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The Role of Accident Investigation in Reducing Road Traffic Accidents

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Abstract*—This paper is intended to provide the law enforcement explorer with basic principles. The study is not all inclusive, and does not delineate specific techniques that must be used. The focus of this study is to provide principals that are flexible and adaptable to various law enforcement situations. We introduce the necessity for accurate, impartial and professional traffic accident investigation and reporting. The objectives to be met at the scene of accident investigations are presented. Additionally, the qualities and abilities of a professional traffic accident investigator are discussed. Approaches to accident reduction through the application of Collision diagrams, education, engineering and enforcement are also introduced.

***Index Terms*— accident, road, traffic, investigation, accident investigation.**

I. INTRODUCTION

Road accidents cause immense human suffering. Every year, around 2,138 people are killed on Libyan roads, 5,950 are seriously injured which mean either dying after or permanently handicapped, and 7,547 minor injured in year 2007 based on Libyan media news. This represents a serious economic burden; the direct cost of road accidents involving motors damaged to be estimated in the region of a 23 million Libyan Dinars (LD) a year excluding property damages, persons, medical care, medicines…etc.

The statistics of the year 2006 says that total number of traffic accidents in Benghazi city were 2,494 accident and total number of vehicles which contributed to these accidents were 4,988 vehicles. The statistics from Aljala Hospital for the year 2006 declared that traffic accidents were the number one killer in Benghazi city, as they come in the first place in the statistics and show that 64% of all death related injuries, beside; being in the second place which indicates 25.87% of all injuries in the hospital see Table 1 and Figure 1.

Nevertheless, no one is satisfied when 6 people are killed every day and more people are seriously injured on Libyan roads. That is unacceptable and it is not inevitable. Further efforts aimed at eliminating the principal causes of this suffering are needed. Since more people are killed and injured and more economic loss is incurred due to traffic accidents than all other types of accidents combined, the importance of traffic accident investigation cannot be over stated. The objectives of this type of investigation range from providing the basic police function and the protection of life and property, to restoring the flow of traffic.

Table I Statistical Data of Aljala Hospital

Cause of injury	Injuries		Fatalities	
	sum	percentage	sum	Percentage
Strike against solid body	663	8.53%	3	1.09%
Injury due to machine	905	11.65%	1	0.36%
Fire shot	141	1.81%	10	3.62%
Swallowing strange material	177	2.28%	0	0.00%
Burn	778	10.01%	21	7.61%
Traffic accidents	**2010**	**25.87%**	**177**	**64.13%**
Suicide	21	0.27%	1	0.36%
Fight	660	8.49%	26	9.42%
Falling from height	2390	30.76%	28	10.14%
Injuries due to animals	21	0.27%	0	0.00%
Drowning	5	0.06%	9	3.26%
Summation	7771	100%	276	100%

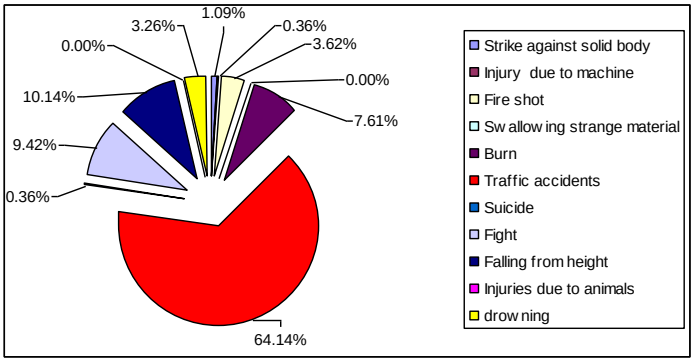

Fig 1. Fatality percentage based on different type of injuries

Many traffic accidents can be prevented. Finding the cause of each accident, regardless of how minor, is critical to preventing a recurrence. The investigating team must recommend a cause (or causes) as well as preventative actions to the Traffic Accident Prevention Leader, who is responsible for implementing the required corrective actions. There are two categories of preventive actions: immediate protection and long-term correction. The purpose of immediate protection is to reduce the immediate risk of another similar traffic accident. Once the cause of an accident is known and all relevant conditions and failures have been identified, long-term corrections may be appropriate. The purpose of these actions is to reduce the likelihood of a similar traffic accident recurring in the future.

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II. THE NEED FOR ACCIDENT INVESTIGATION

The investigation of traffic accidents is necessary, not only to determine traffic law violations, but also to obtain engineering data, protect the rights of the individuals involved, and assist in traffic education.

A Road Accident Investigation (RAI) is a set of procedures carried out on existing roads which includes: a collection of information about accidents and about all the facts linked to them, about road and traffic parameters and other related circumstances (e.g. driver behavior and his impairment "harm", weather and light conditions, etc.), an assessment of the accident distribution on the road network, on the particular road or road section/location, a detailed data analysis of accidents and their circumstances in the targeted spots/sections of roads by using collision diagrams, a determination of the road related deficiencies and elaboration of suggestions for their suppression or treatment.

Carrying out the RAI requires a certain amount of accident and the accompanying data according to the road engineer's given task. A typical task is to outline a preference list of improvement interventions or of black spot treatments (An *accident blackspot* is a term used in road safety management to denote a place where accidents are concentrated.) and to help road engineers detect the amount of road infrastructure deficiencies that influence an accident's occurrence, and to guide them in the implementation of appropriate improvement measures.

All accidents should be investigated. The depth and complexity of the investigation will vary with the circumstances and seriousness of the accident and the reasons to investigate a traffic accident include:

- Most importantly, to find out the cause of accidents and to prevent similar accidents in the future
- To fulfill any legal requirements
- To determine the cost of an accident
- To determine compliance with applicable safety regulations
- May be required for insurance claims

A. The objectives of a road accident investigation

The objectives of a traffic accident investigation are those things that the traffic accident investigator would be expected to accomplish each time he is dispatched to the scene of an accident. The objectives of this type of investigation range from providing the basic police function, the protection of life and property, to restoring the flow of traffic. Although not necessarily all inclusive, a list of objectives would include:

1) The basic police function, the protection of life and property. If this objective is not fulfilled, then the job by definition has not been accomplished.
2) Prevent further collisions; this objective goes hand in hand with the first in that it will go a long way in protecting life and property. However, since subsequent collisions are certainly not the only way for damage or injury to result on the scene of an accident, this objective must stand alone.
3) Gather evidence for prosecution; just as in any other type of case where a violation of law may have occurred, the responding officer must go in with an eye toward prosecution as an end result.
4) Properly record the facts surrounding the collision. Since the investigating officer may well be the only emotionally and financially detached person on the scene, his report of the event is logically the most accurate rendition of the event.
5) Determine the cause(s) of the collision. This is important in prevention of future accidents as well as in the accomplishment of the first four objectives.

B. The accident investigator

The investigators who carry out the investigation need expert qualification and experience in road safety. Their evaluation of the "risk features" of the road and its environs is not only an identification of the hazardous situation, but also draws attention to locations that need more detailed investigation based on accident data analysis.

The qualities of an accident investigator describe what is expected of the person in terms of traits and the abilities describe the skills that may be needed on the scene. The qualities that will get the job done in an effective manner while presenting a professional image of the profession. So a traffic accident investigator must be enthusiastic, sincere, responsible and impartial as he/she delivers this vital public service. The information in the reports may be useful in preventing future accidents through the application of Education, engineering and enforcement. However, the resources expended on the investigation and reconstruction of an accident as well as the diagramming process utilized will generally be dictated by the seriousness of the accident.

The "three E's" refer to processes involved in attempts at accident reduction. The "E's" stand for Education, Engineering and Enforcement.

1) Education: The key to a successful education program is to identify the target group. Through analysis of traffic accident reports, violation notices and officer observations the drivers who are over represented in accidents should receive the most attention.
2) Engineering: In addition to proper engineering prior to the construction of traffic related structures an on-going analysis is necessary. This may take the form of information sharing in which copies of accident reports are forwarded to personnel responsible for construction and maintenance. Engineering changes may affect specific problems such as hydroplaning accidents in flood prone areas. However, through the study of trends and information sharing, problems of a much larger scope can be addressed. An example of this would be uniform signing on a national level which has led to earlier recognition and as a result less confusion. Through standardization of shape, color and message or symbol motorist comprehension has been increased.
3) Enforcement: Enforcement may be the most obvious attempt at accident reduction to the general public. What

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may be less obvious is that it is the most expensive. With this in mind and given the increasing demands on generally decreasing personnel power resources an organized approach is called for. This approach should be based on analysis of the problem. This may be as simple as a pin map showing areas of frequent accidents or graphic representations of accidents by severity, location, day and time. The point is that while traffic enforcement will in all likelihood be a part of uniformed patrol activities this method alone is not always sufficient. If personnel levels permit, specialized enforcement units such as alcohol, speed safety enforcement units cannot only target problems by time day and area, but also develop a high level of expertise in detection and apprehension. This approach combined with selective enforcement on the part of patrol officers can result in significant reductions in accident rates with minimized impact on patrol activities.

III. ACCIDENT DATA

A. *Need of data*

The availability of road accident data is a prerequisite for each efficient road safety management system. Identification and definition of the relevant problem together with knowledge of the data and parameters describing this problem is essential for its successful solution. Comprehensive, up-to date, accident data is needed for recognition of the scope of road safety problems and for raising public awareness. Reliable and relevant data enable the identification of the contributory factors of the individual accidents, and an unveiling of the background of the risk behavior of the road users. It offers the best way to explore the prevention of accidents, and ways to implement measures to reduce accident severity.

Accident data is a crucial element for any road safety intervention. But it is not only the description of the accident circumstances that are needed. Contributing factors like road and traffic characteristics, vehicle parameters, and information about the people involved in the accident have to be registered as well.

B. *Data parameters and their quality*

To effectively analyse, compare and make informed conclusions from the data it is necessary to fulfil the following basic requirements:

- Accuracy (to exactly describe the individual parameters)
- Complexity (to include all features within the given system)
- Availability (to be accessible to all users)
- Uniformity (to apply standard definitions)

The last parameter (uniformity) is of vital importance for comparisons. There are different databases that often exist within one country. These databases may be managed by:

- Police
- Road administration
- Hospitals / health system
- Insurance companies

An agreement on national standards and definitions is desirable among all the relevant subjects (although this is not the case even in many developed countries), because it facilitates comparison of data and ensures its accuracy.

Another aspect to be emphasized when working with accident data is the great amount of underreporting. Not all accidents are reported. There are, of course, many intentionally unreported accidents. But also due to the fact that each database (police, hospital, road administration, insurance company) has its own requirements on what and how to report, only a careful comparison of the different sources can give a "true" picture.

Data is usually collected into a road accident report form (See sample Form in Appendix 3). It is a pre-printed, standardized form where the required information is required. Police officers are the ideal data collectors, as they usually are one of the first to be called to an accident site.

It is quite evident that such complex monitoring of accidents and traffic systems and their maintenance is very expensive. Therefore, it is difficult for many countries to develop and operate such systems to provide road engineers and decision makers with all the relevant and necessary information. Nevertheless, even a minimal amount of information can offer the road engineer the ability to identify safety deficiencies in the road environment, and to design possible countermeasures. Three levels of data sets are considered:

- Minimum data
- Road and traffic data
- Additional data

1) Minimum data

A minimum set of data can provide road engineers with relevant information necessary for basic accident cause investigation. The minimum data can be identified as follows:

- Accident identification (a unique number-based system)
- Time (the date, hour, minute, day of week)
- Location (city, streets number, traffic direction, class and type, ...etc.)
- Accident type (see appendix 1)
- Vehicles involved (number, year, type)
- Accident consequences (fatalities within 24 hours/30days, injuries, material damage)

This elementary set of data can be easily introduced in countries without any accident recording system as an early step for a system based reporting system. It doesn't require huge financial resources, and only limited human input is needed. The existing administrative structure (administration regional governance, health system, etc.) is suitable for involvement.

This key information will enable a basic evaluation of the level of a road's (or road section's) safety in comparison with other roads or sections. This information can direct a road engineer to certain locations which have higher accident frequencies, and provide a basic outline of the possible circumstances and factors that may have led to these accidents. With the aid of additional parameters and features related to the accident site, an estimation of

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potential deficiencies of the road infrastructure can be determined and elaborated.

Certain locations may offer an obvious link between accident causation and the failure of a road or its surroundings. The procedures developed in RSI (Road Safety Inspection) can efficiently facilitate the investigation process. A proposal for improvement measures is, then, an obvious result.

2) Road and traffic data

This set of data provides road engineers with relevant road infrastructure information linked with the location of the accident and other circumstances and factors contributing to the accident occurrence. Even if these data are available, a complementary site investigation is desirable, and can lead to findings which were not obvious from the accident data analysis.

The set of data can include features as follows:

- Road description (tangential section, type of intersection, road number, road category, cross section…)
- Specific places/objects (pedestrian crossing, rail crossing, bridge, tunnel, bus stop, parking place, gas station…)
- Road alignment (evident deficiency or not, slope, narrowing …)
- Road surface (type, permanent state, actual conditions – e.g. snowy, wet, icy surface)
- Road signing and marking (availability, condition, location, …)
- Roadside obstacles (tree, column, bridge….)
- Visibility conditions (clear, limited by alignment, vegetation, obstacles…)
- Weather conditions (dry, dusty, fog, rain, snow…)
- Traffic control (traffic lights, road signs, policeman)
- Position of accident (travel direction of involved participants, location - traffic lane, shoulder, roadside, …)
- Main causes of accident (speeding, overtaking, right of way…)

This level of reporting system can be implemented in countries with a developed road administration that has been introduced to its operation. A link with an existing road inventory database is recommended.

3) Additional data

This set of information contains features related to the vehicles and persons involved in the accident. Such a complete set of information that also includes road and traffic data enables a more detailed and precise investigation; and excludes the seemingly apparent typical single human or vehicle based failure (e.g. breakdown of vehicle, alcohol or drug impairment…).

The data to be gathered are as follows:

- The driver (category of license, driver experience, sex, age, nationality, education…)
- Impairment of the driver (alcohol, drugs, others…)
- Condition of the driver (alert, tired, impulsive, sudden indisposition, suicidal,….)
- Use of restraint devices (helmet, safety belt, child seat….)
- Condition of the pedestrian (alert, impaired by alcohol/drugs,….)
- Behaviour of the pedestrian (proper, faulty, poor estimation of vehicle movement, sudden entry to the road….)
- License plate number
- Brand make of vehicle
- Vehicle operator (private, commercial, public transport…)
- Year of production of the vehicle
- Emergency service involvement

IV. COLLISION DIAGRAMS

Collision diagrams are usually drawn in a scheme at a scale of 1: 200 (or 1: 500). The scheme should contain all important local characteristics, especially those relevant to the movement and manoeuvres of pedestrians and vehicles. If there were changes in the geometry, or traffic organization or management at the site during the investigated period, it is necessary to display them as well.

Symbols for road accidents are marked according to the type of conflict, based on the Road Accident Typology Catalogue (see Appendix 1). The shape of the arrow shows the actual or intended direction of the road user's movement, which corresponds with the direction of travel immediately before the accident. However, collision diagrams not only display those road users who participate in the accident, but all of those who influence the road accident in any way. It is also suitable to indicate; e.g.:

- a pedestrian, who hesitated before crossing the road and caused a rear-end accident, yet remained uninjured
- all the vehicles which participated in an overtaking manoeuvre that caused the oncoming driver to swerve into a roadside ditch.

When displaying those indirect participants in collision diagrams, specific patterns and features will gradually become clear at the analysed location. The less road accidents shown in the scheme; the more important is the supplemental information.

A. Evaluation of collision Diagrams for Safety improvements

Collision diagrams provide a comfortable, yet fast and brief overview of the substantial characteristics of accidents that have occurred at a particular site or road section. The main principle governing how to identify deficiencies in road design that contribute to accidents is to search for common accident patterns in the analyzed collision diagrams. The more often that the pattern is repeated in the diagrams, the greater the probability is that the identified problem or shortcoming in the infrastructure is crucial to the solution. This relationship is also valid vice versa – the more varied and differentiated the accident characteristics are, the lower the

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chances are that the next accident can be avoided with the help of traffic engineering measures only.

The basis for the accident analysis is the accident type classification made according to the road accident typology catalogue. It is also necessary to involve other characteristics in the analysis, e.g.:

• A greater number of road accidents in wet conditions (or other difficult adhesion conditions),
• A greater number of road accidents at night or dusk,
• Accidents that involve only certain vehicle types (exclusively or predominantly motorcycles, heavy vehicles, busses ...),
• Accidents that involve specific types of road users (beginners, elderly people, children, foreigners.....),
• Accidents that occur during a certain time period (e.g. at darkness, dusk, in winter, summer, at sunrise, sunset, on a certain day of the week, etc.).

Detailed observation of the accident site and traffic monitoring at the site after the collision diagrams are drawn are vital. The accumulation of accident types substantially reduces the range of possible deficiencies which the road engineer must focus on during the site visit.

If the contributory factors related to road geometry are not clear from the analysis of the collision diagrams, detailed accident reports should be studied and all available additional information of the accident circumstances should be assessed. In case the mechanism of the accident origin is still unclear, an expert analysis need be carried out. According to experience, this is true in about 5% of cases; in other cases collision diagrams and information obtained from accident reports are sufficient enough to analyse the investigated location.

Appendix 2 shows examples of the use of the collision diagrams for the detection of road deficiencies and their removals. The aim of showing these examples is to demonstrate the usefulness of the collision diagrams for solving black spots in different European countries. Graphic forms may vary slightly in each country, but the principle, background and reasoning remain the same. In any case, collision diagrams are very effective tools, and are an integral part of an accident analysis throughout many countries because they enable the identification of abnormal accident patterns influenced by road design and the appropriate solutions for application.

V. RECOMMENDATIONS AND SUMMARY

A. *Recommendations*

- All levels of government, as well as several key public and private sector associates, support the road safety.
- Raise public awareness of road safety issues.
- Improve communication, cooperation and collaboration among road safety society and different sectors of the government.
- Enhance enforcement measures.
- Improve countrywide road safety data quality and collection.
- Using a recorder and cameras to help ease the investigation records beside the diagrams.

B. *Summary*

The study can be summarized as following:

- Importance and the need of accurate accident investigation in finding the cause(s) of each accident and recommend the preventive actions to reduce the likelihood of a similar traffic accident recurring in the future.
- Importance of qualification and experience of the investigators who carry out the investigation.
- Importance of availability of road accident data.
- The role of collision diagrams and symbols in helping to provide a comfortable, fast and brief overview of the road accident investigation.
- Practice examples of the use of the collision diagrams for the detection of road deficiencies and their removals to demonstrate the usefulness of the collision diagrams for solving black spots in different countries.

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APPENDIXES

APPENDIX 1
TYPES OF ACCIDENTS

The accident type describes the maneuver or conflict situation (e.g. a collision between a vehicle and a pedestrian crossing the road) which resulted in the accident. Only the conflict situation, which led to the accident, plays a role in determining the accident type. Whether and how the road users collided (so called "kind of accident") is not of relevance when determining the accident type. Nor do incorrect actions on the part of road users, i.e. the "accident cause", play a role when determining the accident type.

Classifying accidents according to their common features into several groups facilitates and defines the investigation process. Therefore, groups of accidents according to their occurrence and the types of collision are identified and used in accident analysis. The following list represents the accident types used in the Czech Road Accident Typology, which is based on the Austrian version.

Accidents are divided into the following 10 types:

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- Single vehicle accidents
- Road accidents of vehicles driving in the same direction on the road section
- Road accidents of oncoming vehicles on the road section
- Road accidents of vehicles entering a junction from the same direction
- Road accidents of vehicles entering a junction from opposite directions
- Road accidents of vehicles entering a junction from neighbouring lanes
- Road accidents of vehicles and pedestrians
- Road accidents with standing or parked vehicles
- Road accidents with animals and rail vehicles
- Other road accidents

Most other countries use similar typology of accident types with different number of accident types considered. For example in Germany, the typology contains somewhat less basic accident types - seven (see below with relevant definitions):

1. Driving Accident

An accident in which the driver loses control of the vehicle because he or she was driving at a speed which was inappropriate for the layout, the cross-section, the incline or the conditions of the road, or because he or she did not realise how the road was laid out or that there was a change in the cross-section until it was too late. Driving accidents are not always "one-party accidents" in which the vehicle leaves the road. They can also result in a collision with other road users.

2. Turning-off Accident

Turning-off accidents are those triggered by a conflict between a vehicle turning off a road and a road user travelling in the same or the opposite direction. This can happen at junctions and intersections with roads, at field tracks or cycle tracks, or at entrances to properties/car parks.

3. Turning-into/Crossing Accident

An accident triggered by a conflict between a vehicle which is obliged to give way, turning into a road or crossing the path of other traffic, and a vehicle which has right of way, is referred to as a "turning-into/crossing accident". This can happen at junctions and intersections with roads, field/cycle tracks and railway crossings, or at entrances to properties/car parks.

4. Crossing-over Accident

An accident is triggered by a conflict between a pedestrian crossing the road, and a vehicle, provided the vehicle had not just turned off a road. This rule applies irrespective of whether the accident occurred at a site without any special pedestrian-crossing facilities or at a zebra crossing, a light-controlled crossing or similar installation.

5. Accident caused by Stopping/Parking

An "accident caused by stopping/parking" is an accident triggered by a conflict between a vehicle in moving traffic and a vehicle which is parked (parking) or has stopped (is stopping) on the road. Such accidents include accidents in which the moving traffic conflicted with a vehicle manoeuvring into/out of a parking position. It does not matter whether stopping/parking was permitted.

6. Accident in longitudinal traffic

An "accident in longitudinal traffic" is an accident triggered by a conflict between road users moving in the same or opposite directions, provided the conflict is not the result of a manoeuvre that corresponds to another accident type.

7. Other Accidents

These accidents are all those which cannot be assigned to any other accident type. The basic groups are subsequently divided according to the relevant conflict events into more detailed categories, using the graphical symbols for easier understanding. See Road Accidents Typology Figures below, where the Czech typology is shown, or Figure A-1 with a German example of more detailed categories of stopping/parking accidents.

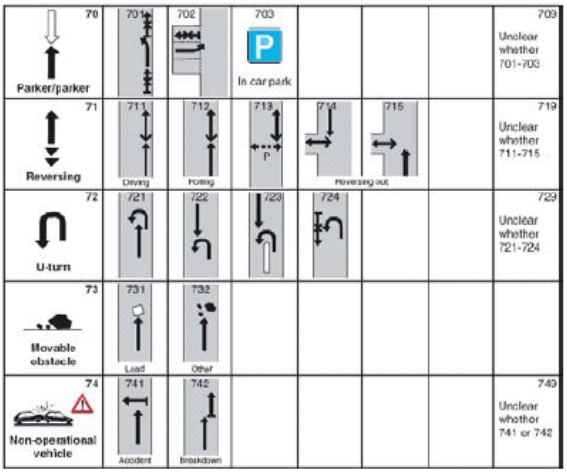
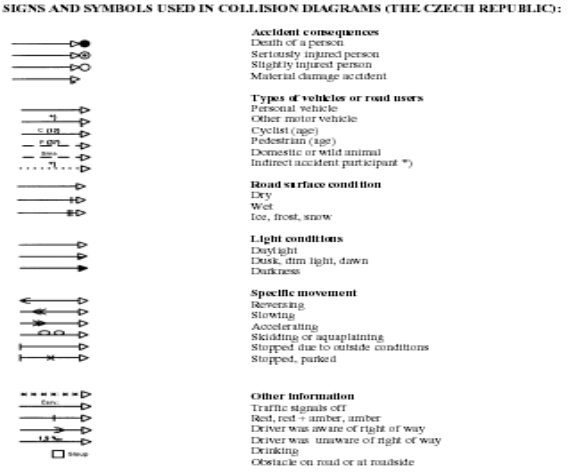


FIG A-1 : TYPOLOGY OF STOPPING/PARKING ACCIDENTS

Road Accidents Typology



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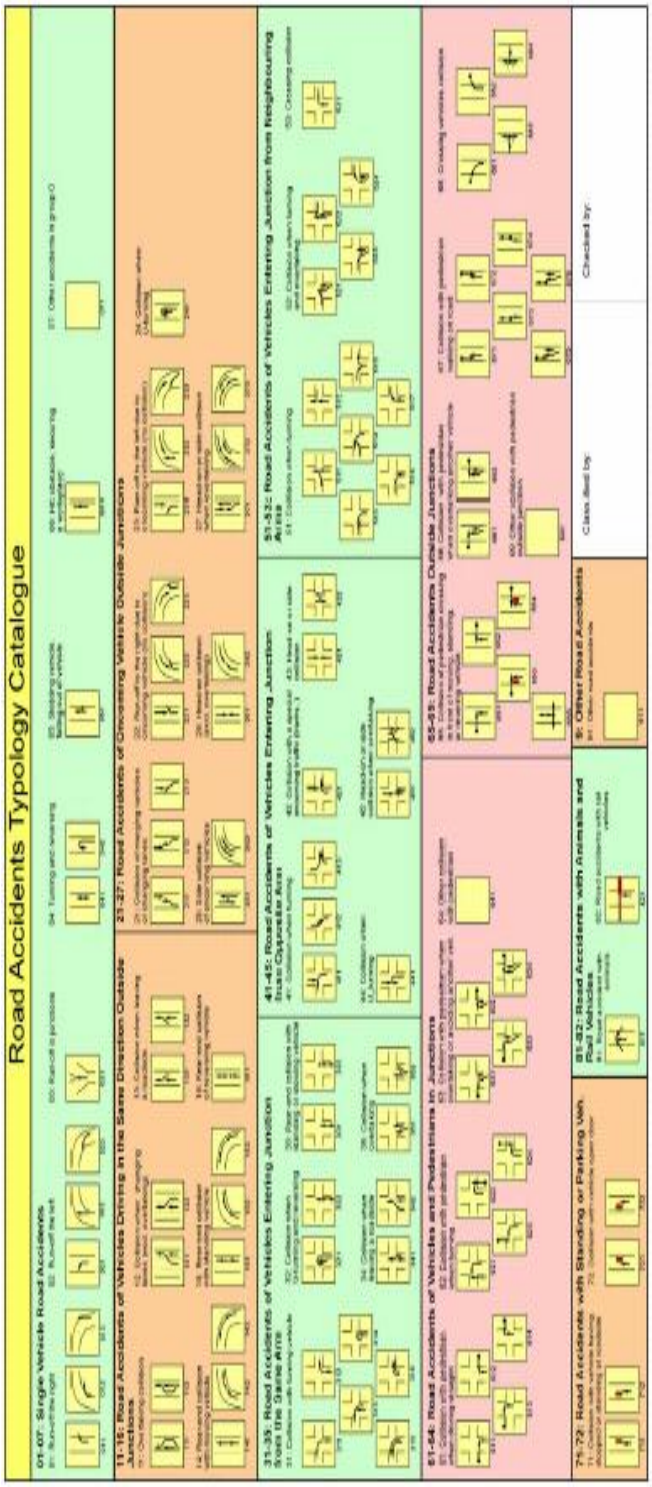

APPENDIX 2

EXAMPLES OF COLLISION DIAGRAMS FOR DETECTING ROAD DEFICIENCIES IN ROAD DESIGN AT HIGH RISK SITES

1. Practice Example

This is a black spot wherein pedestrians are involved. From the collision diagrams it is possible to easily find that most accidents occur when pedestrians are approaching the crosswalk from the right side, and most of accidents occur when the surface is wet. The analyst's task now is to investigate and observe this black spot in the appropriate accident conditions, i.e. at the time when the surface is wet; and develop a hypothesis about the reason why the pedestrians who approach from the right side are more at risk than those who approach from any other direction. Explanation may include for example:

- water drainage on the right side of the pavement is poor, so pedestrians concentrate on negotiating the puddle; rather than paying attention to oncoming cars,
- the speed in one direction may be higher than that in the opposite direction, which in combination with poor adhesive characteristics or road grade may lead to accidents during rainstorms,
- the placement of the pedestrian crossing may be problematic for motorists in one driving direction (i.e. placement behind instead of before an intersection), causing accidents in combination with the poor visibility of crosswalk markings during rainstorms.

2. before/after graphic comparison

If there are some road safety measures implemented on a certain blackspot based on road accident analysis, the trends in road accident frequency have to be monitored further, and evaluated. It is necessary to find out, with the help of before/after analysis, if the measure really helped to reduce the number of road accidents (or accident consequences). The road accident analysis should be carried out once again after a certain period of at least one year after the measure has been implemented. The effects of the implemented measures are found through comparisons of the collision diagrams of the black spot before and after the implementation of the measure (see FIGURE).

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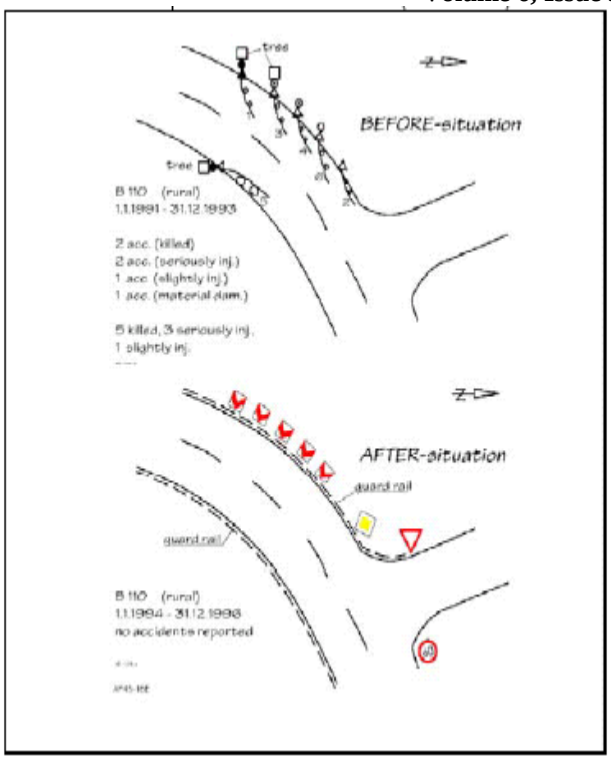

FIG 2: Example of Before/After Evaluation

Example No. 1 (the Czech Republic):
Pedestrian crossing on a main urban route

The unsuitable design of a pedestrian crossing led to the accumulation of accidents with pedestrians. Six accidents involving pedestrians were recorded in a period of 3 years with one serious injury, and 3 slight injuries. After rectification, which was based on collision diagrams analysis (see Figure 6-4), no accidents have been recorded in the last 3 years. The situation "before" is illustrated in Figures 6-1, 6-2 and 6-3.

Situation "Before"

Fig 6-1: "Invisible"crossing

Fig 6-2: Absence of a pedestrian island

Fig 6-3: Crossing is too long

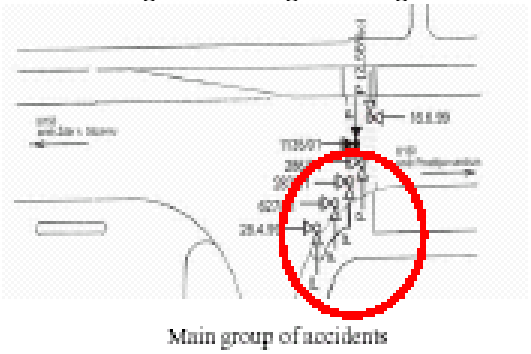

Fig 6-4: Accumulation of accidents

The following safety problems were identified during an analysis and site visit:

- Unsuitable drainage, water staying on the road (pedestrians trying to deal with the water obstacle fail to observe approaching vehicles)
- The crossing is unsuitably placed, and is abrupt from the psychological point of view of motorists, see Figure 6-1 (road marking is insufficiently distinct for approaching drivers. The situation worsens in wet conditions)
- The crossing is too long (9 m), and not equipped with a traffic island– see Figure 6-3 and Figure 6-2
- The speed of passing cars is too great Accident analysis conducted by using the collision diagrams showed a clear accumulation of accidents with similar contributory factors (see Figure 6-4).

According to this analysis, the following solutions were suggested and implemented (see Figure 6-5 and 6-6).

Solution:

- Repair water drainage
- Protect pedestrians by implementing the traffic island
- Improved street lighting, pedestrian crossing lighting, accessories for blind people

After

No accidents in the following 3 year period

Fig 6-5 and 6-6: New appearance of the pedestrian crossing

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Example No. 2 (Germany):
Intersection equipped with 'yield' or 'give way' signs
Before

Majority of traffic accidents caused by unsuitable "give way" signing. It is not distinctively clear who should give way – a phenomena of "psychological give way"

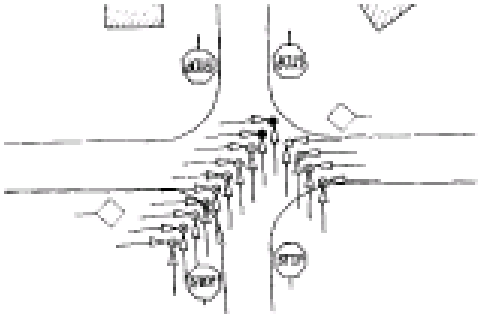

Fig 6-7 Collision diagrams, before reconstruction

After

This problem was solved by the placement of additional traffic signs above pavement. The obligation to "give way" was emphasized and is clearer now.

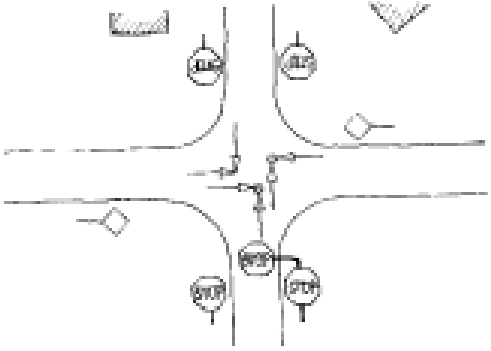

Fig 6-8: Collision diagrams, after reconstruction

APPENDIX 3

ROAD ACCIDENT REOPT FORM

MOTOR VEHICLE ACCIDENT REPORT | Please read the Privacy Act Statement on Page 3. | INSTRUCTIONS: Sections I thru IX are filled out by the vehicle operator. Section X, Items 72 thru 82c are filled out by the operator's supervisor. Sections XI thru XIII are filled out by an accident investigator for bodily injury, fatality, and/or damage exceeding $500.

SECTION I - FEDERAL VEHICLE DATA

1. DRIVER'S NAME (Last, first, middle)	2. DRIVER'S LICENSE NO./STATE/LIMITATIONS	3. DATE OF ACCIDENT
4a. DEPARTMENT/FEDERAL AGENCY PERMANENT OFFICE ADDRESS		4b. WORK TELEPHONE NUMBER ( )
5. TAG OR IDENTIFICATION NUMBER	6. EST. REPAIR COST $ / 7. YEAR OF VEHICLE / 8. MAKE / 9. MODEL	10. SEAT BELTS USED ☐ YES ☐ NO
11. DESCRIBE VEHICLE DAMAGE		

SECTION II - OTHER VEHICLE DATA *(Use Section VIII if additional space is needed.)*

12. DRIVER'S NAME (Last, first, middle)	13. DRIVER'S LICENSE NUMBER/STATE/LIMITATIONS
14a. DRIVER'S WORK ADDRESS	14b. WORK TELEPHONE NUMBER ( )
15a. DRIVER'S HOME ADDRESS	15b. HOME TELEPHONE NUMBER ( )
16. DESCRIBE VEHICLE DAMAGE	17. ESTIMATED REPAIR COST $
18. YEAR OF VEHICLE / 19. MAKE OF VEHICLE / 20. MODEL OF VEHICLE	21. TAG NUMBER AND STATE
22a. DRIVER'S INSURANCE COMPANY NAME AND ADDRESS	22b. POLICY NUMBER
	22c. TELEPHONE NUMBER ( )
23. VEHICLE IS ☐ CO-OWNED ☐ RENTAL ☐ LEASED ☐ PRIVATELY OWNED / 24a. OWNER'S NAME(S) (Last, first, middle)	24b. TELEPHONE NUMBER ( )
25. OWNER'S ADDRESS(ES)	

SECTION III - KILLED OR INJURED *(Use Section VIII if additional space is needed.)*

A	26. NAME (Last, first, middle)			27. SEX	28. DATE OF BIRTH
	29. ADDRESS				
	30. MARK "X" IN TWO APPROPRIATE BOXES ☐ KILLED ☐ INJURED / ☐ DRIVER ☐ HELPER / ☐ PASSENGER ☐ PEDESTRIAN	31. IN WHICH VEHICLE ☐ FED ☐ OTHER (2)	32. LOCATION IN VEHICLE	33. FIRST AID GIVEN BY	
	34. TRANSPORTED BY	35. TRANSPORTED TO			
B	36. NAME (Last, first, middle)			37. SEX	38. DATE OF BIRTH
	39. ADDRESS				
	40. MARK "X" IN TWO APPROPRIATE BOXES ☐ KILLED ☐ INJURED / ☐ DRIVER ☐ HELPER / ☐ PASSENGER ☐ PEDESTRIAN	41. IN WHICH VEHICLE ☐ FED ☐ OTHER (2)	42. LOCATION IN VEHICLE	43. FIRST AID GIVEN BY	
	44. TRANSPORTED BY	45. TRANSPORTED TO			
46. Pedestrian	a. NAME OF STREET OR HIGHWAY		b. DIRECTION OF PEDESTRIAN (SW corner to NE corner, etc.) FROM / TO		
	c. DESCRIBE WHAT PEDESTRIAN WAS DOING AT TIME OF ACCIDENT (Crossing intersection with signal, against signal, diagonally; in roadway playing, walking, hitchhiking, etc.)				

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SECTION IV - ACCIDENT TIME AND LOCATION *(Use Section VIII if additional space is needed.)*

47. DATE OF ACCIDENT | 48. PLACE OF ACCIDENT *(Street address, city, state, ZIP Code; Nearest landmark; Distance nearest intersection; Kind of locality (industrial, business, residential, open country, etc.); Road description).*

49. TIME OF ACCIDENT AM PM

50. INDICATE ON THIS DIAGRAM HOW THE ACCIDENT HAPPENED

Use one of these outlines to sketch the scene. Write in street or highway names or numbers.

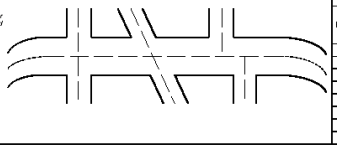
a. Number Federal vehicle as 1, other vehicle as 2, additional vehicle as 3 and show direction of travel with arrow.
Example: 1 2

b. Use solid line to show path before accident and broken line after the accident

c. Show pedestrian by

d. Show railroad by

e. Place arrow in this circle to indicate *NORTH*



51. POINT OF IMPACT *(Check one for each vehicle)*

FED	2	AREA
		a. FRONT
		b. R. FRONT
		c. L. FRONT
		d. REAR
		e. R. REAR
		f. L. REAR
		g. R. SIDE
		h. L. SIDE

52. DESCRIBE WHAT HAPPENED *(Refer to vehicles "Fed", "2", "3", etc. Please include information on posted speed limit, approximate speed of the vehicles, road conditions, weather conditions, driver visibility, condition of accident vehicles, traffic controls (warning light, stop signal, etc.) condition of light (daylight, dusk, night, dawn, artificial light, etc.), and driver actions (making U-turn, passing, stopped in traffic, etc.).*

SECTION V - WITNESS/PASSENGER *(Witness must fill out SF 94, Statement of Witness) (Continue in Section VIII.)*

A
53. NAME *(Last, first, middle)* | 54. WORK TELEPHONE NUMBER ( ) | 55. HOME TELEPHONE NUMBER ( )
56. BUSINESS ADDRESS | 57. HOME ADDRESS

B
58. NAME *(Last, first, middle)* | 59. WORK TELEPHONE NUMBER ( ) | 60. HOME TELEPHONE NUMBER ( )
61. BUSINESS ADDRESS | 62. HOME ADDRESS

SECTION VI - PROPERTY DAMAGE *(Use Section VIII if additional space is needed.)*

63a. NAME OF OWNER | 63b. OFFICE TELEPHONE NUMBER ( ) | 63c. HOME TELEPHONE NUMBER ( )
63d. BUSINESS ADDRESS | 63e. HOME ADDRESS
64a. NAME OF INSURANCE COMPANY | 64b. TELEPHONE NUMBER ( ) | 64c. POLICY NUMBER
65. ITEM DAMAGED | 66. LOCATION OF DAMAGED ITEM | 67. ESTIMATED COST $

SECTION VII - POLICE INFORMATION

68a. NAME OF POLICE OFFICER | 68b. BADGE NUMBER | 68c. TELEPHONE NUMBER ( )
69. PRECINCT OR HEADQUARTERS | 70a. PERSON CHARGED WITH ACCIDENT | 70b. VIOLATION(S)

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SECTION VIII - EXTRA DETAILS

SPACE FOR DETAILED ANSWERS. INDICATE SECTION AND ITEM NUMBER FOR EACH ANSWER. IF MORE SPACE IS NEEDED, CONTINUE ITEMS ON PLAIN BOND PAPER.

SECTION IX - FEDERAL DRIVER CERTIFICATION

In compliance with the Privacy Act of 1974, solicitation of the information requested on this form is authorized by Title 40 U.S.C. Section 491. Disclosure of the information by a Federal employee is mandatory as the first step in the Government's investigation of a motor vehicle accident. The principal purposes for using this information is to provide necessary data for legal counsel in legal actions resulting from the accident and to provide accident information/statistics in analyzing accident causes and developing methods of reducing accidents. Routine use of information may be by Federal, State or local governments, or agencies, when relevant to civil, criminal, or regulatory investigations or prosecutions. An employee of a Federal agency who fails to report accurately a motor vehicle accident involving a Federal vehicle or who refuses to cooperate in the investigation of an accident may be subject to administrative sanctions.

I certify that the information on this form *(Sections I thru VIII)* is correct to the best of my knowledge and belief.

71a. NAME AND TITLE OF DRIVER | 71b. DRIVER'S SIGNATURE AND DATE

SECTION X - DETAILS OF TRIP DURING WHICH ACCIDENT OCCURRED

72. ORIGIN | 73. DESTINATION
74. EXACT PURPOSE OF TRIP

	DATE	TIME *(Circle one)*		DATE	TIME *(Circle one)*
75. TRIP BEGAN		a.m. p.m.	76. ACCIDENT OCCURRED		a.m. p.m.

77. AUTHORITY FOR THE TRIP WAS GIVEN TO THE OPERATOR ☐ ORALLY ☐ IN WRITING *(Explain)*

78. WAS THERE ANY DEVIATION FROM DIRECT ROUTE ☐ NO ☐ YES *(Explain)*

79. WAS THE TRIP MADE WITHIN ESTABLISHED WORKING HOURS ☐ YES ☐ NO *(Explain)*

80. DID THE OPERATOR, WHILE ENROUTE, ENGAGE IN ANY ACTIVITY OTHER THAN THAT FOR WHICH THE TRIP WAS AUTHORIZED. ☐ NO ☐ YES *(Explain)*

81. COMPLETED BY DRIVER'S SUPERVISOR | a. DID THIS ACCIDENT OCCUR WITHIN THE EMPLOYEE'S SCOPE OF DUTY ☐ YES ☐ NO | b. COMMENTS

82a. NAME AND TITLE OF SUPERVISOR | 82b. SUPERVISOR'S SIGNATURE AND DATE | 82c. TELEPHONE NUMBER ( )

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