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DIRECTORATE OF INTELLIGENCE

SOVIET OFFENSIVE CHEMICAL WARFARE CAPABILITIES: A PRELIMINARY REASSESSMENT

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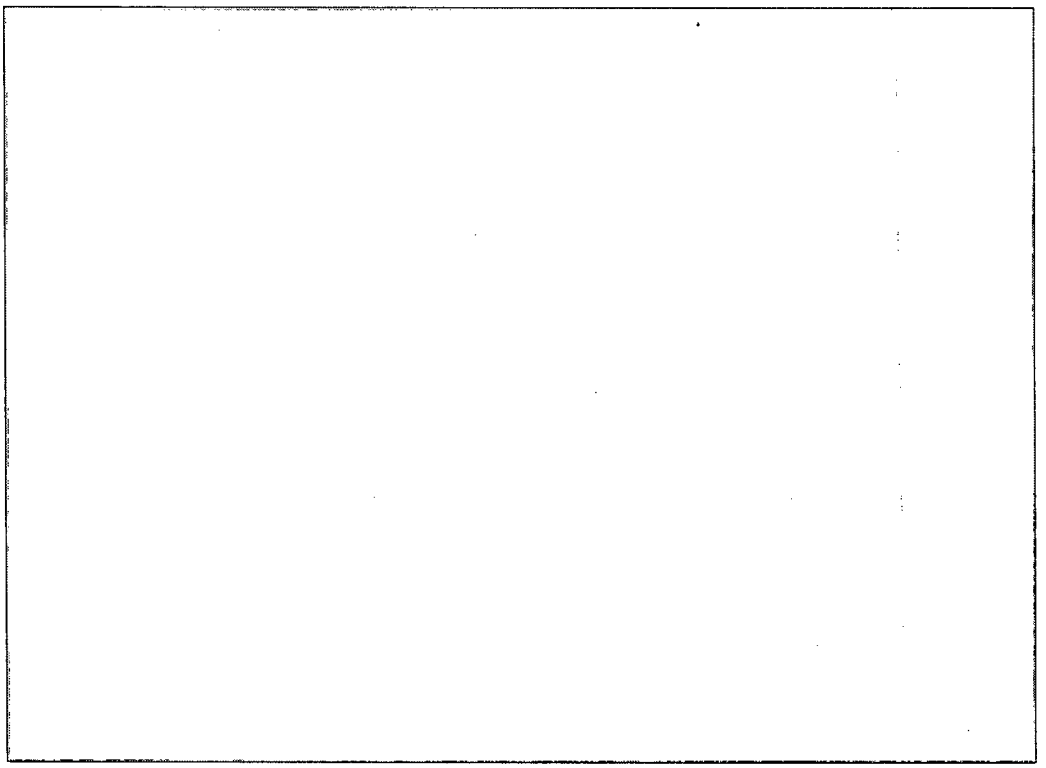

CENTRAL INTELLIGENCE AGENCY
Directorate of Intelligence
Office of Strategic Research
June 1970

WORKING PAPER

Soviet Offensive Chemical Warfare Capabilities: A Preliminary Reassessment

Introduction

This study was undertaken by the Office of Strategic Research in response to recommendations made by the Critical Collection Problems Committee (CCPC) in its report of 16 October 1969. There is little direct evidence bearing on Soviet chemical warfare technology since World War II and no evidence which will permit a confident assessment of CW production, stocks, or military availability. Much remains to be done in both collection and analysis before the uncertainty in these areas can be narrowed. In the interim this report suggests one approach to assessing the quantity of stocks the Soviets could have available and outlines the state of our knowledge concerning Soviet CW capabilities in general.

Note: This paper was produced solely by CIA in the Office of Strategic Research.

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Summary

Soviet interest in the development of chemical warfare (CW) weapons has continued since the disastrous World War I chemical attacks on the Russians by the Germans. Although no chemicals were used during World War II, there is ample evidence that the Soviets intended to be prepared for the eventuality of their use by producing chemical agents at several sites. Soviet knowledge of more modern nerve agents was assured by expropriation of German production equipment and personnel at the end of World War II, although there is no evidence that this equipment was ever used for production of agent on a significant scale.

[redacted]

The sum of evidence currently available will not support a confident estimate of the Soviet Union's capabilities for chemical warfare.

[redacted] Intelligence on all types of delivery systems is sparse, and there is no information on the possible composition of a chemical stockpile. If a storage site or sites could be confirmed, the fact remains that there is insufficient evidence to confirm production of agent since World War II, and there is virtually no evidence of production since the early Fifties. Nine storage sites which show some evidence of CW activity have been identified.

The maximum total storage capacity of these nine sites is 37,000 to 48,000 tons of agent, depending

on the assumed proportions of bulk agent and filled munitions. This estimate assumes that all buildings estimated to be capable of chemical storage do indeed hold toxic chemicals and nothing else.

Such an estimate is relatively meaningless, however, without better knowledge of the composition of the stockpile. Not only is the percentage of modern nerve agent as opposed to World War I type agent unknown but, more important, the amount of agent in filled munitions as opposed to that in bulk storage is unknown. Although a higher proportion of bulk agent would result in a larger stockpile, bulk agent is useless as a military tool until it has been converted into filled munitions, a time-consuming process requiring special facilities.

An estimate based on analogs of US requirements suggests that the Soviets would probably calculate their own chemical requirement for a 30-day operation against the central region of NATO at close to 25,000 tons of agent. This would, of course, have to be in filled munitions readily available to the forces. At the present time the Soviets probably cannot meet such a requirement. The initiation of chemical action against NATO by the Soviets in that context seems unlikely in view of the extreme military and political hazards involved.

* * * * * *

Policy and Doctrine

Most of the available intelligence on Soviet policy and doctrine regarding chemical weapons dates from the early Sixties. This information is in the form of theoretical discourses on military strategy and doctrine. No official policy or planning documents on Soviet offensive chemical warfare are available. The small amount of information dating from later in the Sixties is mostly from East European sources, and reflects no apparent significant changes.

The evidence indicates that the Soviets apparently consider chemical weapons subject to the same restrictions and controls as nuclear weapons. The authorization of the Ministry of Defense would have to be secured for the initiation of action with chemical weapons, and the Ministry in turn would have to receive approval from the Central Committee of the Communist Party. Once approval had been given for the use of chemicals, the selection of targets and procedures for the use of the weapons would probably be determined by the army commander.

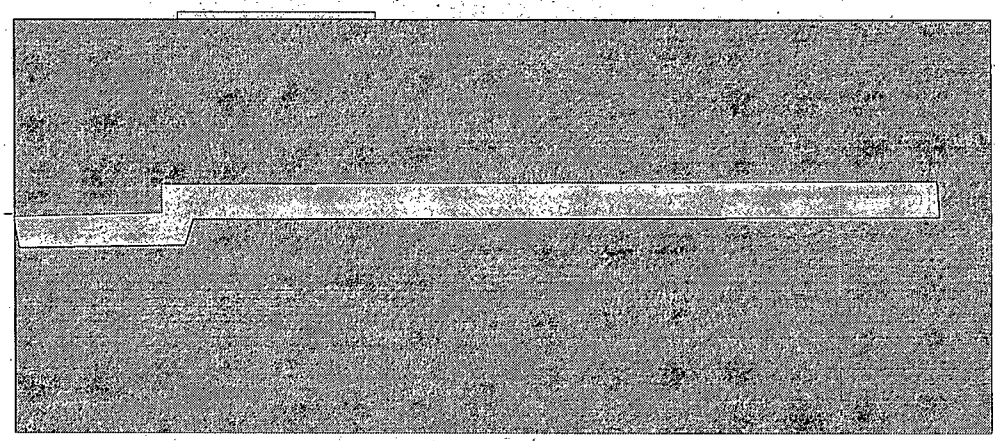
The Soviets regard chemical weapons primarily as weapons for tactical rather than long range use, and they almost invariably speak of them as being used in conjunction with nuclear weapons. The evidence suggests that the Soviets would use chemical weapons only in a nuclear conflict. There is no evidence of weapons or planning for the delivery of chemicals at strategic distances, although one writer mentions the possibility of using longer range tactical missiles for chemical attacks on "war factories, ports, and political and economic centers."

Specific tactical doctrine calls for use of chemical agents against concentrations of personnel, such as units at missile launch positions, troops on the march or in concentrated thrusts, and command posts. Note is made of the usefulness of chemicals in areas where nuclear weapons cannot economically be used, such as in mountainous terrain where the topography would provide blast protection, and of the use of persistent agents to contaminate regions

and deny them to advancing troops, or to cut off evasion or retreat routes.

Chemical Weapons and Delivery Systems

There is evidence that chemical units in the Soviet forces are strictly defensive in their mission. Chemical defense units have been involved in handling small amounts of World War I type chemical agent to be used in training and exercises, but they are not trained in the offensive use of chemical weapons. Apparently, such offensive capabilities as exist in the Soviet forces are integrated into those units which are tasked with conventional offensive operations: rocket battalions, missile brigades, artillery units, and the tactical air forces.



[redacted] said that CBR (chemical, bacteriological, radiological) warheads were never mentioned during the course.

Nonetheless, there is evidence for the existence of some chemical weapons, and such weapons apparently continue to be allocated to forces in certain exercises

and are noted in some planning documents. These references often appear, however, to be in the form of an afterthought and chemical operations are often ignored or given very short treatment in text. Despite this, the fact that they appear in these documents at all implies that such weapons are in the arsenal and would under certain circumstances be made available to the forces. The apparent lack of emphasis may imply either that the Soviets do not consider the advantages to be gained by the use of chemicals great enough to offset the political and military risks involved, or that chemical weapons may not be available in sufficient quantity to produce effective results.

No good technical information is available for CW delivery systems after World War II. At that time the Soviet Union had in its arsenal chemical shells for artillery, chemical land mines, multiple ground-launched rockets, and grenades. Chemical aerial bombs and spray tanks for aircraft were also available.

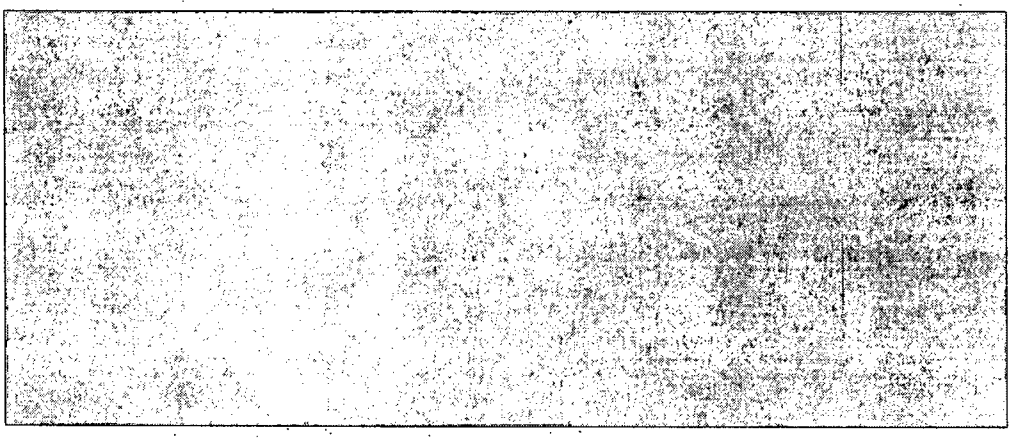
Since that time, Soviet military writings have continued to refer to the existence of most of these conventional systems, with the addition of chemical warheads for tactical rockets and missiles. Little is known, however, about the distribution of chemical weapons to units, storage within units, or the percentage of chemical weapons in the total stockpile. Such detailed information would probably be obtainable only through a human source with access to classified documents dealing specifically with chemical weaponry.

There is good evidence that a chemical warhead option exists for the Frog tactical rocket. There probably is a chemical warhead for the Scud A tactical missile, but evidence for the Scud B is less convincing.

[redacted] Scud B, introduced to the forces in the early Sixties, accounts for about 70 percent of the Scuds in the USSR. Warheads are not interchangeable between the A and B versions.

Chemical munitions may be available for most standard calibers of artillery and for the 122mm, 140mm, 200mm, and 240mm multiple rocket launchers. Intelligence is lacking for these munitions, however, and there is no information on the amount of such munitions that might be in the stockpile. Likewise, data on aerial bombs and chemical land mines are lacking in the postwar period. There are indications that the Soviets consider aerial spray tanks impractical for high performance aircraft.

Production



Among agents which may be in the stockpile are some World War I type agents, including mustard, phosgene, lewisite, and hydrogen cyanide. More modern nerve agents which are known to the Soviets are the G agents--so named because of their German origin--and a newer, reportedly more toxic nerve agent called VR-55.

Tabun, or GA, is the least toxic of the G agents, and is now rarely mentioned in Soviet military

literature. Sarin, or GB, is a highly volatile, nonpersistent agent of intermediate toxicity. Soman, or GD, a partially persistent agent, is the most toxic of the three G agents, and there is no effective therapy for casualties caused by it. Although the captured German production equipment for sarin and tabun was removed [redacted] by the Soviets, there is no evidence of any more than possible experimental or pilot production of any nerve agents there.

References to the agent VR-55 have appeared in Soviet classified documents and, according to one source, it is 10 times as toxic as soman and some 25 times as toxic as sarin. No information has been obtained on the specific chemical properties of this agent, nor is there any evidence of its production.

There is some evidence of CW agent production at two plants in the postwar period, but this has not been confirmed. At all other plants which have been suspected of CW agent production--usually on the basis of their involvement with it in World War II--there is no evidence to support any such activity after World War II. Many of these plants have subsequently become involved in the production of organophosphorous insecticides, which use many of the raw materials and some of the production processes used for nerve agent. The conversion of an insecticide plant to nerve agent production, however, would involve major modifications of the facilities and production of both materials could not take place interchangeably.

[redacted] was reported to produce mustard gas until 1949, when production was terminated "because all the storage tanks were full." There is no information since then to indicate war gas production of any sort, nor has the plant been involved in producing organophosphorous insecticides. Its chief outputs are now ordinary industrial chemicals, mainly acids, and possibly explosives.

[redacted] produced war gas in World War II, and captured German tabun production

equipment and sarin pilot plant equipment were sent there. a part of the plant where work with dangerous materials was carried out, and of the German equipment there. that the area of the plant where this activity was taking place was not large enough for any more than experimental or pilot production. now produces ordinary industrial chemicals and organophosphorous insecticides. No special security measures are in effect there, and no gas masks or protective clothing have been observed. Tank cars seen leaving the plant have been marked with their contents, which are not military in nature.

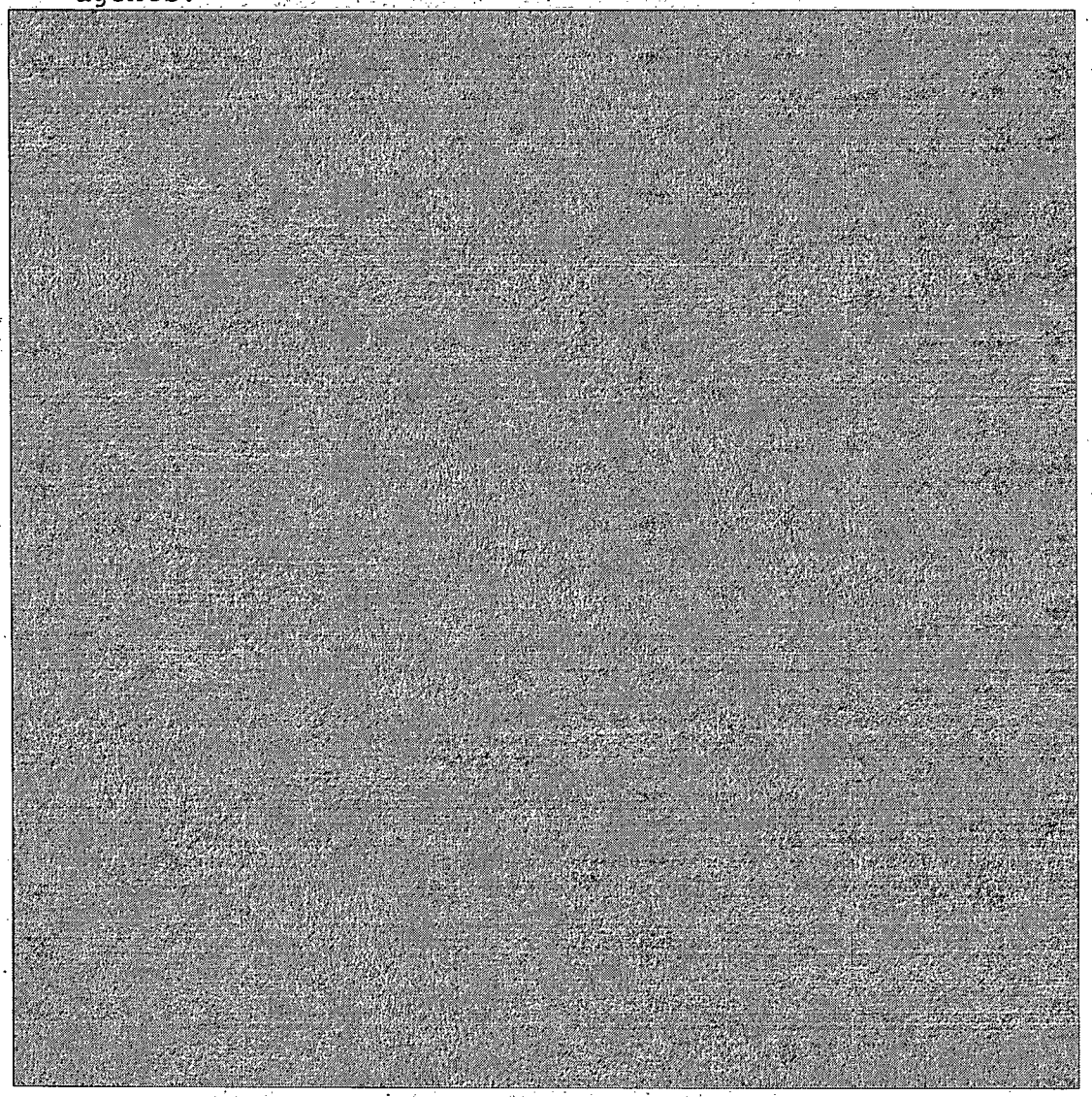
Three other chemical plants, have been suspected of involvement in CW agent production, mainly on the basis of their history of agent production in World War II. There is no evidence of any CW activity since the war at any of these plants, and there is good evidence of production of ordinary chemical products or insecticides at all three.

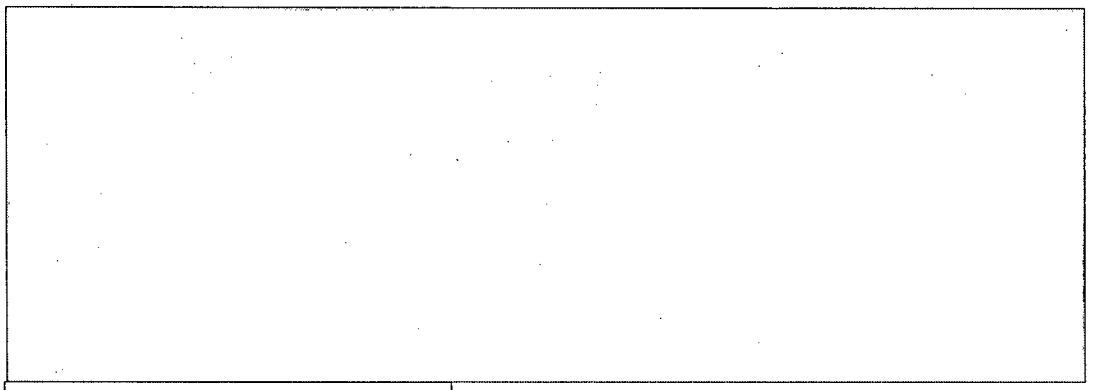
An industrial facility which has been under construction at was formerly thought to be intended for the production of CW agent. suggest that the installation--which after 11 years is still not completed--may become a production facility for missile fuels.

Storage Sites

A confident estimate of total CW agent storage in the USSR is unlikely to be achieved without documentary evidence. Identification of storage sites has been unusually difficult and, even when they are identified, it has not been possible to determine which buildings within the site actually contain chemical agents. No information is available on Soviet storage practices or densities of material in storage sheds. Information is also lacking on the percentage of bulk storage versus

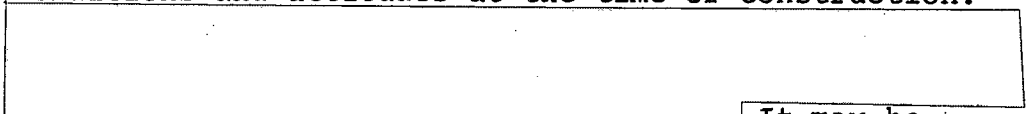
filled munitions; the percentage of World War II type agent versus modern nerve agent; and the amount of nontoxic chemical munitions (incendiaries, smoke, tear gas, etc.), or equipment such as gas masks, sensing devices, or decontamination kits that might be stored in the same sheds. There is evidence, however, that nontoxic chemical warfare materials are sometimes stored in the same sheds as toxic agents.



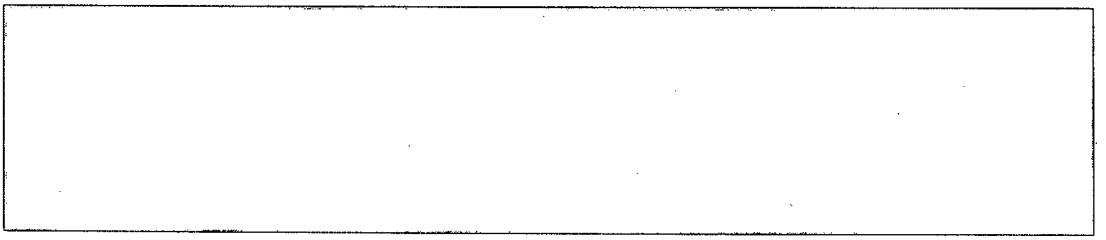


indicators which are often observed in conjunction with activity other than CW include lightning rods by storage sheds, special ventilation on storage buildings, and decontamination vehicles. Lightning rods are present when many kinds of dangerous substances are stored including ordinary ammunition or explosives.

Although it is possible that there may be some connection between unusual ventilation and CW storage, Soviet standards for the construction of storage buildings for ordinary explosives call for some form of ventilation in all cases. US practice in this regard is inconsistent and appears to reflect local conditions and attitudes at the time of construction.



It may be significant that two of the "better" Soviet CW storage sites show no evidence of special provision for ventilation. Decontamination vehicles have several uses other than for chemical warfare applications, and may be present where many kinds of dangerous chemicals are handled, such as missile fuel.



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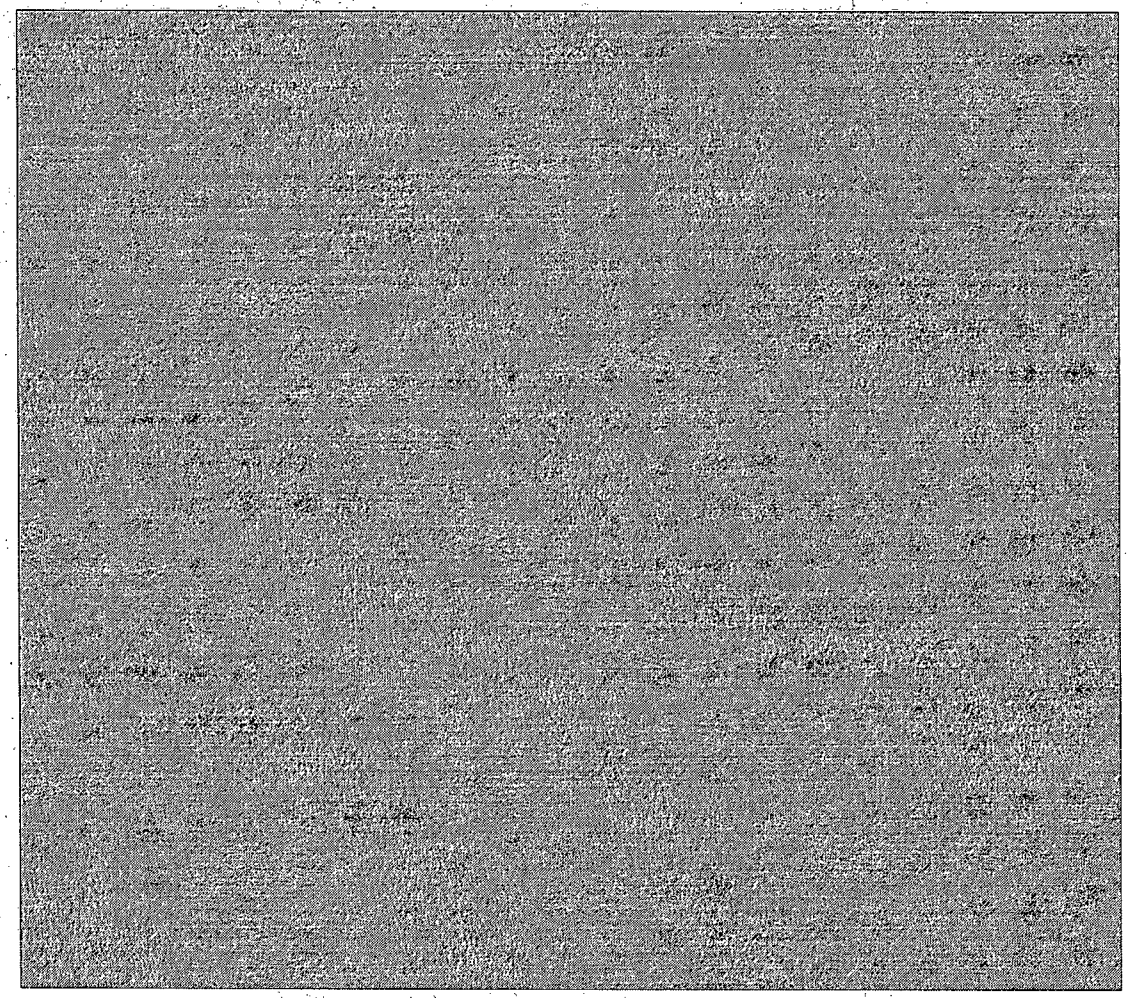

Two CW storage sites in the USSR are currently estimated as *probable* CW associated sites, 6 as *possible*, and 9 as *suspect*. No site is rated *confirmed*. On the basis of a thorough examination of the evidence for CW activity, these 17 sites have been reappraised for this study. Almost all changes which have been made in classification of the sites have involved downgrading or negating sites formerly estimated to be CW associated. The sites as reappraised are listed on the next page and in Appendix I. The details of the evidence for CW activity appear in Appendix II.

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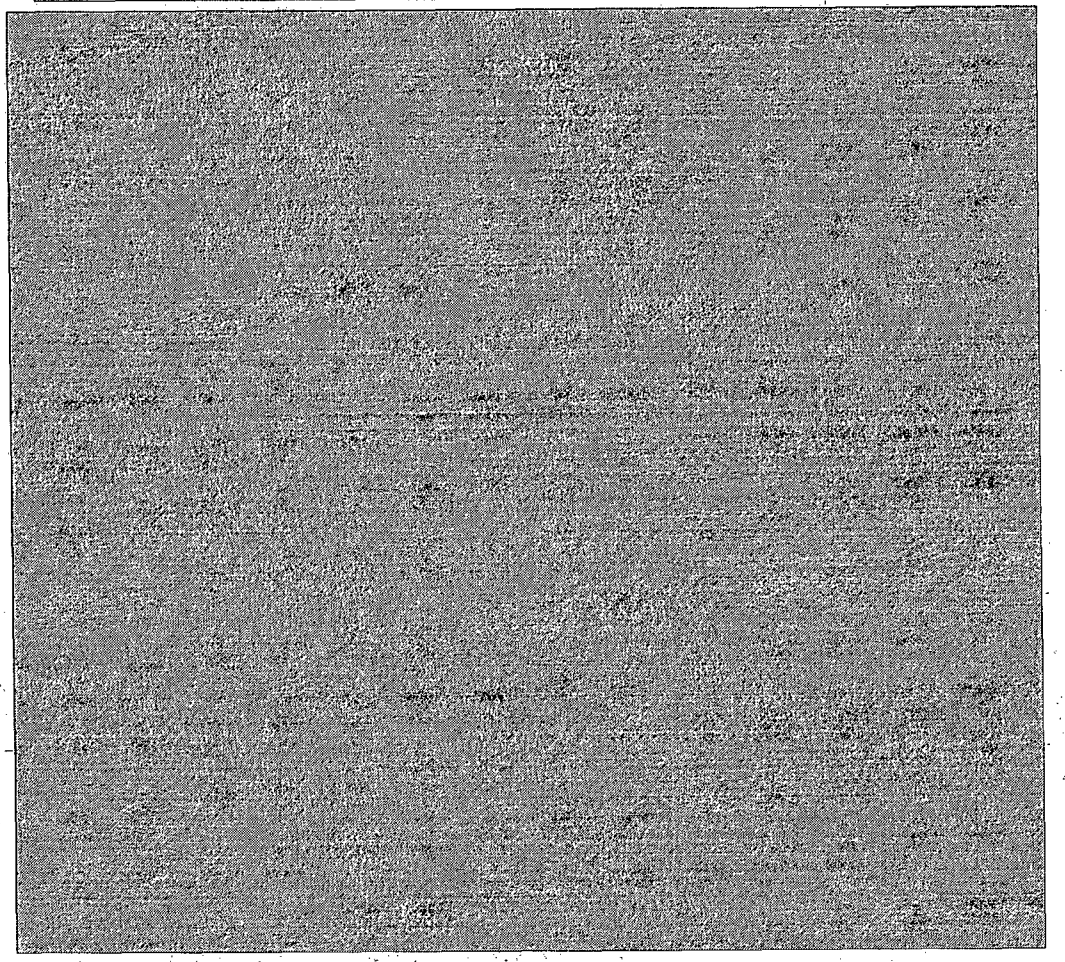


The total square footage in roof area of buildings which could be used for CW storage breaks down as follows:

Probable sites	202,000
Possible sites	552,000
Suspect sites	681,000
Total	1,435,000
Negated sites	936,000

Assuming it possible to identify a storage shed as CW associated, and assuming it to contain *only* toxic agent or munitions, a rough factor for the

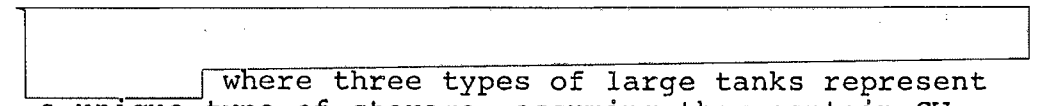
density of chemical agent stored in it might be determined by using analogs of US storage practice, modified by the small amount of data available on Soviet storage practices for ordinary ammunition, explosives, and pesticides. It is doubtful that standards for the storage of toxic chemicals would be less rigid than for these other substances. Such a rough factor could be applied to sheds suspected of holding chemical agent to give an estimated maximum storage capacity. The actual amount of agent stored might be considerably less than this figure.

A major weakness inherent in any attempt to determine the size of the Soviet chemical stockpile is that the ratio of bulk agent to filled munitions is not known. This ratio not only affects the estimated total size of the stockpile, but has serious implications for its military effectiveness.

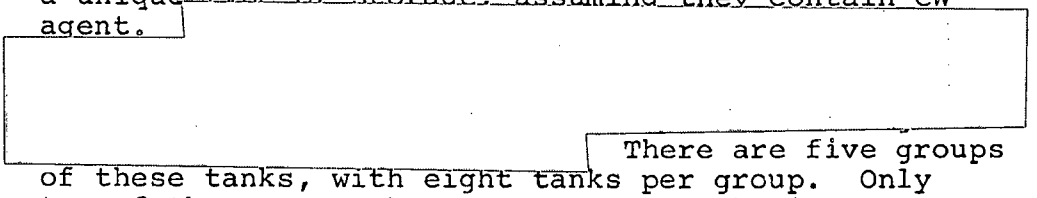
The existence of agent in bulk storage--no matter how large the stockpile--is meaningless unless it can be converted into usable munitions. Severe logistics problems are created by the processes which must be gone through to convert bulk agent into filled munitions. For instance, the conversion of 12,000 tons of agent--approximately half the estimated 30-day requirement (see page 21)--into artillery shells would require filling some 2.5 million shells. Using the most efficient CW munitions filling plant in existence in the US, the process would take 13 months.

If it is assumed that most agent in the USSR is in bulk storage--the most efficient means of storing it--the total amount of agent becomes larger by a factor of about 3 than if stored in filled munitions. If, on the other hand, it is assumed that the Soviet CW stockpile is militarily useful, with most agent in filled munitions, the difficulties of storing such munitions make the result of any calculation of the total stockpile significantly smaller.

Bulk storage may take several forms. It is not known if the Soviets have an equivalent to the US "1-ton" container for CW agents. There is evidence, however, that they have used 200-liter steel drums for the storage of some types of toxic chemicals. Calculations indicate, however, that the amount of agent that could be stored in a given floor area is about the same for both types of containers, and would average about 4.5 tons per 100 square feet of roof area.

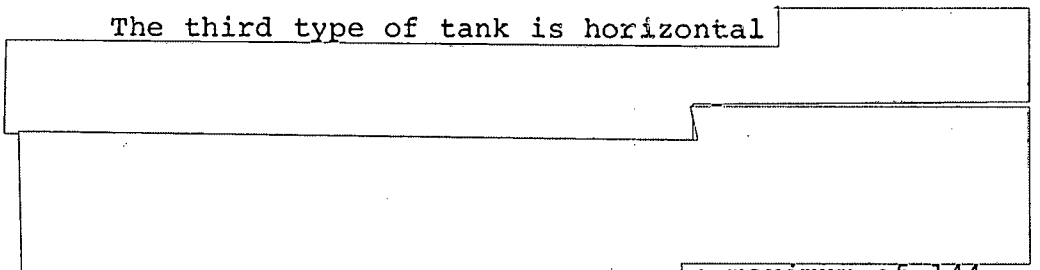


where three types of large tanks represent a unique type of storage, assuming they contain CW agent.



There are five groups of these tanks, with eight tanks per group. Only two of the groups, however, appear to be in use; the rest are overgrown. One tank in one of the "active" groups appears to have its top removed. The capacity of the two active groups is estimated at about 1,300 tons.

The third type of tank is horizontal



a maximum of 144 tanks would be available for storage. The total capacity of these tanks is estimated at about 5,300 tons. If this type of bulk storage were calculated on the basis of tonnage per 100 square feet of roof area, the factor would be 6.3 tons.

An article in the open Soviet literature on the storage of explosives gives several examples of the construction and layout of buildings for various kinds of explosives. Analysis of these buildings

and the materials they were intended to store produced densities of 1.1 to 2.0 tons of explosives per 100 square feet of roof area.

A Soviet article on the construction of facilities for the storage of hazardous pesticides indicates that liquid pesticides are stored at a density of only about 1 ton per 100 square feet of roof area. The example given was, however, for a portion of a storage shed considerably smaller than most sheds thought to be used for the storage of toxic war gases, and the method of storage of the liquid within the building was not described.

US Army chemical storage practices vary with local conditions and requirements. General guidelines call for storage which will permit ready access for inspection of the munitions or containers, and observe normal regulations for the storage of ammunition when loaded munitions are involved. Allowances are made for the configuration of existing storage facilities, and for the use of mechanized loading and unloading equipment when possible. The only limitation on the amount of chemical agent per se stored in a structure is imposed by the total amount of materiel that can be fitted into it, limited by the abovementioned considerations. Figures derived from examples of actual US practice are consistent with Soviet explosives storage densities and with densities calculated from hypothetical storage configurations for various munitions.

The density factors derived by the above methods were combined, with weight given to each factor according to the relevance it was estimated to have to the Soviet stockpile. The resulting averages were 3-3/4 tons of agent per 100 square feet of roof area for bulk storage, and 1-1/3 tons for filled munitions.

Prior to the initiation in 1969 of the program to dispose of outdated agent and munitions, the US Army chemical stockpile was about 30,000 tons. Of this, 57 percent was in bulk storage and 43 percent in filled munitions. As the composition of the Soviet stockpile is unknown, for purposes of this study the factors for storage densities have been ranged from 2/3 bulk and 1/3 filled storage, to 1/3 bulk and 2/3 filled. The resulting composite factor for both types of storage combined ranges from a high of 2.9 tons per 100 square feet of roof area to a low of 2.1 tons.

The application of these factors to the sites now estimated to be involved in CW activity produces the following results:

Probable sites -- 202,000 square feet

4,200 to 5,900 tons

Possible sites -- 552,000 square feet

11,600 to 16,000 tons

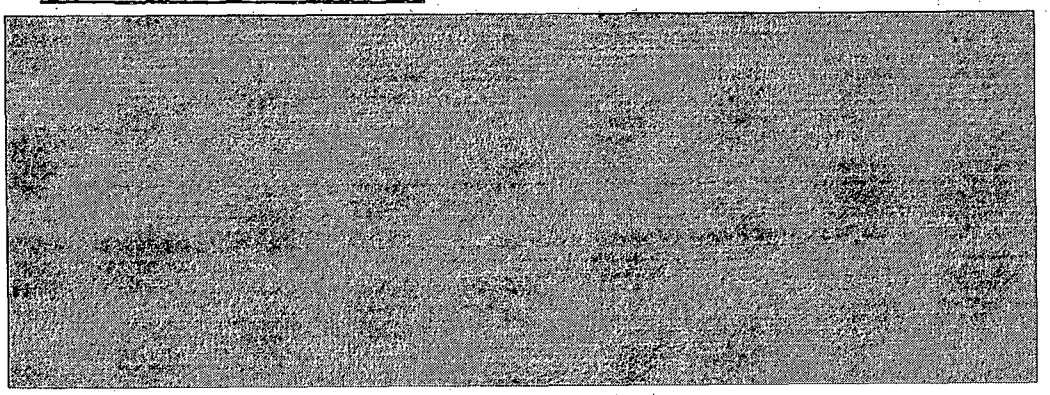
Suspect sites -- 681,000 square feet

14,300 to 19,700 tons

A "best estimate" figure for CW storage has been obtained by combining the *probable* and *possible* sites. This produces totals ranging from 15,800 to 21,900 tons. A figure believed to represent an absolute maximum can be derived by adding the *suspect* sites, producing a range of 30,100 to 41,600 tons of agent. To these figures might be added about 6,600 tons which could be contained in the storage tanks at

[redacted]

Planning Requirements



Several documents, particularly from the early Sixties, indicate an allocation of chemical missiles in exercises of up to 60 percent of the total missiles allocated for the operation. Other planning documents for large scale operations take no note whatever of chemical weapons, while diverging at great length on techniques and tactics for nuclear weapons.

Some documents, mostly from the early Sixties, indicate a certain number or percentage of chemical missiles allocated to forces for an operation or exercise, while these missiles are never used in the course of the action. One possible reason for such a situation may be found in an Ironbark* document: "...the use of missiles with chemical or conventional filling will have an appropriate effect only if they are used in great quantities...the use of even 10 to 15 missiles with chemical filling in a limited interval of time is beyond the capability not only of an army but also of a front**."

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* *Designates material supplied by Colonel Penkovskiy.*

** *The front is the highest Soviet wartime field headquarters for the joint operational control of general purpose forces. It would consist of about three field armies and a tactical air army plus combat and service support.*

The writer notes several reasons why enough launchers could never simultaneously become available in a given area to deliver a large enough chemical strike. He then says, "...this is precisely the reason that frequently during front exercises the majority of missiles with chemical filling allotted for an operation remain unexpended; and, when they are used, the required reliability of destruction of targets is not attained...." Although the present Soviet tactical missile strike capability is considerably greater than in the early Sixties--when these words were written--[redacted] planning documents of the late Sixties continue to suggest a low level of interest in utilizing chemical warheads.

Several sources mention a desired casualty rate of 60 to 80 percent, whereas current US planning documents call for a casualty rate of [redacted] percent among troops under direct attack and [redacted] percent for the entire theater area. This disparity may be the result of differing views of the utility of chemical weapons. Whereas the Soviets appear to view chemical weapons as a substitute form of ordinary artillery or rocket weaponry, for destroying enemy troops, current US planning strives for a concentration of agent just high enough to force the enemy to don protective clothing and gas masks, thereby reducing his combat efficiency.

Practical considerations, both in the amount of agent required and the availability of delivery systems, would probably force the Soviets to adopt a lower casualty rate in actual operations. Calculations made from US ammunition expenditure tables suggest that under average conditions an increase of five times the amount of agent used against a target will produce only 2-1/2 times the casualties.

In lieu of adequate knowledge of Soviet planning philosophy, US planning for chemical operations can provide an idea of how requirements are computed. A recent US study set forth calculations of CW agent requirements for operations in the central region of NATO. The following assumptions were made: that

the desired effect could be had with an overall casualty rate of [redacted] percent in unprotected troops, that all chemical operations would take place in the 0-30 km zone along the front, that two-thirds of the enemy troops--some 1,000,000 troops--would be in the 30 km zone, that each target would be acquired once a day, and that [redacted] percent of all fires would be chemical.

In any analogy between Soviet and US planning, certain differences in planning philosophy must be taken into account. The US requirement of [redacted] percent casualties must be considered an absolute minimum; a lower rate would probably be virtually ineffective. Soviet planning would probably take into consideration the use of tactical rockets and missiles to a depth greater than 30 km. Thus, the Soviets would probably view their requirements for agent and munitions as higher, if anything, than US requirements.

[redacted]

A requirement of 780 tons per day would imply--assuming a reserve of about 30 days' supply through front level--a stockpile of some 23,400 tons of agent *in filled munitions and readily available to the forces.*

There is no evidence that chemical munitions are stored with the Soviet combat forces; only those storage sites noted in this study show any evidence of holding CW agent or munitions. Of these sites, almost all are located well to the interior of the country or near the Sino-Soviet border.

Thus, without extensive prior preparations, including large movements of agent and toxic munitions and the filling of munitions--all hazardous and time-consuming--it is doubtful that the amount of chemical

weapons available to the forces would be sufficient to support a full scale conflict against NATO. Without a significant increase in ready munitions available, the Soviets would probably not consider their chemical capability significant enough to justify risking the political hazards involved in its use.

Eastern Europe

There is no evidence that chemical weapons or munitions in militarily significant quantities are in Eastern Europe, either under control of the Soviets or the Warsaw Pact forces. such weapons would be supplied to the Warsaw Pact forces by the USSR in the event of an invasion, and that there were no such weapons in Czechoslovakia. Other indicated that CW training in the Pact was defensive in nature only.

There are no confirmed storage sites for CW in Eastern Europe. storage or production at several places, but much of this information is contradictory and none has been confirmed by and there is no evidence of chemical storage at the five Soviet probable nuclear storage facilities near airfields in Eastern Europe.

A recent report suggested that a central CW storage depot under Soviet control was to be established in Czechoslovakia, but this has not been confirmed. unloading 12 "warheads" alleged to be chemical into sheds near in 1967. The description of the warheads left unclear their exact type, and the fact that they were crated and not in special cannisters suggests they may have been 240mm rockets rather than warheads for tactical missiles.

There is evidence that small quantities of older type CW agents are stored with defensive CW equipment at some installations. This agent is used for training and exercises, and is not stored in sufficient quantities for military operations. There have been reports of the production of small quantities of agent for research purposes in Czechoslovakia. [redacted] said that all CW training in Poland was defensive in nature, but that very small quantities of World War II type agent--a few pounds per year--were produced for experimental work.

It is not possible to arrive at definitive answers to the question of CW activity in Eastern Europe with the information presently available. As [redacted] coverage of the installations [redacted] by human sources is obtained, a clearer picture may emerge. A research effort [redacted] might in time provide keys to a better understanding of Soviet practices.