

CRIMINAL EXPERTISE OF TRAFFIC ACCIDENTS

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Abstract: *The processes of extension and globalization of the criminal phenomenon determine the judicial bodies to reconsider the approach of the methods of finding and preventing crimes. An important place in this context is occupied by forensic expertise, based on the knowledge of maternal science, forensics, but also on technical, natural, legal sciences and of course procedural norms, which determine the principles and conditions for correct resolution of issues of interest to the judiciary.*

Key words: *globalization, expertise, criminal phenomenon, technical sciences.*

1. General considerations on the rules governing forensic expertise

The procedural norms regulate the fact that “in order to ascertain, clarify or evaluate certain facts or circumstances, which are important for finding out the truth in question, the opinion of an expert is also necessary”.

Specialist studies indicate that forensic expertise is "a means of proof, a valuable probative procedure" necessary to clarify "specific situations of the civil or criminal process."

Forensic expertise can be defined as "an activity of scientific research of traces and material means of evidence, in the sense of identifying persons, animals, objects, substances or phenomena, determining certain properties or changes in their content, form and appearance."

Another definition states that “forensic expertise is the procedural act by which a scientific investigation of material evidence is performed to identify persons, objects, substances, phenomena or events, establish certain properties, changes in form, appearance, content or structure, and the mechanism of their production”.

The forensic investigation activity within the Public Ministry is led by the Forensic Bureau located within the Criminal Investigation and Forensic Section of the Prosecutor's Office attached to the High Court of Cassation and Justice. Within this Office, complex criminal cases are investigated, which require the application of scientific methods and forensic technical means, the prosecutors of this office contributing to the efficiency and dynamization of the criminal investigation activity

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providing tactical, technical and methodological support to prosecutors investigating cases of high complexity.

The Romanian Institute of Forensics operates under the Romanian Police, which, regarding road traffic events, has the Laboratory of Expertise of Trace Matters in Road Accident Cases, performing physio-chemical analyses of paint microparticles, glass shards and objects of clothing that contains dynamic traces of paint.

However, the forensic expertise in the field of road traffic accidents is performed within the National Institute of Forensic Expertise, subordinated to the Ministry of Justice, established in 1998 by Government Decision no. 368/1998, by transforming and reorganizing the Central Forensic Laboratory that has been operating since 1958. Its role is to perform forensic expertise, a first work being performed at the subordinate Intercounty Forensic Laboratories, with distinct territorial competencies, and the Institute performs a new expertise, as well as the first expertise in cases of greater complexity, or if the inter-county laboratories do not have the necessary technical conditions or human resources.

The activity of forensic expertise is regulated by Government Ordinance no. 75 of August 24, 2000, with subsequent amendments and completions, mentioning that forensic examinations are performed by licensed forensic experts working in public institutes or in specialized laboratories, public or private, established by law. Authorized forensic experts must meet certain conditions provided by the same normative act, obtaining this quality being the result of passing the exam organized by the Ministry of Justice in this regard.

The same normative act establishes that, in carrying out the expertise, authorized forensic experts may participate, recommended by the parties and appointed by the judicial bodies, thus giving the parties the possibility to choose an accredited expert based on the type of expertise requested by the court. and to represent them in carrying out the ordered expertise. By the participation of the experts recommended by the parties to the expertise, their suspicions regarding the subjectivity of the authorized experts assigned or appointed to perform the expertise are eliminated, the experts recommended by the parties personally participating in the expertise by observations on the object of the expertise, modification or completion, verification or completing the evidentiary material but also through objections to the expertise report, which will be addressed to the judicial body.

2. The objectives of the forensic expertise of the traffic accident

The judicial body orders the forensic examination to clarify some situations and facts of those involved in the accident, to clarify what happened during the road accident and to determine who is guilty and what is his guilt. For this, the judicial body asks the forensic expert several questions depending on the problems that need to be clarified, these being the objectives of the forensic expertise. In the criminal investigation phase, the objectives of the forensic expertise are included in an ordinance issued by the criminal investigation body and in the trial phase, the objectives are established in a public hearing, being mentioned in the conclusion of the hearing.

In general, the forensic expertise aims to reconstruct the manner of the road event, interested in establishing the conditions from the moment of the accident, the speeds of those involved, their trajectories, the moment of danger, the place of impact, the possibilities of avoidance and prevention of the road event, the cause of the accident. The clarification of these aspects contributes to the solution of the case, leading "to the establishment, by the judicial bodies, of the guilt of the participants in the road event".

The conditions at the time of the accident, which are required to be established, are represented by:

- road characteristics, represented by nature (type of pavement: asphalt, concrete, earth, gravel, etc.), condition of the road (dry, wet, snow-covered road, ice, etc.), constructive solution of the road sector on which occurred the accident (total number of lanes, number of lanes per direction, their width; curved or alignment road; longitudinal and transverse slope of the road; the presence of the sidewalk, its width; and the height of the curbs; other characteristics specific to the road segment), road signs (characteristics of the longitudinal markings delimiting the directions of travel or lanes of the same direction, the presence of cross markings, pedestrian crossings, road signs located in the area, etc.);
- visibility conditions determined both by meteorological conditions (weather without atmospheric precipitation or in conditions of fog, rain, snow, etc.) and by the time of day when the accident occurred (during the day, at night, at dusk) or the configuration of the road (road in alignment or curve, the value of the radius of the curve being important);
- the initial directions of movement of the vehicles and of the other participants in the road traffic, involved in the accident;
- the positions of vehicles, victims and objects in the area, resulting from the occurrence of the road event, their orientation in relation to the directions of travel, the components of the road and fixed landmarks;
- traces found at the crime scene, making an exposition of their characteristics (type of traces: braking, skidding, rolling or combinations thereof; traces of scratching the roadway; other traces formed by stratification or destratification, etc.), mentioning their positions in relation to the vehicles involved, to the objects in the area of the accident, to the characteristics of the road (road edges or axes, fixed points such as kilometre terminals, poles of above-ground electricity distribution networks or other utilities, components fixed buildings located in the vicinity of the accident site, etc.);
- traces on vehicles and on the objects found at the crime scene (dynamic or static traces), vehicle damage;
- injuries to victims, which may indicate the mechanism of impact; the consequences of the road event on the victim's state of health (exposure of specific impact injuries and their location on the victim's body, number of days of medical care and the mechanism of injuries, indicated by the medical examiner, etc.).

As the expert performing the expertise did not participate in the on-site investigation, the establishment of the conditions mentioned above is done by corroborating the entire evidence administered in question, the basis of this activity being the report of

the investigation of the crime scene, the photos from the operative-judicial plate, the sketch of the crime scene attached to the report, as well as the procedural documents administered after the investigation of the crime scene and submitted to the case file.

Establishing the state of affairs, from the moment of the accident, is important for reconstructing the dynamics of the road event and choosing the coefficients used in the calculations to determine the movement parameters of all those involved in the accident.

Following the determination of the speeds of the vehicles, the comparison can be made with the maximum legally allowed limits on the road segment where the event took place, the judicial body will establish whether or not those who drove them complied with the regulations contained in the legal norms in force, regarding the speed of travel on public roads. It is usually required to determine vehicle speeds at the time of the onset of danger and at the time of impact. Establishing the speeds of vehicles and other people involved (pedestrians, cyclists, etc.) is useful for determining the parameters of their movement, the distances between them and the place of collision at different times of the road event, the time elapsed between triggering the state of danger and impact, as well as other elements that interest the cause and that can then be used in determining the avoidance of the road traffic accident.

The reconstruction of the vehicle trajectories is based on the traces found at the crime scene, establishing whether the road traffic participants travelled on the traffic lanes intended for them, with the possibility of identifying the person who by his actions generated a state of danger.

The place of impact is also established based on the traces found at the crime scene, analysing the surfaces covered with shards of glass and plastic fragments, with deposits of soil particles, areas where traces produced by vehicle wheels show sudden changes in their trajectories, areas of the beginning of the traces of scratching the roadway, etc. The establishment of the place of impact, corroborated with the damages of the vehicles, allows the determination of the positions of the vehicles at the moment of the impact, being able to highlight which of those involved in the event left its own corridor, violating the road regulations.

Having established the relations of space and time developed during the road event, it is established the moment when the driver had the possibility to initiate the necessary measures to avoid the impact, this being the moment of triggering the state of danger. This moment "applies equally to both participants in trafficking, with the exception that the one who triggered it could prevent it by complying with legal norms, respectively those imperative norms that obliged the traffic participant to certain actions or inactions (speed reduction, driving at a speed adapted to road conditions, traffic on the right side of the public road, giving priority to passing, etc.)". The analysis of the possibilities to avoid the accident consists in establishing the distance at which the vehicle was at the time of the danger from the place of impact and comparing it with the stopping space from the speed of travel or with the one necessary for a detour manoeuvre. The possibilities of prevention are represented by the actions or inactions that the driver who generated the danger had to adopt in order for the event not to occur.

Following the analysis of the traces and objects found at the place of the road event, it is possible to identify some vehicles involved in accidents leaving the crime scene. Based on the tracks produced by the wheels of unknown vehicles (distance between tracks, characterized by vehicle track; track width, determined by tire width; shape and appearance of the track), a type identification of the vehicle involved can first be made based on the general characteristics of different vehicle categories (two-wheeled vehicles, animal-drawn vehicles, cars, commercial vehicles, special vehicles, etc.).

The identification of the missing vehicle from the crime scene can also be made following the analysis of the fragments from elements detached from the body and found at the accident site. Thus, in one of the specialized publications is presented a case of identification of the perpetrator of a road event starting from plastic fragments found at the place of an accident resulting in the death of the victim. By combining the found body fragments, the part detached from the bumper of a vehicle was reconstructed and, with the help of some specialists in the field of car construction, it was possible to identify the type of vehicle involved in the accident. Subsequent activities by the traffic police found a vehicle of this type in traffic, which lacked a body part similar to the one from which the fragments found at the accident site came. After examining the part disassembled from the body and submitted for repair, it was found that the fragments found at the scene of the accident come from the part disassembled from the vehicle, thus identifying the vehicle involved and, consequently, the perpetrator of the road accident, in the person of the driver.

Among the questions that cannot be constituted as an objective of the forensic expertise is the establishment of those guilty of the accident, of the traffic rules violated by them, in what their guilt consists as well as the level of guilt. The elucidation of these problems exceeds the field of forensic expertise, being the exclusive competence of the judicial bodies, which will base their prosecution and punishment of the guilty not only on the conclusions of the evidence represented by forensic expertise but on the entire evidence administered in question.

3. Capitalizing on the traces collected on the spot in the computerized reconstruction of the road event

The expert report must be structured in three distinct parts. The first part, the introductory part, contains information on the judicial body and the date on which the expertise was ordered, the name, surname of the expert, the place where it was performed, the date of the report and the report, the object of the expertise, the questions answered by the expert, the material on the basis of which the expertise was performed and whether the parties gave explanations during the performance of the expertise. The second part of the expert report contains a detailed description of the operations performed, the explanations and objections of the parties and their analysis in the context of those found by the expert. The last part of the report will be allocated to the conclusions, which will contain the answers to the questions asked by the judicial body as well as the personal opinion of the expert on the object of the expertise.

In order to clarify the findings and conclusions, the expert may be called upon to give verbal explanations on the work he has performed. When the judicial body finds that the expertise is not complete and this deficiency cannot be remedied by hearing the expert, it may order a supplement to be made, which will be carried out by the same or another expert. If "the expertise was performed within the forensic institution, an institute or specialized laboratory, the criminal investigation body or the court shall address the respective institution in order to perform the expertise supplement."

If the judicial body has doubts about the accuracy of the conclusions of the expert report, it may order a new expert opinion.

The structure of the forensic report of the road traffic accident must comply with the requirements of the regulations in force, being structured in the three component parts presented above.

The introductory part of the report will contain the information necessary to highlight the judicial body that ordered the expertise, the expert, the parties, the object and objectives of the expertise (questions to be answered by the expert), the material on which the expertise was performed.

The largest part of the report contains the activities submitted for the requested work, starting with an exposition of the conditions in which the accident occurred, continuing with the presentation of how to determine the kinematics of the road event, divided according to the requested objectives and completing each part corresponding to the questions asked. by the judicial body.

The exposition of the conditions in which the accident occurred is identified by the area of its production, traffic participants, initial directions of travel, and a brief description of the actions of those involved in the event, trajectories and final positions after the accident. Presentation of the traces at the crime scene, the positions in which the vehicles and the victims were found during the investigation of the criminal field, the dimensional and constructive characteristics of the road sector where the accident occurred, the road condition, visibility conditions and other elements considered important in establishing the dynamics of the road event will be listed in this part of the expert report.

The activities carried out to determine the movement parameters of those involved and how to determine them (speeds, places of impact, moment of onset of danger, positions at that time related to road components and place of impact, possibilities to avoid and prevent accidents, cause its production), will be presented clearly and, as far as possible, as succinctly but sufficiently convincingly, structured according to the questions asked by the judicial body.

The last part is where the conclusions are presented, also organized according to the objectives of the expertise. The conclusion must meet certain conditions or requirements in order to be admitted as evidence. "The expert is empowered to draw conclusions only on issues that require a specialist qualification", and cannot be required to rule on issues that do not require such knowledge (for example, if the driver has violated traffic rules) , and, even more, on those that are the competence of other specialists (for example, in the field of technical or medico-legal expertise) ". Also, "the conclusion must be precise, even when the question of the judicial body cannot be

answered categorically [...] it must be accessible, i.e. the interpretation - even in the conditions of a clear wording - does not require special knowledge". This "must clearly reflect the degree of certainty achieved, in this respect distinguishing categorical conclusions, probability and impossibility of solving the problem."

Reconstructing the manner in which the accident occurred provides the judiciary with relevant information on the basis of which it can determine who is guilty of its occurrence, what is its guilt, the extent to which the consequences of the event were influenced by the actions of each participant involved. the prosecution of those responsible for the occurrence of the road accident is carried out.

The general aspects that need to be clarified are usually represented by the speeds of those involved in the accident, their trajectories and the places of collisions, the moment of triggering the state of danger, the ways in which the road event could be avoided or prevented.

Next, a theoretical and applied presentation of the way in which the collision phase can be solved, from a dynamic point of view, with the help of simulation programs can be considered. Two of the programs that perform, by iterative calculation, the kinematic and dynamic modelling of the vehicle's trajectory and the collision modelling are the PC Crash and Virtual CRASH programs, in the vast majority of collision solving by computer analysis. Reconstruction of the collision of the two vehicles, performed with the help of these programs uses the following main input data:

- the positions of the vehicles and the orientation of their longitudinal axes at impact;
- place of impact;
- final positions of vehicles;
- the post-collision decelerations of the two vehicles;
- masses of vehicles and occupants;
- the dimensions of the vehicles and the heights of their centers of mass;
- tire dimensions;
- stiffness of the suspensions;
- steering angle of the steering wheels.

In the simulations, whether it is PC Crash or Virtual CRASH, we start from the final positions of the vehicles involved, recorded in the research report on the spot and based on the traces created and the mechanical models presented, the speeds of the vehicles are determined. at the time of the collision. It should be noted, however, that the PC Crash program also allows an optimization of the collision parameters (place of impact, angle of contact planes, impact speeds, positions and orientation of the longitudinal axes of vehicles at the time of impact, coefficient of return, coefficient of friction between planes, contact). Impact parameters are thus automatically varied in order to minimize the error between the rest positions entered, resulting from the on-site research and the calculated ones, the optimization being achieved, generally, by the genetic method (evolutionary algorithm), using the method of the smallest squares, the program allowing, however, the realization of the optimization process by two other methods, respectively by the linear method (Gauss-Seidel) or by the Monte Carlo method.

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