

Technical and Forensic Support for the Investigation of Violations of Laws and Customs of the War

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The paper describes up-to-date issues of investigating the violation of laws and customs of the war that requires the use of forensic techniques. The author aimed (through the formal logical and system-structural methods) to identify the factors that influence the technical and forensic support of the investigation of violations of laws and customs of the war; characterize forensic techniques in accordance with the specific situations of the crimes under study; to provide practical recommendations on the use of types and means of forensic techniques in these situations. It is noted that the technical and forensic support for the investigation of violations of the laws and customs of the war is conditioned by criminal law and forensic aspects. It is substantiated that the inspection of the scene (as an important source of evidence) in the occupied and deoccupied territories has its own peculiarities (due to the danger of the territories where active hostilities are taking place; physical impossibility to carry out investigative (search) actions and/or detain the perpetrators, etc.); in particular, the technical and forensic means investigating digital traces are of great importance in this case. The author proves the need to provide law enforcement officers with protective equipment and send specialists in the field of explosives engineering, genomic analysis, forensic 3D reconstruction, environmental profiling, etc. to help them during the investigation of violations of the laws and customs of war. The forensic records used for such investigations (in particular, multimodal ones) need to be improved with the latest foreign experience, which will help identify the maximum number of sources of evidence and improve the efficiency and quality of its receipt.

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Keywords: war crimes; investigation of criminal offenses; technical and forensic support; forensic methodology; violation of laws and customs of the war; forensic science.

Research Problem Formulation

With the onset of full-scale russian aggression the pre-trial investigation authorities have faced new challenges related to the need for rapid, comprehensive, and high-quality documentation and collection of evidentiary information on war crimes, of which more than 90% are violations of laws and customs of the war (Art. 438 of the Criminal Code of Ukraine ¹). For instance, according to the Office of the Prosecutor General, in 2022 (since the Russian invasion of Ukraine), 49, 483 criminal proceedings were opened under this article ².

Undoubtedly, a thorough investigation of such criminal offenses is impossible without the use of forensic techniques. The use of scientific and technical means of obtaining evidentiary information

is determined by many factors and has to be carried out in a certain sequence. Therefore, the issue of the choice of the technical and forensic means and methods of detection, fixation and research of material traces and other sources of evidentiary information during the investigation of such crimes requires detailed consideration.

Analysis of Essential Researches and Publications

The issues of strategy and tactics of the pre-trial investigation of war crimes were thoroughly studied by the following scholars: D. O. Koval and R. A. Avramenko ³; O. V. Batiuk and S. O. Dmytriv ⁴; O. M. Dufeniuk ⁵; O. V. Chervyakova ⁶; A. V. Shulzhenko ⁷. Separate issues of technical and

- 1 Кримінальний кодекс України від 05.04.2001 р. № 2341-III (зі змін та допов.). URL: <https://zakon.rada.gov.ua/laws/show/2341-14#Text> (date accessed: 17.03.2023).
- 2 Єдиний звіт про кримінальні правопорушення за січень — грудень 2022 року / Офіс Генпрокурора : офіц. сайт. URL: <https://www.gp.gov.ua/ua/posts/pro-zareyestrovani-kriminalni-pravoporushennya-ta-rezultati-yih-dosudovogo-rozsliduvannya-2> (date accessed: 17.03.2023).
- 3 Коваль Д. О., Авраменко Р. А. Военні злочини. Особливості розслідування міжнародних злочинів, скоєних в контексті збройного конфлікту на Донбасі. Київ ; Одеса, 2019. 36 с. URL: <https://truth-hounds.org/wp-content/uploads/2019/12/%D0%92%D0%BE%D1%94%D0%BD%D0%BD%D1%96-%D0%B7%D0%BB%D0%BE%D1%87%D0%B8%D0%BD%D0%B8-Truth-Hounds.pdf> (date accessed: 15.03.2023).
- 4 Батюк О. В., Дмитрів С. О. До питання організації розслідування військових злочинів. *Соціально-правові студії*. 2021. Вип. 3 (13). С. 77—87. URL: <http://dspace.lvduvs.edu.ua/handle/1234567890/3976> (date accessed: 15.03.2023).
- 5 Дуфенюк О. М. Розслідування воєнних злочинів: логістичні, криміналістичні та судово-медичні питання. *Юридичний науковий електронний журнал*. 2022. № 4. С. 369—374. DOI: [10.32782/2524-0374/2022-4/88](https://doi.org/10.32782/2524-0374/2022-4/88) (date accessed: 15.03.2023).
- 6 Червякова О. В. Відповідальність за воєнні злочини: механізми та процеси відновлення суверенітету та безпеки України. *Форум права*. 2020. № 61 (2). С. 150—162. DOI: [10.5281/zenodo.3883835](https://doi.org/10.5281/zenodo.3883835) (date accessed: 15.03.2023).
- 7 Шульженко А. В. Проблеми доказування об'єктивної сторони у злочинах про порушення законів і звичаїв війни. *Вісник Луганського державного університету внутрішніх справ ім. Е. О. Дідоренка*. 2022. Вип. 2 (98). С. 261—270. DOI: [10.33766/2524-0323.98.261-270](https://doi.org/10.33766/2524-0323.98.261-270) (date accessed: 15.03.2023).

forensic support for war crimes were considered in detail by R. L. Stepanuik ⁸.

Simultaneously, there are no comprehensive researches regarding technical and forensic support for the investigation of violations of laws and customs of the war, taking into account the foreign experience and situations that determine the choice of technical forensic means.

Article Purpose

To determine the features of technical and forensic support for the investigation of violations of laws and customs of the war, taking into account factors that affect their technical and forensic support. To characterize the technical and forensic means in accordance with the specific situations of technical and forensic support of the crimes under investigation, taking into account foreign experience.

Research Methods

Using the formal and logical method the features of technical and forensic support of the pre-trial investigation of violations of laws and customs of the war are determined. The system-structural method made it possible to clarify the means of technical and forensic support for the pre-trial investigation of such crimes, taking into account foreign experience.

Main Content Presentation

In forensic literature, technical and forensic support is defined as a system of scientific and technical means intended for conducting investigative (detective), covert investigative (detective), judicial actions, expert research, as well as information support for the pre-trial investigation, court cases and specially developed technical techniques, methods, methods of their use, necessary for the dynamic optimization of the activities of criminal justice bodies for the prevention of criminal offenses, their investigation and trial ⁹.

During the investigation of war crimes, the sources of significant information are divided into:

- personal — testimony of witnesses, victims, suspects (most often they are captives);
- material — material situation; places of destruction; abandoned equipment, things, weapons, ammunition and their fragments, explosive objects that did not detonate; corpses with signs of violent death; traces of biological origin. These traces also include materials and substances testifying to the use of prohibited weapons or contamination of the ecosystem (soil, water, etc.) with dangerous substances;
- digital — materials for photo and video recording of events; data of electronic, computer and

8 Степанюк Р. Л. Деякі питання техніко-криміналістичного забезпечення розслідування воєнних злочинів. *Сучасні тенденції розвитку криміналістики та кримінального процесу в умовах воєнного стану* : тези доп. Міжнар. наук.-практ. конф. (Харків, 25.11.2022). Харків, 2022. С. 368—371. URL: <https://dspace.univd.edu.ua/xmlui/handle/123456789/15094> (date accessed: 15.03.2023).

9 Павлюк Н. В. Поняття та інноваційні засади техніко-криміналістичного забезпечення розслідування злочинів. *Теорія та практика судової експертизи і криміналістики*. 2015. Вип. 15. С. 96—104. URL: http://nbuv.gov.ua/UJRN/Tpsek_2015_15_15 (date accessed: 10.03.2023).

telecommunication networks; geolocation data of vehicles equipped with GPS beacons; data from open sources of digital information, etc.;

- documentary — protocols; orders; plans for conducting military operations; supply order; personal documents of combatants; financial documents, etc.¹⁰.

Working with these sources of information requires the usage of the technical and forensic means that contribute to the rapid, complete and impartial investigation and trial of violations of the laws and customs of war.

Note that the technical and forensic support for the investigation of criminal offenses is implemented during:

- carrying out separate investigative (search) actions;
- appointing and conducting forensic examinations.

Forensic techniques are used at all stages of the investigation. It consists of the elements that make up the system: forensic photography, video recording; forensic investigation of traces; forensic investigation of signs of a person's appearance; technical forensic examination of documents; forensic writing research; forensic investigation of weapons, ammunition, explosive devices and traces of their use; forensic investigation of substances, materials and products; forensic investigation of the human voice; odorology and forensic registration.

Therefore, the means of forensic technique are diverse. Their use depends

on the type of criminal offense, available evidentiary information and technical forensic situations. We agree with V. S. Bondar that the technical and forensic situation is a situation that has developed at a certain moment of the investigation and necessitates the use of specific and technical means and methods¹¹.

Situational conditioning involves:

- the need to use scientific and technical means;
- a specific type of technical means or a complex of such means, ways, methods and subjects of their application;
- the nature of the objects, in respect of which it is necessary to apply scientific and technical means;
- certain results that are planned to be obtained as a result of the use of scientific and technical means and methods (in particular, to ensure the suitability of traces for further investigation)¹².

The technical and forensic support for the investigation of violations of laws and customs of war is determined by the specifics of their investigation — criminal-legal and forensic aspects. Among the forensic ones, it is worth mentioning the following:

- peculiarities of the traced picture of crimes;
- subjects of technical and forensic support (investigators, employees of operative units, experts);
- peculiarities of technical and forensic situations. This situation is affected by the following factors: the impossibility to carry out

10 Дуфенюк О. М. *Op. cit.* С. 372. DOI: [10.32782/2524-0374/2022-4/88](https://doi.org/10.32782/2524-0374/2022-4/88) (date accessed: 15.03.2023).

11 Бондар В. С. Особливості вирішення техніко-криміналістичних завдань досудового розслідування кримінальних правопорушень. *Криміналістика і судова експертиза*. 2021. Вип. 66. С. 284—296. DOI: [10.33994/kndise.2021.66.28](https://doi.org/10.33994/kndise.2021.66.28) (date accessed: 15.03.2023).

12 Бондар В. С. *Op. cit.* DOI: [10.33994/kndise.2021.66.28](https://doi.org/10.33994/kndise.2021.66.28) (date accessed: 15.03.2023).

investigative (research) actions in the occupied territories; the danger of conducting investigative (research) actions in the territories where active hostilities are taking place; the impossibility to detain guilty persons who are in the territory of the aggressor country.

Among the investigation situations that take place at the initial stage and that determine further technical and forensic situations, we will single out the following:

- violation of laws and customs of the war in the occupied territory;
- violation of laws and customs of the war in the territory controlled by Ukraine.

Consequently, among the typical technical and forensic situations, it is possible to single out scientific and technical means and methods of gathering evidence:

- in the occupied territory;
- on the territory controlled by Ukraine.

As O. V. Fesenko points out, if the crime was committed in the temporarily occupied territory, most often the sources of evidence are the information obtained: as a result of secret investigative (research) actions (in particular, as a result of the removal of information from transport telecommunication networks and electronic information systems: wiretapping the phones of

persons involved in the commission of a crime; gaining access to a person's electronic mailbox); from mass media and the worldwide Internet, as well as the interrogation of witnesses or victims who were able to leave the territory controlled by Ukraine¹³.

The situation indicates the special importance for such investigations of means of research of digital traces. Among them, it is important to single out the Berkeley Protocol on Digital Open Source Investigations¹⁴ (hereinafter referred to as *Berkeley Protocol*), developed by the Law School of the *University of California, Berkeley*, and the Office of the United Nations High Commissioner for Human Rights. Ukraine adopted foreign experience: this protocol is drawn up precisely during the inspection of the scene of the incident in the occupied territory.

Berkeley Protocol is a practical guide to the effective use of open source (access) digital information when investigating violations of international criminal law, human rights, humanitarian law, peace and human security¹⁵. We analyzed crime scene reports using the provision of the Berkeley Protocol which is a review of web pages that can be used as evidence.

Foreign experience shows that online material must be collected in their native format or as close as possible to such a format. Online information should be collected in such a way as to allow the

13 Фесенко О. В. Особливості процесуального доказування у кримінальних провадженнях про злочини, вчинені на тимчасово окупованих територіях. *Особливості процесуального доказування у кримінальних провадженнях про злочини, вчинені на тимчасово окупованих територіях*: мат-ли кругл. столу. (Київ, 26.07.2016). Київ, 2016. С. 122–125.

14 Протокол Берклі з ведення розслідувань з використанням відкритих цифрових даних / Управлін. Верховн. комісара ООН з прав людини та Центру з прав людини Каліфорн. ун-ту в Берклі, Юрид. шк., 2022. 119 с. URL: <https://www.law.berkeley.edu/wp-content/uploads/2022/03/Berkeley-Protocol-Ukrainian.pdf> (date accessed: 11.02.2023).

15 Ibid.

reliability and integrity of its data to be ascertained in the future¹⁶.

Let's consider the collection of digital traces during the investigation of crimes in more detail. First of all, the investigator needs to use geospatial information, geospatial information. Such information can be obtained as a result of content analysis of cartographic applications of mobile devices and their memory cards, as well as cloud services that store data from geolocation programs. The need to collect such information is also evidenced by foreign experience¹⁷.

Using digital information, it is possible to establish:

- persons involved in the crime;
- eyewitnesses;
- stolen property;
- place of crime;
- event time;
- length of stay of a person in a certain place;
- fact of staying in the same place of different persons, in particular accomplices of the crime.

In order to collect such digital traces, special software and hardware complexes are used for forensic content research, which make it possible:

- extract data from mobile devices (on *iOS*, *Android*, *BlackBerry*, *WindowsPhone* platforms);
- import backup copies of devices, as well as physical images (*JTAG*, *Chip-off*);
- receive data from cloud storage (physical data storage from

a computer on the servers of hosting companies);

- download and analyze data from automated accounting systems for services provided by mobile operators;
- extract contacts, messages, calls, file systems, location and deleted information;
- find common locations of several people and build their movement routes;
- detect connections between several devices;
- view all events in chronological order and identify periods of user activity;
- analyze content by keywords;
- use search filters to quickly find the necessary information.

In addition, such hardware and software complexes make it possible to examine the structures of the file system (including deleted data); remove username, passwords, history files, temporary files, analyze geospatial information about the suspect's previous locations.

Investigators and professionals who collect and examine such information must be mindful of security. This applies to software and telecommunications networks. Therefore, the mentioned subjects must have knowledge in the field of digital technologies and constantly improve them. That is, one of the features of the technical and forensic investigation of violations of the laws and customs of

16 Documenting International Crimes and Human Rights Violations for Criminal Accountability Purposes: Guidelines for Civil Society Organisations. 21 Sept 2022 / European Union Agency for Criminal Justice Cooperation. URL: <https://www.eurojust.europa.eu/publication/documenting-international-crimes-and-human-rights-violations> (date accessed: 15.03.2023).

17 Протокол Берклі URL: <https://www.law.berkeley.edu/wp-content/uploads/2022/03/Berkeley-Protocol-Ukrainian.pdf> (date accessed: 15.03.2023).

war committed in the occupied territory is the use of technical and forensic means and methods of collecting digital evidence.

Sources of evidence in the deoccupied territory are: inspection of the scene; interrogation of witnesses and victims; investigative experiments and other investigative (research) actions. It is important to remember that the deoccupied territory remains very dangerous. Therefore, investigative teams have to act in unfavorable conditions: increased risk; rapid changes in the situation; the presence of explosive objects; threats of shelling, collapses, destruction of buildings and structures; damage to transport and energy networks.

In such a situation, the security component is also an important task: for example, providing law enforcement officers with means of protection (special clothing), involving specialists in demining territories, etc.

Considering the specifics of the investigation of such crimes, it is possible to involve a military specialist in conducting investigative (search) actions, who, in accordance with Art. 71 of the Criminal Procedure Code of Ukraine¹⁸ has the status of a specialist.

The next feature of technical and forensic support for the investigation of crimes in the specified situation is the use of such technical means as: metal detectors, body detectors, magnetic lifters, sets for working with micro-objects, sets of technical means for detecting deleted images on metals, mobile explosive

laboratories (for example, “MO-Impulse”, device “BM”, riser “MR-1”, riser “Octopus”, set “Molecule”, “Trace-4”, “Ferrit-1”)¹⁹.

It is advisable for the investigator to use unnamed aerial vehicles during inspections of the places of events in the deoccupied territories. Quadcopters in the inspection process make it possible to assess the scale of destruction from a height and inspect the territory for the presence of suspicious objects (traps, stretch marks, etc.). Such aircraft simplify the inspection of the scene and increase the safety of its participants.

During the inspection of the crime scene, the investigator removes material evidence that needs to be investigated as soon as possible. However, foreign experts experienced in investigating violations of laws and customs of war recommend not to touch or collect dangerous objects. Instead, they advise capturing dangerous objects by photographing (filming) and describing them in detail in the protocol, but in no case remove them from the scene²⁰.

The list of technical means used at the scene depends on the available traces and the situation in which they are made. Most often, during the investigation of violations of the rules and customs of war, the investigator deals with traces of an explosion. Therefore, it should be known on special equipment: means of transporting explosive devices; means of detection and identification of explosive devices and substances; means of contact and remote work with explosive devices; special mobile explosive laboratories.

18 Кримінальний процесуальний кодекс України від 13.04.2012 р. № 4651-IV (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/4651-17#Text> (date accessed: 17.03.2023).

19 Маланчук П. М. Мантула А. П. Перспективи розвитку криміналістичної техніки в розслідуванні, розкритті і попередженні злочинів. *Young Scientist*. 2017. № 11 (51). С. 914–918. URL: http://nbuv.gov.ua/UJRN/molv_2017_11_223 (date accessed: 15.03.2023).

20 Documenting International Crimes ... URL: <https://www.eurojust.europa.eu/publication/documenting-international-crimes-and-human-rights-violations> (date accessed: 15.03.2023).

Technical and forensic means of investigation of explosive devices and substances are diverse and depend on the types of explosive materials and designs of explosive devices.

Thus, among the scientific and technical means used during the detection of explosive objects, today the means of photo and video technology are gaining special importance. As Yu. P. Prykhodko notes, this is due to the fact that explosives change their properties under the influence of oxygen, and this can subsequently negatively affect their preservation, transportation and research ²¹.

Explosive objects in solid, paste-like, liquid form are mostly removed using a set of tools from a special forensic suitcase. In the case of the bulkiness of such explosive objects or the impossibility of their transportation, flushing with swabs is carried out at the scene ²².

During the inspection, you should also take care of:

- specialized transport (minibusses for transportation of forensic equipment, recovered evidence; mobile forensic laboratories; earthmoving equipment; mobile

refrigerators for transporting corpses to forensic autopsies, etc.);

- technical and forensic means, intended for packing physical evidence, extracting objects, and conducting research in field conditions;
- other equipment (for inspection of territories and disposal of potentially dangerous explosive objects, special forensic-archaeological, X-ray, lighting, measuring equipment, etc.).

During the investigation of crimes, the investigator also has to turn to forensic records for information: dactyloscopic; DNA samples; search for missing persons; identification of unidentified corpses; wanted vehicles (in particular, in connection with the missing person); stolen, lost, seized, found, voluntarily surrendered weapons (among those that were illegally stored), etc.

It is worth noting that in the modern world of the latest technologies, multimodal forensic records are rapidly developing, which combine several parameters: for example, fingerprints, images of the face and retina ²³.

21 Приходько Ю. Особливості техніко-криміналістичного забезпечення розслідування злочинів, пов'язаних з кримінальними вибухами. *Visegrad Journal on Human Rights*. 2015. № 5/1. С. 106—113. URL: <http://elar.naiu.kiev.ua/bitstream/123456789/2305/1/%D0%9E%D1%81%D0%BE%D0%B1%D0%BB%D0%B8%D0%B2%D0%BE%D1%81%D1%82%D1%96%20%D1%82%D0%B5%D1%85%D0%BD%D1%96%D0%BA%D0%BE-%D0%BA%D1%80%D0%B8%D0%BC%D1%96%D0%BD%D0%B0%D0%BB%D1%96%D1%81%D1%82%D0%B8%D1%87%D0%BD%D0%BE%D0%B3%D0%BE%20%D0%B7%D0%B0%D0%B1%D0%B5%D0%B7%D0%BF%D0%B5%D1%87%D0%B5%D0%BD%D0%BD%D1%8F%20%D1%80%D0%BE%D0%B7%D1%81%D0%BB%D1%96%D0%B4%D1%83%D0%B2%D0%B0%D0%BD%D0%BD%D1%8F%20%D0%B7%D0%BB%D0%BE%D1%87%D0%B8%D0%BD%D1%96%D0%B2%2C%20%D0%BF%D0%BE%D0%B2%E2%80%99%D1%8F%D0%B7%D0%B0%D0%BD%D0%B8%D1%85%20%D0%B7%20%D0%BA%D1%80%D0%B8%D0%BC%D1%96%D0%BD%D0%B0%D0%BB%D1%8C%D0%BD%D0%B8%D0%BC%D0%B8%20%D0%B2%D0%B8%D0%B1%D1%83%D1%85%D0%B0%D0%BC%D0%B8.pdf> (date accessed: 15.03.2023).

22 Ibid.

23 Rajasekar V., Predić B., Saracevic M., Elhoseny M., Karabasevic D., Stanujkic D., Jayapaul P. Enhanced multimodal biometric recognition approach for smart cities based on an optimized fuzzy genetic algorithm. *Scientific Reports*. 2022. Vol. 12. Art. 622. DOI: [10.1038/s41598-021-04652-3](https://doi.org/10.1038/s41598-021-04652-3) (date accessed: 15.03.2023).

In order to improve dactyloscopic identification and automate dactyloscopic records, various methods of dactyloscopy are also being introduced, in particular contactless. With the help of these technologies, criminologists, experts, and police officers can quickly and easily compare fingerprints at the crime scene with an expanded virtual database. In addition, the use of contactless fingerprinting allows you to obtain high-quality fingerprints, without contamination and with minimal time consumption.

During the investigation of war crimes, it is often necessary to identify corpses. This can be done visually by the features of the appearance or with the help of forensic odontology research, genomic DNA. The work of a forensic pathologist is significantly complicated by: fragmentation of the body as a result of severe explosive, gunshot and other injuries; repeated movement of the corpse by outsiders; changes in the place of burial of human remains; long-term exposure of the body to open, moist air, burial in moist soil and/or in mass burials (as this accelerates the processes of rotting and saponification of the corpse).

Foreign colleagues advise involving specialists in forensic anthropology and forensic archeology for procedural actions in places of mass burials ²⁴.

British scientists claim: if signs of reburial of bodies are detected or if there is information about their movement by transport, it is advisable to examine the soil, vegetation, and pollen deposited in the form of sediment on the victim's body or clothing as a result of contact with them. Comparison of these data with data from ballistic studies and other samples allows to determine primary and secondary crime scenes: this method is called *environmental profiling* (it was first used during the investigation of war crimes in the International Tribunal for the former Yugoslavia) ²⁵.

As for DNA samples, genotyping tests currently mostly use so-called DNA profiling using evidence tracing (hair or skin samples). However, if these samples have a high degree of degradation, it is advisable to use a DNA sequencer to analyze old bones or teeth ²⁶.

Recently, the study of mixed DNA samples is gaining importance. This issue is especially acute when mass graves are found. Until recently, mixed DNA samples (DNA from several people) were considered unsuitable for research because they could not be separated. Today, methods and software have already been developed for the interpretation of complex DNA mixes that are capable of isolating the DNA of four individuals: these technologies are already being used in the USA, New Zealand, and Australia ²⁷.

24 Дүфенюк О. М. Op. cit. DOI: 10.32782/2524-0374/2022-4/88 (date accessed: 15.03.2023).

25 Brown A. G. The use of forensic botany and geology in war crimes investigations in NE Bosnia. *Forensic Science International*. 2006. Vol. 163. Is. 3. Pp. 204–210. DOI: 10.1016/j.forsciint.2006.05.025 (date accessed: 15.03.2023).

26 Kreeger L. R., Weiss D. M. *Forensic DNA Fundamentals for the Prosecutor*. Be not Afraid. USA : American Prosecutors Research Institute, 2003. 39 p. URL: <https://www.crime-scene-investigator.net/APRI-DNAfundamentalsprosecutor.pdf> (date accessed: 15.03.2023).

27 Bieher F. R., Buckleton J. S., Budowle B., Butler J. M., Coble M. D. Evaluation of forensic DNA mixture evidence: protocol for evaluation, interpretation, and statistical calculations using the combined probability of inclusion. *BMC Genetics*. 2016. Vol. 17. Art. 125. DOI: 10.1186/s12863-016-0429-7 (date accessed: 15.03.2023).

Such foreign experience is extremely relevant for Ukraine in the conditions of martial law.

For example, for the investigation of mass burials in Bucha and near Kharkiv, the Ukrainian experts successfully used a mobile DNA laboratory donated by French partners: thanks to its equipment, experts accurately determined genetic profiles even from cremated and mixed remains, which contributed to the prompt identification of the dead ²⁸.

In addition, forensic scientists are conducting numerous studies aimed at improving: methods of identification by DNA and by protein markers of human hair (185 unique protein markers can already be used (together with DNA profiling) to identify a person: their combinations make it possible to single out one person among a million ²⁹); methods of researching traces of blood at the scene and traces of a shot on various obstacles, etc.

Forensic 3D reconstruction of the face based on the skull bones found is also of great importance during the investigation of such crimes. The global scientific community continues to explore the possibilities of using 3D printing to reconstruct the face behind the bones of the skull ³⁰. The Luxembourg company

Artec3D provided Ukraine with 30 *Artec Leo* wireless 3D scanners, with the help of which domestic experts not only reconstruct the faces of victims but also quickly document human remains, preserve evidence of damage to buildings, vehicles and infrastructure ³¹.

As for the detection of injuries on the body of the victims, it is worth noting the positive experience of photographing with alternative lighting, which helps to detect injuries even before they appear on the skin (a special camera using blue light and orange filters is able to distinguish subcutaneous injuries that are invisible to the naked eye) ³².

Conclusions

Technical and forensic support for the investigation of violations of the laws and customs of war is determined by the specialists of their investigation — criminal-legal and forensic aspects. Among the forensic ones, it is worth mentioning the following:

- peculiarities of the trace picture of crimes;
- subjects of technical and forensic support (investigators, employees of operative units, experts);

28 Vergano D., Lisnych K. Ukraine is jump-starting its war-crimes investigations with a French mobile DNA lab / *TheMessenger*. 11/15/2022. URL: <https://themessenger.com/grid/a-french-mobile-dna-lab-is-helping-ukraine-investigate-war-crimes-and-mass-graves> (date accessed: 10.03.2023).

29 Степанюк Р. Л., Лапта С. П. Новітні зарубіжні розробки та перспективні дослідження у галузі техніко-криміналістичного забезпечення протидії злочинності. *Право і Безпека*. 2017. № 2. С. 96—101. URL: http://nbuv.gov.ua/UJRN/Pib_2017_2_19 (date accessed: 15.03.2023).

30 Gupta S., Gupta V., Vij H., Vij R., Tyagi N. Forensic Facial Reconstruction: The Final Frontier. *Journal of Clinical and Diagnostic Research*. 2015. Vol. 9. Is. 9. Pp. 26—28. DOI: [10.7860/JCDR/2015/14621.6568](https://doi.org/10.7860/JCDR/2015/14621.6568) (date accessed: 15.03.2023).

31 3D Scanning Will Be Used in Ukraine to Document Evidence of War Crimes / *TECH-LABS*. Aug 30, 2022. URL: <https://tech-labs.com/news/3d-scanning-will-be-used-ukraine-document-evidence-war-crimes> (date accessed: 10.03.2023).

32 Степанюк Р. Л., Лапта С. П. *Op. cit.* URL: http://nbuv.gov.ua/UJRN/Pib_2017_2_19 (date accessed: 15.03.2023).

- peculiarities of technical and forensic situations. The situation is affected by the following factors: the impossibility to carry out investigative (research) actions in the occupied territories; the danger of conducting investigative (research) actions in the territories where active hostilities are taking place; impossibility to detain guilty persons who are in the territory of the aggressor country.

Typical technical and forensic situations are scientific and technical means and methods of gathering evidence:

- in the occupied territory;
- on the territory controlled by Ukraine.

In the first situation, the technical and forensic means of researching digital traces become especially important, among which it is important to single out the Berkeley Protocol. Subjects of the application of technical and forensic means must take care of the security component software, telecommunication networks, etc.

Sources of evidence in the de-occupied territory are: inspection of the scene; interrogation of witnesses and victims; investigative experiments and other investigative (research) actions. It is important to remember that the de-occupied territory remains very dangerous. Therefore, investigative teams have to act in unfavorable conditions: increased risk; rapid changes in the situation; the presence of explosive objects; threats of shelling, collapses, destruction of buildings and structures; damage to transport and energy networks. In such a situation, the security component is also an important task: for example, providing law enforcement officers with means of

protection (special clothing), involving specialists in demining territories, etc.

It is advisable for the investigator to use unmanned aerial vehicles during inspections of the places of events in the deoccupied territories. Quadcopters in the inspection process make it possible to assess the scale of destruction from a height and inspect the territory for the presence of suspicious objects (traps, stretch marks, etc.). Such aircraft simplify the inspection of the scene and increase the safety of its participants. It is also advisable to send experts in the field of explosives, genomic analysis, forensic 3D reconstruction, environmental profiling, etc. to help investigators and law enforcement officers.

Forensic records used for such investigations (fingerprints; DNA samples; search for missing persons; identification of unidentified corpses; wanted vehicles (in particular, in connection with the disappearance of a person); stolen, lost, seized, found, voluntarily surrendered weapons (from among those that were illegally stored), etc.), in particular multimodal ones, need improvement with the use of the latest foreign experience, which will contribute to the identification of the maximum number of sources of evidentiary information and increase the efficiency and quality of its acquisition.

Техніко-криміналістичне забезпечення розслідування порушень законів і звичаїв війни

Валерій Сокурєнко

Розглянуто актуальні питання розслідування порушень законів і звичаїв війни, що потребує застосування криміналістичної техніки. Автор мав на меті (за допомогою формально-логічного та системно-структурного

методів): визначити чинники, які впливають на техніко-криміналістичне забезпечення розслідування порушень законів і звичаїв війни; схарактеризувати техніко-криміналістичні засоби відповідно до конкретних ситуацій досліджуваних злочинів; надати практичні рекомендації із використання видів і засобів криміналістичної техніки в цих ситуаціях. Зауважено, що техніко-криміналістичне забезпечення розслідування порушень законів і звичаїв війни обумовлено кримінально-правовими та криміналістичними аспектами. Обґрунтовано, що огляд місця події (як важливе джерело доказів) на окупованих і деокупованих територіях має свої особливості (через небезпеку територій, де ведуться активні бойові дії; фізичну неможливість здійснити слідчі (розшукові) дії і/або затримати винних осіб тощо): зокрема, важливого значення у цьому разі набувають техніко-криміналістичні засоби дослідження цифрових слідів. Доведено необхідність під час розслідування порушень законів і звичаїв війни забезпечити працівників правоохоронних органів засобами захисту й відрядити їм на допомогу фахівців у галузі вибухотехніки, геномного аналізу, криміналістичної 3D-реконструкції, профілювання довідки та ін. Використовувані для таких розслідувань криміналістичні обліки (зокрема, мультимодальні), потребують удосконалення із застосуванням новітнього іноземного досвіду, що сприятиме виявленню максимальної кількості джерел доказової інформації та підвищить оперативність і якість її отримання.

Ключові слова: воєнні злочини; розслідування кримінальних правопорушень; техніко-криміналістичне забезпечення; криміналістична методика; порушення законів і звичаїв війни; криміналістика.

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The author declares no conflict of interest.

References

- 3D Scanning Will Be Used in Ukraine to Document Evidence of War Crimes (2022) / TECH-LABS. Aug 30, 2022. URL: <https://tech-labs.com/news/3d-scanning-will-be-used-ukraine-document-evidence-war-crimes>.
- Batiuk, O. V., Dmytriv, S. O. (2021). Do pytannia orhanizatsii rozsliduvannia viiskovykh zlochyniv [On the organization of war crimes investigations]. *Sotsialno-pravovi studii*. Vyp. 3 (13). URL: <http://dspace.lvduvs.edu.ua/handle/1234567890/3976> [in Ukrainian].
- Bieber, F. R., Buckleton, J. S., Budowle, B., Butler, J. M., Coble, M. D. (2016). Evaluation of forensic DNA mixture evidence: protocol for evaluation, interpretation, and statistical calculations using the combined probability of inclusion. *BMC Genetics*. Vol. 17. Art. 125. DOI: [10.1186/s12863-016-0429-7](https://doi.org/10.1186/s12863-016-0429-7).
- Bondar, V. S. (2021). Osoblyvosti vyrishennia tekhniko-kryminalistychnykh zavdan dosudovoho rozsliduvannia kryminalnykh pravoporushen [Peculiarities of solving the technical and forensic tasks of pre-trial investigation of criminal offenses]. *Kryminalistyka i sudova ekspertyza*. Vyp. 66. DOI: [10.33994/kndise.2021.66.28](https://doi.org/10.33994/kndise.2021.66.28) [in Ukrainian].

- Brown, A. G. (2006). The use of forensic botany and geology in war crimes investigations in NE Bosnia. *Forensic Science International*. Vol. 163. Is. 3. DOI: [10.1016/j.forsciint.2006.05.025](https://doi.org/10.1016/j.forsciint.2006.05.025).
- Cherviakova, O. V. (2020). Vidpovidalnist za voienni zlochyny: mekhanizmy ta protsesy vidnovlennia suverenitetu ta bezpeky Ukrainy [Accountability for War Crimes: Mechanisms and Processes for Restoring Ukraine's Sovereignty and Security]. *Forum prava*. № 61 (2). DOI: [10.5281/zenodo.3883835](https://doi.org/10.5281/zenodo.3883835) [in Ukrainian].
- Documenting International Crimes and Human Rights Violations for Criminal Accountability Purposes: Guidelines for Civil Society Organisations* (2022) / European Union Agency for Criminal Justice Cooperation. 21 Sept 2022. URL: <https://www.eurojust.europa.eu/publication/documenting-international-crimes-and-human-rights-violations>.
- Dufeniuk, O. M. (2022). Rozsliduvannia voiennykh zlochyniv: lohistychni, kryminalistychni ta sudovo-medychni pytannia [Investigation of war crimes: logistical, criminalistic and forensic issues]. *Yurydychnyi naukovi elektronnyi zhurnal*. № 4. DOI: [10.32782/2524-0374/2022-4/88](https://doi.org/10.32782/2524-0374/2022-4/88) [in Ukrainian].
- Fesenko, O. V. (2016). Osoblyvosti protsesualnoho dokazuvannia u kryminalnykh provadzheniakh pro zlochyny, vchyneni na tymchasovo okupovanykh terytoriakh [Peculiarities of procedural evidence in criminal proceedings on crimes committed in the temporarily occupied territories]. *Osoblyvosti protsesualnoho dokazuvannia u kryminalnykh provadzheniakh pro zlochyny, vchyneni na tymchasovo okupovanykh terytoriakh* : mat-ly kruhl. stolu. (Kyiv, 26.07.2016). Kyiv [in Ukrainian].
- Gupta, S., Gupta, V., Vij, H., Vij, R., Tyagi, N. (2015). Forensic Facial Reconstruction: The Final Frontier. *Journal of Clinical and Diagnostic Research*. Vol. 9. Is. 9. DOI: [10.7860/JCDR/2015/14621.6568](https://doi.org/10.7860/JCDR/2015/14621.6568).
- Koval, D. O., Avramenko, R. A. (2019). Voienni zlochyny. Osoblyvosti rozsliduvannia mizhnarodnykh zlochyniv, skoienykh v konteksti zbroinoho konfliktu na Donbasi [War crimes. Peculiarities of international crimes investigations, committed in the context of the armed conflicts in Donbas]. Kyiv ; Odesa. URL: <https://truth-hounds.org/wp-content/uploads/2019/12/%D0%92%D0%BE%D1%94%D0%BD%D0%BD%D1%96-%D0%B7%D0%BB%D0%BE%D1%87%D0%B8%D0%BD%D0%B8-Truth-Hounds.pdf> [in Ukrainian].
- Kreeger, L. R., Weiss, D. M. (2003). *Forensic DNA Fundamentals for the Prosecutor. Be not Afraid*. USA : American Prosecutors Research Institute. URL: <https://www.crime-scene-investigator.net/APRI-DNAfundamentalsprosecutor.pdf>.
- Malanchuk, P. M., Mantula, A. P. (2017). Perspektyvy rozvytku kryminalistychnoi tekhniki v rozsliduvanni, rozkrytti i poperedzhenni zlochyniv [Prospects for the development of forensic technology in the investigation, detection and prevention of crimes]. *Young Scientist*. № 11 (51). URL: http://nbuv.gov.ua/UJRN/molv_2017_11_223 [in Ukrainian].
- Pavliuk, N. V. (2015). Poniattia ta innovatsiini zasady tekhniko-kryminalistychnoho zabezpechennia rozsliduvannia zlochyniv [Concept and innovative principles of technical and forensic support of crime investigation]. *Teoriia ta praktyka sudovoi ekspertyzy i kryminalistyky*. Vyp. 15. URL: http://nbuv.gov.ua/UJRN/Tpsek_2015_15_15 [in Ukrainian].
- Protokol Berkli z vedennia rozsliduvan z vykorystanniam vidkrytykh tsyfrovyykh danykh (2022) [Berkeley Protocol on Digital Open Source Investigations] / Upravlin. Verkhovn. komisara OON z prav liudyny ta Tsentru z prav liudyny Kaliforn. un-tu v Berkli, Yuryd. shk. URL: <https://www.law.berkeley.edu/wp-content/uploads/2022/03/Berkeley-Protocol-Ukrainian.pdf> [in Ukrainian].
- Prykhodko, Yu. (2015). Osoblyvosti tekhniko-kryminalistychnoho zabezpechennia rozsliduvannia zlochyniv, poviazanykh z kryminalnymy vybukhamy [Features technical support forensic crime investigation, involved in criminal explosion]. *Visegrad Journal on Human Rights*. № 5/1. URL: <http://elar.naiu.kiev.ua/bitstre>

am/123456789/2305/1/%D0%9E%D1%81%D0%BE%D0%B1%D0%BB%D0%B8%D0%B2%D0%BE%D1%81%D1%82%D1%96%20%D1%82%D0%B5%D1%85%D0%BD%D1%96%D0%BA%D0%BE-%D0%BA%D1%80%D0%B8%D0%BC%D1%96%D0%BD%D0%B0%D0%BB%D1%96%D1%81%D1%82%D0%B8%D1%87%D0%BD%D0%BE%D0%B3%D0%BE%20%D0%B7%D0%B0%D0%B1%D0%B5%D0%B7%D0%BF%D0%B5%D1%87%D0%B5%D0%BD%D0%BD%D1%8F%20%D1%80%D0%BE%D0%B7%D1%81%D0%BB%D1%96%D0%B4%D1%83%D0%B2%D0%B0%D0%BD%D0%BD%D1%8F%20%D0%B7%D0%BB%D0%BE%D1%87%D0%B8%D0%BD%D1%96%D0%B2%2C%20%D0%BF%D0%BE%D0%B2%E2%80%99%D1%8F%D0%B7%D0%B0%D0%BD%D0%B8%D1%85%20%D0%B7%20%D0%BA%D1%80%D0%B8%D0%BC%D1%96%D0%BD%D0%B0%D0%BB%D1%8C%D0%BD%D0%B8%D0%BC%D0%B8%20%D0%B2%D0%B8%D0%B1%D1%83%D1%85%D0%B0%D0%BC%D0%B8.pdf [in Ukrainian].

Rajasekar, V., Predić, B., Saracevic, M., Elhoseny, M., Karabasevic, D., Stanujkic, D., Jayapaul, P. (2022). Enhanced multimodal biometric recognition approach for smart cities based on an optimized fuzzy genetic algorithm. *Scientific Reports*. Vol. 12. Art. 622. DOI: [10.1038/s41598-021-04652-3](https://doi.org/10.1038/s41598-021-04652-3).

Shulzhenko, A. V. (2022). Problemy dokazuvannia obiektyvnoi storony u zlochinakh pro porushennia zakoniv i zvychaiv viiny [Problems of proving of the objective party in crimes on violation of the laws and customs of the war]. *Visnyk Luhanskoho derzhavnoho universytetu vnutrishnikh sprav im. E. O. Didorenka*.

Vyp. 2 (98). DOI: [10.33766/2524-0323.98.261-270](https://doi.org/10.33766/2524-0323.98.261-270) [in Ukrainian].

Stepaniuk, R. L. (2022). Deiaki pytannia tekhniko-kryminalistychnoho zabezpechennia rozsliduvannia voiennykh zlochyniv [Some issues of technical and forensic support for the investigation of war crimes]. *Suchasni tendentsii rozvytku kryminalistyky ta kryminalnoho protsesu v umovakh voiennoho stanu* : tezy dop. Mizhnar. nauk.-prakt. konf. (Kharkiv, 25.11.2022). Kharkiv. URL: <https://dspace.univd.edu.ua/xmlui/handle/123456789/15094> [in Ukrainian].

Stepaniuk, R. L., Lapta, S. P. (2017). Novitni zarubizhni rozrobky ta perspektivni doslidzhennia u haluzi tekhniko-kryminalistychnoho zabezpechennia protydii zlochynnosti [The latest foreign developments and advanced research in the field of technical and forensic support for combating crime.]. *Pravo i Bezpeka*. № 2. URL: http://nbuv.gov.ua/UJRN/Pib_2017_2_19 [in Ukrainian].

Vergano, D., Lisnych, K. (2022). *Ukraine is jump-starting its war-crimes investigations with a French mobile DNA lab* / TheMessenger. 11/15/2022. URL: <https://themessenger.com/grid/a-french-mobile-dna-lab-is-helping-ukraine-investigate-war-crimes-and-mass-graves>.

Yedynyi zvit pro kryminalni pravoporushennia za sichen — hruden 2022 roku (2022) [Single report on criminal offenses for January — December 2022] / Ofis Henprokurora : ofits. sait. URL: <https://www.gp.gov.ua/ua/posts/pro-zareyestrovani-kriminalni-pravoporushennya-ta-rezultati-yih-dosudovogo-rozsliduvannya-2> [in Ukrainian].

Sokurenko, V. (2023). Technical and Forensic Support for the Investigation of Violations of Laws and Customs of the War. *Theory and Practice of Forensic Science and Criminalistics*. Issue 2 (31). P. 11—24. DOI: [10.32353/khrife.2.2023.02](https://doi.org/10.32353/khrife.2.2023.02).