Investigative techniques in low-temperature environments

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Abstract. The important role of improving the activities of all law enforcement agencies depends on the scientific level of their organization. An essential part of the methodology for the investigation of any crime is the element devoted to the specifics of investigative tactics, a special place among which is occupied by an investigative examination of the scene of an incident, from which an investigation usually begins. Investigative actions (in particular, investigative examination) carried out under low air temperature conditions have their own significant features that require separate study. This paper deals with the peculiarities of carrying out a type of procedural investigative action, such as examination in the Arctic conditions (low air temperature), gives practical recommendations to law enforcement officers on how to act in conditions related to adverse weather situation (low temperatures, shortened daylight), deals with the peculiarities of work in these conditions with traces of hands, feet, vehicles, burglary; special attention is paid to the peculiarities of working with odor and shooting traces; special attention is paid to the peculiarities of work at the scene of corpse location and of work with blood traces. General scientific methods were used as the research method - analysis, synthesis, determination of cause-effect relation of the phenomena in conditions of low temperature, and also the philosophical law which assumes differentiation of scientific knowledge about scientific grounds of tactics of procedural investigative actions in combination with the necessity of integration of the received knowledge with other sciences (logic, criminal procedure law, medicine).

1. Introduction

A significant role in the improvement of all the work of law-enforcement agencies depends on the scientific level of its organization [1].

The most important part of the method of investigating any crime is the element devoted to peculiarities of investigative tactics, a special place among which is occupied by the investigative examination of the scene of the incident, from which the investigation usually begins [2].

Examination of the scene of the incident is an investigative action, which is expressed in the activities of the investigator and other persons involved in this process, aimed at "detection, recording, and extraction of traces and other physical evidence in order to clarify the circumstances relevant to the case" [3].

Investigative actions (in particular, investigative examination) carried out under conditions of low air temperature have their significant features that require their separate consideration. This consideration takes on particular significance because so far, no comprehensive studies on the issues raised have been conducted in Russia or abroad. At that, it should be noted that the number of crimes committed in the Arctic region under conditions of low and extremely low temperatures is constantly increasing due to the territory's rich natural resources, small number of inhabitants, difficult geographic conditions and other circumstances. An important issue related to the study of the peculiarities of conducting investigative activities in this area. Scientific literature studies issues of criminal law and criminalistic problems of the
fight against crime in the Arctic region, with considerable attention paid to the study of the structure of crime associated with the special geographical location of the region [4]. A number of authors consider the peculiarities of the investigation and consideration of criminal cases in areas with difficult geographical conditions, noting "that examination in such special geographical and climatic conditions should involve a somewhat different, from the criminalistic point of view, differentiated form of preparation and conduct of the investigative action in order to prevent any violations of the procedural norms of the Criminal Procedure Code of the Russian Federation" [5]. Other authors study the problems of tactics and technology of conducting an investigative examination under special conditions, but typical not only for the Arctic zones [6].

2. Methods
The methods of scientific knowledge described below have been applied in the course of the work on this paper. The work assumed as the main method of scientific research the use of worldview principles in relation to the processes of cognition. Thus, the philosophical law was widely used, which implies the differentiation of scientific knowledge, in particular, about the scientific bases of tactics of procedural investigative actions (including the peculiarities of the investigative examination, i.e. examination of the scene of the incident (crime), physical evidence, etc.) in combination with the need for their integration (primarily in the field of forensic technology and forensic methods) in relation to the data of current research with other sciences (logic, criminal procedure, medicine, etc.). The work also used such general scientific methods as analysis, in which the described phenomenon is broken down into features and properties in order to study it more specifically, and synthesis, designed to combine individual elements of the studied phenomenon into a single whole for more detailed study. The establishment of a causal link between an action and its consequences plays an important role. The method of deduction, which makes it possible to draw conclusions about certain phenomena on the basis of data on their particular features, has led to a conclusion related to the need to take into account in practice the peculiarities of the investigative examination in conditions of low air temperature.

3. Results and Discussion
The quality of the entire investigation of a criminal case depends on how quickly the scene of the incident is inspected, which, in accordance with criminal procedure law, can be carried out even before the initiation of criminal proceedings. The timeliness of the examination affects the preservation of the maximum amount of evidence in the case and traces that are in one way or another related to the offence committed.

There are certain features of working at the scene under low air temperature conditions. However, classical means of fixation and removal of trace evidence objects (material traces of crime), namely, preservation means, with the help of which, for example, the structure of the substance (loose soil, snow, etc.) is fixed, and modeling means (sticky films, gypsum, silicone pastes, plasticine, etc.) can be used with certain exceptions due to the impact of special natural conditions.

In Russian investigative practice, dactyloscopy most often uses sticky films, which can be of several colors: dark and light films are distinguished. In theory and practice, it is well established that dark films are used for fixation and removal of traces revealed with light dactyloscopic powders, while light films are used for fixation and removal of traces revealed with dark powders. In addition to removing traces of sweat and grease, such films can serve as forensic tools to retrieve fibres from clothing, dust, and other micro-objects from various objects. Dactyloscopic films are also used to retrieve certain traces of shoes and vehicles found on linoleum, plywood, planks, iron, smooth asphalt. In addition to sticky films, other materials are used to record traces of crime. Plaster is used to make impressions from three-dimensional traces of shoes, vehicles, hoofed animals. The "K" paste is used to make impressions of burglary tools, small parts of shoe and vehicle tracks. Plasticine finds application for obtaining impressions only from the traces of burglary.

There are also peculiarities in working with other objects of interest to the investigating authorities. For example, it is possible to distinguish certain specifics of work with traces of hands during examination of a scene of incident. For example, the object on which the handprints of the criminal may be located is taken by the edges or inner sides in such a way as not to destroy the traces and not to leave additional ones. "Hand-powder shall be selected so that it meets the following requirements: it must contrast with the trace surface; its grain size must correspond to the nature and properties of the surface to be treated (the more even the surface, the less the specific gravity of the powder grains); it must be dry. Powders should not be applied to wet, dirty, sticky surface" [7], [8].
In conditions of frosty weather, it is allowed to treat the trace surface with powders only in exceptional cases (in case of complete inability to deliver the object of interest to the room with room temperature). It is not allowed to work with moisture-containing sprayers in frosty conditions.

Thus, the object should be delivered to a warm room where, after it has thawed and dried (without a heater), it will be suitable (since the moisture will be removed and the sweat and grease will remain) for treatment with dactyloscopic powders in the usual way.

With regard to the specifics of footprints and tracks of vehicles, it should be noted that search and detection of footprints in the snow is generally not very difficult. However, in some cases, three-dimensional footprints in the snow may not be visible. This occurs when they are illuminated at night, for example, from above by a street lamp. In some other cases, when the light from above falls, they can cause the shadows to disappear. In order to make this trace visible, it is necessary to create a diagonal light, for example, with a hand lamp.

Volumetric footprints should usually be collected in the form of plaster casts. To do this, you should make a solution of gypsum in water as follows: "For 1 part of the water, approximately 1.5 parts of gypsum in powder should be added; the gypsum powder should be slowly poured into the water tank and stirred continuously. As a result, the gypsum solution should have the consistency of thick sour cream. After that, gently pour the solution into the footprint. When half of the casting mass is left in the footprint, put a frame with a string and a tag on it. Then pour the rest of the mortar into the mold. Then, the hardened mold is carefully removed from the footprint" [9].

If the footprint is found in the snow, it must first be covered with thermal insulation material. Before working with such a footprint, it should be fixed so that the footprint does not collapse when the solution is poured into it. The walls and the bottom are strengthened by spraying solutions of substances that form a hard crust. Thus, the footprint found in the snow should be sprayed with ice water from the sprayer (at air temperature from -20 to -2 °C), and at air temperature from 0 to +2 °C - with benzene of temperature: from +15 to +20 °C. In such cases, the footprint becomes covered with a crust of ice that prevents its spoilage when filled with gypsum solution. The plaster and water used to prepare the solution should be pre-cooled. Water is cooled by adding snow to the water until it stops melting.

Cooled gypsum solution is achieved if you pour gypsum, previously brought to a temperature no higher than +4 °C, when stirring in ice water continuously. In five to ten minutes, the cast can be removed from the footprint and then dried at room temperature for 25 to 30 hours. To model plaster casts in the snow, it is most appropriate to use fresh (no more than two months of storage) medical plaster. It is better to use an aqueous gypsum solution up to the temperature level: (-8) - (-10) °C. At lower ambient temperatures, the water to prepare the gypsum solution should be replaced with antifreeze or car window cleaning fluid.

For detection, examination, and fixation of traces of vehicles, the general rules of examination and removal of trace evidence objects [10] are applied. Winter vehicles, such as sleds, aerosleigh, snowmobiles, etc., leave tracks in the form of strips from skids or skis. The possibility of using them to determine the type of vehicle is mainly determined by track features (dimensions) and additional tracks, e.g. animals harnessed in sleds. Only the width and profile of the skids (skis) can be determined from such tracks. It must be taken into account that slides or skis are rolled out, i.e. they slide not only in the course of movement, but also to the sides and traces are wider than skids (skis). The track width can be determined from the sled tracks. The identification value of such tracks depends on the degree of individuality of the terrain of the working part of the skids or skis (scraped areas, chips, scoring material, etc., which can determine the nature of the longitudinal stippling of the track strips). Examination, fixation, and retrieval of animal tracks are carried out according to the general rules of work with surface or volumetric traces.

As for the peculiarities of work with the traces of burglary, it is possible to get casts of plasticine from the volumetric traces of burglary in the frost. It is necessary to make a very thin layer between the trace surface and the plasticine, which does not prevent the display of details of the trace. For this purpose, powder (talc, graphite, potato starch) or vaseline oil can be used, which is applied to the trace before making the impression. In order to get a cast, plasticine should be softened with hands, then pressed to the trace and then separated from it. The impression is packed so that the trace does not come into contact with the packaging material. Instead of plasticine, wax or Russian silicone pastes like Stens can be used for this purpose; Russian "K" pastes should not be used at low air temperatures. Good results in modelling traces of break-in in the frost can be achieved by using polymeric materials instead of plasticine - building pastes that seal seams in buildings at low temperatures. However, in any case it is
necessary to try to make a cut from a part of a construction on which there are traces of burglary in order to further work with them in laboratory conditions [8].

The significance of odor traces for solving the tasks of investigating crimes is due to the fact that odor traces are practically continuous and will continue as long as there are sources of odor and conditions for its formation. Particularly well odor traces are preserved in low ambient temperatures. It should be especially emphasized that on things and objects buried in the ground and snow, odor traces are preserved for up to several months (there is a known case where on a cotton stocking buried in the snow at a depth of about one and a half meters, human odor traces were preserved for more than 40 days).

In literature, all odor traces can be classified according to the nature of their formation into odor traces and traces of their source. Usually, the main odor is "mixed" with a so-called background odor, an environmental odor. It has been established that background odors are not mixed with the base odor and do not form a new one.

In order to collect odor traces, the following are used: syringes, nozzles on the tip of the syringe, glass vials with lapped plugs, sterile gauze medical wipes, sterile medical wool. The most reliable devices for this purpose are Russian odor extraction devices (POZ) or "Shershen" devices.

If personal belongings and objects left by the offender are found at the crime scene, each item or object must be placed in a separate plastic bag, which is hermetically sealed with tweezers or hands in rubber gloves. For better sealing, it is advisable to put the items or objects in double plastic bags (or other packaging with a reliable seal). In hermetically sealed bags, items and objects with odor sources can be stored for months without losing their individual qualities.

It is advisable to carry out work with traces of gunshot with the help of a metal detector; if necessary, to carry out melting of snow.

The result of extraction should be the preservation of gaseous products, for which the shell, pre-packaged in a reliable rubber fingertip, the free end of which is tightly tied, should be placed for about seven hours in the freezer of the refrigerator. It is advisable to transport the shell in a thermos filled with pieces of ice. And the shell should not be unpacked and the thermos should be kept in the freezing chamber for about three hours before that. In this condition, the preservation of shot products during the day is guaranteed [11].

During the examination of a corpse, its sex, approximate age, build, posture (position of the body, head, arms and legs), its position in relation to fixed landmarks, condition of clothing, traces on its surface, including on the soles of shoes, unstable marks on open body parts (if any): lint, fluff, hair, other particles, etc., traces of blood and other traces on clothing and body. All traces on clothing and body are initially fixed on the upper surface of the body, and then, after turning the body over, on the lower surface. Putrid phenomena (cooling, rigor, etc.) are recorded during the examination of the corpse and after the examination of the scene at the time the report is made; the time of recording is indicated in the report. The bedding of the corpse and the objects surrounding the corpse are thoroughly examined and the temperature, wind speed, and other features. The posture of the corpse can sometimes indicate the nature of the incident.

Thus, when dying from cooling, there is a posture of a person shrunk into themselves, who, trying to keep warm, presses their arms and legs to the body, bending them, as if "curled up").

In the immediate vicinity of the corpse and underneath it, there may be signs of human body heat affecting the snow, which melts, followed by the formation of ice crust. At the openings of the nose and mouth of the corpse, icicles can be seen, and on the eyelashes - frost. Skin, cadaveric spots have a pinkish tint due to oxygen oversaturation of the blood. On the skin, you can see "goose skin".

In conditions of low air temperature, it is also necessary to note the posture of the corpse, what is the surface on which the corpse is located; the condition of clothing, the conformity with the season, decrepitude, humidity, and other features; coloration of cadaver spots, the presence of frost or pieces of ice in the area of eyes and mouth and nose holes, whether there is "goose skin" and frostbite of varying degrees, their localization, size, and other features.

When examining a frozen body, it is important to be particularly careful in order to prevent damage to fragile frozen body parts (fingers, ears, etc.).
According to part 1 of article 178 of the Criminal Procedural Code of the Russian Federation, an examination of a frozen corpse is carried out with the obligatory participation of a forensic expert; if it is impossible, another doctor.

Formulation of records related to description of a corpse, traces similar to blood, etc., can be made by a forensic expert (another doctor).

In oral form, on the basis of the external examination of the corpse, the coroner may answer the following questions:

- What is the approximate time of death?
- Are there signs of post-mortem changes in the position of the corpse?
- Are there any external injuries on the corpse, with what weapon(s) are they supposed to have been caused?
- Is the location where the corpse was found the location where the damage was caused which was revealed when the corpse was examined?
- Are there blood-like marks, secretions, or other marks on the body or at the scene of its discovery?
- What is the possible cause of death?

When you examine a corpse, there are no specific signs for cooling. However, there are signs of rapid death. Autopsy of the corpse reveals hemorrhages in the mucous membrane of the stomach - "Vishnevsky's spots". There is an overflow of bladder, due to violation of its innervation. Due to increased heat production, the loss of carbohydrates increases, which is expressed in the disappearance of glycoprotein from the liver, pancreas, brain and is determined by histochemical examination. Microscopic examination can detect areas of necrosis in adrenal glands, testicles. Icing of the brain tissue sometimes leads to an increase in its volume, followed by cracking of the skull bones and suture line disruption. Post mortem skin ruptures may be mistaken for trauma.

Thawing of frozen corpses should be done slowly at room temperature.

In the case of low-temperature deaths, the following questions can be answered by expert examination:

- Are there any signs of other external influences on the corpse?
- Was the death caused by cooling or by other causes?
- What factors contributed to death by cooling (injury, alcohol intoxication, poisoning, illness). Could certain factors have contributed to death by cooling?
- Did the detected injuries (skull bone cracks, skin ruptures, etc.) not result from exposure to cold temperatures?
- When did the victim die?
- Is there alcohol in the victim's blood? [12]

The search for invisible traces of blood is done using strong light sources. It is advisable to examine the object from different angles to the light source, in the rays of which the blood traces have a characteristic luster. Ultraviolet illuminators make it easier to find traces of blood.

Upon detection of blood stains on the snow, they, together with the snow should be transferred to a clean piece of gauze, which after melting the snow should be dried and packaged.

In this case, traces of blood should be collected with as little snow as possible, and then placed in a container (e.g. a plate), on the bottom of which the gauze or cloth previously folded several times is placed. When the snow melts, the blood will soak up the gauze, which must then be dried at room temperature and then sent for forensic examination. A clean sample of gauze similar to the one used to remove the blood stain substance should also be sent to the laboratory. Simply remove the bloodstained snow and place it directly in a vessel to be sent for examination; in such cases, the blood will be strongly diluted with water from the melted snow, making it difficult for subsequent examination to take place. In addition, the blood in this condition will soon rot, which severely limits its ability to be examined.

The retrieved material should be packed in such a way as to preserve the traces during transportation and at the same time prevent the possibility of their loss or replacement, possible contamination.

Drying should be carried out at room temperature in a shaded area.

Ironing, drying using heating radiators, drying cabinets, etc. is not permitted.

It is also very important to check the readiness of the investigation team to perform investigative actions in conditions of low temperatures, namely, to provide an optimal choice of vehicle that will bring the investigation team to the scene of the incident (car or other means of transportation), to organize means of survival in case of natural phenomena that do not provide the possibility of movement to the scene of the incident or back, to ensure the security of the scene and the safety of traces in it.
4. Conclusions
This paper deals with some peculiarities of investigative action provided for by the Russian criminal procedure legislation - an investigative examination.

An investigative examination, like other investigative actions provided for in Russian criminal procedure law, has its own significant features due to the specific nature of its proceedings (place, time, weather conditions, etc.).

The basic features of its implementation in the Arctic conditions (in the conditions of influence of, mainly, low air temperature) are considered, practical recommendations are given to law enforcement officers on actions in the conditions connected with such unfavorable meteorological situation, features of work in such conditions with traces of hands, feet, vehicles, burglary, odour traces, traces of shooting, traces of blood are considered, as well as features of work at the site of frozen corpse discovery.

When inspecting the scene of an accident in low temperature conditions, all measures that can ensure the quality and effectiveness of this investigative action must be observed.

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