems and their defined functions.

20. WP.1 took note of the fact that many of the vehicle systems mentioned in Informal Document No.2 are already on the market.

21. WP.1 further agreed, in response to requests expressed by several of its members, to include these principles in an amendment proposal to the 1968 Convention on Road Traffic to be tabled at the next WP.1 session.

22. WP.1 also agreed to commence a process to create a non-binding advisory instrument dedicated to the highly automated and/or driverless vehicles which would serve the Contracting Parties to 1949 and 1968 Conventions on Road Traffic. This instrument would form the basis of an ancillary legal instrument in the medium term. WP.1 agreed to discuss possible terms of reference for developing this instrument. A draft of such terms of reference would be discussed at the next session. The secretariat was requested to prepare draft terms of reference to be distributed to WP.1 prior to the September 2017 session.

23. WP.1 discussed the issues of the remote parking function, which locates the driver outside of the vehicle. Following the presentation from the secretariat providing its opinion that the 1968 Convention on Road Traffic does not appear to support the remote parking function (many provisions implicitly or explicitly refer to the driver's location being inside of the vehicle), WP.1 requested the IGEAD to prepare a discussion paper on the remote parking function for consideration at the next WP.1 session.

24. The WP.1 Chair provided information (Informal document No. 3) on the workshop on "Governance of the Safety of Autonomous Vehicles", co-organized by the National Highway Traffic Safety Administration (NHTSA), UNECE WP.1 and the Center for Automotive Research (CARS) that took place on 20 October 2016 in Stanford, California. Information was also given on a technical visit to Google X facilities in Mountain View, California on 21 October 2016.

25. WP.1 took note that a second workshop on "Governance of the Safety of Autonomous Vehicles" will be organized in Geneva in June 2017.

D. Loading of vehicles

26. The International Road Transport Union (IRU) informed WP.1 that a Contracting Party to the 1968 Convention on Road Traffic has not yet been identified to partner with IRU and Laser Europe to propose amendments contained in ECE/TRANS/WP.1/2015/5/Rev.2. WP.1 agreed to leave this item on the agenda for the next session.

V. Convention on Road Signs and Signals (1968) (agenda item 4)

Group of Experts on Road Signs and Signals

27. The Chair of the Group of Experts on Road Signs and Signals updated WP.1 on the Group's progress. The Group had completed its review of the A through F category signs. At the next session, it would review the G to H category signs and, time permitting, the non-

Convention signs uploaded to the Road Signs Management System by Contracting Parties. The Group had also been examining the provisions of the 1968 Convention on Road Signs and Signals and of the 1971 European Agreement Supplementing the 1968 Convention on Road Signs and Signals and has been formulating proposals for amending provisions that it identified as internally inconsistent in both instruments. In addition, at the request of ITC, the Group will consider the “Signs and signals for cyclists and pedestrians” report by THE PEP at the next session.

28. The secretariat updated WP.1 on the progress in developing e-CoRSS (electronic platform of the 1968 Convention on Road Signs and Signals), informed about its expected functionalities and its cooperation with the Late Easa Alyousifi Charity Foundation that offered in-kind contribution to initiating e-CoRSS. The secretariat also invited Contracting Parties such as India to provide input into the Road Signs Management System.

29. WP.1 welcomed the progress made by the Group in reviewing signs and provisions of the Convention and the European Agreement. It also welcomed the initiation of the e-CoRSS development.

VI. Consolidated Resolution on Road Traffic (R.E.1) (agenda item 5)

A. A Safe System Approach

30. WP.1 continued to discuss ECE/TRANS/WP.1/2014/6 which incorporates Sweden’s amendment proposals to include a safe system approach into the Consolidated Resolution on Road Traffic (R.E.1). WP.1 reviewed the amendment proposals up to the end of Part 1. The text proposed under 2.4.1.3 (Role of penalties and other restrictive measures) is to be revised by Sweden in cooperation with Spain and the United States.

B. Multi-Disciplinary Crash Investigation (MDCI)

31. WP.1 completed reviewing ECE/TRANS/WP.1/2013/6/Rev.3 submitted by Finland and Sweden and adopted it. WP.1 decided that this document would become a new Chapter 17 in RE.1. The final version of ECE/TRANS/WP.1/2013/6/Rev.3 as adopted at this session is annexed to this report. Upon completion of WP.1 work under agenda item 5 (a), Finland and Sweden with the assistance of the secretariat will format the text of this document to fit the format used in R.E.1.

C. Amendment proposals on distracted driving

32. WP.1 began to discuss ECE/TRANS/WP.1/2017/2 submitted by France, Italy and the Russian Federation which contains proposal amendments to section 1.5 (Use of mobile phones) of RE.1. WP.1 invited the proponents as well as Sweden and the United Kingdom to revise the document and submit it at the next session. Other interested parties were also invited to provide contributions.

D. Amendment proposals on policies for Powered Two Wheelers (PTW)

33. As the follow-up to the seventieth session Round Table’s conclusions (Annex I, ECE/TRANS/WP.1/149) on the role of UNECE WP.1 in promoting road safety policies and international legal instruments globally, the WP.1 Chair reiterated the partnership between

WP.1, NHTSA and Institute of Road Traffic Education (IRTE) to continue using research cluster and academic networking to investigate and address the most critical aspects of road safety in South-East Asia. To this end, IRTE acts as a centre of excellence.

34. IRTE provided information on the Powered Two-Wheeler Conference that took place from 28 to 30 November 2016 in New Delhi. A representative from the University of Birmingham presented ECE/TRANS/WP.1/2017/3 which contained a position paper on policies of Powered Two Wheelers for South-East Asian countries and other low and middle income countries.

35. WP.1 appreciated both presentations, congratulated IRTE and its sponsors for organizing a successful conference in New Delhi and welcomed the solid outcomes of the Conference as outlined in the position paper. It then invited IRTE and the University of Birmingham, working in consultation with the secretariat, to restructure and format the text of the position paper to fit the R.E.1 style, and to present this document at the next session.

E. Amendment proposals on Vulnerable Road Users (VRU)

36. The Chair introduced Informal document No. 4 which contained a proposal on Vulnerable Road Users' policies and guidelines, with a special focus on low and middle income countries, in particular in South-East Asia. This proposal was developed and adopted at the Powered Two-Wheeler Conference mentioned in 5(d) above. WP.1 welcomed the proposal by IRTE with the support of NHTSA and the WP.1 Chair in organizing another workshop in late 2017 to complete the assessment of safety of VRU in South-East Asia in the context of implementation of the transport-related to the Sustainable Development Goals (SDGs) and invited the WP.1 Chair and IRTE to report on progress in this area.

VII. Group of Experts on Improving Safety at Level Crossings (agenda item 6)

37. The Chair and Deputy Chair of the Group of Experts presented the Group's final report (ECE/TRANS/WP.1/2017/4). The presentation focused on the Group's key findings such as availability of data on safety at level crossings, evaluation of accident costs as well as developments in the areas key to safety at level crossings: infrastructure, education and training, legislation, enforcement, institutional framework, human factors, and risk management. The recommendations formulated by the Group were presented in each of the areas to assist in improving safety at level crossings. They also recommended a level crossing specific safe system approach to be established and acted upon.

38. The Chair and Deputy Chair of the Group of Experts also introduced an international plan of action believed by the Group to be necessary for assisting countries in implementing the recommendations. In this regard, they emphasised the Group's recommendation for establishing an international working group to support the implementation of this plan.

39. WP.1 welcomed the report of the Group and adopted it. It took note of the recommendation to establish a dedicated working group on improving safety at level crossings. To this end, it requested the secretariat to explore possibilities for establishing such a group in cooperation with partners, e.g. UIC and to report back on the findings at the next session.

VIII. Revision of the terms of reference and rules of procedure for WP.1 (agenda item 7)

40. WP.1 requested the informal group of experts (Austria, Italy and Japan) to prepare a proposal for the next session on how to revise WP.1 Terms of Reference and Rules of Procedure (TRANS/WP.1/100/Add.1) to accommodate the WP.1 status participation options (i.e. full member versus consultative status). The Chair requested that the Terms of Reference of other Working Parties be considered by the informal group of experts in their proposal.

IX. Change of WP.1 name (agenda item 8)

41. WP.1 welcomed ITC endorsement of its change of name from the Working Party on Road Traffic Safety to Global Forum for Road Traffic Safety (WP.1).

X. Other Business (agenda item 9)

42. The Director of the Sustainable Transport Division described major outcomes of the latest session of ITC, in particular highlighting the “ITC strategy paper” (ECE/TRANS/2017/R.1) and the UNECE Executive Secretary’s draft proposal on the United Nations Road Safety Fund (ITC Informal document No. 9). In relation to the ITC Executive Summary of the strategy paper, WP.1 was encouraged to provide comments at the earliest convenience but prior to its next session so as to allow these comments to be incorporated into a revised version of the document.

43. Concerning the UNECE Executive Secretary’s draft proposal on the United Nations Road Safety Fund, the Director of the Sustainable Transport Division invited WP.1 to provide general feedback as well as comments focusing on a potential WP.1 role and on suggesting concrete options or preferences going forward. Comments should be sent via e-mail to the Executive Secretary (executive.secretary@unece.org), with a copy to the Division Director (Eva.Molnar@unece.org) and the secretary (Robert.Nowak@unece.org) as soon as possible.

44. The WP.1 Chair welcomed the “ITC strategy paper” and indicated that “Road Map for the implementation of Sustainable Development Goals” (as requested by ITC, para. 6, ITC Informal document No. 11) will be prepared and tabled at the next session.

45. WP.1 welcomed the recent accession of Iraq to the 1968 Convention on Road Traffic. WP.1 decided to consider changing the eligibility provisions of the 1971 European supplements to the 1968 Conventions on Road traffic and on Road Signs and Signals.

46. WP.1 decided to dedicate half a day to celebrate its seventy-fifth session by organizing a special event in September 2017.

XI. Date of next session (agenda item 10)

47. The next session of WP.1 is scheduled from 19 to 22 September 2017 in Geneva. The deadline for submission of formal documents is 23 June 2017.

XII. Adoption of the report of the seventy-fourth session (agenda item 11)

48. The Working Party adopted the report of its seventy-fourth session.

Annex

Chapter 17

Multi-Disciplinary Crash Investigation (MDCI)

17.1 Context

17.1.1 Crash investigations and resulting countermeasures

(a) One common approach to road safety is based mainly on a premise where individual road users are solely responsible when crashes occur. This view has been enabled by, and is in turn constitutive of, findings claiming that human error is the cause of approximately 95 per cent of road crashes.

(b) An important contribution to these findings is that crash investigations historically have followed a model based on the assumption that “human error” caused the mishap. Crash investigations have focused on the persons closest to the mishap in order to find the “root cause” of the crash. That has led to the wrong conclusion that improving road user behaviour is the most effective road safety strategy and hence measures have primarily been sought in persuading road users to adopt error-free behaviour. Such measures often consist of legislation, information, education and police surveillance.

(c) To be able to take effective road safety measures it is, however, of utmost importance not only to rely on statistical figures and analyses or investigations to apportion blame and liability to identify road safety measures. There is a need to also seek a deeper understanding of the underlying and contributing factors of the road safety problems to identify effective countermeasures.

(d) Furthermore, there is a growing awareness among traffic safety professionals that a multidimensional systems approach is required today to effectively address road safety issues. Instead of focusing on one element of traffic safety in isolation (engineering, enforcement or education), there is a need to build bridges and relationships between all the elements that influence road safety, and to understand how the various elements affect each other at all times.

(e) The systems approach focuses on the relationships and dependencies between the various individual elements of the traffic system and the organizational levels which influence those relationships. For that reason there is a need to engage different competences in the work of investigating road traffic crashes in order to look at them from different systemic angles.

(f) It cannot be stressed enough that the objective of MDCI is to prevent crashes or their consequences – not to apportion blame or liability. For that reason a very clear boundary between MDCIs and investigations to distribute legal responsibility must be created. If not, there is a great risk that the information flow to the investigators will be seriously hampered if the involved parties suspect that the information will be used for liability matters (see 17.6.1).

(g) It must also be stressed that MDCI is not another or different tool for collecting statistical data about the magnitude of a road safety problem and its prevalence in time and space. Such data is of course valuable for many reasons, e.g. identifying and prioritizing problem areas, but will seldom give any detailed information about the contributing and underlying factors which is necessary to understand why the crashes and injuries occur.

Instead, it is a valuable tool to get a deeper understanding of the underlying crash and injury mechanisms of a limited number of crashes, e.g. a certain type of crashes (see 17.6.1).

17.1.2 Human error approaches

Human error is often defined as unwanted or inappropriate actions leading to an undesired outcome. Broadly, human error models can be categorised as either person models focusing on the errors made at an individual operator level (e.g. driver) or system models focusing on the interaction between wider systemic failures and errors made by individual operators.

17.1.3 The person approach

The person approach focuses upon the errors that operators make when operating in the system. Such errors are seen to emerge from psychological factors in individuals such as aberrant mental processes, including forgetfulness, inattention, poor motivation, carelessness, negligence and recklessness. Error management based on the person approach is focusing on countermeasures aiming at reducing variability in human behaviour through e.g. legislation, enforcement training, education and information campaigns.

17.1.4 The systems approach

System approach models treat human error as a systems failure, rather than solely an individual operator's failure. These models consider the presence of system wide latent conditions and their role in shaping the context in which operators make errors. Unlike the person approach, human error is no longer seen as the primary cause of crashes. Instead it is treated as a consequence of latent failures created by decisions and actions at all levels in a system (e.g. government, local authorities, organizations/companies and their different management levels).

In principle at least, the systems perspective approach is now the dominant approach in most safety critical domains where it is often denoted Human Factors or MTO (Man, Technology and Organization). Current road safety approaches in large parts of the world is based on "Vision Zero" or "Safe System Approach", two expressions of an identical policy which is built on a systems perspective approach.

17.1.5 Crash investigation in relation to human error approaches

It must be understood that the outcome of a crash investigation and hence the precondition of MDCI to become an effective tool for road safety work is very much dependent on the approach to human error. The approach fundamentally forms the basis for the investigation and analysis and hence constitutes which data should be collected. Another important precondition is that those conducting the collection and analysis of crash data and information are competent and understand these working conditions.

17.2 A framework of MDCI

17.2.1 General approach

(a) It is important to establish the fact that MDCI is not a detailed crash investigation method. First and foremost it is a general approach to crash investigation based on a systems approach to crashes and human error which is described above. Hence there is no detailed operational manual for carrying out the investigation. The purpose here is to give some important guidelines and examples of what to think of when establishing and conducting MDCIs.

(b) The most paramount question that MDCI should answer is why a crash occurred and also, which is very important to stress, why the consequences became serious.

The question why must be asked several times, not only on the human level, but also on the technical (e.g. vehicles and infrastructure) and organizational (e.g. organizations responsible for the building and maintenance of infrastructure, professional transport companies and authorities) levels in order to identify latent conditions and contributing factors to the crash and its consequences. It is of utmost importance to understand these conditions and factors in detail in order to be able to learn from them and consequently identify and implement effective measures with a systems approach. It is not enough if the investigation concludes that the crash occurred because the road user did not follow the rules. Instead it must conclude why the road user did not follow the rules and why the consequences became serious. It is first then effective measures can be taken. A brief example:

(c) A professional driver is driving at 70 km/h. The driver falls asleep and drives off the road. The truck hits a rigid lamppost and the driver is killed. The following questions could be asked:

(i) Why did the truck drive off the road? Because the driver fell asleep (many crash investigations end here);

(ii) Why did the driver fall asleep? Because the driver had volunteered to take an extra shift outside the permitted driving hours even though he/she was very tired (and needed the money). Another answer to the question could be that the truck was not equipped with a driver alert system. From this answer further questions could be asked which may result in answers showing that vehicle manufacturers do not find economical or other reasons for marketing such devices and politicians or authorities who are not willing to pass laws or regulations stipulating that the manufacturers must install such systems in their vehicles;

(iii) Why was the driver able to take the extra shift? Because the employer did not have a management system or anything similar to prevent the driver from driving outside the permitted driving hours;

(iv) Why didn't the employer have a safety management system? Because the legislation does not provide that and hence there is no authoritative supervision;

(v) Why was a rigid lamppost placed in close proximity to the road? Because the regulations governing the design of the road permitted such design.

(vi) Why did the regulations permit such design? Because the road authorities do not have a systematic way of investigating crashes, e.g. as a part of a safety management system.

(vii) Why do the road authorities not need a safety management system? Because politicians are unwilling to pass a law which may increase societal costs.

(d) What can be learned from this crash is that important contributing, indirect or underlying causes can be found on other levels of the system which imply measures other than ones directed towards the direct causes connected to the actual situation and the road user. Informing, educating or punishing drivers will hardly solve the underlying system problems of rigid lampposts in close proximity to roads, employers not taking responsibility for safety of their drivers or politicians not willing to pass laws.

17.2.2 Basic preconditions for MDCI

It is of utmost importance to secure information about occurred crashes. This is particularly important if information and data are to be gathered on the scene of the crash. Such information can be obtained by the police, emergency services, alarm centres and should be secured by legislation, formal agreements.

17.2.3 Access to data sources

Access to different information and data sources related to the crash which are important for the analysis must be secured. Examples of such information and data are driver's permit data, vehicle data, infrastructure data (technical data about the road and its surroundings), injury data (hospital data, autopsy reports, etc.), rescue data, organizational information (e.g. information about the road safety work of the road authorities and buyers and sellers of transport services, safety management systems). It is important to establish a long term accessibility through legislation, formal agreements and not only to rely on personal contacts. When it comes to MDCI there may also be a need for establishing new sources. This depends on which information or data that is needed.

17.2.4 Legal aspects

The legal framework in a country may hamper the accessibility to important information for the accomplishment of MDCI. The legislation can be very complex and differ a lot from country to country. Hence it is impossible to give any detailed criteria or advice how to deal with these issues. On a very general level however a piece of advice is the importance of dealing with issues of secrecy and personal privacy.

17.3 Conducting MDCI

17.3.1 Investigation method

(a) The outcome of a crash investigation and hence the prerequisite of MDCI to become an effective tool for road safety work is very much depending on the approach to human error. For that reason the investigation method used for MDCI must be based on the systems approach to human error.

(b) There are several specific methods described in the literature which are based on such an approach. Some examples are:

- MTO Analysis (Man, Technology and Organization);
- AcciMap;
- STAMP;
- FRAM (Functional Resonance Accident Method);
- AEB (Accident Analysis and Barrier Function Method);
- TRIPOD-BETA.

(c) None of these investigation methods is solely developed for road traffic crash investigations. But in some cases, e.g. the MTO Analysis, they could quite easily be adapted and used for MDCI. The details of the different methods and their usability for MDCI will not be further elaborated.

(d) It must also be concluded that the investigation method is not the paramount issue when investigating a crash. Instead it is to apply a systems approach.

17.3.2 Collection of data and information

(a) The operational work to gather data and information and practical tools for that work is rather basic and not specific to MDCI. The preconditions in the form of a systems approach, the specific investigation method used and the crash or crash type of interest very much governs which information and data that are of interest. As mentioned above it is, though, important to guarantee access to the data and information sources.

(b) Generally a rather large amount of information and data are needed to cover the different levels of the road transport system in which the crashes occur. Hence it is impossible to present a list of detailed information and data which should be gathered to answer all questions for all types of crashes when applying a systems perspective approach. For this reason MDCI is not an effective tool for the analysis of, e.g. all crashes in a country. The most effective way to use MDCI is probably for thematic analysis of certain crash types which have been indicated by statistical or quantitative analyses.

(c) An information source which should not be forgotten is testimonies from people (e.g. involved persons, witnesses and experts) collected by interviews or by hearings. Such information is often important in order to be able to answer the question “why” on different levels of the system.

(d) Further the choice and collection of data and information needs to be as unbiased and as objective as possible. Otherwise there is a risk that the assumptions about the nature of crashes guide the investigation resulting in that it finds what it looks for.

17.4 Analysis of road crashes

17.4.1 Composition of an analysis team

(a) MDCI is based on a systems approach to human error. This means that there is a need for a multidisciplinary team to carry out the crash analysis in order to understand the complex interactions among the components of the transport system leading to crashes and injuries. As a basic requirement the team should consist of at least the following expert competences:

- Vehicle mechanics (dynamics and crash properties);
- Road design and traffic engineering;
- Human factors (HF) and behavioural science;
- Medicine (injury mechanisms);
- Crash investigation method.

(b) The members of the analysis team should also have very good knowledge and understanding of the systems approach to human error. They must of course also be as independent and objective as possible. The team may also call on other experts depending on the analysis.

17.4.2 Reconstruction and analysis of the crash and its consequences

To be able to analyse why a crash occurred and/or why the injuries arose it is important to understand what happened. Such reconstruction of a crash must be based on factual findings. There are different practical tools for the reconstruction of vehicle paths on the operational level. But it is almost even more important to reconstruct what happened or rather what did not happen on an organizational level (e.g. road authorities, vehicle manufacturers and sellers and buyers of commercial transports). This must also be reconstructed. Furthermore it is important, if possible, to reconstruct the situation which surrounded or framed the assessments and actions of the road users to be able to understand why the road user acted the way they did.

17.4.3 Formulation of findings and recommendations

(a) The analysis team has a responsibility to base their findings and recommendations logically on factual data and information. Findings and recommendations

must never be based on speculations. If the team form hypotheses which are not covered by the data material they must consider gathering complementary data and information.

(b) The findings and recommendations must further be based on a systems approach to human error. They should, therefore, be based on the analysis of what happened and especially why it happened, both from a crash and injury perspective, on different levels of the system. It means that they principally should be aimed at system countermeasures which have a documented safety effect on crash or injury reduction.

(c) Countermeasures aimed directly at the road user in order to correct their behaviour should only be proposed if there is clear proof that they will have a long-term safety effect. In most cases the behaviour and errors are only a symptom of systemic problems that other road users also may be vulnerable to. The underlying, latent system factors which shape the behaviour or contribute to the injury outcome will still remain in the system. It must also be noted that countermeasures on a higher level in a complex, dynamic system often are more stable or resistant to different pathways to crashes.

17.5 Learning from MDCI

(a) The purpose of MDCI is to learn from failure. But one of the most difficult challenges is to spread the lessons learned and get the recommendations implemented in reality and followed up by different stakeholders and organizations in the road transport system. It is not enough to write reports and spread them quite widely to these stakeholders and hope that they will get the message and consequently act according to the recommendations.

(b) The learning must in some way be integrated or internalized in a systematic way in an organization. This means that there has to be some kind of learning culture in the organization and preferably learning also should be an integral part of a quality assurance system or safety management system (e.g. ISO 39001, a management system standard for road traffic safety). Probably the most effective way of learning from MDCI is if an organization (e.g. a road authority responsible for designing, building and maintaining road infrastructure) carries out own MDCIs as a part of a safety management system.

(c) In the railway area in Europe, legislation stipulates that infrastructure providers and railway companies must have a safety management system of which the investigation of crashes and incidents is an integral part. It could be considered to impose such legislation for important stakeholders also in the road transport system.

(d) In several countries there are specific crash investigation authorities which objectively investigate crashes in different areas of society. These authorities often issue recommendations which at least other public authorities must implement and follow up.

(e) Another less legal way to learn from MDCI is to gather different stakeholders, both private and public, to discuss the analysis and findings of a certain crash or type of crashes and how they can contribute to different countermeasures within their field of formal or informal responsibility.

17.6. Recommendations

17.6.1 MDCI

(a) From a strict safety perspective a crash investigation should be a fact finding activity to learn from the experience of the crash, not an exercise designed to allocate blame or liability.

(b) The emphasis in conducting investigations should be on identifying the underlying causes in a chain of events leading to a crash, the lessons to be learned, and ways

to prevent and mitigate similar crashes or injuries in the future. Hence crash investigation should be used to gather information and data to be able to analyse crashes so that the human and system contributions can be identified. The findings should then be used to develop measures to ensure that similar crashes do not occur again or that the consequences of them are mitigated or reduced.

(c) MDCI should be used for identifying the direct causes and especially the contributing or underlying factors of the crash and its consequences from a systems approach in order to get enough knowledge for implementing effective risk reducing countermeasures to prevent future crashes or their consequences. Annexes VIII and VIIIbis contain operational experiences of MDCI in Finland and Sweden.

(d) For MDCI to become an effective tool for road safety, it should take its starting point in a human error approach based on the safe system approach or other contemporary human factor models.

(e) Different competences and areas of expertise should be engaged in the work of investigating road traffic crashes in order to look at them from different perspectives.

(f) Dedicated legislation or formal agreements may help to facilitate access to information collected by the police, emergency services, alarm centres, etc. about crashes.

(g) Access to different information and data sources related to the crash which are important for the analysis should be secured, e.g. driving permit data, vehicle data, infrastructure data (technical data about the road and its surroundings), injury data (hospital data, autopsy reports), rescue data, organizational information (e.g. information about the road safety work of the road authorities and buyers and sellers of transports, safety management systems), etc.

(h) The issue of data secrecy and processing of information relating to personal privacy should be subject to special attention.

(i) A thematic analysis of certain crash types which have been indicated by statistical or quantitative analyses could be preferred to an analysis of all crashes.

(j) The choice and collection of data and information should to be as unbiased and as objective as possible.

17.2.6 Analysis of road crashes

(a) The crash analysis team should be composed of experts with expertise in different areas such as vehicle mechanics, road design and traffic engineering, human factors and behavioural science, medicine, crash investigation method.

(b) The members of the crash analysis team should also have very good knowledge and understanding of the systems approach to human error.

(c) The crash analysis team should only base its findings and recommendations on factual data and information.

(d) The findings and recommendations should be based on a systems approach to human error and principally should be aimed at system countermeasures which have a documented safety effect on crash or injury reduction.

(e) Countermeasures aimed directly at road users in order to correct behaviour should only be proposed if there is clear proof that they will have a long term road safety effect.

17.6.3 Learning from MDCI

(a) The follow-up to the multidisciplinary investigations should be to communicate the lessons learned from these investigations, work towards the effective implementation of the recommendations and their implementation by the various parties and organizations of the road transport system.

(b) The learning should be integrated in a systematic way in an organization and should be an integral part of a quality assurance system or safety management system (e.g. ISO 39001, a management system standard for road traffic safety).

(c) The implementation of safety management systems as they already exist in the field of European railways, should be considered in the field of road transport systems.
