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Security Dimensions. International & National Studies nr 4 (20), 132-164

2016

SECURITY DIMENSIONS
INTERNATIONAL & NATIONAL STUDIES
NO. 20; 2016 (132–164)
DOI 10.24356/SD/20/7

POSSIBILITY OF THE EVALUATION OF INJURIES OF AN UNBELTED PASSENGER IN A VEHICLE AND THE NEED FOR SPECIAL PROCEDURES WHILE INSPECTING THE SITE OF THE ACCIDENT

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ABSTRACT

Article concerns the issue of car accident scene investigation. An example of modern forensic techniques usage is given, with potential for implementing the FORTIS system as an element of trail.

ARTICLE INFO

Article history
Received: 04.11.2016 Accepted 12.12.2016

Key words
car accident, forensics, FORTIS

Annotation:

The issue of traffic accidents, their documentation and a subsequent clarification represents a complex activity of not only investigative procedures and operations but also a number of other expert activities. The goal of the study is to describe a forensic relevant event „Traffic accident" in the context of the process of documentation, searching and securing forensic relevant clues as well as to show on a particular example not only the necessity of use of investigative-tactic and technical methods in the documentation and clarification process, but also its importance for the quality of expert evidence and concurrent options of the use of modern technologies and procedures for the stated activities while clarifying traffic accidents, and last but not least the quality of searching and securing tracks, complexity and completeness of the documentation for further process of expert examination and the overall investigation outcome.

A car accident is as an extraordinary and undesired event in the traffic, not only in terms of the technical clarification, legal assessment and environmental care[1], a special, complex and in individual operations indivisible issue, whereby the result of the clarification and assessment directly depends especially on the quality and completeness of primary operations performed directly on the scene of the accident, by which the accident site is documented and tracks are secured and on the methodology used by the experts in the evidence.

To assess the complete and complex procedures in the process of the accident site documentation in order to document it and secure tracks and the resulting outcome of the expert evidence as well as other forensic relevant events, it is most suitable to use a model situation.

1 Comp. M. Orinčák, *Overenie účinnosti sorpčných materiálov pri zneškodnení chemických látok*, „Krízový manažment: vedecko - odborný časopis Fakulty bezpečnostného inžinierstva Žilinskej univerzity v Žiline", 2016, Roč. 15, č. 1, p. 34–44; M. Orinčák, *Chemical decontamination of selected hazardous chemical substances*, [in:] *Advances in fire, safety and security research 2015: scientific book*, Fire Research Institute of the Ministry of interior SR, Bratislava 2015, p. 50-59; M. Orinčák, J. Franer, *Aplikácia vyhodnocovacieho programu CAMEO Software Suite a TerEx na vybraté chemické nebezpečné látky v praxi*, „Krízový manažment: vedecko - odborný časopis Fakulty bezpečnostného inžinierstva Žilinskej univerzity v Žiline", 2015, Roč. 14, č. 2, p. 84-94.

Situation:

The accident happened at night as follows – a driver under the influence of alcohol while passing a right-hand bend did not adapt driving speed to condition and nature of the road, the vehicle properties and other circumstances. Consequently, while passing the right-hand bend he drove to the opposite direction to the roadside and then back to his driving direction. After that he drove to right off the road where he crashed into a ditch. Consequently the vehicle turned upside down several times resulting in a severe injury of the passenger with a treatment time and sickness absence of 2 months. The policemen performed a breath test on the driver which detected the alcohol level of 0,20 MG/L.

Photo documentation from the accident site (informative selection):

Due to the injury it was obvious that in this case it was necessary to classify the accident as a criminal offence. In order to document it properly, to clarify it and to precisely define its causes as well as the responsibility in terms of the applicable legislation the accident site inspection was carried out on the spot.

It is obvious from the file documentation as well as from the photo documentation of the accident site that it was performed after the accident at night under unfavourable light conditions (using the artificial light too).

Due to the fact that the first inspection was performed at night, additional inspection of the accident site was performed on the following day during which the photo documentation was prepared (see the selection):




By evaluating the processed record from the accident site inspection we can say that these basic data were obtained and documented:

– *The accident happened at night.*
– *The driver driving a vehicle under the alcohol influence while passing a right-hand bend did not adapt the speed to condition and nature of the road, the vehicle properties and other circumstances. Consequently, while passing the right-hand bend he drove to the opposite direction to the roadside and then back to his driving direction. After that he drove to right off the road where he crashed into a ditch. Consequently the vehicle turned upside down several times resulting in a severe injury of the passenger with a treatment time and sickness absence of 2 months. The policemen performed a breath test on the driver which detected the alcohol level of 0,20 MG/L.*
– *The centre of the railway overpass was chosen as BMP (Basic measurement point). A metal telephone mast 315,0 m far from BMP was chosen as AMP (auxiliary measurement point).*

In the distance 65,02 m from AMP and 6,5 m from the curb the tracks started, directed parallelly, next to one another.

– *In the distance 84,1 m from AMP and 6,3 m from the curb the right track entered the road and was directed across, where in the distance 103 m from AMP and 3,1 m crossed the central line and continued within 111,1 m from AMP, where it left the road.*

– *In the distance 91,8 m from AMP and 6,3 m from the curb the left track entered the road and was directed across the road, where in the distance 108,3 m from AMP and 3,1 m from the curb it crossed the central line and continued within 115,4 m, where it left the road and continued within 117,3 m from AMP and 2,6 m from the curb off the road, where it stopped.*
– *The width of the ditch was 1,8 m.*
– *In the distance 141,4 m from AMP and 21,2 m from AMP there was the LF corner of the vehicle and in the distance 145,8 m from AMP and 21,0 m from the curb off the road there was the RR corner of the vehicle.*

No other tracks were found out and localised on TA site.

These basic information obtained from the accident site inspection record as well as information obtained from the prepared photo documentation were then used to develop the accident site plan at an appropriate scale as a part of the investigative documentation of the accident in question during its inspection.

Within investigation of the stated accident, following the resulting effect, a forensic expert from the transport field was then brought up.

The result of the whole investigation and evidencing process was the following calculation of vehicle movement developed by the expert based on the found facts:

In the course of the following operations the driver, who did not have any injuries in the accident, started to challenge the accuracy and completeness of investigation results in terms that the injury of the passenger was caused mainly due to the fact he was not wearing a safety belt at the time the accident happened.

In order to clarify the above, a decision was made to develop another expert opinion, at assigning of which the expert stated their incompleteness for the purpose of the requested evidence, whereby he showed the incompleteness of the primary inspection through the following facts:

– the shape of the terrain off the road was not found out,
– the spot of the first fall of the vehicle was not localised,
– the vehicle movement trajectory before it stopped in the final position was not defined and localised,
– a contact point on the vehicle when it hit the ditch wall and in the corn field was not defined,
– the tracks in the spot where the vehicle hit the ditch were not documented in detail,
– the track dimensions of the vehicle contact with the terrain were not recorded,
– the tracks of the passenger movement in the terrain were not identified,
– no tracks of the passenger´s contact with the vehicle interior were defined and marked,
– the place where the remains of the right front (RF) door glass were found was not defined and localized,
– the weight and height of the driver and the passenger was not found out,
– the final position of the passenger was not found out and localized,
– the condition of safety belts in the vehicle after the accident was not checked.

Taking into account the deficiencies found during the primary inspection and further inspection and a need for an additional evidence in the matter of the vehicle movement on the surface and the movement of its crew, a decision was taken to elaborate an expert opinion by the experts of the forensic medicine and traumatology department using the Fortis system in cooperation with an expert in the field of transport, thus using the knowledge about the passenger´s injuries to prove the course of the accident.

If we go back to the fact of inviting a forensic expert and initial findings, so on the basis of the statement, these facts were purposely found out in connection with the marking of the final position of the passenger´s body:

the injured body after the accident was lying on the ground approx. 3 m far from the vehicle (not less than 3 and not more than 5 m) on the back, i.e. facing the sky, more or less straight, as if it got from the passenger´s seated position to the lying position – in the same direction as a seated passenger – only straightened to a lying position.

The statement was accompanied with a photograph with a marked additionally indicated approximate final position of the passenger.

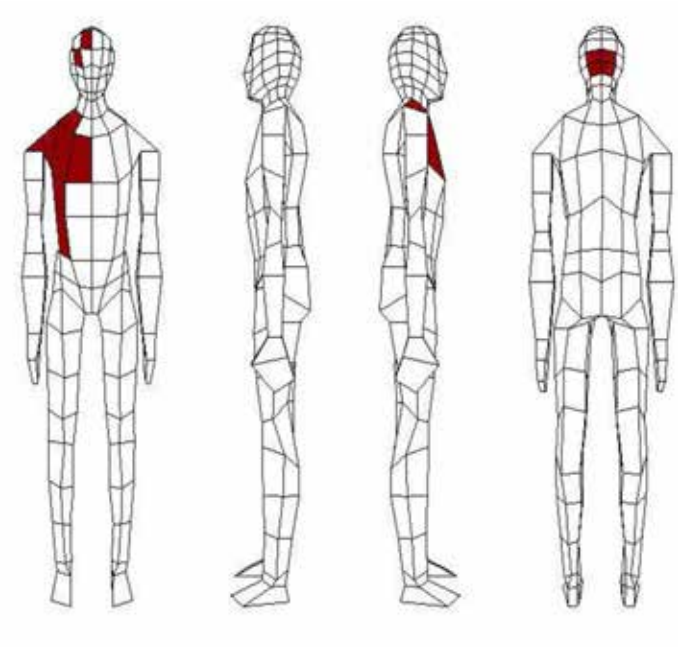
Forensic evaluation of the passenger's injuries – the knowledge enabling to precise the calculation of the vehicle and crew movement

Basic injury to health (ZPZ):

Polytrauma – a traffic injury of the passenger:

– *skin abrasions and bruising on the head, trunk and abdomen (localisation and extent are not stated in the medical records),*
– *a contusion of the abdominal cavity wall (localisation and extent are not stated in the medical records),*
– *multiple serial fractures of the 3rd – 8th rib on the right,*
– *a closed fracture of the right clavicle with a movement of splinters,*
– *a contusion of the right lung,*
– *a focal contusion of the brain stem in the midbrain (according to the results of an MRI examination),*
– *diffuse axonal brain injury (according to the results of an MRI examination).*

The view of the localization of injuries to a passenger incurred in an accident performed in FORTIS program (Forensic Traumatology Injury Scale)



FORTIS forensic individual signature of injuries of a passenger incurred in an accident

FORTIS

	Celkom	ZPZ	Ko1	Ko2
Trup	14,2	14,2	0	0
Panva	0	0	0	0
Pravé stehno	0	0	0	0
Pravé lýtko	0	0	0	0
Pravé chodidlo	0	0	0	0
Ľavé stehno	0	0	0	0
Ľavé lýtko	0	0	0	0
Ľavé chodidlo	0	0	0	0
Ľavé nadlaktie	0	0	0	0
Ľavé predlaktie	0	0	0	0
Pravé nadlaktie	1	1	0	0
Pravé predlaktie	0	0	0	0
Krk	0	0	0	0
Hlava	7,6	7,6	0	0
Ľavé koleno	0	0	0	0
Pravé koleno	0	0	0	0

Celkom: FORTIS ZPZ	22,8
Celkom: FORTIS Ko1	0
Celkom: FORTIS Ko2	0
FORTIS celkom	22,8

Value of injury severity according to Fortis: 22,8

For the further expert investigation of a probable vehicle movement in the terrain it was possible to use, besides the aimed facts, also

– the performed localization of the passenger's injuries and determination of severity of his/her injuries in the form of a signature of injuries prepared in FORTIS system,
– a detailed technical evaluation of the vehicle damage extent and way based on the submitted photo documentation,
– an approximate arrangement of unlocalised tracks of the vehicle movement in the terrain
– a determination of a technical possibility of the passenger´s body movement into its final position in the terrain

The evaluation of the documented damage of the vehicle as a part of the expert´s analysis:

RF fender – pressed, RR fender – pressed, RF door – broken glass, RR door – broken glass

The front part of the vehicle
– the front part undamaged
– a deformation of the LF fender and headlamp
– R bumper shifted to the L side
– the R hood flattened on the R side
MH

the left A pillar undeformed
the right A pillar – a deformation by a collision with the windshield pressed inwards

LR fender – deformed

From the position of the passenger´s safety belt it is obvious that the belt was not active during the course of the accident

a deformed latch of the LF door handle

a deformed RR wheel and a damaged tire of the LF wheel

The glass remains trapped in the guide seal of the RF door

The glass remains trapped in the guide seal of the RR door

Tracks detected in the terrain

The tracks of the vehicle movement in the terrain (the ditch and crop) (it is not possible to rule out the additional tracks in the crop – caused by the movement of people during the realization of TA (traffic accident))

Other findings, evaluations and estimations:

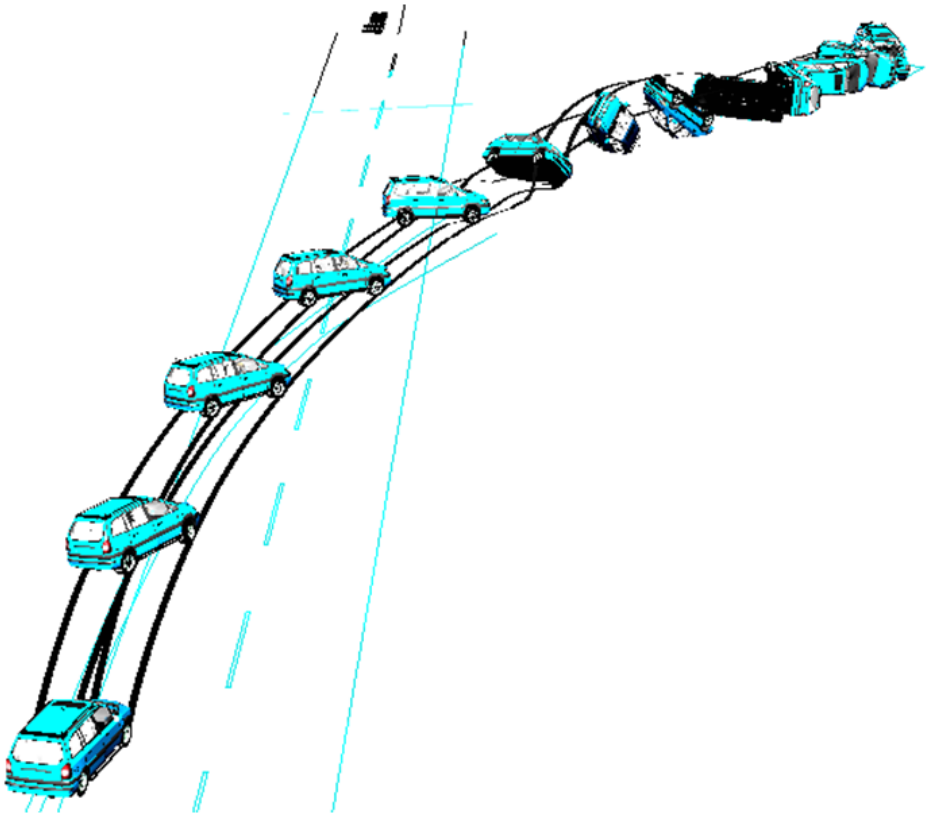
– *the impact of the crop undergrowth on the vehicle movement: little,*
– *the impact of the crop undergrowth on the passenger movement in the terrain: big, in case the passenger did not move above the crop undergrowth in the terrain or directly behind the sliding vehicle,*
– *a not stated finding of the broken glass shards, undetected according to the photo documentation (the glass panels of the RF, RR doors and the windshield may not have been broken at the same time),*
– *the vehicle did not have the contact with the terrain directly by its front or rear part.*

The calculation of the vehicle movement in the terrain

The vehicle movement was derived from the localised and detected tracks, detected approximate shape of the terrain surface in the driving corridor of the vehicle, final vehicle position and detected vehicle deformations, whereby the calculation was verified consequently using the FORTIS system results developed by the forensic doctors.

According to their importance it was possible to consider the stated documents as
– correct (the localised tracks and final vehicle position)
– applicable (the tracks detected on the road and curb, vehicle deformation, statements, approximate shape of the terrain)
– relatively additional (the tracks detected in the terrain next to the vehicle)
– control – the signature of localisation and severity of the passenger´s injuries (Fortis)

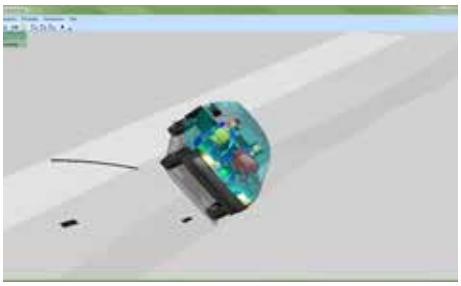
On the basis of the documents the corresponding vehicle movement on the road, on the road edge and in the terrain was calculated – see the view in the ground plan and in the 3D virtual reality including the trajectories of the wheel movement:



The calculation of the crew movement – the passenger with an unfastened seat belt

The movement of the vehicle crew and the passenger on the RF seat (the yellow figure) according to the calculation:

1.



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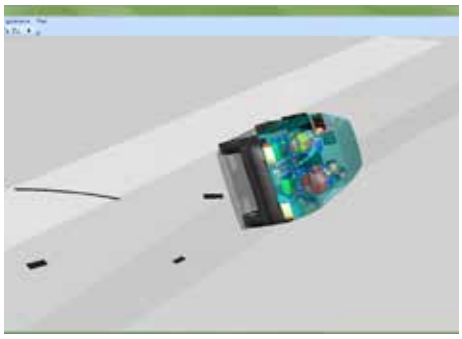
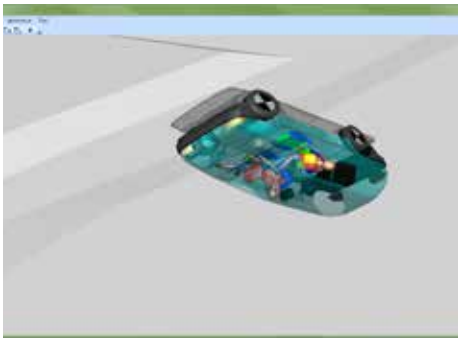


3.

4.

5.



6.

7.

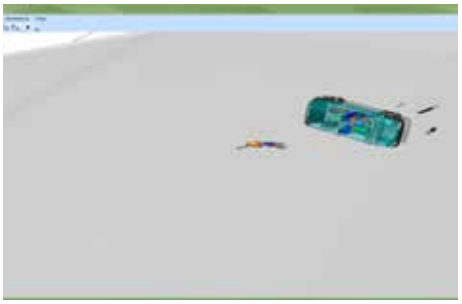
8.

9.

10.

11.

12.



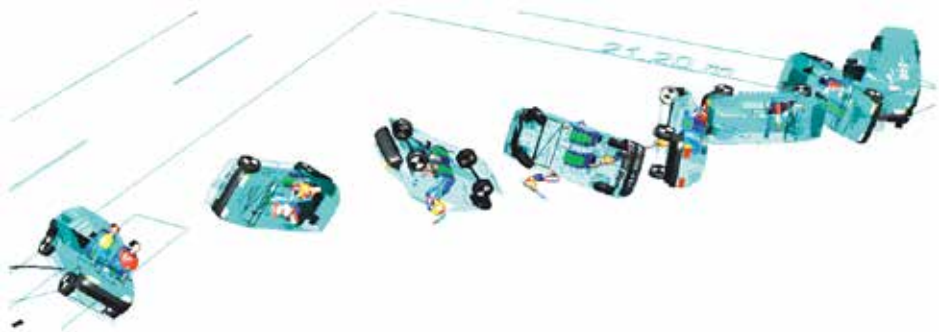
13.

14.

15.

16.

A complete view of the vehicle movement and the unbelted passenger at the interval of 0,5 s.



The calculation of the crew movement – the passenger with a fastened seat belt

A complete view of the vehicle movement and the unbelted passenger in the terrain at the interval of 0,5 s.

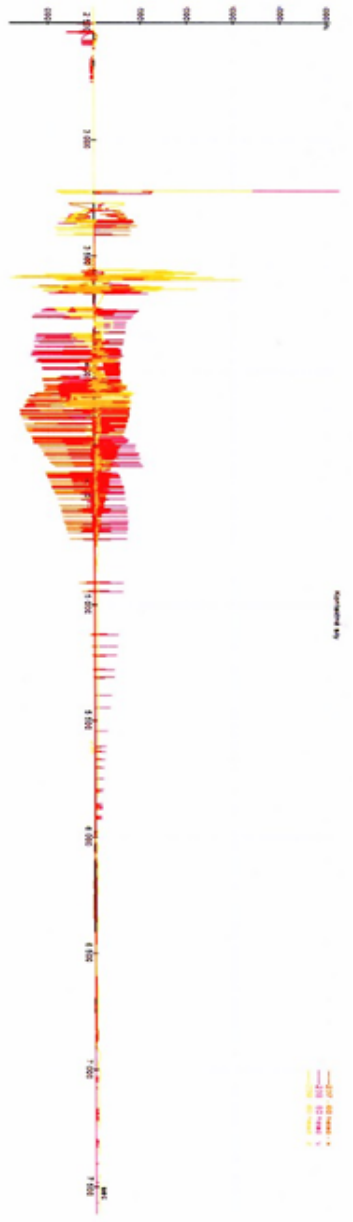
The view in the direction of the vehicle movement

The view opposite the direction of the vehicle movement

The data obtained from the calculation of the crew movement – the physical effects affecting the individual parts of the passenger´s body in case he was not using a seat belt and in case he was using a seat belt– an output example

Nepripútaný - Hlava - kontaktné sily v smere x,y,z

Čas sec	60 head - x N	60 head - y N	60 head - z N
2.5000	0.000000	0.000000	0.000000
2.6000	-0.489238	-2.371268	0.764520
2.7000	-0.599375	-0.842966	-0.156381
2.8000	0.000000	0.000000	0.000000
2.9000	0.000000	0.000000	0.000000
3.0000	0.000000	0.000000	0.000000
3.1000	0.000000	0.000000	0.000000
3.2000	0.000000	0.000000	0.000000
3.3000	31.215781	188.855796	108.375304
3.4000	8.635447	2.777214	-7.135018
3.5000	7.850428	-1.086159	-4.022731
3.6000	980.624154	50.974800	-244.954284
3.7000	-16.410977	10.671517	108.640418
3.8000	-2.524982	-5.442643	8.384165
3.9000	44.033660	292.213350	101.519772
4.0000	397.578821	454.158367	117.045589
4.1000	-1337.523247	-613.203041	149.853774
4.2000	-1421.771437	-132.367963	-35.049467
4.3000	-20.117941	10.142768	75.111359
4.4000	-5.270247	9.736757	4.678333
4.5000	-4.370440	7.948735	0.238588
4.6000	183.001677	-66.846317	33.794949
4.7000	37.314335	-9.756783	44.831717
4.8000	-5.437881	8.078454	52.865751
4.9000	-8.625785	6.973802	60.171678
5.0000	-7.402875	6.558153	59.613442
5.1000	-5.974303	6.131610	54.266146
5.2000	-5.699280	5.702289	58.943208
5.3000	-4.964762	5.124070	55.892183
5.4000	-4.802977	4.610444	58.021438
5.5000	-4.561308	4.135703	58.719536
5.6000	-4.447549	3.667643	59.323336
5.7000	21.414235	113.543298	65.779425
5.8000	-4.336379	2.913362	59.657666
5.9000	-4.702986	2.611604	63.772887
6.0000	-2.497420	2.893316	6.455746
6.1000	-16.409827	11.280614	34.952521
6.2000	-30.937261	20.889688	65.501438
6.3000	-31.723674	22.169108	67.988291
6.4000	-14.568451	10.730999	31.842003
6.5000	-4.840175	4.006636	11.100511
6.6000	-6.179334	7.021890	16.688311
6.7000	-15.272438	14.030432	36.765965
6.8000	-8.938346	10.802478	25.059772
6.9000	0.758530	2.766204	5.214709
7.0000	-0.009890	-2.205282	56.857655
7.1000	-0.009902	-2.208117	56.930750
7.2000	-0.011484	-2.560827	66.024496
7.3000	-0.011671	-2.602512	67.099238
7.4000	-0.011679	-2.604311	67.145618
7.5000	-0.011878	-2.648767	68.291807
7.6000	-0.011703	-2.609773	67.286423



Pripútaný - Hlava - kontaktné sily v smere x,y,z

Čas sec	60 head - x N	60 head - y N	60 head - z N
2.5000	0.000000	0.000000	0.000000
2.6000	0.000000	0.000000	0.000000
2.7000	-78.252174	-148.085459	217.188769
2.8000	-1.041573	-0.611446	-0.014698
2.9000	-57.753679	-6.102226	169.059840
3.0000	-0.389798	0.308880	1.678500
3.1000	0.000000	0.000000	0.000000
3.2000	0.000000	0.000000	0.000000
3.3000	0.000000	0.000000	0.000000
3.4000	0.000000	0.000000	0.000000
3.5000	0.000000	0.000000	0.000000
3.6000	0.000000	0.000000	0.000000
3.7000	0.063693	3.542563	2.130950
3.8000	0.000000	0.000000	0.000000
3.9000	0.000000	0.000000	0.000000
4.0000	0.000000	0.000000	0.000000
4.1000	0.000000	0.000000	0.000000
4.2000	-1.079807	0.578915	-0.676209
4.3000	0.000000	0.000000	0.000000
4.4000	0.000000	0.000000	0.000000
4.5000	-0.148132	0.306795	0.008216
4.6000	0.000000	0.000000	0.000000
4.7000	0.000000	0.000000	0.000000
4.8000	-1.045515	-1.589393	-0.378722
4.9000	-4.103546	-0.936773	1.904779
5.0000	-4.200033	-0.492404	1.184452
5.1000	-3.448563	1.956646	3.515723
5.2000	-3.236177	3.118865	3.030106
5.3000	-3.401879	1.971103	3.254339
5.4000	-4.406451	1.514761	2.519295
5.5000	-1.306529	-0.173629	2.357034
5.6000	0.000000	0.000000	0.000000
5.7000	-205.252349	230.395394	22.848136
5.8000	-1.402726	1.926162	1.029605
5.9000	-0.193938	0.318279	0.406446
6.0000	0.962566	0.755871	0.344806
6.1000	0.000000	0.000000	0.000000
6.2000	108.657904	52.105123	377.501905
6.3000	65.240853	-70.434904	75.581433
6.4000	4.088430	2.581535	-0.056685
6.5000	-245.652111	25.344517	163.419071
6.6000	-81.635709	51.586679	46.877669
6.7000	-114.364741	115.923512	135.331290
6.8000	54.217047	51.628414	37.508242
6.9000	-1.625583	1.250828	2.006990
7.0000	-1.359053	0.993621	1.622891
7.1000	-75.290934	34.189719	57.346352
7.2000	-0.872345	14.889191	36.459709
7.3000	-84.588644	-20.814745	57.101542
7.4000	-4.156534	12.783752	30.367866
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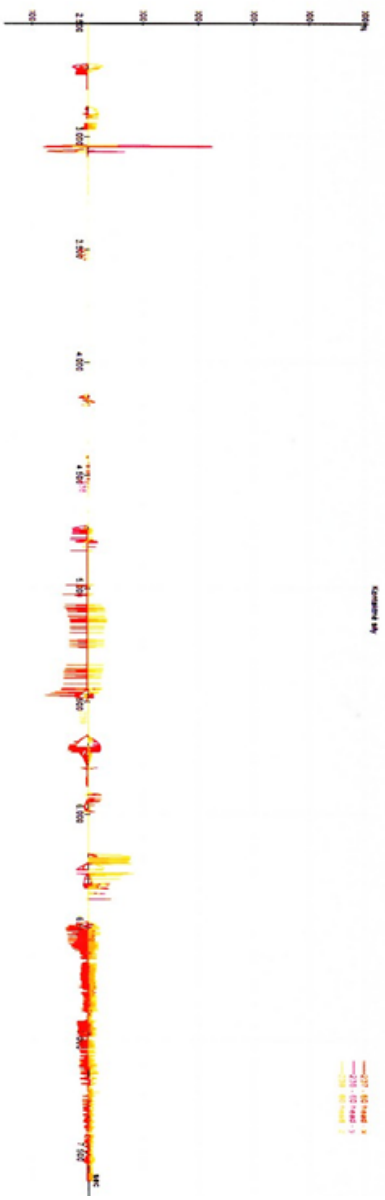
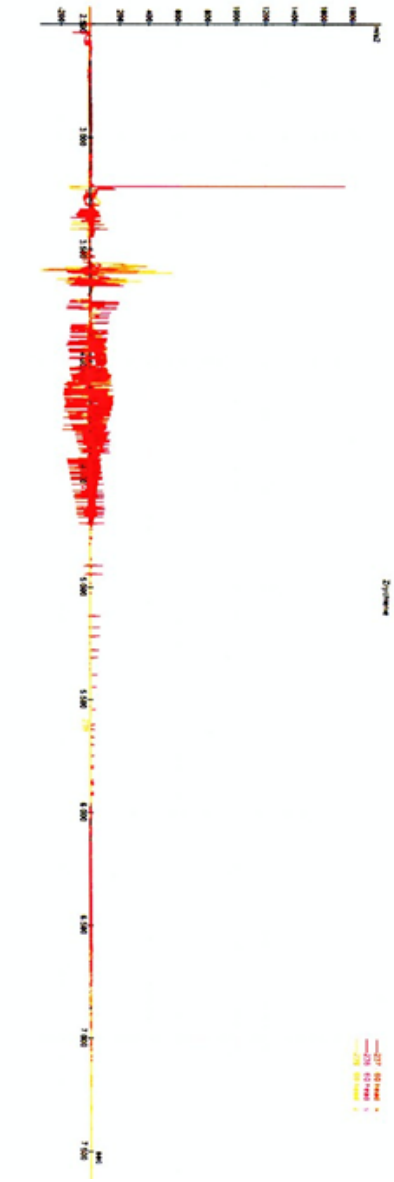
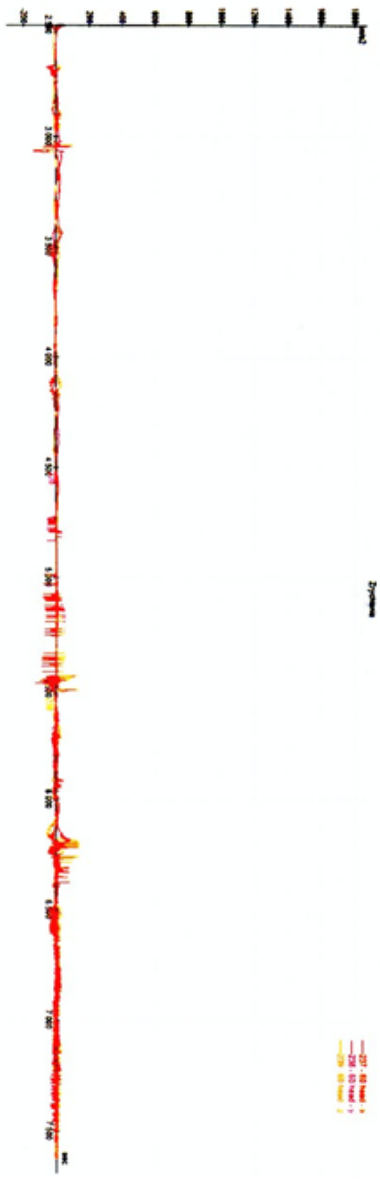


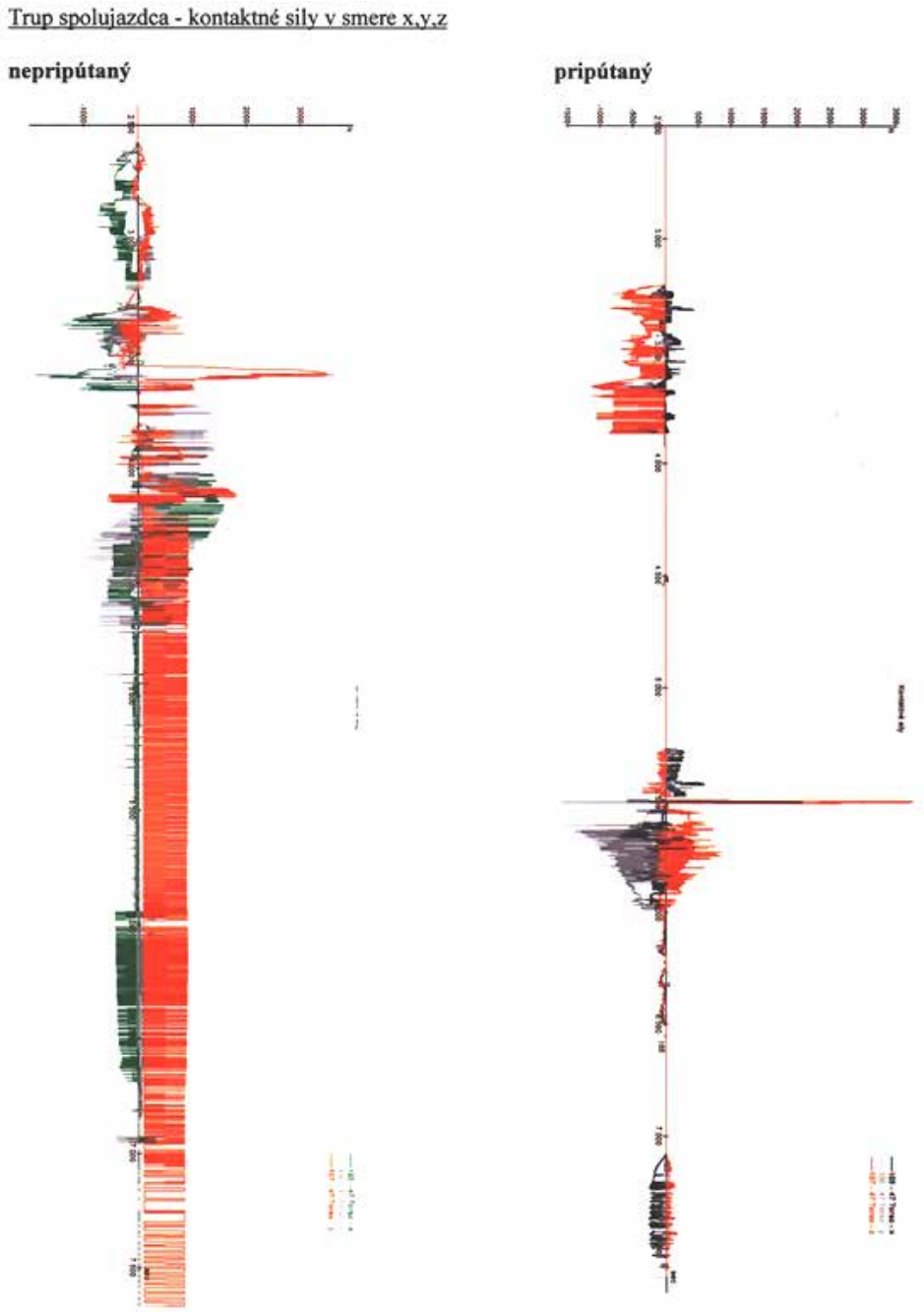
Hlava spolujazdca - zrýchlenie v smere x,y,z (9,81m/s^2 = 1 G)

nepripútaný



pripútaný

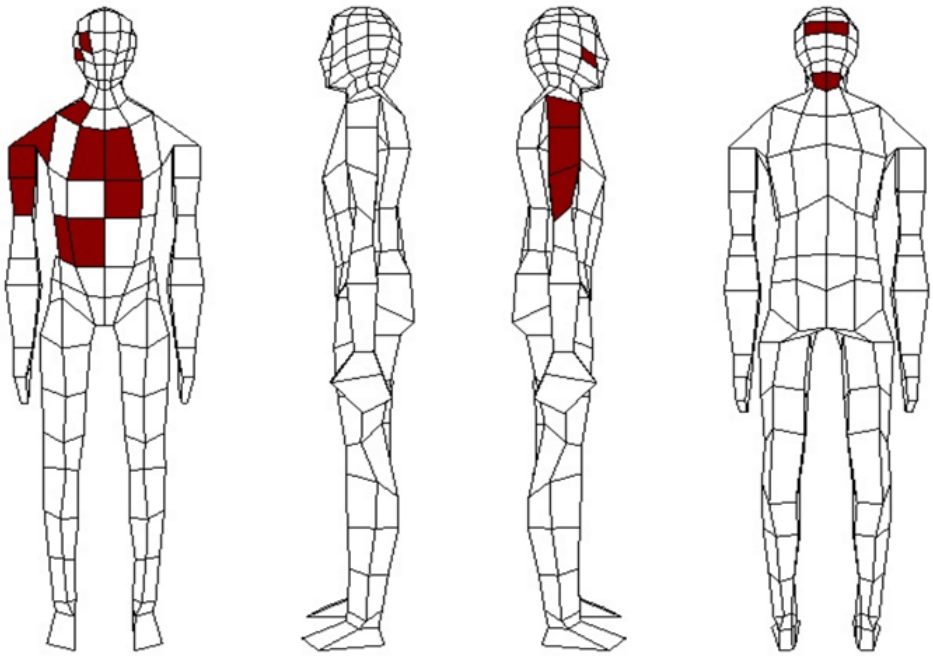



Trup spolujazdca - kontaktné sily v smere x,y,z
nepripútaný
pripútaný

The comparison of the part of the results of the physical parameter calculations affecting the passenger´s body and its parts.

The FORTIS forensic injury signature (Forensic Traumatology Injury Scale) with a belted passenger and its evaluation developed on the basis of the submitted parameters of physical effects and times of their impact on the passenger´s body and its individual parts if he had been belted:

The parametrization of injuries was developed by means of the FORTIS v. 1.2 computer system (authors MUDr. Nikita. Bobrov, CSc., Ing. Ján Mandelík, PhD., Ján Macej)



Meno:
Muž, 86 kg, 185 cm, pripútaný

The forensic conclusion based on the analysis of the vehicle and crew movement

Based on the evaluation of the values and effect times of the physical parameters affecting the body of the passenger not using a seat belt during the accident and based on the calculated values of the affecting physical parameters and times of their effect on the body of the passenger using

a seat belt during the accident as well as based on the visual assessment of the passenger movement on the video records, we may say that:

In terms of the quantification of injury severity and their complications through the scoring we may come to a conclusion that **if the injured passenger had used a safety belt in OMV, he would have suffered the injuries of a smaller extent and severity, quantitatively 40,4% of the severity of the actual injuries within the polytrauma that he in fact suffered as a passenger not wearing safety belt.**

In the assessed case it was the polytrauma of the vehicle passenger after the vehicle drove off the road on the right side, crashed into the lower part of the slope in the ditch next to the right roadside, then turned and rotated at the same around the vertical axis in the field next to the road.

FORTIS

	Celkom	ZPZ	Ko1	Ko2
Trup	6,4	6,4	0	0
Panva	0	0	0	0
Pravé stehno	0	0	0	0
Pravé lýtko	0	0	0	0
Pravé chodidlo	0	0	0	0
Ľavé stehno	0	0	0	0
Ľavé lýtko	0	0	0	0
Ľavé chodidlo	0	0	0	0
Ľavé nadlaktie	0	0	0	0
Ľavé predlaktie	0	0	0	0
Pravé nadlaktie	1,8	1,8	0	0
Pravé predlaktie	0	0	0	0
Krk	0,6	0,6	0	0
Hlava	1,7	1,7	0	0
Ľavé koleno	0	0	0	0
Pravé koleno	0	0	0	0

Celkom: FORTIS ZPZ	10,5
Celkom: FORTIS Ko1	0
Celkom: FORTIS Ko2	0
FORTIS celkom	10,5

The value of injury severity according to Fortis scale: 10,5

The above mentioned injuries of the passenger, namely skin abrasions and bruising on the head, trunk and abdomen, a contusion of the abdominal cavity wall, multiple serial fractures of the 3rd – 8th rib, a closed fracture of the right clavicle, a focal contusion of the right lung, a focal contusion of the brain stem in the midbrain with a diffuse axonal brain injury, **were caused by blunt and blunt-square objects with a narrow as well as wide contact surface**, which affected the described parts of the passen-

ger´s body with force and severity, sometimes with pressure; they were induced by the forceful contacts of the head and body of the vehicle passenger with the parts of the interior and body of the vehicle which were being deformed, first when the vehicle hit the slope in the ditch at the right roadside and consequently after the passenger was tossed outwards from the rolling vehicle through the broken glass of the right front door. As we can see in the technical analysis of the vehicle crew movement in the simulation of the accident in the PC-CRASH program, the accident action might have lasted for approximately 7,5 seconds, out of which 3,3 seconds before the passenger was tossed out of the vehicle, 0,3 seconds during the action of tossing and 3,9 seconds after it. From the above mentioned facts we can assume that the most severe injuries of the passenger´s head and trunk (a contusion of the abdominal cavity wall, multiple serial fractures of the 3rd – 8th rib on the right, a focal contusion of the right lung, a focal contusion of the brain stem in the midbrain with a diffuse axonal brain injury) **might have incurred mainly when the body crashed into the upper, lower and rear window frame of the vehicle door in the phase of the body being tossed out.** Other injuries of the passenger might have incurred before or after he was tossed out of the vehicle. **If the passenger´s seat belt had been fastened properly, his body would not have been tossed out of the vehicle. Thus, the most severe injuries would not have incurred.**

We may add that the stated result – forensic conclusion based on the analysis of the vehicle and crew movement lead to a real assessment of the accident course from the point of view of the driver as well as in terms of the subsequent legal actions and evaluations.

Evaluation of the investigative practices in relation to the criminalistic theory and the matter:

Definition of an accident as a basis for its investigation

Based on the current legislation of the Slovak Republic concerning the road traffic by the term Traffic accident in terms of § 64 Law No. 8/2009 Coll. on road traffic we understand an event in the road traffic that happens in a direct association with the vehicle operation and during which:

a) a person is killed or injured,
b) a road or a generally useful facility is damaged,
c) there is a leakage of dangerous substances, or

d) some of the concerned vehicles including the transported objects or other property are damaged and the damage to the property apparently exceeds 150% of the greater damage according to the Criminal Code.

Furthermore, a loss event is also considered a traffic accident under Section 3, if:

a) if any of the obligations under § 66 Art. 6 Law No. 8/2009 Z. z. on road traffic is not fulfilled
b) if the driver of the concerned vehicle is under the influence of alcohol or other addictive substance, or
c) the loss event participants did not agree on its fault.

Other events in the road traffic in which the damage incurred in a direct connection with the vehicle operation are not considered a traffic accident for the purposes of this law.

A traffic accident (a loss event) may be in regard to the impact caused by it (damage, harm to life or health) classified either as a contravention or as a criminal offence.

Inspection in terms of the theory of criminology:

The theory of forensic strategy says that an inspection is an individual specific method of forensic clarification by which on the basis of direct observation we find out, investigate, evaluate and document the state of physical environment as well as individual objects having a relation with clarifying the event in order to assess the whole situation, find and secure tracks, evidence important for getting to know the objective truth about the situation being clarified and of the offender necessary for an investigator to make a decision on how to proceed further.

Based on the current legislation, criminalistics and tactics principles as well as applicable traffic accident documentation and investigation methodology it is obvious that the Police Force member performed all the necessary operations (such as the inspection of the accident site, photo documentation, etc…) in the full range even under adverse light conditions. It is obvious that the adverse conditions during the inspection and other operations may influence especially the quality and accuracy of the performed operations and measures negatively, but on the other hand the activity in terms of the tactics principles (urgency, non-recurrence…) eliminates the cessation of the relevant information or the cessation of relevant tracks important for the investigation process under the negative effect of other influences resulting in a change of the evidence situation, cessa-

tion of the tracks or devaluation of forensic, tactical, technical or procedural value of the track.

For the investigation and its conclusion to be complete and correct it must be based on the objective fact. That is why we may assume that the quality and completeness of individual operations in the documentation and investigation process itself has a direct and irreplaceable influence on the result and constancy of the final legal decision on the mater.

The evaluation of the investigative procedures at the accident site:

By an analysis of these facts we find out that for the documentation of this accident all the standards of this activity in terms of the current legislation and forensic-tactics principles were applied too. Within the inspection the documentation was carried out, the photo documentation was made as well as the plan of the accident site. In terms of the general investigative procedures we may say that basically the prescribed or routine way of documentation and clarification – investigation of traffic accidents was observed – it is a positional documentation of the position of individual tracks and positions on the site. In this case we are talking about the elements of the planar composition or it is so called planar composition of the accident site, which should be understood as a mutual arrangement of the tracks, final positions, direction of the road, distances of the elements affecting the accident course.

It was the subsequent development of the investigation that revealed that the way it was performed did not exhaust the range of possible and necessary detection.

Based on the years of experience and knowledge of the current issue it is crucial to highlight the relevance and importance of not only the procedure but also the result of the inspection at the accident site, where one can actually recognize perfunctory and knowledgeable attitude of the investigator to the inspection and related operations based on the motto *„if two people do the same, the result will never be the same...*"

How it is possible to evaluate the inspection result in terms of its efficiency for further evidencing as it was incomplete:

1. The shape of the terrain off the road was not detected, which primarily was the profile of the ditch, the stated shortage would have arisen if other technical equipment had been used during the inspection or further inspection (such as photogrammetry, laser scanning system, etc.), the gradual implementation of which might be necessary in the future.

It would have been possible to remove the stated shortage by means of conventional measurements of dimensions and slopes of the ditch and its detailed drawing in the inspection report attachment.

2. The spot of the first fall of the vehicle was not localised, which it was possible to define visually taking the condition of the undergrowth (crop) into account. The stated shortage could have been eliminated by measurement, whereby under those conditions demarcation of the serial number of the track because of the crop undergrowth. In order to do that relatively simple solutions could have been chosen – holding the labels or placing them on a suitable holder above the crop level. But it was possible to perform the stated measurement given the light conditions only during the further inspection.
3. The vehicle movement trajectory before it stopped in the final position was not defined and localised. It was possible to determine it visually given the state of the undergrowth (crop). The stated shortage could have been eliminated in the same way as the track in point 2.
4. The contact spot on the vehicle caused by the vehicle hitting the ditch wall and the crop field was not defined, whereby it was possible to assess if there were remains of the grass or crop on the contact spots on the vehicle. In order to do that a detailed photo documentation of the spots on the vehicle and remains of the grass and undergrowth on these spots would have had to be completed as well as their description.
5. The tracks in the spot where the vehicle hit the ditch were not documented in detail. There must have been typical trenches corresponding to the specific parts of the vehicle. We may anticipate that the tracks in this part of the terrain should have been documented in the same way as the tracks on the road in terms of their direction, length and shape.
6. The dimensions of the tracks of the vehicle contact with the terrain were not localised. In this case it was necessary to document the found tracks in the crop as far as possible and proceed in the same manner as with the track in point 2.
7. The tracks of the passenger´s movement in the terrain were not identified. Even if it had not been obvious how the passenger moved to his final position, it would have been necessary to document this finding at least by means of the photo documentation.
8. The tracks of the passenger contact with the vehicle were not defined. The vehicle interior should have been documented in detail including its damaged parts within the range of the further inspection.

9. The spot where the shards of glass from the RF door were found was not defined and localised.
10. The final position of the passenger, who was tossed out of the vehicle, was not detected and localised. This operation is related to the overall detection of the passenger movement.
11. The condition of the seat belts in the vehicle after the accident was not checked. The stated operation could have been performed during the further inspection.
12. The weight and height of the driver and passenger was not found out exactly. The stated operation could have been performed additionally.

There is no doubt that many of the foregoing facts were "obvious" for the investigators during the inspection, but if these facts were not localised and documented into the accident site inspection protocol, then those findings were not applicable for evidencing and legal assessment as they lacked reproducibility.

In this case the investigator on the accident site should have assessed the important influence of such facts as the mutual arrangements of tracks, final positions, direction of the road, shape of the terrain, position of the vehicle and the passenger´s body, distances from the objects having an impact on the accident course (obstructed view area, horizon, etc.)., etc., which in general could be called „*the elements of* spatial composition". Given the spatial characteristics of the inspection site the use of an orthophoto map in combination with a GPS to create an accident site plan would be appropriate.

We can also assume that if a transport expert had been summoned to the accident site in this case, no such significant shortages while performing the inspection and its documentation would have occurred.

An expert opinion – an integral part of the investigation process

In the direct interaction with the model study it is vital to mention an important and irreplaceable role of an expert in the clarification process and his/her contribution to the whole process which leads to the opinion that the decisive factor of choosing an expert by the prosecuting authorities should be knowing:

– his/her long-term, actual, verified qualifications, professional maturity and capability,
– the results of his already performed evidencing, knowing its demandingness and usability for a legal assessment of the matter,

– the usability of the outputs needed for a final legal assessment of the matter developed by him/her (a form of processing of an expert opinion, a used calculation method, e.g. PC Crash, a video in 3D on CD, a use of the FORTIS system, an ability of an interdisciplinary approach, etc.),
– last but not least it is necessary to evaluate an expert in terms of the principles of Ing. Smrček – a founder of the Forensic Engineering Institute in Brno, which should guarantee „looking for an objective truth, preserving an absolute purity of technical solutions as well as objectivity and incorruptibility" and which are consistently applied by the Forensic Engineering Institute in Žilina and the Ministry of Justice of the Slovak Republic.

Looking at the differences between the requests of the forensic experts and the result of the operations performed by the Police Force members it would be appropriate to ask whether the police procedures of the primary operations are even when following the technology of their performance always correct in regard to their contents and whether they satisfy modern demands of documentation and clarification – traffic accident investigation in cooperation with modern technologies and possibilities of forensic experts to perform an evidence of a high quality by using the latest knowledge and methodology.

In this particular case the use of the FORTIS system had a critical even decisive role, by which the forensic doctors defined the passenger´s injuries in a form applicable for a verification of the calculation of the vehicle and crew movement. There still is a question if the police are sufficiently aware of such forensic medicine methods and if when selecting experts – forensic doctors they consider the ability to use the FORTIS system as an important source of the knowledge useful for the accident course analysis performed by the transport experts.

Therefore, for the accident investigators there is a new possibility to link the investigation performed by experts – forensic doctors and the investigation performed by experts – accident analysts, the use of which would undoubtedly increase the completeness and accuracy of the entire investigation process via an interdisciplinary and thus more complex approach.

Conclusion

It would be absolutely inappropriate to generally state, that the Police in this case did not proceed correctly. The Police procedures were in accord-

ance with the legislation and the requirements of the investigative strategy, technology and methods as well as the investigation methodology. The practice itself and the results in the given field imply that goods results are obtained. But the necessity to point at certain shortages of the inspection and documentation should always be understood as a positive impulse leading towards increasing the quality of the operations in question. We may also admit, that some procedures and their organization might not correspond the present needs, especially the current legal environment and that it is vital to use modern systems and technologies by means of which we are able to carry out a more complex and accurate documentation of the accident site. The knowledge obtained this way is consequently fully utilisable within a forensic investigation of a high quality while determining the cause of the accident in question and in relation with drawing the legal responsibility for it.

However, undoubtedly the decisive element of the entire process are the people, their readiness, knowledge, experience, erudition and last but not least the way of work management. The opinion is justified that it is essential to perform a gradual implementation of the system of observing the quality of investigative operations, their documentation and consequential evaluation of performed specific operations by the police management on all its levels not only in the area of investigation but also in the area of obtaining knowledge and forensic evidence. It is also obvious that these procedures need to be performed in following the current state and development of theory and practice in the field of forensic evidence as well as the final investigation with respect to correctness, speed and efficiency of the final legal assessment.

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Cite this article as:

N. Bobrov, J. Mandelík, P. Havaj, V. Rábek, J. Piwowarski, *Possibility of the Evaluation of Injuries of an Unbelted Passenger in a Vehicle and the Need for Special Procedures while Inspecting the Site of the Accident*, "Security Dimensions. International and National Studies", 2016, no 20, p. 132–164, DOI 10.24356/SD/20/7.