Volume 3, Issue 5, May - 2025 **ISSN(E):** 2938-3773

Web of Discoveries: Journal of Analysis and Inventions
webofjournals.com/index.php/3

PROSPECTIVE TECHNICAL MEANS FOR ASSESSING THE SCALE OF DAMAGE FROM RADIATION AND CHEMICAL EXPOSURE

Abdukhakhar Shamsiyevich Ziyadullaev
Professor Academy of the Armed Forces of the Republic of Uzbekistan

Farhod Tulkinovich Norgitov
Associate Professor, Academy of the Armed Forces of the Republic of Uzbekistan

Abstract
This article analyzes the prospective development of technical means for identifying and assessing the scale of damage under nuclear and chemical contamination conditions.

Keywords: Nuclear damage, chemical damage, damage, radiation, chemical фтв biologic (RKB) protection, radiation and chemical situation, radiation reconnaissance, ionizing radiation sources, airborne gamma-neutron reconnaissance set, ground-based gamma-neutron reconnaissance set, ground-based computational technical means set.

Introduction

Currently, the troops (forces) for radiological, chemical, and biological protection are regarded not only as a type of rapid response support, but also as an integral part of national security. This is due to the continuous expansion of the scope of challenges and threats in the field of RCB (radiation, chemical, and biological) protection and civilian safety. These threats include military-related dangers, the evolving forms of international terrorism, technogenic accidents, disasters, and the high probability of hazardous natural phenomena, all of which affect the activities of the Armed Forces of the Republic of Uzbekistan and virtually all sectors of the state.

The situation is further complicated by forecasts indicating a long- and medium-term expansion of threats in various spheres of national security (military, informational, environmental, etc.) and their growing interconnection. In this context, the leadership of our country is paying special attention to the development of fundamental science as a means of assessing and forecasting future threat trends and proposing the most effective solutions for their mitigation. Therefore, the evolutionary development and improvement of the system for detecting and assessing radiological and chemical situations must address not only existing challenges, but also anticipated threats to national security.

Based on this, one of the most important directions in the development of the theory of RCB (radiological, chemical, and biological) protection is the creation of a scientific and methodological framework that allows for the forecasting of threats to the state in the field of RCB security, protection of troops (forces), implementation methods, and the restructuring of the composition, objectives, and tasks of RCBM forces and means involved in future wars and armed conflicts.

In conditions where weapons of mass destruction are used by a hypothetical enemy, the detection and assessment of radiological and chemical conditions play a critical role at all levels of headquarters and command. The purpose of evaluating the radiological and chemical situation during combat operations is to determine the impact of the enemy's use of weapons of mass destruction on the combat capability of units.

Within military units, radiological and chemical assessments are carried out based on reconnaissance data. At higher formations, from brigade level and above, the situation is evaluated based on preliminary analysis. This assessment helps to determine potential losses (combat capability) of military units, calculate the scale of special treatment (DDD), and develop proposals for how units should plan and conduct operations in contaminated areas. It also clarifies the tasks of RCB reconnaissance. However, in all cases, radiological and chemical data obtained must be rechecked and verified through reconnaissance.

In 1978, the Cosmos-954 satellite crashed in Canada due to a malfunction in its nuclear power unit, contaminating a vast area with radioactive materials from its nuclear reactor. This incident prompted the development of modern technical means and radiation reconnaissance vehicles for detecting sources of ionizing radiation.

As a result of research, a set of technical means was developed to meet modern requirements for radiation reconnaissance and the detection of ionizing radiation sources. This set is designed for conducting airborne and ground-based radiation reconnaissance and for analyzing the obtained reconnaissance data.

Airborne radiation reconnaissance is carried out using aircraft and includes the following tasks: identifying areas contaminated with radioactive substances and determining their boundaries; detecting point sources of ionizing radiation and determining their locations; identifying the composition of the radiation spectrum (measuring the radioactive spectrum); and measuring the dose rate of radioactive radiation at 1 meter above ground level. Ground-based radiation reconnaissance is conducted using RCB reconnaissance transport vehicles and includes the following tasks:

-Detecting sources of ionizing radiation and determining the direction of areas where they are located;

-Measuring the distance to sources of ionizing radiation;

-Identifying the composition of the radioactive radiation spectrum (measuring the radioactive spectrum);

-Measuring the dose rate of radioactive radiation at locations where sources of ionizing radiation have been identified.

The processing, mapping, and documentation of data obtained from airborne and ground radiation reconnaissance are carried out using ground-based computing complexes and include the following tasks:

-Plotting radiation situation maps with indicators of radioactive dose rates;

-Marking identified point sources of ionizing radiation on the map.

The complex of technical tools for radiation reconnaissance and detection of ionizing radiation sources includes the following sets:

-Airborne gamma-neutron reconnaissance set;
-Ground gamma-neutron reconnaissance set;
-Ground-based computing equipment set.

The airborne gamma-neutron reconnaissance set is installed on aircraft and conducts radiation reconnaissance from the air. The devices and modules in this set are controlled by a single operator and are capable of performing the following tasks:

-Detecting and identifying point sources of gamma radiation;
-Detecting and identifying point sources of neutron radiation;
-Measuring the dose rate of radioactive radiation in areas containing gamma radiation sources.

The airborne gamma-neutron reconnaissance set includes the following devices and modules:

-Channel for detecting and identifying point sources of gamma radiation (PGO channel);
-Channel for detecting and identifying point sources of neutron radiation (PNO channel);
-Channel for measuring the dose rate of radioactive radiation (PDS);
-Display and control unit;
-Power distribution device;
-Cables, a set of spare parts, and an operation manual.

The ground-based gamma-neutron reconnaissance set is mounted on armored transport chassis and is intended for conducting radiation reconnaissance on land.

The set consists of numerous devices and modules and enables the execution of the following tasks:Detection of point sources of ionizing radiation and indicating the direction of areas where they are located;Measuring the distance to the detected point sources of ionizing radiation;Determining the composition of the radioactive radiation spectrum (measuring the spectrum);Measuring the dose rate of radioactive radiation at points where sources of ionizing radiation are found.

The ground-based computing equipment set is a collection of technical tools used for processing radiation reconnaissance data. It is installed on the RAG-2M vehicle and performs the following functions:Receiving, processing, and documenting data related to the radiation situation;Plotting radiation situation maps showing radioactive dose rate indicators;Marking points of identified radioactive sources on the map.

The ground-based computing equipment set includes:

-Computer memory unit interface;
-Power distribution device;
-PO-NVK programming device;
-“ES-1866” computer;
-PU-80 printing device;
-UZPU charging and power supply unit;
-14 s 832 direction-setting kit;
-Cables, a spare parts kit, and an operation manual.

In addition, this set documents the following information in tabular form on paper:Name of the channel where the measurement was performed;Date of measurement (day and month);Time of measurement (hours and minutes);Dose rate (in µR/s, mR/s, or R/s);Measurement location.

If sources of ionizing radiation are identified, the following additional information is also recorded:

-Type of radiation source (alpha, beta, gamma);

-Coordinates of the radiation source.

Supplementary to the formalized radiation situation map, the following are also provided:name of the measurement grid;adjustment parameters of the measurement pattern;velocity and movement direction diagram of the vehicle (or aircraft) that recorded the radiation sources.

Conclusion:

The technical means described above are expected to be further improved in the future, providing a reliable basis for timely and accurate detection and assessment of damage under conditions of nuclear and chemical contamination.

References

1. Указ Президента Республики Узбекистан №УП-5066 01.06.2017 “О мерах по коренному повышению эффективности системы предупреждения и ликвидации чрезвычайных ситуаций”.

2. O‘zbekiston Respublikasi Vazirlar Mahkamasining “O‘zbekiston Respublikasi favqulodda vaziyatlarning oldini olish va bunday vaziyatlarda harakat qilish davlat tizimini yanada takomillashtirish to‘g‘risida” gi 26.08.2020 dagi qarori.

3. Энциклопедия безопасности жизнедеятельности. [Электронный ресурс]. - Режим доступа: http://bzhde.ru/chrezvychajne-situacii-s-vybrosom-avarijnyx-ximicheski-opasnyx-veshhestv/ (Murojaat sanasi 10.03.2025y).

Web of Discoveries: Journal of Analysis and Inventions
webofjournals.com/index.php/3