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Soviet Civil Defense Against Chemical and Biological Warfare

Central Intelligence Agency
National Foreign Assessment Center

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Key Judgments

• The USSR has an extensive biological and chemical warfare civil defense program. The effectiveness of the program, however, is limited by the present lack of sufficient resources such as shelters and protective equipment. Preparations for defense against biological and chemical warfare are similar in some respects to those for defense against nuclear weapons and Soviet civil defense preparations against chemical, biological, and nuclear weapons have been and continue to be integrated.

• Most of the Soviet civil defense shelters appear to provide adequate protection against the effects of biological and chemical weapons. The standard-type shelters are equipped with ventilation-filtration systems that include filters specifically designed to remove chemical and biological contaminants. Currently about 10 to 20 percent of the urban population can be accommodated in these shelters and accommodations for 15 to 30 percent are to be built by 1985.

• Compulsory civil defense training in general is not taken seriously by the population. Nevertheless, those portions of the program dealing with chemical and biological weapons will generate at a minimum increased public awareness of the effects of such weapons and appropriate defensive measures.

• Soviet concern with civil defense against biological and chemical weapons continues even after a biological warfare treaty has been signed and talks on limiting chemical weapons are under way.

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DISCUSSION

INTRODUCTION

The principal missions of the Soviet civil defense program are to protect the population and to salvage the national economy in the event of a war. While nuclear weapons are clearly the main Soviet wartime concern, chemical and—to a lesser extent—biological weapons apparently still are regarded as potential threats by the Soviet population. Accordingly, defensive preparations against chemical warfare (CW) and biological warfare (BW) are integral parts of the Soviet civil defense planning and are allotted appreciable time and resources. The most obvious indications of Soviet civil defense preparations for CW and BW defense are: (1) compulsory training for all segments of the population; (2) the stated Soviet objective to provide individual protection for the entire population; (3) the presence of shelters that provide ventilation-filtration systems capable of filtering out chemical and biological particulates; and (4) programs to protect agro-industrial enterprises and food reserves.

The Soviet program for civil defense combines evacuation and individual and collective protection to safeguard the general population from the effects of the weapons of mass destruction. A compulsory training program exists in order to train and educate the population on the effects of nuclear, chemical, and biological weapons and also on the means for the defense against them. The greatest single factor that would limit the effectiveness of the Soviet plan to prevent casualties is the lack of sufficient advance warning of an imminent attack. This factor also would determine in large part the specific course of defensive actions that would be taken.

SOVIET PERCEPTIONS OF THE THREAT OF BW AND CW

Perceptions of the threat of BW and CW held by the Soviet civil defense policymakers are not clear. On the one hand, instructions on the effects and training in the countermeasures to BW and CW weapons are integral parts of the civil defense program. On the other, it now appears that the Soviets have a relatively accurate evaluation of the current deficiencies in US CW and BW capabilities.

The Soviets give attention to CW and BW defense preparedness probably because:

1) CW and BW defense efforts are the result of emphasis placed on BW and CW in previous Soviet doctrine, which was developed when the US had viable offensive CW and BW programs, and has not been revised;

2) periodic publicity in the US about the proposed binary weapons acquisition may have convinced some Soviets of a possible revival of CW weapons systems in the US;

3) the Soviets know that CW or BW weapons are possessed by potential adversaries other than the US; and

4) the inclusion of CW and BW in the civil defense program adds relatively little expense to the program in view of its propaganda value, and side benefits can be derived from this training—primarily the upgrading of public health standards.

It is probable that the Soviet BW/CW civil defense efforts are attributable to some combination of the above reasons. The holdover of policy from earlier years may be the predominant reason. Many of these same reasons may be behind Soviet military policy where a strong CW and BW defensive, as well as offensive, capability is an integral part of current military planning.[1] Whatever the reason, the Soviet military continues to devote extensive resources to CBR defense.

BW/CW CIVIL DEFENSE TRAINING

Defensive measures against BW and CW are integral parts of the Soviet civil defense training program. The stated Soviet belief is that reliable methods exist to protect against the weapons of mass destruction and that substantial reduction in losses can

be achieved if the entire population is familiar with them.[3]

Civil defense training is compulsory in the USSR and includes essentially all segments of the population.[3] This training is most obvious in schools, premilitary training programs, research and academic institutes, and at manufacturing enterprises.[4-6] The training programs typically consist of a series of classroom lectures, demonstrations and exercises using protective clothing, gas masks, and shelter equipment.[7] The lectures normally include descriptions and effects of nuclear, chemical, and biological weapons and the countermeasures to them. The chemical agents described are those that have been standardized in the US.[6-8]

Many students view this training as useless, boring, and generally a waste of time.[9-12] Despite this poor reception, the compulsory civil defense training succeeds in making most of the Soviet population at least aware of chemical and biological weapons and their effects, and such training also gives them some practical experience with protective equipment. This awareness is reinforced by civil defense displays and posters with a CW or BW theme that appear in public places and at work enterprises.[13 14]

The Soviets have instituted many changes to modernize the civil defense training program in the past few years.[3] The thrust of these changes has been to emphasize practical skills rather than theoretical knowledge given in lectures. The Soviets emphasize the concept that by studying and practicing defensive techniques, it is possible to survive an attack by weapons of mass destruction. They, thereby, hope to overcome the often encountered attitude of futility toward CBR defense.[17]

PROVISIONS FOR INDIVIDUAL PROTECTION

Protection of the individual from the immediate effects of an enemy strike with chemicals or biological weapons consists of gas masks, respirators, protective clothing, and individual first aid kits.

The stated Soviet objective is to provide individual protection for the entire population as part of the civil defense program.[17 18] Toward this goal, the Soviets have designed and standardized numerous pieces of CBR protective equipment such as gas masks for adults and children, protective chambers for infants, and self-aid kits containing decontaminants, chemical antidotes, antibiotics, and antiradiation pills. Nevertheless, for practical reasons, the Soviets have not stockpiled such equipment for every man, woman, and child, even in urban areas. For the general population, it appears the Soviets intend to rely to a significant degree on improvised methods of CBR protection as evidenced by the civil defense teachings or methods of making such items as gauze dust masks and impregnated clothing at home.

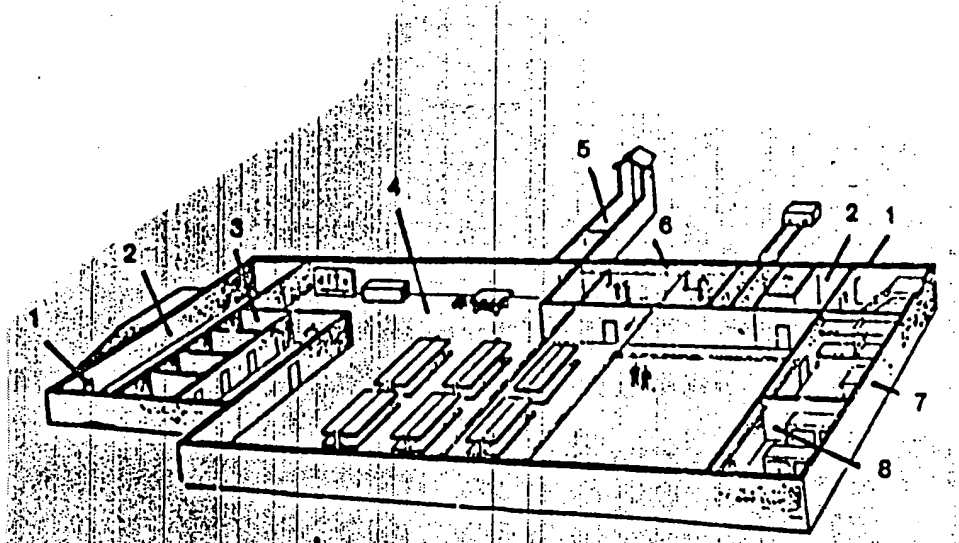
A variety of sources indicate that the available individual CBR protective equipment will be distributed in order of priority. Civil defense personnel, security forces, and personnel in emergency services will be issued complete protective suits and gas masks. This equipment also may be issued to workers in key industries; otherwise, workers in factories and institutes will be issued only gas masks.[17] The general population will receive protective equipment as it is available; it is not known how this will be accomplished.

PROVISIONS FOR COLLECTIVE PROTECTION

The Soviet program for the collective protection of the population from the effects of nuclear, chemical, and biological weapons emphasizes shelters. There are permanent shelters and shelters that are to be "hastily" constructed from available materials when there is a threat of war.[6 18] Permanent shelters have been built for many years in the Soviet Union, and new shelter designs were developed following the resurgence of interest in civil defense in the late 1960s (Figure 1).[19 20]

The shelters are constructed in varying sizes (small, capacity up to 150; medium, 150 to 450 ; and large, over 450 persons) and are located either in a basement area or underground in an area adjacent to a building. Although shelter construction appears to be progressing at an appreciable rate, the number already built is estimated to be sufficient to protect between 10-20 percent of the urban population.[17] By 1985, an estimated 15 to 30 percent of the urban population will be protected. While the effects of nuclear weapons are the primary considerations in the designs of these shelters, most permanent shelters appear to provide adequate protection from the effects of chemical and biological weapons.

The degree of protection that Soviet shelters afford to chemical and biological contaminants is dependent primarily on the design, capacity, and maintenance of the ventilation-filtration system. This system has the complex task of regulating the composition, temperature, and humidity of the air.



1. Hermetically Sealable Door 2. Air Lock 3. Lavatories
4. Area for Shelter Occupants 5. Tunnel to Emergency Exit
6. Ventilation-Filtration Equipment Room 7. Medical Room 8. Storeroom

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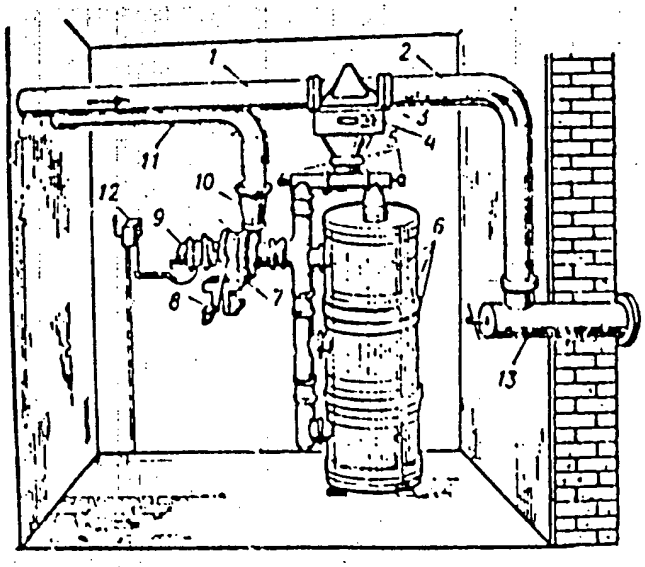
. Representative Design of a Soviet Civil Defense Shelter

The standard system, commonly described as being used in Soviet civil defense shelters, utilizes two separate filtering components with common ductwork.[6 18] One unit is designed to remove dust and radioactive particles, and the other to remove chemical and biological contaminants. An air-regeneration system to be used when the shelter must be sealed frequently is described as part of the ventilation-filtration system.

Protection from the effects of chemical and biological contaminants is achieved by passing the incoming air through particulate and adsorptive filters. Systems designed for this task have been available for many years in the Soviet military, and some of these same units—particularly the model FVA-49—are used for air purification in civil defense shelters. The FVA-49 model (Figure 2) draws air from outside the shelter through a tier of three large replaceable canisters. Each canister contains paper particulate filters (for removing biological contaminants) and activated charcoal (for adsorbing chemical agents).

The FVA-49 model also will remove radioactive particulate matter, but this task preferentially is accomplished by an oiled, fiber mesh dust filter unit. This unit is located away from the main shelter area near the points for air intake. Thus, the radioactive substances that accumulate in the filter are kept at a safe distance from the shelter occupants.



1. Air Intake 2. Emergency Air Intake 3. Valve 4. Prefilter
5. Changeover Rod 6. Filter-Adsorption Canisters
7. Electro-Manual Blower 8 Blower Shaft 9. Motor
10. Air Separation System 11. Duct 12. Motor Switch
13. Sealing Valve

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Figure 2. Standard Soviet Model FVA-49 Ventilation-Filtration Unit

Normal ventilation of the shelter is carried out with only the particulate filtering unit engaged. This unit has a much higher capacity and less aerodynamic resistance than the biological and chemical filtering unit.[16] The latter is to be activated when a biological or chemical attack occurs or is anticipated.

References have been made in the Soviet literature to air-regenerating systems for civil defense shelters.[6 16] These systems are for use when the outside air is not usable, such as during a fire storm, and the shelter is sealed hermetically. The system most commonly described relies on lithium or calcium hydroxide canisters to adsorb carbon dioxide and cylinders of compressed oxygen or air to supply oxygen (Figure 3a). Various Soviet civil defense manuals also mention superoxide systems as being more advanced air-regeneration units (Figure 3b). These references do not specifically state, however, under what instances—other than in areas of high fire probability—the air-regeneration systems actually are installed. Where such systems exist, their use with the sealed shelter would provide complete protection from chemical and bacteriological agents.

The maintenance required to ensure full effectiveness of shelter ventilation-filtration systems is high. Soviet publications call for periodic inspection of seals, overpressure valves, and shock attenuation devices.[21] Humidity, which causes corrosion of ductwork and electrical equipment and the deterioration of canister contents, is the greatest single problem in shelter maintenance. Periodic inspection, oiling, and painting are required to maintain the effectiveness of the ventilation-filtration system in removing CBR contaminants.

Less sophisticated permanent shelters as well as designs for shelters to be built from available materials in the event of war have appeared in the Soviet literature in recent years.[6] The degree of protection afforded by these shelters depends on the existence of air-filtering units. The designs for improvised filtration systems include such techniques as drawing the incoming air through a 1-m thick bed of sand and furnace slag.[6] The Soviets claim that such techniques are effective in removing CBR contaminants, but the effectiveness would appear to be largely dependent on the skill of the individuals constructing the systems.

PROTECTION OF FOOD RESERVES AND AGRICULTURAL CROPS

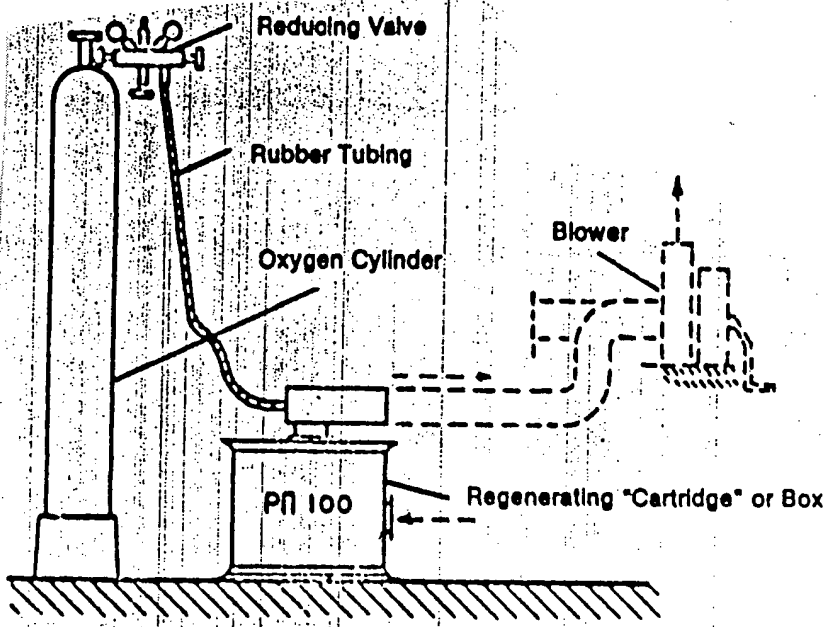
The Soviet civil defense program also includes provisions for protecting food supplies and agricultural crops in the event of hostilities.[3 22] Enterprises for agricultural production are believed by the Soviets to be vulnerable to radioactive fallout and also to possible attack by "anticrop" chemical and biological warfare.[3]

The Soviets have reserves of food which are referred to as "state reserves" and "strategic reserves."[15 16 24–26] Only the reserves of grain, the staple of the Soviet diet, have been studied to any extent in the intelligence community.[26]

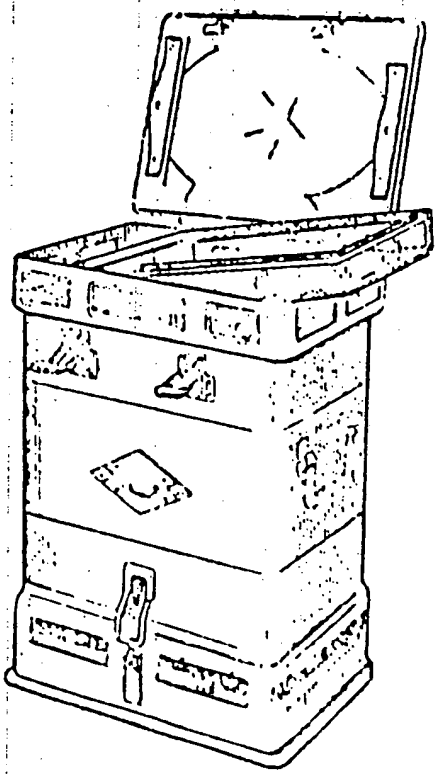
The distinctions between the different types of grain reserves are not clearly understood. The Soviets do not publish information about the amount of grain in the strategic reserves nor the varied types and places of grain storage; the amounts that are reserved for wartime military and civil defense use are not known. Nevertheless, in addition to the traditional grain bunkers and other farm storage, the intelligence community has identified a number of unusual bunkered grain storage facilities located throughout the USSR. These facilities consist of underground or semi-underground structures and could be storage for a small part (about 2.6 million metric tons) of the Soviet strategic grain reserves.[27 28] The underground bunkers are constructed of reinforced concrete with an earth cover which would enhance the bunker's survival against nuclear weapons effects. They also are expected to provide good protection from chemical and biological contamination because they could be easily sealed for periods long enough to permit decontamination of the area.

Recent Soviet and Soviet Bloc publications describe the civil defense program for agro-industrial complexes and specifically address the problem of protection of livestock from the effects of biological and chemical weapons.[29–31] This program is considered to be of increasing importance because of the trend in the USSR toward concentrating livestock in large agro-industrial enterprises.[29] The methods described for protecting livestock include: (1) isolation of the most valuable animals in airtight structures; (2) the use of special "gas masks" for some animals;[3] efficient use of antidotes and vaccines; and (4) the protection of feed and water supplies from contamination by chemical and biological agents. The Soviet publications state that training of farm personnel in these techniques is provided at agricultural institutes and trade schools.

It is doubtful that Soviet livestock enterprises presently have many structures that would provide adequate protection from biological or chemical



a. Type consisting of compressed oxygen (or air) cylinders with canisters for adsorbing carbon dioxide.



b. Convection type utilizing superoxides for both oxygen generation and carbon dioxide adsorption.

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. Soviet Air Regeneration Systems for Civil Defense Shelters

agents or that the Soviets have distributed livestock gas masks. On the other hand, the Soviet livestock industry is dispersed to the extent that only a small part would be threatened by a direct chemical or biological attack. Thus, the plans for agro-industrial protection may appear thorough on paper, but they only could be implemented with much expense and thorough training of the labor force.

CHEMICAL AND BIOLOGICAL ALERTS

The Soviet public is required to know a series of eight warning and alert signals.[5, 6] Two of these warnings are "Chemical Attack" and "Biological Contamination." All of the alerts are to be initiated by local or national civil defense staffs and command posts. The alerts are transmitted through the civil defense communications networks, announced locally over television and radio, and also sounded by sirens and factory whistles.

Publications are widely distributed to the Soviet population and they present in detail the action to be taken following an alert. Basically, these instructions direct the use of gas masks and protective clothing and when and how to enter shelters. If shelters are not accessible, the people will be instructed to leave contaminated areas or to await further instruction. Estimated times for the completion of each step of these procedures are published.[6]

POST-STRIKE CHEMICAL AND BIOLOGICAL RECONNAISSANCE AND MEDICAL PLANNING

Soviet civil defense plans are highly dependent on rapid, efficient reconnaissance units to determine areas of destruction and contamination following an enemy strike with weapons of mass destruction. The reconnaissance activity is conducted by a number of general, as well as specialized, units within both the military and civilian defense forces.[6, 8, 10]

The detection and identification of chemical agents are the responsibilities of chemical reconnaissance units that must accomplish the following tasks: (1) determine the time and place of the chemical strike and the type and concentration of agent employed; (2) determine and mark the borders of contaminated areas; (3) determine the direction of spread of the chemical agent; and (4) determine and mark routes for bypassing areas of chemical contamination. These chemical units are trained to operate both on foot and in vehicles.[8]

Some Soviet civil defense publications describe medical-chemical reconnaissance teams that follow the chemical reconnaissance patrols. These teams are responsible for preventing mass secondary chemical injuries by the ingestion of chemically contaminated water and food products.[8] These teams also are responsible for testing food and water stores with instruments and taking samples for detailed analyses to be performed in the laboratories of the state sanitary-epidemiology (Sanepid) stations.[8]

Soviet plans call for medical treatment to be administered to chemical casualties as soon after exposure as is possible. To accomplish this, antidote syringes are reported to be included in the personal first aid kits of civilians to allow rapid self- and mutual-aid. Follow-on medical aid for chemical casualties is rendered outside the contaminated areas by first aid detachments. In a second medical evacuation stage, specialized medical care for chemical casualties is to be administered at hospitals outside urban areas.[8]

The Soviet approach to containing the effects of biological weapons within the general population is to use strict "quarantine" measures. The Soviets realize the impossibility of determining the exact boundaries of a biologically contaminated area. Consequently, their BW defense plan focuses on identifying the location of the source of the contamination and then determining the approximate boundaries of contamination based on meteorological and epidemiological considerations. Once the contaminating agent is identified, the best course of decontamination, therapeutic, and preventive measures will be chosen. The Soviets realize that detailed procedures cannot be standardized because of the number of possible BW agents that could be used against them and the lack of effective vaccines and antibiotics against some of them.[8] Thus, the overall effectiveness of the BW defense planning will depend on the ability of the Soviets to identify rapidly the causative agent and to implement countermeasures.

This paper was prepared the Office of Scientific Intelligence and was coordinated as appropriate within CIA. Questions and comments may be addressed to

REFERENCES

The source references supporting this paper are identified in a list published separately. Copies of the list are available to authorized personnel and may be obtained from the originating office through regular channels. Requests for the list of references should include the publication number and date of this report.