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Chemical Warfare Developments—USSR: Soviet Chemical Logistics (U)

A Defense Intelligence Report

Defense Intelligence Agency

US Army Foreign Science and Technology Center

DST-1620S-051-87
15 June 1987

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CHEMICAL WARFARE DEVELOPMENTS--USSR:
SOVIET CHEMICAL LOGISTICS (U)

[redacted] (b)(3):10 USC 424

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PREFACE

~~(C)~~ In order to illustrate the use of the methodology presented by this study, a number of assumptions had to be made. Confidence in the validity of these assumptions ranges from moderate to low. The utility of the estimate generated by using these assumptions is to illustrate the use of the model, rather than to give a definitive quantification of the size of the Soviet protective stockpile.

(U) This study discusses Soviet military requirements for chemical logistics to support ground forces operations when chemical, nuclear, or biological weapons are employed or encountered. The logistical implications of large-scale consumption of chemical materiel for smoke or flame operations, decontamination or protection have not previously been determined. The need to stock large amounts of this materiel at all force levels requires the national-level chemical service to include them in its inventory. Any estimate of bulk chemical agent storage must reflect the presence of this other materiel in the chemical depots, and it was the question of the CW agent stockpile that actually necessitated this logistics study.

(U) The terms "chemical logistics," "chemical troops," and "chemical depots" are used throughout this study because they reflect Soviet terminology for these concepts; for example, a chemical depot is a "khimicheskiy sklad." This usage is important because the term "sklad" can be translated as "dump." The Soviets do not use the term "chemical warfare" when discussing facilities or organizations involved in chemical troop activity or storage of chemical materiel.

(U) In order to calculate storage requirements several assumptions and analytical judgments were made in this study. The assumptions represent planning factors of the type used by staff officers to determine wartime requirements and are based on the best available evidence. The assumptions can be easily adjusted to reflect new information as it is received. The analytical judgments were based on broad views rather than specific information when such information was not available. They, too, can be adjusted.

(U) Constructive criticisms, comments, or suggested changes are encouraged and should be forwarded to the Defense Intelligence Agency, Washington, DC 20301-6111 (ATTN: DT).

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SUMMARY

~~(S)~~ An estimate of the Soviet requirement for decontaminant, protective equipment, smoke materiel, and other chemical warfare related materiel can account for the materiel storage needs of the Soviet army in their chemical depots. Such an estimate can be used to find the area available for chemical agents or munitions that could be stored in these depots. A series of assumptions must be made to produce such an estimate. The overall confidence of any estimate is moderate to low, but the methodology presented in this study allows examination of multiple alternatives, not just the circumstances examined in this study.

~~(S)~~ This study assumes chemical munitions are stored at ammunition depots, and the chemical agent(s) present at chemical depots are stored in bulk for later filling into munitions.

~~(S)~~ To estimate the quantity of bulk agent that can be stored in Soviet national-level chemical depots, one approach is to first determine the space requirements for the other items that need to be stored. A model of the Soviet logistical requirements for the storage of chemical materiel (decontaminants, protective gear, smoke and flame chemicals and chemical armament) was constructed, using the Soviet doctrinal requirements for use of these items, training procedures, correlation with other storage doctrine and probability of operating in a particular environment.

~~(S-NOFORN-WNINTEL)~~ In this study all calculations are based on an assumption that 50% of all contamination is nuclear and 50% is chemical. Calculations assume 90 days of storage, including 3 to 5 days at division level, 2 days at army depots, 3 to 4 days at front forward bases, and 10 to 15 days at front rear bases. This allows for an average of 68 days storage at national-level depots. The results of these calculations show that motorized rifle/tank division-level chemical depots must store for daily use about 23 metric tons (MT) of decontaminant, about 11 MT of protective gear, 11.9 MT of smoke-producing materiel, and 2.5 MT of chemical armament.

~~(S-NOFORN-WNINTEL)~~ The total national storage requirement for decontaminant, protective gear, smoke and flame materiel, and chemical armament is estimated at between 499 000 MT and 656 000 MT. The high estimate assumes 68 days of storage for 51 tank divisions (TD), 141 motorized rifle divisions (MRD), and 7 airborne (ABN) divisions (all at full readiness). The low estimate assumes 68 days of storage for the 20 fronts the Soviets can

establish. Each front is assumed to consist of an average of two combined-arms armies and half of a tank army; i.e., there is one tank army for every two fronts. The estimated requirements are:

	High estimate (MT)	Low estimate (MT)
Decontaminant	310 000	235 000
Protective gear	149 000	114 000
Smoke materiel	161 000	121 000
Flame materiel	3 000	3 000
Chemical armament	33 000	26 000
Estimated total	656 000	499 000

~~(S)~~ These numbers do not reflect nondivisional assets; requirements for terrain decontamination; air force, Strategic Rocket Forces, PVO, or naval requirements; or any adjustments that would reflect the likelihood that the entire ground force of the Soviet army would not be involved in a chemical-biological-radiological environment.

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SECTION I

INTRODUCTION (U)

1. Background (U)

(C) Although the intelligence community has long known how the Soviets protect equipment and personnel against chemical-biological-radiological (CBR) contamination, the overall logistical implications of CBR defense, smoke, flame, and specialized chemical materiel requirements have not been assessed. Previously, the intelligence community assessed that the logistical load was minimal, because it was believed that most decontamination solution was mainly water. Accumulated evidence now suggests that the Soviets use significant amounts of other liquid chemicals in decontamination solutions as well as solid decontaminants dispensed by systems such as the ARS-14 vehicle. In addition, the requirements to replace used, lost and damaged protective equipment are now better understood. This replacement imposes a significant load on the logistical system, although not of the same magnitude as the requirements for ammunition, petroleum, oil, and lubricants (POL), or food. The dissemination of obscurants and incendiaries necessitates the replacement of these supplies as well, through the same logistical system.

2. Implications of Logistical Load (U)

~~(C)~~ Consumption of large amounts of decontaminants imposes a load on the Soviet logistic system. The materiel stored at Soviet chemical depots includes decontaminants, smoke and flame supplies, protective gear, decontamination equipment, and other protective measures. During World War II, the Soviets frequently combined smoke, flame, and decontamination agents into one category when discussing chemical supply. The Hirsch report states that a Soviet regulation in 1939 gave the acceptance standards for smoke agents delivered to depots operated by the Directorate of Chemical Defense of the RKKA. (Hirsch was a German chemical warfare (CW) expert who prepared a study on Soviet CW after World War II.)

3. Significance (U)

(b)(1),1.4 (h)

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(b)(1),1.4 (h)

[redacted] Storage requirements for decontaminant, protective equipment, and other materiel were estimated using a computer spreadsheet. The requirements for decontamination materiel can be challenged on the grounds that this represents a large investment by the Soviets, both in real estate and in materiel. [redacted]

(b)(1),1.4 (h)

SECTION II

CHEMICAL LOGISTICS SYSTEM (U)

1. Flow of Chemical Materiel (U)

a. ~~(S)~~ The Soviet military procures materiel from industry by contract. Standards are established and enforced through inspection at the factory by a military representative of the customer (voyenpred) who accepts the materiel for military service.

b. ~~(S)~~ While we do not know how every single shipment of chemical-related materiel takes place, normal Soviet practice is to ship the materiel from the production plant to the using unit or a national-level military storage facility. Table I is a listing of the national-level and other major chemical depots. Categorizing these depots as national-level, as has previously been done, is difficult because we have little definitive information on the true subordination of these depots.

[redacted]

Table I. (U) Large Chemical Depots (b)(1),1.4 (c),1.4 (h)

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Category A	Category B	
Daugavpils	Amankaragay	Kvargozero
Seltso	Arys	Starrye Dorogi
Poltava	Kalinin	Frolischi
Shikhany Depot 2	Kodyma	Rustavi
Chapayevsk	Ochakovo	Prosvet
Korneyevka	Revda	
Kambarka	Rostov	
Nalobikha	Shikhany Depot 1	
Staraya Kuka	Ili	
Krasnaya Rechka	Vsevolozhsk	
Buyanki	Belebey	

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c. ~~(S)~~ The map given below indicates the locations of the Category A depots in table I. As can be seen, most of the depots are located in the western part of the USSR.

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(b)(1),1.4(c)

(~~S~~) Chemical Depots in the Soviet Union

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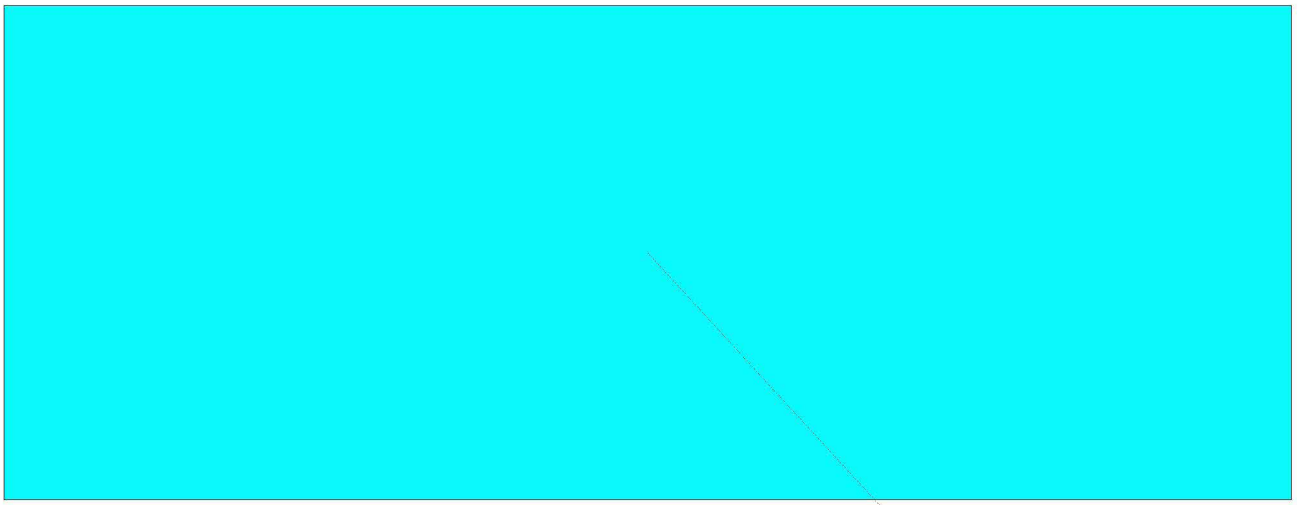
d. ~~(S)~~ As replenishment is required, the Directorate of the Chief of Chemical Troops will direct transfers of materiel from national-level depots to unit depots, probably at the Military District (MD) front level. This depot may issue chemical materiel to a lower-level depot or directly to a chemical unit. If the materiel is a decontaminant, it may be mixed from its constituent chemicals by the chemical unit prior to issuance to a nonchemical unit. If the chemical unit is to use the decontaminant, it may hold the constituent chemicals unmixed until just before use.

e. ~~(S)~~ Training of chemical specialists at formal training schools or units includes use of actual decontaminants. It is nearly certain, however, that very little decontaminant is actually expended in training with tactical units; a tactical unit conducting training will usually use water to simulate the actual decontaminant.



2. Location of Supplies by Echelon (U) (b)(1),1.4 (h)

a. ~~(S)~~ Within the Soviet ground forces, supplies are believed to be echeloned. Table II lists the number of days of supply held at each echelon. As noted previously, it is reasonably certain that the Soviets stock about 90 days of supply. The central (national-level) arsenals, bases, and depots must accordingly stock 64 to 72 days of supply to resupply the fronts.

b. ~~(S)~~ A typical front is usually considered to have three combined-arms (CA) armies and one tank army; we have altered the strength as follows because not all elements of the front will be in continuous combat. For purposes of this study it was assumed that a front has two CA armies and one-half of a tank army. Each CA army has two motorized rifle divisions (MRD)

and one tank division (TD). Each tank army has two TD and one MRD. Using this organization, we calculated the approximate amount of chemical support required at each echelon. (Although an airborne [ABN] division may be given to a front for a specific operation, we did not include it in these discussions. If required, it could be added.)

Table II. (U) Soviet Stockpiles by Echelon

~~(SECRET)~~

Echelon	Days of supply held	Avg. day's supply
Division	3-5	4
Army mobile base	2	2
Front forward base	3-4	3
Front rear base	10-15	13
Central depots	64-72	68
Total	82-98	90

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c. ~~(S)~~ Within a Soviet division, each unit, down to squad or platoon level, has organic decontamination capabilities to enable it to perform emergency or partial decontamination. In addition, there are Chemical Troop units equipped with greater decontamination capabilities. Each Soviet vehicle or major weapon system has at least one onboard vehicle decontamination kit or system. Each combat-arms regiment has a decontamination platoon. Each division has a decontamination company. The division has a total of 29 ARS-12/14 and 2 TMS-65 decontamination vehicles.

SECTION III

DECONTAMINATION EQUIPMENT AND CHEMICALS (U)

1. Requirement for Decontamination (U)

~~(C)~~ During operations in which chemical, nuclear, or biological weapons are involved, some vehicles and weapon systems will be contaminated with material that poses significant health hazards to their crews. While operations can continue with external contamination, eventually all contaminated equipment must be decontaminated to avoid endangering the crews. Decontamination requires the use of special materiel.

2. Decontamination Chemicals (U)

(C) The Soviets list a number of chemicals to use during decontamination operations. Some chemicals are primarily for decontamination of chemical and/or biological agents; others remove radioactive fallout. Different decontaminants are used for personnel and equipment. Chemicals used in replacement kits for personal decontamination are not specifically included in the list below. The chemicals in these kits are the same as some items on the list; however, because the entire kit must be replaced, kits are included with protective items. The following chemicals are used by the Soviets for decontamination.

a. (U) DT-2 (Dichloramine-T) (U). Used with the ARS series decontamination vehicles.

b. (U) DT-6 (Hexachloromelamine) (U). Used with the ARS-series decontamination vehicles.

c. (U) Dichloroethane (U). Used with the ARS-series decontamination vehicles; also used (during World War II) as an antifreeze in munitions filled with mustard (H).

d. (U) Caustic Soda (Sodium Hydroxide) (U). Used with ARS-series decontamination vehicles.

e. (U) Monoethanolamine (U). Used with the ARS-series decontamination vehicles.

f. (U) Ammonia Water (20%-25% Ammonia, 75%-80% Water) (U). Used with the ARS-series decontamination vehicle primarily as an antifreeze in cold weather. Ammonia water also enhances decontaminating capability of the solution to which it is added.

g. (U) Ammonium Bicarbonate (U). Used with the AGV-3 decontamination equipment.

h. (U) DTS-GK (Three Parts Calcium Hypochlorite, Two Parts Calcium Hydroxide) (U). Used with the ARS decontamination vehicle.

i. (U) SF-2U (Detergent) (U). Used with the ARS-series decontamination vehicles.

j. (U) SN-50 (Detergent) (U). One packet per vehicle (less tanks), used with the DK-4K-series vehicle decontamination sets.

k. (U) RD (U). A mixture of benzene, caustic soda, ethylenediamine and alcohol, RD is used in the TDP decontamination set, which is issued with each Soviet tank.

3. Decontamination Solutions (U)

a. ~~(C)~~ Those chemicals mentioned in paragraph 2 are normally mixed in solutions given various names by the Soviets, rather than using the proper chemical name. (In addition to the solutions mentioned here, Soviet manuals discuss other decontamination liquids, primarily organic solvents; e.g., benzene, kerosene, etc. It is almost certain that these other decontaminants are expedients to be used when normal solutions are not available through supply channels.)

b. (U) The normally used solutions are designated as follows.

(1) ~~(C)~~ The primary decontamination solutions used by the Soviets for chemical decontamination of equipment are Decontamination Solution Number 1 and Decontamination Solution Number 2. (b)(1),1.4 (h)

[redacted]

(b)(1),1.4 (h)

(b)(1),1.4 (h)

(b)(1),1.4 (h)

(3) ~~(C)~~ SF-2U is also dissolved in water prior to use. It is used to remove radioactive fallout. The Soviets recognize that all decontamination solutions that remove chemicals will also remove radioactive contamination.

(4) ~~(C)~~ Ammonium bicarbonate is used by steam-generating equipment to decontaminate clothing.

(5) ~~(C)~~ SN-50 is mixed with water in kits used by operators of trucks or armored personnel carriers (APC) to partially decontaminate their equipment, when possible.

(6) ~~(C)~~ RD is issued premixed and prepackaged in fire-extinguisher-like cylinders known as TDP; these are used by tank crews in partial decontamination operations.

4. Decontamination Equipment (U)

~~(S)~~ The Soviets use a variety of decontamination equipment, some of which is briefly described below. The ARS, TMS, AGV, and DDA equipment is designed for complete decontamination operations performed by chemical troops. The other equipment is used by the affected personnel for partial decontamination.

(b)(1),1.4 (h)

a. ~~(C)~~ The ARS-14 decontamination vehicle is organic to most units and is used for complete decontamination of Soviet vehicles and equipment.

(b)(1),1.4 (h)

b. ~~(S)~~ The ARS-14 decontamination vehicle replaced the ARS-12 in production around 1970

(b)(1),1.4 (h)

Few units still are equipped with the ARS-12.

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Table III. (U) ARS-14 Chemical Decontamination Capability

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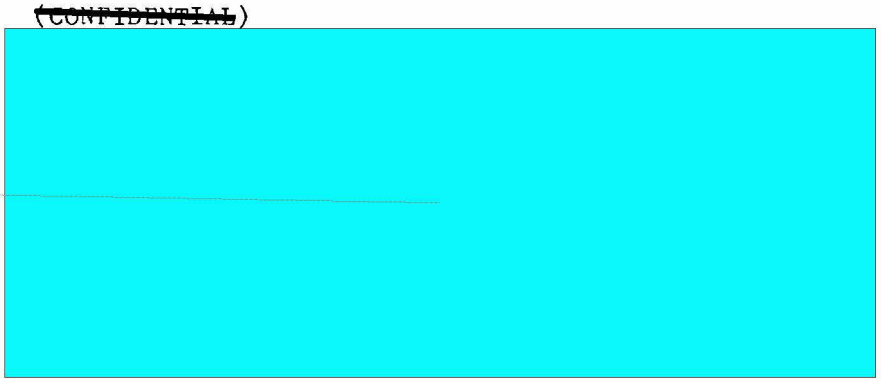


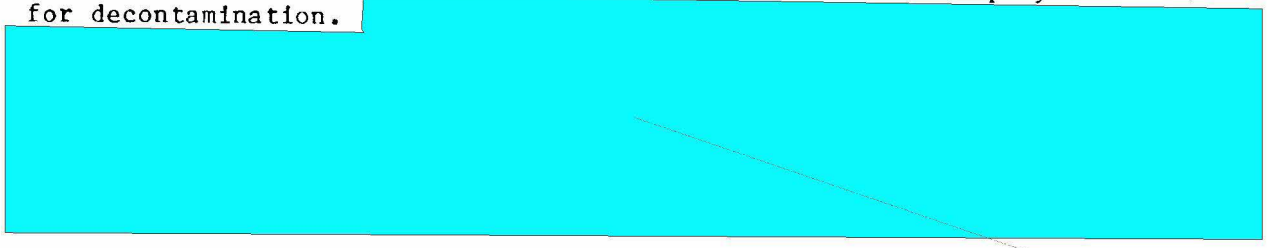
Notes: (~~CONFIDENTIAL~~)

[1]No further breakdown of decontamination capabilities is available. Obviously, trucks vary in size; therefore, these figures represent "generic" norms for average units. Units having vehicles larger or smaller than normal will need more or less decontamination solution.

[2]Using the concept of "generic" vehicle classifications, the exact equipment nomenclature is not essential. To compute requirements for decontaminating materiel, only the general type of equipment need be known. To estimate the ARS capabilities for generic items not included in the table, the table item with the closest surface area is used.

[3]The 57-mm weapon is assumed to mean the 57-mm S-60 antiaircraft gun. The 85-mm weapon was defined for this study as an antitank (AT) gun; it includes the 85-mm D-44 and D-48, as well as the 100-mm T-10.

c. (~~S NOFORN~~) The TMS-65 consists of a jet engine mounted on a truck. Also mounted on the truck are an operator's cabin and two 1500-L tanks for holding liquid. One of the tanks holds jet fuel, while the other holds liquid that is injected into the jet exhaust and used to spray on vehicles for decontamination.



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d. ~~(C)~~ DK vehicle decontamination sets such as IDK and DK-4 series are carried by trucks or armored fighting vehicles (AFV) for partial decontamination of the vehicle. The IDK uses compressed air from a portable pump or the vehicle's air brakes to generate a spray; the DK-4 attaches to a gasoline powered vehicle's exhaust system.

e. ~~(S)~~ Two TDP tank decontamination sets are carried on tanks to partially decontaminate the tank.

f. ~~(C)~~ The AGV-3-series decontamination vehicles are used by chemical troop units to decontaminate clothing and fabric equipment, as well as to provide showering facilities.

g. (U) The PM-DK and A-DK equipment decontamination kits are used by their crews to partially decontaminate small-caliber, crew-served weapons and towed artillery weapons.

h. (U) There are several individual decontamination kits in the IPP series, as well as IDP kits. All are designed to allow the individual soldier to decontaminate himself and his equipment.

i. (U) The DDA-53 and DDA-66 are steam and hot water generators mounted on trucks. They are used to provide showers for personnel decontamination and contain chambers for steam cleaning clothing. Some units tow the DDP, which is a trailer-mounted version of the DDA.

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SECTION IV

DECONTAMINATION REQUIREMENTS (U)

1. Decontamination Procedures (U)

(U) To calculate probable Soviet decontamination agent requirements, it is necessary to discuss decontamination capabilities and requirements.

a. ~~(C)~~ Decontamination units do not appear to be staffed to permit continuous 24-hour-a-day operations. Sustained decontamination is most likely limited to 14 hours a day or less of actual equipment operation. Based on the work loads detailed below, it is probable that, on the average, each piece of vehicle-mounted decontamination equipment will have to expend only two full charges daily.

b. ~~(C)~~ In order to illustrate the use of the methodology presented by this study, a number of assumptions had to be made. Confidence in the validity of these assumptions ranges from moderate to low. The utility of the estimate generated by using these assumptions is to illustrate the use of the model, rather than to give a definitive quantification of the size of the Soviet protective stockpile.

c. ~~(C)~~ Since the chemical troops' mission is to protect against both nuclear and chemical/biological contamination, we assumed equal requirements for chemical and nuclear decontamination. Because chemical decontamination procedures are also effective against biological contamination, BW decontamination is considered a bonus of chemical decontamination. Partial decontamination is also assumed to be equally split between nuclear and chemical. According to Soviet doctrine, partial decontamination is performed by the affected unit before complete decontamination.

d. ~~(S)~~ The assumed split between chemical and nuclear contamination represents a group of chemical use scenarios:

- Selected use of chemicals only: If chemical weapons are used selectively prior to the use of nuclear weapons, the amount of chemical agent in the battle area will be small, as will the area of contamination. Selective use of chemical weapons would result in moderate-to-heavy contamination of some targets. If nuclear weapons are not used in conjunction with selected use of chemical weapons, all contamination on the battlefield will be chemical.

- Use of chemical and nuclear weapons: Once nuclear weapons have been employed, the areas of contamination would become very large; however, most of the contamination would be radiation, not chemical. If nuclear weapons have been used, however, chemical weapons use would be expected in addition to nuclear use.

e. ~~(C)~~ While DTS-GK mixed with water is suitable for most chemical contamination, Soviet writings devote more attention to Decontamination Solutions 1 and 2, which require more training to prepare and use. There is no question that using the organic solvents will decontaminate the vehicles--but so can DTS-GK mixed with water, at much lower ruble and transportation costs. A possible explanation for using the organic solvents is that most decontamination will be of tracked and wheeled equipment that will be muddy, greasy, or oily and contaminated. Using an organic solvent should help to clean the equipment. If there is no readily available supply of water, then organic solvents could substitute for water. In addition, DTS-GK is much more corrosive than the organics.

f. ~~(C)~~ Removal of radiological contamination from materiel is always accomplished (by the ARS vehicle) by washing with a water solution of SF-2U. This procedure requires a much smaller volume of water per item than chemical decontamination. Thus, nuclear decontamination will always result in a lower chemical cost and a smaller transportation requirement than chemical decontamination using organic solvents.

g. (U) A careful examination of probable wartime scenarios yields the following assumptions:

(1) ~~(C-NOFORN)~~ 50% of the expected contamination is chemical and 50% is radiological. For a discussion of the effects of changing this ratio, see paragraph 4.

(2) ~~(S-NOFORN)~~ 60% of all chemical decontamination involves DTS-GK, the other 40% involves Decontamination Solutions 1 and 2. For a discussion of the effects of changing this ratio, see paragraph 5.

(3) ~~(S-NOFORN)~~ When Decontamination Solution 1 is used, 50% of the time DT-6 is used and the other 50% DT-2 is used.

(4) ~~(S-NOFORN)~~ When Decontamination Solution 2 is used, 20% of the time ammonia water is added. (This assumes that the ratio of decontamination conducted during nonfreezing and freezing weather is 80 to 20.)

2. Decontaminant Stockage (U)

(C) All of the decontaminants are stocked at chemical depots or units. All except the ammonium bicarbonate (NH_4HCO_3), SN-50 and RD are used with the ARS-series trucks. RD is used in the TDP decontamination set, two of which accompany every tank. Ammonium bicarbonate is carried with the AGV-3 clothing decontamination set.

(b)(1),1.4 (h) [redacted] Some chemicals are used both by the ARS-series decontamination vehicles and by the individual vehicle crews for partial decontamination.

3. Requirements for Decontamination Solution (U)

a. ~~(S-NOFORN)~~ One way to view decontamination is to estimate how much decontamination materiel is required to decontaminate each item of equipment. Table IV shows how much materiel is required to decontaminate an item of equipment or personnel, using different solutions. The numbers are derived from stated Soviet solution concentrations and the ARS-14 capabilities stated in table III. The last three columns are based on partial decontamination usage, where leftover solution is discarded.

Table IV. (U) Chemical Quantities Required to Decontaminate Various Items

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(b)(1),1.4 (h) [redacted]

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b. ~~(S-NOFORN)~~ To calculate the total amount of decontaminant required daily for a division, the numbers of equipment and personnel to be decontaminated daily must be known. Table V shows the number of personnel and

amount of equipment, vice the seven generic categories (as defined in Note 2 of table III). Daily totals are shown for a TD, MRD, and ABN division.

Table V. (U) Number of Vehicles/ Equipment and Personnel Requiring Daily Decontamination

~~(SECRET NOFORN WNINTEL)~~

Item	MRD	TD	ABN
Tank	236	321	194
APC	129	40	18
122-mm howitzer	25	13	25
85-mm AT gun	4	0	4
120-mm mortar	19	19	19
57-mm gun	46	22	31
Truck	869	804	422
Personnel	6348	5735	3250

Notes: (~~SECRET NOFORN WNINTEL~~)

[1]These figures assume that 35% of the equipment inventory and 50% of the personnel require decontamination, as per General Pikalov's 1980 statement, quoted previously.

[2]The equipment categories are for generic definitions. For example, all tracked vehicles qualify as tanks.

c. ~~(S)~~ Table VI indicates the amount of decontamination materiel required by Soviet divisions on a daily basis. These calculations assume that the division requires decontamination and that the ratios discussed in paragraph 1 apply. Obviously, if there is no contamination, there will be no requirement to replace decontaminant. The division is believed to stock enough decontaminant to support operations for 4 days.

d. ~~(S)~~ Table VII summarizes the decontamination materiel stockage required within each army to support the divisions in that army. The table was generated by adding the army requirements for each TD and MRD in the army and does not include nondivisional units. The army is believed to stockpile materiel for 2 days of combat.

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Table VI. (U) Division Decontamination Requirements

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Division type	Daily weight solids needed (MT)	Daily weight liquids needed (MT)*	Daily total weight needed (MT)**	Four days weight (MT)
MRD	8.9	14.6	23.6	94.4
TD	8.6	13.7	22.3	89.2
ABN	4.9	7.8	12.7	50.8

*Assumes 1 m^3 liquid weighs 1 MT.

**Numbers in this column were generated by the computer using unrounded daily weights; hence they may appear incorrect when columns 1 and 2 as seen are added.

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Table VII. (U) Army Requirements for Decontaminant Stockage

~~(SECRET)~~

Type army	Single day			2 days		
	Solid (MT)	Liquid (m^3)	Total weight (MT)*	Solid (MT)	Liquid (m^3)	Total weight (MT)*
Tank	26.1	42.0	68.1	52.2	84.0	136.2
CA	26.4	42.9	69.3	52.8	85.8	138.6

*Assumes 1 m^3 of liquid weighs 1 MT.

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e. ~~(S)~~ Extrapolating these calculations further, it is possible to determine what the requirements are to store decontamination materiel at the national level to support the ground force divisions. For a force level of 51 TD, 141 MRD and 7 ABN divisions, 309 658 MT of decontaminant are required to support 68 days of combat--68 (141 [23.6] + 51 [22.3] + 7 [12.7]). These numbers can change, but represent prudent evaluation. As such this represents a minimum force level.

f. ~~(S)~~ The storage of decontaminant can be expressed in more than one way. We have been converting the liquid volumes to metric tons in order to

determine a total weight for all kinds of decontaminant. However, the liquids can be viewed separately, since they are stored in drums of 25-L, 50-L, 100-L, and 250-L capacity, which may be stored in the open, and are thus potentially countable.

(b)(1),1.4 (h)

Also, we are assuming the use of the larger-volume drums (where both are known to be used to store a particular chemical) at army level and above, with transfer to some 100-L drums to aid in solution preparation only at division level. This assumption was based on greater ease of handling the fewer containers, with no need for the smaller volume.

(b)(1),1.4 (h)

Table VIII. (U) Liquid Decontaminant Storage

~~(SECRET)~~

Unit	DCE m^3	DCE 100-L drums	DCE 250-L drums	MEA m^3	MEA 100-L drums	MEA 250-L drums	NH_3 water m^3	NH_3 water 100-L drums	NH_3 water 250-L drums	RD m^3	RD 100-L drums
MRD (1 day)	10.5			2.3			1.8			0.8	
TD (1 day)	9.8			2.1			1.7			1.0	
ABN div (1 day)	5.6			1.2			1.0			0.6	
MRD (4 day)	42.0	84	135	9.2	10	34	7.2	18	22	3.2	32
TD (4 day)	39.2	79	126	8.4	9	31	6.8	17	21	4.0	40
CA army (1 day)	30.8			6.7			5.3			2.6	
CA army (2 day)	61.6		247	13.4		54	10.6		43	5.2	52
Tank army (1 day)	30.1			6.5			5.2			2.8	
Tank army (2 day)	60.2		241	13.0		52	10.4		42	5.6	56
Front (1 day)	76.7			16.6			13.2			6.6	
Front forward (4 day)	306.6		1228	66.6		267	52.8		212	26.4	264
Front rear (15 day)	1149.8		4602	249.9		1000	198.0		792	99.0	990
National (division)* (68 day)	137 326.0		549 308	29 906.0		119 624	23 630.0		94 520	11 424.0	114 240
National (front)** (68 day)	104 312.0		417 248	22 644.0		90 576	17 952.0		71 808	8976.0	89 760

*National-level storage depots, calculated from 51 TD + 141 MRD + 7 ABN divisions.
**National-level storage depots, calculated using 20 fronts.
Note: 1.1 m^3 = 1000 L = 4 barrels at 250 L or 10 barrels at 100 L.

~~(SECRET)~~

4. Effect of Varying the Ratio of Nuclear and Chemical Contamination (U)

a. ~~(C)~~ The calculations in preceding discussions addressing decontaminant requirements assumed a ratio of 50% chemical and 50% nuclear contamination. Since nuclear decontamination requires less expenditure of decontaminant, if the percentage of nuclear contamination is higher, then less decontaminant must be stored and used. We have no hard evidence of the ratio of chemical versus nuclear decontamination expected by the Soviets so an analytical judgment was made to select an appropriate ratio for illustrative purposes. Calculations were made using ratios of 25%/75%, 50%/50%, and 75%/25% chemical and nuclear contamination prior to writing the study. (Presenting all the alternatives unduly complicates an understanding of the problem, so the ratio of 50%/50% was selected.)

b. ~~(S)~~ The resulting figures indicating storage requirements for the appropriate time period are given below in table IX.

Table IX. (U) Effect of Varying the Ratio of Chemical and Nuclear Contamination

~~(SECRET)~~

Ratio of chemical/ nuclear contam-ination	CA army decontam-ination material stored (MT)	Tank army decontam-ination material stored (MT)	Front forward depot stocks (MT)	Front rear depot stocks (MT)	National-level 68-day supply, all divisions (MT)	National-level 68-day supply, 20 fronts (MT)
75/25	201.8	197.8	2010	3768.7	449 643	341 700
50/50	139.0	136.4	1384.8	2596.5	309 658	235 416
25/75	75.8	74.8	756	1417.5	168 715	128 520

~~(SECRET)~~

5. Effect of Varying the Ratio of Use of DTS-GK and the Decontamination Solutions Number 1 and Number 2 (U)

a. ~~(S)~~ While the 60%/40% probability of using DTS-GK vs. Decontamination Solutions Number 1 and Number 2 was chosen for our later calculations, the effect of changing this probability was also calculated. While these numbers were not used in later discussions, they are presented here for illustration. The other probabilities selected were 25%/75%, 50%/50%, and 75%/25% for DTS-GK/Decontamination Solutions Number 1 and Number 2 and the resulting figures, in comparison with the original 60%/40% figures are shown in table X.

Table X. (U) Effect of Varying the Ratio of Use of DTS-GK and the Decontaminant Solutions Number 1 and Number 2

~~(SECRET)~~

Ratio of DTS-GK/ DS-1&-2	CA army decontamination material stored (MT)	Tank army decontamination material stored (MT)	Front forward depot stocks (MT)	Front rear depot stocks (MT)	National-level 68-day supply, all divisions (MT)	National-level 68-day supply, 20 fronts (MT)
60/40	139.0	136.4	1384.8	2596.5	309 658	235 416
25/75	208.2	204.0	2073.6	3888.0	463 896	352 512
50/50	159.0	156.0	1584.0	2970.0	354 212	269 280
75/25	109.2	107.4	1088.4	2040.8	243 175	185 028

~~(SECRET)~~

b. ~~(S)~~ Looking at the national-level supply for 68 days for the division structure, the amount of decontaminant required ranges from 243 175 to 463 896 MT, with the preferred ratio of usage resulting in 309 658 MT, which is only 63 000 MT more than the minimum calculation. This amounts to a difference of less than 1000 MT consumption per day, indicating that the 60/40 choice is reasonable and may understate decontamination requirements if nuclear weapons are used much later after the initiation of hostilities than chemical weapons.

SECTION V

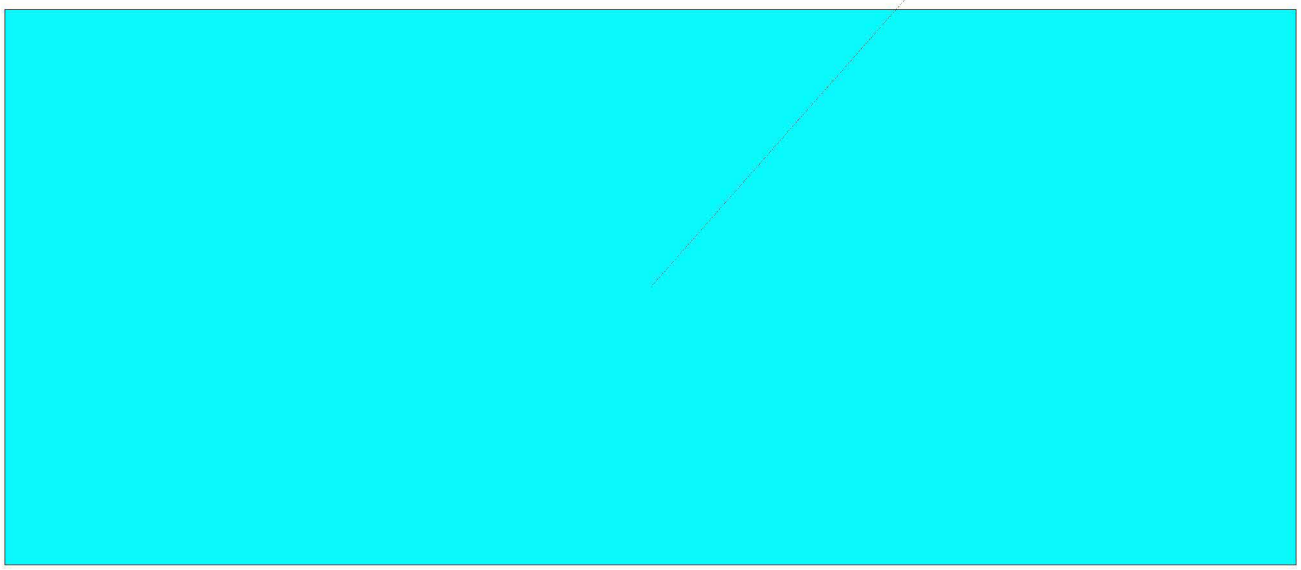
REQUIREMENTS FOR PROTECTIVE MATERIEL AND CHEMICAL ARMAMENT (U)

1. Definitions (U)

(U) Protective materiel is that materiel used to protect personnel and equipment from the effects of CBR contamination, excluding materiel expended in decontamination. This includes (but is not limited to) protective masks, filters, collective protection shelter sets (and related equipment) and protective clothing, as well as alarms and detectors. (The IPP kit is included in the protective gear category in this study, even though it is used to decontaminate.) Protective materiel is used by all ground force personnel. Chemical armament, however, is that equipment that is used only by Chemical Troops. Chemical armament includes decontamination equipment, flamethrowers and smoke-generating equipment.

2. Calculation Factors (U)

(b)(1),1.4 (h)



c. ~~(S NOFORN)~~ The weights given in table XI were used to generate a packed weight for divisional assets in these categories. Using these total packed weights and the 10-day loss rates from table XII (converted to 1 day losses), the expected daily materiel losses for divisions were calculated, and are summarized in table XIII.

Table XI. (U) Selected Protective Equipment and Chemical Armament Packaging Characteristics

~~(CONFIDENTIAL)~~

Description	Packed weight per item (kg)	No. in container	Container volume (m^3)
Protective mask	1.5	30	0.31
Protective mask filter	2.3	40	0.31
Lightweight protective uniform	5.9	12	0.25
Heavy protective suit	5.8	10	0.25
Two-finger gloves	0.5	80	0.14
PRKhR-54 chemical detector kit	4.4	5	0.05
DP-63A lightweight area survey meter	2.5	20	0.10
DP-2 radiation area survey meter	8.8	4	0.14
DP-3B vehicle-mounted area survey meter	21.0	2	0.17
DP-12 radiation contamination area survey meter	8.1	*	*
DP-23A pocket dosimeter kit	9.1	*	*
ADK	8.0	6	*
PMDK	2.3	10	0.07
IDK	6.7	10	0.14
DK-4	55.3	1	0.08

*No data available.

~~(CONFIDENTIAL)~~

Table XII. (U) Expected Divisional Loss Rates of Chemical Materiel (10-Day Operation)

~~(CONFIDENTIAL)~~

Item	Percent of equipment damaged, all cases	Percent of damaged equipment that is a total loss	Percentage of all chemical materiel that is a total loss
Protective mask	22.5%	20%	4.5%
Protective gear	27.5%	30%	8.2%
Decontamination equipment	25.0%	30%	7.5%
Radiation measuring kits	12.0%	10%	1.2%
Decontamination vehicles	15.0%	20%	3.0%
Flamethrower	15.0%	20%	3.0%
Smoke generator	10.0%	20%	2.0%
Collective protection assembly	20.0%	20%	4.0%

~~(CONFIDENTIAL)~~

~~NOT Rreleasable to foreign nationals~~

Table XIII. (U) Division Daily Losses of Protective Equipment and Chemical Armament (MT)

~~(SECRET)~~

Type division	Protective equipment	Chemical armament
MRD	2	2.5
TD	1.6	2.5

~~(SECRET)~~

d. ~~(S NOFORN)~~ Using the expected loss rates given in table XII, the weights given in table XI, and the DIA table of equipment for 141 MRD, 51 TD, and 7 ABN divisions (divisional assets of the entire Soviet ground forces), 24 979 MT of protective materiel and 33 037 MT of chemical armament need to be stored in the national-level chemical depots to support 68 days of combat. Table XIV shows the amount of protective materiel and chemical armament needed to be stored at the army, front forward, front rear, and national-level depots to replace expected combat losses. It does not include those protective mask and collective protection filters replaced as a result of CBR exposure. (The number of filters requiring replacement after CBR exposure is discussed in para 3.)

Table XIV. (U) Weight of Protective Materiel and Chemical Armament Required to be Stored in Unit Depots

~~(SECRET)~~

Unit Depot	Protective equipment (MT)	Chemical armament (MT)	Total (MT)
CA army	11.2	15.0	26.2
Tank army	10.4	15.0	25.4
Front forward	55.2	75.0	130.2
Front rear	207.0	281.2	488.2
National	18 768.0	25 568.0	44 366.0

~~(SECRET)~~

~~NOT RELEASABLE TO FOREIGN NATIONALS~~

3. Filters (U)

(U) We suspect that when the Soviets fully decontaminate a vehicle or individual, they will also replace CBR filters used by the vehicle or individual. This does not rule out replacement at other times, but if the filter is replaced when decontamination occurs, we can calculate a minimum number of filters required by a given force. We can then convert the number of filters to the weight of filters required by that force. (These calculations do not include replacement filters required due to combat damage by non-CBR weapons. Replacement filters required due to combat loss are included in tables XIII and XIV.) Table XV summarizes the weight of filters and IPP kits stored to replace contaminated items. The IPP decontamination kits are included because they are replaced at the same time as the mask filters.

Table XV. (U) Weight of Protective Equipment Required Daily Due to Contamination

~~(SECRET)~~

Unit	Wt of CP filters (MT)	Wt of individual filters (MT)	Wt of IPP kit (MT)	Total wt (MT)*
MRD	2.0	6.1	1.5	9.6
TD	2.7	5.0	1.3	8.9
ABN division	0.9	1.5	0.5	3.0
CA army	6.7	17.2	4.3	28.1
Tank army	7.4	16.1	4.1	27.4
Front	17.1	42.4	10.6	69.9

*Numbers in this column are computer-generated from unrounded starting figures, and thus may appear to disagree with the total of the rounded figures that appear. The totals are correct as seen.

~~(SECRET)~~

Using the formulas given earlier for national-level storage, we determine that national-level storage depots will stock 124 322 MT (all divisions) or 95 064 MT (20 fronts) of filters and IPP kits for replacement.

SECTION VI

SMOKE AND FLAME (U)*

1. Introduction (U)

~~(S-REL NATO)~~ Since 1980, Soviet ground forces have begun to reorganize army-level chemical units, resulting in the formation of flamethrowing and smoke battalions at army level. Thus far, while smoke battalions have been identified, few flame battalions have been identified. Since the signature of flame battalions is difficult to detect, for analytical purposes it is assumed that each ground-force army does in fact have a smoke and a flame battalion.

a. ~~(S)~~ Smoke battalions have 30 TDA-M smoke generators and 20 AGP vehicles (each AGP has two generators) authorized. The TDA-M smoke generator is mounted on a GAZ-66 truck. Some battalions may have more equipment, or may be equipped with ARS-14 vehicles.

b. ~~(S)~~ Each flame battalion probably has 72 LPO-50 and 12 TPO-50 flamethrowers.

2. Smoke Generation (U)

~~(S)~~ Within the Soviet ground forces, obscuring clouds are normally generated in one of four ways. These include mechanical smoke generators (TDA-M); smoke pots or grenades (DM-11 or RDG-2); AFV-mounted smoke grenades or exhaust smoke generators; and artillery or mortar smoke projectiles. Artillery and mortar smoke projectiles are supplied through normal artillery channels. While other obscurant supply is a chemical service function, we do not know who has supply responsibility at national level for AFV-mounted smoke grenades. Mechanical smoke generators use a mixture of gasoline and diesel oil (available through normal POL channels) to generate obscuring clouds. [redacted] Smoke pots are supplied by the chemical service.

(b)(1),1.4 (c),1.4 (h)

*(U) Assistance on Soviet flame and smoke requirements was provided by [redacted] of FSTC.

(b)(3):10 USC 424

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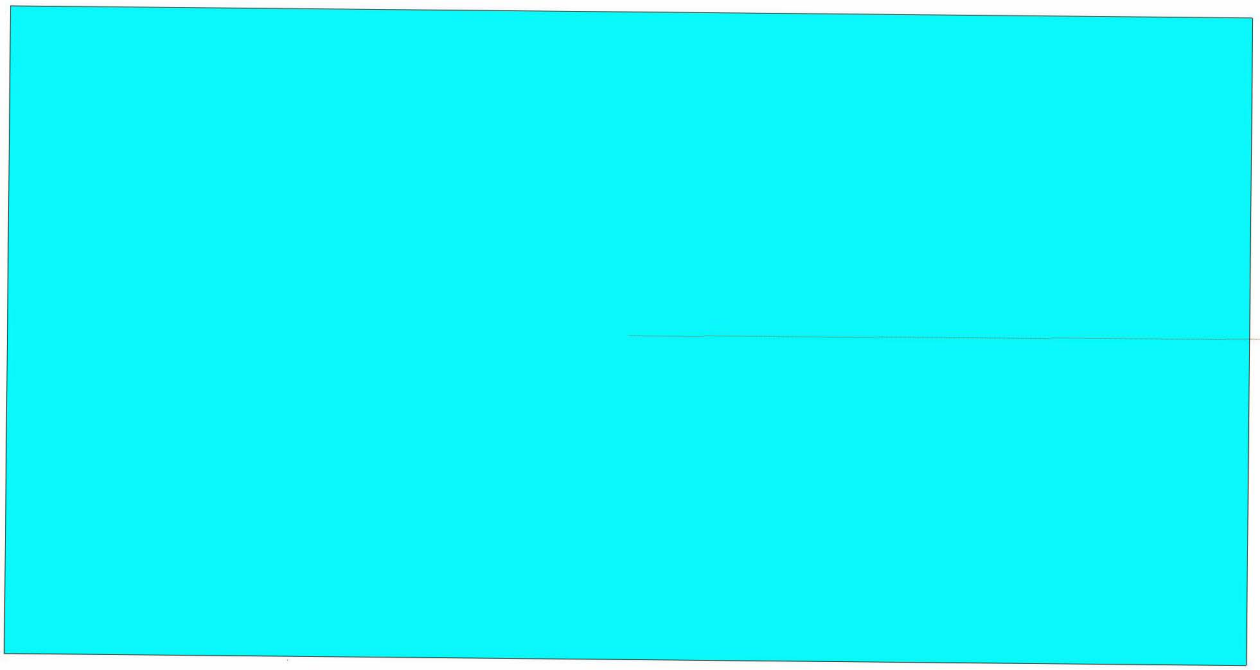
3. Smoke Pots (U)

(U) Listed in table XVI are selected characteristics of Soviet smoke pots. (Table XVI also includes the chemical warning flare SKhT, for which we have no consumption data.) Smoke pots are likely to be used in large quantities during deliberate attacks and screening near fixed installations. Due to the vulnerability of truck-mounted generators, they will be used sparingly to generate smoke when exposed to direct fire. (For an extended discussion on Soviet smoke, see DST-1620S-145-81-VOL 1-CHG 2, Smoke and Other Chemical Warfare Obscurants--Foreign (U), 8 March 1985.



(b)(1),1.4 (h)

a. (U) During World War II each Soviet division was required to maintain a reserve of 500 DM-11 smoke pots and each army, 3000 DM-11. It is assessed that this stockage level is still valid for today's operations. This would have allowed a division to smoke 1 km of front for 1 hour, under favorable conditions. The load for a division would weigh 1.55 MT and occupy 3.3 m^3. The load for an army would weigh 9.3 MT and occupy 20 m^3. In addition, each tank or APC was to be issued with four to six smoke hand grenades. Armies were instructed to be prepared to smoke river crossings for 2 to 3 hours. More current writings indicate that river crossings will be screened for 4 to 5 hours.

b. ~~(S)~~ Since each division and each army can erect a bridge, the army must be prepared to cross a river every day at up to five locations. To

simplify calculations of smoke requirements, only river crossings are discussed because we have the most information about requirements for smoke support of river crossings. In reality, the actual number of river crossings could be higher or lower. Since the units have at least the minimum capability to support the discussed level of operations, Soviet commanders will use available smoke-generating assets not employed in river crossings for other screening purposes to support deliberate attacks, decontamination operations, obscuration of supply depots, or concealment of headquarters. This will result in the expenditure of smoke agent equal to river crossings not made.

(1) ~~(S)~~ If the river crossing site covered is 1 km long, it should take about 700 DM-11 smoke pots per hour or 3500 DM-11 to cover the crossing for 5 hours. The smoke pots would weigh about 10.8 MT. Thus, if each division expended 3500 DM-11 smoke pots at a river crossing, an army could expend 17 500 smoke pots per day. This would require about 54.3 MT of DM-11 smoke pots. For several reasons it is unlikely that all five bridges in an army would be used in a new river crossing each day. Our calculations assume only three river crossings would be constructed daily. This lowers the requirement to less than 32.6 MT of smoke pots daily.

(2) ~~(S)~~ In addition to smoke pots, RDG-2 smoke grenades would be used to provide flanking smoke to cover tanks, APCs, or self-propelled artillery. During World War II, RDG-2 smoke grenades were issued to each Soviet tank/APC. Although many tanks and APCs are equipped with smoke grenade launchers, these launchers only provide screening smoke in the direction the turret is facing. (There is currently no information to indicate whether vehicle launcher smoke grenades are supplied through artillery supply channels. Therefore, the logistics of launcher-fired grenades is not addressed in this study.) We assume that 25% of the tanks/APCs in a division in combat may need more flank screening smoke than the turret launchers can provide, requiring use of the RDG-2 smoke grenades. As indicated by table XVII, each division requires about 1550 RDG-2's daily.

Table XVII. (U) RDG-2 Smoke Grenade Requirements

~~(SECRET)~~

Type division	No. of RDG-2 grenades/ vehicle	% of vehicles using smoke	No. of tanks/ APC/ unit	Wt of RDG-2 grenades (kg)	No. of smoke grenades required	Total wt of RDG-2 grenades required (MT)
MRD	6	25.0%	1041	0.7	1562	1.1
Tank	6	25.0%	1030	0.7	1545	1.1

~~(SECRET)~~

(3) ~~(S)~~ Combining the divisional weights of DM-11 smoke pots (10.8 MT) and RDG-2 grenades (1.1 MT), we see that each division requires 11.9 MT of smoke materiel. Using the formula for army calculations we determine that an army requires 35.8 MT per day. (Since most references we have about stockage levels of smoke pots mention the DM-11, we have used it for calculations. Use of larger pots would probably not significantly change the total weight requirements, as equal amounts of smoke mixture contained in the pots would have to be burned to produce equal sized obscuring clouds.)

c. ~~(C)~~ Smoke battalions probably use smoke pots, in addition to mechanical smoke generators. The smoke pots are probably used to provide smoke for specific operations and to screen their positions prior to the establishment of the screen that they generate. We assess that the BDSh-5 or BDSh-5Kh smoke pots are most likely to be used. Due to their size, these pots would require more time to emplace than smaller pots. Each company in a battalion might carry 100 to 125 smoke pots. If all carried the maximum, the battalion could screen 50 to 75 km of front for 15 minutes with 375 smoke pots. This would require 15.375 MT of smoke pots.

d. ~~(S)~~ Total requirements for smoke pots and grenades are summarized in table XVIII.

Table XVIII. (U) Smoke Stockage Requirements

~~(SECRET)~~

Unit	Depot stockage (MT)
CA army	71.4
Tank army	71.4
Front forward	357.0
Front rear	1339.0
National level (front)	121 380.0
National level (division)	161 031.0

~~(SECRET)~~

[redacted]

(b)(1),1.4 (h)

b. ~~(C)~~ The man-portable flamethrowers LPO-50 and TPO-50 use a napalm-and-fuel mixture that is pressurized by a powder charge and directed on the target by an operator. In addition, the Soviets have a tank-mounted flamethrower, the ATO-200.

c. ~~(C)~~ An LPO-50 flamethrower has three fuel tanks and requires a total of about 0.326 kg of napalm mixed with POL to prepare one charge. (As POL delivery is a responsibility of the Rear Services, it is not addressed here.) A TPO-50 has three separate tanks and requires a total of 1.836 kg of napalm to prepare a charge. The ATO-200 has a 420-L storage tank; if 4% of that volume is napalm, about 12.1 kg of napalm would be required to fill the tank. One kg of napalm powder weighs 1.3 kg when packed. Normally napalm is packed in a container that holds 30 kg and the container occupies a volume of 0.11 m^3. In addition both the LPO-50 and TPO-50 use 0.340 kg propelling charges to fire a flame "rod." (A rod represents one firing of a flamethrower.) For each firing the LPO-50 and TPO-50 require the propelling charge. Both the LPO-50 and TPO-50 are capable of firing three times before refilling with fuel, requiring a total of 1.02 kg of propelling powder. The ATO-200 propelling charge is estimated to be 1.36 kg. The ATO-200 can fire 12 times before the fuel needs to be refilled, and another 16.32 kg of powder charge resupplied. Table XIX lists the amount of materiel required to support flamethrowers for 1 day.

Table XIX. (U) Requirements for Materiel to Support One Complete Flamethrower Filling

~~(SECRET)~~

Type flamethrower	Wt of napalm (kg)	Wt of powder charge (kg)	No. of powder charges/ filling	Total wt flame materiel/ flamethrower (kg)
LPO-50	0.326	0.34	3	1.35
TPO-50	1.836	0.34	3	2.86
ATO-200	15.72	1.36	12	32.04

~~(SECRET)~~

d. ~~(S)~~ A flame unit must operate in close conjunction with motorized rifle or tank units. In addition, empty flamethrowers must be relocated to rear areas to be refilled. This places an upper limit of about five refills per day per flamethrower. The Soviets have at least two and possibly three flame-equipped tank battalions. If each battalion has 31 flame-equipped tanks, then there is a maximum of 93 such tanks in the Soviet inventory.

e. ~~(S)~~ As can be seen in table XX, the total weight of napalm required to be stored at the national level is probably less than 5000 MT. This does not include napalm required for fixed flamethrowers in fortified areas, for field expedient flame mines nor for aircraft.

Table XX. (U) National-Level Flame Requirements

~~(SECRET)~~

Weapon	BN daily needs (MT)	Front daily needs (MT)	No. of BN	Daily needs, all BN (MT)	National needs, all flamethrowers for 68 days (MT)
LPO-50	0.5	2.1	27	14.03	954.4
TPO-50	0.2	0.8	27	5.52	375.3
ATO-200	7.9	0.0	3	23.84	1621.2
Totals				43.39	2950.8

~~(SECRET)~~

SECTION VII

IMPLICATIONS OF REQUIREMENTS (U)

1. Storage Requirements and Capacity (U)

~~(S NOFORN WNINTEL)~~ Referring to table XXI we can see that the Soviet requirement to stock enough chemical materiel at national level to support the ground forces for 68 days can be estimated using either the actual force size in divisions or the requirements to support 20 fronts (the number of Soviet fronts that could be generated in the first 90 days of war). The front requirements reflect a typical front.

Table XXI. (U) National-Level Stockpile Requirements

~~(SECRET NOFORN WNINTEL)~~

National-level stockpile	Decontamination materiel (MT)	Smoke agent (MT)	Flame agent (MT)	Protective equipment (MT)	Chemical armament (MT)	Total (MT)
All divisions	309 658	161 031	2951	149 301	33 037	655 978
20 fronts	235 416	121 380	2951	113 832	25 568	499 147

~~(SECRET NOFORN WNINTEL)~~

(b)(1),1.4
(c),1.4 (h)

[redacted]

b. ~~(S)~~ Discussions addressing decontaminant requirements assumed a ratio of 50% chemical and 50% nuclear contamination. Since nuclear

decontamination requires less expenditure of decontaminant, if the percentage of nuclear contamination is higher, then less decontaminant must be stored and used. We have no hard evidence of the ratio of chemical vs. nuclear decontamination expected by the Soviets so an analytical judgment was made to select an appropriate ratio for illustrative purposes. Calculations were made using ratios of 25%/75%, 50%/50%, and 75%/25% chemical and nuclear contamination prior to writing the study. Presenting all of the alternatives in tabular form throughout the study would have unduly complicated an understanding of the problem so the one ratio had to be selected for illustrative purposes.

(1) ~~(S)~~ After the calculations were made, they were integrated with the requirements for smoke, flame, and chemical armament to determine the total weight of material required to be stored at front and army level, as discussed in paragraph 3a above. We have good information on the total weight of material required for storage at these levels. When the total requirements including decontaminant were examined, the stockage levels at army and front that most closely matched the known Soviet requirements occurred when we assumed a 50%/50% requirement for chemical and nuclear contamination. Table XXII compares the total requirements at army, front, and national level for the choices of 25%/75%, 50%/50%, and 75%/25% chemical and nuclear contamination.

Table XXII. (U) Effect of Varying the Ratio of Contamination on Stockage of Chemical Materiel at Various Levels

~~(SECRET NOFORN WNINTEL)~~

Ratio of chemical/ nuclear contam-ination	Combined-arms army chemical material stored (MT)	Tank army chemical material (MT)	Front forward depot stocks (MT)	Front rear depot stocks (MT)	National-level 68-day supply, all divisions (MT)	National-level 68-day supply, 20 fronts (MT)
75/25	355.6	349.4	3543.6	6644	795 963	602 412
50/50	292.8	288.0	2918.4	5472	655 978	496 128
25/75	229.6	226.4	2289.6	4293	515 034	389 232

~~(SECRET NOFORN WNINTEL)~~

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(2) ~~(S)~~ It is apparent that the ratio of 50%/50% chemical/nuclear contamination most closely matches the doctrinal requirement for storage at army and front forward depots. The 75% chemical comes closer to the doctrinal storage requirements at front rear depots. Since the intent of the study is to present information on stockage levels, the 50%/50% stockage rate was chosen as the most representative rate to use for illustrative purposes. Obviously, if the ratios are changed, the total requirements change.

(3) ~~(S NOFORN WNINTEL)~~ The total stockpile required at national level ranges from a minimum of 389 232 MT (assuming 75% of contamination is nuclear) to 795 963 MT (assuming 75% of the contamination is chemical). We believe that the figures of 656 000 MT for national-level requirements for the current division force structure for 68 days is the best point estimate, within a range of 515 304 to 795 963 MT.

3. Comparison With Doctrine (U)

~~(S)~~ Table XXIII compares the doctrinal requirements for storage of chemical materiel in chemical depots at army and front with estimated requirements. The estimates were done in two ways: using standard force structure and using our altered force structure as previously discussed. The army values are an average of tank army and CA army figures. These estimates include only the TDs and MRDs, not the other supporting units. The doctrinal requirements for storage are from various sources. We believe that our estimated values are the correct order of magnitude, although the standard force structure values appear closer to the doctrinal figures at front level and the altered force structure value is closest at army level.

Table XXIII. (U) Calculated Storage Versus Doctrinal Requirements

~~(SECRET NOFORN WNINTEL)~~

Depots	Doctrinal capacity (MT)	Standard force storage (MT)	Altered force storage (MT)
Army (2 day)	300	387.2	290.4
Front forward (4 day)	3000	3116.8	1459.2
Front rear (15 day)	10 000	11 688.0	5472.0

~~(SECRET NOFORN WNINTEL)~~

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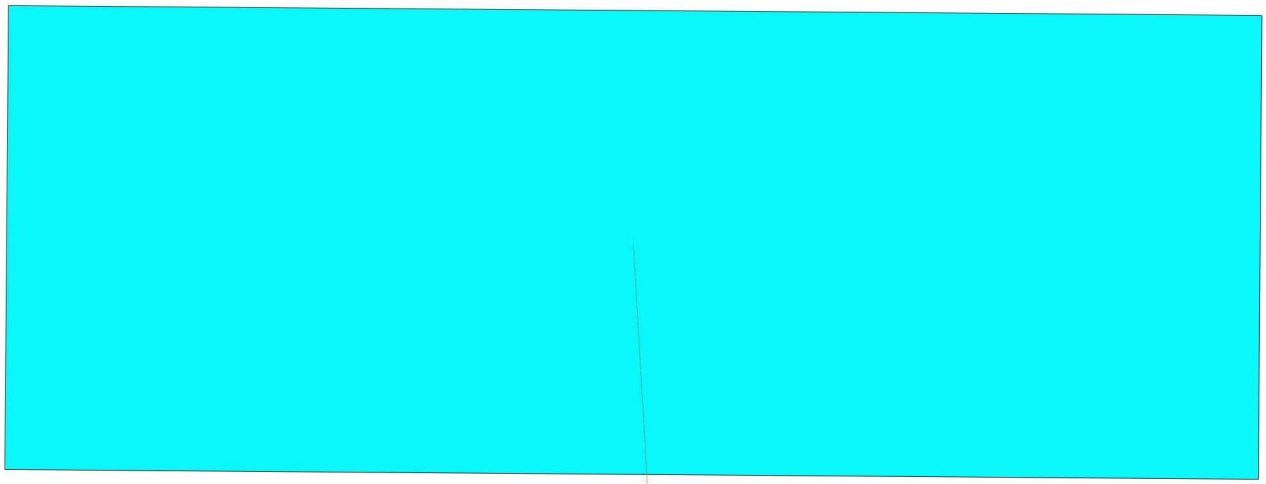
4. Conclusions (U)



(b)(1),1.4 (c),1.4 (h)

DST-1620S-051-87
15 June 1987

LIST OF ABBREVIATIONS

ABN	airborne
ADA	air defense artillery
AFV	armored fighting vehicle
APC	armored personnel carrier
AT	antitank
ATGM	antitank guided missile
BN	battalion
CA	combined-arms
CBR	chemical-biological-radiological
CW	chemical warfare
DCE	Dichloroethane
DIA	Defense Intelligence Agency
DT-2	Dichloramine-T
DT-6	Hexachloromelamine
DTS-GK	Di-tri-salt of hypochlorite, a mixture of calcium hypochlorite and calcium hydroxide
FA	field artillery
FG	field gun
FROG	free-rocket-over-ground
GSFG	Group of Soviet Forces, Germany
G/H	gun or howitzer
GRAU	Main Rocket and Artillery Directorate
MEA	Monoethanolamine
MRD	motorized rifle division
MRL	multiple rocket launcher
MD	military district
MT	metric ton
OPRD	Independent Missile Transport Battalion
POL	petroleum, oil and lubricants
PRTB	Mobile Rocket Technical Base
RKKA	Workers and Peasants Red Army
SF-2U	Sulfanol
SN-50	decontamination detergent
TD	tank division
TVD	Theater of Military Operations
UOF	unit of fire

Pages 36 (reverse blank), 37 thru 41 are Denied in Full (DIF); non responsive to the request

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