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Part VI.

DEACTIVATION OF CONTAMINATED TERRAIN

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In January, 1954, the Soviet Ministry of Defense organ Krasnaya Zvezda (Red Star) began publishing a series of signed articles on atomic energy. The articles are of an elementary nature and were presumably intended to give the lay reader a basic background for understanding not only the military effects of atomic weapons but also the practical applications of atomic energy. Translations of these articles are available in the RAND T-35 series.

Early in August, 1954, the first article of a new series generally entitled "Atomic Weapons and Antiatomic Defense" appeared in Red Star. The first three articles were written by Professor B. Olisov and were published on August 3, 4 and 6, respectively. Their importance from a military point of view is manifest by the fact that they were transmitted by radio broadcast to the Soviet Armed Forces in the Far East. The broadcasts were intercepted by U. S. monitors during the latter part of August.

The present article is the sixth in the series and the third three by Colonel A. Glushkov. It deals with specific methods to be used in the field for deactivating radioactively contaminated terrain. This translation is being released out of sequence because the first two articles by this author have not yet been received. Efforts are being made, however, to preserve the continuity and completeness of this timely and interesting series.

F. J. Krieger

THE ATOMIC WEAPON AND ANTIATOMIC DEFENSE*.

3. DEACTIVATION OF CONTAMINATED TERRAIN

Radioactive contamination of terrain may take place as a result [either] of the settling of the radioactive products of an atomic explosion, or of the use of combat radioactive substances by an enemy, and also as a result of the action of a stream of neutrons, formed in an atomic explosion, which cause artificial radioactivity in certain chemical elements (sodium, potassium, silicon and others) entering the composition of the upper layer of the soil or ground.

Radioactive contamination of the terrain, having a damaging effect on man-power, will always affect the character of the combat operations of troops. Therefore, in order to preserve a constant fighting readiness and a high offensive impetus, troops must know how to correctly utilize knowledge of the properties of radioactively contaminated terrain, so as to decisively carry out any combat tasks, to quickly and correctly use individual means of antichemical protection.

The deactivation of radioactively contaminated terrain is one of the methods which reduce the damaging effect of the products of radioactive decay on man.

Deactivation differs from degassing. For degassing, substances are used which, by entering into chemical reaction with the war gases, render them harmless. In contradistinction to chemical war gases, there is no way of rendering radioactive substances harmless. But it is quite possible to reduce their injurious effect by means of deactivation. Deactivation consists in removing radioactive substances from contaminated surfaces or in covering these surfaces with a layer of uncontaminated material which reduces

Conclusion. For beginning see "Krasnaya Zvezda" for 25 and 26 August 1954.

*Krasnaya Zvezda, 20 August 1954, p. 2

the effect of the products of radioactive decay [redacted].

Usually the terrain is unevenly contaminated with radioactive substances. The closer [one is] to the epicenter of an atomic explosion the greater will be the degree of radioactive contamination; the farther away from the epicenter [one is] the smaller it will be. Contamination resulting from the action of a stream of neutrons may be different in areas with different chemical composition of the soil and earths.

The radioactive substances formed in an atomic explosion, when a wind is present, may also be distributed unevenly on the surface of the earth. In open arens, where they are blown off by the wind, the level of radiation will be lower, and vice versa. The topography, vegetable cover, local objects also have a substantial effect on the distribution of radioactive substances over the surface of the earth. Consequently, the degree of contamination will be higher in some places, lower in others.

Therefore, before carrying out the deactivation of contaminated terrain or establishing passages, it is necessary to make a detailed radiation reconnaissance of the terrain in the region of deployment of the troops or in the planned directions of movement. It is possible that at the same time regions with a safe degree of radioactive contamination will be discovered or ways of by-passing areas with a dangerous degree of contamination will be found. The commanding officer must also take into consideration how zones of contaminated terrain will be overcome -- on foot, in automobiles or in tanks. Depending on the method of overcoming [the terrain] the personnel will either have direct contact with the radioactive substances or have no contact, protecting themselves with various thicknesses [of material] which reduce the radiation dose, as, for example, armor and others. On this depends not only the choice of the means of protection of the personnel, but also the adoption of other measures.

In resolving the question of the deactivation of passages or regions of terrain, it is necessary also to remember that the degree of radioactive contamination of the terrain decreases considerably with time. Therefore, if the tactical situation permits, one should by-pass the contaminated region or wait for a reduction in the degree of contamination which takes place as a result of the natural decay of the radioactive elements. In the latter case, it is necessary to conduct continuous radiation reconnaissance to observe the reduction of the degree of contamination of the terrain.

The mobile character of modern fighting, the speed of offensive operations, demand of troops a decisive overcoming of contaminated terrain, even though it has a high degree of radioactivity. Hence troops must always be prepared to adopt all measures concerning deactivation. The removal of radioactive substances from the hard surfaces of roads (asphalt surface, cobble-stone road), and also from rocky soils may be carried out by sweeping or by washing off the dust with water. Both improvised materials and the special equipment of the municipal economy used for watering and cleaning streets may be used for this purpose.

The matter is somewhat more complicated with the deactivation of passages on soft or loose soils. The removal of radioactive substances by sweeping them off will not always be effective, and frequently even impossible. Road construction equipment -- graders -- may be greatly effective in this work. Cutting off the upper layer of the ground, they simultaneously move it aside with a blade fixed at a certain angle with the direction of motion.

At the same time one should bear in mind that under the conditions of strong radioactive contamination of the terrain, the ground moved insufficiently far aside by the grader, continuing its radioactive radiation, may prove to be a source of damage to personnel who are moving along the passage (see Fig. 1).

Fig 1

Fig 2

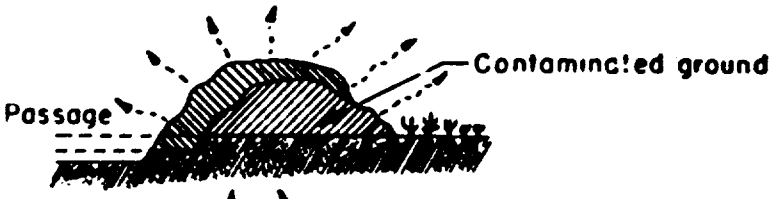
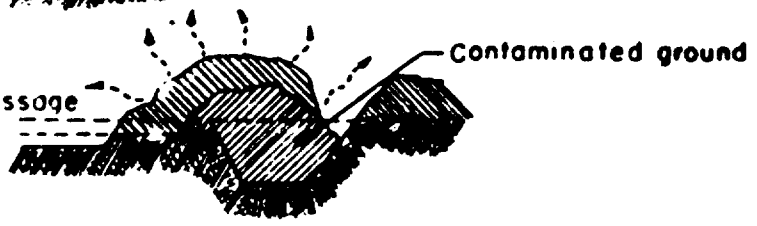


Fig 3



Since with increasing distance gamma-rays are negligibly attenuated by air, it is not expedient in this connection to enlarge the width of the passage and thus move the contaminated ground away from the axis of traffic. Sometimes the building of wide passages will also be impossible because of the terrain. In this case, it is most expedient to cover the contaminated ground with a layer of uncontaminated earth which will reduce the power of the radioactive radiation. For this purpose, after the deactivation of the passage, one should with the same grader cut off another layer of ground and dump it on the contaminated pile so that the radiations to the passage are intercepted by as great a thickness of this ground as possible (see Fig. 2). The following method is also possible: before making the passage, a ditch is dug by an excavator not far away, into which the cut-off contaminated ground is dumped by the grader and is then covered over with uncontaminated earth (see Fig. 3). Bulldozers and ploughs may also be used for deactivation of passages.

As a rule, one should make passages in radioactively contaminated terrain for one-way traffic, remembering that the distance between passages must be such that the dust raised by the traffic on one of them should not reach the other along which traffic is moving in the opposite direction. Depending on the conditions of the tactical situation, it is advisable that this distance be as great as possible.

Deactivation of terrain may be carried out also by covering the contaminated surface with a layer of uncontaminated earth, slag, sand, etc. The thickness of this layer depends on the intensity of radiation in the locality. Therefore, having applied one layer, it is necessary to check the level of radiation with dosimetric instruments. The deposition of earth should be carried out until the radiation level is lowered to a safe point.

This work, however, will often be accompanied by the formation of dust.

Cutting off ground or covering it with uncontaminated earth may considerably lower the degree of irradiation of personnel, but still not shield them from dust. Radioactive dust, raised into the air, may find its way into the respiratory tracts, on the mucous membranes, on the surface of the skin and cause illness of the personnel. It is necessary, therefore, while moving and working, to try to raise a minimum of dust. For this purpose, it is recommended that the ground be watered and the passages be covered with railroad shields or other covers.

While carrying out the work of deactivating the passages, the personnel must without fail be under careful dosimetric control. As soon as the people, who are engaged in the work, receive the maximum permitted dose of irradiation, they must be replaced and taken out of the radioactively contaminated region. It may be that the duration of work in terrain with a high degree of radioactive contamination will be calculated not in hours, but in

minutes. But if commanding officers do not have, for frequent replacement, the required number of crews to operate the engineering machinery, it is necessary to take additional measures to prevent rapid irradiation of personnel. It is expedient, in particular, to install additional walls in the drivers' cabins of the engineering machinery and to cover the floor with materials which reduce the irradiation dose. In the case of the operator of a scraper, it is especially important to thicken the wall which protects him on the side of the scoop. Such measures may provide safety of operation for driver personnel for a much longer time without replacement. On completion of a combat task, it is necessary to carry out sanitary processing of personnel and deactivation.

More difficult than making passages on radioactively contaminated terrain is the work of deactivating positions -- entrenchments, trenches, communication trenches and shelters. The difficulty lies in the fact that this work cannot be mechanized, that the major part of it must be done by hand. Hence it is necessary to carry out deactivation only on the most important points of a position. In deactivating entrenchments and trenches it is necessary to cut off with spades the upper layer of ground, 5 to 7 centimeters thick, from the parapet, slopes and bottom. The work must be carried out in the following sequence: first the parapet is cleaned, then the berms, after that the slopes, and only then the bottom, i.e. the deactivation is carried out from top to bottom. The cut-off ground must be moved away from the deactivated installation as far as possible, not closer than 20 meters, and without fail on the lee side. If the work is carried out under direct enemy fire and difficulties arise with the removal of the contaminated ground, it may be dumped into cul-de-sacs built in the trenches and then covered, but in such a way that the thickness of this ground on the side of the posted personnel is not less than 5 to [illegible] meters.

All the personnel assigned to carry out deactivation and radiation reconnaissance must be provided with individual means of protection against radioactive dust -- antigas and protective suits. The commanding officer must make all arrangements so that his subordinates during their stay in the radioactively contaminated terrain strictly observe all safety rules: no eating, no drinking, no sitting on the ground without special need, etc.

In order to prevent possible contamination of personnel, all engineering machinery and instruments after work on deactivating the terrain must be subjected to deactivation, i.e., to washing on specially equipped platforms in order to remove the radioactive dust which has settled on them. Personnel, who have carried out the work, must then undergo sanitary processing.

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The correct utilization of the protective properties of the terrain, the skillful engineering preparation of it, rapid deactivation -- all these measures are directed toward increasing the combat activity of troops. High offensive spirit, firmness of actions, initiative, aspiration to approach the enemy and destroy him are the most important conditions for achieving victory in the most complex fighting. The cultivation of these qualities by Soviet soldiers is the paramount task of officers.

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