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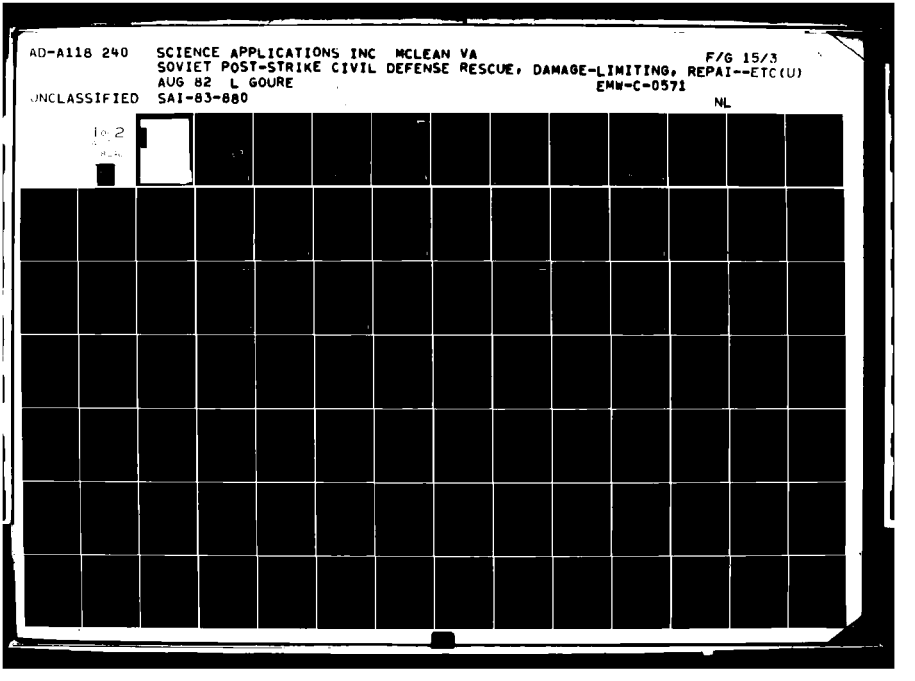

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This report describes and analyzes, on the basis of open Soviet source material, Soviet civil defense concepts, organization, priorities, operational plans and capabilities pertaining to post-strike rescue, damage-limiting, emergency repair and restoration operations in centers of nuclear destruction. Soviet sources indicate that a great deal of importance is attributed to post-strike operations and that the overwhelming majority of civilian and military civil defense forces of over some 20 million are assigned to this mission. The Soviet post-strike

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operations appear to be well organized and equipped; however, their effectiveness depends on a number of favorable assumptions such as: pre-attack evacuation of urban/industrial civil defense forces and equipment and of most of the urban residents; limited enemy strikes on urban areas; relatively little radioactive fallout; and no enemy re-strike. Soviet concepts envisage rapid post-strike reconnaissance and initiation of rescue, damage-limiting and repair activities in zones of light and medium damage, with priority assigned to the rescue of surviving essential workers in shelters—especially those with blocked or damaged ventilation air intakes—and damage-limitation to essential industrial enterprises, utilities, key facilities and utility systems. A primary objective of post-strike operations is to preserve and, where expedient, repair those elements of the economy which are believed to be needed to support the Soviet war effort and facilitate the Soviet Union's post-war recovery. Soviet concepts, plans, organization and *modus operandi* for post-strike operations, as well as Soviet assumptions about the environment which would make such operations feasible, provide useful lessons for possible U.S. civil defense plans to develop capabilities to conduct similar operations.

DETACHABLE SUMMARY

SOVIET POST-STRIKE CIVIL DEFENSE RESCUE, DAMAGE-LIMITING, REPAIR AND RESTORATION OPERATIONS

By

Dr. Leon Goure'

AUGUST 1982

Prepared for:

Federal Emergency Management Agency
Washington, D.C. 20472

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DETACHABLE SUMMARY

Post-strike rescue, damage-limitation, repair and restoration in areas of nuclear damage are one of the primary missions of Soviet civil defense. In Soviet perceptions, such post-strike operations can make an important—and possibly critical—contribution to the Soviet Union's warfighting capabilities, especially in a protracted war, as well as enhance prospects for a more rapid postwar recovery. Indeed, the requirement for post-strike civil defense operations follows logically from Soviet views on the wartime role of the economy in support of Soviet armed forces and their attainment of superiority. Therefore, the Soviets believe in the wartime necessity of maintaining essential enterprises, installations and services in continuous operation (consequently keeping workshifts of essential workers in potentially high risk areas) and of restoring essential production and services following enemy strikes.

These Soviet views largely determine the priorities of post-strike operations. The operations will concentrate on the rescue of essential workers; emergency repair and restoration in support of rescue activities; damage-limitation, repair and restoration on utility lines and at lightly to moderately damaged essential installations, and on the transportation system. In the area of nuclear damage, rescue of non-essential elements of the population will be of secondary priority. Little or no effort will be made to limit damage to residential structures or non-essential installations or to restore severely damaged or totally destroyed essential installations unless absolutely necessary.

The Soviets are well aware that in a nuclear environment, post-strike operations will be difficult and complex and require extensive manpower and equipment. Therefore, from an organizational viewpoint, the great majority of the more than 20 million Soviet civil defense personnel are assigned a role in these operations. Included are all public service, medical, utility, construction, engineering, transportation, technical, trade, catering and repair organizations, as well as

a significant portion of the industrial and agricultural workforce serving in various civil defense formations. Furthermore, at important locations or installations, these forces will be assisted by military civil defense troops and other types of military units. The civil defense authorities can also draft other elements of the population for participation in post-strike operations, and, if necessary, rural civil defense formations will reinforce urban-industrial formations operating in disaster areas.

Along functional lines, the forces are divided into general purpose formations, primarily assigned to rescue missions, and specialized formations organized by specialized services. In terms of their subordination, the formations are either territorial under the control of territorial civil defense chiefs and staffs (i.e., republic, oblast, city, city rayon, etc.), or installation formations under the control of installation civil defense chiefs and staffs—the latter being subordinated to the territorial chiefs. For operational purposes, installation formations may be reinforced by territorial formations. Also, in accordance with decisions of higher level chiefs, installation formations may be ordered to conduct operations at installations other than their own. Wartime command and control structure will follow the territorial-installation line of command, and its authority will supercede peacetime administrative and jurisdictional lines of authority and responsibility.

The Soviets realize that the feasibility of post-strike operations and their effectiveness is very much scenario dependent. In particular, it is recognized that in worst-case situations (such as a massive enemy surprise attack, large scale counter-city and counter-value strikes or high initial radiation levels in the disaster areas and nearby exurban zones) post-strike operations will be severely hampered and their effectiveness markedly reduced. Favorable scenarios for post-strike operations require the completion of urban evacuation, full deployment of civil defense forces in exurban areas, and relatively limited and selective strikes on urban-industrial targets primarily with lower-yield warheads detonated in an airburst mode. The Soviets appear to believe that the

occurrence of relatively favorable scenarios is sufficiently realistic and likely to justify the significant investment in the capability for post-attack operations.

The actual initiation of post-strike operations will be conducted on the basis of situation assessments provided by air and ground reconnaissance (including use of armored vehicles) and will largely depend on radiation levels. Although the Soviets see great urgency in the speedy rescue of occupants in damaged shelters or in shelters with blocked or damaged ventilation systems and in early damage-limiting actions (including containment of the spread of fires to surviving essential installations), these may be precluded or delayed by high radiation levels. According to Soviet publications, the permissible short-time cumulative radiation dose for civil defense personnel is 50r, although it is possible that some personnel may be ordered to risk doses of up to 100r.

Immediate post-strike operations include: 1) clearing and securing access routes to the areas of destruction and work sites; 2) firefighting at the sites and protect surviving essential installations; 3) digging out buried shelters; 4) giving first aid to casualties and evacuating them to medical facilities; 5) the prevention of flooding, gas leaks, and secondary explosions; 6) shutting down power lines; 7) making emergency repairs to water and power lines; and 8) decontaminating areas, structures, personnel and equipment. Repair and restoration operations will begin upon completion of the rescue of survivors, primarily in zones of light to moderate damage. These operations are intended to repair utility lines to undamaged essential enterprises and put back into at least partial operation lightly to moderately damaged essential enterprises, installations and transportation. Surviving or repairable machinery and equipment, as well as parts, semi-finished goods and raw materials from severely damaged installations, will be salvaged and possibly used to set up new production lines in different locations. The repair and restoration process will be facilitated by stocks of machinery, spare parts, equipment, supplies, raw materials and fuel held in storage in exurban areas. There is reason to believe that under

relatively favorable circumstances, the Soviets in fact could rapidly restore operations at lightly to moderately damaged installations, as well as significantly reduce losses among essential workers.

The seriousness of the Soviet commitment to post-strike operations is reflected not only by the creation of a very large trained and equipped civil defense force and the development of detailed plans for this mission, but also by the considerable investment made in it. Although the actual cost of this investment is uncertain, it is evident that the equipping of many millions of civil defense personnel, the acquisition of special equipment and the creation of stockpiles for post-strike operations, as well as the construction of training facilities, represent the equivalent of a multi-billion dollar investment. At the same time, it appears that the cost of Soviet preparations for post-strike operations is probably significantly less than Soviet investments in shelters and in measures to protect the economy to ensure its "stable" operation in wartime.

Despite obvious differences between the U.S. and Soviet political, administrative, economic, social and value systems, Soviet concepts, plans, organization and especially *modus operandi* for the conduct of post-strike operations offer useful lessons for the possible planning and organization of civil defense post-strike rescue, damage-limiting, repair and restoration activities in the U.S. The development of such a capability in the U.S. is a logical part of the mission of the U.S. civil defense system and, as in the case of Soviet civil defense, the possible occurrence of a relatively favorable post-strike environment which would make such operations practical cannot be excluded. Given a real possibility to reduce human and material losses by means of such post-strike operations, it would seem worthwhile for U.S. civil defense to develop the necessary organization and capabilities to be able to exploit opportunities for implementing such operations.

FINAL REPORT

SOVIET POST-STRIKE CIVIL DEFENSE RESCUE, DAMAGE-LIMITING, REPAIR AND RESTORATION OPERATIONS

By

Dr. Leon Goure´

AUGUST 1982

Prepared for:

Federal Emergency Management Agency
Washington, D.C. 20472

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PREFACE

The following report was prepared for the Federal Emergency Management Agency under Contract No. EMW-C-0571 as a part of an ongoing research program on Soviet Civil Defense undertaken by Science Applications, Inc.

The objective of this study is to describe, analyze and assess, on the basis of Soviet open-source materials, Soviet civil defense rationale, plans, organization, operational concepts and capabilities for post-strike rescue, damage-limitation, repair and restoration operations in areas of nuclear destruction.

The author has provided brief descriptions of Soviet post-strike civil defense concepts and organization in earlier reports—notably in Soviet Civil Defense—Post-Strike Repair and Restoration, Center for Advanced International Studies, University of Miami, Final Report, June 1973 (42 pp.), prepared for the Defense Civil Preparedness Agency under Contract No. DAHC20-70-C-0304; and War Survival in Soviet Strategy: USSR Civil Defense (Washington, D.C.: Advanced International Studies Institute, 1976), pp. 169-190. The present report, however, provides an updated and much expanded and detailed description and analysis of the post-strike mission, organization and capabilities, as well as operational concepts, plans and requirements of Soviet civil defense. For a detailed description and analysis of Soviet measures and programs for protection of the economy, which were briefly dealt with in the author's earlier reports, see the author's Soviet Civil Defense Concepts, Programs and Measures for the Protection of Industry in Nuclear War Conditions, Advanced International Studies Institute, Final Report, June 1981, prepared for the Federal Emergency Management Agency under Contract No. EMW-C-0384.

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Section 1

INTRODUCTION

The need to maintain capabilities to carry out rescue and damage limiting as well as repair and restoration activities to deal with natural disasters, major industrial and transportation accidents or acts of terrorism is recognized in all countries. The actual organization of forces and capabilities naturally varies from country to country. However, all countries have some sort of medical service, firefighting organization, organizations for repairing damage to utilities, transportation and other services, road construction and repair organizations, police forces and so on. In various countries, some of these functions are performed by the military, in others by civilian, governmental and, at times, by private organizations; many have some sort of civil defense organization appearing under different names.

Dealing with the consequences of large disasters generally requires considerable manpower, equipment and resources, often on a disproportionate scale in relation to the number of victims or the extent of the damage. For example, the rescue of a single person trapped under the debris of a collapsed building may require a protracted effort by many persons and the use of a considerable amount of equipment. To put out even relatively small fires necessitates the use of considerable specialized equipment and personnel. Furthermore, the repair of damaged utilities, power lines, or industrial and transportation installations calls for the use of trained personnel as well as special equipment and materiel. Even in peacetime, therefore, the scale of disasters may exceed the capabilities of local organizations to deal with them and may require assistance from other parts of the country. At times, such an effort even acquires an international character.

In terms of their magnitude, complexity and requirements for capabilities to deal with them, wartime disasters have the potential of greatly exceeding disasters from natural causes or accidents. Furthermore,

while the latter are usually geographically localized, modern military operations pose a simultaneous threat to the entire population and territory of a country. In addition, such operations may be conducted in a manner deliberately intended to inflict maximum damage and civilian losses while at the same time preventing or disrupting efforts at rescue, damage-limitation, repair and restoration in targeted, i.e., disaster, areas.

The requirement for large stand-by forces and capabilities for dealing with war-generated disasters on a national scale became all too evident in the course of the Second World War. That war saw the appearance of heavy bombers and long-range rockets and, along with this, large-scale deliberate efforts to destroy civilian targets, including cities deep in the territories of the belligerents. It firmly incorporated into strategic objectives the concept of targeting the enemy's economy and national will to fight, as well as a priority requirement for strategic counterforce to weaken the enemy's capability to carry out strategic strikes. Only one major belligerent in the Second World War, the United States, escaped extensive damage to its industries and cities and major losses among its civilian inhabitants.

The possible large-scale use of nuclear weapons in a future war threatens potential population losses and destruction of civilian targets far in excess of those experienced in World War II. Furthermore, in such a war the United States must expect to become a primary target of Soviet strategic nuclear strikes.

The potential unprecedented magnitude of damage and human losses, as well as the possibility of extensive radiological contamination which may result from nuclear strikes on a large set of military and civilian or "value" targets throughout the territory of the belligerent states, pose extraordinary problems for the conduct of post-strike rescue, damage-limiting, repair and restoration operations. Many people in the West tend to anticipate such massive destruction and losses and such an extremely hostile post-strike environment as to preclude in most cases

any meaningful rescue, damage-limiting and repair efforts. However, this worst-case scenario, which expects massive deliberate strikes on cities, is only one and not necessarily the most probable among a number of possible nuclear war scenarios.

It is evident that Soviet planners do not consider the apocalyptic view of nuclear war to be the sole or necessarily most likely scenario. At least they persist in believing in the possibility and utility of post-strike rescue, damage-limiting, repair and restoration operations. Indeed, the conduct of such operations is seen as one of the main missions of USSR Civil Defense. In the Soviet view, they can make an important contribution to the preservation of Soviet warfighting capabilities and the attainment of the fundamental Soviet objective of assuring the Soviet Union's war survival. Consequently, this mission is perceived as a logical and necessary part of a meaningful Soviet civil defense program and capability. This does not mean that the Soviets belittle the difficulties and complexities of conducting such operations in a nuclear war environment. Rather, it is precisely because they recognize the problems that they assign the greatest part of their large civil defense manpower and resources to this mission and insist on the necessity of detailed preparations and planning in peacetime to accomplish it.

It is not surprising, therefore, that there exists a large body of Soviet public source materials consisting of manuals, journals and newspaper articles which describe and discuss in great detail the organization of post-strike civil defense operations, the forces to be employed, as well as the plans, priorities and methods for conducting them. There are also numerous reports in Soviet publications dealing with the training and exercises of specific civil defense forces and command, control and communications organizations assigned to perform this mission in various localities in the USSR, as well as photographs of such forces in action. The present study is based entirely on such open Soviet source materials.

Of course the question of how well Soviet civil defense forces may perform this mission and how effective they may prove to be in saving

people, in limiting damage and restoring vital economic and other critical facilities in the course of a nuclear war are largely scenario-dependent and therefore fraught with considerable uncertainty. Even so, the existence of Soviet plans, organizations, forces and operating concepts for carrying out such post-strike operations undoubtedly enhances prospects that they may be able to achieve significant results.

Given the importance attributed to this civil defense mission and the resources devoted to its implementation in the Soviet Union, a study of this aspect of the Soviet civil defense program can provide a better understanding and appreciation of the character of Soviet civil defense, its capabilities, and Soviet views on nuclear war. It may also be of interest to and instructive for a U.S. civil defense program.

Section 2

SOVIET RATIONALE FOR A REQUIREMENT FOR POST-STRIKE RESCUE, DAMAGE-LIMITATION, REPAIR AND RESTORATION

A nuclear war between the U.S. and Soviet Union is usually envisaged as being primarily characterized by an exchange of strategic nuclear strikes against targets on each other's territory. It is assumed that both sides would seek to attain their respective principal war objectives by means of such strikes. Consequently, the homelands of both powers would become the main theaters of military operations and battlegrounds. It follows, therefore, as Soviet spokesmen insist, that in such a war the "fate of states" and outcome of the war would be largely "decided in the depth of their territories."[1/] Indeed, unless the state can survive, its own military operations—even if they are successful—may become meaningless except as an act of revenge.[2/] From a Soviet viewpoint, therefore, war survival of the state becomes a primary objective and its protection from enemy strikes "one of the most important tasks in a war."[3/] The Soviets assert that to accomplish this will require offensive and defensive actions by the Soviet armed forces for the purpose of reducing the number of nuclear weapons which may strike Soviet territory and effective civil defense "to attain the maximum weakening of the destructive effects" of enemy weapons which may reach their target.[4/] Given that the country's home territory, "as the national basis of the country's defense potential, becomes one of the main targets of enemy attack,"[5/] it follows, as the former USSR Minister of Defense and Politburo member Marshal of the Soviet Union A. Grechko insisted, that:

> Modern war demands not only the creation of reliable protection of industrial installations, as was the case in the past, but of a carefully thought out and organized system of measures to ensure stability of operations of the entire national economy and reliable protection of the populace throughout the country. Civil defense, which now is a factor of strategic significance in ensuring a state's vital activities, plays a special role in accomplishment of this task.[6/]

The official tasks or missions of USSR civil defense are divided into three groups:

1) The first group consists of tasks related to the protection of the population which is said to be "the main task of civil defense."

2) The second group includes measures to protect and raise the stability of operations of the economy in wartime.

3) The third group of measures deals with the liquidation of the consequences of enemy strikes and creating favorable conditions for the restoration of vital production activities at economic installations, utilities and on lines of transportation.

The objectives of all three missions are mutally complementary and interconnected. Together they are seen as contributing to assuring the survival of the Soviet system and state, its ability to wage war and sustain an effective war effort and its attainment of superior national power, military as well as economic, in the course of the war and following its termination.

In the light of these objectives, the purpose of post-strike civil defense operations is not simply to limit human losses and damage for its own sake, although the Soviets would like to do so wherever this is practical. Rather, the primary purpose of these operations is to assure continuing essential economic and logistic support of the war effort and of the armed forces. This is believed to require active, organized and well-planned efforts to limit losses among essential workers and secondary damage to important industrial enterprises, utilities, transportation and other resources needed to sustain the armed forces and the country, as well as the rapid repair of damage at such installations and facilities and the restoration of their activities. The significance attributed to these civil defense operations follows directly from Soviet views on the character of a nuclear war and the role of the economy in it, as well as from Soviet concepts of economic and logistic operations in the course of a nuclear conflict.

2.1 THE ROLE OF THE ECONOMY IN WARTIME

Soviet military doctrine makes a great point of the interrelationship of military and economic power. The economy, or more precisely its "military-economic potential", is said to constitute the basis of the country's military potential in peace as well as in war.[7] The peacetime role of the economy as the foundation of a country's military might and readiness for war is self-evident. Its wartime role, however, is more scenario dependent.

The role which the "military-economic potential" is called upon to play in the course of a war depends in a large measure on its duration. A short war, the Soviets believe, will likely be fought with the weapons and supplies existing at its start.[8] While the Soviets hope this may be the case, they believe that a war between two large coalitions, which will require not only strategic strikes but also ground campaigns in various theaters in order to achieve victory, may be protracted. Thus, according to the Chief of the General Staff and First Deputy Minister of Defense, Marshal of the Soviet Union N. V. Ogarkov:

> It is considered that, with the contemporary means of destruction, a world nuclear war will be comparatively short. However, considering the enormous potential military and economic resources of the coalitions of the belligerent states, it cannot be excluded that it may also be prolonged. Soviet military strategy proceeds from the view that should the Soviet Union be thrust into a nuclear war, the Soviet people and their Armed Forces need to be prepared for the most severe and protracted trial.[9]

A protracted war, however, cannot be fought with only the weapons, equipment and supplies stocked at its start. Furthermore, given the intensity of modern combat operations and the destructiveness of modern weapons, there will be a high rate of loss of and damage to weapons, equipment and supplies, necessitating continuous replacement and logistic support.[10] Indeed, in the opinion of some Soviet military leaders, "it is impossible to conduct war without the continuing supply of the armed forces with everything they need."[11] Thus, the economy will be called upon to produce

everything necessary to sustain the armed forces and their operation as well as the civil defense forces and the population. It is asserted, therefore, that:

> The supplying of the armed forces and the population with everything necessary and the equipping of the civil defense forces with technical supplies for the successful conduct of rescue and emergency repair work in the zones of devastation are only possible under conditions of sustained operation of the installations of the national economy in wartime.[12]

Or again, it must be taken into account that in a modern war with the use of weapons of mass destruction, victory will be gained by the country having an economy which, despite losses and damage suffered in the course of the war, maintains the capability to supply its armed forces with everything they require and supply the country's population with food and basic necessities.[13] It follows from this that the course and outcome of such a war may be largely or even decisively determined by the "correlation of economic forces" between the warring sides during the conflict and at its termination.[14]

2.2 THE OPERATIONS OF THE ECONOMY IN WARTIME

According to Soviet views, the wartime support of the armed forces and the population as well as repair of damage to the economy, transportation and other vital installations and systems will require that essential industries, utilities, transportation and so on remain in continuous operation. Indeed, if circumstances permit, the Soviet economy will be mobilized before the initiation of enemy strikes in order to expand to the greatest possible extent the number of enterprises engaged in defense-related production and the volume of such output. Not only defense plants, therefore, but all enterprises which will convert to defense-related production activities in the event of mobilization, as well as the utilities which will support them, have specific plans and operation-production instructions and schedules ready for implementation in case of a threat of war. Soviet publications indicate that the authorities have identified what they believe to be "essential" enterprises, utilities and services as

well as workers. Their precise identity and number, however, is considered by the Soviets to be a state secret.[15/]

As was noted, one of the primary objectives of Soviet civil defense is to assure the wartime "stability" of the economy. This will include long-term and emergency measures to harden and disperse installations as well as to reduce their vulnerability or that of essential equipment to fire and other forms of secondary damage.[16/] While some key enterprises or select production lines may be relocated to dispersed exurban facilities, the vast majority of the "essential" enterprises will remain in their peacetime locations. Soviet plans, therefore, call for assuring the continuous operation of these enterprises under conditions of possible disruption of supply lines, power systems and utilities. It is recognized that these enterprises, utilities and transportation systems as well as the work force required to operate them will remain at risk and, despite protective measures, could be destroyed or damaged if subjected to enemy attacks.

Soviet civil defense plans call for the "essential" workers to be organized in wartime into two 12-hour workshifts and for their dispersal to exurban areas from which the workshifts will commute to their work sites. To protect the workers as well as management and technical personnel at these sites, there should be ready blast shelters with sufficient space for all working personnel.[17/]

Although the actual number of workers and other personnel at any time in the potential target areas will vary depending on the number and size of "essential" enterprises in each of the particular localities, Soviet civil defense publications suggest that overall they may constitute on the order of 10 percent of the total urban population in cities subject to pre-attack evacuation.

Of course, in the event that there is insufficient time to carry out or complete the evacuation of the urban population, a large number of people, both essential and non-essential, may be at risk in the potential target areas. Presumably, in the event of a warning of an attack, these people will make use of all available shelters.[18/]

2.3 SOVIET VIEWS OF THE POTENTIAL THREAT

As the Soviets see it, nuclear strikes would be used primarily against select targets which "have greatest influence on the course and outcome of the armed struggle,"[19] that is, those whose destruction can achieve "decisive results." Specifically, according to the Soviet view, the strategic nuclear forces have the following missions:

> They are intended to annihilate the enemy's means of nuclear attack and the large groupings of his troops and military bases, to destroy military-industrial installations and to disorganize the aggressor's state and military command and control, and the operations of his rear and transportation.[20]

In other words, strikes will be directed not only against military forces and installations, but also against the "sources" or "foundations" of the country's military power and its ability to wage war. Specifically, governmental and economic centers of control and communications, the transportation systems, significant industrial installations or regions engaged in defense-related production, power plants, and other installations vital to the war effort are likely to be targeted in order to achieve "total disorganization of the enemy's rear areas."[21] Indeed, given the role the economy is said to play in determining the course and outcome of a war, the Soviets anticipate that the economy will become "one of the most important targets" of enemy strikes.[22] Consequently, there is "great significance in insuring high viability of the country's economy under conditions of an attack."[23] Although cities may not be targeted per se, urban damage may be extensive as a consequence of strikes on administrative, economic, transportation and communications targets located in or near cities.

The Soviets assert that unless appropriate measures, including civil defense measures, are taken, enemy strikes could cause so much destruction, damage and human losses as to paralyze the country and deprive it of its ability to continue resisting the enemy.[24] Consequently, the Soviets claim that:

> The side which can preserve to the greatest extent its production forces and their base—the people; ensure the steady work of administrative organs, important industrial facilities and transportation; and protect the bases supplying food and raw materials can be victorious in such a war.[25]

2.4 THE REQUIREMENT FOR POST-STRIKE RESCUE, DAMAGE-LIMITING, REPAIR AND RESTORATION OPERATIONS

The Soviets recognize that in a nuclear war total damage denial to the Soviet Union by means of offensive and defensive military operations and civil defense hardening and dispersal measures is not possible. Even under the most favorable circumstances, damage and casualties must be expected to be extensive. Consequently, Soviet civil defense cannot rely solely on protective measures to minimize the effects of enemy nuclear strikes. To achieve its objectives, civil defense must try to mitigate the consequences of these strikes and, where possible, repair the damage and help restore the ability of the economy, transportation and other vital services to support the armed forces and assure the essential functioning of the state. It is claimed that "the more rapidly the damage resulting from the enemy's first strike is liquidated, the greater will be the possibility of attaining victory in the war."[26]

Soviet publications also cite come specific reasons for the requirement for and utility of post-strike rescue, damage-limiting, repair and restoration operations, which the Soviets refer to by the Russian acronym "SNAVR."

- RESCUE: The Soviets insist that the primary mission of civil defense is the protection of and assistance to the population. The reason for this is not merely humanitarian, but also because the population is "the country's main production force."[27] In a modern war, the number of people needed in the logistic system and defense industry to support a soldier at the front is constantly growing. Consequently, there is a direct correlation between the preservation of the productive element of the population, in particular the skilled work force, and the country's

warfighting capability.[28] It is observed that large losses among the population may paralyze the country's economy as well as demoralize the population and thereby make a sustained war effort impossible.[29]

As was noted, the Soviets anticipate not only that in the event of a surprise attack a substantial part of the urban population, including essential workers, may be in areas subjected to nuclear strikes, but also that workshifts of essential workers will be at essential enterprises in potential target areas following the evacuation of the urban population. Even though a portion of this population and specifically the essential workers, management and other key personnel will be in blast shelters, for practical reasons and also in order to ensure the willingness of essential personnel to work in potential target areas it will be important to develop plans and capabilities for their earliest possible rescue in the event of enemy strikes.

From a practical viewpoint, the requirement for early rescue arises not only from the possibility that people in the target areas may be trapped under the debris or in damaged basements, hasty shelters or blast shelters. An additional reason is that even in undamaged shelters, the length of time the occupants could remain in them will be relatively limited and, furthermore, may be severely restricted by conditions in and outside the shelters. Generally, the Soviets plan for some two to three days' and at most five days' duration of shelter occupancy and equip and supply their shelters accordingly.[30] It is assumed that in most cases it will be possible to rescue and evacuate the shelter occupants within that period.

Aside from the limits on the amounts of water, food, oxidizers for air regeneration equipment and other supplies in the shelters, several other considerations and conditions necessitate the early rescue of shelter occupants. One of these is the fact that small and medium capacity shelters (up to 450 occupants) are not equipped with independent electric power generators. In the event of the failure of electric power supply, their ventilation systems will have to be operated manually and will generate insufficient air (2 m^3/hour per occupant) to keep shelter temperature and

humidity at a tolerable level for more than 10-12 hours.[31] Another factor is that the external air intakes of basement shelters are likely to be blocked by debris at blast overpressures of 11-14 psi or greater.[32] In that event, the occupants' length of survival in the shelter depends either on the volume of air per person in the shelter (usually only sufficient for a few hours) or on the availability of air regeneration equipment and the amount of oxidizers for it (probably sufficient for some 10-12 hours and at most 24 hours). A similar condition will occur during fires which, because of dangerous concentrations of carbon monoxide in the air, may necessitate the shutdown of the ventilation systems.[33] However, the duration of the fires may exceed the amount of breathable air in the shelters not equipped with air regenerators or bottled compressed oxygen, thus making it necessary to rescue the occupants before the fires have burned themselves out.

The readiness of Soviet civil defense forces to carry out early rescue of people trapped in the areas of nuclear destruction undoubtedly also serves to reassure the essential workers who will be required to commute to the potential target areas. In effect they are told that they will be relatively safe in those areas not only because they will have blast shelters at their disposal, but also because in the event of enemy strikes and their being trapped in the shelters they will be rescued. The Soviet civil defense pamphlet for mass distribution states in bold print: "REMEMBER! THE CIVIL DEFENSE ORGANS ARE CONCERNED WITH RESCUING YOU AND RESCUE DETACHMENTS ARE RUSHING TO YOUR AID."[34]

- DAMAGE-LIMITATION AND EMERGENCY REPAIR: The Soviets believe that post-strike damage-limitation and emergency repair can serve several important purposes. First, they are required to facilitate the conduct of rescue operations and to ensure the safety of rescue workers as well as to limit secondary threats to the survivors. Specifically, it will be necessary to keep the sites of rescue operations and the routes to and from them secure from fire, flooding, secondary explosions, leaks of dangerous chemicals, live power lines and so on. Consequently, rescue

operations must be accompanied or even preceded by firefighting, sealing breaks in water, gas fuel, steam, chemical lines, reservoirs and so on.[35] In addition, repair of water and power lines will facilitate fire fighting and other damage-limiting and rescue activities.

Another important objective of these operations is to limit secondary damage, especially to valuable installations, utility lines and other facilities. The primary purpose is to prevent additional damage from spreading fires, explosions and flooding, thereby facilitating the early repair and restoration of partly damaged enterprises, utilities, transportation facilities and so on.[36]

Still another objective of emergency repairs is to restore water, power, gas, steam and so on to surviving or partly-damaged enterprises to allow them to resume operations.[37] Furthermore, damage to rail lines and roads, especially bridges and tunnels, may isolate the fighting armed forces from their logistic support bases and also dangerously disrupt the ability of the economy to continue essential production as well as the delivery of these products and food to where they are needed. Consequently, there will be an urgent need to repair damaged rail lines, road and vehicle bridges, tunnels and so on.[38]

- RESTORATION: The final objective of post-strike operations is the restoration of essential production, transportation, utilities and services and thereby assure the continuing vitality of the state and logistic support of the armed forces.[39] In this sense, post-strike rescue, damage-limiting, repair and restoration operations are an important part of and contribute to the other main mission of Soviet civil defense, that of ensuring the continued "stability" of the wartime economy.[40] Given the extent of likely damage to the economy and transportation, this becomes a vital task of civil defense. Thus it is said that:

> The immeasurably increased dependence of the Soviet armed forces on economic bases makes it incumbent on our civil defense to consider its highest priority responsibility to be that of participating in the

> restoration of the vital activities of industrial and agricultural production facilities damaged by the enemy.[41]

In the event of a protracted war, the side which can more effectively and rapidly restore vital economic activities and transportation can alter the "correlation of economic forces" in its favor and thereby greatly enhance its prospects of winning the war.[42]

Section 2

FOOTNOTES

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Section 3

FUNCTIONS AND ORGANIZATION OF SOVIET POST-STRIKE CIVIL DEFENSE

While insisting on the importance and utility of rescue, damage-limiting, repair and restoration operations in urban areas and at economic installations which have been subjected to nuclear attacks, Soviet civil defense leaders and planners are fully aware of the enormous difficulties and complexities of such undertakings. It is evident that the effective conduct of such operations requires a large, yet flexible organization which includes a variety of specialized elements staffed by well-trained and equipped personnel capable of performing a large number of diverse tasks. It also requires a command, control and communications (C^3) system able to assess the situation, establish priorities and effectively direct and control the utilization and activities of the civil defense forces, equipment and resources.

3.1 TASKS TO BE PERFORMED IN THE COURSE OF POST-STRIKE OPERATIONS

The organization of Soviet civil defense for conducting post-strike operations, i.e., SNAVR, is determined not only by the character, complexities and geographic scope of potential prompt and secondary damage and the life threatening environment which may result from nuclear strikes, but also by the comprehensiveness of the tasks which the civil defense forces are expected to perform. In a sense, the organization of SNAVR can be compared with the organization of military forces during combat operations. In other words, there is a requirement not only for various types of forces and capabilities to achieve the objectives of the operations, but also for a variety of forces and organizations needed to support and service the "combat troops" directly engaged in the operation and to care for the rescued population.

A better understanding of the organizational requirements of post-strike operations can be gained from a list of the tasks which civil defense forces are called upon to perform. These tasks include:[1/]

- Assessment of the damage, radiation environment, conditions along access routes and at designated work sites, and determination of the state of the survivors.
- Monitoring movements of radioactive and chemical clouds and provide warning to the population and civil defense forces.
- Protection of civil defense personnel and equipment in dispersal and assembly areas.
- Clearing, repairing or building access routes to designated work areas and assuring their safety.
- Transportation of personnel and equipment to assigned work sites.
- Firefighting.
- Assuring the safety of civil defense personnel at work sites.
- Search for and rescue of survivors outside the shelters and in damaged shelters.
- Opening shelters buried under debris and providing air to shelters with blocked ventilation air intakes.
- First aid, medical aid, triage and transportation of casualties.
- Prevention of secondary damage from ruptured gas, power, water, steam and chemical lines and reservoirs.
- Provide water and power to work sites and for firefighting.
- Evacuation of occupants of shelters threatened by flooding, gas leaks, etc. and subsequently of all shelter occupants.
- Continuous monitoring of radiation and chemical environment and preparation of available shelters for the protection of civil defense personnel in the event of new enemy strikes.
- Decontamination of civil defense personnel, casualties and evacuees, equipment, clothing, operable industrial and other machinery, food and agricultural resources, water, territories and structures.
- Provide fuel, lubricants and spare parts for transportation and all mechanical equipment used in the operations and evacuation, and repair of damaged or broken-down equipment and vehicles.

- Traffic and security control.
- Supply civil defense workers and rescued people with food, water and clothing.
- Repair of water, fuel, power, gas, etc. lines to surviving elements of essential enterprises.
- When practical, repair of damaged utilities, industrial, transportation, communications and other essential installations and restoration of their operation.
- Maintain continuous communications at all levels.

A further complicating factor which the organization of post-strike operations must take into account is the great diversity of types of installations and enterprises which may be damaged. Each type has its own peculiarities, vulnerabilities and potential for secondary damage, and each requires skilled personnel and possibly specialized equipment and supplies for damage control and repairs.

3.2 COMMAND AND CONTROL OF SNAVR

According to Soviet civil defense manuals, "the civil defense organization provides for a rational combination of centralized and decentralized command and control of civil defense forces and means."[2/] The reason for a great deal of decentralized command and control is obviously due to the recognition that centralized control at a high level will not be able to deal with the possible number of simultaneous enemy strikes, each of which will pose its own problems and operational complexities. Furthermore, the greatest part of the civil defense forces which will be used in implementing SNAVR will be at the lower levels of the chain of command. At the same time, the higher command authorities are likely to be geographically removed from the specific areas of operations.

The command and control system for conducting SNAVR will be different from the normal peacetime system of administration of the civil defense program. In the latter case, in addition to the national

leadership vested in the USSR Council of Ministers and implemented by USSR civil defense under the leadership of Army General A. Altunin in the USSR Ministry of Defense, control is exercised along two main lines: the administrative-territorial and the functional or production principle. The first is in accordance with the administrative structure of the country. In this case, control over and responsibility for implementing the civil defense program is vested in the Councils of Ministers of the union republics and autonomous republics and in the Soviets (Councils) and their executive committees at lower levels [i.e., oblasts (provinces), rural rayons (counties), cities and city rayons (districts), etc.].[3/] Along the functional line, responsibility is vested in the ministries, agencies and departments, as well as in the managers of enterprises, institutions, services, collective and state farms, organizations, etc. For operational purposes, however, the chain of command is simpler.

In order to conduct SNAVR, the chain of command essentially follows a territorial-installation line, as illustrated in Figure 3.1. At each level of the territorial organization, the chief executive officer (in most cases, the chairman of the Council of Ministers or of the Executive Committees of the Soviets) is the designated civil defense chief for the territory for which he is responsible and the civil defense forces in it.[4/] He is normally assisted by deputies for various activities and a staff headed by a chief of staff which implements his decisions. Under control of the civil defense chief and his staff are civil defense services and forces. Each civil defense chief is directly subordinated to the next higher one.

Generally, the republics are too large to allow their civil defense chiefs and staffs to exercise direct or effective control over SNAVR operations under conditions of multiple enemy strikes. This probably holds true even in the case where the very large republics, such as the Russian Socialist Federated Soviet Republic (RSFSR), are probably further subdivided with subsidiary republic civil defense chiefs and staffs in charge of each section. The republic chiefs, however, will

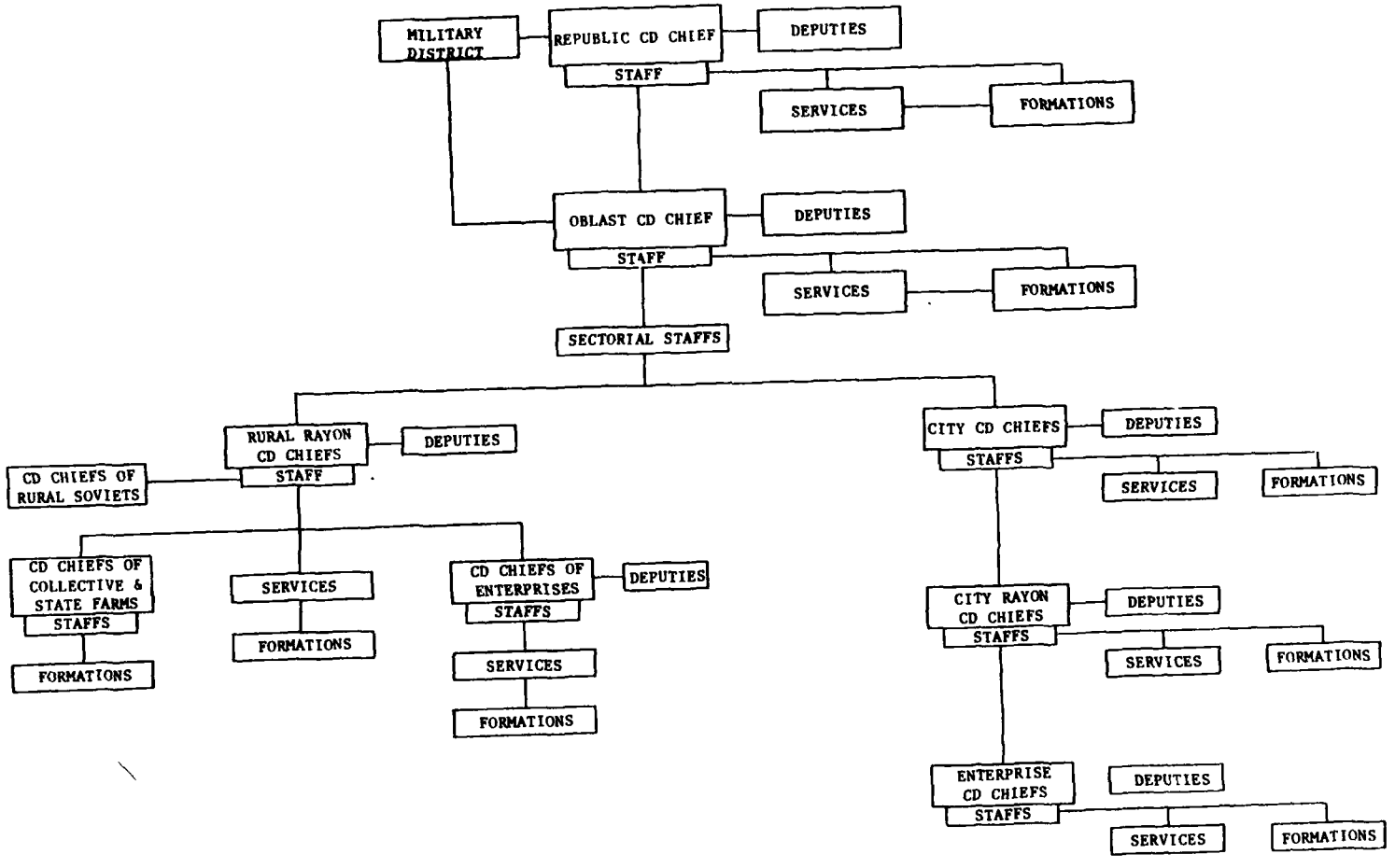

Figure 3.1 Structure of Civil Defense Command and Control

have some forces at their disposal and also will be able to call on assistance by military units under the control of the commanders of military districts. These forces could be sent to assist the most critical localities.

The civil defense chief of the oblast has subordinated to him the civil defense chiefs of rural rayons, cities and urban rayons and of important installations or enterprises located in the oblast's territory.[5/] The oblast chiefs will also have control over the oblast's civil defense services and civil defense territorial formations, as illustrated in Figure 3.2. Important oblasts may have military civil defense units stationed in them which could be called upon to perform various SNAVR missions. In the case of large oblasts or the presence of large cities in them, the oblast command may deploy a number of sectorial commands. For example, a large city and the exurban zone to which its residents will be evacuated may be divided into several sectors under the control of representatives of the oblast civil defense command. Subordinated to the oblast command will be the city, city rayon and rural rayon and some enterprise or installation civil defense chiefs. The city, urban and rural rayon chiefs will operate through their staffs and will have at their disposal various civil defense services and territorial formations. It appears, however, that the majority of the civil defense formations will be under the control of chiefs of enterprises, installations, utilities, transportation organizations, schools, farms, etc. In most instances, these chiefs will be subordinated to the urban and rural rayon civil defense commands. It is possible that in the case of the largest cities, their civil defense chiefs may call directly for assistance by military civil defense units which are specifically assigned for operations in those cities.

In the case of cities, it appears that SNAVR will be under the control of the city and city rayon civil defense chiefs and their staffs. However, the oblast command may conduct initial damage assessments and set general priorities for the operations. In the conduct of SNAVR

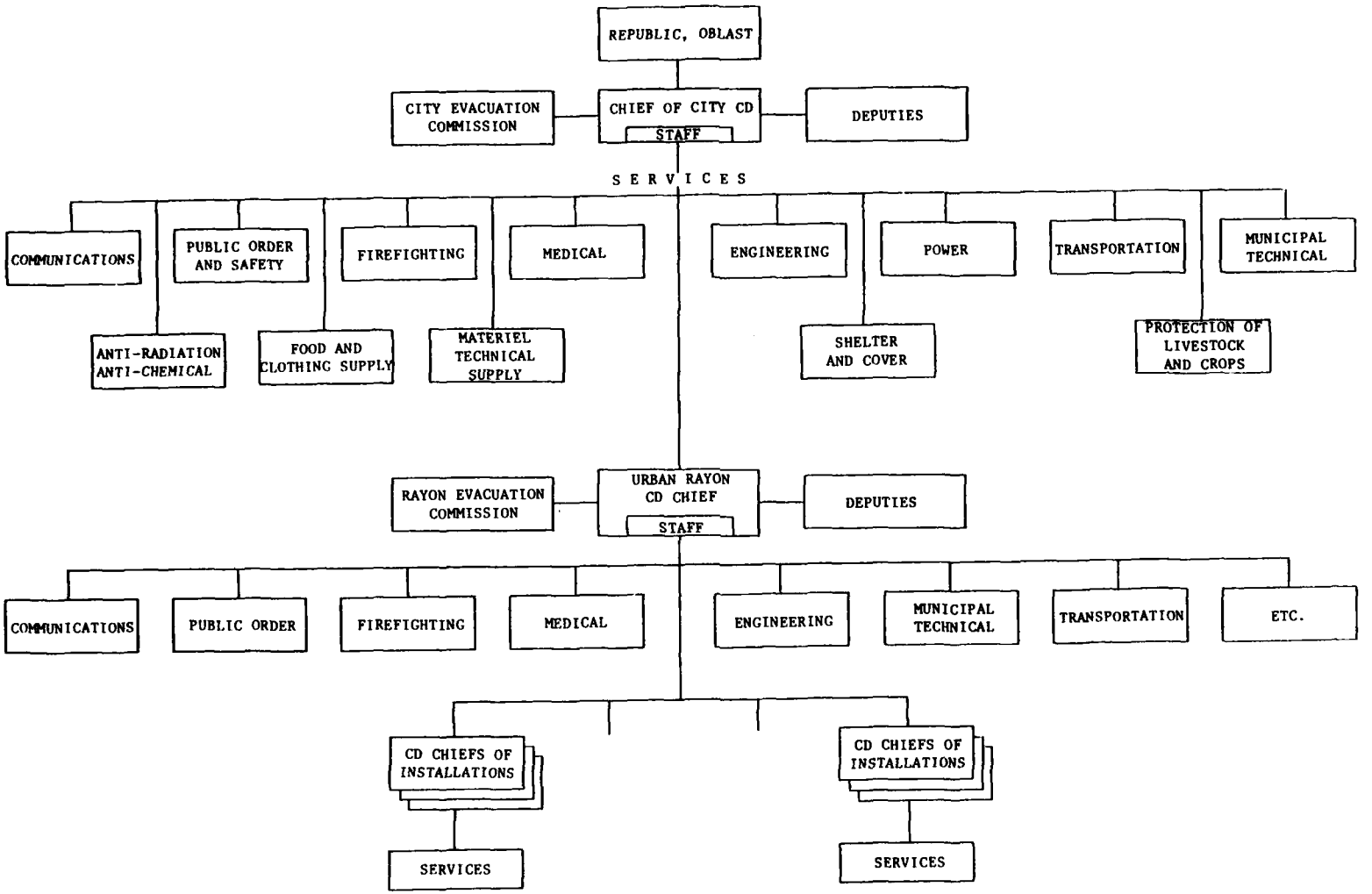

Figure 3.2 City and Urban Rayon Services

operations, the operational chain of command will proceed from the city chief to the city rayon chief to the enterprise chief. As far as the latter is concerned, he will be told by the rayon chief or his chief of staff when to begin operations and his mission. The rayon chief or the city chief can reassign his civil defense forces to operations at other than his own enterprise.[6] Information on the situation will flow both ways—from the enterprise chief upward and from the oblast, city and rayon chiefs downward. If the forces of the enterprises are insufficient to carry out their assignments, they will ask the rayon, city or oblast staff for reinforcements.[7] Similarly, the city chief can ask the oblast chief for reinforcements, which the latter may draw from his own forces or order the chiefs of nearby rural rayons to provide.

Control over civil defense formations and units engaged in SNAVR operations is predominantly exercised by the rayon staffs and chiefs of rayon civil defense services, by the chiefs of enterprises, their staffs and chiefs of services, and finally the unit commanders. Coordination between units at work sites will be controlled by the installation chiefs or their deputies or staffs or by the formation commanders. The installation chiefs will also coordinate their formations' operations with those of neighboring forces through their chiefs or the rayon or city staffs.[8] If communications with higher staffs break down, the enterprise chief may act on his own initiative.[9]

To help plan and coordinate operations, the cities, rayons, enterprises and installations develop coordinated plans in advance for conducting SNAVR.[10] Although it is recognized that these plans will require revisions in light of an actual enemy strike,[11] nevertheless they help to set procedures, modes of operation and priorities which the chiefs can attempt to implement. These plans are coordinated in advance with higher staffs.

Naturally the key to control is communications. At each level there must be communications both upward and downward, and the staffs must have communications with the formations under their control.

In turn, the formation commanders must be able to communicate with their subordinate units, and enterprises must have communications between their exurban command posts and the command posts at the enterprises. The primary means of communications will be various types of radios, but use will also be made of surviving telephone lines, field telephone systems and, if necessary, messengers.[12/]

Although Soviet civil defense publications generally give the impression that wartime command and control of civil defense will be primarily, or even entirely, under civilian leadership, this is misleading. The fact is that USSR Civil Defense is an element of the Soviet defense capability and is expected to play an important role in support of the Soviet Armed Forces and their ability to conduct operations. Consequently, as its chief notes, USSR Civil Defense will be "under single military command" and will operate "in close cooperation with the Armed Forces."[13/] This will be true not only on the national command level, but also at subordinate levels—in the latter case command and control being exercised by the commanders of the military districts. In this connection, it is significant that these commanders have deputies for civil defense and that the chiefs of the civil defense staffs of republics, oblasts and other large territorial units, as well as of large cities, are military men. The latter is also true for the full time professional members of the staffs at these levels. Furthermore, the military civil defense units and other military units which are under the control of the military district commanders play an important role in SNAVR operations. The commanders will control the employment of these units in accordance with military priorities. Thus, given that Soviet civil defense is responsible for performing its operations, as it is sometimes put, "in the interest of the Armed Forces," one must expect that the "single military command" and the military district commanders will have a great deal of say in the setting of priorities for SNAVR operations and for the concentration of most urgent repair and restoration efforts. Of course, while implementing these priorities at lower levels, the civilian civil defense formations, in most instances, will be under the control of their own chiefs and staffs.

3.3 ORGANIZATION OF CIVIL DEFENSE FORCES FOR SNAVR

For the purpose of organizing and manning the civilian forces required to conduct SNAVR operations, Soviet civil defense takes full advantage of all existing economic, territorial and municipal, technical, transportation, public service, etc. organizations and agencies and their management, personnel and equipment. In practice, all organizations which may be useful in executing or supporting SNAVR operations are included. This makes it possible for Soviet civil defense not only to have large forces to conduct SNAVR operations, but also a great variety of types of units capable of dealing with the most diverse disaster situations and damage and of operating independently or in various combinations. Furthermore, in an emergency the civil defense authorities can demand the participation in such operations of all men 16 to 60 years of age and women 16 to 55 years of age—the only exception being pregnant women, women with children up to eight years old with no one else to care for them, and sick or crippled men.[14/]

There are two basic types of civilian civil defense forces for conducting SNAVR operations. One consists of general purpose or rescue forces; the other of specialized forces based on various services. In terms of their subordination, the forces are divided into territorial and installation forces. The first, depending on their subordination, are intended for use anywhere in the territory of republics, oblasts, rural rayons, cities or city rayons, and they are under the direct control of the corresponding civil defense chiefs and their staffs. The second are primarily intended for conducting SNAVR operations at the specific installations on whose basis they are organized and are under the direct control of the civil defense chiefs of the installations and their staffs.[15/]

3.3.1 Civil Defense Services

For other than general purpose units, civil defense forces are organized on the basis of functional, specialized services which in turn are based on appropriate public service or technical organizations. The

services are responsible for organizing, training and equipping civil defense forces; planning their actions in an emergency; and leading them during SNAVR operations. As a rule, the chiefs or the senior technicians or professionals of the organizations or departments on which the services are based act as chiefs of these services. In the case of services at given levels with a large number of personnel and units, the chiefs will be assisted by staffs.

In principle, the civil defense chiefs at each level—from republic to individual installations or enterprises—determine the number of services to be organized. In practice, the number of services depends in a large measure on the number and types of technical and service organizations under the jurisdiction of each civil defense chief. However, each chief must obtain approval for the number of services he wishes to organize from the next higher civil defense chief. Furthermore, the chiefs of the services, while being under the control of the civil defense chief of the level at which they are organized, are also given directions and guidance by the corresponding chiefs of services of the next higher level. For example, the chiefs of services of an industrial enterprise are under the control of the civil defense chief of the enterprise and his staff, but also receive directions from the chiefs of the rayon or city civil defense services.

The most common services include: Communications, Public Order and Safety, Firefighting, Medical, Transportation, Power, Engineering or Technical Repair, Municipal Technical, Food and Clothing Supply, Materiel-Technical Supply, Anti-Radiation and Anti-Chemical Defense and, where appropriate, various others such as Protection of Livestock and Crops, Water-Sewage System, Gas System and Blackout.[16/] There is also a Shelter Service.

• COMMUNICATIONS SERVICE: This service is organized on the basis of communications ministries, administrations, departments and agencies of republics, oblasts, cities, urban rayons and rural rayons, as well as of the communications offices of economic and other installations. It is

responsible for organizing the transmission of civil defense warnings and signals to civil defense leaders at various levels and to the public, establishing civil defense communication nets at various levels, and restoring damaged communications systems. The heads of the communications ministries, organizations or departments usually serve as chiefs of the service at each level.

- PUBLIC ORDER AND SAFETY: This service is organized on the basis of the police organization at republic, oblast, city, urban rayon and rural rayon levels and the security departments and volunteer militia at installations. It is responsible for organizing the enforcement of civil defense orders, traffic control during evacuation and SNAVR operations, protection of state and private property, and maintenance of quarantines in areas with epidemic diseases.

- FIREFIGHTING SERVICE: This service is organized on the basis of fire prevention and firefighting administrations and departments primarily at oblast, city, urban rayon and rural rayon levels and fire departments or volunteer fire services at installations, villages and state and collective farms. The service is responsible for fire prevention measures, the organization of training and equipping civil defense firefighting forces, and measures to localize and extinguish fires.

- MEDICAL SERVICE: This service is organized on the basis of public health organizations, departments and facilities at republic, oblast, city, urban rayon and rural rayon levels; medical aid points; and medical and prophylactic departments and services at installations. The chiefs of the medical organizations or departments at each level serve as chiefs of the medical service for that level. The medical service is responsible for the training of personnel, the preparation of the medical portions of the civil defense emergency operation plans at the various levels, the creation of necessary supplies and facilities, the organization of medical services for evacuees in hosting areas following the evacuation of the urban population, and the implementation of medical assistance to casualties in the event of an enemy attack.

• TRANSPORTATION SERVICE: This service is organized on the basis of transportation administrations, departments and organizations at various levels. It applies primarily to motor vehicle transportation and, to a lesser degree, to river and sea-going transportation. Railroad transportation is an independent service and is primarily under the control of its own ministry and subordinate railroad districts or section administrations. Even so, by joint agreements and planning, the railroad service makes available railroad transportation to the transportation services at republic, oblast, and especially city and urban rayon levels. The service is responsible for planning and organizing the movement of urban evacuees to exurban hosting areas, the transportation of civil defense forces as well as the evacuation of casualties to medical facilities, and transportation of supplies and equipment.

• POWER SERVICE: This service is organized on the basis of electric power administrations or departments and services at various levels. In cities and urban rayons, this service may be a part of the Municipal-Technical Service. It is responsible for planning and development of measures for ensuring the uninterrupted supply of electric power to essential installations, utilities and transportation; the training of appropriate forces to repair the power system; and control over the repair and restoration of the power system.

• ENGINEERING OR TECHNICAL REPAIR SERVICE: This service is organized at oblast, city, urban and rural rayon levels and installations on the basis of construction, technical-assembly and repair organizations. It is responsible for organizing the construction of rapidly-errectable shelters in an emergency, post-strike clearing and repair of roads and bridges, tearing down unstable damaged structures, rescue of casualties from under debris and digging out buried shelters, repair of technical damage at installations, and assists in fighting fires at industrial installations. It also organizes, trains and equips civil defense engineering forces and directs their operation during SNAVR.

• MUNICIPAL-TECHNICAL SERVICE: This service is organized primarily in cities and urban rayons and at inhabited centers in rural rayons on the basis of water, gas, sewage and sometimes electric power administrations, departments or agencies and their construction, service and repair sections. Their responsibility is to plan and organize the repair of utility lines and installations; decontaminate territory, installations, equipment and personnel of utilities; prepare various public facilities (baths, showers, laundries, etc.) to be used for the decontamination of personnel and their clothes; and organize, train, and equip forces to perform these tasks. This service may also be called upon to assure the readiness for use of existing shelters.

• FOOD AND CLOTHING SUPPLY SERVICE: This service is established on the basis of trade and public feeding departments and organizations and food safety and quality control laboratories predominantly at the city, urban and rural rayon levels and of the food catering departments of large enterprises. It is responsible for planning for and taking measures to protect food, clothing and other goods of first necessity; organizing the feeding of urban evacuees and civil defense forces in exurban zones during the latter's SNAVR operations; and feeding and clothing rescued personnel and casualties, as well as the clothing of civil defense personnel following their exposure to radioactive or chemical contaminates. The service also organizes control of the safety of food from radioactive and chemical contamination.

• MATERIEL-TECHNICAL SUPPLY SERVICE: This service is organized on the basis of materiel and technology supply and repair organizations at oblast, city, urban and rural rayon levels and at installations. It is responsible for planning and organizing the supplying of civil defense forces with materiel and equipment and the storage, transportation, fueling, maintenance and repair of equipment and machinery used in SNAVR operations. In the absence of a Food and Clothing Supply Service organization, the Materiel-Technical Supply Service will perform its function.

• ANTI-RADIATION AND ANTI-CHEMICAL DEFENSE SERVICE: This service is organized on the basis of chemical laboratories and chemical workshops of cities, urban and rural rayons and especially enterprises. It is responsible for planning and implementing measures to protect workers and employees, water supply, food and stocks of food against radioactive and chemical contamination.

• WATER, SEWAGE AND GAS SERVICE: This may be established as a separate service in large cities where it would be based on the cities' water, sewage and gas administrations or departments and their construction, service and repair organizations. Otherwise, these functions are a part of the Municipal-Technical Service.

• SHELTER SERVICE: This service is organized in cities, urban as well as rural rayons, and especially at installations on the basis of construction organizations and agencies, construction departments and shops at installations, and housing departments. It is noteworthy that among the services, it is the only one not involved in SNAVR. The chiefs of the shelter service are the heads of the organizations or departments which form the basis for the service at each level. The responsibilities of this service include planning shelter protection for the population, especially workers and employees; supervising the construction of shelters and covers and seeing to their proper maintenance; organizing and training shelter management personnel, and so on.

In practice, because of their different requirements and capabilities, installations may combine some of the standard services or establish additional ones. For example, the Moscow First State Ballbearing Plant is reported to have organized a Mechanization of Rescue Work and Transportation Service which combines the functions of the Transportation and Materiel-Technical Supply Service, with the organization of the use and operation of mechanized construction equipment.[17/]

3.3.2. Formations

The civil defense forces are organized into a variety of formations. They include non-specialized and specialized formations—the latter organized by the various services. Their type, number and size varies in accordance with the character and size of the organization or installation from which they are drawn. This is so not only because the number of employees at each installation varies but also because each type of installation has its own peculiarities and vulnerabilities which may require special formations to deal with in an emergency.[18/] For example, the vulnerabilities of steel plants or machine-building plants will differ significantly from chemical plants, oil refineries, sea ports, and so on.

Civil defense formations are divided into two general categories: *GENERAL PURPOSE FORMATIONS* and *SERVICE FORMATIONS*.[19/] As was noted, in terms of their subordination these formations may be territorial or installation formations—the former intended for use in republics, oblasts, cities and urban as well as rural rayons, and the latter intended for use at industrial and other important installations. Furthermore, the formations of installations are duplicated in each of the two workshifts which will be organized when war threatens at all industrial installations, agencies, facilities and services which will remain in operation in wartime.

In terms of their organizational structure, the formations are made up of detachments, each of which is made up of a number of commands; each command is made up of several groups, and each group is composed of several squads or teams.

- *GENERAL PURPOSE FORMATIONS* are said to be the main or basic types of units. They are organized at both the territorial and installation levels and are under the direct control of the civil defense chiefs at the various levels. Their primary function is to conduct rescue operations in zones of destruction. These formations include Rescue Detachments, Composite Rescue Detachments, and Composite Mechanized Detachments.

Rescue Detachments: These detachments are made up of 350 to 538 members and include three commands of up to 110 persons each, with each command having three groups of up to 33 persons each, and each group having three to four squads or teams.[20] Such detachments may also be larger, having up to five commands.[21] A regular Rescue Detachment is likely to be composed of two or more Rescue Commands and one Medical Command.[22] Independent Rescue Commands may also be organized which may be made up of 102 to 135 persons or more.[23]

Composite Rescue Detachments: These detachments are essentially Rescue Detachments reinforced by a Mechanized Command or Group.[24] They may also include other groups necessary to facilitate rescue operations such as Firefighting Groups, Emergency Repair Groups, etc. The Mechanization Group or Command operates mechanized construction equipment such as bulldozers, scoop shovels, cranes, etc. used in expediting rescue operations. The territorial and installation Composite Rescue Detachments or Commands are considered to be high-readiness mobile units which will be the first to be sent into the zones of destruction.[25] For this reason, these detachments will also be the first to be evacuated from the city to exurban dispersal areas. As Figure 3.3, Diagram of a Composite Rescue Detachment, shows, it will also include a reconnaissance squad, a radiation control team, and a communications team, as well as a supply squad. The commanders of detachments will be assisted by several deputies and a small staff.

In peacetime, in order to prevent disruption of the work of installations and services when required to provide civil defense forces for dealing with natural disasters or accidents, the high-readiness Rescue and Composite Rescue Detachments and Commands recruit their personnel from a number of the installations' departments or production shops. Similarly, the high-readiness Territorial Rescue and Composite Rescue Detachments of the cities and rayons are normally made up of commands and groups drawn from a number of various enterprises, installations, organizations, or departments so as not to disrupt their normal activities.

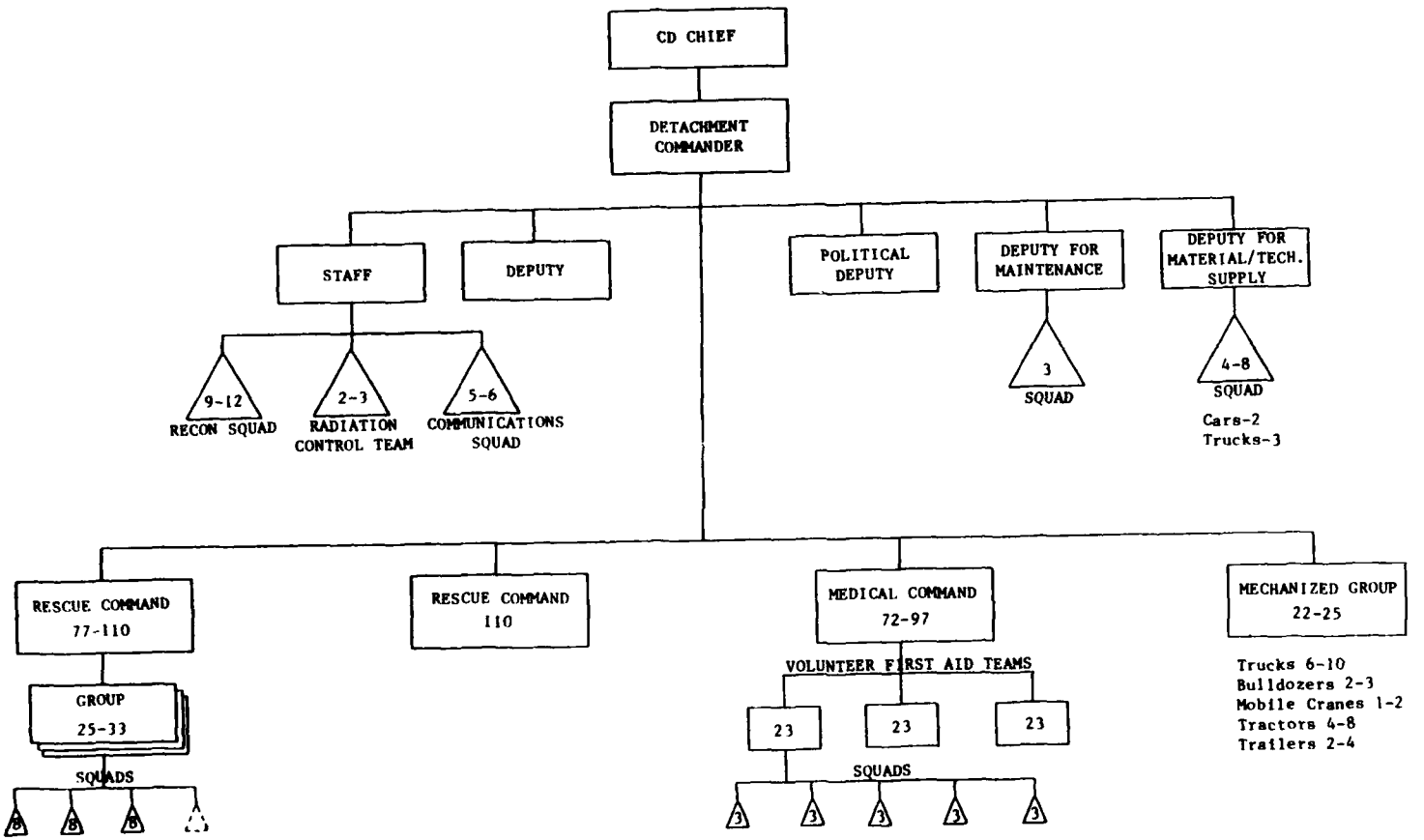

Figure 3.3 Diagram of a Composite Rescue Detachment

Reconnaissance Commands or Groups:[26] Like the rescue units, the Reconnaissance Commands or Groups are under the direct control of the civil defense chiefs at the various levels. It is likely that, as will be discussed below, the reconnaissance missions at oblast and largest-city levels will be performed by military units. In other cities and at rayon and installation levels, however, there are likely to be civilian civil defense units. These units are distinct from the reconnaissance squads of the various general purpose and service detachments and commands. A Reconnaissance Group is normally made up of a group commander, a deputy commander, two or more drivers-radio operators and three to five teams—three to four persons each—or up to 24 persons in all. The group will have a number of vehicles and radiation measuring instruments and chemical detection kits. The function of the Reconnaissance Commands or Groups is to ascertain and monitor the radiological-chemical situation in the exurban dispersal areas, to reconnoiter the approach routes to the disaster area, determine conditions in the disaster areas or, specifically, at installations where rescue and repair operations are to be undertaken, and monitor radiological and chemical contamination. The information provided by the reconnaissance units to the civil defense chiefs provides the basis for their decisions on the conduct of SNAVR operations. Personnel of Reconnaissance Groups at industrial installations is usually drawn from laboratory workers and workers of the installations' construction offices.

In principle, a Reconnaissance Group can reconnoiter a strip 2-4 km wide in vehicles and 0.6-1 km wide on foot.[27] Of course, the penetration of the Reconnaissance Group into the disaster area will be determined first of all by the radiation-chemical environment.

- *SERVICE FORMATIONS* are organized on the basis of the services established at various levels and are intended to perform a variety of specialized or technical functions. For this reason, the personnel of these formations is made up predominantly of skilled workers and technicians, and the formations are led by technicians, engineers and heads

of technical or service organizations and departments. As was noted, service formations may be territorial or installation formations. However, by decision of territorial civil defense chiefs (i.e., oblast, city, urban or rural rayons), territorial formations may be assigned to assist installation formations.

Given the many types of service formations, it appears more practical to discuss them according to their main functions or missions.

• COMMUNICATIONS: Communications units are usually small, mostly squads or groups, recruited from among communications workers of radio stations, telephone-telegraph agencies, communications workers of installations, and similar personnel. At an industrial enterprise, a Communications Group may include communications squads (radio and/or telephone operators), some persons of Mobile Communications Units, and messenger squads equipped with motorcycles or cars. At enterprises, there would be a Communications Group in each workshift. Normally, one Communications Squad would be at the enterprise's command post and another at the enterprise's exurban command post. The various formations would also have communications personnel.

The same picture would also hold for higher level civil defense organizations, i.e., republic, oblast, city and urban and rural rayons. At communications installations there would be detachments, commands or groups to repair damaged communications equipment and lines and for laying telephone lines.

• PUBLIC ORDER AND SAFETY: Except for installations, Public Order and Safety Detachments, Commands, Groups and Squads are organized on the basis of the police. A command may be made up of 17 to 37 persons, composed of several groups of 10-15 persons, a reconnaissance group of some 6 persons, guard teams of 3 persons, and squads of 4-5 persons.[28/] At installations, the commands or groups are drawn from the installation's security personnel and volunteer police. Obviously a major element of the Public Order and Safety formations will be made up of the city and urban rayon police personnel, and will operate under the control of the city

and urban rayon civil defense chiefs and their staffs. These forces may be reinforced by military police and rural rayon Public Order and Safety Commands or Groups. The units themselves, like the services under which they are organized, will be under the command of the chiefs of police of the various levels.

• FIREFIGHTING: In urban areas, the firefighting forces are primarily based on the city and urban rayon fire departments. In the rural areas, they are based on the volunteer fire departments. At installations, they are based on their fire departments and may be reinforced by workers assigned to these units. According to one Soviet civil defense manual, the personnel of firefighting formations should amount to 5 percent of an enterprise's workforce.[29/] These units will be commanded by the chiefs of the fire departments. The units will be formed into detachments, commands, groups and squads. An economic enterprise's Firefighting Command may have 25-39 persons for one-shift operation and 47-75 persons for a two-shift operation, with three to five fire engines. It will be made up of a commander and deputy commander, one or two communications personnel, a person charged with property control, and a number of squads of 6-8 persons each.[30/]

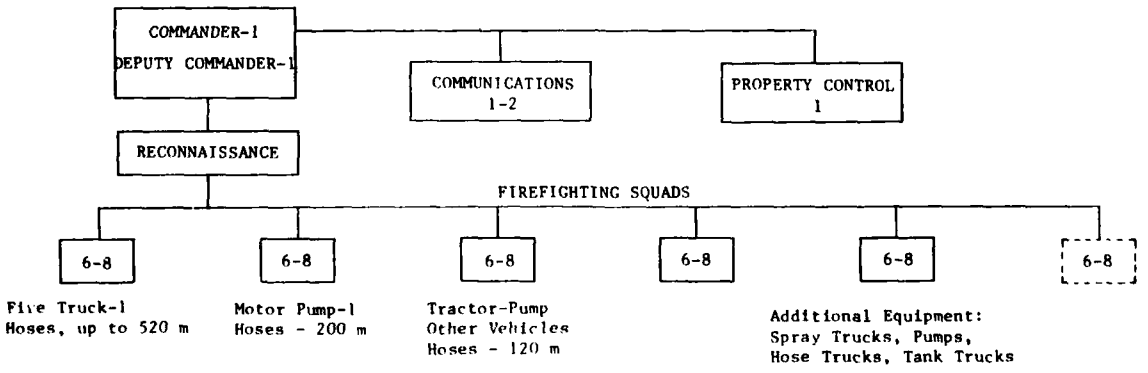

Figure 3.4 Organization of a Firefighting Command at an Economic Installation

Firefighting detachments and commands may have reconnaissance squads or teams which are used to assess the fire situation in the area where SNAVR operations are to be conducted.

Specialized firefighting units are organized at highly fire-prone installations such as chemical plants, oil fields, refineries and oil tank farms, port facilities, etc. At such installations there may be, in addition to the Firefighting Detachments and Commands, Commands for Explosive Work and Mechanization Commands with heavy mobile equipment.[31/] Among the equipment may be foam generators and trucks with turbojet engines and water or chemical tanks which use the jet stream to blow the water/chemicals on the fires.[32/]

- MEDICAL: The organization of the Medical Service is fairly complex. It involves two principal elements: The Volunteer First Aid units and the formations of the regular Medical Service which includes the entire public health and medical organizations at republic, oblast, city, urban and rural rayon levels and at installations. Their mission is to provide first medical assistance and subsequent hospitalization and treatment to casualties in disaster areas or in areas of epidemics.

Volunteer First Aid Detachments (OSD) and Squads (SD) are primarily organized at installations, schools and institutions of higher learning and also at large laboratories, agencies and institutions. They are made predominantly of women "volunteers" and senior high school students who are given training in first aid and stretcher carrying. An OSD is made up of four or five SD squads of 23 persons each, with each squad divided into 2-3 man teams. An OSD may have some 97-120 persons.[33/] The teams are equipped with first aid medical kits and stretchers. The OSDs and SDs are attached to Rescue Detachments and Composite Rescue Detachments and also to *First Medical Aid Detachments (OPM)*.[34/] Consequently, the OSDs and SDs will be in the main first aid forces introduced into the disaster areas to assist rescued casualties. They also will operate in support of *Mobile Anti-Epidemic Detachments (PPEO)* and hospitals, and will give first aid during the urban evacuation

at assembly and embarkation points during the travel of evacuees to hosting areas and in the latter. In principle, SD can give first aid to up to 500 casualties in 10 hours.[35]

First aid will also be given by *First Aid Posts (SP)* which are normally established at enterprises, farms, schools and in residential areas to provide first aid to workers, students, and residents. These posts may consist of full time nurses or part-time first aid personnel and a number of persons who will act as stretcher-bearers. Thus, a post may have a squad of four to five persons.

The *First Medical Aid Detachment (OPM)* is the first professional medical unit to give assistance to casualties. It is organized on the basis of hospitals, dispensaries and polyclinics "regardless of their (peacetime) administrative subordination."[36] An OPM is described as a mobile medical unit of the hospital or dispensary on whose basis it is organized.

An OPM may have from five to twelve medical doctors, in addition to a number of middle-level medical personnel, male nurses, service personnel, two SDs, and various support personnel for the pharmacy, laboratory, to conduct partial decontamination of patients and their clothing and for supplies.[37] Altogether, the OPM has a total of some 144 personnel,[38] and the unit is led by a chief physician. On location, the organization of an OPM includes a casualty *Reception-Triage-Tagging Point (PSO)*, an operating room with several operating tables, a bandaging room, an isolation space and a casualty evacuation point from which the casualties are transported to hospitals in the exurban areas. An OPM may be reinforced with medical specialists to provide specialized aid to the casualties and treat those who cannot be promptly evacuated. In principle, an OPM can provide emergency surgical treatment for 300 casualties in 24 hours.

Mobile Anti-Epidemic Detachments (PPEO) are organized on the basis of sanitation-epidemological stations and epidemological, microbiological and hygiene institutes and are responsible for medical-hygienic

and anti-epidemic measures in areas of destruction and areas subjected to attacks with bacteriological weapons. These detachments have a command element and a sanitation-epidemological, laboratory and disinfection section. The disinfection section includes a SD. This detachment conducts decontamination, disinfection, insect and rodent control and other similar measures, establishes mobile or fixed *Disinfection-Shower Stations (DDA)*, and has a mobile laboratory.[39]

Special Medical Aid Detachments or Brigades (OSMP and BSMP or BrSMP). These detachments or brigades are organized on the basis of medical institutes and schools, medical research institutes and large hospitals of republics, oblasts and cities. They are mobile units intended to provide specialized medical care—mainly surgery of various types. The units will perform their functions at exurban hospitals or field hospitals which serve as the initial reception points for serious casualties evacuated from the disaster areas. An OSMP will have 8-17 brigades, each brigade being composed of two medical doctors, two medical assistants and a driver.[40]

Specialized Anti-Epidemic Brigades (SPEB) are organized on the basis of anti-plague institutes and stations for the purpose of assisting public health agencies in carrying out measures for protecting the population from plague and for operating in areas of bacteriological contamination.[41]

The Medical Service also has a variety of general and specialized hospitals in the exurban areas to process and treat casualties and the sick.[42] Transportation of casualties to the hospitals from the disaster areas will be by ambulances, adapted vehicles for transporting casualties such as buses,[43] and other vehicles of the Medical Service and, if insufficient, by vehicles of the Transportation Service.[44]

- TRANSPORTATION-ROAD CLEARING: The Transportation Services at the various levels down to individual installations are based on the vehicle transportation organizations, departments, vehicle parks, etc., which in turn form transportation units. While the services control the allocation

of transportation to civil defense organizations and formations and for various civil defense operations, it appears that the means of transportation are largely dedicated to these formations or operations in advance in accordance with coordinated and approved plans.

In order to assure the movement of formations engaged in SNAVR to their assigned work sites and to open secure routes to them through damaged roads, debris, fire, snow, etc., *Movement Support Detachments (OOD)* (literally: Detachments for Assuring Movement) are formed. The main element of an OOD consists of units of Mechanization, organized on the basis of construction, road and bridge building, snow clearing and other similar organizations or departments equipped with heavy mechanized equipment, such as bulldozers, mobile hoists, road graders, snow plows, etc.[45/] In addition, the detachment may be reinforced with a Firefighting Group, a Decontamination Command, a Repair-Technical Group, a Volunteer First Aid Squad and a Public Order and Safety Squad for traffic control.[46/]

• ENGINEERING AND EMERGENCY REPAIR: In order to conduct engineering and emergency repair work in the zone of destruction, there are a variety of detachments, commands and groups. Their specific sizes and compositions will vary depending on the number of available personnel in the departments, installations and shops which serve as a basis for their organization, and also the availability of equipment. Formations performing these functions include:

Mechanization Detachments, Commands and Groups: These units use heavy mechanized construction equipment such as bulldozers, scoop shovels, mobile cranes, graders, mobile compressors and generators, etc. In addition to assisting in the clearing and repair of access routes to the area of destruction, these units assist the Rescue Detachments in opening buried shelters and providing occupants with air, pulling down weakened walls of buildings, laying routes to water reservoirs or rivers for the firefighting units and so on.

Composite Mechanized Detachments: These are primarily Mechanization Detachments or Commands, reinforced with Volunteer First Aid Squads, Decontamination Groups, Rescue Groups and so on.[47]

Technical-Repair Commands and Groups: Usually such commands and groups specialize in repair to water lines, gas lines, power systems and sewage systems, but at installations they may also specialize in the repair of fuel, chemical and other types of lines and other equipment. Furthermore, they may be organized to repair and restore installation equipment. A Technical-Repair Command is usually said to be made up of three to four groups, each group being composed of four to five squads.[48] However, the organizational structure of these units may vary a good deal. For example, Figure 3.5 shows a diagram of a *Water-Sewage Pipeline Technical-Repair Command* as given in a Soviet civil defense manual.[49]

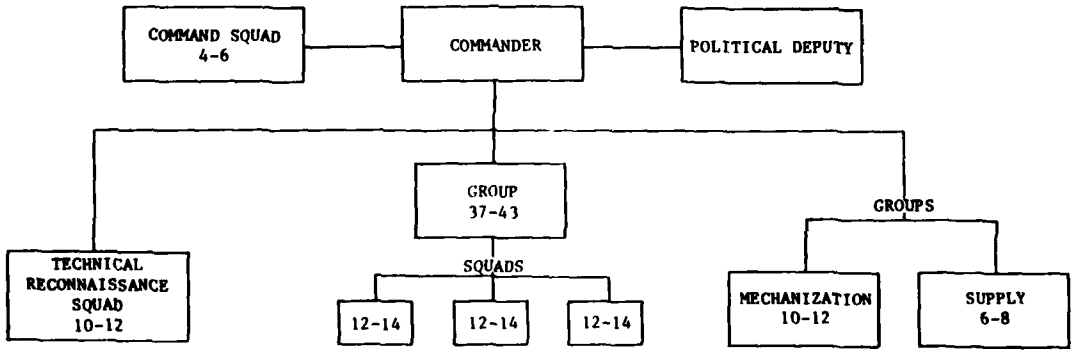

Figure 3.5 Diagram of a Water-Sewage Pipeline Technical-Repair Command

Similarly, Figure 3.6 shows the organization of an *Electric Power Transmission Line Repair Command.*[50]

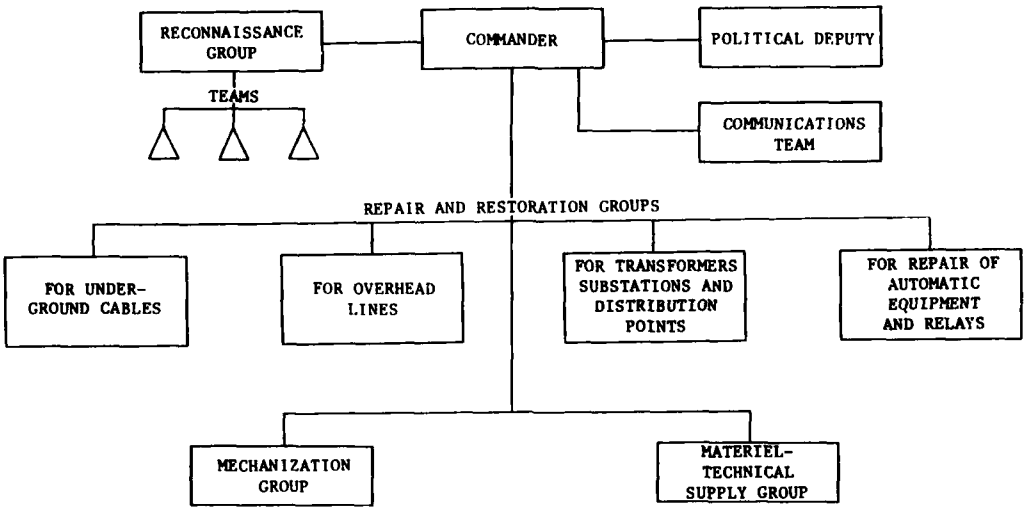

Figure 3.6 Diagram of the Organization of an Electric Power Transmission Line Repair Command

Given that emergency repairs at work sites may require the simultaneous repair of water, gas, power and sewage lines, the various specialized commands can be unified into *Repair-Technical Detachments*.

• DECONTAMINATION: The Soviets see a requirement for decontamination of people, clothing, equipment, structures, livestock, crops and territories following their exposure to radioactive contamination, as well as contamination by toxic gases and bacteriological agents. Consequently, there are organized Decontamination Detachments which may include: *Mobile Decontamination Commands (KO)* as well as *Washing Stations (SOP), Clothing Decontamination Stations (SOO)* and *Stations for Decontamination of Vehicles (SOT)*.

A *Mobile Decontamination Command (KO)* is said to be composed of three to four groups, each of which includes 15-22 persons. It is equipped with trucks, spray trucks and tank trailers, tractors, decontamination equipment, sand spreaders and so on.[51/] According to a Soviet manual, Figure 3.7 is a diagram of the organization of a *Mobile Decontamination Command*.[52/]

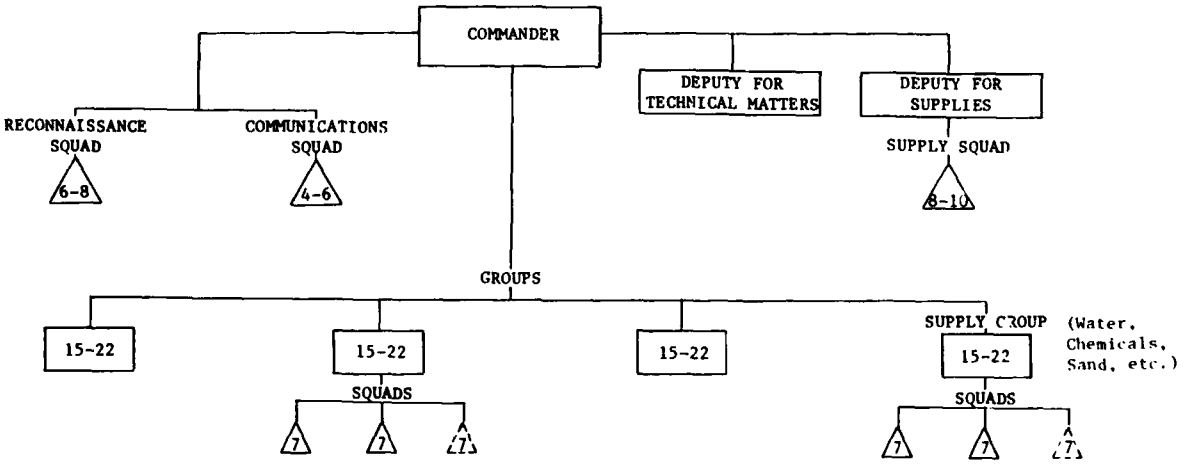

Figure 3.7 Diagram of the Organization of a Mobile Decontamination Command

Washing Stations (SOP) are organized on the basis of public baths, showers and laundries, or they may be field units with showers in tents and with mobile pumps and water heating units using special vehicles for this purpose.[53/] In principle, the SOP and the *Clothing Decontamination Station (SOO)* should be colocated in order to simultaneously decontaminate both personnel and their clothes. The SOO must be able to wash, disinfect and dry the clothes of personnel undergoing decontamination.[54/] Otherwise, the SOP must issue new clothes to the decontaminated persons. There are also mobile and stationary systems for disinfecting clothes exposed to bacteriological contamination.

Stations for Decontamination of Vehicles (SOT) are organized on the basis of car washes, garages and other facilities for washing vehicles. Mobile washing installations or manual portable washing systems are also used.[55/]

It is claimed that a Decontamination Detachment can decontaminate in a period of 10 hours up to 200 trucks or 40 km of hard surface roads 6 meters wide.[56] The detachment can also be used to fight fires or to pump water out of flooded shelters.

• *SUPPORT FORMATIONS:* There are basically two general types of support formations—those supporting the equipment and those supplying civil defense and the general population. The first deals primarily with the fueling, maintenance, repair and evacuation of damaged vehicles, as well as mechanized and other equipment used by the civil defense forces. The second deals with supplying food, water, clothing, goods of first necessity, decontamination chemicals and so on to civil defense personnel and the population in disaster areas. The following are some of the formations:

Mobile Vehicle Fueling Stations (PAZS): These units consist of a fuel tank truck and trailer and five persons, organized on the basis of fueling stations of enterprises, transportation organizations, oil storage facilities and the like. These units will fuel vehicles and provide lubricants during urban evacuation, the deployment of SNAVR forces, and will also fuel mechanized equipment and vehicles during SNAVR operations.[57]

Mobile Repair and Restoration Groups (PRVG): These mobile groups are organized on the basis of vehicle repair facilities. Their duty is to repair vehicles in the field. A group has a number of mobile repair teams of four-five persons each, and they are equipped with trucks carrying repair equipment and parts and also towing vehicles.[58] These activities can be backed by mobile parts supply bases.

Mobile Vehicle Evacuation Groups (EGr): These groups collect damaged and broken-down vehicles and evacuate those which require more repair work than can be done in the field.[59]

Collection Point for Damaged Vehicles (SPPM): These are collection points primarily in the zone of destruction where an attempt will be

made to carry out partial repairs on the vehicles.[60] Those which cannot be repaired will be towed to exurban repair stations.

Repair Shops (RM) and Technical Service Stations (STO): These are organized on the basis of exurban repair facilities for the repair of damaged and broken down vehicles and other mechanized equipment.[61]

Food and clothing supply is organized on the basis of food and clothing stores, restaurants and warehouses whose personnel form appropriate civil defense mobile units to feed and supply civil defense personnel and also urban evacuees. These formations include:

Mobile Feeding Stations (PPP): These stations are equipped with field kitchens or their equivalent and are intended to provide hot food or cold rations and drinking water to civil defense personnel in exurban assembly areas and during SNAVR operations.[62] The formations have vehicles to transport their equipment, supplies and personnel.

Mobile Food Supply Stations (PPPS): These stations are organized on the basis of food stores and storage organizations. They provide dry or uncooked food to civil defense personnel and also transport food from storage facilities to the Mobile Feeding Stations for preparation.[63] When they are initially evacuated to the exurban areas, the PPS should have on hand a three-day stock of food.

Mobile Clothing Supply Stations (PPVS): Such a unit is usually composed of a chief, a storekeeper and two trucks with trailers. The function of the PPVS is to carry clothes, shoes and linens to First Medical Aid Posts (OPM) for use by casualties whose clothes are contaminated and to the Washing Stations (SOP) or other places where personnel undergo decontamination.[64] In particular, the PPVS should provide the SNAVR work teams with fresh clothes in the rest areas after they leave the disaster areas.

As was noted, the types and sizes of civil defense formations at installations depend largely on their character or function, the number of their employees, the availability of various equipment and so on. Most of

the formations discussed above apply to territorial organizations and economic installations. However, civil defense formations are also organized at administrative-educational institutions.

Governmental-administrative institutions, scientific-research organizations and planning-design bureaus have their own civil defense chief, staff and organization. Depending on their specific character and size, they will have Rescue Detachments, Commands or Groups, Reconnaissance Groups, Communications Groups or Squads, Volunteer First Aid Squads, Firefighting Commands or Sections, Repair-Technical Commands or Squads, Public Order and Safety Commands or Groups, and Shelter Service Squads.[65/]

Educational institutions will organize various formations composed of students led by faculty members. Institutions of higher learning, especially large ones, will have Rescue Detachments or Commands, Reconnaissance Groups, Communications Squads, Volunteer First Aid Squads, Repair-Technical Groups or Squads, Shelter Service Groups or Squads and Public Order and Safety Groups or Squads.[66/] Secondary schools, vocational schools and technical schools usually organize Rescue Commands or Groups, a Volunteer First Aid Squad, Public Order and Safety Groups or Squads, and Shelter Service Squads.[67/]

3.3.3 Military Civil Defense Formations

Military forces, and in particular military civil defense troops, play an important role in SNAVR operations, both independently and in conjunction with civilian civil defense formations. Indeed, it is asserted that the troops form the "backbone" of the forces conducting SNAVR operations.[68/] This is so because the military units are better trained and equipped and more disciplined than their civilian counterparts. It must also be kept in mind that USSR Civil Defense is under military control and that the military districts, councils and services play an active role in civil defense, both in peace and war. Indeed, according to the chief of USSR Civil Defense, Army General A. Altunin, "under modern conditions,

successful activity by Civil Defense is impossible without the active participation, leadership and assistance of the organs of military command in its affairs."[69] He also points out that the implementation of the civil defense mission requires "the joint efforts and close cooperation" of USSR Civil Defense and the Soviet Armed Forces.[70]

Like the civilian formations, the military civil defense troops and other military forces perform a variety of tasks in connection with SNAVR. One of these tasks, for which the military is better equipped than the civilian units, is the conduct of immediate post-strike reconnaissance of the disaster area. This is accomplished by aircraft, helicopters, ground reconnaissance in tanks and other armored vehicles, and naval units in ports.[71] Presumably the results of these reconnaissance activities are reported to the oblast and city civil defense staffs.

The civil defense troops also include heavy engineering or "mechanization" battalions, companies and platoons.[72] These units participate in clearing routes to the disaster area and work sites, digging out buried shelters and performing other engineering work. Helicopters may be used to lift compressors, pumps, or rescue personnel into priority work sites. There are also firefighting units which participate in fighting fires along access routes and at the sites of rescue operations; limiting damage to enterprises and oil, gas and chemical installations; and so on.[73] There will also be decontamination units.[74] Medical assistance will be provided by the medics of the civil defense troop units and other military units and also by military medical units under the control of the military districts.[75] The military units will also provide communications if that of the civilian forces is disrupted or ineffective, and they may set up emergency water purification systems and assist key enterprises in the repair of their power, water, gas and other essential systems. They may provide additional military police to reinforce the Public Order and Safety Units, engineering, railroad, bridge and road construction units, and so on.

Although the civil defense troops can be used in a variety of ways, Soviet literature appears to suggest that they will operate primarily at key industrial and other important installations. Joint exercises with civilian civil defense formations are frequently held at such enterprises and installations.[76]

Section 3

FOOTNOTES

1. For example, see P. T. Egorov, I. A. Shlyakhov and N. I. Alabin, Grazhdanskaya Oborona (Civil Defense), 3rd edition (Moscow: Vysshaya shkola, 1977), p. 12; A. K. Vakhtin, N. A. Shitov and Yu. M. Volkov, Tekhnika Bezopastnosti pri Vypolnenii Neotlozhnykh Avariyno-Vosstanovitel'nykh Rabot v Ochage Porazheniya (Safety Measures While Carrying Out Emergency Repair and Restoration Work in Centers of Destruction), (Moscow: Atomizdat, 1979), p. 3; P. G. Yakubovskiy, editor, Grazhdanskaya Oborona, 5th edition, (Moscow: Prosveshcheniye, 1972), pp. 151-152; Yu. Yu. Kammerer and A. E. Kharkevich, Avariynye Raboty na Kommunal'nykh Setyakh v Ochage Yadernogo Porazheniya (Repair Work on Municipal Utility Lines in Centers of Nuclear Destruction), (Moscow: Stroyizdat, 1972), pp. 18-19; Colonel V. Komarnitskiy, "Localizing Damage," Voyennyye Znaniya (Military Knowledge), No. 9, September 1981, p. 23.

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3. For example, see V. G. Strekozov, Oboronnaya Rabota Mestnykh Sovetov (Defense Work of Local Soviets), (Moscow: Yuridicheskaya literatura, 1981), pp. 50-58.

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9. Krechetnikov and Olovyanishnikov, op. cit., p. 92.

10. Krechetnikov and Olovyanishnikov, op. cit., pp. 54-55; Egorov, et al., op. cit., pp. 178-184; Krutskikh, op. cit., p. 96.

11. Krechetnikov and Olovyanishnikov, op. cit., p. 54.

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Section 4

INITIATION OF POST-ATTACK OPERATIONS

The ability of Soviet civil defense to initiate and conduct SNAVR operations following enemy nuclear strikes depends on a number of factors. Among these factors are the pre-attack deployment and readiness of the civil defense forces, assessments of the situation by effective post-strike reconnaissance, the timing and character of the organization of movements of civil defense forces to the disaster areas and the safety rules under which this is done, and the priorities assigned to the forces which will engage in SNAVR operations.

4.1 DEPLOYMENT OF CIVIL DEFENSE FORCES

In general, Soviet civil defense plans assume that it will be possible to evacuate the urban civil defense formations to exurban areas prior to an enemy attack. In the case of some services (for example, medical service or mechanized units), most or all of their personnel and equipment will be evacuated to pre-designated locations in the exurban areas. In the case of industrial enterprises, utilities and services which will remain in operation in wartime, the civil defense formations will be duplicated in the workshifts so that one element will be at the installations with the working workshift and the other in the assigned exurban hosting areas with the resting workshift.[1/]

High readiness Composite Rescue Detachments may be the first to be evacuated to designated exurban staging areas.[2/] As was noted, this can be done without serious disruption of production because the personnel of such units is recruited in a manner to minimize such disruption. A portion of the heavy mechanized equipment of the formations will also be moved on a priority basis.[3/] It will travel together with the formations to nearby hosting areas or it will be left in protected storage sites such as ravines, mine-shafts, special shelters and so on in what are believed to be relatively safe areas as close as possible to the cities or the

installations.[4] The rest of the heavy mechanized equipment will be evacuated after the completion of construction of rapidly erectable shelters and other protective structures in the cities and at the installations.[5] The operators will either proceed to assigned hosting areas or remain with the equipment if they are provided with adequate shelters, communications equipment and supplies.[6]

Following evacuation from the cities, the deployment of civil defense formations varies depending on whether they belong to a service which transfers most or all of its activities to the exurban areas or whether they are part of a workshift of an essential enterprise, utility or service. In the former case, the formations may be concentrated at the exurban facilities where they will carry out most of their duties; for example, medical units will be concentrated at exurban hospitals. In the second case, the formations will be deployed in accordance with the resettlement of the evacuated workshifts in the hosting areas. For this reason, the civil defense plans designate specific staging or assembly areas for the formations, especially those of the second type, to which they will proceed from the hosting areas following a nuclear strike on the cities or industrial and other economic installations.[7] Similarly, the military civil defense units will be assigned assembly or jump-off areas to which they will proceed from their dispersal locations prior to the initiation of SNAVR operations.[8]

Normally these staging or assembly areas for civil defense formations will be located near the hosting areas and the pre-selected roads which will be used by the formations to travel to the disaster areas. The high readiness Composite Rescue Detachments, Mechanization Commands or Groups and Engineering Commands will build shelters in the staging areas for personnel and equipment and also access roads to these areas to facilitate the movement and deployment of the formations.[9]

In order to facilitate control over the movement of the formations, lines or points of departure will be designated for them. Usually

these will be points along the routes to the disaster areas from which the formations will initiate their movement to those areas after they have formed in the appropriate marching order.[10/] Traffic control posts will be set up at the departure points.[11/]

It is the responsibility of the civil defense staffs and formation commanders to ensure that the formations have all the prescribed equipment and supplies. If these were not issued in full prior to the evacuation of the formations, the necessary equipment and supplies will be issued to the formations from stocks kept in the exurban zone. Following the evacuation, the service and formation commanders will bring the formations to a state of readiness as quickly as possible and deploy the necessary communications net.

4.2 RECONNAISSANCE

Soviet publications insist that "reconnaissance is a most importnat form of assuring the actions of civil defense forces."[12/] Reconnaissance provides assessments of the post-strike situation as well as warnings of dangers on the basis of which the civil defense chiefs, their staffs and the commanders of services and formations plan their course of action. Consequently, the objective of reconnaissance is to provide "in the shortest time reliable and complete information on the situation resulting from the enemy's use of weapons of mass destruction."[13/] Reconnaissance must be conducted continuously and actively, it must be timely both in the information it collects and the transmission of this information to higher staffs and commanders, and it must be reliable.[14/] Consequently, it must be conducted around the clock and regardless of weather conditions.

Reconnaissance is organized at republic, oblast, oblast sector, city, urban rayon, rural rayon, installation and formation levels by the respective civil defense chiefs and their staffs and service as well as formation commanders. Use will be made of both military and civilian reconnaissance units and of a variety of technical means of reconnaissance.[15/]

The mission of reconnaissance is to ascertain: the GZ of nuclear detonations or other weapons of mass destruction, the yield of the nuclear weapons, the character and levels of contamination and the direction of movement of the radioactive fallout, the extent of destruction and damage, the extent and character of fires, the conditions of the routes to the areas of destruction and the obstacles on it and identify alternative routes, conditions at the sites where SNAVR operations will be conducted, the state of surviving shelters and the people in them, the extent of damage to utility lines, possible sites of secondary explosions, chemical-bacteriological contamination, the number of casualties requiring treatment and evacuation, requirements for urgent repair of damage, and so on.[16/]

Reconnaissance can be general or special.[17/] General reconnaissance is conducted to assess the general character and scope of the damage and its outer limits, conditions in the area of destruction, levels of radiation, conditions along the routes of travel of the SNAVR formations and at the sites where they will conduct operations. Special reconnaissance is organized by the civil defense services such as firefighting, engineering and technical repair, medical, anti-radiation and anti-chemical and so on to develop more precise and detailed information for the purpose of planning specific actions by specialized formations.

Reconnaissance can be conducted by aerial means, on waterways and along coastal areas by boat, or on the ground by various means of transportation and on foot.

- AERIAL RECONNAISSANCE: This reconnaissance is organized by the republic or oblast civil defense chiefs in cooperation with the military. For this purpose, use is made of specially-equipped reconnaissance aircraft and helicopters, which conduct visual and, if necessary, photographic reconnaissance, and also measure radiation levels in the zones of destruction and track the movement of radioactive clouds.[18/] Television cameras may also be used to transmit pictures of the disaster areas to the higher civil defense command posts.[19/] This reconnaissance will provide the higher

civil defense chiefs and staffs with a general picture of conditions in the zone of destruction, the location of the GZ of the detonation, the potential threat of flooding and will make it possible to warn the population in the path of the movement of the fallout clouds, as well as determine their outer limits.

Presumably, both military and civilian aircraft and helicopters may be used for this purpose, flying from dispersal fields. There are indications that at the republic, oblast and possibly oblast sector levels the civil defense command post will have dedicated military light aircraft and helicopters at their disposal.

• WATERWAY AND COASTAL RECONNAISSANCE: This reconnaissance is conducted by civil defense reconnaissance groups and military reconnaissance units on fast motor boats and other small vessels.[20/] The reconnaissance personnel will be equipped with radiation measuring devices, chemical detection kits and communications equipment. Their mission will be to ascertain conditions, levels of radioactive and chemical contamination, the extent of damage along the banks of waterways and in ports, the state of bridges, ferries and other crossings and canal locks, and to determine the possibility of using water routes for the transportation of civil defense formations into the zone of destruction.[21/]

• GROUND RECONNAISSANCE: Ground reconnaissance can be general or specialized. It is conducted by the reconnaissance units of the city, urban and rural rayons and installations staffs, by the reconnaissance squads of the formations and also by the reconnaissance personnel of military units. Ground reconnaissance will be conducted in vehicles or on foot. The vehicles will include tanks and armored personnel carriers operated by military personnel, as well as scout cars, trucks, tractors and so on.[22/] Beyond the points where vehicle routes are obstructed, reconnaissance is conducted on foot.

In addition to greater speed and area coverage, vehicles provide reconnaissance personnel with greater protection against radiation

and consequently allow them to penetrate deeper into the contaminated disaster zone. Furthermore, the tracked vehicles facilitate the crossing of rubble and cross-country movement. Thus, while reconnaissance personnel on foot will not cross areas with a radiation level of 30r/hr, those in motor vehicles may advance up to a line of 100r/hr and those in armored vehicles into zones with radiation levels up to 200r/hr.[23/] Areas with higher radiation levels can only be surveyed by helicopter or aircraft.

The reconnaissance squads or teams (usually three to five persons in each team) are equipped with protective suits, gas masks, dosimeters, chemical detection kits, maps, compasses, medical first aid kits, and radios. The objectives of general reconnaissance will be to: 1) ascertain conditions along the routes to the disaster zone and the feasibility of their use by the SNAVR formations; 2) if necessary, identify alternate routes and by-passes; 3) determine the character and levels of contamination along the routes and at the target installations and mark them with special warning signs beginning with radiation levels of 0.5r/hr; 4) locate surviving shelters and determine the condition of their occupants and conditions in the area where SNAVR operations will be conducted; and 5) assess damage and locate safe places in surviving structures where rescued casualties can be brought. In addition, reconnaissance personnel will assist in the continuous monitoring of contamination levels in the course of SNAVR operations. Specialized reconnaissance provided by the reconnaissance groups or teams of the various services will refine information of special concern to the various services and their formations (medical, engineering, firefighting, bacteriological defense, etc.). These reconnaissance teams may either conduct their activity simultaneously with the units conducting general reconnaissance or follow them into the zone of destruction. The reconnaissance teams will report their observations at frequent intervals by radio to the civil defense staffs to which they are subordinated. It is believed that one reconnaissance team on foot can reconnoiter a strip 0.5 to 1 km wide and at installations, three structures.[24/]

• OBSERVATION POSTS: Observation posts are established at enterprises and, in some cases, at the edge of cities. An observation post is usually manned by two or three persons and is located in a protected structure.[25/] The observers are equipped with protective suits, gas masks, dosimeters, chemical detection kits, azimuth boards with pointers, binoculars, watches, compasses, medical first aid kits, individual decontamination packets, and communications equipment such as radios or telephones. They normally will report their observations to the civil defense command posts at the installations, which in turn will transmit them to the installations' civil defense staffs at their exurban command posts. The mission of the observation posts is to report the direction of, distance to and probable yields of nuclear detonations; conduct periodic measurements of levels of radioactive and chemical contamination; and keep the command posts informed about observed damage to or around installations. The posts may be equipped with remote radiation measuring meters or, in the case of high outside radiation levels, readings will be taken inside the post and then adjusted according to the shelter's radiation protection factor (PF).

4.2.1 The Conduct of Reconnaissance

It is planned to initiate aerial reconnaissance as soon as possible following a nuclear strike. Simultaneously, the military reconnaissance units may initiate a general ground reconnaissance in armored vehicles and begin reconnaissance along waterways. Upon receipt of information from this reconnaissance on general conditions in the zone of destruction, higher civil defense staffs will pass the information along to subordinate chiefs (city and urban as well as rural rayons), who, in turn, will inform the installation chiefs under their control, as well as instruct them to initiate their own reconnaissance activities.[26/] On the basis of the general situation report, the installation staffs will assign specific missions to the commanders of their reconnaissance groups in order to obtain more detailed information on conditions along the routes to the zones of destruction and at the installations (if they can be reached).

If communications between the installation command posts and higher staffs are disrupted, the installation chiefs will order the initiation of reconnaissance on their own initiative in accordance with existing plans.[27] They will also attempt to obtain additional information on the situation from the command posts at the installations and their observations posts as well as from the staffs of neighboring commands.

If it is not possible for the installation staffs to rapidly obtain reconnaissance information on conditions at their respective installations, it is suggested that they can estimate the probable damage to them on the basis of peacetime assessments of their hardnesses and vulnerabilities if they are told by higher staffs the probable yields, mode of detonation and locations of the GZ of the nuclear strikes.[28]

The installation staffs will initiate reconnaissance operations as soon as possible after receiving an "All Clear" signal from higher staffs, even though the possibility of enemy follow-on strikes is recognized. Because of the urgency ascribed to the earliest initiation of SNAVR, it does not appear that the start of reconnaissance will wait for the cessation of radioactive fallout. Presumably, on-going aerial surveillance of the movement of fallout clouds will provide some advanced warning of the arrival of fallout from strikes in other areas. The timing of the advance of the first echelons of the SNAVR forces will depend on the situation assessment provided by higher staffs and the reports of the installations' reconnaissance units. Consequently, the staffs may wait until the completion of the reconnaissance or, if initial reports appear relatively favorable, the first echelons may follow fairly closely behind the reconnaissance units.

Soviet manuals note that reconnaissance at various types of economic installations has its own peculiarities and requirements.[29] Thus, at mining installations, reconnaissance must ascertain the state of the underground tunnels and shafts which may be used as shelters and the conditions of the ventilation systems. At oil and gas installations,

particular attention must be paid to the fire situation, the possibility of explosions, the presence of toxic gases in the air, and ascertain the threat these may pose to surviving shelter occupants. At electric power plants, it is necessary to rapidly assess the damage and shut down the equipment and damaged power lines. At chemical enterprises, reconnaissance must ascertain the danger of secondary fires, explosions, the presence of toxic gases and spills of toxic chemicals. At food processing enterprises, there will be the danger of secondary fires, explosions and chemical spills. At transportation installations, reconnaissance must determine the threat of secondary fires, explosions of fuel storages and the possibility of moving surviving transportation means out of the danger zone. Reconnaissance personnel surveying installations which may be a source of toxic gases and spills of toxic chemicals will require closed-system-type respirators as well as protective suits. To facilitate locating shelters in the debris, the reconnaissance teams are issued maps on which are indicated the compass bearings and distances of the shelters from reference points which are unlikely to be destroyed or buried under debris.[30/]

Following the completion of the reconnaissance, the personnel will be directed to proceed to assembly points in uncontaminated locations where personnel, clothing and vehicle decontamination stations (*SOP, SOT* and *SOO*) are deployed.[31/] There the personnel, their clothes, vehicles and equipment will undergo decontamination. The personnel will be provided with food and allowed to rest. If the personnel has not received the maximum permissible radiation dose, they will be used in subsequent operations.

4.3 THE DECISION PROCESS FOR INITIATION OF SNAVR OPERATIONS

The civil defense chiefs' decision to initiate SNAVR operations with the forces at their disposal depends primarily on the information obtained by reconnaissance. It is the responsibility of the staffs to assemble and evaluate the information on the situation and conditions obtained from higher staffs, their own general and specialized reconnaissance units, assessments by the service chiefs and staffs, and information

provided by neighboring organizations. The staffs will also collect information on the meteorological conditions and forecasts.[32/]

The civil defense chiefs will base their decisions on the information, assessments and recommendations of their staffs and services. On this basis, they must determine the feasibility of their forces reaching the zone of destruction and of conducting SNAVR operations at assigned locations, the probable scope and character of these operations in light of the levels of damage and secondary effects of the strikes, the probable number of casualties at the locations and so on. In turn, this allows them to decide whether they have sufficient forces and equipment to carry out this mission or must request reinforcements from higher staffs.

On the basis of available information, the civil defense chiefs will order the initiation of SNAVR operations. They will determine the order of march of the formations, the deployment of the second echelons and reserves, assign the formations specific tasks, set the limits on permissible exposure of personnel to radiation, designate assembly points for the formations after they complete their missions, establish the forms of cooperation between formations and neighboring units, and so on.[33/] The chiefs and their staffs will coordinate the actions of the formations; ensure their safety, timely relief and resupply; keep them informed about the situation, the location of medical aid stations, medical evacuation points, mobile maintenance groups and so on.

4.4 PRIORITIES

According to Soviet civil defense manuals, the first priority of SNAVR is to rescue casualties and occupants of damaged shelters or shelters buried under debris.[34/] If the urban evacuation has been completed, the personnel to be rescued will be primarily essential workers at installations which will remain in operation in wartime. If the evacuation has not been completed, the installations' units will conduct SNAVR operations at their respective installations while the rayon and city or oblast territorial units may conduct such in the rest of the zone

of destruction or reinforce installation formations at especially important installations.[35/]

There is little doubt that special priority is assigned to SNAVR operations at essential installations. Thus, according to Soviet manuals, "In the course of SNAVR, the main effort must be focused on installations which will continue production activities in the cities in wartime."[36/] Such installations will be primarily industries engaged in defense-related production, the utilities needed to keep them in operation, important storage facilities, as well as the transportation and communications systems.[37/] One Soviet civil defense manual puts it as follows:

> In view of the enormous amount of work which will have to be carried out in the zone of destruction, it is very important to select the most important and urgent ones and to direct all efforts to them. Particular attention should be paid to industrial and transportation installations where the largest number of people may be concentrated.[38/]

This approach is also reflected in the fact that a large part of the SNAVR forces is made up of the resting workshifts from those essential installations, and that the rayon and city chiefs are likely to send the territorial and military forces to assist SNAVR operations at the most important or valuable installations. Obviously, damage-limitation to non-essential installations and residential areas will receive secondary attention, if any.

In practice, however, the determination of where and whether to initiate SNAVR operations will depend on the extent of damage suffered by the installations and on radiation levels. In principle, rescue operations should be attempted wherever practical, although repair activities will not be attempted in zones of total or severe damage. From the viewpoint of rescue activities, it is assumed that near the GZs of nuclear detonations all surface structures as well as most or all shelters will be destroyed.[39/] Outward from that area, however, people in shelters are expected to survive. Those in ordinary basements are all likely to be

killed in the zones of total destruction and to suffer some 50 percent fatalities in the zones of severe damage.[40]

In order to assess the prospects for and magnitude of SNAVR operations, the zone of destruction is divided into four categories:[41]

1) zone of total destruction, which suffered blast overpressures in excess of 7.2 psi;

2) zone of severe damage, which received overpressures of 4.2 to 7.2 psi;

3) zone of moderate damage, which received overpressures of 3.6 to 4.2 psi; and

4) zone of light damage, which received overpressures of 1.4 to 3.6 psi.

For purposes of estimating the problems confronting engineering work in connection with SNAVR, the disaster area is divided into three zones:[42]

1) The first includes areas exposed to 14.2 psi and greater blast overpressures. It is characterized by massive mounds of rubble which will block the streets; varying degrees of damage to underground utility lines and shelters; the blockage of shelter entrances, emergency exits and ventilation air intakes by debris; fires in the rubble with generation of large amounts of carbon monoxide and other toxic gases.

2) The second consists of the zone exposed to blast overpressures in the range of 4.2 to 14.2 psi, which is characterized by total and severe damage to surface structures, little or no damage to underground utility lines and shelters, complete blockage of side streets and partial blockage of main streets by rubble, partial or complete blockage of shelter doors, emergency exits and air intakes in the upper range of the blast overpressures,[43] numerous and spreading fires in the rubble and in partially standing structures.

3) The third includes the areas exposed to 1.4 to 4.2 psi blast overpressure and is characterized by light to moderate damage to surface structures, no damage to underground utility lines and shelters, partial blockage of side streets by rubble in densely

built-up areas, and large numbers of fires which may join to become mass fires.

The above characterizations of damage zones reflect both the degree of urgency in the conduct of rescue of survivors and the difficulties confronting such operations. This is so because two factors severely limit the length of time people can remain in shelters not equipped with air regeneration systems, which appears to be the case for the great majority of Soviet urban shelters. One of these factors is the blockage of the external ventilation air intakes by rubble which, according to Soviet manuals, is likely to occur in the case of basement shelters at blast overpressures of 11-14 psi.[44/] Shelter doors are expected to be blocked by rubble at overpressures of 4.2 psi in the case of basement shelters in residential buildings, at 7.1 psi in the case of basement shelters in industrial buildings, and at 11-14 psi in the case of detached shelters.[45/]

In the event of blockage of ventilation air intakes, the length of time people can survive in the shelters not equipped with air regenerators will depend on the volume of air per person in the shelters. It appears that on the average this volume will suffice from some four to six, and at most ten, hours. Thus, according to Soviet civil defense manuals, it is critical to provide air to the occupants of such shelters in three to five hours after the nuclear detonation.[46/] Occupants of shelters with air regeneration systems may be able to survive longer, but it appears likely that the oxidizers or bottled compressed oxygen used for this purpose will only suffice for some ten to twelve hours and, at most, 24 hours.

The second factor is the necessity of shutting down shelter ventilation systems during fires to avoid drawing dangerous amounts of carbon monoxide into the shelters, as well as hot air in the case of shelters not equipped with heat filters.[47/] The duration of fires, however, varies from a few hours to in excess of 24 hours in the case of fires in the rubble[48/] and, consequently, may burn longer than there will be breathable air in the shelters.

Thus, while there is special urgency to effect the rescue of shelter occupants in the zones of total and severe damage, the rescue forces will be confronted with the greatest obstacles and difficulties in reaching those zones in a few hours following a nuclear detonation. It is noted, therefore, that near the GZ in the zone of total destruction where buildings and shelters are destroyed and the radiation levels are high, the initial introduction of civil defense formations into them "as a rule should be delayed."[49/]

4.5 THE SIGNIFICANCE OF RADIATION LEVELS FOR THE INITIATION OF SNAVR OPERATIONS

The decision to initiate SNAVR operations and the extent of such operations in the zone of destruction will depend on the radiation environment. According to Soviet standards, the acceptable limits of exposure of SNAVR personnel to radiation are a cumulative dose of 50r over a period of two to four days and 100r over a period of ten days.[50/] Thus, in principle, the civil defense chiefs can either expose each team to a single maximum dose of up to 25r if they wish to use it again in the contaminated areas in the next few days or to a maximum dose of 50r if the team will not be used again for a number of days. They can also order the teams to risk a single exposure of up to 100r, which may cause some of the personnel to become ill. Account will be taken of the radiation doses received by SNAVR personnel not only at the assigned work sites but also along their travel to them and subsequent return from them to safe areas.[51/]

According to Soviet manuals, therefore, the timing of the initiation of SNAVR operations at the assigned work sites will depend on the level of radiation there and the maximum exposure allowed for the personnel. Thus, if the teams are limited to a maximum dose of 25r the first day of work and to a cumulative total dose of 50r over a four-day period, they could start working as follows:[52/]

- In areas with an initial radiation level of 8r/hr one hour after detonation—in one hour after the detonation and they could remain for eight hours.

- In areas with an initial radiation level of 26r/hr one hour after detonation—in two hours after the detonation and they could remain eight hours.

- In areas with an initial radiation level of 80r/hr one hour after detonation—in four hours after the detonation and they could remain two hours.

- In areas with an initial radiation level of 140r/hr one hour after detonation—in six hours after the detonation and the initial team could remain two hours.

- In areas with an initial radiation level of 240r/hr one hour after detonation—in 12 hours after the detonation and they could remain two hours.

- In areas with an initial radiation level of 500r/hr one hour after detonation—in 22 hours after the detonation and remain two hours.

- In areas with an initial radiation level of 1,000r/hr one hour after detonation—in 37 hours after the detonation and remain two hours.

- In areas with an initial radiation level of 3,000r/hr one hour after detonation—in four days after the detonation and remain two hours.

- For initial radiation levels of 6,000 to 10,000r/hr one hour after detonation, the teams could initiate rescue work only in seven to twelve days after the detonation.

Of course, work could begin earlier if the decision is made to expose the first shift to a dose of 50r or even 100r the first day.[53/] Furthermore, operators of mechanized equipment may be shielded to some degree and consequently could begin work somewhat earlier than other personnel or remain longer in the contaminated area.[54/]

The limits on exposure of the workshifts will also dictate the number of such shifts required for continuous SNAVR operations depending

on the radiation levels present. For example, in areas with radiation levels of 8-26r/hr one hour after detonation, three shifts could work without exceeding a maximum cumulative dose of 50r over four days. In the case of radiation levels of 80r/hr one hour after detonation, four shifts will be required; for levels of 140r/hr one hour after detonation, six shifts; for 240r/hr one hour after detonation, eight shifts; for 500r/hr one hour after detonation, nine shifts; and for higher initial radiation levels, ten shifts.[55/]

It appears from the above that timely rescue of occupants of shelters with blocked ventilation air intakes or with significant structural damage in the zones of total and severe damage, especially in the presence of high radiation levels, will be very difficult if not impossible. Significantly, a Soviet article on post-strike medical assistance notes that in a nuclear strike situation, "the time from the moment of injury until the arrival of medical workers...in some instances will probably reach several days."[56/] Other publications mention the importance of giving aid to the "main mass of casualties" during the first 12 to 14 hours after a nuclear detonation.[57/] Even if radiation levels are relatively low, penetration of the zones of total and severe damage by the formations will be slow because of the rubble and fires. For example, it is said that it may require in excess of two hours for bulldozers to lay one kilometer of route over the rubble while building accesses to the sites of shelters buried under debris.[58/] Additional time will be needed to locate the shelters and provide them with air. Consequently, the time required for such rescue activities may exceed the time the occupants can survive in the shelters with inoperative ventilation systems.

In practice, therefore, the initial SNAVR operations will focus their efforts in the zones of moderate and light damage, radiation levels permitting. Another reason for this is that these will be the zones where limitation of secondary damage could significantly contribute to the early repair and restoration of essential installations.[59/]

4.6 ORGANIZATION OF THE MOVEMENT OF SNAVR FORMATIONS TO THE DISASTER ZONE

The recommended practice is to divide the formations into two echelons and a reserve. The number of workshifts in each echelon will depend on the size of the available forces, their equipment, and the amount of work which will need to be performed. The first echelon will be the first to be dispatched to the zone of destruction and will undertake the most urgent rescue and emergency repair work. The second echelon will either replace the first one when the latter's personnel are withdrawn or will expand its work. The reserve will be used either to reinforce the first or second echelons or will be used to deal with unexpected tasks which may arise in the course of the SNAVR operations or because of additional enemy strikes.[60/]

It is considered desirable to organize the move to the disaster zone and the deployment of forces there by shifts. Thus, the initial forces which will move into the zone will be made up of the first shift of the various formations assigned to the first echelon. In order to facilitate control, formations departing from the same staging areas should travel together in a convoy. The heavy mechanized equipment stored near the cities or installations will join the rescue forces at the approaches to the zone of destruction.[61/] According to Soviet civil defense publications, the installation civil defense chiefs should personally lead the first shift, leaving their deputies and chiefs of staff in charge of the remaining forces.[62/]

The organization of the movement and the order in which the formations will travel to their assigned destinations will depend on a number of factors, such as the number of routes assigned to each chief for use by his forces, how these forces are equipped and, in particular, on the state of the routes and conditions along them as reported by reconnaissance. In most cases it is likely that the reconnaissance units will be followed by reinforced *Movement Support Detachments (OOD)* for the purpose of clearing the routes through the rubble,

building by-passes and ensuring safety along them.[63] The detachment would have bulldozers, scrapers and some mobile cranes, as well as fire-fighting, decontamination and other support units such as Volunteer First Aid teams, Public Order and Safety personnel to establish control posts, and so on.[64] The Movement Support Detachment may also be made up of military engineering and firefighting subunits.[65] One or more such detachments should operate on all the designated routes and act as the lead elements for the rest of the SNAVR forces, which will be made up first of all of Rescue and Composite Rescue Detachments.

The convoy commanders will exercise continuous control over the movement by means of signals with flags and radios. They will also remain in radio contact with the reconnaissance and OOD units ahead of them and the staffs at the exurban command posts. It is recommended that the vehicles in the convoy travel some 25 to 50 meters apart. When crossing areas with dangerous levels of radiation, the vehicles should speed up and close up.[66]

The most urgent task during this phase of SNAVR operations is to clear routes so that the formations can reach their assigned work sites as soon as possible. This may require the removal of debris, emergency repair of roads and bridges, firefighting where fires threaten the routes or the construction of fire breaks along them, the construction of detours around obstacles, clearing of deep snow along routes and possible decontamination of sections of the routes.[67] It may also require the shoring up or pulling down of damaged structures along the routes which threaten to collapse on them.[68] Depending on the height and volume of rubble blocking the routes, passages will be cleared through the rubble or a route will be leveled over it. The rubble will be cleared if its height does not exceed 0.5-0.8 meters and it does not block the routes for significant distances, otherwise routes will be laid over the rubble. Such passages may be 3-4 meters wide for one-way traffic with lay-bys every 150-250 meters for traffic moving in the other direction, or 6-8 meters wide for two-way traffic.[69] Traffic control along the routes

will be by posts of the Public Order and Safety Detachments. Because of the potential limits on the staytime of occupants in shelters, it is noted that "the main volume of work on the construction of passages (through the rubble) must be completed in 4-6 hours after the nuclear detonation."[70/]

One factor which may facilitate the rapid penetration of SNAVR forces into the zone of destruction is the Soviet practice of building wide radial avenues and strips of greenery and parks in the large cities. The width of these avenues may be twice the average height of buildings along them plus 15 or more meters, which, among other things, is intended to ensure that they will not be completely blocked by rubble.[71/] It is also expected that these same wide avenues and park strips will act as fire breaks.

Most of the mechanized equipment will be moved into the disaster zone with the first workshift and will remain there for the use of subsequent shifts until the work is completed.[72/]

Monitoring of the radiation and chemical situations along the routes will be continuous. The convoy and unit commanders will ensure that the exposure of the personnel will not exceed permissible doses. The monitoring levels of radioactive and chemical contamination will be carried out by reconnaissance personnel, the personnel of the mobile decontamination commands and the radiological and chemical monitors with the convoy and formation commanders. If, while in route, the formations encounter areas with dangerous levels of radiation which they cannot relatively easily bypass, the convoy commander will lead the convoy to the nearest safe settlement and contact higher staffs for instructions.[73/] If the staffs know of the existence of safer routes, the convoys may be diverted to them, after coordinating their movements with the organization to which these routes are initially assigned.

Section 4

FOOTNOTES

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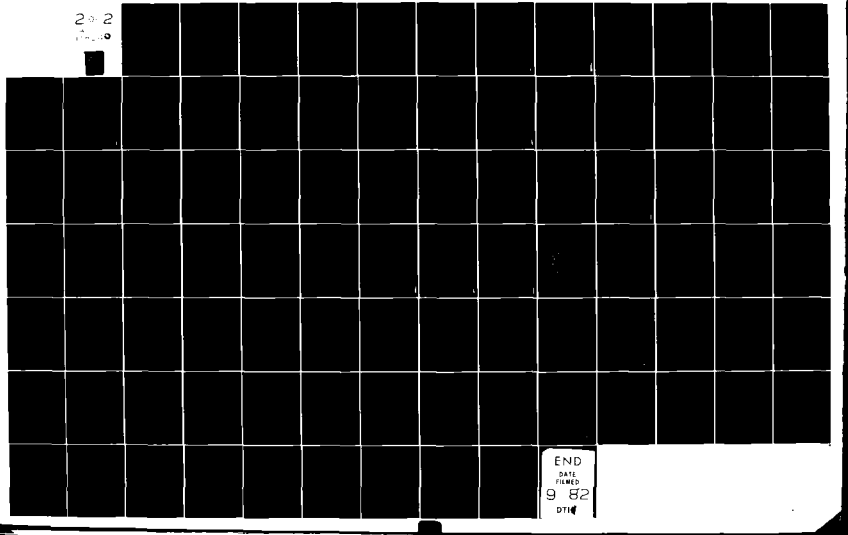

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Section 5

POST-STRIKE RESCUE OPERATIONS

Soviet civil defense publications insist that the primary mission of post-strike SNAVR operations is to rescue and give assistance to the survivors in the zones of nuclear destruction and chemical and bacteriological contamination. For example, it is said that:

> The main objective of SNAVR is the rescue of the population following enemy nuclear strikes and giving necessary aid to the casualties. Without the successful execution of such work, it is impossible to restore the activities of installations and branches of the national economy which have been subjected to enemy strikes...[1/]

Reduction of losses among the population, especially of essential workers, is considered very important because large losses "may have a strong paralyzing effect not only in individual areas, but on the whole economic life of the country."[2/]

Soviet civil defense manuals recognize that rescue operations in a nuclear disaster zone will be difficult, complex and require large numbers of personnel and equipment. In particular, such operations will include not only finding and rescuing survivors, giving them medical assistance and evacuating them to safe areas, but also firefighting, engineering, repair, decontamination and other support activities to facilitate rescue operations, prevent additional casualties and ensure the safety of the rescue personnel.[3/] Consequently, the conduct of SNAVR will require joint, coordinated actions by various types of civil defense formations.

5.1 COMMAND AND CONTROL AT SITES OF SNAVR OPERATIONS

From the standpoint of rescue operations and control over them, the simplest situation envisaged in Soviet manuals is the one in which the entire urban population is evacuated and only one workshift is at

essential installations in the target areas at the time of enemy strikes. In this case, the number of personnel requiring rescue and the sites where such operations would need to be conducted would be limited and known to the civil defense chiefs while the size of civil defense forces available for conducting such operations would be optimal.

In principle, installation formations will conduct rescue operations at their own installations.[4/] When this is the case, command and control at the sites of operations will be exercised by the civil defense chiefs of the installations or their deputies. They will establish work priorities and schedules, assign tasks to formation commanders, coordinate their actions, set norms for maximum permissible exposure of personnel to radiation, keep the formation commanders informed about the general situation and the location of *Medical Aid Stations (OPM)* and fueling stations, ensure that the formations are fed and provided with drinking water and so on.[5/] In part, this will be done on the basis of information on the situation provided by the rayon and city staffs. The installation chiefs will also exercise direct control over the specialized formations at the sites or through their staffs and service chiefs.[6/]

When possible, the chiefs will establish command posts in the area of operations.[7/] These command posts will be equipped with means of communications which will keep the chiefs in contact (by radio, telephone or messengers) with their staffs at the exurban command posts, the formation commanders at the work sites, the chiefs of services and, directly or indirectly, with senior chiefs and neighboring forces.[8/] If the work area is large, it will be divided into sectors, each under the control of a senior commander, most likely the commander of the Rescue Detachment or Composite Rescue Detachment. In their turn, the rescue formations at their assigned work sites will make requests to the chiefs or senior commanders for additional specialized forces to assist them in their rescue work, such as requests for firefighters; engineers with mechanized equipment, power drills and air compressors; Volunteer First Aid Detachments, etc.

The coordination of work by the general purpose formations with other types of formations is carried out at the work sites. Having received their assignments from the installation chiefs, the commanders of the general purpose formations coordinate their operations with:[9/]

- Reconnaissance units to obtain precise information on the conditions of people trapped in the rubble and in shelters and on locations of damage to utility lines. They then assign these units to continuous monitoring of the radiological and chemical situation;

- Engineering formations to establish priorities in the cleaning of debris at the site of rescue operations, the opening of accesses to surviving shelters, and the preparation of shelters for use by formation personnel in the event of a second enemy strike;

- Medical formations to organize first aid to casualties, their evacuation to the *First Medical Aid Stations (OPM)* or to exurban hospitals, and medical assistance to formation personnel;

- Firefighting formations to localize and contain fires at the work sites, protect valuable materials and equipment, rescue people in burning buildings, and supply water to the formations and decontamination stations;

- Technical-Repair formations to temporarily repair communication, water and power lines to assist the rescue operations, prevent flooding of work sites and surviving shelters, shut off damaged power lines and conduct rescue work at power installations;

- Anti-radiation and anti-chemical defense formations to monitor the radiological, chemical and bacteriological situations; give warning of dangerous changes in those situations; and decontaminate work sites, equipment and personnel; and

- Food, clothing and material technical supply formations to ensure the timely supply of formations at the work sites and after they are withdrawn to rest areas.

If installation civil defense forces are ordered by higher staffs to work at installations other than their own, these forces will be placed

under the command and control of the chiefs and staffs of the latter installations. This is done on the ground that these chiefs and their staffs and service commanders are most familiar with their own installations and, therefore, best able to make effective use of reinforcements. The same would be true for rural formations which may be dispatched to assist in rescue operations at installations and may also be the case when military subunits operate in support of installation forces.

In the case of territorial formations, when not working at installations, they will remain under the control of the rayon, city or oblast chiefs to whom they are subordinated. These chiefs and their staffs will coordinate the operations of these formations as well as those of the installations under their control, generally supervise the distribution and assignment of forces, and designate the locations where the main efforts should be concentrated.

The most difficult situation for rescue operations will be one in which the urban population has not been evacuated and the enemy delivers a surprise attack. In this event, there will be large numbers of casualties and persons trapped in damaged structures and ordinary basements, and most or all of the urban civil defense forces and their chiefs and staffs may be either destroyed or pinned down. The same will be true for the mechanized equipment which the urban civil defense forces would use during SNAVR operations. Except for the civil defense forces in the zones of light damage which may be able to participate in rescue operations, SNAVR operations will have to be carried out by rural formations, formations from towns and installations which have not been attacked and are not pinned down by radioactive fallout.[10/] In such a case, control over the forces and military units and their employment will be exercised by surviving higher civil defense chiefs and staffs (oblast or oblast sector) and by those of the rural rayons or by military commanders.[11/] It is noted that such a situation may create an acute shortage of forces and means. This may require a call on the military for additional help and a careful setting of priorities in order to make best use of available

forces. It is recognized that in such a situation, the SNAVR forces will be hampered by their unfamiliarity with the localities, sites or installations where they will have to conduct their operations.[12/]

The chiefs and their staffs are responsible for organizing the timely relief of the workshifts when their personnel has received the maximum permissible radiation dose. In principle, the chiefs, their staffs and the formation commanders can determine in advance on the basis of the radiation situation the length of time each workshift can remain at a work site and, therefore, arrange for its timely relief. If an installation chief does not have sufficient forces available to him to relieve his working forces, he will request assistance from higher staffs.

In order to ensure the uninterrupted conduct of SNAVR operations, the working shifts will continue their activities until replaced by relief formations.[13/] The commanders of the relieved formations will coordinate the changeover with those of the arriving formations and will fully inform the latter about conditions, priorities, work in progress, availability of mechanized equipment, location of command posts, medical aid stations, supply points, and so on.[14/]

On instructions from the chiefs or their staffs, the relieved formations will proceed to a *Washing Station (SOO)* in the exurban zone to undergo decontamination while their vehicles and equipment may be sent to *Vehicle Decontamination Stations (SOT)*. From there, the personnel will go to prepared rest areas where they will be fed, re-equipped and resupplied, if necessary, and made ready to return to the disaster zone following the rest period, if the personnel has not been exposed to the total permissible short-term radiation dose (i.e., 50-100r).[15/]

5.2 RESCUE OPERATIONS

The objective of post-strike rescue operations is to rescue survivors in the zones of nuclear and chemical disaster, give them medical

assistance and evacuate them to safe areas. To facilitate these activities will require:

- opening access routes to where the survivors are located in shelters and in damaged surface structures,
- removal of rubble over buried shelter entrances,
- provision of air to shelters with blocked or damaged ventilation systems,
- localization of fires at rescue sites,
- prevention of flooding and secondary fires and explosions at sites of rescue operations,
- provision of water for firefighting and rescue activities,
- first aid to casualties,
- initial medical aid,
- evacuation of rescued survivors,
- decontamination of casualties and personnel of rescue formations, their clothes, equipment and possibly of work territories, and,
- supply and support of working formations and their equipment.

In principle, the reconnaissance conducted in the disaster areas should provide the civil defense chiefs and their staffs with information not only on conditions in the disaster areas, but also on the state of the shelters and their occupants and the presence of survivors in the rubble on the surface. The immediate secondary threat to survivors and rescuers will be posed by fires. Consequently, fire reconnaissance should assess the fires, the directions and rates at which they are spreading, the most urgent threats they pose to the survivors, the possibility of their causing secondary explosions or release toxic gases, etc.[16/] This will serve as a basis for determining priorities in firefighting at the sites of rescue operations.

Rescue operations are likely to begin with a combination of clearing accesses to the work sites by personnel of rescue detachments and mechanized units and firefighting to secure the work sites. The priorities of the rescue of survivors will depend on specific conditions at the work sites. If the attack came by surprise, it will be assumed that there may be survivors in the aboveground damaged structures and in basements. Finding and rescuing them will necessitate a search by the personnel of the Rescue Detachments, Composite Rescue Detachments, Volunteer First Aid Detachments and Firefighting Commands.[17/] This personnel will be assigned search sectors or areas and attempts will be made to ensure that the entire areas assigned to the formations are uniformly searched. If survivors are found, the rescue forces will dig them out or remove them from upper floors to the ground. Depending on conditions, digging through the rubble to reach survivors may be done manually or by mechanized means (cranes, hoists, power shovels, pneumatic drills, etc.)[18/] This type of rescue is believed to be difficult and time consuming.

In the case of shelters, the rescue forces will concentrate first on those with blocked or damaged ventilation air intakes and blocked exits. Their primary efforts will be directed at digging out the shelters' external emergency exits and air intakes.[19/] This will be done as far as possible by mechanized equipment, i.e., bulldozers, power shovels, hoists, etc. If this is not possible, an attempt will be made to drill a hole into the roof or side of the shelters in order to insert a hose from an air compressor.[20/]

Next, the rescuers will attempt to open the shelters in order to evacuate their occupants. This may be done by clearing the rubble off the external emergency exits or regular shelter exits. The latter, however, may have to be done manually in the case of basement shelters. If this is not possible, openings to the shelters will have to be made from outside, either down through the roofs or by means of lateral galleries through the rubble and the shelter walls.[21/] This work will require the use of pneumatic drills and hammers and cutting torches or will have to be

performed manually with hammers and crowbars. If the shelter occupants are sufficiently fit, they may assist in breaking through the shelter walls using whatever hand tools may be available in the shelter.

The specific methods for carrying out rescue operations and the rates of their execution will depend on conditions prevailing at the work sites. For example, one key factor will be the height, volume and character of the rubble covering the shelters and their exits and air intakes. The digging out of a shelter may require several squads supported by one or more units of mechanized equipment, as well as pneumatic drills and hammers, compressors and cutting torches. If it is necessary to dig a tunnel down to the shelter and break through its wall, the work will be performed by teams of three or four persons at one time.[22/] In contaminated areas, it may be necessary to decontaminate the work sites as well as the access tunnels used to reach the shelters.[23/] Table 5.1 indicates some of the work norms cited in Soviet manuals and the lengths of time assigned to their performance.[24/]

The work norms indicate that in the case of shelters with blocked ventilation air intakes or damaged ventilation systems whose occupants could survive only some 4 to 6 hours, rescue may be effected in time only where mechanized equipment is used. Manual clearing of rubble from air intakes and emergency exits would be useful only if the height of the rubble does not exceed 1 meter. Of course, this does not take account of the time it would take the rescue formations to reach the work sites and start work on providing air to the shelter occupants.

As was noted, first priority is assigned to the rescue of survivors whose lives are in immediate danger and casualties in need of early medical assistance. Occupants of shelters not in immediate danger but where shelter exits are blocked will be rescued after the completion of the most urgent rescue efforts and will be evacuated when the radiation levels and fire situation make it relatively safe to do so. Survivors in undamaged shelters at installations may be called upon to participate in the SNAVR operations.

Table 5.1 Soviet Estimated Time for Performance of Various Tasks

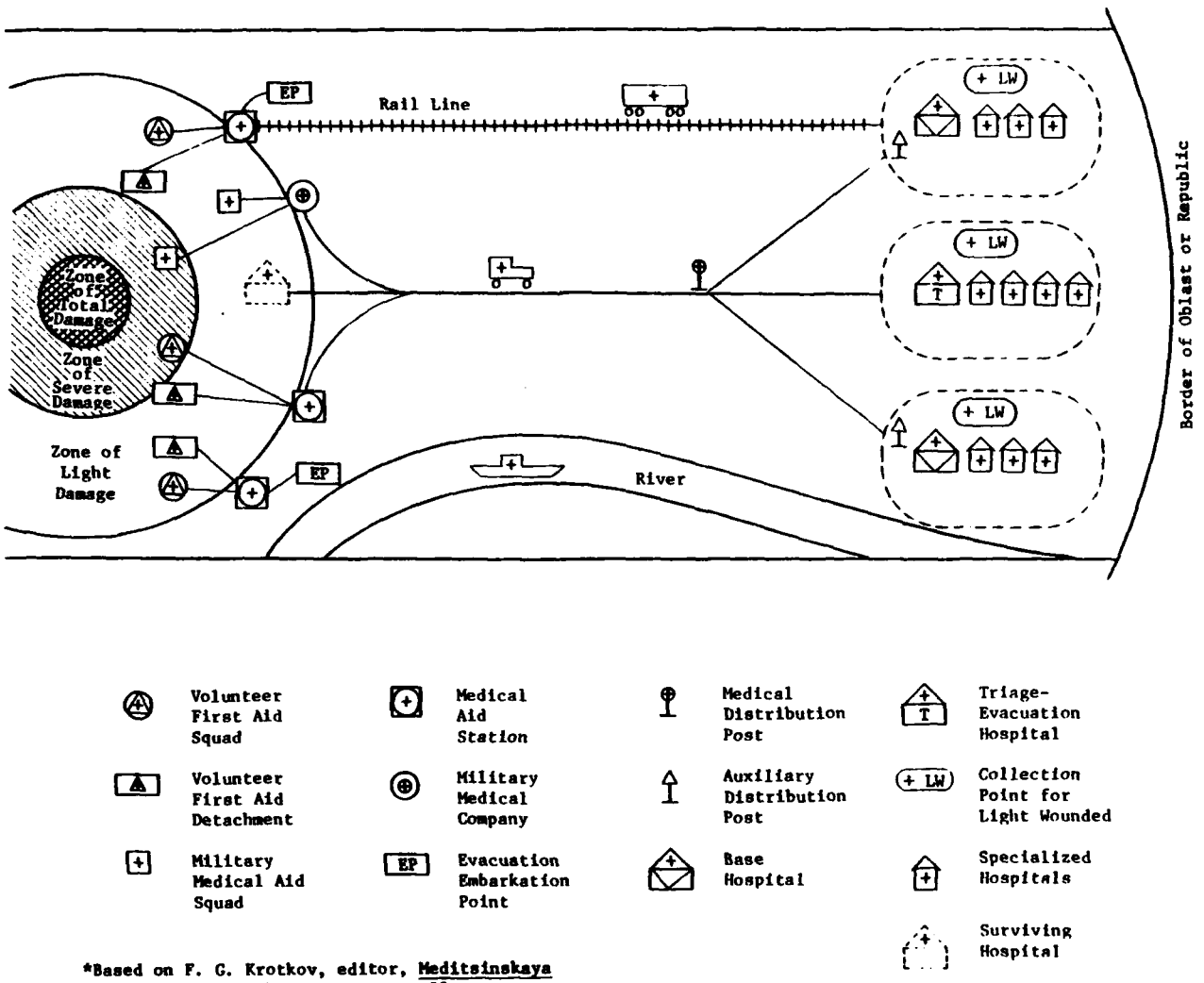
TYPE OF WORK	NUMBER OF PERSONS	EQUIPMENT	TIME (in hours)
Clearing emergency exit head with height of rubble above it:		Bulldozer or Power Shovel	
1 meter	4		0.8-1.0
2 meters	4		1.0-1.5
3 meters	4		1.5-2.7
4 meters	4		2.7-5.0
Clearing emergency exit manually with height of rubble above it:			
1 meter	4	--	2-2.5
2 meters	4-12	--	5-8
3 meters	6	--	14-15
4 meters	6	--	30-32
Digging a 11 m^3 pit along shelter wall:			
manually	4	--	6.5-7
manually	6-7	--	< 5-6
with power shovel	2-3	Power Shovel	< 0.5
Drilling air hole through rubble and 40 cm thick shelter roof with height of rubble:		Pneumatic Drill	
1 meter	6-7		0.5-1
2 meters	6-7		0.8-1.5
Removing rubble manually and drilling air hole through 40 cm shelter roof with height of rubble:		Compressor, Pneumatic Drill	
1 meter	6-7		2.5-3
2 meters	6-7		< 8-8.5
3 meters	6-7		14.5-15.5
Cutting 0.7 x 0.7 m opening in shelter wall:		Compressor, Pneumatic Hammer, Cutting Torches	
Brick wall, 80 cm thick:	6-7		1.5-2
Concrete, 60 cm thick:	6-7		< 3-3.5
Reinforced concrete, 50 cm thick:	6-7		< 4-5
Manually in brick wall 80 cm thick:	6-7	--	< 8-10

5.3 MEDICAL ASSISTANCE

First medical aid is provided by the Volunteer First Aid Detachments and Squads. These detachments and squads are attached to the Rescue Detachments and Composite Rescue Detachments, the *Movement Support Detachments (OOD)*, the *First Medical Aid Detachments (OPM)*, and the medical units of the Military Civil Defense troops.[25/] The deployment of medical formations and evacuation of casualties is depicted in Figure 5.1.

A Volunteer First Aid Squad is equipped with gas masks and protective suits, individual medical kits, medication and decontamination packets, 5 stretchers, 13 flashlights, individual canteens and 1 dosimeter.[26/] Significantly, the squads are not equipped with splints (they are told to use whatever materials are handy for this purpose) or with means to give casualties whole blood or plasma transfusions. Although there are five stretchers, it is noted that the women who make up these squads lack the physical strength to carry casualties on stretchers any considerable distance. Consequently, the Rescue Detachments must provide male stretcher-bearer teams, four men per stretcher, if it is necessary to carry the casualties some 250 meters or more.[27/] One Soviet source asserts that while a squad should be able to give first aid to some 50 casualties in one hour, the transportation of these casualties on stretchers a distance of 200 to 500 meters in that time will require up to 40 stretcher bearers.[28/] According to Soviet manuals, however, a squad is estimated to have sufficient medical supplies to give first aid to only 15 to 20 casualties;[29/] presumably after that it must be either resupplied or replaced by a fresh squad.

The squads attached to the rescue units will participate in the search of the rubble for survivors and, if radiation levels permit, give them first aid on the spot. Alternatively, they will establish first aid stations in places which provide some shielding against radiation. They may be reinforced by the surviving first aid squads of the workshifts which were at the installations at the time of the enemy strike if conditions make it possible for them to leave their shelters.[30/]



*Based on F. G. Krotkov, editor, Meditsinskaya Sluzhba Grazhdanskoy Oborony, p. 92.

Figure 5.1 Diagram of the Deployment of Medical Formations and Evacuation of Casualties*

Unless the *First Medical Aid Stations (OPM)* are sufficiently close to the sites of rescue operations to make it practical for stretcher-bearers to bring the casualties directly to them, the casualties will be brought to collection points from which they will be transported to the OPMs by vehicles. The vehicles used will first be those assigned to the OPM as well as available vehicles of other formations and military medical subunits.[31/]

The OPMs are set up in usable buildings (preferably medical institutions, schools or public buildings) in the zones of light damage or outside the zone of nuclear destruction where radiation levels do not exceed 0.5r/hour.[32/] In the case of large areas of nuclear destruction and fires, the OPMs may be 10 to 20 km or more from the actual sites of rescue operations.[33/]

Casualties arriving at an OPM are divided into two flow lines: light or walking wounded and those with severe and medium-serious wounds arriving on stretchers. Initial control over this division is exercised by a *Distribution Post (RP)* which is set up some 50 to 150 meters ahead of the OPM on the access route to it.[34/] If there are several access routes, there may be more than one such post. The basic personnel of a Distribution Post consists of a medical assistant or nurse, two dosimeter operators and one or two members of Volunteer First Aid teams.[35/] If the flow of incoming casualties is heavy, the numbers of persons manning the post will be increased. The post separates the light wounded from the others and directs the first to the reception point for light wounded and the other casualties to the OPM's *Reception-Triage Section (PSO)*. The post also checks the clothes and bodies of the incoming casualties for radiation, and if they are contaminated, they will send them first to a decontamination post at the OPM. At least one Soviet manual argues, however, that such a check is unnecessary and ineffective because accurate readings in the open will be distorted by background radiation, and the measurements will give no indication of the actual radiation dose received by an incoming casualty.[36/] Nevertheless, manuals published later have

continued to cite the need for dosimetric checks of incoming casualties by the Distribution Posts.[37] The unloading of casualties from transports is done by Volunteer First Aid Squads.

The *Reception-Triage Section (PSO)* is divided into two departments: one for walking wounded and one for stretcher cases. Here takes place the initial triage and tagging of the casualties, determination of the urgency and type of medical treatment required, and, if necessary, the casualties may be given transfusions, antibiotics, pain killers, oxygen and so on.[38]

Casualties not in need of urgent treatment or only needing their bandages changed or shots of antibiotics will be sent on to exurban hospitals. Those in need of urgent treatment, including emergency surgery, will be held back at the OPM until they can travel to the hospitals. For this purpose, in addition to a surgery-bandaging section, the OPM will also have a hospital section.[39] In principle, the surgical section should be capable of performing up to 300 surgical interventions in a 24-hour period.[40]

As was noted, the OPMs will have a capability to carry out partial decontamination of the arriving casualties and their clothes and shoes. The OPMs also have Casualty-Evacuation Sections which will establish collection-evacuation points for walking wounded and stretcher cases. These will be colocated with points of embarkation or on means of transportation (i.e., by vehicles, railroad trains or river boats).[41] These points should provide the waiting casualties with cover. The loading or transport will be done primarily by Volunteer First Aid Squads and stretcher-bearer teams under the supervision of a medical assistant or nurse.[42]

The distances from the OPMs to the base hospitals will vary. It is recommended, however, that travel time to the latter should not exceed 10 to 12 hours.[43] The hospital system is a part of the oblast and republic medical service and will be deployed in the rural areas and small towns; it will also include facilities set up by evacuated urban hospitals and medical organizations. The basic administrative hospital will be the

Hospital Base, which will include a *Triage-Evacuation Hospital (SEG)*, a base hospital, various specialized hospitals or departments, a *Collection Point for Light Wounded (PSLP)*, and various support facilities.[44] The initial allocation of casualties in transit to the hospital bases is carried out by *Medical Distribution Posts (MRP)* organized by the Triage-Evacuation Hospitals and established on the routes of transportation of casualties (at crossroads, transfer points, boat or train unloading points, etc.). The MRPs control the flow of casualties to the hospitals to prevent their overloading, direct casualties in need of urgent treatment to the nearest triage-evacuation or base hospitals, and keep the hospital base administrations informed about the volume of arriving casualties.[45] At each hospital base which controls a number of hospitals, there may be Auxiliary Medical Distribution Posts which will direct the arriving transport with casualties to specific hospitals, depending on the casualties' medical tags and evidence of urgent need of treatment.

Casualty-Evacuation Reception Points (EP) are organized at points of disembarkation of casualties transported by rail, water or air. Personnel at these points are responsible for unloading casualties and reloading them on vehicles for their trip to hospitals, giving the casualties medication and treating the most urgent cases which cannot wait until their arrival at the hospitals, and rechecking the correctness of the casualties' medical tags. EPs will also be organized at the hospital bases to unload arriving casualties.[46]

The Triage-Evacuation Hospitals and Base Hospitals are the main hospital units receiving the mass of casualties arriving from the OPMs and surviving medical facilities in the disaster areas. They sort the casualties, sending those who are transportable to appropriate base and specialized hospitals, and treat and hospitalize those in need of most urgent medical attention. The Triage-Evacuation Hospitals are normally deployed closer to the cities along the main casualty-evacuation routes than the base hospitals.[47] They are likely to be located in rural rayon hospitals and public buildings in rural settlements and have 500 to 1,000

beds.[48] It is noted that during the first two days following a strike, a Triage-Evacuation Hospital may have to process 3,000 to 5,000 or more casualties and treat or hospitalize 12 to 15 casualties or more per hour.[49] Of course, the actual numbers of casualties will depend on various factors such as the number of persons in the zone of destruction, the character of the strike, the effectiveness of the shelters, the timing of the initiation of rescue operations following the strike and so on. It is obvious that under unfavorable circumstances, such as high radiation levels in the zones of destruction, a significant portion of the severely wounded casualties will likely die before they can be rescued.

The hospital bases will establish special hospitals for the treatment of radiation casualties, with the exception of those who have received radiation doses of 150 to 200r who will be treated in the *Hospitals for Light Wounded (PSLP)*[50] These casualties will undergo a special treatment program, including blood transfusions, oxygen, special food and so on, while also being treated for other physical damage they may have suffered.

Hospitals for light wounded who are assumed to be for the most part ambulatory, will have some 50 beds and out-patient clinics which can process up to 700-800 wounded per day.[51] The wounded would be housed in the general areas of these hospitals and clinics.

5.4 SAFETY PROCEDURES

The ability of civil defense formations to execute SNAVR operations in the zones of nuclear destruction depends among other factors on measures to ensure the safety of the formations' personnel. The potential hazards include radiation and chemical contamination, additional radioactive fallout, fires, falling debris, secondary explosions, live power lines and flooding. Each of these hazards will have to be dealt with to prevent formation personnel from becoming casualties themselves.

The hazard posed by the radiation environment will depend on radiation levels. As was noted (see Section 4), the civil defense chiefs

will set the maximum permissible cumulative irradiation doses which personnel may receive "in accordance with wartime standards."[52/] Ideally, this dose should not exceed 50r in a 24-hour period, although it is possible that a dose of 100r will be allowed. Account will be taken of the irradiation doses received by personnel during their movement to their assigned work sites and during their withdrawal to safe areas. This and the radiation levels at the work sites at the time of the formations' arrival will determine the length of time they can remain to perform their rescue and associated operations. According to Soviet manuals, continuous dosimetric control at the travel routes, work sites and of groups and individual formation members will be maintained to prevent overexposures.[53/]

In most instances, Soviet civil defense publications recommend that personnel working in areas of radioactive contamination wear gas masks and protective suits. A few authors, however, have taken exception to this, noting that under these conditions the personnel quickly tires or becomes overheated and that in any case, this equipment will not shield personnel from gamma radiation.[54/] Some recommend that the rescue personnel be equipped with fabric dust masks, coveralls and boots so as to reduce direct inhalation of radioactive dust or skin contact with it, while avoiding the physical burdens imposed on personnel by wearing gas masks and impregnated or rubberized protective suits.[55/] To reduce the amount of radioactive dust which may get on the clothing or body, it is suggested that the work sites be soaked down with water to keep down the dust.[56/]

It may also be necessary to decontaminate the work sites, passageways, first aid and command posts and so on. This will be done by washing radioactive materials off surfaces, scraping soil surfaces with bulldozers or graders, or covering the contaminated ground surfaces with a layer of uncontaminated sand to a depth of 8-10 centimeters or snow up to 20 centimeters.[57/]

One safety measure is the timely warning of formations of the threat of imminent radioactive fallout resulting from nuclear detonations in areas other than those where these formations are conducting rescue operations. As was noted, the higher civil defense staffs (republic, oblast) organize aerial and ground monitoring of the movement of radioactive clouds and will give timely warning to the population in their path. Such warnings will also be issued to the city, rayon and installation civil defense chiefs and staffs whose formations are engaged in SNAVR operations following nuclear strikes on their own cities or installations. These warnings will be relayed to the formations working in the zone of destruction or traveling to or from them. Upon receiving such warnings, the formation personnel will be instructed to seek best available cover to wait out the fallout following which new assessments will be made of the levels of radiation at the work sites, and it will be determined whether and when the personnel can resume work.[58/]

A major potential threat to the safety of survivors and civil defense personnel in the zone of destruction will be posed by fires. This will be true along the access routes to the work sites as well as at the latter. It is noteworthy that the danger of the spread of fires and the occurrence of mass fires with the ignition of 70 percent or more of surface structures is expected to most likely occur in densely built-up urban areas which suffered light and moderate and, to a lesser extent, severe blast damage, as well as at installations which process or store significant amounts of flammable materials.[59/] In other words, the mass fires may develop precisely where rescue efforts will be concentrated. At the same time, fires in the rubble will be especially long-smoldering and generate high concentrations of carbon monoxide.[60/] It is important, therefore, to contain individual or scattered fires in the areas of SNAVR operations and at essential installations so that they do not spread and become mass fires and also to put out fires at the work sites which threaten to cause secondary explosions and possibly additional casualties. It is noted that once mass fires have become established, it will be

impossible to engage in SNAVR operations in those areas for four to ten hours after their start.[61]

In order to prevent the spread of fires, the firefighting formations, with the support of engineering units and heavy mechanized equipment, will attempt to isolate or "localize" fires. This will be done by building firebreaks along the front of the fires by pulling down buildings, removing highly flammable materials, digging trenches, establishing earth walls, etc.[62] Such firebreaks may be 50 to 100 meters wide. Wide streets may serve as the baseline for such firebreaks. If it is not possible to prevent the occurrence of mass fires, civil defense personnel and rescued survivors should be evacuated out of their path.[63]

The presence of carbon monoxide in burning and smoldering rubble and its high concentration in basement areas requires that firefighting and rescue personnel exercise great caution during efforts to dig out buried shelters and rescue survivors in basements. It is recommended that during such activities the stay times of the teams in such danger areas be limited to 30-35 minutes or use be made of self-contained respirator systems.[64] Firefighting at installations which pose a particular danger of secondary explosions is carried out by special firefighting commands with special equipment supported by engineering-technical units.

Prevention of secondary fires and explosions will also require sealing or shutting down ruptured gas mains and fuel pipelines and shutting off damaged power lines.[65] This work will be carried out by the Technical-Repair formations of the Municipal-Technical Service.

To ensure the safety of SNAVR personnel, facilitate their work and prevent the flooding of surviving shelters and basements, efforts will be made to prevent the flooding of work sites as a result of ruptured water, steam and sewer mains and reservoirs. This will require the sealing of damaged mains, the pumping out of water from lower areas, construction of earth walls, diversion of flood water and so on.

Another safety measure is the pulling down or shoring up of unstable damaged walls and structures along the access routes and at the

work sites which may collapse on SNAVR personnel, their equipment and rescued survivors.[66] Great care is recommended also in the shoring of tunnels dug through the rubble to reach the shelters or persons trapped in the rubble.

One significant safety measure is the instruction to prepare vacated shelters for use by SNAVR formations in the event of new enemy strikes.[67] Included is emergency repair of light damage to the shelters and of rapidly repairable shelter filter-ventilation units. According to a Soviet manual, the shelters should be brought to a state of readiness in some four hours.[68] While this obviously will involve the clearing of rubble from shelter entrances, emergency exits and ventilation air intakes, the caulking of minor cracks in the shelter walls and so on, it is not clear whether it will also include the repair of power lines to the shelters, the repair of ventilation units, the restocking of air regeneration equipment with oxidizers, replenishment of the shelters' reserves of water and so on. It appears unlikely that the shelters could be restocked in a short time to allow protracted occupancy by SNAVR personnel in the event of follow-on enemy strikes. It is also noted that empty shelters with working ventilation systems should be used by SNAVR crews as rest places and for eating.[69] Soviet publications provide no information concerning the existence of stocks for repairing and restocking shelters.

5.5 PECULIARITIES OF RESCUE WORK AT VARIOUS TYPES OF INSTALLATIONS

In the case of mines, rescue work on the surface is carried out by civil defense formations and underground by special mine-rescue commands. Rescue work will include firefighting at the surface installations, clearing of rubble from shafts and reinforcement of shafts to prevent further damage to them, installation of ventilators, and repair of power units and elevators or connecting up mobile generators.[70] Efforts will also be made to restore the water pumping installations, evacuate personnel from shafts threatened with flooding, and prevent the build up of gases in the mines.

The main danger at oil installations is the possibility of secondary oil fires and explosions. To deal with them, use will be made of all available firefighting formations with special firefighting equipment such as self-propelled turbojet extinguishers and also demolition commands.[71]

Firefighting will concentrate on oil well fires, reservoir fires, and prevention of the spread of fires to other fuel tanks of oil refining and pumping installations. Shelter occupants endangered by the spread of fires, explosions and flooding as a result of firefighting activities will be evacuated.

At power installations, there will be the danger of secondary fires, broken live power lines, fuel fires in the case of thermal-electric power plants, and flooding in the case of damage to dams of hydro-electric power plants.[72] To facilitate rescue operations and prevent additional damage, it will be necessary to shut down generators, pumps and other electric equipment. Civil defense personnel must wear rubber boots and gloves. All work must be carried out under the supervision of power technicians.[73]

Rescue work at chemical and food enterprises faces the threat of secondary fires and explosions as well as release of toxic chemicals. Personnel engaged in SNAVR operations at such installations will require self-contained respirators with oxygen tanks and special protective suits against acids.[74] It will also be necessary to decontaminate the sites of rescue and repair operations and the clothing of personnel exposed to toxic chemicals. The first aid and medical units will be prepared to assist personnel and survivors who have been exposed to toxic chemical gases and acids, ensure that all survivors in the danger zone are provided with gas masks, have ready oxygen bottles and other means to administer artifical respiration, and decontaminate the casualties.[75]

At transportation facilities, there will be danger of large secondary fires and explosions and possible release of toxic chemicals,

especially in the case of railroad freight yards and river and sea ports with damaged vessels. Rescue and repair operations will require the use of appropriate equipment. In addition to rescue of shelter occupants, it may be necessary to rescue survivors from overturned or burning railroad cars, burning and sinking ships, burning aircraft and so on.[76]

Obviously, each installation and locality will have its own peculiarities which will pose special problems for SNAVR operations. For this reason, it is especially desirable that these operations be conducted by the installations' own formations and that firefighting and repairs be carried out by specially-trained personnel most familiar with the tasks entrusted to them. Ideally, much of the work will be carried out under the supervision and control of senior technical specialists of the installations.

Section 5

FOOTNOTES

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Section 6

REPAIR AND RESTORATION

Repair and restoration are an integral part of Soviet post-strike SNAVR operations. They are intended to achieve several objectives. In the case of emergency repairs, these include:

- Damage-limitation, i.e., reduction of the danger of additional casualties and damage as a result of secondary effects of nuclear detonations, and
- Facilitating rescue operations and ensuring the safety of civil defense personnel and survivors in the zones of destruction.

The objectives of restoration work include:

- Restoration of vital services, i.e., power, gas, water, etc., and transportation to surviving essential industrial and other important installations and facilities, and
- Repair of damaged industrial and other essential installations, utilities and services at the earliest time so that they can contribute to the war effort, the logistic support of the armed forces and the welfare of the population.

Emergency repair will be carried out simultaneously with rescue operations. While these repairs may also contribute to restoration objectives, the latter activities will be undertaken primarily following the completion of the rescue operations.

6.1 EMERGENCY REPAIR OPERATIONS

As has been noted, according to Soviet civil defense manuals emergency repair operations include the construction of access routes to sites of rescue activities, shoring up or pulling down dangerously weakened structures along the access routes and at work sites, repairing vacated shelters for use by SNAVR personnel, and decontaminating territories, structures, equipment and personnel.[1/] The main focus of emergency

repair activities, however, is on containment of damage to and repair of utility lines and systems. As the Soviet see it:

> Repair-restoration work on municipal utility and power lines and installations is carried out in order to facilitate rescue work in the center of destruction, maintain undamaged installations in operation, and for the purpose of rapid restoration of important enterprises and facilities.[2]

The urgency of such repairs arises first from the potential danger that damage to these lines and installations may pose to rescue personnel and survivors, and second, because various activities associated with rescue and damage-limitation (firefighting, for example) will require water and power. One reason why damage to utility lines is expected to pose such a threat appears to be that the Soviets do not intend to shut down municipal or industrial water, power or gas systems or all fuel and steam lines in the event of an air raid warning. This is partly so because Soviet small- and medium-capacity shelters are not equipped with independent electric power generators, but depend on outside power sources for the operation of their filter-ventilation systems. A power shutdown would force the occupants to shift to manual operation of the ventilation fans which would reduce the amount of air provided by the ventilation (from some 7 m^3/hour per person to 2 m^3/hour per person) to a level insufficient to prevent a rapid rise in temperature-humidity in the shelters.[3] Second, the Soviets seek to minimize disruption of essential production and services. While a partial shutdown of production activities and utilities will be carried out when the air raid alert is sounded, not all such activities can be brought to a standstill. Finally, as was noted, SNAVR operations require water and power, and therefore it is desirable to make use of undamaged or rapidly repairable water and power lines. Thus, Soviet discussions of emergency repairs on public utility lines and power systems treat the problem as if it is expected that these utility and power systems will be in operation at the time of the enemy strike.

Soviet publications characterize damage to utility and power systems as follows:[4]

- Total Damage: Rupture of cables, destruction of pipelines and power transmission poles over considerable areas; possible flooding due to burst pipes and gas contamination due to ruptured gas lines.

- Severe to Moderate Damage: Ruptures and deformations in separate areas of underground pipelines and cables; destruction and deformation of individual power transmission and communications towers and poles; ruptures and damage on technological pipelines.

- Light Damage: Insignificant destruction and breaks in individual elements of the systems.

Soviet expectations of probable damage for various blast overpressures, as reflected in Soviet manuals, are shown in Table 6.1.[5/]

For purposes of comparison, it should be noted that Soviet manuals characterize damage to surface structures as follows:

- Total destruction occurs at blast overpressures of 0.3-0.4 kg/cm^2 (4.2-5.6 psi) and greater in the case of multi-story brick residential buildings; for multi-story buildings with metal frames and reinforced concrete wall panels at overpressures of 0.35-0.5 kg/cm^2 (4.9-7.1 psi); and for industrial buildings with metal frames at 0.6-0.8 kg/cm^2 (8.5-11.3 psi).

- Severe damage will occur at overpressures of 0.2-0.3 kg/cm^2 (2.8-4.2 psi) for multi-story brick structures; at 0.25-0.35 kg/cm^2 (3.5-4.9 psi) for multi-story buildings with reinforced concrete wall panels; and at 0.35-0.45 kg/cm^2 (5.0-6.4 psi) in the case of industrial buildings with metal frames.

- Moderate damage will occur at overpressures of 0.1-0.2 kg/cm^2 (1.4-2.8 psi) in multi-story brick buildings; 0.15-0.25 kg/cm^2 (2.1-3.5 psi) in multi-story buildings with metal frames and reinforced concrete wall panels; and 0.2-0.35 kg/cm^2 (2.8-4.9 psi) in the case of industrial buildings with metal frames.

- Light damage will occur at overpressures of 0.08-0.1 kg/cm^2 (1.1-1.4 psi) in multi-story brick buildings; 0.08-0.15 kg/cm^2 (1.1-2.1 psi) in multi-story buildings with metal frames and reinforced concrete wall panels; and 0.1-0.2 kg/cm^2 (1.4-2.8 psi) in the case of industrial buildings with metal frames.

Table 6.1 Damage Levels on Public Utilities, Power Systems and Technological Pipelines for Various Overpressures in kg/cm^2 (psi)

TYPES OF STRUCTURES AND INSTALLATIONS	CHARACTER OF DAMAGE FOR VARIOUS OVERPRESSURES			
	TOTAL	SEVERE	MODERATE	LIGHT
Thermal and atomic electric power stations	--	0.45 (6.3)	0.35 (4.9)	0.25 (3.5)
Same as above, earthquake resistant	--	2.0-3.0 (28.4-42.6)	1.5-2.0 (21.3-28.4)	0.25-0.3 (3.5-4.2)
Hydroelectric power station	--	5.0-6.0 (71.0-85.2)	3.0-4.0 (42.6-56.8)	1.0-2.0 (14.2-28.4)
Transformer substations and feeder building of brick or block	0.6-1.0 (8.5-14.2)	0.5-0.6 (7.1-8.5)	0.3-0.4 (4.2-7.1)	0.1-0.3 (1.4-4.2)
High tension electric transmission lines	1.0-2.0 (14.2-28.4)	0.5-1.0 (7.1-14.2)	0.3-0.5 (4.2-7.1)	0.2-0.3 (2.8-4.2)
Low voltage electric lines and telephone lines	--	0.8-1.2 (11.3-17.0)		--
Underground power cables	10-15 (142.0-213.0)	5.0-10.0 (71.2-142.0)	3.0-5.0 (42.6-71.2)	2.0-3.0 (28.4-42.6)
Power cables on ground surface	1.0-2.0 (14.2-28.4)	0.5-1.0 (7.1-14.2)	0.3-0.5 (4.2-7.1)	0.1-0.3 (1.4-4.2)
Power lines for electrified RR	--	0.7 (10.0)	0.6 (8.5)	0.5 (7.1)
Water tower	0.6-1.0 (8.5-14.2)	0.5-0.6 (7.1-8.5)	0.3-0.5 (4.2-7.1)	0.2-0.3 (2.8-4.2)
Underground reservoirs	2.0 (28.4)	1.0-2.0 (14.2-28.4)	0.5-1.0 (7.1-14.2)	0.3-0.5 (4.2-7.1)
Partially buried reservoirs	1 (14.2)	0.5-1.0 (7.1-14.2)	0.3-0.5 (4.2-7.1)	0.1-0.3 (1.4-4.2)
Aboveground storage tanks, gas holders	--	0.7-1.0 (9.9-14.2)	0.2-0.7 (2.8-9.9)	0.15-0.2 (2.1-2.8)
Boilers, distribution control stations in brick structures	0.35-0.45 (4.9-6.3)	0.25-0.35 (3.5-4.9)	0.15-0.25 (2.1-3.5)	0.07-0.15 (0.9-2.1)
Inspection wells, manholes/ gates/sluice valves and pumping stations	10.0-12.0 (142-170)	6.0-10.0 (85.2-142.0)	4.0-6.0 (56.8-85.2)	2.0-4.0 (28.4-56.8)
Underground water, gas and sewer steel pipes with diameter <350mm	15.0-20.0 (213-284)	10.0-15.0 (142-213)	6.0-10.0 (85.2-142)	4.0-6.0 (56.8-85.2)
Underground steel pipes with diameter >350mm	10 (142)	6.0-10.0 (85.2-142)	3.5-6.0 (49.7-85.2)	2.0-3.5 (28.4-49.7)
Underground cast iron, asbestos or ceramic pipes or conduits	15.0-20.0 (213-284)	10.0-15.0 (142-213)	6.0-10.0 (85.2-142)	2.0-6.0 (28.4-85.2)
Underground reinforced concrete pipes, 1.5m diameter and 0.2m thick	--	12.0-15.0 (170-213)	--	--

It is clear from the above descriptions of damage that underground utility lines are considerably more blast resistant than aboveground structures and utility lines. Even though emergency repairs would be made primarily to underground utility systems which have suffered light and moderate damage, such damage is likely to occur in areas which, from the viewpoint of damage to surface structures, would be characterized as having suffered total destruction. As was noted, because of the destruction, fires and likely high radiation levels in such areas, the Soviets do not expect to be able to conduct early rescue operations in them. Light and moderate damage to aboveground utility lines and systems, however, will roughly correspond to the zones of light, moderate and, to some extent, severe damage suffered by surface structures, although various elements of the lines and systems are somewhat harder than surface buildings. The most extensive damage to the utility lines will be in the buildings themselves as well as to overhead power and telephone lines, aboveground storage tanks and gas holders, water towers, aboveground steam, fuel, gas and chemical pipes and so on.

6.1.1 Emergency Repair of Water Systems

Soviet manuals point out that while damage to water mains and pipes, reservoirs, sewer lines, and steam pipes may pose the threat of flooding shelters, washing out access routes, interfering with rescue operations and causing significant secondary damage, the lack of water could adversely affect firefighting, decontamination and medical activities, all of which could cause additional casualties.[6/]

As far as it is practical, repairs on the water system will be performed by the repair-technical units of the cities' water administrations or under their supervision by engineering formations. The activities begin with attempts to shut off damaged pipe sections by closing valves to isolate them. To do this may require clearing rubble blocking manholes in order to reach the valves and water or sewer pumping stations. In the case where the water system has been damaged over a wide area, the entire water system may have to be shut down.[7/]

Shelters, work sites and access routes in danger of flooding will be protected by earth, stone walls or dams. Efforts will be made to divert the flow of water to non-critical areas or into undamaged dumps or sewers, and if basements areas are flooded, thereby threatening the shelters, they will be pumped out.[8/]

In order to provide water to the sites of rescue and firefighting operations, attempts will be made to make use of undamaged sections of the water pipes, pumping stations and so on. Ruptured sections of the water pipes can be bypassed by connecting undamaged sections with a temporary pipe system laid on the surface of the ground.[9/] Power to pumping stations at undamaged wells or along the pipelines may be provided from repaired power lines or by mobile electric power units.[10/] Temporary water pipes may also be laid to surviving reservoirs, lakes, rivers, etc. from which the water will be pumped by mobile motor pumping units, or the water may be transported to the work sites in tank cars.[11/]

Once the flow of water in the damaged part of the system is shut off, repairs can be made to ruptured pipes, damaged reservoirs, pumping stations, etc. It is assumed that repairs to pipelines will be most frequent.[12/] Emergency repairs on the pipelines will be instituted first where "important" sites of rescue and firefighting operations urgently require water or where it is essential to restore water supply to surviving enterprises to allow them to resume operations. It will be necessary to dig out the damaged pipes. Cracks and breaks in the pipes can be repaired temporarily by means of patches or sleeves or by replacing the damaged pipes with new ones held in place by various types of temporary clamps.[13/] Depending on the extent of the damage to be patched and the diameter of the pipes, such work by teams of three to five workers may require from one to ten hours, and digging out a damaged manhole may take three to four hours.[14/]

Emergency repair work on steam and hot water pipelines and sewer lines will be essentially similar to those on the water system. The main initial objective will be to shut off damaged sections to prevent flooding

and injuries to survivors and SNAVR personnel, or, if this is not possible, then to divert the water from shelters, work sites and routes.[15/]

6.1.2 Emergency Repairs of Gas Lines

Ruptured gas lines pose a threat of secondary fires, explosions, and possible dangerously toxic concentrations. It is said that propane gas will explode at concentrations of 2.3-9.5 percent, butane at 1.8-8.5 percent, and methane at 5.4-14.9 percent.[16/] Emergency repair work on the gas lines and installations will be carried out by Repair-Technical Commands of the cities' gas service, whose personnel should be equipped with closed-system respirators and special tools.[17/] These commands will be assisted by engineering and mechanization formations.

In areas where gas lines or installations have been ruptured, it is important to evacuate endangered survivors and to shut off the damaged sections or at least significantly reduce the gas pressures in them. Lowering the pressure in the ruptured pipes will also facilitate the fighting of burning escaping gas.[18/] Gas lines in damaged buildings can be shut off at the buildings or at the mains. If large areas are damaged, it will be necessary to shut off damaged lower pressure lines from higher pressure mains and, if necessary, the surviving gas holders.[19/] If it is not possible to determine the precise location of gas leaks by external indicators, it may be necessary to drill test holes for this purpose along gas lines suspected of such leaks.[20/]

If the gas lines have suffered a limited number of cracks or breaks, it may be possible to carry out emergency repair work on them. The ends of broken gas pipes will be sealed using wood plugs or inflatable balloons reinforced with layers of wet clay, or the broken sections will be replaced or bypassed by installing metal pipes or, in the case of low-pressure lines, rubber hoses.[21/] The joints may be packed with wet clay or held in place by clamps. Cracks in steel pipes could be sealed by patches of tightly-woven cloth and layers of wet clay or sheets of rubber or lead held in place by clamps.[22/] Cracks in plastic pipes will either be patched or the

damaged sections will be replaced. Patches will also be used on cracked cast-iron pipes. Insofar as it is practical, emergency repairs will be carried out on gas distribution stations and pumps.

6.1.3 Emergency Repairs at Electric Power Lines and Installations

It is interesting to note that some Soviet civil defense manuals assert that:

> A large electric power system comprised of a large number of electric power stations located a considerable distance from each other and the existence of automatic circuit breaker systems able to instantaneously shut off any power source and power equipment of the consumers, thereby preserving the system's ability to remain in operation, is sufficiently reliable. There is little likelihood of a complete breakdown of such a system even if nuclear weapons are used simultaneously against many cities and power stations.[23]

In this connection, the Soviets like to point out that a large part of the Soviet electric power system is integrated into a single national power grid which at the present time comprises more than 900 power plants.[24] The amount of damage suffered by the electric power system will also depend to a degree on the effectiveness of various measures instituted to limit damage to it.[25] In any event, it is said that considerable damage must be expected, especially to exposed power lines, the towers and poles supporting them, and transformer and distribution stations. Before any repairs can be initiated, it will be necessary to shut off or ground live damaged power lines and cut off damaged wires carrying up to 380 watts.[26] Apparently, power will be maintained from undamaged stations and lines. Important economic installations should receive power along two or more separate feeder lines and, if possible, from two or more power plants which are separated from each other by at least two miles. Consequently, undamaged or lightly damaged enterprises may continue to receive power if at least one feeder line is intact. If both are damaged, then all power to the plant must by shut off at least temporarily.[27]

Emergency repair on the power system will be carried out in order to provide power first to sites of rescue operations and water systems and second to undamaged or lightly damaged essential enterprises and installations, including transportation.[28/] For this purpose, broken power lines may be repaired or temporary lines may be strung. It is noted that temporary lines will only connect stepdown substations and distribution stations to the nearest surviving or mobile transformer substations.[29/] Bent high-tension transmission towers may be pulled into place by bulldozers. At the same time it will be necessary to fight fires at damaged power plants, transformer and distribution stations, and where broken lines have ignited surrounding areas. Major repair work on the damaged power systems will be initiated only after the completion of rescue and damage-limiting operations.

6.1.4 Emergency Actions on Technological Pipelines

Technological or production pipelines include lines carrying fuel, chemicals, etc., primarily at enterprises, ports, storage installations and so on. In order to prevent fires and explosions, it will be necessary to shut off the flow to reservoirs and equipment and to shut down all pumps which maintain pressure in those pipes.[30/] Chemical and fuel spills will have to be contained and treated chemically or covered with earth. Repair personnel will attempt to seal leaks in storage tanks and reservoirs or pump out their contents.

Aside from facilitating rescue operations, the emergency repair and damage-limiting operations appear to be concerned only with essential installations, utility systems, and transportation. Repair and damage limitation to non-essential facilities, including the residential sector in zones of destruction, will be given low priority. Of course, this will be dictated in a large measure by the sheer magnitude of damage in the nuclear zones of destruction, which will necessitate the concentration of manpower and resources on what the authorities view as constituting the immediately more valuable assets requiring preservation or repairs.

6.2 RESTORATION OPERATIONS

As was noted, the objective of post-strike restoration operations is the reconstitution of essential industrial production, transportation, utilities and services which are necessary to sustain the country's war effort and supply the population with basic necessities. According to Soviet civil defense manuals:

> Following the completion of rescue and emergency repair and restoration work, activities are organized which include repair and restoration work intended to ensure the continued functioning of surviving industrial installations, public utilities and power systems. They may also include decontamination of the zone of destruction, relocation of the homeless population and giving it assistance, supplying people with food, clothing, articles of first necessity and so on.[31/]

Priority in restoration work is focused on "essential" installations—that is those on which the logistic support of the armed forces and the basic sustenance of the population depend.[32/] The "essential" installations include those industrial enterprises and other production as well as processing facilities which are designated to remain in operation in wartime, as well as transportation and communication and the utilities and services needed to keep them in operation. Undoubtedly, first priority in restoration is assigned to defense-related production, transportation, oil and electric power.[33/] There is every reason to believe that the Ministry of Defense, the Armed Forces' Rear Services, and the Military Districts will have a major say in the matter of setting priorities for restoration.

Indeed, plans for restoration and reconstitution of essential production, transportation and services, and control mechanisms for the management and allocation of supplies and likely scarce materials and resources are already drawn up in peacetime. For example, it is said that:

> Preparations for the restoration and renewal of production must be carried out in advance, long before the war. For this purpose, it is planned to create essential stocks of construction materials and machinery, prepare trained cadres of repair workers, and create organs of control over the restoration work. The order of priority for restoration of destroyed installations is determined in advance, as are also priorities in providing for the distribution of materials in short supply, etc.[34/]

From a practical viewpoint, repair operations apparently will concentrate on: 1) restoration of utilities and essential services at undamaged enterprises, b) repairing and restoring production activities at installations which have received light to moderate damage, and c) restoring damaged or destroyed critical installations on rail lines and roads, i.e., bridges, railroad switching facilities, freightyards, and communication installations.

It should be noted that all Soviet enterprises are expected to analyze the vulnerabilities of their structures, production processes, equipment and machinery, power and other support systems in peacetime.[35/] This is done not only to take steps to reduce the worst of the vulnerabilities, but also to allow the management to draw up contingency plans and make preparations for the repair and restoration of these enterprises and installations for various levels of damage to them.[36/]

The focus on restoration of operations at undamaged installations and at those which suffered only light to moderate damage is directly related to the level of effort, the amount of resources, and the time required to do so. According to Soviet definition, installations which received only light damage will require little repair work, while those which received moderate damage will require considerable repairs and possible replacement of seriously damaged machinery and equipment.[37/] Installations which have received more severe damage will require, in most cases, complete reconstruction. Because of the amount of effort and time required for this, such restoration usually will not be a part of

SNAVR operations but will come under recovery planning, and unless critical for the war effort, it will not be carried out in wartime.[38] In effect, therefore, priorities in repairs and restoration will be largely determined by a kind of triage process of damaged installations.

In the case of enterprises which have not suffered significant damage, or at least when part of their production lines can be fairly easily restored, the main restoration problem will likely be that of providing them with power, gas, fuel, water and whatever else is needed to allow them to resume operations. This in turn may necessitate fairly extensive repairs on power installations and lines, water and gas systems and so on.[39] Such repairs, as well as those to damaged installation structures, will be primarily of a temporary type. If electric power cannot be restored fairly quickly, then in the case of essential enterprises, the military may provide them with mobile electric power plants or enterprises may have such plants themselves which can be brought from their exurban storage areas.[40] Alternatively, the more critical enterprises may obtain power, steam, fuel, etc. from other relatively nearby enterprises whose power and steam plants, water wells, etc. have survived or could be more readily repaired.[41]

As was noted, Soviet plans for the restoration of essential installations and services and for maintaining them in operation provide for the stockpiling in peacetime of fuel, raw materials, semi-finished goods, machinery, spare parts and construction materials, pipes, wires and so on, as far as possible, in dispersed exurban locations.[42] Anticipating the disruption of transportation and supply systems, enterprises should have stocks of fuel and raw materials which will make it possible for them to remain in operation for a "certain length of time."[43] Thermal-electric power plants should be capable of burning various types of fuel so as not to be forced to shut down if they are unable to receive their regular type of fuel.[44]

The Soviets appear to be fairly realistic in their expectations about the extent to which essential production and other activities could

be initially restored. Restoration efforts will focus on the most essential production lines of damaged enterprises and installations. This will involve making various types of temporary repairs to the utility lines and structures, and may require the use of salvaged, undamaged machinery and equipment or parts from other production lines of these enterprises.[45/] Even so, it is recognized that it is likely that the restored production lines and processes will work with reduced capacity because of insufficient power and water, inefficient use of machinery and equipment, partial repairs to technological pipeline systems, etc. The important thing, as the Soviets see it, is to ensure the preservation of the most valuable or irreplaceable machinery and equipment. Thus, if these core elements of production processes survive, "then it will be possible to restore production in a short time."[46/] Early restoration of production at surviving enterprises may also be facilitated and expedited by salvaged machinery, equipment, spare parts, semi-finished goods, and raw materials from more severely damaged enterprises and installations. Alternatively, the salvaged machinery, equipment and supplies may be moved to new locations where, with the help of stocked machinery, parts and equipment, new production lines may be set up at existing industrial facilities or even in separate locations using rapidly-erectable structures and so on.

6.3 DECONTAMINATION OPERATIONS

As was noted, decontamination will be applied to territories, buildings, equipment and supplies, as well as people and livestock. According to Soviet civil defense plans, the forces must be prepared to deal with radioactive, chemical and bacteriological contamination.[47/] In the Soviet view, the latter two may occur either as a result of enemy strikes with chemical and bacteriological weapons, a possibility Soviet civil defense gives every indication of taking seriously, or as a consequence of blast damage and fires which may release toxic or dangerous chemicals, cause contamination of water and food, or release dangerous

bacteria from damaged laboratories, etc. Furthermore, dangerous epidemics could occur because of poor health and sanitation conditions, rapid increase in insect and rodent pests and so on. Decontamination operations by appropriate civil defense formations will be carried out in support of rescue and emergency repair activities. Their objective will be to facilitate these activities as well as treat personnel and equipment exposed to contamination. Such operations will also be conducted during the subsequent repair and restoration phase. Their objective will be to ensure the safety of repair personnel and workers of surviving essential installations; to facilitate resumption of production and other critical activities, including agriculture, to make it possible to use remaining food stocks, supplies, and water; and to permit the population outside the zones of destruction to reoccupy their homes and prevent the spread of dangerous epidemics among the population.

It is recognized that in the case of contamination of wide areas, the volume of decontamination work could be enormous and require a great deal of time. Consequently, decontamination, especially of terrain and structures, will be carried out only where it is important to do so rather than wait for the completion of natural decay of the contamination (i.e., radioactive and chemical).[48/] Thus, rather than decontaminate large terrain areas to ensure the safety of people, it may be sufficient to decontaminate passages through the areas, work sites, vehicle parking areas, etc.[49/] It will be considered urgent, however, to decontaminate the buildings, machinery, equipment and supplies of essential enterprises and installations, transportation and communications facilities and equipment, warehouses and supplies stored in them and sources of water.[50/]

Primary responsibility for carrying out decontamination rests with the *Mobile Decontamination Commands (KO)*. These commands will make extensive use of various motorized and mechanized equipment normally available in the economy and municipal services or adapted for this purpose. This equipment will consist of sanitation and spray trucks, tank trucks and trailers, tractors with scraper blades and bulldozers or graders,

snow plows, deep plows, sand spreaders, mobile pumps and spray-washing machines and so on, as well as various manually-operated sprayers.[51] It is claimed that a Mobile Decontamination Command can, in a period of 10 hours, decontaminate 200 trucks or 40 km of hard surface road 6 meters wide.[52] An example of the deployment of these vehicles is given in Figure 6.1.

6.3.1 Decontamination of Radioactive Substances

In the case of radioactive contamination of surfaces, the objective of decontamination is to remove radioactive particles and lower the intensity of radiation to tolerable levels. For example, radiation levels inside structures should be reduced to levels not to exceed 90 mrem/hour.[53]

Methods of decontamination of territorial areas include washing radioactive materials off hard surfaces or scraping off and removing layers of contaminated soil or snow. Washing involves spraying the area with water under pressure by sanitation and spray vehicles, fire engines, etc. The degree of decontamination depends in a large measure on the pressure of the spray and the volume of water used for this purpose.[54] Various soaps and detergents as well as ammonia and other chemical compounds can be added to the water to increase the effectiveness of the washing-down process.[55] In the case of removal of soil or snow surfaces, the depth of the scraping will depend on the density of the surfaces. Thus, soil would be removed to a depth of 5 to 10 cm and up to 15 cm, packed snow to a depth of 6 cm, and loose snow to a depth of up to 20-25 cm, or the surface is plowed under to a depth of 20 cm.[56] It is noted that to achieve a five-fold reduction in radiation levels, the width of the decontaminated area (i.e., scraped strip) should be 35 meters and for a ten-fold reduction, up to 90 meters.[57] An alternate method is to cover the contaminated area with a layer of up to 20 cm of uncontaminated soil, sand or slag which may be only a temporary measure.[58]

Decontamination of structures is done by washing them down, giving particular attention to windows, doors, balconies, ledges and the lower

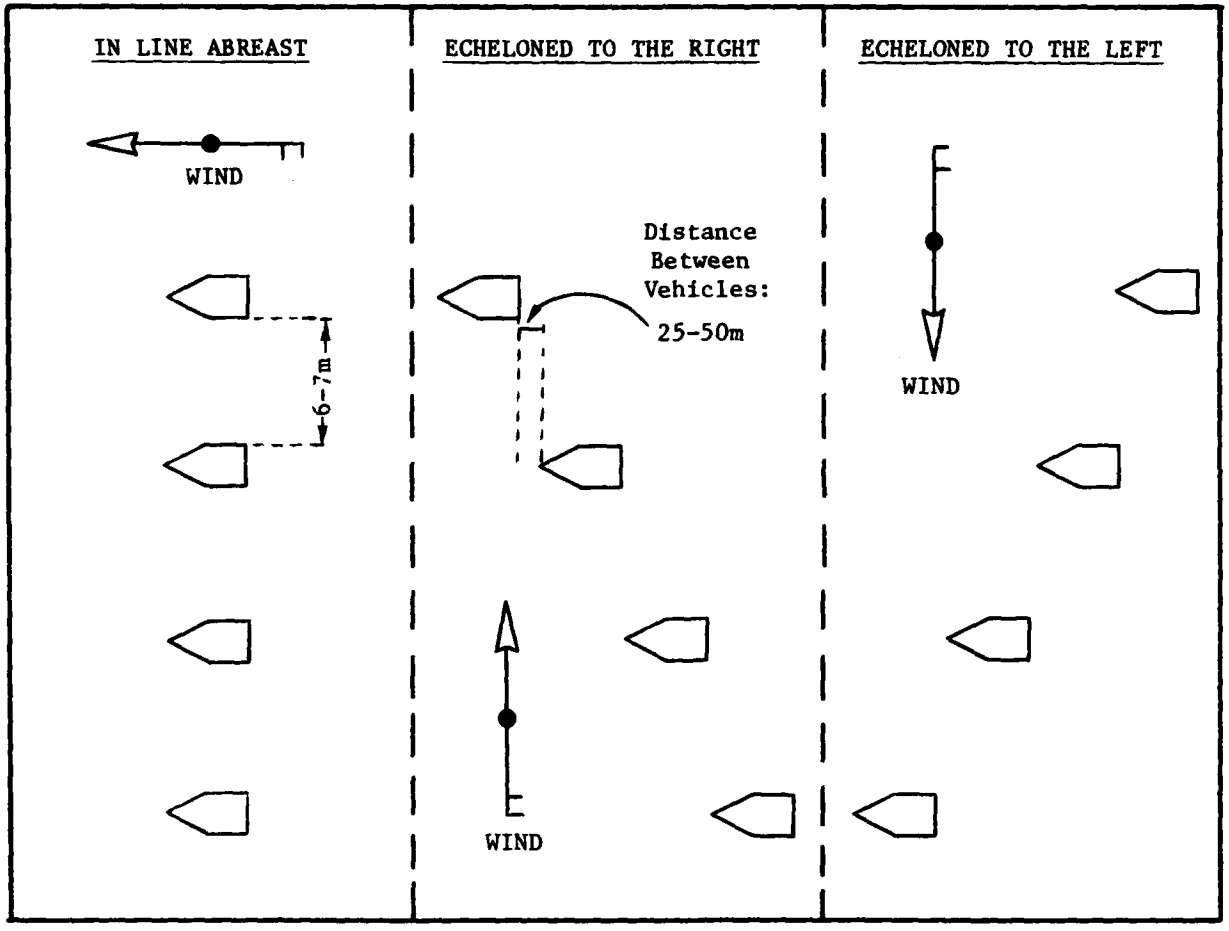


Figure 6.1 Decontamination of Territory: Deployment of Washing-Spraying Vehicles Depending on Wind Direction

floors. The interior spaces in structures are decontaminated by wiping walls and other surfaces, removing dust and, where possible, by washing down surfaces using hand sprays where it is not possible to employ large volumes of water. At enterprises, machinery and equipment, when possible, will be washed down and the interior structural surfaces may be hosed down. Alternatively, machinery surfaces will be wiped with soap-soda solutions and their parts with lubricants, kerosene or gasoline, etc.[59/]

In rural areas, depending on levels of contamination, the surface of fields used for cultivation may also have to be scraped off or plowed under to a depth of 40 to 60 cm.[60/] It is noted, however, that the radioactive fallout from the troposphere and stratosphere will continue for two to three months and will contain long-lasting radioactive isotopes (Sr-90, I-131, C-14, Te 127 m, etc.) and that some fallout of such isotopes may continue for at least seven years.[61/] To reduce their effects, it will be necessary to increase the levels of calcium and potassium in the soil and select crops which absorb less Sr-90 from the soil. In the case of food stocks not protected against radioactive contamination, the contaminated layers must be removed in the case of flour and salt to a depth of 5-10 mm, grain up to 80 mm, and stored potatoes up to 15 cm.[62/] Water is decontaminated by means of filtration, sedimentation and distillation.[63/]

In the case of vehicles and mobile equipment, they should be decontaminated if their radiation readings exceed 180 mrem/hour. Decontamination will be carried out at *Vehicle Decontamination Stations (SOT)* or by their operators. Essentially, the process will involve washing down the vehicles or using various chemical mixes in water and wiping parts and interior surfaces.[64/] According to Soviet estimates, the decontamination of a truck by washing will require 600 liters of water, 2-3 liters of gasoline and 1 kg of rags and will take 20-24 minutes. However, decontamination by wiping only will require 10 liters of decontamination solutions, 5 kg of rags and will require 50-70 minutes.[65/]

6.3.2 Dealing with Chemical Contamination

Decontamination of chemical contaminants consists either in their neutralization, that is rendering toxic or dangerous chemicals safe, or their removal from contaminated surfaces. Soviet civil defense literature devotes a great deal of attention to decontamination following enemy use of chemical weapons, i.e., nerve-gases, mustard gas, phosgene, etc. There is less specific discussion of toxic chemicals or acids which may cause contamination as a result of nuclear blast damage, fires or secondary effects of nuclear destruction.

Decontamination of chemical agents includes spraying them with various chemical solutions. For CW agents, there are two types of ready solutions identified as Solution No. 1 for mustard gas and V-gases and Solution No. 2 for agents of the Sarin type.[66/] Other decontaminants include suspensions in water of a 3 Ca $(OCl)_2 \cdot 2$ Ca $(OH)_2$, also designated as DTS GK; chloramine B solution in water; dichloramine B and T solutions designated DT-2 and DT-2T, respectively; hexachloramine solution designated as DT-6; dichloroethane; sodium sulphide; ammonia alkali solutions, and so on.[67/] To treat hard surfaces, use may also be made of clay, peat, marl, ash and so on to blot up the chemicals as well as hot water and steam.[68/] It is also possible to scrape off the contaminated soil and wash hard surfaces down with water under pressure. Obviously, in the case of chemical contamination occurring as a consequence of nuclear blast damage and fires, the choice of decontamination methods will depend on the character of the contaminants.

Soviet civil defense also pays attention to the possible use of chemical weapons against agricultural resources to destroy crops and livestock, contaminate fodder, food stocks, water, agricultural land, equipment and buildings.[69/] Various measures will be carried out to decontaminate and treat livestock which has been exposed to chemical (and for that matter, also radioactive) agents, and contaminated crops may be destroyed. Decontamination of terrain and structures will be similar to that employed in urban areas.[70/]

6.3.3 Decontamination of Centers of Biological-Bacteriological Contamination

As was noted, Soviet publications discuss at considerable length the problem of dealing with and decontamination of bacteriological agents which may be employed by the enemy against people, livestock and crops. In addition, there is the problem of possible infectious disease, epidemics and the spread of diseases among livestock and crops which may occur as a consequence of the destruction and disruption resulting from nuclear strikes. As was noted in Section 3, there exists *Anti-Epidemic Brigades (SPEB)* for dealing with outbreaks of epidemics among people.

These brigades and other elements of the Medical Service will treat the population while the Security formations and elements of the armed forces will enforce a quarantine of the infected areas. Decontamination of terrain and structures will be similar to that of chemical contamination, but will also include wide spraying with disinfectants, bleaches, and so on.[71/] Decontamination will also include insect and rodent control.

Soviet civil defense publications make no mention of the problem of bodies remaining in the zones of destruction becoming a source of infection. Indeed, nothing is mentioned publicly about the problem of disposal of the dead or which organization will be responsible for it. It is admitted, however, the large losses among the livestock may pose a major disposal and infection control problem and that considerable effort will be required to bury the carcasses if they cannot be processed for food.[72/] In the case of crop diseases, the implementation of various chemical spraying and other treatment programs obviously will depend on the availability of sufficient stocks of appropriate supplies and equipment.[73/]

6.4 SUPPORT ACTIVITIES

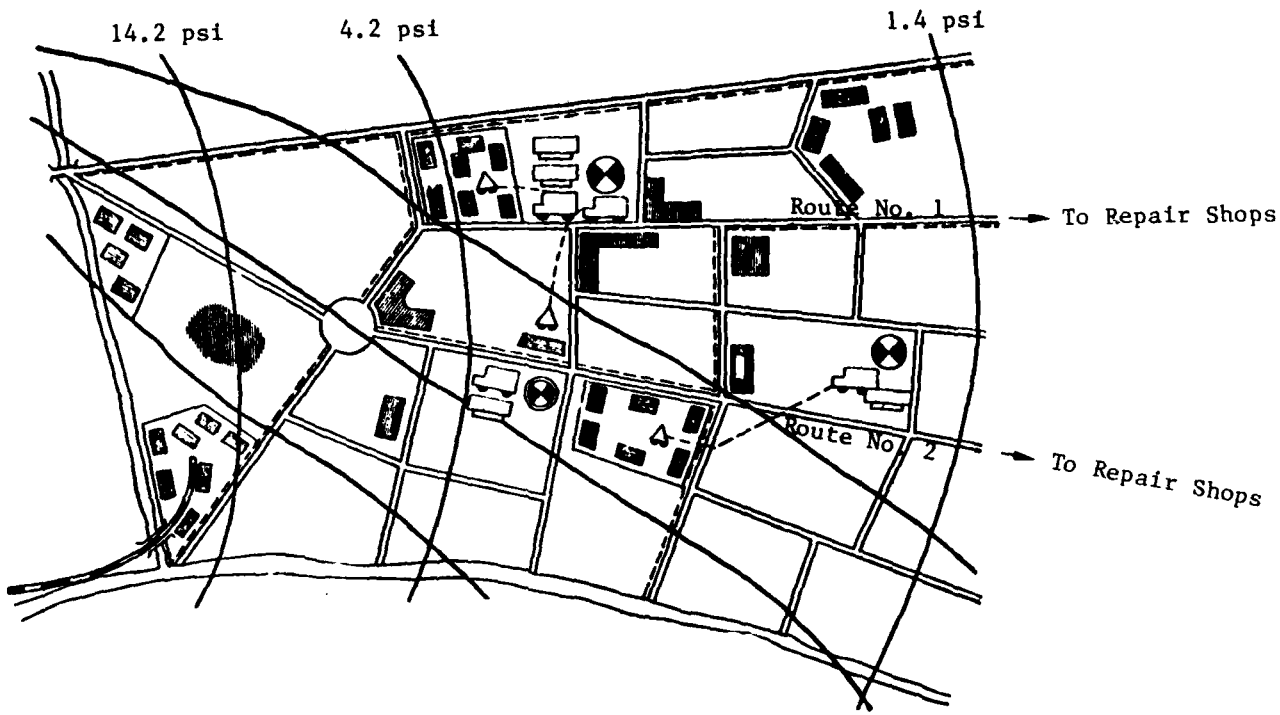
As previously noted in Section 3, SNAVR operations will be supported by various civil defense support formations. These formations

will supply SNAVR personnel in the zones of destruction and exurban assembly areas; feed and clothe rescued people and casualties; and provide vehicles and mechanized and power equipment with fuel and lubricants and maintain and repair them, as well as recover and repair damaged ones in the zones of destruction.

Depending on radiation levels, the *Mobile Feeding Stations (PPP)* will provide SNAVR personnel and casualties at OPM stations with hot food and drinking water in the zone of destruction or in the assembly areas after they leave these zones. If it is impractical to provide hot food, the *Mobile Food Supply Stations (PPPS)* will supply SNAVR personnel with dry rations. As was noted, the *Mobile Clothing Supply Stations (PPVS)* will provide SNAVR personnel and the rescued population with clothes and shoes, primarily after they leave the zones of destruction. The *Mobile Vehicle Fueling Stations (PAZS)* will provide the vehicles used for the transportation of SNAVR personnel, casualties and supplies, along with the fuel and lubricants for the mechanized and motorized equipment used in SNAVR operations.[74/]

Of some interest for post-strike repair and restoration operations is the organization of the recovery and repair of damaged and broken down vehicles and mechanized-motorized equipment. These vehicles will be needed both during the repair, decontamination and restoration phase and the subsequent recovery phase. An example of their deployment is shown in Figure 6.2.

The vehicles and mechanized-motorized equipment in the zones of destruction which cannot be repaired on the spot by the *Mobile Repair and Restoration Groups (PRVG)* will be towed or transported by these groups and, in particular, by the *Mobile Vehicle Evacuation Groups (EGr)* to *Collection Points for Damaged Vehicles (SPPM)* which will be initially established in the zones of light and moderate damage at locations free of dangerous radioactive contamination.[75/] During the rescue and emergency repair phase, priority in repairs will be given to the mechanized equipment needed for rescue work and vehicles used in the evacuation of



Initially Deployed Collection Points for Damaged Vehicles (SPPM)

Later Deployed SPPM

Independent Mobile Repair Units

Mobile Repair and Restoration Group (PRVG)

Mobile Vehicle Evacuation Group (EGr)

----- Sector Boundaries

Figure 6.2 Deployment of Vehicle Repair, Collection and Evacuation System

casualties.[76] Along with this, collection and retrieval of damaged vehicles and equipment from uncontaminated areas in the zones of light and moderate damage will begin, and thereafter these activities will be extended to other areas as radiation levels decline.[77] If possible, repairs will be made at the SPPMs by the PRVGs attached to them if the damage or mechanical breakdowns are relatively minor. Otherwise, the vehicles and equipment requiring more extensive repairs will be evacuated from the forward SPPMs to exurban repair shops and service centers or to SPPMs in their vicinity. The evacuation will begin with those vehicles and equipment requiring the least work to be followed later by those in need of extensive repairs and restoration. Last to be evacuated will be vehicles and equipment too severely damaged for cost effective repairs, which will be cannibalized for parts.[78]

Section 6

FOOTNOTES

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Section 7

IMPLICATIONS OF SOVIET PLANS AND CAPABILITIES FOR POST-STRIKE RESCUE, REPAIR AND RESTORATION FOR PROTRACTED WAR AND RECOVERY

The Soviets obviously regard assuring the "stability" of operations and viability of the economy in wartime, as well as the rapid repair and restoration of damaged essential installations following an enemy strike, to be important missions of USSR civil defense. Both are intended to limit damage to the economy and vital facilities. As was noted (see Section 2), the Soviets attach great and, under certain circumstances, decisive importance to the ability of the economy to assure continuous logistic support of the armed forces and the population in wartime and the reconstitution of this capability following enemy strikes. In the Soviet view, the superior ability of the Soviet economy and services to provide support to the war effort can be critical for assuring a favorable war outcome and for making it possible for the Soviet Union to gain control over the postwar international environment.[1/] Thus, as the Soviets see it, "civil defense is becoming a strategic factor which can influence to a significant extent the course and outcome of a modern war, as well as the postwar recovery of the economy."[2/]

Actually, the Soviets recognize that the significance of the economy in terms of its influence on the conduct of a war will differ in a short and a protracted war. In the case of a short war, new defense production will have little if any effect on the warfighting and, if the economy was subjected to enemy strikes, it is unlikely that it could be reconstituted in time to resupply the armed forces. In the Soviet view, therefore, such a war will be most likely fought with the weapons and supplies on hand in the armed forces or stockpiled in peacetime for this purpose. For example, it is said that:

> At the very outbreak of a nuclear war, the economies of the belligerent nations will be subjected to large-scale destruction. Therefore, one can no longer assume that supply to the combat

> forces can be assured by mobilizing the nation's economic resources as the war progresses. The course and outcome of the nuclear-missile war will also be determined by the stores of weapons, combat materiel, gear, ammunition, food stuffs, strategic materials, etc., which will have been stockpiled before the war.[3]

Or again, "victory in such a war will go to the side which has already created the necessary material conditions prior to its outbreak."[4]

Even so, in a short war there will be an urgent requirement to restore the transportation system in order to supply the armed forces. There will also be the need to carry out post-strike rescue, damage-limiting, repair and restoration operations in the zones of nuclear destruction in order to limit human losses and damage and facilitate post-war recovery.

As was noted, however, Soviet political and military leaders also take into consideration that a war, even a nuclear one, may become protracted, and they believe in the necessity to plan and prepare for waging such a war. In this event, "the capability of a country to build up its war production during hostilities will become a relevant factor," which can have a decisive influence on the course and outcome of the war.[5] Indeed, the correlation of economic capabilities between the belligerents is expected to be a significant factor in the conduct of a protracted war and in influencing its outcome.[6] It is said, therefore, that:

> A war will evidently involve some degree of restoration of important industrial complexes. Large segments of the population will be required to liquidate the effects of the nuclear weapons and continue working in the enterprises in order to support their country's economic strength, thus influencing the correlation of economic indices of the belligerent states in a favorable manner.[7]

Thus in a protracted war, in addition to damage limitation and rescue activities, it will be highly important to restore not only transportation, but also essential defense-related production and necessary

utilities and services for this purpose and to assure the effective distribution of surviving stocks of supplies.

Soviet ability to ensure the "stability" of the operations and viability of the economy and its rapid postwar repair and restoration depends on the combination of pre-attack civil defense measures to reduce the economy's vulnerabilities to attack and on holding in readiness large capabilities for carrying out post-strike rescue, damage-limiting, repair and restoration operations in the zones of nuclear damage. This appears to be a rational approach to the difficult and complex problem of attempting to ensure the ability of the economy to sustain the war effort and to recover. Of course, the pre-attack measures, which include protection of the management and work force, hardening, dispersal and duplication of essential industrial capabilities and utilities, protection of agricultural resources, creation of stockpiles, and so on,[8/] represent an attempt to limit the vulnerabilities of essential installations and services, and the economy as a whole, to the direct effects of nuclear strikes. Post-strike SNAVR operations, in addition to rescuing personnel in the zones of nuclear damage, are intended to limit damage from secondary effects of the nuclear strikes and create "essential conditions for the restoration of production activities of installations of the national economy."[9/] Thus, the possibility of restoration of essential economic activities will depend at least in part on the effectiveness of both types of civil defense measures.

Of course the actual effectiveness of the Soviet measures will also depend on the scale of enemy nuclear strikes and their targets. Indeed, the success of the Soviet plans and measures can be said to be based on relatively optimistic enemy strike scenarios. It is recognized that in some war initiation scenarios, such as a massive bolt-from-the-blue attack on the Soviet Union targeted against cities, essential economic installations, transportation and so on, Soviet civil defense would most likely be largely paralyzed and most damage-limiting measures could not be implemented. It is also evident that the effectiveness of Soviet post-strike operations would be markedly degraded, not only by large-scale destruction but also by

high levels of radiation which would prevent the early initiation of such operations and thereby greatly reduce their utility. Indeed, the Soviets make clear that the focus of post-strike repair and restoration operations is on undamaged installations and on those which suffered light to moderate damage. Attempts to restore more severely damaged installations in the course of a war will only be made in those instances where it is absolutely essential. Otherwise, they will be written off for the duration of the war or serve as a source of salvage of equipment, materials or parts which may facilitate restoration of less damaged installations or the rapid assembly of new critical production or transportation lines in other localities.

It is evident, therefore, that the Soviet concept of rapid initiation of post-strike operations is based on a war scenario which assumes not only strategic warning of an enemy attack, but also selective and fairly restrained enemy strikes against urban-economic targets. It also appears to assume that such strikes would be carried out by relatively low-yield nuclear weapons detonated primarily in an air burst mode. Even then, as was noted, the Soviets recognize that rescue operations in the zones of total and severe destruction may come too late to save occupants of shelters buried under debris with blocked or damaged ventilation systems.

Under favorable conditions, however, Soviet post-strike operations, reinforced by pre-attack civil defense measures to reduce the vulnerability of the economy and facilitate its repair and restoration, could have a significant effect in terms of reducing losses among essential workers, limiting damage from secondary effects, and facilitating the early restoration of operations of undamaged as well as lightly to moderately damaged essential installations, utilities and services. Furthermore, the plans and capabilities for conducting rescue operations will have a positive effect on the morale of essential workers who are required to work at these installations.

Presumably, if the post-strike operations can limit damage from fires, flooding and secondary explosions to installations in the zones of light to moderate destruction, various factors may facilitate their early

restoration and resumption of operations. Among these factors will be: 1) the survival and disciplined use of the essential work force; 2) the survival of underground utility lines; 3) the practice of providing power to installations on the basis of multi-source, multi-input line energy systems; 4) the provision of mobile power stations; 5) possible "autonomy of production enterprises and associations in terms of energy and water supplies,"[10] and 6) the availability of stocks of machinery, spare parts, raw materials, food, etc. stored at the exurban zone, and so on. Restoration of rail and road transport would be facilitated by the duplication of bridges, the construction of bypasses around cities and possible choke points,[11] the availability of significant stocks of repair materials and reserve bridging equipment in the hands of the military as well as civilian organizations and the existence of large military and civilian rail, bridge and road construction and engineering organizations.

Soviet civil defense does appear to have the capability to mount a large and effective SNAVR effort. Under favorable conditions, all but the workshifts of essential enterprises would be at risk in the target areas. Consequently, the leadership could call on many millions of evacuated skilled workers, technicians and engineers and the general evacuated urban population, as well as rural civil defense forces, to participate in these operations. Furthermore, as was noted, the armed forces would support these operations with large numbers of civil defense troops, engineering, medical and other units.[12] Most of the large number of transportation, mechanization, construction and firefighting equipment and other essential gear would be outside the target areas, having been either evacuated or being present in the rural areas and in the military units. The operations would be well supported by a large medical organization and various well-organized technical and supply services. There appears to also be a well-organized military controlled command, control and communications structure for post-strike operations, which is unincumbered by uncertainties in administrative or jurisdictional lines of authority or responsibility and which will be very tough-minded in setting

priorities for the operations and the employment of the forces and resources in accordance with defense interests.

The rapid restoration of damaged essential installations will greatly benefit from the ability of the authorities to concentrate forces and resources and to make use of all surviving equipment and supplies under centralized control. The task will be aided by the pre-war creation by essential enterprises of reserves of equipment and materials for repair purposes and to allow them to continue to function for some time in the event of disruption of the supply distribution system and transportation, and also by the ability of thermal-electric power plants to use various types of fuel. New production lines may be set up at surviving enterprises with salvaged machinery and equipment from destroyed ones. In this connection, it should be noted that in the Soviet Union a very high percentage of machine tools and production capacities are normally engaged in repairs. For example, over one-third of all metal cutting machines are so employed, and 44 percent of tractor production capacity is in repair facilities—a significant portion of which are located in exurban areas.[13/]

While not minimizing the enormity and complexity of the problem of post-strike repair and restoration, the Soviet civil defense system appears, at least conceptually, to be well prepared for its mission of limiting damage and rapidly restoring essential production and services when this can be done with a reasonable prospect of timely contribution to the war effort or early recovery. The report on Soviet Civil Defense, issued by the Director of Central Intelligence in July 1978, concluded that:

> Soviet leaders and civil defense planners are probably confident that, through rapid shutdown and emergency repairs by the surviving work force, limited production at slightly or moderately damaged sights could be restored soon after an attack.[14/]

The same report also noted that there are probably sufficient stocks of fuel and food to sustain the population at least in the near-term post-strike period, while longer term essential production will depend on the

existence of sufficient strategic reserves and the restoration of transportation. No doubt Soviet confidence in their ability to reconstitute essential production is based in a large measure on their World War II experience during which the Soviets faced the problem of restoration of production in the devastated liberated territories of the USSR, as well as the problem of setting up production for many evacuated large defense plants in new locations.

It should be noted, however, that while mentioning the possible threat of successive strikes, Soviet publications do not discuss how this may affect the ability of the Soviet Union to reconstitute defense production in a protracted war. The usual Soviet scenario appears to envisage the employment of the major part of the strategic forces in the first strike and, consequently, a subsequent "decrease in the nuclear effect against the deep rear" of the enemy state with the use of strategic forces held in reserve.[15/] How this scenario is affected by the growth in the number of warheads in the U.S. strategic inventory, the adoption by the U.S. of the Countervailing Strategy, or by the growing number of warheads in the Soviet strategic inventory and the existence of large, relatively secure Soviet strategic reserve forces is uncertain. One could argue, however, that the Countervailing Strategy, with its emphasis on escalation control and on targeting counter-military and counter-warfighting capabilities, may be perceived as enhancing the utility and effectiveness of Soviet civil defense in general, including its concept of post-strike operations. Indeed, the Soviets appear to see the U.S. as tending to increasingly adopt a strategic and warfighting doctrine similar to their own. In any event, although the ability of the Soviet Union to wage a protracted nuclear war is fraught with great uncertainties (which the Soviets themselves recognize), Soviet civil defense plans, organization and capabilities for conducting post-strike rescue, damage-limiting, repair and restoration operations may significantly improve prospects for some form of rapid reconstruction of the Soviet logistic and economic support of the war effort, as well as for a more speedy postwar recovery.

Section 7

FOOTNOTES

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2. Major General A. S. Milovidov, editor, The Philosophical Heritage of V. I. Lenin and the Problems of Contemporary War (Moscow: Voyenizdat, 1972), translated by the U.S. Air Force, Soviet Military Thought Series, No. 5, (Washington, D.C.: U.S. Government Printing Office), p. 240. See also Colonel General A. Altunin, "Civil Defense Today" in Lyudi i Dela Grazhdanskoy Oborony (People and Affairs of Civil Defense), (Moscow: Voyenizdat, 1974), p. 6.

3. Colonel M. P. Skirdo, Narod, Armiya, Polkovodets (The People, the Army, the Commander), (Moscow: Voyenizdat, 1970), p. 126. See also, Sokolovskiy, op. cit., p. 388.

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6. Major Generals D. A. Volkogonov, A. S. Milovidov, and S. A. Tyushkevich, Voyna i Armiya (War and the Army), (Moscow: Voyenizdat, 1977), p. 155.

7. Skirdo, op. cit., p. 62. See also, Colonel A. Sukhoguzov, "Problems of Viability of the Economy in Modern War," Kommunist Vooruzhennykh Sil (Communist of the Armed Forces), No. 3, February 1972, p. 13; Colonel L. Korzun, "Problems of the Stability of Production," Voyennyye Znaniya, No. 10, October 1972, pp. 26-27.

8. See L. Goure, Soviet Civil Defense Concepts, Programs and Measures for the Protection of Industry in Nuclear War Conditions, Final Report, Advanced International Studies Institute, prepared under FEMA Contract No. EMW-C-0384, June 1981, passim.

9. Colonels M. P. Tsivilev, A. A. Nikanorov and B. M. Suslin, Inzhernerno-Spasatel'nye i Neotlozhnye Avariyno-Vosstanovitel'nye Raboty v Ochage Yadernogo Porazheniya (Engineering-Rescue and Emergency Repair and Restoration Work in a Center of Nuclear Destruction), (Moscow: Voyenizdat, 1975), p. 6. See also, Colonel V. Komernitskiy, "Containing Damage," Voyennyye Znaniya, No. 9, September 1981, p. 23; Yu. Yu. Kammerer and A. E. Kharkevich, Avariynye Raboty na Kommunal'nykh Setyakh v Ochage Yadernogo Porazheniya (Repair Work on Municipal Utility Lines in a Center of Nuclear Destruction), (Moscow: Stroyizdat, 1972), p. 26.

10. Marshal of the Soviet Union N. Ogarkov, "Guarding Peaceful Labor," Kommunist, No. 10, July 1981, p. 89.

11. For example, see K. V. Svirskiy et al., editors, Atlas Avtomobil'nykh Dorog SSSR (USSR Atlas of Automobile Roads), (Moscow: Glavroye Uprovleniye Geodeziy i Kartografiy pri Sovete Ministrov SSSR, 1981), passim; Marshal of Aviation G. V. Zimin, Razvitiye Protivovozdushnoy Oborony (Development of Anti-Air Defense), (Moscow: Voyenizdat, 1976), p. 114.

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Section 8

SOME OBSERVATIONS ON THE LEVEL OF EFFORT DEVOTED BY SOVIET CIVIL DEFENSE TO POST-STRIKE OPERATIONS

Post-strike rescue, damage-limitation, repair and restoration is one of the three main functions or missions of USSR Civil Defense. As was noted in Section 2, the others deal with the protection of leadership elements, essential workers and the general population and with the protection of the economy and its "stable" operation in wartime. Although all three are, to a considerable degree, interdependent and mutually supporting, each has its own requirements for personnel, equipment and other investments.

In principle, to assess the level of effort the Soviets devote to SNAVR, it can be measured either against the total effort devoted to civil defense or relative to efforts and investments in the other two primary missions of Soviet civil defense. Furthermore, measurements could be made in terms of a number of categories, such as number of personnel, materiel or financial investments. Unfortunately, such assessments and comparisons are fraught with great uncertainties because of Soviet secrecy. For example, the Soviets have not made public information on the size of the organized civil defense forces, the military civil defense forces, the civil defense annual budget (or, for that matter, any data on this budget), the cost and amounts of various types of equipment used by civil defense personnel, the amounts of materiel, equipment and supplies in storage for use during SNAVR operations and so on. Consequently, it is only possible to make very rough and tentative assessments of the level of Soviet efforts devoted to civil defense or, specifically, to SNAVR.

Some tentative estimates can be made about the level of effort devoted to SNAVR in terms of personnel assigned to this mission. As was noted (Section 3), nearly all of the Soviet civil defense services and organized formations can be expected to be used in SNAVR operations.

Indeed, from an organizational and functional point of view, only the Shelter Service and shelter management personnel are not involved in SNAVR. Of course some of the other civil defense services and formations are not only assigned tasks in the course of SNAVR operations, but also support and participate in the other basic civil defense missions. For example, the Transportation Service and formations will assist in the pre-attack evacuation of the urban population; the Engineering Service and formations will participate in the construction of expedient shelters in the cities and for evacuees in rural areas, and also implement hasty hardening measures at essential installations; and the Public Order and Safety Service and formations will assist in the control of the evacuation. Other services and formations, such as firefighting, rescue, decontamination, medical and so on will be primarily devoted to SNAVR operations.

Nearly all the civil defense command and control elements will be directly involved in SNAVR and, to varying degrees, in the control of the forces employed in its operations and measures carried out in conjunction with them. The only exceptions will be the Evacuation Commissions in the urban areas and at installations which will plan and direct the evacuation, the Evacuation Reception Commissions in the exurban areas responsible for the resettlement of the evacuees, and some of the civil defense training organizations. It is estimated that in peacetime USSR civil defense has some 115,000 full time personnel,[1/] the majority of whom serve in civil defense staffs, planning and training organizations.

In a wartime situation, however, the Soviets will activate all the civil defense leadership and staff elements which in peacetime are kept on standby and whose personnel is involved in civil defense only part-time—and that largely for training purposes. In other words, in an emergency, the civilian civil defense chiefs and their staffs, as well as the chiefs and staffs of the various services at all levels (i.e., republics, oblasts, cities, urban and rural rayons and at significant installations) will assume a full time status in charge of the civil

defense forces and organizations under their control. Undoubtedly, this will result in a significant expansion of the command and control organization which will participate in SNAVR operations and may involve several hundred thousand persons. For example, at an essential plant, as a result of an emergency, full time civil defense duties would be assumed by the director of the plant, his main deputy, and three other deputies (for political affairs, engineering-technical matters and material-technical supplies), while the chiefs of staff (who may or may not be full time in peacetime) will then have the full time assistance of two or three deputies as well as of the chiefs of the plant's various civil defense services.[2/]

An emergency will also result in the activation of the civilian civil defense formations. The total size of this force is likely to be in excess of 20 million.[3/] Of this total, the number of personnel serving in the shelter management and operation teams which do not participate in SNAVR, is relatively small. If, as Soviet publications indicate, these teams will be composed in most cases of three persons and there are at present some 15,000 to 20,000 blast shelters in the cities and at industrial sites,[4/] then the total personnel assigned to this task will be on the order of 60,000 to 100,000. It is probable that in an emergency additional shelter teams will be activated to manage dual purpose shelters (i.e., underground garages, tunnels, walkways, subways, etc.) and some of the hastily-built blast shelters. Even so, personnel engaged in shelter management and operations is unlikely to total much over 100,000 and surely less than 200,000, all the more so as the Soviets hope to evacuate most the population of potential high risk cities before an enemy attack which may leave many shelters in them unoccupied. In other words, the element of the civil defense organization which does not participate in SNAVR appears to represent less than one percent of the total personnel in the Soviet organized civilian civil defense forces.

Of course, in practice not all of these 20 million-plus civil defense personnel would be available to participate in SNAVR operations

in targeted urban areas and at targeted installations. For one thing, a substantial part of this personnel will be based on the agricultural work force on state and collective farms which, in a large number of cases, will be too far from the disaster areas to provide assistance. Furthermore, a major share of all rural civil defense formations will be engaged in dealing with the effects of radioactive fallout on agricultural resources and with any damage caused by blast and fires. Another factor is that transfer of civil defense formations from cities and installations not subjected to attack to those struck by nuclear weapons may be impractical over any significant distance in a post-strike environment. Furthermore, most of these formations will have to remain in place in order to be ready to deal with the effects of possible subsequent enemy strikes against their cities or installations. Still, as Soviet statements indicate, it is expected that SNAVR and later repair and restoration activities will require the efforts of many millions of Soviet citizens, and obviously unless they suffer major losses from an enemy surprise attack, Soviet civil defense has the capability to field very large civil defense forces to implement SNAVR.

It is also worth noting that these forces will be made up of a high percentage of skilled personnel drawn from many professions. As was noted in Section 3, the SNAVR forces will be drawn not only from the industrial, transportation and rural work force, but also from all types of specialized services and organizations which could enhance the effectiveness of SNAVR operations. Indeed, while the percentage of personnel who will serve in the SNAVR formations will vary depending in part on the type of organization or installation from which these formations are drawn, in the case of the specialized services and organizations, most of their personnel will likely be involved, with the exception of military reservists called up for active military service. This will be especially true for public health and medical organizations, public works and construction organizations, transportation, utilities, and, naturally, police, fire and communications organizations.

The size of some of these organizations on which data is provided in Soviet publications and what this may imply for the size of civil defense forces is discussed below.

• MEDICAL PERSONNEL: At the beginning of 1981, the Soviet Union was said to have 996,000 medical doctors and 2,789,900 middle-level medical personnel.[5/] Of course, in the event of a threat of war, a portion of the medical personnel will be called up for military service. However, 69 percent of medical doctors are women, and there is a high percentage of women among the middle-level medical personnel. In addition, there are several million members of the Volunteer First Aid Detachments. Furthermore, in an emergency, military medical units and facilities may supplement the civilian medical formations and facilities.[6/] As was noted, in wartime all medical personnel not in the armed forces (with the exception of pregnant women and women with young children) would be expected to serve in the civil defense Medical Service and its formations. This is likely to represent upward of 1.8 million doctors and middle-level personnel, assisted by several million service personnel and members of Volunteer First Aid Detachments.

• COMMUNICATIONS PERSONNEL: Officially, the Soviet Union had at the beginning of 1981, 1,634,000 persons described as employed in the communications service and organizations.[7/] This number, however, also includes postal workers. The actual number of persons working in radio, telephone, telegraph, television and other forms of communications is not given in Soviet statistics. Certainly most of such personnel not called up for military service is likely to be included in the civil defense Communications Service. In addition, the civil defense formations will have their own communications teams or squads. Soviet discussion of civil defense exercises give no indication of any shortage of communications personnel. It is possible that during SNAVR operations the military will assist with the repair and restoration of damaged communications facilities.

• ENGINEERING PERSONNEL: Soviet statistics provide inadequate information on personnel in this category, in particular on personnel employed in utilities, who, again with the exception of those called up for military service, would for the most part serve in civil defense formations. A large part of employees of construction organizations would be included in civil defense engineering formations of one type or another. At the beginning of 1981, 11,572,000 persons were employed in construction organizations, including 1,630,000 engineers and technicians.[8/] Of those, 1,251,000 engineers and technicians and 8,174,000 workers were employed in building and assembly organizations.[9/] It is likely that most male engineers, technicians and workers not called up for military service would serve in civil defense engineering and repair formations. This could easily represent a force in excess of 5 million.

• TRANSPORTATION PERSONNEL: At the beginning of 1981, there were 10,324,000 employed in transportation organizations, including 2,616,000 in railroad transportation, 433,000 in water transportation, and 7,275,000 in automotive and urban electrical transportation—among the latter, 2,432,000 in road freight transport.[10/] Again, except for those called up for military service, all transportation workers would be considered in wartime to be mobilized to perform what is regarded as a critical war service.

• FIREFIGHTING AND POLICE PERSONNEL: No information was found in Soviet publications about the number of personnel serving in firefighting and police organizations or in firefighting and security services at industrial and other installations. It is certain, however, that in an emergency all of this personnel would be available for civil defense duty.

• INDUSTRIAL WORKERS: The percentage of the industrial work force which serves in civil defense formations appears to vary. At some enterprises it is on the order of 20 to 25 percent, while at others it may be 70 percent or more.[11/] It is likely that the percentage will be especially high at the so-called essential enterprises which will remain in operation in wartime. However, the number of such enterprises and

the size of their wartime work force naturally is kept secret in the Soviet Union. At the beginning of 1981, 36,891,000 persons were employed in industry.[12/] If 20 percent of this work force actually served in civil defense formations, this would represent in excess of 7 million persons. Of course the non-essential industries will be shut down in an emergency and their employees would be resettled in the rural areas—in many instances at too great a distance from the targeted cities to make their participation in SNAVR operations practical. As was noted, however, a high percentage of the employees of enterprises which will remain in operation in wartime will participate in SNAVR formations.

Another way to make a very rough estimate of the size of the industrial and utilities work force which may be engaged in SNAVR operations is based on the assumption, suggested by some Soviet civil defense leaders, that following the evacuation of the urban population, on the average 10 percent of urban residents would be present in the evacuated cities. This 10 percent would be made up primarily of one workshift of the workers of essential industrial enterprises, utilities and services which will remain in operation in wartime.

According to Soviet population statistics for January 1981, there were 273 cities in the USSR with a population of 100,000 or greater, including 20 cities with a population of over one million.[13/] The total population of these cities was somewhat over 109 million. Assuming that the population of all of these cities would be evacuated, the workshifts present in these cities at any one time could number some 11 million workers. Given that in wartime the workers will be divided into two 12-hour workshifts, the size of the resting workshifts in the exurban areas will be approximately the same or also some 11 million. If one assumes that at least 70 percent of the resting workshifts could be employed in SNAVR operations, this would constitute a force of some 7.7 million. To this number could be added the 7 percent or so of the population (i.e., 70 percent of the resting workshifts) of cities of 50,000 to 100,000 which contain essential enterprises and installations and would also be evacuated prior to an enemy attack.

• RURAL WORKERS: The availability of rural civil defense formations to assist in SNAVR operations in the event of nuclear strikes on cities or essential installations will probably vary from locality to locality, depending on the location of these formations relative to the targeted cities and installations. In 1980, there were 26.1 million persons identified as working in agricultural production.[14/] If 20 percent of these were in civil defense formations, this would represent a force of 6.2 million; if 50 percent, then 13 million.

• MILITARY FORCES: Although Soviet publications make specific mention of civil defense troops and the existence of a military civil defense academy which graduates junior officers for service with these troops, no information is published on the peacetime size of this force. In wartime, this force would be greatly expanded following the mobilization of the armed forces and the call up of reservists. As a guess, it is assumed here that the total wartime strength of Soviet civil defense troops may be on the order of 150,000 to 200,000 men who could participate in SNAVR operations. In addition, in an emergency the military districts could commit other military units (engineering, rail, bridge and road construction, firefighting, medical communications, helicopter, etc.) to these operations.

Assessments of the level of effort devoted by USSR Civil Defense to the SNAVR mission in terms of investments and costs is especially difficult and uncertain because of lack of information about the costs of the civil defense program as a whole and of any of its elements. On the whole, SNAVR requires the least peacetime construction in comparison with other elements of the civil defense program which call for shelter construction and investments in various measures for protection of the economy and for assuring its "stable" operation in wartime. To the extent that peacetime shelter construction is significant for SNAVR, it applies primarily to exurban command posts which may be built for the civil defense command elements at all levels. In the same category would be protected storage installations in exurban areas for reserves of

equipment, spare parts and supplies which would be used by the SNAVR forces. The number of such storage facilities and the amount of such reserves stored in them could represent over time a substantial investment.

Given that the civilian civil defense formations are unpaid and on standby in peacetime, personnel costs of SNAVR formations is minimal. More significant is the peacetime cost of full time civilian and military personnel (some 100,000).

In terms of equipment, the SNAVR forces will use primarily what is already available and in peacetime use in the economy (i.e., construction equipment, firefighting equipment, transportation equipment, etc.). Nevertheless, a certain amount of special equipment will also be provided. This will include gas masks and protective coveralls or suits for all formation personnel—over 20 million persons, large numbers of dosimeters, radiation meters and chemical detection kits, medical equipment and stretchers for the Volunteer First Aid Detachments, equipment and supplies for field hospitals and First Medical Aid Detachments, special decontamination equipment and decontamination supplies, a large number of various types of radios, field kitchens and tents, various hand tools and so on. Undoubtedly, there also will be certain reserves of specialized vehicles, engineering and decontamination equipment and so on. In addition, there will be the cost of the equipment of the military civil defense troops and of the helicopters, aircraft and other materiel dedicated to civil defense which may be used in SNAVR operations. Unfortunately, there is no precise data on how much of the specialized equipment and various types of supplies are prepared and readily available. There is also insufficient data concerning the state of repairs of the equipment and the availability of spare parts for it, although occasionally published complaints suggest that there are problems in this area.

There are several types of gas masks and presumably a sufficient number of them available to equip all or the great majority of SNAVR personnel. At present there exists nearly a dozen different types of radiation or roentgen meters, dosimeters and individual dosimeters.[15/]

These are described in some detail in Soviet literature. According to published Soviet instructions, dosimeters are assigned one to a team or squad or one-two for every 14-20 persons, and there should also be one in each shelter (including remote readers).[16/] Individual exposure indicators will be issued to SNAVR personnel working in contaminated zones of destruction and also to essential workers who will continue their work at essential enterprises. Each reconnaissance team will have radiation meters or dosimeters and so will each radiation control team. The total number of available radiation instruments is not known.

Normally the gas masks, protective clothing, dosimeters and all other personal equipment of civil defense personnel is under the control of the deputy commanders of units for supplies. In peacetime, this equipment is kept in storage, either at the enterprises, utilities, institutes, schools, etc. or, in some cases, in exurban warehouses and issued to the units only for training and exercises. Presumably, in time of threat of war, the equipment will be issued to the civil defense personnel.

Also little is known about Soviet stockpiles and storage of medical supplies, food, fuel, equipment, machinery, spare parts, etc. While protected storage facilities in exurban areas are known to exist, no precise information is available as to their number, capacity or what is stored in them.[17/] Soviet publications indicate, however, that it is expected to expand stocks of standby supplies and equipment for industrial enterprises, utilities, etc. during a pre-attack crisis situation. More recently, some Soviet military leaders, notably Marshal of the Soviet Union Ogarkov, have been arguing that it is not possible to rely on the occurrence of a protracted pre-war crisis and therefore that all necessary support preparations for the economy, and presumably civil defense, should already be implemented in peacetime.[18/]

Despite uncertainties, it is likely that the special equipment and supplies intended for SNAVR represent the equivalent of a multi-billion dollar investment. Even so, in all probability the cost of this investment is significantly smaller than that of Soviet investments in

shelter construction, industrial hardening and other measures intended to ensure the wartime operation of the economy.

Finally, there is the cost of training the SNAVR formations. According to Soviet published materials, this training includes the construction of various training sites and facilities at city, urban rayon and large installation levels. The cost of these training facilities varies. Soviet publications mention some having been built at the cost of 12,500 rubles (or some $16,000) and others at the cost of 73,000 rubles (or nearly $100,000).[19/] Given the large number of such training facilities,[20/] it is possible that in all their construction may have cost the equivalent of $1 to $3 billion. It should be noted, however, that training in SNAVR operations often takes place in conjunction with the demolition of old buildings or industrial structures, repair of installations, industrial accidents and so on. Except for training facilities and the expenditure of a certain amount on imitation materials and supplies, the training involves no significant costs because the time of personnel engaged in the training is essentially free.

Overall, therefore, while Soviet civil defense appears to have built up over the years a large capability for conducting post-strike rescue, damage-limiting, repair and restoration operations in zones of destruction, its annual cost is probably less than the cost of the other elements of the Soviet civil defense program.

Section 8

FOOTNOTES

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3. See DCI, op. cit., p. 8; L. Goure, War Survival in Soviet Strategy: USSR Civil Defense, (Washington, D.C.: Advanced International Studies Institute, 1976), p. 74.

4. DCI, op. cit., p. 9.

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6. For example, see Lieutenant Colonel Ye. Galitskiy, "The Coordination of Civil Defense with Units of the Armed Forces," Voyennaya Mysl' (Military Thought), No. 4, April 1968, translated in FPD No. 0052/69, May 27, 1969, p. 51.

7. Central Statistical Administration, op. cit., p. 358.

8. Ibid., p. 351.

9. Ibid.

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11. See Erkki Mäntyaara, Väestösuogelu Lehti (Helsinki), No. 2, 1974; Gromov and Krechetnikov, op. cit., p. 27; Goure, op. cit., p. 73.

12. Central Statistical Administration, op. cit., p. 357; Vestnik Statistiki, No. 8, August 1981, p. 77.

13. Central Statistical Administration, op. cit., pp. 18-23.

14. Ibid., p. 282.

15. For example, see P. T. Egorov, I. A. Shlyakhov and N. I. Alabin, Grazhdanskaya Oborona (Civil Defense), 3rd edition, (Moscow: Vysshaya Shkola, 1977), pp. 110-123; M. Maksimov and B. Rykunov, "Radiological and Chemical Monitoring," Voyennyye Znaniya (Military Knowledge), No. 9, September 1980, pp. 24-25; Colonel S. Titov, "Be Able to Work with Instruments," Voyennyye Znaniya, No. 1, January 1981, pp. 18-19.

16. Maksimov and Rykunov, op. cit., p. 24.

17. For a discussion of Soviet stockpiles and reserves, see L. Goure, Soviet Civil Defense Concepts, Programs and Measures for the Protection of Industry in Nuclear War Conditions, Advanced International Studies Institute, Final Report, June 1981, prepared for the Federal Emergency Management Agency under Contract No. EMW-C-0384, pp. 107-112.

18. Marshal of the Soviet Union N. Ogarkov, "Guarding Peaceful Labor," Kommunist, No. 10, July 1981, p. 87.

19. For example, see Colonel A. Zaitsev, "A Double Advantage," Voyennyye Znaniya (Military Knowledge), No. 1, January 1974, p. 25.

20. Goure, op. cit., pp. 199-200.

Section 9

CONCLUSIONS AND IMPLICATIONS FOR U.S. CIVIL DEFENSE PLANNING

There is no doubt that the Soviets regard the capability to conduct large-scale post-strike rescue, damage-limiting, repair and restoration operations (also known by the Soviet acronym "SNAVR") as an essential element of their civil defense program. They believe this capability can not only reduce losses—especially among essential workers—but also can make an important and possibly even critical contribution to the Soviet Union's ability to wage a war, in particular a protracted one. They also see it as enhancing prospects for an early postwar recovery which may leave the Soviet Union in a dominant position in the world. Furthermore, given the commitment of nearly all of the more than 20 million strong organized civil defense forces to these post-strike operations and the multi-billion dollar investment in this civil defense mission, there is every reason to believe that the Soviets are serious about it.

It is evident that requirement for post-strike SNAVR operations logically follows from Soviet views on the wartime role of the economy and transportation in support of warfighting capabilities and their potential contribution to the attainment of superiority by the Soviet Union in the course of the war and after its termination. Thus, the necessity for post-strike rescue operations in the zones of nuclear destructior arises as a consequence of Soviet intentions to keep one workshift continuously at risk at essential industrial enterprises, utilities, installations and transportation systems even after the evacuation of the urban population. Although these workers will have blast shelters to protect them in the event of an enemy strike, Soviet shelters are equipped and stocked for relatively short occupant staytime. Furthermore, the Soviets recognize that in the event of damage to the shelter structures, their ventilation systems or blockage of ventilation air intakes by rubble, the shelter occupants will be in critical need of

early rescue if they are to survive. Quite aside from humanitarian considerations or the desirability of reassuring the essential workers, the priority given to their rescue (even in the event the evacuation of the urban population has not been completed) follows from the Soviet belief that this valuable element of the work force will continue to be important for the war effort and postwar recovery.

Similarly, priority in damage-limiting, repair and restoration operations (other than those required to facilitate rescue activities) is assigned to those essential installations which can be rapidly put back into operation and which are judged to be necessary to the war effort and further logistic support of the armed forces. While this approach ensures an effective concentration and use of SNAVR forces, it also means that little or no effort will be made to limit damage from secondary effects of nuclear strikes to residential areas and non-essential installations or even to severely damaged essential installations.

The Soviets appear to have a realistic view of conditions or war scenarios which would either make effective post-strike operations practical or largely prevent their implementation. For example, they recognize that such operations would be severely curtailed or their effectiveness markedly reduced in the event of a massive enemy surprise attack on cities and value targets, which would preclude a large part of the urban SNAVR forces and their equipment from being deployed. Similarly, large-scale enemy strikes on cities and essential installations, even after the completion of the urban evacuation, or high radiation levels in the zones of destruction and nearby exurban areas may prevent timely SNAVR operations or leave little to repair and restore.

Consequently, Soviet discussions of SNAVR operations generally postulate more favorable scenarios in which the cities are evacuated and the SNAVR forces are deployed in readiness in the exurban areas, enemy strikes on cities and economic targets are limited in numbers and in the yields of warheads used, and radiation levels will not pin down the SNAVR forces or preclude the timely initiation of operations. The Soviets

apparently believe the prospects of occurrence of such favorable scenarios to be sufficiently realistic and likely that the considerable efforts and investments in the creation of a large SNAVR capability in their view are justified.

Of course, attainment of the objectives of SNAVR operations will also depend on the effectiveness of civil defense measures taken to: 1) protect the population and, in particular, the essential workers; 2) limit damage to essential industrial enterprises, utilities, transportation and other installations; and 3) ensure the "stability" of their operations in wartime.

Soviet realism (and incidentally, tough-mindedness) is also reflected in the recognition that, because SNAVR operations in major disaster areas require very large forces and a great deal of equipment, the effectiveness of such operations depends on the selective concentration of their efforts (which will focus on essential workers primarily in the zones of light, moderate and, where practical, severe damage) and to repair and restoration activities which will concentrate on lightly to moderately damaged essential installations and utility systems, while severely damaged or destroyed ones will be restored in wartime only in the case of major necessity.

The implementation of SNAVR will also be facilitated by the contingency plans for dealing with various levels of possible damage drawn up in peacetime by the civil defense staffs at various levels, especially at enterprises and installations, and the stocking in exurban areas of spare parts, repair materials, raw materials, fuel and other supplies needed to expedite the repair and resumption of operations by restorable enterprises and installations.

At the same time, the Soviets recognize that peacetime contingency planning of SNAVR is insufficient for dealing with actual nuclear war disaster situations. Consequently, decisions on the initiation and feasibility of SNAVR, the employment of forces, and the selection of work sites will depend in practice on the situation and damage assessments

provided by extensive air and ground reconnaissance of the disaster areas. Soviet civil defense manuals also suggest that a limiting factor on SNAVR operations will be the safety of SNAVR personnel whose short-time cumulative exposure to radiation should be limited by preference to a dose of some 50r and at most not exceed 100r.

The creation of a large SNAVR capability greatly benefits from the ability of USSR Civil Defense to incorporate into its organization and formations all peacetime organizations which may contribute to the effectiveness of SNAVR operations (public service, utilities, construction, transportation, technical, etc.), as well as a large number of trained and equipped industrial and rural workers. It is also evident that the effectiveness of SNAVR operations, at least at important locations, will be considerably enhanced by the participation in them of military civil defense troops and other military units with their special equipment. Finally, the conduct of SNAVR operations and the employment of forces will benefit from a fairly streamlined command and control system, which will supercede the peacetime administrative and jurisdictional lines of authority and control and will have the power to make full use of available resources. There is every reason to believe that the military will play a major controlling and decision-making role in the command and control system.

Given that the Soviet Union is committed to a large, comprehensive civil defense program, the inclusion in it of a SNAVR capability whose operations may result in a significant payoff appears to be a reasonable decision. This is all the more so as the costs of SNAVR in terms of overall Soviet investments in civil defense are probably significantly smaller than the investments in shelter construction and measures to enhance the wartime survivability of the economy and "stability" of its operations. In a large measure, this is due to the fact that in peacetime the vast majority of the multi-million civil defense personnel receives no pay for their participation in formations and training, and also because the greatest part of their equipment will come from what is in peacetime use in the economy, utilities, transportation, public service and so on.

Even so, the personal equipment of SNAVR personnel and the provision of various special equipment (for example, large numbers of radios, dosimeters and radiation meters, medical and decontamination equipment, etc.), the requirement for significant stocks of various materiel and supplies, as well as the construction of large numbers of training facilities, undoubtedly have added up over the years to a multi-billion dollar investment in the SNAVR capability.

The actual effectiveness of Soviet post-strike operations is very much scenario-dependent and, therefore, uncertain. There is every reason to believe, however, that under relatively favorable circumstances and given the existence of a large and well-equipped SNAVR force, such operations could have a significant payoff in terms of reducing human and material losses and the rapid resumption of operations by lightly to moderately damaged essential installations, utility systems, and probably also by transportation. From the Soviet viewpoint, the possibility of achieving such results and the contribution this can make to Soviet war-fighting capabilities and postwar recovery makes the effort and its cost worthwhile.

The question arises as to what implications the Soviet concepts and practices of post-strike rescue, damage-limiting, repair and restoration operations may have for U.S. civil defense planning. First, there appear to be a number of reasons why U.S. civil defense planners—like those in the Soviet Union—should be interested in such post-strike operations.

1. Planning for post-strike rescue and damage-limitation in areas of nuclear destruction, i.e., mitigation of human and material losses, is a legitimate mission of civil defense and a logical as well as necessary part of its function.

2. It is usually assumed that even if pre-attack crisis relocation (CR) is successfully implemented, a significant percentage of the population in high risk areas will refuse to leave the latter. Furthermore, it appears desirable to leave a certain number of essential workers in these areas. Given the uncertainties of how a Soviet attack may be conducted, U.S. civil

defense cannot simply write-off these elements of the population, all the less so the essential workers who may be trapped in buried shelters. Consequently, there should be plans and capabilities for conducting post-strike rescue operations in the nuclear disaster areas.

3. Damage-limitation, especially to significant economic installations, will be important in order to facilitate the sustainment of the surviving population and to hasten post-war recovery. Furthermore, U.S. planners do not exclude the possibility of a protracted war which may require the reconstitution of U.S. defense and warfighting capabilities, including essential elements of the defense industry. Finally, it is conceivable that the outcome of a nuclear war may be determined by which of the superpowers is able to win the recovery race and to reconstitute more rapidly the basic elements of national power.

As the Soviet model indicates, a major portion of the forces for post-strike operations are composed of various types of public service organizations. This also would be true for the organization of any U.S. post-strike rescue and damage-limiting capability. In practice, however, the integration of such public service organizations (municipal, county, state, private, etc.) into the civil defense system, their systematic training, effective control over them in a nuclear war situation, and the instilling of necessary discipline in their personnel, may pose major difficulties in the U.S. It may also be impractical in the U.S. to organize on a compulsory basis the essential labor force of industry, transportation, utilities, etc. to perform post-strike operations as is done in the Soviet Union. It is possible, therefore, that in order to develop the necessary capabilities for post-strike operations, greater use may have to be made in the U.S. of military forces, including the eventual creation of military civil defense troops. In any event, just as in the Soviet Union, so also in the U.S. effective utilization for post-strike operations of urban public service organizations and others which may be used for this purpose would depend on the timely relocation of their personnel and equipment to nearby exurban areas.

Of particular interest is the Soviet system of post-strike reconnaissance and damage assessment of nuclear disaster areas. It is obvious that rapid and accurate reconnaissance, supported by an effective communications system, is essential for the planning and conduct of post-strike operations. The Soviet combined use of aerial and ground reconnaissance—including the use of helicopters, light aircraft and armored vehicles—and of fixed monitoring posts appears to be well suited for this purpose. In the U.S., it may be possible to make greater use of automated monitoring and observation posts. It is possible that, as in the Soviet Union, some of the more urgent reconnaissance activities may have to be undertaken by the military.

The Soviets are undoubtedly right in believing that large-scale post-strike rescue, damage-limiting, repair and restoration operations must be supported by an effective logistic system. This implies not only a precise knowledge of available resources in exurban areas, but also the pre-positioning and stockpiling of deficient supplies and equipment there to support the operations. It also implies that various civil defense command levels must have the authority to take and use whatever resources are available regardless of their peacetime ownership.

Given the nature and possible extent of nuclear damage and hazards which may result from strikes on urban areas and industrial centers, the Soviets are probably right to give priority to the conduct of rescue, damage-limiting and emergency repair operations in the zones of light and moderate damage. It seems likely that these zones will contain the largest number of survivors and that they will offer the best prospects for effective damage-limiting operations. Even so, the latter activities will probably have to be selective in order to make efficient use of available civil defense resources.

There is no doubt that large-scale rescue operations must be supported by a well-organized medical service. It may be impractical in the U.S. to attempt to duplicate the Soviet "volunteer first aid" system for work in the disaster areas. However, it should be noted that otherwise

the Soviet civil defense medical service and its *modus operandi* appears to be essentially modeled on the military medical service, i.e., first medical aid and triage units as close as possible to the zone of rescue operations, backed by a system of field and base hospitals in safe areas. The U.S. could develop a similar system largely modeled on the U.S. Army Medical Service in the field. However, this would require the timely evacuation of medical organizations from high risk areas, a system of pre-assigning medical personnel in private practice to specific medical organizations in the exurban areas, and the pre-positioning of stocks of medical supplies and equipment in those areas.

As in the case of Soviet plans for post-strike operations, their effective conduct in the U.S. will also depend on the character of the post-attack environment—in particular on the scope and intensity of radioactive contamination. Given Soviet expectations that the post-strike environment may be favorable for the conduct of rescue and damage-limiting operations in the Soviet Union, the possible occurrence of similar conditions in the U.S. cannot be discounted. Account would have to be taken, however, of the relatively larger yields of Soviet warheads and the threat from fallout which may result from Soviet strikes on military and other non-urban high priority targets. Finally, as in the Soviet case, the personnel engaged in large-scale post-strike operations will be vulnerable to follow-on enemy strikes and dangerous fallout while in transit to the zones of operations and while working in them. This shared vulnerability could be an incentive for both sides to refrain from deliberately exploiting it. Nevertheless, the ideal answer to this problem would be the availability of sufficient shelters along the approach routes and in the likely zones of operation to protect civil defense personnel against these threats.

There appears to be ample reasons why U.S. civil defense should have a capability to deal not only with the consequences of natural and industrial disasters, but also with those resulting from an enemy nuclear attack. There is at least a reasonable possibility that conditions would

permit the conduct of post-strike rescue, damage-limiting, emergency repair and restoration operations. It could also be argued that the existence of such a capability may enhance public confidence in civil defense as well as strengthen the willingness of essential workers to remain in risk areas. After all, the public already expects and is used to the conduct of such operations in non-nuclear disaster situations. Thus, while due allowances must be made for the differences in the Soviet and U.S. political, governmental, societal and economic, as well as value, systems, Soviet concepts, organization and capabilities for conducting large-scale post-strike operations can offer useful lessons should the U.S. decide to create such a capability for itself.

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SOVIET POST-STRIKE CIVIL DEFENSE RESCUE, DAMAGE-LIMITING, REPAIR AND RESTORATION OPERATIONS

Dr. Leon Goure´, Science Applications, Inc., McLean, VA
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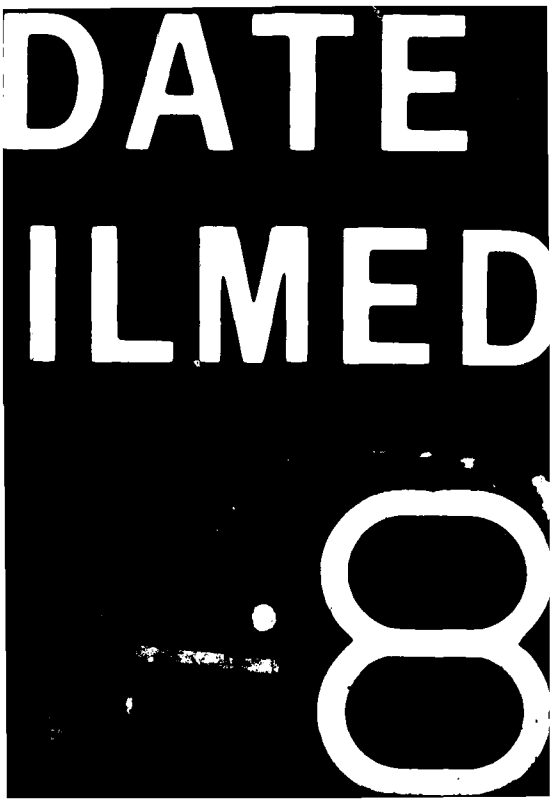
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